

### More Filesystems! AFS, FILER, DFS, SAMBA

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## Outline

• AFS, Filer

### Storage for Windows systems DFS, SMB



### **AFS: Use cases**

- Current
  - \$HOME (interactive logon service) → user volumes (/afs/cern.ch/user)
  - Filesystem interface for local BATCH access

→ preferably workspace volumes (/afs/cern.ch/work)

- Small Experiments data, projects  $\rightarrow$  /afs/cern.ch/project, ...
- Software compilation, websites... → all (mainly workspaces)

#### Migrated into other services

- Large Experiments data
- Most of Project spaces
- Archival of old data/projects (first website in the world!)
- Software distribution  $\rightarrow$  now on a dedicated, RO system (CVMFS)



# **AFS: Infrastructure and Operations**

- Fully virtualized on OpenStack VMs + Ceph storage:
  - 69 Fileservers (shared, 8cores/15G/4partitions)
  - CEPH block storage
  - 4 DBs
  - Some FS+DB under critical power (\$HOME + Critical projects)

#### • Software:

- OpenAFS 1.8.10
- RHEL 9 (on-going migration)
- Backup to Tape:
  - Daily
  - Integrated with CERN Tape Archive



# **AFS In Numbers**



- 44487 volumes, 7k clients
- 487 TB (-4% than 2022)
- 4.4 billion files (+26% than 2022)
- Numbers stable, no big additions or removals
- AFS is global, but its usage at CERN is mostly local







### Filer

#### • Virtualized NFS (v3 or v4) server on VM

- Underlying storage is Ceph RBD
  - Plain and simple attached volume
  - QoS from volume type or aggregation of volumes
- · ZFS as filesystem on top
  - Comes as 3<sup>rd</sup>-party Kernel module
  - Provides snapshots and replication capabilities (`zfs send | receive`)
  - Quota management (.zfs.{user/group}quotas), compression, deduplication

#### No HA, no Clustering, Failover is manual

- We could do better (e.g., DRBD, Pacemaker, ...)
- Never manifested as lacking feature

#### Plans? Consolidate in favour of Ceph







## **DFS Service**

**DFS (Distributed File System)** is a role service in Windows Server that enables to group shared folders located on different servers into one or more logically structured namespaces. Provides a virtual view of shared folders, where a single path leads to files located on multiple servers.

**DFS** provides to all CERN users a centrally hosted file space. Primarily dedicated to the **Windows** based ecosystem.



### **DFS** overview





DFS Data Servers

#### Auxiliary components



DFS Management Database



SOAP Web Services



"DFS Robot" scripts

#### **DFS** features

- Windows Network Share access
- Windows-native permissions management
- Web GUI + WebDAV access
- Quota management
- Snapshots (Previous versions)
- Backup
- Managed by Puppet, Group policies and CMF
- Alarms: icinga2
- Metrics: telegraf > influxDB > Grafana



# **DFS Backup**

	DFS
Technology	TSM – IBM Spectrum Protect
Schedule	Daily invoked at 18:00
Туре	<ul><li>Incremental</li><li>Image every 4 weeks</li></ul>
Retention	Extra Versions: 300 days Only Version: 370 days
Restore	2 <sup>nd</sup> or 3 <sup>rd</sup> line support



#### IBM Spectrum Protect Plus



# Usage overview

- Standard DFS projects
- UNOSAT dedicated servers (5 servers, 227 TB)
- MEDIA (CDS content) (12 servers, 257 TB)
- Engineering data (PLM/ARAS) (5 servers, Storage Spaces Direct)
- **DFS Web hosting storage** (2 servers, 4155 websites)

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ontacts	Departments	11/24/2020 9:43 AM	File folder	
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Music	Projects	3/5/2024 4:36 PM	File folder	
	Scratch	11/5/2013 2:55 PM	File folder	
Pictures	Services	10/16/2023 1:30 PM	File folder	
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	Workspaces	11/5/2013 2:55 PM	File folder	
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# Examples of DFS usage

#### Total number of files stored on DFS: ~500 millions



- Media (CDS multimedia content, lecture recordings etc.)
- Engineering storage
- Documents
- Web for IIS websites

- Sources (images, drivers) for Windows installations (Diane) and CMF applications
- Antimatter experiments: ALPHA, BASE, ...
- Cryogenics, cooling and ventilation, power supply infrastructure data



### Size of the service

Number of "projects"	2 870 (**)
Number of websites	4 102 (**)
Users (unique)	6 338 (*)
Accounts (unique, users + web + computers)	15 984 (*)
Data servers	75
Namespace servers	3
Total capacity	~3 PB
Used capacity	~1.5 PB

(\*) data from 2024 (\*\*) data from 07/03/2024



# **DFS** plans

In the context of rationalisation of document management systems at CERN and consolidation of available storage systems the **DFS** is slowly **phased-out**.

**CERNBox** service replaces DFS delivering higher capacity, sync and share capabilities, modern web interface with applications and many more functionalities.





# SAMBA gateway in CERNBox

- Provides SAMBA access for Windows clients to CERNBox
- High-available solution implemented based on the CTDB daemon





## SAMBA architecture

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	geant4	6/29/2023 5:46 PM	File folder		
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	gen-connected-lockers	6/28/2022 1:54 PM	File folder		
	geode-apex	10/17/2023 12:10 PM	File folder		
	geomodel	2/2/2023 12:19 PM	File folder		
	geopode	10/26/2023 12:14 PM	File folder		
	gep-fw	9/15/2023 3:53 PM	File folder		
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SAMBA server internals

- CTDB a high-availability load-sharing CIFS server cluster (floating IPs)
- Bare-metal deployment (due to network constraints at CERN)
- EOS (fuse mount)
  - Homes, media, projects instances
- CephFS (kernel mount)
  - Multiple volumes
- Different ACLs management between EOS and CephFS



# Thank you!



