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Open AFS *Status and Futures*

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What is OpenAFS?

- OpenAFS is a global, federated, location independent open source storage system that provides pervasive data access from a broad range of heterogeneous devices scaling from handsets to super computers.

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OpenAFS Status

- Broad platform support
  - UNIX
    - MacOS 10.3-**10.5**, Solaris (Sparc and x86) 7-**11** and OpenSolaris
    - AIX 5.1-5.3; HPUX 11.0, 11i, 11i v2, 11i v3; IRIX 6.5;
    - NetBSD, FreeBSD and OpenBSD (server only)
  - Linux 2.4 and 2.6 (through .24) kernels
    - Fedora Core 3-7, RHEL3-5, Debian and others
  - Microsoft Windows
    - 2000, XP, Server 2003, Vista, Server 2008
    - (32-bit and 64-bit)
- 180 Public Cells (and an increasing number of known private cells)
- Growing number of developers
  - Partnerships with academic CS departments

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Common Usage Models

- Pervasive data access
  - Home directories, project data, … accessible from anywhere, from any device
- Federated collaboration
- Read-only publication
- Context-aware application deployment
- Distributed computing

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OpenAFS Strengths

- WAN friendly
- NAT capable
- Authentication, Authorization, and Auditing
- Change notifications
- Distributed administration
- High availability
  - Maintenance without downtime
- Data consistency

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What Makes OpenAFS Unique?

- It's the cache manager
    - Intelligent caching
    - Automatic cell and volume discovery
    - @sys context sensitive name replacement
    - Pre-fetching
    - Disconnected operations
        - Limited read-only in Windows client
    - Local directory updates
    - Very large cache support (25GB or greater)

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Future Cache Manager Enhancements

- Object Storage Referrals
- Read-write disconnected mode
- Automated tuning of cache size and object allocations
- Windows
  - Unicode support
  - Native Redirector client
- Privacy for anonymous access
- Pass-through file access
- Cache usage limits
  - Read-only vs Read/write
  - Local vs Remote

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Where is OpenAFS in the Technology Adoption Life Cycle

- Over the last seven years since IBM declared end-of-life and released AFS to the open source community, the product has returned to an early adopters phase in which only visionaries commit to the technology.

- OpenAFS is rapidly re-approaching "the Chasm" which can be crossed only by producing the 100% solution for a specific target audience.

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The Need for Pragmatism When Selecting a Storage Solution

- Access to data is the most important building block of an IT organization

- Once a storage solution is deployed and populated, migrating to another solution is nearly impossible

- Confidence in the long term availability and success of your existing solution is key.

- If there is no confidence, start planning your migration today. It will take ten years!

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CRITERIA	OPENAFS	OPENAFS NOTES	LUSTRE	LUSTRE NOTES	NFS V4	NFS V4 NOTES
Single namespace	Yes	Defaults to /afs.	No	Planned for 1.8.	Extension	Not widely available.
Access Control	Directory	Clients support per-file ACLs	File	POSIX acls.	File	Superset of POSIX acls.
Distributed Architecture	Yes	Limited support for serving any (existing) filesystem.	Yes	Serve from up to 400 Object Storage Servers.	Yes	Can serve any filesystem.
Server platform support	Broad	Windows servers available but not supported	Linux	Solaris planned.	Broad	Hummingbird Maestro Windows Server
Volume Management	Yes	Transparent movement of	No	Online data migration	Extension	Not always available
Filesystem snapshots	Limited	Typically one "backup".	No	Planned for 3.0.	No	
Quotas	Yes	Granular to container ("volume") level.	Yes		No	Implemented by the backend.
POSIX Extended	No	Planned.	Yes		Yes	
Locking	Advisory	Whole file only.	Yes	No lockf/flock yet.	Yes	Mandatory and Advisory.
Transport	UDP IPv4	TCP support planned.	TCP IPv4		TCP	IPv6 not widely available.
Replication	Read-Only	Read-Write planned.	Local	RAID, not multi-server yet.	Extension	Not widely available.
Disconnected Mode	No	In progress	No	Planned for 1.8.	No	
Object Storage	No	Integration to begin soon.	Yes	That's largely the point!	Extension	In pNFS/NFS v4.1.
Location Transparency	Yes	Even cross-installation.	Yes	Location of Object Storage Servers is transparent.	No	Referrals offer limited functionality.
Security	Yes	56 bit fcrypt.	No	Planned for 1.8.	Yes	GSSAPI RPC.
Authentication	Yes	Kerberos 4 and Kerberos 5.	No	Kerberos support in Lustre	Yes	GSSAPI / Kerberos 5.
Multiplatform	Yes	Windows, Mac, Linux, most Unix variants.	No	Limited Windows pCIFS client. No Mac client yet.	Yes	Proprietary Windows client; Not in MacOS
Scalability	Yes	Thousands of clients per server in practice.	Yes	30000 clients per node.	Yes	
Performance	Moderate	No parallel access today. Limited by transport.	High	Optimized; Uses object-based storage.	Varies	pNFS extension, TCP allow good performance.
Open Source	Yes	IBM Public License V1.0.	Yes	GPL.	Available	Citi reference implementation is GPL.
Commercial Support	Yes	Secure Endpoints, Sine Nomine Associates.	Yes	ClusterFS (now Sun).	Yes	Typically from OS vendor.

Why OpenAFS Should Be In Your Future?

- OpenAFS has
  - demonstrated the ability to adopt to new platforms
    - Windows Vista and Server 2008
    - MacOS X Leopard
    - Linux 2.6
    - Solaris 11
  - an active community
  - operating system vendor enthusiasm
  - increasing forward momentum

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How Does OpenAFS Achieve the 100% Solution?

- http://www.openafs.org/roadmap.html
  - Enhance the protocol and server data structures
  - Become a first class file system for MacOS X, Windows, and beyond
  - Dramatically improve server throughput by implementing asynchronous events
  - Reduce the cost of replicating large files and volumes
  - Develop innovative user interfaces that make AFS content readily accessible and searchable
  - Further address the needs of the pervasive computing model
  - Port Servers to Windows Server 2003/2008

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How Can the High Energy Physics Community Help OpenAFS?

- Communicate your needs
- Assist us in obtaining resources to address them
  - Development contracts
  - Grants
  - Developer time
  - Testing Resources
  - Documenters
  - Language Translators

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Q&A

Further questions can be addressed to
openafs-elders@openafs.org

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Thank You!
Hope to See You at the Workshop

- AFS & Kerberos Best Practice Workshop
- May 19-23
- Newark, New Jersey, United States
- Hosted by New Jersey Institute of Technology

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