
S3Fs Documentation

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Continuum Analytics

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S3Fs is a Pythonic file interface to S3. It builds on top of [boto3](#).

The top-level class `S3FileSystem` holds connection information and allows typical file-system style operations like `cp`, `mv`, `ls`, `du`, `glob`, etc., as well as put/get of local files to/from S3.

The connection can be anonymous - in which case only publicly-available, read-only buckets are accessible - or via credentials explicitly supplied or in configuration files.

Calling `open()` on a `S3FileSystem` (typically using a context manager) provides an `S3File` for read or write access to a particular key. The object emulates the standard `File` protocol (`read`, `write`, `tell`, `seek`), such that functions expecting a file can access S3. Only binary read and write modes are implemented, with blocked caching.

This project was originally designed as a storage-layer interface for [dask.distributed](#) and has a very similar interface to [hdfs3](#)

CHAPTER 1

Examples

Simple locate and read a file:

```
>>> import s3fs
>>> fs = s3fs.S3FileSystem(anon=True)
>>> fs.ls('my-bucket')
['my-file.txt']
>>> with fs.open('my-bucket/my-file.txt', 'rb') as f:
...     print(f.read())
b'Hello, world'
```

(see also `walk` and `glob`)

Reading with delimited blocks:

```
>>> s3.read_block(path, offset=1000, length=10, delimiter=b'\n')
b'A whole line of text\n'
```

Writing with blocked caching:

```
>>> s3 = s3fs.S3FileSystem(anon=False) # uses default credentials
>>> with s3.open('mybucket/new-file', 'wb') as f:
...     f.write(2*2**20 * b'a')
...     f.write(2*2**20 * b'a') # data is flushed and file closed
>>> s3.du('mybucket/new-file')
{'mybucket/new-file': 4194304}
```

Because S3Fs faithfully copies the Python file interface it can be used smoothly with other projects that consume the file interface like `gzip` or `pandas`.

```
>>> with s3.open('mybucket/my-file.csv.gz', 'rb') as f:
...     g = gzip.GzipFile(fileobj=f) # Decompress data with gzip
...     df = pd.read_csv(g)         # Read CSV file with Pandas
```


CHAPTER 2

Limitations

This project is meant for convenience, rather than feature completeness. The following are known current omissions:

- file access is always binary (although readline and iterating by line are possible)
- no permissions/access-control (i.e., no chmod/chmown methods)

The AWS key and secret may be provided explicitly when creating an `S3FileSystem`. A more secure way, not including the credentials directly in code, is to allow boto to establish the credentials automatically. Boto will try the following methods, in order:

- `aws_access_key_id`, `aws_secret_access_key`, and `aws_session_token` environment variables

- configuration files such as `~/.aws/credentials`

- for nodes on EC2, the IAM metadata provider

In a distributed environment, it is not expected that raw credentials should be passed between machines. In the explicitly provided credentials case, the method `get_delegated_s3pars()` can be used to obtain temporary credentials. When not using explicit credentials, it should be expected that every machine also has the appropriate environment variables, config files or IAM roles available.

If none of the credential methods are available, only anonymous access will work, and `anon=True` must be passed to the constructor.

Furthermore, `S3FileSystem.current()` will return the most-recently created instance, so this method could be used in preference to the constructor in cases where the code must be agnostic of the credentials/config used.

Requester Pays Buckets

Some buckets, such as the [arXiv raw data](#), are configured so that the requester of the data pays any transfer fees. You must be authenticated to access these buckets and (because these charges may be unexpected) amazon requires an additional key on many of the API calls. To enable `RequesterPays` create your file system as

```
>>> s3 = s3fs.S3FileSystem(anon=False, requester_pays=True)
```

Serverside Encryption

For some buckets/files you may want to use some of s3's server side encryption features. *s3fs* supports these in a few ways

```
>>> s3 = s3fs.S3FileSystem(  
...     s3_additional_kwargs={'ServerSideEncryption': 'AES256'})
```

This will create an s3 filesystem instance that will append the `ServerSideEncryption` argument to all s3 calls (where applicable).

The same applies for *s3.open*. Most of the methods on the filesystem object will also accept and forward keyword arguments to the underlying calls. The most recently specified argument is applied last in the case where both *s3_additional_kwargs* and a method's ***kwargs* are used.

The *s3.utils.SSEParams* provides some convenient helpers for the serverside encryption parameters in particular. An instance can be passed instead of a regular python dictionary as the *s3_additional_kwargs* parameter.

6.1 Installation

6.1.1 Conda

The `s3fs` library and its dependencies can be installed from the [conda-forge](#) repository using `conda`:

```
$ conda install s3fs -c conda-forge
```

6.1.2 PyPI

You can install `s3fs` with `pip`:

```
pip install s3fs
```

6.1.3 Install from source

You can also download the `s3fs` library from Github and install normally:

```
git clone git@github.com:dask/s3fs
cd s3fs
python setup.py install
```

6.2 API

`S3FileSystem`([anon, key, secret, token, ...])

Access S3 as if it were a file system.

Continued on next page

Table 6.1 – continued from previous page

<code>S3FileSystem.cat(path, **kwargs)</code>	Returns contents of file
<code>S3FileSystem.du(path[, total, deep])</code>	Bytes in keys at path
<code>S3FileSystem.exists(path)</code>	Does such a file/directory exist?
<code>S3FileSystem.get(path, filename, **kwargs)</code>	Stream data from file at path to local filename
<code>S3FileSystem.glob(path)</code>	Find files by glob-matching.
<code>S3FileSystem.info(path[, refresh])</code>	Detail on the specific file pointed to by path.
<code>S3FileSystem.ls(path[, detail, refresh])</code>	List single “directory” with or without details
<code>S3FileSystem.mkdir(path[, acl])</code>	Make new bucket or empty key
<code>S3FileSystem.mv(path1, path2, **kwargs)</code>	Move file between locations on S3
<code>S3FileSystem.open(path[, mode, block_size, ...])</code>	Open a file for reading or writing
<code>S3FileSystem.put(filename, path, **kwargs)</code>	Stream data from local filename to file at path
<code>S3FileSystem.read_block(fn, offset, length)</code>	Read a block of bytes from an S3 file
<code>S3FileSystem.rm(path[, recursive])</code>	Remove keys and/or bucket.
<code>S3FileSystem.tail(path[, size])</code>	Return last bytes of file
<code>S3FileSystem.touch(path[, acl])</code>	Create empty key
<hr/>	
<code>S3File(s3, path[, mode, block_size, acl, ...])</code>	Open S3 key as a file.
<code>S3File.close()</code>	Close file
<code>S3File.flush([force, retries])</code>	Write buffered data to S3.
<code>S3File.info(**kwargs)</code>	File information about this path
<code>S3File.read([length])</code>	Return data from cache, or fetch pieces as necessary
<code>S3File.seek(loc[, whence])</code>	Set current file location
<code>S3File.tell()</code>	Current file location
<code>S3File.write(data)</code>	Write data to buffer.
<hr/>	
<code>S3Map(root[, s3, check, create])</code>	Wrap an S3FileSystem as a mutable wrapping.

```
class s3fs.core.S3FileSystem (anon=False, key=None, secret=None, token=None,
                             use_ssl=True, client_kwargs=None, requester_pays=False,
                             default_block_size=None, default_fill_cache=True, con-
                             fig_kwargs=None, s3_additional_kwargs=None, **kwargs)
```

Access S3 as if it were a file system.

This exposes a filesystem-like API (ls, cp, open, etc.) on top of S3 storage.

Provide credentials either explicitly (`key=`, `secret=`) or depend on boto’s credential methods. See boto3 documentation for more information. If no credentials are available, use `anon=True`.

Parameters `anon` : bool (False)

Whether to use anonymous connection (public buckets only). If False, uses the key/secret given, or boto’s credential resolver (environment variables, config files, EC2 IAM server, in that order)

key : string (None)

If not anonymous, use this access key ID, if specified

secret : string (None)

If not anonymous, use this secret access key, if specified

token : string (None)

If not anonymous, use this security token, if specified

use_ssl : bool (True)

Whether to use SSL in connections to S3; may be faster without, but insecure

s3_additional_kwargs : dict of parameters that are used when calling s3 api methods.

Typically used for things like “ServerSideEncryption”.

client_kwargs : dict of parameters for the boto3 client

requester_pays : bool (False)

If RequesterPays buckets are supported.

default_block_size: None, int

If given, the default block size value used for `open()`, if no specific value is given at all time. The built-in default is 5MB.

default_fill_cache : Bool (True)

Whether to use cache filling with `open` by default. Refer to `S3File.open`.

config_kwargs : dict of parameters passed to `botocore.client.Config`

kwargs : other parameters for boto3 session

Examples

```
>>> s3 = S3FileSystem(anon=False)
>>> s3.ls('my-bucket/')
['my-file.txt']
```

```
>>> with s3.open('my-bucket/my-file.txt', mode='rb') as f:
...     print(f.read())
b'Hello, world!'
```

Methods

<code>bulk_delete(pathlist, **kwargs)</code>	Remove multiple keys with one call
<code>cat(path, **kwargs)</code>	Returns contents of file
<code>chmod(path, acl, **kwargs)</code>	Set Access Control on a bucket/key
<code>connect([refresh])</code>	Establish S3 connection object.
<code>copy(path1, path2, **kwargs)</code>	Copy file between locations on S3
<code>current()</code>	Return the most recently created S3FileSystem
<code>du(path[, total, deep])</code>	Bytes in keys at path
<code>exists(path)</code>	Does such a file/directory exist?
<code>get(path, filename, **kwargs)</code>	Stream data from file at path to local filename
<code>get_delegated_s3pars([exp])</code>	Get temporary credentials from STS, appropriate for sending across a network.
<code>getxattr(path, attr_name, **kwargs)</code>	Get an attribute from the metadata.
<code>glob(path)</code>	Find files by glob-matching.
<code>head(path[, size])</code>	Return first bytes of file
<code>info(path[, refresh])</code>	Detail on the specific file pointed to by path.
<code>invalidate_cache([path])</code>	

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Table 6.4 – continued from previous page

<i>ls</i> (path[, detail, refresh])	List single “directory” with or without details
<i>merge</i> (path, filelist, **kwargs)	Create single S3 file from list of S3 files
<i>metadata</i> (path[, refresh])	Return metadata of path.
<i>mkdir</i> (path[, acl])	Make new bucket or empty key
<i>mv</i> (path1, path2, **kwargs)	Move file between locations on S3
<i>open</i> (path[, mode, block_size, acl, fill_cache])	Open a file for reading or writing
<i>put</i> (filename, path, **kwargs)	Stream data from local filename to file at path
<i>read_block</i> (fn, offset, length[, delimiter])	Read a block of bytes from an S3 file
<i>rm</i> (path[, recursive])	Remove keys and/or bucket.
<i>rmdir</i> (path, **kwargs)	Remove empty key or bucket
<i>setxattr</i> (path[, copy_kwargs])	Set metadata.
<i>tail</i> (path[, size])	Return last bytes of file
<i>touch</i> (path[, acl])	Create empty key
<i>url</i> (path[, expires])	Generate presigned URL to access path by HTTP
<i>walk</i> (path[, refresh])	Return all real keys below path

bulk_delete (*pathlist*, ***kwargs*)

Remove multiple keys with one call

Parameters *pathlist* : list of strings

The keys to remove, must all be in the same bucket.

cat (*path*, ***kwargs*)

Returns contents of file

chmod (*path*, *acl*, ***kwargs*)

Set Access Control on a bucket/key

See <http://docs.aws.amazon.com/AmazonS3/latest/dev/acl-overview.html#canned-acl>

Parameters *path* : string

the object to set

acl : string

the value of ACL to apply

connect (*refresh=False*)

Establish S3 connection object.

Parameters *refresh* : bool (True)

Whether to use cached filelists, if already read

copy (*path1*, *path2*, ***kwargs*)

Copy file between locations on S3

classmethod current ()

Return the most recently created S3FileSystem

If no S3FileSystem has been created, then create one

du (*path*, *total=False*, *deep=False*, ***kwargs*)

Bytes in keys at path

exists (*path*)

Does such a file/directory exist?

get (*path*, *filename*, ***kwargs*)
Stream data from file at path to local filename

get_delegated_s3pars (*exp=3600*)
Get temporary credentials from STS, appropriate for sending across a network. Only relevant where the key/secret were explicitly provided.

Parameters *exp* : int

Time in seconds that credentials are good for

Returns dict of parameters

getxattr (*path*, *attr_name*, ***kwargs*)
Get an attribute from the metadata.

Examples

```
>>> mys3fs.getxattr('mykey', 'attribute_1')
'value_1'
```

glob (*path*)
Find files by glob-matching.

Note that the bucket part of the path must not contain a “*”

head (*path*, *size=1024*, ***kwargs*)
Return first bytes of file

info (*path*, *refresh=False*, ***kwargs*)
Detail on the specific file pointed to by path.

Gets details only for a specific key, directories/buckets cannot be used with info.

ls (*path*, *detail=False*, *refresh=False*, ***kwargs*)
List single “directory” with or without details

merge (*path*, *filelist*, ***kwargs*)
Create single S3 file from list of S3 files

Uses multi-part, no data is downloaded. The original files are not deleted.

Parameters *path* : str

The final file to produce

filelist : list of str

The paths, in order, to assemble into the final file.

metadata (*path*, *refresh=False*, ***kwargs*)
Return metadata of path.

Metadata is cached unless *refresh=True*.

Parameters *path* : string/bytes

filename to get metadata for

refresh : bool (=False)

if False, look in local cache for file metadata first

mkdir (*path*, *acl*='', ***kwargs*)

Make new bucket or empty key

mv (*path1*, *path2*, ***kwargs*)

Move file between locations on S3

open (*path*, *mode*='rb', *block_size*=None, *acl*='', *fill_cache*=None, ***kwargs*)

Open a file for reading or writing

Parameters path: string

Path of file on S3

mode: string

One of 'rb' or 'wb'

block_size: int

Size of data-node blocks if reading

fill_cache: bool

If seeking to new a part of the file beyond the current buffer, with this True, the buffer will be filled between the sections to best support random access. When reading only a few specific chunks out of a file, performance may be better if False.

acl: str

Canned ACL to set when writing

kwargs: dict-like

Additional parameters used for s3 methods. Typically used for ServerSideEncryption.

put (*filename*, *path*, ***kwargs*)

Stream data from local filename to file at path

read_block (*fn*, *offset*, *length*, *delimiter*=None, ***kwargs*)

Read a block of bytes from an S3 file

Starting at *offset* of the file, read *length* bytes. If *delimiter* is set then we ensure that the read starts and stops at *delimiter* boundaries that follow the locations *offset* and *offset + length*. If *offset* is zero then we start at zero. The bytestring returned WILL include the end *delimiter* string.

If *offset+length* is beyond the eof, reads to eof.

Parameters fn: string

Path to filename on S3

offset: int

Byte offset to start read

length: int

Number of bytes to read

delimiter: bytes (optional)

Ensure reading starts and stops at *delimiter* bytestring

See also:

`distributed.utils.read_block`

Examples

```
>>> s3.read_block('data/file.csv', 0, 13)
b'Alice, 100\nBo'
>>> s3.read_block('data/file.csv', 0, 13, delimiter=b'\n')
b'Alice, 100\nBob, 200\n'
```

Use `length=None` to read to the end of the file. `>>> s3.read_block('data/file.csv', 0, None, delimiter=b'\n') # doctest: +SKIP b'Alice, 100\nBob, 200\nCharlie, 300'`

rm (*path*, *recursive=False*, ***kwargs*)

Remove keys and/or bucket.

Parameters *path* : string

The location to remove.

recursive : bool (True)

Whether to remove also all entries below, i.e., which are returned by `walk()`.

rmdir (*path*, ***kwargs*)

Remove empty key or bucket

setxattr (*path*, *copy_kwargs=None*, ***kw_args*)

Set metadata.

Attributes have to be of the form documented in the [‘Metadata Reference’](#).

kw_args [key-value pairs like `field="value"`, where the values must be strings. Does not alter existing fields,] unless the field appears here - if the value is `None`, delete the field.

copy_args [dict, optional] dictionary of additional params to use for the underlying `s3.copy_object`.

Examples

```
>>> mys3file.setxattr(attribute_1='value1', attribute_2='value2')
# Example for use with copy_args
>>> mys3file.setxattr(copy_kwargs={'ContentType': 'application/pdf'},
↳ attribute_1='value1')
```

<http://docs.aws.amazon.com/AmazonS3/latest/dev/UsingMetadata.html#object-metadata>

tail (*path*, *size=1024*, ***kwargs*)

Return last bytes of file

touch (*path*, *acl=''*, ***kwargs*)

Create empty key

If *path* is a bucket only, attempt to create bucket.

url (*path*, *expires=3600*, ***kwargs*)

Generate presigned URL to access *path* by HTTP

Parameters *path* : string

the key path we are interested in

expires : int

the number of seconds this signature will be good for.

walk (*path*, *refresh=False*)

Return all real keys below path

class `s3fs.core.S3File` (*s3*, *path*, *mode='rb'*, *block_size=5242880*, *acl=''*, *fill_cache=True*,
s3_additional_kwargs=None)

Open S3 key as a file. Data is only loaded and cached on demand.

Parameters *s3* : boto3 connection

path : string

S3 bucket/key to access

block_size : int

read-ahead size for finding delimiters

fill_cache: bool

If seeking to new a part of the file beyond the current buffer, with this True, the buffer will be filled between the sections to best support random access. When reading only a few specific chunks out of a file, performance may be better if False.

acl: str

Canned ACL to apply

See also:

[`S3FileSystem.open`](#) used to create `S3File` objects

Examples

```
>>> s3 = S3FileSystem()
>>> with s3.open('my-bucket/my-file.txt', mode='rb') as f:
...     ...
```

Methods

<code>close()</code>	Close file
<code>flush([force, retries])</code>	Write buffered data to S3.
<code>getxattr(xattr_name, **kwargs)</code>	Get an attribute from the metadata.
<code>info(**kwargs)</code>	File information about this path
<code>metadata([refresh])</code>	Return metadata of file.
<code>next()</code>	
<code>read([length])</code>	Return data from cache, or fetch pieces as necessary
<code>readable()</code>	Return whether the S3File was opened for reading
<code>readline([length])</code>	Read and return a line from the stream.
<code>readlines()</code>	Return all lines in a file as a list
<code>seek(loc[, whence])</code>	Set current file location
<code>seekable()</code>	Return whether the S3File is seekable (only in read mode)
<code>setxattr([copy_kwargs])</code>	Set metadata.
<code>tell()</code>	Current file location
<code>url(**kwargs)</code>	HTTP URL to read this file (if it already exists)

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Table 6.5 – continued from previous page

<code>writable()</code>	Return whether the S3File was opened for writing
<code>write(data)</code>	Write data to buffer.

close()

Close file

If in write mode, key is only finalized upon close, and key will then be available to other processes.

flush (*force=False, retries=10*)

Write buffered data to S3.

Uploads the current buffer, if it is larger than the block-size. If the buffer is smaller than the block-size, this is a no-op.

Due to S3 multi-upload policy, you can only safely force flush to S3 when you are finished writing.

Parameters force : bool

When closing, write the last block even if it is smaller than blocks are allowed to be.

getxattr (*xattr_name, **kwargs*)

Get an attribute from the metadata. See `getxattr()`.

Examples

```
>>> mys3file.getxattr('attribute_1')
'value_1'
```

info (***kwargs*)

File information about this path

metadata (*refresh=False, **kwargs*)

Return metadata of file. See `metadata()`.

Metadata is cached unless *refresh=True*.

read (*length=-1*)

Return data from cache, or fetch pieces as necessary

Parameters length : int (-1)

Number of bytes to read; if <0, all remaining bytes.

readable ()

Return whether the S3File was opened for reading

readline (*length=-1*)

Read and return a line from the stream.

If length is specified, at most size bytes will be read.

readlines ()

Return all lines in a file as a list

seek (*loc, whence=0*)

Set current file location

Parameters loc : int

byte location

whence : {0, 1, 2}

from start of file, current location or end of file, resp.

seekable ()

Return whether the S3File is seekable (only in read mode)

setxattr (*copy_kwargs=None*, ***kwargs*)

Set metadata. See `setxattr()`.

Examples

```
>>> mys3file.setxattr(attribute_1='value1', attribute_2='value2')
```

tell ()

Current file location

url (***kwargs*)

HTTP URL to read this file (if it already exists)

writable ()

Return whether the S3File was opened for writing

write (*data*)

Write data to buffer.

Buffer only sent to S3 on `close()` or if buffer is greater than or equal to `blocksize`.

Parameters data : bytes

Set of bytes to be written.

class `s3fs.mapping.S3Map` (*root*, *s3=None*, *check=False*, *create=False*)

Wrap an S3FileSystem as a mutable wrapping.

The keys of the mapping become files under the given `root`, and the values (which must be bytes) the contents of those files.

Parameters root : string

prefix for all the files (perhaps just a bucket name)

s3 : S3FileSystem

check : bool (=True)

performs a touch at the location, to check writeability.

Examples

```
>>> s3 = s3fs.S3FileSystem()
>>> d = MapWrapping('mybucket/mapstore/', s3=s3)
>>> d['loc1'] = b'Hello World'
>>> list(d.keys())
['loc1']
>>> d['loc1']
b'Hello World'
```

Methods

<code>clear()</code>	Remove all keys below root - empties out mapping
<code>get((k[,d]) -> D[k] if k in D, ...)</code>	
<code>items(...)</code>	
<code>keys()</code>	
<code>pop((k[,d]) -> v, ...)</code>	If key is not found, d is returned if given, otherwise <code>KeyError</code> is raised.
<code>popitem() -> (k, v), ...)</code>	as a 2-tuple; but raise <code>KeyError</code> if D is empty.
<code>setdefault((k[,d]) -> D.get(k,d), ...)</code>	
<code>update((E, ...)</code>	If E present and has a <code>.keys()</code> method, does: for k in E: <code>D[k] = E[k]</code>
<code>values(...)</code>	

class `s3fs.utils.ParamKwargsHelper` (*s3*)

Utility class to help extract the subset of keys that an s3 method is actually using

Parameters `s3` : boto S3FileSystem

Methods

<code>filter_dict(method_name, d)</code>
--

class `s3fs.utils.SSEParams` (*server_side_encryption=None, sse_customer_algorithm=None, sse_customer_key=None, sse_kms_key_id=None*)

Methods

<code>to_kwargs()</code>

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