FS Workshop

Paris 2013

How OMERO 5 uses FS to preserve your original image files on OMERO.server and avoid data duplication.

Outline

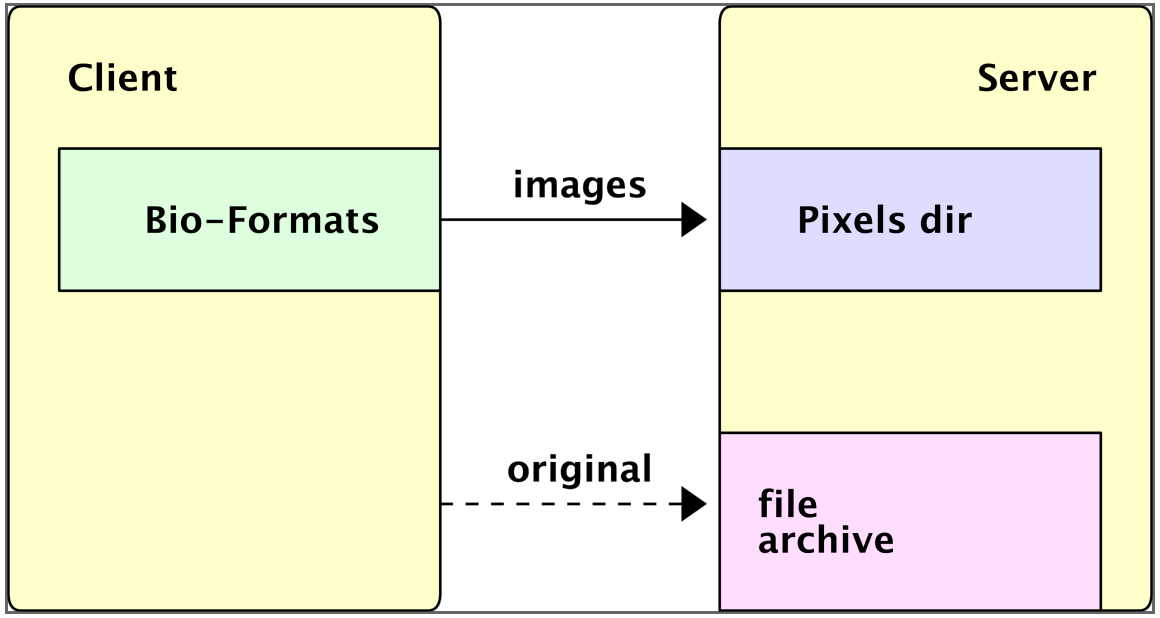
- Before FS
- Introducing FS
- DEMO #1: Importing and Downloading
- Advantages of FS
- Introducing Filesets
- DEMO #2: Moving and Deleting
- Migrating to FS
- Building on FS

OMERO 4

- server stores Pixels files
- additionally, original files may be stored
  - ***data duplication***
  - in triplicate for big images

OMERO 4

Getting Data In



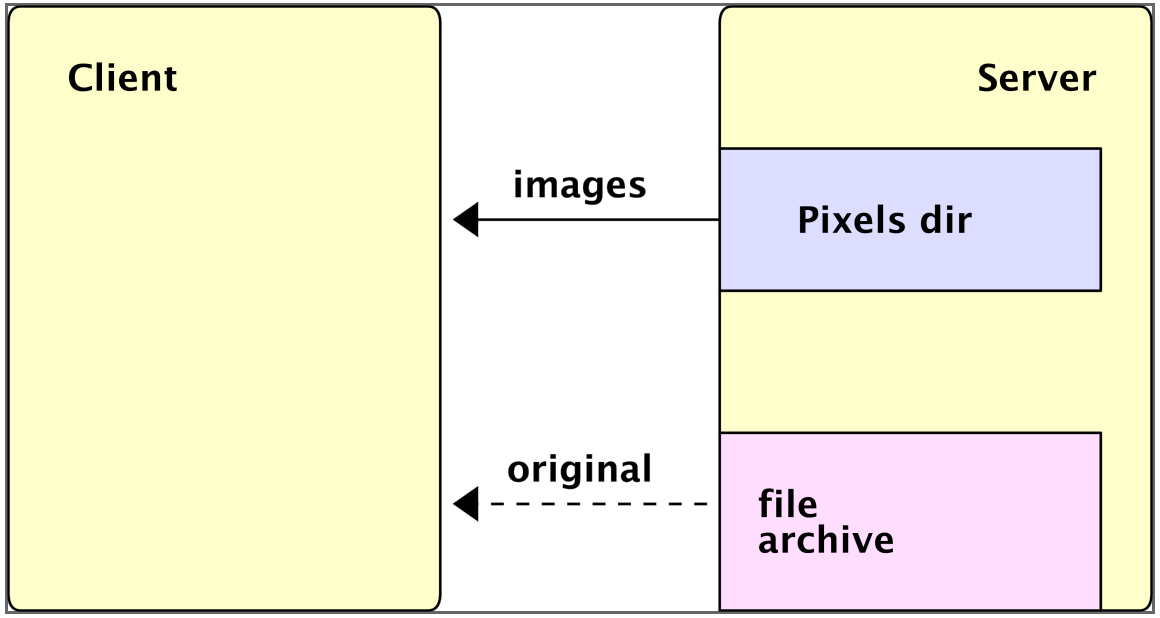
OMERO 4

Getting Data In

- client software extracts planes from image files
- server stores and uses Pixels files
  - Pixels files are uncompressed, so may be large
- additionally, original files could be archived
- *data is duplicated*

OMERO 4

Getting Data Out



OMERO 4

Getting Data Out

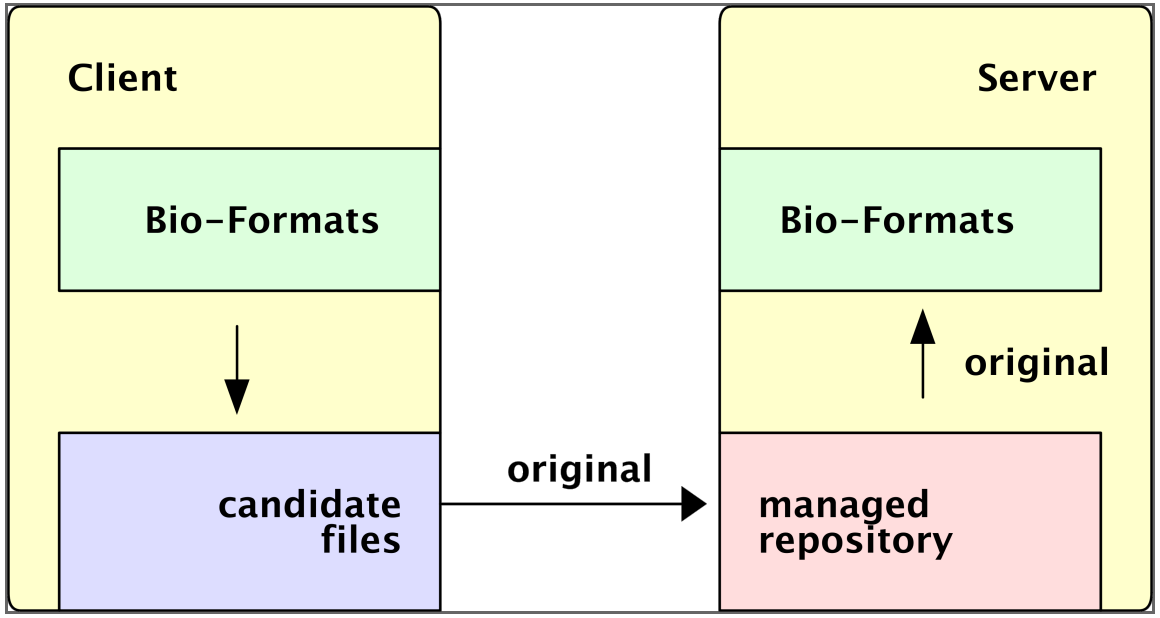
- clients obtain rendered images from server
  - Pixels structure is optimized for reading
  - rendering is thus a fast, direct process
- original files available only if archived

OMERO 5

- server *does not* store Pixels files
- *only* original files are stored
  - ***no data duplication***
  - except for big images without subresolutions

OMERO 5

Getting Data In



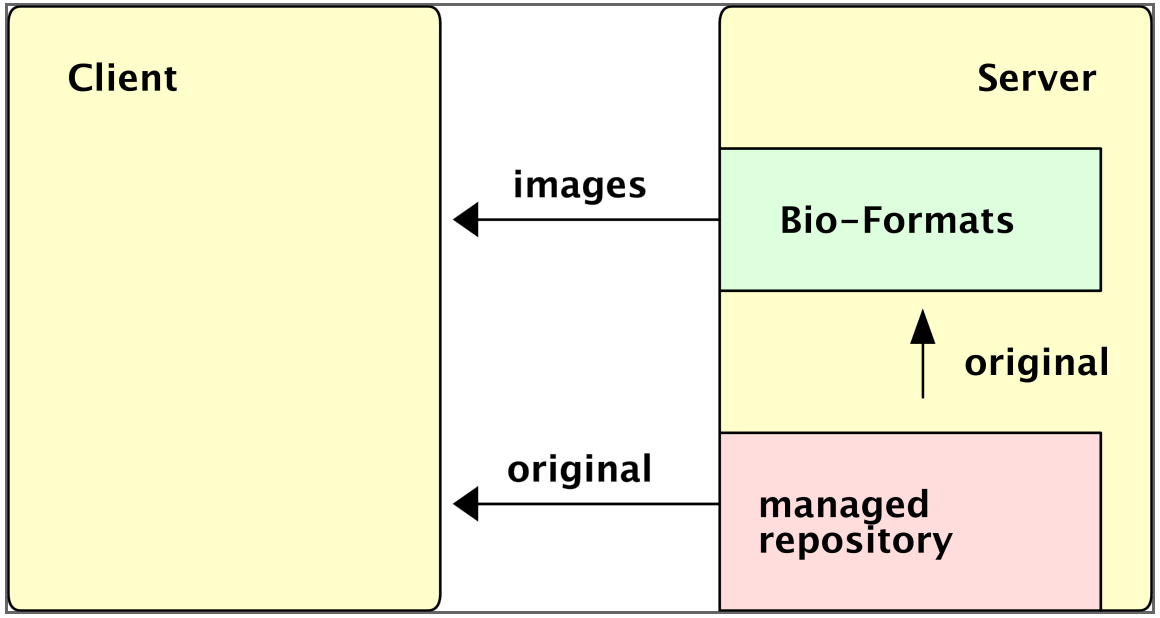
OMERO 5

Getting Data In

- clients upload only the original files
  - can disconnect after upload
  - client and server compare files to check integrity
- *no data duplication*

OMERO 5

Getting Data Out



OMERO 5

Getting Data Out

- server now uses Bio-Formats in rendering
  - Bio-Formats extracts planes from original files
  - Bio-Formats performance much improved
- original files always available for download

Some Numbers

DV
(~125MB)

	pre-fs	pre-fs (archived)	fs
import	22 s.	26 s.	18 s.
avg. plane view	0.19 s.	0.18 s.	0.20 s.
size on disk	128 MB	256 MB	128 MB

LEI
(~130MB / 140 TIFFs)

	pre-fs	pre-fs (archived)	fs
import	27 s.	44 s.	107 s. (?)
avg. plane view	0.67 s.	0.67 s.	0.72 s.
size on disk	73 MB	200 MB	131 MB

SVS
(~500MB)

	pre-fs	pre-fs (archived)	fs
import	23 s.	23 s.	36 s.
pyramids	90 min.	90 min.	n/a
avg. plane view	0.25 s.	0.25 s.	0.23 s.
size on disk	5.5 GB	5.5 GB	500 MB

InCell
(~9GB/~1000 TIFFs)

	pre-fs	pre-fs (archived)	fs
import	23 min.	n/a	34 min.
avg. plane view	0.50 s.	n/a	0.71 s.
size on disk	9 GB	n/a	9 GB

FS in Action #1

Importing and Downloading

We now show import and download in OMERO 5.

FS in Action #1

Importing and Downloading

- no archive checkbox
- file import is fast
- import log, aids debugging slow/failed
- checksums dialog for file integrity
- download files, content intact
- SVS viewable, uses subresolutions

No Data Duplication

- OMERO 5 does not create Pixels files
  - no duplication of image data on server
  - except for big images without subresolutions
- preserve original data structure
  - uploaded image files readable by other software
  - need not duplicate image data outside FS

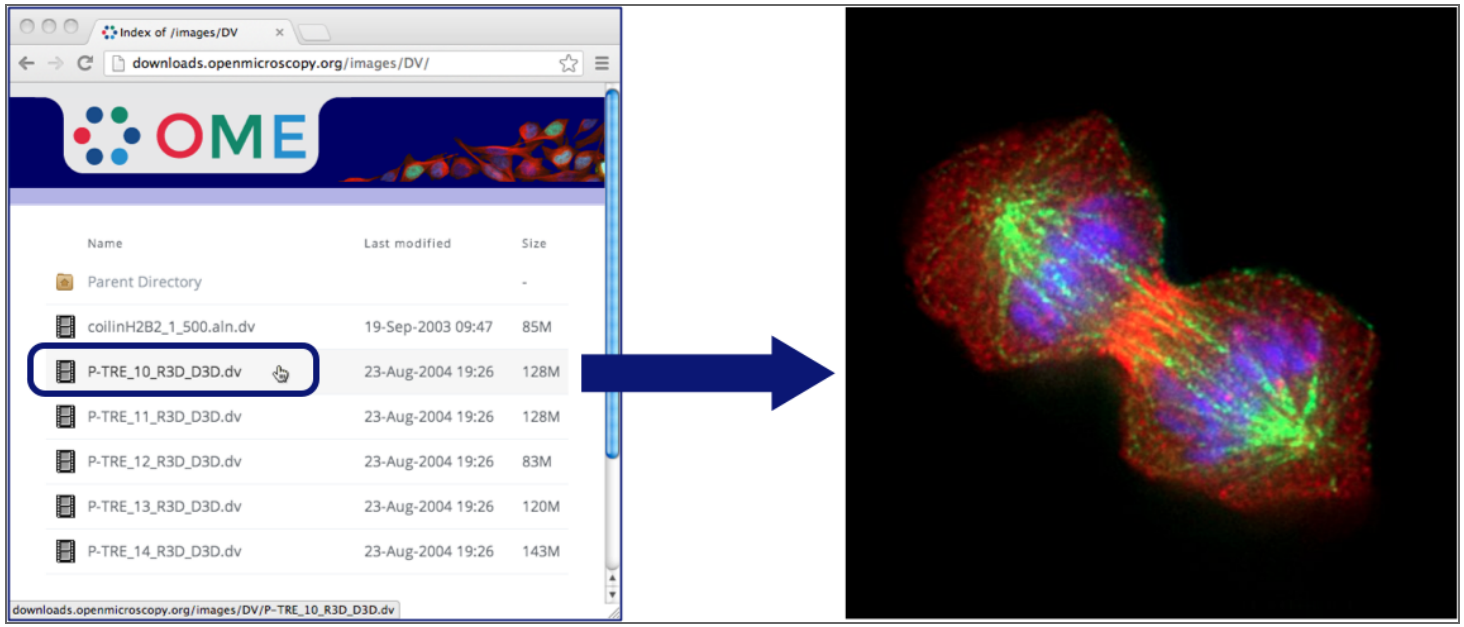
More FS Advantages

- OMERO.server becomes master data repository
  - easily share data, reproduce analyses
  - protect against data loss on local systems
- each upload has an import log recorded
- Bio-Formats improvements benefit existing data

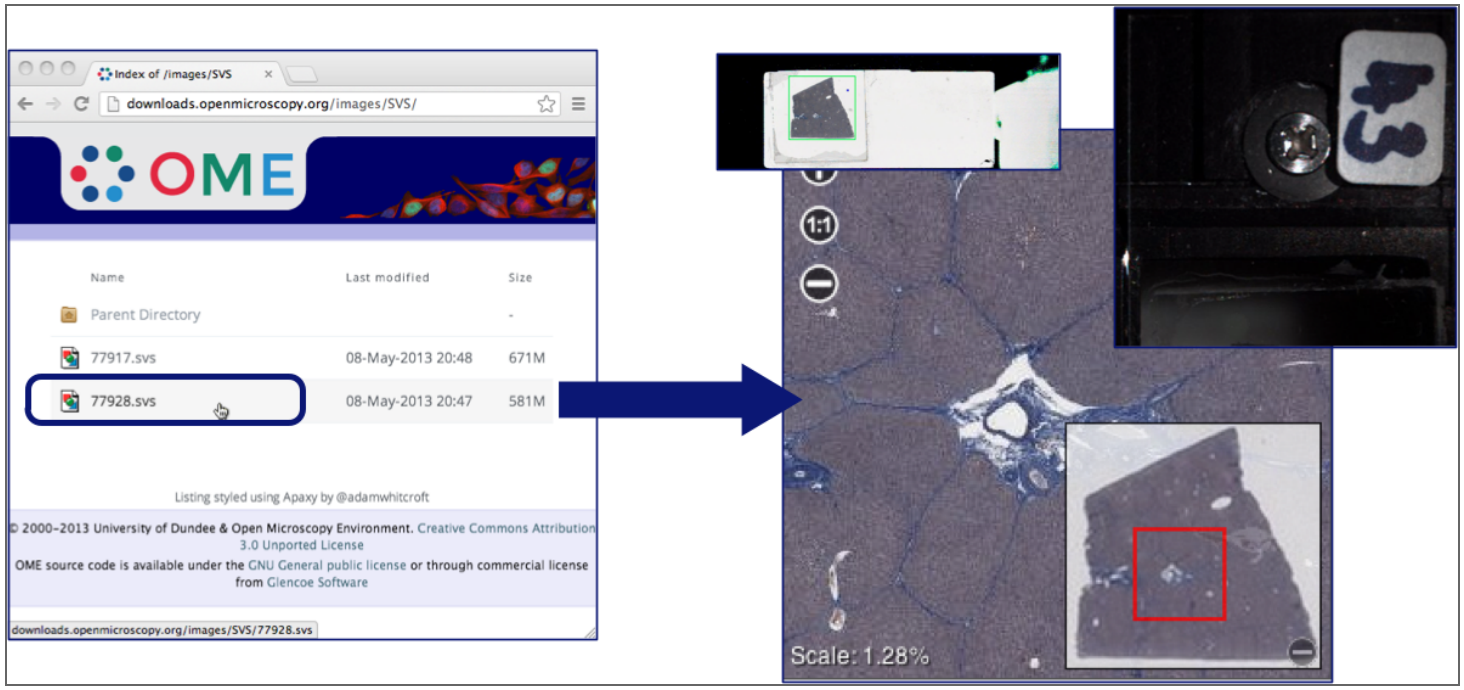
Introducing Filesets

- a set of related files
  - Bio-Formats must read them together
- a set of images, arising from those files
- may be just one file and one image
- Project/Dataset, Screen/Plate hierarchy remains

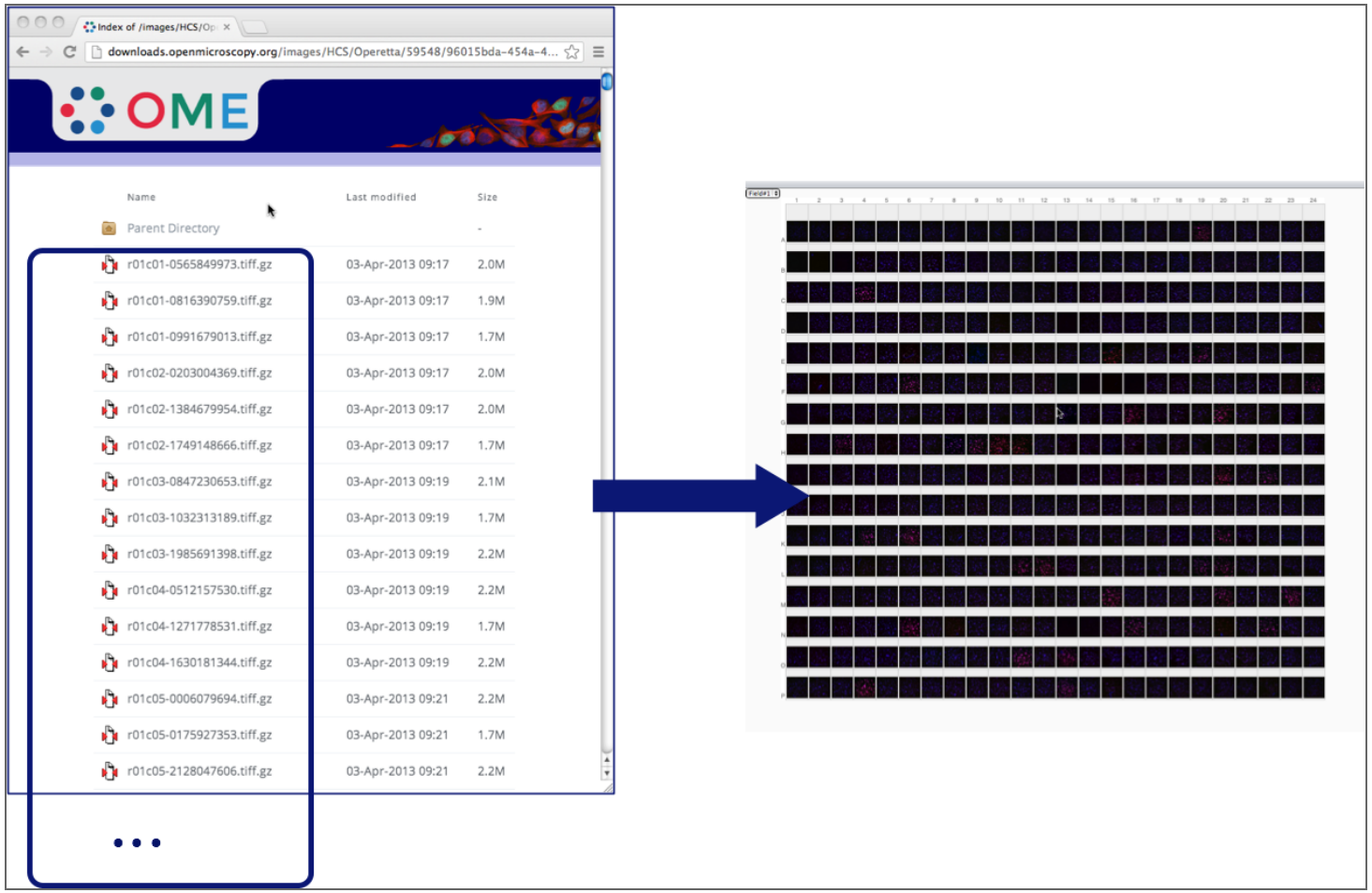
One File → One Image



One File → Many Images



Many Files → Many Images



Many Files → One Image

- e.g. lei, metamorph?

Fileset Indivisibility

- files must be kept together for Bio-Formats
- must also associate the files' images
- server prohibits certain acts on partial filesets
  - move between groups
  - delete

FS in Action #2

Moving and Deleting

We now show move and delete in OMERO 5.

FS in Action #2

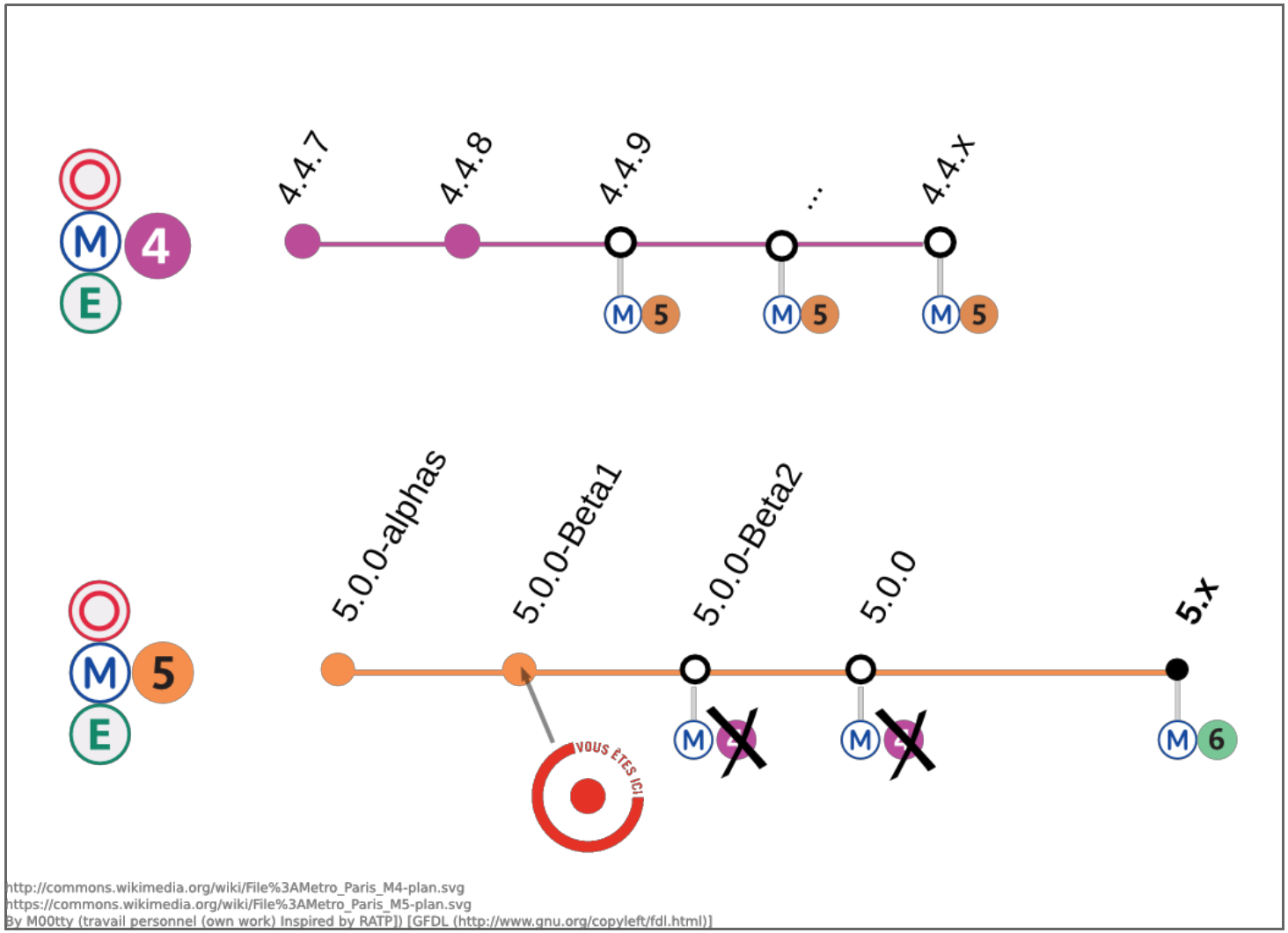
Moving and Deleting

- change group: partial fails
- change group: complete succeeds
- split fileset images across datasets
- delete: partial fails
- delete: complete succeeds

Migrating to FS

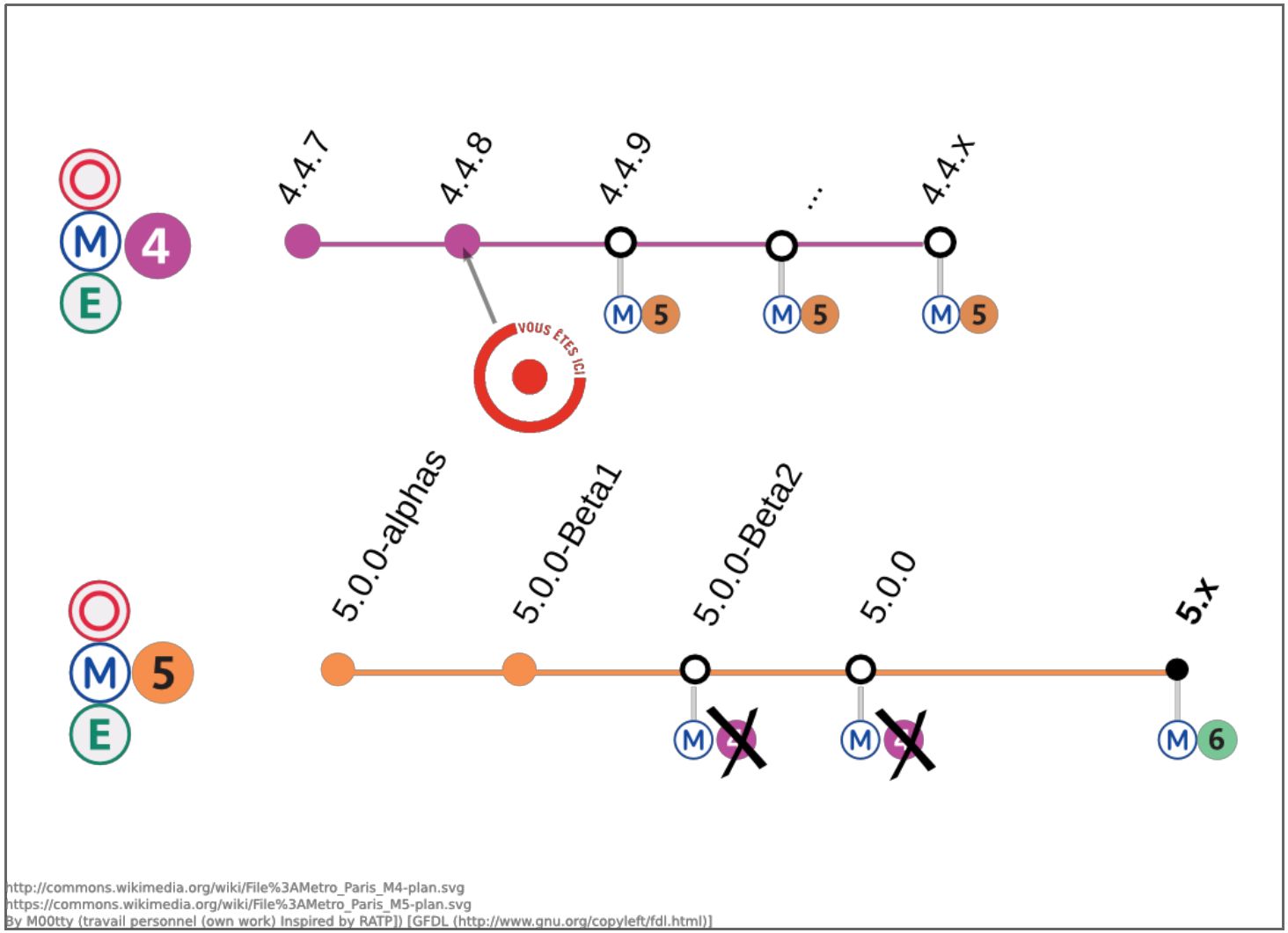
- new OMERO users should try out OMERO 5
  - upgrades will be provided between each beta
  - and to 5.0.0 and beyond
- upgrades from OMERO 4 currently being tested
  - process for upgrade to be released after summer
  - pre-FS data will be supported

Migrating to FS



http://commons.wikimedia.org/wiki/File%3AMetro_Paris_M4-plan.svg
https://commons.wikimedia.org/wiki/File%3AMetro_Paris_M5-plan.svg
By M00tty (travail personnel (own work) Inspired by RATP]) [GFDL (http://www.gnu.org/copyleft/fdl.html)]

Migrating to FS



http://commons.wikimedia.org/wiki/File%3AMetro_Paris_M4-plan.svg
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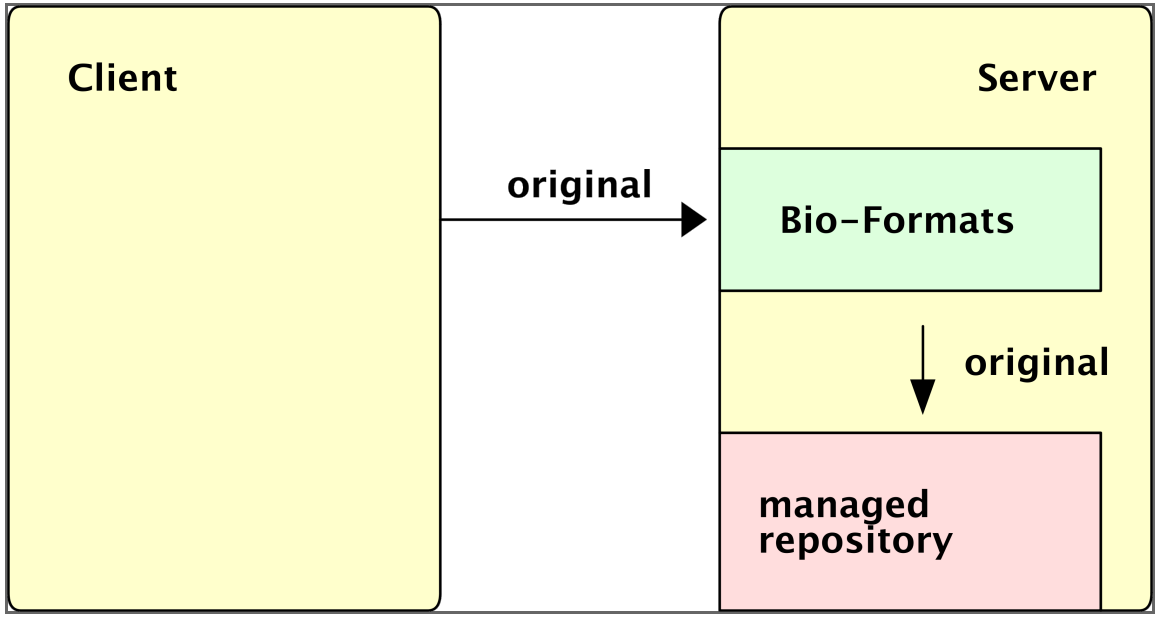
Building on FS

- reconsider fileset handling (deletion, etc.)
  - server-side recovery from partial deletes?
- detect and report post-upload file corruption

Next-Generation FS

Getting Data In



Next-Generation FS

Getting Data In

- import without Bio-Formats on clients
  - all file format scanning done on server
  - file upload from web client
  - ability to upload unknown file formats

Any Feedback?

- We welcome questions and comments on FS.
- What further work on FS would be most useful?
- Would you like to try out FS at your site?

The Managed Repository

```
/home/data/sample$ tree zeiss-lsm-martin/  # Files local to client
zeiss-lsm-martin/
├── 01-01.lsm
├── 01-02.lsm
└── 051215-j-tf.mdb
```

```
/OMERO/ManagedRepository/josh_0$ tree .    # Files on the server
.
├── 2013-06
│   ├── 17
│   │   ├── 09-02-55.180
│   │   │   ├── 01-01.lsm
│   │   │   ├── 01-02.lsm
│   │   │   └── 051215-j-tf.mdb
│   │   ├── 09-02-55.180.log
```

Configuring FS

etc/omero.properties

- Managed Repository Directory

```
omero.data.dir=/OMERO/
omero.managed.dir=${omero.data.dir}/ManagedRepository
```

- Template Paths

```
omero.fs.repo.path=%user%_%userId%/%year%-%month%/%day%
/%time%
```

Configuring FS

etc/omero.properties

Permitted File Naming

```
omero.fs.repo.path_rules=Windows required, UNIX required
```

Configuring FS

etc/omero.properties

Default Checksum Algorithm

```
omero.checksum.default=SHA1-160
```

also Adler-32, CRC-32, MD5-128,
Murmur3-32, Murmur3-128

FS in SQL

Find an Image's Fileset

```
SELECT fileset FROM image WHERE id = ?
```

FS in SQL

Find Images in Fileset

```
SELECT name FROM image WHERE fileset = ?
```

FS in SQL

Find Paths of Files in Fileset

```
SELECT of.path || of.name
FROM originalfile of, filesetentry fse
WHERE of.id = fse.originalfile
AND fse.fileset = ?
```

FS in SQL

Find Checksums of Files in Fileset

```
SELECT of.name, ca.value, of.hash
FROM originalfile of, filesetentry fse, checksumalgorithm ca
WHERE of.hasher = ca.id
AND of.id = fse.originalfile
AND fse.fileset = ?
```