DataLad – decentralized data distribution for consumption and sharing of scientific datasets

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http://datalad.org

http://www.pymvpa.org

http://NeuroDebian.net

http://duecredit.org

Visit our DataLad/NeuroDebian exhibit table and posters #1855, #1870

Acknowledgements

debian.org

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1429999

Houston, we've got a problem...

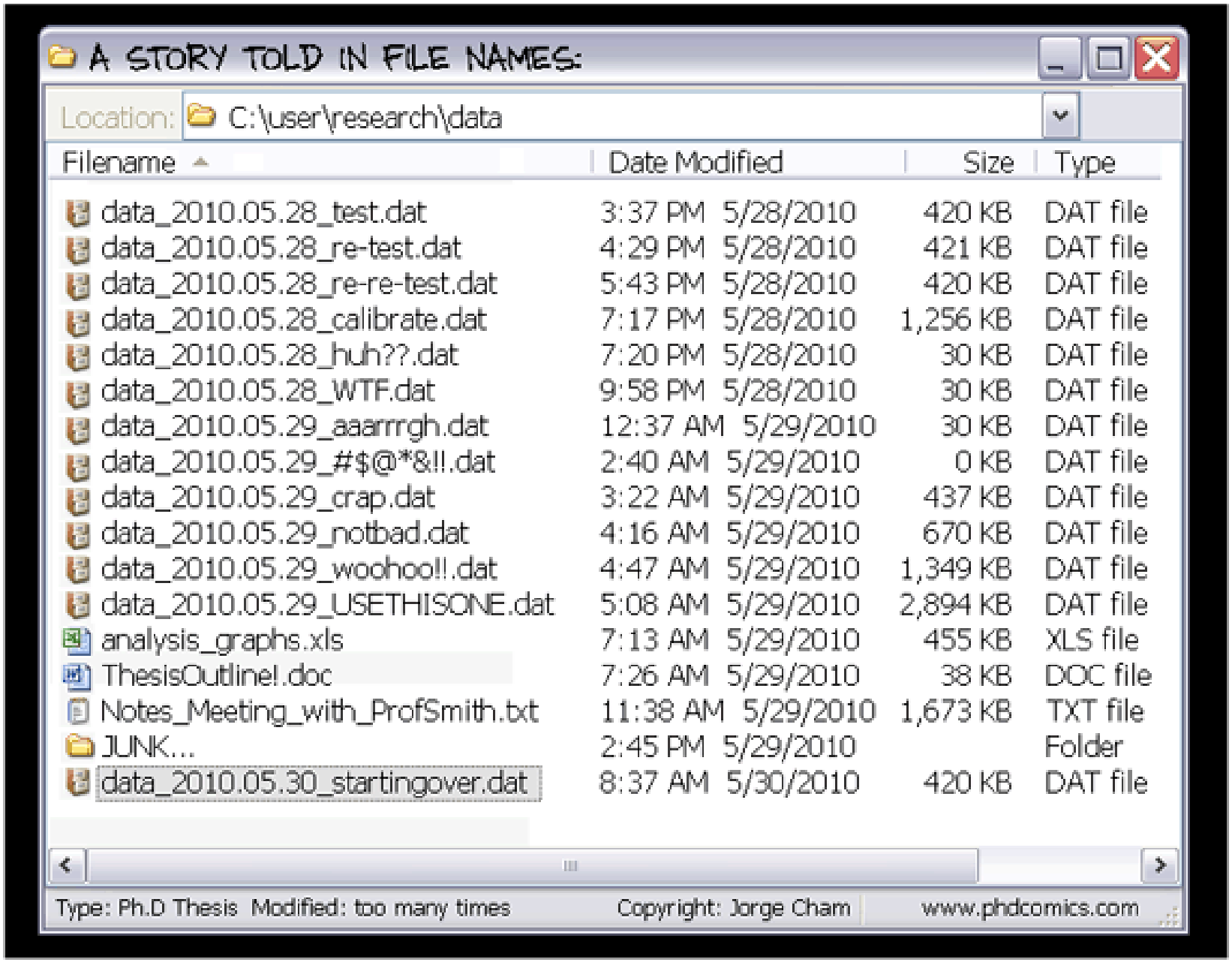
Data is a 2nd-class citizen within software platforms

Why?

- tarballs are **inefficient** distribution format
- **absent versioning** of data

derived and/or curated data does change!

Why?


A STORY TOLD IN FILE NAMES:
Location: C:\user\research\data
Filename | Date Modified | Size | Type
data_2010.05.28_test.dat 3:37 PM 5/28/2010 420 KB DAT file
data_2010.05.28_re-test.dat 4:29 PM 5/28/2010 421 KB DAT file
data_2010.05.28_re-re-test.dat 5:43 PM 5/28/2010 420 KB DAT file
data_2010.05.28_calibrate.dat 7:17 PM 5/28/2010 1,256 KB DAT file
data_2010.05.28_huh??.dat 7:20 PM 5/28/2010 30 KB DAT file
data_2010.05.28_WTF.dat 9:58 PM 5/28/2010 30 KB DAT file
data_2010.05.29_aaarrrgh.dat 12:37 AM 5/29/2010 30 KB DAT file
data_2010.05.29_#$@*&!!.dat 2:40 AM 5/29/2010 0 KB DAT file
data_2010.05.29_crap.dat 3:22 AM 5/29/2010 437 KB DAT file
data_2010.05.29_notbad.dat 4:16 AM 5/29/2010 670 KB DAT file
data_2010.05.29_woohoo!!.dat 4:47 AM 5/29/2010 1,349 KB DAT file
data_2010.05.29_USETHISONE.dat 5:08 AM 5/29/2010 2,894 KB DAT file
analysis_graphs.xls 7:13 AM 5/29/2010 455 KB XLS file
ThesisOutline!.doc 7:26 AM 5/29/2010 38 KB DOC file
Notes_Meeting_with_ProfSmith.txt 11:38 AM 5/29/2010 1,673 KB TXT file
JUNK... 2:45 PM 5/29/2010 Folder
data_2010.05.30_startingover.dat 8:37 AM 5/30/2010 420 KB DAT file
Type: Ph.D Thesis Modified: too many times
Copyright: Jorge Cham
www.phdcomics.com

ge!

Why?

- tarballs are **inefficient** distribution format
- **absent versioning** of data

derived and/or curated data does change!

- code version control systems are **inadequate** for data

duplication, monolithic storage, etc.

- **absent data distributions**

no efficient ways to install and upgrade

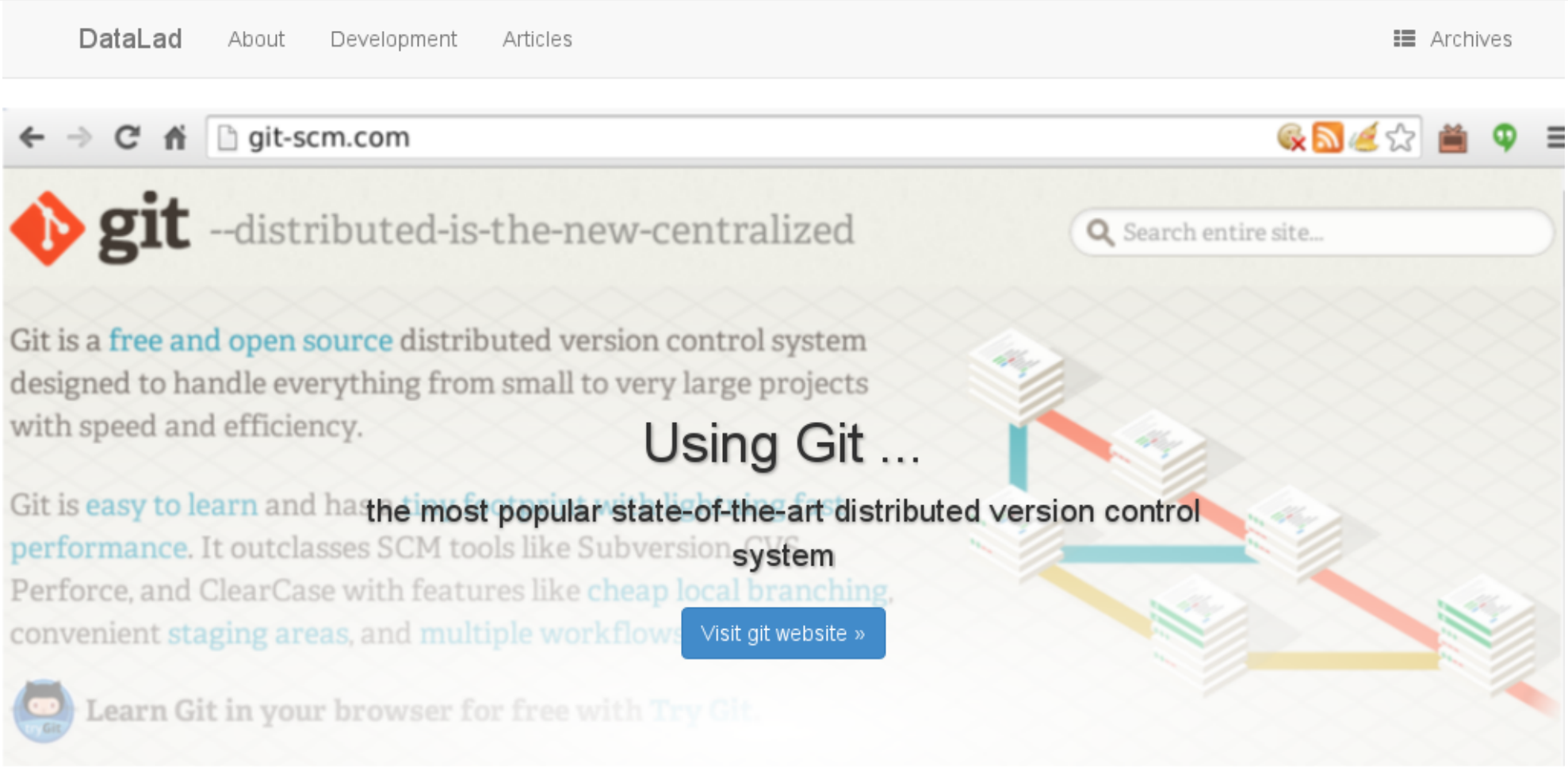
- **cacophony** of authorization schemes and interfaces
- **absent data testing**

*data can and **does** have bugs (see e.g. Halchenko, 2012; Rohlfing, 2013)*

- **difficulty to share** derivative data

shareable? where to host? how to "link" back?

Welcome datalad.org



DataLad aims to provide access to scientific data available from various sources (e.g. lab or consortium web-sites such as Human connectome; data sharing portals such as OpenFMRI and CRCNS) through a single convenient interface and integrated with your software package managers (such as APT in Debian). Although initially targeting neuroimaging and neuroscience data in general, it will not be limited by the domain and we would welcome a wide range of contributions.

DataLad's goal

is to develop a data distribution platform

- with **unambiguous versioning**
- **without data duplication** - data and authorization stays with original data providers
- **distributed** data storage and management model
- providing **uniform access** to a wide range of data sources
- **scalable** to manage terabytes of data
- **integrated** with existing software distributions
- **trustworthy** to rely upon in critical applications
- **available** across all major operating systems

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Managing data should be as easy as managing code and software

How: Foundation #1 – Git

DataLad is

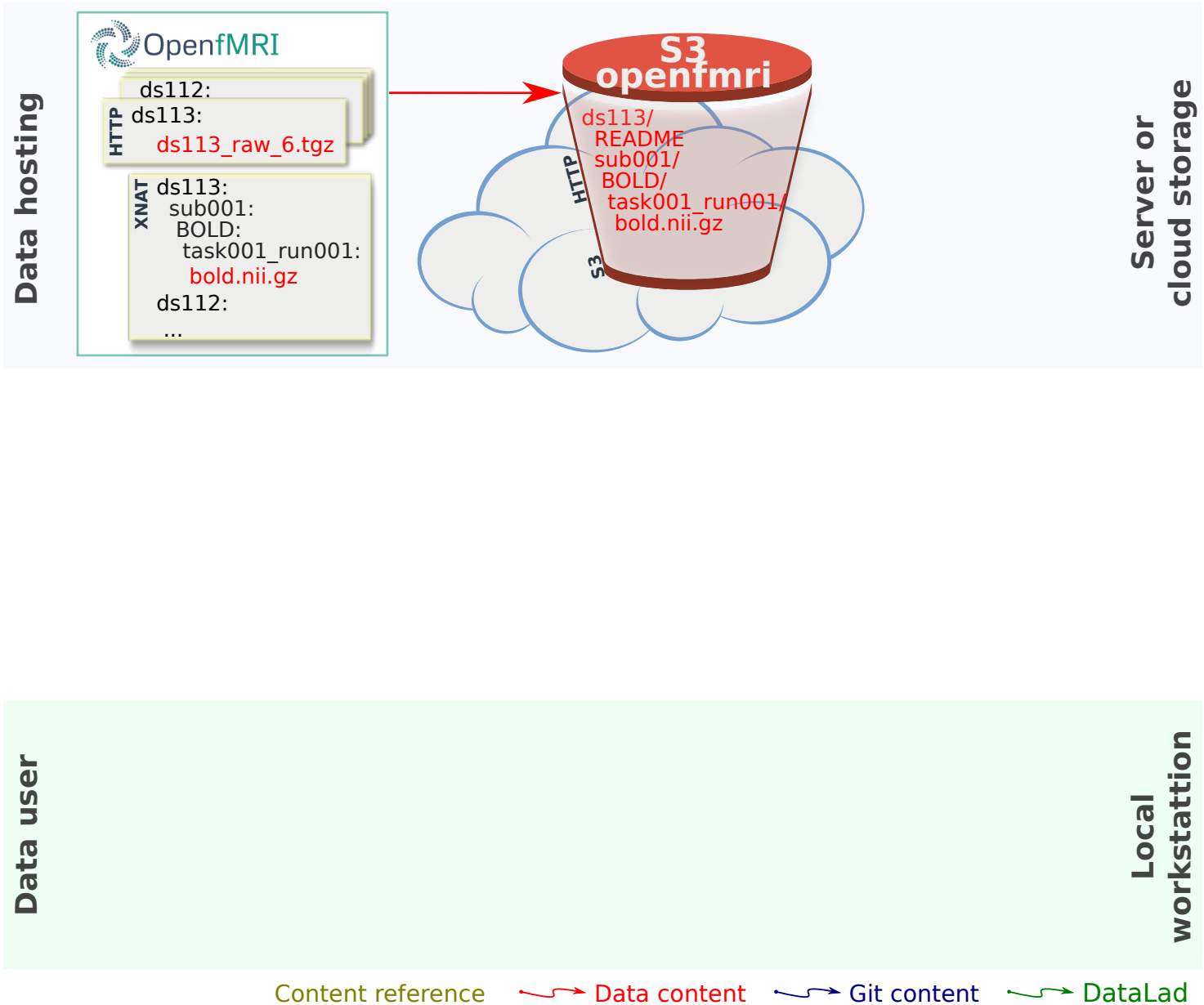
- built on and compatible with git
- all version-control and (distributed) workflow features are supported
- a datalad “distribution” is a plain git repository with sub-modules filled with meta data
- use GitHub or any other git server for collaboration, make data available from elsewhere (institutional website, cloud, *etc.*)

How: Foundation #2 – Git-annex

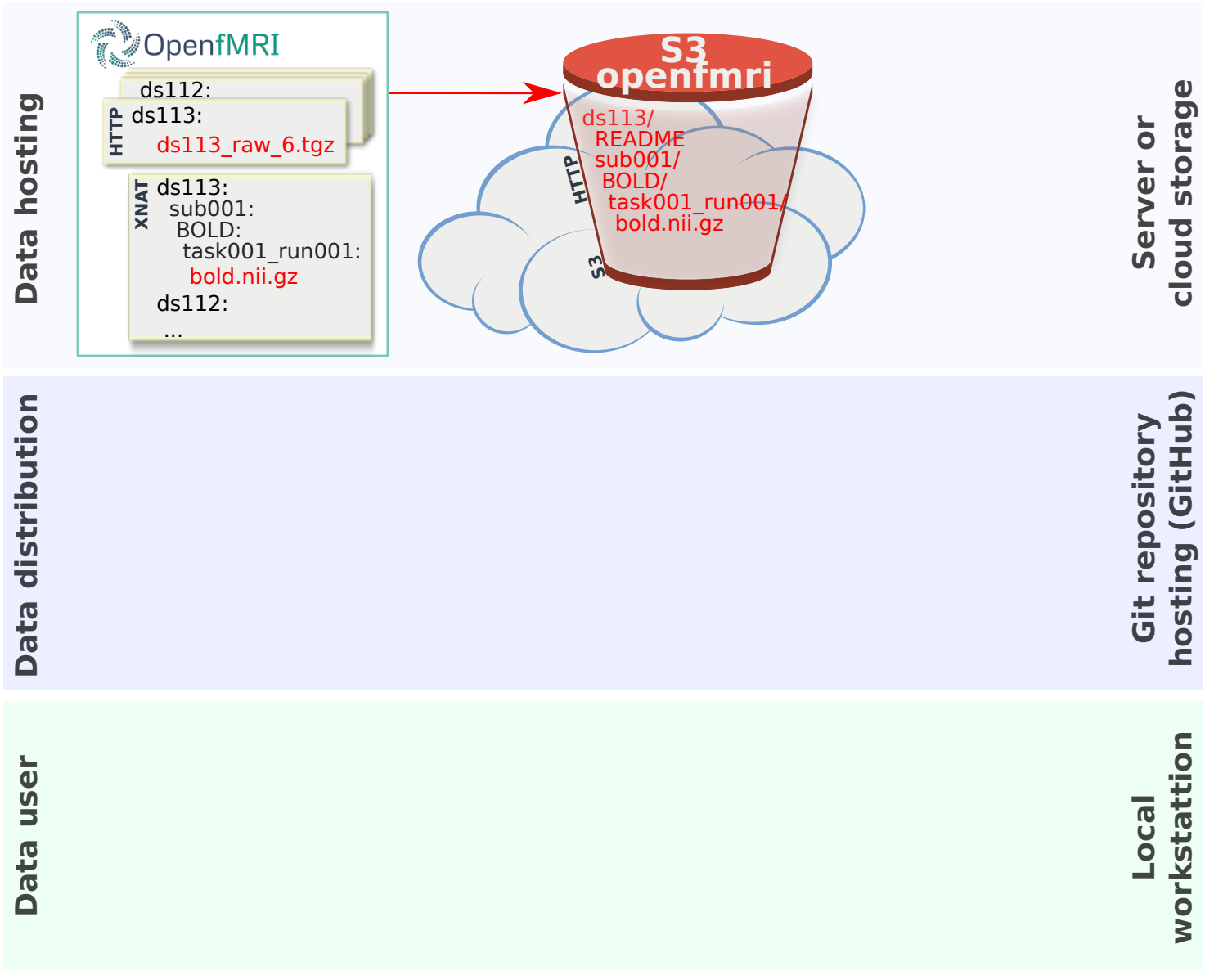
Git-annex

- provides access to data load from variety of sources: HTTP, FTP, RSYNC, Amazon S3, *etc.*
- allows for custom extensions to get access to the data. DataLad uses that facility to provide access to data from tarballs, XNAT, COINS (let's talk!), ...*etc.*
- features optional Dropbox-like synchronization facility via *git-annex assistant*.

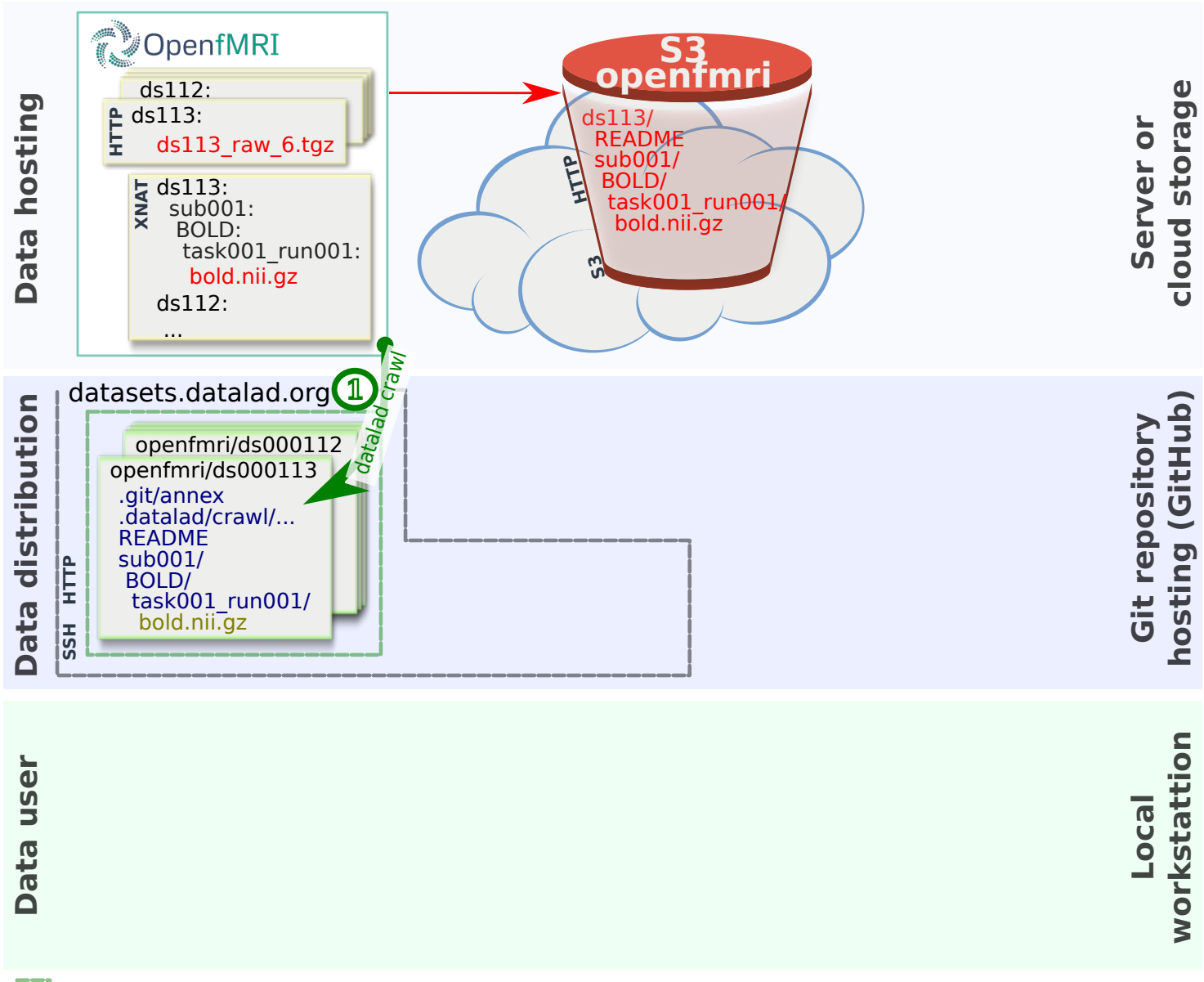
DataLad data distribution: Data life cycle



DataLad data distribution: Data life cycle



DataLad data distribution: Data life cycle



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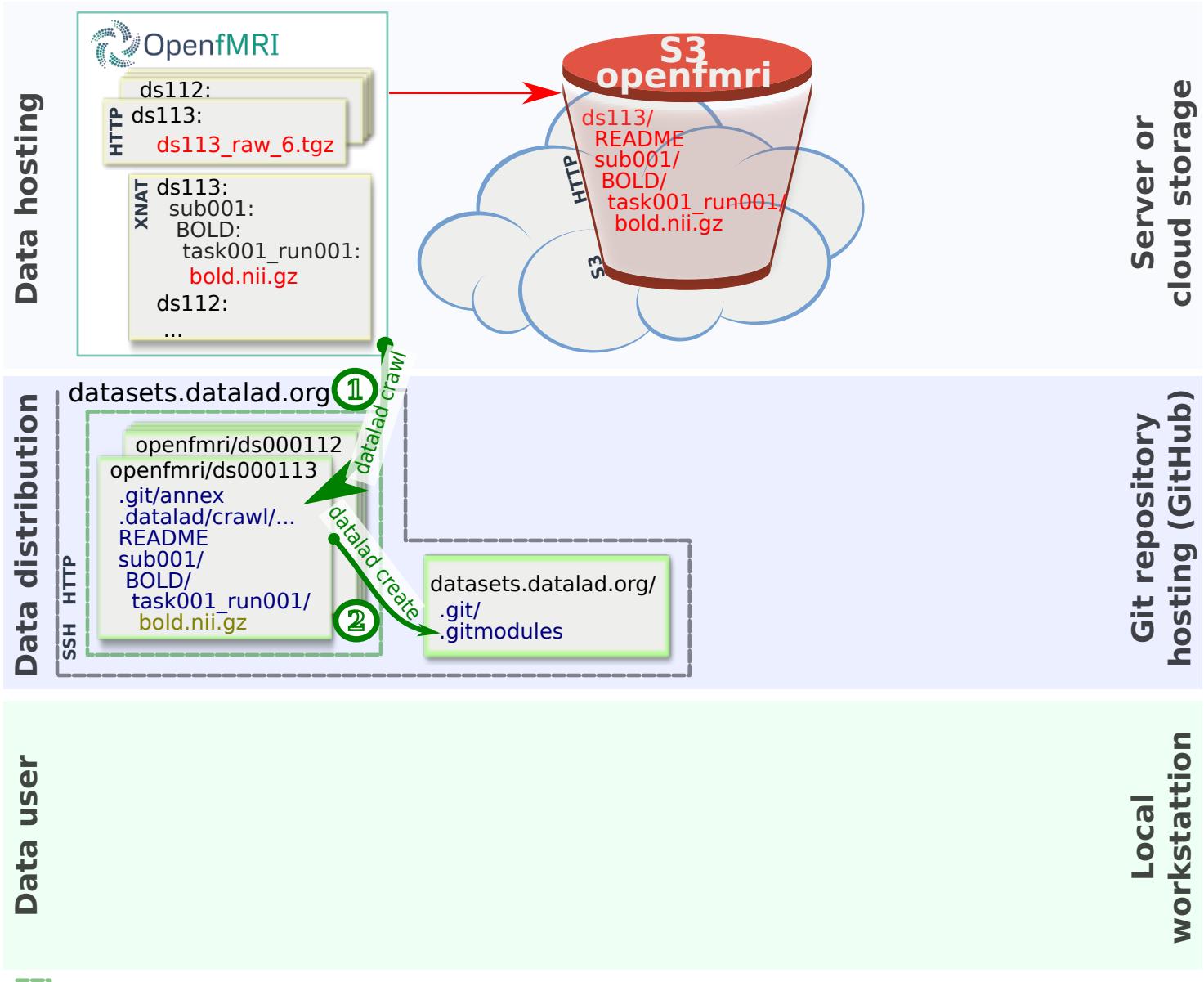

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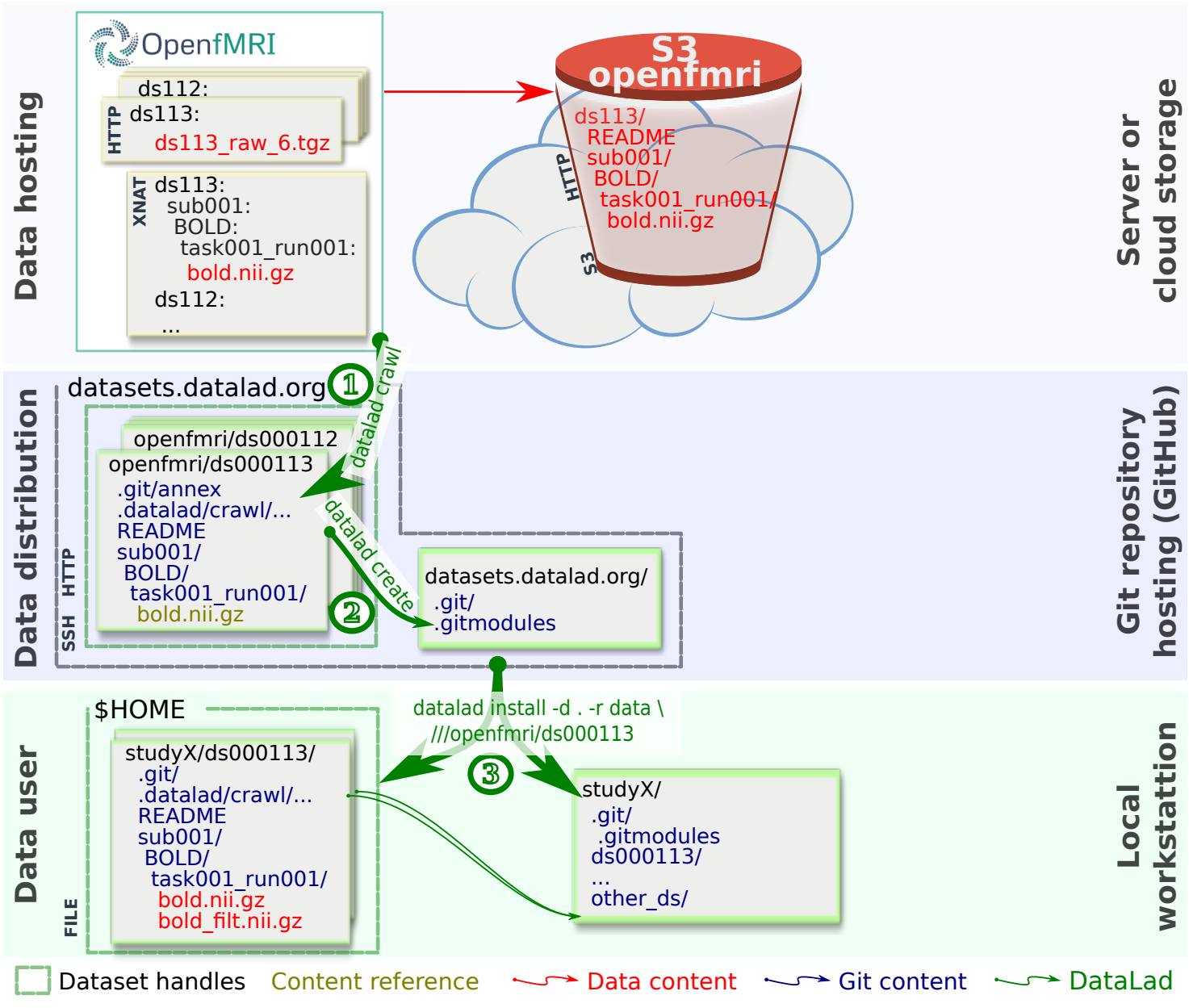
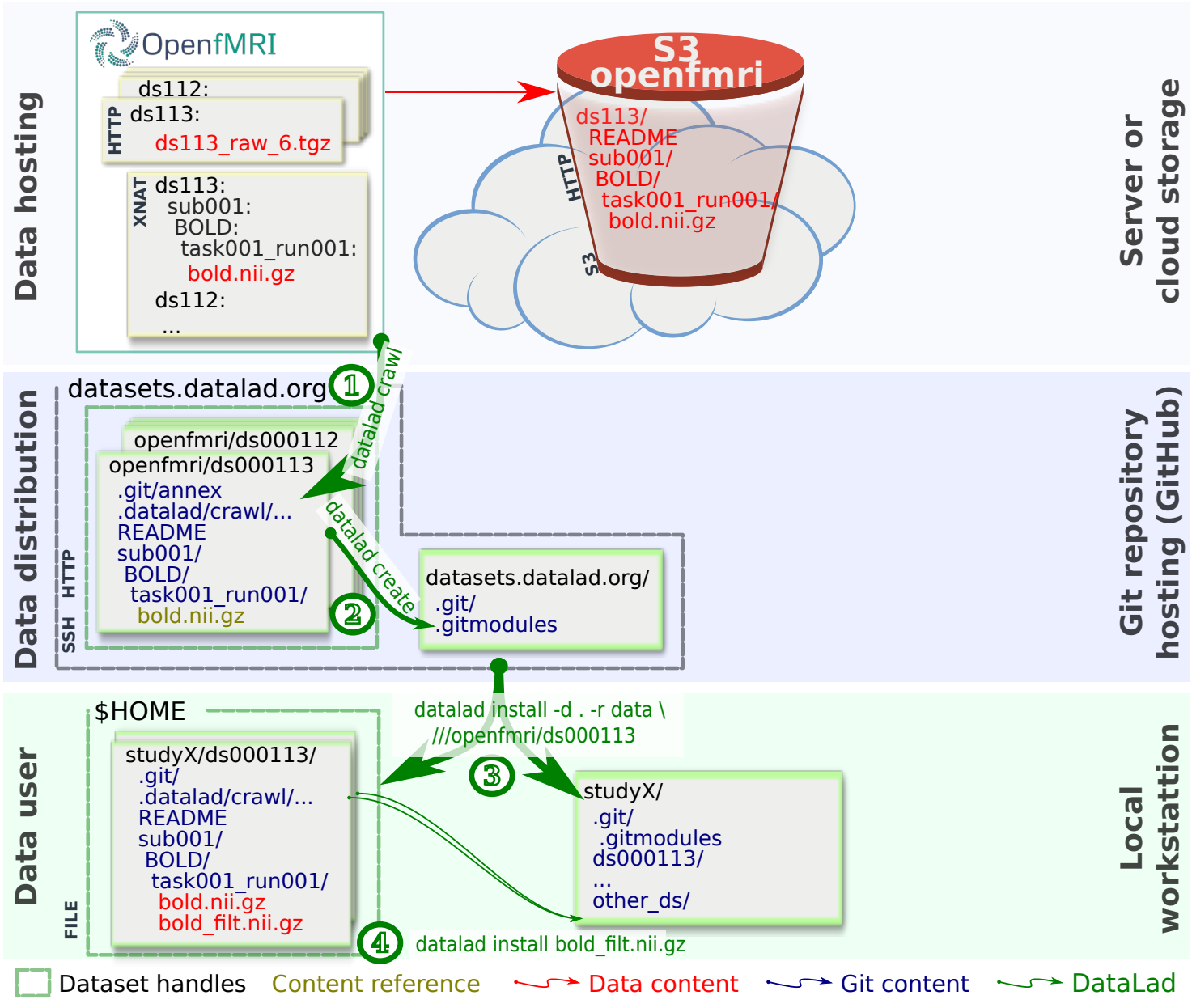
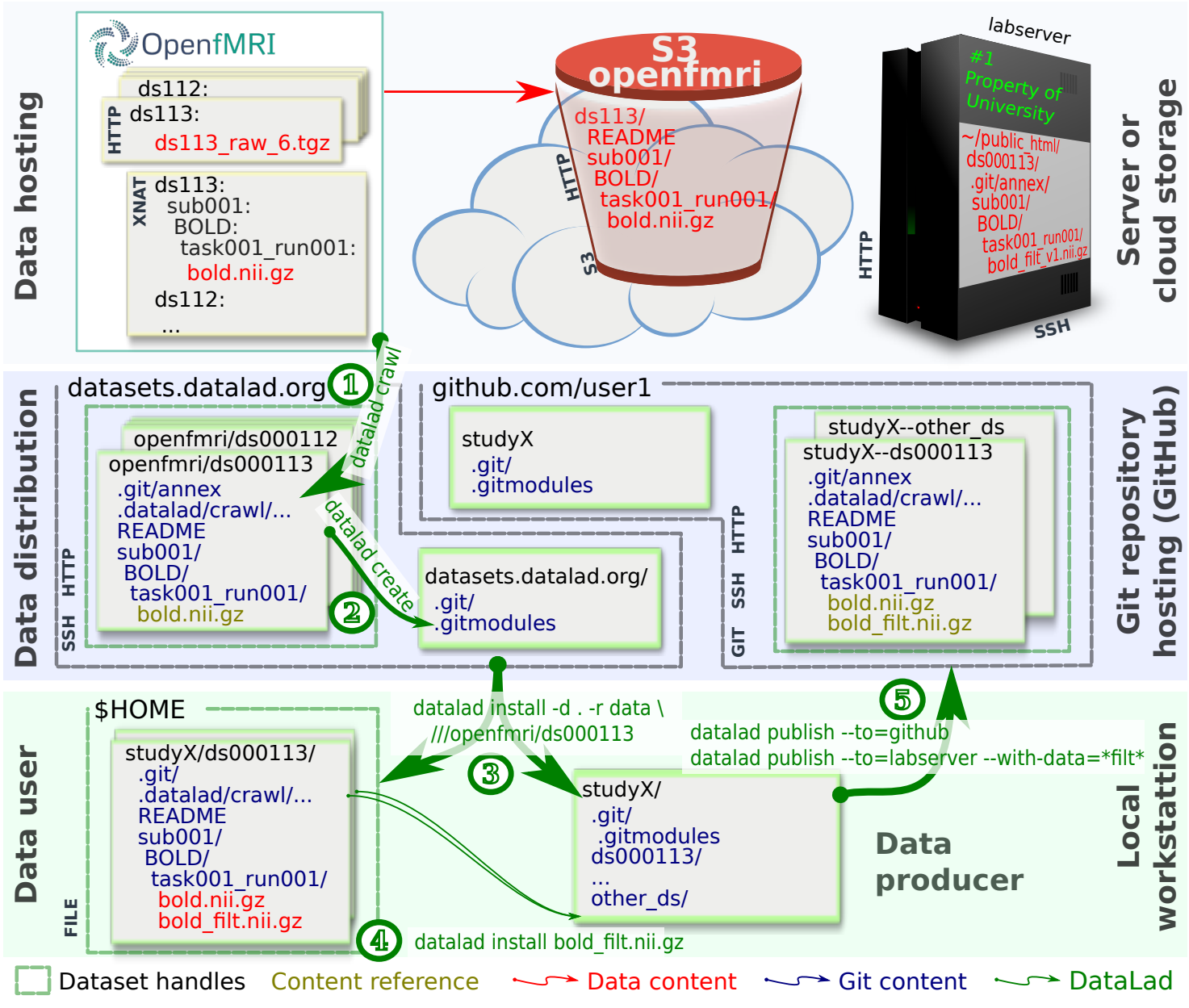


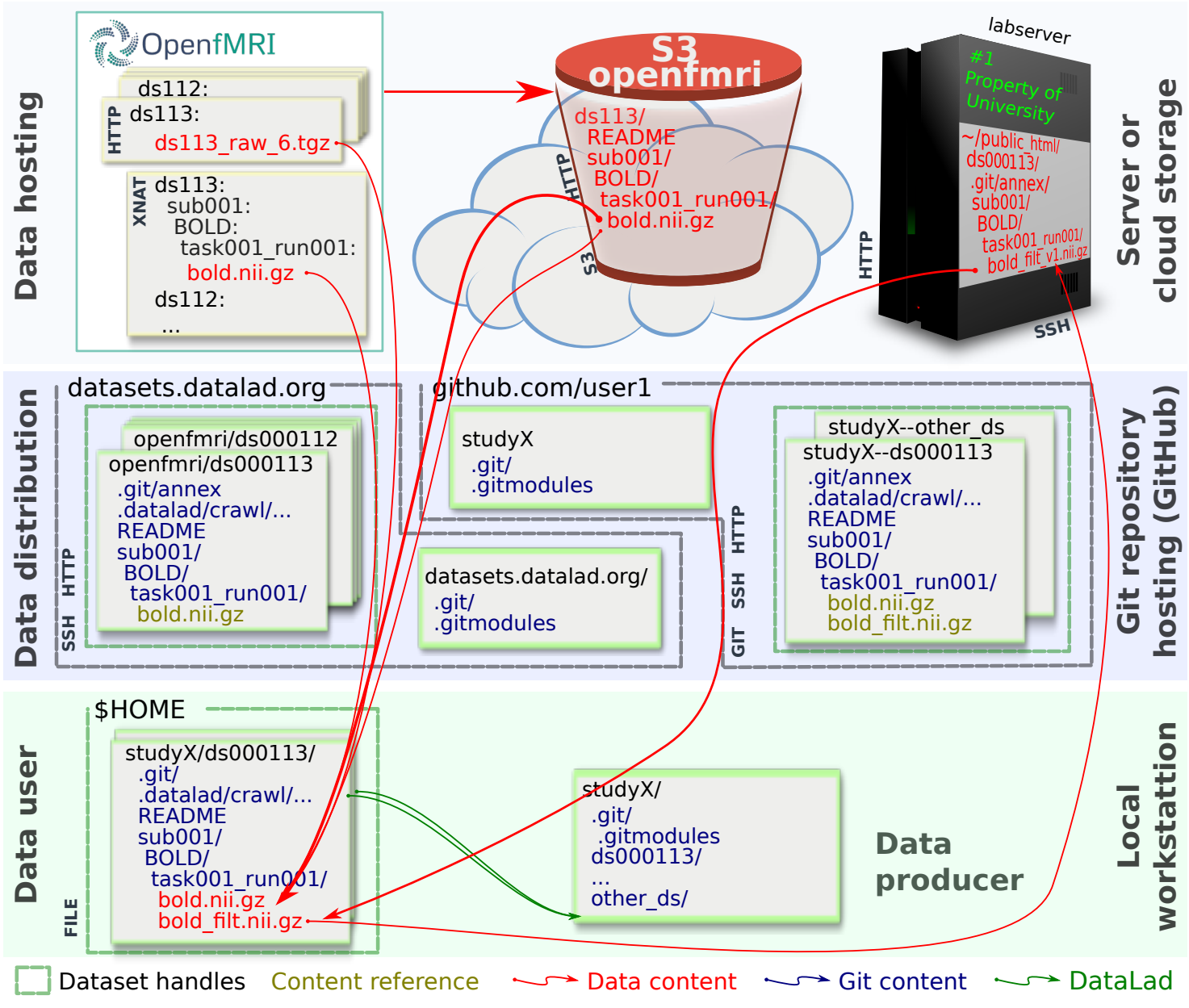
DataLad data distribution: Data life cycle



DataLad data distribution: Data life cycle



DataLad data distribution: Data life cycle



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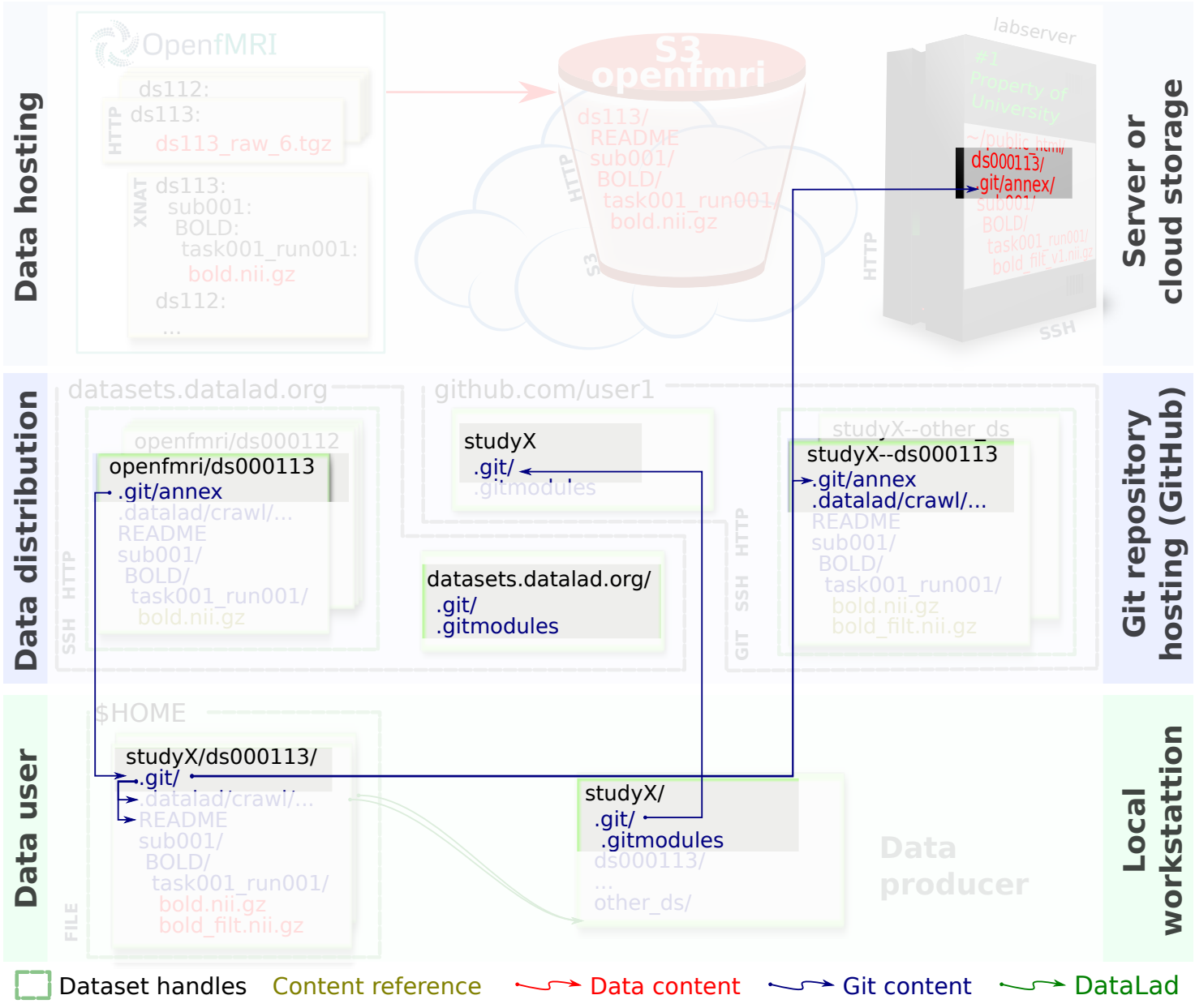


OpenfMRI ds000001: website

https://openfmri.org/dataset/ds000001/

Revision: 2.0.0 Date Set: May 24, 2016, 7:26 p.m.

Notes:

- Converted to BIDS standard.

Data Associated with Revision:

- Raw data on AWS

Revision: 1.1.0 Date Set: Feb. 18, 2016, 8:28 p.m.

Notes:

Updated orientation information in NIFTI headers for better left-right determination.

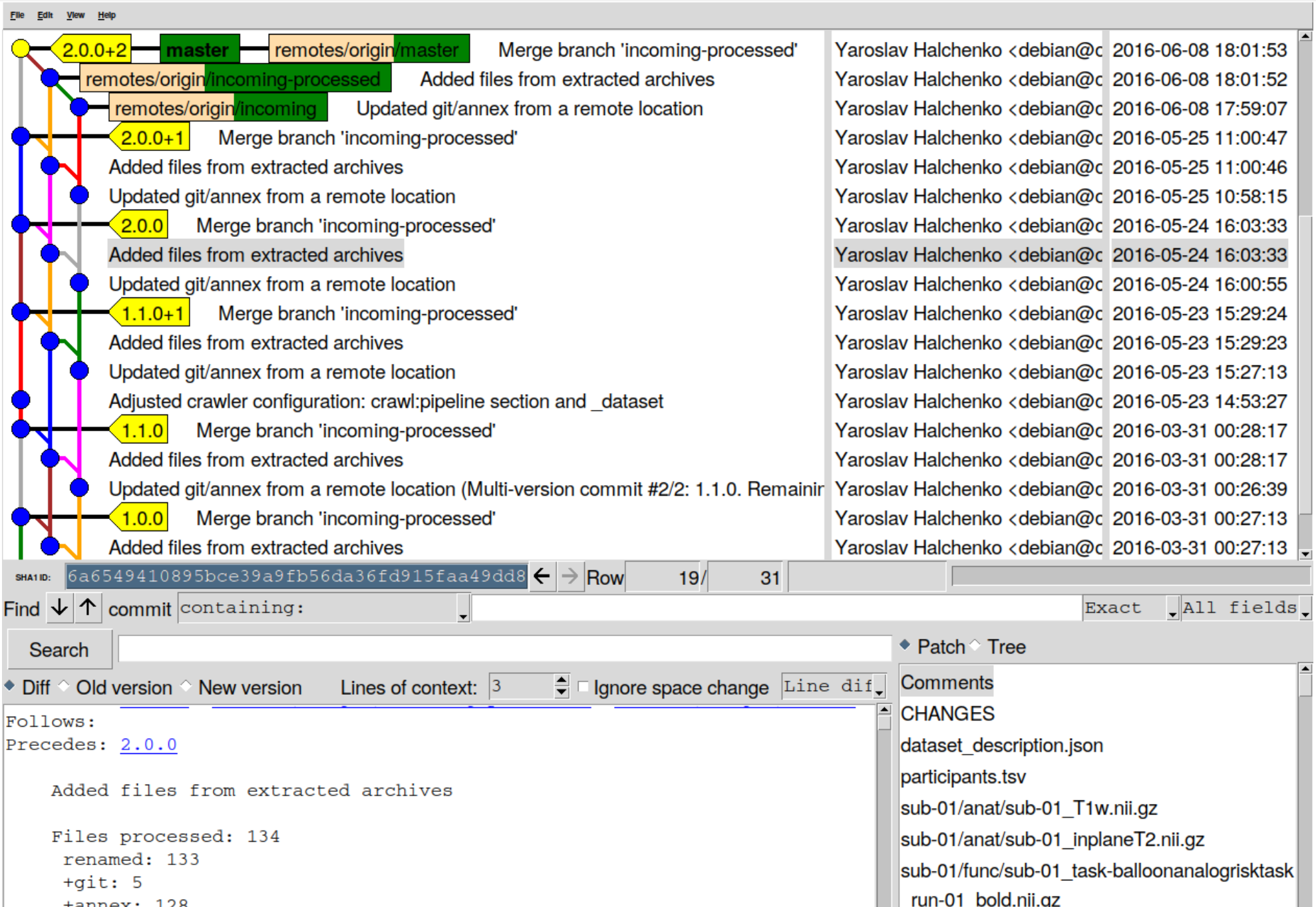
Data Associated with Revision:

- Raw data checksums
- Raw data on AWS

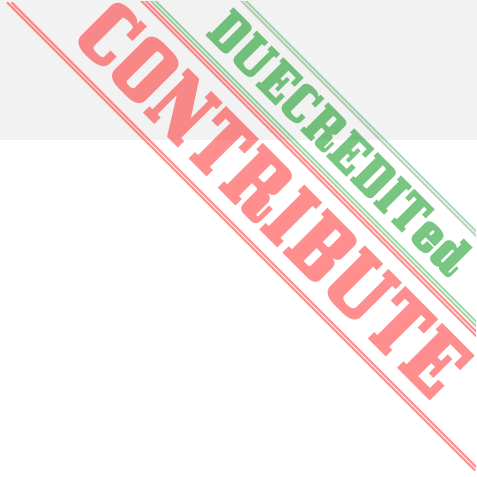
Revision: 1.0.0 Date Set: July 10, 2012, 8:28 p.m.

Data Associated with Revision:

OpenfMRI ds000001: gitk



DataLad WiP



Our growing "distribution" :

- http://datasets.datalad.org

Covered :

- http://openfmri.org (S3)
- http://crcns.org
- http://studyforrest.org

Coming :

- http://humanconnectome.org (S3, XNAT)
- http://nitrc.org/ir (INDI, FCP, *etc.*)
- http://coins.mrn.org (COINS)

Meta-data to facilitate search, custom views etc

Integration NeuroDebian

```
apt-get install openfmri-ds000113
apt-get install openfmri
```

AutomagicIO: automatically fetch necessary files

Given Python code which accesses files within annex repository (example from PyMVPA):

using a 12 dof linear transformation.

```
verbose(1, "Loading data...")
filepath = os.path.join(cfg.get('location', 'tutorial data'),
                        'hyperalignment_tutorial_data.hdf5.gz')
ds_all = h5load(filepath)
# zscore all datasets individually
_ = [zscore(ds) for ds in ds_all]
# inject the subject ID into all datasets
for i,sd in enumerate(ds_all):
    sd.sa['subject'] = np.repeat(i, len(sd))
# number of subjects
nsubjs = len(ds_all)
# number of categories
ncats = len(ds_all[0].UT)
# number of run
nruns = len(ds_all[0].UC)
verbose(2, "%d subjects" % len(ds_all))
verbose(2, "Per-subject dataset: %i samples with %i features" % ds_all[0].shape)
verbose(2, "Stimulus categories: %s" % ', '.join(ds_all[0].UT))
```

AutomagicIO: automatically fetch necessary files

DataLad can automatically fetch necessary load whenever specific file is requested:

```
2 5329.....................................:Thu 23 Jun 2016 12:39:11 PM CEST:.
(git)hopa:/tmp/PyMVPA[master]
$> datalad install -s http://data.pymvpa.org/datasets/tutorial_data /tmp/tutorial_data
2016-06-23 12:39:13,771 [INFO   ] Installing /tmp/tutorial_data (install.py:353)
1 installed item is available at
<Dataset path=/tmp/tutorial_data>
2 5329.....................................:Thu 23 Jun 2016 12:39:13 PM CEST:.
(git)hopa:/tmp/PyMVPA[master]
$> MVPA_LOCATION_TUTORIAL_DATA=/tmp/tutorial_data python -m datalad doc/examples/hyperalignment.
py
 Loading data...
2016-06-23 12:39:19,746 [INFO   ] File /tmp/tutorial_data/hyperalignment_tutorial_data.hdf5.gz h
as no content -- retrieving (auto.py:164)
/tmp/tutorial_data/.git 100%[==============================>]  15.04M  --.-KB/s    in 0.02s
  10 subjects
  Per-subject dataset: 56 samples with 3509 features
  Stimulus categories: Chair, DogFace, FemaleFace, House, MaleFace, MonkeyFace, Shoe
 Performing classification analyses...
  within-subject... done in 1.2 seconds
  between-subject (anatomically aligned)...done in 0.6 seconds
  between-subject (hyperaligned)...done in 3.3 seconds
 Average classification accuracies:
  within-subject: 0.57 +/-0.063
  between-subject (anatomically aligned): 0.42 +/-0.035
  between-subject (hyperaligned): 0.62 +/-0.050
```

DataLad's summary

DataLad ...

- provides simplified interface
- uses pure git/git-annex repositories under – power users can stay in power
- helps with authentication, crawling of available resources, and accessing data from archives
- is ready for you to start using it, documentation is growing: datalad.readthedocs.org

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Managing data is similar to managing code and software


Brain Download:
iz compltes.
ICANHASCHEEZBURGER.COM

Thank you!

For more information visit

DataLad poster: #1855 12:45 - 02:45 PM (today)

DataLad exhibit table (thank you OHBM)

Website: datalad.org

Github: github.com/datalad

Twitter: @datalad (I am @yarikoptic)

References

Halchenko, Y. O. (2012). Incorrect probabilities in Harvard-Oxford-sub left hemisphere. [Retrived 11-Mar-2013].

Rohlfing, T. (2013). Incorrect icbm-dti-81 atlas orientation and white matter labels. *Frontiers in Neuroscience*, 7(4).

DataLad's testing