# ATLAS disk usage patten at BNL

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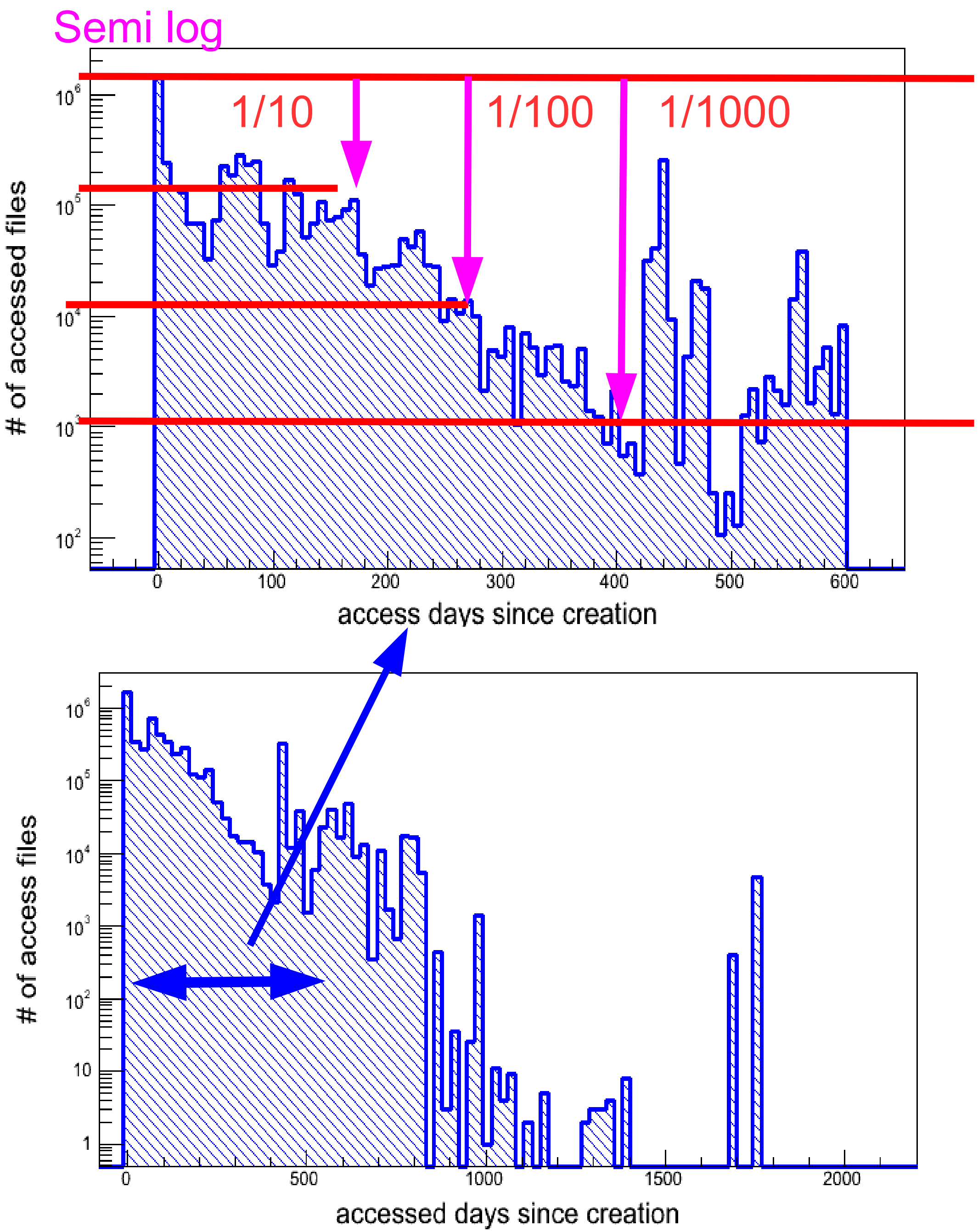
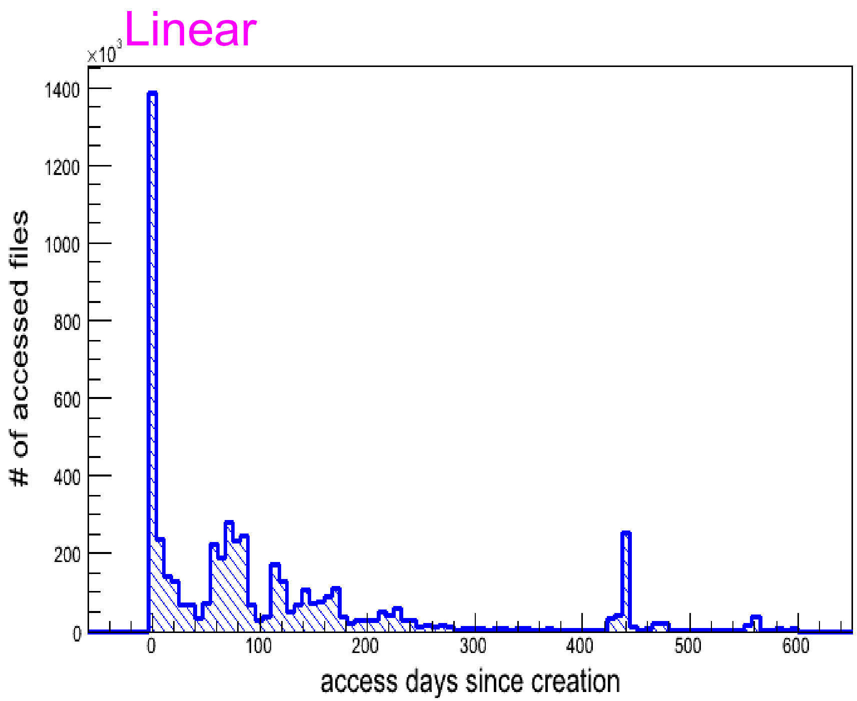
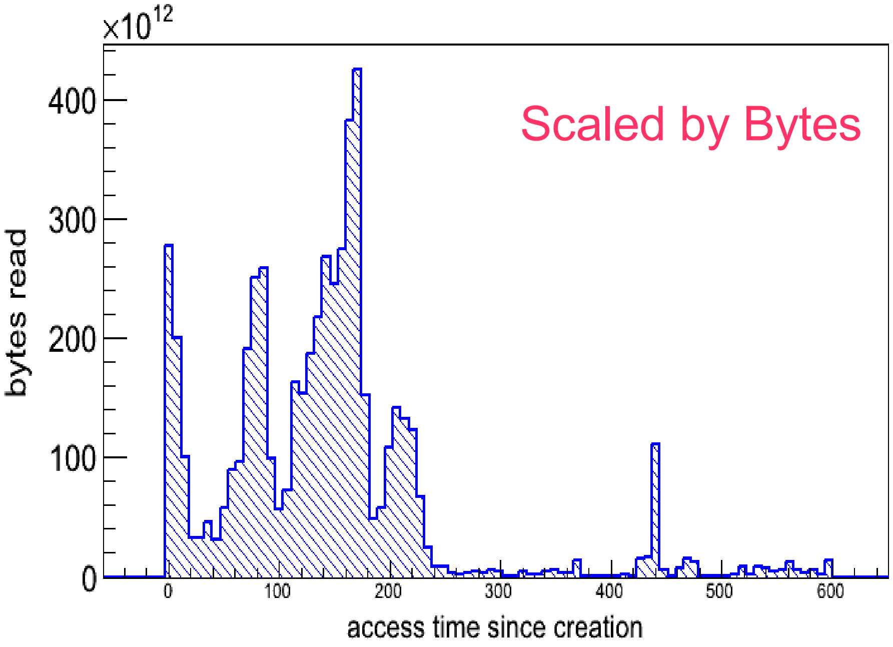
# Motivation and Methods

- Identify the current usage pattern of ATLAS data
  - How often data is read
  - How much data is read
  - Which kind of data is read
- Use dCache's internal Billing Database and Chimera Database as a source of information
  - dCache's billing db records all read/write activities in dCache in PostgreSQL
  - dCache's ChimeraDb records all existing file in dCache.
- Can we design the storage specifically for ATLAS data access pattern instead of the use of generic, all purpose storage.
  - Advantage/disadvantage in performance, cost, features

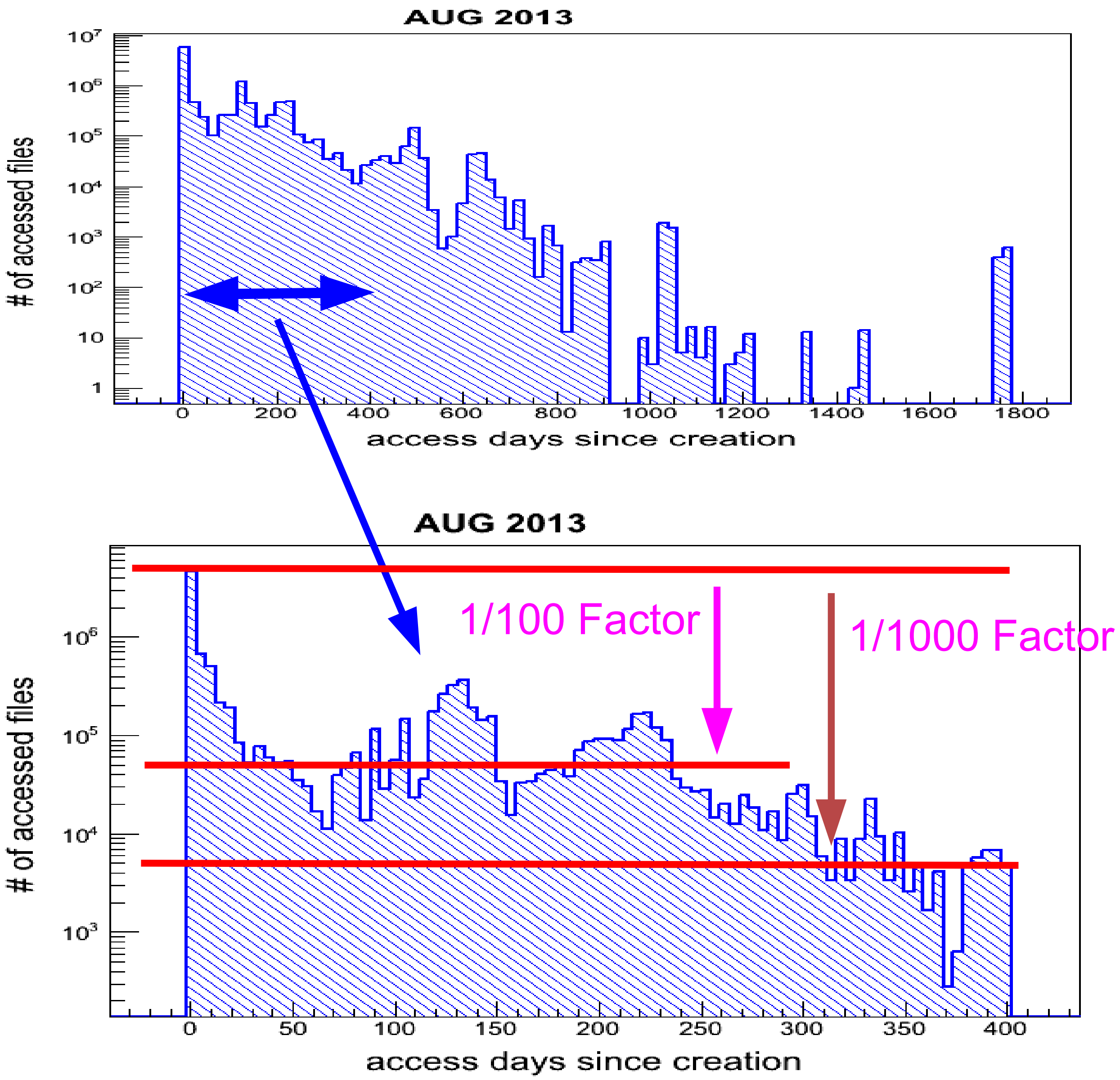
# Age of files read during June 2013







# Age of files read during Aug 2013



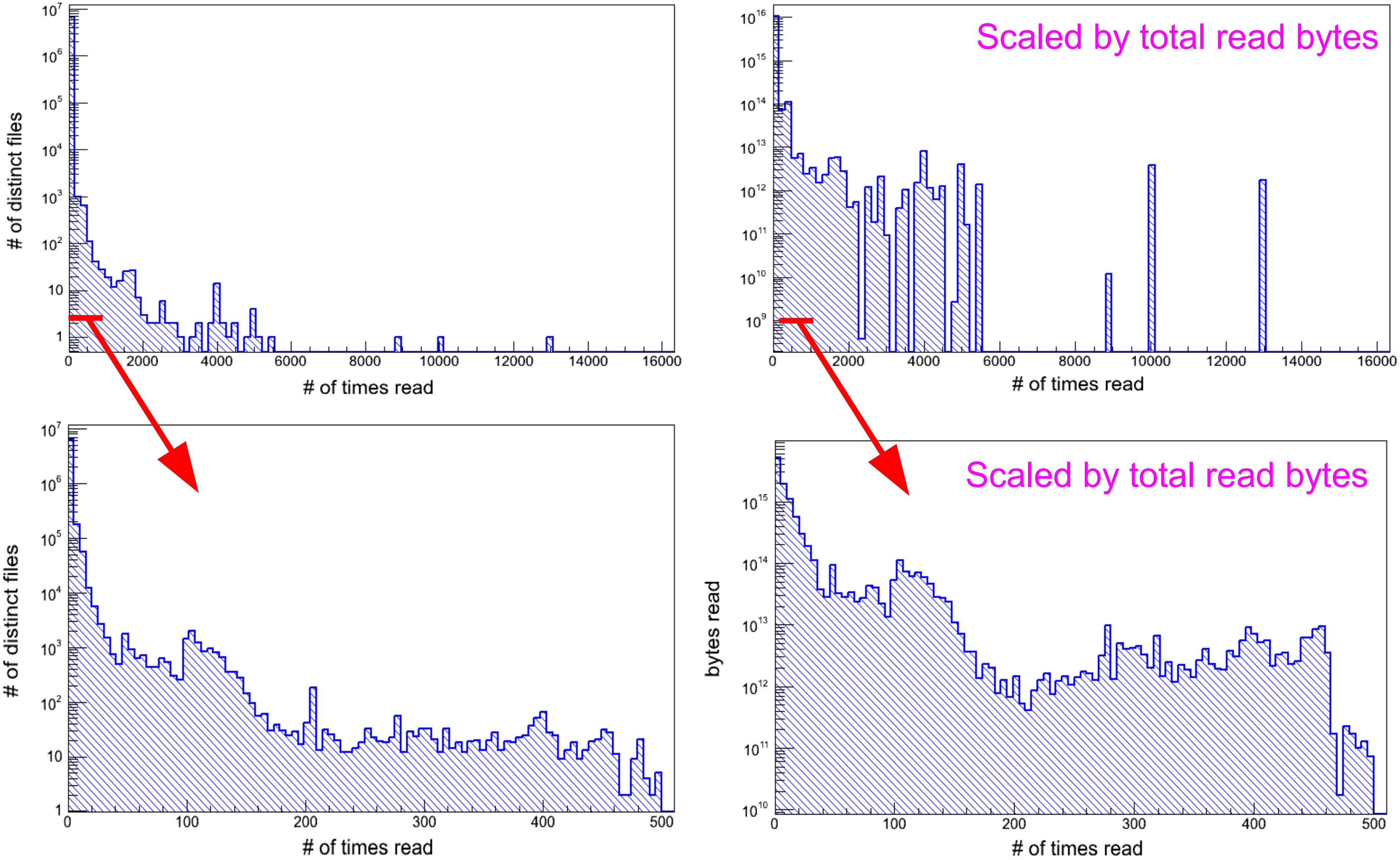
1/100 Factor

1/1000 Factor

# Points for age of files

- There is a patten! The age is not uniform.
- Most files are read immediately after they were written to storage.
- By the age of 1 year, the chance of being used is about 1/1000th
  - How much data do we have over 1 year?
    - Larger than a few PB.
    - Is it necessary to be located on the high performance disks without much use?
      - Can the high latency storage be acceptable?

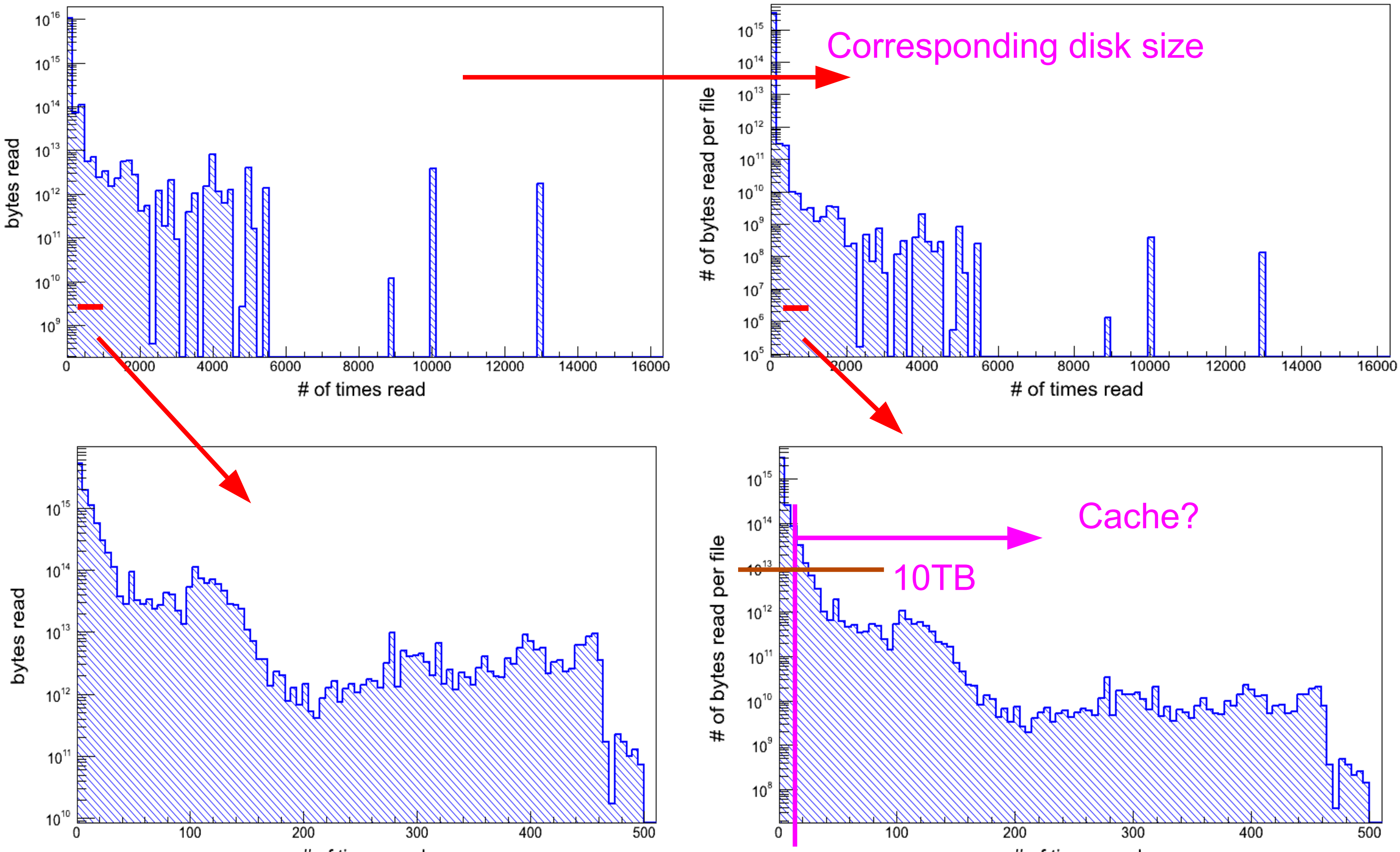
# Frequency of file usage and total network data volume in June 2013



Scaled by total read bytes

Scaled by total read bytes

# Network vs Disk data volume in June 2013



Corresponding disk size

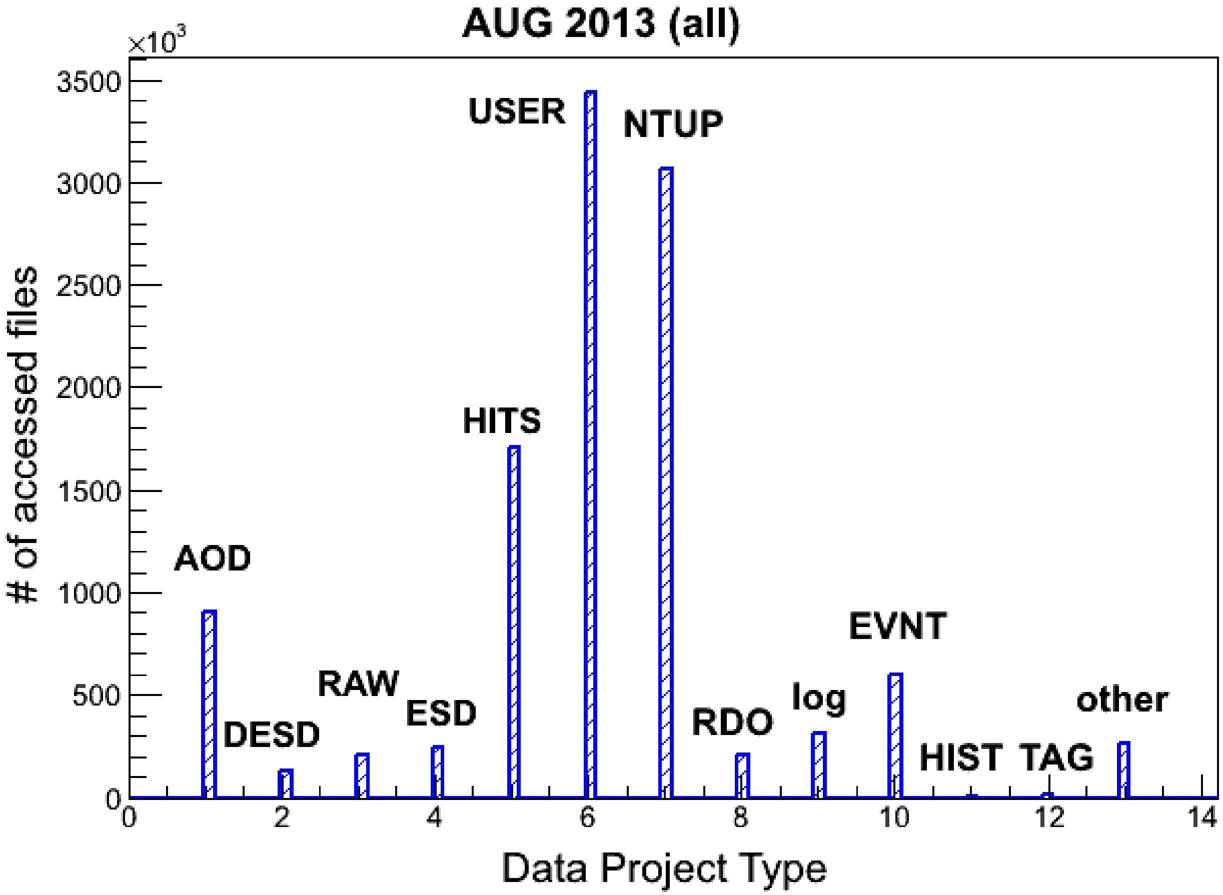
Cache?

10TB

# Points for frequency of file reuse

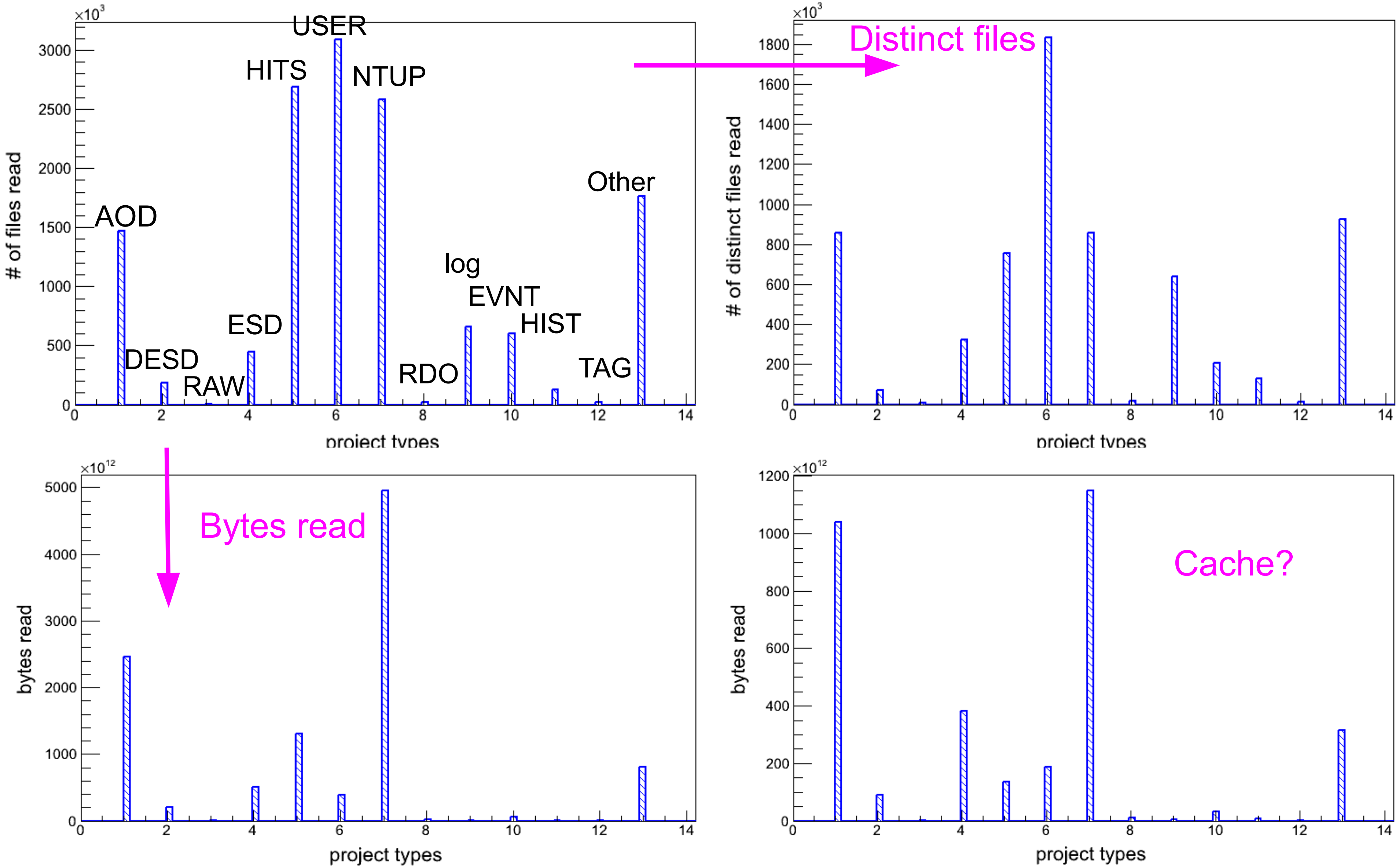
- Large fraction of files are reused only a few times at most.
- Small fraction of files are reused many times. Some of them are used over 1000 times.
  - Which one?
- The storage space required for highly reused data are not too large.
  - How much?

# Type of accessed data?



USER and NTUP are most accessed in terms of number of access.

# Type of accessed data
# June 2013

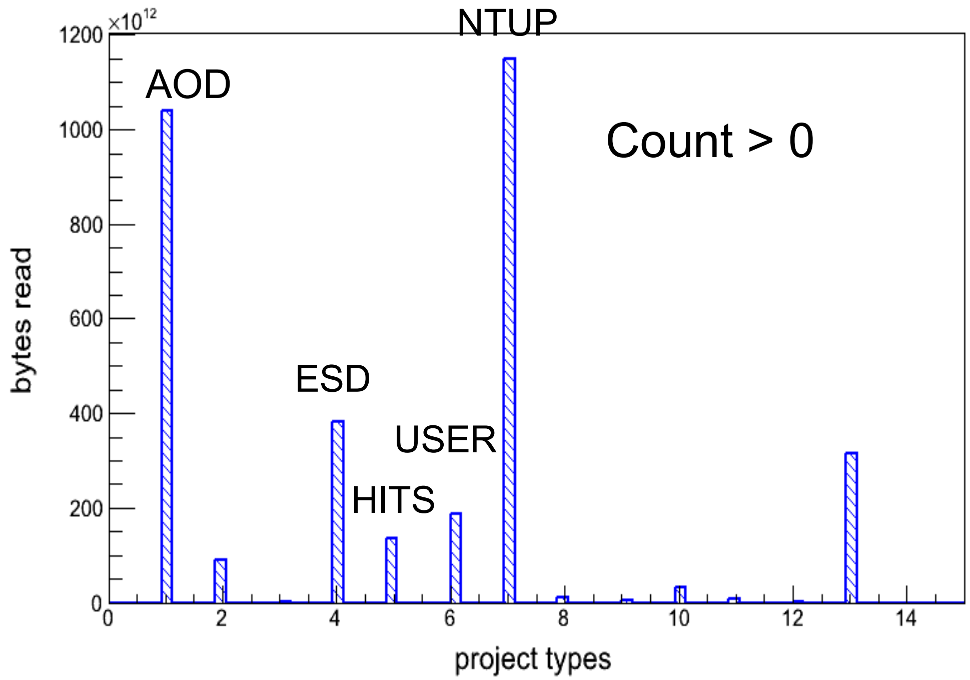


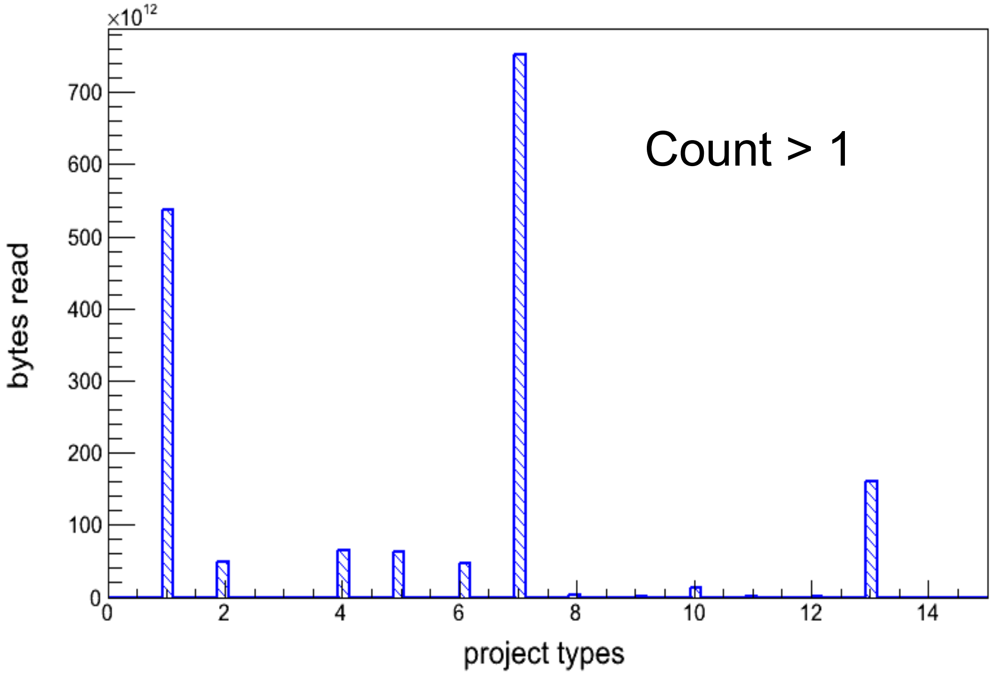
Distinct files

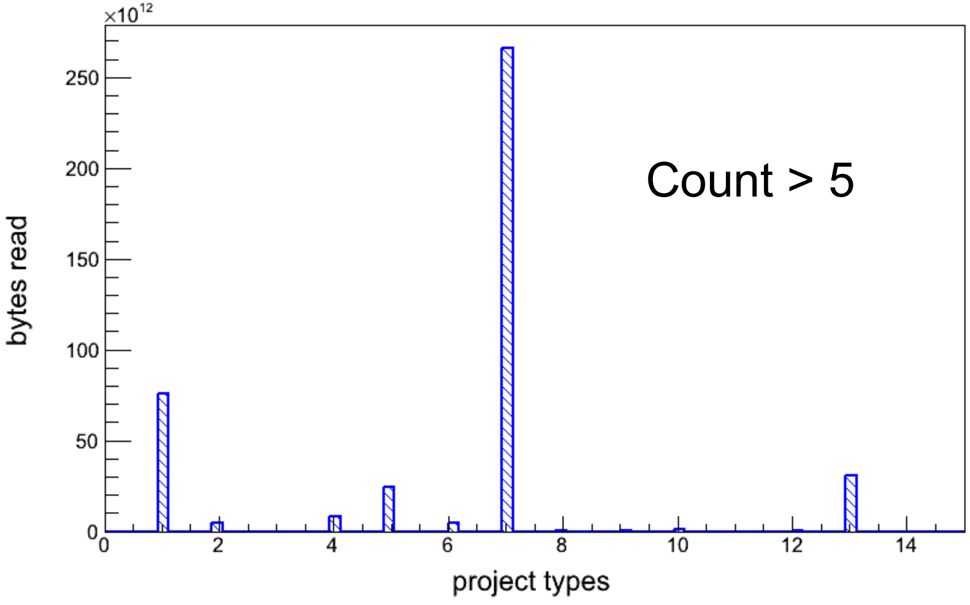
Bytes read

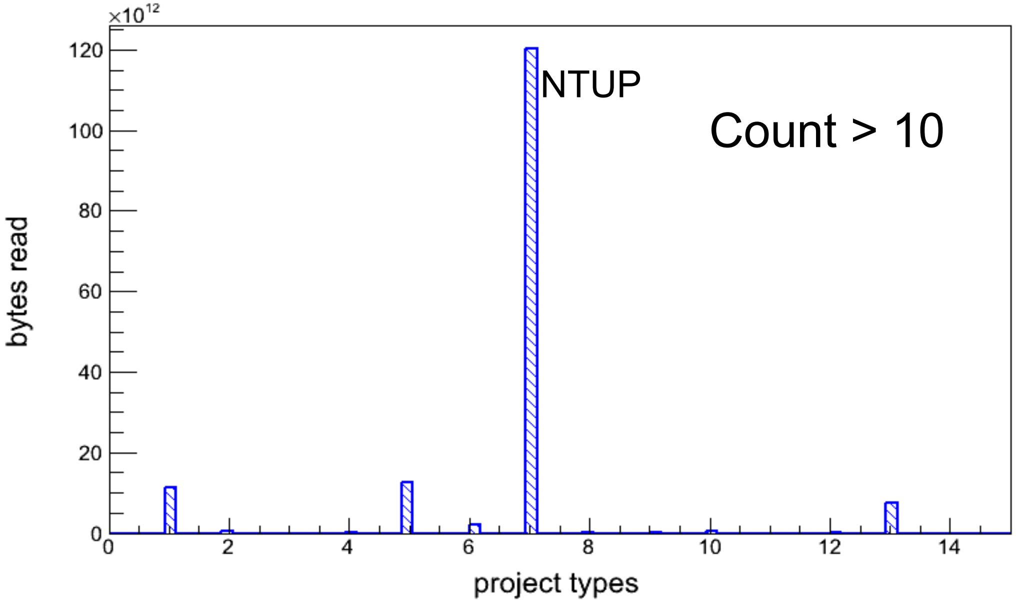
Cache?

# Variation of data types with different number of reuse counts

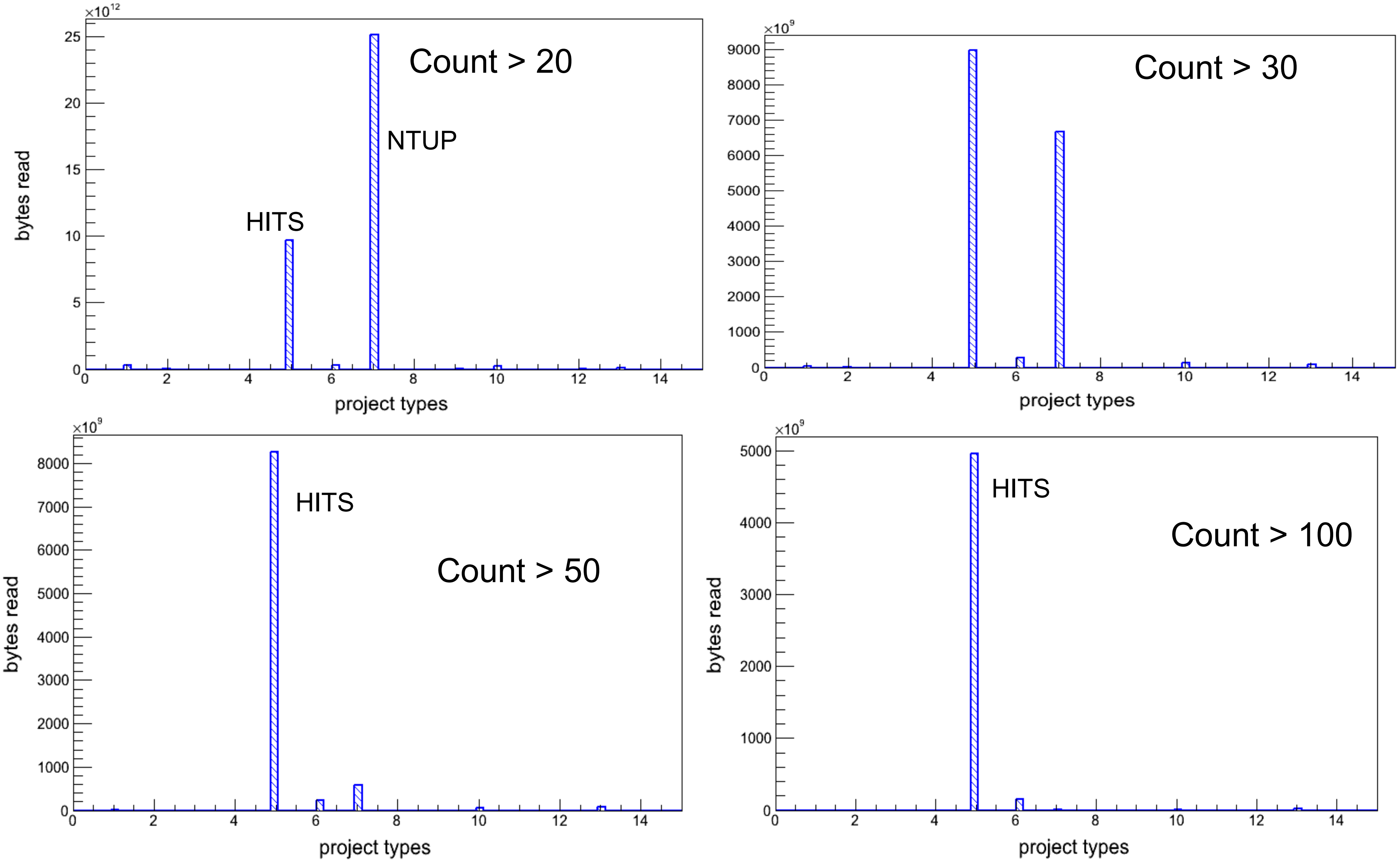






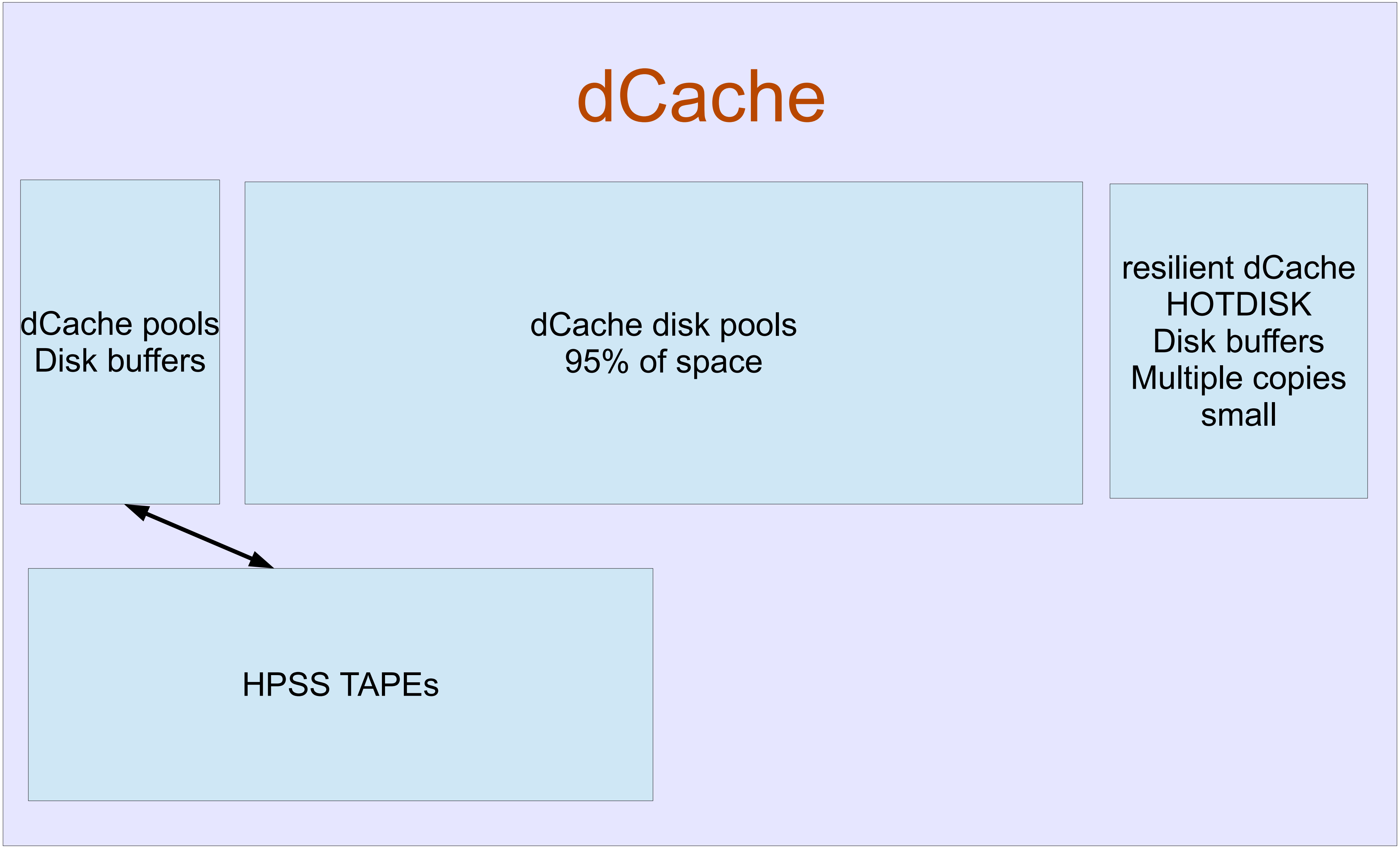


# Variation of data types with different number of reuse counts



- Only a few types of data requires storage for reuse.
  - NTUP has the largest fractions
  - For high reuse counts, HITS are most often used.

# Current BNL storage



dCache

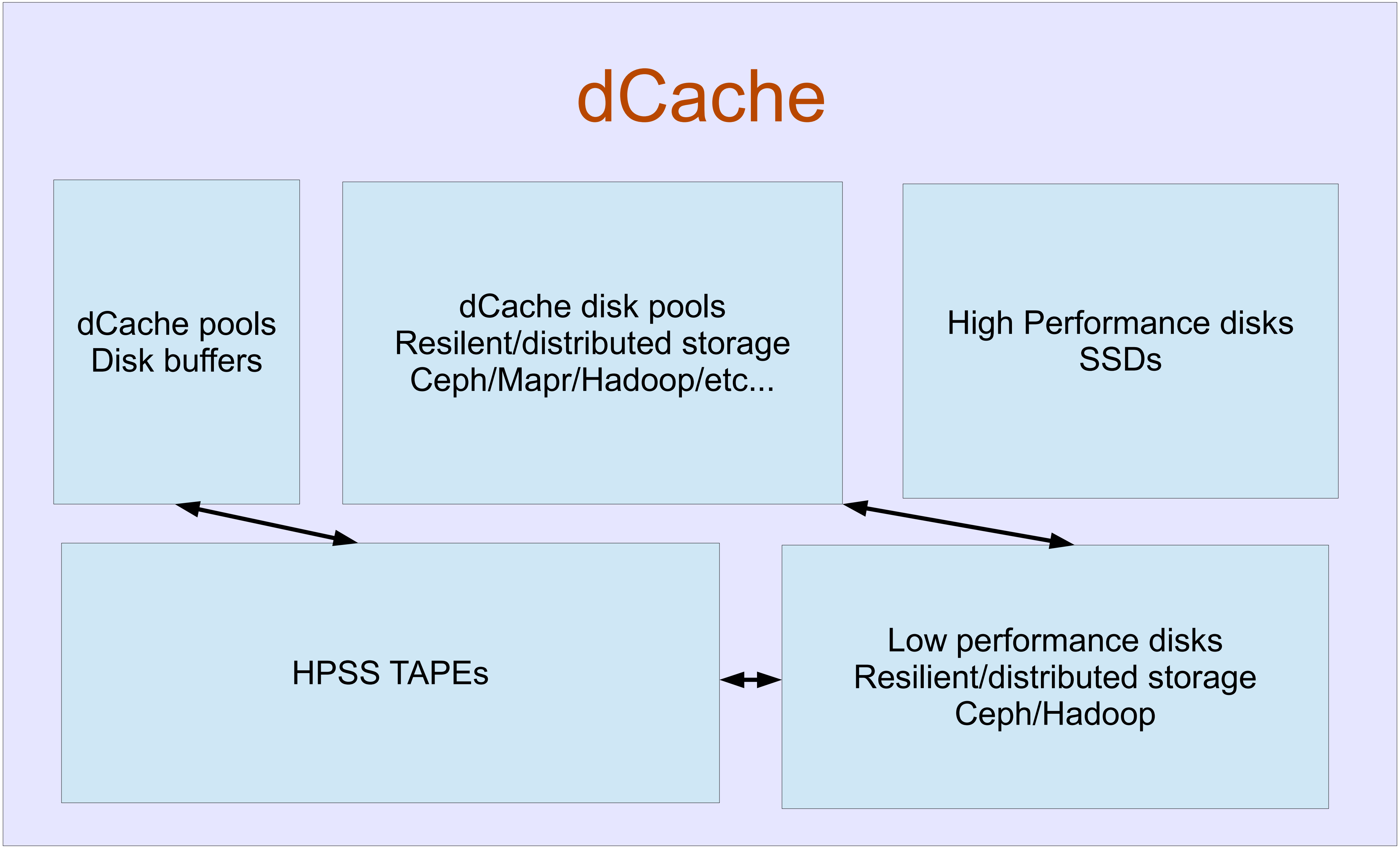
dCache pools
Disk buffers

dCache disk pools
95% of space

resilient dCache
HOTDISK
Disk buffers
Multiple copies
small

HPSS TAPEs

# Possible modification to storage



dCache

dCache pools
Disk buffers

dCache disk pools
Resilent/distributed storage
Ceph/Mapr/Hadoop/etc...

High Performance disks
SSDs

HPSS TAPEs

Low performance disks
Resilient/distributed storage
Ceph/Hadoop