

# Status of the HERA Data Bit-Preservation

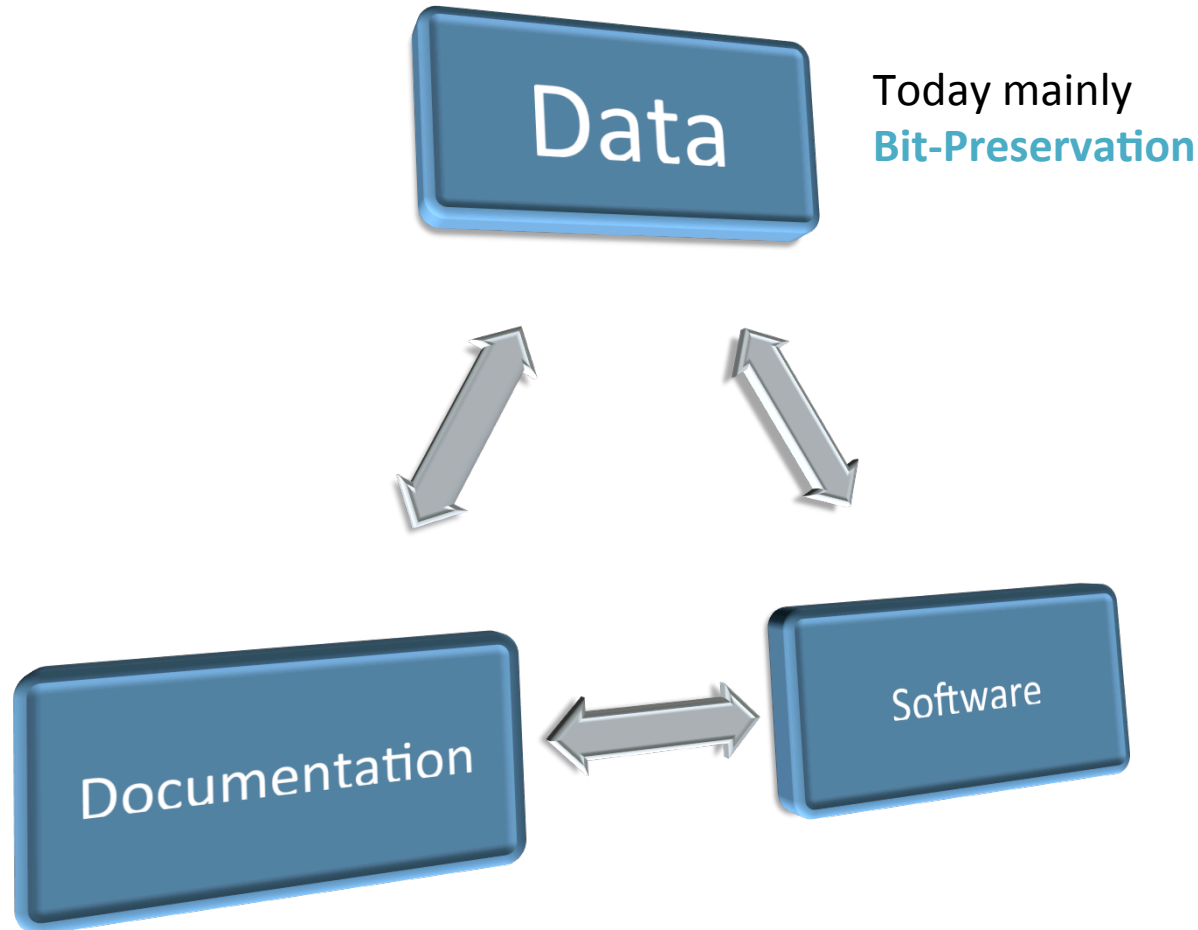
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DESY-IT


@Future Physics with HERA Data for Current and  
Planned Experiments

13.11.14

# Aspects of data preservation



# DPHEP activities

- There had been many activities over the past years
  - Documentation, accumulated over the years, has been collected, stored and catalogued. Non-digital documentation partly digitized
  - ICFA Study Group  Study Group for Data Preservation and Long Term Analysis in High Energy Physics
    - Analyzed the various aspects of data preservation and explored various solutions
  - DPHEP agreement signed this year
    - “Data from high-energy physics (HEP) experiments are collect with significant financial and human effort and are mostly unique”
    - signed by : CERN, DESY, IN2P3, HIP, IHEP, KEK, MPI Munich
- Importance of data preservation is clearly acknowledged. What are the technical solutions?

# Aspects of data preservation

DESY IT provides Infrastructure:



Today mainly  
**Bit-Preservation**

Mass storage

- long term preservation
- easy access



- Archive web server



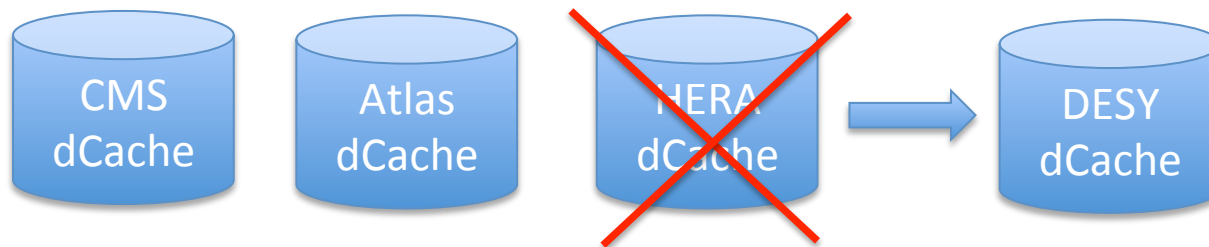
Software preservation  
ongoing work

- Virtual machines
- Testing

**SL6 until 2020**

# Transition old -> new Store

- At DESY different dCache instances for mass storage are maintained
  - dCache is an abstraction layer between hardware and filesystem
    - Hardware: disks, tape robot
    - Access: different protocols; from dcap,xrood,NFSv4.1 to WebDAV
- All HERA data has been stored on the **HERA dCache**
  - HERA dCache is more than 13 years old and cannot be reasonably maintained
  - HERA dCache will be **set read-only end of 2014**
  - Planned **shutdown** mid of 2015
    - of course provided that all data is copied
- Good opportunity to clean up and define the HERA legacy dataset!
  - Mainly done but the last 20% is difficult - as always ...
  - Data, MC, log files etc.
- Transfer data to new store:  
dphep area on **DESY dCache**



# Transition old -> new Store

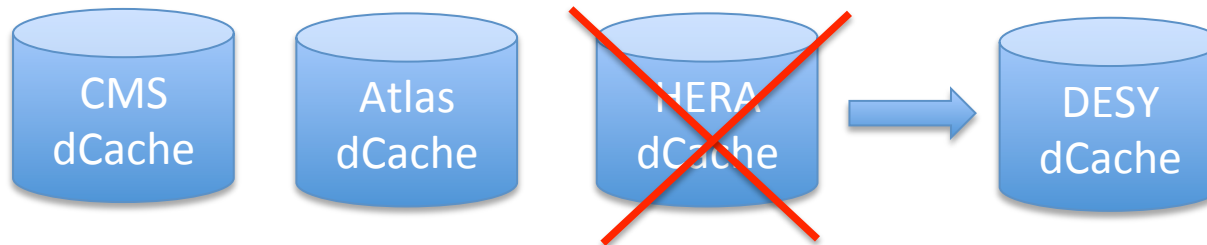
- We try to guarantee:
  - Long term preservation
  - Easy access for the near future



As much as possible on disk  
for easy access during the  
next years



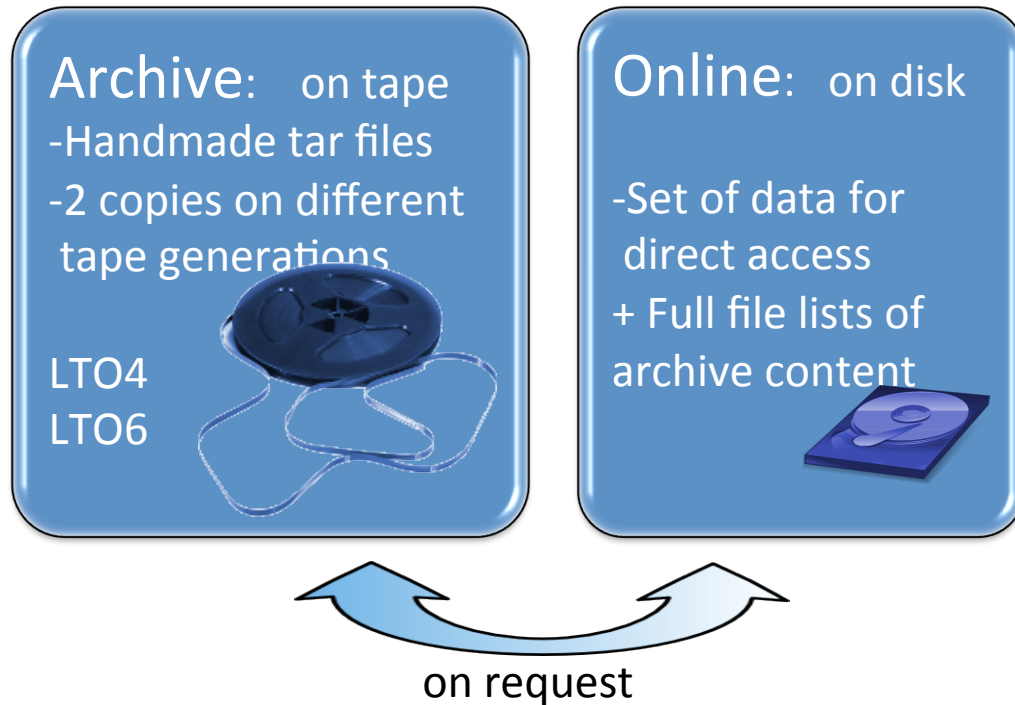
- tapes
- redundant copies
- a plain and simple format to allow access with standard unix tools for the decades to come



# Storage Structure

## DPHEP on DESY dCache

### A twofold system



- There is an archive part with a well defined content
  - All data identified for preservation will be available in 2 redundant tape copies
  - The archive is not generally accessible
- There is an online part
  - Here you find a subset of your data
  - Can be mounted wherever needed i.e. bird cluster or wgs

Small files are not tape friendly -> tar files

# List files

The tape archive is not generally accessible but the full content is documented in text files

e.g. H1 directory:

/pnfs/desy.de/dphep/online/h1/ (mount may be different)

| -- **DPHEP/lists**

<- relation between archive

tar files and the

individual files in online

| -- data

| -- mc

| -- mc2 -> mc

| -- pseudocc

| -- noise

| -- random\_sim

`-- shower

**For each experiment**

**all files in the archive are listed here**

**This is **the place to check** whether all your data is stored**



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BTW:

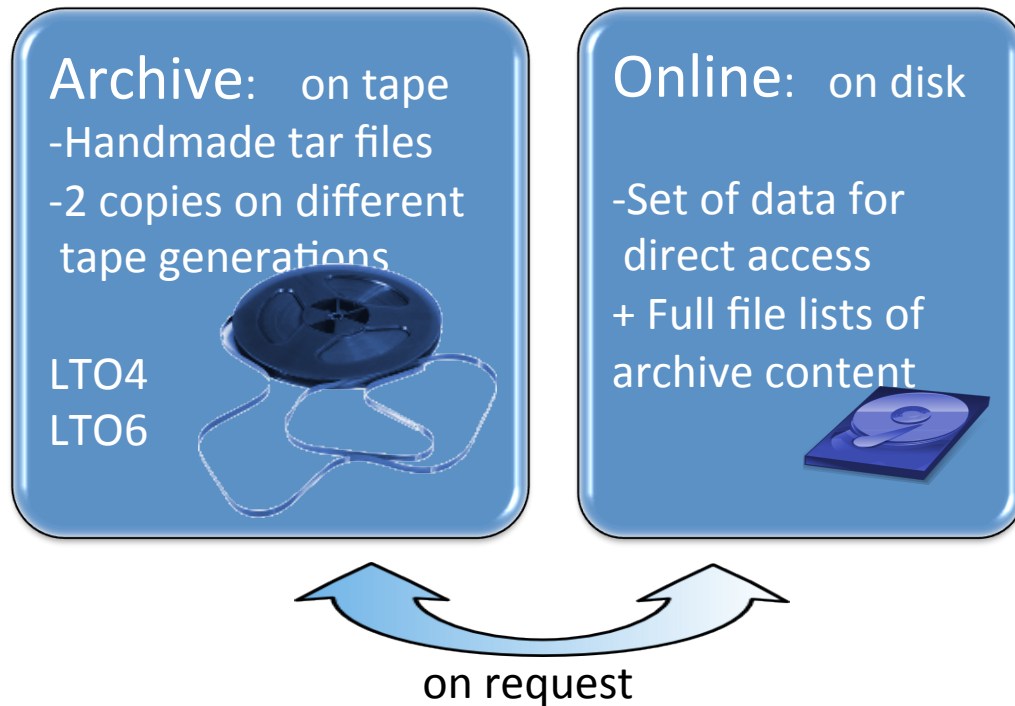
A copy from the HERA dCache a  
DB with checksums is also saved  
here:

Text files with checksum used to  
verify the archive tar file content  
as part of the plain and simple  
concept.

# Storage Structure

## DPHEP on DESY dCache

### A twofold system

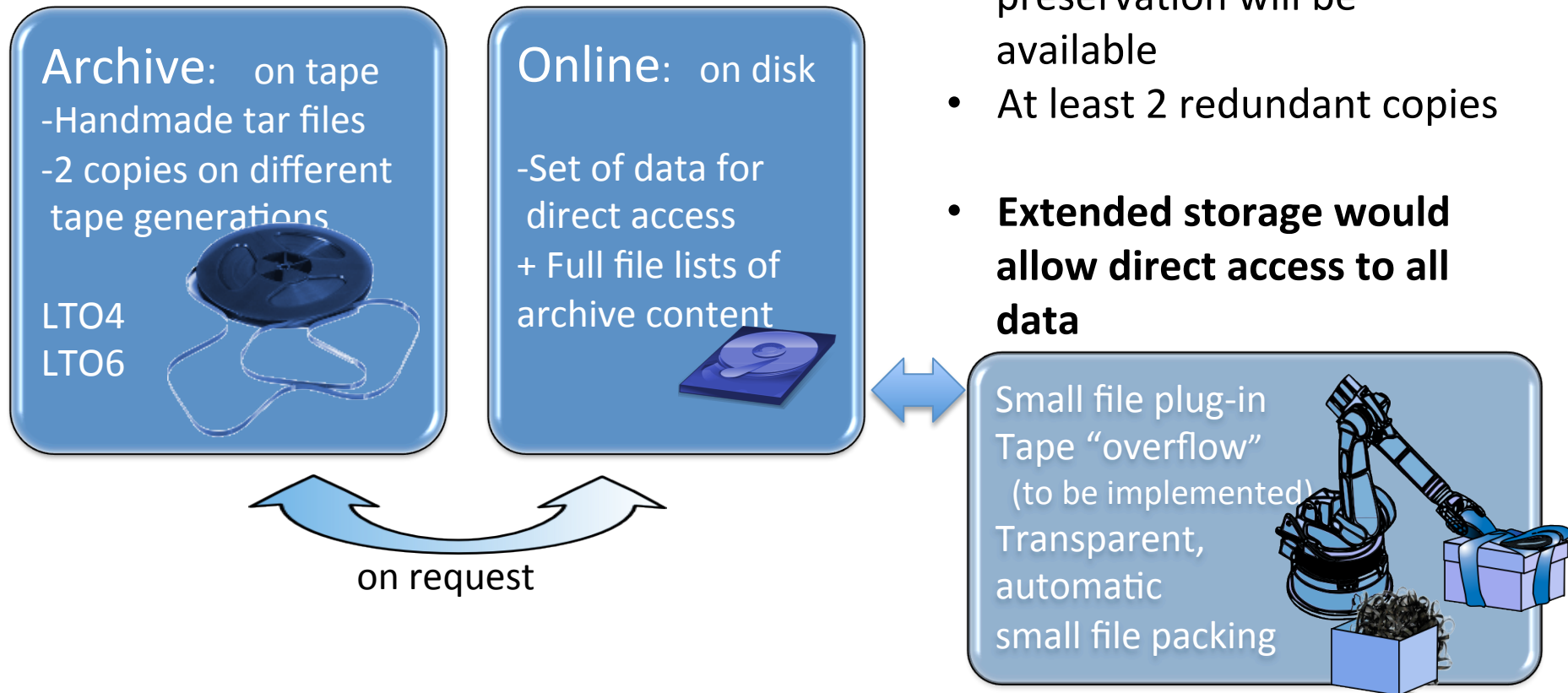


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  - All data identified for preservation will be available in 2 redundant tape copies
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- **Present concept needs manual intervention not all data is in the online part**

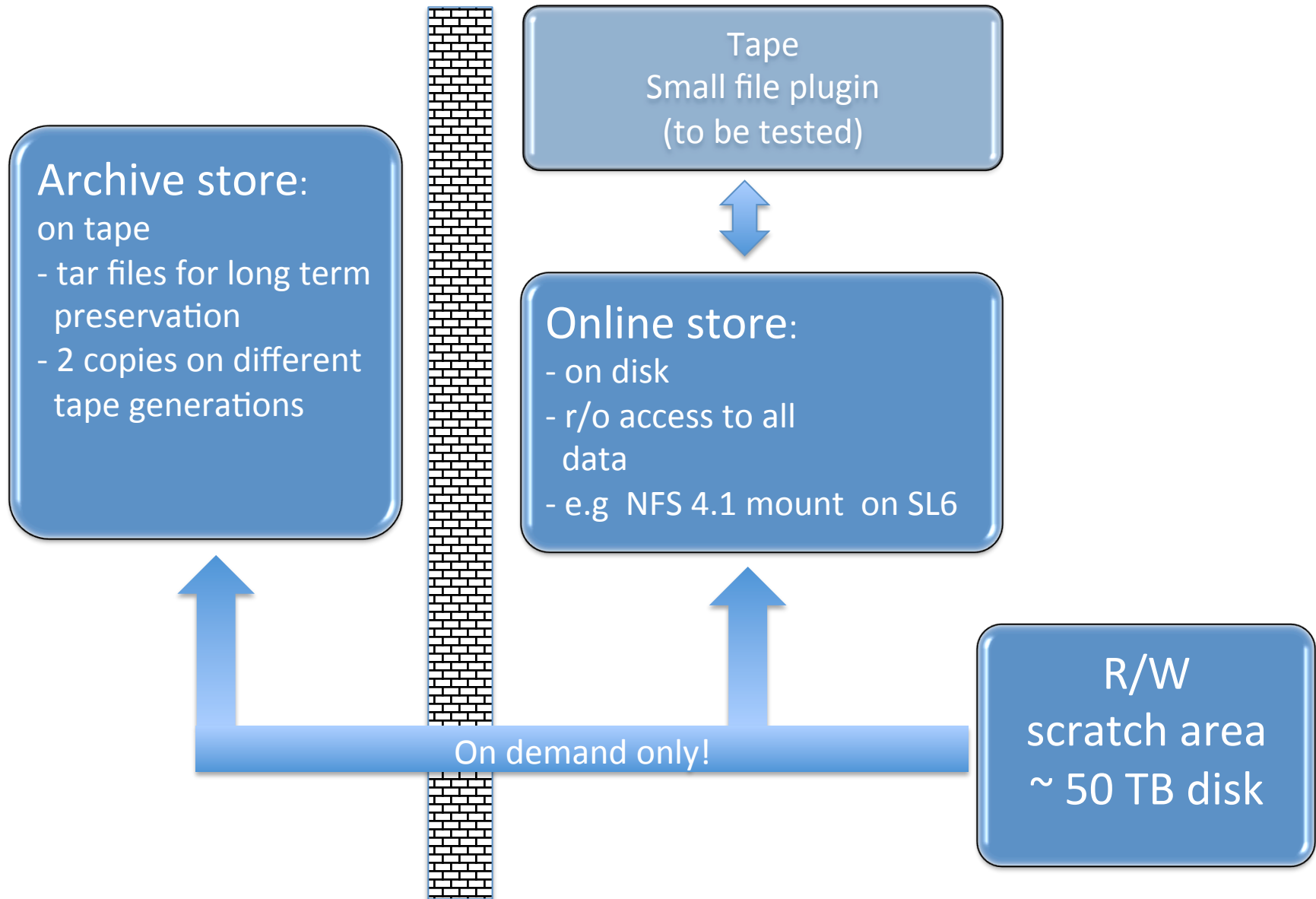
# Storage Structure

## DPHEP on DESY dCache

Small files are not tape friendly

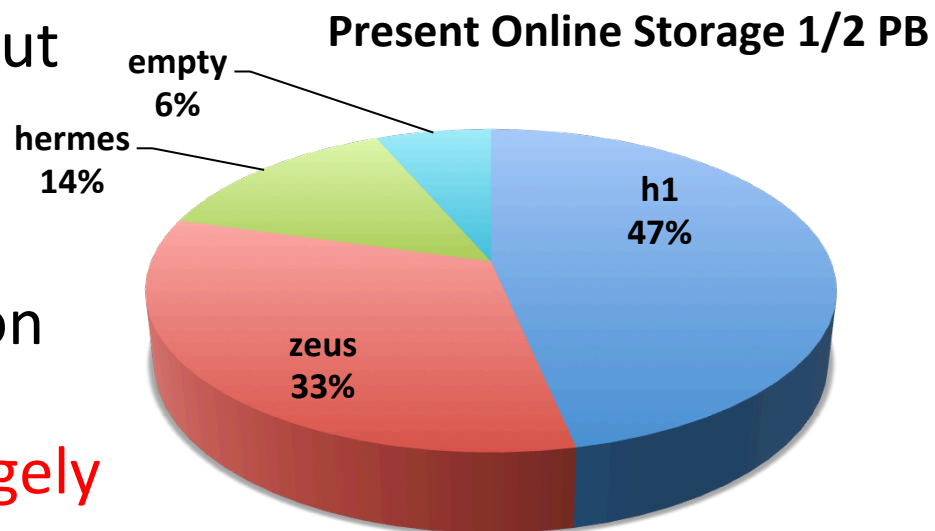


# HERA Data on DESY dCache in 2015

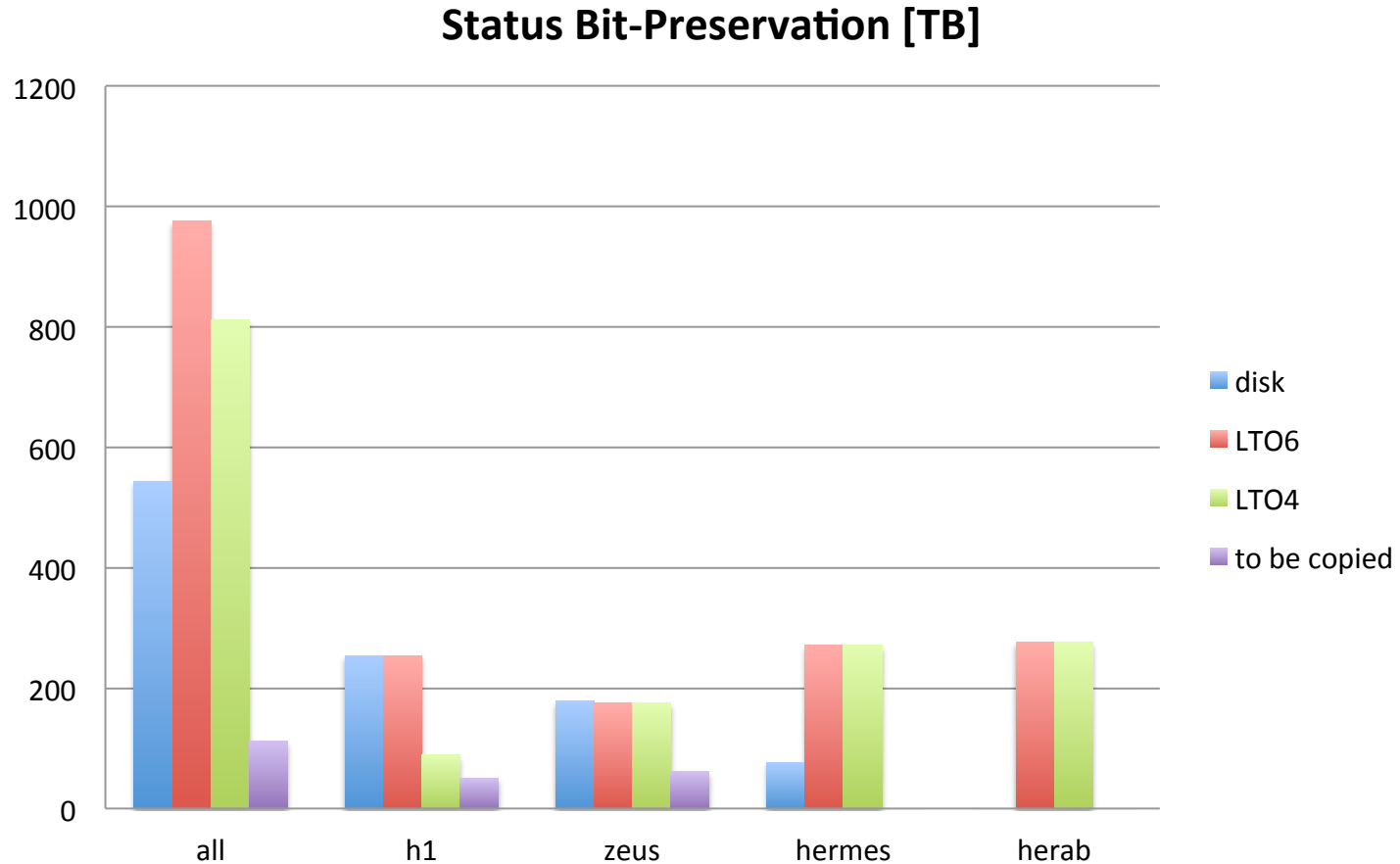


# To be copied

- **H1 ~51 TB** (details to be confirmed)
- **ZEUS ~62 TB**  
(of log files (~1/2 million) and a list of PAW ntuple)
- **HERMES** 77 TB under discussion
- About 115 TB to be copied
  - There will be in total about 620 TB online
    - Storage will be extended soon
  - It seems that the selection process comes to an end
  - The legacy data set is largely defined



# Overview Bit-Preservation



# For the Statistics Enthusiasts: present storage content

H1	Hermes	Zeus	HeraB	type
509006	2007929 (+4450486)	569920 (+404632)	846059	files
5784	7269	4856	4104	tar files
106	404	267	391	LTO4 (800G) tapes
79	114	74	110	LTO6 (2.4T) tapes
254	77	175	0	TBytes online
89	271	175	276	TBytes on LTO4 tape
254	271	175	276	TBytes on LTO6 tape

# Summary

- HERA dCache will be closed next year
  - Will be set read-only at the end of 2014
- DESY dCache will be the new home for the HERA data
  - Moving of the data still ongoing (until next year)
  - Datasets are not yet fully defined but close to a defined legacy dataset
- The legacy dataset will stay easily accessible for the coming years
  - Additional r/w scratch dCache area ~50TB
- Long term preservation guaranteed by additional 2 tape copies