# Building Bridges

## pyfilesystem: unified access to storages and services


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Python Users Berlin 03/2016

# /about

- 20 years in publishing business since 1995
- Python, Zope, Plone
- XML, PDF, EPUB, DOCX, DITA

XMLDIRECTOR
<content_management/>

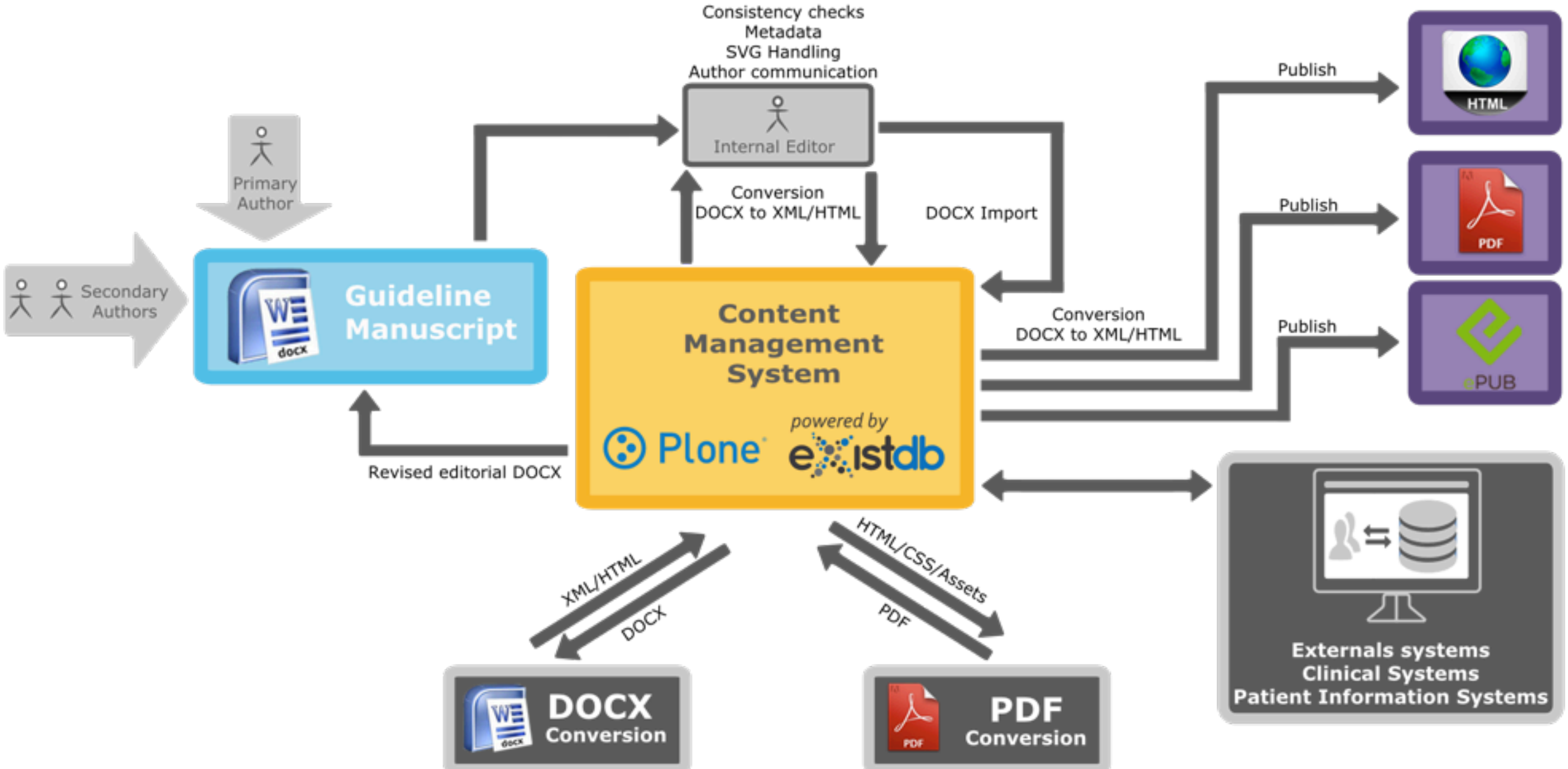
produce & publish

print-css.
rocks

# Agenda

- **pyfilesystem**
  - storages systems
  - storage APIs
  - **unified access to storages**
  - **not:** storage/service specific higher API functionality

# Publishing solutions require connectivity to different storages



# Our Publishing Universe

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Alfresco

amazon web services | S3

ownCloud

existdb

Dropbox

SFTP

BASE

ePUB

PDF

EPUB

DOCX

xml

HTML

LaTeX

# Characteristics of storages

- usually hierarchical model (folders, collections, files)
- folder operations:
  - makedir, renamedir, removedir, exists…
- file operations:
  - open, read, write, exists, stat…

# Common problem

- every storage/filesystem/service has its own API/SDK (or several )
    - standard filesystem API
    - Dropbox API
    - Google Drive API
    - Sharepoint: WebDAV, CMIS, REST
- specific code for each storage type
- storages not easily interchangeable

# pyfilesystem

- **abstraction layer** on top of storages, access through a uniform API
- Python 2/3 compatible
- various filesystem/webservices drivers
- **Goal**: your code must not know about the underlaying storage system. The backend is just a configuration option.
- extensible (writing a new driver is straight forward
- sandboxed filesystem operations
- OOTB support for: WebDAV, S(FTP), RPCFS, OSFS, S3, ZIP, Memory, MultiFS, WrapFS

```
handle = fs.opener(some_url)
with handle.open('foo', 'w') as fp:
    fp.write(data)

handle.listdir(dirname)

handle.makedir('foo/bar/test')

handle.removedir('foo/bar/test)

handle.exists(some_filename)

handle.isfile(some_name)

handle.move(src, dst)

handle.copy(src, dst)

….
```

# pyfilesystem concepts

- **Sandboxing**
  - no access outside to resources outside a configured root path
- **Paths**
  - '/' as path separator
  - '.' current directory
  - '..' parent directory
- **Errors**
  - Identical exceptions across filesystem/storage types

# Opening filesystems/storages

```
from fs.osfs import OSFS
my_f           = OSFS('/foo/bar')

from fs.contrib.davfs import DAVFS
dav_fs         = DAVFS('http://host:port/webdav', credentials=…)

from fs.opener import opener
ftp_fs, path  = opener.parse('ftp://ftp.mozilla.org/pub')
davs_fs, path = opener.parse('http://user:pass@host:port/webdav')
s3_fs, path   = opener.parse('s3://mybucket/some/folter')
```

# Multi-filesystem (read-only)

```
-- templates
   |-- snippets
   |   `-- panel.html
   |-- index.html
   |-- profile.html
   `-- base.html

-- theme
   |-- snippets
   |   |-- widget.html
   |   `-- extra.html
   |-- index.html
   `-- theme.html
```

```
from fs.osfs import OSFS
from fs.multifs import MultiFS

themed_template_fs = MultiFS()
themed_template_fs.addfs('templates', OSFS('templates'))
themed_template_fs.addfs('theme', OSFS('theme'))
```

# Multi-filesystem (read-only)

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-- templates
   |-- snippets
   |   `-- panel.html
   |-- index.html
   |-- profile.html
   `-- base.html

-- theme
   |-- snippet
   |   |-- wid
   |   `-- ext
   |-- index.h
   `-- theme.h
```

```
|-- snippets
|   |-- panel.html
|   |-- widget.html
|   `-- extra.html
|-- index.html
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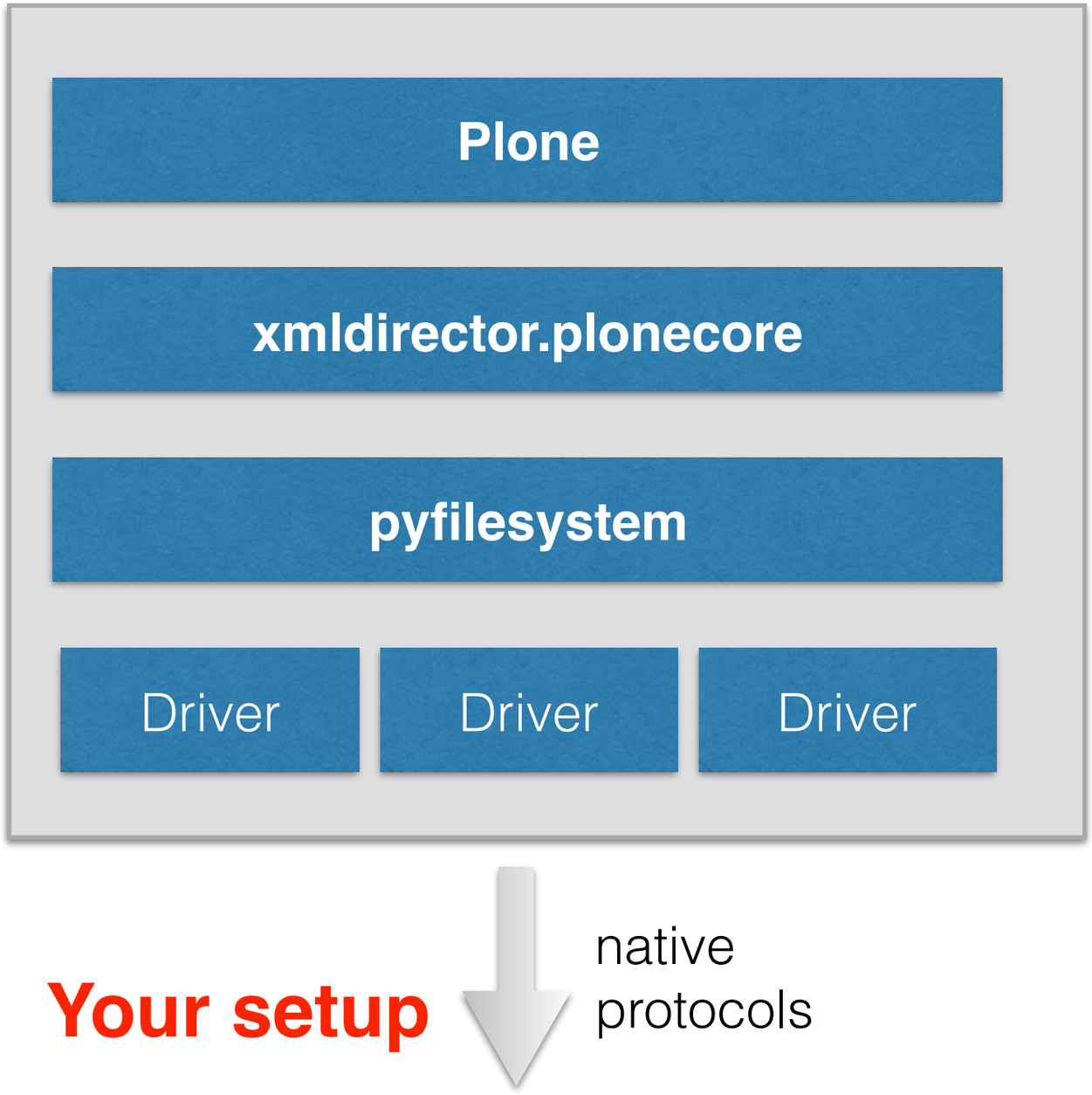
# Implementing drivers/ essential methods

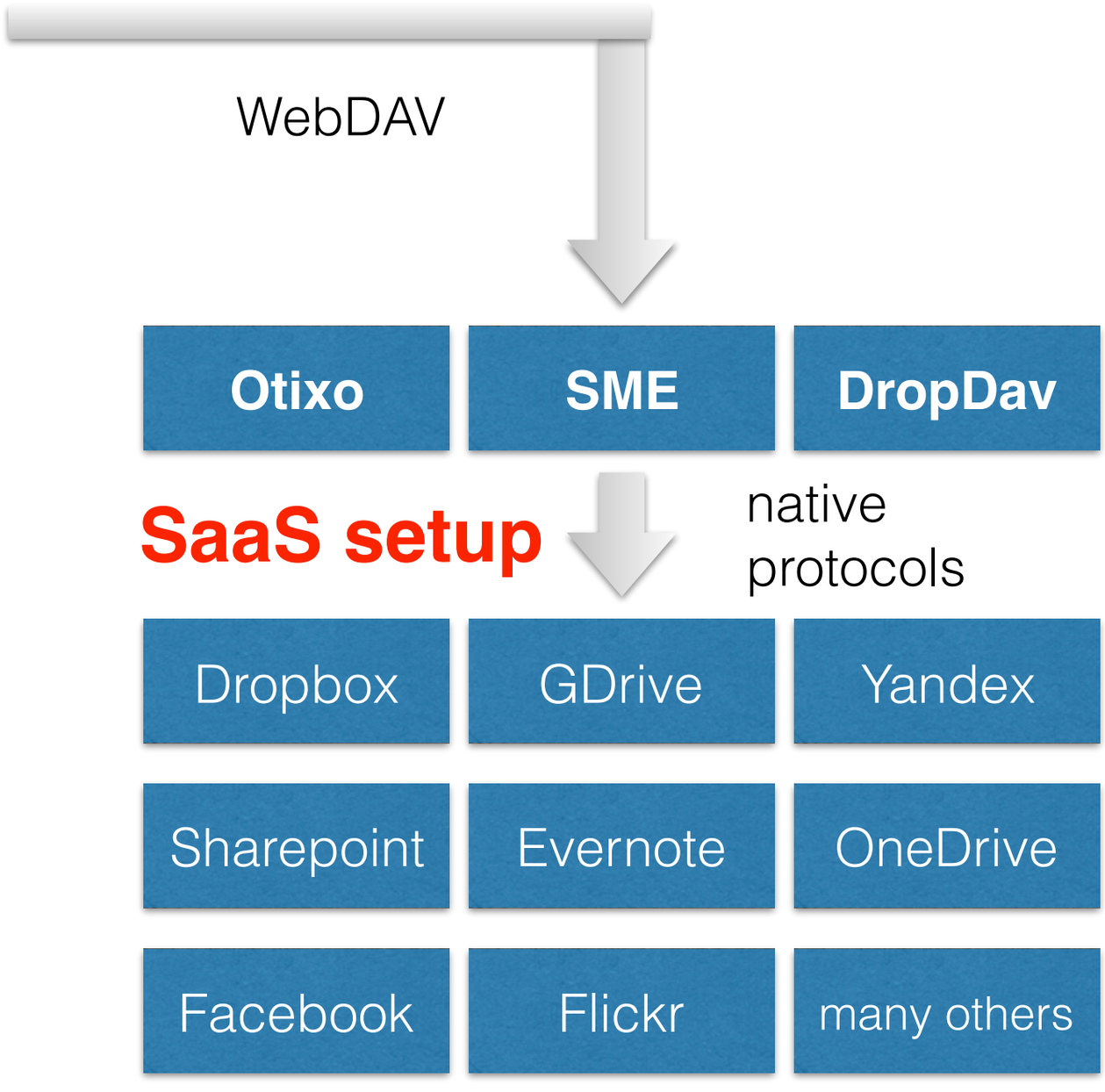
```
open()      Opens a file for read/writing
isfile()    Check whether the path exists and is a file
isdir()     Check whether a path exists and is a directory
listdir()   List the contents of a directory
makedir()   Create a new directory
remove()    Remove an existing file
removedir() Remove an existing directory
rename()    Atomically rename a file or directory
getinfo()   Return information about the path e.g. size, mtime
```

# Implementing drivers/ non-essential methods

```
copy()        Copy a file to a new location
copydir()     Recursively copy a directory to a new location
desc()        Return a short descriptive text regarding a path
exists()      Check whether a path exists as file or directory
listdirinfo() Get a directory listing along
               with the info dict for   each entry
ilistdir()    Generator version of the listdir method
ilistdirinfo() Generator version of the listdirinfo method
getpathurl() Get an external URL at which the
             given file can be accessed, if possible
getsyspath() Get a file's name in the local filesystem, if possible
getmeta()    Get the value of a filesystem meta value, if it exists
getmmap()    Gets an mmap object for the given resource, if supported
hassyspath() Check if a path maps to a system path
             (recognized by the OS)
haspathurl() Check if a path maps to an external URL
hasmeta()    Check if a filesystem meta value exists
move()       Move a file to a new location
movedir()    Recursively move a directory to a new location
settimes()   Sets the accessed and modified times of a path
```

# Architecture



# pyfilesystem driver options

| Storage/ Web Service | self-hosted (Privacy) | via external SaaS Bridge (limited privacy?) |
|---|---|---|
| **WebDAV** (Owncloud, BaseX, eXist-DB, Alfresco, etc.) | **YES** | **YES** |
| **Amazon S3** | **YES** | **YES** |
| **Local filesystem** | **YES** | **NO** |
| **Dropbox** | **(YES, auth token issues)** | **YES** |
| **FTP/SFTP** | **(YES, V1.4)** | **YES** |
| 4Shared ADrive Alfresco Amazon Cloud Amazon S3 Box CloudMe Copy Cubby Digital Bucket DriveOnWeb Dropbox Dump Truck Evernote FTP Fabasoft Facebook FilesAnywhere Flickr GMX.DE Google Drive HiDrive Huddle LiveDrive Mediencenter MyDrive OneDrive Online FileFolder OwnCloud Picasa SugarSync TrendMicro SafeSync Web.de WebDAV Yandex | **NO** | **YES** |

# Supported services through 3rd party services (example)

Amazon Cloud
Box
Dropbox
FTP
WebDAV
Web.de
Google Drive
Flickr
Evernote
GMX.DE
HiDrive
Digital Bucket
Picasa
Facebook
Copy
Cubby
SugarSync
Amazon S3
MyDrive
Dump Truck
4Shared
CloudMe
Yandex
OwnCloud
Mediencenter
Online FileFolder
Alfresco
Huddle
FilesAnywhere
OneDrive

# Further development (Funding)

- native **Dropbox** support (via Dropbox SDK)
- NTML authentication support for WebDAV driver
- native **Sharepoint/Office 365** support (via CMIS, REST, WebDAV NTLM, Microsoft Graph)
- anyone interested in funding further drivers?


Santos
Tour
down
under
6-28 JANUARY

# Conclusions

- the underlaying storage/filesystem is just a configuration option
- same code will work across different storage types
- unit-test your pyfilesystem-based code against used storage types
- minor behavioral differences between drivers
- dealing with OAuth (Dropbox, Google Drive)

# pyfilesystem

```
> pip install fs
```

**https://pyfilesystem.readthedocs.org/**

**https://github.com/revolunet/pyfilesystem**