

Updates on the BHL Global Cluster

biodiversity heritage library

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Us?

- We do this talk a lot.. generally our shirts match.



What is the BHL?

- BHL - The Biodiversity Heritage Library
 - digitization component of the Encyclopedia of Life
 - a consortium of a global partners
 - aims to share historic biodiversity literature texts
 - provide open access of all content
 - free for all



Why do we need a cluster?

- All BHL data is at the Internet Archive in San Francisco
 - no redundancy
 - single point of failure (earthquake risk)
 - limited in how we could serve
 - no easy way to analyze data
- First global BHL cluster gives us
 - redundancy
 - no single point of failure
 - various new serving options
 - new ways to run analytics

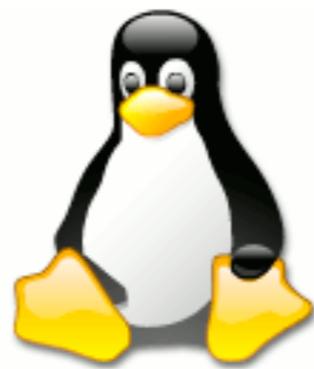
#win!





**Use Linux and open source software running on
commodity hardware to create a scalable, distributed filesystem.**

software



Ext4
File System



hardware





Woods Hole Cluster Report for Wed, 25 Aug 2010 07:08:01 -0400

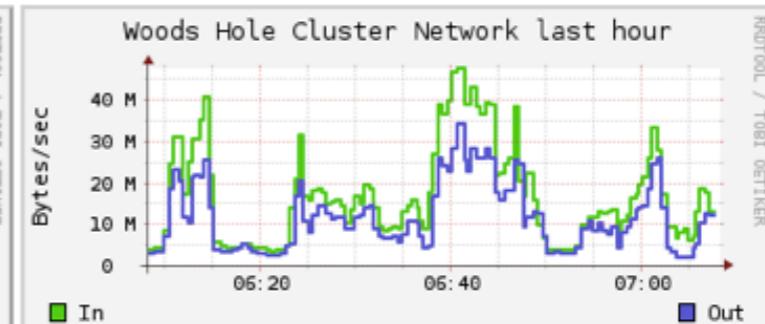
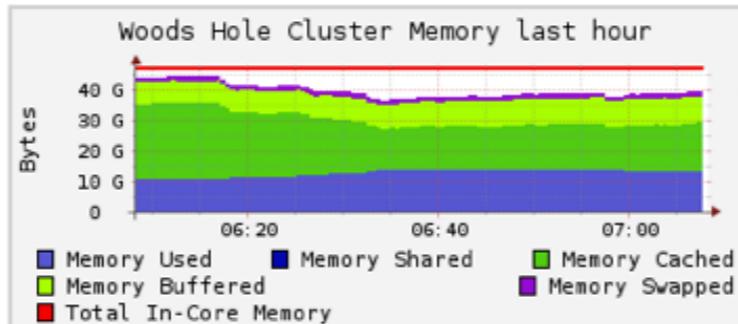
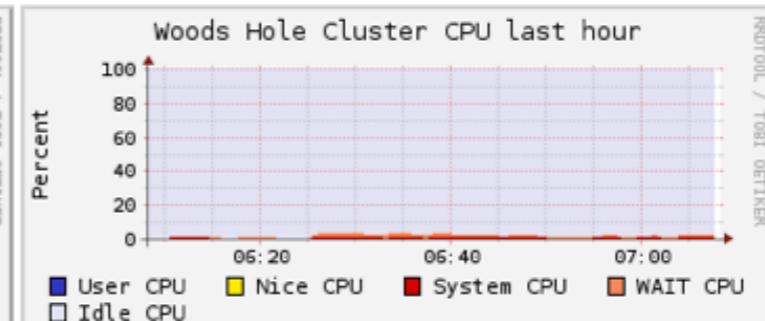
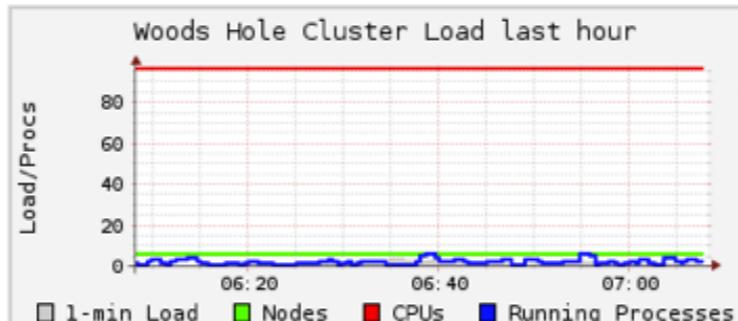
[Get Fresh Data](#)Metric Last Sorted [Physical View](#)[Woods Hole Grid > Woods Hole >](#)

Overview of Woods Hole

CPUs Total: **96**
Hosts up: **6**
Hosts down: **0**

Avg Load (15, 5, 1m):
1%, 1%, 1%
Localtime:
2010-08-25 07:07

Cluster Load Percentages



Show Hosts: yes no

Woods Hole **load_one** last hour sorted **descending**

RROUTOL / TORI OETIKER

clstr-04



clstr-06



clstr-01



<http://whbhl01.ubio.org/ganglia>

```
# ls -lh /mnt/glusterfs/www/a/actasocietatissc26suom
total 649M
-rwxr-xr-x 1 www-data www-data 19M 2009-07-10 01:55 actasocietatissc26suom_abbyy.gz
-rwxr-xr-x 1 www-data www-data 28M 2009-07-10 06:53 actasocietatissc26suom_bw.pdf
-rwxr-xr-x 1 www-data www-data 1.3K 2009-06-12 10:21 actasocietatissc26suom_dc.xml
-rwxr-xr-x 1 www-data www-data 18M 2009-07-10 03:05 actasocietatissc26suom_djvu
-rwxr-xr-x 1 www-data www-data 1.3M 2009-07-10 06:54 actasocietatissc26suom_djvu.txt
-rwxr-xr-x 1 www-data www-data 14M 2009-07-10 02:08 actasocietatissc26suom_djvu.xml
-rwxr-xr-x 1 www-data www-data 4.4K 2009-12-14 04:42 actasocietatissc26suom_files.xml
-rwxr-xr-x 1 www-data www-data 20M 2009-07-09 18:57 actasocietatissc26suom_flippy.zip
-rwxr-xr-x 1 www-data www-data 285K 2009-07-09 18:52 actasocietatissc26suom.gif
-rwxr-xr-x 1 www-data www-data 193M 2009-07-09 18:51 actasocietatissc26suom_jp2.zip
-rwxr-xr-x 1 www-data www-data 5.7K 2009-06-12 10:21 actasocietatissc26suom_marc.xml
-rwxr-xr-x 1 www-data www-data 2.0K 2009-06-12 10:21 actasocietatissc26suom_meta.mrc
-rwxr-xr-x 1 www-data www-data 416 2009-06-12 10:21 actasocietatissc26suom_metasource.xml
-rwxr-xr-x 1 www-data www-data 2.2K 2009-12-01 12:20 actasocietatissc26suom_meta.xml
-rwxr-xr-x 1 www-data www-data 279K 2009-12-14 04:42 actasocietatissc26suom_names.xml
-rwxr-xr-x 1 www-data www-data 324M 2009-07-09 13:28 actasocietatissc26suom_orig_jp2.tar
-rwxr-xr-x 1 www-data www-data 34M 2009-07-10 04:35 actasocietatissc26suom.pdf
-rwxr-xr-x 1 www-data www-data 365K 2009-07-09 13:28 actasocietatissc26suom_scandata.xml
```

initial population





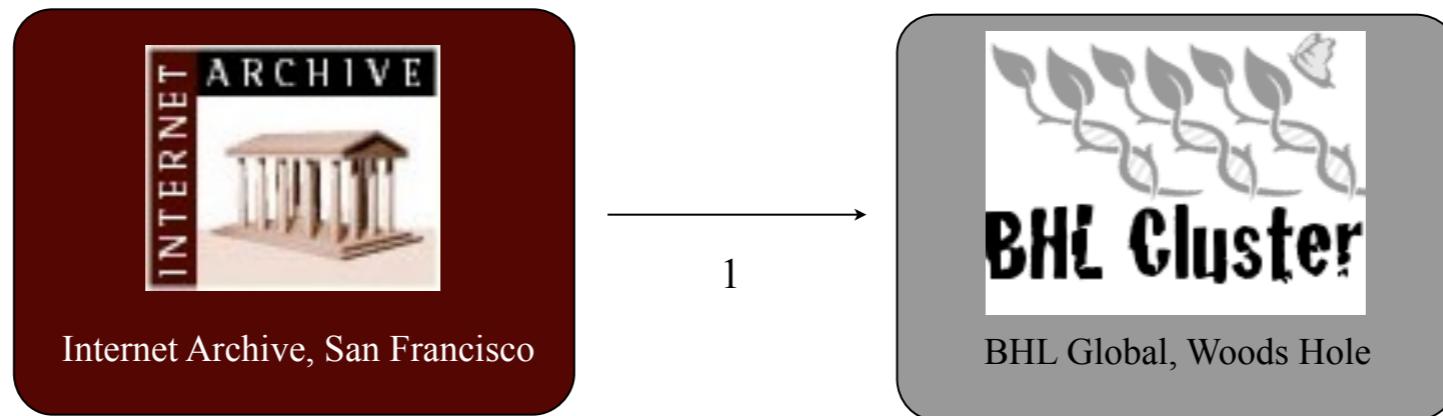
	191Mb	381Mb	572Mb	763Mb	954Mb
clustr-02		<= ia311215.us.archive.org		85.7Mb	54.2Mb
clustr-02		<= ia311030.us.archive.org		24.6Mb	19.1Mb
clustr-02		<= ia310807.us.archive.org		22.3Mb	19.0Mb
clustr-02		<= ia360606.us.archive.org		18.1Mb	16.7Mb
clustr-02		<= ia350603.us.archive.org		17.9Mb	13.9Mb
clustr-02		<= ia331404.us.archive.org		14.3Mb	11.0Mb
clustr-02		<= ia331419.us.archive.org		9.52Mb	6.89Mb
clustr-02		<= ia301506.us.archive.org		9.44Mb	4.67Mb
clustr-02		<= ia301531.us.archive.org		2.67Mb	2.43Mb
clustr-02		<= vpnreserved2.mbl.edu		208b	208b
128.128.175.255		<= geldorf319.mbl.edu		0b	366b
clustr-02		<= dns1.mbl.edu		704b	246b
128.128.163.255		<= DHCP160103.mbl.edu		936b	187b
128.128.175.255		<= bpcolorphoto.mbl.edu		0b	183b
128.128.171.255		<= 128.128.171.146		0b	183b
255.255.255.255		<= 192.168.56.1		0b	54b
128.128.171.255		<= 128.128.168.27		0b	54b
255.255.255.255		<= 10.0.1.1		0b	0b
255.255.255.255		<= 10.0.2.1		0b	0b
128.128.175.255		<= 175wins134.mbl.edu		0b	0b
128.128.175.255		<= squalus.mbl.edu		0b	0b
255.255.255.255		<= *		0b	0b
128.128.163.255		<= 128.128.162.165		0b	0b
128.128.171.255		<= 128.128.170.216		0b	0b
128.128.171.255		<= 128.128.168.227		0b	0b
TX: cumm: 37.0MB peak: 3.39Mb			rates: 3.39Mb 2.43Mb 2.12Mb		
RX: 2.20GB 205Mb			205Mb 148Mb 126Mb		
TOTAL: 2.24GB 208Mb			208Mb 150Mb 128Mb		

the plan

- Internet2 - woohoo
 - “This will take forever” (it took longer)
 - “We need more space” (not 24TB)
 - “something’s overloading the network” (oops)
 - “this checksum is wrong” (what the...)
- **Lessons learned** would we do it again? Probably not.



code: grabbyd



code: grabbyd_reporting



Current transfer rate 10043.09 KB/s

Clustered data store size 66 of 97 Terabytes

RUN1 download completed at 15:13:26 NUM: 3136/9950 ID: anatomischeranze47anat Number of files: 18 Size of files: 463M total

RUN2 download completed at 15:25:47 NUM: 570/10000 ID: blainesoutlineso00blai Number of files: 18 Size of files: 959M total

RUN3 download completed at 14:38:35 NUM: 866/10000 ID: controlseriesbul1556mass Number of files: 18 Size of files: 1.4G total

cluster status as of Tue Aug 24 15:30:01 EDT 2010 - updated every 15 minutes

code: bhl-sync

Open source Dropbox model

inotify

lsyncd

OpenSSH

rsync

all of our created code is open sourced
and available at bit.ly/bhl-bits

bhl-sync

St. Louis ← Woods Hole → London

Synced

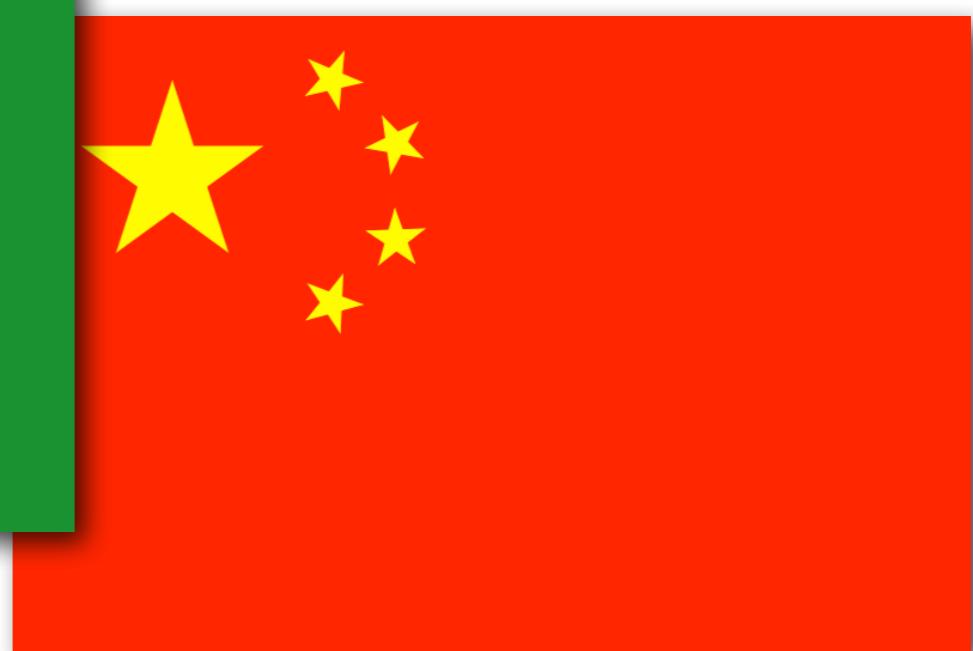
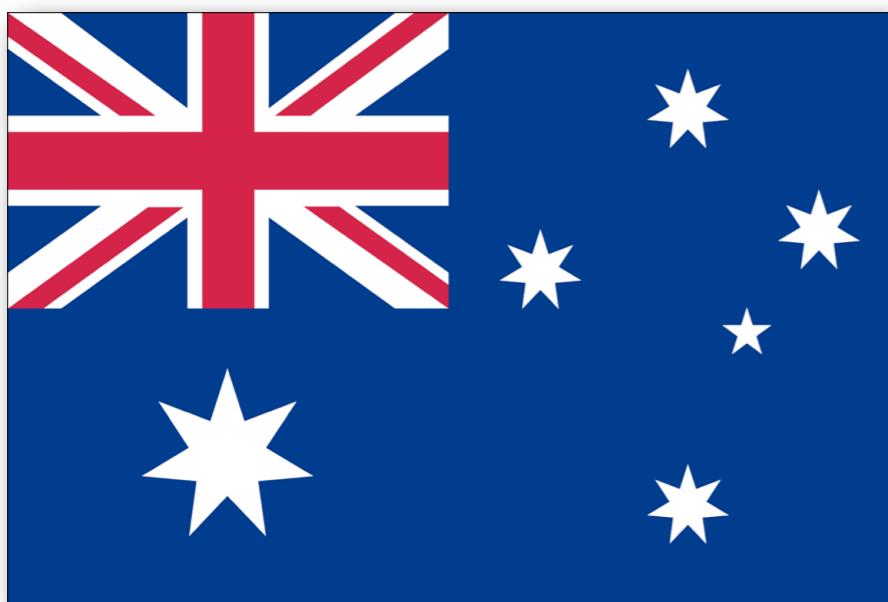
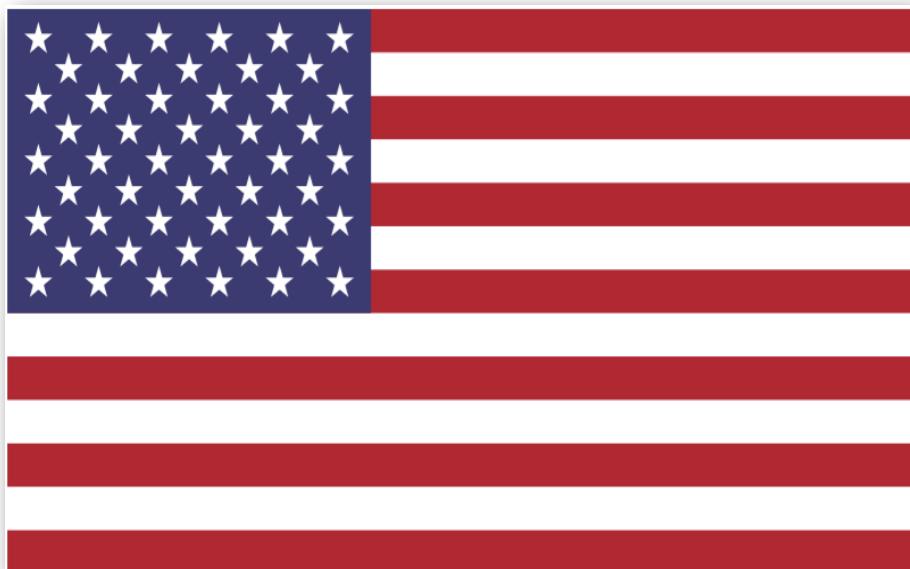
24476 files

Synced

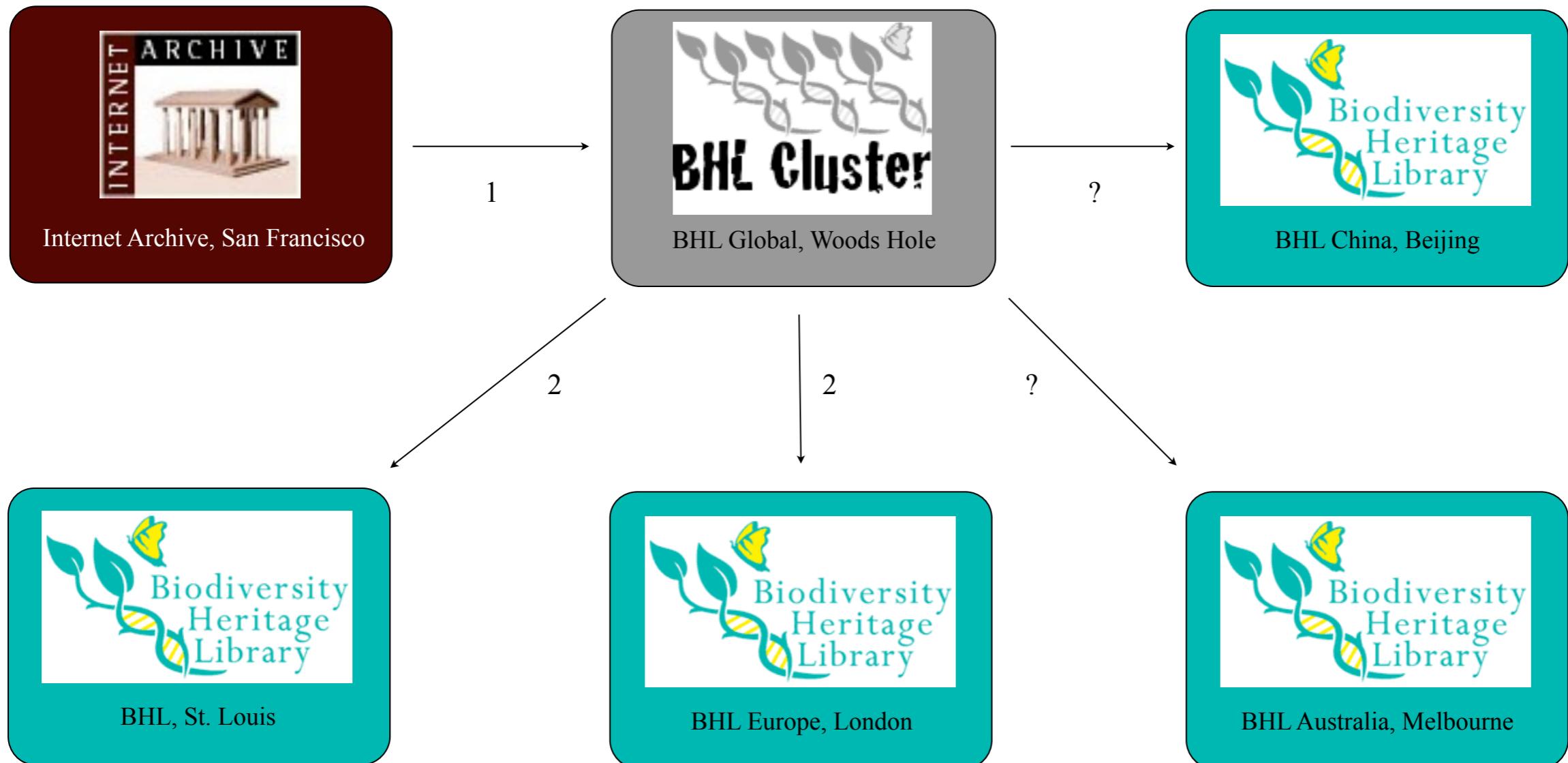
updated: Fri Aug 20 13:02:18 EDT 2010 (updated hourly)

<http://bit.ly/09-bhl-sync>

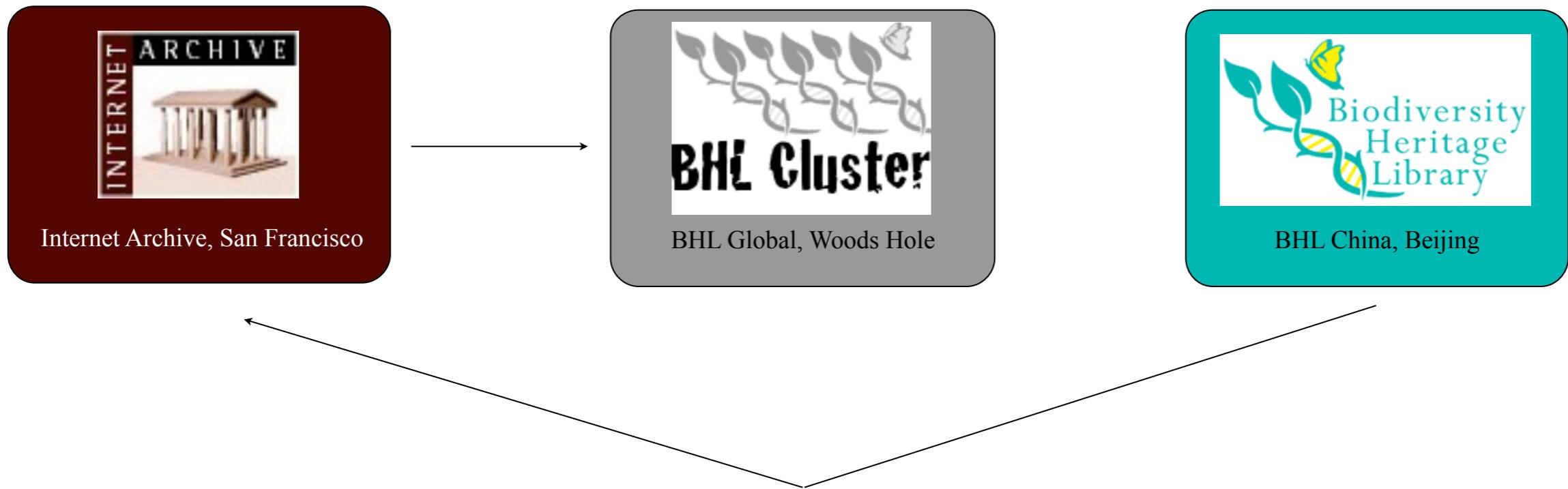
Replication | Replication



BHL content distribution

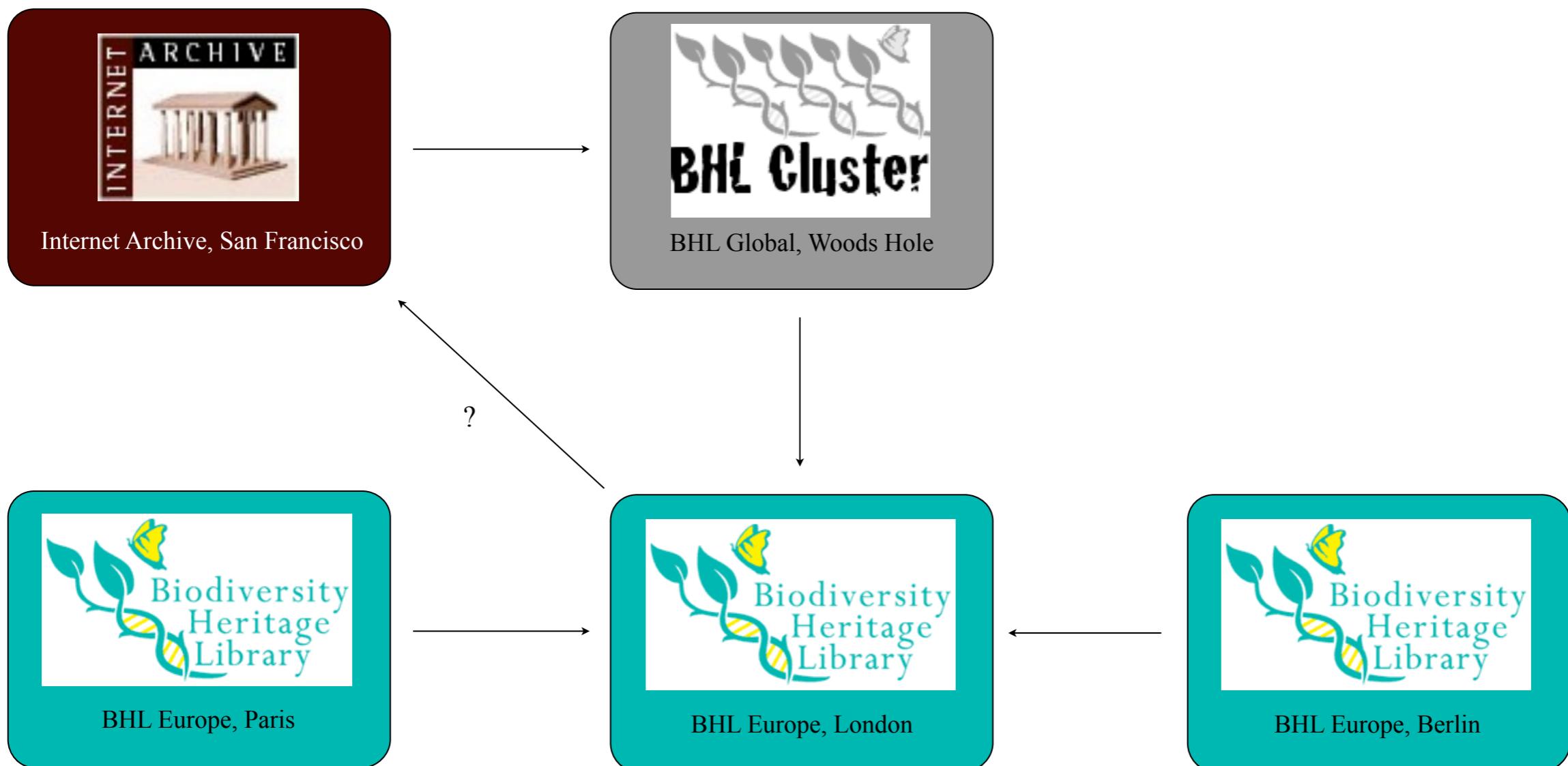


BHL content + local data



Content sourced from China, scanned by
Internet Archive, replicated into BHL Global

BHL content + regional data



Content sourced from BHL Europe partners may, or may not,
be passed back to Internet Archive and BHL Global

other replication challenges

- deleting content - "going dark"
- new content coming in from other sources (localization of content)
- distributing modified content



fedora-commons integration

Repository platform

- storage, access and management digital content
- a base for software developers to build tools for sharing
- free, community supported, open source software



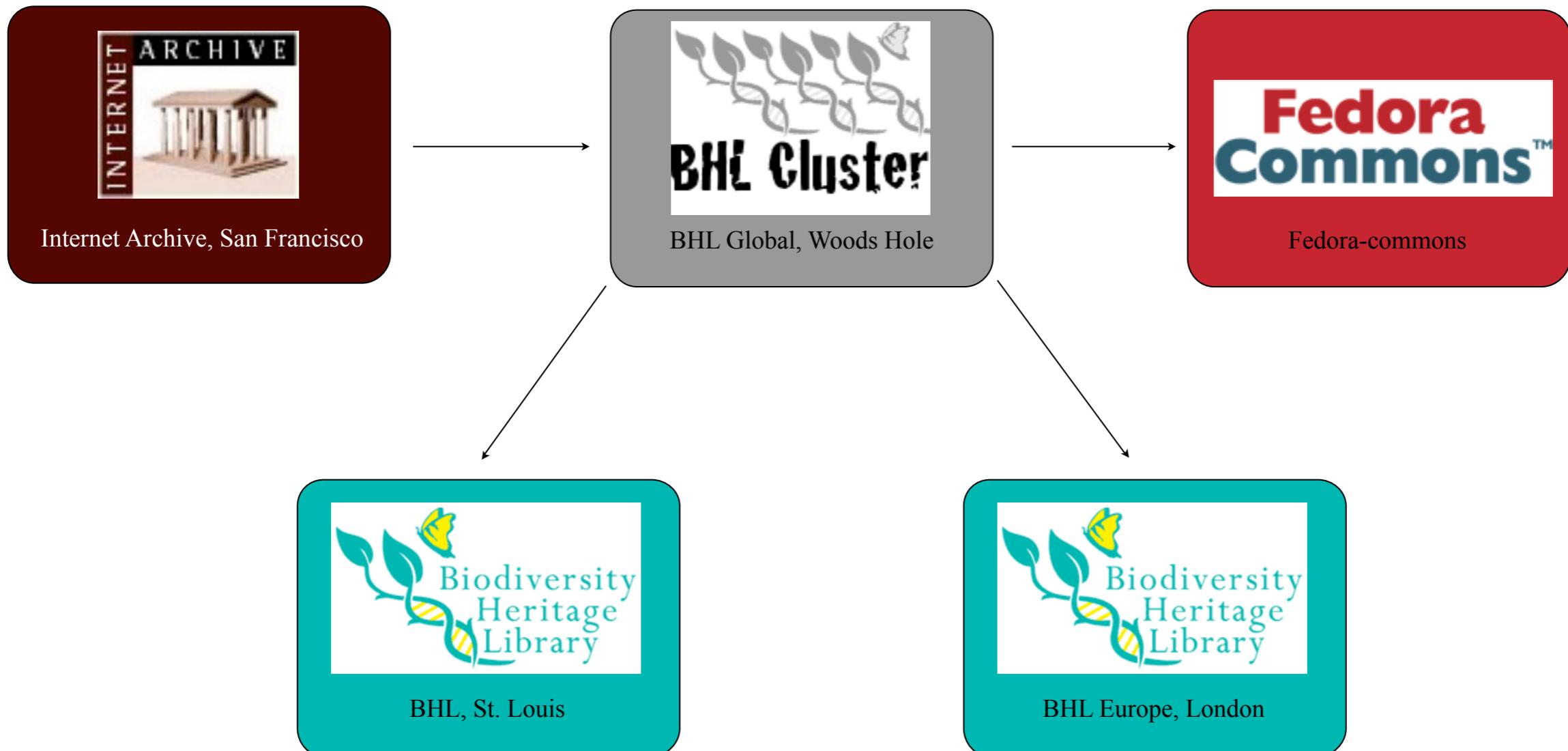
fedora-commons integration

Repository platform

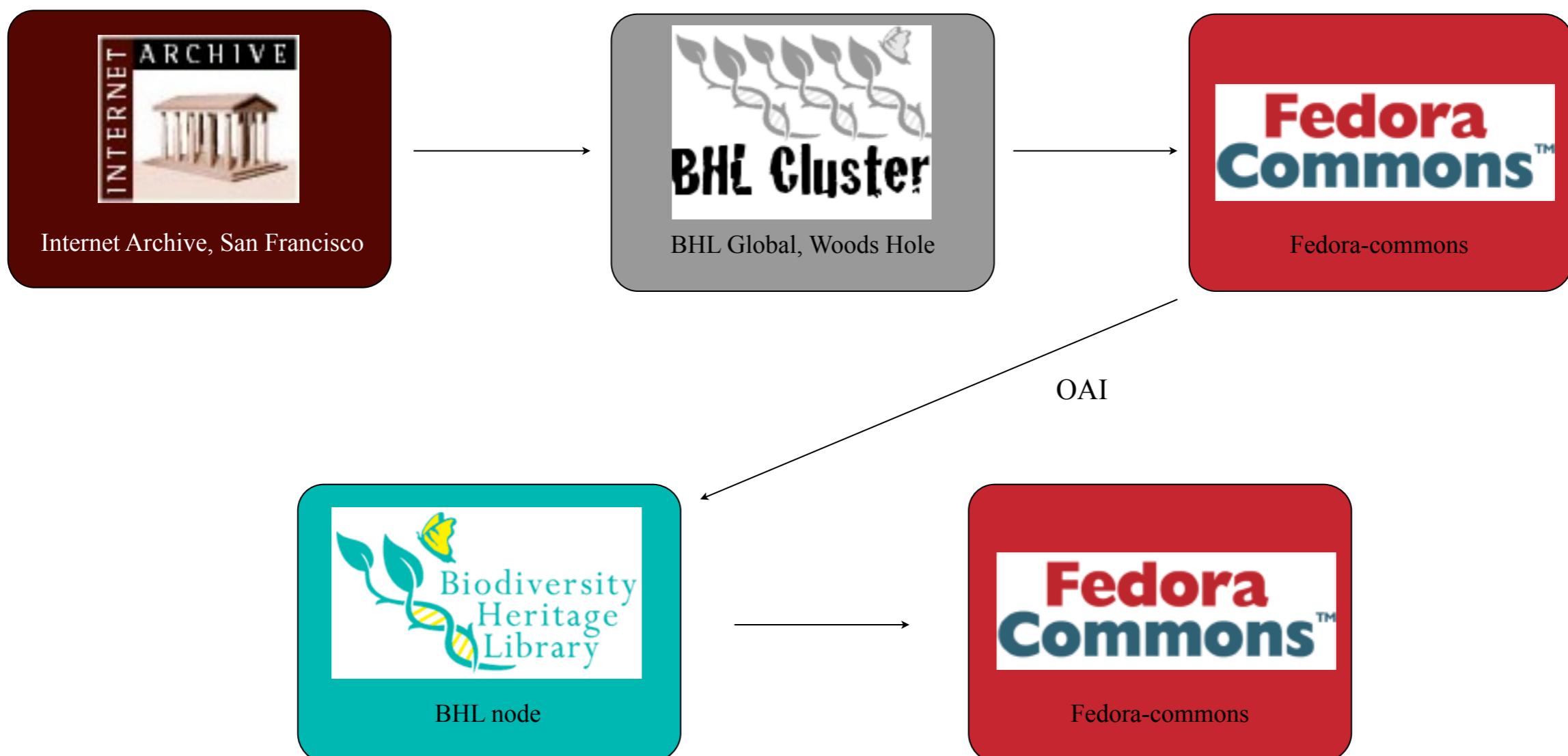
- storage, access and management digital content
- a base for software developers to build tools for sharing
- free, community supported, open source software
- Maintains a persistent, stable, digital archive
 - provides backup, redundancy and disaster recovery
 - complements existing architecture by incorporating open standards
 - stores data in a neutral manner
 - shares data via OAI



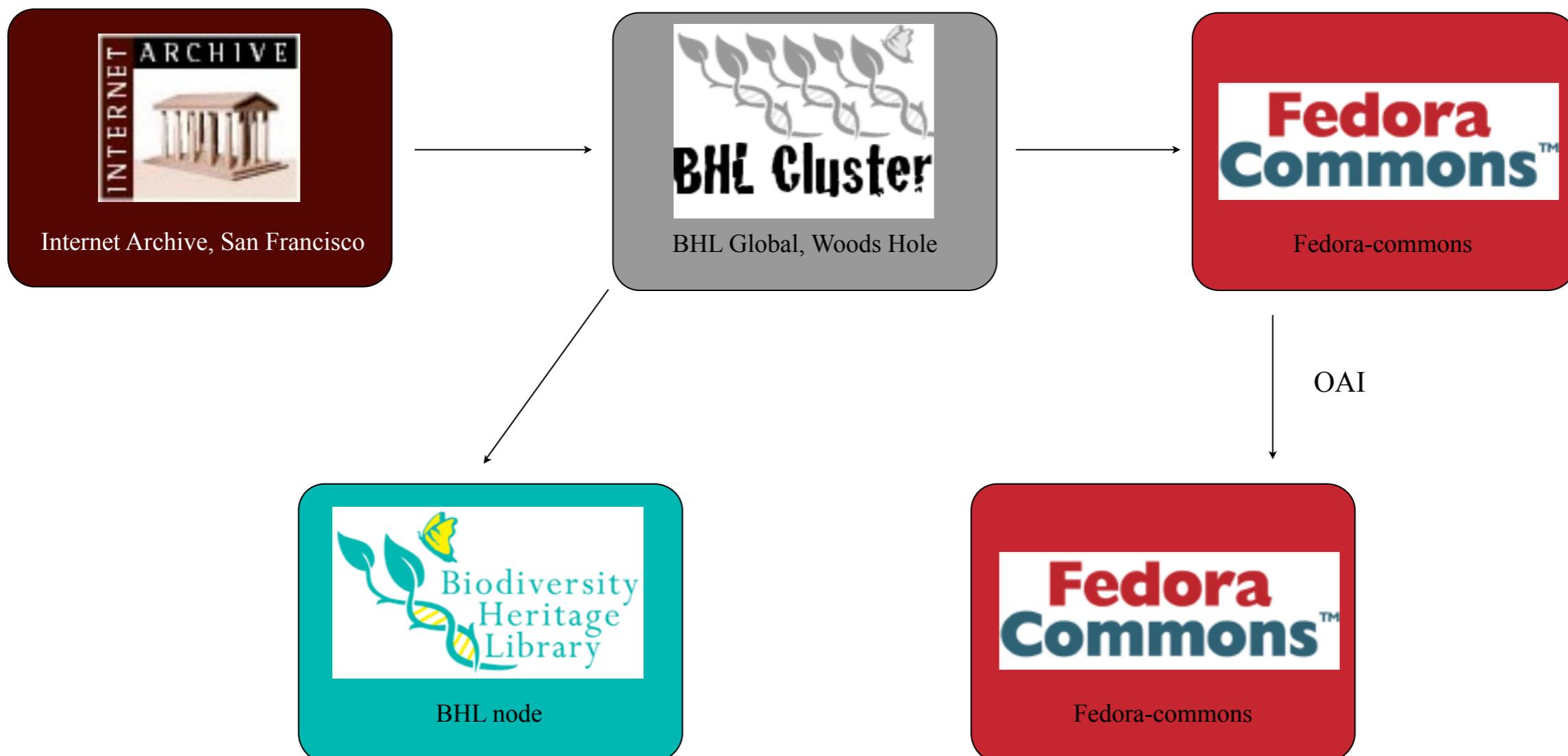
BHL content distribution



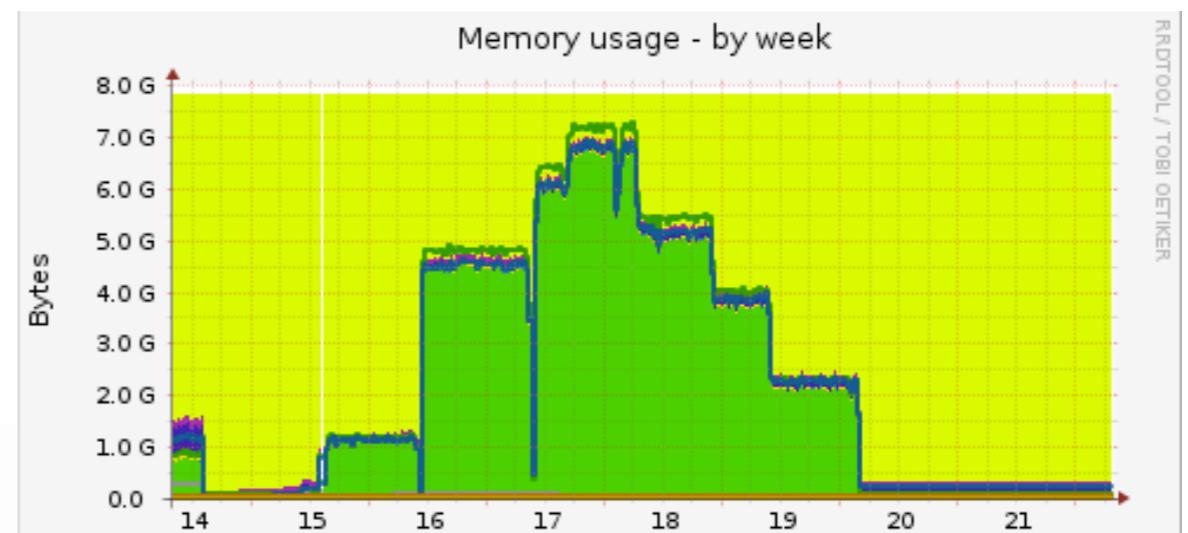
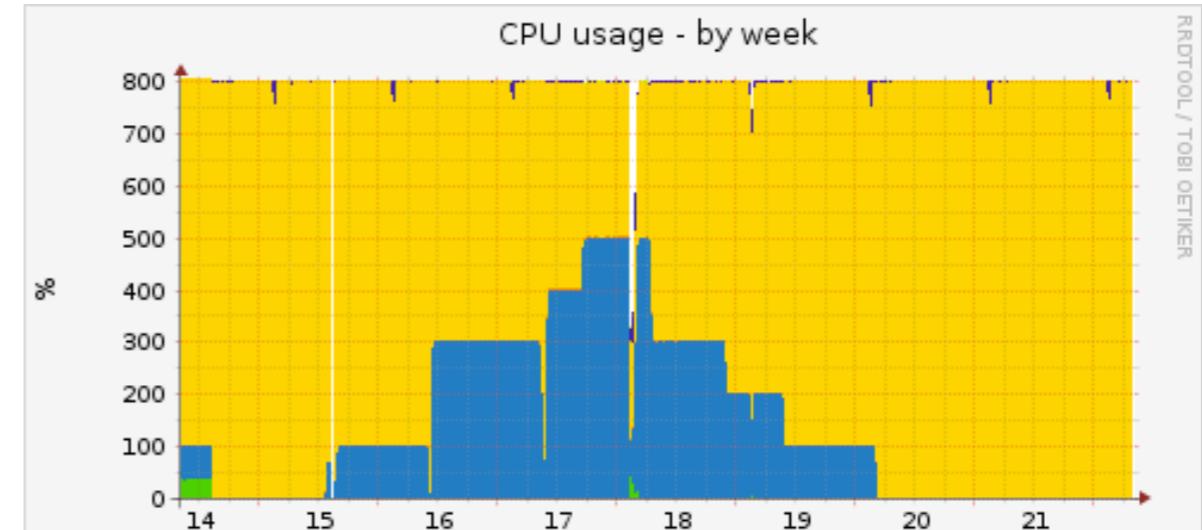
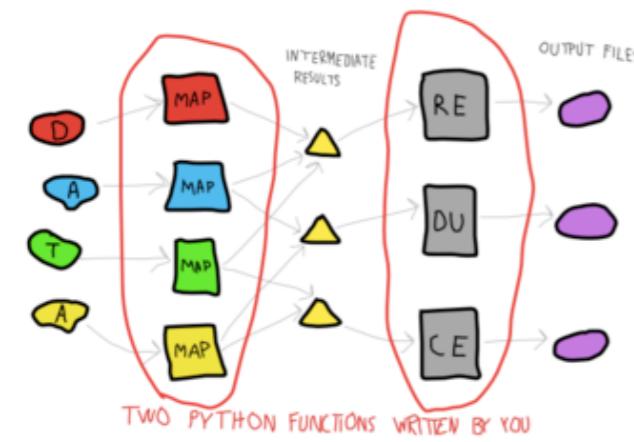
BHL content distribution



BHL content distribution



computational services



thanks.

anthony goddard



phil cryer



all code available bit.ly/bhl-bits

presentation slides on slidesha.re/bhl-slides