pyHanko

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PyHanko is a tool for signing and stamping PDF files.

CHAPTER

ONE

CLI USER'S GUIDE

This guide offers a high-level overview of pyHanko as a command-line tool.

(Under construction)

If you installed pyHanko using `pip`, you should be able to invoke pyHanko using the `pyhanko` command, like so:

```
pyhanko --help
```

If the `pyhanko` package is on your `PYTHONPATH` buth the `pyhanko` executable isn't on your `PATH` for whatever reason, you can also invoke the CLI through

```
python -m pyhanko --help
```

This guide will adopt the former calling convention.

You can run `pyhanko` in verbose mode by passing the `--verbose` flag before specifying the subcommand to invoke.

```
pyhanko --verbose <subcommand>
```

Note: The CLI portion of pyHanko was implemented using Click. In particular, this means that it comes with a built-in help function, which can be accessed through `pyhanko --help`.

Caution: The pyHanko CLI makes heavy use of Click's subcommand functionality. Due to the way this works, the precise position of a command-line parameter sometimes matters. In general, double-dash options (e.g. `--option`) should appear after the subcommand to which they apply, but before the next one.

Right now, the pyHanko CLI offers two subcommand groups, for *sign* and *stamp*, respectively. Additional configuration options are available in an optional YAML *config file*.

Warning: This guide assumes that pyHanko is installed with all optional dependencies, including those required for PKCS#11 support and image support.

1.1 Signing PDF files

Signing PDF files using pyHanko can be very simple or somewhat complicated, depending on the specific requirements of your use case. PyHanko offers support for both visible and invisible signatures, several baseline PAdES profiles, seed values, and creating signatures using PKCS#11 devices.

1.1.1 Some background on PDF signatures

In order to properly understand the way pyHanko operates, having some background on the way PDF signatures work is useful. The goal of this subsection is to provide a bird's eye view, and covers only the bare minimum. For further details, please refer to the relevant sections of the ISO 32000 standard(s).

A PDF signature is always contained in a signature *field* in the PDF's form structure. Freeware PDF readers that do not have form editing functionality will typically not allow you to manipulate signature fields directly, but might allow you to fill existing form fields with a signature, or create a signature together with its corresponding form field. Using pyHanko, you can both insert new (empty) signature fields, and fill in existing ones.

Separate from the signature field containing it, a signature may or may not have an *appearance* associated with it. Signatures without such an appearance are referred to as *invisible* signatures. Invisible signatures have the advantage of being comparatively simpler to implement and configure, but when a PDF containing an invisible signature is opened in a reader application without signature support, it may not be visually obvious that the PDF file even contains a signature at all.

The signature object itself contains some PDF-specific metadata, such as

- the byte range of the file that it covers;
- the hash function used to compute the document hash to be signed;
- a modification policy that indicates the ways in which the file can still be modified.

The actual cryptographic signature is embedded as a CMS object. General CMS objects are defined in **RFC 5652**, but only a limited subset is meaningful in PDF. When creating a signature, the signer is authenticated using the private key associated with an X.509 certificate, as issued by most common PKI authorities nowadays. The precise way this private key is provisioned is immaterial: it can be read from a file on disk, or the signature can be generated by a hardware token; this has no impact on the structure of the signature object in the file.

In a typical signed PDF file with only one signature, the signed byte range covers the entire document, except for the area containing the actual CMS data of the signature. However, there are a number of legitimate reasons why this may *not* be the case:

- documents containing multiple signatures and/or timestamps;
- signatures that allow further modification, such as form filling or annotation.

Generally speaking, the signer decides what modifications are still permitted after a signature is made[1].

The cryptographically informed reader might ask how it is *at all* possible to modify a file without invalidating the signature. After all, hash functions are supposed to prevent exactly this kind of thing. The answer here lies in the *incremental update* feature of the PDF standard. The specification allows for updating files by appending data to the end of the file, keeping the original bytes in place. These incremental update sections can create and modify existing objects in the file, while still preserving the original version in some form. Such changes are typically opaque to the user that views the file. The byte range attached to the signature ensures that the document hash can still be computed over the original data, and thus the integrity of the signature can still be validated.

However, since incremental updates allow the final rendered document to be modified in essentially arbitrary ways, the onus is on the *validator* to ensure that all such incremental updates made after a signature was created actually

[1] There are some legitimate modifications that cannot be prohibited by any document modification policy, such as the addition of document timestamps and updates to the document security store.

are "legitimate" changes. What precisely constitutes a "legitimate" change depends on the signature's modification policy, but is not rigorously defined in the standard[2]. It goes without saying that this has led to various exploits where PDF readers could be duped into allowing illicit modifications to signed PDF files without raising suspicion. As a consequence of this, some signature validation tools do not even bother to do any such validation, and simply reject *all* signatures in documents that have been modified through incremental updates.

See *Validating PDF signatures* for an overview of pyHanko's signature validation features.

Note: By default, pyHanko uses incremental updates for all operations, regardless of the presence of earlier signatures in the file.

1.1.2 Creating signature fields

Adding new (empty) signature fields is done through the `addfields` subcommand of `pyhanko sign`. The CLI only allows you to specify the page and coordinates of the field, but more advanced properties and metadata can be manipulated through the API.

The syntax of the `addfields` subcommand is as follows:

```
pyhanko sign addfields --field  PAGE/X1,Y1,X2,Y2/NAME input.pdf output.pdf
```

The page numbering starts at 1, and the numbers specify the coordinates of two opposing corners of the bounding box of the signature field. The coordinates are Cartesian, i.e. the y-coordinate increases from bottom to top. Multiple signature fields may be created in one command, by passing the last argument multiple times.

Note: You can specify page numbers "in reverse" by providing a negative number for the `PAGE` entry. With this convention, page `-1` refers to the last page of the document, page `-2` the second-to-last, etc.

Note: Creating empty signature fields ahead of time isn't always necessary. PyHanko's signing functionality can also create them together with a signature, and Adobe Reader offers similar conveniences. As such, this feature is mainly useful to create fields for other people to sign.

1.1.3 Creating simple signatures

All operations relating to digital signatures are performed using the `pyhanko sign` subcommand. The relevant command group for adding signatures is `pyhanko sign addsig`.

Warning: The commands explained in this subsection do not attempt to validate the signer's certificate by default. You'll have to take care of that yourself, either through your PDF reader of choice, or the *validation functionality in pyHanko*.

[2] The author has it on good authority that a rigorous incremental update validation specification is beyond the scope of the PDF standard itself.

Signing a PDF file using key material on disk

There are two ways to sign a PDF file using a key and a certificate stored on disk. The signing is performed in the exact same way in either case, but the format in which the key material is stored differs somewhat.

To sign a file with key material sourced from loose PEM or DER-encoded files, the `pemder` subcommand is used.

```
pyhanko sign addsig --field Sig1 pemder \
    --key key.pem --cert cert.pem input.pdf output.pdf
```

This would create a signature in `input.pdf` in the signature field `Sig1` (which will be created if it doesn't exist), with a private key loaded from `key.pem`, and a corresponding certificate loaded from `cert.pem`. The result is then saved to `output.pdf`. Note that the `--field` parameter is optional if the input file contains a single unfilled signature field.

Note: The `--field` parameter also accepts parameters of the form passed to `addfields`, see *Creating signature fields*.

You will be prompted for a passphrase to unlock the private key, which can be read from another file using `--passfile`.

The same result can be obtained using data from a PKCS#12 file (these usually have a `.pfx` or `.p12` extension) as follows:

```
pyhanko sign addsig --field Sig1 pkcs12 \
    input.pdf output.pdf secrets.pfx
```

By default, these calls create invisible signature fields, but if the field specified using the `--field` parameter exists and has a widget associated with it, a simple default appearance will be generated (see Fig. 1.1).

In many cases, you may want to embed extra certificates (e.g. for intermediate certificate authorities) into your signature, to facilitate validation. This can be accomplished using the `--chain` flag to either subcommand. When using the `pkcs12` subcommand, pyHanko will automatically embed any extra certificates found in the PKCS#12 archive passed in.

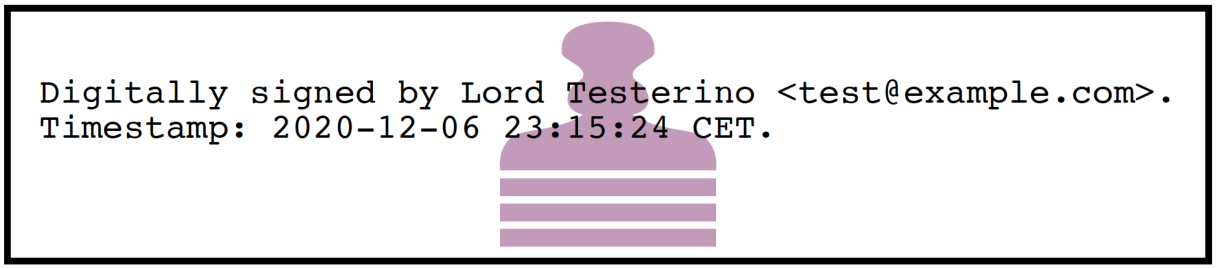
Digitally signed by Lord Testerino <test@example.com>.
Timestamp: 2020-12-06 23:15:24 CET.

Fig. 1.1: The default appearance of a (visible) signature in pyHanko.

Signing a PDF file using a PKCS#11 token

PyHanko also supports creating signatures using PKCS#11 devices. In order to do so, you'll need the following information:

- The path to the PKCS#11 module, which is typically a shared object library (`.so`, `.dll` or `.dylib`, depending on your operating system)
- The label of the PKCS#11 token you're accessing (unless the token selection criteria are specified in the configuration file).
- The PKCS#11 label(s) of the certificate and key you're using, stored in the token. If the key and certificate labels are the same, you can omit the key label.

Most of these settings can be stored in the configuration file as well, see *Named PKCS#11 setups*. In fact, there are quite a few advanced settings that are not exposed as command-line switches, but can be specified in the configuration file. These include selecting tokens by serial number and selecting keys and certificates by ID.

With this information, producing a basic signature isn't very hard:

```
pyhanko sign addsig pkcs11 --lib /path/to/module.so \
    --token-label testrsa --cert-label signer document.pdf output.pdf
```

Have a look at `pyhanko sign addsig pkcs11 --help` for a full list of options.

Signing a PDF file using a Belgian eID card

To sign a PDF file using your eID card, use the `beid` subcommand to `addsig`, with the `--lib` parameter to tell pyHanko where to look for the eID PKCS#11 library.

Note: Of course, you can also use the `pkcs11` subcommand, but `beid` provides an extra layer of convenience.

On Linux, it is named `libbeidpkcs11.so` and can usually be found under `/usr/lib` or `/usr/local/lib`. On macOS, it is named `libbeidpkcs11.dylib`, and can similarly be found under `/usr/local/lib`. The Windows version is typically installed to `C:\Windows\System32` and is called `beidpkcs11.dll`.

On Linux, this boils down to the following:

```
pyhanko sign addsig --field Sig1 beid \
    --lib /path/to/libbeidpkcs11.so input.pdf output.pdf
```

On all platforms, the eID middleware will prompt you to enter your PIN to create the signature.

Warning: This command will produce a non-repudiable signature using the 'Signature' certificate on your eID card (as opposed to the 'Authentication' certificate). These signatures are legally equivalent to a normal "wet" signature wherever they are allowed, so use them with care.

In particular, you should only allow software you trust[3] to use the 'Signature' certificate!

[3] This obviously also applies to pyHanko itself; be aware that pyHanko's *license* doesn't make any fitness-for-purpose guarantees, so making sure you know what you're running is 100% your own responsibility.

Warning: You should also be aware that your national registry number (rijksregisternummer, no. de registre national) is embedded into the metadata of the signature certificate on your eID card[4]. As such, it can also be **read off from any digital signature you create**. While national registry numbers aren't secret per se, they are nevertheless often considered sensitive personal information, so you may want to be careful where you send documents containing your eID signature or that of someone else.

1.1.4 Creating signatures with long lifetimes

Background

A simple PDF signature—or any CMS signature for that matter—is only cryptographically valid insofar as the certificate of the signer is valid. In most common trust models, this means that the signature ceases to be meaningful together with the expiration of the signer certificate, or the latter's revocation.

The principal reason for this is the fact that it is no longer practical to verify whether a certificate was valid at the time of signing, if validation happens after the certificate already expired or was revoked. This, in turn, has to do with the fact that it is not always reasonable for certificate authorities to publicly supply historical validity proofs for all certificates they ever signed at all possible points in time.

Hence, in order for a signature to remain valid long after signing, the signer needs to supply two additional pieces of data:

1. a trusted timestamp signed by a time stamping authority (TSA), to prove the time of signing to the validator;
2. revocation information (relevant CRLs or OCSP responses) for all certificates in the chain of trust of the signer's certificate, and of the TSA.

For both of these, it is crucial that the relevant data is collected at the time of signing and embedded into the signed document. The revocation information in particular can be delicate, since the validator needs to be able to verify the validity of not only the signer's certificate, but also that of all issuers in the chain of trust, the OCSP responder's certificates used to sign the embedded OCSP responses, etc.

Time stamp tokens are commonly obtained from TSA's via the HTTP-based protocol specified in **RFC 3161**.

Within the PDF standard, there are two broad categories of such long-lived signatures.

- Signers can opt to embed revocation information into the CMS data structure of the signature, as a signed attribute.
  - In this case, the revocation info is a signed attribute, protected from tampering by the signer's own signature.
  - This scheme uses Adobe-specific extensions to the CMS standard, which are explicitly defined in the PDF specification, but may not be supported by generic CMS tools that are unaware of PDF.
- Signers can opt to embed revocation information into the Document Security Store (DSS).
  - In this case the revocation info is (a priori) not protected by a signature, although this is often remedied by appending a document time stamp after updating the DSS (see also *Long-term archival (LTA) needs*).
  - The above approach has the convenient side effect that it can be used to 'fix' non-LTV-enabled signatures by embedding the required revocation information after the fact, together with a document timestamp. Obviously, this is predicated on the certificate's still being valid when the revocation information is compiled. This workflow is not guaranteed to be acceptable in all X.509 validation models, but is supported in pyHanko through the `ltvfix` subcommand; see *Adding validation data to an existing signature*.
  - This approach is used in the PAdES baseline profiles B-LT and B-LTA defined by ETSI, and the (mildly modified) versions subsumed into ISO 32000-2 (PDF 2.0). As such, it is not part of ISO 32000-1 'proper'.

[4] The certificate's serial number is in fact equal to the holder's national registry number.

Note: The author generally prefers the DSS-based signature profiles over the legacy approach based on CMS attributes, but both are supported in pyHanko.

Timestamps in pyHanko

Embedding a timestamp token into a signature using pyHanko is as simple as passing the `--timestamp-url` parameter to `addsig`. The URL should resolve to an endpoint that responds to the HTTP-based protocol described in **RFC 3161**.

```
pyhanko sign addsig --field Sig1 --timestamp-url http://tsa.example.com \
    pemder --key key.pem --cert cert.pem input.pdf output.pdf
```

Warning: In the CLI, only public time stamping servers are supported right now (i.e. those that do not require authentication). The API is more flexible.

Embedding revocation info with pyHanko

In order to embed validation info, use the `--with-validation-info` flag to the `addsig` command.

```
pyhanko sign addsig --field Sig1 --timestamp-url http://tsa.example.com \
    --with-validation-info --use-pades pemder \
    --key key.pem --cert cert.pem input.pdf output.pdf
```

This will validate the signer's signature, and embed the necessary revocation information into the signature. The resulting signature complies with the PAdES B-LT baseline profile. If you want to embed the revocation data into the CMS object instead of the document security store (see above), leave off the `--use-pades` flag.

Using the `--trust`, `--trust-replace` and `--other-certs` parameters, it is possible to fine tune the validation context that will be used to embed the validation data. You can also predefine validation contexts in the configuration file, and select them using the `--validation-context` parameter. See *Named validation contexts* for further information.

Warning: By default, pyHanko requires signer certificates to have the non-repudiation key usage extension bit set on signer certificates. If this is not suitable for your use case, take a look at *Key usage settings*.

Long-term archival (LTA) needs

The observant reader may have noticed that embedding revocation information together with a timestamp merely _shifts_ the validation problem: what if the TSA certificate used to sign the timestamp token is already expired by the time we try to validate the signature?

The PAdES B-LTA scheme provides a solution for this issue: by appending a new document timestamp whenever the most recent one comes close to expiring, we can produce a chain of timestamps that allows us to ensure the validity of both the signatures and their corresponding revocation data essentially indefinitely.

This does, however, require 'active' maintenance of the document. PyHanko provides for this through the `ltaupdate` subcommand of `pyhanko sign`.

```
pyhanko sign ltaupdate --timestamp-url http://tsa.example.com input.pdf
```

Note that `ltaupdate` modifies files in-place. It is also unnecessary to provide a field name for the new timestamp; the software will automatically generate one using Python's `uuid` module.

Warning: It is important to note that pyHanko only validates the outermost timestamp when performing an LTA update. This means that the "garbage in, garbage out" principle is in effect: if the timestamp chain was already broken elsewhere in the input document, running `ltaupdate` will not detect that, let alone fix it.

Note: The reader may also wonder what happens if the trust anchor that guaranteed the signer's certificate at the time of signing happens to expire. Answering this question is technically beyond the specifications of the PKI system, since root certificates are trusted by fiat, and (by definition) do not have some higher authority backing them to enforce their validity constraints.

Some hold the view that expiration dates on trust anchors should be taken as mere suggestions rather than hard cutoffs. Regardless of the merits of this view in general, for the purposes of point-in-time validation, the only sensible answer seems to be to leave this judgment call up to the discretion of the validator.

It is also useful to note that some certificate authorities implement key rollover by cross-signing their new roots with their old roots and vice-versa. Provided these cross-signed certificates are available to the validator, these should allow older chains of trust to be validated against the newer roots.

1.1.5 Customising signature appearances

To a limited degree, the appearance of a visible signature made with pyHanko can be customised. You can specify a named style using the `--style-name` parameter to `addsig`:

```
pyhanko sign addsig --field Sig1 --style-name mystyle pemder \
    --key key.pem --cert cert.pem input.pdf output.pdf
```

This assumes that a style named `mystyle` is available in the configuration file. Defining styles works the same way as pyHanko's stamping functionality; see *Stamping PDF files* and *Styles for stamping and signature appearances* for details.

1.2 Validating PDF signatures

1.2.1 Basic use

Validating signatures in a PDF file is done through the `validate` subcommand of `pyhanko sign`.

A simple use case might look like this:

```
pyhanko sign validate --pretty-print document.pdf
```

This will print a human-readable overview of the validity status of the signatures in `document.pdf`. The trust setup can be configured using the *same command-line parameters* and *configuration options* as for creating LTV signatures.

Warning: By default, pyHanko requires signer certificates to have the non-repudiation key usage extension bit set on signer certificates. If this is not suitable for your use case, take a look at *Key usage settings*.

1.2.2 Factors in play when validating a signature

In this subsection, we go over the various factors considered by pyHanko when evaluating the validity of a PDF signature.

Cryptographic integrity

The most fundamental aspect of any digital signature: verify that the bytes of the file covered by the signature produce the correct hash value, and that the signature object is a valid signature of that hash. By 'valid', we mean that the cryptographic signature should be verifiable using the public key in the certificate that is marked as the signer's in the signature object. In other words, we need to check that the *purported* signer's certificate actually produced the signature.

Authenticity: trust settings

Having verified that the signature was produced by the (claimed) signer's certificate, we next have to validate the binding between the certificate and its owner. That is to say, we have to convince ourselves that the entity whose name is on the certificate is in control of the private key, i.e. that the signer is who they claim to be.

Technically, this is done by establishing a *chain of trust* to a trust anchor, which we rely on to judge the validity of cryptographic identity claims. This is where the *trust settings* mentioned above come into play.

Incremental updates: difference analysis

PDF files can be modified, even when signed, by appending data to the end of the previous revision. These are *incremental updates*. In particular, this is how forms with multiple signatures are implemented in PDF. These incremental updates can essentially modify the original document in arbitrary ways, which is a problem, since they are (by definition) not covered by any earlier signatures.

In short, validators have two options: either reject all incremental updates (and decline to support multiple-signer scenarios of any kind), or police incremental updates by itself. The exact way in which this is supposed to be done is not specified precisely in the PDF standard.

Warning: PyHanko attempts to run a difference analysis on incremental updates, and processes modifications on a reject-by-default basis (i.e. all updates that can't be vetted as OK are considered suspect). However, this feature is (very) experimental, and shouldn't be relied on too much.

Establishing the time of signing

There are a number of ways to indicate when a signature was made. These broadly fall into two categories:

- Self-reported timestamps: those are based on the signer's word, and shouldn't necessarily be trusted as accurate.
- Trusted timestamps: these derive from timestamp tokens issued by a trusted timestamping authority at the time of signing.

Especially in the context of long-term verifiability of signatures and preventing things like backdating of documents, having an accurate measure of when the timestamp was made can be of crucial importance. PyHanko will tell you when a signature includes a timestamp token, and validate it along with the signature.

Note: Strictly speaking, a timestamp token only provides proof that the signature existed when the timestamp token was created. The signature itself may have been generated long before that!

If you also need a "lower bound" on the signing time, you might want to look into signed content timestamps (see `cades_signed_attr_spec` and *`timestamp_content`*).

Right now, pyHanko supports these when signing, but does not take them into account in the validation process. They are also not available in the CLI yet.

Evaluating seed value constraints

Finally, the document author can put certain restrictions on future signatures when setting up the form fields. These are known as *seed values* in the PDF standard. Not all seed values represent constraints (some are intended as suggestions), but one especially useful use of them is to earmark signature fields for use by specific signers. When validating signatures, pyHanko will also report on whether (mandatory) seed value constraints were respected.

Warning: Not all digital signing software is capable of processing seed values, so some false positives are to be expected.

Obviously, seed value constraints are only *truly* reliable if the document author secures the document with a certification signature before sending it for signing. Otherwise, later signers can modify the seed values *before* putting their signatures in place. See *here* for other concerns to keep in mind when relying on seed values.

Warning: PyHanko currently does *not* offer validation of structural PAdES profile requirements, in the sense that it can't tell you if a signature complies with all the provisions required by a particular PAdES profile. Note that these are requirements on the signature itself, and have no bearing on possible later modifications to the document.

Adding validation data to an existing signature

Sometimes, the validation data on a signature that was meant to have a long lifetime can be incomplete. This can have many causes, ranging from implementation problems to simple, temporary network issues.

To remedy this problem, pyHanko can fetch and append current validation information through the `ltvfix` command.

```
pyhanko sign ltvfix --field Sig1 document.pdf
```

The `ltvfix` command supports the same arguments as `validate` to select a validation context and specify trust settings.

Warning: By default, pyHanko's point-in-time validation requires OCSP responses and CRLs to be valid at the time of signing. This is often problematic when revocation information is added after the fact.

To emulate the default behaviour of Acrobat and other PDF viewers, use the `--retroactive-revinfo` switch when validating. This will cause pyHanko to treat CRLs and OCSP responses as valid infinitely far back into the past.

Note: This *will* cause incorrect behaviour when validating signatures backed by CAs that make use of certificate holds, but given that content timestamps (i.e. timestamps proving that a signature was created *after* some given time) aren't accounted for in pyHanko's trust model, this is somewhat unavoidable for the time being.

1.3 Stamping PDF files

Besides signing, pyHanko can also apply its signature appearance styles as stamps to a PDF file. Essentially, this renders a small overlay on top of the existing PDF content, without involving any of the signing logic.

Warning: The usefulness of this feature is currently rather limited, since visual stamp styles are still quite primitive. Additionally, the current version of pyHanko's CLI doesn't make it easy to take advantage of the customisation features available in the API.

The basic syntax of a stamping command is the following:

```
pyhanko stamp --style-name some-style --page 2 input.pdf output.pdf 50 100
```

This will render a stamp in the named style `some-style` at coordinates `(50, 100)` on the second page of `input.pdf`, and write the output to `output.pdf`. For details on how to define named styles, see *Styles for stamping and signature appearances*.

Note: In terms of rendering, there is one important difference between signatures and stamps: stamps added through the CLI are rendered at their "natural" size/aspect ratio, while signature appearances need to fit inside the predefined box of their corresponding form field widget. This may cause unexpected behaviour.

1.4 Configuration options

1.4.1 Config file location

PyHanko reads its configuration from a YAML file. By default, if a file named `pyhanko.yml` exists in the current directory, pyHanko will attempt to read and process it. You can manually specify a configuration file location via the `--config` parameter to `pyhanko`.

Note that a configuration file is usually not required, although some of pyHanko's behaviour cannot be fully customised using command line options. In these cases, the configuration must be sourced from a config file.

1.4.2 Configuration options

Logging options

Under the `logging` key in the configuration file, you can set up the configuration for Python's logging module. Here's an example.

```
logging:
    root-level: ERROR
    root-output: stderr
    by-module:
        pyhanko_certvalidator:
            level: DEBUG
            output: pyhanko_certvalidator.log
        pyhanko.sign:
            level: DEBUG
```

The keys `root-level` and `root-ouput` allow you to set the log level and the output stream (respectively) for the root logger. The default log level is `INFO`, and the default output stream is `stderr`. The keys under `by-module` allow you to specify more granular per-module logging configuration. The `level` key is mandatory in this case.

Note: If `pyhanko` is invoked with `--verbose`, the root logger will have its log level set to `DEBUG`, irrespective of the value specified in the configuration.

Named validation contexts

Validation contexts can be configured under the `validation-contexts` top-level key. The example below defines two validation configs named `default` and `special-setup`, respectively:

```
validation-contexts:
    default:
        other-certs: some-cert.pem.cert
    special-setup:
        trust: customca.pem.cert
        trust-replace: true
        other-certs: some-cert.pem.cert
```

The parameters are the same as those used to define validation contexts in the CLI. This is how they are interpreted:

- `trust`: One or more paths to trust anchor(s) to be used.
- `trust-replace`: Flag indicating whether the `trust` setting should override the system trust (default `false`).
- `other-certs`: One or more paths to other certificate(s) that may be needed to validate an end entity certificate.

The certificates should be specified in DER or PEM-encoded form. Currently, pyHanko can only read trust information from files on disk, not from other sources.

Selecting a named validation context from the CLI can be done using the `--validation-context` parameter. Applied to the example from *here*, this is how it works:

```
pyhanko sign addsig --field Sig1 --timestamp-url http://tsa.example.com \
    --with-validation-info --validation-context special-setup \
    --use-pades pemder --key key.pem --cert cert.pem input.pdf output.pdf
```

In general, you're free to choose whichever names you like. However, if a validation context named `default` exists in the configuration file, it will be used implicitly if `--validation-context` is absent. You can override the name of the default validation context using the `default-validation-context` top-level key, like so:

```
default-validation-context: setup-a
validation-contexts:
    setup-a:
        trust: customca.pem.cert
        trust-replace: true
        other-certs: some-cert.pem.cert
    setup-b:
        trust: customca.pem.cert
        trust-replace: false
```

Time drift tolerance

Changed in version 0.5.0: Allow overriding the global value locally.

By default, pyHanko allows a drift of 10 seconds when comparing times. This value can be overridden in two ways: using the top-level `time-tolerance` configuration option, or by setting `time-tolerance` in a *named validation context*.

Given the example config below, using `setup-a` would set the time drift tolerance to 180 seconds. Since the global `time-tolerance` setting is set to 30 seconds, this value would be used with `setup-b`, or with any trust settings specified on the command line.

```
time-tolerance: 30
validation-contexts:
    setup-a:
        time-tolerance: 180
        trust: customca.pem.cert
        trust-replace: true
        other-certs: some-cert.pem.cert
    setup-b:
        trust: customca.pem.cert
        trust-replace: false
```

Allow revocation information to apply retroactively

New in version 0.5.0.

By default, `pyhanko-certvalidator` applies OCSP and CRL validity windows very strictly. For an OCSP response or a CRL to be considered valid, the validation time must fall within this window. In other words, with the default settings, an OCSP response fetched at some later date does not count for the purposes of establishing the revocation status of a certificate used with an earlier signature. However, pyHanko's conservative default position is often more strict than what's practically useful, so this behaviour can be overridden with a configuration setting (or the `--retroactive-revinfo` command line flag).

In the example config below, `retroactive-revinfo` is set to `true` globally, but to `false` in `setup-a` specifically. In either case, the `--retroactive-revinfo` flag can override this setting.

```
retroactive-revinfo: true
validation-contexts:
    setup-a:
        retroactive-revinfo: false
        trust: customca.pem.cert
        trust-replace: true
        other-certs: some-cert.pem.cert
    setup-b:
        trust: customca.pem.cert
        trust-replace: false
```

Named PKCS#11 setups

New in version 0.7.0.

Since the CLI parameters for signing files with a PKCS#11 token can get quite verbose, you might want to put the parameters in the configuration file. You can declare named PKCS#11 setups under the `pkcs11-setups` top-level key in pyHanko's configuration. Here's a minimal example:

```
pkcs11-setups:
    test-setup:
        module-path: /usr/lib/libsofthsm2.so
        token-criteria:
            label: testrsa
        cert-label: signer
```

If you need to, you can also put the user PIN right in the configuration:

```
pkcs11-setups:
    test-setup:
        module-path: /usr/lib/libsofthsm2.so
        token-criteria:
            label: testrsa
        cert-label: signer
        user-pin: 1234
```

Danger: If you do this, you should obviously take care to keep your configuration file in a safe place.

To use a named PKCS#11 configuration from the command line, invoke pyHanko like this:

```
pyhanko sign addsig pkcs11 --p11-setup test-setup input.pdf output.pdf
```

Named PKCS#11 setups also allow you to access certain advanced features that otherwise aren't available from the CLI directly. Here is an example.

```
pkcs11-setups:
   test-setup:
       module-path: /path/to/module.so
       token-criteria:
           serial: 17aa21784b9f
       cert-id: 1382391af78ac390
       key-id: 1382391af78ac390
```

This configuration will select a token based on the serial number instead of the label, and use PKCS#11 object IDs to select the certificate and the private key. All of these are represented as hex strings.

For a full overview of the parameters you can set on a PKCS#11 configuration, see the API reference documentation for `PKCS11SignatureConfig`.

Note: Using the `--p11-setup` argument to `pkcs11` will cause pyHanko to ignore all other parameters to the `pkcs11` subcommand. In other words, you have to put everything in the configuration.

Named setups for on-disk key material

New in version 0.8.0.

Starting from version 0.8.0, you can also put parameters for on-disk key material into the configuration file in much the same way as for PKCS#11 tokens (see *Named PKCS#11 setups* above). This is done using the `pkcs12-setups` and `pemder-setups` top-level keys, depending on whether the key material is made available as a PKCS#12 file, or as individual PEM/DER-encoded files.

Here are some examples.

```yaml
pkcs12-setups:
    foo:
        pfx-file: path/to/signer.pfx
        other-certs: path/to/more/certs.chain.pem
pemder-setups:
    bar:
        key-file: path/to/signer.key.pem
        cert-file: path/to/signer.cert.pem
        other-certs: path/to/more/certs.chain.pem
```

For non-interactive use, you can also put the passphrase into the configuration file (again, take care to set up your file access permissions correctly).

```yaml
pkcs12-setups:
    foo:
        pfx-file: path/to/signer.pfx
        other-certs: path/to/more/certs.chain.pem
        pfx-passphrase: secret
pemder-setups:
    bar:
        key-file: path/to/signer.key.pem
        cert-file: path/to/signer.cert.pem
        other-certs: path/to/more/certs.chain.pem
        key-passphrase: secret
```

On the command line, you can use these named setups like this:

```
pyhanko sign addsig pkcs12 --p12-setup foo input.pdf output.pdf
pyhanko sign addsig pemder --pemder-setup bar input.pdf output.pdf
```

For a full overview of the parameters you can set in these configuration dictionaries, see the API reference documentation for `PKCS12SignatureConfig` and `PemDerSignatureConfig`.

Key usage settings

New in version 0.5.0.

There are two additional keys that can be added to a named validation context: `signer-key-usage` and `signer-extd-key-usage`. Both either take a string argument, or an array of strings. These define the necessary key usage (resp. extended key usage) extensions that need to be present in signer certificates. For `signer-key-usage`, the possible values are as follows:

- `digital_signature`
- `non_repudiation`

- key_encipherment
- data_encipherment
- key_agreement
- key_cert_sign
- crl_sign
- encipher_only
- decipher_only

We refer to § 4.2.1.3 in **RFC 5280** for an explanation of what these values mean. By default, pyHanko requires signer certificates to have at least the non_repudiation extension, but you may want to change that depending on your requirements.

Values for extended key usage extensions can be specified as human-readable names, or as OIDs. The human-readable names are derived from the names in asn1crypto.x509.KeyPurposeId in asn1crypto. If you need a key usage extension that doesn't appear in the list, you can specify it as a dotted OID value instead. By default, pyHanko does not require any specific extended key usage extensions to be present on the signer's certificate.

This is an example showcasing key usage settings for a validation context named setup-a:

```
validation-contexts:
    setup-a:
        trust: customca.pem.cert
        trust-replace: true
        other-certs: some-cert.pem.cert
        signer-key-usage: ["digital_signature", "non_repudiation"]
        signer-extd-key-usage: ["code_signing", "2.999"]
```

Note: These key usage settings are mainly intended for use with validation, but are also checked when signing with an active validation context.

Styles for stamping and signature appearances

In order to use a style other than the default for a PDF stamp or (visible) signature, you'll have to write some configuration. New styles can be defined under the stamp-styles top-level key. Here are some examples:

```
stamp-styles:
    default:
        type: text
        background: __stamp__
        stamp-text: "Signed by %(signer)s\nTimestamp: %(ts)s"
        text-box-style:
            font: NotoSerif-Regular.otf
    noto-qr:
        type: qr
        background: background.png
        stamp-text: "Signed by %(signer)s\nTimestamp: %(ts)s\n%(url)s"
        text-box-style:
            font: NotoSerif-Regular.otf
            leading: 13
```

To select a named style at runtime, pass the `--style-name` parameter to `addsig` (when signing) or `stamp` (when stamping). As was the case for validation contexts, the style named `default` will be chosen if the `--style-name` parameter is absent. Similarly, the default style's name can be overridden using the `default-stamp-style` top-level key.

Let us now briefly go over the configuration parameters in the above example. All parameters have sane defaults.

- `type`: This can be either `text` or `qr`, for a simple text box or a stamp with a QR code, respectively. The default is `text`. Note that QR stamps require the `--stamp-url` parameter on the command line.
- `background`: Here, you can specify any of the following:
  - a path to a bitmap image;
  - a path to a PDF file (the first page will be used as the stamp background);
  - the special value `__stamp__`, which will render a simplified version of the pyHanko logo in the background of the stamp (using PDF graphics operators directly).

  When using bitmap images, any file format natively supported by Pillow should be OK. If not specified, the stamp will not have a background.
- `stamp-text`: A template string that will be used to render the text inside the stamp's text box. Currently, the following variables can be used:
  - `signer`: the signer's name (only for signatures);
  - `ts`: the time of signing/stamping;
  - `url`: the URL associated with the stamp (only for QR stamps).
- `text-box-style`: With this parameter, you can fine-tune the text box's style parameters. The most important one is `font`, which allows you to specify an OTF font that will be used to render the text. If not specified, pyHanko will use a standard monospaced Courier font. See *`TextBoxStyle`* in the API reference for other customisable parameters.

The parameters used in the example styles shown above are not the only ones. The *dynamic configuration mechanism* used by pyHanko automatically exposes virtually all styling settings that are available to users of the (high-level) library API. For example, to use a stamp style where the text box is shifted to the right, and the background image is displayed on the left with custom margins, you could write something like the following:

```yaml
stamp-styles:
    more-complex-demo:
        type: text
        stamp-text: "Test Test Test\n%(ts)s"
        background: image.png
        background-opacity: 1
        background-layout:
          x-align: left
          margins:
            left: 10
            top: 10
            bottom: 10
        inner-content-layout:
          x-align: right
          margins:
            right: 10
```

These settings are documented in the API reference documentation for *`BaseStampStyle`* and its subclasses.

Note: In general, the following rules apply when working with these "autoconfigurable" classes from within YAML.

- Underscores in field names (at the Python level) can be replaced with hyphens in YAML.
- Some fields will in turn be of an autoconfigurable type, e.g. `background_layout` is a `SimpleBoxLayoutRule`, which can also be configured using a YAML dictionary (as shown in the example above).
- In other cases, custom logic is provided to initialise certain fields, which is then documented on the (overridden) `process_entries()` method of the relevant class.

CHAPTER

TWO

LIBRARY (SDK) USER'S GUIDE

This guide offers a high-level overview of pyHanko as a Python library. For the API reference docs generated from the source, see the *API reference*.

The pyHanko library roughly consists of the following components.

- The *pyhanko.pdf_utils* package, which is essentially a (gutted and heavily modified) fork of PyPDF2, with various additions to support the kind of low-level operations that pyHanko needs to support its various signing and validation workflows.
- The *pyhanko.sign* package, which implements the general signature API supplied by pyHanko.
- The *pyhanko.stamp* module, which implements the signature appearance rendering & stamping functionality.
- The *pyhanko.keys* module with utilities handle key and certificate loading.
- Support subpackages to handle CLI and configuration: `pyhanko.config` and `pyhanko.cli`. These mostly consist of very thin wrappers around library functionality, and shouldn't really be considered public API, except for the parts *used in the plugin system*.

2.1 Reading and writing PDF files

Note: This page only describes the read/write functionality of the *pdf_utils* package. See *The pdf-utils package* for further information.

2.1.1 Reading files

Opening PDF files for reading and writing in pyHanko is easy.

For example, to instantiate a *PdfFileReader* reading from `document.pdf`, it suffices to do the following.

```
from pyhanko.pdf_utils.reader import PdfFileReader

with open('document.pdf', 'rb') as doc:
    r = PdfFileReader(doc)
    # ... do stuff ...
```

In-memory data can be read in a similar way: if `buf` is a `bytes` object containing data from a PDF file, you can use it in a *PdfFileReader* as follows.

```python
from pyhanko.pdf_utils.reader import PdfFileReader
from io import BytesIO

buf = b'<PDF file data goes here>'
doc = BytesIO(buf)
r = PdfFileReader(doc)
# ... do stuff ...
```

2.1.2 Modifying files

If you want to modify a PDF file, use `IncrementalPdfFileWriter`, like so.

```python
from pyhanko.pdf_utils.incremental_writer import IncrementalPdfFileWriter

with open('document.pdf', 'rb+') as doc:
    w = IncrementalPdfFileWriter(doc)
    # ... do stuff ...
    w.write_in_place()
```

Using `write_in_place()` will cause the generated update to be appended to the same stream as the input stream; this is why we open the file with `'rb+'`. If you want the output to be written to a different file or buffer, use `write()` instead. Obviously, opening the input file with `'rb'` is sufficient in this case.

Note: Due to the way PDF signing works, pyHanko's signing API will usually take care of calling `write` or `write_in_place` as appropriate, and do its own processing of the results. In most standard use cases, you probably don't need to worry about explicit writes too much.

Any `IncrementalPdfFileWriter` objects used in a signing operation should be discarded afterwards. If you want to continue appending updates to a signed document, create a new `IncrementalPdfFileWriter` on top of the output.

This should suffice to get you started with pyHanko's signing and validation functionality, but the reader/writer classes can do a lot more. To learn more about the inner workings of the low-level PDF manipulation layer of the library, take a look at *The pdf-utils package* or *the API reference*.

Warning: While the `pyhanko.pdf_utils` module is very powerful in that it allows you to modify objects in the PDF file in essentially arbitrary ways, and with a lot of control over the output, actually using it in this way requires some degree of familiarity with the PDF standard.

As things are now, pyHanko does *not* offer any facilities to help you format documents neatly, or to do any kind of layout work beyond the most basic operations. This may or may not change in the future. In the meantime, you're probably better off using typesetting software or a HTML to PDF converter for your more complex layout needs, and let pyHanko handle the signing step at the end.

2.2 Signature fields

The creation of signature fields—that is to say, *containers* for (future) signatures—is handled by the `pyhanko.sign.fields` module. Depending on your requirements, you may not need to call the functions in this module explicitly; in many simple cases, pyHanko's *signing functionality* takes care of that for you.

However, if you want more control, or you need some of the more advanced functionality (such as seed value support or field locking) that the PDF standard offers, you might want to read on.

2.2.1 General API design

In general terms, a signature field is described by a `SigFieldSpec` object, which is passed to the `append_signature_field()` function for inclusion in a PDF file.

As the name suggests, a `SigFieldSpec` is a specification for a new signature field. These objects are designed to be immutable and stateless. A `SigFieldSpec` object is instantiated by calling `SigFieldSpec()` with the following keyword parameters.

- `sig_field_name`: the field's name. This is the only mandatory parameter; it must not contain any period (`.`) characters.
- `on_page` and `box`: determine the position and page at which the signature field's widget should be put (see *Positioning*).
- `seed_value_dict`: specify the seed value settings for the signature field (see *Seed value settings*).
- `field_mdp_spec` and `doc_mdp_update_value`: specify a template for the modification and field locking policy that the signer should apply (see *Document modification policy settings*).

Hence, to create a signature field specification for an invisible signature field named `Sig1`, and add it to a file `document.pdf`, you would proceed as follows.

```
from pyhanko.sign.fields import SigFieldSpec, append_signature_field
from pyhanko.pdf_utils.incremental_writer import IncrementalPdfFileWriter

with open('document.pdf', 'rb+') as doc:
    w = IncrementalPdfFileWriter(doc)
    append_signature_field(w, SigFieldSpec(sig_field_name="Sig1"))
    w.write_in_place()
```

2.2.2 Positioning

The position of a signature field is essentially only relevant for visible signatures. The following `SigFieldSpec` parameters determine where a signature widget will end up:

- `on_page`: index of the page on which the signature field should appear (default: `0`);
- `box`: bounding box of the signature field, represented as a 4-tuple `(x1, y1, x2, y2)` in Cartesian coordinates (i.e. the vertical axis runs bottom to top).

Caution: In contrast with the CLI, pages are zero-indexed in the API.

2.2.3 Seed value settings

The PDF standard provides a way for document authors to provide so-called "seed values" for signature fields. These instruct the signer about the possible values for certain signature properties and metadata. They can be purely informative, but can also be used to restrict the signer in various ways.

Below is a non-exhaustive list of things that seed values can do.

- Put restrictions on the signer's certificate, including
  - the issuer,
  - the subject's distinguished name,
  - key usage extensions.
- Force the signer to embed a timestamp (together with a suggested time stamping server URL).
- Offer the signer a list of choices to choose from when selecting a reason for signing.
- Instruct the signer to use a particular signature (sub-)handler (e.g. tell the signer to produce PAdES-style signatures).

Most of these recommendations can be marked as mandatory using flags. In this case, they also introduce a validation burden.

Caution: Before deciding whether seed values are right for your use case, please consider the following factors.

1. Seed values are a (relatively) obscure feature of the PDF specification, and not all PDF software offers support for it. Using mandatory seed values is therefore probably only viable in a closed, controlled environment with well-defined document workflows. When using seed values in an advisory manner, you may want to provide alternative hints, perhaps in the form of written instructions in the document, or in the form of other metadata.
2. At this time, pyHanko only supports a subset of the seed value specification in the standard, but this should be resolved in due time. The extent of what is supported is recorded in the API reference for `SigSeedValFlags`.
3. Since incremental updates can modify documents in arbitrary ways, mandatory seed values can only be (reliably) enforced if the author includes a certification signature, to prevent later signers from surreptitiously changing the rules.

   If this is not an option for whatever reason, then you'll have to make sure that the entity validating the signatures is aware of the restrictions the author intended through out-of-band means.
4. Consider whether using signatures with explicitly identified signature policies would be more appropriate (see e.g. **RFC 5126**, § 5.8). Processing signature policies requires more specialised validation tools, but they are standardised much more rigorously than seed values in PDF. In particular, it is the superior choice when working with signatures in an AdES context. However, pyHanko's support for these workflows is currently limited[1].

Seed values for a new signature field are configured through the `seed_value_dict` attribute of `SigFieldSpec`. This attribute takes a `SigSeedValueSpec` object, containing the desired seed value configuration. For a detailed overview of the seed values that can be specified, follow the links to the API reference; we only discuss the most important points below.

The mandatory seed values are indicated by the `flags` attribute, which takes a `SigSeedValFlags` object as its value. This is a subclass of `Flag`, so you can combine different flags using bitwise operations.

[1] Currently, pyHanko doesn't yet support automatic enforcement of signature policies (to the extent that they can be machine-verified in the first place, obviously). This goes for both the signer and the validator. However, you can still *declare* signature policies by extending your favourite `Signer` subclass and adding the relevant signed attributes. Validators that do not support signature policy processing will typically ignore the policy setting altogether.

Restrictions and suggestions pertaining to the signer's certificate deserve special mention, since they're a bit special. These are encoded the `cert` attribute of `SigSeedValueSpec`, in the form of a `SigCertConstraints` object. This class has a `flags` attribute of its own, indicating which of the `SigCertConstraints` are to be enforced. Its value is a `SigCertConstraintFlags` object. In other words, the enforceability of certificate constraints is *not* controlled by the `flags` attribute of `SigSeedValueSpec`, but by the `flags` attribute of the `SigCertConstraints` object inside the `cert` attribute. This mirrors the way in which these restrictions are defined in the PDF specification.

Since this is all rather abstract, let's discuss a concrete example. The code below shows how you might instantiate a signature field specification for a ballot form of sorts, subject to the following requirements.

- Only people with voting rights should be able to sign the ballot. This is enforced by requiring that the certificates be issued by a specific certificate authority.
- The signer can either vote for or against the proposed measure, or abstain. For the sake of the example, let's encode that by one of three possible reasons for signing.
- Since we want to avoid cast ballots being modified after the fact, we require a strong hash function to be used (at least `sha256`).

```
from pyhanko.sign import fields
from pyhanko.keys import load_cert_from_pemder

franchising_ca = load_cert_from_pemder('path/to/certfile')
sv = fields.SigSeedValueSpec(
    reasons=[
        'I vote in favour of the proposed measure',
        'I vote against the proposed measure',
        'I formally abstain from voting on the proposed measure'
    ],
    cert=fields.SigCertConstraints(
        issuers=[franchising_ca],
        flags=fields.SigCertConstraintFlags.ISSUER
    ),
    digest_methods=['sha256', 'sha384', 'sha512'],
    flags=fields.SigSeedValFlags.REASONS | fields.SigSeedValFlags.DIGEST_METHOD
)

sp = fields.SigFieldSpec('BallotSignature', seed_value_dict=sv)
```

Note the use of the bitwise-or operator `|` to combine multiple flags.

2.2.4 Document modification policy settings

Broadly speaking, the PDF specification outlines two ways to specify the degree to which a document may be modified after a signature is applied, *without* these modifications affecting the validity of the signature.

- The **document modification detection policy** (DocMDP) is an integer between one and three, indicating on a document-wide level which classes of modification are permissible. The three levels are defined as follows:
  - level 1: no modifications are allowed;
  - level 2: form filling and signing are allowed;
  - level 3: form filling, signing and commenting are allowed.

  The default value is 2.

- The **field modification detection policy** (FieldMDP), as the name suggests, specifies the form fields that can be modified after signing. FieldMDPs can be inclusive or exclusive, and as such allow fairly granular control.

When creating a signature field, the document author can suggest policies that the signer should apply in the signature object.

Warning: There are a number of caveats that apply to MDP settings in general; see *Some background on PDF signatures*.

Traditionally, the DocMDP settings are exclusive to certification signatures (i.e. the first, specially marked signature included by the document author), but in PDF 2.0 it is possible for approval (counter)signatures to set the DocMDP level to a stricter value than the one already in force—although this uses a setting in the field's locking dictionary rather than an explicit DocMDP dictionary on the signature itself.

In pyHanko, these settings are controlled by the `field_mdp_spec` and `doc_mdp_update_value` parameters of `SigFieldSpec`. The example below specifies a field with instructions for the signer to lock a field called `SomeTextField`, and set the DocMDP value for that signature to `FORM_FILLING` (i.e. level 2). PyHanko will respect these settings when signing, but other software might not.

```
from pyhanko.sign import fields

fields.SigFieldSpec(
    'Sig1', box=(10, 74, 140, 134),
    field_mdp_spec=fields.FieldMDPSpec(
        fields.FieldMDPAction.INCLUDE, fields=['SomeTextField']
    ),
    doc_mdp_update_value=fields.MDPPerm.FORM_FILLING
)
```

The `doc_mdp_update_value` value is more or less self-explanatory, since it's little more than a numerical constant. The value passed to `field_mdp_spec` is an instance of `FieldMDPSpec`. `FieldMDPSpec` objects take two parameters:

- `fields`: The fields that are subject to the policy, which can be specified exclusively or inclusively, depending on the value of `action` (see below).
- `action`: This is an instance of the enum `FieldMDPAction`. The possible values are as follows.
  - `ALL`: all fields should be locked after signing. In this case, the value of the `fields` parameter is irrelevant.
  - `INCLUDE`: all fields specified in `fields` should be locked, while the others remain unlocked (in the absence of other more restrictive policies).
  - `EXCLUDE`: all fields *except* the ones specified in `fields` should be locked.

2.3 Signing functionality

This page describes pyHanko's signing API.

Note: Before continuing, you may want to take a look at the *background on PDF signatures* in the CLI documentation.

2.3.1 General API design

The value entry (/V) of a signature field in a PDF file is given by a PDF dictionary: the "signature object". This signature object in turn contains a /Contents key (a byte string) with a DER-encoded rendition of the CMS object (see **RFC 5652**) containing the actual cryptographic signature. To avoid confusion, the latter will be referred to as the "signature CMS object", and we'll reserve the term "signature object" for the PDF dictionary that is the value of the signature field.

The signature object contains a /ByteRange key outlining the bytes of the document that should be hashed to validate the signature. As a general rule, the hash of the PDF file used in the signature is computed over all bytes in the file, except those under the /Contents key. In particular, the /ByteRange key of the signature object is actually part of the signed data, which implies that the size of the signature CMS object needs to be estimated ahead of time. As we'll see soon, this has some minor implications for the API design (see *this subsection* in particular).

The pyHanko signing API is spread across several modules in the *pyhanko.sign* package. Broadly speaking, it has three aspects:

- *PdfSignatureMetadata* specifies high-level metadata & structural requirements for the signature object and (to a lesser degree) the signature CMS object.
- *Signer* and its subclasses are responsible for the construction of the signature CMS object, but are in principle "PDF-agnostic".
- *PdfSigner* is the "steering" class that invokes the *Signer* on an *IncrementalPdfFileWriter* and takes care of formatting the resulting signature object according to the specifications of a *PdfSignatureMetadata* object.

This summary, while a bit of an oversimplification, provides a decent enough picture of the separation of concerns in the signing API. In particular, the fact that construction of the CMS object is delegated to another class that doesn't need to bother with any of the PDF-specific minutiae makes it relatively easy to support other signing technology (e.g. particular HSMs).

2.3.2 A simple example

Changed in version 0.9.0: New async-first API.

Virtually all parameters of *PdfSignatureMetadata* have sane defaults. The only exception is the one specifying the signature field to contain the signature—this parameter is always mandatory if the number of empty signature fields in the document isn't exactly one.

In simple cases, signing a document can therefore be as easy as this:

```
from pyhanko.sign import signers
from pyhanko.pdf_utils.incremental_writer import IncrementalPdfFileWriter


cms_signer = signers.SimpleSigner.load(
    'path/to/signer/key.pem', 'path/to/signer/cert.pem',
    ca_chain_files=('path/to/relevant/certs.pem',),
    key_passphrase=b'secret'
)

with open('document.pdf', 'rb') as doc:
    w = IncrementalPdfFileWriter(doc)
    out = signers.sign_pdf(
        w, signers.PdfSignatureMetadata(field_name='Signature1'),
        signer=cms_signer,
```

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```
    )

    # do stuff with 'out'
    # ...
```

The *sign_pdf()* function is a thin convenience wrapper around *PdfSigner*'s *sign_pdf()* method, with essentially the same API. The following code is more or less equivalent.

```
from pyhanko.sign import signers
from pyhanko.pdf_utils.incremental_writer import IncrementalPdfFileWriter


cms_signer = signers.SimpleSigner.load(
    'path/to/signer/key.pem', 'path/to/signer/cert.pem',
    ca_chain_files=('path/to/relevant/certs.pem',),
    key_passphrase=b'secret'
)

with open('document.pdf', 'rb') as doc:
    w = IncrementalPdfFileWriter(doc)
    out = signers.PdfSigner(
        signers.PdfSignatureMetadata(field_name='Signature1'),
        signer=cms_signer,
    ).sign_pdf(w)

    # do stuff with 'out'
    # ...
```

The advantages of instantiating the *PdfSigner* object yourself include reusability and more granular control over the signature's appearance.

In the above examples, `out` ends up containing a byte buffer (`io.BytesIO` object) with the signed output. You can control the output stream using the `output` or `in_place` parameters; see the documentation for *sign_pdf()*.

Danger: Any *IncrementalPdfFileWriter* used in the creation of a signature should be discarded afterwards. Further modifications would simply invalidate the signature anyway.

For a full description of the optional parameters, see the API reference documentation for *PdfSignatureMetadata* and *PdfSigner*.

Warning: If there is no signature field with the name specified in the *field_name* parameter of *PdfSignatureMetadata*, pyHanko will (by default) create an invisible signature field to contain the signature. This behaviour can be turned off using the `existing_fields_only` parameter to *sign_pdf()*, or you can supply a custom field spec when initialising the *PdfSigner*.

For more details on signature fields and how to create them, take a look at *Signature fields*.

Note that, from version 0.9.0 onwards, pyHanko can also be called asynchronously. In fact, this is now the preferred mode of invocation for most lower-level functionality. Anyway, the example from this section could have been written asynchronously as follows.

```
import asyncio
from pyhanko.sign import signers
from pyhanko.pdf_utils.incremental_writer import IncrementalPdfFileWriter


async def async_demo(signer, fname):
    with open(fname, 'rb') as doc:
        w = IncrementalPdfFileWriter(doc)
        out = await signers.async_sign_pdf(
            w, signers.PdfSignatureMetadata(field_name='Signature1'),
            signer=signer,
        )

        return out

cms_signer = signers.SimpleSigner.load(
    'path/to/signer/key.pem', 'path/to/signer/cert.pem',
    ca_chain_files=('path/to/relevant/certs.pem',),
    key_passphrase=b'secret'
)
asyncio.run(async_demo(cms_signer, 'document.pdf'))
```

For a signing process with *SimpleSigner* that doesn't perform any certificate validation, pyHanko's move towards a more async-focused API probably doesn't buy you all that much. However, using an asynchronous calling conventions allow for more efficient I/O when the signing code needs to access resources over a network. This typically becomes relevant when

- the cryptographic operations are performed by a remote signing service, or
- revocation info for the chain of trust needs to be embedded.

While you don't strictly *need* to use the new asynchronous APIs to reap all the benefits of this move, there are quite a few scenarios where it makes a lot of sense to do so, especially if your project is already structured around nonblocking/concurrent I/O operations.

2.3.3 Signature appearance generation

See also:

Styles for stamping and signature appearances in the CLI documentation for the CLI equivalent, and *Signature fields* for information on how to create signature fields in general.

When creating visible signatures, you can control the visual appearance to a degree, using different stamp types. This can be done in one of several ways.

Text-based stamps

PyHanko's standard stamp type is the *text stamp*. At its core, a text stamp appearance is simply some text in a box, possibly with interpolated parameters. Text stamps can use TrueType and OpenType fonts (or fall back to a generic monospaced font by default). Additionally, text stamps can also have backgrounds.

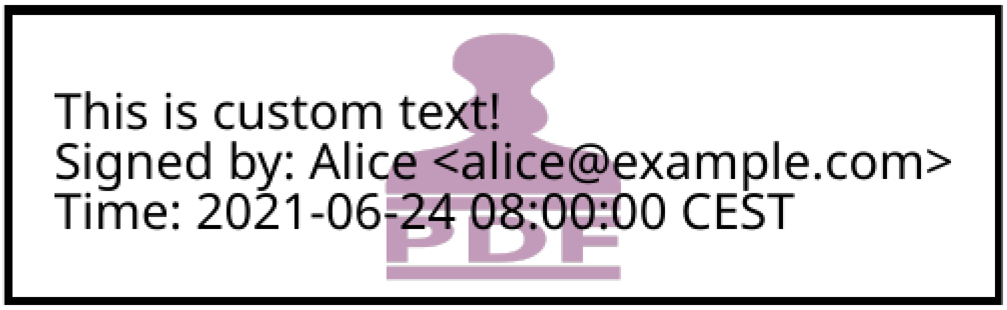
Text stamp styles are (unsurprisingly) described by a *TextStampStyle* object. Here's a code sample demonstrating basic usage, with some custom text using a TrueType font, and a bitmap background.

```python
from pyhanko import stamp
from pyhanko.pdf_utils import text, images
from pyhanko.pdf_utils.font import opentype
from pyhanko.pdf_utils.incremental_writer import IncrementalPdfFileWriter
from pyhanko.sign import fields, signers


signer = signers.SimpleSigner.load(...)
with open('document.pdf', 'rb') as inf:
    w = IncrementalPdfFileWriter(inf)
    fields.append_signature_field(
        w, sig_field_spec=fields.SigFieldSpec(
            'Signature', box=(200, 600, 400, 660)
        )
    )

    meta = signers.PdfSignatureMetadata(field_name='Signature')
    pdf_signer = signers.PdfSigner(
        meta, signer=signer, stamp_style=stamp.TextStampStyle(
            # the 'signer' and 'ts' parameters will be interpolated by pyHanko, if present
            stamp_text='This is custom text!\nSigned by: %(signer)s\nTime: %(ts)s',
            text_box_style=text.TextBoxStyle(
                font=opentype.GlyphAccumulatorFactory('path/to/NotoSans-Regular.ttf')
            ),
            background=images.PdfImage('stamp.png')
        ),
    )
    with open('document-signed.pdf', 'wb') as outf:
        pdf_signer.sign_pdf(w, output=outf)
```

Fig. 2.1 shows what the result might look like. Obviously, the final result will depend on the size of the bounding box, font properties, background size etc.

The layout of a text stamp can be tweaked to some degree, see *TextStampStyle*.

Note: You can define values for your own custom interpolation parameters using the `appearance_text_params` argument to *sign_pdf()*.



This is custom text!
Signed by: Alice <alice@example.com>
Time: 2021-06-24 08:00:00 CEST

Fig. 2.1: A text stamp in Noto Sans Regular with an image background.

QR code stamps

Besides text stamps, pyHanko also supports signature appearances with a QR code embedded in them. Here's a variation of the previous example that leaves out the background, but includes a QR code in the end result.

```
from pyhanko import stamp
from pyhanko.pdf_utils import text
from pyhanko.pdf_utils.font import opentype
from pyhanko.pdf_utils.incremental_writer import IncrementalPdfFileWriter
from pyhanko.sign import fields, signers


signer = signers.SimpleSigner.load(...)
with open('document.pdf', 'rb') as inf:
    w = IncrementalPdfFileWriter(inf)
    fields.append_signature_field(
        w, sig_field_spec=fields.SigFieldSpec(
            'Signature', box=(200, 600, 400, 660)
        )
    )

    meta = signers.PdfSignatureMetadata(field_name='Signature')
    pdf_signer = signers.PdfSigner(
        meta, signer=signer, stamp_style=stamp.QRStampStyle(
            # Let's include the URL in the stamp text as well
            stamp_text='Signed by: %(signer)s\nTime: %(ts)s\nURL: %(url)s',
            text_box_style=text.TextBoxStyle(
                font=opentype.GlyphAccumulatorFactory('path/to/NotoSans-Regular.ttf')
            ),
        ),
    )
    with open('document-signed.pdf', 'wb') as outf:
        # with QR stamps, the 'url' text parameter is special-cased and mandatory, even␣
↪if it
        # doesn't occur in the stamp text: this is because the value of the 'url'␣
↪parameter is
        # also used to render the QR code.
```

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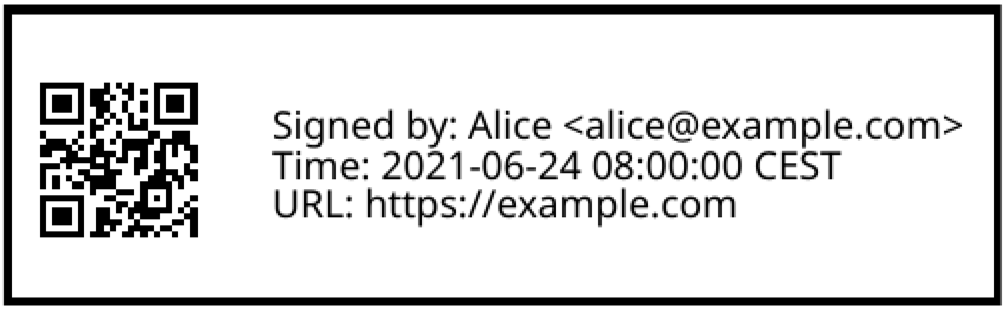
```
        pdf_signer.sign_pdf(
            w, output=outf,
            appearance_text_params={'url': 'https://example.com'}
        )
```

Fig. 2.2 shows some possible output obtained with these settings.



Signed by: Alice <alice@example.com>
Time: 2021-06-24 08:00:00 CEST
URL: https://example.com

Fig. 2.2: A QR stamp in Noto Sans Regular, pointing to https://example.com

Static content stamps

PyHanko is mainly a signing library, and as such, its appearance generation code is fairly primitive. If you want to go beyond pyHanko's default signature appearances, you have the option to import an entire page from an external PDF file to use as the appearance, without anything else overlaid on top. Here's how that works.

```
from pyhanko import stamp
from pyhanko.pdf_utils.incremental_writer import IncrementalPdfFileWriter
from pyhanko.sign import fields, signers


signer = signers.SimpleSigner.load(...)
with open('document.pdf', 'rb') as inf:
    w = IncrementalPdfFileWriter(inf)
    fields.append_signature_field(
        w, sig_field_spec=fields.SigFieldSpec(
            'Signature', box=(200, 600, 400, 660)
        )
    )

    meta = signers.PdfSignatureMetadata(field_name='Signature')
    pdf_signer = signers.PdfSigner(
        meta, signer=signer,
        stamp_style=stamp.StaticStampStyle.from_pdf_file('my-fancy-appearance.pdf')
    )
    with open('document-signed.pdf', 'wb') as outf:
        pdf_signer.sign_pdf(w, output=outf)
```

The result of this snippet with a file from pyHanko's test suite is shown in Fig. 2.3. Essentially, this way of working allows you to use whatever tools you like to generate the signature appearance, and use the result with pyHanko's signing tools. The bounding box of the content is derived from the imported page's `MediaBox` (i.e. the principal page bounding box), so take that into account when designing your own appearances.

Note: The external PDF content is imported "natively": all vector operations will remain vector operations, embedded fonts are copied over, etc. There is no rasterisation involved.

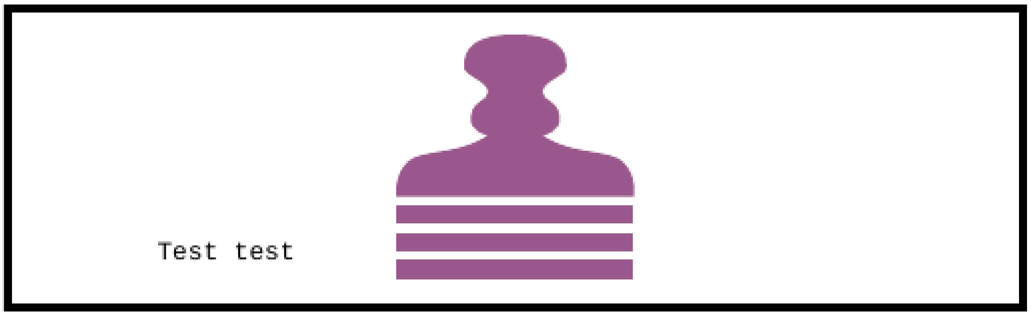


Fig. 2.3: Example of a signature appearance using a stamp imported from an external PDF file.

2.3.4 Timestamp handling

Cryptographic timestamps (specified by **RFC 3161**) play a role in PDF signatures in two different ways.

- They can be used as part of a PDF signature (embedded into the signature CMS object) to establish a (verifiable) record of the time of signing.
- They can also be used in a stand-alone way to provide document timestamps (PDF 2.0).

From a PDF syntax point of view, standalone document timestamps are formally very similar to PDF signatures. PyHanko implements these using the *`timestamp_pdf()`* method of *`PdfTimeStamper`*.

Timestamp tokens (TST) embedded into PDF signatures are arguably the more common occurrence. These function as countersignatures to the signer's signature, proving that a signature existed at a certain point in time. This is a necessary condition for (most) long-term verifiability schemes.

Typically, such timestamp tokens are provided over HTTP, from a trusted time stamping authority (TSA), using the protocol specified in **RFC 3161**. PyHanko provides a client for this protocol; see `HTTPTimeStamper`.

A *`PdfSigner`* can specify a default `TimeStamper` to procure timestamp tokens from some TSA, but sometimes pyHanko can infer a TSA endpoint from the signature field's seed values.

The example from the previous section doesn't need to be modified by a lot to include a trusted timestamp in the signature.

```python
from pyhanko.sign import signers, timestamps
from pyhanko.pdf_utils.incremental_writer import IncrementalPdfFileWriter


cms_signer = signers.SimpleSigner.load(
    'path/to/signer/key.pem', 'path/to/signer/cert.pem',
    ca_chain_files=('path/to/relevant/certs.pem',),
```

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```
    key_passphrase=b'secret'
)

tst_client = timestamps.HTTPTimeStamper('http://example.com/tsa')

with open('document.pdf', 'rb') as doc:
    w = IncrementalPdfFileWriter(doc)
    out = signers.sign_pdf(
        w, signers.PdfSignatureMetadata(field_name='Signature1'),
        signer=cms_signer, timestamper=tst_client
    )

    # do stuff with 'out'
    # ...
```

As a general rule, pyHanko will attempt to obtain a timestamp token whenever a `TimeStamper` is available, but you may sometimes see more TST requests go over the wire than the number of signatures you're creating. This is normal: since the timestamps are to be embedded into the signature CMS object of the signature, pyHanko needs a sample token to estimate the CMS object's size[2]. These "dummy tokens" are cached on the `TimeStamper`, so you can cut down on the number of such unnecessary requests by reusing the same `TimeStamper` for many signatures.

2.3.5 Creating PAdES signatures

Creating signatures conforming to various PAdES baseline profiles is also fairly straightforward using the pyHanko API.

To create a PAdES B-LTA signature, you can follow the template of the example below. This is the most advanced PAdES baseline profile. For other PAdES baseline profiles, tweak the parameters of the `PdfSignatureMetadata` object accordingly.

```
from pyhanko.pdf_utils.incremental_writer import IncrementalPdfFileWriter
from pyhanko.sign import signers, timestamps
from pyhanko.sign.fields import SigSeedSubFilter
from pyhanko_certvalidator import ValidationContext

# Load signer key material from PKCS#12 file
# This assumes that any relevant intermediate certs are also included
# in the PKCS#12 file.
signer = signers.SimpleSigner.load_pkcs12(
    pfx_file='signer.pfx', passphrase=b'secret'
)

# Set up a timestamping client to fetch timestamps tokens
timestamper = timestamps.HTTPTimeStamper(
    url='http://tsa.example.com/timestampService'
)

# Settings for PAdES-LTA
signature_meta = signers.PdfSignatureMetadata(
```

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[2] The size of a timestamp token is difficult to predict ahead of time, since it depends on many unknown factors, including the number & form of the various certificates that might come embedded within them.

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```python
    field_name='Signature', md_algorithm='sha256',
    # Mark the signature as a PAdES signature
    subfilter=SigSeedSubFilter.PADES,
    # We'll also need a validation context
    # to fetch & embed revocation info.
    validation_context=ValidationContext(allow_fetching=True),
    # Embed relevant OCSP responses / CRLs (PAdES-LT)
    embed_validation_info=True,
    # Tell pyHanko to put in an extra DocumentTimeStamp
    # to kick off the PAdES-LTA timestamp chain.
    use_pades_lta=True
)

with open('input.pdf', 'rb') as inf:
    w = IncrementalPdfFileWriter(inf)
    with open('output.pdf', 'wb') as outf:
        signers.sign_pdf(
            w, signature_meta=signature_meta, signer=signer,
            timestamper=timestamper, output=outf
        )
```

Warning: For PAdES profiles requiring revocation information to be gathered, it is crucial that the validation context be set up correctly. Not only do you need to ensure that fetching revocation information is allowed (by passing `allow_fetching=True`), but you should also make sure that all certificates that you intend to use can actually be validated at usage time. If you rely on trust roots that are not in the system trust on your machine, you may need to pass in your own trust roots using the `trust_roots` or `extra_trust_roots` parameters to *ValidationContext*.

2.3.6 Using `aiohttp` for network I/O

New in version 0.9.0.

In version `0.9.0`, pyHanko's lower-level APIs were reworked from an "async-first" perspective. For backwards compatibility reasons, the default implementation pyHanko's network I/O code (for fetching revocation info, timestamps, etc.) still uses the `requests` library with some crude `asyncio` plumbing around it. However, to take maximal advantage of the new `asyncio` facilities, you need to use a networking library that actually supports asynchronous I/O natively. In principle, nothing stops you from plugging in an async-friendly library of your choosing, but pyHanko(and its dependency `pyhanko-certvalidator`) can already be used with `aiohttp` without much additional effort—`aiohttp` is a widely-used library for asynchronous HTTP.

Note: The reason why the `aiohttp` backend isn't the default one is simple: using `aiohttp` requires the caller to manage a connection pool, which was impossible to properly retrofit into pyHanko without causing major breakage in the higher-level APIs as well.

Also note that `aiohttp` is an optional dependency.

Here's an example demonstrating how you could use `aiohttp`-based networking in pyHanko to create a PAdES-B-LTA signature.

```python
import aiohttp
from pyhanko.pdf_utils.incremental_writer import IncrementalPdfFileWriter
from pyhanko.sign import signers
from pyhanko.sign.fields import SigSeedSubFilter
from pyhanko.sign.timestamps.aiohttp_client import AIOHttpTimeStamper
from pyhanko_certvalidator import ValidationContext
from pyhanko_certvalidator.fetchers.aiohttp_fetchers \
    import AIOHttpFetcherBackend

# Load signer key material from PKCS#12 file
# (see earlier examples)
signer = signers.SimpleSigner.load_pkcs12(
    pfx_file='signer.pfx', passphrase=b'secret'
)

# This demo async function takes an aiohttp session, an input
# file name and an output file name.
async def sign_doc_demo(session, input_file, output_file):
    # Use the aiohttp fetcher backend provided by pyhanko-certvalidator,
    # and tell it to use our client session.
    validation_context = ValidationContext(
        fetcher_backend=AIOHttpFetcherBackend(session),
        allow_fetching=True
    )

    # Similarly, we choose an RFC 3161 client implementation
    # that uses AIOHttp under the hood
    timestamper = AIOHttpTimeStamper(
        'http://tsa.example.com/timestampService',
        session=session
    )

    # The signing config is otherwise the same
    settings = signers.PdfSignatureMetadata(
        field_name='AsyncSignatureExample',
        validation_context=validation_context,
        subfilter=SigSeedSubFilter.PADES,
        embed_validation_info=True
    )

    with open(input_file, 'rb') as inf:
        w = IncrementalPdfFileWriter(inf)
        with open(output_file, 'wb') as outf:
            await signers.async_sign_pdf(
                w, settings, signer=signer, timestamper=timestamper,
                output=outf
            )

async def demo():
   # Set up our aiohttp session
   async with aiohttp.ClientSession() as session:
       await sign_doc_demo(session, 'input.pdf', 'output.pdf')
```

Note: Best practices for managing `aiohttp` sessions are beyond the scope of this guide. Have a look at the documentation for more information on how to use the `aiohttp` library effectively.

2.3.7 Extending `Signer`

Changed in version 0.9.0: New async-first API.

Providing detailed guidance on how to implement your own *`Signer`* subclass is beyond the scope of this guide—the implementations of *`SimpleSigner`* and *`PKCS11Signer`* should help. You might also want to take a look at *the AWS KMS example* on the *advanced examples page*. This subsection merely highlights some of the issues you should keep in mind.

First, if all you want to do is implement a signing device or technique that's not supported by pyHanko, it should be sufficient to implement *`async_sign_raw()`*. This method computes the raw cryptographic signature of some data (typically a document hash) with the appropriate key material. It also takes a `dry_run` flag, signifying that the returned object should merely have the correct size, but the content doesn't matter[1].

If your requirements necessitate further modifications to the structure of the CMS object, you'll most likely have to override *`async_sign()`*, which is responsible for the construction of the CMS object itself.

2.3.8 The low-level `PdfCMSEmbedder` API

New in version 0.3.0.

Changed in version 0.7.0: Digest wrapped in *`PreparedByteRangeDigest`* in step 3; `output` returned in step 3 instead of step 4.

If even extending *`Signer`* doesn't cover your use case (e.g. because you want to take the construction of the signature CMS object out of pyHanko's hands entirely), all is not lost. The lowest-level "managed" API offered by pyHanko is the one provided by *`PdfCMSEmbedder`*. This class offers a coroutine-based interface that takes care of all PDF-specific operations, but otherwise gives you full control over what data ends up in the signature object's `/Contents` entry.

Note: *`PdfSigner`* uses *`PdfCMSEmbedder`* under the hood, so you're still mostly using the same code paths with this API.

Danger: Some advanced features aren't available this deep in the API (mainly seed value checking). Additionally, *`PdfCMSEmbedder`* doesn't really do any input validation; you're on your own in that regard. See also *Interrupted signing* for a more middle-of-the-road solution.

Here is an example demonstrating its use, sourced more or less directly from the test suite. For details, take a look at the API docs for *`PdfCMSEmbedder`*.

```python
from datetime import datetime
from pyhanko.sign import signers
from pyhanko.sign.signers import cms_embedder
from pyhanko.pdf_utils.incremental_writer import IncrementalPdfFileWriter
```

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[1] The `dry_run` flag is used in the estimation of the CMS object's size. With key material held in memory it doesn't really matter all that much, but if the signature is provided by a HSM, or requires additional input on the user's end (such as a PIN), you typically don't want to use the "real" signing method in dry-run mode.

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```python
from io import BytesIO

input_buf = BytesIO(b'<input file goes here>')
w = IncrementalPdfFileWriter(input_buf)

# Phase 1: coroutine sets up the form field, and returns a reference
cms_writer = cms_embedder.PdfCMSEmbedder().write_cms(
    field_name='Signature', writer=w
)
sig_field_ref = next(cms_writer)

# just for kicks, let's check
assert sig_field_ref.get_object()['/T'] == 'Signature'

# Phase 2: make a placeholder signature object,
# wrap it up together with the MDP config we want, and send that
# on to cms_writer
timestamp = datetime.now(tz=tzlocal.get_localzone())
sig_obj = signers.SignatureObject(timestamp=timestamp, bytes_reserved=8192)

md_algorithm = 'sha256'
# for demonstration purposes, let's do a certification signature instead
# of a plain old approval signature here
cms_writer.send(
    cms_embedder.SigObjSetup(
        sig_placeholder=sig_obj,
        mdp_setup=cms_embedder.SigMDPSetup(
            md_algorithm=md_algorithm, certify=True,
            docmdp_perms=fields.MDPPerm.NO_CHANGES
        )
    )
)

# Phase 3: write & hash the document (with placeholder)
prep_digest, output = cms_writer.send(
    cms_embedder.SigIOSetup(md_algorithm=md_algorithm, in_place=True)
)
# The `output` variable is a handle to the stream that contains
# the document to be signed, with a placeholder allocated to hold
# the actual signature contents.

# Phase 4: construct the CMS object, and pass it on to cms_writer

# NOTE: I'm using a regular SimpleSigner here, but you can substitute
# whatever CMS supplier you want.

signer: signers.SimpleSigner = FROM_CA
# let's supply the CMS object as a raw bytestring
cms_bytes = signer.sign(
    data_digest=prep_digest.document_digest,
    digest_algorithm=md_algorithm, timestamp=timestamp
```

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```
).dump()
sig_contents = cms_writer.send(cms_bytes)

# The (signed) output document is in `output` now.
# `sig_contents` holds the content of the signature container
# in the PDF file, including any padding.
```

2.3.9 Interrupted signing

New in version 0.7.0.

Changed in version 0.9.0: The new async-first API requires some changes to the workflow at this (relatively low) level of abstraction.

Changed in version 0.14.0: It is no longer mandatory to make the signer's certificate available from the start of the workflow, although this comes at the cost of some convenience (signature size estimation and revocation info collection being two major ones). This makes it easier to implement remote signing scenarios where the signer's certificate is unknown until the remote signing service produces its response.

There are use cases where trying to run the entire signing process in one go isn't feasible. Think of a remote signing scenario with pyHanko running on a server, and calling an external signing service to perform the cryptographic operations, or a case where pyHanko needs to wait for interactive user input to proceed with signing.

In cases like this, there are several points where you can interrupt the signing process partway through, save the state, and pick up where you left off some time later—this conserves valuable resources in some scenarios. We refer to *pyhanko.sign.signers.pdf_signer* for a full overview of what's possible; below, we describe the most common use case: a scenario where pyHanko prepares a document for signing, computes the digest, sends it off to somewhere else for signing, and finishes the signing process once the response comes in (potentially in an entirely different thread).

In the example scenario, we use *ExternalSigner* to format the signed attributes and the final CMS object, but the same principle applies (mutatis mutandis) to remote signers that supply complete CMS objects.

```
from pyhanko.sign import signers, fields, timestamps
from pyhanko.sign.signers.pdf_signer import PdfTBSDocument
from pyhanko_certvalidator import ValidationContext
from pyhanko.pdf_utils.writer import BasePdfFileWriter

# Skeleton code for an interrupted PAdES signature


async def prep_document(w: BasePdfFileWriter):
    vc = ValidationContext(...)
    pdf_signer = signers.PdfSigner(
        signers.PdfSignatureMetadata(
            field_name='SigNew', embed_validation_info=True, use_pades_lta=True,
            subfilter=fields.SigSeedSubFilter.PADES,
            validation_context=vc,
            md_algorithm='sha256'
        ),
        # note: this signer will not perform any cryptographic operations,
        # it's just there to bundle certificates with the generated CMS
        # object and to provide size estimates
        signer=signers.ExternalSigner(
```

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```
            signing_cert=..., ...,
            # placeholder value, appropriate for a 2048-bit RSA key
            # (for example's sake)
            signature_value=bytes(256),
        ),
        timestamper=timestamps.HTTPTimeStamper('http://tsa.example.com')
    )
    prep_digest, tbs_document, output = \
        await pdf_signer.async_digest_doc_for_signing(w)
    md_algorithm = tbs_document.md_algorithm
    psi = tbs_document.post_sign_instructions

    signed_attrs = await ext_signer.signed_attrs(
        prep_digest.document_digest, 'sha256', use_pades=True
    )
    psi = tbs_document.post_sign_instructions
    return prep_digest, signed_attrs, psi, output

# After prep_document finishes, you can serialise the contents
# of prep_digest, signed_attrs and psi somewhere.
# The output stream can also be stored in a temporary file, for example.
# You could now call the remote signing service, and once the response
# comes back, proceed with finish_signing() after deserialising
# all the intermediate outputs from the previous step.

async def finish_signing(sig_value: bytes, prep_digest, signed_attrs,
                         psi, output_handle):
    # Here, assume sig_value is the signed digest of the signed_attrs
    # bytes, obtained from some remote signing service

    # use ExternalSigner to format the CMS given the signed value
    # we obtained from the remote signing service
    ext_signer = instantiate_external_signer(sig_value)
    sig_cms = await ext_signer.async_sign_prescribed_attributes(
        'sha256', signed_attrs=signed_attrs,
        timestamper=DUMMY_HTTP_TS
    )

    validation_context = ValidationContext(...)
    await PdfTBSDocument.async_finish_signing(
        output_handle, prepared_digest=prep_digest,
        signature_cms=sig_cms,
        post_sign_instr=psi,
        validation_context=validation_context
    )
```

The above example below also showcases how to apply proper post-signature processing in an interrupted PAdES signature. This is only necessary for PAdES-LT and PAdES-LTA signatures. In other scenarios, you can replace the `async_finish_signing` call with the following one-liner:

```
prep_digest.fill_with_cms(output_handle, sig_cms)
```

In particular, you don't have to bother with *`PostSignInstructions`* at all.

Note that, starting with pyHanko 0.14.0, the signer's certificate need no longer be provided at the start of the signing process, if you supply some additional parameters yourself. Here's what that might look like in a toy example.

```
w = IncrementalPdfFileWriter(pdf_file_handle)
pdf_signer = signers.PdfSigner(
    # Specifying a digest algorithm (or signature mechanism)
    # is necessary if the signing cert is not available
    signers.PdfSignatureMetadata(
        field_name='Signature',
    ),
    signer=ExternalSigner(
        # note the 'None's
        signing_cert=None, cert_registry=None,
        signature_value=256,
    )
)

# Since estimation is disabled without a certificate
# available, bytes_reserved becomes mandatory.
prep_digest, tbs_document, output = await pdf_signer\
    .async_digest_doc_for_signing(w, bytes_reserved=8192)

# Call the external service
# note: the signing certificate is in the returned payload,
# but we don't (necessarily) need to do anything with it.
signature_container = \
    await call_external_service(prep_digest.document_digest)

# Note: in the meantime, we could've serialised and deserialised
# the contents of 'output', of course
await PdfTBSDocument.async_finish_signing(output, prep_digest)

# If you want, you can now proceed to tack on additional revisions
# with revocation information, document timestamps and the like.
```

2.3.10 Generic data signing

New in version 0.7.0.

Changed in version 0.9.0: New async-first API.

If you need to produce CMS signatures that are not intended to be consumed as traditional PDF signatures (for whatever reason), the *Signer* classes in pyHanko expose a more flexible API that you can use.

The *Signer* class's *async_sign_general_data()* method is a fairly thin wrapper around *async_sign()* that performs some of the bookkeeping operations on the payload being signed. It outputs a CMS object with essentially the same set of attributes that would be expected in a typical PDF signature, but the actual payload can be arbitrary data.

It can take either an IO-type object, or simply a `bytes` payload. For advanced uses (e.g. those requiring a custom-set *contentType*), passing in a `cms.ContentInfo` (or `cms.EncapsulatedContentInfo` object) also works. This has a number of caveats; carefully review the API documentation for *async_sign_general_data()* and section 5.1 of **RFC 5652** first.

The signer can operate in "detached" or "encapsulating" mode. In the former case, the payload being signed is not encoded as part of the resulting CMS object. When in doubt, use detached mode—it's the default.

Here is an example showcasing a typical invocation, combined with a call to *embed_payload_with_cms()* to embed the resulting payload as a signed attachment in a PDF file.

```python
from pyhanko.sign.signers.pdf_cms import SimpleSigner
from pyhanko.sign.signers.functions import embed_payload_with_cms
from pyhanko.pdf_utils import embed, writer

async def demo():
    data = b'Hello world!'
    # instantiate a SimpleSigner
    sgn = SimpleSigner(...)
    # Sign some data
    signature = \
        await sign.async_sign_general_data(data, 'sha256', detached=False)

    # Embed the payload into a PDF file, with the signature
    # object as a related file.
    w = writer.PdfFileWriter()  # fresh writer, for demonstration's sake
    embed_payload_with_cms(
        w, file_spec_string='attachment.txt',
        file_name='attachment.txt',
        payload=embed.EmbeddedFileObject.from_file_data(
            w, data=data, mime_type='text/plain',
        ),
        cms_obj=signature,
        file_spec_kwargs={'description': "Signed attachment test"}
    )
```

Warning: This way of signing attachments is not standard, and chances are that your PDF reader won't process the signature at all. This snippet is simply a demonstration of the general principle behind CMS signing, and doesn't really represent any particular PDF feature.

2.4 Validation functionality

Note: Before reading this, you may want to take a look at *Factors in play when validating a signature* for some background on the validation process.

Danger: In addition to the caveats outlined in *Validating PDF signatures*, you should be aware that the validation API is still very much in flux, and likely to change by the time pyHanko reaches its beta stage.

2.4.1 General API design

PyHanko's validation functionality resides in the validation module. Its most important components are

- the EmbeddedPdfSignature class (responsible for modelling existing signatures in PDF documents);
- the various subclasses of SignatureStatus (encoding the validity status of signatures and timestamps);
- validate_pdf_signature() and validate_pdf_ltv_signature(), for running the actual validation logic.
- the DocumentSecurityStore class and surrounding auxiliary classes (responsible for handling DSS updates in documents).

While you probably won't need to interface with DocumentSecurityStore directly, knowing a little about EmbeddedPdfSignature and SignatureStatus is useful.

2.4.2 Accessing signatures in a document

There is a convenience property on PdfFileReader, aptly named embedded_signatures. This property produces an array of EmbeddedPdfSignature objects, in the order that they were applied to the document. The result is cached on the reader object.

These objects can be used to inspect the signature manually, if necessary, but they are mainly intended to be used as input for validate_pdf_signature() and validate_pdf_ltv_signature().

2.4.3 Validating a PDF signature

All validation in pyHanko is done with respect to a certain *validation context* (an object of type pyhanko_certvalidator.ValidationContext). This object tells pyHanko what the trusted certificates are, and transparently provides mechanisms to request and keep track of revocation data. For LTV validation purposes, a ValidationContext can also specify a point in time at which the validation should be carried out.

Warning: PyHanko currently uses a forked version of the certvalidator library, registered as pyhanko-certvalidator on PyPI. The changes in the forked version are minor, and the API is intended to be backwards-compatible with the "mainline" version.

The principal purpose of the ValidationContext is to let the user explicitly specify their own trust settings. However, it may be necessary to juggle several *different* validation contexts over the course of a validation operation. For example, when performing LTV validation, pyHanko will first validate the signature's timestamp against the user-specified validation context, and then build a new validation context relative to the signing time specified in the timestamp.

Here's a simple example to illustrate the process of validating a PDF signature w.r.t. a specific trust root.

```python
from pyhanko.keys import load_cert_from_pemder
from pyhanko_certvalidator import ValidationContext
from pyhanko.pdf_utils.reader import PdfFileReader
from pyhanko.sign.validation import validate_pdf_signature

root_cert = load_cert_from_pemder('path/to/certfile')
vc = ValidationContext(trust_roots=[root_cert])

with open('document.pdf', 'rb') as doc:
    r = PdfFileReader(doc)
    sig = r.embedded_signatures[0]
```

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```
    status = validate_pdf_signature(sig, vc)
    print(status.pretty_print_details())
```

2.4.4 Long-term verifiability checking

As explained *here* and *here* in the CLI documentation, making sure that PDF signatures remain verifiable over long time scales requires special care. Signatures that have this property are often called "LTV enabled", where LTV is short for *long-term verifiable*.

To verify a LTV-enabled signature, you should use `validate_pdf_ltv_signature()` instead of `validate_pdf_signature()`. The API is essentially the same, but `validate_pdf_ltv_signature()` takes a required `validation_type` parameter. The `validation_type` is an instance of the enum `pyhanko.sign.validation.RevocationInfoValidationType` that tells pyHanko where to find and how to process the revocation data for the signature(s) involved[1]. See the documentation for `pyhanko.sign.validation.RevocationInfoValidationType` for more information on the available profiles.

In the initial `ValidationContext` passed to `validate_pdf_ltv_signature()` via `bootstrap_validation_context`, you typically want to leave `moment` unset (i.e. verify the signature at the current time).

This is the validation context that will be used to establish the time of signing. When this step is done, pyHanko will construct a new validation context pointed towards that point in time. You can specify keyword arguments to the `ValidationContext` constructor using the `validation_context_kwargs` parameter of `validate_pdf_ltv_signature()`. In typical situations, you can leave the `bootstrap_validation_context` parameter off entirely, and let pyHanko construct an initial validation context using `validation_context_kwargs` as input.

The PAdES B-LTA validation example below should clarify that.

```
from pyhanko.keys import load_cert_from_pemder
from pyhanko.pdf_utils.reader import PdfFileReader
from pyhanko.sign.validation import (
    validate_pdf_ltv_signature, RevocationInfoValidationType
)

root_cert = load_cert_from_pemder('path/to/certfile')

with open('document.pdf', 'rb') as doc:
    r = PdfFileReader(doc)
    sig = r.embedded_signatures[0]
    status = validate_pdf_ltv_signature(
        sig, RevocationInfoValidationType.PADES_LTA,
        validation_context_kwargs={'trust_roots': [root_cert]}
    )
    print(status.pretty_print_details())
```

Notice how, rather than passing a `ValidationContext` object directly, the example code only supplies `validation_context_kwargs`. These keyword arguments will be used both to construct an initial validation context (at the current time), and to construct any subsequent validation contexts for point-of-time validation once the signing time is known.

In the example, the `validation_context_kwargs` parameter ensures that all validation will happen w.r.t. one specific trust root.

[1] Currently, pyHanko can't figure out by itself which LTV strategy is being used, so the caller has to specify it explicitly.

If all this sounds confusing, that's because it is. You may want to take a look at the source of `validate_pdf_ltv_signature()` and its tests, and/or play around a little.

> **Warning:** Even outside the LTV context, pyHanko always distinguishes between validation of the signing time and validation of the signature itself. In fact, `validate_pdf_signature()` reports both (see the docs for `timestamp_validity`).
>
> However, since the LTV adjudication process is entirely moot without a trusted record of the signing time, `validate_pdf_ltv_signature()` will raise a `SignatureValidationError` if the timestamp token (or timestamp chain) fails to validate. Otherwise, `validate_pdf_ltv_signature()` returns a `PdfSignatureStatus` as usual.

2.4.5 Incremental update analysis

Changed in version 0.2.0: The initial ad-hoc approach was replaced by a more extensible and maintainable rule-based validation system. See `pyhanko.sign.diff_analysis`.

As explained in *the CLI documentation*, the PDF standard has provisions that allow files to be updated by appending so-called "incremental updates". This also works for signed documents, since appending data does not destroy the cryptographic integrity of the signed data.

That being said, since incremental updates can change essentially any aspect of the resulting document, validators need to be careful to evaluate whether these updates were added for a legitimate reason. Examples of such legitimate reasons could include the following:

- adding a second signature,
- adding comments,
- filling in (part of) a form,
- updating document metadata,
- performing cryptographic "bookkeeping work" such as appending fresh document timestamps and/or revocation information to ensure the long-term verifiability of a signature.

Not all of these reasons are necessarily always valid: the signer can tell the validator which modifications they allow to go ahead without invalidating their signature. This can either be done through the "DocMDP" setting (see `MDPPerm`), or for form fields, more granularly using FieldMDP settings (see `FieldMDPSpec`).

That being said, the standard does not specify a concrete procedure for validating any of this. PyHanko takes a reject-by-default approach: the difference analysis tool uses rules to compare document revisions, and judge which object updating operations are legitimate (at a given `MDPPerm` level). Any modifications for which there is no justification invalidate the signature.

The default diff policy is defined in `DEFAULT_DIFF_POLICY`, but you can define your own, either by implementing your own subclass of `DiffPolicy`, or by defining your own rules and passing those to an instance of `StandardDiffPolicy`. `StandardDiffPolicy` takes care of some boilerplate for you, and is the mechanism backing `DEFAULT_DIFF_POLICY`. Explaining precisely how to implement custom diff rules is beyond the scope of this guide, but you can take a look at the source of the `diff_analysis` module for more information.

To actually use a custom diff policy, you can proceed as follows.

```
from pyhanko.keys import load_cert_from_pemder
from pyhanko_certvalidator import ValidationContext
from pyhanko.pdf_utils.reader import PdfFileReader
from pyhanko.sign.validation import validate_pdf_signature
```

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```python
from my_awesome_module import CustomDiffPolicy

root_cert = load_cert_from_pemder('path/to/certfile')
vc = ValidationContext(trust_roots=[root_cert])

with open('document.pdf', 'rb') as doc:
    r = PdfFileReader(doc)
    sig = r.embedded_signatures[0]
    status = validate_pdf_signature(sig, vc, diff_policy=CustomDiffPolicy())
    print(status.pretty_print_details())
```

The `modification_level` and `docmdp_ok` attributes on *`PdfSignatureStatus`* will tell you to what degree the signed file has been modified after signing (according to the diff policy used).

Warning: The most lenient MDP level, *`ANNOTATE`*, is currently not supported by the default diff policy.

Danger: Due to the lack of standardisation when it comes to signature validation, correctly adjudicating incremental updates is inherently somewhat risky and ill-defined, so until pyHanko matures, you probably shouldn't rely on its judgments too heavily.

Should you run into unexpected results, by all means file an issue. All information helps!

If necessary, you can opt to turn off difference analysis altogether. This is sometimes a very reasonable thing to do, e.g. in the following cases:

- you don't trust pyHanko to correctly evaluate the changes;
- the (sometimes rather large) performance cost of doing the diff analysis is not worth the benefits;
- you need validate only one signature, after which the document shouldn't change at all.

In these cases, you might want to rely on the `coverage` property of *`PdfSignatureStatus`* instead. This property describes the degree to which a given signature covers a file, and is much cheaper/easier to compute.

Anyhow, to disable diff analysis completely, it suffices to pass the `skip_diff` parameter to *`validate_pdf_signature()`*.

```python
from pyhanko.keys import load_cert_from_pemder
from pyhanko_certvalidator import ValidationContext
from pyhanko.pdf_utils.reader import PdfFileReader
from pyhanko.sign.validation import validate_pdf_signature

root_cert = load_cert_from_pemder('path/to/certfile')
vc = ValidationContext(trust_roots=[root_cert])

with open('document.pdf', 'rb') as doc:
    r = PdfFileReader(doc)
    sig = r.embedded_signatures[0]
    status = validate_pdf_signature(sig, vc, skip_diff=True)
    print(status.pretty_print_details())
```

2.4.6 Probing different aspects of the validity of a signature

The `PdfSignatureStatus` objects returned by `validate_pdf_signature()` and `validate_pdf_ltv_signature()` provide a fairly granular account of the validity of the signature.

You can print a human-readable validity report by calling `pretty_print_details()`, and if all you're interested in is a yes/no judgment, use the the `bottom_line` property.

Should you ever need to know more, a `PdfSignatureStatus` object also includes information on things like

- the certificates making up the chain of trust,
- the validity of the embedded timestamp token (if present),
- the invasiveness of incremental updates applied after signing,
- seed value constraint compliance.

For more information, take a look at `PdfSignatureStatus` in the API reference.

2.5 The `pdf-utils` package

The `pdf_utils` package is the part of pyHanko that implements the logic for reading & writing PDF files.

2.5.1 Background and future perspectives

The core of the `pdf_utils` package is based on code from PyPDF2. I forked/vendored PyPDF2 because it was the Python PDF library that would be the easiest to adapt to the low-level needs of a digital signing tool like pyHanko.

The "inherited" parts mostly consist of the PDF parsing logic, filter implementations (though they've been heavily rewritten) and RC4 cryptography support. I stripped out most of the functionality that I considered "fluff" for the purposes of designing a DigSig tool, for several reasons:

- When I started working on pyHanko, the PyPDF2 project was all but dead, the codebase largely untested and the internet was rife with complaints about all kinds of bugs. Removing code that I didn't need served primarily as a way to reduce my maintenance burden, and to avoid attaching my name to potential bugs that I wasn't willing to fix myself.
- PyPDF2 included a lot of compatibility logic to deal with Python 2. I never had any interest in supporting Python versions prior to 3.7, so I ditched all that.
- Stripping out unnecessary code left me with greater freedom to deviate from the PyPDF2 API where I considered it necessary to do so.

I may or may not split off the `pdf_utils` package into a fully-fledged Python PDF library at some point, but for now, it merely serves as pyHanko's PDF toolbox. That said, if you need bare-bones access to PDF structures outside pyHanko's digital signing context, you might find some use for it even in its current state.

This page is intended as a companion to the API reference for `pyhanko.pdf_utils`, rather than a detailed standalone guide.

Danger: For the reasons specified above, most of `pyhanko.pdf_utils` should be considered private API.

The internal data model for PDF objects isn't particularly likely to change, but the text handling and layout code is rather primitive and immature, so I'm not willing to commit to freezing that API (yet).

Danger: There are a number of stream encoding schemes (or "filters") that aren't supported (yet), most notably the LZW compression scheme. Additionally, we don't have support for all PNG predictors in the Flate decoder/encoder.

2.5.2 PDF object model

The `pyhanko.pdf_utils.generic` module maps PDF data structures to Python objects. PDF arrays, dictionaries and strings are largely interoperable with their native Python counterparts, and can (usually) be interfaced with in the same manner.

When dealing with indirect references, the package distinguishes between the following two kinds:

- `IndirectObject`: this represents an indirect reference as embedded into another PDF object (e.g. a dictionary value given by an indirect object);
- `Reference`: this class represents an indirect reference by itself, i.e. not as a PDF object.

This distinction is rarely relevant, but the fact that `IndirectObject` inherits from `PdfObject` means that it supports the `container_ref` API, which is meaningless for "bare" `Reference` objects.

As a general rule, use `Reference` whenever you're using indirect objects as keys in a Python dictionary or collecting them into a set, but use `IndirectObject` if you're writing indirect objects into PDF output.

2.5.3 PDF content abstractions

The `pyhanko.pdf_utils.content` module provides a fairly bare-bones abstraction for handling content that "compiles down" to PDF graphics operators, namely the `PdfContent` class. Among other things, it takes care of some of the PDF resource management boilerplate. It also allows you to easily encapsulate content into form XObjects when necessary.

Below, we briefly go over the uses of `PdfContent` within the library itself. These also serve as a template for implementing your own `PdfContent` subclasses.

Images

PyHanko relies on Pillow for image support. In particular, we currently support pretty much all RGB bitmap types that Pillow can handle. Other colour spaces are not (yet) available. Additionally, we currently don't take advantage of PDF's native JPEG support, or some of its more clever image compression techniques.

The `pyhanko.pdf_utils.images` module provides a `PdfContent` subclass (aptly named `pyhanko.pdf_utils.images.PdfImage`) as a convenience.

Text & layout

The layout code in pyHanko is currently very, very primitive, fragile and likely to change significantly going forward. That said, pyHanko can do some basic text box rendering, and is capable of embedding CID-keyed OTF fonts for use with CJK text, for example. Given the (for now) volatile state of the API, I won't document it here, but you can take a look at `pyhanko.pdf_utils.text` and `pyhanko.pdf_utils.font`, or the code in `pyhanko.stamp`.

2.6 Developing CLI plugins

New in version 0.18.0.

Warning: This is an incubating feature. API adjustments are still possible.

Since version `0.18.0`, pyHanko's CLI can load *Signer* implementations from external sources with minimal configuration.

If you develop an integration for a remote signing service or hardware device that isn't already supported by the pyHanko CLI out of the box, you can make your implementation available to CLI users as a separate package. If you set things up the right way, all your users have to do is install it, and pyHanko will automagically detect the plugin.

This page aims to provide you with some pointers to upgrade your *Signer* implementation into a CLI-integrated plugin.

Note: Plugins are only supported on Python 3.8 and up.

2.6.1 General principles

Throughout, we assume that you have a *Signer* implementation that you want to hook into the CLI. This could be an *integration that you developed yourself*, or simply a wrapper around an existing *Signer* to facilitate integration with some third-party service or a particular hardware device. Anything goes.

In order to help you write the necessary glue code to patch things into the CLI, we'll go over the following:

- how to provide the mapping between CLI arguments and instances of your *Signer*;
- how to get access to other parts of the CLI context (e.g. configuration settings);
- how to ensure that the `pyhanko` executable picks up your plugin.

2.6.2 The plugin API

Implementation-wise, all you have to do is implement the *SigningCommandPlugin* interface. This will provide the link between pyHanko's `click`-based CLI and your custom *Signer*.

This is what the basic skeleton looks like.

```
class MySigningCommand(SigningCommandPlugin):
    subcommand_name = 'mysigner'
    help_summary = 'a short line about the plugin'

    def click_options(self) -> List[click.Option]:
        ...

    def create_signer(
        self, context: CLIContext, **kwargs
    ) -> ContextManager[Signer]:
        ...
```

The *subcommand_name* and *help_summary* attributes are self-explanatory: they respectively provide the name and help text for the subcommand to `addsig` that's being added by your plugin.

The `click_options()` method provides the `click` options to your plugin's subcommand. For more details on how to define options see the Click documentation.

As an example, the options for a simplified version of the `pkcs11` subcommand in pyHanko's CLI could've been defined as follows.

```
def click_options(self) -> List[click.Option]:
    return [
        click.Option(
            ('--lib',),
            help='path to PKCS#11 module',
            type=readable_file,
            required=False,
        ),
        click.Option(
            ('--token-label',),
            help='PKCS#11 token label',
            type=str,
            required=False,
        ),
        click.Option(
            ('--cert-label',),
            help='certificate label',
            type=str,
            required=False,
        ),
        click.Option(
            ('--key-label',), help='key label', type=str, required=False
        ),
    ]
```

The core plumbing for your plugin will be supplied in the `create_signer()` method.

Here's a brief rundown of what the arguments mean.

- The `context` parameter supplies the current `CLIContext`, which in particular exposes access to the contents of the config file (if any).
- The remaining keyword arguments are wired through directly from `click`, and will correspond to the options you defined in `click_options()`.

Note that the return type of `create_signer()` is not just a `Signer`, but a context manager wrapping a `Signer`. This allows pyHanko to easily return control to the plugin after signing or when errors are thrown, so that the plugin code can run its own teardown logic.

Warning: The plugin class must have a no-arguments `__init__` method.

2.6.3 Plugin discovery and registration

Using a package entry points

The easiest way to make your plugin discoverable is to package it with a package entry point for pyHanko CLI plugins. The entry point group ID is `pyhanko.cli_plugin.signing`. If you manage your plugin's packaging metadata with `pyproject.toml`, this is all you have to add:

```
[project.entry-points."pyhanko.cli_plugin.signing"]
your_plugin = "some_package.path.to.module:SomePluginClass"
```

With entry points set up, pyHanko will automatically discover your plugin if it's installed (i.e. if `importlib` can find it).

From the configuration file

If you don't want to use packages or can't for some reason, you also have the option to reference them from pyHanko's configuration file, like so:

```
plugins:
    - some_package.path.to.module:SomePluginClass
```

2.7 Advanced examples

2.7.1 A custom `Signer` to use AWS KMS asynchronously

New in version 0.9.0.

This example demonstrates how to use `aioboto3` to set up a custom *`Signer`* implementation that invokes the AWS KMS API to sign documents, and does so in an asynchronous manner.

The example implementation is relatively minimal, but it should be sufficient to get an idea of what's possible. Further information on `aioboto3` is available from the project's GitHub page.

The ideas in this snippet can be combined with other async-native components to set up an asynchronous signing workflow. For example, if you're looking for a way to fetch & embed revocation information asynchronously, have a look at *this section in the signing docs* to learn more about `aiohttp` usage and resource management.

```
import asyncio

import aioboto3

from asn1crypto import x509, algos
from cryptography.hazmat.primitives import hashes

from pyhanko.pdf_utils.incremental_writer import IncrementalPdfFileWriter
from pyhanko.sign import Signer, signers
from pyhanko.sign.general import get_pyca_cryptography_hash, \
    load_cert_from_pemder
from pyhanko_certvalidator.registry import SimpleCertificateStore
```

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```python
class AsyncKMSSigner(Signer):

    def __init__(self, session: aioboto3.session, key_id: str,
                 signing_cert: x509.Certificate,
                 signature_mechanism: algos.SignedDigestAlgorithm,
                 # this can be derived from the above, obviously
                 signature_mechanism_aws_id: str,
                 other_certs=()):
        self.session = session
        self.signing_cert = signing_cert
        self.key_id = key_id
        self.signature_mechanism = signature_mechanism
        self.signature_mechanism_aws_id = signature_mechanism_aws_id
        self.cert_registry = cr = SimpleCertificateStore()
        cr.register_multiple(other_certs)
        super().__init__()

    async def async_sign_raw(self, data: bytes,
                             digest_algorithm: str, dry_run=False) -> bytes:
        if dry_run:
            return bytes(256)

        # Send hash to server instead of raw data
        hash_spec = get_pyca_cryptography_hash(
            self.signature_mechanism.hash_algo
        )
        md = hashes.Hash(hash_spec)
        md.update(data)

        async with self.session.client('kms') as kms_client:
            result = await kms_client.sign(
                KeyId=self.key_id,
                Message=md.finalize(),
                MessageType='DIGEST',
                SigningAlgorithm=self.signature_mechanism_aws_id
            )
            signature = result['Signature']
            assert isinstance(signature, bytes)
            return signature


async def run():

    # Load relevant certificates
    # Note: the AWS KMS does not provide certificates by itself,
    # so the details of how certificates are provisioned are beyond
    # the scope of this example.
    cert = load_cert_from_pemder('path/to/your/signing-cert.pem')
    chain = list(load_certs_from_pemder('path/to/chain.pem'))

    # AWS credentials
    kms_key_id = "KEY_ID_GOES_HERE"
```

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```
    aws_access_key_id = "ACCESS_KEY_GOES_HERE"
    aws_secret_access_key = "SECRET_GOES_HERE"

    # Set up aioboto3 session with provided credentials & region
    session = aioboto3.Session(
        aws_access_key_id=aws_access_key_id,
        aws_secret_access_key=aws_secret_access_key,
        # substitute your region here
        region_name='eu-central-1'
    )

    # Set up our signer
    signer = AsyncKMSSigner(
        session=session, key_id=kms_key_id,
        signing_cert=cert, other_certs=chain,
        # change the signature mechanism according to your key type
        # I'm using an ECDSA key over the NIST-P384 (secp384r1) curve here.
        signature_mechanism=algos.SignedDigestAlgorithm(
            {'algorithm': 'sha384_ecdsa'}
        ),
        signature_mechanism_aws_id='ECDSA_SHA_384'
    )

    with open('input.pdf', 'rb') as inf:
        w = IncrementalPdfFileWriter(inf)
        meta = signers.PdfSignatureMetadata(
            field_name='AWSKMSExampleSig'
        )
        with open('output.pdf', 'wb') as outf:
            await signers.async_sign_pdf(
                w, meta, signer=signer,output=outf
            )


if __name__ == '__main__':
    loop = asyncio.get_event_loop()
    loop.run_until_complete(run())
```

CHAPTER THREE

API REFERENCE

This is the API reference for pyHanko, compiled from the docstrings present in the Python source files. For a more high-level overview, see the *library user guide*. If you are interested in using pyHanko as a command-line application, please refer to the *CLI user guide*.

Warning: Any function, class or method that is *not* covered by this documentation is considered private API by definition.

Until pyHanko goes into beta, *any* part of the API is subject to change without notice, but this applies doubly to the undocumented parts. Tread with caution.

3.1 pyhanko package

3.1.1 Subpackages

pyhanko.config package

Submodules

pyhanko.config.api module

This module contains utilities for allowing dataclasses to be populated by user-provided configuration (e.g. from a Yaml file).

Note: On naming conventions: this module converts hyphens in key names to underscores as a matter of course.

`class pyhanko.config.api.ConfigurableMixin`

Bases: `object`

General configuration mixin for dataclasses

`classmethod process_entries(`*config_dict*`)`

Hook method that can modify the configuration dictionary to overwrite or tweak some of their values (e.g. to convert string parameters into more complex Python objects)

Subclasses that override this method should call `super().process_entries()`, and leave keys that they do not recognise untouched.

Parameters
`config_dict` – A dictionary containing configuration values.

Raises
ConfigurationError – when there is a problem processing a relevant entry.

classmethod check_config_keys(*keys_supplied: Set[str]*)

Check whether all supplied keys are meaningful.

Parameters
`keys_supplied` – The keys supplied in the configuration.

Raises
ConfigurationError – if at least one key does not make sense.

classmethod from_config(*config_dict*)

Attempt to instantiate an object of the class on which it is called, by means of the configuration settings passed in.

First, we check that the keys supplied in the dictionary correspond to data fields on the current class. Then, the dictionary is processed using the *process_entries()* method. The resulting dictionary is passed to the initialiser of the current class as a kwargs dict.

Parameters
`config_dict` – A dictionary containing configuration values.

Returns
An instance of the class on which it is called.

Raises
ConfigurationError – when an unexpected configuration key is encountered or left unfilled, or when there is a problem processing one of the config values.

pyhanko.config.api.**check_config_keys**(*config_name*, *expected_keys*, *supplied_keys*)

pyhanko.config.api.**process_oid**(*asn1crypto_class: Type[ObjectIdentifier]*, *id_string*, *param_name*)

pyhanko.config.api.**process_oids**(*asn1crypto_class: Type[ObjectIdentifier]*, *strings*, *param_name*)

pyhanko.config.api.**process_bit_string_flags**(*asn1crypto_class: Type[BitString]*, *strings*, *param_name*)

pyhanko.config.errors module

exception pyhanko.config.errors.**ConfigurationError**

Bases: `ValueError`

Signal configuration errors.

pyhanko.config.local_keys module

class pyhanko.config.local_keys.**PKCS12SignatureConfig**(*pfx_file: str*, *other_certs: Optional[List[Certificate]] = None*, *pfx_passphrase: Optional[bytes] = None*, *prompt_passphrase: bool = True*, *prefer_pss: bool = False*)

Bases: *ConfigurableMixin*

Configuration for a signature using key material on disk, contained in a PKCS#12 bundle.

pfx_file: str

Path to the PKCS#12 file.

other_certs: Optional[List[Certificate]] = None

Other relevant certificates.

pfx_passphrase: Optional[bytes] = None

PKCS#12 passphrase (if relevant).

prompt_passphrase: bool = True

Prompt for the PKCS#12 passphrase. Default is `True`.

> **Note:** If `key_passphrase` is not `None`, this setting has no effect.

prefer_pss: bool = False

Prefer PSS to PKCS#1 v1.5 padding when creating RSA signatures.

classmethod process_entries(*config_dict*)

Hook method that can modify the configuration dictionary to overwrite or tweak some of their values (e.g. to convert string parameters into more complex Python objects)

Subclasses that override this method should call `super().process_entries()`, and leave keys that they do not recognise untouched.

Parameters

config_dict – A dictionary containing configuration values.

Raises

ConfigurationError – when there is a problem processing a relevant entry.

class pyhanko.config.local_keys.**PemDerSignatureConfig**(*key_file: str, cert_file: str, other_certs: Optional[List[Certificate]] = None, key_passphrase: Optional[bytes] = None, prompt_passphrase: bool = True, prefer_pss: bool = False*)

Bases: *ConfigurableMixin*

Configuration for a signature using PEM or DER-encoded key material on disk.

key_file: str

Signer’s private key.

cert_file: str

Signer’s certificate.

other_certs: Optional[List[Certificate]] = None

Other relevant certificates.

key_passphrase: Optional[bytes] = None

Signer’s key passphrase (if relevant).

prompt_passphrase: bool = True

Prompt for the key passphrase. Default is `True`.

> **Note:** If *key_passphrase* is not `None`, this setting has no effect.

prefer_pss: bool = False

Prefer PSS to PKCS#1 v1.5 padding when creating RSA signatures.

classmethod process_entries(*config_dict*)

Hook method that can modify the configuration dictionary to overwrite or tweak some of their values (e.g. to convert string parameters into more complex Python objects)

Subclasses that override this method should call `super().process_entries()`, and leave keys that they do not recognise untouched.

Parameters
`config_dict` – A dictionary containing configuration values.

Raises
ConfigurationError – when there is a problem processing a relevant entry.

pyhanko.config.logging module

class pyhanko.config.logging.**StdLogOutput**(*value*)

Bases: `Enum`

An enumeration.

STDERR = 1

STDOUT = 2

class pyhanko.config.logging.**LogConfig**(*level: Union[int, str]*, *output: Union[pyhanko.config.logging.StdLogOutput, str]*)

Bases: `object`

level: Union[int, str]

Logging level, should be one of the levels defined in the logging module.

output: Union[*StdLogOutput*, str]

Name of the output file, or a standard one.

static parse_output_spec(*spec*) → Union[*StdLogOutput*, str]

pyhanko.config.logging.**parse_logging_config**(*log_config_spec*) → Dict[Optional[str], *LogConfig*]

pyhanko.config.pkcs11 module

class pyhanko.config.pkcs11.**TokenCriteria**(*label: Optional[str] = None*, *serial: Optional[bytes] = None*)

Bases: *ConfigurableMixin*

New in version 0.14.0.

Search criteria for a PKCS#11 token.

label: Optional[str] = None

Label of the token to use. If `None`, there is no constraint.

serial: Optional[bytes] = None

Serial number of the token to use. If `None`, there is no constraint.

classmethod process_entries(*config_dict*)

Hook method that can modify the configuration dictionary to overwrite or tweak some of their values (e.g. to convert string parameters into more complex Python objects)

Subclasses that override this method should call `super().process_entries()`, and leave keys that they do not recognise untouched.

Parameters
`config_dict` – A dictionary containing configuration values.

Raises
ConfigurationError – when there is a problem processing a relevant entry.

class pyhanko.config.pkcs11.**PKCS11PinEntryMode**(*value*)

Bases: `Enum`

Pin entry behaviour if the user PIN is not supplied as part of the config.

PROMPT = 1

Prompt for a PIN (the default).

Note: This value is only processed by the CLI, and ignored when the PKCS#11 signer is called from library code. In those cases, the default is effectively *SKIP*.

DEFER = 2

Let the PKCS #11 module handle its own authentication during login.

Note: This applies to some devices that have physical PIN pads, for example.

SKIP = 3

Skip the login process altogether.

Note: This applies to some devices that manage user authentication outside the scope of PKCS #11 entirely.

static parse_mode_setting(*value: Any*) → *PKCS11PinEntryMode*

class pyhanko.config.pkcs11.**PKCS11SignatureConfig**(*module_path: str, cert_label: Optional[str] = None, cert_id: Optional[bytes] = None, signing_certificate: Optional[Certificate] = None, token_criteria: Optional[TokenCriteria] = None, other_certs: Optional[List[Certificate]] = None, key_label: Optional[str] = None, key_id: Optional[bytes] = None, slot_no: Optional[int] = None, user_pin: Optional[str] = None, prompt_pin: PKCS11PinEntryMode = PKCS11PinEntryMode.PROMPT, other_certs_to_pull: Optional[Iterable[str]] = (), bulk_fetch: bool = True, prefer_pss: bool = False, raw_mechanism: bool = False*)

Bases: `ConfigurableMixin`

Configuration for a PKCS#11 signature.

This class is used to load PKCS#11 setup information from YAML configuration.

module_path: str
Path to the PKCS#11 module shared object.

cert_label: Optional[str] = None
PKCS#11 label of the signer's certificate.

cert_id: Optional[bytes] = None
PKCS#11 ID of the signer's certificate.

signing_certificate: Optional[Certificate] = None
The signer's certificate. If present, *cert_id* and *cert_label* will not be used to obtain the signer's certificate from the PKCS#11 token.

Note: This can be useful in case the signer's certificate is not available on the token, or if you would like to present a different certificate than the one provided on the token.

token_criteria: Optional[*TokenCriteria*] = None
PKCS#11 token name

other_certs: Optional[List[Certificate]] = None
Other relevant certificates.

key_label: Optional[str] = None
PKCS#11 label of the signer's private key. Defaults to *cert_label* if the latter is specified and *key_id* is not.

key_id: Optional[bytes] = None
PKCS#11 key ID.

slot_no: Optional[int] = None
Slot number of the PKCS#11 slot to use.

user_pin: Optional[str] = None
The user's PIN. If unspecified, the user will be prompted for a PIN if *prompt_pin* is `True`.

Warning: Some PKCS#11 tokens do not allow the PIN code to be communicated in this way, but manage their own authentication instead (the Belgian eID middleware is one such example). For such tokens, leave this setting set to `None` and additionally set *prompt_pin* to `False`.

prompt_pin: *PKCS11PinEntryMode* = 1
Set PIN entry and PKCS #11 login behaviour.

Note: If *user_pin* is not `None`, this setting has no effect.

other_certs_to_pull: Optional[Iterable[str]] = ()
List labels of other certificates to pull from the PKCS#11 device. Defaults to the empty tuple. If `None`, pull *all* certificates.

bulk_fetch: bool = True
Boolean indicating the fetching strategy. If `True`, fetch all certs and filter the unneeded ones. If `False`, fetch the requested certs one by one. Default value is `True`, unless `other_certs_to_pull` has one or fewer elements, in which case it is always treated as `False`.

`prefer_pss: bool = False`

Prefer PSS to PKCS#1 v1.5 padding when creating RSA signatures.

`raw_mechanism: bool = False`

Invoke the raw variant of the PKCS#11 signing operation.

Note: This is currently only supported for ECDSA signatures.

`classmethod check_config_keys`(*keys_supplied: Set[str]*)

Check whether all supplied keys are meaningful.

Parameters
`keys_supplied` – The keys supplied in the configuration.

Raises
`ConfigurationError` – if at least one key does not make sense.

`classmethod process_entries`(*config_dict*)

Hook method that can modify the configuration dictionary to overwrite or tweak some of their values (e.g. to convert string parameters into more complex Python objects)

Subclasses that override this method should call `super().process_entries()`, and leave keys that they do not recognise untouched.

Parameters
`config_dict` – A dictionary containing configuration values.

Raises
`ConfigurationError` – when there is a problem processing a relevant entry.

pyhanko.config.trust module

`pyhanko.config.trust.init_validation_context_kwargs`(**, trust: Union[Iterable[str], str], trust_replace: bool, other_certs: Union[Iterable[str], str], retroactive_revinfo: bool = False, time_tolerance: Optional[Union[timedelta, int]] = None*) → Dict[str, Any]

`pyhanko.config.trust.parse_trust_config`(*trust_config, time_tolerance, retroactive_revinfo*) → dict

pyhanko.cli package

Submodules

pyhanko.cli.config module

`class pyhanko.cli.config.CLIConfig`(*validation_contexts: Dict[str, dict], stamp_styles: Dict[str, dict], default_validation_context: str, default_stamp_style: str, time_tolerance: timedelta, retroactive_revinfo: bool, raw_config: dict*)

Bases: `object`

CLI configuration settings.

validation_contexts: Dict[str, dict]

Named validation contexts. The values in this dictionary are themselves dictionaries that support the following keys:

- `trust`: path to a root certificate or list of such paths
- `trust-replace`: whether the value of the `trust` setting should replace the system trust, or add to it
- `other-certs`: paths to other relevant certificates that are not trusted by fiat.
- `time-tolerance`: a time drift tolerance setting in seconds
- `retroactive-revinfo`: whether to consider revocation information retroactively valid
- `signer-key-usage-policy`: Signer key usage requirements. See *KeyUsageConstraints*.

There are two settings that are deprecated but still supported for backwards compatibility:

- `signer-key-usage`: Supplanted by `signer-key-usage-policy`
- `signer-extd-key-usage`: Supplanted by `signer-key-usage-policy`

These may eventually be removed.

Callers should not process this information directly, but rely on *get_validation_context()* instead.

stamp_styles: Dict[str, dict]

Named stamp styles. The type of style is selected by the `type` key, which can be either `qr` or `text` (the default is `text`). For other settings values, see :class:.`QRStampStyle` and *TextStampStyle*.

Callers should not process this information directly, but rely on *get_stamp_style()* instead.

default_validation_context: str

The name of the default validation context. The default value for this setting is `default`.

default_stamp_style: str

The name of the default stamp style. The default value for this setting is `default`.

time_tolerance: timedelta

Time drift tolerance (global default).

retroactive_revinfo: bool

Whether to consider revocation information retroactively valid (global default).

raw_config: dict

The raw config data parsed into a Python dictionary.

get_validation_context(*name: Optional[str] = None*, *as_dict: bool = False*)

Retrieve a validation context by name.

Parameters

- **name** – The name of the validation context. If not supplied, the value of *default_validation_context* will be used.
- **as_dict** – If `True` return the settings as a keyword argument dictionary. If `False` (the default), return a *ValidationContext* object.

get_signer_key_usages(*name: Optional[str] = None*) → *KeyUsageConstraints*

Get a set of key usage constraints for a given validation context.

Parameters

name – The name of the validation context. If not supplied, the value of *default_validation_context* will be used.

Returns
A `KeyUsageConstraints` object.

`get_stamp_style`(*name: Optional[str] = None*) → Union[*TextStampStyle*, *QRStampStyle*]

Retrieve a stamp style by name.

Parameters
`name` – The name of the style. If not supplied, the value of `default_stamp_style` will be used.

Returns
A `TextStampStyle` or *QRStampStyle* object.

class `pyhanko.cli.config.`**`CLIRootConfig`**(*config: CLIConfig, log_config: Dict[Optional[str], LogConfig], plugin_endpoints: List[str]*)

Bases: `object`

Config settings that are only relevant tothe CLI root and are not exposed to subcommands and plugins.

`config:` ***`CLIConfig`***

General CLI config.

`log_config: Dict[Optional[str],` ***`LogConfig`*****`]`**

Per-module logging configuration. The keys in this dictionary are module names, the `LogConfig` values define the logging settings.

The `None` key houses the configuration for the root logger, if any.

`plugin_endpoints: List[str]`

List of plugin endpoints to load, of the form `package.module:PluginClass`. See `SigningCommandPlugin`.

The value of this setting is ignored if `--no-plugins` is passed.

Note: This is convenient for importing plugin classes that don't live in installed packages for some reason or another.

Plugins that are part of packages should define their endpoints in the package metadata, which will allow them to be discovered automatically. See the docs for `SigningCommandPlugin` for more information.

`pyhanko.cli.config.`**`parse_cli_config`**(*yaml_str*) → *CLIRootConfig*

`pyhanko.cli.config.`**`process_root_config_settings`**(*config_dict: dict*) → dict

`pyhanko.cli.config.`**`process_config_dict`**(*config_dict: dict*) → dict

pyhanko.cli.plugin_api module

class `pyhanko.cli.plugin_api.`**`SigningCommandPlugin`**

Bases: `ABC`

New in version 0.18.0.

Interface for integrating custom, user-supplied signers into the pyHanko CLI as subcommands of `addsig`.

Implementations are discovered through the `pyhanko.cli_plugin.signing` package entry point. Such entry points can be registered in `pyproject.toml` as follows:

```
[project.entry-points."pyhanko.cli_plugin.signing"]
your_plugin = "some_package.path.to.module:SomePluginClass"
```

Subclasses exposed as entry points are required to have a no-arguments `__init__` method.

Warning: This is an incubating feature. API adjustments are still possible.

Warning: Plugin support requires Python 3.8 or later.

`subcommand_name: ClassVar[str]`

The name of the subcommand for the plugin.

`help_summary: ClassVar[str]`

A short description of the plugin for use in the `--help` output.

`unavailable_message: ClassVar[Optional[str]] = None`

Message to display if the plugin is unavailable.

`click_options``()` → List[Option]

The list of `click` options for your custom command.

`click_extra_arguments``()` → List[Argument]

The list of `click` arguments for your custom command.

`is_available``()` → bool

A hook to determine whether your plugin is available or not (e.g. based on the availability of certain dependencies). This should not depend on the pyHanko configuration, but may query system information in other ways as appropriate.

The default is to always report the plugin as available.

Returns

return `True` if the plugin is available, else `False`

`create_signer``(`*context:* CLIContext, ***kwargs*`)` → AbstractContextManager[*Signer*]

Instantiate a context manager that creates and potentially also implements a deallocator for a *`Signer`* object.

Parameters

- **`context`** – The active *`CLIContext`*.
- **`kwargs`** – All keyword arguments processed by `click` through the CLI, resulting from *`click_options()`* and *`click_extra_arguments()`*.

Returns

A context manager that manages the lifecycle for a *`Signer`*.

`pyhanko.cli.plugin_api.`**`register_signing_plugin`**`(`*cls*`)`

Manually put a plugin into the signing plugin registry.

Parameters

`cls` – A plugin class.

Returns

The same class.

class `pyhanko.cli.plugin_api.`**`CLIContext`**(*sig_settings: Optional[PdfSignatureMetadata] = None*, *config: Optional[CLIConfig] = None*, *existing_fields_only: bool = False*, *timestamp_url: Optional[str] = None*, *stamp_style: Optional[BaseStampStyle] = None*, *stamp_url: Optional[str] = None*, *new_field_spec: Optional[SigFieldSpec] = None*, *prefer_pss: bool = False*, *detach_pem: bool = False*, *lenient: bool = False*)

Bases: `object`

Context object that cobbles together various CLI settings values that were gathered by various subcommands during the lifetime of a CLI invocation, either from configuration or from command line arguments. This object is passed around as a `click` context object.

Not all settings are applicable to all subcommands, so all values are optional.

`sig_settings: Optional[PdfSignatureMetadata] = None`

The settings that will be used to produce a new signature.

`config: Optional[CLIConfig] = None`

Valuse for CLI configuration settings.

`existing_fields_only: bool = False`

Whether signing operations should use existing fields only.

`timestamp_url: Optional[str] = None`

Endpoint URL for the timestamping service to use.

`stamp_style: Optional[BaseStampStyle] = None`

Stamp style to use for generating visual signature appearances, if applicable.

`stamp_url: Optional[str] = None`

For QR stamp styles, defines the URL used to generate the QR code.

`new_field_spec: Optional[SigFieldSpec] = None`

Field spec used to generate new signature fields, if applicable.

`prefer_pss: bool = False`

When working with RSA keys, prefer RSASSA-PSS signing if available.

`detach_pem: bool = False`

When producing detached signature payloads (i.e. non-PDF CMS), save the result in a PEM file instead of in a DER file.

`lenient: bool = False`

Process PDF files in nonstrict mode.

pyhanko.pdf_utils package

Subpackages

pyhanko.pdf_utils.crypt package

Submodules

pyhanko.pdf_utils.crypt.api module

exception pyhanko.pdf_utils.crypt.api.**PdfKeyNotAvailableError**(*msg: str*, **args*)

Bases: *PdfReadError*

class pyhanko.pdf_utils.crypt.api.**AuthStatus**(*value*)

Bases: *OrderedEnum*

Describes the status after an authentication attempt.

FAILED = 0

USER = 1

OWNER = 2

class pyhanko.pdf_utils.crypt.api.**AuthResult**(*status:* AuthStatus, *permission_flags: Optional[int] = None*)

Bases: object

Describes the result of an authentication attempt.

status: *AuthStatus*

Authentication status after the authentication attempt.

permission_flags: Optional[int] = None

Granular permission flags. The precise meaning depends on the security handler.

class pyhanko.pdf_utils.crypt.api.**SecurityHandlerVersion**(*value*)

Bases: VersionEnum

Indicates the security handler's version.

The enum constants are named more or less in accordance with the cryptographic algorithms they permit.

RC4_40 = 1

RC4_LONGER_KEYS = 2

RC4_OR_AES128 = 4

AES256 = 5

OTHER = None

Placeholder value for custom security handlers.

as_pdf_object() → *PdfObject*

classmethod from_number(*value*) → *SecurityHandlerVersion*

check_key_length(*key_length: int*) → int

class pyhanko.pdf_utils.crypt.api.**SecurityHandler**(*version:* SecurityHandlerVersion, *legacy_keylen*, *crypt_filter_config:* CryptFilterConfiguration, *encrypt_metadata=True*, *compat_entries=True*)

Bases: object

Generic PDF security handler interface.

This class contains relatively little actual functionality, except for some common initialisation logic and bookkeeping machinery to register security handler implementations.

Parameters

- **version** – Indicates the version of the security handler to use, as described in the specification. See *SecurityHandlerVersion*.
- **legacy_keylen** – Key length in bytes (only relevant for legacy encryption handlers).
- **crypt_filter_config** – The crypt filter configuration for the security handler, in the form of a *CryptFilterConfiguration* object.

  Note: PyHanko implements legacy security handlers (which, according to the standard, aren't crypt filter-aware) using crypt filters as well, even though they aren't serialised to the output file.

- **encrypt_metadata** – Flag indicating whether document (XMP) metadata is to be encrypted.

  Warning: Currently, PyHanko does not manage metadata streams, so until that changes, it is the responsibility of the API user to mark metadata streams using the */Identity* crypt filter as required.

  Nonetheless, the value of this flag is required in key derivation computations, so the security handler needs to know about it.

- **compat_entries** – Write deprecated but technically unnecessary configuration settings for compatibility with certain implementations.

static register(*cls: Type[*SecurityHandler*]*)

Register a security handler class. Intended to be used as a decorator on subclasses.

See *build()* for further information.

Parameters
cls – A subclass of *SecurityHandler*.

static build(*encrypt_dict:* DictionaryObject) → *SecurityHandler*

Instantiate an appropriate *SecurityHandler* from a PDF document's encryption dictionary.

PyHanko will search the registry for a security handler with a name matching the `/Filter` entry. Failing that, a security handler implementing the protocol designated by the `/SubFilter` entry (see *support_generic_subfilters()*) will be chosen.

Once an appropriate *SecurityHandler* subclass has been selected, pyHanko will invoke the subclass's *instantiate_from_pdf_object()* method with the original encryption dictionary as its argument.

Parameters
encrypt_dict – A PDF encryption dictionary.

Returns

classmethod get_name() → str

Retrieves the name of this security handler.

Returns
The name of this security handler.

extract_credential() → Optional[*SerialisableCredential*]

Extract a serialisable credential for later use, if the security handler supports it. It should allow the security handler to be unlocked with the same access level as the current one.

Returns
A serialisable credential, or `None`.

`classmethod support_generic_subfilters()` → Set[str]

Indicates the generic `/SubFilter` values that this security handler supports.

Returns
A set of generic protocols (indicated in the `/SubFilter` entry of an encryption dictionary) that this *`SecurityHandler`* class implements. Defaults to the empty set.

`classmethod instantiate_from_pdf_object`(*encrypt_dict:* DictionaryObject)

Instantiate an object of this class using a PDF encryption dictionary as input.

Parameters
`encrypt_dict` – A PDF encryption dictionary.

Returns

`is_authenticated()` → bool

Return `True` if the security handler has been successfully authenticated against for document encryption purposes.

The default implementation just attempts to call *`get_file_encryption_key()`* and returns `True` if that doesn't raise an error.

`as_pdf_object()` → *DictionaryObject*

Serialise this security handler to a PDF encryption dictionary.

Returns
A PDF encryption dictionary.

`authenticate`(*credential*, *id1=None*) → *AuthResult*

Authenticate a credential holder with this security handler.

Parameters

- **`credential`** – A credential. The type of the credential is left up to the subclasses.
- **`id1`** – The first part of the document ID of the document being accessed.

Returns
An *`AuthResult`* object indicating the level of access obtained.

`get_string_filter()` → *CryptFilter*

Returns
The crypt filter responsible for decrypting strings for this security handler.

`get_stream_filter`(*name=None*) → *CryptFilter*

Parameters
`name` – Optionally specify a crypt filter by name.

Returns
The default crypt filter responsible for decrypting streams for this security handler, or the crypt filter named `name`, if not `None`.

`get_embedded_file_filter()`

Returns
The crypt filter responsible for decrypting embedded files for this security handler.

get_file_encryption_key() → bytes

Retrieve the global file encryption key (used for streams and/or strings). If there is no such thing, or the key is not available, an error should be raised.

Raises

PdfKeyNotAvailableError – when the key is not available

classmethod read_cf_dictionary(*cfdict: DictionaryObject*, *acts_as_default: bool*) → Optional[*CryptFilter*]

Interpret a crypt filter dictionary for this type of security handler.

Parameters

- **cfdict** – A crypt filter dictionary.
- **acts_as_default** – Indicates whether this filter is intended to be used in `/StrF` or `/StmF`.

Returns

An appropriate *CryptFilter* object, or `None` if the crypt filter uses the `/None` method.

Raises

NotImplementedError – Raised when the crypt filter's `/CFM` entry indicates an unknown crypt filter method.

classmethod process_crypt_filters(*encrypt_dict: DictionaryObject*) → Optional[*CryptFilterConfiguration*]

classmethod register_crypt_filter(*method: NameObject*, *factory: Callable[[DictionaryObject, bool], CryptFilter]*)

get_min_pdf_version() → Optional[Tuple[int, int]]

class pyhanko.pdf_utils.crypt.api.**CryptFilter**

Bases: `object`

Generic abstract crypt filter class.

The superclass only handles the binding with the security handler, and offers some default implementations for serialisation routines that may be overridden in subclasses.

There is generally no requirement for crypt filters to be compatible with *any* security handler (the leaf classes in this module aren't), but the API supports mixin usage so code can be shared.

property method: *NameObject*

Returns

The method name (`/CFM` entry) associated with this crypt filter.

property keylen: int

Returns

The keylength (in bytes) of the key associated with this crypt filter.

encrypt(*key*, *plaintext: bytes*, *params=None*) → bytes

Encrypt plaintext with the specified key.

Parameters

- **key** – The current local key, which may or may not be equal to this crypt filter's global key.
- **plaintext** – Plaintext to encrypt.

- **`params`** – Optional parameters private to the crypt filter, specified as a PDF dictionary. These can only be used for explicit crypt filters; the parameters are then sourced from the corresponding entry in `/DecodeParms`.

Returns
The resulting ciphertext.

`decrypt`(*key*, *ciphertext: bytes*, *params=None*) → bytes

Decrypt ciphertext with the specified key.

Parameters

- **`key`** – The current local key, which may or may not be equal to this crypt filter's global key.
- **`ciphertext`** – Ciphertext to decrypt.
- **`params`** – Optional parameters private to the crypt filter, specified as a PDF dictionary. These can only be used for explicit crypt filters; the parameters are then sourced from the corresponding entry in `/DecodeParms`.

Returns
The resulting plaintext.

`as_pdf_object`() → *DictionaryObject*

Serialise this crypt filter to a PDF crypt filter dictionary.

Note: Implementations are encouraged to use a cooperative inheritance model, where subclasses first call `super().as_pdf_object()` and add the keys they need before returning the result.

This makes it easy to write crypt filter mixins that can provide functionality to multiple handlers.

Returns
A PDF crypt filter dictionary.

`derive_shared_encryption_key`() → bytes

Compute the (global) file encryption key for this crypt filter.

Returns
The key, as a `bytes` object.

Raises
`misc.PdfError` – Raised if the data needed to derive the key is not present (e.g. because the caller hasn't authenticated yet).

`derive_object_key`(*idnum*, *generation*) → bytes

Derive the encryption key for a specific object, based on the shared file encryption key.

Parameters

- **`idnum`** – ID of the object being encrypted.
- **`generation`** – Generation number of the object being encrypted.

Returns
The local key to use for this object.

`set_embedded_only`()

property shared_key: bytes

Return the shared file encryption key for this crypt filter, or attempt to compute it using `derive_shared_encryption_key()` if not available.

class `pyhanko.pdf_utils.crypt.api.`**`IdentityCryptFilter`**

Bases: `CryptFilter`

Class implementing the trivial crypt filter.

This is a singleton class, so all its instances are identical. Additionally, some of the `CryptFilter` API is nonfunctional. In particular, `as_pdf_object()` always raises an error, since the `/Identity` filter cannot be serialised.

`method = '/None'`

`keylen = 0`

`derive_shared_encryption_key``()` → bytes

Always returns an empty byte string.

`derive_object_key``(`*idnum*, *generation*`)` → bytes

Always returns an empty byte string.

Parameters

- **`idnum`** – Ignored.
- **`generation`** – Ignored.

Returns

`as_pdf_object``()`

Not implemented for this crypt filter.

Raises

`misc.PdfError` – Always.

`encrypt``(`*key*, *plaintext: bytes*, *params=None*`)` → bytes

Identity function.

Parameters

- **`key`** – Ignored.
- **`plaintext`** – Returned as-is.
- **`params`** – Ignored.

Returns

The original plaintext.

`decrypt``(`*key*, *ciphertext: bytes*, *params=None*`)` → bytes

Identity function.

Parameters

- **`key`** – Ignored.
- **`ciphertext`** – Returned as-is.
- **`params`** – Ignored.

Returns

The original ciphertext.

class pyhanko.pdf_utils.crypt.api.**CryptFilterConfiguration**(*crypt_filters: Dict[str, CryptFilter], default_stream_filter='/Identity', default_string_filter='/Identity', default_file_filter=None*)

Bases: `object`

Crypt filter store attached to a security handler.

Instances of this class are not designed to be reusable.

Parameters

- **crypt_filters** – A dictionary mapping names to their corresponding crypt filters.
- **default_stream_filter** – Name of the default crypt filter to use for streams.
- **default_stream_filter** – Name of the default crypt filter to use for strings.
- **default_file_filter** – Name of the default crypt filter to use for embedded files.

Note: PyHanko currently is not aware of embedded files, so managing these is the API user's responsibility.

filters()

Enumerate all crypt filters in this configuration.

set_security_handler(*handler: SecurityHandler*)

Set the security handler on all crypt filters in this configuration.

Parameters
handler – A *SecurityHandler* instance.

get_for_stream()

Retrieve the default crypt filter to use with streams.

Returns
A *CryptFilter* instance.

get_for_string()

Retrieve the default crypt filter to use with strings.

Returns
A *CryptFilter* instance.

get_for_embedded_file()

Retrieve the default crypt filter to use with embedded files.

Returns
A *CryptFilter* instance.

property stream_filter_name: *NameObject*

The name of the default crypt filter to use with streams.

property string_filter_name: *NameObject*

The name of the default crypt filter to use with streams.

property embedded_file_filter_name: *NameObject*

Retrieve the name of the default crypt filter to use with embedded files.

as_pdf_object()

Serialise this crypt filter configuration to a dictionary object, including all its subordinate crypt filters (with the exception of the identity filter, if relevant).

standard_filters()

Return the "standard" filters associated with this crypt filter configuration, i.e. those registered as the defaults for strings, streams and embedded files, respectively.

These sometimes require special treatment (as per the specification).

Returns
A set with one, two or three elements.

`pyhanko.pdf_utils.crypt.api.`**`build_crypt_filter`**`(`*reg: Dict[NameObject, Callable[[DictionaryObject, bool], CryptFilter]], cfdict: DictionaryObject, acts_as_default: bool*`)` → Optional[*CryptFilter*]

Interpret a crypt filter dictionary for a security handler.

Parameters

- **`reg`** – A registry of named crypt filters.
- **`cfdict`** – A crypt filter dictionary.
- **`acts_as_default`** – Indicates whether this filter is intended to be used in `/StrF` or `/StmF`.

Returns
An appropriate *`CryptFilter`* object, or `None` if the crypt filter uses the `/None` method.

Raises
`NotImplementedError` – Raised when the crypt filter's `/CFM` entry indicates an unknown crypt filter method.

`pyhanko.pdf_utils.crypt.api.`**`ALL_PERMS = -4`**

Dummy value that translates to "everything is allowed" in an encrypted PDF document.

pyhanko.pdf_utils.crypt.cred_ser module

`class pyhanko.pdf_utils.crypt.cred_ser.`**`SerialisedCredential`**`(`*credential_type: str, data: bytes*`)`

Bases: `object`

A credential in serialised form.

`credential_type: str`

The registered type name of the credential (see *`SerialisableCredential.register()`*).

`data: bytes`

The credential data, as a byte string.

`class pyhanko.pdf_utils.crypt.cred_ser.`**`SerialisableCredential`**

Bases: `ABC`

Class representing a credential that can be serialised.

`classmethod get_name()` → str

Get the type name of the credential, which will be embedded into serialised values and used on deserialisation.

static register(*cls: Type[*SerialisableCredential*]*)

Register a subclass into the credential serialisation registry, using the name returned by `get_name()`. Can be used as a class decorator.

Parameters
`cls` – The subclass.

Returns
The subclass.

static deserialise(*ser_value:* SerialisedCredential) → *SerialisableCredential*

Deserialise a `SerialisedCredential` value by looking up the proper subclass of `SerialisableCredential` and invoking its deserialisation method.

Parameters
`ser_value` – The value to deserialise.

Returns
The deserialised credential.

Raises
`misc.PdfReadError` – If a deserialisation error occurs.

serialise() → *SerialisedCredential*

Serialise a value to an annotated `SerialisedCredential` value.

Returns
A `SerialisedCredential` value.

Raises
`misc.PdfWriteError` – If a serialisation error occurs.

pyhanko.pdf_utils.crypt.filter_mixins module

class pyhanko.pdf_utils.crypt.filter_mixins.**RC4CryptFilterMixin**(**, keylen=5, **kwargs*)

Bases: `CryptFilter`, `ABC`

Mixin for RC4-based crypt filters.

Parameters
`keylen` – Key length, in bytes. Defaults to 5.

method = '/V2'

property keylen: int

Returns
The keylength (in bytes) of the key associated with this crypt filter.

encrypt(*key, plaintext: bytes, params=None*) → bytes

Encrypt data using RC4.

Parameters

- `key` – Local encryption key.
- `plaintext` – Plaintext to encrypt.
- `params` – Ignored.

Returns
Ciphertext.

decrypt(*key*, *ciphertext: bytes*, *params=None*) → bytes

Decrypt data using RC4.

Parameters

- **key** – Local encryption key.
- **ciphertext** – Ciphertext to decrypt.
- **params** – Ignored.

Returns
Plaintext.

derive_object_key(*idnum*, *generation*) → bytes

Derive the local key for the given object ID and generation number, by calling `legacy_derive_object_key()`.

Parameters

- **idnum** – ID of the object being encrypted.
- **generation** – Generation number of the object being encrypted.

Returns
The local key.

class pyhanko.pdf_utils.crypt.filter_mixins.**AESCryptFilterMixin**(*, *keylen: int*, ***kwargs*)

Bases: *CryptFilter*, `ABC`

Mixin for AES-based crypt filters.

property method: *NameObject*

Returns
The method name (`/CFM` entry) associated with this crypt filter.

property keylen: int

Returns
The keylength (in bytes) of the key associated with this crypt filter.

encrypt(*key*, *plaintext: bytes*, *params=None*)

Encrypt data using AES in CBC mode, with PKCS#7 padding.

Parameters

- **key** – The key to use.
- **plaintext** – The plaintext to be encrypted.
- **params** – Ignored.

Returns
The resulting ciphertext, prepended with a 16-byte initialisation vector.

decrypt(*key*, *ciphertext: bytes*, *params=None*) → bytes

Decrypt data using AES in CBC mode, with PKCS#7 padding.

Parameters

- **key** – The key to use.

- **ciphertext** – The ciphertext to be decrypted, prepended with a 16-byte initialisation vector.
- **params** – Ignored.

Returns
The resulting plaintext.

derive_object_key(*idnum*, *generation*) → bytes

Derive the local key for the given object ID and generation number.

If the associated handler is of version *SecurityHandlerVersion.AES256* or greater, this method simply returns the global key as-is. If not, the computation is carried out by `legacy_derive_object_key()`.

Parameters

- **idnum** – ID of the object being encrypted.
- **generation** – Generation number of the object being encrypted.

Returns
The local key.

pyhanko.pdf_utils.crypt.pubkey module

class pyhanko.pdf_utils.crypt.pubkey.**PubKeyCryptFilter**(**, *recipients=None*, *acts_as_default=False*, *encrypt_metadata=True*, ***kwargs*)

Bases: *CryptFilter*, `ABC`

Crypt filter for use with public key security handler. These are a little more independent than their counterparts for the standard security handlers, since different crypt filters can cater to different sets of recipients.

Parameters

- **recipients** – List of CMS objects encoding recipient information for this crypt filters.
- **acts_as_default** – Indicates whether this filter is intended to be used in `/StrF` or `/StmF`.
- **encrypt_metadata** – Whether this crypt filter should encrypt document-level metadata.

Warning: See *SecurityHandler* for some background on the way pyHanko interprets this value.

add_recipients(*certs: List[Certificate]*, *perms=-4*, *ignore_key_usage=False*)

Add recipients to this crypt filter. This always adds one full CMS object to the Recipients array

Parameters

- **certs** – A list of recipient certificates.
- **perms** – The permission bits to assign to the listed recipients.
- **ignore_key_usage** – If `False`, the *keyEncipherment* key usage extension is required.

authenticate(*credential*) → *AuthResult*

Authenticate to this crypt filter in particular. If used in `/StmF` or `/StrF`, you don't need to worry about calling this method directly.

Parameters
credential – The *EnvelopeKeyDecrypter* to authenticate with.

Returns
An `AuthResult` object indicating the level of access obtained.

`derive_shared_encryption_key()` → bytes

Compute the (global) file encryption key for this crypt filter.

Returns
The key, as a `bytes` object.

Raises
misc.PdfError – Raised if the data needed to derive the key is not present (e.g. because the caller hasn't authenticated yet).

`as_pdf_object()`

Serialise this crypt filter to a PDF crypt filter dictionary.

Note: Implementations are encouraged to use a cooperative inheritance model, where subclasses first call `super().as_pdf_object()` and add the keys they need before returning the result.

This makes it easy to write crypt filter mixins that can provide functionality to multiple handlers.

Returns
A PDF crypt filter dictionary.

`class pyhanko.pdf_utils.crypt.pubkey.`**`PubKeyAESCryptFilter`**`(*, recipients=None, acts_as_default=False, encrypt_metadata=True, **kwargs)`

Bases: *PubKeyCryptFilter*, *AESCryptFilterMixin*

AES crypt filter for public key security handlers.

`class pyhanko.pdf_utils.crypt.pubkey.`**`PubKeyRC4CryptFilter`**`(*, recipients=None, acts_as_default=False, encrypt_metadata=True, **kwargs)`

Bases: *PubKeyCryptFilter*, *RC4CryptFilterMixin*

RC4 crypt filter for public key security handlers.

`pyhanko.pdf_utils.crypt.pubkey.`**`DEFAULT_CRYPT_FILTER = '/DefaultCryptFilter'`**

Default name to use for the default crypt filter in public key security handlers.

`pyhanko.pdf_utils.crypt.pubkey.`**`DEF_EMBEDDED_FILE = '/DefEmbeddedFile'`**

Default name to use for the EFF crypt filter in public key security handlers for documents where only embedded files are encrypted.

`class pyhanko.pdf_utils.crypt.pubkey.`**`PubKeyAdbeSubFilter`**`(value)`

Bases: `Enum`

Enum describing the different subfilters that can be used for public key encryption in the PDF specification.

`S3 = '/adbe.pkcs7.s3'`

`S4 = '/adbe.pkcs7.s4'`

`S5 = '/adbe.pkcs7.s5'`

pyhanko.pdf_utils.crypt.pubkey.**construct_envelope_content**(*seed: bytes*, *perms: int*, *include_permissions=True*)

pyhanko.pdf_utils.crypt.pubkey.**construct_recipient_cms**(*certificates: List[Certificate]*, *seed: bytes*, *perms: int*, *include_permissions=True*, *ignore_key_usage=False*) → ContentInfo

class pyhanko.pdf_utils.crypt.pubkey.**EnvelopeKeyDecrypter**(*cert: Certificate*)

Bases: `object`

General credential class for use with public key security handlers.

This allows the key decryption process to happen offline, e.g. on a smart card.

Parameters
cert – The recipient's certificate.

decrypt(*encrypted_key: bytes*, *algo_params: KeyEncryptionAlgorithm*) → bytes

Invoke the actual key decryption algorithm.

Parameters

- **encrypted_key** – Payload to decrypt.
- **algo_params** – Specification of the encryption algorithm as a CMS object.

Returns
The decrypted payload.

class pyhanko.pdf_utils.crypt.pubkey.**SimpleEnvelopeKeyDecrypter**(*cert: Certificate*, *private_key: PrivateKeyInfo*)

Bases: *EnvelopeKeyDecrypter*, *SerialisableCredential*

Implementation of *EnvelopeKeyDecrypter* where the private key is an RSA key residing in memory.

Parameters

- **cert** – The recipient's certificate.
- **private_key** – The recipient's private key.

classmethod **get_name**() → str

Get the type name of the credential, which will be embedded into serialised values and used on deserialisation.

static **load**(*key_file*, *cert_file*, *key_passphrase=None*)

Load a key decrypter using key material from files on disk.

Parameters

- **key_file** – File containing the recipient's private key.
- **cert_file** – File containing the recipient's certificate.
- **key_passphrase** – Passphrase for the key file, if applicable.

Returns
An instance of *SimpleEnvelopeKeyDecrypter*.

classmethod **load_pkcs12**(*pfx_file*, *passphrase=None*)

Load a key decrypter using key material from a PKCS#12 file on disk.

Parameters

- **pfx_file** – Path to the PKCS#12 file containing the key material.
- **passphrase** – Passphrase for the private key, if applicable.

Returns

An instance of *SimpleEnvelopeKeyDecrypter*.

decrypt(*encrypted_key: bytes*, *algo_params: KeyEncryptionAlgorithm*) → bytes

Decrypt the payload using RSA with PKCS#1 v1.5 padding. Other schemes are not (currently) supported by this implementation.

Parameters

- **encrypted_key** – Payload to decrypt.
- **algo_params** – Specification of the encryption algorithm as a CMS object. Must use `rsaes_pkcs1v15`.

Returns

The decrypted payload.

pyhanko.pdf_utils.crypt.pubkey.**read_seed_from_recipient_cms**(*recipient_cms: ContentInfo*, *decrypter:* EnvelopeKeyDecrypter) → Tuple[Optional[bytes], Optional[int]]

class pyhanko.pdf_utils.crypt.pubkey.**PubKeySecurityHandler**(*version:* SecurityHandlerVersion, *pubkey_handler_subfilter:* PubKeyAdbeSubFilter, *legacy_keylen*, *encrypt_metadata=True*, *crypt_filter_config: Optional[*CryptFilterConfiguration*] = None*, *recipient_objs: Optional[list] = None*, *compat_entries=True*)

Bases: *SecurityHandler*

Security handler for public key encryption in PDF.

As with the standard security handler, you essentially shouldn't ever have to instantiate these yourself (see *build_from_certs()*).

classmethod **build_from_certs**(*certs: List[Certificate]*, *keylen_bytes=16*, *version=SecurityHandlerVersion.AES256*, *use_aes=True*, *use_crypt_filters=True*, *perms: int = -4*, *encrypt_metadata=True*, *ignore_key_usage=False*, ***kwargs*) → *PubKeySecurityHandler*

Create a new public key security handler.

This method takes many parameters, but only `certs` is mandatory. The default behaviour is to create a public key encryption handler where the underlying symmetric encryption is provided by AES-256. Any remaining keyword arguments will be passed to the constructor.

Parameters

- **certs** – The recipients' certificates.
- **keylen_bytes** – The key length (in bytes). This is only relevant for legacy security handlers.
- **version** – The security handler version to use.
- **use_aes** – Use AES-128 instead of RC4 (only meaningful if the `version` parameter is *RC4_OR_AES128*).

- **use_crypt_filters** – Whether to use crypt filters. This is mandatory for security handlers of version *RC4_OR_AES128* or higher.
- **perms** – Permission flags (as a 4-byte signed integer).
- **encrypt_metadata** – Whether to encrypt document metadata.

> **Warning:** See *SecurityHandler* for some background on the way pyHanko interprets this value.

- **ignore_key_usage** – If `False`, the *keyEncipherment* key usage extension is required.

Returns
An instance of *PubKeySecurityHandler*.

classmethod get_name() → str

Retrieves the name of this security handler.

Returns
The name of this security handler.

classmethod support_generic_subfilters() → Set[str]

Indicates the generic `/SubFilter` values that this security handler supports.

Returns
A set of generic protocols (indicated in the `/SubFilter` entry of an encryption dictionary) that this *SecurityHandler* class implements. Defaults to the empty set.

classmethod read_cf_dictionary(*cfdict: DictionaryObject*, *acts_as_default: bool*) → *CryptFilter*

Interpret a crypt filter dictionary for this type of security handler.

Parameters

- **cfdict** – A crypt filter dictionary.
- **acts_as_default** – Indicates whether this filter is intended to be used in `/StrF` or `/StmF`.

Returns
An appropriate *CryptFilter* object, or `None` if the crypt filter uses the `/None` method.

Raises
NotImplementedError – Raised when the crypt filter's `/CFM` entry indicates an unknown crypt filter method.

classmethod process_crypt_filters(*encrypt_dict: DictionaryObject*) → Optional[*CryptFilterConfiguration*]

classmethod gather_pub_key_metadata(*encrypt_dict: DictionaryObject*)

classmethod instantiate_from_pdf_object(*encrypt_dict: DictionaryObject*)

Instantiate an object of this class using a PDF encryption dictionary as input.

Parameters
encrypt_dict – A PDF encryption dictionary.

Returns

as_pdf_object()

Serialise this security handler to a PDF encryption dictionary.

Returns
A PDF encryption dictionary.

add_recipients(*certs: List[Certificate]*, *perms=-4*, *ignore_key_usage=False*)

authenticate(*credential: Union[EnvelopeKeyDecrypter, SerialisedCredential]*, *id1=None*) → *AuthResult*

Authenticate a user to this security handler.

Parameters

- **credential** – The credential to use (an instance of `EnvelopeKeyDecrypter` in this case).
- **id1** – First part of the document ID. Public key encryption handlers ignore this key.

Returns
An `AuthResult` object indicating the level of access obtained.

get_file_encryption_key() → bytes

Retrieve the global file encryption key (used for streams and/or strings). If there is no such thing, or the key is not available, an error should be raised.

Raises
`PdfKeyNotAvailableError` – when the key is not available

pyhanko.pdf_utils.crypt.standard module

class pyhanko.pdf_utils.crypt.standard.**StandardSecuritySettingsRevision**(*value*)

Bases: `VersionEnum`

Indicate the standard security handler revision to emulate.

RC4_BASIC = 2

RC4_EXTENDED = 3

RC4_OR_AES128 = 4

AES256 = 6

OTHER = None

Placeholder value for custom security handlers.

as_pdf_object() → *PdfObject*

classmethod from_number(*value*) → *StandardSecuritySettingsRevision*

class pyhanko.pdf_utils.crypt.standard.**StandardCryptFilter**

Bases: `CryptFilter`, `ABC`

Crypt filter for use with the standard security handler.

derive_shared_encryption_key() → bytes

Compute the (global) file encryption key for this crypt filter.

Returns
The key, as a `bytes` object.

Raises
`misc.PdfError` – Raised if the data needed to derive the key is not present (e.g. because the caller hasn't authenticated yet).

`as_pdf_object()`

Serialise this crypt filter to a PDF crypt filter dictionary.

Note: Implementations are encouraged to use a cooperative inheritance model, where subclasses first call `super().as_pdf_object()` and add the keys they need before returning the result.

This makes it easy to write crypt filter mixins that can provide functionality to multiple handlers.

Returns
A PDF crypt filter dictionary.

`class pyhanko.pdf_utils.crypt.standard.StandardAESCryptFilter(*, keylen: int, **kwargs)`

Bases: *StandardCryptFilter*, *AESCryptFilterMixin*

AES crypt filter for the standard security handler.

`class pyhanko.pdf_utils.crypt.standard.StandardRC4CryptFilter(*, keylen=5, **kwargs)`

Bases: *StandardCryptFilter*, *RC4CryptFilterMixin*

RC4 crypt filter for the standard security handler.

`class pyhanko.pdf_utils.crypt.standard.StandardSecurityHandler(version: SecurityHandlerVersion, revision: StandardSecuritySettingsRevision, legacy_keylen, perm_flags: int, odata, udata, oeseed=None, ueseed=None, encrypted_perms=None, encrypt_metadata=True, crypt_filter_config: Optional[CryptFilterConfiguration] = None, compat_entries=True)`

Bases: *SecurityHandler*

Implementation of the standard (password-based) security handler.

You shouldn't have to instantiate *StandardSecurityHandler* objects yourself. For encrypting new documents, use *build_from_pw()* or *build_from_pw_legacy()*.

For decrypting existing documents, pyHanko will take care of instantiating security handlers through *SecurityHandler.build()*.

`classmethod get_name()` → str

Retrieves the name of this security handler.

Returns
The name of this security handler.

`classmethod build_from_pw_legacy(rev: StandardSecuritySettingsRevision, id1, desired_owner_pass, desired_user_pass=None, keylen_bytes=16, use_aes128=True, perms: int = -4, crypt_filter_config=None, encrypt_metadata=True, **kwargs)`

Initialise a legacy password-based security handler, to attach to a *PdfFileWriter*. Any remaining keyword arguments will be passed to the constructor.

Danger: The functionality implemented by this handler is deprecated in the PDF standard. We only provide it for testing purposes, and to interface with legacy systems.

Parameters

- **rev** – Security handler revision to use, see *StandardSecuritySettingsRevision*.
- **id1** – The first part of the document ID.
- **desired_owner_pass** – Desired owner password.
- **desired_user_pass** – Desired user password.
- **keylen_bytes** – Length of the key (in bytes).
- **use_aes128** – Use AES-128 instead of RC4 (default: True).
- **perms** – Permission bits to set (defined as an integer)
- **crypt_filter_config** – Custom crypt filter configuration. PyHanko will supply a reasonable default if none is specified.

Returns

A *StandardSecurityHandler* instance.

classmethod build_from_pw(*desired_owner_pass*, *desired_user_pass=None*, *perms=-4*, *encrypt_metadata=True*, ***kwargs*)

Initialise a password-based security handler backed by AES-256, to attach to a *PdfFileWriter*. This handler will use the new PDF 2.0 encryption scheme.

Any remaining keyword arguments will be passed to the constructor.

Parameters

- **desired_owner_pass** – Desired owner password.
- **desired_user_pass** – Desired user password.
- **perms** – Desired usage permissions.
- **encrypt_metadata** – Whether to set up the security handler for encrypting metadata as well.

Returns

A *StandardSecurityHandler* instance.

classmethod gather_encryption_metadata(*encrypt_dict:* DictionaryObject) → dict

Gather and preprocess the "easy" metadata values in an encryption dictionary, and turn them into constructor kwargs.

This function processes `/Length`, `/P`, `/Perms`, `/O`, `/U`, `/OE`, `/UE` and `/EncryptMetadata`.

classmethod instantiate_from_pdf_object(*encrypt_dict:* DictionaryObject)

Instantiate an object of this class using a PDF encryption dictionary as input.

Parameters

encrypt_dict – A PDF encryption dictionary.

Returns

as_pdf_object()

Serialise this security handler to a PDF encryption dictionary.

Returns
A PDF encryption dictionary.

authenticate(*credential*, *id1: Optional[bytes] = None*) → *AuthResult*

Authenticate a user to this security handler.

Parameters

- **credential** – The credential to use (a password in this case).
- **id1** – First part of the document ID. This is mandatory for legacy encryption handlers, but meaningless otherwise.

Returns
An `AuthResult` object indicating the level of access obtained.

get_file_encryption_key() → bytes

Retrieve the (global) file encryption key for this security handler.

Returns
The file encryption key as a `bytes` object.

Raises
misc.PdfReadError – Raised if this security handler was instantiated from an encryption dictionary and no credential is available.

Module contents

Changed in version 0.13.0: Refactor `crypt` module into package.

Changed in version 0.3.0: Added support for PDF 2.0 encryption standards and crypt filters.

Utilities for PDF encryption. This module covers all methods outlined in the standard:

- Legacy RC4-based encryption (based on PyPDF2 code).
- AES-128 encryption with legacy key derivation (partly based on PyPDF2 code).
- PDF 2.0 AES-256 encryption.
- Public key encryption backed by any of the above.

Following the language in the standard, encryption operations are backed by subclasses of the `SecurityHandler` class, which provides a more or less generic API.

Danger: The members of this package are all considered internal API, and are therefore subject to change without notice.

Danger: One should also be aware that the legacy encryption scheme implemented here is (very) weak, and we only support it for compatibility reasons. Under no circumstances should it still be used to encrypt new files.

About crypt filters

Crypt filters are objects that handle encryption and decryption of streams and strings, either for all of them, or for a specific subset (e.g. streams representing embedded files). In the context of the PDF standard, crypt filters are a notion that only makes sense for security handlers of version 4 and up. In pyHanko, however, *all* encryption and decryption operations pass through crypt filters, and the serialisation/deserialisation logic in `SecurityHandler` and its subclasses transparently deals with staying backwards compatible with earlier revisions.

Internally, pyHanko loosely distinguishes between implicit and explicit uses of crypt filters:

- Explicit crypt filters are used by directly referring to them from the `/Filter` entry of a stream dictionary. These are invoked in the usual stream decoding process.
- Implicit crypt filters are set by the `/StmF` and `/StrF` entries in the security handler's crypt filter configuration, and are invoked by the object reading/writing procedures as necessary. These filters are invisble to the stream encoding/decoding process: the *`encoded_data`* attribute of an "implicitly encrypted" stream will therefore contain decrypted data ready to be decoded in the usual way.

As long as you don't require access to encoded object data and/or raw encrypted object data, this distiction should be irrelevant to you as an API user.

pyhanko.pdf_utils.font package

Submodules

pyhanko.pdf_utils.font.api module

class `pyhanko.pdf_utils.font.api.`**`ShapeResult`**(*graphics_ops: bytes*, *x_advance: float*, *y_advance: float*)

Bases: `object`

Result of shaping a Unicode string.

`graphics_ops: bytes`

PDF graphics operators to render the glyphs.

`x_advance: float`

Total horizontal advance in em units.

`y_advance: float`

Total vertical advance in em units.

class `pyhanko.pdf_utils.font.api.`**`FontEngine`**(*writer:* BasePdfFileWriter, *base_postscript_name: str*, *embedded_subset: bool*, *obj_stream=None*)

Bases: `object`

General interface for text shaping and font metrics.

`property uses_complex_positioning`

If `True`, this font engine expects the line matrix to always be equal to the text matrix when exiting and entering *`shape()`*. In other words, the current text position is where `0 0 Td` would move to.

If `False`, this method does not use any text positioning operators, and therefore uses the PDF standard's 'natural' positioning rules for text showing operators.

The default is `True` unless overridden.

shape(*txt: str*) → *ShapeResult*

Render a string to a format suitable for inclusion in a content stream and measure its total cursor advancement vector in em units.

Parameters
`txt` – String to shape.

Returns
A shaping result.

as_resource() → *PdfObject*

Convert a `FontEngine` to a PDF object suitable for embedding inside a resource dictionary.

Note: If the PDF object is an indirect reference, the caller must not attempt to dereference it. In other words, implementations can use preallocated references to delay subsetting until the last possible moment (this is even encouraged, see `prepare_write()`).

Returns
A PDF dictionary.

prepare_write()

Called by the writer that manages this font resource before the PDF content is written to a stream.

Subsetting operations and the like should be carried out as part of this method.

class pyhanko.pdf_utils.font.api.**FontSubsetCollection**(*base_postscript_name: str, subsets: Dict[Union[str, NoneType], ForwardRef('FontEngine')] = <factory>*)

Bases: `object`

base_postscript_name: str

Base postscript name of the font.

subsets: Dict[Optional[str], *FontEngine*]

Dictionary mapping prefixes to subsets. `None` represents the full font.

add_subset() → str

class pyhanko.pdf_utils.font.api.**FontEngineFactory**

Bases: `object`

create_font_engine(*writer:* BasePdfFileWriter, *obj_stream=None*) → *FontEngine*

pyhanko.pdf_utils.font.basic module

class pyhanko.pdf_utils.font.basic.**SimpleFontEngineFactory**(*name: str, avg_width: float, meta: Optional[*SimpleFontMeta*] = None*)

Bases: `FontEngineFactory`

create_font_engine(*writer:* BasePdfFileWriter, *obj_stream=None*)

static **default_factory**()

Returns
A `FontEngineFactory` instance representing the Courier standard font.

class pyhanko.pdf_utils.font.basic.**SimpleFontEngine**(*writer: BasePdfFileWriter*, *name: str*, *avg_width: float*, *meta: Optional[SimpleFontMeta] = None*)

Bases: `FontEngine`

Simplistic font engine that effectively only works with PDF standard fonts, and does not care about font metrics. Best used with monospaced fonts such as Courier.

property uses_complex_positioning

If `True`, this font engine expects the line matrix to always be equal to the text matrix when exiting and entering `shape()`. In other words, the current text position is where `0 0 Td` would move to.

If `False`, this method does not use any text positioning operators, and therefore uses the PDF standard's 'natural' positioning rules for text showing operators.

The default is `True` unless overridden.

shape(*txt*) → *ShapeResult*

Render a string to a format suitable for inclusion in a content stream and measure its total cursor advancement vector in em units.

Parameters
txt – String to shape.

Returns
A shaping result.

as_resource()

Convert a `FontEngine` to a PDF object suitable for embedding inside a resource dictionary.

Note: If the PDF object is an indirect reference, the caller must not attempt to dereference it. In other words, implementations can use preallocated references to delay subsetting until the last possible moment (this is even encouraged, see `prepare_write()`).

Returns
A PDF dictionary.

class pyhanko.pdf_utils.font.basic.**SimpleFontMeta**(*first_char: int*, *last_char: int*, *widths: List[int]*, *descriptor: pyhanko.pdf_utils.generic.DictionaryObject*)

Bases: `object`

first_char: int

last_char: int

widths: List[int]

descriptor: *DictionaryObject*

pyhanko.pdf_utils.font.basic.**get_courier**(*pdf_writer: BasePdfFileWriter*)

Quick-and-dirty way to obtain a Courier font resource.

Parameters
pdf_writer – A PDF writer.

Returns
A resource dictionary representing the standard Courier font (or one of its metric equivalents).

pyhanko.pdf_utils.font.opentype module

Basic support for OpenType/TrueType font handling & subsetting.

This module relies on fontTools for OTF parsing and subsetting, and on HarfBuzz (via `uharfbuzz`) for shaping.

`class pyhanko.pdf_utils.font.opentype.`**`GlyphAccumulator`**(*writer:* BasePdfFileWriter, *font_handle*, *font_size*, *features=None*, *ot_language_tag=None*, *ot_script_tag=None*, *writing_direction=None*, *bcp47_lang_code=None*, *obj_stream=None*)

Bases: *`FontEngine`*

Utility to collect & measure glyphs from OpenType/TrueType fonts.

Parameters

- **`writer`** – A PDF writer.
- **`font_handle`** – File-like object
- **`font_size`** – Font size in pt units.

  Note: This is only relevant for some positioning intricacies (or hacks, depending on your perspective) that may not matter for your use case.

- **`features`** – Features to use. If `None`, use HarfBuzz defaults.
- **`ot_script_tag`** – OpenType script tag to use. Will be guessed by HarfBuzz if not specified.
- **`ot_language_tag`** – OpenType language tag to use. Defaults to the default language system for the current script.
- **`writing_direction`** – Writing direction, one of 'ltr', 'rtl', 'ttb' or 'btt'. Will be guessed by HarfBuzz if not specified.
- **`bcp47_lang_code`** – BCP 47 language code. Used to mark the text's language in the PDF content stream, if specified.
- **`obj_stream`** – Try to put font-related objects into a particular object stream, if specified.

`marked_content_property_list`(*txt*) → *DictionaryObject*

`shape`(*txt: str*, *with_actual_text: bool = True*) → *ShapeResult*

Render a string to a format suitable for inclusion in a content stream and measure its total cursor advancement vector in em units.

Parameters
`txt` – String to shape.

Returns
A shaping result.

`prepare_write`()

This implementation of `prepare_write` will embed a subset of this glyph accumulator's font into the PDF writer it belongs to. Said subset will include all glyphs necessary to render the strings provided to the accumulator via `feed_string()`.

Danger: Due to the way `fontTools` handles subsetting, this is a destructive operation. The in-memory representation of the original font will be overwritten by the generated subset.

`as_resource``()` → *IndirectObject*

Convert a `FontEngine` to a PDF object suitable for embedding inside a resource dictionary.

Note: If the PDF object is an indirect reference, the caller must not attempt to dereference it. In other words, implementations can use preallocated references to delay subsetting until the last possible moment (this is even encouraged, see `prepare_write()`).

Returns
A PDF dictionary.

`class pyhanko.pdf_utils.font.opentype.`**`GlyphAccumulatorFactory`**`(`*font_file: str*, *font_size: int = 10*, *ot_script_tag: Optional[str] = None*, *ot_language_tag: Optional[str] = None*, *writing_direction: Optional[str] = None*, *create_objstream_if_needed: bool = True*`)`

Bases: `FontEngineFactory`

Stateless callable helper class to instantiate `GlyphAccumulator` objects.

`font_file: str`

Path to the OTF/TTF font to load.

`font_size: int = 10`

Font size.

`ot_script_tag: Optional[str] = None`

OpenType script tag to use. Will be guessed by HarfBuzz if not specified.

`ot_language_tag: Optional[str] = None`

OpenType language tag to use. Defaults to the default language system for the current script.

`writing_direction: Optional[str] = None`

Writing direction, one of 'ltr', 'rtl', 'ttb' or 'btt'. Will be guessed by HarfBuzz if not specified.

`create_objstream_if_needed: bool = True`

Create an object stream to hold this glyph accumulator's assets if no object stream is passed in, and the writer supports object streams.

`create_font_engine``(`*writer:* BasePdfFileWriter, *obj_stream=None*`)` → *GlyphAccumulator*

pyhanko.pdf_utils.metadata package

Submodules

pyhanko.pdf_utils.metadata.info module

`pyhanko.pdf_utils.metadata.info.`**`update_info_dict`**(*meta:* DocumentMetadata, *info:* DictionaryObject, *only_update_existing: bool = False*) → bool

`pyhanko.pdf_utils.metadata.info.`**`view_from_info_dict`**(*info_dict:* DictionaryObject) → *DocumentMetadata*

pyhanko.pdf_utils.metadata.model module

New in version 0.14.0.

This module contains the XMP data model classes and namespace registry, in addition to a simplified document metadata model used for automated metadata management.

`class pyhanko.pdf_utils.metadata.model.`**`DocumentMetadata`**(*title: ~typing.Optional[~typing.Union[~pyhanko.pdf_utils.misc.StringW str]] = None, author: ~typing.Optional[~typing.Union[~pyhanko.pdf_utils.misc.StringW str]] = None, subject: ~typing.Optional[~typing.Union[~pyhanko.pdf_utils.misc.StringW str]] = None, keywords: ~typing.List[str] = <factory>, creator: ~typing.Optional[~typing.Union[~pyhanko.pdf_utils.misc.StringW str]] = None, created: ~typing.Optional[~typing.Union[str, ~datetime.datetime]] = None, last_modified: ~typing.Optional[~typing.Union[str, ~datetime.datetime]] = 'now', xmp_extra: ~typing.List[~pyhanko.pdf_utils.metadata.model.XmpStructure] = <factory>, xmp_unmanaged: bool = False*)

Bases: `object`

Simple representation of document metadata. All entries are optional.

`title: Optional[Union[`*`StringWithLanguage`*`, str]] = None`

The document's title.

`author: Optional[Union[`*`StringWithLanguage`*`, str]] = None`

The document's author.

`subject: Optional[Union[`*`StringWithLanguage`*`, str]] = None`

The document's subject.

`keywords: List[str]`

Keywords associated with the document.

creator: Optional[Union[*StringWithLanguage*, str]] = None

The software that was used to author the document.

Note: This is distinct from the producer, which is typically used to indicate which PDF processor(s) interacted with the file.

created: Optional[Union[str, datetime]] = None

The time when the document was created. To set it to the current time, specify `now`.

last_modified: Optional[Union[str, datetime]] = 'now'

The time when the document was last modified. Defaults to the current time upon serialisation if not specified.

xmp_extra: List[*XmpStructure*]

Extra XMP metadata.

xmp_unmanaged: bool = False

Flag metadata as XMP-only. This means that the info dictionary will be cleared out as much as possible, and that all attributes other than *xmp_extra* will be ignored when updating XMP metadata.

Note: The last-modified date and producer entries in the info dictionary will still be updated.

Note: *DocumentMetadata* represents a data model that is much more simple than what XMP is actually capable of. You can use this flag if you need more fine-grained control.

view_over(*base:* DocumentMetadata)

pyhanko.pdf_utils.metadata.model.**VENDOR = 'pyHanko 0.18.1'**

pyHanko version identifier in textual form

pyhanko.pdf_utils.metadata.model.**MetaString**

A regular string, a string with a language code, or nothing at all.

alias of `Optional[Union[`*StringWithLanguage*`, str]]`

class pyhanko.pdf_utils.metadata.model.**ExpandedName**(*ns: str*, *local_name: str*)

Bases: `object`

An expanded XML name.

ns: str

The URI of the namespace in which the name resides.

local_name: str

The local part of the name.

class pyhanko.pdf_utils.metadata.model.**Qualifiers**(*quals: Dict[*ExpandedName, XmpValue*]*)

Bases: `object`

XMP value qualifiers wrapper. Implements `__getitem__`. Note that `xml:lang` gets special treatment.

Parameters

quals – The qualifiers to model.

classmethod of(**lst: Tuple[ExpandedName, XmpValue]*) → *Qualifiers*

Construct a `Qualifiers` object from a list of name-value pairs.

Parameters
`lst` – A list of name-value pairs.

Returns
A `Qualifiers` object.

classmethod lang_as_qual(*lang: Optional[str]*) → *Qualifiers*

Construct a `Qualifiers` object that only wraps a language qualifier.

Parameters
`lang` – A language code.

Returns
A `Qualifiers` object.

iter_quals(*with_lang: bool = True*) → Iterable[Tuple[*ExpandedName*, *XmpValue*]]

Iterate over all qualifiers.

Parameters
`with_lang` – Include the language qualifier.

Returns

property lang: Optional[str]

Retrieve the language qualifier, if any.

property has_non_lang_quals: bool

Check if there are any non-language qualifiers.

class pyhanko.pdf_utils.metadata.model.**XmpValue**(*value: ~typing.Union[~pyhanko.pdf_utils.metadata.model.XmpStructure, ~pyhanko.pdf_utils.metadata.model.XmpArray, ~pyhanko.pdf_utils.metadata.model.XmpUri, str], qualifiers: ~pyhanko.pdf_utils.metadata.model.Qualifiers = <factory>*)

Bases: `object`

A general XMP value, potentially with qualifiers.

value: Union[*XmpStructure*, *XmpArray*, XmpUri, str]

The value.

qualifiers: *Qualifiers*

Qualifiers that apply to the value.

class pyhanko.pdf_utils.metadata.model.**XmpStructure**(*fields: Dict[ExpandedName, XmpValue]*)

Bases: `object`

A generic XMP structure value. Implements `__getitem__` for field access.

Parameters
`fields` – The structure's fields.

classmethod of(**lst: Tuple[ExpandedName, XmpValue]*) → *XmpStructure*

Construct an `XmpStructure` from a list of name-value pairs.

Parameters
`lst` – A list of name-value pairs.

Returns
An an *XmpStructure*.

`class pyhanko.pdf_utils.metadata.model.`**`XmpArrayType`**`(`*value*`)`

Bases: `Enum`

XMP array types.

`ORDERED = 'Seq'`

Ordered array.

`UNORDERED = 'Bag'`

Unordered array.

`ALTERNATIVE = 'Alt'`

Alternative array.

`as_rdf``()` → *ExpandedName*

Render the type as an XML name.

`class pyhanko.pdf_utils.metadata.model.`**`XmpArray`**`(`*array_type: XmpArrayType*, *entries: List[XmpValue]*`)`

Bases: `object`

An XMP array.

`array_type:` *XmpArrayType*

The type of the array.

`entries:` `List[`*XmpValue*`]`

The entries in the array.

`classmethod` **`ordered`**`(`*lst: Iterable[XmpValue]*`)` → *XmpArray*

Convert a list to an ordered XMP array.

Parameters
`lst` – An iterable of XMP values.

Returns
An ordered *XmpArray*.

`classmethod` **`unordered`**`(`*lst: Iterable[XmpValue]*`)` → *XmpArray*

Convert a list to an unordered XMP array.

Parameters
`lst` – An iterable of XMP values.

Returns
An unordered *XmpArray*.

`classmethod` **`alternative`**`(`*lst: Iterable[XmpValue]*`)` → *XmpArray*

Convert a list to an alternative XMP array.

Parameters
`lst` – An iterable of XMP values.

Returns
An alternative *XmpArray*.

pyhanko.pdf_utils.metadata.model.**NS = {'dc': 'http://purl.org/dc/elements/1.1/', 'pdf': 'http://ns.adobe.com/pdf/1.3/', 'pdfaExtension': 'http://www.aiim.org/pdfa/ns/extension/', 'pdfaProperty': 'http://www.aiim.org/pdfa/ns/property#', 'pdfaSchema': 'http://www.aiim.org/pdfa/ns/schema#', 'pdfaid': 'http://www.aiim.org/pdfa/ns/id/', 'pdfuaid': 'http://www.aiim.org/pdfua/ns/id/', 'rdf': 'http://www.w3.org/1999/02/22-rdf-syntax-ns#', 'x': 'adobe:ns:meta/', 'xml': 'http://www.w3.org/XML/1998/namespace', 'xmp': 'http://ns.adobe.com/xap/1.0/'}**

Known namespaces and their customary prefixes.

pyhanko.pdf_utils.metadata.model.**XML_LANG = http://www.w3.org/XML/1998/namespace/lang**

`lang` in the `xml` namespace.

pyhanko.pdf_utils.metadata.model.**RDF_RDF = http://www.w3.org/1999/02/22-rdf-syntax-ns#RDF**

RDF in the `rdf` namespace.

pyhanko.pdf_utils.metadata.model.**RDF_SEQ = http://www.w3.org/1999/02/22-rdf-syntax-ns#Seq**

Seq in the `rdf` namespace.

pyhanko.pdf_utils.metadata.model.**RDF_BAG = http://www.w3.org/1999/02/22-rdf-syntax-ns#Bag**

Bag in the `rdf` namespace.

pyhanko.pdf_utils.metadata.model.**RDF_ALT = http://www.w3.org/1999/02/22-rdf-syntax-ns#Alt**

`Alt` in the `rdf` namespace.

pyhanko.pdf_utils.metadata.model.**RDF_LI = http://www.w3.org/1999/02/22-rdf-syntax-ns#li**

`li` in the `rdf` namespace.

pyhanko.pdf_utils.metadata.model.**RDF_VALUE = http://www.w3.org/1999/02/22-rdf-syntax-ns#value**

`value` in the `rdf` namespace.

pyhanko.pdf_utils.metadata.model.**RDF_RESOURCE = http://www.w3.org/1999/02/22-rdf-syntax-ns#resource**

`resource` in the `rdf` namespace.

pyhanko.pdf_utils.metadata.model.**RDF_PARSE_TYPE = http://www.w3.org/1999/02/22-rdf-syntax-ns#parseType**

parseType in the `rdf` namespace.

pyhanko.pdf_utils.metadata.model.**RDF_ABOUT = http://www.w3.org/1999/02/22-rdf-syntax-ns#about**

about in the `rdf` namespace.

pyhanko.pdf_utils.metadata.model.**RDF_DESCRIPTION = http://www.w3.org/1999/02/22-rdf-syntax-ns#Description**

`Description` in the `rdf` namespace.

pyhanko.pdf_utils.metadata.model.**DC_TITLE = http://purl.org/dc/elements/1.1/title**

`title` in the dc namespace.

pyhanko.pdf_utils.metadata.model.**DC_CREATOR = http://purl.org/dc/elements/1.1/creator**

`creator` in the dc namespace.

pyhanko.pdf_utils.metadata.model.**DC_DESCRIPTION = http://purl.org/dc/elements/1.1/description**

`description` in the dc namespace.

pyhanko.pdf_utils.metadata.model.**PDF_PRODUCER = http://ns.adobe.com/pdf/1.3/Producer**

Producer in the pdf namespace.

pyhanko.pdf_utils.metadata.model.**PDF_KEYWORDS = http://ns.adobe.com/pdf/1.3/keywords**

keywords in the pdf namespace.

pyhanko.pdf_utils.metadata.model.**X_XMPMETA = adobe:ns:meta/xmpmeta**

xmpmeta in the x namespace.

pyhanko.pdf_utils.metadata.model.**X_XMPTK = adobe:ns:meta/xmptk**

xmptk in the x namespace.

pyhanko.pdf_utils.metadata.model.**XMP_CREATORTOOL = http://ns.adobe.com/xap/1.0/CreatorTool**

CreatorTool in the xmp namespace.

pyhanko.pdf_utils.metadata.model.**XMP_CREATEDATE = http://ns.adobe.com/xap/1.0/CreateDate**

CreateDate in the xmp namespace.

pyhanko.pdf_utils.metadata.model.**XMP_MODDATE = http://ns.adobe.com/xap/1.0/ModifyDate**

ModifyDate in the xmp namespace.

pyhanko.pdf_utils.metadata.xmp_xml module

pyhanko.pdf_utils.metadata.xmp_xml.**iter_attrs**(*elem: Element*) → Iterator[Tuple[*ExpandedName*, str]]

pyhanko.pdf_utils.metadata.xmp_xml.**add_xmp_value**(*container: Element*, *value:* XmpValue)

pyhanko.pdf_utils.metadata.xmp_xml.**serialise_xmp**(*roots: List[*XmpStructure*]*, *out: BinaryIO*)

class pyhanko.pdf_utils.metadata.xmp_xml.**MetadataStream**(*dict_data: Optional[dict] = None*, *stream_data: Optional[bytes] = None*, *encoded_data: Optional[bytes] = None*, *handler: Optional[*SecurityHandler*] = None*)

Bases: *StreamObject*

classmethod from_xmp(*xmp: List[*XmpStructure*]*) → *MetadataStream*

property xmp: List[*XmpStructure*]

update_xmp_with_meta(*meta:* DocumentMetadata)

pyhanko.pdf_utils.metadata.xmp_xml.**update_xmp_with_meta**(*meta:* DocumentMetadata, *roots: Iterable[*XmpStructure*] = ()*)

pyhanko.pdf_utils.metadata.xmp_xml.**meta_from_xmp**(*roots: List[*XmpStructure*]*)

exception pyhanko.pdf_utils.metadata.xmp_xml.**XmpXmlProcessingError**

Bases: ValueError

pyhanko.pdf_utils.metadata.xmp_xml.**parse_xmp**(*inp: BinaryIO*) → List[*XmpStructure*]

pyhanko.pdf_utils.metadata.xmp_xml.**register_namespaces**()

Module contents

Submodules

pyhanko.pdf_utils.barcodes module

`class pyhanko.pdf_utils.barcodes.`**`BarcodeBox`**`(`*barcode_type*, *code*`)`

Bases: `PdfContent`

Thin wrapper around python-barcode functionality.

This will render a barcode of the specified type as PDF graphics operators.

`render``()` → bytes

Compile the content to graphics operators.

`class pyhanko.pdf_utils.barcodes.`**`PdfStreamBarcodeWriter`**

Bases: `BaseWriter`

Implementation of writer class for the python-barcode library to output PDF graphics operators. Note: _paint_text is intentionally dummied out. Please use the functionality implemented in pyhanko.pdf_utils.text instead.

`property command_stream: bytes`

`save``(`*filename*, *output*`)`

Saves the rendered output to *filename*.

Parameters

filename
[String] Filename without extension.

output
[String] The rendered output.

Returns
The full filename with extension.

Return type
String

pyhanko.pdf_utils.content module

`class pyhanko.pdf_utils.content.`**`ResourceType`**`(`*value*`)`

Bases: `Enum`

Enum listing resources that can be used as keys in a resource dictionary.

See ISO 32000-1, § 7.8.3 Table 34.

`EXT_G_STATE = '/ExtGState'`

External graphics state specifications. See ISO 32000-1, § 8.4.5.

`COLOR_SPACE = '/ColorSpace'`

Colour space definitions. See ISO 32000-1, § 8.6.

PATTERN = '/Pattern'

Pattern definitions. See ISO 32000-1, § 8.7.

SHADING = '/Shading'

Shading definitions. See ISO 32000-1, § 8.7.4.3.

XOBJECT = '/XObject'

External object definitions (images and form XObjects). See ISO 32000-1, § 8.8.

FONT = '/Font'

Font specifications. See ISO 32000-1, § 9.

PROPERTIES = '/Properties'

Marked content properties. See ISO 32000-1, § 14.6.2.

exception `pyhanko.pdf_utils.content.`**ResourceManagementError**

Bases: `ValueError`

Used to signal problems with resource dictionaries.

class `pyhanko.pdf_utils.content.`**PdfResources**

Bases: `object`

Representation of a PDF resource dictionary.

This class implements `__getitem__()` with *ResourceType* keys for dynamic access to its attributes. To merge two instances of *PdfResources* into one another, the class overrides `__iadd__()`, so you can write.

```
res1 += res2
```

Note: Merging two resource dictionaries with conflicting resource names will produce a *ResourceManagementError*.

Note: This class is currently only used for new resource dictionaries.

as_pdf_object() → *DictionaryObject*

Render this instance of *PdfResources* to an actual resource dictionary.

class `pyhanko.pdf_utils.content.`**PdfContent**(*resources: Optional[PdfResources] = None*, *box: Optional[BoxConstraints] = None*, *writer: Optional[BasePdfFileWriter] = None*)

Bases: `object`

Abstract representation of part of a PDF content stream.

> **Warning:** Whether *PdfContent* instances can be reused or not is left up to the subclasses.

writer = None

The `__init__()` method comes with an optional `writer` parameter that can be used to let subclasses register external resources with the writer by themselves.

It can also be set after the fact by calling *set_writer()*.

set_resource(*category: ResourceType*, *name: NameObject*, *value: PdfObject*)

Set a value in the resource dictionary associated with this content fragment.

Parameters

- **category** – The resource category to which the resource belongs.

- **name** – The resource's (internal) name.
- **value** – The resource's value.

import_resources(*resources: PdfResources*)

Import resources from another resource dictionary.

Parameters
resources – An instance of *PdfResources*.

Raises
ResourceManagementError – Raised when there is a resource name conflict.

property resources: *PdfResources*

Returns
The *PdfResources* instance associated with this content fragment.

render() → bytes

Compile the content to graphics operators.

as_form_xobject() → *StreamObject*

Render the object to a form XObject to be referenced by another content stream. See ISO 32000-1, § 8.8.

Note: Even if *writer* is set, the resulting form XObject will not be registered. This is left up to the caller.

Returns
A *StreamObject* instance representing the resulting form XObject.

set_writer(*writer*)

Override the currently registered writer object.

Parameters
writer – An instance of *BasePdfFileWriter*.

add_to_page(*writer: BasePdfFileWriter, page_ix: int, prepend: bool = False*)

Convenience wrapper around *BasePdfFileWriter.add_stream_to_page()* to turn a *PdfContent* instance into a page content stream.

Parameters

- **writer** – A PDF file writer.
- **page_ix** – Index of the page to modify. The first page has index *0*.
- **prepend** – Prepend the content stream to the list of content streams, as opposed to appending it to the end. This has the effect of causing the stream to be rendered underneath the already existing content on the page.

Returns
An *IndirectObject* reference to the page object that was modified.

class pyhanko.pdf_utils.content.**RawContent**(*data: bytes, resources: Optional[PdfResources] = None, box: Optional[BoxConstraints] = None*)

Bases: *PdfContent*

Raw byte sequence to be used as PDF content.

box: *BoxConstraints*

render() → bytes

Compile the content to graphics operators.

`class pyhanko.pdf_utils.content.ImportedPdfPage(file_name, page_ix=0)`

Bases: `PdfContent`

Import a page from another PDF file (lazily)

box: `BoxConstraints`

render() → bytes

Compile the content to graphics operators.

pyhanko.pdf_utils.embed module

Utility classes for handling embedded files in PDFs.

New in version 0.7.0.

`pyhanko.pdf_utils.embed.embed_file(pdf_writer: BasePdfFileWriter, spec: FileSpec)`

Embed a file in the document-wide embedded file registry of a PDF writer.

Parameters

- **pdf_writer** – PDF writer to house the embedded file.
- **spec** – File spec describing the embedded file.

Returns

`class pyhanko.pdf_utils.embed.EmbeddedFileObject(pdf_writer: BasePdfFileWriter, dict_data=None, stream_data=None, encoded_data=None, params: Optional[EmbeddedFileParams] = None, mime_type: Optional[str] = None)`

Bases: `StreamObject`

`classmethod from_file_data(pdf_writer: BasePdfFileWriter, data: bytes, compress=True, params: Optional[EmbeddedFileParams] = None, mime_type: Optional[str] = None) → EmbeddedFileObject`

Construct an embedded file object from file data.

This is a very thin wrapper around the constructor, with a slightly less intimidating API.

Note: This method will not register the embedded file into the document's embedded file namespace, see `embed_file()`.

Parameters

- **pdf_writer** – PDF writer to use.
- **data** – File contents, as a `bytes` object.
- **compress** – Whether to compress the embedded file's contents.
- **params** – Optional embedded file parameters.
- **mime_type** – Optional MIME type string.

Returns

An embedded file object.

write_to_stream(*stream*, *handler=None*, *container_ref=None*)

Abstract method to render this object to an output stream.

Parameters

- **stream** – An output stream.
- **container_ref** – Local encryption key.
- **handler** – Security handler

class pyhanko.pdf_utils.embed.**EmbeddedFileParams**(*embed_size: bool = True*, *embed_checksum: bool = True*, *creation_date: Union[datetime.datetime, NoneType] = None*, *modification_date: Union[datetime.datetime, NoneType] = None*)

Bases: `object`

embed_size: bool = True

If true, record the file size of the embedded file.

Note: This value is computed over the file content before PDF filters are applied. This may have performance implications in cases where the file stream contents are presented in pre-encoded form.

embed_checksum: bool = True

If true, add an MD5 checksum of the file contents.

Note: This value is computed over the file content before PDF filters are applied. This may have performance implications in cases where the file stream contents are presented in pre-encoded form.

creation_date: Optional[datetime] = None

Record the creation date of the embedded file.

modification_date: Optional[datetime] = None

Record the modification date of the embedded file.

class pyhanko.pdf_utils.embed.**FileSpec**(*file_spec_string: str*, *file_name: Optional[str] = None*, *embedded_data: Optional[EmbeddedFileObject] = None*, *description: Optional[str] = None*, *af_relationship: Optional[NameObject] = None*, *f_related_files: Optional[List[RelatedFileSpec]] = None*, *uf_related_files: Optional[List[RelatedFileSpec]] = None*)

Bases: `object`

Dataclass modelling an embedded file description in a PDF.

file_spec_string: str

A path-like file specification string, or URL.

Note: For backwards compatibility, this string should be encodable in PDFDocEncoding. For names that require general Unicode support, refer to *`file_name`*.

file_name: Optional[str] = None

A path-like Unicode file name.

embedded_data: Optional[*EmbeddedFileObject*] = None

Reference to a stream object containing the file's data, as embedded in the PDF file.

description: Optional[str] = None

Textual description of the file.

af_relationship: Optional[*NameObject*] = None

Associated file relationship specifier.

f_related_files: Optional[List[*RelatedFileSpec*]] = None

Related files with PDFDocEncoded names.

uf_related_files: Optional[List[*RelatedFileSpec*]] = None

Related files with Unicode-encoded names.

as_pdf_object() → *DictionaryObject*

Represent the file spec as a PDF dictionary.

class pyhanko.pdf_utils.embed.**RelatedFileSpec**(*name: str*, *embedded_data:* EmbeddedFileObject)

Bases: `object`

Dataclass modelling a RelatedFile construct in PDF.

name: str

Name of the related file.

Note: The encoding requirements of this field depend on whether the related file is included via the `/F` or `/UF` key.

embedded_data: *EmbeddedFileObject*

Reference to a stream object containing the file's data, as embedded in the PDF file.

classmethod **fmt_related_files**(*lst: List[*RelatedFileSpec*]*)

pyhanko.pdf_utils.embed.**wrap_encrypted_payload**(*plaintext_payload: bytes*, ***, *password: Optional[str] = None*, *certs: Optional[List[Certificate]] = None*, *security_handler: Optional[*SecurityHandler*] = None*, *file_spec_string: str = 'attachment.pdf'*, *params: Optional[*EmbeddedFileParams*] = None*, *file_name: Optional[str] = None*, *description='Wrapped document'*, *include_explanation_page=True*) → *PdfFileWriter*

Include a PDF document as an encrypted attachment in a wrapper document.

This function sets certain flags in the wrapper document's collection dictionary to instruct compliant PDF viewers to display the attachment instead of the wrapping document. Viewers that do not fully support PDF collections will display a landing page instead, explaining how to open the attachment manually.

Using this method mitigates some weaknesses in the PDF standard's encryption provisions, and makes it harder to manipulate the encrypted attachment without knowing the encryption key.

Danger: Until PDF supports authenticated encryption mechanisms, this is a mitigation strategy, not a foolproof defence mechanism.

Warning: While users of viewers that do not support PDF collections can still open the attached file manually, the viewer still has to support PDF files where only the attachments are encrypted.

Note: This is not quite the same as the "unencrypted wrapper document" pattern discussed in the PDF 2.0 specification. The latter is intended to support nonstandard security handlers. This function uses a standard security handler on the wrapping document to encrypt the attachment as a binary blob. Moreover, the functionality in this function is available in PDF 1.7 viewers as well.

Parameters

- **`plaintext_payload`** – The plaintext payload (a binary representation of a PDF document).
- **`security_handler`** – The security handler to use on the wrapper document. If `None`, a security handler will be constructed based on the `password` or `certs` parameter.
- **`password`** – Password to encrypt the attachment with. Will be ignored if `security_handler` is provided.
- **`certs`** – Encrypt the file using PDF public-key encryption, targeting the keys in the provided certificates. Will be ignored if `security_handler` is provided.
- **`file_spec_string`** – PDFDocEncoded file spec string for the attachment.
- **`params`** – Embedded file parameters to use.
- **`file_name`** – Unicode file name for the attachment.
- **`description`** – Description for the attachment
- **`include_explanation_page`** – If `False`, do not generate an explanation page in the wrapper document. This setting could be useful if you want to customise the wrapper document's behaviour yourself.

Returns

A `PdfFileWriter` representing the wrapper document.

pyhanko.pdf_utils.extensions module

`class pyhanko.pdf_utils.extensions.`**`DevExtensionMultivalued`**`(`*`value`*`)`

Bases: `Enum`

Setting indicating how an extension is expected to behave well w.r.t. the new mechanism for multivalued extensions in ISO 32000-2:2020.

`ALWAYS = 1`

Always serialise this extension as a multivalued extension.

`NEVER = 2`

Never serialise this extension as a multivalued extension.

`MAYBE = 3`

Make this extension single-valued whenever possible, but allow multiple values as well, e.g. when a different but non-comparable extension with the same prefix is already present in the file.

class pyhanko.pdf_utils.extensions.**DeveloperExtension**(*prefix_name:* NameObject, *base_version:* NameObject, *extension_level: int*, *url: Optional[str] = None*, *extension_revision: Optional[str] = None*, *compare_by_level: bool = False*, *subsumed_by: Iterable[int] = ()*, *subsumes: Iterable[int] = ()*, *multivalued:* DevExtensionMultivalued = *DevExtensionMultivalued.MAYBE*)

Bases: `object`

PDF developer extension designation.

prefix_name: *NameObject*

Registered developer prefix.

base_version: *NameObject*

Base version on to which the extension applies.

extension_level: int

Extension level.

url: Optional[str] = None

Optional URL linking to the extension's documentation.

extension_revision: Optional[str] = None

Optional extra revision information. Not comparable.

compare_by_level: bool = False

Compare developer extensions by level number. If this value is `True` and a copy of this extension already exists in the target file with a higher level number, do not override it. If one exists with a lower level number, override it.

If this value is `False`, the decision is based on *subsumed_by* and *subsumes*.

> **Warning:** It is generally not safe to assume that extension levels are used as a versioning system (i.e. that higher extension levels supersede lower ones), hence why the default is `False`.

subsumed_by: Iterable[int] = ()

List of extension levels that would subsume this one. If one of these is present in the extensions dictionary, attempting to register this extension will not override it.

Default value: empty.

> **Warning:** This parameter is ignored if *compare_by_level* is `True`.

subsumes: Iterable[int] = ()

List of extensions explicitly subsumed by this one. If one of these is present in the extensions dictionary, attempting to register this extension will override it.

Default value: empty.

> **Warning:** This parameter is ignored if *compare_by_level* is `True`.

multivalued: *DevExtensionMultivalued* = 3

Setting indicating whether this extension is expected to behave well w.r.t. the new mechanism for multivalued extensions in ISO 32000-2:2020.

as_pdf_object() → *DictionaryObject*

Format the data in this object into a PDF dictionary for registration into the */Extensions* dictionary.

Returns

A `generic.DictionaryObject`.

pyhanko.pdf_utils.filters module

Implementation of stream filters for PDF.

Taken from PyPDF2 with modifications. See *here* for the original license of the PyPDF2 project.

Note that not all decoders specified in the standard are supported. In particular `/LZWDecode` and the various JPEG-based decoders are missing.

class pyhanko.pdf_utils.filters.**Decoder**

Bases: `object`

General filter/decoder interface.

decode(*data: bytes*, *decode_params: dict*) → bytes

Decode a stream.

Parameters

- **data** – Data to decode.
- **decode_params** – Decoder parameters, sourced from the `/DecoderParams` entry associated with this filter.

Returns

Decoded data.

encode(*data: bytes*, *decode_params: dict*) → bytes

Encode a stream.

Parameters

- **data** – Data to encode.
- **decode_params** – Encoder parameters, sourced from the `/DecoderParams` entry associated with this filter.

Returns

Encoded data.

class pyhanko.pdf_utils.filters.**ASCII85Decode**

Bases: *Decoder*

Implementation of the base 85 encoding scheme specified in ISO 32000-1.

encode(*data: bytes*, *decode_params=None*) → bytes

Encode a stream.

Parameters

- **data** – Data to encode.

- **decode_params** – Encoder parameters, sourced from the /DecoderParams entry associated with this filter.

Returns
Encoded data.

decode(*data*, *decode_params=None*)

Decode a stream.

Parameters

- **data** – Data to decode.
- **decode_params** – Decoder parameters, sourced from the /DecoderParams entry associated with this filter.

Returns
Decoded data.

class pyhanko.pdf_utils.filters.**ASCIIHexDecode**

Bases: *Decoder*

Wrapper around binascii.hexlify() that implements the *Decoder* interface.

encode(*data: bytes*, *decode_params=None*) → bytes

Encode a stream.

Parameters

- **data** – Data to encode.
- **decode_params** – Encoder parameters, sourced from the /DecoderParams entry associated with this filter.

Returns
Encoded data.

decode(*data*, *decode_params=None*)

Decode a stream.

Parameters

- **data** – Data to decode.
- **decode_params** – Decoder parameters, sourced from the /DecoderParams entry associated with this filter.

Returns
Decoded data.

class pyhanko.pdf_utils.filters.**FlateDecode**

Bases: *Decoder*

Implementation of the /FlateDecode filter.

> **Warning:** Currently not all predictor values are supported. This may cause problems when extracting image data from PDF files.

decode(*data: bytes*, *decode_params*)

Decode a stream.

Parameters

- **data** – Data to decode.
- **decode_params** – Decoder parameters, sourced from the `/DecoderParams` entry associated with this filter.

Returns
Decoded data.

encode(*data*, *decode_params=None*)

Encode a stream.

Parameters

- **data** – Data to encode.
- **decode_params** – Encoder parameters, sourced from the `/DecoderParams` entry associated with this filter.

Returns
Encoded data.

`pyhanko.pdf_utils.filters.`**get_generic_decoder**(*name: str*) → *Decoder*

Instantiate a specific stream filter decoder type by (PDF) name.

The following names are recognised:

- **/FlateDecode or /Fl for the decoder implementing Flate**
  compression.
- `/ASCIIHexDecode` or `/AHx` for the decoder that converts bytes to their hexadecimal representations.
- `/ASCII85Decode` or `/A85` for the decoder that converts byte strings to a base-85 textual representation.

Warning: `/Crypt` is a special case because it requires access to the document's security handler.

Warning: LZW compression is currently unsupported, as are most compression methods that are used specifically for image data.

Parameters
name – Name of the decoder to instantiate.

pyhanko.pdf_utils.generic module

Implementation of PDF object types and other generic functionality. The internals were imported from PyPDF2, with modifications.

See *here* for the original license of the PyPDF2 project.

class `pyhanko.pdf_utils.generic.`**Dereferenceable**

Bases: `object`

Represents an opaque reference to a PDF object associated with a PDF Handler (see *PdfHandler*).

This can either be a reference to an object with an object ID (see *Reference*) or a reference to the trailer of a PDF document (see *TrailerReference*).

`get_object()` → *PdfObject*

Retrieve the PDF object backing this dereferenceable.

Returns
A `PdfObject`.

`get_pdf_handler()`

Return the PDF handler associated with this dereferenceable.

Returns
a `PdfHandler`.

`class pyhanko.pdf_utils.generic.Reference(`*idnum: int*, *generation: int = 0*, *pdf: Optional[object] = None*`)`

Bases: `Dereferenceable`

A reference to an object with a certain ID and generation number, with a PDF handler attached to it.

Warning: Contrary to what one might expect, the generation number does *not* indicate the document revision in which the object was modified. In fact, nonzero generation numbers are exceedingly rare these days; in most real-world PDF files, objects are simply overridden without ever increasing the generation number.

Except in very specific circumstances, dereferencing a `Reference` will return the most recent version of the object with the stated object ID and generation number.

`idnum: int`

The object's ID.

`generation: int = 0`

The object's generation number (usually *0*)

`pdf: object = None`

The PDF handler associated with this reference, an instance of `PdfHandler`.

Warning: This field is ignored when hashing or comparing `Reference` objects, so it is the API user's responsibility to not mix up references originating from unrelated PDF handlers.

`get_object()` → *PdfObject*

Retrieve the PDF object backing this dereferenceable.

Returns
A `PdfObject`.

`get_pdf_handler()`

Return the PDF handler associated with this dereferenceable.

Returns
a `PdfHandler`.

`class pyhanko.pdf_utils.generic.TrailerReference(`*reader*`)`

Bases: `Dereferenceable`

A reference to the trailer of a PDF document.

Warning: Since the trailer does not have a well-defined object ID in files with "classical" cross-reference tables (as opposed to cross-reference streams), this is not a subclass of `Reference`.

Parameters
`reader` – a `PdfFileReader`

`get_object()` → *PdfObject*

Retrieve the PDF object backing this dereferenceable.

Returns
A `PdfObject`.

`get_pdf_handler()`

Return the PDF handler associated with this dereferenceable.

Returns
a `PdfHandler`.

`class pyhanko.pdf_utils.generic.PdfObject`

Bases: `object`

Superclass for all PDF objects.

`container_ref: Optional[Dereferenceable] = None`

For objects read from a file, *container_ref* points to the unique addressable object containing this object.

Note: Consider the following object definition in a PDF file:

```
4 0 obj
<< /Foo (Bar) >>
```

This declares a dictionary with ID *4*, but the values `/Foo` and `(Bar)` are also PDF objects (a name and a string, respectively). All of these will have *container_ref* given by a `Reference` with object ID *4* and generation number *0*.

If an object is part of the trailer of a PDF file, *container_ref* will be a `TrailerReference`. For newly created objects (i.e. those not read from a file), *container_ref* is always `None`.

`get_container_ref()` → *Dereferenceable*

Return a reference to the closest parent object containing this object. Raises an error if no such reference can be found.

`get_object()`

Resolves indirect references.

Returns
self, unless an instance of `IndirectObject`.

`write_to_stream`(*stream*, *handler: Optional[SecurityHandler] = None*, *container_ref: Optional[Reference] = None*)

Abstract method to render this object to an output stream.

Parameters

- `stream` – An output stream.
- `container_ref` – Local encryption key.

- **handler** – Security handler

class pyhanko.pdf_utils.generic.**IndirectObject**(*idnum*, *generation*, *pdf*)

Bases: *PdfObject*, *Dereferenceable*

Thin wrapper around a *Reference*, implementing both the *Dereferenceable* and *PdfObject* interfaces.

> **Warning:** For many purposes, this class is functionally interchangeable with *Reference*, with one important exception: *IndirectObject* instances pointing to the same reference but occurring at different locations in the file may have distinct *container_ref* values.

get_object()

Returns
The PDF object this reference points to.

get_pdf_handler()

Return the PDF handler associated with this dereferenceable.

Returns
a *PdfHandler*.

property idnum: int

Returns
the object ID of this reference.

property generation

Returns
the generation number of this reference.

write_to_stream(*stream*, *handler: Optional[*SecurityHandler*] = None*, *container_ref=None*)

Abstract method to render this object to an output stream.

Parameters

- **stream** – An output stream.
- **container_ref** – Local encryption key.
- **handler** – Security handler

static read_from_stream(*stream*, *container_ref:* Dereferenceable)

class pyhanko.pdf_utils.generic.**NullObject**

Bases: *PdfObject*

PDF *null* object.

All instances are treated as equal and falsy.

write_to_stream(*stream*, *handler: Optional[*SecurityHandler*] = None*, *container_ref=None*)

Abstract method to render this object to an output stream.

Parameters

- **stream** – An output stream.
- **container_ref** – Local encryption key.
- **handler** – Security handler

static read_from_stream(*stream*)

class pyhanko.pdf_utils.generic.**BooleanObject**(*value*)

Bases: PdfObject

PDF boolean value.

write_to_stream(*stream*, *handler: Optional[SecurityHandler] = None*, *container_ref=None*)

Abstract method to render this object to an output stream.

Parameters

- **stream** – An output stream.
- **container_ref** – Local encryption key.
- **handler** – Security handler

static read_from_stream(*stream*)

class pyhanko.pdf_utils.generic.**FloatObject**(*value='0'*, *context=None*)

Bases: Decimal, PdfObject

PDF Float object.

Internally, these are treated as decimals (and therefore actually fixed-point objects, to be precise).

as_numeric()

Returns

a Python float value for this object.

write_to_stream(*stream*, *handler: Optional[SecurityHandler] = None*, *container_ref=None*)

Abstract method to render this object to an output stream.

Parameters

- **stream** – An output stream.
- **container_ref** – Local encryption key.
- **handler** – Security handler

class pyhanko.pdf_utils.generic.**NumberObject**(*value*)

Bases: int, PdfObject

PDF number object. This is the PDF type for integer values.

NumberPattern = re.compile(b'[^+-.0-9]')

ByteDot = b'.'

as_numeric()

Returns

a Python int value for this object.

write_to_stream(*stream*, *handler: Optional[SecurityHandler] = None*, *container_ref=None*)

Abstract method to render this object to an output stream.

Parameters

- **stream** – An output stream.
- **container_ref** – Local encryption key.

- **handler** – Security handler

static read_from_stream(*stream*)

class pyhanko.pdf_utils.generic.**ByteStringObject**

Bases: bytes, *PdfObject*

PDF bytestring class.

property original_bytes

For compatibility with *TextStringObject.original_bytes*

write_to_stream(*stream*, *handler: Optional[SecurityHandler] = None*, *container_ref=None*)

Abstract method to render this object to an output stream.

Parameters

- **stream** – An output stream.
- **container_ref** – Local encryption key.
- **handler** – Security handler

class pyhanko.pdf_utils.generic.**TextStringObject**

Bases: str, *PdfObject*

PDF text string object.

autodetected_encoding: Optional[*TextStringEncoding*] = None

Autodetected encoding when parsing the file.

force_output_encoding: Optional[*TextStringEncoding*] = None

Output encoding to use when serialising the string. The default is to try PDFDocEncoding first, and fall back to UTF-16BE.

property original_bytes

Retrieve the original bytes of the string as specified in the source file.

This may be necessary if this string was misidentified as a text string.

write_to_stream(*stream*, *handler: Optional[SecurityHandler] = None*, *container_ref=None*)

Abstract method to render this object to an output stream.

Parameters

- **stream** – An output stream.
- **container_ref** – Local encryption key.
- **handler** – Security handler

class pyhanko.pdf_utils.generic.**NameObject**

Bases: str, *PdfObject*

PDF name object. These are valid Python strings, but names and strings are treated differently in the PDF specification, so proper care is required.

write_to_stream(*stream*, *handler: Optional[SecurityHandler] = None*, *container_ref=None*)

Abstract method to render this object to an output stream.

Parameters

- **stream** – An output stream.

- **container_ref** – Local encryption key.
- **handler** – Security handler

static **read_from_stream**(*stream*)

class pyhanko.pdf_utils.generic.**ArrayObject**(*iterable=()*, */*)

Bases: `list`, *PdfObject*

PDF array object. This class extends from Python's list class, and supports its interface.

Warning: Contrary to the case of dictionary objects, PyPDF2 does not transparently dereference array entries when accessed using `__getitem__()`. For usability & consistency reasons, I decided to depart from that and dereference automatically. This makes the behaviour of *ArrayObject* consistent with *DictionaryObject*.

That said, some vestiges of the old PyPDF2 behaviour may linger in the codebase. I'll fix those as I get to them.

raw_get(*index*, *decrypt: EncryptedObjAccess = EncryptedObjAccess.TRANSPARENT*)

Changed in version 0.14.0: `decrypt` parameter is no longer boolean

Get a value from an array without dereferencing. In other words, if the value corresponding to the given key is of type *IndirectObject*, the indirect reference will not be resolved.

Parameters

- **index** – Key to look up in the dictionary.
- **decrypt** – What to do when retrieving encrypted objects; see *EncryptedObjAccess*. The default is *EncryptedObjAccess.TRANSPARENT*.

Returns

A *PdfObject*.

write_to_stream(*stream*, *handler: Optional[SecurityHandler] = None*, *container_ref=None*)

Abstract method to render this object to an output stream.

Parameters

- **stream** – An output stream.
- **container_ref** – Local encryption key.
- **handler** – Security handler

static **read_from_stream**(*stream*, *container_ref*)

class pyhanko.pdf_utils.generic.**DictionaryObject**(*dict_data=None*)

Bases: `dict`, *PdfObject*

A PDF dictionary object.

Keys in a PDF dictionary are PDF names, and values are PDF objects.

When accessing a key using the standard `__getitem__()` syntax, *IndirectObject* references will be resolved.

raw_get(*key: Union[NameObject, str]*, *decrypt: EncryptedObjAccess = EncryptedObjAccess.TRANSPARENT*)

Changed in version 0.14.0: `decrypt` parameter is no longer boolean

Get a value from a dictionary without dereferencing. In other words, if the value corresponding to the given key is of type *`IndirectObject`*, the indirect reference will not be resolved.

Parameters

- **`key`** – Key to look up in the dictionary.
- **`decrypt`** – What to do when retrieving encrypted objects; see *`EncryptedObjAccess`*. The default is *`EncryptedObjAccess.TRANSPARENT`*.

Returns

A *`PdfObject`*.

`setdefault`(*key*, *value=None*)

Insert key with a value of default if key is not in the dictionary.

Return the value for key if key is in the dictionary, else default.

`get_and_apply`(*key*, *function: Callable[[*PdfObject*], Any]*, ***, *raw=False*, *default=None*)

`get_value_as_reference`(*key*, *optional=False*) → *Reference*

`write_to_stream`(*stream*, *handler: Optional[*SecurityHandler*] = None*, *container_ref=None*)

Abstract method to render this object to an output stream.

Parameters

- **`stream`** – An output stream.
- **`container_ref`** – Local encryption key.
- **`handler`** – Security handler

`static read_from_stream`(*stream*, *container_ref:* Dereferenceable, *as_metadata_stream: bool = False*)

`class` `pyhanko.pdf_utils.generic.`**`StreamObject`**(*dict_data: Optional[dict] = None*, *stream_data: Optional[bytes] = None*, *encoded_data: Optional[bytes] = None*, *handler: Optional[*SecurityHandler*] = None*)

Bases: *`DictionaryObject`*

PDF stream object.

Essentially, a PDF stream is a dictionary object with a binary blob of data attached. This data can be encoded by various filters (not all of which are currently supported, see *`filters`*).

A stream object can be initialised with encoded or decoded data. The former is used by *`reader.PdfFileReader`* to provide on-demand decoding, with *`writer.BasePdfFileWriter`* and its subclasses working the other way around.

Note: The *`StreamObject`* class manages some of its dictionary keys by itself. This is partly the case for the various `/Filter` and `/DecodeParms` entries, but also for the `/Length` entry. The latter will be overwritten as necessary.

Parameters

- **`dict_data`** – The dictionary data for this stream object.
- **`stream_data`** – The (unencoded) stream data.

- **`encoded_data`** – The encoded stream data.

> **Warning:** Ordinarily, a stream can be initialised either from decoded and from encoded data.
>
> If both *stream_data* and *encoded_data* are provided, the caller is responsible for making sure that both are compatible given the currently relevant filter configuration.

- **`handler`** – A reference to the currently active `pyhanko.pdf_utils.crypt.SecurityHandler`. This is only necessary if the stream requires crypt filters.

`add_crypt_filter`(*name='/Identity'*, *params=None*, *handler: Optional[SecurityHandler] = None*)

`strip_filters`()

Ensure the stream is decoded, and remove any filters.

`property data: bytes`

Return the decoded stream data as bytes. If the stream hasn't been decoded yet, it will be decoded on-the-fly.

Raises

`.misc.PdfStreamError` – If the stream could not be decoded.

`property encoded_data: bytes`

Return the encoded stream data as bytes. If the stream hasn't been encoded yet, it will be encoded on-the-fly.

Raises

`.misc.PdfStreamError` – If the stream could not be encoded.

`apply_filter`(*filter_name*, *params=None*, *allow_duplicates: Optional[bool] = True*)

Apply a new filter to this stream. This filter will be prepended to any existing filters. This means that is is placed *last* in the encoding order, but *first* in the decoding order.

Note: Calling this method on an encoded stream will first cause the stream to be decoded using the filters already present. The cached value for the encoded stream data will be cleared.

Parameters

- **`filter_name`** – Name of the filter (see `DECODERS`)
- **`params`** – Parameters to the filter (will be written to `/DecodeParms` if not `None`)
- **`allow_duplicates`** – If `None`, silently ignore duplicate filters. If `False`, raise ValueError when attempting to add a duplicate filter. If `True` (default), duplicate filters are allowed.

`compress`()

Convenience method to add a `/FlateDecode` filter with default settings, if one is not already present.

Note: compression is not actually applied until the stream is written.

`property is_embedded_file_stream`

`write_to_stream`(*stream*, *handler: Optional[SecurityHandler] = None*, *container_ref=None*)

Abstract method to render this object to an output stream.

Parameters

- **`stream`** – An output stream.
- **`container_ref`** – Local encryption key.
- **`handler`** – Security handler

`pyhanko.pdf_utils.generic.`**`read_object`**`(`*stream*, *container_ref: Dereferenceable*, *as_metadata_stream: bool = False*`)` → *PdfObject*

Read a PDF object from an input stream.

Note: The *container_ref* parameter tells the API which reference to register when the returned object is modified in an incremental update. See also here *here* for further information.

Parameters

- **`stream`** – An input stream.
- **`container_ref`** – A reference to an object containing this one.

  Note: It is perfectly possible (and common) for *container_ref* to resolve to the return value of this function.
- **`as_metadata_stream`** – Whether to dereference the object as an XMP metadata stream.

Returns

A `PdfObject`.

`pyhanko.pdf_utils.generic.`**`pdf_name`**

alias of `NameObject`

`pyhanko.pdf_utils.generic.`**`pdf_string`**`(`*string: Union[str, bytes, bytearray]*`)` → Union[*ByteStringObject*, *TextStringObject*]

Encode a string as a `TextStringObject` if possible, or a `ByteStringObject` otherwise.

Parameters

`string` – A Python string.

`pyhanko.pdf_utils.generic.`**`pdf_date`**`(`*dt: datetime*`)` → *TextStringObject*

Convert a datetime object into a PDF string. This function supports both timezone-aware and naive datetime objects.

Parameters

`dt` – The datetime object to convert.

Returns

A `TextStringObject` representing the datetime passed in.

`class` `pyhanko.pdf_utils.generic.`**`TextStringEncoding`**`(`*value*`)`

Bases: `Enum`

Encodings for PDF text strings.

`PDF_DOC = None`

PDFDocEncoding (one-byte character codes; PDF-specific).

`UTF16BE = (b'\xfe\xff', 'utf-16be')`

UTF-16BE encoding.

`UTF8 = (b'\xef\xbb\xbf', 'utf-8')`

UTF-8 encoding (PDF 2.0)

`UTF16LE = (b'\xff\xfe', 'utf-16le')`

UTF-16LE encoding.

Note: This is strictly speaking invalid in PDF 2.0, but some authoring tools output such strings anyway (presumably due to the fact that it's the default wide character encoding on Windows).

encode(*string: str*) → bytes

Encode a string with BOM.

Parameters
`string` – The string to encode.

Returns
The encoded string.

decode(*string: Union[bytes, bytearray]*) → str

Decode a string with BOM.

Parameters
`string` – The string to encode.

Returns
The encoded string.

Raises
`UnicodeDecodeError` – Raised if decoding fails.

class pyhanko.pdf_utils.generic.**EncryptedObjAccess**(*value*)

Bases: `Enum`

Defines what to do when an encrypted object is encountered when retrieving an object from a container.

`PROXY = 0`

Return the proxy object as-is, and leave further encryption/decryption handling to the caller.

`TRANSPARENT = 1`

Transparently decrypt the proxy's content (similarly wrapping any sub-containers in *DecryptedObjectProxy*, so this applies recursively).

Note: This is the default in most situations, since it's the least likely to get in the way of any APIs that are not explicitly aware of content encryption concerns.

`RAW = 2`

Return the underlying raw object as written, without attempting or deferring decryption.

class pyhanko.pdf_utils.generic.**DecryptedObjectProxy**(*raw_object:* PdfObject, *handler*)

Bases: *PdfObject*

Internal proxy class that allows transparent on-demand encryption of objects.

Warning: Most public-facing APIs won't leave you to deal with these *directly* (that's half the reason this class exists in the first place), and the API of this class is considered internal.

However, for reasons related to the historical PyPDF2 codebase from which pyHanko's object handling code ultimately derives, there are some Python builtins that might cause these wrapper objects to inadvertently "leak". Please tell us about such cases so we can make those types of access more convenient and robust.

Danger: The `__eq__` implementation on this class is not safe for general use, due to the fact that certain structures in PDF are exempt from encryption. Only compare proxy objects with == in areas of the document where these exemptions don't apply.

Parameters

- **`raw_object`** – A raw object, typically as-parsed from a PDF file.
- **`handler`** – The security handler governing this object.

`raw_object:` *`PdfObject`*

The underlying raw object, in its encrypted state.

`property decrypted:` *`PdfObject`*

The decrypted PDF object exposed as a property.

If this object is a container object, its constituent parts will be wrapped in *`DecryptedObjectProxy`* as well, in order to defer further decryption until the values are requested through a getter method on the container.

`write_to_stream`(*stream*, *handler: Optional[*SecurityHandler*] = None*, *container_ref=None*)

Abstract method to render this object to an output stream.

Parameters

- **`stream`** – An output stream.
- **`container_ref`** – Local encryption key.
- **`handler`** – Security handler

`get_object`()

Resolves indirect references.

Returns

self, unless an instance of *`IndirectObject`*.

`property container_ref`

pyhanko.pdf_utils.images module

Utilities for embedding bitmap image data into PDF files.

The image data handling is done by Pillow.

Note: Note that also here we only support a subset of what the PDF standard provides for. Most RGB and grayscale images (with or without transparency) that can be read by PIL/Pillow can be used without issue. PNG images with an indexed palette backed by one of these colour spaces can also be used.

Currently there is no support for CMYK images or (direct) support for embedding JPEG-encoded image data as such, but these features may be added later.

`pyhanko.pdf_utils.images.`**`pil_image`**(*img: Image*, *writer:* BasePdfFileWriter)

This function writes a PIL/Pillow `Image` object to a PDF file writer, as an image XObject.

Parameters

- **`img`** – A Pillow `Image` object
- **`writer`** – A PDF file writer

Returns

A reference to the image XObject written.

`class` `pyhanko.pdf_utils.images.`**`PdfImage`**(*image: Union[Image, str]*, *writer: Optional[*BasePdfFileWriter*] = None*, *resources: Optional[*PdfResources*] = None*, *name: Optional[str] = None*, *opacity=None*, *box: Optional[*BoxConstraints*] = None*)

Bases: *`PdfContent`*

Wrapper class that implements the *`PdfContent`* interface for image objects.

Note: Instances of this class are reusable, in the sense that the implementation is aware of changes to the associated `writer` object. This allows the same image to be embedded into multiple files without instantiating a new *`PdfImage`* every time.

`property image_ref:` *`IndirectObject`*

Return a reference to the image XObject associated with this *`PdfImage`* instance. If no such reference is available, it will be created using *`pil_image()`*, and the result will be cached until the `writer` attribute changes (see *`set_writer()`*).

Returns

An indirect reference to an image XObject.

`render`() → bytes

Compile the content to graphics operators.

`box:` *`BoxConstraints`*

pyhanko.pdf_utils.incremental_writer module

Utility for writing incremental updates to existing PDF files.

`class` `pyhanko.pdf_utils.incremental_writer.`**`IncrementalPdfFileWriter`**(*input_stream*, *prev: Optional[*PdfFileReader*] = None*, *strict=True*)

Bases: *`BasePdfFileWriter`*

Class to incrementally update existing files.

This *`BasePdfFileWriter`* subclass encapsulates a *`PdfFileReader`* instance in addition to exposing an interface to add and modify PDF objects.

Incremental updates to a PDF file append modifications to the end of the file. This is critical when the original file contents are not to be modified directly (e.g. when it contains digital signatures). It has the additional advantage of providing an automatic audit trail of sorts.

Parameters

- `input_stream` – Input stream to read current revision from.
- `strict` – Ingest the source file in strict mode. The default is `True`.
- `prev` – Explicitly pass in a PDF reader. This parameter is internal API.

`IO_CHUNK_SIZE = 4096`

`classmethod from_reader`(*reader:* PdfFileReader) → *IncrementalPdfFileWriter*

Instantiate an incremental writer from a PDF file reader.

Parameters
`reader` – A *`PdfFileReader`* object with a PDF to extend.

`ensure_output_version`(*version*)

`get_object`(*ido*, *as_metadata_stream: bool = False*)

Retrieve the object associated with the provided reference from this PDF handler.

Parameters

- `ref` – An instance of *`generic.Reference`*.
- `as_metadata_stream` – Whether to dereference the object as an XMP metadata stream.

Returns
A PDF object.

`mark_update`(*obj_ref: Union[*Reference, IndirectObject*]*)

Mark an object reference to be updated. This is only relevant for incremental updates, but is included as a no-op by default for interoperability reasons.

Parameters
`obj_ref` – An indirect object instance or a reference.

`update_container`(*obj:* PdfObject)

Mark the container of an object (as indicated by the *`container_ref`* attribute on *`PdfObject`*) for an update.

As with *`mark_update()`*, this only applies to incremental updates, but defaults to a no-op.

Parameters
`obj` – The object whose top-level container needs to be rewritten.

`update_root`()

Signal that the document catalog should be written to the output. Equivalent to calling *`mark_update()`* with `root_ref`.

`set_info`(*info: Optional[Union[*IndirectObject, DictionaryObject*]]*)

Set the `/Info` entry of the document trailer.

Parameters
`info` – The new `/Info` dictionary, as an indirect reference.

`set_custom_trailer_entry`(*key:* NameObject, *value:* PdfObject)

Set a custom, unmanaged entry in the document trailer or cross-reference stream dictionary.

Warning: Calling this method to set an entry that is managed by pyHanko internally (info dictionary, document catalog, etc.) has undefined results.

Parameters

- **key** – Dictionary key to use in the trailer.
- **value** – Value to set

write(*stream*)

Write the contents of this PDF writer to a stream.

Parameters
stream – A writable output stream.

property document_meta_view: *DocumentMetadata*

write_in_place()

Write the updated file contents in-place to the same stream as the input stream. This obviously requires a stream supporting both reading and writing operations.

encrypt(*user_pwd*)

Method to handle updates to encrypted files.

This method handles decrypting of the original file, and makes sure the resulting updated file is encrypted in a compatible way. The standard mandates that updates to encrypted files be effected using the same encryption settings. In particular, incremental updates cannot remove file encryption.

Parameters
user_pwd – The original file's user password.

Raises
PdfReadError – Raised when there is a problem decrypting the file.

encrypt_pubkey(*credential:* EnvelopeKeyDecrypter)

Method to handle updates to files encrypted using public-key encryption.

The same caveats as `encrypt()` apply here.

Parameters
credential – The *EnvelopeKeyDecrypter* handling the recipient's private key.

Raises
PdfReadError – Raised when there is a problem decrypting the file.

stream_xrefs: bool

Boolean controlling whether or not the output file will contain its cross-references in stream format, or as a classical XRef table.

The default for new files is `True`. For incremental updates, the writer adapts to the system used in the previous iteration of the document (as mandated by the standard).

pyhanko.pdf_utils.layout module

Layout utilities (to be expanded)

exception `pyhanko.pdf_utils.layout.`**LayoutError**(*msg: str*, **args*)

Bases: `ValueError`

Indicates an error in a layout computation.

exception `pyhanko.pdf_utils.layout.`**`BoxSpecificationError`**(*msg: Optional[str] = None*)

Bases: `LayoutError`

Raised when a box constraint is over/underspecified.

class `pyhanko.pdf_utils.layout.`**`BoxConstraints`**(*width: Optional[Union[int, float]] = None, height: Optional[Union[int, float]] = None, aspect_ratio: Optional[Fraction] = None*)

Bases: `object`

Represents a box of potentially variable width and height. Among other uses, this can be leveraged to produce a variably sized box with a fixed aspect ratio.

If width/height are not defined yet, they can be set by assigning to the `width` and `height` attributes.

property width: int

Returns
The width of the box.

Raises
`BoxSpecificationError` – if the box's width could not be determined.

property width_defined: bool

Returns
`True` if the box currently has a well-defined width, `False` otherwise.

property height: int

Returns
The height of the box.

Raises
`BoxSpecificationError` – if the box's height could not be determined.

property height_defined: bool

Returns
`True` if the box currently has a well-defined height, `False` otherwise.

property aspect_ratio: Fraction

Returns
The aspect ratio of the box.

Raises
`BoxSpecificationError` – if the box's aspect ratio could not be determined.

property aspect_ratio_defined: bool

Returns
`True` if the box currently has a well-defined aspect ratio, `False` otherwise.

class `pyhanko.pdf_utils.layout.`**`AxisAlignment`**(*value*)

Bases: `Enum`

Class representing one-dimensional alignment along an axis.

`ALIGN_MIN = 1`

Align maximally towards the negative end of the axis.

ALIGN_MID = 2

Center content along the axis.

ALIGN_MAX = 3

Align maximally towards the positive end of the axis.

classmethod from_x_align(*align_str: str*) → *AxisAlignment*

Convert from a horizontal alignment config string.

Parameters
`align_str` – A string: 'left', 'mid' or 'right'.

Returns
An `AxisAlignment` value.

Raises
`ConfigurationError` – on unexpected string inputs.

classmethod from_y_align(*align_str: str*) → *AxisAlignment*

Convert from a vertical alignment config string.

Parameters
`align_str` – A string: 'bottom', 'mid' or 'top'.

Returns
An `AxisAlignment` value.

Raises
`ConfigurationError` – on unexpected string inputs.

property flipped

align(*container_len: int*, *inner_len: int*, *pre_margin*, *post_margin*) → int

class pyhanko.pdf_utils.layout.Margins(*left: int = 0*, *right: int = 0*, *top: int = 0*, *bottom: int = 0*)

Bases: `ConfigurableMixin`

Class describing a set of margins.

left: int = 0

right: int = 0

top: int = 0

bottom: int = 0

classmethod uniform(*num*)

Return a set of uniform margins.

Parameters
`num` – The uniform margin to apply to all four sides.

Returns
`Margins(num, num, num, num)`

static effective(*dim_name*, *container_len*, *pre*, *post*)

Internal helper method to compute effective margins.

`effective_width`(*width*)

Compute width without margins.

Parameters
`width` – The container width.

Returns
The width after subtracting the left and right margins.

Raises
`LayoutError` – if the container width is too short to accommodate the margins.

`effective_height`(*height*)

Compute height without margins.

Parameters
`height` – The container height.

Returns
The height after subtracting the top and bottom margins.

Raises
`LayoutError` – if the container height is too short to accommodate the margins.

`classmethod from_config`(*config_dict*)

Attempt to instantiate an object of the class on which it is called, by means of the configuration settings passed in.

First, we check that the keys supplied in the dictionary correspond to data fields on the current class. Then, the dictionary is processed using the `process_entries()` method. The resulting dictionary is passed to the initialiser of the current class as a kwargs dict.

Parameters
`config_dict` – A dictionary containing configuration values.

Returns
An instance of the class on which it is called.

Raises
`ConfigurationError` – when an unexpected configuration key is encountered or left unfilled, or when there is a problem processing one of the config values.

`class pyhanko.pdf_utils.layout.InnerScaling`(*value*)

Bases: `Enum`

Class representing a scaling convention.

`NO_SCALING = 1`

Never scale content.

`STRETCH_FILL = 2`

Scale content to fill the entire container.

`STRETCH_TO_FIT = 3`

Scale content while preserving aspect ratio until either the maximal width or maximal height is reached.

`SHRINK_TO_FIT = 4`

Scale content down to fit in the container, while preserving the original aspect ratio.

classmethod from_config(*config_str: str*) → *InnerScaling*

Convert from a configuration string.

Parameters
`config_str` – A string: 'none', 'stretch-fill', 'stretch-to-fit', 'shrink-to-fit'

Returns
An `InnerScaling` value.

Raises
`ConfigurationError` – on unexpected string inputs.

class pyhanko.pdf_utils.layout.**SimpleBoxLayoutRule**(*x_align: AxisAlignment*, *y_align: AxisAlignment*, *margins: Margins = Margins(left=0, right=0, top=0, bottom=0)*, *inner_content_scaling: InnerScaling = InnerScaling.SHRINK_TO_FIT*)

Bases: `ConfigurableMixin`

Class describing alignment, scaling and margin rules for a box positioned inside another box.

x_align: *AxisAlignment*

Horizontal alignment settings.

y_align: *AxisAlignment*

Vertical alignment settings.

margins: *Margins* **= Margins(left=0, right=0, top=0, bottom=0)**

Container (inner) margins. Defaults to all zeroes.

inner_content_scaling: *InnerScaling* **= 4**

Inner content scaling rule.

classmethod process_entries(*config_dict*)

Hook method that can modify the configuration dictionary to overwrite or tweak some of their values (e.g. to convert string parameters into more complex Python objects)

Subclasses that override this method should call `super().process_entries()`, and leave keys that they do not recognise untouched.

Parameters
`config_dict` – A dictionary containing configuration values.

Raises
`ConfigurationError` – when there is a problem processing a relevant entry.

substitute_margins(*new_margins: Margins*) → *SimpleBoxLayoutRule*

fit(*container_box: BoxConstraints*, *inner_nat_width: int*, *inner_nat_height: int*) → *Positioning*

Position and possibly scale a box within a container, according to this layout rule.

Parameters

- `container_box` – `BoxConstraints` describing the container.
- `inner_nat_width` – The inner box's natural width.
- `inner_nat_height` – The inner box's natural height.

Returns
A `Positioning` describing the scaling & position of the lower left corner of the inner box.

class `pyhanko.pdf_utils.layout.`**`Positioning`**(*x_pos: int*, *y_pos: int*, *x_scale: float*, *y_scale: float*)

Bases: *`ConfigurableMixin`*

Class describing the position and scaling of an object in a container.

`x_pos: int`

Horizontal coordinate

`y_pos: int`

Vertical coordinate

`x_scale: float`

Horizontal scaling

`y_scale: float`

Vertical scaling

`as_cm`()

Convenience method to convert this *`Positioning`* into a PDF `cm` operator.

Returns

A byte string representing the `cm` operator corresponding to this *`Positioning`*.

pyhanko.pdf_utils.misc module

Utility functions for PDF library. Taken from PyPDF2 with modifications and additions, see *here* for the original license of the PyPDF2 project.

Generally, all of these constitute internal API, except for the exception classes.

exception `pyhanko.pdf_utils.misc.`**`PdfError`**(*msg: str*, **args*)

Bases: `Exception`

exception `pyhanko.pdf_utils.misc.`**`PdfReadError`**(*msg: str*, **args*)

Bases: *`PdfError`*

exception `pyhanko.pdf_utils.misc.`**`PdfStrictReadError`**(*msg: str*, **args*)

Bases: *`PdfReadError`*

exception `pyhanko.pdf_utils.misc.`**`PdfWriteError`**(*msg: str*, **args*)

Bases: *`PdfError`*

exception `pyhanko.pdf_utils.misc.`**`PdfStreamError`**(*msg: str*, **args*)

Bases: *`PdfReadError`*

exception `pyhanko.pdf_utils.misc.`**`IndirectObjectExpected`**(*msg: Optional[str] = None*)

Bases: *`PdfReadError`*

`pyhanko.pdf_utils.misc.`**`get_and_apply`**(*dictionary: dict*, *key*, *function: Callable*, ***, *default=None*)

class `pyhanko.pdf_utils.misc.`**`OrderedEnum`**(*value*)

Bases: `Enum`

Ordered enum (from the Python documentation)

class pyhanko.pdf_utils.misc.**StringWithLanguage**(*value: str*, *lang_code: Optional[str] = None*, *country_code: Optional[str] = None*)

Bases: `object`

A string with a language attached to it.

value: str

lang_code: Optional[str] = None

country_code: Optional[str] = None

pyhanko.pdf_utils.misc.**is_regular_character**(*byte_value: int*)

pyhanko.pdf_utils.misc.**read_non_whitespace**(*stream*, *seek_back=False*, *allow_eof=False*)

Finds and reads the next non-whitespace character (ignores whitespace).

pyhanko.pdf_utils.misc.**read_until_whitespace**(*stream*, *maxchars: Optional[int] = None*) → bytes

Reads non-whitespace characters and returns them. Stops upon encountering whitespace, or, if `maxchars` is not `None`, when maxchars is reached.

Parameters

- **stream** – stream to read
- **maxchars** – maximal number of bytes to read before returning

pyhanko.pdf_utils.misc.**read_until_delimiter**(*stream*) → bytes

Read until a token delimiter (i.e. a delimiter character or a PDF whitespace character) is encountered, and rewind the stream to the previous character.

Parameters
stream – A stream.

Returns
The bytes read.

pyhanko.pdf_utils.misc.**read_until_regex**(*stream*, *regex*, *ignore_eof: bool = False*)

Reads until the regular expression pattern matched (ignore the match) Raise `PdfStreamError` on premature end-of-file.

Parameters

- **stream** – stream to search
- **regex** – regex to match
- **ignore_eof** – if true, ignore end-of-line and return immediately

Raises
`PdfStreamError` – on premature EOF

pyhanko.pdf_utils.misc.**skip_over_whitespace**(*stream*, *stop_after_eol=False*) → bool

Similar to `read_non_whitespace()`, but returns a `bool` if more than one whitespace character was read.

Will return the cursor to before the first non-whitespace character encountered, or after the first end-of-line sequence if one is encountered.

pyhanko.pdf_utils.misc.**skip_over_comment**(*stream*) → bool

Skip over a comment and position the cursor at the first byte after the EOL sequence following the comment. If there is no comment under the cursor, do nothing.

Parameters
`stream` – stream to read

Returns
`True` if a comment was read.

`pyhanko.pdf_utils.misc.`**`instance_test`**`(`*cls*`)`

`pyhanko.pdf_utils.misc.`**`peek`**`(`*itr*`)`

`pyhanko.pdf_utils.misc.`**`assert_writable_and_random_access`**`(`*output*`)`

Raise an error if the buffer in question is not writable, and return a boolean to indicate whether it supports random-access reading.

Parameters
`output` –

Returns

`pyhanko.pdf_utils.misc.`**`prepare_rw_output_stream`**`(`*output*`)`

Prepare an output stream that supports both reading and writing. Intended to be used for writing & updating signed files: when producing a signature, we render the PDF to a byte buffer with placeholder values for the signature data, or straight to the provided output stream if possible.

More precisely: this function will return the original output stream if it is writable, readable and seekable. If the `output` parameter is `None`, not readable or not seekable, this function will return a `BytesIO` instance instead. If the `output` parameter is not `None` and not writable, `IOError` will be raised.

Parameters
`output` – A writable file-like object, or `None`.

Returns
A file-like object that supports reading, writing and seeking.

`pyhanko.pdf_utils.misc.`**`finalise_output`**`(`*orig_output*, *returned_output*`)`

Several internal APIs transparently replaces non-readable/seekable buffers with BytesIO for signing operations, but we don't want to expose that to the public API user. This internal API function handles the unwrapping.

`pyhanko.pdf_utils.misc.`**`DEFAULT_CHUNK_SIZE = 4096`**

Default chunk size for stream I/O.

`pyhanko.pdf_utils.misc.`**`chunked_write`**`(`*temp_buffer: bytearray*, *stream*, *output*, *max_read=None*`)`

`pyhanko.pdf_utils.misc.`**`chunked_digest`**`(`*temp_buffer: bytearray*, *stream*, *md*, *max_read=None*`)`

`pyhanko.pdf_utils.misc.`**`chunk_stream`**`(`*temp_buffer: Union[bytearray, memoryview]*, *stream*, *max_read=None*`)` → Iterable[Union[bytearray, memoryview]]

`class` `pyhanko.pdf_utils.misc.`**`ConsList`**`(`**args*, ***kwds*`)`

Bases: `Generic`[`ListElem`]

`head: Optional[ListElem]`

`tail: Optional[`*`ConsList`*`[ListElem]] = None`

`static empty``()` → *ConsList*[ListElem]

`static sing``(`*value: ListElem*`)` → *ConsList*[ListElem]

`property last: Optional[ListElem]`

cons(*head: ListElem*) → *ConsList*[ListElem]

class pyhanko.pdf_utils.misc.**Singleton**(*name*, *bases*, *dct*)

Bases: `type`

pyhanko.pdf_utils.misc.**rd**(*x*)

pyhanko.pdf_utils.misc.**isoparse**(*dt_str: str*) → datetime

pyhanko.pdf_utils.misc.**lift_iterable_async**(*i: Iterable[X]*) → *CancelableAsyncIterator*[X]

pyhanko.pdf_utils.qr module

class pyhanko.pdf_utils.qr.**PdfStreamQRImage**(*border*, *width*, *box_size*, **args*, ***kwargs*)

Bases: `BaseImage`

Quick-and-dirty implementation of the Image interface required by the qrcode package.

kind: Optional[str] = 'PDF'

allowed_kinds: Optional[Tuple[str]] = ('PDF',)

qr_color = (0, 0, 0)

new_image(***kwargs*)

Build the image class. Subclasses should return the class created.

drawrect(*row*, *col*)

Draw a single rectangle of the QR code.

append_single_rect(*command_stream*, *row*, *col*)

format_qr_color()

setup_drawing_area()

render_command_stream()

save(*stream*, *kind=None*)

Save the image file.

process()

Processes QR code after completion

drawrect_context(*row*, *col*, *active*, *context*)

Draw a single rectangle of the QR code given the surrounding context

class pyhanko.pdf_utils.qr.**PdfFancyQRImage**(*border*, *width*, *box_size*, **_args*, *version*, *center_image: Optional[PdfContent] = None*, ***kwargs*)

Bases: *PdfStreamQRImage*

centerpiece_corner_radius = 0.2

save(*stream*, *kind=None*)

Save the image file.

process()

Processes QR code after completion

append_single_rect(*command_stream*, *row*, *col*)

is_major_position_pattern(*row*, *col*)

is_position_pattern(*row*, *col*)

draw_position_patterns()

draw_centerpiece()

setup_drawing_area()

render_command_stream()

pyhanko.pdf_utils.qr.**rounded_square**(*x_pos: float*, *y_pos: float*, *sz: float*, *rad: float*) → List[bytes]

Add a subpath of a square with rounded corners at the given position. Doesn't include any painting or clipping operations.

The path is drawn counterclockwise.

Parameters

- **x_pos** – The x-coordinate of the enveloping square's lower left corner.
- **y_pos** – The y-coordinate of the enveloping square's lower left corner.
- **sz** – The side length of the enveloping square.
- **rad** – The corner radius.

Returns

A list of graphics operators.

pyhanko.pdf_utils.reader module

Utility to read PDF files. Contains code from the PyPDF2 project; see *here* for the original license.

The implementation was tweaked with the express purpose of facilitating historical inspection and auditing of PDF files with multiple revisions through incremental updates. This comes at a cost, and future iterations of this module may offer more flexibility in terms of the level of detail with which file size is scrutinised.

class pyhanko.pdf_utils.reader.**PdfFileReader**(*stream*, *strict: bool = True*)

Bases: *PdfHandler*

Class implementing functionality to read a PDF file and cache certain data about it.

last_startxref = None

has_xref_stream = False

xrefs: *XRefCache*

property document_meta_view: *DocumentMetadata*

property input_version

property trailer_view: *DictionaryObject*

Returns a view of the document trailer of the document represented by this *PdfHandler* instance.

The view is effectively read-only, in the sense that any writes will not be reflected in the actual trailer (if the handler supports writing, that is).

Returns
A `generic.DictionaryObject` representing the current state of the document trailer.

property root_ref: *Reference*

Returns
A reference to the document catalog of this PDF handler.

property document_id: Tuple[bytes, bytes]

get_historical_root(*revision: int*)

Get the document catalog for a specific revision.

Parameters
revision – The revision to query, the oldest one being *0*.

Returns
The value of the document catalog dictionary for that revision.

property total_revisions: int

Returns
The total number of revisions made to this file.

get_object(*ref*, *revision=None*, *never_decrypt=False*, *transparent_decrypt=True*, *as_metadata_stream=False*)

Read an object from the input stream.

Parameters

- **ref** – `Reference` to the object.
- **revision** – Revision number, to return the historical value of a reference. This always bypasses the cache. The oldest revision is numbered *0*. See also `HistoricalResolver`.
- **never_decrypt** – Skip decryption step (only needed for parsing `/Encrypt`)
- **transparent_decrypt** – If `True`, all encrypted objects are transparently decrypted by default (in the sense that a user of the API in a PyPDF2 compatible way would only "see" decrypted objects). If `False`, this method may return a proxy object that still allows access to the "original".

  Danger: The encryption parameters are considered internal, undocumented API, and subject to change without notice.

- **as_metadata_stream** – Whether to dereference the object as an XMP metadata stream.

Returns
A `PdfObject`.

Raises
PdfReadError – Raised if there is an issue reading the object from the file.

cache_get_indirect_object(*generation*, *idnum*)

cache_indirect_object(*generation*, *idnum*, *obj*)

read()

decrypt(*password: Union[str, bytes]*) → *AuthResult*

When using an encrypted PDF file with the standard PDF encryption handler, this function will allow the file to be decrypted. It checks the given password against the document's user password and owner password, and then stores the resulting decryption key if either password is correct.

Both legacy encryption schemes and PDF 2.0 encryption (based on AES-256) are supported.

Danger: Supplying either user or owner password will work. Cryptographically, both allow the decryption key to be computed, but processors are expected to adhere to the `/P` flags in the encryption dictionary when accessing a file with the user password. Currently, pyHanko does not enforce these restrictions, but it may in the future.

Danger: One should also be aware that the legacy encryption schemes used prior to PDF 2.0 are (very) weak, and we only support them for compatibility reasons. Under no circumstances should these still be used to encrypt new files.

Parameters
`password` – The password to match.

decrypt_pubkey(*credential:* EnvelopeKeyDecrypter) → *AuthResult*

Decrypt a PDF file encrypted using public-key encryption by providing a credential representing the private key of one of the recipients.

Danger: The same caveats as in `decrypt()` w.r.t. permission handling apply to this method.

Danger: The robustness of the public key cipher being used is not the only factor in the security of public-key encryption in PDF. The standard still permits weak schemes to encrypt the actual file data and file keys. PyHanko uses sane defaults everywhere, but other software may not.

Parameters
`credential` – The `EnvelopeKeyDecrypter` handling the recipient's private key.

property encrypted

Returns
`True` if a document is encrypted, `False` otherwise.

get_historical_resolver(*revision: int*) → *HistoricalResolver*

Return a `PdfHandler` instance that provides a view on the file at a specific revision.

Parameters
`revision` – The revision number to use, with *0* being the oldest.

Returns
An instance of `HistoricalResolver`.

property embedded_signatures

Returns
The signature objects embedded in this document, in signing order; see `EmbeddedPdfSignature`.

property embedded_regular_signatures

Returns
The signature objects of type `/Sig` embedded in this document, in signing order; see `EmbeddedPdfSignature`.

property embedded_timestamp_signatures

Returns
The signature objects of type `/DocTimeStamp` embedded in this document, in signing order; see `EmbeddedPdfSignature`.

class pyhanko.pdf_utils.reader.HistoricalResolver(*reader: PdfFileReader*, *revision*)

Bases: `PdfHandler`

`PdfHandler` implementation that provides a view on a particular revision of a PDF file.

Instances of `HistoricalResolver` should be created by calling the `get_historical_resolver()` method on a `PdfFileReader` object.

Instances of this class cache the result of `get_object()` calls.

Danger: This class is documented, but is nevertheless considered internal API, and easy to misuse.

In particular, the *container_ref* attribute must *not* be relied upon for objects retrieved from a `HistoricalResolver`. Internally, it is only used to make lazy decryption work in historical revisions.

Note: Be aware that instances of this class transparently rewrite the PDF handler associated with any reference objects returned from the reader, so calling `get_object()` on an indirect reference object will cause the reference to be resolved within the selected revision.

property document_meta_view: DocumentMetadata

property document_id: Tuple[bytes, bytes]

property trailer_view: DictionaryObject

Returns a view of the document trailer of the document represented by this `PdfHandler` instance.

The view is effectively read-only, in the sense that any writes will not be reflected in the actual trailer (if the handler supports writing, that is).

Returns
A `generic.DictionaryObject` representing the current state of the document trailer.

get_object(*ref: Reference*, *as_metadata_stream: bool = False*)

Retrieve the object associated with the provided reference from this PDF handler.

Parameters

- **ref** – An instance of `generic.Reference`.
- **as_metadata_stream** – Whether to dereference the object as an XMP metadata stream.

Returns
A PDF object.

property root_ref: *Reference*

Returns
A reference to the document catalog of this PDF handler.

explicit_refs_in_revision()

refs_freed_in_revision()

object_streams_used()

is_ref_available(*ref: Reference*) → bool

Check if the reference in question was in scope for this revision. This call doesn't care about the specific semantics of free vs. used objects; it conservatively answers 'no' in any situation where the object ID _could_ have been assigned by the revision in question.

Parameters
`ref` – A reference object (usually one written to by a newer revision)

Returns
`True` if the reference is unassignable, `False` otherwise.

collect_dependencies(*obj: PdfObject*, *since_revision=None*) → Set[*Reference*]

Collect all indirect references used by an object and its descendants.

Parameters

- `obj` – The object to inspect.
- `since_revision` – Optionally specify a revision number that tells the scanner to only include objects IDs that were added in that revision or later.

Warning: In particular, this means that the scanner will not recurse into older objects either.

Returns
A `set` of *Reference* objects.

pyhanko.pdf_utils.reader.**parse_catalog_version**(*version_str*) → Optional[Tuple[int, int]]

class pyhanko.pdf_utils.reader.**RawPdfPath**(**path: Union[str, int]*)

Bases: `object`

Class to model raw paths in a file.

This class is internal API.

walk_nodes(*from_obj*, *transparent_dereference=True*) → Generator[Tuple[Optional[Union[int, str]], *PdfObject*], None, None]

access_on(*from_obj*, *dereference_last=True*) → *PdfObject*

access_reference_on(*from_obj*) → *Reference*

pyhanko.pdf_utils.reader.**process_data_at_eof**(*stream*) → int

Auxiliary function that reads backwards from the current position in a stream to find the EOF marker and startxref value

This is internal API.

Parameters
`stream` – A stream to read from

Returns
The value of the startxref pointer, if found. Otherwise a PdfReadError is raised.

pyhanko.pdf_utils.rw_common module

Utilities common to reading and writing PDF files.

`class pyhanko.pdf_utils.rw_common.PdfHandler`

Bases: `object`

Abstract class providing a general interface for quering objects in PDF readers and writers alike.

`get_object`(*ref:* Reference, *as_metadata_stream: bool = False*)

Retrieve the object associated with the provided reference from this PDF handler.

Parameters

- `ref` – An instance of *`generic.Reference`*.
- `as_metadata_stream` – Whether to dereference the object as an XMP metadata stream.

Returns
A PDF object.

`property trailer_view:` *`DictionaryObject`*

Returns a view of the document trailer of the document represented by this *`PdfHandler`* instance.

The view is effectively read-only, in the sense that any writes will not be reflected in the actual trailer (if the handler supports writing, that is).

Returns
A *`generic.DictionaryObject`* representing the current state of the document trailer.

`property document_meta_view:` *`DocumentMetadata`*

`property root_ref:` *`Reference`*

Returns
A reference to the document catalog of this PDF handler.

`property root:` *`DictionaryObject`*

Returns
The document catalog of this PDF handler.

`property document_id: Tuple[bytes, bytes]`

`find_page_container`(*page_ix*)

Retrieve the node in the page tree containing the page with index `page_ix`, along with the necessary objects to modify it in an incremental update scenario.

Parameters
`page_ix` – The (zero-indexed) number of the page for which we want to retrieve the parent. A negative number counts pages from the back of the document, with index `-1` referring to the last page.

Returns
A triple with the `/Pages` object (or a reference to it), the index of the target page in said `/Pages` object, and a (possibly inherited) resource dictionary.

find_page_for_modification(*page_ix*)

Retrieve the page with index `page_ix` from the page tree, along with the necessary objects to modify it in an incremental update scenario.

Parameters
page_ix – The (zero-indexed) number of the page to retrieve. A negative number counts pages from the back of the document, with index `-1` referring to the last page.

Returns
A tuple with a reference to the page object and a (possibly inherited) resource dictionary.

pyhanko.pdf_utils.text module

Utilities related to text rendering & layout.

class pyhanko.pdf_utils.text.**TextStyle**(*font: ~pyhanko.pdf_utils.font.api.FontEngineFactory = <factory>, font_size: int = 10, leading: ~typing.Optional[int] = None*)

Bases: *ConfigurableMixin*

Container for basic test styling settings.

font: *FontEngineFactory*

The *FontEngineFactory* to be used for this text style. Defaults to Courier (as a non-embedded standard font).

font_size: int = 10

Font size to be used.

leading: Optional[int] = None

Text leading. If `None`, the *font_size* parameter is used instead.

classmethod process_entries(*config_dict*)

Hook method that can modify the configuration dictionary to overwrite or tweak some of their values (e.g. to convert string parameters into more complex Python objects)

Subclasses that override this method should call `super().process_entries()`, and leave keys that they do not recognise untouched.

Parameters
config_dict – A dictionary containing configuration values.

Raises
ConfigurationError – when there is a problem processing a relevant entry.

class pyhanko.pdf_utils.text.**TextBoxStyle**(*font: ~pyhanko.pdf_utils.font.api.FontEngineFactory = <factory>, font_size: int = 10, leading: ~typing.Optional[int] = None, border_width: int = 0, box_layout_rule: ~typing.Optional[~pyhanko.pdf_utils.layout.SimpleBoxLayoutRule] = None, vertical_text: bool = False*)

Bases: *TextStyle*

Extension of *TextStyle* for use in text boxes.

border_width: int = 0

Border width, if applicable.

box_layout_rule: Optional[*SimpleBoxLayoutRule*] = None

Layout rule to nest the text within its containing box.

> **Warning:** This only affects the position of the text object, not the alignment of the text within.

vertical_text: bool = False

Switch layout code to vertical mode instead of horizontal mode.

class pyhanko.pdf_utils.text.TextBox(*style:* TextBoxStyle, *writer*, *resources: Optional[*PdfResources*] = None*, *box: Optional[*BoxConstraints*] = None*, *font_name='F1'*)

Bases: *PdfContent*

Implementation of a text box that implements the *PdfContent* interface.

> **Note:** Text boxes currently don't offer automatic word wrapping.

box: *BoxConstraints*

put_string_line(*txt*)

property content_lines

Returns

Text content of the text box, broken up into lines.

property content

Returns

The actual text content of the text box. This is a modifiable property.

In textboxes that don't have a fixed size, setting this property can cause the text box to be resized.

property leading

Returns

The effective leading value, i.e. the *leading* attribute of the associated *TextBoxStyle*, or *font_size* if not specified.

render()

Compile the content to graphics operators.

pyhanko.pdf_utils.writer module

Utilities for writing PDF files. Contains code from the PyPDF2 project; see *here* for the original license.

class pyhanko.pdf_utils.writer.**BasePdfFileWriter**(*root: Union[*IndirectObject, DictionaryObject*], info: Optional[Union[*IndirectObject, DictionaryObject*]], document_id:* ArrayObject, *obj_id_start: int = 0, stream_xrefs: bool = True*)

Bases: *PdfHandler*

Base class for PDF writers.

output_version = (1, 7)

Output version to be declared in the output file.

stream_xrefs: bool

Boolean controlling whether or not the output file will contain its cross-references in stream format, or as a classical XRef table.

The default for new files is `True`. For incremental updates, the writer adapts to the system used in the previous iteration of the document (as mandated by the standard).

get_subset_collection(*base_postscript_name: str*)

property document_meta: *DocumentMetadata*

property document_meta_view: *DocumentMetadata*

ensure_output_version(*version*)

set_info(*info: Optional[Union[*IndirectObject, DictionaryObject*]]*) → Optional[*IndirectObject*]

Set the `/Info` entry of the document trailer.

Parameters
info – The new `/Info` dictionary, as an indirect reference.

set_custom_trailer_entry(*key:* NameObject, *value:* PdfObject)

Set a custom, unmanaged entry in the document trailer or cross-reference stream dictionary.

Warning: Calling this method to set an entry that is managed by pyHanko internally (info dictionary, document catalog, etc.) has undefined results.

Parameters

- **key** – Dictionary key to use in the trailer.
- **value** – Value to set

property document_id: Tuple[bytes, bytes]

mark_update(*obj_ref: Union[*Reference, IndirectObject*]*)

Mark an object reference to be updated. This is only relevant for incremental updates, but is included as a no-op by default for interoperability reasons.

Parameters
obj_ref – An indirect object instance or a reference.

`update_container`(*obj:* PdfObject)

Mark the container of an object (as indicated by the `container_ref` attribute on `PdfObject`) for an update.

As with `mark_update()`, this only applies to incremental updates, but defaults to a no-op.

Parameters
`obj` – The object whose top-level container needs to be rewritten.

`property root_ref: Reference`

Returns
A reference to the document catalog.

`update_root`()

Signal that the document catalog should be written to the output. Equivalent to calling `mark_update()` with `root_ref`.

`register_extension`(*ext:* DeveloperExtension)

`get_object`(*ido*, *as_metadata_stream: bool = False*)

Retrieve the object associated with the provided reference from this PDF handler.

Parameters

- `ref` – An instance of `generic.Reference`.
- `as_metadata_stream` – Whether to dereference the object as an XMP metadata stream.

Returns
A PDF object.

`allocate_placeholder`() → *IndirectObject*

Allocate an object reference to populate later. Calls to `get_object()` for this reference will return `NullObject` until it is populated using `add_object()`.

This method is only relevant in certain advanced contexts where an object ID needs to be known before the object it refers to can be built; chances are you'll never need it.

Returns
A `IndirectObject` instance referring to the object just allocated.

`add_object`(*obj*, *obj_stream: Optional[*ObjectStream*] = None*, *idnum=None*) → *IndirectObject*

Add a new object to this writer.

Parameters

- `obj` – The object to add.
- `obj_stream` – An object stream to add the object to.
- `idnum` – Manually specify the object ID of the object to be added. This is only allowed for object IDs that have previously been allocated using `allocate_placeholder()`.

Returns
A `IndirectObject` instance referring to the object just added.

`prepare_object_stream`(*compress=True*)

Prepare and return a new `ObjectStream` object.

Parameters
`compress` – Indicates whether the resulting object stream should be compressed.

Returns
An `ObjectStream` object.

property trailer_view: `DictionaryObject`

Returns a view of the document trailer of the document represented by this `PdfHandler` instance.

The view is effectively read-only, in the sense that any writes will not be reflected in the actual trailer (if the handler supports writing, that is).

Returns
A `generic.DictionaryObject` representing the current state of the document trailer.

write(*stream*)

Write the contents of this PDF writer to a stream.

Parameters
stream – A writable output stream.

register_annotation(*page_ref*, *annot_ref*)

Register an annotation to be added to a page. This convenience function takes care of calling `mark_update()` where necessary.

Parameters

- **page_ref** – Reference to the page object involved.
- **annot_ref** – Reference to the annotation object to be added.

insert_page(*new_page*, *after=None*)

Insert a page object into the tree.

Parameters

- **new_page** – Page object to insert.
- **after** – Page number (zero-indexed) after which to insert the page.

Returns
A reference to the newly inserted page.

import_object(*obj: PdfObject*, *obj_stream: Optional[ObjectStream] = None*) → *PdfObject*

Deep-copy an object into this writer, dealing with resolving indirect references in the process.

Danger: The table mapping indirect references in the input to indirect references in the writer is not preserved between calls. Concretely, this means that invoking `import_object()` twice on the same input reader may cause object duplication.

Parameters

- **obj** – The object to import.
- **obj_stream** – The object stream to import objects into.

Note: Stream objects and bare references will not be put into the object stream; the standard forbids this.

Returns
The object as associated with this writer. If the input object was an indirect reference, a dictionary (incl. streams) or an array, the returned value will always be a new instance.

`import_page_as_xobject`(*other:* PdfHandler, *page_ix=0*, *inherit_filters=True*)

Import a page content stream from some other `PdfHandler` into the current one as a form XObject.

Parameters

- **`other`** – A `PdfHandler`
- **`page_ix`** – Index of the page to copy (default: 0)
- **`inherit_filters`** – Inherit the content stream's filters, if present.

Returns

An `IndirectObject` referring to the page object as added to the current reader.

`add_stream_to_page`(*page_ix*, *stream_ref*, *resources=None*, *prepend=False*)

Append an indirect stream object to a page in a PDF as a content stream.

Parameters

- **`page_ix`** – Index of the page to modify. The first page has index *0*.
- **`stream_ref`** – `IndirectObject` reference to the stream object to add.
- **`resources`** – Resource dictionary containing resources to add to the page's existing resource dictionary.
- **`prepend`** – Prepend the content stream to the list of content streams, as opposed to appending it to the end. This has the effect of causing the stream to be rendered underneath the already existing content on the page.

Returns

An `IndirectObject` reference to the page object that was modified.

`merge_resources`(*orig_dict*, *new_dict*) → bool

Update an existing resource dictionary object with data from another one. Returns `True` if the original dict object was modified directly.

The caller is responsible for avoiding name conflicts with existing resources.

`class pyhanko.pdf_utils.writer.PageObject`(*contents*, *media_box*, *resources=None*)

Bases: `DictionaryObject`

Subclass of `DictionaryObject` that handles some of the initialisation boilerplate for page objects.

`class pyhanko.pdf_utils.writer.PdfFileWriter`(*stream_xrefs=True*, *init_page_tree=True*, *info=None*)

Bases: `BasePdfFileWriter`

Class to write new PDF files.

`encrypt`(*owner_pass*, *user_pass=None*, ***kwargs*)

Mark this document to be encrypted with PDF 2.0 encryption (AES-256).

Caution: While pyHanko supports legacy PDF encryption as well, the API to create new documents using outdated encryption is left largely undocumented on purpose to discourage its use.

This caveat does *not* apply to incremental updates added to existing documents.

> **Danger:** The PDF 2.0 standard mandates AES-256 in CBC mode, and also includes 12 bytes of known plaintext by design. This implies that a sufficiently knowledgeable attacker can inject arbitrary content into your encrypted files without knowledge of the password.
>
> Adding a digital signature to the encrypted document is **not** a foolproof way to deal with this either, since most viewers will still allow the document to be opened before signatures are validated, and therefore end users are still exposed to potentially malicious content.
>
> Until the standard supports authenticated encryption schemes, you should **never** rely on its encryption provisions if tampering is a concern.

Parameters

- `owner_pass` – The desired owner password.
- `user_pass` – The desired user password (defaults to the owner password if not specified)
- `kwargs` – Other keyword arguments to be passed to *`StandardSecurityHandler.build_from_pw()`*.

`encrypt_pubkey`(*recipients: List[Certificate]*, ***kwargs*)

Mark this document to be encrypted with PDF 2.0 public key encryption. The certificates passed in should be RSA certificates.

PyHanko defaults to AES-256 to encrypt the actual file contents. The seed used to derive the file encryption key is also encrypted using AES-256 and bundled in a CMS EnvelopedData object. The envelope key is then encrypted separately for each recipient, using their respective public keys.

> **Caution:** The caveats for *`encrypt()`* also apply here.

Parameters

- `recipients` – Certificates of the recipients that should be able to decrypt the document.
- `kwargs` – Other keyword arguments to be passed to *`PubKeySecurityHandler.build_from_certs()`*.

`stream_xrefs: bool`

Boolean controlling whether or not the output file will contain its cross-references in stream format, or as a classical XRef table.

The default for new files is `True`. For incremental updates, the writer adapts to the system used in the previous iteration of the document (as mandated by the standard).

`objects: Dict[Tuple[int, int], PdfObject]`

`object_streams: List[ObjectStream]`

`objs_in_streams: Dict[int, PdfObject]`

`security_handler: Optional[SecurityHandler]`

`set_custom_trailer_entry`(*key:* NameObject, *value:* PdfObject)

Set a custom, unmanaged entry in the document trailer or cross-reference stream dictionary.

Warning: Calling this method to set an entry that is managed by pyHanko internally (info dictionary, document catalog, etc.) has undefined results.

Parameters

- **key** – Dictionary key to use in the trailer.
- **value** – Value to set

`pyhanko.pdf_utils.writer.`**`init_xobject_dictionary`**`(`*command_stream: bytes*, *box_width*, *box_height*, *resources: Optional[DictionaryObject] = None*`)` → *StreamObject*

Helper function to initialise form XObject dictionaries.

Note: For utilities to handle image XObjects, see `images`.

Parameters

- **command_stream** – The XObject's raw appearance stream.
- **box_width** – The width of the XObject's bounding box.
- **box_height** – The height of the XObject's bounding box.
- **resources** – A resource dictionary to include with the form object.

Returns

A `StreamObject` representation of the form XObject.

`pyhanko.pdf_utils.writer.`**`copy_into_new_writer`**`(`*input_handler: PdfHandler*, *writer_kwargs: Optional[dict] = None*`)` → *PdfFileWriter*

Copy all objects in a given PDF handler into a new `PdfFileWriter`. This operation will attempt to preserve the document catalog of the original `input_handler`.

Very roughly, calling this function and then immediately invoking `write()` on the resulting writer should result in an equivalent document as far as presentation is concerned. As a general rule, behaviour that is controlled from outside the document catalog (e.g. encryption) or that requires byte-for-byte equivalence with the original (e.g. digital signatures) will not survive this translation.

Parameters

- **input_handler** – `PdfHandler` to source objects from.
- **writer_kwargs** – Keyword arguments to pass to the writer.

Returns

New `PdfFileWriter` containing all objects from the input handler.

pyhanko.pdf_utils.xref module

Internal utilities to handle the processing of cross-reference data and document trailer data.

This entire module is considered internal API.

class `pyhanko.pdf_utils.xref.`**`XRefCache`**(*reader*, *xref_sections: List[XRefSection]*)

Bases: `object`

Internal class to parse & store information from the xref section(s) of a PDF document.

Stores both the most recent status of all xrefs in addition to their historical values.

All members of this class are considered internal API and are subject to change without notice.

property total_revisions

`get_last_change`(*ref:* Reference)

`object_streams_used_in`(*revision*)

`get_introducing_revision`(*ref:* Reference)

`get_xref_container_info`(*revision*) → *XRefSectionMetaInfo*

`get_xref_data`(*revision*) → *XRefSectionData*

`explicit_refs_in_revision`(*revision*) → Set[*Reference*]

Look up the object refs for all objects explicitly added or overwritten in a given revision.

Parameters
`revision` – A revision number. The oldest revision is zero.

Returns
A set of Reference objects.

`refs_freed_in_revision`(*revision*) → Set[*Reference*]

Look up the object refs for all objects explicitly freed in a given revision.

Parameters
`revision` – A revision number. The oldest revision is zero.

Returns
A set of Reference objects.

`get_startxref_for_revision`(*revision*) → int

Look up the location of the XRef table/stream associated with a specific revision, as indicated by startxref or /Prev.

Parameters
`revision` – A revision number. The oldest revision is zero.

Returns
An integer pointer

`get_historical_ref`(*ref*, *revision*) → Optional[Union[int, *ObjStreamRef*]]

Look up the location of the historical value of an object.

Note: This method is not suitable for determining whether or not a particular object ID is available in a given revision, since it treats unused objects and freed objects the same way.

Parameters

- **`ref`** – An object reference.
- **`revision`** – A revision number. The oldest revision is zero.

Returns

An integer offset, an object stream reference, or `None` if the reference does not resolve in the specified revision.

property hybrid_xrefs_present: bool

Determine if a file uses hybrid references anywhere.

Returns

`True` if hybrid references were detected, `False` otherwise.

`class pyhanko.pdf_utils.xref.`**`XRefBuilder`**`(`*handler: PdfHandler, stream, strict: bool, last_startxref: int*`)`

Bases: `object`

`err_limit = 10`

`read_xrefs``()`

`class pyhanko.pdf_utils.xref.`**`XRefType`**`(`*value*`)`

Bases: `Enum`

Different types of cross-reference entries.

`FREE = 1`

A freeing instruction.

`STANDARD = 2`

A regular top-level object.

`IN_OBJ_STREAM = 3`

An object that is part of an object stream.

`class pyhanko.pdf_utils.xref.`**`XRefEntry`**`(`*xref_type: XRefType, location: Optional[Union[int, ObjStreamRef]], idnum: int, generation: int = 0*`)`

Bases: `object`

Value type representing a single cross-reference entry.

`xref_type:` *`XRefType`*

The type of cross-reference entry.

`location: Optional[Union[int,` *`ObjStreamRef`*`]]`

Location the cross-reference points to.

`idnum: int`

The ID of the object being referenced.

`generation: int = 0`

The generation number of the object being referenced.

`class pyhanko.pdf_utils.xref.`**`ObjStreamRef`**`(`*obj_stream_id: int, ix_in_stream: int*`)`

Bases: `object`

Identifies an object that's part of an object stream.

obj_stream_id: int

The ID number of the object stream (its generation number is presumed zero).

ix_in_stream: int

The index of the object in the stream.

exception pyhanko.pdf_utils.xref.**ObjectHeaderReadError**(*msg: str*, **args*)

Bases: *PdfReadError*

class pyhanko.pdf_utils.xref.**XRefSection**(*meta_info:* XRefSectionMetaInfo, *xref_data:* XRefSectionData)

Bases: object

Describes a cross-reference section and describes how it is serialised into the PDF file.

meta_info: ***XRefSectionMetaInfo***

Metadata about the cross-reference section.

xref_data: ***XRefSectionData***

A description of the actual object pointer definitions.

class pyhanko.pdf_utils.xref.**XRefSectionData**

Bases: object

Internal class for bookkeeping on a single cross-reference section, independently of the others.

try_resolve(*ref: Union[*Reference, IndirectObject*]*) → Optional[Union[int, *ObjStreamRef*]]

process_entries(*entries: Iterator[*XRefEntry*]*, *strict: bool*)

process_hybrid_entries(*entries: Iterator[*XRefEntry*]*, *xref_meta_info:* XRefSectionMetaInfo, *strict: bool*)

higher_generation_refs()

class pyhanko.pdf_utils.xref.**XRefSectionType**(*value*)

Bases: Enum

An enumeration.

STANDARD = 1

STREAM = 2

HYBRID_MAIN = 3

HYBRID_STREAM = 4

class pyhanko.pdf_utils.xref.**XRefSectionMetaInfo**(*xref_section_type:* pyhanko.pdf_utils.xref.XRefSectionType, *size: int*, *declared_startxref: int*, *start_location: int*, *end_location: int*, *stream_ref: Union[*pyhanko.pdf_utils.generic.Reference, *NoneType]*)

Bases: object

xref_section_type: ***XRefSectionType***

The type of cross-reference section.

size: **int**

The highest object ID in scope for this xref section.

declared_startxref: **int**

Location pointed to by the startxref pointer in that revision.

start_location: **int**

Actual start location of the xref data. This should be equal to *declared_startxref*, but in broken files that may not be the case.

end_location: **int**

Location where the xref data ended.

stream_ref: **Optional[*Reference*]**

Reference to the relevant xref stream, if applicable.

class pyhanko.pdf_utils.xref.**TrailerDictionary**

Bases: *PdfObject*

The standard mandates that each trailer shall contain at least all keys used in the preceding trailer, even if unmodified. Of course, we cannot trust documents to actually follow this rule, so this class implements fallbacks.

non_trailer_keys = {'/DecodeParms', '/Filter', '/Index', '/Length', '/Type', '/W', '/XRefStm'}

add_trailer_revision(*trailer_dict:* DictionaryObject)

raw_get(*key*, *decrypt:* EncryptedObjAccess = *EncryptedObjAccess.TRANSPARENT*, *revision=None*)

flatten(*revision=None*) → *DictionaryObject*

keys()

items()

write_to_stream(*stream*, *handler=None*, *container_ref=None*)

Abstract method to render this object to an output stream.

Parameters

- **stream** – An output stream.
- **container_ref** – Local encryption key.
- **handler** – Security handler

pyhanko.pdf_utils.xref.**read_object_header**(*stream*, *strict*)

pyhanko.pdf_utils.xref.**parse_xref_stream**(*xref_stream:* StreamObject, *strict:* *bool* = *True*) → Iterator[*XRefEntry*]

Parse a single cross-reference stream and yield its entries one by one.

This is internal API.

Parameters

- **xref_stream** – A StreamObject.
- **strict** – Boolean indicating whether we're running in strict mode.

Returns
A generator object yielding *XRefEntry* objects.

pyhanko.pdf_utils.xref.**parse_xref_table**(*stream*) → Iterator[*XRefEntry*]

Parse a single cross-reference table and yield its entries one by one.

This is internal API.

Parameters
stream – A file-like object pointed to the start of the cross-reference table.

Returns
A generator object yielding *XRefEntry* objects.

pyhanko.pdf_utils.xref.**write_xref_table**(*stream*, *position_dict: Dict[Tuple[int, int], int]*)

class pyhanko.pdf_utils.xref.**ObjectStream**(*compress=True*)

Bases: object

Utility class to collect objects into a PDF object stream.

Object streams are mainly useful for space efficiency reasons. They allow related objects to be grouped & compressed together in a more flexible manner.

Warning: Object streams can only be used in files with a cross-reference stream, as opposed to a classical XRef table. In particular, this means that incremental updates to files with a legacy XRef table cannot contain object streams either. See § 7.5.7 in ISO 32000-1 for further details.

Danger: Use *BasePdfFileWriter.prepare_object_stream()* to create instances of object streams. The *__init__* function is internal API.

add_object(*idnum: int*, *obj: PdfObject*)

Add an object to an object stream. Note that objects in object streams always have their generation number set to *0* by definition.

Parameters

- **idnum** – The object's ID number.
- **obj** – The object to embed into the object stream.

Raises
TypeError – Raised if obj is an instance of *StreamObject* or *IndirectObject*.

as_pdf_object() → *StreamObject*

Render the object stream to a PDF stream object

Returns
An instance of *StreamObject*.

class pyhanko.pdf_utils.xref.**XRefStream**(*position_dict: Dict[Tuple[int, int], Union[int, Tuple[int, int]]]*)

Bases: *StreamObject*

write_to_stream(*stream*, *handler=None*, *container_ref=None*)

Abstract method to render this object to an output stream.

Parameters

- **stream** – An output stream.
- **container_ref** – Local encryption key.
- **handler** – Security handler

Module contents

pyhanko.sign package

Subpackages

pyhanko.sign.ades package

Submodules

pyhanko.sign.ades.api module

class pyhanko.sign.ades.api.**GenericCommitment**(*value*)

Bases: `Enum`

An enumeration.

PROOF_OF_ORIGIN = 1

PROOF_OF_RECEIPT = 2

PROOF_OF_DELIVERY = 3

PROOF_OF_SENDER = 4

PROOF_OF_APPROVAL = 5

PROOF_OF_CREATION = 6

property asn1: *CommitmentTypeIndication*

class pyhanko.sign.ades.api.**CAdESSignedAttrSpec**(*commitment_type: Optional[CommitmentTypeIndication] = None, timestamp_content: bool = False, signature_policy_identifier: Optional[SignaturePolicyIdentifier] = None, signer_attributes: Optional[SignerAttrSpec] = None*)

Bases: `object`

Class that controls signed CAdES attributes on a PDF signature.

commitment_type: Optional[*CommitmentTypeIndication*] = None

Signature commitment type. Can be one of the standard values, or a custom one.

timestamp_content: bool = False

Indicate whether the signature should include a signed timestamp.

Note: This should be contrasted with *unsigned* timestamps: a signed timestamp proves that the signature was created *after* some point in time, while an *unsigned* timestamp computed over the signed content proves that the signature existed *before* said point in time.

signature_policy_identifier: Optional[*SignaturePolicyIdentifier*] = None

Signature policy identifier to embed into the signature.

Warning: Right now, pyHanko does not "understand" signature policies, so the signature policy identifier will be taken at face value and embedded without paying any heed to the actual rules of the signature policy. It is the API user's responsibility to make sure that all relevant provisions of the signature policy are adhered to.

signer_attributes: Optional[*SignerAttrSpec*] = None

Settings for signer's attributes, to be included in a `signer-attributes-v2` attribute on the signature.

prepare_providers(*message_digest*, *md_algorithm*, *timestamper: Optional[*TimeStamper*] = None*)

class pyhanko.sign.ades.api.**SignerAttrSpec**(*claimed_attrs: Iterable[AttCertAttribute]*, *certified_attrs: Iterable[AttributeCertificateV2]*)

Bases: `object`

Class that controls the `signer-attributes-v2` signed CAdES attribute.

These represent attributes of the signing entity, not the signature or signed content.

Note: Out of the box, only basic claimed attributes and certified attributes through V2 X.509 attribute certificates are supported.

claimed_attrs: Iterable[AttCertAttribute]

Attributes claimed by the signer without further justification.

certified_attrs: Iterable[AttributeCertificateV2]

Attribute certificates containing signer attributes.

pyhanko.sign.ades.asn1_util module

pyhanko.sign.ades.asn1_util.**as_set_of**(*asn1_type: Type*)

pyhanko.sign.ades.asn1_util.**register_cms_attribute**(*dotted_oid: str*, *readable_name: str*, *asn1_type: Type*)

pyhanko.sign.ades.cades_asn1 module

class pyhanko.sign.ades.cades_asn1.**CommitmentTypeIdentifier**(*value=None*, *default=None*, *contents=None*, ***kwargs*)

Bases: `ObjectIdentifier`

class pyhanko.sign.ades.cades_asn1.**CommitmentTypeQualifier**(*value=None*, *default=None*, ***kwargs*)

Bases: `Sequence`

class pyhanko.sign.ades.cades_asn1.**CommitmentTypeQualifiers**(*value=None*, *default=None*, *contents=None*, *spec=None*, ***kwargs*)

Bases: `SequenceOf`

class pyhanko.sign.ades.cades_asn1.**CommitmentTypeIndication**(*value=None*, *default=None*, ***kwargs*)

Bases: `Sequence`

class pyhanko.sign.ades.cades_asn1.**SigPolicyQualifierId**(*value=None*, *default=None*, *contents=None*, ***kwargs*)

Bases: `ObjectIdentifier`

class pyhanko.sign.ades.cades_asn1.**NoticeNumbers**(*value=None*, *default=None*, *contents=None*, *spec=None*, ***kwargs*)

Bases: `SequenceOf`

class pyhanko.sign.ades.cades_asn1.**NoticeReference**(*value=None*, *default=None*, ***kwargs*)

Bases: `Sequence`

class pyhanko.sign.ades.cades_asn1.**SPUserNotice**(*value=None*, *default=None*, ***kwargs*)

Bases: `Sequence`

class pyhanko.sign.ades.cades_asn1.**SPDocSpecification**(*value=None*, *default=None*, ***kwargs*)

Bases: `Sequence`

class pyhanko.sign.ades.cades_asn1.**SigPolicyQualifierInfo**(*value=None*, *default=None*, ***kwargs*)

Bases: `Sequence`

class pyhanko.sign.ades.cades_asn1.**SigPolicyQualifierInfos**(*value=None*, *default=None*, *contents=None*, *spec=None*, ***kwargs*)

Bases: `SequenceOf`

class pyhanko.sign.ades.cades_asn1.**SignaturePolicyId**(*value=None*, *default=None*, ***kwargs*)

Bases: `Sequence`

class pyhanko.sign.ades.cades_asn1.**SignaturePolicyIdentifier**(*name=None*, *value=None*, ***kwargs*)

Bases: `Choice`

class pyhanko.sign.ades.cades_asn1.**SignaturePolicyDocument**(*value=None*, *default=None*, ***kwargs*)

Bases: `Sequence`

class pyhanko.sign.ades.cades_asn1.**SignaturePolicyStore**(*value=None*, *default=None*, ***kwargs*)

Bases: `Sequence`

class pyhanko.sign.ades.cades_asn1.**DisplayText**(*name=None*, *value=None*, ***kwargs*)

Bases: `Choice`

class pyhanko.sign.ades.cades_asn1.**SignerAttributesV2**(*value=None*, *default=None*, ***kwargs*)

Bases: `Sequence`

class pyhanko.sign.ades.cades_asn1.**CertifiedAttributesV2**(*value=None*, *default=None*, *contents=None*, *spec=None*, ***kwargs*)

Bases: `SequenceOf`

class pyhanko.sign.ades.cades_asn1.**CertifiedAttributeChoices**(*name=None*, *value=None*, ***kwargs*)

Bases: `Choice`

class pyhanko.sign.ades.cades_asn1.**OtherAttrCert**(*value=None*, *default=None*, ***kwargs*)

Bases: `Sequence`

class pyhanko.sign.ades.cades_asn1.**OtherAttrCertId**(*value=None*, *default=None*, *contents=None*, ***kwargs*)

Bases: `ObjectIdentifier`

class pyhanko.sign.ades.cades_asn1.**SignedAssertions**(*value=None*, *default=None*, *contents=None*, *spec=None*, ***kwargs*)

Bases: `SequenceOf`

class pyhanko.sign.ades.cades_asn1.**SignedAssertion**(*value=None*, *default=None*, ***kwargs*)

Bases: `Sequence`

class pyhanko.sign.ades.cades_asn1.**SignedAssertionId**(*value=None*, *default=None*, *contents=None*, ***kwargs*)

Bases: `ObjectIdentifier`

pyhanko.sign.ades.report module

Module for AdES reporting data.

Defines enums for all AdES validation statuses defined in ETSI EN 319 102-1, clause 5.1.3.

class pyhanko.sign.ades.report.**AdESStatus**(*value*)

Bases: `Enum`

An enumeration.

PASSED = 1

INDETERMINATE = 2

FAILED = 3

class pyhanko.sign.ades.report.**AdESSubIndic**

Bases: `object`

property status: *AdESStatus*

class pyhanko.sign.ades.report.**AdESPassed**(*value*)

Bases: *AdESSubIndic*, `Enum`

An enumeration.

OK = 1

class pyhanko.sign.ades.report.**AdESFailure**(*value*)

Bases: *AdESSubIndic*, Enum

An enumeration.

FORMAT_FAILURE = 1

HASH_FAILURE = 2

SIG_CRYPTO_FAILURE = 3

REVOKED = 4

NOT_YET_VALID = 5

class pyhanko.sign.ades.report.**AdESIndeterminate**(*value*)

Bases: *AdESSubIndic*, Enum

An enumeration.

SIG_CONSTRAINTS_FAILURE = 1

CHAIN_CONSTRAINTS_FAILURE = 2

CERTIFICATE_CHAIN_GENERAL_FAILURE = 3

CRYPTO_CONSTRAINTS_FAILURE = 4

EXPIRED = 5

NOT_YET_VALID = 6

POLICY_PROCESSING_ERROR = 7

SIGNATURE_POLICY_NOT_AVAILABLE = 8

TIMESTAMP_ORDER_FAILURE = 9

NO_SIGNING_CERTIFICATE_FOUND = 10

NO_CERTIFICATE_CHAIN_FOUND = 11

REVOKED_NO_POE = 12

REVOKED_CA_NO_POE = 13

OUT_OF_BOUNDS_NO_POE = 14

REVOCATION_OUT_OF_BOUNDS_NO_POE = 15

OUT_OF_BOUNDS_NOT_REVOKED = 16

CRYPTO_CONSTRAINTS_FAILURE_NO_POE = 17

NO_POE = 18

TRY_LATER = 19

SIGNED_DATA_NOT_FOUND = 20

GENERIC = 21

Module contents

pyhanko.sign.diff_analysis package

Changed in version 0.2.0: Module extracted from *pyhanko.sign.validation* and restructured into a more rule-based format.

Changed in version 0.11.0: Module refactored into sub-package.

This package defines utilities for difference analysis between revisions of the same PDF file. PyHanko uses this functionality to validate signatures on files that have been modified after signing (using PDF's incremental update feature).

In pyHanko's validation model, every incremental update is disallowed by default. For a change to be accepted, it must be cleared by at least one whitelisting rule. These rules can moreover *qualify* the modification level at which they accept the change (see *ModificationLevel*). Additionally, any rule can veto an entire revision as suspect by raising a *SuspiciousModification* exception. Whitelisting rules are encouraged to apply their vetoes liberally.

Whitelisting rules are bundled in *DiffPolicy* objects for use by the validator.

Guidelines for developing rules for use with `StandardDiffPolicy`

Caution: These APIs aren't fully stable yet, so some changes might still occur between now and the first major release.

In general, you should keep the following informal guidelines in mind when putting together custom diff rules.

- All rules are either executed completely (i.e. their generators exhausted) or aborted.
- If the diff runner aborts a rule, this always means that the entire revision is rejected. In other words, for accepted revisions, all rules will always have run to completion.
- Whitelisting rules are allowed to informally delegate some checking to other rules, provided that this is documented clearly.

  Note: Example: *CatalogModificationRule* ignores `/AcroForm`, which is validated by another rule entirely.

- Rules should be entirely stateless. "Clearing" a reference by yielding it does not imply that the revision cannot be vetoed by that same rule further down the road (this is why the first point is important).

Subpackages

pyhanko.sign.diff_analysis.rules package

Submodules

pyhanko.sign.diff_analysis.rules.file_structure_rules module

class pyhanko.sign.diff_analysis.rules.file_structure_rules.**CatalogModificationRule**(*ignored_keys=None*)

Bases: *QualifiedWhitelistRule*

Rule that adjudicates modifications to the document catalog.

Parameters

ignored_keys – Values in the document catalog that may change between revisions. The default ones are /AcroForm, /DSS, /Extensions, /Metadata, /MarkInfo and /Version.

Checking for /AcroForm, /DSS and /Metadata is delegated to *FormUpdatingRule*, *DSSCompareRule* and *MetadataUpdateRule*, respectively.

apply_qualified(*old: HistoricalResolver*, *new: HistoricalResolver*) → Iterable[Tuple[*ModificationLevel*, *ReferenceUpdate*]]

Apply the rule to the changes between two revisions.

Parameters

- **old** – The older, base revision.
- **new** – The newer revision to be vetted.

class pyhanko.sign.diff_analysis.rules.file_structure_rules.**ObjectStreamRule**

Bases: *WhitelistRule*

Rule that allows object streams to be added.

Note that this rule only whitelists the object streams themselves (provided they do not override any existing objects, obviously), not the objects in them.

apply(*old: HistoricalResolver*, *new: HistoricalResolver*) → Iterable[*ReferenceUpdate*]

Apply the rule to the changes between two revisions.

Parameters

- **old** – The older, base revision.
- **new** – The newer revision to be vetted.

class pyhanko.sign.diff_analysis.rules.file_structure_rules.**XrefStreamRule**

Bases: *WhitelistRule*

Rule that allows new cross-reference streams to be defined.

apply(*old: HistoricalResolver*, *new: HistoricalResolver*) → Iterable[*ReferenceUpdate*]

Apply the rule to the changes between two revisions.

Parameters

- **old** – The older, base revision.
- **new** – The newer revision to be vetted.

pyhanko.sign.diff_analysis.rules.form_field_rules module

class pyhanko.sign.diff_analysis.rules.form_field_rules.**DSSCompareRule**

Bases: *WhitelistRule*

Rule that allows changes to the document security store (DSS).

This rule will validate the structure of the DSS quite rigidly, and will raise *SuspiciousModification* whenever it encounters structural problems with the DSS. Similarly, modifications that remove structural items from the DSS also count as suspicious. However, merely removing individual OCSP responses, CRLs or certificates when they become irrelevant is permitted. This is also allowed by PAdES.

apply(*old:* HistoricalResolver, *new:* HistoricalResolver) → Iterable[*ReferenceUpdate*]

Apply the rule to the changes between two revisions.

Parameters

- **old** – The older, base revision.
- **new** – The newer revision to be vetted.

class pyhanko.sign.diff_analysis.rules.form_field_rules.**SigFieldCreationRule**(*approve_widget_bindings=True*, *al-low_new_visible_after_certify=Fa*

Bases: `FieldMDPRule`

This rule allows signature fields to be created at the root of the form hierarchy, but disallows the creation of other types of fields. It also disallows field deletion.

In addition, this rule will allow newly created signature fields to attach themselves as widget annotations to pages.

The creation of invisible signature fields is considered a modification at level `ModificationLevel.LTA_UPDATES`, but appearance-related changes will be qualified with `ModificationLevel.FORM_FILLING`.

Parameters

- **allow_new_visible_after_certify** – Creating new visible signature fields is disallowed after certification signatures by default; this is stricter than Acrobat. Set this parameter to `True` to disable this check.
- **approve_widget_bindings** – Set to `False` to reject new widget annotation registrations associated with approved new fields.

apply(*context:* FieldComparisonContext) → Iterable[Tuple[*ModificationLevel*, *FormUpdate*]]

Apply the rule to the given `FieldComparisonContext`.

Parameters

context – The context of this form revision evaluation, given as an instance of `FieldComparisonContext`.

class pyhanko.sign.diff_analysis.rules.form_field_rules.**SigFieldModificationRule**(*allow_in_place_appearance_* *bool = True*, *al-ways_modifiable=None*, *value_update_keys=None*)

Bases: `BaseFieldModificationRule`

This rule allows signature fields to be filled in, and set an appearance if desired. Deleting values from signature fields is disallowed, as is modifying signature fields that already contain a signature.

This rule will take field locks into account if the `FieldComparisonContext` includes a `FieldMDPSpec`.

For (invisible) document timestamps, this is allowed at `ModificationLevel.LTA_UPDATES`, but in all other cases the modification level will be bumped to `ModificationLevel.FORM_FILLING`.

check_form_field(*fq_name: str*, *spec:* FieldComparisonSpec, *context:* FieldComparisonContext) → Iterable[Tuple[*ModificationLevel*, *FormUpdate*]]

Investigate updates to a particular form field. This function is called by `apply()` for every form field in the new revision.

Parameters

- **fq_name** – The fully qualified name of the form field.j

- **spec** – The *FieldComparisonSpec* object describing the old state of the field in relation to the new state.
- **context** – The full *FieldComparisonContext* that is currently being evaluated.

Returns
An iterable yielding *FormUpdate* objects qualified with an appropriate *ModificationLevel*.

class pyhanko.sign.diff_analysis.rules.form_field_rules.**GenericFieldModificationRule**(*allow_in_place_appeara bool = True*, *al- ways_modifiable=None*, *value_update_keys=Nor*

Bases: *BaseFieldModificationRule*

This rule allows non-signature form fields to be modified at `ModificationLevel.FORM_FILLING`.

This rule will take field locks into account if the *FieldComparisonContext* includes a *FieldMDPSpec*.

check_form_field(*fq_name: str*, *spec:* FieldComparisonSpec, *context:* FieldComparisonContext) → Iterable[Tuple[*ModificationLevel*, *FormUpdate*]]

Investigate updates to a particular form field. This function is called by `apply()` for every form field in the new revision.

Parameters

- **fq_name** – The fully qualified name of the form field.j
- **spec** – The *FieldComparisonSpec* object describing the old state of the field in relation to the new state.
- **context** – The full *FieldComparisonContext* that is currently being evaluated.

Returns
An iterable yielding *FormUpdate* objects qualified with an appropriate *ModificationLevel*.

class pyhanko.sign.diff_analysis.rules.form_field_rules.**BaseFieldModificationRule**(*allow_in_place_appearance bool = True*, *al- ways_modifiable=None*, *value_update_keys=None*)

Bases: *FieldMDPRule*

Base class that implements some boilerplate to validate modifications to individual form fields.

compare_fields(*spec:* FieldComparisonSpec) → bool

Helper method to compare field dictionaries.

Parameters
spec – The current *FieldComparisonSpec*.

Returns
`True` if the modifications are permissible even when the field is locked, `False` otherwise. If keys beyond those in `value_update_keys` are changed, a *SuspiciousModification* is raised.

apply(*context:* FieldComparisonContext) → Iterable[Tuple[*ModificationLevel*, *FormUpdate*]]

Apply the rule to the given `FieldComparisonContext`.

Parameters

context – The context of this form revision evaluation, given as an instance of `FieldComparisonContext`.

check_form_field(*fq_name: str*, *spec:* FieldComparisonSpec, *context:* FieldComparisonContext) → Iterable[Tuple[*ModificationLevel*, *FormUpdate*]]

Investigate updates to a particular form field. This function is called by `apply()` for every form field in the new revision.

Parameters

- **fq_name** – The fully qualified name of the form field.j
- **spec** – The `FieldComparisonSpec` object describing the old state of the field in relation to the new state.
- **context** – The full `FieldComparisonContext` that is currently being evaluated.

Returns

An iterable yielding `FormUpdate` objects qualified with an appropriate `ModificationLevel`.

pyhanko.sign.diff_analysis.rules.metadata_rules module

class pyhanko.sign.diff_analysis.rules.metadata_rules.**DocInfoRule**

Bases: `WhitelistRule`

Rule that allows the `/Info` dictionary in the trailer to be updated.

apply(*old:* HistoricalResolver, *new:* HistoricalResolver) → Iterable[*ReferenceUpdate*]

Apply the rule to the changes between two revisions.

Parameters

- **old** – The older, base revision.
- **new** – The newer revision to be vetted.

class pyhanko.sign.diff_analysis.rules.metadata_rules.**MetadataUpdateRule**(*check_xml_syntax=True*, *always_refuse_stream_override=False*)

Bases: `WhitelistRule`

Rule to adjudicate updates to the XMP metadata stream.

The content of the metadata isn't actually validated in any significant way; this class only checks whether the XML is well-formed.

Parameters

- **check_xml_syntax** – Do a well-formedness check on the XML syntax. Default `True`.
- **always_refuse_stream_override** – Always refuse to override the metadata stream if its object ID existed in a prior revision, including if the new stream overrides the old metadata stream and the syntax check passes. Default `False`.

Note: In other situations, pyHanko will reject stream overrides on general principle, since combined with the fault-tolerance of some PDF readers, these can allow an attacker to manipulate parts of the signed content in subtle but significant ways.

In case of the metadata stream, the risk is significantly mitigated thanks to the XML syntax check on both versions of the stream, but if you're feeling extra paranoid, you can turn the default behaviour back on by setting `always_refuse_stream_override` to `True`.

`static is_well_formed_xml`(*metadata_ref:* Reference)

Checks whether the provided stream consists of well-formed XML data. Note that this does not perform any more advanced XML or XMP validation, the check is purely syntactic.

Parameters
`metadata_ref` – A reference to a (purported) metadata stream.

Raises
`SuspiciousModification` – if there are indications that the reference doesn't point to an XML stream.

`apply`(*old:* HistoricalResolver, *new:* HistoricalResolver) → Iterable[*ReferenceUpdate*]

Apply the rule to the changes between two revisions.

Parameters

- `old` – The older, base revision.
- `new` – The newer revision to be vetted.

Module contents

Rule implementations for the standard difference analysis policy.

Submodules

pyhanko.sign.diff_analysis.commons module

Module defining common helpers for use by rules and policies.

In principle, these aren't relevant to the high-level validation API.

`pyhanko.sign.diff_analysis.commons.qualify`(*level:* ModificationLevel, *rule_result: Generator[RefToUpd, None, R]*) → Generator[Tuple[*ModificationLevel*, RefToUpd], None, R]

This is a helper function for rule implementors. It attaches a fixed modification level to an existing reference update generator, respecting the original generator's return value (if relevant).

A prototypical use would be of the following form:

```python
def some_generator_function():
    # do stuff
    for ref in some_list:
        # do stuff
        yield ref

```

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```
    # do more stuff
    return summary_value

# ...

def some_qualified_generator_function():
    summary_value = yield from qualify(
        ModificationLevel.FORM_FILLING,
        some_generator_function()
    )
```

Provided that `some_generator_function` yields `ReferenceUpdate` objects, the yield type of the resulting generator will be tuples of the form `(level, ref)`.

Parameters

- **`level`** – The modification level to set.
- **`rule_result`** – A generator that outputs references to be whitelisted.

Returns

A converted generator that outputs references qualified at the modification level specified.

`pyhanko.sign.diff_analysis.commons.`**`qualify_transforming`**`(`*level:* ModificationLevel, *rule_result: Generator[QualifyIn, None, R]*, *transform: Callable[[QualifyIn], OutRefUpd]*`)` → Generator[Tuple[*ModificationLevel*, OutRefUpd], None, R]

This is a version of *`qualify()`* that additionally allows a transformation to be applied to the output of the rule.

Parameters

- **`level`** – The modification level to set.
- **`rule_result`** – A generator that outputs references to be whitelisted.
- **`transform`** – Function to apply to the reference object before appending the modification level and yielding it.

Returns

A converted generator that outputs references qualified at the modification level specified.

`pyhanko.sign.diff_analysis.commons.`**`safe_whitelist`**`(`*old:* HistoricalResolver, *old_ref*, *new_ref*`)` → Generator[*Reference*, None, None]

Checks whether an indirect reference in a PDF structure can be updated without clobbering an older object in a way that causes ramifications at the PDF syntax level.

The following are verified:

- Does the old reference point to a non-stream object?
- If the new reference is equal to the old one, does the new reference point to a non-stream object?
- If the new reference is not equal to the old one, is the new reference a newly defined object?

This is a generator for syntactical convenience and integration with internal APIs, but it will always yield at most one element.

`pyhanko.sign.diff_analysis.commons.`**`compare_key_refs`**(*key*, *old:* HistoricalResolver, *old_dict:* DictionaryObject, *new_dict:* DictionaryObject) → Generator[*Reference*, None, Tuple[Optional[*PdfObject*], Optional[*PdfObject*]]]

Ensure that updating a key in a dictionary has no undesirable side effects. The following scenarios are allowed:

0. replacing a direct value with another direct value
1. adding a key in new_dict
2. replacing a direct value in old_dict with a reference in new_dict
3. the reverse (allowed by default)
4. replacing a reference with another reference (that doesn't override anything else)

The restrictions of *safe_whitelist* apply to this function as well.

Note: this routine is only safe to use if the structure of the resulting values is also checked. Otherwise, it can lead to reference leaks if one is not careful.

`pyhanko.sign.diff_analysis.commons.`**`compare_dicts`**(*old_dict: Optional[*PdfObject*]*, *new_dict: Optional[*PdfObject*]*, *ignored: FrozenSet[str] = frozenset({})*, *raise_exc=True*) → bool

Compare entries in two dictionaries, optionally ignoring certain keys.

`pyhanko.sign.diff_analysis.commons.`**`assert_not_stream`**(*obj*)

Throw *`SuspiciousModification`* if the argument is a stream object.

pyhanko.sign.diff_analysis.constants module

Internal constants for the difference analysis sub-package.

pyhanko.sign.diff_analysis.form_rules_api module

Module defining API types for use by form analysis rules.

In principle, these aren't relevant to the high-level validation API.

`class` `pyhanko.sign.diff_analysis.form_rules_api.`**`FormUpdatingRule`**(*field_rules: List[*FieldMDPRule*]*, *ignored_acroform_keys=None*)

Bases: `object`

Special whitelisting rule that validates changes to the form attached to the input document.

This rule is special in two ways:

- it outputs *`FormUpdate`* objects instead of references;
- it delegates most of the hard work to sub-rules (instances of *`FieldMDPRule`*).

A *`DiffPolicy`* can have at most one *`FormUpdatingRule`*, but there is no limit on the number of *`FieldMDPRule`* objects attached to it.

`FormUpdate` objects contain a reference plus metadata about the form field it belongs to.

Parameters

- **`field_rules`** – A list of `FieldMDPRule` objects to validate the individual form fields.
- **`ignored_acroform_keys`** – Keys in the `/AcroForm` dictionary that may be changed. Changes are potentially subject to validation by other rules.

`apply`(*old: HistoricalResolver*, *new: HistoricalResolver*) → Iterable[Tuple[*ModificationLevel*, *FormUpdate*]]

Evaluate changes in the document's form between two revisions.

Parameters

- **`old`** – The older, base revision.
- **`new`** – The newer revision to be vetted.

`class pyhanko.sign.diff_analysis.form_rules_api.`**`FormUpdate`**(*updated_ref: Reference*, *context_checked: Optional[Context] = None*, *field_name: Optional[str] = None*, *valid_when_locked: bool = False*, *valid_when_certifying: bool = True*)

Bases: `ReferenceUpdate`

Container for a reference together with (optional) metadata.

Currently, this metadata consists of the relevant field's (fully qualified) name, and whether the update should be approved or not if said field is locked by the FieldMDP policy currently in force.

`field_name: Optional[str] = None`

The relevant field's fully qualified name, or `None` if there's either no obvious associated field, or if there are multiple reasonable candidates.

`valid_when_locked: bool = False`

Flag indicating whether the update is valid even when the field is locked. This is only relevant if `field_name` is not `None`.

`valid_when_certifying: bool = True`

Flag indicating whether the update is valid when checking against an explicit DocMDP policy. Default is `True`. If `False`, the change will only be accepted if we are evaluating changes to a document after an approval signature.

`class pyhanko.sign.diff_analysis.form_rules_api.`**`FieldMDPRule`**

Bases: `object`

Sub-rules attached to a `FormUpdatingRule`.

`apply`(*context: FieldComparisonContext*) → Iterable[Tuple[*ModificationLevel*, *FormUpdate*]]

Apply the rule to the given `FieldComparisonContext`.

Parameters

`context` – The context of this form revision evaluation, given as an instance of `FieldComparisonContext`.

`class pyhanko.sign.diff_analysis.form_rules_api.`**`FieldComparisonSpec`**(*field_type: str*, *old_field_ref: Optional[Reference]*, *new_field_ref: Optional[Reference]*, *old_canonical_path: Optional[RawPdfPath]*)

Bases: `object`

Helper object that specifies a form field name together with references to its old and new versions.

`field_type: str`

The (fully qualified) form field name.

`old_field_ref: Optional[`*`Reference`*`]`

A reference to the field's dictionary in the old revision, if present.

`new_field_ref: Optional[`*`Reference`*`]`

A reference to the field's dictionary in the new revision, if present.

`old_canonical_path: Optional[`*`RawPdfPath`*`]`

Path from the trailer through the AcroForm structure to this field (in the older revision). If the field is new, set to `None`.

`property old_field: Optional[`*`DictionaryObject`*`]`

Returns
The field's dictionary in the old revision, if present, otherwise `None`.

`property new_field: Optional[`*`DictionaryObject`*`]`

Returns
The field's dictionary in the new revision, if present, otherwise `None`.

`expected_contexts``()` → Set[*Context*]

`class pyhanko.sign.diff_analysis.form_rules_api.`**`FieldComparisonContext`**(*field_specs: Dict[str,* FieldComparisonSpec*]*, *old:* HistoricalResolver, *new:* HistoricalResolver)

Bases: `object`

Context for a form diffing operation.

`field_specs: Dict[str, `*`FieldComparisonSpec`*`]`

Dictionary mapping field names to *`FieldComparisonSpec`* objects.

`old:` ***`HistoricalResolver`***

The older, base revision.

`new:` ***`HistoricalResolver`***

The newer revision.

pyhanko.sign.diff_analysis.policies module

Module defining pyHanko's standard difference policy implementation.

`class pyhanko.sign.diff_analysis.policies.`**`StandardDiffPolicy`**(*global_rules: List[*QualifiedWhitelistRule*]*, *form_rule: Optional[*FormUpdatingRule*]*, *reject_object_freeing=True*, *ignore_orphaned_objects=True*, *ignore_identical_objects=True*)

Bases: *DiffPolicy*

Run a list of rules to analyse the differences between two revisions.

Parameters

- **global_rules** – The *QualifiedWhitelistRule* objects encoding the rules to apply.
- **form_rule** – The *FormUpdatingRule* that adjudicates changes to form fields and their values.
- **reject_object_freeing** – Always fail revisions that free objects that existed prior to signing.

  Note: PyHanko resolves freed references to the `null` object in PDF, and a freeing instruction in a cross-reference section is always registered as a change that needs to be approved, regardless of the value of this setting.

  It is theoretically possible for a rule to permit deleting content, in which case allowing objects to be freed might be reasonable. That said, pyHanko takes the conservative default position to reject all object freeing instructions as suspect.

- **ignore_orphaned_objects** – Some PDF writers create objects that aren't used anywhere (tsk tsk). Since those don't affect the "actual" document content, they can usually be ignored. If `True`, newly created orphaned objects will be cleared at level *ModificationLevel.LTA_UPDATES*. Default is `True`.
- **ignore_orphaned_objects** – Some PDF writers overwrite objects with identical copies. Pointless and annoying, but also more or less harmless.

apply(*old: HistoricalResolver*, *new: HistoricalResolver*, *field_mdp_spec: Optional[FieldMDPSpec] = None*, *doc_mdp: Optional[MDPPerm] = None*) → *DiffResult*

Execute the policy on a pair of revisions, with the MDP values provided. *SuspiciousModification* exceptions should be propagated.

Parameters

- **old** – The older, base revision.
- **new** – The newer revision.
- **field_mdp_spec** – The field MDP spec that's currently active.
- **doc_mdp** – The DocMDP spec that's currently active.

Returns

A *DiffResult* object summarising the policy's judgment.

review_file(*reader: PdfFileReader*, *base_revision: Union[int, HistoricalResolver]*, *field_mdp_spec: Optional[FieldMDPSpec] = None*, *doc_mdp: Optional[MDPPerm] = None*) → Union[*DiffResult*, *SuspiciousModification*]

Implementation of *DiffPolicy.review_file()* that reviews each intermediate revision between the base revision and the current one individually.

pyhanko.sign.diff_analysis.policies.**DEFAULT_DIFF_POLICY** = **<pyhanko.sign.diff_analysis.policies.StandardDiffPolicy object>**

Default *DiffPolicy* implementation.

This policy includes the following rules, all with the default settings. The unqualified rules in the list all have their updates qualified at level `LTA_UPDATES`.

- *CatalogModificationRule*,
- *DocInfoRule*,
- *ObjectStreamRule*,
- *XrefStreamRule*,
- *DSSCompareRule*,
- *MetadataUpdateRule*.
- *FormUpdatingRule*, with the following field rules:
  - *SigFieldCreationRule*,
  - *SigFieldModificationRule*,
  - *GenericFieldModificationRule*.

`pyhanko.sign.diff_analysis.policies.`**`NO_CHANGES_DIFF_POLICY = <pyhanko.sign.diff_analysis.policies.StandardDiffPolicy object>`**

DiffPolicy implementation that does not provide any rules, and will therefore simply reject all changes.

pyhanko.sign.diff_analysis.policy_api module

class `pyhanko.sign.diff_analysis.policy_api.`**`ModificationLevel`**(*value*)

Bases: *OrderedEnum*

Records the (semantic) modification level of a document.

Compare *MDPPerm*, which records the document modification policy associated with a particular signature, as opposed to the empirical judgment indicated by this enum.

`NONE = 0`

The document was not modified at all (i.e. it is byte-for-byte unchanged).

`LTA_UPDATES = 1`

The only updates are of the type that would be allowed as part of signature long term archival (LTA) processing. That is to say, updates to the document security store or new document time stamps. For the purposes of evaluating whether a document has been modified in the sense defined in the PAdES and ISO 32000-2 standards, these updates do not count. Adding form fields is permissible at this level, but only if they are signature fields. This is necessary for proper document timestamp support.

`FORM_FILLING = 2`

The only updates are extra signatures and updates to form field values or their appearance streams, in addition to the previous levels.

`ANNOTATIONS = 3`

In addition to the previous levels, manipulating annotations is also allowed at this level.

Note: This level is currently unused by the default diff policy, and modifications to annotations other than those permitted to fill in forms are treated as suspicious.

`OTHER = 4`

The document has been modified in ways that aren't on the validator's whitelist. This always invalidates the corresponding signature, irrespective of cryptographical integrity or `/DocMDP` settings.

exception pyhanko.sign.diff_analysis.policy_api.**SuspiciousModification**

Bases: ValueError

Error indicating a suspicious modification

class pyhanko.sign.diff_analysis.policy_api.**DiffResult**(*modification_level: ModificationLevel, changed_form_fields: Set[str]*)

Bases: object

Encodes the result of a difference analysis on two revisions.

Returned by *DiffPolicy.apply()*.

modification_level: *ModificationLevel*

The strictest modification level at which all changes pass muster.

changed_form_fields: Set[str]

Set containing the names of all changed form fields.

Note: For the purposes of this parameter, a change is defined as any *FormUpdate* where *FormUpdate.valid_when_locked* is False.

class pyhanko.sign.diff_analysis.policy_api.**DiffPolicy**

Bases: object

Analyse the differences between two revisions.

apply(*old: HistoricalResolver, new: HistoricalResolver, field_mdp_spec: Optional[FieldMDPSpec] = None, doc_mdp: Optional[MDPPerm] = None*) → *DiffResult*

Execute the policy on a pair of revisions, with the MDP values provided. *SuspiciousModification* exceptions should be propagated.

Parameters

- **old** – The older, base revision.
- **new** – The newer revision.
- **field_mdp_spec** – The field MDP spec that's currently active.
- **doc_mdp** – The DocMDP spec that's currently active.

Returns

A *DiffResult* object summarising the policy's judgment.

review_file(*reader: PdfFileReader, base_revision: Union[int, HistoricalResolver], field_mdp_spec: Optional[FieldMDPSpec] = None, doc_mdp: Optional[MDPPerm] = None*) → Union[*DiffResult*, *SuspiciousModification*]

Compare the current state of a file to an earlier version, with the MDP values provided. *SuspiciousModification* exceptions should be propagated.

If there are multiple revisions between the base revision and the current one, the precise manner in which the review is conducted is left up to the implementing class. In particular, subclasses may choose to review each intermediate revision individually, or handle them all at once.

Parameters

- **reader** – PDF reader representing the current state of the file.
- **base_revision** – The older, base revision. You can choose between providing it as a revision index, or a *HistoricalResolver* instance.

- **`field_mdp_spec`** – The field MDP spec that's currently active.
- **`doc_mdp`** – The DocMDP spec that's currently active.

Returns
A *`DiffResult`* object summarising the policy's judgment.

pyhanko.sign.diff_analysis.rules_api module

Module defining common API types for use by rules and policies.

In principle, these aren't relevant to the high-level validation API.

`class pyhanko.sign.diff_analysis.rules_api.`**`QualifiedWhitelistRule`**

Bases: `object`

Abstract base class for a whitelisting rule that outputs references together with the modification level at which they're cleared.

This is intended for use by complicated whitelisting rules that need to differentiate between multiple levels.

`apply_qualified`(*old:* HistoricalResolver, *new:* HistoricalResolver) → Iterable[Tuple[*ModificationLevel*, *ReferenceUpdate*]]

Apply the rule to the changes between two revisions.

Parameters

- **`old`** – The older, base revision.
- **`new`** – The newer revision to be vetted.

`class pyhanko.sign.diff_analysis.rules_api.`**`WhitelistRule`**

Bases: `object`

Abstract base class for a whitelisting rule that simply outputs cleared references without specifying a modification level.

These rules are more flexible than rules of type *`QualifiedWhitelistRule`*, since the modification level can be specified separately (see *`WhitelistRule.as_qualified()`*).

`apply`(*old:* HistoricalResolver, *new:* HistoricalResolver) → Iterable[*ReferenceUpdate*]

Apply the rule to the changes between two revisions.

Parameters

- **`old`** – The older, base revision.
- **`new`** – The newer revision to be vetted.

`as_qualified`(*level:* ModificationLevel) → *QualifiedWhitelistRule*

Construct a new *`QualifiedWhitelistRule`* that whitelists the object references from this rule at the level specified.

Parameters
`level` – The modification level at which the output of this rule should be cleared.

Returns
A *`QualifiedWhitelistRule`* backed by this rule.

class `pyhanko.sign.diff_analysis.rules_api.`**ReferenceUpdate**(*updated_ref:* pyhanko.pdf_utils.generic.Reference, *context_checked: Union[*pyhanko.sign.diff_analysis.rules_api.Context, *NoneType] = None*)

Bases: `object`

updated_ref: *Reference*

Reference that was (potentially) updated.

context_checked: Optional[*Context*] = None

classmethod curry_ref(***kwargs*) → Callable[[*Reference*], RefUpdateType]

property approval_type: ApprovalType

class `pyhanko.sign.diff_analysis.rules_api.`**Context**

Bases: `object`

classmethod from_absolute(*pdf_handler:* PdfHandler, *absolute_path:* RawPdfPath) → *AbsoluteContext*

classmethod relative_to(*start: Union[*DictionaryObject, ArrayObject, TrailerDictionary*], path: Union[*RawPdfPath, *int, str]*) → *RelativeContext*

descend(*path: Union[*RawPdfPath, *int, str]*) → *Context*

class `pyhanko.sign.diff_analysis.rules_api.`**RelativeContext**(*anchor:* pyhanko.pdf_utils.generic.Dereferenceable, *relative_path:* pyhanko.pdf_utils.reader.RawPdfPath)

Bases: `Context`

anchor: *Dereferenceable*

Reference to the container object. In comparisons, this should be the reference tied to the older revision.

relative_path: *RawPdfPath*

Path to the object from the container.

descend(*path: Union[*RawPdfPath, *int, str]*) → *RelativeContext*

class `pyhanko.sign.diff_analysis.rules_api.`**AbsoluteContext**(*path:* pyhanko.pdf_utils.reader.RawPdfPath, *pdf_handler:* pyhanko.pdf_utils.rw_common.PdfHandler)

Bases: `Context`

path: *RawPdfPath*

Absolute path from the trailer.

pdf_handler: *PdfHandler*

The PDF handler to which this context is tied.

property relative_view: *RelativeContext*

descend(*path: Union[*RawPdfPath, *int, str]*) → *AbsoluteContext*

pyhanko.sign.signers package

Submodules

pyhanko.sign.signers.cms_embedder module

This module describes and implements the low-level `PdfCMSEmbedder` protocol for embedding CMS payloads into PDF signature objects.

`class pyhanko.sign.signers.cms_embedder.PdfCMSEmbedder`(*new_field_spec: Optional[*SigFieldSpec*] = None*)

Bases: `object`

Low-level class that handles embedding CMS objects into PDF signature fields.

It also takes care of appearance generation and DocMDP configuration, but does not otherwise offer any of the conveniences of `PdfSigner`.

Parameters
`new_field_spec` – `SigFieldSpec` to use when creating new fields on-the-fly.

`write_cms`(*field_name: Optional[str]*, *writer:* BasePdfFileWriter, *existing_fields_only=False*)

New in version 0.3.0.

Changed in version 0.7.0: Digest wrapped in `PreparedByteRangeDigest` in step 3; `output` returned in step 3 instead of step 4.

This method returns a generator coroutine that controls the process of embedding CMS data into a PDF signature field. Can be used for both timestamps and regular signatures.

Danger: This is a very low-level interface that performs virtually no error checking, and is intended to be used in situations where the construction of the CMS object to be embedded is not under the caller's control (e.g. a remote signer that produces full-fledged CMS objects).

In almost every other case, you're better of using `PdfSigner` instead, with a custom `Signer` implementation to handle the cryptographic operations if necessary.

The coroutine follows the following specific protocol.

1. First, it retrieves or creates the signature field to embed the CMS object in, and yields a reference to said field.
2. The caller should then send in a `SigObjSetup` object, which is subsequently processed by the coroutine. For convenience, the coroutine will then yield a reference to the signature dictionary (as embedded in the PDF writer).
3. Next, the caller should send a `SigIOSetup` object, describing how the resulting document should be hashed and written to the output. The coroutine will write the entire document with a placeholder region reserved for the signature and compute the document's hash and yield it to the caller. It will then yield a `prepared_digest, output` tuple, where `prepared_digest` is a `PreparedByteRangeDigest` object containing the document digest and the relevant offsets, and `output` is the output stream to which the document to be signed was written.

   From this point onwards, **no objects may be changed or added** to the `IncrementalPdfFileWriter` currently in use.

4. Finally, the caller should pass in a CMS object to place inside the signature dictionary. The CMS object can be supplied as a raw `bytes` object, or an `asn1crypto`-style object. The coroutine's final yield is the value of the signature dictionary's `/Contents` entry, given as a hexadecimal string.

> **Caution:** It is the caller's own responsibility to ensure that enough room is available in the placeholder signature object to contain the final CMS object.

Parameters

- **`field_name`** – The name of the field to fill in. This should be a field of type `/Sig`.
- **`writer`** – An *`IncrementalPdfFileWriter`* containing the document to sign.
- **`existing_fields_only`** – If `True`, never create a new empty signature field to contain the signature. If `False`, a new field may be created if no field matching `field_name` exists.

Returns

A generator coroutine implementing the protocol described above.

`class pyhanko.sign.signers.cms_embedder.`**`SigMDPSetup`**(*md_algorithm: str*, *certify: bool = False*, *field_lock: Union[*pyhanko.sign.fields.FieldMDPSpec*, NoneType] = None*, *docmdp_perms: Union[*pyhanko.sign.fields.MDPPerm*, NoneType] = None*)

Bases: `object`

`md_algorithm: str`

Message digest algorithm to write into the signature reference dictionary, if one is written at all.

> **Warning:** It is the caller's responsibility to make sure that this value agrees with the value embedded into the CMS object, and with the algorithm used to hash the document. The low-level *`PdfCMSEmbedder`* API *will* simply take it at face value.

`certify: bool = False`

Sign with an author (certification) signature, as opposed to an approval signature. A document can contain at most one such signature, and it must be the first one.

`field_lock: Optional[`*`FieldMDPSpec`*`] = None`

Field lock information to write to the signature reference dictionary.

`docmdp_perms: Optional[`*`MDPPerm`*`] = None`

DocMDP permissions to write to the signature reference dictionary.

`apply`(*sig_obj_ref*, *writer*)

Apply the settings to a signature object.

> **Danger:** This method is internal API.

`class pyhanko.sign.signers.cms_embedder.`**`SigObjSetup`**(*sig_placeholder:* PdfSignedData, *mdp_setup: Optional[*SigMDPSetup*] = None*, *appearance_setup: Optional[*SigAppearanceSetup*] = None*)

Bases: `object`

Describes the signature dictionary to be embedded as the form field's value.

sig_placeholder: *PdfSignedData*

Bare-bones placeholder object, usually of type `SignatureObject` or `DocumentTimestamp`.

In particular, this determines the number of bytes to allocate for the CMS object.

mdp_setup: Optional[*SigMDPSetup*] = None

Optional DocMDP settings, see `SigMDPSetup`.

appearance_setup: Optional[*SigAppearanceSetup*] = None

Optional appearance settings, see `SigAppearanceSetup`.

class `pyhanko.sign.signers.cms_embedder.`**SigAppearanceSetup**(*style: BaseStampStyle, timestamp: datetime, name: Optional[str], text_params: Optional[dict] = None*)

Bases: `object`

Signature appearance configuration.

Part of the low-level `PdfCMSEmbedder` API, see `SigObjSetup`.

style: *BaseStampStyle*

Stamp style to use to generate the appearance.

timestamp: datetime

Timestamp to show in the signature appearance.

name: Optional[str]

Signer name to show in the signature appearance.

text_params: Optional[dict] = None

Additional text interpolation parameters to pass to the underlying stamp style.

apply(*sig_annot, writer*)

Apply the settings to an annotation.

Danger: This method is internal API.

class `pyhanko.sign.signers.cms_embedder.`**SigIOSetup**(*md_algorithm: str, in_place: bool = False, chunk_size: int = 4096, output: Optional[IO] = None*)

Bases: `object`

I/O settings for writing signed PDF documents.

Objects of this type are used in the penultimate phase of the `PdfCMSEmbedder` protocol.

md_algorithm: str

Message digest algorithm to use to compute the document hash. It should be supported by *pyca/cryptography*.

Warning: This is also the message digest algorithm that should appear in the corresponding `signerInfo` entry in the CMS object that ends up being embedded in the signature field.

`in_place: bool = False`

Sign the input in-place. If `False`, write output to a `BytesIO` object, or *output* if the latter is not `None`.

`chunk_size: int = 4096`

Size of the internal buffer (in bytes) used to feed data to the message digest function if the input stream does not support `memoryview`.

`output: Optional[IO] = None`

Write the output to the specified output stream. If `None`, write to a new `BytesIO` object. Default is `None`.

pyhanko.sign.signers.constants module

This module defines constants & defaults used by pyHanko when creating digital signatures.

`pyhanko.sign.signers.constants.DEFAULT_MD = 'sha256'`

Default message digest algorithm used when computing digests for use in signatures.

`pyhanko.sign.signers.constants.DEFAULT_SIG_SUBFILTER = SigSeedSubFilter.ADOBE_PKCS7_DETACHED`

Default SubFilter to use for a PDF signature.

`pyhanko.sign.signers.constants.DEFAULT_SIGNER_KEY_USAGE = {'non_repudiation'}`

Default key usage bits required for the signer's certificate.

`pyhanko.sign.signers.constants.SIG_DETAILS_DEFAULT_TEMPLATE = 'Digitally signed by %(signer)s.\nTimestamp: %(ts)s.'`

Default template string for signature appearances.

`pyhanko.sign.signers.constants.DEFAULT_SIGNING_STAMP_STYLE = TextStampStyle(border_width=3, background=<pyhanko.pdf_utils.content.RawContent object>, background_layout=SimpleBoxLayoutRule(x_align=<AxisAlignment.ALIGN_MID: 2>, y_align=<AxisAlignment.ALIGN_MID: 2>, margins=Margins(left=5, right=5, top=5, bottom=5), inner_content_scaling=<InnerScaling.SHRINK_TO_FIT: 4>), background_opacity=0.6, text_box_style=TextBoxStyle(font=<pyhanko.pdf_utils.font.basic.SimpleFontEngineFactory object>, font_size=10, leading=None, border_width=0, box_layout_rule=None, vertical_text=False), inner_content_layout=None, stamp_text='Digitally signed by %(signer)s.\nTimestamp: %(ts)s.', timestamp_format='%Y-%m-%d %H:%M:%S %Z')`

Default stamp style used for visible signatures.

`pyhanko.sign.signers.constants.ESIC_EXTENSION_1 = DeveloperExtension(prefix_name='/ESIC', base_version='/1.7', extension_level=1, url=None, extension_revision=None, compare_by_level=True, subsumed_by=(), subsumes=(), multivalued=<DevExtensionMultivalued.NEVER: 2>)`

ESIC extension for PDF 1.7. Used to declare usage of PAdES structures.

`pyhanko.sign.signers.constants.ISO32001 = DeveloperExtension(prefix_name='/ISO_', base_version='/2.0', extension_level=32001, url='https://www.iso.org/standard/45874.html', extension_revision=':2022', compare_by_level=False, subsumed_by=(), subsumes=(), multivalued=<DevExtensionMultivalued.ALWAYS: 1>)`

ISO extension to PDF 2.0 to include SHA-3 and SHAKE256 support. This extension is defined in ISO/TS 32001.

Declared automatically whenever either of these is used in the signing or document digesting process.

`pyhanko.sign.signers.constants.ISO32002 = DeveloperExtension(prefix_name='/ISO_', base_version='/2.0', extension_level=32002, url='https://www.iso.org/standard/45875.html', extension_revision=':2022', compare_by_level=False, subsumed_by=(), subsumes=(), multivalued=<DevExtensionMultivalued.ALWAYS: 1>)`

ISO extension to PDF 2.0 to include EdDSA support and clarify supported curves for ECDSA. This extension is defined in ISO/TS 32002.

Declared automatically whenever Ed25519 or Ed448 are used, and when ECDSA is used with one of the curves listed in ISO/TS 32002.

pyhanko.sign.signers.csc_signer module

New in version 0.10.0.

Asynchronous *`Signer`* implementation for interacting with a remote signing service using the Cloud Signature Consortium (CSC) API.

This implementation is based on version 1.0.4.0 (2019-06) of the CSC API specification.

Usage notes

This module's *`CSCSigner`* class supplies an implementation of the *`Signer`* class in pyHanko. As such, it is flexible enough to be used either through pyHanko's high-level API (*`sign_pdf()`* et al.), or through the *interrupted signing API*.

`CSCSigner` overview

`CSCSigner` is only directly responsible for calling the `signatures/signHash` endpoint in the CSC API. Other than that, it only handles batch control. This means that the following tasks require further action on the API user's part:

- authenticating to the signing service (typically using OAuth2);
- obtaining Signature Activation Data (SAD) from the signing service;
- provisioning the certificates to embed into the document (usually those are supplied by the signing service as well).

The first two involve a degree of implementation/vendor dependence that is difficult to cater to in full generality, and the third is out of scope for *`Signer`* subclasses in general.

However, this module still provides a number of convenient hooks and guardrails that should allow you to fill in these blanks with relative ease. We briefly discuss these below.

Throughout, the particulars of how pyHanko should connect to a signing service are supplied in a *`CSCServiceSessionInfo`* object. This object contains the base CSC API URL, the CSC credential ID to use, and authentication data.

Authenticating to the signing service

While the authentication process itself is the API user's responsibility, *CSCServiceSessionInfo* includes an *oauth_token* field that will (by default) be used to populate the HTTP `Authorization` header for every request.

To handle OAuth-specific tasks, you might want to use a library like OAuthLib.

Obtaining SAD from the signing service

This is done by subclassing *CSCAuthorizationInfo* and passing an instance to the *CSCSigner*. The *CSCAuthorizationInfo* instance should call the signer's `credentials/authorize` endpoint with the proper parameters required by the service. See the documentation for *CSCAuthorizationInfo* for details and= information about helper functions.

Certificate provisioning

In pyHanko's API, *Signer* instances need to be initialised with the signer's certificate, preferably together with other relevant CA certificates. In a CSC context, these are typically retrieved from the signing service by calling the `credentials/info` endpoint.

This module offers a helper function to handle that task, see *fetch_certs_in_csc_credential()*.

class `pyhanko.sign.signers.csc_signer.`**CSCSigner**(*session: ClientSession*, *auth_manager:* CSCAuthorizationManager, *sign_timeout: int = 300*, *prefer_pss: bool = False*, *embed_roots: bool = True*, *client_data: Optional[str] = None*, *batch_autocommit: bool = True*, *batch_size: Optional[int] = None*, *est_raw_signature_size=512*)

Bases: *Signer*

Implements the *Signer* interface for a remote CSC signing service. Requests are made asynchronously, using `aiohttp`.

Parameters

- **session** – The `aiohttp` session to use when performing queries.
- **auth_manager** – A *CSCAuthorizationManager* instance capable of procuring signature activation data from the signing service.
- **sign_timeout** – Timeout for signing operations, in seconds. Defaults to 300 seconds (5 minutes).
- **prefer_pss** – When signing using an RSA key, prefer PSS padding to legacy PKCS#1 v1.5 padding. Default is `False`. This option has no effect on non-RSA signatures.
- **embed_roots** – Option that controls whether or not additional self-signed certificates should be embedded into the CMS payload. The default is `True`.
- **client_data** – CSC client data to add to any signing request(s), if applicable.
- **batch_autocommit** – Whether to automatically commit a signing transaction as soon as a batch is full. The default is `True`. If `False`, the caller has to trigger *commit()* manually.
- **batch_size** – The number of signatures to sign in one transaction. This defaults to 1 (i.e. a separate `signatures/signHash` call is made for every signature).

- `est_raw_signature_size` – Estimated raw signature size (in bytes). Defaults to 512 bytes, which, combined with other built-in safety margins, should provide a generous overestimate.

`get_signature_mechanism_for_digest`(*digest_algorithm*)

Get the signature mechanism for this signer to use. If `signature_mechanism` is set, it will be used. Otherwise, this method will attempt to put together a default based on mechanism used in the signer's certificate.

Parameters
`digest_algorithm` – Digest algorithm to use as part of the signature mechanism. Only used if a signature mechanism object has to be put together on-the-fly.

Returns
A `SignedDigestAlgorithm` object.

`async format_csc_signing_req`(*tbs_hashes: List[str]*, *digest_algorithm: str*) → dict

Populate the request data for a CSC signing request

Parameters

- `tbs_hashes` – Base64-encoded hashes that require signing.
- `digest_algorithm` – The digest algorithm to use.

Returns
A dict that, when encoded as a JSON object, be used as the request body for a call to `signatures/signHash`.

`async async_sign_raw`(*data: bytes*, *digest_algorithm: str*, *dry_run=False*) → bytes

Compute the raw cryptographic signature of the data provided, hashed using the digest algorithm provided.

Parameters

- `data` – Data to sign.
- `digest_algorithm` – Digest algorithm to use.

Warning: If `signature_mechanism` also specifies a digest, they should match.

- `dry_run` – Do not actually create a signature, but merely output placeholder bytes that would suffice to contain an actual signature.

Returns
Signature bytes.

`async commit`()

Commit the current batch by calling the `signatures/signHash` endpoint on the CSC service.

This coroutine does not return anything; instead, it notifies all waiting signing coroutines that their signature has been fetched.

`class pyhanko.sign.signers.csc_signer.CSCServiceSessionInfo`(*service_url: str*, *credential_id: str*, *oauth_token: Optional[str] = None*, *api_ver: str = 'v1'*)

Bases: `object`

Information about the CSC service, together with the required authentication data.

service_url: str

Base URL of the CSC service. This is the part that precedes `/csc/<version>/...` in the API endpoint URLs.

credential_id: str

The identifier of the CSC credential to use when signing. The format is vendor-dependent.

oauth_token: Optional[str] = None

OAuth token to use when making requests to the CSC service.

api_ver: str = 'v1'

CSC API version.

Note: This section does not affect any of the internal logic, it only changes how the URLs are formatted.

---

endpoint_url(*endpoint_name*)

Complete an endpoint name to a full URL.

Parameters
endpoint_name – Name of the endpoint (e.g. `credentials/info`).

Returns
A URL.

property auth_headers

HTTP Header(s) necessary for authentication, to be passed with every request.

Note: By default, this supplies the `Authorization` header with the value of *oauth_token* as the `Bearer` value.

Returns
A `dict` of headers.

class pyhanko.sign.signers.csc_signer.**CSCCredentialInfo**(*signing_cert: Certificate*, *chain: List[Certificate]*, *supported_mechanisms: FrozenSet[str]*, *max_batch_size: int*, *hash_pinning_required: bool*, *response_data: dict*)

Bases: `object`

Information about a CSC credential, typically fetched using a `credentials/info` call. See also *fetch_certs_in_csc_credential()*.

signing_cert: Certificate

The signer's certificate.

chain: List[Certificate]

Other relevant CA certificates.

supported_mechanisms: FrozenSet[str]

Signature mechanisms supported by the credential.

max_batch_size: int

The maximal batch size that can be used with this credential.

hash_pinning_required: bool

Flag controlling whether SAD must be tied to specific hashes.

response_data: dict

The JSON response data from the server as an otherwise unparsed `dict`.

as_cert_store() → *CertificateStore*

Register the relevant certificates into a `CertificateStore` and return it.

Returns
A `CertificateStore`.

async pyhanko.sign.signers.csc_signer.**fetch_certs_in_csc_credential**(*session: ClientSession*, *csc_session_info:* CSCServiceSessionInfo, *timeout: int = 30*) → *CSCCredentialInfo*

Call the `credentials/info` endpoint of the CSC service for a specific credential, and encode the result into a `CSCCredentialInfo` object.

Parameters

- **session** – The `aiohttp` session to use when performing queries.
- **csc_session_info** – General information about the CSC service and the credential.
- **timeout** – How many seconds to allow before time-out.

Returns
A `CSCCredentialInfo` object with the processed response.

class pyhanko.sign.signers.csc_signer.**CSCAuthorizationInfo**(*sad: str*, *expires_at: Optional[datetime] = None*)

Bases: `object`

Authorization data to make a signing request. This is the result of a call to `credentials/authorize`.

sad: str

Signature activation data; opaque to the client.

expires_at: Optional[datetime] = None

Expiry date of the signature activation data.

class pyhanko.sign.signers.csc_signer.**CSCAuthorizationManager**(*csc_session_info:* CSCServiceSessionInfo, *credential_info:* CSCCredentialInfo)

Bases: `ABC`

Abstract class that handles authorisation requests for the CSC signing client.

Note: Implementations may wish to make use of the `format_csc_auth_request()` convenience method to format requests to the `credentials/authorize` endpoint.

Parameters

- **csc_session_info** – General information about the CSC service and the credential.
- **credential_info** – Details about the credential.

async authorize_signature(*hash_b64s: List[str]*) → *CSCAuthorizationInfo*

Request a SAD token from the signing service, either freshly or to extend the current transaction.

Depending on the lifecycle of this object, pre-fetched SAD values may be used. All authorization transaction management is left to implementing subclasses.

Parameters
hash_b64s – Base64-encoded hash values about to be signed.

Returns
Authorization data.

format_csc_auth_request(*num_signatures: int = 1*, *pin: Optional[str] = None*, *otp: Optional[str] = None*, *hash_b64s: Optional[List[str]] = None*, *description: Optional[str] = None*, *client_data: Optional[str] = None*) → dict

Format the parameters for a call to `credentials/authorize`.

Parameters

- **num_signatures** – The number of signatures to request authorisation for.
- **pin** – The user's PIN (if applicable).
- **otp** – The current value of an OTP token, provided by the user (if applicable).
- **hash_b64s** – An explicit list of base64-encoded hashes to be tied to the SAD. Is optional if the service's SCAL value is 1, i.e. when *hash_pinning_required* is false.
- **description** – A free-form description of the authorisation request (optional).
- **client_data** – Custom vendor-specific data (if applicable).

Returns
A dict that, when encoded as a JSON object, be used as the request body for a call to `credentials/authorize`.

static parse_csc_auth_response(*response_data: dict*) → *CSCAuthorizationInfo*

Parse the response from a `credentials/authorize` call into a *CSCAuthorizationInfo* object.

Parameters
response_data – The decoded response JSON.

Returns
A *CSCAuthorizationInfo* object.

property auth_headers

HTTP Header(s) necessary for authentication, to be passed with every request. By default, this delegates to *CSCServiceSessionInfo.auth_headers*.

Returns
A `dict` of headers.

class pyhanko.sign.signers.csc_signer.**PrefetchedSADAuthorizationManager**(*csc_session_info: CSCServiceSessionInfo*, *credential_info: CSCCredentialInfo*, *csc_auth_info: CSCAuthorizationInfo*)

Bases: *CSCAuthorizationManager*

Simplistic *CSCAuthorizationManager* for use with pre-fetched signature activation data.

This class is effectively only useful for CSC services that do not require SAD to be pinned to specific document hashes. It allows you to use a SAD that was fetched before starting the signing process, for a one-shot signature.

This can simplify resource management in cases where obtaining a SAD is time-consuming, but the caller still wants the conveniences of pyHanko's high-level API without having to keep too many pyHanko objects in memory while waiting for a `credentials/authorize` call to go through.

Legitimate uses are limited, but the implementation is trivial, so we provide it here.

Parameters

- **`csc_session_info`** – General information about the CSC service and the credential.
- **`credential_info`** – Details about the credential.
- **`csc_auth_info`** – The pre-fetched signature activation data.

`async authorize_signature`(*hash_b64s: List[str]*) → *CSCAuthorizationInfo*

Return the prefetched SAD, or raise an error if called twice.

Parameters
`hash_b64s` – List of hashes to be signed; ignored.

Returns
The prefetched authorisation data.

pyhanko.sign.signers.functions module

This module defines pyHanko's high-level API entry points.

`pyhanko.sign.signers.functions.sign_pdf`(*pdf_out:* BasePdfFileWriter, *signature_meta:* PdfSignatureMetadata, *signer:* Signer, *timestamper: Optional[*TimeStamper*] = None*, *new_field_spec: Optional[*SigFieldSpec*] = None*, *existing_fields_only=False*, *bytes_reserved=None*, *in_place=False*, *output=None*)

Thin convenience wrapper around *`PdfSigner.sign_pdf()`*.

Parameters

- **`pdf_out`** – An *`IncrementalPdfFileWriter`*.
- **`bytes_reserved`** – Bytes to reserve for the CMS object in the PDF file. If not specified, make an estimate based on a dummy signature.
- **`signature_meta`** – The specification of the signature to add.
- **`signer`** – *`Signer`* object to use to produce the signature object.
- **`timestamper`** – *`TimeStamper`* object to use to produce any time stamp tokens that might be required.
- **`in_place`** – Sign the input in-place. If `False`, write output to a `BytesIO` object.
- **`existing_fields_only`** – If `True`, never create a new empty signature field to contain the signature. If `False`, a new field may be created if no field matching *`field_name`* exists.
- **`new_field_spec`** – If a new field is to be created, this parameter allows the caller to specify the field's properties in the form of a *`SigFieldSpec`*. This parameter is only meaningful if `existing_fields_only` is `False`.
- **`output`** – Write the output to the specified output stream. If `None`, write to a new `BytesIO` object. Default is `None`.

Returns
The output stream containing the signed output.

`async pyhanko.sign.signers.functions.`**`async_sign_pdf`**(*pdf_out:* BasePdfFileWriter, *signature_meta:* PdfSignatureMetadata, *signer:* Signer, *timestamper: Optional[*TimeStamper*] = None*, *new_field_spec: Optional[*SigFieldSpec*] = None*, *existing_fields_only=False*, *bytes_reserved=None*, *in_place=False*, *output=None*)

Thin convenience wrapper around *`PdfSigner.async_sign_pdf()`*.

Parameters

- **`pdf_out`** – An *`IncrementalPdfFileWriter`*.
- **`bytes_reserved`** – Bytes to reserve for the CMS object in the PDF file. If not specified, make an estimate based on a dummy signature.
- **`signature_meta`** – The specification of the signature to add.
- **`signer`** – *`Signer`* object to use to produce the signature object.
- **`timestamper`** – *`TimeStamper`* object to use to produce any time stamp tokens that might be required.
- **`in_place`** – Sign the input in-place. If `False`, write output to a `BytesIO` object.
- **`existing_fields_only`** – If `True`, never create a new empty signature field to contain the signature. If `False`, a new field may be created if no field matching *`field_name`* exists.
- **`new_field_spec`** – If a new field is to be created, this parameter allows the caller to specify the field's properties in the form of a *`SigFieldSpec`*. This parameter is only meaningful if `existing_fields_only` is `False`.
- **`output`** – Write the output to the specified output stream. If `None`, write to a new `BytesIO` object. Default is `None`.

Returns
The output stream containing the signed output.

`pyhanko.sign.signers.functions.`**`embed_payload_with_cms`**(*pdf_writer:* BasePdfFileWriter, *file_spec_string: str*, *payload:* EmbeddedFileObject, *cms_obj: ContentInfo*, *extension='.sig'*, *file_name: Optional[str] = None*, *file_spec_kwargs=None*, *cms_file_spec_kwargs=None*)

Embed some data as an embedded file stream into a PDF, and associate it with a CMS object.

The resulting CMS object will also be turned into an embedded file, and associated with the original payload through a related file relationship.

This can be used to bundle (non-PDF) detached signatures with PDF attachments, for example.

New in version 0.7.0.

Parameters

- **`pdf_writer`** – The PDF writer to use.
- **`file_spec_string`** – See *`file_spec_string`* in *`FileSpec`*.
- **`payload`** – Payload object.

- **cms_obj** – CMS object pertaining to the payload.
- **extension** – File extension to use for the CMS attachment.
- **file_name** – See *file_name* in *FileSpec*.
- **file_spec_kwargs** – Extra arguments to pass to the *FileSpec* constructor for the main attachment specification.
- **cms_file_spec_kwargs** – Extra arguments to pass to the *FileSpec* constructor for the CMS attachment specification.

pyhanko.sign.signers.pdf_byterange module

This module contains the low-level building blocks for dealing with bookkeeping around `/ByteRange` digests in PDF files.

class pyhanko.sign.signers.pdf_byterange.**PreparedByteRangeDigest**(*document_digest: bytes*, *reserved_region_start: int*, *reserved_region_end: int*)

Bases: `object`

New in version 0.7.0.

Changed in version 0.14.0: Removed `md_algorithm` attribute since it was unused.

Bookkeeping class that contains the digest of a document that is about to be signed (or otherwise authenticated) based on said digest. It also keeps track of the region in the output stream that is omitted in the byte range.

Instances of this class can easily be serialised, which allows for interrupting the signing process partway through.

document_digest: bytes

Digest of the document, computed over the appropriate `/ByteRange`.

reserved_region_start: int

Start of the reserved region in the output stream that is not part of the `/ByteRange`.

reserved_region_end: int

End of the reserved region in the output stream that is not part of the `/ByteRange`.

fill_with_cms(*output: IO*, *cms_data: Union[bytes, ContentInfo]*)

Write a DER-encoded CMS object to the reserved region indicated by *reserved_region_start* and *reserved_region_end* in the output stream.

Parameters

- **output** – Output stream to use. Must be writable and seekable.
- **cms_data** – CMS object to write. Can be provided as an `asn1crypto.cms.ContentInfo` object, or as raw DER-encoded bytes.

Returns

A `bytes` object containing the contents that were written, plus any additional padding.

fill_reserved_region(*output: IO*, *content_bytes: bytes*)

Write hex-encoded contents to the reserved region indicated by *reserved_region_start* and *reserved_region_end* in the output stream.

Parameters

- **output** – Output stream to use. Must be writable and seekable.
- **content_bytes** – Content bytes. These will be padded, hexadecimally encoded and written to the appropriate location in output stream.

Returns
A bytes object containing the contents that were written, plus any additional padding.

class pyhanko.sign.signers.pdf_byterange.**PdfByteRangeDigest**(*data_key='/Contents'*, ***, *bytes_reserved=None*)

Bases: *DictionaryObject*

General class to model a PDF Dictionary that has a /ByteRange entry and a another data entry (named /Contents by default) that will contain a value based on a digest computed over said /ByteRange. The /ByteRange will cover the entire file, except for the value of the data entry itself.

Danger: This is internal API.

Parameters

- **data_key** – Name of the data key, which is /Contents by default.
- **bytes_reserved** – Number of bytes to reserve for the contents placeholder. If None, a generous default is applied, but you should try to estimate the size as accurately as possible.

fill(*writer: BasePdfFileWriter*, *md_algorithm*, *in_place=False*, *output=None*, *chunk_size=4096*)

Generator coroutine that handles the document hash computation and the actual filling of the placeholder data.

Danger: This is internal API; you should use use *PdfSigner* wherever possible. If you *really* need fine-grained control, use *PdfCMSEmbedder* instead.

class pyhanko.sign.signers.pdf_byterange.**PdfSignedData**(*obj_type*, *subfilter: SigSeedSubFilter = SigSeedSubFilter.ADOBE_PKCS7_DETACHED*, *timestamp: Optional[datetime] = None*, *bytes_reserved=None*)

Bases: *PdfByteRangeDigest*

Generic class to model signature dictionaries in a PDF file. See also *SignatureObject* and *DocumentTimestamp*.

Parameters

- **obj_type** – The type of signature object.
- **subfilter** – See *SigSeedSubFilter*.
- **timestamp** – The timestamp to embed into the /M entry.
- **bytes_reserved** – The number of bytes to reserve for the signature. Defaults to 16 KiB.

Warning: Since the CMS object is written to the output file as a hexadecimal string, you should request **twice** the (estimated) number of bytes in the DER-encoded version of the CMS object.

class pyhanko.sign.signers.pdf_byterange.**SignatureObject**(*timestamp: Optional[datetime] = None, subfilter: SigSeedSubFilter = SigSeedSubFilter.ADOBE_PKCS7_DETACHED, name=None, location=None, reason=None, app_build_props: Optional[BuildProps] = None, bytes_reserved=None*)

Bases: *PdfSignedData*

Class modelling a (placeholder for) a regular PDF signature.

Parameters

- **timestamp** – The (optional) timestamp to embed into the /M entry.
- **subfilter** – See *SigSeedSubFilter*.
- **bytes_reserved** – The number of bytes to reserve for the signature. Defaults to 16 KiB.

  Warning: Since the CMS object is written to the output file as a hexadecimal string, you should request **twice** the (estimated) number of bytes in the DER-encoded version of the CMS object.

- **name** – Signer name. You probably want to leave this blank, viewers should default to the signer's subject name.
- **location** – Optional signing location.
- **reason** – Optional signing reason. May be restricted by seed values.

class pyhanko.sign.signers.pdf_byterange.**DocumentTimestamp**(*bytes_reserved=None*)

Bases: *PdfSignedData*

Class modelling a (placeholder for) a regular PDF signature.

Parameters

bytes_reserved – The number of bytes to reserve for the signature. Defaults to 16 KiB.

Warning: Since the CMS object is written to the output file as a hexadecimal string, you should request **twice** the (estimated) number of bytes in the DER-encoded version of the CMS object.

class pyhanko.sign.signers.pdf_byterange.**BuildProps**(*name: str, revision: Optional[str] = None*)

Bases: object

Entries in a signature build properties dictionary; see Adobe PDF Signature Build Dictionary Specification.

name: str

The application's name.

revision: Optional[str] = None

The application's revision ID string.

Note: This corresponds to the **REx** entry in the build properties dictionary.

`as_pdf_object()` → *DictionaryObject*

Render the build properties as a PDF object.

Returns

A PDF dictionary.

pyhanko.sign.signers.pdf_cms module

This module defines utility classes to format CMS objects for use in PDF signatures.

`class pyhanko.sign.signers.pdf_cms.Signer`(**, prefer_pss: bool = False, embed_roots: bool = True, signature_mechanism: Optional[SignedDigestAlgorithm] = None, signing_cert: Optional[Certificate] = None, cert_registry: Optional[CertificateStore] = None, attribute_certs: Iterable[AttributeCertificateV2] = ()*)

Bases: `object`

Abstract signer object that is agnostic as to where the cryptographic operations actually happen.

As of now, pyHanko provides two implementations:

- *`SimpleSigner`* implements the easy case where all the key material can be loaded into memory.
- *`PKCS11Signer`* implements a signer that is capable of interfacing with a PKCS#11 device (see also *`BEIDSigner`*).

Parameters

- **`prefer_pss`** – When signing using an RSA key, prefer PSS padding to legacy PKCS#1 v1.5 padding. Default is `False`. This option has no effect on non-RSA signatures.
- **`embed_roots`** – New in version 0.9.0.

  Option that controls whether or not additional self-signed certificates should be embedded into the CMS payload. The default is `True`.

  Note: The signer's certificate is always embedded, even if it is self-signed.

  Note: Trust roots are configured by the validator, so embedding them doesn't affect the semantics of a typical validation process. Therefore, they can be safely omitted in most cases. Nonetheless, embedding the roots can be useful for documentation purposes. In addition, some validators are poorly implemented, and will refuse to build paths if the roots are not present in the file.

  Warning: To be precise, if this flag is `False`, a certificate will be dropped if (a) it is not the signer's, (b) it is self-issued and (c) its subject and authority key identifiers match (or either is missing). In other words, we never validate the actual self-signature. This heuristic is sufficiently accurate for most applications.

- **`signature_mechanism`** – The (cryptographic) signature mechanism to use for all signing operations. If unset, the default behaviour is to try to impute a reasonable one given the preferred digest algorithm and public key.

- **signing_cert** – See *signing_cert*.
- **attribute_certs** – See *attribute_certs*.
- **cert_registry** – Initial value for *cert_registry*. If unset, an empty certificate store will be initialised.

property signature_mechanism: Optional[SignedDigestAlgorithm]

Changed in version 0.18.0: Turned into a property instead of a class attribute.

The (cryptographic) signature mechanism to use for all signing operations.

property signing_cert: Optional[Certificate]

Changed in version 0.14.0: Made optional (see note)

Changed in version 0.18.0: Turned into a property instead of a class attribute.

The certificate that will be used to create the signature.

Note: This is an optional field only to a limited extent. Subclasses may require it to be present, and not setting it at the beginning of the signing process implies that certain high-level convenience features will no longer work or be limited in function (e.g., automatic hash selection, appearance generation, revocation information collection, . . .).

However, making *signing_cert* optional enables certain signing workflows where the certificate of the signer is not known until the signature has actually been produced. This is most relevant in certain types of remote signing scenarios.

property cert_registry: *CertificateStore*

Changed in version 0.18.0: Turned into a property instead of a class attribute.

Collection of certificates associated with this signer. Note that this is simply a bookkeeping tool; in particular it doesn't care about trust.

property attribute_certs: Iterable[AttributeCertificateV2]

Changed in version 0.18.0: Turned into a property instead of a class attribute.

Attribute certificates to include with the signature.

Note: Only v2 attribute certificates are supported.

get_signature_mechanism_for_digest(*digest_algorithm: Optional[str]*) → SignedDigestAlgorithm

Get the signature mechanism for this signer to use. If *signature_mechanism* is set, it will be used. Otherwise, this method will attempt to put together a default based on mechanism used in the signer's certificate.

Parameters

digest_algorithm – Digest algorithm to use as part of the signature mechanism. Only used if a signature mechanism object has to be put together on-the-fly.

Returns

A `SignedDigestAlgorithm` object.

property subject_name: Optional[str]

Returns

The subject's common name as a string, extracted from *signing_cert*, or `None` if no signer's certificate is available static **format_revinfo**(*ocsp_responses: Optional[list] = None*, *crls: Optional[list] = None*)

Format Adobe-style revocation information for inclusion into a CMS object.

Parameters

- **ocsp_responses** – A list of OCSP responses to include.
- **crls** – A list of CRLs to include.

signer_info(*digest_algorithm: str*, *signed_attrs*, *signature*)

Format the `SignerInfo` entry for a CMS signature.

Parameters

- **digest_algorithm** – Digest algorithm to use.
- **signed_attrs** – Signed attributes (see *signed_attrs()*).
- **signature** – The raw signature to embed (see `sign_raw()`).

Returns

An `asn1crypto.cms.SignerInfo` object.

async **async_sign_raw**(*data: bytes*, *digest_algorithm: str*, *dry_run=False*) → bytes

Compute the raw cryptographic signature of the data provided, hashed using the digest algorithm provided.

Parameters

- **data** – Data to sign.
- **digest_algorithm** – Digest algorithm to use.

  Warning: If *signature_mechanism* also specifies a digest, they should match.

- **dry_run** – Do not actually create a signature, but merely output placeholder bytes that would suffice to contain an actual signature.

Returns

Signature bytes.

async **unsigned_attrs**(*digest_algorithm: str*, *signature: bytes*, *signed_attrs: CMSAttributes*, *timestamper=None*, *dry_run=False*) → Optional[CMSAttributes]

Changed in version 0.9.0: Made asynchronous _(breaking change)_

Changed in version 0.14.0: Added `signed_attrs` parameter _(breaking change)_

Compute the unsigned attributes to embed into the CMS object. This function is called after signing the hash of the signed attributes (see *signed_attrs()*).

By default, this method only handles timestamp requests, but other functionality may be added by subclasses

If this method returns `None`, no unsigned attributes will be embedded.

Parameters

- **digest_algorithm** – Digest algorithm used to hash the signed attributes.
- **signed_attrs** – Signed attributes of the signature.
- **signature** – Signature of the signed attribute hash.
- **timestamper** – Timestamp supplier to use.

- **dry_run** – Flag indicating "dry run" mode. If `True`, only the approximate size of the output matters, so cryptographic operations can be replaced by placeholders.

Returns
The unsigned attributes to add, or `None`.

`async signed_attrs`(*data_digest: bytes*, *digest_algorithm: str*, *attr_settings: Optional[*PdfCMSSignedAttributes*] = None*, *content_type='data'*, *use_pades=False*, *timestamper=None*, *dry_run=False*, *is_pdf_sig=True*)

Changed in version 0.4.0: Added positional `digest_algorithm` parameter _(breaking change)_.

Changed in version 0.5.0: Added `dry_run`, `timestamper` and `cades_meta` parameters.

Changed in version 0.9.0: Made asynchronous, grouped some parameters under `attr_settings` _(breaking change)_

Format the signed attributes for a CMS signature.

Parameters

- **data_digest** – Raw digest of the data to be signed.
- **digest_algorithm** – New in version 0.4.0.

  Name of the digest algorithm used to compute the digest.
- **use_pades** – Respect PAdES requirements.
- **dry_run** – New in version 0.5.0.

  Flag indicating "dry run" mode. If `True`, only the approximate size of the output matters, so cryptographic operations can be replaced by placeholders.
- **attr_settings** – *PdfCMSSignedAttributes* object describing the attributes to be added.
- **timestamper** – New in version 0.5.0.

  Timestamper to use when creating timestamp tokens.
- **content_type** – CMS content type of the encapsulated data. Default is *data*.

  Danger: This parameter is internal API, and non-default values must not be used to produce PDF signatures.
- **is_pdf_sig** – Whether the signature being generated is for use in a PDF document.

  Danger: This parameter is internal API.

Returns
An `asn1crypto.cms.CMSAttributes` object.

`async async_sign`(*data_digest: bytes*, *digest_algorithm: str*, *dry_run=False*, *use_pades=False*, *timestamper=None*, *signed_attr_settings: Optional[*PdfCMSSignedAttributes*] = None*, *is_pdf_sig=True*, *encap_content_info=None*) → ContentInfo

New in version 0.9.0.

Produce a detached CMS signature from a raw data digest.

Parameters

- `data_digest` – Digest of the actual content being signed.
- `digest_algorithm` – Digest algorithm to use. This should be the same digest method as the one used to hash the (external) content.
- `dry_run` – If `True`, the actual signing step will be replaced with a placeholder.

  In a PDF signing context, this is necessary to estimate the size of the signature container before computing the actual digest of the document.
- `signed_attr_settings` – *`PdfCMSSignedAttributes`* object describing the attributes to be added.
- `use_pades` – Respect PAdES requirements.
- `timestamper` – `TimeStamper` used to obtain a trusted timestamp token that can be embedded into the signature container.

  Note: If `dry_run` is true, the timestamper's `dummy_response()` method will be called to obtain a placeholder token. Note that with a standard `HTTPTimeStamper`, this might still hit the timestamping server (in order to produce a realistic size estimate), but the dummy response will be cached.
- `is_pdf_sig` – Whether the signature being generated is for use in a PDF document.

  Danger: This parameter is internal API.
- `encap_content_info` – Data to encapsulate in the CMS object.

  Danger: This parameter is internal API, and must not be used to produce PDF signatures.

Returns

An `ContentInfo` object.

`async async_sign_prescribed_attributes`(*digest_algorithm: str*, *signed_attrs: CMSAttributes*, *cms_version='v1'*, *dry_run=False*, *timestamper=None*, *encap_content_info=None*) → ContentInfo

New in version 0.9.0.

Start the CMS signing process with the prescribed set of signed attributes.

Parameters

- `digest_algorithm` – Digest algorithm to use. This should be the same digest method as the one used to hash the (external) content.
- `signed_attrs` – CMS attributes to sign.
- `dry_run` – If `True`, the actual signing step will be replaced with a placeholder.

  In a PDF signing context, this is necessary to estimate the size of the signature container before computing the actual digest of the document.
- `timestamper` – `TimeStamper` used to obtain a trusted timestamp token that can be embedded into the signature container.

Note: If `dry_run` is true, the timestamper's `dummy_response()` method will be called to obtain a placeholder token. Note that with a standard `HTTPTimeStamper`, this might still hit the timestamping server (in order to produce a realistic size estimate), but the dummy response will be cached.

- **`cms_version`** – CMS version to use.
- **`encap_content_info`** – Data to encapsulate in the CMS object.

Danger: This parameter is internal API, and must not be used to produce PDF signatures.

Returns

An `ContentInfo` object.

`async async_sign_general_data`(*input_data: Union[IO, bytes, ContentInfo, EncapsulatedContentInfo]*, *digest_algorithm: str*, *detached=True*, *use_cades=False*, *timestamper=None*, *chunk_size=4096*, *signed_attr_settings: Optional[*PdfCMSSignedAttributes*] = None*, *max_read=None*) → ContentInfo

New in version 0.9.0.

Produce a CMS signature for an arbitrary data stream (not necessarily PDF data).

Parameters

- **`input_data`** – The input data to sign. This can be either a `bytes` object a file-type object, a `cms.ContentInfo` object or a `cms.EncapsulatedContentInfo` object.

Warning: `asn1crypto` mandates `cms.ContentInfo` for CMS v1 signatures. In practical terms, this means that you need to use `cms.ContentInfo` if the content type is `data`, and `cms.EncapsulatedContentInfo` otherwise.

Warning: We currently only support CMS v1, v3 and v4 signatures. This is only a concern if you need certificates or CRLs of type 'other', in which case you can change the version yourself (this will not invalidate any signatures). You'll also need to do this if you need support for version 1 attribute certificates, or if you want to sign with `subjectKeyIdentifier` in the `sid` field.

- **`digest_algorithm`** – The name of the digest algorithm to use.
- **`detached`** – If `True`, create a CMS detached signature (i.e. an object where the encapsulated content is not embedded in the signature object itself). This is the default. If `False`, the content to be signed will be embedded as encapsulated content.
- **`signed_attr_settings`** – *`PdfCMSSignedAttributes`* object describing the attributes to be added.
- **`use_cades`** – Construct a CAdES-style CMS object.
- **`timestamper`** – *`PdfTimeStamper`* to use to create a signature timestamp

Note: If you want to create a *content* timestamp (as opposed to a *signature* timestamp), see `CAdESSignedAttrSpec`.

- **`chunk_size`** – Chunk size to use when consuming input data.
- **`max_read`** – Maximal number of bytes to read from the input stream.

Returns

A CMS ContentInfo object of type signedData.

`sign`(*data_digest: bytes*, *digest_algorithm: str*, *timestamp: Optional[datetime] = None*, *dry_run=False*, *revocation_info=None*, *use_pades=False*, *timestamper=None*, *cades_signed_attr_meta: Optional[*CAdESSignedAttrSpec*] = None*, *encap_content_info=None*) → ContentInfo

Deprecated since version 0.9.0: Use `async_sign()` instead. The implementation of this method will invoke `async_sign()` using `asyncio.run()`.

Produce a detached CMS signature from a raw data digest.

Parameters

- **`data_digest`** – Digest of the actual content being signed.
- **`digest_algorithm`** – Digest algorithm to use. This should be the same digest method as the one used to hash the (external) content.
- **`timestamp`** – Signing time to embed into the signed attributes (will be ignored if `use_pades` is `True`).

  Note: This timestamp value is to be interpreted as an unfounded assertion by the signer, which may or may not be good enough for your purposes.

- **`dry_run`** – If `True`, the actual signing step will be replaced with a placeholder.

  In a PDF signing context, this is necessary to estimate the size of the signature container before computing the actual digest of the document.

- **`revocation_info`** – Revocation information to embed; this should be the output of a call to `Signer.format_revinfo()` (ignored when `use_pades` is `True`).
- **`use_pades`** – Respect PAdES requirements.
- **`timestamper`** – `TimeStamper` used to obtain a trusted timestamp token that can be embedded into the signature container.

  Note: If `dry_run` is true, the timestamper's `dummy_response()` method will be called to obtain a placeholder token. Note that with a standard `HTTPTimeStamper`, this might still hit the timestamping server (in order to produce a realistic size estimate), but the dummy response will be cached.

- **`cades_signed_attr_meta`** – New in version 0.5.0.

  Specification for CAdES-specific signed attributes.

- **`encap_content_info`** – Data to encapsulate in the CMS object.

> **Danger:** This parameter is internal API, and must not be used to produce PDF signatures.

Returns
An `ContentInfo` object.

`sign_prescribed_attributes`(*digest_algorithm: str*, *signed_attrs: CMSAttributes*, *cms_version='v1'*, *dry_run=False*, *timestamper=None*, *encap_content_info=None*) → ContentInfo

Deprecated since version 0.9.0: Use *`async_sign_prescribed_attributes()`* instead. The implementation of this method will invoke *`async_sign_prescribed_attributes()`* using `asyncio.run()`.

Start the CMS signing process with the prescribed set of signed attributes.

Parameters

- **`digest_algorithm`** – Digest algorithm to use. This should be the same digest method as the one used to hash the (external) content.
- **`signed_attrs`** – CMS attributes to sign.
- **`dry_run`** – If `True`, the actual signing step will be replaced with a placeholder.

  In a PDF signing context, this is necessary to estimate the size of the signature container before computing the actual digest of the document.
- **`timestamper`** – `TimeStamper` used to obtain a trusted timestamp token that can be embedded into the signature container.

  > **Note:** If `dry_run` is true, the timestamper's `dummy_response()` method will be called to obtain a placeholder token. Note that with a standard `HTTPTimeStamper`, this might still hit the timestamping server (in order to produce a realistic size estimate), but the dummy response will be cached.
- **`cms_version`** – CMS version to use.
- **`encap_content_info`** – Data to encapsulate in the CMS object.

  > **Danger:** This parameter is internal API, and must not be used to produce PDF signatures.

Returns
An `ContentInfo` object.

`sign_general_data`(*input_data: Union[IO, bytes, ContentInfo, EncapsulatedContentInfo]*, *digest_algorithm: str*, *detached=True*, *timestamp: Optional[datetime] = None*, *use_cades=False*, *timestamper=None*, *cades_signed_attr_meta: Optional[CAdESSignedAttrSpec] = None*, *chunk_size=4096*, *max_read=None*) → ContentInfo

New in version 0.7.0.

Deprecated since version 0.9.0: Use *`async_sign_general_data()`* instead. The implementation of this method will invoke *`async_sign_general_data()`* using `asyncio.run()`.

Produce a CMS signature for an arbitrary data stream (not necessarily PDF data).

Parameters

- **input_data** – The input data to sign. This can be either a `bytes` object a file-type object, a `cms.ContentInfo` object or a `cms.EncapsulatedContentInfo` object.

  Warning: `asn1crypto` mandates `cms.ContentInfo` for CMS v1 signatures. In practical terms, this means that you need to use `cms.ContentInfo` if the content type is `data`, and `cms.EncapsulatedContentInfo` otherwise.

  Warning: We currently only support CMS v1, v3 and v4 signatures. This is only a concern if you need certificates or CRLs of type 'other', in which case you can change the version yourself (this will not invalidate any signatures). You'll also need to do this if you need support for version 1 attribute certificates, or if you want to sign with `subjectKeyIdentifier` in the `sid` field.

- **digest_algorithm** – The name of the digest algorithm to use.
- **detached** – If `True`, create a CMS detached signature (i.e. an object where the encapsulated content is not embedded in the signature object itself). This is the default. If `False`, the content to be signed will be embedded as encapsulated content.
- **timestamp** – Signing time to embed into the signed attributes (will be ignored if `use_cades` is `True`).

  Note: This timestamp value is to be interpreted as an unfounded assertion by the signer, which may or may not be good enough for your purposes.

- **use_cades** – Construct a CAdES-style CMS object.
- **timestamper** – *`PdfTimeStamper`* to use to create a signature timestamp

  Note: If you want to create a *content* timestamp (as opposed to a *signature* timestamp), see *`CAdESSignedAttrSpec`*.

- **cades_signed_attr_meta** – Specification for CAdES-specific signed attributes.
- **chunk_size** – Chunk size to use when consuming input data.
- **max_read** – Maximal number of bytes to read from the input stream.

Returns

A CMS ContentInfo object of type signedData.

`class pyhanko.sign.signers.pdf_cms.`**`SimpleSigner`**(*signing_cert: Certificate*, *signing_key: PrivateKeyInfo*, *cert_registry:* CertificateStore, *signature_mechanism: Optional[SignedDigestAlgorithm] = None*, *prefer_pss: bool = False*, *embed_roots: bool = True*, *attribute_certs: Optional[Iterable[AttributeCertificateV2]] = None*)

Bases: *`Signer`*

Simple signer implementation where the key material is available in local memory.

`signing_key: PrivateKeyInfo`

Private key associated with the certificate in `signing_cert`.

`async async_sign_raw`(*data: bytes*, *digest_algorithm: str*, *dry_run=False*) → bytes

Compute the raw cryptographic signature of the data provided, hashed using the digest algorithm provided.

Parameters

- **`data`** – Data to sign.
- **`digest_algorithm`** – Digest algorithm to use.

  Warning: If `signature_mechanism` also specifies a digest, they should match.

- **`dry_run`** – Do not actually create a signature, but merely output placeholder bytes that would suffice to contain an actual signature.

Returns

Signature bytes.

`sign_raw`(*data: bytes*, *digest_algorithm: str*) → bytes

Synchronous raw signature implementation.

Parameters

- **`data`** – Data to be signed.
- **`digest_algorithm`** – Digest algorithm to use.

Returns

Raw signature encoded according to the conventions of the signing algorithm used.

`classmethod load_pkcs12`(*pfx_file*, *ca_chain_files=None*, *other_certs=None*, *passphrase=None*, *signature_mechanism=None*, *prefer_pss=False*)

Load certificates and key material from a PCKS#12 archive (usually `.pfx` or `.p12` files).

Parameters

- **`pfx_file`** – Path to the PKCS#12 archive.
- **`ca_chain_files`** – Path to (PEM/DER) files containing other relevant certificates not included in the PKCS#12 file.
- **`other_certs`** – Other relevant certificates, specified as a list of `asn1crypto.x509.Certificate` objects.
- **`passphrase`** – Passphrase to decrypt the PKCS#12 archive, if required.
- **`signature_mechanism`** – Override the signature mechanism to use.
- **`prefer_pss`** – Prefer PSS signature mechanism over RSA PKCS#1 v1.5 if there's a choice.

Returns

A *`SimpleSigner`* object initialised with key material loaded from the PKCS#12 file provided.

`classmethod load`(*key_file*, *cert_file*, *ca_chain_files=None*, *key_passphrase=None*, *other_certs=None*, *signature_mechanism=None*, *prefer_pss=False*)

Load certificates and key material from PEM/DER files.

Parameters

- **`key_file`** – File containing the signer's private key.

- **cert_file** – File containing the signer's certificate.
- **ca_chain_files** – File containing other relevant certificates.
- **key_passphrase** – Passphrase to decrypt the private key (if required).
- **other_certs** – Other relevant certificates, specified as a list of `asn1crypto.x509.Certificate` objects.
- **signature_mechanism** – Override the signature mechanism to use.
- **prefer_pss** – Prefer PSS signature mechanism over RSA PKCS#1 v1.5 if there's a choice.

Returns

A *SimpleSigner* object initialised with key material loaded from the files provided.

`class pyhanko.sign.signers.pdf_cms.`**`ExternalSigner`**(*signing_cert: Optional[Certificate]*, *cert_registry: Optional[CertificateStore]*, *signature_value: Optional[Union[bytes, int]] = None*, *signature_mechanism: Optional[SignedDigestAlgorithm] = None*, *prefer_pss: bool = False*, *embed_roots: bool = True*)

Bases: *Signer*

Class to help formatting CMS objects for use with remote signing. It embeds a fixed signature value into the CMS, set at initialisation.

Intended for use with *Interrupted signing*.

Parameters

- **signing_cert** – The signer's certificate.
- **cert_registry** – The certificate registry to use in CMS generation.
- **signature_value** – The value of the signature as a byte string, a placeholder length, or `None`.
- **signature_mechanism** – The signature mechanism used by the external signing service.
- **prefer_pss** – Switch to prefer PSS when producing RSA signatures, as opposed to RSA with PKCS#1 v1.5 padding.
- **embed_roots** – Whether to embed relevant root certificates into the CMS payload.

`async` **`async_sign_raw`**(*data: bytes*, *digest_algorithm: str*, *dry_run=False*) → bytes

Return a fixed signature value.

`class pyhanko.sign.signers.pdf_cms.`**`PdfCMSSignedAttributes`**(*signing_time: Optional[datetime] = None*, *cades_signed_attrs: Optional[CAdESSignedAttrSpec] = None*, *adobe_revinfo_attr: Optional[RevocationInfoArchival] = None*)

Bases: `CMSSignedAttributes`

New in version 0.7.0.

Changed in version 0.14.0: Split off some fields into `CMSSignedAttributes`.

Serialisable container class describing input for various signed attributes in a CMS object for a PDF signature.

adobe_revinfo_attr: Optional[RevocationInfoArchival] = None

Adobe-style signed revocation info attribute.

async pyhanko.sign.signers.pdf_cms.**format_attributes**(*attr_provs: List[CMSAttributeProvider], other_attrs: Iterable[CMSAttributes] = (), dry_run: bool = False*) → CMSAttributes

Format CMS attributes obtained from attribute providers.

Parameters

- **attr_provs** – List of attribute providers.
- **other_attrs** – Other (predetermined) attributes to include.
- **dry_run** – Whether to invoke the attribute providers in dry-run mode or not.

Returns

A `cms.CMSAttributes` value.

async pyhanko.sign.signers.pdf_cms.**format_signed_attributes**(*data_digest: bytes, attr_provs: List[CMSAttributeProvider], content_type='data', dry_run=False*) → CMSAttributes

Format signed attributes for a CMS `SignerInfo` value.

Parameters

- **data_digest** – The byte string to put in the `messageDigest` attribute.
- **attr_provs** – List of attribute providers to source attributes from.
- **content_type** – The content type of the data being signed (default is `data`).
- **dry_run** – Whether to invoke the attribute providers in dry-run mode or not.

Returns

A `cms.CMSAttributes` value representing the signed attributes.

pyhanko.sign.signers.pdf_cms.**asyncify_signer**(*signer_cls*)

Decorator to turn a legacy *`Signer`* subclass into one that works with the new async API.

pyhanko.sign.signers.pdf_cms.**select_suitable_signing_md**(*key: PublicKeyInfo*) → str

Choose a reasonable default signing message digest given the properties of (the public part of) a key.

The fallback value is `constants.DEFAULT_MD`.

Parameters

key – A `keys.PublicKeyInfo` object.

Returns

The name of a message digest algorithm.

pyhanko.sign.signers.pdf_cms.**signer_from_p12_config**(*config: PKCS12SignatureConfig, provided_pfx_passphrase: Optional[bytes] = None*)

pyhanko.sign.signers.pdf_cms.**signer_from_pemder_config**(*config: PemDerSignatureConfig, provided_key_passphrase: Optional[bytes] = None*)

pyhanko.sign.signers.pdf_signer module

This module implements support for PDF-specific signing functionality.

class pyhanko.sign.signers.pdf_signer.**PdfSignatureMetadata**(*field_name: ~typing.Optional[str] = None*, *md_algorithm: ~typing.Optional[str] = None*, *location: ~typing.Optional[str] = None*, *reason: ~typing.Optional[str] = None*, *name: ~typing.Optional[str] = None*, *app_build_props: ~typing.Optional[~pyhanko.sign.signers.pdf_byterange.BuildP = None*, *certify: bool = False*, *subfilter: ~typing.Optional[~pyhanko.sign.fields.SigSeedSubFilter] = None*, *embed_validation_info: bool = False*, *use_pades_lta: bool = False*, *timestamp_field_name: ~typing.Optional[str] = None*, *validation_context: ~typing.Optional[~pyhanko_certvalidator.context.ValidationC = None*, *docmdp_permissions: ~pyhanko.sign.fields.MDPPerm = MDPPerm.FILL_FORMS*, *signer_key_usage: ~typing.Set[str] = <factory>*, *cades_signed_attr_spec: ~typing.Optional[~pyhanko.sign.ades.api.CAdESSignedAttrSp = None*, *dss_settings: ~pyhanko.sign.signers.pdf_signer.DSSContentSettings = DSSContentSettings(include_vri=True, skip_if_unneeded=True, placement=<SigDSSPlacementPreference.TOGETHER_WITH 3>, next_ts_settings=None)*, *tight_size_estimates: bool = False*, *ac_validation_context: ~typing.Optional[~pyhanko_certvalidator.context.ValidationC = None*)

Bases: `object`

Specification for a PDF signature.

field_name: Optional[str] = None

The name of the form field to contain the signature. If there is only one available signature field, the name may be inferred.

md_algorithm: Optional[str] = None

The name of the digest algorithm to use. It should be supported by *pyca/cryptography*.

If `None`, `select_suitable_signing_md()` will be invoked to generate a suitable default, unless a seed value dictionary happens to be available.

location: Optional[str] = None

Location of signing.

reason: Optional[str] = None

Reason for signing (textual).

name: Optional[str] = None

Name of the signer. This value is usually not necessary to set, since it should appear on the signer's certificate, but there are cases where it might be useful to specify it here (e.g. in situations where signing is delegated to a trusted third party).

app_build_props: Optional[*BuildProps*] = None

Properties of the application that created the signature.

If specified, this data will be recorded in the **Prop_Build** dictionary of the signature.

certify: bool = False

Sign with an author (certification) signature, as opposed to an approval signature. A document can contain at most one such signature, and it must be the first one.

subfilter: Optional[*SigSeedSubFilter*] = None

Signature subfilter to use.

This should be one of *ADOBE_PKCS7_DETACHED* or *PADES*. If not specified, the value may be inferred from the signature field's seed value dictionary. Failing that, *ADOBE_PKCS7_DETACHED* is used as the default value.

embed_validation_info: bool = False

Flag indicating whether validation info (OCSP responses and/or CRLs) should be embedded or not. This is necessary to be able to validate signatures long after they have been made. This flag requires *validation_context* to be set.

The precise manner in which the validation info is embedded depends on the (effective) value of *subfilter*:

- With *ADOBE_PKCS7_DETACHED*, the validation information will be embedded inside the CMS object containing the signature.
- With *PADES*, the validation information will be embedded into the document security store (DSS).

use_pades_lta: bool = False

If `True`, the signer will append an additional document timestamp after writing the signature's validation information to the document security store (DSS). This flag is only meaningful if *subfilter* is *PADES*.

The PAdES B-LTA profile solves the long-term validation problem by adding a timestamp chain to the document after the regular signatures, which is updated with new timestamps at regular intervals. This provides an audit trail that ensures the long-term integrity of the validation information in the DSS, since OCSP responses and CRLs also have a finite lifetime.

See also *PdfTimeStamper.update_archival_timestamp_chain()*.

timestamp_field_name: Optional[str] = None

Name of the timestamp field created when *use_pades_lta* is `True`. If not specified, a unique name will be generated using `uuid`.

validation_context: Optional[*ValidationContext*] = None

The validation context to use when validating signatures. If provided, the signer's certificate and any timestamp certificates will be validated before signing.

This parameter is mandatory when *embed_validation_info* is `True`.

docmdp_permissions: *MDPPerm* **= 2**

Indicates the document modification policy that will be in force after this signature is created. Only relevant for certification signatures or signatures that apply locking.

> **Warning:** For non-certification signatures, this is only explicitly allowed since PDF 2.0 (ISO 32000-2), so older software may not respect this setting on approval signatures.

signer_key_usage: Set[str]

Key usage extensions required for the signer's certificate. Defaults to `non_repudiation` only, but sometimes `digital_signature` or a combination of both may be more appropriate. See `x509.KeyUsage` for a complete list.

Only relevant if a validation context is also provided.

cades_signed_attr_spec: Optional[*CAdESSignedAttrSpec*] = None

New in version 0.5.0.

Specification for CAdES-specific attributes.

dss_settings: *DSSContentSettings* **= DSSContentSettings(include_vri=True, skip_if_unneeded=True, placement=<SigDSSPlacementPreference.TOGETHER_WITH_NEXT_TS: 3>, next_ts_settings=None)**

New in version 0.8.0.

DSS output settings. See *DSSContentSettings*.

tight_size_estimates: bool = False

New in version 0.8.0.

When estimating the size of a signature container, do not add safety margins.

> **Note:** This should be OK if the entire CMS object is produced by pyHanko, and the signing scheme produces signatures of a fixed size. However, if the signature container includes unsigned attributes such as signature timestamps, the size of the signature is never entirely predictable.

ac_validation_context: Optional[*ValidationContext*] = None

New in version 0.11.0.

Validation context for attribute certificates

class pyhanko.sign.signers.pdf_signer.**DSSContentSettings**(*include_vri: bool = True*, *skip_if_unneeded: bool = True*, *placement:* SigDSSPlacementPreference *= SigDSSPlacementPreference.TOGETHER_WITH_NEXT_TS*, *next_ts_settings: Optional[*TimestampDSSContentSettings*] = None*)

Bases: *GeneralDSSContentSettings*

New in version 0.8.0.

Settings for a DSS update with validation information for a signature.

placement: *SigDSSPlacementPreference* **= 3**

Preference for where to perform a DSS update with validation information for a specific signature. See *SigDSSPlacementPreference*.

The default is *SigDSSPlacementPreference.TOGETHER_WITH_NEXT_TS*.

next_ts_settings: Optional[*TimestampDSSContentSettings*] = None

Explicit settings for DSS updates pertaining to a document timestamp added as part of the same signing workflow, if applicable.

If `None`, a default will be generated based on the values of this settings object.

Note: When consuming *DSSContentSettings* objects, you should call *get_settings_for_ts()* instead of relying on the value of this field.

get_settings_for_ts() → *TimestampDSSContentSettings*

Retrieve DSS update settings for document timestamps that are part of our signing workflow, if there are any.

assert_viable()

Check settings for consistency, and raise *SigningError* otherwise.

class pyhanko.sign.signers.pdf_signer.**TimestampDSSContentSettings**(*include_vri: bool = True*, *skip_if_unneeded: bool = True*, *update_before_ts: bool = False*)

Bases: *GeneralDSSContentSettings*

New in version 0.8.0.

Settings for a DSS update with validation information for a document timestamp.

Note: In most workflows, adding a document timestamp doesn't trigger any DSS updates beyond VRI additions, because the same TSA is used for signature timestamps and for document timestamps.

update_before_ts: bool = False

Perform DSS update before creating the timestamp, instead of after.

Warning: This setting can only be used if `include_vri` is `False`.

assert_viable()

Check settings for consistency, and raise *SigningError* otherwise.

class pyhanko.sign.signers.pdf_signer.**GeneralDSSContentSettings**(*include_vri: bool = True*, *skip_if_unneeded: bool = True*)

Bases: `object`

New in version 0.8.0.

Settings that govern DSS creation and updating in general.

`include_vri: bool = True`

Flag to control whether to create and update entries in the VRI dictionary. The default is to always update the VRI dictionary.

Note: The VRI dictionary is a relic of the past that is effectively deprecated in the current PAdES standards, and most modern validators don't rely on it being there.

That said, there's no real harm in creating these entries, other than that it occasionally forces DSS updates where none would otherwise be necessary, and that it prevents the DSS from being updated prior to signing (as opposed to after signing).

`skip_if_unneeded: bool = True`

Do not perform a write if updating the DSS would not add any new information.

Note: This setting is only used if the DSS update would happen in its own revision.

`class pyhanko.sign.signers.pdf_signer.SigDSSPlacementPreference(`*value*`)`

Bases: `Enum`

New in version 0.8.0.

Preference for where to perform a DSS update with validation information for a specific signature.

`TOGETHER_WITH_SIGNATURE = 1`

Update the DSS in the revision that contains the signature. Doing so can be useful to create a PAdES-B-LT signature in a single revision. Such signatures can be processed by a validator that isn't capable of incremental update analysis.

Warning: This setting can only be used if `include_vri` is `False`.

`SEPARATE_REVISION = 2`

Always perform the DSS update in a separate revision, after the signature, but before any timestamps are added.

Note: This is the old default behaviour.

`TOGETHER_WITH_NEXT_TS = 3`

If the signing workflow includes a document timestamp after the signature, update the DSS in the same revision as the timestamp. In the absence of document timestamps, this is equivalent to *`SEPARATE_REVISION`*.

Warning: This option controls the addition of validation info for the signature and its associated signature timestamp, not the validation info for the document timestamp itself. See *`DSSContentSettings.next_ts_settings`*.

In most practical situations, the distinction is only relevant in interrupted signing workflows (see *Interrupted signing*), where the lifecycle of the validation context is out of pyHanko's hands.

class pyhanko.sign.signers.pdf_signer.**PdfTimeStamper**(*timestamper:* TimeStamper, *field_name: Optional[str] = None*, *invis_settings:* InvisSigSettings *= InvisSigSettings(set_print_flag=True, set_hidden_flag=False, box_out_of_bounds=False)*, *readable_field_name: str = 'Timestamp'*)

Bases: `object`

Class to encapsulate the process of appending document timestamps to PDF files.

property field_name: str

Retrieve or generate the field name for the signature field to contain the document timestamp.

Returns

The field name, as a (Python) string.

timestamp_pdf(*pdf_out:* IncrementalPdfFileWriter, *md_algorithm*, *validation_context=None*, *bytes_reserved=None*, *validation_paths=None*, *timestamper: Optional[*TimeStamper*] = None*, ***, *in_place=False*, *output=None*, *dss_settings:* TimestampDSSContentSettings *= TimestampDSSContentSettings(include_vri=True, skip_if_unneeded=True, update_before_ts=False)*, *chunk_size=4096*, *tight_size_estimates: bool = False*)

Changed in version 0.9.0: Wrapper around *`async_timestamp_pdf()`*.

Timestamp the contents of `pdf_out`. Note that `pdf_out` should not be written to after this operation.

Parameters

- **pdf_out** – An *`IncrementalPdfFileWriter`*.
- **md_algorithm** – The hash algorithm to use when computing message digests.
- **validation_context** – The *`pyhanko_certvalidator.ValidationContext`* against which the TSA response should be validated. This validation context will also be used to update the DSS.
- **bytes_reserved** – Bytes to reserve for the CMS object in the PDF file. If not specified, make an estimate based on a dummy signature.

  Warning: Since the CMS object is written to the output file as a hexadecimal string, you should request **twice** the (estimated) number of bytes in the DER-encoded version of the CMS object.

- **validation_paths** – If the validation path(s) for the TSA's certificate are already known, you can pass them using this parameter to avoid having to run the validation logic again.
- **timestamper** – Override the default *`TimeStamper`* associated with this *`PdfTimeStamper`*.
- **output** – Write the output to the specified output stream. If `None`, write to a new `BytesIO` object. Default is `None`.
- **in_place** – Sign the original input stream in-place. This parameter overrides `output`.
- **chunk_size** – Size of the internal buffer (in bytes) used to feed data to the message digest function if the input stream does not support `memoryview`.
- **dss_settings** – DSS output settings. See *`TimestampDSSContentSettings`*.

- `tight_size_estimates` – When estimating the size of a document timestamp container, do not add safety margins.

Note: External TSAs cannot be relied upon to always produce the exact same output length, which makes this option risky to use.

Returns
The output stream containing the signed output.

`async async_timestamp_pdf`(*pdf_out:* IncrementalPdfFileWriter, *md_algorithm*, *validation_context=None*, *bytes_reserved=None*, *validation_paths=None*, *timestamper: Optional[*TimeStamper*] = None*, ***, *in_place=False*, *output=None*, *dss_settings:* TimestampDSSContentSettings *= TimestampDSSContentSettings(include_vri=True, skip_if_unneeded=True, update_before_ts=False)*, *chunk_size=4096*, *tight_size_estimates: bool = False*, *embed_roots: bool = True*)

New in version 0.9.0.

Timestamp the contents of `pdf_out`. Note that `pdf_out` should not be written to after this operation.

Parameters

- `pdf_out` – An *`IncrementalPdfFileWriter`*.
- `md_algorithm` – The hash algorithm to use when computing message digests.
- `validation_context` – The *`pyhanko_certvalidator.ValidationContext`* against which the TSA response should be validated. This validation context will also be used to update the DSS.
- `bytes_reserved` – Bytes to reserve for the CMS object in the PDF file. If not specified, make an estimate based on a dummy signature.

Warning: Since the CMS object is written to the output file as a hexadecimal string, you should request **twice** the (estimated) number of bytes in the DER-encoded version of the CMS object.

- `validation_paths` – If the validation path(s) for the TSA's certificate are already known, you can pass them using this parameter to avoid having to run the validation logic again.
- `timestamper` – Override the default *`TimeStamper`* associated with this *`PdfTimeStamper`*.
- `output` – Write the output to the specified output stream. If `None`, write to a new `BytesIO` object. Default is `None`.
- `in_place` – Sign the original input stream in-place. This parameter overrides `output`.
- `chunk_size` – Size of the internal buffer (in bytes) used to feed data to the message digest function if the input stream does not support `memoryview`.
- `dss_settings` – DSS output settings. See *`TimestampDSSContentSettings`*.
- `tight_size_estimates` – When estimating the size of a document timestamp container, do not add safety margins.

Note: External TSAs cannot be relied upon to always produce the exact same output length, which makes this option risky to use.

- `embed_roots` – Option that controls whether the root certificate of each validation path should be embedded into the DSS. The default is `True`.

Note: Trust roots are configured by the validator, so embedding them typically does nothing in a typical validation process. Therefore they can be safely omitted in most cases. Nonetheless, embedding the roots can be useful for documentation purposes.

Returns
The output stream containing the signed output.

`update_archival_timestamp_chain`(*reader:* PdfFileReader, *validation_context*, *in_place=True*, *output=None*, *chunk_size=4096*, *default_md_algorithm='sha256'*)

Changed in version 0.9.0: Wrapper around *`async_update_archival_timestamp_chain()`*.

Validate the last timestamp in the timestamp chain on a PDF file, and write an updated version to an output stream.

Parameters

- `reader` – A `PdfReader` encapsulating the input file.
- `validation_context` – *`pyhanko_certvalidator.ValidationContext`* object to validate the last timestamp.
- `output` – Write the output to the specified output stream. If `None`, write to a new `BytesIO` object. Default is `None`.
- `in_place` – Sign the original input stream in-place. This parameter overrides `output`.
- `chunk_size` – Size of the internal buffer (in bytes) used to feed data to the message digest function if the input stream does not support `memoryview`.
- `default_md_algorithm` – Message digest to use if there are no preceding timestamps in the file.

Returns
The output stream containing the signed output.

`async async_update_archival_timestamp_chain`(*reader:* PdfFileReader, *validation_context*, *in_place=True*, *output=None*, *chunk_size=4096*, *default_md_algorithm='sha256'*, *embed_roots: bool = True*)

New in version 0.9.0.

Validate the last timestamp in the timestamp chain on a PDF file, and write an updated version to an output stream.

Parameters

- `reader` – A `PdfReader` encapsulating the input file.
- `validation_context` – *`pyhanko_certvalidator.ValidationContext`* object to validate the last timestamp.
- `output` – Write the output to the specified output stream. If `None`, write to a new `BytesIO` object. Default is `None`.

- **`in_place`** – Sign the original input stream in-place. This parameter overrides `output`.
- **`chunk_size`** – Size of the internal buffer (in bytes) used to feed data to the message digest function if the input stream does not support `memoryview`.
- **`default_md_algorithm`** – Message digest to use if there are no preceding timestamps in the file.
- **`embed_roots`** – Option that controls whether the root certificate of each validation path should be embedded into the DSS. The default is `True`.

  Note: Trust roots are configured by the validator, so embedding them typically does nothing in a typical validation process. Therefore they can be safely omitted in most cases. Nonetheless, embedding the roots can be useful for documentation purposes.

Returns

The output stream containing the signed output.

`class pyhanko.sign.signers.pdf_signer.`**`PdfSigner`**(*signature_meta:* PdfSignatureMetadata, *signer:* Signer, *, *timestamper: Optional[*TimeStamper*] = None*, *stamp_style: Optional[*BaseStampStyle*] = None*, *new_field_spec: Optional[*SigFieldSpec*] = None*)

Bases: `object`

Class to handle PDF signatures in general.

Parameters

- **`signature_meta`** – The specification of the signature to add.
- **`signer`** – *`Signer`* object to use to produce the signature object.
- **`timestamper`** – *`TimeStamper`* object to use to produce any time stamp tokens that might be required.
- **`stamp_style`** – Stamp style specification to determine the visible style of the signature, typically an object of type *`TextStampStyle`* or *`QRStampStyle`*. Defaults to `constants.DEFAULT_SIGNING_STAMP_STYLE`.
- **`new_field_spec`** – If a new field is to be created, this parameter allows the caller to specify the field's properties in the form of a *`SigFieldSpec`*. This parameter is only meaningful if `existing_fields_only` is `False`.

`property` **`default_md_for_signer: Optional[str]`**

Name of the default message digest algorithm for this signer, if there is one. This method will try the *`md_algorithm`* attribute on the signer's `signature_meta`, or try to retrieve the digest algorithm associated with the underlying *`Signer`*.

Returns

The name of the message digest algorithm, or `None`.

`register_extensions`(*pdf_out:* BasePdfFileWriter, *, *md_algorithm: str*)

`init_signing_session`(*pdf_out:* BasePdfFileWriter, *existing_fields_only=False*) → *PdfSigningSession*

Initialise a signing session with this *`PdfSigner`* for a specified PDF file writer.

This step in the signing process handles all field-level operations prior to signing: it creates the target form field if necessary, and makes sure the seed value dictionary gets processed.

See also *`digest_doc_for_signing()`* and *`sign_pdf()`*.

Parameters

- **pdf_out** – The writer containing the PDF file to be signed.
- **existing_fields_only** – If `True`, never create a new empty signature field to contain the signature. If `False`, a new field may be created if no field matching *field_name* exists.

Returns

A *PdfSigningSession* object modelling the signing session in its post-setup stage.

digest_doc_for_signing(*pdf_out: BasePdfFileWriter*, *existing_fields_only=False*, *bytes_reserved=None*, ***, *appearance_text_params=None*, *in_place=False*, *output=None*, *chunk_size=4096*) → Tuple[*PreparedByteRangeDigest*, *PdfTBSDocument*, IO]

Deprecated since version 0.9.0: Use *async_digest_doc_for_signing()* instead.

Set up all stages of the signing process up to and including the point where the signature placeholder is allocated, and the document's `/ByteRange` digest is computed.

See *sign_pdf()* for a less granular, more high-level approach.

Note: This method is useful in remote signing scenarios, where you might want to free up resources while waiting for the remote signer to respond. The *PreparedByteRangeDigest* object returned allows you to keep track of the required state to fill the signature container at some later point in time.

Parameters

- **pdf_out** – A PDF file writer (usually an *IncrementalPdfFileWriter*) containing the data to sign.
- **existing_fields_only** – If `True`, never create a new empty signature field to contain the signature. If `False`, a new field may be created if no field matching *field_name* exists.
- **bytes_reserved** – Bytes to reserve for the CMS object in the PDF file. If not specified, make an estimate based on a dummy signature.

  Warning: Since the CMS object is written to the output file as a hexadecimal string, you should request **twice** the (estimated) number of bytes in the DER-encoded version of the CMS object.

- **appearance_text_params** – Dictionary with text parameters that will be passed to the signature appearance constructor (if applicable).
- **output** – Write the output to the specified output stream. If `None`, write to a new `BytesIO` object. Default is `None`.
- **in_place** – Sign the original input stream in-place. This parameter overrides `output`.
- **chunk_size** – Size of the internal buffer (in bytes) used to feed data to the message digest function if the input stream does not support `memoryview`.

Returns

A tuple containing a *PreparedByteRangeDigest* object, a *PdfTBSDocument* object and an output handle to which the document in its current state has been written.

async async_digest_doc_for_signing(*pdf_out: BasePdfFileWriter*, *existing_fields_only=False*, *bytes_reserved=None*, ***, *appearance_text_params=None*, *in_place=False*, *output=None*, *chunk_size=4096*) → Tuple[*PreparedByteRangeDigest*, *PdfTBSDocument*, IO]

New in version 0.9.0.

Set up all stages of the signing process up to and including the point where the signature placeholder is allocated, and the document's `/ByteRange` digest is computed.

See `sign_pdf()` for a less granular, more high-level approach.

Note: This method is useful in remote signing scenarios, where you might want to free up resources while waiting for the remote signer to respond. The `PreparedByteRangeDigest` object returned allows you to keep track of the required state to fill the signature container at some later point in time.

Parameters

- **`pdf_out`** – A PDF file writer (usually an `IncrementalPdfFileWriter`) containing the data to sign.
- **`existing_fields_only`** – If `True`, never create a new empty signature field to contain the signature. If `False`, a new field may be created if no field matching `field_name` exists.
- **`bytes_reserved`** – Bytes to reserve for the CMS object in the PDF file. If not specified, make an estimate based on a dummy signature.

  Warning: Since the CMS object is written to the output file as a hexadecimal string, you should request **twice** the (estimated) number of bytes in the DER-encoded version of the CMS object.

- **`appearance_text_params`** – Dictionary with text parameters that will be passed to the signature appearance constructor (if applicable).
- **`output`** – Write the output to the specified output stream. If `None`, write to a new `BytesIO` object. Default is `None`.
- **`in_place`** – Sign the original input stream in-place. This parameter overrides `output`.
- **`chunk_size`** – Size of the internal buffer (in bytes) used to feed data to the message digest function if the input stream does not support `memoryview`.

Returns

A tuple containing a `PreparedByteRangeDigest` object, a `PdfTBSDocument` object and an output handle to which the document in its current state has been written.

`sign_pdf`(*pdf_out:* BasePdfFileWriter, *existing_fields_only=False*, *bytes_reserved=None*, ***, *appearance_text_params=None*, *in_place=False*, *output=None*, *chunk_size=4096*)

Changed in version 0.9.0: Wrapper around `async_sign_pdf()`.

Sign a PDF file using the provided output writer.

Parameters

- **`pdf_out`** – A PDF file writer (usually an `IncrementalPdfFileWriter`) containing the data to sign.
- **`existing_fields_only`** – If `True`, never create a new empty signature field to contain the signature. If `False`, a new field may be created if no field matching `field_name` exists.
- **`bytes_reserved`** – Bytes to reserve for the CMS object in the PDF file. If not specified, make an estimate based on a dummy signature.

- **appearance_text_params** – Dictionary with text parameters that will be passed to the signature appearance constructor (if applicable).
- **output** – Write the output to the specified output stream. If `None`, write to a new `BytesIO` object. Default is `None`.
- **in_place** – Sign the original input stream in-place. This parameter overrides `output`.
- **chunk_size** – Size of the internal buffer (in bytes) used to feed data to the message digest function if the input stream does not support `memoryview`.

Returns
The output stream containing the signed data.

`async async_sign_pdf`(*pdf_out:* BasePdfFileWriter, *existing_fields_only=False*, *bytes_reserved=None*, ***, *appearance_text_params=None*, *in_place=False*, *output=None*, *chunk_size=4096*)

New in version 0.9.0.

Sign a PDF file using the provided output writer.

Parameters

- **pdf_out** – A PDF file writer (usually an *IncrementalPdfFileWriter*) containing the data to sign.
- **existing_fields_only** – If `True`, never create a new empty signature field to contain the signature. If `False`, a new field may be created if no field matching *field_name* exists.
- **bytes_reserved** – Bytes to reserve for the CMS object in the PDF file. If not specified, make an estimate based on a dummy signature.
- **appearance_text_params** – Dictionary with text parameters that will be passed to the signature appearance constructor (if applicable).
- **output** – Write the output to the specified output stream. If `None`, write to a new `BytesIO` object. Default is `None`.
- **in_place** – Sign the original input stream in-place. This parameter overrides `output`.
- **chunk_size** – Size of the internal buffer (in bytes) used to feed data to the message digest function if the input stream does not support `memoryview`.

Returns
The output stream containing the signed data.

`class pyhanko.sign.signers.pdf_signer.PdfSigningSession`(*pdf_signer:* PdfSigner, *pdf_out:* BasePdfFileWriter, *cms_writer*, *sig_field*, *md_algorithm: str*, *timestamper: Optional[*TimeStamper*]*, *subfilter:* SigSeedSubFilter, *system_time: Optional[datetime] = None*, *sv_spec: Optional[*SigSeedValueSpec*] = None*)

Bases: `object`

New in version 0.7.0.

Class modelling a PDF signing session in its initial state.

The `__init__` method is internal API, get an instance using *PdfSigner.init_signing_session()*.

async perform_presign_validation(*pdf_out: Optional[*BasePdfFileWriter*] = None*) → Optional[*PreSignValidationStatus*]

Perform certificate validation checks for the signer's certificate, including any necessary revocation checks.

This function will also attempt to validate & collect revocation information for the relevant TSA (by requesting a dummy timestamp).

Parameters
pdf_out – Current PDF writer. Technically optional; only used to look for the end of the timestamp chain in the previous revision when producing a PAdES-LTA signature in a document that is already signed (to ensure that the timestamp chain is uninterrupted).

Returns
A *PreSignValidationStatus* object, or None if there is no validation context available.

async estimate_signature_container_size(*validation_info: Optional[*PreSignValidationStatus*]*, *tight=False*)

prepare_tbs_document(*validation_info: Optional[*PreSignValidationStatus*]*, *bytes_reserved*, *appearance_text_params=None*) → *PdfTBSDocument*

Set up the signature appearance (if necessary) and signature dictionary in the PDF file, to put the document in its final pre-signing state.

Parameters

- **validation_info** – Validation information collected prior to signing.
- **bytes_reserved** – Bytes to reserve for the signature container.
- **appearance_text_params** – Optional text parameters for the signature appearance content.

Returns
A *PdfTBSDocument* describing the document in its final pre-signing state.

class pyhanko.sign.signers.pdf_signer.**PdfTBSDocument**(*cms_writer*, *signer:* Signer, *md_algorithm: str*, *use_pades: bool*, *timestamper: Optional[*TimeStamper*] = None*, *post_sign_instructions: Optional[*PostSignInstructions*] = None*, *validation_context: Optional[*ValidationContext*] = None*)

Bases: object

New in version 0.7.0.

A PDF document in its final pre-signing state.

The `__init__` method is internal API, get an instance using *PdfSigningSession.prepare_tbs_document()*. Alternatively, use *resume_signing()* or *finish_signing()* to continue a previously interrupted signing process without instantiating a new *PdfTBSDocument* object.

digest_tbs_document(**, output: Optional[IO] = None*, *in_place: bool = False*, *chunk_size=4096*) → Tuple[*PreparedByteRangeDigest*, IO]

Write the document to an output stream and compute the digest, while keeping track of the (future) location of the signature contents in the output stream.

The digest can then be passed to the next part of the signing pipeline.

> **Warning:** This method can only be called once.

Parameters

- **`output`** – Write the output to the specified output stream. If `None`, write to a new `BytesIO` object. Default is `None`.
- **`in_place`** – Sign the original input stream in-place. This parameter overrides `output`.
- **`chunk_size`** – Size of the internal buffer (in bytes) used to feed data to the message digest function if the input stream does not support `memoryview`.

Returns

A tuple containing a *`PreparedByteRangeDigest`* and the output stream to which the output was written.

`async perform_signature`(*document_digest: bytes*, *pdf_cms_signed_attrs:* PdfCMSSignedAttributes) → *PdfPostSignatureDocument*

Perform the relevant cryptographic signing operations on the document digest, and write the resulting CMS object to the appropriate location in the output stream.

> **Warning:** This method can only be called once, and must be invoked after *`digest_tbs_document()`*.

Parameters

- **`document_digest`** – Digest of the document, as computed over the relevant `/ByteRange`.
- **`pdf_cms_signed_attrs`** – Description of the signed attributes to include.

Returns

A *`PdfPostSignatureDocument`* object.

`classmethod resume_signing`(*output: IO*, *prepared_digest:* PreparedByteRangeDigest, *signature_cms: Union[bytes, ContentInfo]*, *post_sign_instr: Optional[*PostSignInstructions*] = None*, *validation_context: Optional[*ValidationContext*] = None*) → *PdfPostSignatureDocument*

Resume signing after obtaining a CMS object from an external source.

This is a class method; it doesn't require a *`PdfTBSDocument`* instance. Contrast with *`perform_signature()`*.

Parameters

- **`output`** – Output stream housing the document in its final pre-signing state. This stream must at least be writable and seekable, and also readable if post-signature processing is required.
- **`prepared_digest`** – The prepared digest returned by a prior call to *`digest_tbs_document()`*.
- **`signature_cms`** – CMS object to embed in the signature dictionary.
- **`post_sign_instr`** – Instructions for post-signing processing (DSS updates and document timestamps).

- **validation_context** – Validation context to use in post-signing operations. This is mainly intended for TSA certificate validation, but it can also contain additional validation data to embed in the DSS.

Returns
A *PdfPostSignatureDocument*.

`classmethod finish_signing`(*output: IO*, *prepared_digest:* PreparedByteRangeDigest, *signature_cms: Union[bytes, ContentInfo]*, *post_sign_instr: Optional[*PostSignInstructions*] = None*, *validation_context: Optional[*ValidationContext*] = None*, *chunk_size=4096*)

Finish signing after obtaining a CMS object from an external source, and perform any required post-signature processing.

This is a class method; it doesn't require a *PdfTBSDocument* instance. Contrast with *perform_signature()*.

Parameters

- **output** – Output stream housing the document in its final pre-signing state.
- **prepared_digest** – The prepared digest returned by a prior call to *digest_tbs_document()*.
- **signature_cms** – CMS object to embed in the signature dictionary.
- **post_sign_instr** – Instructions for post-signing processing (DSS updates and document timestamps).
- **validation_context** – Validation context to use in post-signing operations. This is mainly intended for TSA certificate validation, but it can also contain additional validation data to embed in the DSS.
- **chunk_size** – Size of the internal buffer (in bytes) used to feed data to the message digest function if the input stream does not support `memoryview`.

`async classmethod async_finish_signing`(*output: IO*, *prepared_digest:* PreparedByteRangeDigest, *signature_cms: Union[bytes, ContentInfo]*, *post_sign_instr: Optional[*PostSignInstructions*] = None*, *validation_context: Optional[*ValidationContext*] = None*, *chunk_size=4096*)

Finish signing after obtaining a CMS object from an external source, and perform any required post-signature processing.

This is a class method; it doesn't require a *PdfTBSDocument* instance. Contrast with *perform_signature()*.

Parameters

- **output** – Output stream housing the document in its final pre-signing state.
- **prepared_digest** – The prepared digest returned by a prior call to *digest_tbs_document()*.
- **signature_cms** – CMS object to embed in the signature dictionary.
- **post_sign_instr** – Instructions for post-signing processing (DSS updates and document timestamps).
- **validation_context** – Validation context to use in post-signing operations. This is mainly intended for TSA certificate validation, but it can also contain additional validation data to embed in the DSS.

- **chunk_size** – Size of the internal buffer (in bytes) used to feed data to the message digest function if the input stream does not support `memoryview`.

class `pyhanko.sign.signers.pdf_signer.`**`PdfPostSignatureDocument`**(*sig_contents: bytes*, *post_sign_instr: Optional[PostSignInstructions] = None*, *validation_context: Optional[ValidationContext] = None*)

Bases: `object`

New in version 0.7.0.

Represents the final phase of the PDF signing process

async **`post_signature_processing`**(*output: IO*, *chunk_size=4096*)

Handle DSS updates and LTA timestamps, if applicable.

Parameters

- **output** – I/O buffer containing the signed document. Must support reading, writing and seeking.
- **chunk_size** – Chunk size to use for I/O operations that do not support the buffer protocol.

class `pyhanko.sign.signers.pdf_signer.`**`PreSignValidationStatus`**(*signer_path: ~pyhanko_certvalidator.path.ValidationPath, validation_paths: ~typing.List[~pyhanko_certvalidator.path.ValidationPath], ts_validation_paths: ~typing.Optional[~typing.List[~pyhanko_certvalidator.pat = None, adobe_revinfo_attr: ~typing.Optional[~asn1crypto.pdf.RevocationInfoArchival = None, ocsps_to_embed: ~typing.List[~asn1crypto.ocsp.OCSPResponse] = <factory>, crls_to_embed: ~typing.List[~asn1crypto.crl.CertificateList] = <factory>, ac_validation_paths: ~typing.List[~pyhanko_certvalidator.path.ValidationPath] = <factory>*)

Bases: `object`

New in version 0.7.0.

Container for validation data collected prior to creating a signature, e.g. for later inclusion in a document's DSS, or as a signed attribute on the signature.

`signer_path:` *`ValidationPath`*

Validation path for the signer's certificate.

`validation_paths:` `List[`*`ValidationPath`*`]`

List of other relevant validation paths.

`ts_validation_paths:` `Optional[List[`*`ValidationPath`*`]] = None`

List of validation paths relevant for embedded timestamps.

`adobe_revinfo_attr:` `Optional[RevocationInfoArchival] = None`

Preformatted revocation info attribute to include, if requested by the settings.

ocsps_to_embed: List[OCSPResponse]

List of OCSP responses collected so far.

crls_to_embed: List[CertificateList]

List of CRLS collected so far.

ac_validation_paths: List[*ValidationPath*]

List of validation paths relevant for embedded attribute certificates.

class pyhanko.sign.signers.pdf_signer.**PostSignInstructions**(*validation_info: ~pyhanko.sign.signers.pdf_signer.PreSignValidationStatus, timestamper: ~typing.Optional[~pyhanko.sign.timestamps.api.TimeStamper = None, timestamp_md_algorithm: ~typing.Optional[str] = None, timestamp_field_name: ~typing.Optional[str] = None, dss_settings: ~pyhanko.sign.signers.pdf_signer.DSSContentSettings = DSSContentSettings(include_vri=True, skip_if_unneeded=True, placement=<SigDSSPlacementPreference.TOGETHER_WITH 3>, next_ts_settings=None), tight_size_estimates: bool = False, embed_roots: bool = True, file_credential: ~typing.Optional[~pyhanko.pdf_utils.crypt.cred_ser.Serialised = None*)

Bases: object

New in version 0.7.0.

Container class housing instructions for incremental updates to the document after the signature has been put in place. Necessary for PAdES-LT and PAdES-LTA workflows.

validation_info: *PreSignValidationStatus*

Validation information to embed in the DSS (if not already present).

timestamper: Optional[*TimeStamper*] = None

Timestamper to use for produce document timestamps. If None, no timestamp will be added.

timestamp_md_algorithm: Optional[str] = None

Digest algorithm to use when producing timestamps. Defaults to *DEFAULT_MD*.

timestamp_field_name: Optional[str] = None

Name of the timestamp field to use. If not specified, a field name will be generated.

dss_settings: *DSSContentSettings* = DSSContentSettings(include_vri=True, skip_if_unneeded=True, placement=<SigDSSPlacementPreference.TOGETHER_WITH_NEXT_TS: 3>, next_ts_settings=None)

New in version 0.8.0.

Settings to fine-tune DSS generation.

tight_size_estimates: bool = False

New in version 0.8.0.

When estimating the size of a document timestamp container, do not add safety margins.

Note: External TSAs cannot be relied upon to always produce the exact same output length, which makes this option risky to use.

`embed_roots: bool = True`

New in version 0.9.0.

Option that controls whether the root certificate of each validation path should be embedded into the DSS. The default is `True`.

Note: Trust roots are configured by the validator, so embedding them typically does nothing in a typical validation process. Therefore they can be safely omitted in most cases. Nonetheless, embedding the roots can be useful for documentation purposes.

Note: This setting is not part of *`DSSContentSettings`* because its value is taken from the corresponding property on the *`Signer`* involved, not from the initial configuration.

`file_credential: Optional[SerialisedCredential] = None`

New in version 0.13.0.

Serialised file credential, to update encrypted files.

pyhanko.sign.timestamps package

Submodules

pyhanko.sign.timestamps.aiohttp_client module

`class pyhanko.sign.timestamps.aiohttp_client.AIOHttpTimeStamper`(*url*, *session: Union[ClientSession, LazySession]*, *https=False*, *timeout=5*, *headers=None*, *auth: Optional[BasicAuth] = None*)

Bases: *`TimeStamper`*

`async async_request_headers()` → dict

Format the HTTP request headers. Subclasses can override this to perform their own header generation logic.

Returns

Header dictionary.

`async get_session()` → ClientSession

`async async_timestamp`(*message_digest*, *md_algorithm*) → ContentInfo

Request a timestamp for the given message digest.

Parameters

- `message_digest` – Message digest to which the timestamp will apply.

- **`md_algorithm`** – Message digest algorithm to use.

Note: As per **RFC 8933**, `md_algorithm` should also be the algorithm used to compute `message_digest`.

Returns
A timestamp token, encoded as an `asn1crypto.cms.ContentInfo` object.

Raises

- **`IOError`** – Raised in case of an I/O issue in the communication with the timestamping server.
- ***`TimestampRequestError`*** – Raised if the timestamp server did not return a success response, or if the server's response is invalid.

`async` **`async_request_tsa_response`**(*req: TimeStampReq*) → TimeStampResp

Submit the specified timestamp request to the server.

Parameters
`req` – Request body to submit.

Returns
A timestamp response from the server.

Raises
`IOError` – Raised in case of an I/O issue in the communication with the timestamping server.

pyhanko.sign.timestamps.api module

Module to handle the timestamping functionality in pyHanko.

Many PDF signature profiles require trusted timestamp tokens. The tools in this module allow pyHanko to obtain such tokens from **RFC 3161**-compliant time stamping authorities.

`class pyhanko.sign.timestamps.api.`**`TimeStamper`**(*include_nonce=True*)

Bases: `object`

Changed in version 0.9.0: Made API more asyncio-friendly _(breaking change)_

Class to make **RFC 3161** timestamp requests.

`request_cms`(*message_digest*, *md_algorithm*)

Format the body of an **RFC 3161** request as a CMS object. Subclasses with more specific needs may want to override this.

Parameters

- **`message_digest`** – Message digest to which the timestamp will apply.
- **`md_algorithm`** – Message digest algorithm to use.

Note: As per **RFC 8933**, `md_algorithm` should also be the algorithm used to compute `message_digest`.

Returns
An `asn1crypto.tsp.TimeStampReq` object.

async validation_paths(*validation_context*)

Produce validation paths for the certificates gathered by this *TimeStamper*.

This is internal API.

Parameters
`validation_context` – The validation context to apply.

Returns
An asynchronous generator of validation paths.

async async_dummy_response(*md_algorithm*) → ContentInfo

Return a dummy response for use in CMS object size estimation.

For every new `md_algorithm` passed in, this method will call the `timestamp()` method exactly once, with a dummy digest. The resulting object will be cached and reused for future invocations of `dummy_response()` with the same `md_algorithm` value.

Parameters
`md_algorithm` – Message digest algorithm to use.

Returns
A timestamp token, encoded as an `asn1crypto.cms.ContentInfo` object.

async async_request_tsa_response(*req: TimeStampReq*) → TimeStampResp

Submit the specified timestamp request to the server.

Parameters
`req` – Request body to submit.

Returns
A timestamp response from the server.

Raises
`IOError` – Raised in case of an I/O issue in the communication with the timestamping server.

async async_timestamp(*message_digest*, *md_algorithm*) → ContentInfo

Request a timestamp for the given message digest.

Parameters

- `message_digest` – Message digest to which the timestamp will apply.
- `md_algorithm` – Message digest algorithm to use.

Note: As per **RFC 8933**, `md_algorithm` should also be the algorithm used to compute `message_digest`.

Returns
A timestamp token, encoded as an `asn1crypto.cms.ContentInfo` object.

Raises

- `IOError` – Raised in case of an I/O issue in the communication with the timestamping server.
- *TimestampRequestError* – Raised if the timestamp server did not return a success response, or if the server's response is invalid.

pyhanko.sign.timestamps.common_utils module

exception `pyhanko.sign.timestamps.common_utils.`**`TimestampRequestError`**

Bases: `OSError`

Raised when an error occurs while requesting a timestamp.

`pyhanko.sign.timestamps.common_utils.`**`get_nonce`**`()`

`pyhanko.sign.timestamps.common_utils.`**`extract_ts_certs`**`(`*ts_token*, *store:* CertificateStore`)`

`pyhanko.sign.timestamps.common_utils.`**`dummy_digest`**`(`*md_algorithm: str*`)` → bytes

`pyhanko.sign.timestamps.common_utils.`**`handle_tsp_response`**`(`*response: TimeStampResp*, *nonce: Optional[bytes]*`)` → ContentInfo

`pyhanko.sign.timestamps.common_utils.`**`set_tsp_headers`**`(`*headers: dict*`)`

pyhanko.sign.timestamps.dummy_client module

class `pyhanko.sign.timestamps.dummy_client.`**`DummyTimeStamper`**`(`*tsa_cert: Certificate*, *tsa_key: PrivateKeyInfo*, *certs_to_embed: Optional[*CertificateStore*] = None*, *fixed_dt: Optional[datetime] = None*, *include_nonce=True*, *override_md=None*`)`

Bases: *`TimeStamper`*

Timestamper that acts as its own TSA. It accepts all requests and signs them using the certificate provided. Used for testing purposes.

`request_tsa_response``(`*req: TimeStampReq*`)` → TimeStampResp

async **`async_request_tsa_response`**`(`*req: TimeStampReq*`)` → TimeStampResp

Submit the specified timestamp request to the server.

Parameters
`req` – Request body to submit.

Returns
A timestamp response from the server.

Raises
`IOError` – Raised in case of an I/O issue in the communication with the timestamping server.

pyhanko.sign.timestamps.requests_client module

class `pyhanko.sign.timestamps.requests_client.`**`HTTPTimeStamper`**`(`*url*, *https=False*, *timeout=5*, *auth=None*, *headers=None*`)`

Bases: *`TimeStamper`*

Standard HTTP-based timestamp client.

request_headers() → dict

Format the HTTP request headers.

Returns
Header dictionary.

async **async_request_tsa_response**(*req: TimeStampReq*) → TimeStampResp

Submit the specified timestamp request to the server.

Parameters
req – Request body to submit.

Returns
A timestamp response from the server.

Raises
IOError – Raised in case of an I/O issue in the communication with the timestamping server.

pyhanko.sign.validation package

Submodules

pyhanko.sign.validation.ades module

This module contains a number of functions to handle AdES signature validation.

Danger: This API is incubating, and not all features of the spec have been fully implemented at this stage. There will be bugs, and API changes may still occur.

async pyhanko.sign.validation.ades.**ades_basic_validation**(*signed_data: SignedData, validation_spec: SignatureValidationSpec, *, status_cls: Type[StatusType], timing_info: Optional[ValidationTimingInfo] = None, raw_digest: Optional[bytes] = None, validation_data_handlers: Optional[ValidationDataHandlers] = None, signature_not_before_time: Optional[datetime] = None, extra_status_kwargs: Optional[Dict[str, Any]] = None*) → *AdESBasicValidationResult*

async pyhanko.sign.validation.ades.**ades_basic_validation**(*signed_data: SignedData, validation_spec: SignatureValidationSpec, *, timing_info: Optional[ValidationTimingInfo] = None, raw_digest: Optional[bytes] = None, validation_data_handlers: Optional[ValidationDataHandlers] = None, signature_not_before_time: Optional[datetime] = None, extra_status_kwargs: Optional[Dict[str, Any]] = None*) → *AdESBasicValidationResult*

Validate a CMS signature according to ETSI EN 319 102-1 § 5.3.

Parameters

- **`signed_data`** – The `SignedData` value.
- **`validation_spec`** – Validation settings to apply.
- **`raw_digest`** – The expected message digest attribute value.
- **`timing_info`** – Data object describing the timing of the validation. Defaults to *`ValidationTimingInfo.now()`*.
- **`validation_data_handlers`** – Data handlers to manage validation data.
- **`extra_status_kwargs`** – Extra keyword arguments to pass to the signature status object's `__init__` function.
- **`status_cls`** – The class of the resulting status object in pyHanko's internal validation API.
- **`signature_not_before_time`** – Time when the signature was known _not_ to exist.

Returns

A *`AdESBasicValidationResult`*.

`async pyhanko.sign.validation.ades.`**`ades_with_time_validation`**(*signed_data: SignedData, validation_spec: SignatureValidationSpec, *, timing_info: Optional[ValidationTimingInfo] = None, raw_digest: Optional[bytes] = None, validation_data_handlers: Optional[ValidationDataHandlers] = None, signature_not_before_time: Optional[datetime] = None, extra_status_kwargs: Optional[Dict[str, Any]] = None*) → *AdESWithTimeValidationResult*

`async pyhanko.sign.validation.ades.`**`ades_with_time_validation`**(*signed_data: SignedData, validation_spec: SignatureValidationSpec, *, status_cls: Type[StatusType], timing_info: Optional[ValidationTimingInfo] = None, raw_digest: Optional[bytes] = None, validation_data_handlers: Optional[ValidationDataHandlers] = None, signature_not_before_time: Optional[datetime] = None, extra_status_kwargs: Optional[Dict[str, Any]] = None*) → *AdESWithTimeValidationResult*

Validate a CMS signature with time according to ETSI EN 319 102-1 § 5.5.

Parameters

- **`signed_data`** – The `SignedData` value.
- **`validation_spec`** – Validation settings to apply.

- **raw_digest** – The expected message digest attribute value.
- **timing_info** – Data object describing the timing of the validation. Defaults to *ValidationTimingInfo.now()*.
- **validation_data_handlers** – Data handlers to manage validation data.
- **extra_status_kwargs** – Extra keyword arguments to pass to the signature status object's `__init__` function.
- **status_cls** – The class of the resulting status object in pyHanko's internal validation API.
- **signature_not_before_time** – Time when the signature was known _not_ to exist.

Returns

A *AdESBasicValidationResult*.

`async pyhanko.sign.validation.ades.`**`ades_lta_validation`**(*embedded_sig: EmbeddedPdfSignature, pdf_validation_spec: PdfSignatureValidationSpec, timing_info: Optional[ValidationTimingInfo] = None, signature_not_before_time: Optional[datetime] = None*) → *AdESLTAValidationResult*

Validate a PAdES signature providing long-term availability and integrity of validation material. See ETSI EN 319 102-1, § 5.6.3.

For the purposes of PAdES validation, the chain of document time stamps in the document serves as the unique Evidence Record (ER).

Parameters

- **embedded_sig** – The PDF signature to validate.
- **pdf_validation_spec** – PDF signature validation settings.
- **timing_info** – Data object describing the timing of the validation. Defaults to *ValidationTimingInfo.now()*.
- **signature_not_before_time** – Time when the signature was known _not_ to exist.

Returns

A validation result.

`async pyhanko.sign.validation.ades.`**`ades_timestamp_validation`**(*tst_signed_data: SignedData, validation_spec: SignatureValidationSpec, expected_tst_imprint: bytes, *, status_cls: Type[StatusType], timing_info: Optional[ValidationTimingInfo] = None, validation_data_handlers: Optional[ValidationDataHandlers] = None, extra_status_kwargs: Optional[Dict[str, Any]] = None*) → *AdESBasicValidationResult*

async pyhanko.sign.validation.ades.**ades_timestamp_validation**(*tst_signed_data: SignedData*, *validation_spec: SignatureValidationSpec*, *expected_tst_imprint: bytes*, ***, *timing_info: Optional[ValidationTimingInfo] = None*, *validation_data_handlers: Optional[ValidationDataHandlers] = None*, *extra_status_kwargs: Optional[Dict[str, Any]] = None*) → *AdESBasicValidationResult*

Validate a timestamp token according to ETSI EN 319 102-1 § 5.4.

Parameters

- **tst_signed_data** – The `SignedData` value of the timestamp.
- **validation_spec** – Validation settings to apply.
- **expected_tst_imprint** – The expected message imprint in the timestamp token.
- **timing_info** – Data object describing the timing of the validation. Defaults to *ValidationTimingInfo.now()*.
- **validation_data_handlers** – Data handlers to manage validation data.
- **extra_status_kwargs** – Extra keyword arguments to pass to the signature status object's `__init__` function.
- **status_cls** – The class of the resulting status object in pyHanko's internal validation API.

Returns

A *AdESBasicValidationResult*.

class pyhanko.sign.validation.ades.**AdESBasicValidationResult**(*ades_subindic: AdESSubIndic*, *api_status: Optional[StatusType]*, *failure_msg: Optional[str]*)

Bases: `Generic[StatusType]`

Result of validation of basic signatures.

ETSI EN 319 102-1, § 5.3

ades_subindic: *AdESSubIndic*

AdES subindication.

api_status: Optional[StatusType]

A status descriptor object from pyHanko's own validation API. Will be an instance of *SignatureStatus* or a subclass thereof.

failure_msg: Optional[str]

A string describing the reason why validation failed, if applicable.

class pyhanko.sign.validation.ades.**AdESWithTimeValidationResult**(**args*, ***kwds*)

Bases: *AdESBasicValidationResult*

best_signature_time: datetime

signature_not_before_time: Optional[datetime]

`class pyhanko.sign.validation.ades.`**`AdESLTAValidationResult`**`(`*ades_subindic:* AdESSubIndic, *api_status: Optional[StatusType], failure_msg: Optional[str], best_signature_time: datetime, signature_not_before_time: Optional[datetime], oldest_evidence_record_timestamp: Optional[datetime], signature_timestamp_status: Optional[*AdESBasicValidationResult*]*`)`

Bases: *`AdESWithTimeValidationResult`*

Result of a PAdES validation for a signature providing long-term availability and integrity of validation material. See ETSI EN 319 102-1, § 5.6.3.

`oldest_evidence_record_timestamp: Optional[datetime]`

The oldest timestamp in the evidence record, after validation.

Note: For PAdES, this refers to the chain of document timestamp signatures after signing.

`signature_timestamp_status: Optional[`*`AdESBasicValidationResult`*`]`

The validation result for the signature time stamp, if applicable.

pyhanko.sign.validation.dss module

`class pyhanko.sign.validation.dss.`**`VRI`**`(`*certs: set = <factory>, ocsps: set = <factory>, crls: set = <factory>*`)`

Bases: `object`

VRI dictionary as defined in PAdES / ISO 32000-2. These dictionaries collect data that may be relevant for the validation of a specific signature.

Note: The data are stored as PDF indirect objects, not asn1crypto values. In particular, values are tied to a specific PDF handler.

`certs: set`

Relevant certificates.

`ocsps: set`

Relevant OCSP responses.

`crls: set`

Relevant CRLs.

`as_pdf_object``()` → *DictionaryObject*

Returns

A PDF dictionary representing this VRI entry.

`class pyhanko.sign.validation.dss.`**`DocumentSecurityStore`**`(`*writer: Optional[*BasePdfFileWriter*], certs=None, ocsps=None, crls=None, vri_entries=None, backing_pdf_object=None*`)`

Bases: `object`

Representation of a DSS in Python.

`property modified`

`static sig_content_identifier`(*contents*) → *NameObject*

Hash the contents of a signature object to get the corresponding VRI identifier.

This is internal API.

Parameters
`contents` – Signature contents.

Returns
A name object to put into the DSS.

`register_vri`(*identifier*, ***, *certs=()*, *ocsps=()*, *crls=()*)

Register validation information for a set of signing certificates associated with a particular signature.

Parameters

- **`identifier`** – Identifier of the signature object (see *sig_content_identifier*). If `None`, only embed the data into the DSS without associating it with any VRI.
- **`certs`** – Certificates to add.
- **`ocsps`** – OCSP responses to add.
- **`crls`** – CRLs to add.

`as_pdf_object`()

Convert the `DocumentSecurityStore` object to a python dictionary. This method also handles DSS updates.

Returns
A PDF object representing this DSS.

`load_certs`() → Iterable[Certificate]

Return a generator that parses and yields all certificates in the DSS.

Returns
A generator yielding `Certificate` objects.

`as_validation_context`(*validation_context_kwargs*, *include_revinfo=True*) → *ValidationContext*

Construct a validation context from the data in this DSS.

Parameters

- **`validation_context_kwargs`** – Extra kwargs to pass to the `__init__` function.
- **`include_revinfo`** – If `False`, revocation info is skipped.

Returns
A validation context preloaded with information from this DSS.

`classmethod read_dss`(*handler:* PdfHandler) → *DocumentSecurityStore*

Read a DSS record from a file and add the data to a validation context.

Parameters
`handler` – PDF handler from which to read the DSS.

Returns

A DocumentSecurityStore object describing the current state of the DSS.

`classmethod supply_dss_in_writer`(*pdf_out:* BasePdfFileWriter, *sig_contents*, ***, *certs=None*, *ocsps=None*, *crls=None*, *paths=None*, *validation_context=None*, *embed_roots: bool = True*) → *DocumentSecurityStore*

Add or update a DSS, and optionally associate the new information with a VRI entry tied to a signature object.

You can either specify the CMS objects to include directly, or pass them in as output from *pyhanko_certvalidator*.

Parameters

- **`pdf_out`** – PDF writer to write to.
- **`sig_contents`** – Contents of the new signature (used to compute the VRI hash), as a hexadecimal string, including any padding. If `None`, the information will not be added to any VRI dictionary.
- **`certs`** – Certificates to include in the VRI entry.
- **`ocsps`** – OCSP responses to include in the VRI entry.
- **`crls`** – CRLs to include in the VRI entry.
- **`paths`** – Validation paths that have been established, and need to be added to the DSS.
- **`validation_context`** – Validation context from which to draw OCSP responses and CRLs.
- **`embed_roots`** – New in version 0.9.0.

  Option that controls whether the root certificate of each validation path should be embedded into the DSS. The default is `True`.

  Note: Trust roots are configured by the validator, so embedding them typically does nothing in a typical validation process. Therefore they can be safely omitted in most cases. Nonetheless, embedding the roots can be useful for documentation purposes.

  Warning: This only applies to paths, not the `certs` parameter.

Returns

a *`DocumentSecurityStore`* object containing both the new and existing contents of the DSS (if any).

`classmethod add_dss`(*output_stream*, *sig_contents*, ***, *certs=None*, *ocsps=None*, *crls=None*, *paths=None*, *validation_context=None*, *force_write: bool = False*, *embed_roots: bool = True*, *file_credential: Optional[*SerialisedCredential*] = None*)

Wrapper around *`supply_dss_in_writer()`*.

The result is applied to the output stream as an incremental update.

Parameters

- **`output_stream`** – Output stream to write to.

- **sig_contents** – Contents of the new signature (used to compute the VRI hash), as a hexadecimal string, including any padding. If `None`, the information will not be added to any VRI dictionary.
- **certs** – Certificates to include in the VRI entry.
- **ocsps** – OCSP responses to include in the VRI entry.
- **crls** – CRLs to include in the VRI entry.
- **paths** – Validation paths that have been established, and need to be added to the DSS.
- **force_write** – Force a write even if the DSS doesn't have any new content.
- **validation_context** – Validation context from which to draw OCSP responses and CRLs.
- **embed_roots** – New in version 0.9.0.

  Option that controls whether the root certificate of each validation path should be embedded into the DSS. The default is `True`.

  Note: Trust roots are configured by the validator, so embedding them typically does nothing in a typical validation process. Therefore they can be safely omitted in most cases. Nonetheless, embedding the roots can be useful for documentation purposes.

  Warning: This only applies to paths, not the `certs` parameter.

- **file_credential** – New in version 0.13.0.

  Serialised file credential, to update encrypted files.

async pyhanko.sign.validation.dss.**async_add_validation_info**(*embedded_sig: EmbeddedPdfSignature, validation_context: ValidationContext, skip_timestamp=False, add_vri_entry=True, in_place=False, output=None, force_write=False, chunk_size=4096, embed_roots: bool = True*)

Add validation info (CRLs, OCSP responses, extra certificates) for a signature to the DSS of a document in an incremental update. This is a wrapper around *`collect_validation_info()`*.

Parameters

- **embedded_sig** – The signature for which the revocation information needs to be collected.
- **validation_context** – The validation context to use.
- **skip_timestamp** – If `True`, do not attempt to validate the timestamp attached to the signature, if one is present.
- **add_vri_entry** – Add a `/VRI` entry for this signature to the document security store. Default is `True`.
- **output** – Write the output to the specified output stream. If `None`, write to a new `BytesIO` object. Default is `None`.

- **in_place** – Sign the original input stream in-place. This parameter overrides `output`.
- **chunk_size** – Chunk size parameter to use when copying output to a new stream (irrelevant if `in_place` is `True`).
- **force_write** – Force a new revision to be written, even if not necessary (i.e. when all data in the validation context is already present in the DSS).
- **embed_roots** – Option that controls whether the root certificate of each validation path should be embedded into the DSS. The default is `True`.

  Note: Trust roots are configured by the validator, so embedding them typically does nothing in a typical validation process. Therefore they can be safely omitted in most cases. Nonetheless, embedding the roots can be useful for documentation purposes.

Returns
The (file-like) output object to which the result was written.

`async pyhanko.sign.validation.dss.collect_validation_info`(*embedded_sig:* EmbeddedPdfSignature, *validation_context:* ValidationContext, *skip_timestamp=False*)

Query revocation info for a PDF signature using a validation context, and store the results in a validation context.

This works by validating the signer's certificate against the provided validation context, which causes revocation info to be cached for later retrieval.

Warning: This function does *not* actually validate the signature, but merely checks the signer certificate's chain of trust.

Parameters

- **embedded_sig** – Embedded PDF signature to operate on.
- **validation_context** – Validation context to use.
- **skip_timestamp** – If the signature has a time stamp token attached to it, also collect revocation information for the timestamp.

Returns
A list of validation paths.

pyhanko.sign.validation.errors module

`exception pyhanko.sign.validation.errors.SignatureValidationError`(*failure_message*, *ades_subindication: Optional[*AdESSubIndic*] = None*)

Bases: *ValueErrorWithMessage*

Error validating a signature.

`property ades_status: Optional[AdESStatus]`

exception pyhanko.sign.validation.errors.**DisallowedAlgorithmError**(*failure_message*, *permanent: bool*)

Bases: *SignatureValidationError*

exception pyhanko.sign.validation.errors.**ValidationInfoReadingError**(*failure_message*)

Bases: *ValueErrorWithMessage*

Error reading validation info.

exception pyhanko.sign.validation.errors.**NoDSSFoundError**

Bases: *ValidationInfoReadingError*

exception pyhanko.sign.validation.errors.**SigSeedValueValidationError**(*failure_message*, *ades_subindication: Optional[*AdESSubIndic*] = None*)

Bases: *SignatureValidationError*

Error validating a signature's seed value constraints.

exception pyhanko.sign.validation.errors.**CMSAlgorithmProtectionError**(*failure_message*)

Bases: *ValueErrorWithMessage*

Error related to CMS algorithm protection checks.

pyhanko.sign.validation.generic_cms module

pyhanko.sign.validation.generic_cms.**validate_sig_integrity**(*signer_info: SignerInfo*, *cert: Certificate*, *expected_content_type: str*, *actual_digest: bytes*, *algorithm_usage_policy: Optional[*CMSAlgorithmUsagePolicy*] = None*, *time_indic: Optional[datetime] = None*) → Tuple[bool, bool]

Validate the integrity of a signature for a particular signerInfo object inside a CMS signed data container.

Warning: This function does not do any trust checks, and is considered "dangerous" API because it is easy to misuse.

Parameters

- **signer_info** – A cms.SignerInfo object.
- **cert** – The signer's certificate.

  Note: This function will not attempt to extract certificates from the signed data.

- **expected_content_type** – The expected value for the content type attribute (as a Python string, see cms.ContentType).
- **actual_digest** – The actual digest to be matched to the message digest attribute.
- **algorithm_usage_policy** – Algorithm usage policy.

- **time_indic** – Time indication for the production of the signature.

Returns
A tuple of two booleans. The first indicates whether the provided digest matches the value in the signed attributes. The second indicates whether the signature of the digest is valid.

async pyhanko.sign.validation.generic_cms.**async_validate_cms_signature**(*signed_data: SignedData*, *, *status_cls: Type[StatusType]*, *raw_digest: Optional[bytes] = None*, *validation_context: Optional[ValidationContext] = None*, *status_kwargs: Optional[dict] = None*, *key_usage_settings: Optional[KeyUsageConstraints] = None*) → StatusType

async pyhanko.sign.validation.generic_cms.**async_validate_cms_signature**(*signed_data: SignedData*, *, *raw_digest: Optional[bytes] = None*, *validation_context: Optional[ValidationContext] = None*, *status_kwargs: Optional[dict] = None*, *key_usage_settings: Optional[KeyUsageConstraints] = None*) → *SignatureStatus*

Validate a CMS signature (i.e. a `SignedData` object).

Parameters

- **signed_data** – The `asn1crypto.cms.SignedData` object to validate.
- **status_cls** – Status class to use for the validation result.
- **raw_digest** – Raw digest, computed from context.
- **validation_context** – Validation context to validate the signer's certificate.
- **status_kwargs** – Other keyword arguments to pass to the `status_class` when reporting validation results.
- **key_usage_settings** – A *KeyUsageConstraints* object specifying which key usages must or must not be present in the signer's certificate.
- **algorithm_policy** – The algorithm usage policy for the signature validation.

> **Warning:** This is distinct from the algorithm usage policy used for certificate validation, but the latter will be used as a fallback if this parameter is not specified.
>
> It is nonetheless recommended to align both policies unless there is a clear reason to do otherwise.

Returns
A `SignatureStatus` object (or an instance of a proper subclass)

`async pyhanko.sign.validation.generic_cms.`**`collect_timing_info`**`(`*signer_info: SignerInfo, ts_validation_context: Optional[ValidationContext], raw_digest: bytes*`)`

Collect and validate timing information in a `SignerInfo` value. This includes the `signingTime` attribute, content timestamp information and signature timestamp information.

Parameters

- **`signer_info`** – A `SignerInfo` value.
- **`ts_validation_context`** – The timestamp validation context to validate against.
- **`raw_digest`** – The raw external message digest bytes (only relevant for the validation of the content timestamp token, if there is one)

`async pyhanko.sign.validation.generic_cms.`**`validate_tst_signed_data`**`(`*tst_signed_data: SignedData, validation_context: Optional[ValidationContext], expected_tst_imprint: bytes, algorithm_policy: Optional[CMSAlgorithmUsagePolicy] = None*`)`

Validate the `SignedData` of a time stamp token.

Parameters

- **`tst_signed_data`** – The `SignedData` value to validate; must encapsulate a `TSTInfo` value.
- **`validation_context`** – The validation context to validate against.
- **`expected_tst_imprint`** – The expected message imprint value that should be contained in the encapsulated `TSTInfo`.
- **`algorithm_policy`** – The algorithm usage policy for the signature validation.

> **Warning:** This is distinct from the algorithm usage policy used for certificate validation, but the latter will be used as a fallback if this parameter is not specified.
>
> It is nonetheless recommended to align both policies unless there is a clear reason to do otherwise.

Returns
Keyword arguments for a `TimeStampSignatureStatus`.

async pyhanko.sign.validation.generic_cms.**async_validate_detached_cms**(*input_data: Union[bytes, IO, ContentInfo, EncapsulatedContentInfo]*, *signed_data: SignedData*, *signer_validation_context: Optional[ValidationContext] = None*, *ts_validation_context: Optional[ValidationContext] = None*, *ac_validation_context: Optional[ValidationContext] = None*, *key_usage_settings: Optional[KeyUsageConstraints] = None*, *algorithm_policy: Optional[CMSAlgorithmUsagePolicy] = None*, *chunk_size=4096*, *max_read=None*) → *StandardCMSSignatureStatus*

Validate a detached CMS signature.

Parameters

- **input_data** – The input data to sign. This can be either a `bytes` object, a file-like object or a `cms.ContentInfo` / `cms.EncapsulatedContentInfo` object.

  If a CMS content info object is passed in, the *content* field will be extracted.

- **signed_data** – The `cms.SignedData` object containing the signature to verify.
- **signer_validation_context** – Validation context to use to verify the signer certificate's trust.
- **ts_validation_context** – Validation context to use to verify the TSA certificate's trust, if a timestamp token is present. By default, the same validation context as that of the signer is used.
- **ac_validation_context** – Validation context to use to validate attribute certificates. If not supplied, no AC validation will be performed.

  Note: **RFC 5755** requires attribute authority trust roots to be specified explicitly; hence why there's no default.

- **algorithm_policy** – The algorithm usage policy for the signature validation.

  Warning: This is distinct from the algorithm usage policy used for certificate validation, but the latter will be used as a fallback if this parameter is not specified.

It is nonetheless recommended to align both policies unless there is a clear reason to do otherwise.

- **key_usage_settings** – Key usage parameters for the signer.
- **chunk_size** – Chunk size to use when consuming input data.
- **max_read** – Maximal number of bytes to read from the input stream.

Returns
A description of the signature's status.

async pyhanko.sign.validation.generic_cms.**cms_basic_validation**(*signed_data: SignedData, raw_digest: Optional[bytes] = None, validation_context: Optional[*ValidationContext*] = None, status_kwargs: Optional[dict] = None, validation_path: Optional[*ValidationPath*] = None, pkix_validation_params: Optional[*PKIXValidationParams*] = None, algorithm_policy: Optional[*CMSAlgorithmUsagePolicy*] = None, *, key_usage_settings:* KeyUsageConstraints) → Dict[str, Any]

Perform basic validation of CMS and PKCS#7 signatures in isolation (i.e. integrity and trust checks).

Internal API.

pyhanko.sign.validation.generic_cms.**compute_signature_tst_digest**(*signer_info: SignerInfo*) → Optional[bytes]

Compute the digest of the signature according to the message imprint algorithm information in a signature timestamp token.

Internal API.

Parameters
signer_info – A `SignerInfo` value.

Returns
The computed digest, or `None` if there is no signature timestamp.

pyhanko.sign.validation.generic_cms.**extract_tst_data**(*signer_info: SignerInfo, signed: bool = False*) → Optional[SignedData]

Extract signed data associated with a timestamp token.

Internal API.

Parameters

- **signer_info** – A `SignerInfo` value.
- **signed** – If `True`, look for a content timestamp (among the signed attributes), else look for a signature timestamp (among the unsigned attributes).

Returns
The `SignedData` value found, or `None`.

`pyhanko.sign.validation.generic_cms.`**`extract_self_reported_ts`**(*signer_info: SignerInfo*) → Optional[datetime]

Extract self-reported timestamp (from the `signingTime` attribute)

Internal API.

Parameters
`signer_info` – A `SignerInfo` value.

Returns
The value of the `signingTime` attribute as a `datetime`, or `None`.

`pyhanko.sign.validation.generic_cms.`**`extract_certs_for_validation`**(*signed_data: SignedData*) → *SignedDataCerts*

Extract certificates from a CMS signed data object for validation purposes, identifying the signer's certificate in accordance with ETSI EN 319 102-1, 5.2.3.4.

Parameters
`signed_data` – The CMS payload.

Returns
The extracted certificates.

`async` `pyhanko.sign.validation.generic_cms.`**`collect_signer_attr_status`**(*sd_attr_certificates: Iterable[AttributeCertificateV2]*, *signer_cert: Certificate*, *validation_context: Optional[*ValidationContext*]*, *sd_signed_attrs: CMSAttributes*)

`pyhanko.sign.validation.generic_cms.`**`validate_algorithm_protection`**(*attrs: CMSAttributes*, *claimed_digest_algorithm_obj: DigestAlgorithm*, *claimed_signature_algorithm_obj: SignedDigestAlgorithm*)

Internal API to validate the CMS algorithm protection attribute defined in **RFC 6211**, if present.

Parameters

- **`attrs`** – A CMS attribute list.
- **`claimed_digest_algorithm_obj`** – The claimed (i.e. unprotected) digest algorithm value.
- **`claimed_signature_algorithm_obj`** – The claimed (i.e. unprotected) signature algorithm value.

Raises

- **`errors.CMSStructuralError`** – if multiple CMS protection attributes are present
- ***`errors.CMSAlgorithmProtectionError`*** – if a mismatch is detected

pyhanko.sign.validation.ltv module

class pyhanko.sign.validation.ltv.**RevocationInfoValidationType**(*value*)

Bases: Enum

Indicates a validation profile to use when validating revocation info.

ADOBE_STYLE = 'adobe'

Retrieve validation information from the CMS object, using Adobe's revocation info archival attribute.

PADES_LT = 'pades'

Retrieve validation information from the DSS, and require the signature's embedded timestamp to still be valid.

PADES_LTA = 'pades-lta'

Retrieve validation information from the DSS, but read & validate the chain of document timestamps leading up to the signature to establish the integrity of the validation information at the time of signing.

classmethod as_tuple()

pyhanko.sign.validation.ltv.**apply_adobe_revocation_info**(*signer_info: SignerInfo*, *validation_context_kwargs=None*) → *ValidationContext*

Read Adobe-style revocation information from a CMS object, and load it into a validation context.

Parameters

- **signer_info** – Signer info CMS object.
- **validation_context_kwargs** – Extra kwargs to pass to the `__init__` function.

Returns

A validation context preloaded with the relevant revocation information.

pyhanko.sign.validation.ltv.**retrieve_adobe_revocation_info**(*signer_info: SignerInfo*)

Retrieve Adobe-style revocation information from a `SignerInfo` value, if present.

Internal API.

Parameters

signer_info – A `SignerInfo` value.

Returns

A tuple of two (potentially empty) lists, containing OCSP responses and CRLs, respectively.

pyhanko.sign.validation.ltv.**get_timestamp_chain**(*reader:* PdfFileReader) → Iterator[*EmbeddedPdfSignature*]

Get the document timestamp chain of the associated reader, ordered from new to old.

Parameters

reader – A `PdfFileReader`.

Returns

An iterable of `EmbeddedPdfSignature` objects representing document timestamps.

async pyhanko.sign.validation.ltv.**async_validate_pdf_ltv_signature**(*embedded_sig: EmbeddedPdfSignature, validation_type: RevocationInfoValidationType, validation_context_kwargs: Optional[dict] = None, bootstrap_validation_context: Optional[ValidationContext] = None, ac_validation_context_kwargs=None, force_revinfo=False, diff_policy: Optional[DiffPolicy] = None, key_usage_settings: Optional[KeyUsageConstraints] = None, skip_diff: bool = False*) → *PdfSignatureStatus*

New in version 0.9.0.

Validate a PDF LTV signature according to a particular profile.

Parameters

- **embedded_sig** – Embedded signature to evaluate.
- **validation_type** – Validation profile to use.
- **validation_context_kwargs** – Keyword args to instantiate *pyhanko_certvalidator.ValidationContext* objects needed over the course of the validation.
- **ac_validation_context_kwargs** – Keyword arguments for the validation context to use to validate attribute certificates. If not supplied, no AC validation will be performed.

  Note: **RFC 5755** requires attribute authority trust roots to be specified explicitly; hence why there's no default.

- **bootstrap_validation_context** – Validation context used to validate the current timestamp.
- **force_revinfo** – Require all certificates encountered to have some form of live revocation checking provisions.
- **diff_policy** – Policy to evaluate potential incremental updates that were appended to the signed revision of the document. Defaults to DEFAULT_DIFF_POLICY.
- **key_usage_settings** – A *KeyUsageConstraints* object specifying which key usages must or must not be present in the signer's certificate.
- **skip_diff** – If True, skip the difference analysis step entirely.

Returns

The status of the signature.

async pyhanko.sign.validation.ltv.**establish_timestamp_trust**(*tst_signed_data: SignedData, validation_context: ValidationContext, expected_tst_imprint: bytes*)

Wrapper around `validate_tst_signed_data()` for use when analysing timestamps for the purpose of establishing a timestamp chain. Its main purpose is throwing/logging an error if validation fails, since that amounts to lack of trust in the purported validation time.

This is internal API.

Parameters

- **tst_signed_data** – The `SignedData` value to validate; must encapsulate a `TSTInfo` value.
- **validation_context** – The validation context to apply to the timestamp.
- **expected_tst_imprint** – The expected message imprint for the `TSTInfo` value.

Returns
A *TimestampSignatureStatus* if validation is successful.

Raises
`SignatureValidationError` if validation fails.

pyhanko.sign.validation.pdf_embedded module

class pyhanko.sign.validation.pdf_embedded.**EmbeddedPdfSignature**(*reader: PdfFileReader, sig_field: DictionaryObject, fq_name: str*)

Bases: `object`

Class modelling a signature embedded in a PDF document.

sig_object: *DictionaryObject*

The signature dictionary.

sig_field: *DictionaryObject*

The field dictionary of the form field containing the signature.

signed_data: **SignedData**

CMS signed data in the signature.

property embedded_attr_certs: List[AttributeCertificateV2]

Embedded attribute certificates.

property other_embedded_certs: List[Certificate]

Embedded X.509 certificates, excluding than that of the signer.

property signer_cert: Certificate

Certificate of the signer.

property sig_object_type: *NameObject*

Returns the type of the embedded signature object. For ordinary signatures, this will be `/Sig`. In the case of a document timestamp, `/DocTimeStamp` is returned.

Returns
A PDF name object describing the type of signature.

property field_name

Returns
Name of the signature field.

property self_reported_timestamp: Optional[datetime]

Returns
The signing time as reported by the signer, if embedded in the signature's signed attributes.

property attached_timestamp_data: Optional[SignedData]

Returns
The signed data component of the timestamp token embedded in this signature, if present.

compute_integrity_info(*diff_policy=None*, *skip_diff=False*)

Compute the various integrity indicators of this signature.

Parameters

- **diff_policy** – Policy to evaluate potential incremental updates that were appended to the signed revision of the document. Defaults to `DEFAULT_DIFF_POLICY`.
- **skip_diff** – If `True`, skip the difference analysis step entirely.

summarise_integrity_info() → dict

Compile the integrity information for this signature into a dictionary that can later be passed to *PdfSignatureStatus* as kwargs.

This method is only available after calling *EmbeddedPdfSignature.compute_integrity_info()*.

property seed_value_spec: Optional[*SigSeedValueSpec*]

property docmdp_level: Optional[*MDPPerm*]

Returns
The document modification policy required by this signature or its Lock dictionary.

Warning: This does not take into account the DocMDP requirements of earlier signatures (if present).

The specification forbids signing with a more lenient DocMDP than the one currently in force, so this should not happen in a compliant document. That being said, any potential violations will still invalidate the earlier signature with the stricter DocMDP policy.

property fieldmdp: Optional[*FieldMDPSpec*]

Returns
Read the field locking policy of this signature, if applicable. See also *FieldMDPSpec*.

compute_digest() → bytes

Compute the `/ByteRange` digest of this signature. The result will be cached.

Returns
The digest value.

compute_tst_digest() → Optional[bytes]

Compute the digest of the signature needed to validate its timestamp token (if present).

Warning: This computation is only relevant for timestamp tokens embedded inside a regular signature. If the signature in question is a document timestamp (where the entire signature object is a timestamp token), this method does not apply.

Returns
The digest value, or `None` if there is no timestamp token.

`evaluate_signature_coverage()` → *SignatureCoverageLevel*

Internal method used to evaluate the coverage level of a signature.

Returns
The coverage level of the signature.

`evaluate_modifications`(*diff_policy:* DiffPolicy) → Union[*DiffResult*, *SuspiciousModification*]

Internal method used to evaluate the modification level of a signature.

`class pyhanko.sign.validation.pdf_embedded.DocMDPInfo`(*permission*, *author_sig*)

Bases: `tuple`

Encodes certification information for a signed document, consisting of a reference to the author signature, together with the associated DocMDP policy.

`property author_sig`

Alias for field number 1

`property permission`

Alias for field number 0

`pyhanko.sign.validation.pdf_embedded.read_certification_data`(*reader:* PdfFileReader) → Optional[*DocMDPInfo*]

Read the certification information for a PDF document, if present.

Parameters
`reader` – Reader representing the input document.

Returns
A *`DocMDPInfo`* object containing the relevant data, or `None`.

async pyhanko.sign.validation.pdf_embedded.**async_validate_pdf_signature**(*embedded_sig: EmbeddedPdfSignature, signer_validation_context: Optional[ValidationContext] = None, ts_validation_context: Optional[ValidationContext] = None, ac_validation_context: Optional[ValidationContext] = None, diff_policy: Optional[DiffPolicy] = None, key_usage_settings: Optional[KeyUsageConstraints] = None, skip_diff: bool = False, algorithm_policy: Optional[CMSAlgorithmUsagePolicy] = None*) → *PdfSignatureStatus*

New in version 0.9.0.

Validate a PDF signature.

Parameters

- **embedded_sig** – Embedded signature to evaluate.
- **signer_validation_context** – Validation context to use to validate the signature's chain of trust.
- **ts_validation_context** – Validation context to use to validate the timestamp's chain of trust (defaults to `signer_validation_context`).
- **ac_validation_context** – Validation context to use to validate attribute certificates. If not supplied, no AC validation will be performed.

  Note: **RFC 5755** requires attribute authority trust roots to be specified explicitly; hence why there's no default.

- **diff_policy** – Policy to evaluate potential incremental updates that were appended to the signed revision of the document. Defaults to `DEFAULT_DIFF_POLICY`.
- **key_usage_settings** – A `KeyUsageConstraints` object specifying which key usages must or must not be present in the signer's certificate.
- **skip_diff** – If `True`, skip the difference analysis step entirely.
- **algorithm_policy** – The algorithm usage policy for the signature validation.

> **Warning:** This is distinct from the algorithm usage policy used for certificate validation, but the latter will be used as a fallback if this parameter is not specified.
>
> It is nonetheless recommended to align both policies unless there is a clear reason to do otherwise.

Returns
The status of the PDF signature in question.

`async pyhanko.sign.validation.pdf_embedded.`**`async_validate_pdf_timestamp`**`(`*embedded_sig: EmbeddedPdfSignature, validation_context: Optional[ValidationContext] = None, diff_policy: Optional[DiffPolicy] = None, skip_diff: bool = False*`)` → *DocumentTimestampStatus*

New in version 0.9.0.

Validate a PDF document timestamp.

Parameters

- **`embedded_sig`** – Embedded signature to evaluate.
- **`validation_context`** – Validation context to use to validate the timestamp's chain of trust.
- **`diff_policy`** – Policy to evaluate potential incremental updates that were appended to the signed revision of the document. Defaults to `DEFAULT_DIFF_POLICY`.
- **`skip_diff`** – If `True`, skip the difference analysis step entirely.

Returns
The status of the PDF timestamp in question.

`pyhanko.sign.validation.pdf_embedded.`**`report_seed_value_validation`**`(`*embedded_sig: EmbeddedPdfSignature, validation_path: ValidationPath, timestamp_found: bool*`)`

Internal API function to enforce seed value constraints (if present) and report on the result(s).

Parameters

- **`embedded_sig`** – The embedded signature.
- **`validation_path`** – The validation path for the signer's certificate.
- **`timestamp_found`** – Flag indicating whether a valid timestamp was found or not.

Returns
A `status_kwargs` dict.

`pyhanko.sign.validation.pdf_embedded.`**`extract_contents`**`(`*sig_object: DictionaryObject*`)` → bytes

Internal function to extract the (DER-encoded) signature bytes from a PDF signature dictionary.

Parameters
`sig_object` – A signature dictionary.

Returns
The extracted contents as a byte string.

pyhanko.sign.validation.policy_decl module

class `pyhanko.sign.validation.policy_decl.`**`SignatureValidationSpec`**(*cert_validation_policy: pyhanko_certvalidator.context.CertValidationPolic*
revinfo_gathering_policy: pyhanko.sign.validation.policy_decl.RevocationInfo
= RevocationInfoGatheringSpec(online_fetching_rule=<RevinfoOnlineF
2>,
fetcher_backend=<pyhanko_certvalidator.fetche
object at 0x7f3d82266310>),
ts_cert_validation_policy: Union[pyhanko_certvalidator.context.CertValida
NoneType] = None,
ac_validation_policy: Union[pyhanko_certvalidator.context.CertValida
NoneType] = None,
local_knowledge: pyhanko.sign.validation.policy_decl.LocalKnowled
= LocalKnowledge(known_ocsps=[], known_crls=[], known_certs=[], known_poes=[]),
key_usage_settings: pyhanko.sign.validation.settings.KeyUsageConstra
= KeyUsageConstraints(key_usage=None, key_usage_forbidden=None, extd_key_usage=None, explicit_extd_key_usage_required=True, match_all_key_usages=False),
signature_algorithm_policy: Union[pyhanko.sign.validation.utils.CMSAlgorit
NoneType] = None)

Bases: `object`

`cert_validation_policy:` *`CertValidationPolicySpec`*

`revinfo_gathering_policy:` *`RevocationInfoGatheringSpec`* **`= RevocationInfoGatheringSpec(online_fetching_rule=<RevinfoOnlineFetchingRule.NO_HISTORICAL_FETCH: 2>, fetcher_backend=<pyhanko_certvalidator.fetchers.requests_fetchers.RequestsFetcherBackend object>)`**

`ts_cert_validation_policy:` `Optional[`*`CertValidationPolicySpec`*`]` **`= None`**

ac_validation_policy: Optional[*CertValidationPolicySpec*] = None

local_knowledge: *LocalKnowledge* = LocalKnowledge(known_ocsps=[], known_crls=[], known_certs=[], known_poes=[])

key_usage_settings: *KeyUsageConstraints* = KeyUsageConstraints(key_usage=None, key_usage_forbidden=None, extd_key_usage=None, explicit_extd_key_usage_required=True, match_all_key_usages=False)

signature_algorithm_policy: Optional[*CMSAlgorithmUsagePolicy*] = None

class pyhanko.sign.validation.policy_decl.**PdfSignatureValidationSpec**(*signature_validation_spec: py-hanko.sign.validation.policy_decl.SignatureV diff_policy: Union[pyhanko.sign.diff_analysis.policy_api NoneType] = <py-hanko.sign.diff_analysis.policies.StandardDi object at 0x7f3d883ad850>*)

Bases: object

signature_validation_spec: *SignatureValidationSpec*

diff_policy: Optional[*DiffPolicy*] = <pyhanko.sign.diff_analysis.policies.StandardDiffPolicy object>

class pyhanko.sign.validation.policy_decl.**RevinfoOnlineFetchingRule**(*value*)

Bases: Enum

An enumeration.

ALWAYS_FETCH = 1

Always permit fetching revocation information from online sources.

NO_HISTORICAL_FETCH = 2

Only attempt to fetch revocation information when performing validation of a signature at the current time, and use the local cache in past validation evaluation.

LOCAL_ONLY = 3

Only use locally cached revocation information.

class pyhanko.sign.validation.policy_decl.**LocalKnowledge**(*known_ocsps: List[pyhanko_certvalidator.revinfo.archival.OCSPContainer = <factory>, known_crls: List[pyhanko_certvalidator.revinfo.archival.CRLContainer] = <factory>, known_certs: List[asn1crypto.x509.Certificate] = <factory>, known_poes: List[pyhanko.sign.validation.policy_decl.KnownPOE] = <factory>*)

Bases: object

known_ocsps: List[*OCSPContainer*]

known_crls: List[*CRLContainer*]

known_certs: List[Certificate]

known_poes: List[*KnownPOE*]

add_to_poe_manager(*poe_manager: POEManager*)

class pyhanko.sign.validation.policy_decl.**RevocationInfoGatheringSpec**(*online_fetching_rule: pyhanko.sign.validation.policy_decl.RevinfoO = <RevinfoOnlineFetchingRule.NO_HISTORICAL_FETCH: 2>, fetcher_backend: pyhanko_certvalidator.fetchers.api.FetcherBac = <factory>*)

Bases: object

online_fetching_rule: *RevinfoOnlineFetchingRule* = 2

fetcher_backend: *FetcherBackend*

class pyhanko.sign.validation.policy_decl.**KnownPOE**(*digest: bytes, poe_time: datetime.datetime*)

Bases: object

digest: bytes

poe_time: datetime

class pyhanko.sign.validation.policy_decl.**CMSAlgorithmUsagePolicy**

Bases: *AlgorithmUsagePolicy*, ABC

Algorithm usage policy for CMS signatures.

digest_combination_allowed(*signature_algo: SignedDigestAlgorithm, message_digest_algo: DigestAlgorithm, moment: Optional[datetime]*) → *AlgorithmUsageConstraint*

Verify whether a digest algorithm is compatible with the digest algorithm implied by the provided signature algorithm, if any.

By default, this enforces the convention (requirement in RFC 8933) that the message digest must be computed using the same digest algorithm as the one used by the signature, if applicable.

Checking whether the individual algorithms are allowed is not the responsibility of this method.

Parameters

- **signature_algo** – A signature mechanism to use
- **message_digest_algo** – The digest algorithm used for the message digest
- **moment** – The point in time for which the assessment needs to be made.

Returns

A usage constraint.

static **lift_policy**(*policy: AlgorithmUsagePolicy*) → *CMSAlgorithmUsagePolicy*

Lift a 'base' *AlgorithmUsagePolicy* to a CMS usage algorithm policy with default settings. If the policy passed in is already a *CMSAlgorithmUsagePolicy*, return it as-is.

Parameters

policy – The underlying original policy

Returns
The lifted policy

`pyhanko.sign.validation.policy_decl.`**`bootstrap_validation_data_handlers`**(*spec: SignatureValidationSpec, timing_info: Optional[ValidationTimingInfo] = None, is_historical: Optional[bool] = None, poe_manager_override: Optional[POEManager] = None*) → *ValidationDataHandlers*

pyhanko.sign.validation.settings module

`class` `pyhanko.sign.validation.settings.`**`KeyUsageConstraints`**(*key_usage: Optional[Set[str]] = None, key_usage_forbidden: Optional[Set[str]] = None, extd_key_usage: Optional[Set[str]] = None, explicit_extd_key_usage_required: bool = True, match_all_key_usages: bool = False*)

Bases: *`ConfigurableMixin`*

Convenience class to pass around key usage requirements and validate them. Intended to be flexible enough to handle both PKIX and ISO 32000 certificate seed value constraint semantics.

Changed in version 0.6.0: Bring extended key usage semantics in line with **RFC 5280** (PKIX).

`key_usage: Optional[Set[str]] = None`

All or some (depending on `match_all_key_usage`) of these key usage extensions must be present in the signer's certificate. If not set or empty, all key usages are considered acceptable.

`key_usage_forbidden: Optional[Set[str]] = None`

These key usages must not be present in the signer's certificate.

Note: This behaviour is undefined in **RFC 5280** (PKIX), but included for compatibility with certificate seed value settings in ISO 32000.

`extd_key_usage: Optional[Set[str]] = None`

List of acceptable key purposes that can appear in an extended key usage extension in the signer's certificate, if such an extension is at all present. If not set, all extended key usages are considered acceptable.

If no extended key usage extension is present, or if the `anyExtendedKeyUsage` key purpose ID is present, the resulting behaviour depends on *`explicit_extd_key_usage_required`*.

Setting this option to the empty set (as opposed to `None`) effectively bans all (presumably unrecognised) extended key usages.

> **Warning:** Note the difference in behaviour with *key_usage* for empty sets of valid usages.

> **Warning:** Contrary to what some CAs seem to believe, the criticality of the extended key usage extension is irrelevant here. Even a non-critical EKU extension **must** be enforced according to **RFC 5280** § 4.2.1.12.
>
> In practice, many certificate authorities issue non-repudiation certs that can also be used for TLS authentication by only including the TLS client authentication key purpose ID in the EKU extension. Interpreted strictly, **RFC 5280** bans such certificates from being used to sign documents, and pyHanko will enforce these semantics if *extd_key_usage* is not `None`.

explicit_extd_key_usage_required: bool = True

New in version 0.6.0.

Require an extended key usage extension with the right key usages to be present if *extd_key_usage* is non-empty.

If this flag is `True`, at least one key purpose in *extd_key_usage* must appear in the certificate's extended key usage, and `anyExtendedKeyUsage` will be ignored.

match_all_key_usages: bool = False

New in version 0.6.0.

If `True`, all key usages indicated in *key_usage* must be present in the certificate. If `False`, one match suffices.

If *key_usage* is empty or `None`, this option has no effect.

validate(*cert: Certificate*)

classmethod process_entries(*config_dict*)

Hook method that can modify the configuration dictionary to overwrite or tweak some of their values (e.g. to convert string parameters into more complex Python objects)

Subclasses that override this method should call `super().process_entries()`, and leave keys that they do not recognise untouched.

Parameters
`config_dict` – A dictionary containing configuration values.

Raises
ConfigurationError – when there is a problem processing a relevant entry.

pyhanko.sign.validation.status module

class pyhanko.sign.validation.status.**SignatureStatus**(*intact: bool*, *valid: bool*, *trust_problem_indic: Optional[AdESSubIndic]*, *signing_cert: Certificate*, *pkcs7_signature_mechanism: str*, *md_algorithm: str*, *validation_path: Optional[ValidationPath]*, *revocation_details: Optional[RevocationDetails]*, *error_time_horizon: Optional[datetime]*)

Bases: `object`

Class describing the validity of a (general) CMS signature.

intact: bool

Reports whether the signature is *intact*, i.e. whether the hash of the message content (which may or may not be embedded inside the CMS object itself) matches the hash value that was signed.

If there are no signed attributes, this is equal to *valid*.

valid: bool

Reports whether the signature is *valid*, i.e. whether the signature in the CMS object itself (usually computed over a hash of the signed attributes) is cryptographically valid.

trust_problem_indic: Optional[*AdESSubIndic*]

If not None, provides the AdES subindication indication what went wrong when validating the signer's certificate.

signing_cert: Certificate

Contains the certificate of the signer, as embedded in the CMS object.

pkcs7_signature_mechanism: str

CMS signature mechanism used.

md_algorithm: str

Message digest algorithm used.

validation_path: Optional[*ValidationPath*]

Validation path providing a valid chain of trust from the signer's certificate to a trusted root certificate.

revocation_details: Optional[*RevocationDetails*]

Details on why and when the signer's certificate (or another certificate in the chain) was revoked.

error_time_horizon: Optional[datetime]

Informational timestamp indicating a point in time where the validation behaviour potentially changed (e.g. expiration, revocation, etc.).

The presence of this value by itself should not be taken as an assertion that validation would have succeeded if executed before that point in time.

key_usage: ClassVar[Set[str]] = {'non_repudiation'}

Class property indicating which key usages are accepted on the signer's certificate. The default is `non_repudiation` only.

extd_key_usage: ClassVar[Optional[Set[str]]] = None

Class property indicating which extended key usage key purposes are accepted to be present on the signer's certificate.

See *KeyUsageConstraints.extd_key_usage*.

summary_fields()

property revoked: bool

Reports whether the signer's certificate has been revoked or not. If this field is `True`, then obviously *trusted* will be `False`.

property trusted: bool

Reports whether the signer's certificate is trusted w.r.t. the currently relevant validation context and key usage requirements.

summary(*delimiter=','*) → str

Provide a textual but machine-parsable summary of the validity.

classmethod default_usage_constraints(*key_usage_settings: Optional[KeyUsageConstraints] = None*) → *KeyUsageConstraints*

class pyhanko.sign.validation.status.**TimestampSignatureStatus**(*intact: bool*, *valid: bool*, *trust_problem_indic: Optional[AdESSubIndic]*, *signing_cert: Certificate*, *pkcs7_signature_mechanism: str*, *md_algorithm: str*, *validation_path: Optional[ValidationPath]*, *revocation_details: Optional[RevocationDetails]*, *error_time_horizon: Optional[datetime]*, *timestamp: datetime*)

Bases: *SignatureStatus*

Signature status class used when validating timestamp tokens.

key_usage: ClassVar[Set[str]] = {}

There are no (non-extended) key usage requirements for TSA certificates.

extd_key_usage: ClassVar[Optional[Set[str]]] = {'time_stamping'}

TSA certificates must have the `time_stamping` extended key usage extension (OID 1.3.6.1.5.5.7.3.8).

timestamp: datetime

Value of the timestamp token as a datetime object.

describe_timestamp_trust()

class pyhanko.sign.validation.status.**X509AttributeInfo**(*attr_type: AttCertAttributeType*, *attr_values: Iterable[Asn1Value]*)

Bases: `object`

Info on an X.509 attribute.

attr_type: AttCertAttributeType

The certified attribute's type.

attr_values: Iterable[Asn1Value]

The certified attribute's values.

class pyhanko.sign.validation.status.**CertifiedAttributeInfo**(*attr_type: AttCertAttributeType*, *attr_values: Iterable[Asn1Value]*, *validation_results: Iterable[ACValidationResult]*)

Bases: *X509AttributeInfo*

Info on a certified attribute, including AC validation results.

validation_results: Iterable[*ACValidationResult*]

The validation details for the attribute in question (possibly several if values for the same attribute were sourced from several different ACs).

class pyhanko.sign.validation.status.**ClaimedAttributes**

Bases: `object`

Container class for extracted information on attributes asserted by a signer without an attribute certificate.

classmethod from_iterable(*attrs: Iterable[AttCertAttribute], parse_error_fatal=False*)

class pyhanko.sign.validation.status.**CertifiedAttributes**

Bases: `object`

Container class for extracted attribute certificate information.

classmethod from_results(*results: Iterable[ACValidationResult], parse_error_fatal=False*)

class pyhanko.sign.validation.status.**CAdESSignerAttributeAssertions**(*claimed_attrs: ClaimedAttributes, certified_attrs: Optional[CertifiedAttributes] = None, ac_validation_errs: Optional[Collection[Union[ValidationError, PathBuildingError]]] = None, unknown_attrs_present: bool = False*)

Bases: `object`

Value type describing information extracted (and, if relevant, validated) from a `signer-attrs-v2` signed attribute.

claimed_attrs: ***ClaimedAttributes***

Attributes claimed by the signer without additional justification. May be empty.

certified_attrs: Optional[*CertifiedAttributes*] = None

Attributes claimed by the signer using an attribute certificate.

This field will only be populated if an attribute certificate validation context is available, otherwise its value will be `None`, even if there are no attribute certificates present.

ac_validation_errs: Optional[Collection[Union[*ValidationError*, *PathBuildingError*]]] = None

Attribute certificate validation errors.

This field will only be populated if an attribute certificate validation context is available, otherwise its value will be `None`, even if there are no attribute certificates present.

unknown_attrs_present: bool = False

Records if the `signer-attrs-v2` attribute contained certificate types or signed assertions that could not be processed.

This does not affect the validation process by default, but will trigger a warning.

property valid

class pyhanko.sign.validation.status.**StandardCMSSignatureStatus**(*intact: bool*, *valid: bool*, *trust_problem_indic: Optional[AdESSubIndic]*, *signing_cert: Certificate*, *pkcs7_signature_mechanism: str*, *md_algorithm: str*, *validation_path: Optional[ValidationPath]*, *revocation_details: Optional[RevocationDetails]*, *error_time_horizon: Optional[datetime]*, *ac_attrs: Optional[CertifiedAttributes] = None*, *ac_validation_errs: Optional[Collection[Union[PathValidationError, PathBuildingError]]] = None*, *cades_signer_attrs: Optional[CAdESSignerAttributeAssertions] = None*, *signer_reported_dt: Optional[datetime] = None*, *timestamp_validity: Optional[TimestampSignatureStatus] = None*, *content_timestamp_validity: Optional[TimestampSignatureStatus] = None*)

Bases: *SignerAttributeStatus*, *SignatureStatus*

Status of a standard "end-entity" CMS signature, potentially with timing information embedded inside.

signer_reported_dt: Optional[datetime] = None

Signer-reported signing time, if present in the signature.

Generally speaking, this timestamp should not be taken as fact.

timestamp_validity: Optional[*TimestampSignatureStatus*] = None

Validation status of the signature timestamp token embedded in this signature, if present.

content_timestamp_validity: Optional[*TimestampSignatureStatus*] = None

Validation status of the content timestamp token embedded in this signature, if present.

property bottom_line: bool

Formulates a general judgment on the validity of this signature. This takes into account the cryptographic validity of the signature, the signature's chain of trust and the validity of the timestamp token (if present).

Returns
True if all constraints are satisfied, False otherwise.

summary_fields()

pretty_print_details()

pretty_print_sections() → List[Tuple[str, str]]

class pyhanko.sign.validation.status.**SignatureCoverageLevel**(*value*)

Bases: *OrderedEnum*

Indicate the extent to which a PDF signature (cryptographically) covers a document. Note that this does *not* pass judgment on whether uncovered updates are legitimate or not, but as a general rule, a legitimate signature will satisfy at least *ENTIRE_REVISION*.

UNCLEAR = 0

The signature's coverage is unclear and/or disconnected. In standard PDF signatures, this is usually a bad sign.

CONTIGUOUS_BLOCK_FROM_START = 1

The signature covers a contiguous block in the PDF file stretching from the first byte of the file to the last byte in the indicated `/ByteRange`. In other words, the only interruption in the byte range is fully occupied by the signature data itself.

ENTIRE_REVISION = 2

The signature covers the entire revision in which it occurs, but incremental updates may have been added later. This is not necessarily evidence of tampering. In particular, it is expected when a file contains multiple signatures. Nonetheless, caution is required.

ENTIRE_FILE = 3

The entire file is covered by the signature.

class pyhanko.sign.validation.status.**ModificationInfo**(*coverage: Union[*pyhanko.sign.validation.status.SignatureCoverageLevel*, NoneType] = None*, *diff_result: Union[*pyhanko.sign.diff_analysis.policy_api.DiffResult, pyhanko.sign.diff_analysis.policy_api.SuspiciousModification*, NoneType] = None*, *docmdp_ok: Union[bool, NoneType] = None*)

Bases: `object`

coverage: Optional[*SignatureCoverageLevel*] = None

Indicates how much of the document is covered by the signature.

diff_result: Optional[Union[*DiffResult*, *SuspiciousModification*]] = None

Result of the difference analysis run on the file:

- If `None`, no difference analysis was run.
- If the difference analysis was successful, this attribute will contain a *DiffResult* object.
- If the difference analysis failed due to unforeseen or suspicious modifications, the *SuspiciousModification* exception thrown by the difference policy will be stored in this attribute.

docmdp_ok: Optional[bool] = None

Indicates whether the signature's *modification_level* is in line with the document signature policy in force.

If `None`, compliance could not be determined.

property modification_level: Optional[*ModificationLevel*]

Indicates the degree to which the document was modified after the signature was applied.

Will be `None` if difference analysis results are not available; an instance of *ModificationLevel* otherwise.

class pyhanko.sign.validation.status.**PdfSignatureStatus**(*intact: bool*, *valid: bool*, *trust_problem_indic: Optional[AdESSubIndic]*, *signing_cert: Certificate*, *pkcs7_signature_mechanism: str*, *md_algorithm: str*, *validation_path: Optional[ValidationPath]*, *revocation_details: Optional[RevocationDetails]*, *error_time_horizon: Optional[datetime]*, *ac_attrs: Optional[CertifiedAttributes] = None*, *ac_validation_errs: Optional[Collection[Union[PathValidationError, PathBuildingError]]] = None*, *cades_signer_attrs: Optional[CAdESSignerAttributeAssertions] = None*, *signer_reported_dt: Optional[datetime] = None*, *timestamp_validity: Optional[TimestampSignatureStatus] = None*, *content_timestamp_validity: Optional[TimestampSignatureStatus] = None*, *coverage: Optional[SignatureCoverageLevel] = None*, *diff_result: Optional[Union[DiffResult, SuspiciousModification]] = None*, *docmdp_ok: Optional[bool] = None*, *has_seed_values: bool = False*, *seed_value_constraint_error: Optional[SigSeedValueValidationError] = None*)

Bases: `ModificationInfo`, `StandardCMSSignatureStatus`

Class to indicate the validation status of a PDF signature.

has_seed_values: bool = False

Records whether the signature form field has seed values.

seed_value_constraint_error: Optional[*SigSeedValueValidationError*] = None

Records the reason for failure if the signature field's seed value constraints didn't validate.

property bottom_line: bool

Formulates a general judgment on the validity of this signature. This takes into account the cryptographic validity of the signature, the signature's chain of trust, compliance with the document modification policy, seed value constraint compliance and the validity of the timestamp token (if present).

Returns

`True` if all constraints are satisfied, `False` otherwise.

property seed_value_ok: bool

Indicates whether the signature satisfies all mandatory constraints in the seed value dictionary of the associated form field.

Warning: Currently, not all seed value entries are recognised by the signer and/or the validator, so this judgment may not be entirely accurate in some cases.

> See *SigSeedValueSpec*.

summary_fields()

pretty_print_sections()

class pyhanko.sign.validation.status.**DocumentTimestampStatus**(*intact: bool*, *valid: bool*, *trust_problem_indic: Optional[AdESSubIndic]*, *signing_cert: Certificate*, *pkcs7_signature_mechanism: str*, *md_algorithm: str*, *validation_path: Optional[ValidationPath]*, *revocation_details: Optional[RevocationDetails]*, *error_time_horizon: Optional[datetime]*, *timestamp: datetime*, *coverage: Optional[SignatureCoverageLevel] = None*, *diff_result: Optional[Union[DiffResult, SuspiciousModification]] = None*, *docmdp_ok: Optional[bool] = None*)

Bases: *ModificationInfo*, *TimestampSignatureStatus*

Class to indicate the validation status of a PDF document timestamp.

class pyhanko.sign.validation.status.**RevocationDetails**(*ca_revoked: bool*, *revocation_date: datetime*, *revocation_reason: CRLReason*)

Bases: `object`

Contains details about a certificate revocation related to a signature.

ca_revoked: bool

If `False`, the revoked certificate is the signer's. If `True`, there's a revoked CA certificate higher up the chain.

revocation_date: datetime

The date and time of revocation.

revocation_reason: CRLReason

The reason why the certificate was revoked.

class pyhanko.sign.validation.status.**SignerAttributeStatus**(*ac_attrs: Union[pyhanko.sign.validation.status.CertifiedAttributes, NoneType] = None*, *ac_validation_errs: Union[Collection[Union[pyhanko_certvalidator.errors.Pat py-hanko_certvalidator.errors.PathBuildingError]], NoneType] = None*, *cades_signer_attrs: Union[pyhanko.sign.validation.status.CAdESSignerAttrib NoneType] = None*)

Bases: `object`

ac_attrs: Optional[*CertifiedAttributes*] = None

Certified attributes sourced from valid attribute certificates embedded into the `SignedData`'s `certificates` field and the CAdES-style `signer-attrs-v2` attribute (if present).

Will be `None` if no validation context for attribute certificate validation was provided.

Note: There is a semantic difference between attribute certificates extracted from the `certificates` field and those extracted from the `signer-attrs-v2` attribute. In the former case, the ACs are not covered by the signature. However, a CAdES-style `signer-attrs-v2` attribute is signed, so the signer is expected to have explicitly _acknowledged_ all attributes, in the AC. See also *`cades_signer_attrs`*.

ac_validation_errs: Optional[Collection[Union[*PathValidationError*, *PathBuildingError*]]] = None

Errors encountered while validating attribute certificates embedded into the `SignedData`'s `certificates` field and the CAdES-style `signer-attrs-v2` attribute (if present).

Will be `None` if no validation context for attribute certificate validation was provided.

cades_signer_attrs: Optional[*CAdESSignerAttributeAssertions*] = None

Information extracted and validated from the signed `signer-attrs-v2` attribute defined in CAdES.

pyhanko.sign.validation.utils module

class pyhanko.sign.validation.utils.**CMSAlgorithmUsagePolicy**

Bases: *`AlgorithmUsagePolicy`*, `ABC`

Algorithm usage policy for CMS signatures.

digest_combination_allowed(*signature_algo: SignedDigestAlgorithm*, *message_digest_algo: DigestAlgorithm*, *moment: Optional[datetime]*) → *AlgorithmUsageConstraint*

Verify whether a digest algorithm is compatible with the digest algorithm implied by the provided signature algorithm, if any.

By default, this enforces the convention (requirement in RFC 8933) that the message digest must be computed using the same digest algorithm as the one used by the signature, if applicable.

Checking whether the individual algorithms are allowed is not the responsibility of this method.

Parameters

- **signature_algo** – A signature mechanism to use
- **message_digest_algo** – The digest algorithm used for the message digest
- **moment** – The point in time for which the assessment needs to be made.

Returns

A usage constraint.

static lift_policy(*policy:* AlgorithmUsagePolicy) → *CMSAlgorithmUsagePolicy*

Lift a 'base' *`AlgorithmUsagePolicy`* to a CMS usage algorithm policy with default settings. If the policy passed in is already a *`CMSAlgorithmUsagePolicy`*, return it as-is.

Parameters

policy – The underlying original policy

Returns
The lifted policy

`pyhanko.sign.validation.utils.`**`validate_raw`**(*signature: bytes*, *signed_data: bytes*, *cert: ~asn1crypto.x509.Certificate*, *signature_algorithm: ~asn1crypto.algos.SignedDigestAlgorithm*, *md_algorithm: str*, *prehashed=False*, *algorithm_policy: ~typing.Optional[~pyhanko.sign.validation.utils.CMSAlgorithmUsagePolicy] = <pyhanko.sign.validation.utils._DefaultPolicyMixin object>*, *time_indic: ~typing.Optional[~datetime.datetime] = None*)

Validate a raw signature. Internal API.

`pyhanko.sign.validation.utils.`**`extract_message_digest`**(*signer_info: SignerInfo*)

Module contents

`pyhanko.sign.validation.`**`validate_pdf_signature`**(*embedded_sig: EmbeddedPdfSignature*, *signer_validation_context: Optional[ValidationContext] = None*, *ts_validation_context: Optional[ValidationContext] = None*, *diff_policy: Optional[DiffPolicy] = None*, *key_usage_settings: Optional[KeyUsageConstraints] = None*, *skip_diff: bool = False*) → *PdfSignatureStatus*

Changed in version 0.9.0: Wrapper around `async_validate_pdf_signature()`.

Validate a PDF signature.

Parameters

- **`embedded_sig`** – Embedded signature to evaluate.
- **`signer_validation_context`** – Validation context to use to validate the signature's chain of trust.
- **`ts_validation_context`** – Validation context to use to validate the timestamp's chain of trust (defaults to `signer_validation_context`).
- **`diff_policy`** – Policy to evaluate potential incremental updates that were appended to the signed revision of the document. Defaults to `DEFAULT_DIFF_POLICY`.
- **`key_usage_settings`** – A `KeyUsageConstraints` object specifying which key usages must or must not be present in the signer's certificate.
- **`skip_diff`** – If `True`, skip the difference analysis step entirely.

Returns
The status of the PDF signature in question.

`pyhanko.sign.validation.`**`validate_cms_signature`**(*signed_data: ~asn1crypto.cms.SignedData*, *status_cls=<class 'pyhanko.sign.validation.status.SignatureStatus'>*, *raw_digest: ~typing.Optional[bytes] = None*, *validation_context: ~typing.Optional[~pyhanko_certvalidator.context.ValidationContext] = None*, *status_kwargs: ~typing.Optional[dict] = None*, *key_usage_settings: ~typing.Optional[~pyhanko.sign.validation.settings.KeyUsageConstraints] = None*, *encap_data_invalid=False*)

Deprecated since version 0.9.0: Use *async_validate_cms_signature()* instead.

Changed in version 0.7.0: Now handles both detached and enveloping signatures.

Changed in version 0.17.0: The `encap_data_invalid` parameter is ignored.

Validate a CMS signature (i.e. a `SignedData` object).

Parameters

- **signed_data** – The `asn1crypto.cms.SignedData` object to validate.
- **status_cls** – Status class to use for the validation result.
- **raw_digest** – Raw digest, computed from context.
- **validation_context** – Validation context to validate the signer's certificate.
- **status_kwargs** – Other keyword arguments to pass to the `status_class` when reporting validation results.
- **key_usage_settings** – A *KeyUsageConstraints* object specifying which key usages must or must not be present in the signer's certificate.
- **encap_data_invalid** – As of version `0.17.0`, this parameter is ignored.

Returns

A *SignatureStatus* object (or an instance of a proper subclass)

`pyhanko.sign.validation.`**`validate_detached_cms`**(*input_data: Union[bytes, IO, ContentInfo, EncapsulatedContentInfo], signed_data: SignedData, signer_validation_context: Optional[ValidationContext] = None, ts_validation_context: Optional[ValidationContext] = None, key_usage_settings: Optional[KeyUsageConstraints] = None, chunk_size=4096, max_read=None*) → *StandardCMSSignatureStatus*

Deprecated since version 0.9.0: Use *generic_cms.async_validate_detached_cms()* instead.

Validate a detached CMS signature.

Parameters

- **input_data** – The input data to sign. This can be either a `bytes` object, a file-like object or a `cms.ContentInfo` / `cms.EncapsulatedContentInfo` object.

  If a CMS content info object is passed in, the *content* field will be extracted.
- **signed_data** – The `cms.SignedData` object containing the signature to verify.
- **signer_validation_context** – Validation context to use to verify the signer certificate's trust.
- **ts_validation_context** – Validation context to use to verify the TSA certificate's trust, if a timestamp token is present. By default, the same validation context as that of the signer is used.
- **key_usage_settings** – Key usage parameters for the signer.
- **chunk_size** – Chunk size to use when consuming input data.
- **max_read** – Maximal number of bytes to read from the input stream.

Returns

A description of the signature's status.

pyhanko.sign.validation.**validate_pdf_timestamp**(*embedded_sig: EmbeddedPdfSignature*, *validation_context: Optional[ValidationContext] = None*, *diff_policy: Optional[DiffPolicy] = None*, *skip_diff: bool = False*) → *DocumentTimestampStatus*

Changed in version 0.9.0: Wrapper around `async_validate_pdf_timestamp()`.

Validate a PDF document timestamp.

Parameters

- **embedded_sig** – Embedded signature to evaluate.
- **validation_context** – Validation context to use to validate the timestamp's chain of trust.
- **diff_policy** – Policy to evaluate potential incremental updates that were appended to the signed revision of the document. Defaults to `DEFAULT_DIFF_POLICY`.
- **skip_diff** – If `True`, skip the difference analysis step entirely.

Returns

The status of the PDF timestamp in question.

pyhanko.sign.validation.**validate_pdf_ltv_signature**(*embedded_sig: EmbeddedPdfSignature*, *validation_type: RevocationInfoValidationType*, *validation_context_kwargs=None*, *bootstrap_validation_context=None*, *force_revinfo=False*, *diff_policy: Optional[DiffPolicy] = None*, *key_usage_settings: Optional[KeyUsageConstraints] = None*, *skip_diff: bool = False*) → *PdfSignatureStatus*

Changed in version 0.9.0: Wrapper around `async_validate_pdf_ltv_signature()`.

Validate a PDF LTV signature according to a particular profile.

Parameters

- **embedded_sig** – Embedded signature to evaluate.
- **validation_type** – Validation profile to use.
- **validation_context_kwargs** – Keyword args to instantiate `pyhanko_certvalidator.ValidationContext` objects needed over the course of the validation.
- **bootstrap_validation_context** – Validation context used to validate the current timestamp.
- **force_revinfo** – Require all certificates encountered to have some form of live revocation checking provisions.
- **diff_policy** – Policy to evaluate potential incremental updates that were appended to the signed revision of the document. Defaults to `DEFAULT_DIFF_POLICY`.
- **key_usage_settings** – A `KeyUsageConstraints` object specifying which key usages must or must not be present in the signer's certificate.
- **skip_diff** – If `True`, skip the difference analysis step entirely.

Returns

The status of the signature.

pyhanko.sign.validation.**add_validation_info**(*embedded_sig: EmbeddedPdfSignature, validation_context: ValidationContext, skip_timestamp=False, add_vri_entry=True, in_place=False, output=None, force_write=False, chunk_size=4096*)

Changed in version 0.9.0: Wrapper around *async_add_validation_info()*

Add validation info (CRLs, OCSP responses, extra certificates) for a signature to the DSS of a document in an incremental update.

Parameters

- **embedded_sig** – The signature for which the revocation information needs to be collected.
- **validation_context** – The validation context to use.
- **skip_timestamp** – If True, do not attempt to validate the timestamp attached to the signature, if one is present.
- **add_vri_entry** – Add a /VRI entry for this signature to the document security store. Default is True.
- **output** – Write the output to the specified output stream. If None, write to a new BytesIO object. Default is None.
- **in_place** – Sign the original input stream in-place. This parameter overrides output.
- **chunk_size** – Chunk size parameter to use when copying output to a new stream (irrelevant if in_place is True).
- **force_write** – Force a new revision to be written, even if not necessary (i.e. when all data in the validation context is already present in the DSS).

Returns

The (file-like) output object to which the result was written.

Submodules

pyhanko.sign.attributes module

class pyhanko.sign.attributes.**SignedAttributeProviderSpec**

Bases: ABC

New in version 0.14.0.

Interface for setting up signed attributes, independently of the *Signer* hierarchy.

signed_attr_providers(*data_digest: bytes, digest_algorithm: str*) → Iterable[*CMSAttributeProvider*]

Lazily set up signed attribute providers.

Parameters

- **data_digest** – The digest of the data to be signed.
- **digest_algorithm** – The digest algorithm used.

class pyhanko.sign.attributes.**UnsignedAttributeProviderSpec**

Bases: ABC

New in version 0.14.0.

Interface for setting up unsigned attributes, independently of the *Signer* hierarchy.

`unsigned_attr_providers`(*signature: bytes*, *signed_attrs: CMSAttributes*, *digest_algorithm: str*) → Iterable[*CMSAttributeProvider*]

Lazily set up unsigned attribute providers.

Parameters

- **`signature`** – The signature computed over the signed attributes.
- **`signed_attrs`** – Signed attributes over which the signature was taken.
- **`digest_algorithm`** – The digest algorithm used.

`class pyhanko.sign.attributes.`**`CMSAttributeProvider`**

Bases: `object`

Base class to provide asynchronous CMS attribute values.

`attribute_type: str`

Name of the CMS attribute type this provider supplies. See `cms.CMSAttributeType`.

`async` **`build_attr_value`**(*dry_run=False*)

Build the attribute value asynchronously.

Parameters
`dry_run` – `True` if the signer is operating in dry-run (size estimation) mode.

Returns
An attribute value appropriate for the attribute type.

`async` **`get_attribute`**(*dry_run=False*) → Optional[CMSAttribute]

`class pyhanko.sign.attributes.`**`SigningTimeProvider`**(*timestamp: datetime*)

Bases: *`CMSAttributeProvider`*

Provide a value for the signing-time attribute (i.e. an otherwise unauthenticated timestamp).

Parameters
`timestamp` – Datetime object to include.

`attribute_type: str = 'signing_time'`

Name of the CMS attribute type this provider supplies. See `cms.CMSAttributeType`.

`async` **`build_attr_value`**(*dry_run=False*) → Time

Build the attribute value asynchronously.

Parameters
`dry_run` – `True` if the signer is operating in dry-run (size estimation) mode.

Returns
An attribute value appropriate for the attribute type.

`class pyhanko.sign.attributes.`**`SigningCertificateV2Provider`**(*signing_cert: Certificate*)

Bases: *`CMSAttributeProvider`*

Provide a value for the signing-certificate-v2 attribute.

Parameters
`signing_cert` – Certificate containing the signer's public key.

`attribute_type: str = 'signing_certificate_v2'`

Name of the CMS attribute type this provider supplies. See `cms.CMSAttributeType`.

async build_attr_value(*dry_run=False*) → SigningCertificateV2

Build the attribute value asynchronously.

Parameters
dry_run – True if the signer is operating in dry-run (size estimation) mode.

Returns
An attribute value appropriate for the attribute type.

class pyhanko.sign.attributes.**AdobeRevinfoProvider**(*value: RevocationInfoArchival*)

Bases: *CMSAttributeProvider*

Yield Adobe-style revocation information for inclusion into a CMS object.

Parameters
value – A (pre-formatted) RevocationInfoArchival object.

attribute_type: str = 'adobe_revocation_info_archival'

Name of the CMS attribute type this provider supplies. See `cms.CMSAttributeType`.

async build_attr_value(*dry_run=False*) → Optional[RevocationInfoArchival]

Build the attribute value asynchronously.

Parameters
dry_run – True if the signer is operating in dry-run (size estimation) mode.

Returns
An attribute value appropriate for the attribute type.

class pyhanko.sign.attributes.**CMSAlgorithmProtectionProvider**(*digest_algo: str*, *signature_algo: SignedDigestAlgorithm*)

Bases: *CMSAttributeProvider*

attribute_type: str = 'cms_algorithm_protection'

Name of the CMS attribute type this provider supplies. See `cms.CMSAttributeType`.

async build_attr_value(*dry_run=False*) → CMSAlgorithmProtection

Build the attribute value asynchronously.

Parameters
dry_run – True if the signer is operating in dry-run (size estimation) mode.

Returns
An attribute value appropriate for the attribute type.

class pyhanko.sign.attributes.**TSTProvider**(*digest_algorithm: str*, *data_to_ts: bytes*, *timestamper: TimeStamper*, *attr_type: str = 'signature_time_stamp_token'*, *prehashed=False*)

Bases: *CMSAttributeProvider*

attribute_type: str

Name of the CMS attribute type this provider supplies. See `cms.CMSAttributeType`.

async build_attr_value(*dry_run=False*) → ContentInfo

Build the attribute value asynchronously.

Parameters
dry_run – True if the signer is operating in dry-run (size estimation) mode.

Returns
An attribute value appropriate for the attribute type.

pyhanko.sign.beid module

Sign PDF files using a Belgian eID card.

This module defines a very thin convenience wrapper around *pyhanko.sign.pkcs11* to set up a PKCS#11 session with an eID card and read the appropriate certificates on the device.

`pyhanko.sign.beid.`**`open_beid_session`**`(`*lib_location*, *slot_no=None*`)` → Session

Open a PKCS#11 session

Parameters

- **`lib_location`** – Path to the shared library file containing the eID PKCS#11 module. Usually, the file is named `libbeidpkcs11.so`, `libbeidpkcs11.dylib` or `beidpkcs11.dll`, depending on your operating system.
- **`slot_no`** – Slot number to use. If not specified, the first slot containing a token labelled `BELPIC` will be used.

Returns

An open PKCS#11 session object.

`class` `pyhanko.sign.beid.`**`BEIDSigner`**`(`*pkcs11_session: Session*, *use_auth_cert: bool = False*, *bulk_fetch: bool = False*, *embed_roots=True*`)`

Bases: *PKCS11Signer*

Belgian eID-specific signer implementation that automatically populates the (trustless) certificate list with the relevant certificates stored on the card. This includes the government's (self-signed) root certificate and the certificate of the appropriate intermediate CA.

pyhanko.sign.fields module

Utilities to deal with signature form fields and their properties in PDF files.

`class` `pyhanko.sign.fields.`**`SigFieldSpec`**`(`*sig_field_name: str*, *on_page: int = 0*, *box: Optional[Tuple[int, int, int, int]] = None*, *seed_value_dict: Optional[SigSeedValueSpec] = None*, *field_mdp_spec: Optional[FieldMDPSpec] = None*, *doc_mdp_update_value: Optional[MDPPerm] = None*, *combine_annotation: bool = True*, *empty_field_appearance: bool = False*, *invis_sig_settings: InvisSigSettings = InvisSigSettings(set_print_flag=True, set_hidden_flag=False, box_out_of_bounds=False)*, *readable_field_name: Optional[str] = None*, *visible_sig_settings: VisibleSigSettings = VisibleSigSettings(rotate_with_page=True, scale_with_page_zoom=True, print_signature=True)*`)`

Bases: `object`

Description of a signature field to be created.

`sig_field_name: str`

Name of the signature field.

`on_page: int = 0`

Index of the page on which the signature field should be included (starting at *0*). A negative number counts pages from the back of the document, with index `-1` referring to the last page.

Note: This is essentially only relevant for visible signature fields, i.e. those that have a widget associated with them.

box: Optional[Tuple[int, int, int, int]] = None

Bounding box of the signature field, if applicable.

Typically specified in `ll_x`, `ll_y`, `ur_x`, `ur_y` format, where `ll_*` refers to the lower left and `ur_*` to the upper right corner.

seed_value_dict: Optional[*SigSeedValueSpec*] = None

Specification for the seed value dictionary, if applicable.

field_mdp_spec: Optional[*FieldMDPSpec*] = None

Specification for the field lock dictionary, if applicable.

doc_mdp_update_value: Optional[*MDPPerm*] = None

Value to use for the document modification policy associated with the signature in this field.

This value will be embedded into the field lock dictionary if specified, and is meaningless if *field_mdp_spec* is not specified.

Warning: DocMDP entries for approval signatures are a PDF 2.0 feature. Older PDF software will likely ignore this part of the field lock dictionary.

combine_annotation: bool = True

Flag controlling whether the field should be combined with its annotation dictionary; `True` by default.

empty_field_appearance: bool = False

Generate a neutral appearance stream for empty, visible signature fields. If `False`, an empty appearance stream will be put in.

Note: We use an empty appearance stream to satisfy the appearance requirements for widget annotations in ISO 32000-2. However, even when a nontrivial appearance stream is present on an empty signature field, many viewers will not use it to render the appearance of the empty field on-screen.

Instead, these viewers typically substitute their own native widget.

invis_sig_settings: *InvisSigSettings* = InvisSigSettings(set_print_flag=True, set_hidden_flag=False, box_out_of_bounds=False)

Advanced settings to control invisible signature field generation.

readable_field_name: Optional[str] = None

Human-readable field name (`/TU` entry).

Note: This value is commonly rendered as a tooltip in viewers, but also serves an accessibility purpose.

visible_sig_settings: *VisibleSigSettings* = VisibleSigSettings(rotate_with_page=True, scale_with_page_zoom=True, print_signature=True)

Advanced settings to control the generation of visible signature fields.

format_lock_dictionary() → Optional[*DictionaryObject*]

class pyhanko.sign.fields.**SigSeedValFlags**(*value*)

Bases: `Flag`

Flags for the `/Ff` entry in the seed value dictionary for a signature field. These mark which of the constraints are to be strictly enforced, as opposed to optional ones.

> **Warning:** The flags *LEGAL_ATTESTATION* and *APPEARANCE_FILTER* are processed in accordance with the specification when creating a signature, but support is nevertheless limited.
>
> - PyHanko does not support legal attestations at all, so given that the *LEGAL_ATTESTATION* requirement flag only restricts the legal attestations that can be used by the signer, pyHanko can safely ignore it when signing.
>
>   On the other hand, since the validator is not aware of legal attestations either, it cannot validate signatures that make *legal_attestations* a mandatory constraint.
>
> - Since pyHanko does not define any named appearances, setting the *APPEARANCE_FILTER* flag and the *appearance* entry in the seed value dictionary will make pyHanko refuse to sign the document.
>
>   When validating, the situation is different: since pyHanko has no way of knowing whether the signer used the named appearance imposed by the seed value dictionary, it will simply emit a warning and continue validating the signature.

FILTER = 1

Makes the signature handler setting mandatory. PyHanko only supports `/Adobe.PPKLite`.

SUBFILTER = 2

See *subfilters*.

V = 4

See *sv_dict_version*.

REASONS = 8

See *reasons*.

LEGAL_ATTESTATION = 16

See *legal_attestations*.

ADD_REV_INFO = 32

See *add_rev_info*.

DIGEST_METHOD = 64

See `digest_method`.

LOCK_DOCUMENT = 128

See *lock_document*.

APPEARANCE_FILTER = 256

See *appearance*.

class pyhanko.sign.fields.**SigCertConstraints**(*flags: ~pyhanko.sign.fields.SigCertConstraintFlags = SigCertConstraintFlags.None*, *subjects: ~typing.Optional[~typing.List[~asn1crypto.x509.Certificate]] = None*, *subject_dn: ~typing.Optional[~asn1crypto.x509.Name] = None*, *issuers: ~typing.Optional[~typing.List[~asn1crypto.x509.Certificate]] = None*, *info_url: ~typing.Optional[str] = None*, *url_type: ~pyhanko.pdf_utils.generic.NameObject = '/Browser'*, *key_usage: ~typing.Optional[~typing.List[~pyhanko.sign.fields.SigCertKeyUsage]] = None*)

Bases: `object`

This part of the seed value dictionary allows the document author to set constraints on the signer's certificate.

See Table 235 in ISO 32000-1.

flags: *SigCertConstraintFlags* **= 0**

Enforcement flags. By default, all entries are optional.

subjects: Optional[List[Certificate]] = None

Explicit list of certificates that can be used to sign a signature field.

subject_dn: Optional[Name] = None

Certificate subject names that can be used to sign a signature field. Subject DN entries that are not mentioned are unconstrained.

issuers: Optional[List[Certificate]] = None

List of issuer certificates that the signer certificate can be issued by. Note that these issuers do not need to be the *direct* issuer of the signer's certificate; any descendant relationship will do.

info_url: Optional[str] = None

Informational URL that should be opened when an appropriate certificate cannot be found (if *url_type* is `/Browser`, that is).

Note: PyHanko ignores this value, but we include it for compatibility.

url_type: *NameObject* **= '/Browser'**

Handler that should be used to open *info_url*. `/Browser` is the only implementation-independent value.

key_usage: Optional[List[*SigCertKeyUsage*]] = None

Specify the key usage extensions that should (or should not) be present on the signer's certificate.

classmethod from_pdf_object(*pdf_dict*)

Read a PDF dictionary into a *SigCertConstraints* object.

Parameters
pdf_dict – A *DictionaryObject*.

Returns
A *SigCertConstraints* object.

as_pdf_object()

Render this *SigCertConstraints* object to a PDF dictionary.

Returns
A `DictionaryObject`.

`satisfied_by`(*signer: Certificate*, *validation_path: Optional[*ValidationPath*]*)

Evaluate whether a signing certificate satisfies the required constraints of this `SigCertConstraints` object.

Parameters

- `signer` – The candidate signer's certificate.
- `validation_path` – Validation path of the signer's certificate.

Raises
`UnacceptableSignerError` – Raised if the conditions are not met.

`class pyhanko.sign.fields.SigSeedValueSpec`(*flags: ~pyhanko.sign.fields.SigSeedValFlags = SigSeedValFlags.None*, *reasons: ~typing.Optional[~typing.List[str]] = None*, *timestamp_server_url: ~typing.Optional[str] = None*, *timestamp_required: bool = False*, *cert: ~typing.Optional[~pyhanko.sign.fields.SigCertConstraints] = None*, *subfilters: ~typing.Optional[~typing.List[~pyhanko.sign.fields.SigSeedSubFilter]] = None*, *digest_methods: ~typing.Optional[~typing.List[str]] = None*, *add_rev_info: ~typing.Optional[bool] = None*, *seed_signature_type: ~typing.Optional[~pyhanko.sign.fields.SeedSignatureType] = None*, *sv_dict_version: ~typing.Optional[~typing.Union[~pyhanko.sign.fields.SeedValueDictVersion, int]] = None*, *legal_attestations: ~typing.Optional[~typing.List[str]] = None*, *lock_document: ~typing.Optional[~pyhanko.sign.fields.SeedLockDocument] = None*, *appearance: ~typing.Optional[str] = None*)

Bases: `object`

Python representation of a PDF seed value dictionary.

`flags: SigSeedValFlags = 0`

Enforcement flags. By default, all entries are optional.

`reasons: Optional[List[str]] = None`

Acceptable reasons for signing.

`timestamp_server_url: Optional[str] = None`

RFC 3161 timestamp server endpoint suggestion.

`timestamp_required: bool = False`

Flags whether a timestamp is required. This flag is only meaningful if `timestamp_server_url` is specified.

`cert: Optional[SigCertConstraints] = None`

Constraints on the signer's certificate.

`subfilters: Optional[List[SigSeedSubFilter]] = None`

Acceptable `/SubFilter` values.

digest_methods: Optional[List[str]] = None

Acceptable digest methods.

add_rev_info: Optional[bool] = None

Indicates whether revocation information should be embedded.

Warning: This flag exclusively refers to the Adobe-style revocation information embedded within the CMS object that is written to the signature field. PAdES-style revocation information that is saved to the document security store (DSS) does *not* satisfy the requirement. Additionally, the standard mandates that `/SubFilter` be equal to `/adbe.pkcs7.detached` if this flag is `True`.

seed_signature_type: Optional[SeedSignatureType] = None

Specifies the type of signature that should occupy a signature field; this represents the `/MDP` entry in the seed value dictionary. See `SeedSignatureType` for details.

Caution: Since a certification-type signature is by definition the first signature applied to a document, compliance with this requirement cannot be cryptographically enforced.

sv_dict_version: Optional[Union[*SeedValueDictVersion*, int]] = None

Specifies the compliance level required of a seed value dictionary processor. If `None`, pyHanko will compute an appropriate value.

Note: You may also specify this value directly as an integer. This covers potential future versions of the standard that pyHanko does not support out of the box.

legal_attestations: Optional[List[str]] = None

Specifies the possible legal attestations that a certification signature occupying this signature field can supply. The corresponding flag in *`flags`* indicates whether this is a mandatory constraint.

Caution: Since *`legal_attestations`* is only relevant for certification signatures, compliance with this requirement cannot be reliably enforced. Regardless, since pyHanko's validator is also unaware of legal attestation settings, it will refuse to validate signatures where this seed value constitutes a mandatory constraint.

Additionally, since pyHanko does not support legal attestation specifications at all, it vacuously satisfies the requirements of this entry no matter what, and will therefore ignore it when signing.

lock_document: Optional[*SeedLockDocument*] = None

Tell the signer whether or not the document should be locked after signing this field; see *`SeedLockDocument`* for details.

The corresponding flag in *`flags`* indicates whether this constraint is mandatory.

appearance: Optional[str] = None

Specify a named appearance to use when generating the signature. The corresponding flag in *`flags`* indicates whether this constraint is mandatory.

> **Caution:** There is no standard registry of named appearances, so these constraints are not portable, and cannot be validated.
>
> PyHanko currently does not define any named appearances.

as_pdf_object()

Render this *SigSeedValueSpec* object to a PDF dictionary.

Returns
A *DictionaryObject*.

classmethod from_pdf_object(*pdf_dict*)

Read from a seed value dictionary.

Parameters
pdf_dict – A *DictionaryObject*.

Returns
A *SigSeedValueSpec* object.

build_timestamper()

Return a timestamper object based on the *timestamp_server_url* attribute of this *SigSeedValueSpec* object.

Returns
A `HTTPTimeStamper`.

class pyhanko.sign.fields.**SigCertConstraintFlags**(*value*)

Bases: `Flag`

Flags for the `/Ff` entry in the certificate seed value dictionary for a dictionary field. These mark which of the constraints are to be strictly enforced, as opposed to optional ones.

> **Warning:** While this enum records values for all flags, not all corresponding constraint types have been implemented yet.

SUBJECT = 1

See *SigCertConstraints.subjects*.

ISSUER = 2

See *SigCertConstraints.issuers*.

OID = 4

Currently not supported.

SUBJECT_DN = 8

See *SigCertConstraints.subject_dn*.

RESERVED = 16

Currently not supported (reserved).

KEY_USAGE = 32

See *SigCertConstraints.key_usage*.

URL = 64

See *SigCertConstraints.info_url*.

Note: As specified in the standard, this enforcement bit is supposed to be ignored by default. We include it for compatibility reasons.

UNSUPPORTED = 20

Flags for which the corresponding constraint is unsupported.

class pyhanko.sign.fields.**SigSeedSubFilter**(*value*)

Bases: Enum

Enum declaring all supported /SubFilter values.

ADOBE_PKCS7_DETACHED = '/adbe.pkcs7.detached'

PADES = '/ETSI.CAdES.detached'

ETSI_RFC3161 = '/ETSI.RFC3161'

class pyhanko.sign.fields.**SeedValueDictVersion**(*value*)

Bases: *OrderedEnum*

Specify the minimal compliance level for a seed value dictionary processor.

PDF_1_5 = 1

Require the reader to understand all keys defined in PDF 1.5.

PDF_1_7 = 2

Require the reader to understand all keys defined in PDF 1.7.

PDF_2_0 = 3

Require the reader to understand all keys defined in PDF 2.0.

class pyhanko.sign.fields.**SeedLockDocument**(*value*)

Bases: Enum

Provides a recommendation to the signer as to whether the document should be locked after signing. The corresponding flag in *SigSeedValueSpec.flags* determines whether this constraint is a required constraint.

LOCK = '/true'

Lock the document after signing.

DO_NOT_LOCK = '/false'

Lock the document after signing.

SIGNER_DISCRETION = '/auto'

Leave the decision up to the signer.

Note: This is functionally equivalent to not specifying any value.

class pyhanko.sign.fields.**SigCertKeyUsage**(*must_have: Optional[KeyUsage] = None*, *forbidden: Optional[KeyUsage] = None*)

Bases: object

Encodes the key usage bits that must (resp. must not) be active on the signer's certificate.

Note: See § 4.2.1.3 in **RFC 5280** and `KeyUsage` for more information on key usage extensions.

Note: The human-readable names of the key usage extensions are recorded in `camelCase` in **RFC 5280**, but this class uses the naming convention of `KeyUsage` in `asn1crypto`. The conversion is done by replacing `camelCase` with `snake_case`. For example, `nonRepudiation` becomes `non_repudiation`, and `digitalSignature` turns into `digital_signature`.

Note: This class is intended to closely replicate the definition of the KeyUsage entry Table 235 in ISO 32000-1. In particular, it does *not* provide a mechanism to deal with extended key usage extensions (cf. § 4.2.1.12 in **RFC 5280**).

Parameters

- **must_have** – The `KeyUsage` object encoding the key usage extensions that must be present on the signer's certificate.
- **forbidden** – The `KeyUsage` object encoding the key usage extensions that must *not* be present on the signer's certificate.

encode_to_sv_string()

Encode the key usage requirements in the format specified in the PDF specification.

Returns
A string.

classmethod **read_from_sv_string**(*ku_str*)

Parse a PDF KeyUsage string into an instance of *SigCertKeyUsage*. See Table 235 in ISO 32000-1.

Parameters
ku_str – A PDF KeyUsage string.

Returns
An instance of *SigCertKeyUsage*.

classmethod **from_sets**(*must_have: Optional[Set[str]] = None*, *forbidden: Optional[Set[str]] = None*)

Initialise a *SigCertKeyUsage* object from two sets.

Parameters

- **must_have** – The key usage extensions that must be present on the signer's certificate.
- **forbidden** – The key usage extensions that must *not* be present on the signer's certificate.

Returns
A *SigCertKeyUsage* object encoding these.

must_have_set() → Set[str]

Return the set of key usage extensions that must be present on the signer's certificate.

forbidden_set() → Set[str]

Return the set of key usage extensions that must not be present on the signer's certificate.

`class pyhanko.sign.fields.`**`MDPPerm`**(*value*)

Bases: *`OrderedEnum`*

Indicates a `/DocMDP` level.

Cf. Table 254 in ISO 32000-1.

`NO_CHANGES = 1`

No changes to the document are allowed.

> **Warning:** This does not apply to DSS updates and the addition of document time stamps.

`FILL_FORMS = 2`

Form filling & signing is allowed.

`ANNOTATE = 3`

Form filling, signing and commenting are allowed.

> **Warning:** Validating this `/DocMDP` level is not currently supported, but included in the list for completeness.

`class pyhanko.sign.fields.`**`FieldMDPAction`**(*value*)

Bases: `Enum`

Marker for the scope of a `/FieldMDP` policy.

`ALL = '/All'`

The policy locks all form fields.

`INCLUDE = '/Include'`

The policy locks all fields in the list (see *`FieldMDPSpec.fields`*).

`EXCLUDE = '/Exclude'`

The policy locks all fields except those specified in the list (see *`FieldMDPSpec.fields`*).

`class pyhanko.sign.fields.`**`FieldMDPSpec`**(*action: FieldMDPAction, fields: Optional[List[str]] = None*)

Bases: `object`

`/FieldMDP` policy description.

This class models both field lock dictionaries and `/FieldMDP` transformation parameters.

`action:` ***`FieldMDPAction`***

Indicates the scope of the policy.

`fields: Optional[List[str]] = None`

Indicates the fields subject to the policy, unless *`action`* is *`FieldMDPAction.ALL`*.

`as_pdf_object``()` → *DictionaryObject*

Render this `/FieldMDP` policy description as a PDF dictionary.

Returns

A *`DictionaryObject`*.

as_transform_params() → *DictionaryObject*

Render this `/FieldMDP` policy description as a PDF dictionary, ready for inclusion into the `/TransformParams` entry of a `/FieldMDP` dictionary associated with a signature object.

Returns
A `DictionaryObject`.

as_sig_field_lock() → *DictionaryObject*

Render this `/FieldMDP` policy description as a PDF dictionary, ready for inclusion into the `/Lock` dictionary of a signature field.

Returns
A `DictionaryObject`.

classmethod from_pdf_object(*pdf_dict*) → *FieldMDPSpec*

Read a PDF dictionary into a `FieldMDPSpec` object.

Parameters
pdf_dict – A `DictionaryObject`.

Returns
A `FieldMDPSpec` object.

is_locked(*field_name: str*) → bool

Adjudicate whether a field should be locked by the policy described by this `FieldMDPSpec` object.

Parameters
field_name – The name of a form field.

Returns
`True` if the field should be locked, `False` otherwise.

class pyhanko.sign.fields.**SignatureFormField**(*field_name*, ***, *box=None*, *include_on_page=None*, *combine_annotation=True*, *invis_settings: InvisSigSettings = InvisSigSettings(set_print_flag=True, set_hidden_flag=False, box_out_of_bounds=False)*, *visible_settings: VisibleSigSettings = VisibleSigSettings(rotate_with_page=True, scale_with_page_zoom=True, print_signature=True)*, *annot_flags=None*)

Bases: `DictionaryObject`

register_widget_annotation(*writer: BasePdfFileWriter*, *sig_field_ref*)

class pyhanko.sign.fields.**InvisSigSettings**(*set_print_flag: bool = True*, *set_hidden_flag: bool = False*, *box_out_of_bounds: bool = False*)

Bases: `object`

Invisible signature widget generation settings.

These settings exist because there is no real way of including an untagged invisible signature in a document that complies with the requirements of both PDF/A-2 (or -3) and PDF/UA-1.

Compatibility with PDF/A (the default) requires the print flag to be set. Compatibility with PDF/UA requires the hidden flag to be set (which is banned in PDF/A) or the box to be outside the crop box.

set_print_flag: bool = True

Set the print flag. Required in PDF/A.

set_hidden_flag: bool = False

Set the hidden flag. Required in PDF/UA.

box_out_of_bounds: bool = False

Put the box out of bounds (technically, this just makes the box zero-sized with large negative coordinates).

This is a hack to get around the fact that PDF/UA requires the hidden flag to be set on all in-bounds untagged annotations, and some validators consider [0, 0, 0, 0] to be an in-bounds rectangle if (0, 0) is a point that falls within the crop box.

class `pyhanko.sign.fields.`**VisibleSigSettings**(*rotate_with_page: bool = True*, *scale_with_page_zoom: bool = True*, *print_signature: bool = True*)

Bases: `object`

New in version 0.14.0.

Additional flags used when setting up visible signature widgets.

rotate_with_page: bool = True

Allow the signature widget to rotate with the page if rotation is applied (e.g. by way of the page's `/Rotate` entry). Default is `True`.

Note: If `False`, this will cause the `NoRotate` flag to be set.

scale_with_page_zoom: bool = True

Allow the signature widget to scale with the page's zoom level. Default is `True`.

Note: If `False`, this will cause the `NoZoom` flag to be set.

print_signature: bool = True

Render the signature when the document is printed. Default `True`.

`pyhanko.sign.fields.`**enumerate_sig_fields**(*handler: PdfHandler*, *filled_status=None*)

Enumerate signature fields.

Parameters

- **handler** – The *PdfHandler* to operate on.
- **filled_status** – Optional boolean. If `True` (resp. `False`) then all filled (resp. empty) fields are returned. If left `None` (the default), then all fields are returned.

Returns

A generator producing signature fields.

`pyhanko.sign.fields.`**append_signature_field**(*pdf_out: BasePdfFileWriter*, *sig_field_spec: SigFieldSpec*)

Append signature fields to a PDF file.

Parameters

- **pdf_out** – Incremental writer to house the objects.
- **sig_field_spec** – A *SigFieldSpec* object describing the signature field to add.

`pyhanko.sign.fields.`**ensure_sig_flags**(*writer: BasePdfFileWriter*, *lock_sig_flags: bool = True*)

Ensure the SigFlags setting is present in the AcroForm dictionary.

Parameters

- **writer** – A PDF writer.
- **lock_sig_flags** – Whether to flag the document as append-only.

`pyhanko.sign.fields.`**`prepare_sig_field`**(*sig_field_name*, *root*, *update_writer:* BasePdfFileWriter, *existing_fields_only=False*, ***kwargs*)

Returns a tuple of a boolean and a reference to a signature field. The boolean is `True` if the field was created, and `False` otherwise.

Danger: This function is internal API.

`pyhanko.sign.fields.`**`apply_sig_field_spec_properties`**(*pdf_out:* BasePdfFileWriter, *sig_field:* DictionaryObject, *sig_field_spec:* SigFieldSpec)

Internal function to apply field spec properties to a newly created field.

pyhanko.sign.general module

General tools related to Cryptographic Message Syntax (CMS) signatures, not necessarily to the extent implemented in the PDF specification.

CMS is defined in **RFC 5652**. To parse CMS messages, pyHanko relies heavily on asn1crypto.

`pyhanko.sign.general.`**`simple_cms_attribute`**(*attr_type*, *value*)

Convenience method to quickly construct a CMS attribute object with one value.

Parameters

- **attr_type** – The attribute type, as a string or OID.
- **value** – The value.

Returns

A `cms.CMSAttribute` object.

`pyhanko.sign.general.`**`find_cms_attribute`**(*attrs*, *name*)

Find and return CMS attribute values of a given type.

Note: This function will also check for duplicates, but not in the sense of multivalued attributes. In other words: multivalued attributes are allowed; listing the same attribute OID more than once is not.

Parameters

- **attrs** – The `cms.CMSAttributes` object.
- **name** – The attribute type as a string (as defined in `asn1crypto`).

Returns

The values associated with the requested type, if present.

Raises

- *`NonexistentAttributeError`* – Raised when no such type entry could be found in the `cms.CMSAttributes` object.
- *`CMSStructuralError`* – Raised if the given OID occurs more than once.

`pyhanko.sign.general.`**`find_unique_cms_attribute`**`(`*attrs*, *name*`)`

Find and return a unique CMS attribute value of a given type.

Parameters

- **`attrs`** – The `cms.CMSAttributes` object.
- **`name`** – The attribute type as a string (as defined in `asn1crypto`).

Returns

The value associated with the requested type, if present.

Raises

- *`NonexistentAttributeError`* – Raised when no such type entry could be found in the `cms.CMSAttributes` object.
- *`MultivaluedAttributeError`* – Raised when the attribute's cardinality is not 1.

`exception` `pyhanko.sign.general.`**`NonexistentAttributeError`**

Bases: `KeyError`

`exception` `pyhanko.sign.general.`**`MultivaluedAttributeError`**

Bases: `ValueError`

`exception` `pyhanko.sign.general.`**`SigningError`**`(`*msg: str*, **args*`)`

Bases: `ValueError`

Error encountered while signing a file.

`exception` `pyhanko.sign.general.`**`UnacceptableSignerError`**`(`*msg: str*, **args*`)`

Bases: *`SigningError`*

Error raised when a signer was judged unacceptable.

`class` `pyhanko.sign.general.`**`SignedDataCerts`**`(`*signer_cert: Certificate*, *other_certs: List[Certificate]*, *attribute_certs: List[AttributeCertificateV2]*`)`

Bases: `object`

Value type to describe certificates included in a CMS signed data payload.

`signer_cert: Certificate`

The certificate identified as the signer's certificate.

`other_certs: List[Certificate]`

Other (public-key) certificates included in the signed data object.

`attribute_certs: List[AttributeCertificateV2]`

Attribute certificates included in the signed data object.

`pyhanko.sign.general.`**`extract_signer_info`**`(`*signed_data: SignedData*`)` → SignerInfo

Extract the unique `SignerInfo` entry of a CMS signed data value, or throw a `ValueError`.

Parameters

`signed_data` – A CMS `SignedData` value.

Returns

A CMS `SignerInfo` value.

Raises

`ValueError` – If the number of `SignerInfo` values is not exactly one.

`pyhanko.sign.general.`**`extract_certificate_info`**`(`*signed_data: SignedData*`)` → *SignedDataCerts*

Extract and classify embedded certificates found in the `certificates` field of the signed data value.

Parameters
`signed_data` – A CMS `SignedData` value.

Returns
A *`SignedDataCerts`* object containing the embedded certificates.

`pyhanko.sign.general.`**`get_cms_hash_algo_for_mechanism`**`(`*mech: SignedDigestAlgorithm*`)` → str

Internal function that takes a `SignedDigestAlgorithm` instance and returns the name of the digest algorithm that has to be used to compute the `messageDigest` attribute.

Parameters
`mech` – A signature mechanism.

Returns
A digest algorithm name.

`pyhanko.sign.general.`**`get_pyca_cryptography_hash`**`(`*algorithm*`)` → HashAlgorithm

`pyhanko.sign.general.`**`get_pyca_cryptography_hash_for_signing`**`(`*algorithm*, *prehashed=False*`)` → Union[HashAlgorithm, Prehashed]

`pyhanko.sign.general.`**`optimal_pss_params`**`(`*cert: Certificate*, *digest_algorithm: str*`)` → RSASSAPSSParams

Figure out the optimal RSASSA-PSS parameters for a given certificate. The subject's public key must be an RSA key.

Parameters

- **`cert`** – An RSA X.509 certificate.
- **`digest_algorithm`** – The digest algorithm to use.

Returns
RSASSA-PSS parameters.

`pyhanko.sign.general.`**`process_pss_params`**`(`*params: RSASSAPSSParams*, *digest_algorithm*, *prehashed=False*`)`

Extract PSS padding settings and message digest from an `RSASSAPSSParams` value.

Internal API.

`pyhanko.sign.general.`**`as_signing_certificate`**`(`*cert: Certificate*`)` → SigningCertificate

Format an ASN.1 `SigningCertificate` object, where the certificate is identified by its SHA-1 digest.

Parameters
`cert` – An X.509 certificate.

Returns
A `tsp.SigningCertificate` object referring to the original certificate.

`pyhanko.sign.general.`**`as_signing_certificate_v2`**`(`*cert: Certificate*, *hash_algo='sha256'*`)` → SigningCertificateV2

Format an ASN.1 `SigningCertificateV2` value, where the certificate is identified by the hash algorithm specified.

Parameters

- **`cert`** – An X.509 certificate.
- **`hash_algo`** – Hash algorithm to use to digest the certificate. Default is SHA-256.

Returns
A `tsp.SigningCertificateV2` object referring to the original certificate.

`pyhanko.sign.general.`**`match_issuer_serial`**(*expected_issuer_serial: Union[IssuerAndSerialNumber, IssuerSerial]*, *cert: Certificate*) → bool

Match the issuer and serial number of an X.509 certificate against some expected identifier.

Parameters

- **`expected_issuer_serial`** – A certificate identifier, either `cms.IssuerAndSerialNumber` or `tsp.IssuerSerial`.
- **`cert`** – An `x509.Certificate`.

Returns
`True` if there's a match, `False` otherwise.

`pyhanko.sign.general.`**`check_ess_certid`**(*cert: Certificate*, *certid: Union[ESSCertID, ESSCertIDv2]*)

Match an `ESSCertID` value against a certificate.

Parameters

- **`cert`** – The certificate to match against.
- **`certid`** – The `ESSCertID` value.

Returns
`True` if the `ESSCertID` matches the certificate, `False` otherwise.

`exception` `pyhanko.sign.general.`**`CMSExtractionError`**(*failure_message*)

Bases: *`ValueErrorWithMessage`*

`pyhanko.sign.general.`**`byte_range_digest`**(*stream: IO*, *byte_range: Iterable[int]*, *md_algorithm: str*, *chunk_size=4096*) → Tuple[int, bytes]

Internal API to compute byte range digests. Potentially dangerous if used without due caution.

Parameters

- **`stream`** – Stream over which to compute the digest. Must support seeking and reading.
- **`byte_range`** – The byte range, as a list of (offset, length) pairs, flattened.
- **`md_algorithm`** – The message digest algorithm to use.
- **`chunk_size`** – The I/O chunk size to use.

Returns
A tuple of the total digested length, and the actual digest.

`exception` `pyhanko.sign.general.`**`ValueErrorWithMessage`**(*failure_message*)

Bases: `ValueError`

Value error with a failure message attribute that can be conveniently extracted, instead of having to rely on extracting exception args generically.

`exception` `pyhanko.sign.general.`**`CMSStructuralError`**(*failure_message*)

Bases: *`ValueErrorWithMessage`*

Structural error in a CMS object.

`pyhanko.sign.general.`**`load_cert_from_pemder`**(*cert_file*)

A convenience function to load a single PEM/DER-encoded certificate from a file.

Parameters
`cert_file` – A file name.

Returns
An `asn1crypto.x509.Certificate` object.

`pyhanko.sign.general.`**`load_certs_from_pemder`**(*cert_files*)

A convenience function to load PEM/DER-encoded certificates from files.

Parameters
`cert_files` – An iterable of file names.

Returns
A generator producing `asn1crypto.x509.Certificate` objects.

`pyhanko.sign.general.`**`load_certs_from_pemder_data`**(*cert_data_bytes: bytes*)

A convenience function to load PEM/DER-encoded certificates from binary data.

Parameters
`cert_data_bytes` – `bytes` object from which to extract certificates.

Returns
A generator producing `asn1crypto.x509.Certificate` objects.

`pyhanko.sign.general.`**`load_private_key_from_pemder`**(*key_file*, *passphrase: Optional[bytes]*) → PrivateKeyInfo

A convenience function to load PEM/DER-encoded keys from files.

Parameters

- `key_file` – File to read the key from.
- `passphrase` – Key passphrase.

Returns
A private key encoded as an unencrypted PKCS#8 PrivateKeyInfo object.

`pyhanko.sign.general.`**`load_private_key_from_pemder_data`**(*key_bytes: bytes*, *passphrase: Optional[bytes]*) → PrivateKeyInfo

A convenience function to load PEM/DER-encoded keys from binary data.

Parameters

- `key_bytes` – `bytes` object to read the key from.
- `passphrase` – Key passphrase.

Returns
A private key encoded as an unencrypted PKCS#8 PrivateKeyInfo object.

pyhanko.sign.pkcs11 module

This module provides PKCS#11 integration for pyHanko, by providing a wrapper for python-pkcs11 that can be seamlessly plugged into a `PdfSigner`.

`class pyhanko.sign.pkcs11.`**`PKCS11Signer`**(*pkcs11_session: Session*, *cert_label: Optional[str] = None*, *signing_cert: Optional[Certificate] = None*, *ca_chain=None*, *key_label: Optional[str] = None*, *prefer_pss=False*, *embed_roots=True*, *other_certs_to_pull=()*, *bulk_fetch=True*, *key_id: Optional[bytes] = None*, *cert_id: Optional[bytes] = None*, *use_raw_mechanism=False*)

Bases: *Signer*

Signer implementation for PKCS11 devices.

Parameters

- **pkcs11_session** – The PKCS11 session object to use.
- **cert_label** – The label of the certificate that will be used for signing, to be pulled from the PKCS#11 token.
- **cert_id** – ID of the certificate object that will be used for signing, to be pulled from the PKCS#11 token.
- **signing_cert** – The signer's certificate. If the signer's certificate is provided via this parameter, the `cert_label` and `cert_id` parameters will not be used to retrieve the signer's certificate.
- **ca_chain** – Set of other relevant certificates (as `asn1crypto.x509.Certificate` objects).
- **key_label** – The label of the key that will be used for signing. Defaults to the value of `cert_label` if left unspecified and `key_id` is also unspecified.

  Note: At least one of `key_id`, `key_label` and `cert_label` must be supplied.

- **key_id** – ID of the private key object (optional).
- **other_certs_to_pull** – List labels of other certificates to pull from the PKCS#11 device. Defaults to the empty tuple. If `None`, pull *all* certificates.
- **bulk_fetch** – Boolean indicating the fetching strategy. If `True`, fetch all certs and filter the unneeded ones. If `False`, fetch the requested certs one by one. Default value is `True`, unless `other_certs_to_pull` has one or fewer elements, in which case it is always treated as `False`.
- **use_raw_mechanism** – Use the 'raw' equivalent of the selected signature mechanism. This is useful when working with tokens that do not support a hash-then-sign mode of operation.

  Note: This functionality is only available for ECDSA at this time. Support for other signature schemes will be added on an as-needed basis.

property cert_registry: *CertificateStore*

Changed in version 0.18.0: Turned into a property instead of a class attribute.

Collection of certificates associated with this signer. Note that this is simply a bookkeeping tool; in particular it doesn't care about trust.

property signing_cert

Changed in version 0.14.0: Made optional (see note)

Changed in version 0.18.0: Turned into a property instead of a class attribute.

The certificate that will be used to create the signature.

Note: This is an optional field only to a limited extent. Subclasses may require it to be present, and not setting it at the beginning of the signing process implies that certain high-level convenience features will no longer work or be limited in function (e.g., automatic hash selection, appearance generation, revocation information collection, . . .).

However, making *signing_cert* optional enables certain signing workflows where the certificate of the signer is not known until the signature has actually been produced. This is most relevant in certain types of remote signing scenarios.

async async_sign_raw(*data: bytes*, *digest_algorithm: str*, *dry_run=False*) → bytes

Compute the raw cryptographic signature of the data provided, hashed using the digest algorithm provided.

Parameters

- **data** – Data to sign.
- **digest_algorithm** – Digest algorithm to use.

  Warning: If `signature_mechanism` also specifies a digest, they should match.

- **dry_run** – Do not actually create a signature, but merely output placeholder bytes that would suffice to contain an actual signature.

Returns
Signature bytes.

async ensure_objects_loaded()

Async method that, when awaited, ensures that objects (relevant certificates, key handles, . . .) are loaded.

This coroutine is guaranteed to be called & awaited in `sign_raw()`, but some property implementations may cause object loading to be triggered synchronously (for backwards compatibility reasons). This blocks the event loop the first time it happens.

To avoid this behaviour, asynchronous code should ideally perform *await signer.ensure_objects_loaded()* after instantiating the signer.

Note: The asynchronous context manager on *PKCS11SigningContext* takes care of that automatically.

pyhanko.sign.pkcs11.**open_pkcs11_session**(*lib_location: str*, *slot_no: Optional[int] = None*, *token_label: Optional[str] = None*, *token_criteria: Optional[TokenCriteria] = None*, *user_pin: Optional[Union[str, object]] = None*) → Session

Open a PKCS#11 session

Parameters

- **lib_location** – Path to the PKCS#11 module.
- **slot_no** – Slot number to use. If not specified, the first slot containing a token labelled `token_label` will be used.
- **token_label** – Deprecated since version 0.14.0: Use `token_criteria` instead.

  Label of the token to use. If `None`, there is no constraint.
- **token_criteria** – Criteria that the token should match.
- **user_pin** – User PIN to use, or `PROTECTED_AUTH`. If `None`, authentication is skipped.

> **Note:** Some PKCS#11 implementations do not require PIN when the token is opened, but will prompt for it out-of-band when signing. Whether `PROTECTED_AUTH` or `None` is used in this case depends on the implementation.

Returns
An open PKCS#11 session object.

`class pyhanko.sign.pkcs11.`**`PKCS11SigningContext`**(*config: PKCS11SignatureConfig*, *user_pin: Optional[str] = None*)

Bases: `object`

Context manager for PKCS#11 configurations.

`pyhanko.sign.pkcs11.`**`find_token`**(*slots: List[Slot]*, *slot_no: Optional[int] = None*, *token_criteria: Optional[TokenCriteria] = None*) → Optional[Token]

Internal helper method to find a token.

Parameters

- **`slots`** – The list of slots.
- **`slot_no`** – Slot number to use. If not specified, the first slot containing a token satisfying the criteria will be used
- **`token_criteria`** – Criteria the token must satisfy.

Returns
A PKCS#11 token object, or `None` if none was found.

`pyhanko.sign.pkcs11.`**`select_pkcs11_signing_params`**(*signature_mechanism: SignedDigestAlgorithm*, *digest_algorithm: str*, *use_raw_mechanism: bool*) → PKCS11SignatureOperationSpec

Internal helper function to set up a PKCS #11 signing operation.

Parameters

- **`signature_mechanism`** – The signature mechanism to use (as an ASN.1 value)
- **`digest_algorithm`** – The digest algorithm to use
- **`use_raw_mechanism`** – Whether to attempt to use the raw mechanism on pre-hashed data.

Returns

Module contents

3.1.2 Submodules

3.1.3 pyhanko.keys module

Utility module to load keys and certificates.

`pyhanko.keys.`**`load_cert_from_pemder`**(*cert_file*)

A convenience function to load a single PEM/DER-encoded certificate from a file.

Parameters
`cert_file` – A file name.

Returns
An `asn1crypto.x509.Certificate` object.

`pyhanko.keys.`**`load_certs_from_pemder`**`(`*cert_files*`)`

A convenience function to load PEM/DER-encoded certificates from files.

Parameters
`cert_files` – An iterable of file names.

Returns
A generator producing `asn1crypto.x509.Certificate` objects.

`pyhanko.keys.`**`load_certs_from_pemder_data`**`(`*cert_data_bytes: bytes*`)`

A convenience function to load PEM/DER-encoded certificates from binary data.

Parameters
`cert_data_bytes` – `bytes` object from which to extract certificates.

Returns
A generator producing `asn1crypto.x509.Certificate` objects.

`pyhanko.keys.`**`load_private_key_from_pemder`**`(`*key_file*, *passphrase: Optional[bytes]*`)` → PrivateKeyInfo

A convenience function to load PEM/DER-encoded keys from files.

Parameters

- **`key_file`** – File to read the key from.
- **`passphrase`** – Key passphrase.

Returns
A private key encoded as an unencrypted PKCS#8 PrivateKeyInfo object.

`pyhanko.keys.`**`load_private_key_from_pemder_data`**`(`*key_bytes: bytes*, *passphrase: Optional[bytes]*`)` → PrivateKeyInfo

A convenience function to load PEM/DER-encoded keys from binary data.

Parameters

- **`key_bytes`** – `bytes` object to read the key from.
- **`passphrase`** – Key passphrase.

Returns
A private key encoded as an unencrypted PKCS#8 PrivateKeyInfo object.

3.1.4 pyhanko.stamp module

Utilities for stamping PDF files.

Here 'stamping' loosely refers to adding small overlays (QR codes, text boxes, etc.) on top of already existing content in PDF files.

The code in this module is also used by the *`sign`* module to render signature appearances.

`class` `pyhanko.stamp.`**`AnnotAppearances`**`(`*normal: IndirectObject*, *rollover: Optional[IndirectObject] = None*, *down: Optional[IndirectObject] = None*`)`

Bases: `object`

Convenience abstraction to set up an appearance dictionary for a PDF annotation.

Annotations can have three appearance streams, which can be roughly characterised as follows:

- *normal*: the only required one, and the default one;
- *rollover*: used when mousing over the annotation;
- *down*: used when clicking the annotation.

These are given as references to form XObjects.

Note: This class only covers the simple case of an appearance dictionary for an annotation with only one appearance state.

See § 12.5.5 in ISO 32000-1 for further information.

`as_pdf_object()` → *DictionaryObject*

Convert the `AnnotationAppearances` instance to a PDF dictionary.

Returns

A *`DictionaryObject`* that can be plugged into the `/AP` entry of an annotation dictionary.

`class pyhanko.stamp.BaseStampStyle`(*border_width: int = 3, background: ~typing.Optional[~pyhanko.pdf_utils.content.PdfContent] = None, background_layout: ~pyhanko.pdf_utils.layout.SimpleBoxLayoutRule = SimpleBoxLayoutRule(x_align=<AxisAlignment.ALIGN_MID: 2>, y_align=<AxisAlignment.ALIGN_MID: 2>, margins=Margins(left=5, right=5, top=5, bottom=5), inner_content_scaling=<InnerScaling.SHRINK_TO_FIT: 4>), background_opacity: float = 0.6*)

Bases: *`ConfigurableMixin`*

Base class for stamp styles.

`border_width: int = 3`

Border width in user units (for the stamp, not the text box).

`background: Optional[PdfContent] = None`

`PdfContent` instance that will be used to render the stamp's background.

`background_layout: SimpleBoxLayoutRule = SimpleBoxLayoutRule(x_align=<AxisAlignment.ALIGN_MID: 2>, y_align=<AxisAlignment.ALIGN_MID: 2>, margins=Margins(left=5, right=5, top=5, bottom=5), inner_content_scaling=<InnerScaling.SHRINK_TO_FIT: 4>)`

Layout rule to render the background inside the stamp's bounding box. Only used if the background has a fully specified `PdfContent.box`.

Otherwise, the renderer will position the cursor at `(left_margin, bottom_margin)` and render the content as-is.

`background_opacity: float = 0.6`

Opacity value to render the background at. This should be a floating-point number between *0* and *1*.

`classmethod process_entries`(*config_dict*)

This implementation of *`process_entries()`* processes the *`background`* configuration value. This can either be a path to an image file, in which case it will be turned into an instance of `PdfImage`, or the special value `__stamp__`, which is an alias for *`STAMP_ART_CONTENT`*.

`create_stamp`(*writer:* BasePdfFileWriter, *box:* BoxConstraints, *text_params: dict*) → *BaseStamp*

class pyhanko.stamp.TextStampStyle(*border_width: int = 3, background: ~typing.Optional[~pyhanko.pdf_utils.content.PdfContent] = None, background_layout: ~pyhanko.pdf_utils.layout.SimpleBoxLayoutRule = SimpleBoxLayoutRule(x_align=<AxisAlignment.ALIGN_MID: 2>, y_align=<AxisAlignment.ALIGN_MID: 2>, margins=Margins(left=5, right=5, top=5, bottom=5), inner_content_scaling=<InnerScaling.SHRINK_TO_FIT: 4>), background_opacity: float = 0.6, text_box_style: ~pyhanko.pdf_utils.text.TextBoxStyle = TextBoxStyle(font=<pyhanko.pdf_utils.font.basic.SimpleFontEngineFactory object>, font_size=10, leading=None, border_width=0, box_layout_rule=None, vertical_text=False), inner_content_layout: ~typing.Optional[~pyhanko.pdf_utils.layout.SimpleBoxLayoutRule] = None, stamp_text: str = '%(ts)s', timestamp_format: str = '%Y-%m-%d %H:%M:%S %Z'*)

Bases: `BaseStampStyle`

Style for text-based stamps.

Roughly speaking, this stamp type renders some predefined (but parametrised) piece of text inside a text box, and possibly applies a background to it.

text_box_style: *TextBoxStyle* = TextBoxStyle(font=<pyhanko.pdf_utils.font.basic.SimpleFontEngineFactory object>, font_size=10, leading=None, border_width=0, box_layout_rule=None, vertical_text=False)

The text box style for the internal text box used.

inner_content_layout: Optional[*SimpleBoxLayoutRule*] = None

Rule determining the position and alignment of the inner text box within the stamp.

> **Warning:** This only affects the position of the box, not the alignment of the text within.

stamp_text: str = '%(ts)s'

Text template for the stamp. The template can contain an interpolation parameter `ts` that will be replaced by the stamping time.

Additional parameters may be added if necessary. Values for these must be passed to the `__init__()` method of the `TextStamp` class in the `text_params` argument.

timestamp_format: str = '%Y-%m-%d %H:%M:%S %Z'

Datetime format used to render the timestamp.

create_stamp(*writer:* BasePdfFileWriter, *box:* BoxConstraints, *text_params: dict*) → *TextStamp*

class pyhanko.stamp.**QRStampStyle**(*border_width: int = 3*, *background: ~typing.Optional[~pyhanko.pdf_utils.content.PdfContent] = None*, *background_layout: ~pyhanko.pdf_utils.layout.SimpleBoxLayoutRule = SimpleBoxLayoutRule(x_align=<AxisAlignment.ALIGN_MID: 2>, y_align=<AxisAlignment.ALIGN_MID: 2>, margins=Margins(left=5, right=5, top=5, bottom=5), inner_content_scaling=<InnerScaling.SHRINK_TO_FIT: 4>)*, *background_opacity: float = 0.6*, *text_box_style: ~pyhanko.pdf_utils.text.TextBoxStyle = TextBoxStyle(font=<pyhanko.pdf_utils.font.basic.SimpleFontEngineFactory object>, font_size=10, leading=None, border_width=0, box_layout_rule=None, vertical_text=False)*, *inner_content_layout: ~typing.Optional[~pyhanko.pdf_utils.layout.SimpleBoxLayoutRule] = None*, *stamp_text: str = 'Digital version available at\nthis url: %(url)s\nTimestamp: %(ts)s'*, *timestamp_format: str = '%Y-%m-%d %H:%M:%S %Z'*, *innsep: int = 3*, *qr_inner_size: ~typing.Optional[int] = None*, *qr_position: ~pyhanko.stamp.QRPosition = QRPosition.LEFT_OF_TEXT*, *qr_inner_content: ~typing.Optional[~pyhanko.pdf_utils.content.PdfContent] = None*)

Bases: `TextStampStyle`

Style for text-based stamps together with a QR code.

This is exactly the same as a text stamp, except that the text box is rendered with a QR code to the left of it.

innsep: int = 3

Inner separation inside the stamp.

stamp_text: str = 'Digital version available at\nthis url: %(url)s\nTimestamp: %(ts)s'

Text template for the stamp. The description of `TextStampStyle.stamp_text` still applies, but an additional default interpolation parameter `url` is available. This parameter will be replaced with the URL that the QR code points to.

qr_inner_size: Optional[int] = None

Size of the QR code in the inner layout. By default, this is in user units, but if the stamp has a fully defined bounding box, it may be rescaled depending on `inner_content_layout`.

If unspecified, a reasonable default will be used.

qr_position: QRPosition = SimpleBoxLayoutRule(x_align=<AxisAlignment.ALIGN_MIN: 1>, y_align=<AxisAlignment.ALIGN_MID: 2>, margins=Margins(left=0, right=0, top=0, bottom=0), inner_content_scaling=<InnerScaling.SHRINK_TO_FIT: 4>)

Position of the QR code relative to the text box.

qr_inner_content: Optional[PdfContent] = None

Inner graphics content to be included in the QR code (experimental).

classmethod process_entries(*config_dict*)

This implementation of `process_entries()` processes the `background` configuration value. This can either be a path to an image file, in which case it will be turned into an instance of `PdfImage`, or the special value `__stamp__`, which is an alias for `STAMP_ART_CONTENT`.

create_stamp(*writer:* BasePdfFileWriter, *box:* BoxConstraints, *text_params: dict*) → *QRStamp*

class pyhanko.stamp.StaticStampStyle(*border_width: int = 3*, *background: ~typing.Optional[~pyhanko.pdf_utils.content.PdfContent] = None*, *background_layout: ~pyhanko.pdf_utils.layout.SimpleBoxLayoutRule = SimpleBoxLayoutRule(x_align=<AxisAlignment.ALIGN_MID: 2>, y_align=<AxisAlignment.ALIGN_MID: 2>, margins=Margins(left=5, right=5, top=5, bottom=5), inner_content_scaling=<InnerScaling.SHRINK_TO_FIT: 4>)*, *background_opacity: float = 1.0*)

Bases: `BaseStampStyle`

Stamp style that does not include any custom parts; it only renders the background.

background_opacity: float = 1.0

Opacity value to render the background at. This should be a floating-point number between *0* and *1*.

classmethod from_pdf_file(*file_name*, *page_ix=0*, ***kwargs*) → *StaticStampStyle*

Create a `StaticStampStyle` from a page from an external PDF document. This is a convenience wrapper around `ImportedPdfContent`.

The remaining keyword arguments are passed to `StaticStampStyle`'s init method.

Parameters

- **file_name** – File name of the external PDF document.
- **page_ix** – Page index to import. The default is `0`, i.e. the first page.

create_stamp(*writer: BasePdfFileWriter*, *box: BoxConstraints*, *text_params: dict*) → *StaticContentStamp*

class pyhanko.stamp.QRPosition(*value*)

Bases: `Enum`

QR positioning constants, with the corresponding default content layout rule.

LEFT_OF_TEXT = SimpleBoxLayoutRule(x_align=<AxisAlignment.ALIGN_MIN: 1>, y_align=<AxisAlignment.ALIGN_MID: 2>, margins=Margins(left=0, right=0, top=0, bottom=0), inner_content_scaling=<InnerScaling.SHRINK_TO_FIT: 4>)

RIGHT_OF_TEXT = SimpleBoxLayoutRule(x_align=<AxisAlignment.ALIGN_MAX: 3>, y_align=<AxisAlignment.ALIGN_MID: 2>, margins=Margins(left=0, right=0, top=0, bottom=0), inner_content_scaling=<InnerScaling.SHRINK_TO_FIT: 4>)

ABOVE_TEXT = SimpleBoxLayoutRule(x_align=<AxisAlignment.ALIGN_MID: 2>, y_align=<AxisAlignment.ALIGN_MAX: 3>, margins=Margins(left=0, right=0, top=0, bottom=0), inner_content_scaling=<InnerScaling.SHRINK_TO_FIT: 4>)

BELOW_TEXT = SimpleBoxLayoutRule(x_align=<AxisAlignment.ALIGN_MID: 2>, y_align=<AxisAlignment.ALIGN_MIN: 1>, margins=Margins(left=0, right=0, top=0, bottom=0), inner_content_scaling=<InnerScaling.SHRINK_TO_FIT: 4>)

property horizontal_flow

classmethod from_config(*config_str*) → *QRPosition*

Convert from a configuration string.

Parameters

config_str – A string: 'left', 'right', 'top', 'bottom'

Returns
An `QRPosition` value.

Raises
`ConfigurationError` – on unexpected string inputs.

`class pyhanko.stamp.`**`BaseStamp`**(*writer:* BasePdfFileWriter, *style*, *box: Optional[*BoxConstraints*] = None*)

Bases: `PdfContent`

`render`()

Compile the content to graphics operators.

`register`() → *IndirectObject*

Register the stamp with the writer coupled to this instance, and cache the returned reference.

This works by calling `PdfContent.as_form_xobject()`.

Returns
An indirect reference to the form XObject containing the stamp.

`apply`(*dest_page: int*, *x: int*, *y: int*)

Apply a stamp to a particular page in the PDF writer attached to this `BaseStamp` instance.

Parameters

- **`dest_page`** – Index of the page to which the stamp is to be applied (starting at *0*).
- **`x`** – Horizontal position of the stamp's lower left corner on the page.
- **`y`** – Vertical position of the stamp's lower left corner on the page.

Returns
A reference to the affected page object, together with a `(width, height)` tuple describing the dimensions of the stamp.

`as_appearances`() → *AnnotAppearances*

Turn this stamp into an appearance dictionary for an annotation (or a form field widget), after rendering it. Only the normal appearance will be defined.

Returns
An instance of `AnnotAppearances`.

`class pyhanko.stamp.`**`TextStamp`**(*writer:* BasePdfFileWriter, *style*, *text_params=None*, *box: Optional[*BoxConstraints*] = None*)

Bases: `BaseStamp`

Class that renders a text stamp as specified by an instance of `TextStampStyle`.

`get_default_text_params`()

Compute values for the default string interpolation parameters to be applied to the template string specified in the stamp style. This method does not take into account the `text_params` init parameter yet.

Returns
A dictionary containing the parameters and their values.

`class pyhanko.stamp.`**`QRStamp`**(*writer:* BasePdfFileWriter, *url: str*, *style:* QRStampStyle, *text_params=None*, *box: Optional[*BoxConstraints*] = None*)

Bases: `TextStamp`

`get_default_text_params()`

Compute values for the default string interpolation parameters to be applied to the template string specified in the stamp style. This method does not take into account the `text_params` init parameter yet.

Returns
A dictionary containing the parameters and their values.

`apply`(*dest_page*, *x*, *y*)

Apply a stamp to a particular page in the PDF writer attached to this `BaseStamp` instance.

Parameters

- **`dest_page`** – Index of the page to which the stamp is to be applied (starting at *0*).
- **`x`** – Horizontal position of the stamp's lower left corner on the page.
- **`y`** – Vertical position of the stamp's lower left corner on the page.

Returns
A reference to the affected page object, together with a `(width, height)` tuple describing the dimensions of the stamp.

`class pyhanko.stamp.StaticContentStamp`(*writer:* BasePdfFileWriter, *style:* StaticStampStyle, *box:* BoxConstraints)

Bases: `BaseStamp`

Class representing stamps with static content.

`pyhanko.stamp.text_stamp_file`(*input_name: str*, *output_name: str*, *style:* TextStampStyle, *dest_page: int*, *x: int*, *y: int*, *text_params=None*)

Add a text stamp to a file.

Parameters

- **`input_name`** – Path to the input file.
- **`output_name`** – Path to the output file.
- **`style`** – Text stamp style to use.
- **`dest_page`** – Index of the page to which the stamp is to be applied (starting at *0*).
- **`x`** – Horizontal position of the stamp's lower left corner on the page.
- **`y`** – Vertical position of the stamp's lower left corner on the page.
- **`text_params`** – Additional parameters for text template interpolation.

`pyhanko.stamp.qr_stamp_file`(*input_name: str*, *output_name: str*, *style:* QRStampStyle, *dest_page: int*, *x: int*, *y: int*, *url: str*, *text_params=None*)

Add a QR stamp to a file.

Parameters

- **`input_name`** – Path to the input file.
- **`output_name`** – Path to the output file.
- **`style`** – QR stamp style to use.
- **`dest_page`** – Index of the page to which the stamp is to be applied (starting at *0*).
- **`x`** – Horizontal position of the stamp's lower left corner on the page.
- **`y`** – Vertical position of the stamp's lower left corner on the page.

- **url** – URL for the QR code to point to.
- **text_params** – Additional parameters for text template interpolation.

`pyhanko.stamp.`**`STAMP_ART_CONTENT = <pyhanko.pdf_utils.content.RawContent object>`**

Hardcoded stamp background that will render a stylised image of a stamp using PDF graphics operators (see below).

3.1.5 pyhanko.version module

3.2 pyhanko_certvalidator package

3.2.1 Subpackages

pyhanko_certvalidator.fetchers package

Subpackages

pyhanko_certvalidator.fetchers.aiohttp_fetchers package

Submodules

pyhanko_certvalidator.fetchers.aiohttp_fetchers.cert_fetch_client module

class `pyhanko_certvalidator.fetchers.aiohttp_fetchers.cert_fetch_client.`**`AIOHttpCertificateFetcher`**(*session Union[* Lazy-Ses-sion*]*, *user_a per_re per-mit_pe*

Bases: *CertificateFetcher*, *AIOHttpMixin*

async fetch_certs(*url*, *url_origin_type*)

Fetch one or more certificates from a URL.

Parameters

- **url** – URL to fetch.
- **url_origin_type** – Parameter indicating where the URL came from (e.g. 'CRL'), for error reporting purposes.

Raises

CertificateFetchError - when a network I/O or decoding error occurs

Returns

An iterable of asn1crypto.x509.Certificate objects.

fetch_cert_issuers(*cert: Union[Certificate, AttributeCertificateV2]*)

Fetches certificates from the authority information access extension of a certificate.

Parameters
cert – A certificate

Raises
CertificateFetchError - when a network I/O or decoding error occurs

Returns
An asynchronous generator yielding asn1crypto.x509.Certificate objects that were fetched.

fetch_crl_issuers(*certificate_list*)

Fetches certificates from the authority information access extension of an asn1crypto.crl.CertificateList.

Parameters
certificate_list – An asn1crypto.crl.CertificateList object

Raises
CertificateFetchError - when a network I/O or decoding error occurs

Returns
An asynchronous generator yielding asn1crypto.x509.Certificate objects that were fetched.

fetched_certs() → Iterable[Certificate]

Return all certificates retrieved by this certificate fetcher.

pyhanko_certvalidator.fetchers.aiohttp_fetchers.crl_client module

class pyhanko_certvalidator.fetchers.aiohttp_fetchers.crl_client.**AIOHttpCRLFetcher**(*session: Union[ClientSession, LazySession], user_agent=None, per_request_timeout=10*)

Bases: *CRLFetcher*, *AIOHttpMixin*

async fetch(*cert: Union[Certificate, AttributeCertificateV2], *, use_deltas=True*)

Fetches the CRLs for a certificate.

Parameters

- **cert** – An asn1crypto.x509.Certificate object to get the CRL for
- **use_deltas** – A boolean indicating if delta CRLs should be fetched

Raises
CRLFetchError - when a network/IO error or decoding error occurs

Returns
An iterable of CRLs fetched.

fetched_crls() → Iterable[CertificateList]

Return all CRLs fetched by this CRL fetcher.

fetched_crls_for_cert(*cert*) → Iterable[CertificateList]

Return all relevant fetched CRLs for the given certificate

Parameters
`cert` – A certificate.

Returns
An iterable of CRLs

Raises
`KeyError` – if no fetch operations have been performed for this certificate

pyhanko_certvalidator.fetchers.aiohttp_fetchers.ocsp_client module

class pyhanko_certvalidator.fetchers.aiohttp_fetchers.ocsp_client.**AIOHttpOCSPFetcher**(*session: Union[ClientSession, LazySession], user_agent=None, per_request_timeout=1*

certid_hash_algo='sha1', request_nonces=True)

Bases: *OCSPFetcher*, *AIOHttpMixin*

async **fetch**(*cert: Union[Certificate, AttributeCertificateV2], authority: Authority*) → OCSPResponse

Fetch an OCSP response for a certificate.

Parameters

- **cert** – The certificate for which an OCSP response has to be fetched.
- **authority** – The issuing authority.

Raises
OCSPFetchError - Raised if an OCSP response could not be obtained.

Returns
An OCSP response.

fetched_responses() → Iterable[OCSPResponse]

Return all responses fetched by this OCSP fetcher.

fetched_responses_for_cert(*cert: Certificate*) → Iterable[OCSPResponse]

Return all responses fetched by this OCSP fetcher that are relevant to determine the revocation status of the given certificate.

pyhanko_certvalidator.fetchers.aiohttp_fetchers.util module

class pyhanko_certvalidator.fetchers.aiohttp_fetchers.util.**LazySession**

Bases: object

async **get_session**()

async **close**()

class pyhanko_certvalidator.fetchers.aiohttp_fetchers.util.**AIOHttpMixin**(*session: Union[ClientSession, LazySession], user_agent=None, per_request_timeout=10*)

Bases: `object`

async **get_session**() → ClientSession

get_results()

get_results_for_tag(*tag*)

Module contents

class pyhanko_certvalidator.fetchers.aiohttp_fetchers.**AIOHttpFetcherBackend**(*session: Optional[ClientSession] = None, per_request_timeout=10*)

Bases: *FetcherBackend*

get_fetchers() → *Fetchers*

Set up fetchers synchronously.

Note: This is a synchronous method

async **close**()

Clean up the resources associated with this fetcher backend, asynchronously.

pyhanko_certvalidator.fetchers.requests_fetchers package

Submodules

pyhanko_certvalidator.fetchers.requests_fetchers.cert_fetch_client module

class pyhanko_certvalidator.fetchers.requests_fetchers.cert_fetch_client.**RequestsCertificateFetcher**(*user per_ per- mit_*

Bases: *CertificateFetcher*, *RequestsFetcherMixin*

Implementation of async CertificateFetcher API using requests, for backwards compatibility. This class does not require resource management.

async **fetch_certs**(*url*, *url_origin_type*)

Fetch one or more certificates from a URL.

Parameters

- **url** – URL to fetch.
- **url_origin_type** – Parameter indicating where the URL came from (e.g. 'CRL'), for error reporting purposes.

Raises
CertificateFetchError - when a network I/O or decoding error occurs

Returns
An iterable of asn1crypto.x509.Certificate objects.

fetch_cert_issuers(*cert: Union[Certificate, AttributeCertificateV2]*)

Fetches certificates from the authority information access extension of a certificate.

Parameters
cert – A certificate

Raises
CertificateFetchError - when a network I/O or decoding error occurs

Returns
An asynchronous generator yielding asn1crypto.x509.Certificate objects that were fetched.

fetch_crl_issuers(*certificate_list*)

Fetches certificates from the authority information access extension of an asn1crypto.crl.CertificateList.

Parameters
certificate_list – An asn1crypto.crl.CertificateList object

Raises
CertificateFetchError - when a network I/O or decoding error occurs

Returns
An asynchronous generator yielding asn1crypto.x509.Certificate objects that were fetched.

fetched_certs() → Iterable[Certificate]

Return all certificates retrieved by this certificate fetcher.

pyhanko_certvalidator.fetchers.requests_fetchers.crl_client module

class pyhanko_certvalidator.fetchers.requests_fetchers.crl_client.**RequestsCRLFetcher**(**args*, ***kwargs*)

Bases: *CRLFetcher*, *RequestsFetcherMixin*

async **fetch**(*cert: Union[Certificate, AttributeCertificateV2]*, ***, *use_deltas=True*)

Fetches the CRLs for a certificate.

Parameters

- **cert** – An asn1crypto.x509.Certificate object to get the CRL for
- **use_deltas** – A boolean indicating if delta CRLs should be fetched

Raises
CRLFetchError - when a network/IO error or decoding error occurs

Returns
An iterable of CRLs fetched.

fetched_crls() → Iterable[CertificateList]

Return all CRLs fetched by this CRL fetcher.

fetched_crls_for_cert(*cert*) → Iterable[CertificateList]

Return all relevant fetched CRLs for the given certificate

Parameters
`cert` – A certificate.

Returns
An iterable of CRLs

Raises
`KeyError` – if no fetch operations have been performed for this certificate

pyhanko_certvalidator.fetchers.requests_fetchers.ocsp_client module

`class pyhanko_certvalidator.fetchers.requests_fetchers.ocsp_client.`**`RequestsOCSPFetcher`**`(`*user_agent=None, per_request_timeout= cer- tid_hash_algo='sha1 re- quest_nonces=True*`)`

Bases: *`OCSPFetcher`*, *`RequestsFetcherMixin`*

`async fetch``(`*cert: Union[Certificate, AttributeCertificateV2], authority:* Authority`)` → OCSPResponse

Fetch an OCSP response for a certificate.

Parameters

- **`cert`** – The certificate for which an OCSP response has to be fetched.
- **`authority`** – The issuing authority.

Raises
OCSPFetchError - Raised if an OCSP response could not be obtained.

Returns
An OCSP response.

`fetched_responses``()` → Iterable[OCSPResponse]

Return all responses fetched by this OCSP fetcher.

`fetched_responses_for_cert``(`*cert: Union[Certificate, AttributeCertificateV2]*`)` → Iterable[OCSPResponse]

Return all responses fetched by this OCSP fetcher that are relevant to determine the revocation status of the given certificate.

pyhanko_certvalidator.fetchers.requests_fetchers.util module

`class pyhanko_certvalidator.fetchers.requests_fetchers.util.`**`RequestsFetcherMixin`**`(`*user_agent=None, per_request_timeout=10*`)`

Bases: `object`

`get_results``()`

`get_results_for_tag``(`*tag*`)`

Module contents

Fetcher implementation using the `requests` library for backwards compatibility. This fetcher backend doesn't take advantage of asyncio, but has the advantage of not requiring any resource management on the caller's part.

`class pyhanko_certvalidator.fetchers.requests_fetchers.`**`RequestsFetcherBackend`**(*per_request_timeout=10*)

Bases: `FetcherBackend`

`get_fetchers``()` → *Fetchers*

Set up fetchers synchronously.

Note: This is a synchronous method

`async` **`close`**`()`

Clean up the resources associated with this fetcher backend, asynchronously.

Submodules

pyhanko_certvalidator.fetchers.api module

Asynchronous API for fetching OCSP responses, CRLs and certificates.

`class pyhanko_certvalidator.fetchers.api.`**`OCSPFetcher`**

Bases: `ABC`

Utility interface to fetch and cache OCSP responses.

`async` **`fetch`**(*cert: Union[Certificate, AttributeCertificateV2]*, *authority:* Authority) → OCSPResponse

Fetch an OCSP response for a certificate.

Parameters

- **`cert`** – The certificate for which an OCSP response has to be fetched.
- **`authority`** – The issuing authority.

Raises

OCSPFetchError - Raised if an OCSP response could not be obtained.

Returns

An OCSP response.

`fetched_responses``()` → Iterable[OCSPResponse]

Return all responses fetched by this OCSP fetcher.

`fetched_responses_for_cert`(*cert: Union[Certificate, AttributeCertificateV2]*) → Iterable[OCSPResponse]

Return all responses fetched by this OCSP fetcher that are relevant to determine the revocation status of the given certificate.

`class pyhanko_certvalidator.fetchers.api.`**`CRLFetcher`**

Bases: `ABC`

Utility interface to fetch and cache CRLs.

async **fetch**(*cert: Union[Certificate, AttributeCertificateV2]*, ***, *use_deltas=None*) → Iterable[CertificateList]

Fetches the CRLs for a certificate.

Parameters

- **cert** – An asn1crypto.x509.Certificate object to get the CRL for
- **use_deltas** – A boolean indicating if delta CRLs should be fetched

Raises
CRLFetchError - when a network/IO error or decoding error occurs

Returns
An iterable of CRLs fetched.

fetched_crls() → Iterable[CertificateList]

Return all CRLs fetched by this CRL fetcher.

fetched_crls_for_cert(*cert: Union[Certificate, AttributeCertificateV2]*) → Iterable[CertificateList]

Return all relevant fetched CRLs for the given certificate

Parameters
cert – A certificate.

Returns
An iterable of CRLs

Raises
KeyError – if no fetch operations have been performed for this certificate

class pyhanko_certvalidator.fetchers.api.**CertificateFetcher**

Bases: ABC

Utility interface to fetch and cache certificates.

fetch_cert_issuers(*cert: Union[Certificate, AttributeCertificateV2]*) → AsyncGenerator[Certificate, None]

Fetches certificates from the authority information access extension of a certificate.

Parameters
cert – A certificate

Raises
CertificateFetchError - when a network I/O or decoding error occurs

Returns
An asynchronous generator yielding asn1crypto.x509.Certificate objects that were fetched.

fetch_crl_issuers(*certificate_list*) → AsyncGenerator[Certificate, None]

Fetches certificates from the authority information access extension of an asn1crypto.crl.CertificateList.

Parameters
certificate_list – An asn1crypto.crl.CertificateList object

Raises
CertificateFetchError - when a network I/O or decoding error occurs

Returns
An asynchronous generator yielding asn1crypto.x509.Certificate objects that were fetched.

fetched_certs() → Iterable[Certificate]

Return all certificates retrieved by this certificate fetcher.

class pyhanko_certvalidator.fetchers.api.**Fetchers**(*ocsp_fetcher:* OCSPFetcher, *crl_fetcher:* CRLFetcher, *cert_fetcher:* CertificateFetcher)

Bases: `object`

Models a collection of fetchers to be used by a validation context.

The intention is that these can share resources (like a connection pool) in a unified, controlled manner. See also `FetcherBackend`.

ocsp_fetcher: *OCSPFetcher*

crl_fetcher: *CRLFetcher*

cert_fetcher: *CertificateFetcher*

class pyhanko_certvalidator.fetchers.api.**FetcherBackend**

Bases: `ABC`

Generic, bare-bones interface to help abstract away instantiation logic for fetcher implementations.

Intended to operate as an asynchronous context manager, with *async with backend_obj as fetchers: …* putting the resulting `Fetchers` object in to the variable named *fetchers*.

Note: The initialisation part of the API is necessarily synchronous, for backwards compatibility with the old `ValidationContext` API. If you need asynchronous resource management, handle it elsewhere, or use some form of lazy resource provisioning.

Alternatively, you can pass `Fetchers` objects to the validation context yourself, and forgo use of the `FetcherBackend` API altogether.

get_fetchers() → *Fetchers*

Set up fetchers synchronously.

Note: This is a synchronous method

async **close**()

Clean up the resources associated with this fetcher backend, asynchronously.

pyhanko_certvalidator.fetchers.common_utils module

Internal backend-agnostic utilities to help process fetched certificates, CRLs and OCSP responses.

pyhanko_certvalidator.fetchers.common_utils.**unpack_cert_content**(*response_data: bytes*, *content_type: Optional[str]*, *url: str*, *permit_pem: bool*)

pyhanko_certvalidator.fetchers.common_utils.**format_ocsp_request**(*cert: Certificate*, *authority:* Authority, ***, *certid_hash_algo: str*, *request_nonces: bool*) `pyhanko_certvalidator.fetchers.common_utils.`**`process_ocsp_response_data`**`(`*response_data: bytes, *, ocsp_request: OCSPRequest, ocsp_url: str*`)`

`async` `pyhanko_certvalidator.fetchers.common_utils.`**`queue_fetch_task`**`(`*results: Dict[T, Union[R, Exception]], running_jobs: Dict[T, Event], tag: T, async_fun: Callable[[], Awaitable[R]]*`)` → Union[R, Exception]

`async` `pyhanko_certvalidator.fetchers.common_utils.`**`crl_job_results_as_completed`**`(`*jobs*`)`

`async` `pyhanko_certvalidator.fetchers.common_utils.`**`ocsp_job_get_earliest`**`(`*jobs*`)`

`async` `pyhanko_certvalidator.fetchers.common_utils.`**`complete_certificate_fetch_jobs`**`(`*fetch_jobs*`)`

`pyhanko_certvalidator.fetchers.common_utils.`**`gather_aia_issuer_urls`**`(`*cert: Union[Certificate, AttributeCertificateV2]*`)`

Module contents

`class` `pyhanko_certvalidator.fetchers.`**`Fetchers`**`(`*ocsp_fetcher:* OCSPFetcher, *crl_fetcher:* CRLFetcher, *cert_fetcher:* CertificateFetcher`)`

Bases: `object`

Models a collection of fetchers to be used by a validation context.

The intention is that these can share resources (like a connection pool) in a unified, controlled manner. See also *`FetcherBackend`*.

`ocsp_fetcher:` *`OCSPFetcher`*

`crl_fetcher:` *`CRLFetcher`*

`cert_fetcher:` *`CertificateFetcher`*

`class` `pyhanko_certvalidator.fetchers.`**`FetcherBackend`**

Bases: `ABC`

Generic, bare-bones interface to help abstract away instantiation logic for fetcher implementations.

Intended to operate as an asynchronous context manager, with *async with backend_obj as fetchers: …* putting the resulting *`Fetchers`* object in to the variable named *fetchers*.

Note: The initialisation part of the API is necessarily synchronous, for backwards compatibility with the old `ValidationContext` API. If you need asynchronous resource management, handle it elsewhere, or use some form of lazy resource provisioning.

Alternatively, you can pass *`Fetchers`* objects to the validation context yourself, and forgo use of the *`FetcherBackend`* API altogether.

`get_fetchers()` → *Fetchers*

Set up fetchers synchronously.

Note: This is a synchronous method

`async close()`

Clean up the resources associated with this fetcher backend, asynchronously.

`class pyhanko_certvalidator.fetchers.`**`OCSPFetcher`**

Bases: `ABC`

Utility interface to fetch and cache OCSP responses.

`async fetch`(*cert: Union[Certificate, AttributeCertificateV2]*, *authority:* Authority) → OCSPResponse

Fetch an OCSP response for a certificate.

Parameters

- **`cert`** – The certificate for which an OCSP response has to be fetched.
- **`authority`** – The issuing authority.

Raises

OCSPFetchError - Raised if an OCSP response could not be obtained.

Returns

An OCSP response.

`fetched_responses()` → Iterable[OCSPResponse]

Return all responses fetched by this OCSP fetcher.

`fetched_responses_for_cert`(*cert: Union[Certificate, AttributeCertificateV2]*) → Iterable[OCSPResponse]

Return all responses fetched by this OCSP fetcher that are relevant to determine the revocation status of the given certificate.

`class pyhanko_certvalidator.fetchers.`**`CRLFetcher`**

Bases: `ABC`

Utility interface to fetch and cache CRLs.

`async fetch`(*cert: Union[Certificate, AttributeCertificateV2]*, ***, *use_deltas=None*) → Iterable[CertificateList]

Fetches the CRLs for a certificate.

Parameters

- **`cert`** – An asn1crypto.x509.Certificate object to get the CRL for
- **`use_deltas`** – A boolean indicating if delta CRLs should be fetched

Raises

CRLFetchError - when a network/IO error or decoding error occurs

Returns

An iterable of CRLs fetched.

`fetched_crls()` → Iterable[CertificateList]

Return all CRLs fetched by this CRL fetcher.

fetched_crls_for_cert(*cert: Union[Certificate, AttributeCertificateV2]*) → Iterable[CertificateList]

Return all relevant fetched CRLs for the given certificate

Parameters
`cert` – A certificate.

Returns
An iterable of CRLs

Raises
`KeyError` – if no fetch operations have been performed for this certificate

class pyhanko_certvalidator.fetchers.**CertificateFetcher**

Bases: `ABC`

Utility interface to fetch and cache certificates.

fetch_cert_issuers(*cert: Union[Certificate, AttributeCertificateV2]*) → AsyncGenerator[Certificate, None]

Fetches certificates from the authority information access extension of a certificate.

Parameters
`cert` – A certificate

Raises
CertificateFetchError - when a network I/O or decoding error occurs

Returns
An asynchronous generator yielding asn1crypto.x509.Certificate objects that were fetched.

fetch_crl_issuers(*certificate_list*) → AsyncGenerator[Certificate, None]

Fetches certificates from the authority information access extension of an asn1crypto.crl.CertificateList.

Parameters
`certificate_list` – An asn1crypto.crl.CertificateList object

Raises
CertificateFetchError - when a network I/O or decoding error occurs

Returns
An asynchronous generator yielding asn1crypto.x509.Certificate objects that were fetched.

fetched_certs() → Iterable[Certificate]

Return all certificates retrieved by this certificate fetcher.

pyhanko_certvalidator.fetchers.**default_fetcher_backend**() → *FetcherBackend*

Instantiate a default fetcher backend that doesn't require any resource management, but is less efficient than a fully asynchronous fetcher would be.

pyhanko_certvalidator.ltv package

Submodules

pyhanko_certvalidator.ltv.ades_past module

async pyhanko_certvalidator.ltv.ades_past.**past_validate**(*path:* ValidationPath, *validation_policy_spec:* CertValidationPolicySpec, *validation_data_handlers:* ValidationDataHandlers, *init_control_time: Optional[datetime] = None*, *best_signature_time: Optional[datetime] = None*) → datetime

Execute the ETSI EN 319 102-1 past certificate validation algorithm against the given path (ETSI EN 319 102-1, § 5.6.2.1).

Instead of merely evaluating X.509 validation constraints, the algorithm will perform a full point-in-time reevaluation of the path at the control time mandated by the specification. This implies that a caller implementing the past signature validation algorithm no longer needs to explicitly reevaluate CA certificate revocation times and/or algorithm constraints based on POEs.

Warning: This is incubating internal API.

Parameters

- **path** – The prospective validation path against which to execute the algorithm.
- **validation_policy_spec** – The validation policy specification.
- **validation_data_handlers** – The handlers used to manage collected certificates,revocation information and proof-of-existence records.
- **init_control_time** – Initial control time; defaults to the current time.
- **best_signature_time** – Usage time to use in freshness computations.

Returns

The control time returned by the time sliding algorithm. Informally, the last time at which the certificate was known to be valid.

pyhanko_certvalidator.ltv.errors module

exception pyhanko_certvalidator.ltv.errors.**PastValidatePrecheckFailure**(*message: str*)

Bases: *ValidationError*

exception pyhanko_certvalidator.ltv.errors.**TimeSlideFailure**(*message: str*)

Bases: *ValidationError*

pyhanko_certvalidator.ltv.poe module

class pyhanko_certvalidator.ltv.poe.**POEManager**(*current_dt_override: Optional[datetime] = None*)

Bases: `object`

Class to manage proof-of-existence (POE) claims.

Parameters

current_dt_override – Override the current time.

register(*data: Union[bytes, Asn1Value]*, *dt: Optional[datetime] = None*) → datetime

Register a new POE claim if no POE for an earlier time is available.

Parameters

- **data** – Data to register a POE claim for.
- **dt** – The POE time to register. If `None`, assume the current time.

Returns

The oldest POE datetime available.

register_by_digest(*digest: bytes*, *dt: Optional[datetime] = None*) → datetime

Register a new POE claim if no POE for an earlier time is available.

Parameters

- **digest** – SHA-256 digest of the data to register a POE claim for.
- **dt** – The POE time to register. If `None`, assume the current time.

Returns

The oldest POE datetime available.

pyhanko_certvalidator.ltv.poe.**digest_for_poe**(*data: bytes*) → bytes

pyhanko_certvalidator.ltv.time_slide module

async pyhanko_certvalidator.ltv.time_slide.**time_slide**(*path: ValidationPath*, *init_control_time: datetime*, *revinfo_manager: RevinfoManager*, *rev_trust_policy: CertRevTrustPolicy*, *algo_usage_policy: Optional[AlgorithmUsagePolicy]*, *time_tolerance: timedelta*) → datetime

Execute the ETSI EN 319 102-1 time slide algorithm against the given path.

Warning: This is incubating internal API.

Note: This implementation will also attempt to take into account chains of trust of indirect CRLs. This is not a requirement of the specification, but also somewhat unlikely to arise in practice in cases where AdES compliance actually matters.

Parameters

- **path** – The prospective validation path against which to execute the time slide algorithm.
- **init_control_time** – The initial control time, typically the current time.
- **revinfo_manager** – The revocation info manager.
- **rev_trust_policy** – The trust policy for revocation information.
- **algo_usage_policy** – The algorithm usage policy.
- **time_tolerance** – The tolerance to apply when evaluating time-related constraints.

Returns
The resulting control time.

async pyhanko_certvalidator.ltv.time_slide.**ades_gather_prima_facie_revinfo**(*path:* ValidationPath, *revinfo_manager:* RevinfoManager, *control_time:* *datetime*, *revocation_checking_rule:* RevocationCheckingRule) → Tuple[List[*CRLOfInterest*], List[*OCSPResponseOfInterest*]]

Gather potentially relevant revocation information for the leaf certificate of a candidate validation path. Only the scope of the revocation information will be checked, no detailed validation will occur.

Parameters

- **path** – The candidate validation path.
- **revinfo_manager** – The revocation info manager.
- **control_time** – The time horizon that serves as a relevance cutoff.
- **revocation_checking_rule** – Revocation info rule controlling which kind(s) of revocation information will be fetched.

Returns
A 2-element tuple containing a list of the fetched CRLs and OCSP responses, respectively.

pyhanko_certvalidator.ltv.types module

class pyhanko_certvalidator.ltv.types.**ValidationTimingInfo**(*validation_time: datetime.datetime*, *best_signature_time: datetime.datetime*, *point_in_time_validation: bool*)

Bases: object

validation_time: datetime

best_signature_time: datetime

point_in_time_validation: bool

classmethod now(*tz: Optional[tzinfo] = None*) → *ValidationTimingInfo*

class pyhanko_certvalidator.ltv.types.**ValidationTimingParams**(*timing_info:* pyhanko_certvalidator.ltv.types.ValidationTimingInfo, *time_tolerance: datetime.timedelta*)

Bases: object

timing_info: ***ValidationTimingInfo***

time_tolerance: timedelta

property validation_time

property best_signature_time

property point_in_time_validation

class `pyhanko_certvalidator.ltv.types.`**IssuedItemContainer**

Bases: `ABC`

A container for some data object issued by an entity (e.g. a certificate).

property issuance_date: Optional[datetime]

The issuance date of the item.

Module contents

pyhanko_certvalidator.revinfo package

Submodules

pyhanko_certvalidator.revinfo.archival module

class `pyhanko_certvalidator.revinfo.archival.`**RevinfoUsabilityRating**(*value*)

Bases: `Enum`

Description of whether a piece of revocation information is considered usable in the circumstances provided.

OK = 1

The revocation information is usable.

STALE = 2

The revocation information is stale/too old.

TOO_NEW = 3

The revocation information is too recent.

Note: This is never an issue in the AdES validation model.

UNCLEAR = 4

The usability of the revocation information could not be assessed unambiguously.

property usable_ades: bool

Boolean indicating whether the assigned rating corresponds to a "fresh" judgment in AdES.

class `pyhanko_certvalidator.revinfo.archival.`**RevinfoUsability**(*rating: RevinfoUsabilityRating, last_usable_at: Optional[datetime] = None*)

Bases: `object`

Usability rating and cutoff date for a particular piece of revocation information.

rating: *RevinfoUsabilityRating*

The rating assigned.

last_usable_at: Optional[datetime] = None

The last date at which the revocation infromation could have been considered usable, if applicable.

class pyhanko_certvalidator.revinfo.archival.**RevinfoContainer**

Bases: *IssuedItemContainer*, ABC

A container for a piece of revocation information.

usable_at(*policy: CertRevTrustPolicy*, *timing_params: ValidationTimingParams*) → *RevinfoUsability*

Assess the usability of the revocation information given a revocation information trust policy and timing parameters.

Parameters

- **policy** – The revocation information trust policy.
- **timing_params** – Timing-related information.

Returns

A *RevinfoUsability* judgment.

property revinfo_sig_mechanism_used: Optional[SignedDigestAlgorithm]

Extract the signature mechanism used to guarantee the authenticity of the revocation information, if applicable.

class pyhanko_certvalidator.revinfo.archival.**OCSPContainer**(*ocsp_response_data: OCSPResponse*, *index: int = 0*)

Bases: *RevinfoContainer*

Container for an OCSP response.

ocsp_response_data: OCSPResponse

The OCSP response value.

index: int = 0

The index of the SingleResponse payload in the original OCSP response object retrieved from the server, if applicable.

classmethod load_multi(*ocsp_response: OCSPResponse*) → List[*OCSPContainer*]

Turn an OCSP response object into one or more *OCSPContainer* objects. If a *OCSPContainer* contains more than one SingleResponse, then the same OCSP response will be duplicated into multiple containers, each with a different index value.

Parameters

ocsp_response – An OCSP response.

Returns

A list of *OCSPContainer* objects, one for each SingleResponse value.

property issuance_date: Optional[datetime]

The issuance date of the item.

usable_at(*policy: CertRevTrustPolicy*, *timing_params: ValidationTimingParams*) → *RevinfoUsability*

Assess the usability of the revocation information given a revocation information trust policy and timing parameters.

Parameters

- **policy** – The revocation information trust policy.
- **timing_params** – Timing-related information.

Returns
A *RevinfoUsability* judgment.

extract_basic_ocsp_response() → Optional[BasicOCSPResponse]

Extract the `BasicOCSPResponse`, assuming there is one (i.e. the OCSP response is a standard, non-error response).

extract_single_response() → Optional[SingleResponse]

Extract the unique `SingleResponse` value identified by the index.

property revinfo_sig_mechanism_used: Optional[SignedDigestAlgorithm]

Extract the signature mechanism used to guarantee the authenticity of the revocation information, if applicable.

class pyhanko_certvalidator.revinfo.archival.**CRLContainer**(*crl_data: CertificateList*)

Bases: *RevinfoContainer*

Container for a certificate revocation list (CRL).

crl_data: CertificateList

The CRL data.

usable_at(*policy:* CertRevTrustPolicy, *timing_params:* ValidationTimingParams) → *RevinfoUsability*

Assess the usability of the revocation information given a revocation information trust policy and timing parameters.

Parameters

- **policy** – The revocation information trust policy.
- **timing_params** – Timing-related information.

Returns
A *RevinfoUsability* judgment.

property issuance_date: Optional[datetime]

The issuance date of the item.

property revinfo_sig_mechanism_used: SignedDigestAlgorithm

Extract the signature mechanism used to guarantee the authenticity of the revocation information, if applicable.

pyhanko_certvalidator.revinfo.archival.**sort_freshest_first**(*lst: Iterable[RevInfoType]*) → List[RevInfoType]

Sort a list of revocation information containers in freshest-first order.

Revocation information that does not have a well-defined issuance date will be grouped at the end.

Parameters
lst – A list of *RevinfoContainer* objects of the same type.

Returns
The same list sorted from fresh to stale.

pyhanko_certvalidator.revinfo.archival.**process_legacy_crl_input**(*crls: Iterable[Union[bytes, CertificateList,* CRLContainer*]]*) → List[*CRLContainer*]

Internal function to process legacy CRL data into one or more *CRLContainer*.

Parameters
: **crls** – Legacy CRL input data.

Returns
: A list of *CRLContainer* objects.

`pyhanko_certvalidator.revinfo.archival.`**process_legacy_ocsp_input**(*ocsps: Iterable[Union[bytes, OCSPResponse, OCSPContainer]]*) → List[*OCSPContainer*]

Internal function to process legacy OCSP data into one or more *OCSPContainer*.

Parameters
: **ocsps** – Legacy OCSP input data.

Returns
: A list of *OCSPContainer* objects.

pyhanko_certvalidator.revinfo.constants module

pyhanko_certvalidator.revinfo.manager module

class `pyhanko_certvalidator.revinfo.manager.`**RevinfoManager**(*certificate_registry: CertificateRegistry, poe_manager: POEManager, crls: Iterable[CRLContainer], ocsps: Iterable[OCSPContainer], fetchers: Optional[Fetchers] = None*)

Bases: `object`

New in version 0.20.0.

Class to manage and potentially fetch revocation information.

Parameters

- **certificate_registry** – The associated certificate registry.
- **poe_manager** – The proof-of-existence (POE) data manager.
- **crls** – CRL data.
- **ocsps** – OCSP response data.
- **fetchers** – Fetchers for collecting revocation information. If `None`, no fetching will be performed.

property poe_manager: *POEManager*

The proof-of-existence (POE) data manager.

property certificate_registry: *CertificateRegistry*

The associated certificate registry.

property fetching_allowed: bool

Boolean indicating whether fetching is allowed.

property crls: List[CertificateList]

A list of all cached `crl.CertificateList` objects

property ocsps: List[OCSPResponse]

A list of all cached `ocsp.OCSPResponse` objects

property new_revocation_certs: List[Certificate]

A list of newly-fetched `x509.Certificate` objects that were obtained from OCSP responses and CRLs

record_crl_issuer(*certificate_list*, *cert*)

Records the certificate that issued a certificate list. Used to reduce processing code when dealing with self-issued certificates and multiple CRLs.

Parameters

- **certificate_list** – An ans1crypto.crl.CertificateList object
- **cert** – An ans1crypto.x509.Certificate object

check_crl_issuer(*certificate_list*) → Optional[Certificate]

Checks to see if the certificate that signed a certificate list has been found

Parameters
certificate_list – An ans1crypto.crl.CertificateList object

Returns
None if not found, or an asn1crypto.x509.Certificate object of the issuer

async async_retrieve_crls(*cert*) → List[*CRLContainer*]

New in version 0.20.0.

Parameters
cert – An asn1crypto.x509.Certificate object

Returns
A list of `CRLContainer` objects

async async_retrieve_ocsps(*cert*, *authority:* Authority) → List[*OCSPContainer*]

New in version 0.20.0.

Parameters

- **cert** – An asn1crypto.x509.Certificate object
- **authority** – The issuing authority for the certificate

Returns
A list of `OCSPContainer` objects

evict_ocsps(*hashes_to_evict: Set[bytes]*)

Internal API to eliminate local OCSP records from consideration.

Parameters
hashes_to_evict – A collection of OCSP response hashes; see `digest_for_poe()`.

evict_crls(*hashes_to_evict: Set[bytes]*)

Internal API to eliminate local CRLs from consideration.

Parameters
hashes_to_evict – A collection of CRL hashes; see `digest_for_poe()`.

pyhanko_certvalidator.revinfo.validate_crl module

class pyhanko_certvalidator.revinfo.validate_crl.**CRLWithPaths**(*crl: CRLContainer, paths: List[ValidationPath]*)

Bases: object

A CRL with a number of candidate paths

crl: *CRLContainer*

paths: List[*ValidationPath*]

async pyhanko_certvalidator.revinfo.validate_crl.**verify_crl**(*cert: Union[Certificate, AttributeCertificateV2], path: ValidationPath, validation_context: ValidationContext, use_deltas=True, proc_state: Optional[ValProcState] = None*)

Verifies a certificate against a list of CRLs, checking to make sure the certificate has not been revoked. Uses the algorithm from https://tools.ietf.org/html/rfc5280#section-6.3 as a basis, but the implementation differs to allow CRLs from unrecorded locations.

Parameters

- **cert** – An asn1crypto.x509.Certificate or asn1crypto.cms.AttributeCertificateV2 object to check for in the CRLs
- **path** – A pyhanko_certvalidator.path.ValidationPath object of the cert's validation path, or in the case of an AC, the AA's validation path.
- **validation_context** – A pyhanko_certvalidator.context.ValidationContext object to use for caching validation information
- **use_deltas** – A boolean indicating if delta CRLs should be used
- **proc_state** – Internal state for error reporting and policy application decisions.

Raises

pyhanko_certvalidator.errors.CRLNoMatchesError - when none of the CRLs match the certificate pyhanko_certvalidator.errors.CRLValidationError - when any error occurs trying to verify the CertificateList pyhanko_certvalidator.errors.RevokedError - when the CRL indicates the certificate has been revoked

class pyhanko_certvalidator.revinfo.validate_crl.**ProvisionalCRLTrust**(*path: ValidationPath, delta: Optional[CRLContainer]*)

Bases: object

A provisional CRL path, together with an optional delta CRL that may be relevant.

path: *ValidationPath*

A provisional validation path for the CRL. Requires path validation.

delta: Optional[*CRLContainer*]

A delta CRL that may be relevant to the parent CRL for which the path was put together.

class pyhanko_certvalidator.revinfo.validate_crl.**CRLOfInterest**(*crl: CRLContainer, prov_paths: List[ProvisionalCRLTrust], is_indirect: bool, crl_authority_name: Name*)

Bases: `object`

A CRL of interest.

crl: *CRLContainer*

The CRL data, packaged in a revocation info container.

prov_paths: `List[`*ProvisionalCRLTrust*`]`

Candidate validation paths for the CRL, together with relevant delta CRLs, if appropriate.

is_indirect: `bool`

Boolean indicating whether the CRL is an indirect one.

crl_authority_name: `Name`

Distinguished name for the authority for which the CRL controls revocation.

`class pyhanko_certvalidator.revinfo.validate_crl.`**CRLCollectionResult**(*crls: List[*CRLOfInterest*]*, *failure_msgs: List[str]*)

Bases: `object`

The result of a CRL collection operation for AdES point-in-time validation purposes.

crls: `List[`*CRLOfInterest*`]`

List of potentially relevant CRLs.

failure_msgs: `List[str]`

List of failure messages, for error reporting purposes.

`async pyhanko_certvalidator.revinfo.validate_crl.`**collect_relevant_crls_with_paths**(*cert: Union[Certificate, AttributeCertificateV2]*, *path:* ValidationPath, *revinfo_manager:* RevinfoManager, *control_time: datetime*, *use_deltas=True*, *proc_state: Optional[ValProcState] = None*) → *CRLCollectionResult*

Collect potentially relevant CRLs with the associated validation paths. Will not perform actual path validation.

Parameters

- **cert** – The certificate under scrutiny.
- **path** – The path currently being evaluated.

- **revinfo_manager** – The revocation info manager.
- **control_time** – The control time before which the validation info should have been issued.
- **use_deltas** – Whether to include delta CRLs.
- **proc_state** – The state of any prior validation process.

Returns
A `CRLCollectionResult`.

`pyhanko_certvalidator.revinfo.validate_crl.`**`find_cert_in_list`**(*cert: Union[Certificate, AttributeCertificateV2]*, *cert_issuer_name: Name*, *certificate_list: CertificateList*, *crl_authority_name: Name*)

Looks for a cert in the list of revoked certificates

Parameters

- **cert** – An asn1crypto.x509.Certificate object of the cert being checked, or an asn1crypto.cms.AttributeCertificateV2 object in the case of an attribute certificate.
- **cert_issuer_name** – The certificate issuer's distinguished name
- **certificate_list** – An ans1crypto.crl.CertificateList object to look in for the cert
- **crl_authority_name** – The distinguished name of the default authority for which the CRL issues certificates.

Returns
A tuple of (None, None) if not present, otherwise a tuple of (asn1crypto.x509.Time object, asn1crypto.crl.CRLReason object) representing the date/time the object was revoked and why

pyhanko_certvalidator.revinfo.validate_ocsp module

`async pyhanko_certvalidator.revinfo.validate_ocsp.`**`verify_ocsp_response`**(*cert: Union[Certificate, AttributeCertificateV2]*, *path: ValidationPath*, *validation_context: ValidationContext*, *proc_state: Optional[ValProcState] = None*)

Verifies an OCSP response, checking to make sure the certificate has not been revoked. Fulfills the requirements of https://tools.ietf.org/html/rfc6960#section-3.2.

Parameters

- **cert** – An asn1cyrpto.x509.Certificate object or an asn1crypto.cms.AttributeCertificateV2 object to verify the OCSP response for
- **path** – A pyhanko_certvalidator.path.ValidationPath object of the cert's validation path, or in the case of an AC, the AA's validation path.
- **validation_context** – A pyhanko_certvalidator.context.ValidationContext object to use for caching validation information
- **proc_state** – Internal state for error reporting and policy application decisions.

Raises

pyhanko_certvalidator.errors.OCSPNoMatchesError - when none of the OCSP responses match the certificate pyhanko_certvalidator.errors.OCSPValidationIndeterminateError - when the OCSP response could not be verified pyhanko_certvalidator.errors.RevokedError - when the OCSP response indicates the certificate has been revoked

class pyhanko_certvalidator.revinfo.validate_ocsp.**OCSPResponseOfInterest**(*ocsp_response:* py-hanko_certvalidator.revinfo.archival.OC *prov_path:* py-hanko_certvalidator.path.ValidationPath

Bases: object

ocsp_response: *OCSPContainer*

prov_path: *ValidationPath*

class pyhanko_certvalidator.revinfo.validate_ocsp.**OCSPCollectionResult**(*responses: List[*OCSPResponseOfInterest*]*, *failure_msgs: List[str]*)

Bases: object

The result of an OCSP collection operation for AdES point-in-time validation purposes.

responses: List[*OCSPResponseOfInterest*]

List of potentially relevant OCSP responses.

failure_msgs: List[str]

List of failure messages, for error reporting purposes.

async pyhanko_certvalidator.revinfo.validate_ocsp.**collect_relevant_responses_with_paths**(*cert: Union[Certificate, AttributeCertificateV2]*, *path:* ValidationPath, *revinfo_manager:* RevinfoManager, *control_time: datetime*, *proc_state: Optional[ValProcState* = *None*) → *OCSPCollectionResult*

Collect potentially relevant OCSP responses with the associated validation paths. Will not perform actual path validation.

Parameters

- `cert` – The certificate under scrutiny.
- `path` – The path currently being evaluated.
- `revinfo_manager` – The revocation info manager.
- `control_time` – The control time before which the validation info should have been issued.
- `proc_state` – The state of any prior validation process.

Returns

A `OCSPCollectionResult`.

Module contents

3.2.2 Submodules

3.2.3 pyhanko_certvalidator.asn1_types module

class pyhanko_certvalidator.asn1_types.**Target**(*name=None*, *value=None*, ***kwargs*)

Bases: `Choice`

class pyhanko_certvalidator.asn1_types.**TargetCert**(*value=None*, *default=None*, ***kwargs*)

Bases: `Sequence`

class pyhanko_certvalidator.asn1_types.**Targets**(*value=None*, *default=None*, *contents=None*, *spec=None*, ***kwargs*)

Bases: `SequenceOf`

class pyhanko_certvalidator.asn1_types.**SequenceOfTargets**(*value=None*, *default=None*, *contents=None*, *spec=None*, ***kwargs*)

Bases: `SequenceOf`

class pyhanko_certvalidator.asn1_types.**AttrSpec**(*value=None*, *default=None*, *contents=None*, *spec=None*, ***kwargs*)

Bases: `SequenceOf`

class pyhanko_certvalidator.asn1_types.**AAControls**(*value=None*, *default=None*, ***kwargs*)

Bases: `Sequence`

accept(*attr_id: AttCertAttributeType*) → bool

classmethod read_extension_value(*cert: Certificate*) → Optional[*AAControls*]

3.2.4 pyhanko_certvalidator.authority module

class pyhanko_certvalidator.authority.**TrustQualifiers**(*standard_parameters: Optional[PKIXValidationParams] = None*, *max_path_length: Optional[int] = None*, *max_aa_path_length: Optional[int] = None*)

Bases: `object`

Parameters that allow a trust root to be qualified.

standard_parameters: Optional[*PKIXValidationParams*] = None

Standard validation parameters that will apply when initialising the PKIX validation process.

max_path_length: Optional[int] = None

Maximal allowed path length for this trust root, excluding self-issued intermediate CA certificates. If `None`, any path length will be accepted.

max_aa_path_length: Optional[int] = None

Maximal allowed path length for this trust root for the purposes of AAControls. If `None`, any path length will be accepted.

class `pyhanko_certvalidator.authority.`**`Authority`**

Bases: `ABC`

New in version 0.20.0.

Abstract authority, i.e. a named key.

`property name: Name`

The authority's name.

`property public_key: PublicKeyInfo`

The authority's public key.

`property hashable`

A hashable unique identifier of the authority, used in `__eq__` and `__hash__`.

`property key_id: Optional[bytes]`

Key ID as (potentially) referenced in an authorityKeyIdentifier extension. Only used to eliminate non-matching trust anchors, never to retrieve keys or to definitively identify trust anchors.

`is_potential_issuer_of`(*cert: Certificate*) → bool

Function to determine whether this trust root could potentially be an issuer of a given certificate. This function is used during path building.

Parameters
`cert` – The certificate to evaluate.

class `pyhanko_certvalidator.authority.`**`TrustAnchor`**(*authority: Authority, quals: Optional[TrustQualifiers] = None*)

Bases: `object`

Abstract trust root. A trust root is an authority with trust qualifiers. Equality of trust roots reduces to equality of authorities.

`property authority:` *`Authority`*

`property trust_qualifiers:` *`TrustQualifiers`*

Qualifiers for the trust root.

`pyhanko_certvalidator.authority.`**`derive_quals_from_cert`**(*cert: Certificate*) → *TrustQualifiers*

Extract trust qualifiers from data and extensions of a certificate.

Note: Recall that any property of a trust root other than its name and public key are in principle irrelevant to the PKIX validation algorithm itself. This function is merely a helper function that allows the certificate's other data to be conveniently gathered to populate the default validation parameters for paths deriving from that trust root.

Parameters
`cert` – The certificate from which to extract qualifiers (usually a self-signed one)

Returns
A *`TrustQualifiers`* object with the extracted qualifiers.

class `pyhanko_certvalidator.authority.`**`AuthorityWithCert`**(*cert: Certificate*)

Bases: *`Authority`*

New in version 0.20.0.

Authority provisioned as a certificate.

Parameters
`cert` – The certificate.

`property name: Name`

The authority's name.

`property public_key`

The authority's public key.

`property hashable`

A hashable unique identifier of the authority, used in `__eq__` and `__hash__`.

`property key_id: Optional[bytes]`

Key ID as (potentially) referenced in an authorityKeyIdentifier extension. Only used to eliminate non-matching trust anchors, never to retrieve keys or to definitively identify trust anchors.

`property certificate: Certificate`

`is_potential_issuer_of`(*cert: Certificate*)

Function to determine whether this trust root could potentially be an issuer of a given certificate. This function is used during path building.

Parameters
`cert` – The certificate to evaluate.

`class pyhanko_certvalidator.authority.CertTrustAnchor`(*cert: Certificate*, *quals: Optional[*TrustQualifiers*] = None*, *derive_default_quals_from_cert: bool = False*)

Bases: *`TrustAnchor`*

New in version 0.20.0.

Trust anchor provisioned as a certificate.

Parameters

- `cert` – The certificate, usually self-signed.
- `quals` – Explicit trust qualifiers.
- `derive_default_quals_from_cert` – Flag indicating to derive default trust qualifiers from the certificate content if explicit ones are not provided. Defaults to `False`.

`property certificate: Certificate`

`property trust_qualifiers:` *`TrustQualifiers`*

Qualifiers for the trust root.

`class pyhanko_certvalidator.authority.NamedKeyAuthority`(*entity_name: Name*, *public_key: PublicKeyInfo*)

Bases: *`Authority`*

Authority provisioned as a named key.

Parameters

- `entity_name` – The name of the entity that controls the private key of the trust root.
- `public_key` – The trust root's public key.

property name: Name

The authority's name.

property public_key

The authority's public key.

property key_id: Optional[bytes]

Key ID as (potentially) referenced in an authorityKeyIdentifier extension. Only used to eliminate non-matching trust anchors, never to retrieve keys or to definitively identify trust anchors.

property hashable

A hashable unique identifier of the authority, used in `__eq__` and `__hash__`.

3.2.5 pyhanko_certvalidator.context module

class `pyhanko_certvalidator.context.`**ACTargetDescription**(*validator_names: ~typing.List[~asn1crypto.x509.GeneralName] = <factory>, group_memberships: ~typing.List[~asn1crypto.x509.GeneralName] = <factory>*)

Bases: `object`

Value type to guide attribute certificate targeting checks, for attribute certificates that use the target information extension.

As stipulated in RFC 5755, an AC targeting check passes if the information in the relevant `AATargetDescription` matches at least one `Target` in the AC's target information extension.

validator_names: List[GeneralName]

The validating entity's names.

This value is matched directly against any `Target``s that use the ``targetName` alternative.

group_memberships: List[GeneralName]

The validating entity's group memberships.

This value is matched against any `Target``s that use the ``targetGroup` alternative.

class pyhanko_certvalidator.context.**ValidationContext**(*trust_roots: Optional[Iterable[Union[Certificate, TrustAnchor]]] = None, extra_trust_roots: Optional[Iterable[Union[Certificate, TrustAnchor]]] = None, other_certs: Optional[Iterable[Certificate]] = None, whitelisted_certs: Optional[Iterable[Union[bytes, str]]] = None, moment: Optional[datetime] = None, best_signature_time: Optional[datetime] = None, allow_fetching: bool = False, crls: Optional[Iterable[Union[bytes, CertificateList]]] = None, ocsps: Optional[Iterable[Union[bytes, OCSPResponse]]] = None, revocation_mode: str = 'soft-fail', revinfo_policy: Optional[CertRevTrustPolicy] = None, weak_hash_algos: Optional[Iterable[str]] = None, time_tolerance: timedelta = datetime.timedelta(seconds=1), retroactive_revinfo: bool = False, fetcher_backend: Optional[FetcherBackend] = None, acceptable_ac_targets: Optional[ACTargetDescription] = None, poe_manager: Optional[POEManager] = None, revinfo_manager: Optional[RevinfoManager] = None, certificate_registry: Optional[CertificateRegistry] = None, trust_manager: Optional[TrustManager] = None, algorithm_usage_policy: Optional[AlgorithmUsagePolicy] = None, fetchers: Optional[Fetchers] = None*)

Bases: `object`

property revinfo_manager: *RevinfoManager*

property revinfo_policy: *CertRevTrustPolicy*

property retroactive_revinfo: bool

property time_tolerance: timedelta

property moment: datetime

property best_signature_time: datetime

property fetching_allowed: bool

property crls: List[CertificateList]

A list of all cached `crl.CertificateList` objects

property ocsps: List[OCSPResponse]

A list of all cached `ocsp.OCSPResponse` objects

property soft_fail_exceptions

A list of soft-fail exceptions that were ignored during checks

is_whitelisted(*cert*)

Checks to see if a certificate has been whitelisted

Parameters
`cert` – An asn1crypto.x509.Certificate object

Returns
A bool - if the certificate is whitelisted

async async_retrieve_crls(*cert*)

Parameters
`cert` – An asn1crypto.x509.Certificate object

Returns
A list of asn1crypto.crl.CertificateList objects

retrieve_crls(*cert*)

Deprecated since version 0.17.0: Use `async_retrieve_crls()` instead.

Parameters
`cert` – An asn1crypto.x509.Certificate object

Returns
A list of asn1crypto.crl.CertificateList objects

async async_retrieve_ocsps(*cert*, *issuer*)

Parameters

- `cert` – An asn1crypto.x509.Certificate object
- `issuer` – An asn1crypto.x509.Certificate object of cert's issuer

Returns
A list of asn1crypto.ocsp.OCSPResponse objects

retrieve_ocsps(*cert*, *issuer*)

Deprecated since version 0.17.0: Use `async_retrieve_ocsps()` instead.

Parameters

- `cert` – An asn1crypto.x509.Certificate object
- `issuer` – An asn1crypto.x509.Certificate object of cert's issuer

Returns
A list of asn1crypto.ocsp.OCSPResponse objects

record_validation(*cert*, *path*)

Records that a certificate has been validated, along with the path that was used for validation. This helps reduce duplicate work when validating a ceritifcate and related resources such as CRLs and OCSPs.

Parameters

- `cert` – An ans1crypto.x509.Certificate object
- `path` – A pyhanko_certvalidator.path.ValidationPath object

check_validation(*cert*)

Checks to see if a certificate has been validated, and if so, returns the ValidationPath used to validate it.

Parameters
`cert` – An asn1crypto.x509.Certificate object

Returns
None if not validated, or a pyhanko_certvalidator.path.ValidationPath object of the validation path

clear_validation(*cert*)

Clears the record that a certificate has been validated

Parameters
`cert` – An ans1crypto.x509.Certificate object

property acceptable_ac_targets: Optional[*ACTargetDescription*]

class pyhanko_certvalidator.context.**ValidationDataHandlers**(*revinfo_manager:* RevinfoManager, *poe_manager:* POEManager, *cert_registry:* CertificateRegistry)

Bases: `object`

Value class to hold 'manager'/'registry' objects. These are responsible for accumulating and exposing various data collections that are relevant for certificate validation.

revinfo_manager: ***RevinfoManager***

The revocation information manager.

poe_manager: ***POEManager***

The proof-of-existence record manager.

cert_registry: ***CertificateRegistry***

The certificate registry.

Note: The certificate registry is a trustless construct. It only holds certificates, but does mark them as trusted or store information related to how the certificates fit together.

pyhanko_certvalidator.context.**bootstrap_validation_data_handlers**(*fetchers: ~typing.Optional[~typing.Union[~pyhanko_certvalida ~pyhanko_certvalidator.fetchers.api.FetcherBackend] = <pyhanko_certvalidator.fetchers.requests_fetchers.Req object>, crls: ~typing.Iterable[~pyhanko_certvalidator.revinfo.archi = (), ocsps: ~typing.Iterable[~pyhanko_certvalidator.revinfo.archi = (), certs: ~typing.Iterable[~asn1crypto.x509.Certificate] = (), poe_manager: ~typing.Optional[~pyhanko_certvalidator.ltv.poe.POE = None*) → *ValidationDataHandlers*

Simple bootstrapping method for a `ValidationDataHandlers` instance with reasonable defaults.

Parameters

- **fetchers** – Data fetcher implementation and/or backend to use. If `None`, remote fetching is disabled. The `requests`-based implementation is the default.
- **crls** – Initial collection of CRLs to feed to the revocation info manager.
- **ocsps** – Initial collection of OCSP responses to feed to the revocation info manager.
- **certs** – Initial collection of certificates to add to the certificate registry.
- **poe_manager** – Explicit POE manager. Will instantiate an empty one if left unspecified.

Returns
A *ValidationDataHandlers* object.

class pyhanko_certvalidator.context.**CertValidationPolicySpec**(*trust_manager: ~py-hanko_certvalidator.registry.TrustManager, revinfo_policy: ~py-hanko_certvalidator.policy_decl.CertRevTrustPolicy, time_tolerance: ~datetime.timedelta = datetime.timedelta(seconds=1), acceptable_ac_targets: ~typ-ing.Optional[~pyhanko_certvalidator.context.ACTarget = None, algorithm_usage_policy: ~typ-ing.Optional[~pyhanko_certvalidator.policy_decl.Algo = <py-hanko_certvalidator.policy_decl.DisallowWeakAlgorith object>, pkix_validation_params: ~typ-ing.Optional[~pyhanko_certvalidator.policy_decl.PKIX = None*)

Bases: `object`

Policy object describing how to validate certificates at a high level.

Note: A certificate validation policy differs from a validation context in that *ValidationContext* objects keep state as well. This is not the case for a certificate validation policy, which makes them suitable for reuse in complex validation workflows where the same policy needs to be applied independently in multiple steps.

Warning: While a certification policy spec is intended to be stateless, some of its fields are abstract classes. As such, the true behaviour may depend on the underlying implementation.

trust_manager: *TrustManager*

The trust manager that defines this policy's trust anchors.

revinfo_policy: *CertRevTrustPolicy*

The policy describing how to handle certificate revocation and associated revocation information.

time_tolerance: timedelta = datetime.timedelta(seconds=1)

The time drift tolerated during validation. Defaults to one second.

acceptable_ac_targets: Optional[*ACTargetDescription*] = None

Targets to accept when evaluating the scope of an attribute certificate.

algorithm_usage_policy: Optional[*AlgorithmUsagePolicy*] = <pyhanko_certvalidator.policy_decl.DisallowWeakAlgorithmsPolicy object>

Policy on cryptographic algorithm usage. If left unspecified, a default will be used.

pkix_validation_params: Optional[*PKIXValidationParams*] = None

The PKIX validation parameters to use, as defined in **RFC 5280**.

build_validation_context(*timing_info:* ValidationTimingInfo, *handlers: Optional[*ValidationDataHandlers*]*) → *ValidationContext*

Build a validation context from this policy, validation timing info and a set of validation data handlers.

Parameters

- **timing_info** – Timing settings.
- **handlers** – Optionally specify validation data handlers. A reasonable default will be supplied if absent.

Returns

A new *ValidationContext* reflecting the parameters.

3.2.6 pyhanko_certvalidator.errors module

exception pyhanko_certvalidator.errors.**PathError**

Bases: Exception

exception pyhanko_certvalidator.errors.**PathBuildingError**

Bases: *PathError*

exception pyhanko_certvalidator.errors.**CertificateFetchError**

Bases: *PathBuildingError*

exception pyhanko_certvalidator.errors.**CRLValidationError**

Bases: Exception

exception pyhanko_certvalidator.errors.**CRLNoMatchesError**

Bases: *CRLValidationError*

exception pyhanko_certvalidator.errors.**CRLFetchError**

Bases: *CRLValidationError*

exception pyhanko_certvalidator.errors.**CRLValidationIndeterminateError**

Bases: *CRLValidationError*

property failures

exception pyhanko_certvalidator.errors.**OCSPValidationError**

Bases: Exception

exception pyhanko_certvalidator.errors.**OCSPNoMatchesError**

Bases: *OCSPValidationError*

exception pyhanko_certvalidator.errors.**OCSPValidationIndeterminateError**

Bases: *OCSPValidationError*

property failures

exception pyhanko_certvalidator.errors.**OCSPFetchError**

Bases: `OCSPValidationError`

exception pyhanko_certvalidator.errors.**ValidationError**(*message: str*)

Bases: `Exception`

exception pyhanko_certvalidator.errors.**PathValidationError**(*msg: str*, **, *proc_state: ValProcState*)

Bases: `ValidationError`

classmethod from_state(*msg: str*, *proc_state: ValProcState*) → TPathErr

exception pyhanko_certvalidator.errors.**RevokedError**(*msg*, *reason: CRLReason*, *revocation_dt: datetime*, *proc_state: ValProcState*)

Bases: `PathValidationError`

classmethod format(*reason: CRLReason*, *revocation_dt: datetime*, *revinfo_type: str*, *proc_state: ValProcState*)

exception pyhanko_certvalidator.errors.**InsufficientRevinfoError**(*msg: str*, **, *proc_state: ValProcState*)

Bases: `PathValidationError`

exception pyhanko_certvalidator.errors.**InsufficientPOEError**(*msg: str*, **, *proc_state: ValProcState*)

Bases: `PathValidationError`

exception pyhanko_certvalidator.errors.**ExpiredError**(*msg*, *expired_dt: datetime*, *proc_state: ValProcState*)

Bases: `PathValidationError`

classmethod format(***, *expired_dt: datetime*, *proc_state: ValProcState*)

exception pyhanko_certvalidator.errors.**NotYetValidError**(*msg*, *valid_from: datetime*, *proc_state: ValProcState*)

Bases: `PathValidationError`

classmethod format(***, *valid_from: datetime*, *proc_state: ValProcState*)

exception pyhanko_certvalidator.errors.**InvalidCertificateError**(*message: str*)

Bases: `ValidationError`

exception pyhanko_certvalidator.errors.**DisallowedAlgorithmError**(**args*, *banned_since: Optional[datetime] = None*, ***kwargs*)

Bases: `PathValidationError`

classmethod from_state(*msg: str*, *proc_state: ValProcState*, *banned_since: Optional[datetime] = None*) → *DisallowedAlgorithmError*

exception pyhanko_certvalidator.errors.**InvalidAttrCertificateError**(*message: str*)

Bases: `InvalidCertificateError`

exception pyhanko_certvalidator.errors.**PSSParameterMismatch**

Bases: `InvalidSignature`

exception pyhanko_certvalidator.errors.**DSAParametersUnavailable**

Bases: `InvalidSignature`

3.2.7 pyhanko_certvalidator.name_trees module

exception pyhanko_certvalidator.name_trees.**NameConstraintError**

Bases: ValueError

pyhanko_certvalidator.name_trees.**host_tree_contains**(*base_host: str*, *other_host: str*) → bool

pyhanko_certvalidator.name_trees.**uri_tree_contains**(*base: str*, *other: str*) → bool

pyhanko_certvalidator.name_trees.**dns_tree_contains**(*base: str*, *other: str*)

pyhanko_certvalidator.name_trees.**email_tree_contains**(*base: str*, *other: str*)

pyhanko_certvalidator.name_trees.**dirname_tree_contains**(*base: Name*, *other: Name*)

class pyhanko_certvalidator.name_trees.**GeneralNameType**(*value*)

Bases: Enum

An enumeration.

OTHER_NAME = 1

RFC822_NAME = 2

DNS_NAME = 3

X400_ADDRESS = 4

DIRECTORY_NAME = 5

EDI_PARTY_NAME = 6

UNIFORM_RESOURCE_IDENTIFIER = 7

IP_ADDRESS = 8

REGISTERED_ID = 9

property check_membership: Optional[Callable[[Union[str, Name], Union[str, Name]], bool]]

classmethod from_choice(*choice*) → *GeneralNameType*

exception pyhanko_certvalidator.name_trees.**UnsupportedNameTypeError**(*name_type: GeneralNameType*)

Bases: NotImplementedError

class pyhanko_certvalidator.name_trees.**NameSubtree**(*name_type: pyhanko_certvalidator.name_trees.GeneralNameType*, *tree_base: Union[pyhanko_certvalidator.name_trees._StringOrName, NoneType]*, *min: int = 0*, *max: Union[int, NoneType] = None*)

Bases: object

name_type: *GeneralNameType*

tree_base: Optional[_StringOrName]

min: int = 0

max: Optional[int] = None

classmethod from_name(*name_type:* GeneralNameType, *name: Union[str, Name]*)

classmethod from_general_subtree(*subtree*) → *NameSubtree*

classmethod universal_tree(*name_type:* GeneralNameType) → *NameSubtree*

Tree that contains all names of a given type.

Parameters
`name_type` – The name type to use.

Returns

pyhanko_certvalidator.name_trees.**x509_names_to_subtrees**(*names: Iterable[Name]*) → Dict[*GeneralNameType*, Set[*NameSubtree*]]

pyhanko_certvalidator.name_trees.**process_general_subtrees**(*subtrees: GeneralSubtrees*) → Dict[*GeneralNameType*, Set[*NameSubtree*]]

class pyhanko_certvalidator.name_trees.**NameConstraintValidationResult**(*failing_name_type: Optional[*GeneralNameType*] = None*, *failing_name: Optional[Union[str, Name]] = None*)

Bases: `object`

property error_message

class pyhanko_certvalidator.name_trees.**PermittedSubtrees**(*initial_permitted_subtrees: Dict[*GeneralNameType, *Set[*NameSubtree*]]*)

Bases: `object`

intersect_with(*trees: Dict[*GeneralNameType, *Set[*NameSubtree*]]*)

accept_name(*name_type:* GeneralNameType, *name*) → bool

accept_cert(*cert: Certificate*) → *NameConstraintValidationResult*

class pyhanko_certvalidator.name_trees.**ExcludedSubtrees**(*initial_excluded_subtrees: Dict[*GeneralNameType, *Set[*NameSubtree*]]*)

Bases: `object`

union_with(*trees: Dict[*GeneralNameType, *Set[*NameSubtree*]]*)

reject_name(*name_type:* GeneralNameType, *name*) → bool

accept_cert(*cert: Certificate*) → *NameConstraintValidationResult*

pyhanko_certvalidator.name_trees.**default_permitted_subtrees**() → Dict[*GeneralNameType*, Set[*NameSubtree*]]

pyhanko_certvalidator.name_trees.**default_excluded_subtrees**() → Dict[*GeneralNameType*, Set[*NameSubtree*]]

3.2.8 pyhanko_certvalidator.path module

`class pyhanko_certvalidator.path.`**`QualifiedPolicy`**(*issuer_domain_policy_id: str*, *user_domain_policy_id: str*, *qualifiers: frozenset*)

Bases: `object`

`issuer_domain_policy_id: str`

Policy OID in the issuer domain (i.e. as listed on the certificate).

`user_domain_policy_id: str`

Policy OID of the equivalent policy in the user domain.

`qualifiers: frozenset`

Set of x509.PolicyQualifierInfo objects.

`class pyhanko_certvalidator.path.`**`ValidationPath`**(*trust_anchor:* TrustAnchor, *interm: Iterable[Certificate]*, *leaf: Optional[Union[Certificate, AttributeCertificateV2]]*)

Bases: `object`

Represents a path going towards an end-entity certificate or attribute certificate.

`property trust_anchor:` *`TrustAnchor`*

`property first`

Returns the current beginning of the path - for a path to be complete, this certificate should be a trust root

Warning: This is a compatibility property, and will return the first non-root certificate if the trust root is not provisioned as a certificate. If you want the trust root itself (even when it doesn't have a certificate), use *`trust_anchor`*.

Returns

The first asn1crypto.x509.Certificate object in the path

`property leaf: Optional[Union[Certificate, AttributeCertificateV2]]`

Returns the current leaf certificate (AC or public-key). The trust root's certificate will be returned if there is one and there are no other certificates in the path.

If the trust root is certificate-less and there are no certificates, the result will be `None`.

`describe_leaf``()` → Optional[str]

`get_ee_cert_safe``()` → Optional[Certificate]

Returns the current leaf certificate if it is an X.509 public-key certificate, and `None` otherwise. :return:

`property last: Certificate`

Returns the last certificate in the path if it is an X.509 public-key certificate, and throws an error otherwise.

Returns

The last asn1crypto.x509.Certificate object in the path

`iter_authorities``()` → Iterable[*Authority*]

Iterate over all authorities in the path, including the trust root.

find_issuing_authority(*cert: Union[Certificate, AttributeCertificateV2]*)

Return the issuer of the cert specified, as defined by this path

Parameters
`cert` – A certificate to get the issuer of

Raises
LookupError - when the issuer of the certificate could not be found

Returns
An asn1crypto.x509.Certificate object of the issuer

truncate_to_and_append(*cert: Certificate*, *new_leaf: Union[Certificate, AttributeCertificateV2]*)

Remove all certificates in the path after the cert specified and return them in a new path.

Internal API.

Parameters

- `cert` – An asn1crypto.x509.Certificate object to find
- `new_leaf` – A new leaf certificate to append.

Raises
LookupError - when the certificate could not be found

Returns
The current ValidationPath object, for chaining

truncate_to_issuer_and_append(*cert: Certificate*)

Remove all certificates in the path after the issuer of the cert specified, as defined by this path, and append a new one.

Internal API.

Parameters
`cert` – A new leaf certificate to append.

Raises
LookupError - when the issuer of the certificate could not be found

Returns
The current ValidationPath object, for chaining

copy_and_append(*cert: Union[Certificate, AttributeCertificateV2]*)

copy_and_drop_leaf() → *ValidationPath*

Drop the leaf cert from this path and return a new path with the last intermediate certificate set as the leaf.

qualified_policies() → Optional[FrozenSet[*QualifiedPolicy*]]

aa_attr_in_scope(*attr_id: AttCertAttributeType*) → bool

property pkix_len

iter_certs(*include_root: bool*) → Iterator[Certificate]

Iterate over the certificates in the path.

Parameters
`include_root` – Include the root (if it is supplied as a certificate)

Returns
An iterator.

3.2.9 pyhanko_certvalidator.policy_decl module

New in version 0.20.0.

class pyhanko_certvalidator.policy_decl.**RevocationCheckingRule**(*value*)

Bases: `Enum`

Rules determining in what circumstances revocation data has to be checked, and what kind.

CRL_REQUIRED = 'clrcheck'

Check CRLs.

OCSP_REQUIRED = 'ocspcheck'

Check OCSP.

CRL_AND_OCSP_REQUIRED = 'bothcheck'

Check CRL and OCSP.

CRL_OR_OCSP_REQUIRED = 'eithercheck'

Check CRL or OCSP.

NO_CHECK = 'nocheck'

Do not check.

CHECK_IF_DECLARED = 'ifdeclaredcheck'

Check revocation information if declared in the certificate.

Warning: This is not an ESI check type, but is preserved for compatibility with the 'hard-fail' mode in certvalidator.

Note: In this mode, cached CRLs will _not_ be checked if the certificate does not list any distribution points.

CHECK_IF_DECLARED_SOFT = 'ifdeclaredsoftcheck'

Check revocation information if declared in the certificate, but do not fail validation if the check fails.

Warning: This is not an ESI check type, but is preserved for compatibility with the 'soft-fail' mode in certvalidator.

Note: In this mode, cached CRLs will _not_ be checked if the certificate does not list any distribution points.

property strict: bool

property tolerant: bool

property crl_mandatory: bool

property crl_relevant: bool

property ocsp_mandatory: bool

property ocsp_relevant: bool

class pyhanko_certvalidator.policy_decl.**RevocationCheckingPolicy**(*ee_certificate_rule: RevocationCheckingRule*, *intermediate_ca_cert_rule: RevocationCheckingRule*)

Bases: `object`

Class describing a revocation checking policy based on the types defined in the ETSI TS 119 172 series.

ee_certificate_rule: ***RevocationCheckingRule***

Revocation rule applied to end-entity certificates.

intermediate_ca_cert_rule: ***RevocationCheckingRule***

Revocation rule applied to certificates further up the path.

classmethod from_legacy(*policy: str*)

property essential: bool

class pyhanko_certvalidator.policy_decl.**FreshnessReqType**(*value*)

Bases: `Enum`

Freshness requirement type.

DEFAULT = 1

The default freshness policy, i.e. the `certvalidator` legacy policy. This policy considers revocation info valid between its `thisUpdate` and `nextUpdate` times, but not outside of that window.

MAX_DIFF_REVOCATION_VALIDATION = 2

Freshness policy requiring that the validation time, if later than the issuance date of the revocation info, be sufficiently close to that issuance date.

TIME_AFTER_SIGNATURE = 3

Freshness policy requiring that the revocation info be issued after a predetermined "cooldown period" after the certificate was used to produce a signature.

class pyhanko_certvalidator.policy_decl.**CertRevTrustPolicy**(*revocation_checking_policy: RevocationCheckingPolicy*, *freshness: Optional[timedelta] = None*, *freshness_req_type: FreshnessReqType = FreshnessReqType.DEFAULT*, *expected_post_expiry_revinfo_time: Optional[timedelta] = None*, *retroactive_revinfo: bool = False*)

Bases: `object`

Class describing conditions for trusting revocation info. Based on CertificateRevTrust in ETSI TS 119 172-3.

revocation_checking_policy: ***RevocationCheckingPolicy***

The revocation checking policy requirements.

freshness: Optional[timedelta] = None

Freshness interval. If not specified, this defaults to the distance between `thisUpdate` and `nextUpdate` for the given piece of revocation information.

freshness_req_type: ***FreshnessReqType*** **= 1**

Controls whether the freshness requirement applies relatively to the signing time or to the validation time.

expected_post_expiry_revinfo_time: Optional[timedelta] = None

Duration for which the issuing CA is expected to supply status information after a certificate expires.

retroactive_revinfo: bool = False

Treat revocation info as retroactively valid, i.e. ignore the `this_update` field in CRLs and OCSP responses. This parameter is not taken into account for freshness policies other than *FreshnessReqType.DEFAULT*, and is `False` by default in those cases.

> **Warning:** Be careful with this option, since it will cause incorrect behaviour for CAs that make use of certificate holds or other reversible revocation methods.

class pyhanko_certvalidator.policy_decl.**PKIXValidationParams**(*user_initial_policy_set: frozenset = frozenset({'any_policy'}), initial_policy_mapping_inhibit: bool = False, initial_explicit_policy: bool = False, initial_any_policy_inhibit: bool = False, initial_permitted_subtrees: Union[Dict[*pyhanko_certvalidator.name_trees.General*, Set[*pyhanko_certvalidator.name_trees.NameSubtree*]], NoneType] = None, initial_excluded_subtrees: Union[Dict[*pyhanko_certvalidator.name_trees.General*, Set[*pyhanko_certvalidator.name_trees.NameSubtree*]], NoneType] = None*)

Bases: `object`

user_initial_policy_set: frozenset = frozenset({'any_policy'})

Set of policies that the user is willing to accept. By default, any policy is acceptable.

When setting this parameter to a non-default value, you probably want to set *initial_explicit_policy* as well.

Note: These are specified in the policy domain of the trust root(s), and subject to policy mapping by intermediate certificate authorities.

initial_policy_mapping_inhibit: bool = False

Flag indicating whether policy mapping is forbidden along the entire certification chains. By default, policy mapping is permitted.

Note: Policy constraints on intermediate certificates may force policy mapping to be inhibited from some point onwards.

initial_explicit_policy: bool = False

Flag indicating whether path validation must terminate with at least one permissible policy; see *user_initial_policy_set*. By default, no such requirement is imposed.

Note: If *user_initial_policy_set* is set to its default value of `{'any_policy'}`, the effect is that the path validation must accept at least one policy, without specifying which.

> **Warning:** Due to widespread mis-specification of policy extensions in the wild, many real-world certification chains terminate with an empty set (or rather, tree) of valid policies. Therefore, this flag is set to `False` by default.

`initial_any_policy_inhibit: bool = False`

Flag indicating whether `anyPolicy` should be left unprocessed when it appears in a certificate. By default, `anyPolicy` is always processed when it appears.

`initial_permitted_subtrees: Optional[Dict[GeneralNameType, Set[NameSubtree]]] = None`

Set of permitted subtrees for each name type, indicating restrictions to impose on subject names (and alternative names) in the certification path.

By default, all names are permitted. This behaviour can be modified by name constraints on intermediate CA certificates.

`initial_excluded_subtrees: Optional[Dict[GeneralNameType, Set[NameSubtree]]] = None`

Set of excluded subtrees for each name type, indicating restrictions to impose on subject names (and alternative names) in the certification path.

By default, no names are excluded. This behaviour can be modified by name constraints on intermediate CA certificates.

`merge`(*other:* PKIXValidationParams) → *PKIXValidationParams*

Combine the conditions of these PKIX validation params with another set of parameters, producing the most lenient set of parameters that is stricter than both inputs.

Parameters
`other` – Another set of PKIX validation parameters.

Returns
A combined set of PKIX validation parameters.

`class pyhanko_certvalidator.policy_decl.`**`AlgorithmUsageConstraint`**(*allowed: bool*, *not_allowed_after: Optional[datetime] = None*, *failure_reason: Optional[str] = None*)

Bases: `object`

Expression of a constraint on the usage of an algorithm (possibly with parameter choices).

`allowed: bool`

Flag indicating whether the algorithm can be used.

`not_allowed_after: Optional[datetime] = None`

Date indicating when the algorithm became unavailable (given the relevant choice of parameters, if applicable).

`failure_reason: Optional[str] = None`

A human-readable description of the failure reason, if applicable.

`class pyhanko_certvalidator.policy_decl.`**`AlgorithmUsagePolicy`**

Bases: `ABC`

Abstract interface defining a usage policy for cryptographic algorithms.

digest_algorithm_allowed(*algo: DigestAlgorithm*, *moment: Optional[datetime]*) → *AlgorithmUsageConstraint*

Determine if the indicated digest algorithm can be used at the point in time indicated.

Parameters

- **algo** – A digest algorithm description in ASN.1 form.
- **moment** – The point in time at which the algorithm should be usable. If `None`, then the returned judgment applies at all times.

Returns

A `AlgorithmUsageConstraint` expressing the judgment.

signature_algorithm_allowed(*algo: SignedDigestAlgorithm*, *moment: Optional[datetime]*, *public_key: Optional[PublicKeyInfo]*) → *AlgorithmUsageConstraint*

Determine if the indicated signature algorithm (including the associated digest function and any parameters, if applicable) can be used at the point in time indicated.

Parameters

- **algo** – A signature mechanism description in ASN.1 form.
- **moment** – The point in time at which the algorithm should be usable. If `None`, then the returned judgment applies at all times.
- **public_key** – The public key associated with the operation, if available.

  Note: This parameter can be used to enforce key size limits or to filter out keys with known structural weaknesses.

Returns

A `AlgorithmUsageConstraint` expressing the judgment.

class pyhanko_certvalidator.policy_decl.**DisallowWeakAlgorithmsPolicy**(*weak_hash_algos=frozenset({'md2', 'md5', 'sha1'})*, *weak_signature_algos=frozenset({})*, *rsa_key_size_threshold=2048*, *dsa_key_size_threshold=3192*)

Bases: `AlgorithmUsagePolicy`

Primitive usage policy that forbids a list of user-specified "weak" algorithms and allows everything else. It also ignores the time parameter completely.

Note: This denial-based strategy is supplied to provide a backwards-compatible default. In many scenarios, an explicit allow-based strategy is more appropriate. Users with specific security requirements are encouraged to implement `AlgorithmUsagePolicy` themselves.

Parameters

- **weak_hash_algos** – The list of digest algorithms considered weak. Defaults to `DEFAULT_WEAK_HASH_ALGOS`.
- **weak_signature_algos** – The list of digest algorithms considered weak. Defaults to the empty set.
- **rsa_key_size_threshold** – The key length threshold for RSA keys, in bits.

- **dsa_key_size_threshold** – The key length threshold for DSA keys, in bits.

digest_algorithm_allowed(*algo: DigestAlgorithm*, *moment: Optional[datetime]*) → *AlgorithmUsageConstraint*

Determine if the indicated digest algorithm can be used at the point in time indicated.

Parameters

- **algo** – A digest algorithm description in ASN.1 form.
- **moment** – The point in time at which the algorithm should be usable. If `None`, then the returned judgment applies at all times.

Returns

A `AlgorithmUsageConstraint` expressing the judgment.

signature_algorithm_allowed(*algo: SignedDigestAlgorithm*, *moment: Optional[datetime]*, *public_key: Optional[PublicKeyInfo]*) → *AlgorithmUsageConstraint*

Determine if the indicated signature algorithm (including the associated digest function and any parameters, if applicable) can be used at the point in time indicated.

Parameters

- **algo** – A signature mechanism description in ASN.1 form.
- **moment** – The point in time at which the algorithm should be usable. If `None`, then the returned judgment applies at all times.
- **public_key** – The public key associated with the operation, if available.

Note: This parameter can be used to enforce key size limits or to filter out keys with known structural weaknesses.

Returns

A `AlgorithmUsageConstraint` expressing the judgment.

class pyhanko_certvalidator.policy_decl.**AcceptAllAlgorithms**

Bases: `AlgorithmUsagePolicy`

digest_algorithm_allowed(*algo: DigestAlgorithm*, *moment: Optional[datetime]*) → *AlgorithmUsageConstraint*

Determine if the indicated digest algorithm can be used at the point in time indicated.

Parameters

- **algo** – A digest algorithm description in ASN.1 form.
- **moment** – The point in time at which the algorithm should be usable. If `None`, then the returned judgment applies at all times.

Returns

A `AlgorithmUsageConstraint` expressing the judgment.

signature_algorithm_allowed(*algo: SignedDigestAlgorithm*, *moment: Optional[datetime]*, *public_key: Optional[PublicKeyInfo]*) → *AlgorithmUsageConstraint*

Determine if the indicated signature algorithm (including the associated digest function and any parameters, if applicable) can be used at the point in time indicated.

Parameters

- **algo** – A signature mechanism description in ASN.1 form.
- **moment** – The point in time at which the algorithm should be usable. If `None`, then the returned judgment applies at all times.
- **public_key** – The public key associated with the operation, if available.

Note: This parameter can be used to enforce key size limits or to filter out keys with known structural weaknesses.

Returns

A *AlgorithmUsageConstraint* expressing the judgment.

`pyhanko_certvalidator.policy_decl.`**`DEFAULT_WEAK_HASH_ALGOS = frozenset({'md2', 'md5', 'sha1'})`**

Digest algorithms considered weak by default.

`pyhanko_certvalidator.policy_decl.`**`REQUIRE_REVINFO = RevocationCheckingPolicy(ee_certificate_rule=<RevocationCheckingRule.CRL_OR_OCSP_REQUIRED: 'eithercheck'>, intermediate_ca_cert_rule=<RevocationCheckingRule.CRL_OR_OCSP_REQUIRED: 'eithercheck'>)`**

Policy indicating that revocation information is always required, but either OCSP or CRL-based revocation information is OK.

`pyhanko_certvalidator.policy_decl.`**`NO_REVOCATION = RevocationCheckingPolicy(ee_certificate_rule=<RevocationCheckingRule.NO_CHECK: 'nocheck'>, intermediate_ca_cert_rule=<RevocationCheckingRule.NO_CHECK: 'nocheck'>)`**

Policy indicating that revocation information is never required.

3.2.10 pyhanko_certvalidator.policy_tree module

`pyhanko_certvalidator.policy_tree.`**`update_policy_tree`**(*certificate_policies*, *valid_policy_tree: PolicyTreeRoot*, *depth: int*, *any_policy_uninhibited: bool*) → Optional[*PolicyTreeRoot*]

Internal method to update the policy tree during RFC 5280 validation.

`pyhanko_certvalidator.policy_tree.`**`enumerate_policy_mappings`**(*mappings: Iterable[PolicyMapping]*, *proc_state: ValProcState*)

Internal function to process policy mapping extension values into a Python dictionary mapping issuer domain policies to the corresponding policies in the subject policy domain.

`pyhanko_certvalidator.policy_tree.`**`apply_policy_mapping`**(*policy_map*, *valid_policy_tree*, *depth: int*, *policy_mapping_uninhibited: bool*)

Internal function to apply the policy mapping to the current policy tree in accordance with the algorithm in RFC 5280.

`pyhanko_certvalidator.policy_tree.`**`prune_unacceptable_policies`**(*path_length*, *valid_policy_tree*, *acceptable_policies*) → Optional[*PolicyTreeRoot*]

`class` `pyhanko_certvalidator.policy_tree.`**`PolicyTreeRoot`**

Bases: `object`

A generic policy tree node, used for the root node in the tree

classmethod init_policy_tree(*valid_policy*, *qualifier_set*, *expected_policy_set*)

Accepts values for a PolicyTreeNode that will be created at depth 0

Parameters

- **valid_policy** – A unicode string of a policy name or OID
- **qualifier_set** – An instance of asn1crypto.x509.PolicyQualifierInfos
- **expected_policy_set** – A set of unicode strings containing policy names or OIDs

add_child(*valid_policy*, *qualifier_set*, *expected_policy_set*)

Creates a new PolicyTreeNode as a child of this node

Parameters

- **valid_policy** – A unicode string of a policy name or OID
- **qualifier_set** – An instance of asn1crypto.x509.PolicyQualifierInfos
- **expected_policy_set** – A set of unicode strings containing policy names or OIDs

remove_child(*child*)

Removes a child from this node

Parameters
child – An instance of PolicyTreeNode

at_depth(*depth*) → Iterable[*PolicyTreeNode*]

Returns a generator yielding all nodes in the tree at a specific depth

Parameters
depth – An integer >= 0 of the depth of nodes to yield

Returns
A generator yielding PolicyTreeNode objects

walk_up(*depth*)

Returns a generator yielding all nodes in the tree at a specific depth, or above. Yields nodes starting with leaves and traversing up to the root.

Parameters
depth – An integer >= 0 of the depth of nodes to walk up from

Returns
A generator yielding PolicyTreeNode objects

nodes_in_current_domain() → Iterable[*PolicyTreeNode*]

Returns a generator yielding all nodes in the tree that are children of an `any_policy` node.

class pyhanko_certvalidator.policy_tree.**PolicyTreeNode**(*valid_policy: str*, *qualifier_set: PolicyQualifierInfos*, *expected_policy_set: Set[str]*)

Bases: `PolicyTreeRoot`

A policy tree node that is used for all nodes but the root

path_to_root()

3.2.11 pyhanko_certvalidator.registry module

class pyhanko_certvalidator.registry.**CertificateCollection**

Bases: ABC

Abstract base class for read-only access to a collection of certificates.

retrieve_by_key_identifier(*key_identifier: bytes*)

Retrieves a cert via its key identifier

Parameters
key_identifier – A byte string of the key identifier

Returns
None or an asn1crypto.x509.Certificate object

retrieve_many_by_key_identifier(*key_identifier: bytes*)

Retrieves possibly multiple certs via the corresponding key identifiers

Parameters
key_identifier – A byte string of the key identifier

Returns
A list of asn1crypto.x509.Certificate objects

retrieve_by_name(*name: Name*)

Retrieves a list certs via their subject name

Parameters
name – An asn1crypto.x509.Name object

Returns
A list of asn1crypto.x509.Certificate objects

retrieve_by_issuer_serial(*issuer_serial*)

Retrieve a certificate by its `issuer_serial` value.

Parameters
issuer_serial – The `issuer_serial` value of the certificate.

Returns
The certificate corresponding to the `issuer_serial` key passed in.

Returns
None or an asn1crypto.x509.Certificate object

class pyhanko_certvalidator.registry.**CertificateStore**

Bases: *CertificateCollection*, ABC

register(*cert: Certificate*) → bool

Register a single certificate.

Parameters
cert – Certificate to add.

Returns
`True` if the certificate was added, `False` if it already existed in this store.

register_multiple(*certs: Iterable[Certificate]*)

Register multiple certificates.

Parameters
`certs` – Certificates to register.

Returns
`True` if at least one certificate was added, `False` if all certificates already existed in this store.

`class pyhanko_certvalidator.registry.`**`SimpleCertificateStore`**

Bases: *`CertificateStore`*

Simple trustless certificate store.

`classmethod` **`from_certs`**(*certs*)

`register`(*cert: Certificate*) → bool

Register a single certificate.

Parameters
`cert` – Certificate to add.

Returns
`True` if the certificate was added, `False` if it already existed in this store.

`retrieve_many_by_key_identifier`(*key_identifier: bytes*)

Retrieves possibly multiple certs via the corresponding key identifiers

Parameters
`key_identifier` – A byte string of the key identifier

Returns
A list of asn1crypto.x509.Certificate objects

`retrieve_by_name`(*name: Name*)

Retrieves a list certs via their subject name

Parameters
`name` – An asn1crypto.x509.Name object

Returns
A list of asn1crypto.x509.Certificate objects

`retrieve_by_issuer_serial`(*issuer_serial*)

Retrieve a certificate by its `issuer_serial` value.

Parameters
`issuer_serial` – The `issuer_serial` value of the certificate.

Returns
The certificate corresponding to the `issuer_serial` key passed in.

Returns
None or an asn1crypto.x509.Certificate object

`class pyhanko_certvalidator.registry.`**`TrustManager`**

Bases: `object`

Abstract trust manager API.

`is_root`(*cert: Certificate*) → bool

Checks if a certificate is in the list of trust roots in this registry

Parameters
`cert` – An asn1crypto.x509.Certificate object

Returns
A boolean - if the certificate is in the CA list

find_potential_issuers(*cert: Certificate*) → Iterator[*TrustAnchor*]

Find potential issuers that might have (directly) issued a particular certificate.

Parameters
cert – Issued certificate.

Returns
An iterator with potentially relevant trust anchors.

class pyhanko_certvalidator.registry.**SimpleTrustManager**

Bases: *TrustManager*

Trust manager backed by a list of trust roots, possibly in addition to the system trust list.

classmethod **build**(*trust_roots: Optional[Iterable[Union[Certificate,* TrustAnchor*]]] = None*, *extra_trust_roots: Optional[Iterable[Union[Certificate,* TrustAnchor*]]] = None*) → *SimpleTrustManager*

Parameters

- **trust_roots** – If the operating system's trust list should not be used, instead pass a list of asn1crypto.x509.Certificate objects. These certificates will be used as the trust roots for the path being built.
- **extra_trust_roots** – If the operating system's trust list should be used, but augmented with one or more extra certificates. This should be a list of asn1crypto.x509.Certificate objects.

Returns

is_root(*cert: Certificate*)

Checks if a certificate is in the list of trust roots in this registry

Parameters
cert – An asn1crypto.x509.Certificate object

Returns
A boolean - if the certificate is in the CA list

iter_certs() → Iterator[Certificate]

find_potential_issuers(*cert: Certificate*) → Iterator[*TrustAnchor*]

Find potential issuers that might have (directly) issued a particular certificate.

Parameters
cert – Issued certificate.

Returns
An iterator with potentially relevant trust anchors.

class pyhanko_certvalidator.registry.**CertificateRegistry**(*, *cert_fetcher: Optional[*CertificateFetcher*] = None*)

Bases: *SimpleCertificateStore*

Contains certificate lists used to build validation paths, and is also capable of fetching missing certificates if a certificate fetcher is supplied.

classmethod build(*certs: Iterable[Certificate] = ()*, ***, *cert_fetcher: Optional[*CertificateFetcher*] = None*)

Convenience method to set up a certificate registry and import certs into it.

Parameters

- **certs** – Initial list of certificates to import.
- **cert_fetcher** – Certificate fetcher to handle retrieval of missing certificates (in situations where that is possible).

Returns

A populated certificate registry.

retrieve_by_name(*name: Name*, *first_certificate: Optional[Certificate] = None*)

Retrieves a list certs via their subject name

Parameters

- **name** – An asn1crypto.x509.Name object
- **first_certificate** – An asn1crypto.x509.Certificate object that if found, should be placed first in the result list

Returns

A list of asn1crypto.x509.Certificate objects

find_potential_issuers(*cert: Certificate*, *trust_manager:* TrustManager) → Iterator[Union[*TrustAnchor*, Certificate]]

async fetch_missing_potential_issuers(*cert: Certificate*)

class pyhanko_certvalidator.registry.**PathBuilder**(*trust_manager:* TrustManager, *registry:* CertificateRegistry)

Bases: `object`

Class to handle path building.

build_paths(*end_entity_cert*)

Builds a list of ValidationPath objects from a certificate in the operating system trust store to the end-entity certificate

Note: This is a synchronous equivalent of `async_build_paths()` that calls the latter in a new event loop. As such, it can't be used from within asynchronous code.

Parameters

end_entity_cert – A byte string of a DER or PEM-encoded X.509 certificate, or an instance of asn1crypto.x509.Certificate

Returns

A list of pyhanko_certvalidator.path.ValidationPath objects that represent the possible paths from the end-entity certificate to one of the CA certs.

async async_build_paths(*end_entity_cert: Certificate*)

Builds a list of ValidationPath objects from a certificate in the operating system trust store to the end-entity certificate, returning all paths in a single list.

Parameters

end_entity_cert – A byte string of a DER or PEM-encoded X.509 certificate, or an instance of asn1crypto.x509.Certificate

Returns
A list of pyhanko_certvalidator.path.ValidationPath objects that represent the possible paths from the end-entity certificate to one of the CA certs.

`async_build_paths_lazy`(*end_entity_cert: Certificate*) → *CancelableAsyncIterator*[*ValidationPath*]

Builds a list of ValidationPath objects from a certificate in the operating system trust store to the end-entity certificate, and emit them as an asynchronous generator.

Parameters
`end_entity_cert` – A byte string of a DER or PEM-encoded X.509 certificate, or an instance of asn1crypto.x509.Certificate

Returns
An asynchronous iterator that yields pyhanko_certvalidator.path.ValidationPath objects that represent the possible paths from the end-entity certificate to one of the CA certs, and raises PathBuildingError if no paths could be built

`class pyhanko_certvalidator.registry.`**`LazyPathIterator`**(*walker: _PathWalker*, *cert: Certificate*)

Bases: `CancelableAsyncIterator`[`ValidationPath`]

`async cancel`()

`class pyhanko_certvalidator.registry.`**`LayeredCertificateStore`**(*stores: List[*CertificateCollection*]*)

Bases: `CertificateCollection`

Trustless certificate store that looks up certificates in other stores in a specific order.

`retrieve_many_by_key_identifier`(*key_identifier: bytes*)

Retrieves possibly multiple certs via the corresponding key identifiers

Parameters
`key_identifier` – A byte string of the key identifier

Returns
A list of asn1crypto.x509.Certificate objects

`retrieve_by_name`(*name: Name*)

Retrieves a list certs via their subject name

Parameters
`name` – An asn1crypto.x509.Name object

Returns
A list of asn1crypto.x509.Certificate objects

`retrieve_by_issuer_serial`(*issuer_serial*)

Retrieve a certificate by its `issuer_serial` value.

Parameters
`issuer_serial` – The `issuer_serial` value of the certificate.

Returns
The certificate corresponding to the `issuer_serial` key passed in.

Returns
None or an asn1crypto.x509.Certificate object

3.2.12 pyhanko_certvalidator.util module

`pyhanko_certvalidator.util.`**`extract_dir_name`**(*names: GeneralNames*, *err_msg_prefix: str*) → Name

`pyhanko_certvalidator.util.`**`extract_ac_issuer_dir_name`**(*attr_cert: AttributeCertificateV2*) → Name

`pyhanko_certvalidator.util.`**`get_issuer_dn`**(*cert: Union[Certificate, AttributeCertificateV2]*) → Name

`pyhanko_certvalidator.util.`**`issuer_serial`**(*cert: Union[Certificate, AttributeCertificateV2]*) → bytes

`pyhanko_certvalidator.util.`**`get_ac_extension_value`**(*attr_cert: AttributeCertificateV2*, *ext_name: str*)

`pyhanko_certvalidator.util.`**`get_relevant_crl_dps`**(*cert: Union[Certificate, AttributeCertificateV2]*, ***, *use_deltas*) → List[DistributionPoint]

`pyhanko_certvalidator.util.`**`get_ocsp_urls`**(*cert: Union[Certificate, AttributeCertificateV2]*)

`pyhanko_certvalidator.util.`**`get_declared_revinfo`**(*cert: Union[Certificate, AttributeCertificateV2]*)

`pyhanko_certvalidator.util.`**`validate_sig`**(*signature: bytes*, *signed_data: bytes*, *public_key_info: PublicKeyInfo*, *sig_algo: str*, *hash_algo: str*, *parameters=None*)

`class` `pyhanko_certvalidator.util.`**`ConsList`**(**args*, ***kwds*)

Bases: `Generic`[`ListElem`]

`head: Optional[ListElem]`

`tail: Optional[ConsList[ListElem]] = None`

`static empty`() → *ConsList*[ListElem]

`static sing`(*value: ListElem*) → *ConsList*[ListElem]

`property last: Optional[ListElem]`

`cons`(*head: ListElem*) → *ConsList*[ListElem]

`class` `pyhanko_certvalidator.util.`**`CancelableAsyncIterator`**(**args*, ***kwds*)

Bases: `ABC`, `AsyncIterator`[`T`]

`async cancel`()

3.2.13 pyhanko_certvalidator.validate module

`pyhanko_certvalidator.validate.`**`validate_path`**(*validation_context*, *path*, *parameters: Optional[PKIXValidationParams] = None*)

Validates the path using the algorithm from https://tools.ietf.org/html/rfc5280#section-6.1.

Critical extensions on the end-entity certificate are not validated and are left up to the consuming application to process and/or fail on.

Note: This is a synchronous equivalent of *`async_validate_path()`* that calls the latter in a new event loop. As such, it can't be used from within asynchronous code.

Parameters

- **validation_context** – A pyhanko_certvalidator.context.ValidationContext object to use for configuring validation behavior
- **path** – A pyhanko_certvalidator.path.ValidationPath object of the path to validate
- **parameters** – Additional input parameters to the PKIX validation algorithm. These are not used when validating CRLs and OCSP responses.

Raises

pyhanko_certvalidator.errors.PathValidationError - when an error occurs validating the path pyhanko_certvalidator.errors.RevokedError - when the certificate or another certificate in its path has been revoked

Returns

The final certificate in the path - an instance of asn1crypto.x509.Certificate

`async pyhanko_certvalidator.validate.`**`async_validate_path`**(*validation_context: ValidationContext*, *path: ValidationPath*, *parameters: Optional[PKIXValidationParams] = None*)

Validates the path using the algorithm from https://tools.ietf.org/html/rfc5280#section-6.1.

Critical extensions on the end-entity certificate are not validated and are left up to the consuming application to process and/or fail on.

Parameters

- **validation_context** – A pyhanko_certvalidator.context.ValidationContext object to use for configuring validation behavior
- **path** – A pyhanko_certvalidator.path.ValidationPath object of the path to validate
- **parameters** – Additional input parameters to the PKIX validation algorithm. These are not used when validating CRLs and OCSP responses.

Raises

pyhanko_certvalidator.errors.PathValidationError - when an error occurs validating the path pyhanko_certvalidator.errors.RevokedError - when the certificate or another certificate in its path has been revoked

Returns

The final certificate in the path - an instance of asn1crypto.x509.Certificate

`pyhanko_certvalidator.validate.`**`validate_tls_hostname`**(*validation_context: ValidationContext*, *cert: Certificate*, *hostname: str*)

Validates the end-entity certificate from a pyhanko_certvalidator.path.ValidationPath object to ensure that the certificate is valid for the hostname provided and that the certificate is valid for the purpose of a TLS connection.

THE CERTIFICATE PATH MUST BE VALIDATED SEPARATELY VIA validate_path()!

Parameters

- **validation_context** – A pyhanko_certvalidator.context.ValidationContext object to use for configuring validation behavior
- **cert** – An asn1crypto.x509.Certificate object returned from validate_path()
- **hostname** – A unicode string of the TLS server hostname

Raises

pyhanko_certvalidator.errors.InvalidCertificateError - when the certificate is not valid for TLS or the hostname `pyhanko_certvalidator.validate.`**`validate_usage`**(*validation_context:* ValidationContext, *cert: Certificate*, *key_usage: Set[str]*, *extended_key_usage: Set[str]*, *extended_optional: bool*)

Validates the end-entity certificate from a pyhanko_certvalidator.path.ValidationPath object to ensure that the certificate is valid for the key usage and extended key usage purposes specified.

THE CERTIFICATE PATH MUST BE VALIDATED SEPARATELY VIA validate_path()!

Parameters

- **`validation_context`** – A pyhanko_certvalidator.context.ValidationContext object to use for configuring validation behavior
- **`cert`** – An asn1crypto.x509.Certificate object returned from validate_path()
- **`key_usage`** – A set of unicode strings of the required key usage purposes
- **`extended_key_usage`** – A set of unicode strings of the required extended key usage purposes
- **`extended_optional`** – A bool - if the extended_key_usage extension may be omitted and still considered valid

Raises

pyhanko_certvalidator.errors.InvalidCertificateError - when the certificate is not valid for the usages specified

`pyhanko_certvalidator.validate.`**`validate_aa_usage`**(*validation_context:* ValidationContext, *cert: Certificate*, *extended_key_usage: Optional[Set[str]] = None*)

Validate AA certificate profile conditions in RFC 5755 § 4.5

Parameters

- **`validation_context`** –
- **`cert`** –
- **`extended_key_usage`** –

Returns

`pyhanko_certvalidator.validate.`**`check_ac_holder_match`**(*holder_cert: Certificate*, *holder: Holder*)

Match a candidate holder certificate against the holder entry of an attribute certificate.

Parameters

- **`holder_cert`** – Candidate holder certificate.
- **`holder`** – Holder value to match against.

Returns

Return the parts of the holder entry that mismatched as a set. Possible values are *'base_certificate_id'*, *'entity_name'* and *'object_digest_info'*. If the returned set is empty, all entries in the holder entry matched the information in the certificate.

`class` `pyhanko_certvalidator.validate.`**`ACValidationResult`**(*attr_cert: AttributeCertificateV2*, *aa_cert: Certificate*, *aa_path:* ValidationPath, *approved_attributes: Dict[str, AttCertAttribute]*)

Bases: `object`

The result of a successful attribute certificate validation.

`attr_cert: AttributeCertificateV2`

The attribute certificate that was validated.

`aa_cert: Certificate`

The attribute authority that issued the certificate.

`aa_path:` *`ValidationPath`*

The validation path of the attribute authority's certificate.

`approved_attributes: Dict[str, AttCertAttribute]`

Approved attributes in the attribute certificate, possibly filtered by AA controls.

`async pyhanko_certvalidator.validate.`**`async_validate_ac`**(*attr_cert: AttributeCertificateV2*, *validation_context:* ValidationContext, *aa_pkix_params:* PKIXValidationParams = *PKIXValidationParams(user_initial_policy_set=frozenset({'any_policy'}), initial_policy_mapping_inhibit=False, initial_explicit_policy=False, initial_any_policy_inhibit=False, initial_permitted_subtrees=None, initial_excluded_subtrees=None)*, *holder_cert: Optional[Certificate] = None*) → *ACValidationResult*

Validate an attribute certificate with respect to a given validation context.

Parameters

- **`attr_cert`** – The attribute certificate to validate.
- **`validation_context`** – The validation context to validate against.
- **`aa_pkix_params`** – PKIX validation parameters to supply to the path validation algorithm applied to the attribute authority's certificate.
- **`holder_cert`** – Certificate of the presumed holder to match against the AC's holder entry. If not provided, the holder check is left to the caller to perform.

  Note: This is a convenience option in case there's only one reasonable candidate holder certificate (e.g. when the attribute certificates are part of a CMS SignedData value with only a single signer).

Returns

An *`ACValidationResult`* detailing the validation result, if successful.

`async pyhanko_certvalidator.validate.`**`intl_validate_path`**(*validation_context:* ValidationContext, *path:* ValidationPath, *proc_state: ValProcState*, *parameters: Optional[*PKIXValidationParams*] = None*)

Internal copy of validate_path() that allows overriding the name of the end-entity certificate as used in exception messages. This functionality is used during chain validation when dealing with indirect CRLs issuer or OCSP responder certificates.

Parameters

- **`validation_context`** – A pyhanko_certvalidator.context.ValidationContext object to use for configuring validation behavior

- **path** – A pyhanko_certvalidator.path.ValidationPath object of the path to validate
- **proc_state** – Internal state for error reporting and policy application decisions.
- **parameters** – Additional input parameters to the PKIX validation algorithm. These are not used when validating CRLs and OCSP responses.

Returns
The final certificate in the path - an instance of asn1crypto.x509.Certificate

3.2.14 pyhanko_certvalidator.version module

3.2.15 Module contents

class pyhanko_certvalidator.**CertificateValidator**(*end_entity_cert: Certificate*, *intermediate_certs: Optional[Iterable[Certificate]] = None*, *validation_context: Optional[*ValidationContext*] = None*, *pkix_params: Optional[*PKIXValidationParams*] = None*)

Bases: `object`

property certificate

async async_validate_path() → *ValidationPath*

Builds possible certificate paths and validates them until a valid one is found, or all fail.

Raises
pyhanko_certvalidator.errors.PathBuildingError - when an error occurs building the path pyhanko_certvalidator.errors.PathValidationError - when an error occurs validating the path pyhanko_certvalidator.errors.RevokedError - when the certificate or another certificate in its path has been revoked

validate_usage(*key_usage*, *extended_key_usage=None*, *extended_optional=False*)

Validates the certificate path and that the certificate is valid for the key usage and extended key usage purposes specified.

Deprecated since version 0.17.0: Use `async_validate_usage()` instead.

Parameters

- **key_usage** – A set of unicode strings of the required key usage purposes. Valid values include:
  - ”digital_signature”
  - ”non_repudiation”
  - ”key_encipherment”
  - ”data_encipherment”
  - ”key_agreement”
  - ”key_cert_sign”
  - ”crl_sign”
  - ”encipher_only”
  - ”decipher_only”

- `extended_key_usage` – A set of unicode strings of the required extended key usage purposes. These must be either dotted number OIDs, or one of the following extended key usage purposes:
  - "server_auth"
  - "client_auth"
  - "code_signing"
  - "email_protection"
  - "ipsec_end_system"
  - "ipsec_tunnel"
  - "ipsec_user"
  - "time_stamping"
  - "ocsp_signing"
  - "wireless_access_points"

  An example of a dotted number OID:
  - "1.3.6.1.5.5.7.3.1"
- `extended_optional` – A bool - if the extended_key_usage extension may be ommited and still considered valid

Raises

pyhanko_certvalidator.errors.PathValidationError - when an error occurs validating the path pyhanko_certvalidator.errors.RevokedError - when the certificate or another certificate in its path has been revoked pyhanko_certvalidator.errors.InvalidCertificateError - when the certificate is not valid for the usages specified

Returns

A pyhanko_certvalidator.path.ValidationPath object of the validated certificate validation path

`async async_validate_usage`(*key_usage*, *extended_key_usage=None*, *extended_optional=False*)

Validates the certificate path and that the certificate is valid for the key usage and extended key usage purposes specified.

Parameters

- `key_usage` – A set of unicode strings of the required key usage purposes. Valid values include:
  - "digital_signature"
  - "non_repudiation"
  - "key_encipherment"
  - "data_encipherment"
  - "key_agreement"
  - "key_cert_sign"
  - "crl_sign"
  - "encipher_only"
  - "decipher_only"

- **extended_key_usage** – A set of unicode strings of the required extended key usage purposes. These must be either dotted number OIDs, or one of the following extended key usage purposes:
  - ”server_auth”
  - ”client_auth”
  - ”code_signing”
  - ”email_protection”
  - ”ipsec_end_system”
  - ”ipsec_tunnel”
  - ”ipsec_user”
  - ”time_stamping”
  - ”ocsp_signing”
  - ”wireless_access_points”

  An example of a dotted number OID:

  - ”1.3.6.1.5.5.7.3.1”
- **extended_optional** – A bool - if the extended_key_usage extension may be ommited and still considered valid

Raises
pyhanko_certvalidator.errors.PathValidationError - when an error occurs validating the path pyhanko_certvalidator.errors.RevokedError - when the certificate or another certificate in its path has been revoked pyhanko_certvalidator.errors.InvalidCertificateError - when the certificate is not valid for the usages specified

Returns
A pyhanko_certvalidator.path.ValidationPath object of the validated certificate validation path

`validate_tls`(*hostname*)

Validates the certificate path, that the certificate is valid for the hostname provided and that the certificate is valid for the purpose of a TLS connection.

Deprecated since version 0.17.0: Use `async_validate_tls()` instead.

Parameters
hostname – A unicode string of the TLS server hostname

Raises
pyhanko_certvalidator.errors.PathValidationError - when an error occurs validating the path pyhanko_certvalidator.errors.RevokedError - when the certificate or another certificate in its path has been revoked pyhanko_certvalidator.errors.InvalidCertificateError - when the certificate is not valid for TLS or the hostname

Returns
A pyhanko_certvalidator.path.ValidationPath object of the validated certificate validation path

`async async_validate_tls`(*hostname*)

Validates the certificate path, that the certificate is valid for the hostname provided and that the certificate is valid for the purpose of a TLS connection.

Parameters
: `hostname` – A unicode string of the TLS server hostname

Raises
: pyhanko_certvalidator.errors.PathValidationError - when an error occurs validating the path pyhanko_certvalidator.errors.RevokedError - when the certificate or another certificate in its path has been revoked pyhanko_certvalidator.errors.InvalidCertificateError - when the certificate is not valid for TLS or the hostname

Returns
: A pyhanko_certvalidator.path.ValidationPath object of the validated certificate validation path

class `pyhanko_certvalidator.`**`ValidationContext`**(*trust_roots: Optional[Iterable[Union[Certificate, TrustAnchor]]] = None, extra_trust_roots: Optional[Iterable[Union[Certificate, TrustAnchor]]] = None, other_certs: Optional[Iterable[Certificate]] = None, whitelisted_certs: Optional[Iterable[Union[bytes, str]]] = None, moment: Optional[datetime] = None, best_signature_time: Optional[datetime] = None, allow_fetching: bool = False, crls: Optional[Iterable[Union[bytes, CertificateList]]] = None, ocsps: Optional[Iterable[Union[bytes, OCSPResponse]]] = None, revocation_mode: str = 'soft-fail', revinfo_policy: Optional[CertRevTrustPolicy] = None, weak_hash_algos: Optional[Iterable[str]] = None, time_tolerance: timedelta = datetime.timedelta(seconds=1), retroactive_revinfo: bool = False, fetcher_backend: Optional[FetcherBackend] = None, acceptable_ac_targets: Optional[ACTargetDescription] = None, poe_manager: Optional[POEManager] = None, revinfo_manager: Optional[RevinfoManager] = None, certificate_registry: Optional[CertificateRegistry] = None, trust_manager: Optional[TrustManager] = None, algorithm_usage_policy: Optional[AlgorithmUsagePolicy] = None, fetchers: Optional[Fetchers] = None*)

Bases: `object`

property revinfo_manager: ***RevinfoManager***

property revinfo_policy: ***CertRevTrustPolicy***

property retroactive_revinfo: bool

property time_tolerance: timedelta

property moment: datetime

property best_signature_time: datetime

property fetching_allowed: bool

property crls: List[CertificateList]

A list of all cached `crl.CertificateList` objects

property ocsps: List[OCSPResponse]

A list of all cached `ocsp.OCSPResponse` objects

property soft_fail_exceptions

A list of soft-fail exceptions that were ignored during checks

is_whitelisted(*cert*)

Checks to see if a certificate has been whitelisted

Parameters
`cert` – An asn1crypto.x509.Certificate object

Returns
A bool - if the certificate is whitelisted

async async_retrieve_crls(*cert*)

Parameters
`cert` – An asn1crypto.x509.Certificate object

Returns
A list of asn1crypto.crl.CertificateList objects

retrieve_crls(*cert*)

Deprecated since version 0.17.0: Use *async_retrieve_crls()* instead.

Parameters
`cert` – An asn1crypto.x509.Certificate object

Returns
A list of asn1crypto.crl.CertificateList objects

async async_retrieve_ocsps(*cert*, *issuer*)

Parameters

- `cert` – An asn1crypto.x509.Certificate object
- `issuer` – An asn1crypto.x509.Certificate object of cert's issuer

Returns
A list of asn1crypto.ocsp.OCSPResponse objects

retrieve_ocsps(*cert*, *issuer*)

Deprecated since version 0.17.0: Use *async_retrieve_ocsps()* instead.

Parameters

- `cert` – An asn1crypto.x509.Certificate object
- `issuer` – An asn1crypto.x509.Certificate object of cert's issuer

Returns
A list of asn1crypto.ocsp.OCSPResponse objects

record_validation(*cert*, *path*)

Records that a certificate has been validated, along with the path that was used for validation. This helps reduce duplicate work when validating a ceritifcate and related resources such as CRLs and OCSPs.

Parameters

- `cert` – An ans1crypto.x509.Certificate object
- `path` – A pyhanko_certvalidator.path.ValidationPath object

check_validation(*cert*)

Checks to see if a certificate has been validated, and if so, returns the ValidationPath used to validate it.

Parameters
`cert` – An asn1crypto.x509.Certificate object

Returns
None if not validated, or a pyhanko_certvalidator.path.ValidationPath object of the validation path

clear_validation(*cert*)

Clears the record that a certificate has been validated

Parameters
`cert` – An ans1crypto.x509.Certificate object

property acceptable_ac_targets: Optional[*ACTargetDescription*]

class pyhanko_certvalidator.**PKIXValidationParams**(*user_initial_policy_set: frozenset = frozenset({'any_policy'})*, *initial_policy_mapping_inhibit: bool = False*, *initial_explicit_policy: bool = False*, *initial_any_policy_inhibit: bool = False*, *initial_permitted_subtrees: Union[Dict[pyhanko_certvalidator.name_trees.GeneralNameType, Set[pyhanko_certvalidator.name_trees.NameSubtree]], NoneType] = None*, *initial_excluded_subtrees: Union[Dict[pyhanko_certvalidator.name_trees.GeneralNameType, Set[pyhanko_certvalidator.name_trees.NameSubtree]], NoneType] = None*)

Bases: `object`

user_initial_policy_set: frozenset = frozenset({'any_policy'})

Set of policies that the user is willing to accept. By default, any policy is acceptable.

When setting this parameter to a non-default value, you probably want to set *`initial_explicit_policy`* as well.

Note: These are specified in the policy domain of the trust root(s), and subject to policy mapping by intermediate certificate authorities.

initial_policy_mapping_inhibit: bool = False

Flag indicating whether policy mapping is forbidden along the entire certification chains. By default, policy mapping is permitted.

Note: Policy constraints on intermediate certificates may force policy mapping to be inhibited from some point onwards.

initial_explicit_policy: bool = False

Flag indicating whether path validation must terminate with at least one permissible policy; see *`user_initial_policy_set`*. By default, no such requirement is imposed.

Note: If *user_initial_policy_set* is set to its default value of `{'any_policy'}`, the effect is that the path validation must accept at least one policy, without specifying which.

Warning: Due to widespread mis-specification of policy extensions in the wild, many real-world certification chains terminate with an empty set (or rather, tree) of valid policies. Therefore, this flag is set to `False` by default.

`initial_any_policy_inhibit: bool = False`

Flag indicating whether `anyPolicy` should be left unprocessed when it appears in a certificate. By default, `anyPolicy` is always processed when it appears.

`initial_permitted_subtrees: Optional[Dict[GeneralNameType, Set[NameSubtree]]] = None`

Set of permitted subtrees for each name type, indicating restrictions to impose on subject names (and alternative names) in the certification path.

By default, all names are permitted. This behaviour can be modified by name constraints on intermediate CA certificates.

`initial_excluded_subtrees: Optional[Dict[GeneralNameType, Set[NameSubtree]]] = None`

Set of excluded subtrees for each name type, indicating restrictions to impose on subject names (and alternative names) in the certification path.

By default, no names are excluded. This behaviour can be modified by name constraints on intermediate CA certificates.

`merge`(*other:* PKIXValidationParams) → *PKIXValidationParams*

Combine the conditions of these PKIX validation params with another set of parameters, producing the most lenient set of parameters that is stricter than both inputs.

Parameters
`other` – Another set of PKIX validation parameters.

Returns
A combined set of PKIX validation parameters.

async `pyhanko_certvalidator.`**`find_valid_path`**(*certificate: Certificate*, *paths:* CancelableAsyncIterator*[*ValidationPath*]*, *validation_context:* ValidationContext, *pkix_validation_params: Optional[*PKIXValidationParams*] = None*)

CHAPTER

FOUR

RELEASE HISTORY

4.1 0.18.1

Release date: 2023-04-29

4.1.1 Dependency changes

- Remove dependency on `pytz` with fallback to `backports.zoneinfo`
- Bump `tzlocal` version to `4.3`.
- Do not rely on deprecated timezone API anymore in the tests. See PR #257.

4.2 0.18.0

Release date: 2023-04-26

4.2.1 Note

This is largely a maintenance release in the sense that it adds relatively little in the way of core features, but it nevertheless comes with some major reorganisation and work to address technical debt.

This release also marks pyHanko's move to beta status. That doesn't mean that it's feature-complete in every respect, but it does mean that we've now entered a stabilisation phase in anticipation of the `1.0.0` release, so until then the focus will be on fixing bugs and clearing up issues in the documentation (in particular regarding the API contract). After the `1.0.0` release, pyHanko will simply follow SemVer.

4.2.2 Breaking changes

Some changes have been made to the *`Signer`* class. For all practical purposes, these are mostly relevant for custom *`Signer`* implementations. Regular users should see fairly little impact.

- The arguments to `__init__` have been made keyword-only.
- Several attributes have been turned into read-only properties:
  - *`signing_cert`*
  - *`cert_registry`*
  - *`attribute_certs`*

  - *signature_mechanism*

  This change was made to better reflect the way the properties were used internally, and made it easier to set expectations for the API: it doesn't make sense to allow arbitrary modifications to these properties for all *Signer* implementations. The parameters to `__init__` have been extended to allow setting defaults more cleanly. Implementation-wise, the properties are backed by an underscored internal variable (e.g. `_signing_cert` for `signing_cert`). Subclasses can of course still elect to make some of these read-only properties writable by declaring setters.

- `get_signature_mechanism` was renamed to *get_signature_mechanism_for_digest()* to make it more clear that it does more than just fetch the underlying value of *signature_mechanism*.

Concretely, this means that init logic of the form

```
class MySigner(Signer):
    def __init__(
        self,
        signing_cert: x509.Certificate,
        cert_registry: CertificateStore,
        *args, **kwargs
    ):
        self.signing_cert = signing_cert
        self.cert_registry = cert_registry
        self.signature_mechanism = signature_mechanism
        super().__init__()
```

needs to be rewritten as

```
class MySigner(Signer):
    def __init__(
        self,
        signing_cert: x509.Certificate,
        cert_registry: CertificateStore,
        *args, **kwargs
    ):
        self._signing_cert = signing_cert
        self._cert_registry = cert_registry
        self._signature_mechanism = signature_mechanism
        super().__init__()
```

or, alternatively, as

```
class MySigner(Signer):
    def __init__(
        self,
        signing_cert: x509.Certificate,
        cert_registry: CertificateStore,
        *args, **kwargs
    ):
        super().__init__(
            signing_cert=signing_cert,
            cert_registry=cert_registry,
            signature_mechanism=signature_mechanism
        )
```

Other than these, there have been some miscellaneous changes.

- The CLI no longer allows signing files encrypted using public-key encryption targeted towards the signer's certificate, because that feature didn't make much sense in key management terms, was rarely used, and hard to integrate with the new plugin system.
- APIs with `status_cls` parameters have made certain args keyword-only for strict type checking purposes.
- Move `add_content_to_page` to *add_to_page()* to deal with a (conceptual) circular dependency between modules.
- *CertificateStore* is no longer reexported by *pyhanko.sign.general*.
- The *BEIDSigner* no longer allows convenient access to the authentication certificate.
- Packaging-wise, underscores have been replaced with hyphens in optional dependency groups.
- In `pyhanko_certvalidator`, *InvalidCertificateError* is no longer a subclass of *PathValidationError*.

Finally, some internal refactoring took place as well:

- The `cli.py` module was refactored into a new subpackage (`pyhanko.cli`) and is now also tested systematically.
- CLI config classes have been refactored, some configuration was moved to the new `pyhanko.config` package.
- Time tolerance config now passes around timedelta objects instead of second values.
- The *qualify()* function in the difference analysis has been split into *qualify()* and *qualify_transforming()*.

4.2.3 Organisational changes

- Certificate and key loading was moved to a new *pyhanko.keys* module, but *pyhanko.sign.general* still reexports the relevant functions for backwards compatibility. Concretely, the affected functions are
  - *pyhanko.keys.load_cert_from_pemder()*,
  - *pyhanko.keys.load_certs_from_pemder()*,
  - *pyhanko.keys.load_certs_from_pemder_data()*,
  - *pyhanko.keys.load_private_key_from_pemder()*,
  - *pyhanko.keys.load_private_key_from_pemder_data()*.
- Onboarded `mypy` and flag pyHanko as a typed library by adding `py.typed`.
- Package metadata and tooling settings have now been centralised to `pyproject.toml`. Other configuration files like `setup.py`, `requirements.txt` and most tool-specific config have been eliminated.
- The docstring-based documentation for `pyhanko_certvalidator` was added to the API reference.
- Some non-autogenerated API reference documentation pages were consolidated to reduce the sprawl.
- Heavily reworked the CI/CD pipeline. PyHanko releases are now published via GitHub Actions and signed with Sigstore. GPG signatures will continue to be provided for the time being.

4.2.4 Dependency changes

- Bump `pyhanko-certvalidator` to `0.22.0`.
- Relax the upper bound on `uharfbuzz` for better Python 3.11 support

4.2.5 Bugs fixed

- The AdES LTA validator now tolerates documents that don't have a DSS (assuming that all the required information is otherwise present).
- Ensure that the *`trusted`* attribute on *`SignatureStatus`* is not set if the validation path is not actually available.
- Correct the typing on *`validation_path`*.
- Fix several result presentation bugs in the AdES code.
- Fix overeager sharing of *`POEManager`* objects in AdES code.
- Correct algo policy handling in AdES-with-time validation.
- Ensure that `container_ref` is also populated on past versions of the trailer dictionary.

4.2.6 New features and enhancements

Signing

- *The CLI now features plugins*! All current `addsig` subcommands have been reimplemented to use the plugin interface. Other plugins will be auto-detected through package entry points.

Validation

- Refine algorithm policy handling; put in place a subclass of *`AlgorithmUsagePolicy`* specifically for CMS validation; see *`CMSAlgorithmUsagePolicy`*.
- Try to remember paths when validation fails.
- Make certificates from local CMS context available during path building for past certificate validation (subject to PoE checks).
- Move *`docmdp_ok`* up in the hierarchy to *`ModificationInfo`*.

4.3 0.17.2

Release date: 2023-03-10

4.3.1 Note

This is a follow-up on yesterday's bugfix release, addressing a number of similar issues.

4.3.2 Bugs fixed

- Address another potential infinite loop in the comment processing logic.
- Fix some (rather esoteric) correctness issues w.r.t. PDF whitespace.

4.4 0.17.1

Release date: 2023-03-09

4.4.1 Note

This is a maintenance release without significant functionality changes. It contains a bugfix, addresses some documentation issues and applies the Black formatter to the codebase.

4.4.2 Bugs fixed

- Address a potential infinite loop in the PDF parsing logic. See PR #237.

4.5 0.17.0

Release date: 2023-01-31

4.5.1 Note

This is a bit of an odd release. It comes with relatively few functional changes or enhancements to existing features, but it has nevertheless been in the works for quite a long time.

In early 2022, I decided that the time was right to equip pyHanko with its own AdES validation engine, implementing the machinery specified by ETSI EN 319 102-1. I knew ahead of time that this would not be an easy task:

- PyHanko's own validation code was put together in a fairly ad-hoc manner starting from the provisions in the CMS specification, so some refactoring would be necessary.
- `pyhanko-certvalidator` also was never designed to be anything more than an RFC 5280 validation engine, and retrofitting the fine-tuning required by the AdES spec definitely wasn't easy.

Initially, I estimated that this effort would take a few months tops. Yet here we are, approximately one year down the road: *`pyhanko.sign.validation.ades`*.

Truth be told, the implementation isn't yet ready for prime time, but it is in a state where it's at least useful for experimentation purposes, and can be iterated on. Also, given the volume of subtle changes and far-reaching refactoring in the internals of both the `pyhanko` and `pyhanko-certvalidator` packages, continually rebasing the `feature/ades-validation` feature branch turned into a chore quite quickly.

So, if you're keen to start playing around with AdES validation: please do so, and let me know what you think. If standards-based validation is not something you care about, feel free to disregard everything I wrote above, it almost certainly won't affect any of your code.

My plan is to incrementally build upon and polish the code in `pyhanko.sign.validation.ades`, and eventually deprecate the current ad-hoc LTV validation logic in `pyhanko.sign.validation.ltv.async_validate_pdf_ltv_signature()`. That's still a ways off from now, though.

4.5.2 Dependency updates

- `pyhanko-certvalidator` updated to `0.20.0`

4.5.3 Breaking changes

- There are various changes in the validation internals that are not backwards compatible, but all of those concern internal APIs.
- There are some noteworthy changes to the `pyhanko-certvalidator` API. Those are documented in the change log. Most of these do not affect basic usage.

4.5.4 New features and enhancements

Validation

- Experimental AdES validation engine `pyhanko.sign.validation.ades`.
- In the status API, make a more meaningful distinction between `valid` and `intact`, and document that distinction.

4.6 0.16.0

Release date: 2022-12-21

4.6.1 Dependency updates

- `pyhanko-certvalidator` updated to `0.19.8`

4.6.2 Breaking changes

This release includes breaking changes to the difference analysis engine. Unless you're implementing your own difference analysis policies, this change should break your API usage.

4.6.3 New features and enhancements

Signing

- Add support for **Prop_Build** metadata in signatures. See PR #192

Validation

- Improvements to the difference analysis engine that allow more nuance to be expressed in the rule system.

4.6.4 Bugs fixed

- Tolerate an indirect **Extensions** and **MarkInfo** dictionary in difference analysis. See PR #177.
- Gracefully handle unreadable/undecodable producer strings.

4.7 0.15.1

Release date: 2022-10-27

4.7.1 Note

This release adds Python 3.11 to the list of supported Python versions.

4.7.2 Dependency updates

- `pyhanko-certvalidator` updated to `0.19.6`
- `certomancer` updated to `0.9.1`

4.7.3 Bugs fixed

- Be more tolerant towards deviations from DER restrictions in signed attributes when validating signatures.

4.8 0.15.0

Release date: 2022-10-11

4.8.1 Note

Other than a few bug fixes, the highlight of this release is the addition of support for two very recently published PDF extension standards, ISO/TS 32001 and ISO/TS 32002.

4.8.2 Bugs fixed

- Fix metadata handling in encrypted documents see issue #160.
- Make sure XMP stream dictionaries contain the required typing entries.
- Respect `visible_sig_settings` on field autocreation.
- Fix a division by zero corner case in the stamp layout code; see issue #170.

4.8.3 New features and enhancements

Signing

- Add support for the new PDF extensions defined by ISO/TS 32001 and ISO/TS 32002; see PR #169.
  - SHA-3 support
  - EdDSA support for both the PKCS#11 signer and the in-memory signer
  - Auto-register developer extensions in the file
- Make it easier to extract keys from `bytes` objects.

Validation

- Add support for validating EdDSA signatures (as defined in ISO/TS 32002)

4.9 0.14.0

Release date: 2022-09-17

4.9.1 Note

This release contains a mixture of minor and major changes. Of particular note is the addition of automated metadata management support, including XMP metadata. This change affects almost every PDF write operation in the background. While pyHanko has very good test coverage, some instability and regressions may ensue. Bug reports are obviously welcome.

4.9.2 Breaking changes

The breaking changes in this release are all relatively minor. Chances are that your code isn't affected at all, other than perhaps by the change to *PreparedByteRangeDigest*.

- md_algorithm attribute removed from *PreparedByteRangeDigest* since it wasn't necessary for further processing.
- Low-level change in raw_get for PDF container object types (*ArrayObject* and *DictionaryObject*): the decrypt parameter is no longer a boolean, but a tri-state enum value of type *EncryptedObjAccess*.
- Developer extension management API moved into *pyhanko.pdf_utils.extensions*.
- *get_courier()* convenience function moved into *pyhanko.pdf_utils.font.basic* and now takes a mandatory writer argument.
- The token_label attribute was removed from PKCS11SignatureConfig, but will still be parsed (with a deprecation warning).
- The prompt_pin attribute in PKCS11SignatureConfig was changed from a bool to an enum. See PKCS11PinEntryMode.

4.9.3 Dependency updates

- pytest-aiohttp updated to 1.0.4
- certomancer updated to 0.9.0
- certomancer-csc-dummy updated to 0.2.1
- Relax bounds on uharfbuzz to allow everything up to the current version (i.e. 0.30.0) as well.
- New optional dependency group xmp, which for now only contains defusedxml

4.9.4 Bugs fixed

- Allow certificates with no CN in the certificate subject.
- The extension dictionary handling logic can now deal with encrypted documents without actually decrypting the document contents.
- Fix processing error when passing empty strings to uharfbuzz; see issue #132.
- Use proper PDF text string serialisation routine in simple font handler, to ensure everything is escaped correctly.
- Ensure that output_version is set to at least the input version in incrementally updated files.

4.9.5 New features and enhancements

Signing

- Drop the requirement for *signing_cert* to be set from the start of the signing process in an interrupted signing workflow. This has come up on several occasions in the past, since it's necessary in remote signing scenarios where the certificate is generated or provided on-demand when submitting the document digest to the signing service. See pull #141 for details.
- Add convenience API to set the /TU entry on a signature field; see *readable_field_name*.
- Allow greater control over the initialisation of document timestamp fields.

- New class hierarchy for (un)signed attribute provisioning; see *SignedAttributeProviderSpec* and *UnsignedAttributeProviderSpec*.
- Allow greater control over annotation flags for visible signatures. This is implemented using *VisibleSigSettings*. See discussion #150.
- Factor out and improve PKCS#11 token finding; see `TokenCriteria` and issue #149.
- Factor out and improve PKCS#11 mechanism selection, allowing more raw modes.
- Change pin entry settings for PKCS#11 to be more granular, in order to also allow `PROTECTED_AUTH`; see issue #133.
- Allow the PKCS#11 PIN to be sourced from an environment variable when pyHanko is invoked through the CLI and no PIN is provided in the configuration. PyHanko will now first check the `PYHANKO_PKCS11_PIN` variable before prompting for a PIN. This also works when prompting for PIN entry is disabled altogether.

Note: The PKCS#11 code is now also tested in CI, using SoftHSMv2.

Validation

- Allow validation time overrides in the CLI. Passing in the special value `claimed` tells pyHanko to take the stated signing time in the file at face value. See issue #130.

Encryption

- Also return permissions on owner access to allow for easier inspection.
- Better version enforcement for security handlers.

Layout

- Allow metrics to be specified for simple fonts.
- Provide metrics for default Courier font.
- Experimental option that allows graphics to be embedded in the central area of the QR code; see *qr_inner_content*.

Miscellaneous

- Basic XMP metadata support with optional `xmp` dependency group.
- Automated metadata management (document info dictionary, XMP metadata).
- Refactor some low-level digesting and CMS validation code.
- Make the CLI print a warning when the key passphrase is left empty.
- Tweak configuration management utilities to better cope with fallback logic for deprecated configuration parameters.
- Move all cross-reference writing logic into *pyhanko.pdf_utils.xref*.
- Improve error classes and error reporting in the CLI so that errors in non-verbose mode still provide a little more info.

4.10 0.13.2

Release date: 2022-07-02

4.10.1 Note

This is a patch release to address some dependency issues and bugs.

4.10.2 Dependency updates

- `python-barcode` updated and pinned to `0.14.0`.

4.10.3 Bugs fixed

- Fix lack of newline after XRef stream header.
- Do not write **DigestMethod** in signature reference dictionaries (deprecated/nonfunctional entry).
- Make *`pyhanko.pdf_utils.writer.copy_into_new_writer()`* more flexible by allowing caller-specified keyword arguments for the writer object.
- Refine settings for invisible signature fields (see *`pyhanko.sign.fields.InvisSigSettings`*).
- Correctly read objects from object streams in encrypted documents.

4.11 0.13.1

Release date: 2022-05-01

4.11.1 Note

This is a patch release to update `fontTools` and `uharfbuzz` to address a conflict between the latest `fontTools` and older `uharfbuzz` versions.

4.11.2 Dependency updates

- `fontTools` updated to `4.33.3`
- `uharfbuzz` updated to `0.25.0`

4.12 0.13.0

Release date: 2022-04-25

4.12.1 Note

Like the previous two releases, this is largely a maintenance release.

4.12.2 Dependency updates

- `asn1crypto` updated to `1.5.1`
- `pyhanko-certvalidator` updated to `0.19.5`
- `certomancer` updated to `0.8.2`
- Depend on `certomancer-csc-dummy` for tests; get rid of `python-pae` test dependency.

4.12.3 Bugs fixed

- Various parsing robustness improvements.
- Be consistent with security handler version bounds.
- Improve coverage of encryption code.
- Ensure owner password gets prioritised in the legacy security handler.

4.12.4 New features and enhancements

Miscellaneous

- Replaced some `ValueError` usages with `PdfError`
- Improvements to error handling in strict mode.
- Make CLI stack traces less noisy by default.

Encryption

- Refactor internal `crypt` module into package.
- Add support for serialising credentials.
- Cleaner credential inheritance for incremental writers.

Signing

- Allow post-signing actions on encrypted files with serialised credentials.
- Improve `--use-pades-lta` ergonomics in CLI.
- Add `--no-pass` parameter to `pemder` CLI.

Validation

- Preparatory scaffolding for AdES status reporting.
- Provide some tolerance against malformed ACs.
- Increase robustness against invalid DNs.

4.13 0.12.1

Release date: 2022-02-26

4.13.1 Dependency updates

- `uharfbuzz` updated to `0.19.0`
- `pyhanko-certvalidator` updated to `0.19.4`
- `certomancer` updated to `0.8.1`

4.13.2 Bugs fixed

- Fix typing issue in DSS reading logic (see issue #81)

4.14 0.12.0

Release date: 2022-01-26

4.14.1 Note

This is largely a maintenance release, and contains no new high-level features or public API changes. As such, upgrading is strongly recommended.

The most significant change is the (rather minimalistic) support for hybrid reference files. Since working with hybrid reference files means dealing with potential ambiguity (which is dangerous when dealing with signatures), creation and validation of signatures in hybrid reference documents is only enabled in nonstrict mode. Hybrid reference files are relatively rare these days, but the internals need to be able to cope with them either way, in order to be able to update such files safely.

4.14.2 New features and enhancements

Miscellaneous

- Significant refactor of cross-reference parsing internals. This doesn't affect any public API entrypoints, but read the reference documentation for *`pyhanko.pdf_utils.xref`* if you happen to have code that directly relies on that internal logic.
- Minimal support for hybrid reference files.
- Add `strict` flag to *`IncrementalPdfFileWriter`*.
- Expose `--no-strict-syntax` CLI flag in the `addsig` subcommand.

4.14.3 Bugs fixed

- Ensure that signature appearance bounding boxes are rounded to a reasonable precision. Failure to do so caused issues with some viewers.
- To be consistent with the purpose of the strictness flag, non-essential xref consistency checking is now only enabled when running in strict mode (which is the default).
- The hybrid reference support indirectly fixes some potential silent file corruption issues that could arise when working on particularly ill-behaved hybrid reference files.

4.15 0.11.0

Release date: 2021-12-23

4.15.1 Dependency changes

- Update `pyhanko-certvalidator` to `0.19.2`
- Bump `fontTools` to `4.28.2`
- Update `certomancer` test dependency to `0.7.1`

4.15.2 Breaking changes

Due to import order issues resulting from refactoring of the validation code, some classes and class hierarchies in the higher-level API had to be moved. The affected classes are listed below, with links to their respective new locations in the API reference.

- *`KeyUsageConstraints`*
- *`SignatureValidationError`*
- `WeakHashAlgorithmError`
- *`SigSeedValueValidationError`*
- *`SignatureStatus`*
- *`StandardCMSSignatureStatus`*
- *`PdfSignatureStatus`*

- *TimestampSignatureStatus*
- *DocumentTimestampStatus*

The low-level function *validate_sig_integrity()* was also moved.

4.15.3 New features and enhancements

Signing

- Support embedding attribute certificates into CMS signatures, either in the `certificates` field or using the CAdES `signer-attrs-v2` attribute.
- More explicit errors on unfulfilled text parameters
- Better use of `asyncio` when collecting validation information for timestamps
- Internally disambiguate PAdES and CAdES for the purpose of attribute handling.

Validation

- Refactor `diff_analysis` module into sub-package
- Refactor `validation` module into sub-package (together with portions of *pyhanko.sign.general*); see *Breaking changes*.
- Make extracted certificate information more easily accessible.
- Integrated attribute certificate validation (requires a separate validation context with trust roots for attribute authorities)
- Report on signer attributes as supplied by the CAdES `signer-attrs-v2` attribute.

Miscellaneous

- Various parsing and error handling improvements to xref processing, object streams, and object header handling.
- Use `NotImplementedError` for unimplemented stream filters instead of less-appropriate exceptions
- Always drop GPOS/GDEF/GSUB when subsetting OpenType and TrueType fonts
- Initial support for string-keyed CFF fonts as CIDFonts (subsetting is still inefficient)
- *copy_into_new_writer()* is now smarter about how it deals with the `/Producer` line
- Fix a typo in the ASN.1 definition of `signature-policy-store`
- Various, largely aesthetic, cleanup & docstring fixes in internal APIs

4.15.4 Bugs fixed

- Fix a critical bug in content timestamp generation causing the wrong message imprint to be sent to the timestamping service. The bug only affected the signed `content-time-stamp` attribute from CAdES, not the (much more widely used) `signature-time-stamp` attribute. The former timestamps the content (and is part of the signed data), while the latter timestamps the signature (and is therefore not part of the signed data).
- Fix a bug causing an empty unsigned attribute sequence to be written if there were no unsigned attributes. This is not allowed (although many validators accept it), and was a regression introduced in `0.9.0`.
- Ensure non-PDF CAdES signatures always have `signingTime` set.
- Fix and improve timestamp summary reporting
- Corrected TrueType subtype handling
- Properly set *`ts_validation_paths`*
- Gracefully deal with unsupported certificate types in CMS
- Ensure attribute inspection internals can deal with `SignerInfo` without `signedAttrs`.

4.16 0.10.0

Release date: 2021-11-28

4.16.1 Dependency changes

- Update `pyhanko-certvalidator` to `0.18.0`
- Update `aiohttp` to `3.8.0` (optional dependency)
- Introduce `python-pae==0.1.0` (tests)

4.16.2 New features and enhancements

Signing

- There's a new *`Signer`* implementation that allows pyHanko to be used with remote signing services that implement the Cloud Signature Consortium API. Since auth handling differs from vendor to vendor, using this feature requires still the caller to supply an authentication handler implementation; see `pyhanko.sign.signers.csc_signer` for more information. *This feature is currently incubating.*

Validation

- Add CLI option to skip diff analysis.
- Add CLI flag to disable strict syntax checks.
- Use chunked digests while validating.
- Improved difference analysis logging.

Miscellaneous

- Better handling of nonexistent objects: clearer errors in strict mode, better fallback behaviour in nonstrict mode. This applies to both regular object dereferencing and xref history analysis.
- Added many new tests for various edge cases, mainly in validation code.
- Added `Python :: 3` and `Python :: 3.10` classifiers to distribution.

4.16.3 Bugs fixed

- Fix bug in output handler in timestamp updater that caused empty output in some configurations.
- Fix a config parsing error when no stamp styles are defined in the configuration file.

4.17 0.9.0

Release date: 2021-10-31

4.17.1 Dependency changes

- Update `pyhanko-certvalidator` to `0.17.3`
- Update `fontTools` to `4.27.1`
- Update `certomancer` to `0.6.0` (tests)
- Introduce `pytest-aiohttp~=0.3.0` and `aiohttp>=3.7.4` (tests)

4.17.2 API-breaking changes

This is a pretty big release, with a number of far-reaching changes in the lower levels of the API that may cause breakage. Much of pyHanko's internal logic has been refactored to prefer asynchronous I/O wherever possible (`pyhanko-certvalidator` was also refactored accordingly). Some compromises were made to allow non-async-aware code to continue working as-is.

If you'd like a quick overview of how you can take advantage of the new asynchronous library functions, take a look at *this section in the signing docs*.

Here's an overview of low-level functionality that changed:

- CMS signing logic was refactored and made asynchronous (only relevant if you implemented your own custom signers)
- Time stamp client API was refactored and made asynchronous (only relevant if you implemented your own time stamping clients)
- The *interrupted signing* workflow now involves more asyncio as well.
- *`perform_presign_validation()`* was made asynchronous.
- *`prepare_tbs_document()`*: the `bytes_reserved` parameter is mandatory now.
- *`post_signature_processing()`* was made asynchronous.
- `collect_validation_info()` was made asynchronous

Other functions have been deprecated in favour of asynchronous equivalents; such deprecations are documented in *the API reference*. The section on extending `Signer` *has also been updated*.

Warning: Even though we have pretty good test coverage, due to the volume of changes, some instability may ensue. Please do not hesitate to report bugs on the issue tracker!

4.17.3 New features and enhancements

Signing

- Async-first signing API
- Relax `token-label` requirements in PKCS#11 config, allowing `slot-no` as an alternative
- Allow selecting keys and certificates by ID in the PKCS#11 signer
- Allow the signer's certificate to be sourced from a file in the PKCS#11 signer
- Allow BeID module path to be specified in config
- Tweak cert querying logic in PKCS#11 signer
- Add support for raw ECDSA to the PKCS#11 signer
- Basic DSA support (for completeness w.r.t. ISO 32000)
- Choose a default message digest more cleverly, based on the signing algorithm and key size
- Fail loudly when trying to add a certifying signature to an already-signed document using the high-level signing API
- Provide a flag to skip embedding root certificates

Validation

- Async-first validation API
- Use non-zero exit code on failed CLI validation

Miscellaneous

- Minor reorganisation of `config.py` functions
- Move PKCS#11 pin prompt logic to `cli.py`
- Improve font embedding efficiency (better stream management)
- Ensure idempotence of object stream flushing
- Improve PKCS#11 signer logging
- Make `stream_xrefs=False` by default in `copy_into_new_writer()`
- Removed a piece of fallback logic for `md_algorithm` that relied on obsolete parts of the standard
- Fixed a number of issues related to unexpected cycles in PDF structures

4.17.4 Bugs fixed

- Treat ASCII form feed (`\f`) as PDF whitespace
- Fix a corner case with null incremental updates
- Fix some font compatibility issues (relax assumptions about the presence of certain tables/entries)
- Be more tolerant when parsing name objects
- Correct some issues related to DSS update validation
- Correct *`pdf_date()`* output for negative UTC offsets

4.18 0.8.0

Release date: 2021-08-23

4.18.1 Dependency changes

- Update `pyhanko-certvalidator` to `0.16.0`.

4.18.2 API-breaking changes

Some fields and method names in the config API misspelled ``pkcs11` as ``pcks11``. This has been corrected in this release. This is unlikely to cause issues for library users (since the config API is primarily used by the CLI code), but it's a breaking change all the same. If you do have code that relies on the config API, simply substituting `s/pcks/pkcs/g` should fix things.

4.18.3 New features and enhancements

Signing

- Make certificate fetching in the PKCS#11 signer more flexible.
  - Allow passing in the signer's certificate from outside the token.
  - Improve certificate registry initialisation.
- Give more control over updating the DSS in complex signature workflows. By default, pyHanko now tries to update the DSS in the revision that adds a document timestamp, after the signature (if applicable). In the absence of a timestamp, the old behaviour persists.
- Added a flag to (attempt to) produce CMS signature containers without any padding.
- Use `signing-certificate-v2` instead of `signing-certificate` when producing signatures.
- Default to empty appearance streams for empty signature fields.
- Much like the `pkcs11-setups` config entry, there are now `pemder-setups` and `pkcs12-setups` at the top level of pyHanko's config file. You can use those to store arguments for the `pemder` and `pkcs12` subcommands of pyHanko's `addsig` command, together with passphrases for non-interactive use. See *Named setups for on-disk key material*.

Validation

- Enforce the end-entity cert constraint imposed by the `signing-certificate` or `signing-certificate-v2` attribute (if present).
- Improve issuer-serial matching logic.
- Improve CMS attribute lookup routines.

Encryption

- Add a flag to suppress creating "legacy compatibility" entries in the encryption dictionary if they aren't actually required or meaningful (for now, this only applies to `/Length`).

Miscellaneous

- Lazily load the version entry in the catalog.
- Minor internal I/O handling improvements.
- Allow constructing an *`IncrementalPdfFileWriter`* from a *`PdfFileReader`* object.
- Expose common API to modify (most) trailer entries.
- Automatically recurse into all configurable fields when processing configuration data.
- Replace some certificate storage/indexing classes by references to their corresponding classes in `pyhanko-certvalidator`.

4.18.4 Bugs fixed

- Add `/NeedAppearances` in the AcroForm dictionary to the whitelist for incremental update analysis.
- Fixed several bugs related to difference analysis on encrypted files.
- Improve behaviour of dev extensions in difference analysis.
- Fix encoding issues with `SignedDigestAlgorithm`, in particular ensuring that the signature mechanism encodes the relevant digest when using ECDSA.
- Process passfile contents more robustly in the CLI.
- Correct timestamp revinfo fetching (by ensuring that a dummy response is present)

4.19 0.7.0

Release date: 2021-07-25

4.19.1 Dependency changes

Warning: If you used OTF/TTF fonts with pyHanko prior to the `0.7.0` release, you'll need HarfBuzz going forward. Install pyHanko with the `[opentype]` optional dependency group to grab everything you need.

- Update `pyhanko-certvalidator` to `0.15.3`
- TrueType/OpenType support moved to new optional dependency group labelled `[opentype]`.
  - Dependency on `fontTools` moved from core dependencies to `[opentype]` group.
  - We now use HarfBuzz (`uharfbuzz==0.16.1`) for text shaping with OTF/TTF fonts.

4.19.2 API-breaking changes

Warning: If you use any of pyHanko's lower-level APIs, review this section carefully before updating.

Signing code refactor

This release includes a refactor of the `pyhanko.sign.signers` module into a *package* with several submodules. The original API exposed by this module is reexported in full at the package level, so existing code using pyHanko's publicly documented signing APIs *should* continue to work **without modification**.

There is one notable exception: as part of this refactor, the low-level `PdfCMSEmbedder` protocol was tweaked slightly, to support the new interrupted signing workflow (see below). The required changes to existing code should be minimal; have a look at *the relevant section* in the library documentation for a concrete description of the changes, and an updated usage example.

In addition, if you extended the `PdfSigner` class, then you'll have to adapt to the new internal signing workflow as well. This may be tricky due to the fact that the separation of concerns between different steps in the signing process is now enforced more strictly. I'm not aware of use cases requiring `PdfSigner` to be extended, but if you're having trouble migrating your custom subclass to the new API structure, feel free to open an issue. Merely having subclassed `Signer` shouldn't require you to change anything.

Fonts

The low-level font loading API has been refactored to make font resource handling less painful, to provide smoother HarfBuzz integration and to expose more OpenType tweaks in the API.

To this end, the old `pyhanko.pdf_utils.font` module was turned into a package containing three modules: `api`, `basic` and `opentype`. The `api` module contains the definitions for the general `FontEngine` and `FontEngineFactory` classes, together with some other general plumbing logic. The `basic` module provides a minimalist implementation with a (non-embedded) monospaced font. If you need TrueType/OpenType support, you'll need the `opentype` module together with the optional dependencies in the `[opentype]` dependency group (currently `fontTools` and `uharfbuzz`, see above). Take a look at the section for `pyhanko.pdf_utils.font` in *the API reference documentation* for further details.

For the time being, there are no plans to support embedding **Type1** fonts, or to offer support for **Type3** fonts at all.

Miscellaneous

- The `content_stream` parameter was removed from *`import_page_as_xobject()`*. Content streams are now merged automatically, since treating a page content stream array non-atomically is a bad idea.
- *`PdfSigner`* is no longer a subclass of *`PdfTimeStamper`*.

4.19.3 New features and enhancements

Signing

- *Interrupted signing* workflow: segmented signing workflow that can be interrupted partway through and resumed later (possibly in a different process or on a different machine). Useful for dealing with signing processes that rely on user interaction and/or remote signing services.
- *Generic data signing* support: construct CMS `signedData` objects for arbitrary data (not necessarily for use in PDF signature fields).
- Experimental API for signing individual embedded files (nonstandard).
- PKCS#11 settings can now be set in the configuration file.

Validation

- Add support for validating CMS `signedData` structures against arbitrary payloads (see also: *Generic data signing*)
- Streamline CMS timestamp validation.
- Support reporting on (CAdES) content timestamps in addition to signature timestamps.
- Allow signer certificates to be identified by the `subjectKeyIdentifier` extension.

Encryption

- Support granular crypt filters for embedded files
- Add convenient API to encrypt and wrap a PDF document as a binary blob. The resulting file will open as usual in a viewer that supports PDF collections; a fallback page with alternative instructions is shown otherwise.

Miscellaneous

- Complete overhaul of appearance generation & layout system. Most of these changes are internal, except for some font loading mechanics (see above). All use of OpenType / TrueType fonts now requires the `[opentype]` optional dependency group. New features:
  - Use HarfBuzz for shaping (incl. complex scripts)
  - Support TrueType fonts and OpenType fonts without a CFF table.
  - Support vertical writing (among other OpenType features).
  - Use ActualText marked content in addition to ToUnicode.
  - Introduce simple box layout & alignment rules, and apply them uniformly across all layout decisions where possible. See *`pyhanko.stamp`* and *`pyhanko.pdf_utils.layout`* for API documentation.
- Refactored stamp style dataclass hierarchy. This should not affect existing code.

- Allow externally generated PDF content to be used as a stamp appearance.
- Utility API for embedding files into PDF documents.
- Added support for PDF developer extension declarations.

4.19.4 Bugs fixed

Signing

- Declare ESIC extension when producing a PAdES signature on a PDF 1.x file.

Validation

- Fix handling of orphaned objects in diff analysis.
- Tighten up tolerances for (visible) signature field creation.
- Fix typo in `BaseFieldModificationRule`
- Deal with some VRI-related corner cases in the DSS diffing logic.

Encryption

- Improve identity crypt filter behaviour when applied to text strings.
- Correct handling of non-default public-key crypt filters.

Miscellaneous

- Promote stream manipulation methods to base writer.
- Correct some edge cases w.r.t. PDF content import
- Use floats for MediaBox.
- Handle escapes in PDF name objects.
- Correct ToUnicode CMap formatting.
- Do not close over GSUB when computing font subsets.
- Fix `output_version` handling oversight.
- Misc. export list & type annotation corrections.

4.20 0.6.1

Release date: 2021-05-22

4.20.1 Dependency changes

- Update `pyhanko-certvalidator` to `0.15.2`
- Replace constraint on `certomancer` and `pyhanko-certvalidator` by soft minor version constraint (~=)
- Set version bound for `freezegun`

4.20.2 Bugs fixed

- Add `/Q` and `/DA` keys to the whitelist for incremental update analysis on form fields.

4.21 0.6.0

Release date: 2021-05-15

4.21.1 Dependency changes

Warning: pyHanko's `0.6.0` release includes quite a few changes to dependencies, some of which may break compatibility with existing code. Review this section carefully before updating.

The `pyhanko-certvalidator` dependency was updated to `0.15.1`. This update adds support for name constraints, RSASSA-PSS and EdDSA for the purposes of X.509 path validation, OCSP checking and CRL validation.

Warning: Since `pyhanko-certvalidator` has considerably diverged from "mainline" `certvalidator`, the Python package containing its modules was also renamed from `certvalidator` to `pyhanko_certvalidator`, to avoid potential namespace conflicts down the line. You should update your code to reflect this change.

Concretely,

```
from certvalidator import ValidationContext
```

turns into

```
from pyhanko_certvalidator import ValidationContext
```

in the new release.

There were several changes to dependencies with native binary components:

- The Pillow dependency has been relaxed to >=`7.2.0`, and is now optional. The same goes for `python-barcode`. Image & 1D barcode support now needs to be installed explicitly using the `[image-support]` installation parameter.
- PKCS#11 support has also been made optional, and can be added using the `[pkcs11]` installation parameter.

The test suite now makes use of Certomancer. This also removed the dependency on `ocspbuilder`.

4.21.2 New features and enhancements

Signing

- Make preferred hash inference more robust.
- Populate `/AP` when creating an empty visible signature field (necessary in PDF 2.0)

Validation

- Timestamp and DSS handling tweaks:
  - Preserve OCSP resps / CRLs from validation kwargs when reading the DSS.
  - Gracefully process revisions that don't have a DSS.
  - When creating document timestamps, the `validation_context` parameter is now optional.
- Enforce `certvalidator`'s `weak_hash_algos` when validating PDF signatures as well. Previously, this setting only applied to certificate validation. By default, MD5 and SHA-1 are considered weak (for digital signing purposes).
- Expose `DocTimeStamp/Sig` distinction in a more user-friendly manner.
  - The `sig_object_type` property on `EmbeddedPdfSignature` now returns the signature's type as a PDF name object.
  - *`PdfFileReader`* now has two extra convenience properties named `embedded_regular_signatures` and `embedded_timestamp_signatures`, that return a list of all regular signatures and document timestamps, respectively.

Encryption

- Refactor internal APIs in pyHanko's security handler implementation to make them easier to extend. Note that while anyone is free to register their own crypt filters for whatever purpose, pyHanko's security handler is still considered internal API, so behaviour is subject to change between minor version upgrades (even after `1.0.0`).

Miscellaneous

- Broaden the scope of `--soft-revocation-check`.
- Corrected a typo in the signature of `validate_sig_integrity`.
- Less opaque error message on missing PKCS#11 key handle.
- Ad-hoc hash selection now relies on `pyca/cryptography` rather than `hashlib`.

4.21.3 Bugs fixed

- Correct handling of DocMDP permissions in approval signatures.
- Refactor & correct handling of SigFlags when signing prepared form fields in unsigned files.
- Fixed issue with trailing whitespace and/or `NUL` bytes in array literals.
- Corrected the export lists of various modules.

4.22 0.5.1

Release date: 2021-03-24

4.22.1 Bugs fixed

- Fixed a packaging blunder that caused an import error on fresh installs.

4.23 0.5.0

Release date: 2021-03-22

4.23.1 Dependency changes

Update `pyhanko-certvalidator` dependency to `0.13.0`. Dependency on `cryptography` is now mandatory, and `oscrypto` has been marked optional. This is because we now use the `cryptography` library for all signing and encryption operations, but some cryptographic algorithms listed in the PDF standard are not available in `cryptography`, so we rely on `oscrypto` for those. This is only relevant for the *decryption* of files encrypted with a public-key security handler that uses DES, triple DES or RC2 to encrypt the key seed.

In the public API, we exclusively work with `asn1crypto` representations of ASN.1 objects, to remain as backend-independent as possible.

Note: While `oscrypto` is listed as optional in pyHanko's dependency list, it is still required in practice, since `pyhanko-certvalidator` depends on it.

4.23.2 New features and enhancements

Encryption

- Enforce `keyEncipherment` key extension by default when using public-key encryption
- Show a warning when signing a document using public-key encryption through the CLI. We currently don't support using separate encryption credentials in the CLI, and using the same key pair for decryption and signing is bad practice.
- Several minor CLI updates.

Signing

- Allow customisation of key usage requirements in signer & validator, also in the CLI.
- Actively preserve document timestamp chain in new PAdES-LTA signatures.
- Support setups where fields and annotations are separate (i.e. unmerged).
- Set the `lock` bit in the annotation flags by default.
- Tolerate signing fields that don't have any annotation associated with them.
- Broader support for PAdES / CAdES signed attributes.

Validation

- Support validating PKCS #7 signatures that don't use `signedAttrs`. Nowadays, those are rare in the wild, but there's at least one common commercial PDF library that outputs such signatures by default (vendor name redacted to protect the guilty).
- **Timestamp-related fixes:**
  - Improve signature vs. document timestamp handling in the validation CLI.
  - Improve & test handling of malformed signature dictionaries in PDF files.
  - Align document timestamp updating logic with validation logic.
  - Correct key usage check for time stamp validation.
- Allow customisation of key usage requirements in signer & validator, also in the CLI.
- Allow LTA update function to be used to start the timestamp chain as well as continue it.
- Tolerate indirect references in signature reference dictionaries.
- Improve some potential ambiguities in the PAdES-LT and PAdES-LTA validation logic.
- **Revocation info handling changes:**
  - Support "retroactive" mode for revocation info (i.e. treat revocation info as valid in the past).
  - Added functionality to append current revocation information to existing signatures.
  - Related CLI updates.

Miscellaneous

- Some key material loading functions were cleaned up a little to make them easier to use.
- I/O tweaks: use chunked writes with a fixed buffer when copying data for an incremental update
- Warn when revocation info is embedded with an offline validation context.
- Improve SV validation reporting.

4.23.3 Bugs fixed

- Fix issue with `/Certs` not being properly dereferenced in the DSS (#4).
- Fix loss of precision on `FloatObject` serialisation (#5).
- Add missing dunders to `BooleanObject`.
- Do not use `.dump()` with `force=True` in validation.
- Corrected digest algorithm selection in timestamp validation.
- Correct handling of writes with empty user password.
- Do not automatically add xref streams to the object cache. This avoids a class of bugs with some kinds of updates to files with broken xref streams.
- Due to a typo, the `/Annots` array of a page would not get updated correctly if it was an indirect object. This has been corrected.

4.24 0.4.0

Release date: 2021-02-14

4.24.1 New features and enhancements

Encryption

- Expose permission flags outside security handler
- Make file encryption key straightforward to grab

Signing

- Mildly refactor *PdfSignedData* for non-signing uses
- **Make DSS API more flexible**
  - Allow direct input of cert/ocsp/CRL objects as opposed to only certvalidator output
  - Allow input to not be associated with any concrete VRI.
- **Greatly improved PKCS#11 support**
  - Added support for RSASSA-PSS and ECDSA.
  - Added tests for RSA functionality using SoftHSMv2.
  - Added a command to the CLI for generic PKCS#11.
  - *Note:* Tests don't run in CI, and ECDSA is not included in the test suite yet (SoftHSMv2 doesn't seem to expose all the necessary mechanisms).
- Factor out *unsigned_attrs* in signer, added a *digest_algorithm* parameter to *signed_attrs*.
- Allow signing with any *BasePdfFileWriter* (in particular, this allows creating signatures in the initial revision of a PDF file)
- Add *CMSAlgorithmProtection* attribute when possible * *Note:* Not added to PAdES signatures for the time being.

- Improved support for deep fields in the form hierarchy (arguably orthogonal to the standard, but it doesn't hurt to be flexible)

Validation

- **Path handling improvements:**
  - Paths in the structure tree are also simplified.
  - Paths can be resolved relative to objects in a file.
- **Limited support for tagged PDF in the validator.**
  - Existing form fields can be filled in without tripping up the modification analysis module.
  - Adding new form fields to the structure tree after signing is not allowed for the time being.
- **Internal refactoring in CMS validation logic:**
  - Isolate cryptographic integrity validation from trust validation
  - Rename *externally_invalid* API parameter to *encap_data_invalid*
  - Validate *CMSAlgorithmProtection* when present.
- Improved support for deep fields in the form hierarchy (arguably orthogonal to the standard, but it doesn't hurt to be flexible).
- Added

Miscellaneous

- Export *copy_into_new_writer*.
- Transparently handle non-seekable output streams in the signer.
- Remove unused *__iadd__* implementation from VRI class.
- Clean up some corner cases in *container_ref* handling.
- Refactored *SignatureFormField* initialisation (internal API).

4.24.2 Bugs fixed

- Deal with some XRef processing edge cases.
- Make *signed_revision* on embedded signatures more robust.
- Fix an issue where DocTimeStamp additions would trigger */All*-type field locks.
- Fix some issues with *modification_level* handling in validation status reports.
- Fix a few logging calls.
- Fix some minor issues with signing API input validation logic.

4.25 0.3.0

Release date: 2021-01-26

4.25.1 New features and enhancements

Encryption

- Reworked internal crypto API.
- Added support for PDF 2.0 encryption.
- Added support for public key encryption.
- Got rid of the homegrown *RC4* class (not that it matters all to much, *RC4* isn't secure anyhow); all cryptographic operations in *crypt.py* are now delegated to *oscrypto*.

Signing

- Encrypted files can now be signed from the CLI.
- With the optional *cryptography* dependency, pyHanko can now create RSASSA-PSS signatures.
- Factored out a low-level *PdfCMSEmbedder* API to cater to remote signing needs.

Miscellaneous

- The document ID can now be accessed more conveniently.
- The version number is now single-sourced in *version.py*.
- Initialising the page tree in a *PdfFileWriter* is now optional.
- Added a convenience function for copying files.

Validation

- With the optional *cryptography* dependency, pyHanko can now validate RSASSA-PSS signatures.
- Difference analysis checker was upgraded with capabilities to handle multiply referenced objects in a more straightforward way. This required API changes, and it comes at a significant performance cost, but the added cost is probably justified. The changes to the API are limited to the *diff_analysis* module itself, and do not impact the general validation API whatsoever.

4.25.2 Bugs fixed

- Allow */DR* and */Version* updates in diff analysis
- Fix revision handling in *trailer.flatten()*

4.26 0.2.0

Release date: 2021-01-10

4.26.1 New features and enhancements

Signing

- Allow the caller to specify an output stream when signing.

Validation

- The incremental update analysis functionality has been heavily refactored into something more rule-based and modular. The new difference analysis system is also much more user-configurable, and a (sufficiently motivated) library user could even plug in their own implementation.
- The new validation system treats `/Metadata` updates more correctly, and fixes a number of other minor stability problems.
- Improved validation logging and status reporting mechanisms.
- Improved seed value constraint enforcement support: this includes added support for `/V`, `/MDP`, `/LockDocument`, `/KeyUsage` and (passive) support for `/AppearanceFilter` and `/LegalAttestation`.

CLI

- You can now specify negative page numbers on the command line to refer to the pages of a document in reverse order.

General PDF API

- Added convenience functions to retrieve references from dictionaries and arrays.
- Tweaked handling of object freeing operations; these now produce PDF `null` objects instead of (Python) `None`.

4.26.2 Bugs fixed

- `root_ref` now consistently returns a `Reference` object
- Corrected wrong usage of `@freeze_time` in tests that caused some failures due to certificate expiry issues.
- Fixed a gnarly caching bug in `HistoricalResolver` that sometimes leaked state from later revisions into older ones.
- Prevented cross-reference stream updates from accidentally being saved with the same settings as their predecessor in the file. This was a problem when updating files generated by other PDF processing software.

4.27 0.1.0

Release date: 2020-12-30

Initial release.

CHAPTER

FIVE

FREQUENTLY ASKED QUESTIONS (FAQ)

Read these before filing bug reports.

5.1 Errors and other unexpected behaviour

5.1.1 I'm getting an error about hybrid reference files when trying to sign / validate a file. What gives?

This is explained in the *release notes* for version `0.12.0`.

Hybrid reference files were introduced as a transitional compatibility measure between PDF 1.4 and PDF 1.5. Since PDF 1.5 support is all but universal now, they're no longer useful these days, and therefore relatively rare. Nevertheless, some tools still routinely generate such files.

Prior to 0.12.0, pyHanko would actually not process hybrid files correctly and would sometimes even accidentally corrupt them. That bug has been fixed, but there's more to it than that. The problem with hybrid files is that *by design* there's no single unambiguous way to parse them, which makes them inherently less secure than non-hybrid PDFs. That's a problem when dealing with document signatures, and also the reason why pyHanko `0.12.0` makes hybrid files an "opt-in" feature: you have to disable strict parsing mode to be able to use them.

For API users, that means passing `strict=False` to any `IncrementalPdfFileWriter` or `PdfFileReader` objects that could touch hybrid files.

For CLI users, there's the `--no-strict-syntax` switch, which is available for both signing and validation subcommands.

5.1.2 Why am I getting path building errors?

There are many reasons why path building could fail, but the most common ones are

- missing intermediate certificates that pyHanko is not aware of;
- a certificate pathing up to a root that is not a trust anchor.

In either case, you probably need to review your *validation context settings*.

5.2 Features & customisation

5.2.1 How do I use pyHanko to sign PDFs with a remote signing service?

It depends. Does your signing service return "raw" signed hashes? If so, read *the section on custom Signers*. Does it return fully-fledged CMS/PKCS#7 objects? Then have a look at *the PdfCMSEmbedder API* and *the section on interrupted signing*. The interrupted signing pattern is actually relevant in all remote signing scenarios, so give it a read either way.

PyHanko ships with built-in support for the CSC API (see the API docs for `csc_signer`). There's also an example illustrating how to use pyHanko with the AWS KMS API on *the advanced examples page*.

5.2.2 I can't get pyHanko to work with <insert PKCS#11 device here>. Can you help me?

If pyHanko's generic `PKCS11Signer` doesn't work with your favourite PKCS#11 device out of the box, that could be due to any number of reasons, including but not limited to

- nonconformities in the PKCS#11 implementation for your device;
- bugs in your device's drivers or PKCS#11 middleware;
- interop with the PKCS#11 library that pyHanko uses under the hood;
- bugs in pyHanko itself;
- pyHanko using different defaults than <insert PKCS#11 client in other language>;
- hardware issues;
- user error.

When facing an issue with PKCS#11, please *never* file a bug report on the issue tracker unless you're very sure you've correctly identified the root cause. Posting your question on the discussion forum is of course allowed, but bear in mind that PKCS#11 usage issues are generally difficult to diagnose remotely without access to the hardware in question. Be prepared to do your own troubleshooting.

CHAPTER

SIX

KNOWN ISSUES

This page lists some TODOs and known limitations of pyHanko.

- Expand, polish and rigorously test the validation functionality. The test suite covers a variety of scenarios already, but the difference checker in particular is still far from perfect.
- LTV validation was implemented ad-hoc, and likely does not fully adhere to the PAdES specification. This will require some effort to implement correctly. In the meantime, you should treat the result as a pyHanko-specific interpretation of the validity of the chain of trust based on the validation info present in the file, not as a final judgment on whether the signature complies with any particular PAdES profile.

  Note: Starting from version `0.17.0`, pyHanko ships with an experimental implementation of AdES validation according to ETSI EN 319 102-1. Relevant entry points can be found in `pyhanko.sign.validation.ades`. Note that the API is currently incubating, and the implementation is still incomplete in several respects.

- The most lenient document modification policy (i.e. addition of comments and annotations) is not supported. Comments added to a signed PDF will therefore be considered “unsafe” changes, regardless of the policy set by the signer.
- There is currently no explicit support for signing and stamping PDF/A and PDF/UA files. That is to say, pyHanko treats these as any other PDF file and will produce output that may not comply with the provisions of these standards. As of `0.14.0`, it is possible to generate compliant output using pyHanko in most cases, but pyHanko itself will not attempt to enforce any additional restrictions.
- CLI support for signing files encrypted using PDF’s public-key encryption functionality is limited.

CHAPTER

SEVEN

LICENSES

7.1 pyHanko License

7.2 Original PyPDF2 license

This package contains various elements based on code from the PyPDF2 project, of which we reproduce the license below.

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CHAPTER

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INDICES AND TABLES

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