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Jeffrey Altman
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.
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
    - (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
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
OpenAFS Strengths

- WAN friendly
- NAT capable
- Authentication, Authorization, and Auditing
- Change notifications
- Distributed administration
- High availability
  - Maintenance without downtime
- Data consistency
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)
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
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.
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!
<table>
<thead>
<tr>
<th>CRITERIA</th>
<th>OPENAFS</th>
<th>OPENAFS NOTES</th>
<th>LUSTRE</th>
<th>LUSTRE NOTES</th>
<th>NFS V4</th>
<th>NFS V4 NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single namespace</td>
<td>Yes</td>
<td>Defaults to /afs.</td>
<td>No</td>
<td>Planned for 1.8.</td>
<td>Extension</td>
<td>Not widely available.</td>
</tr>
<tr>
<td>Distributed Architecture</td>
<td>Yes</td>
<td>Limited support for serving any (existing) filesystem.</td>
<td>Yes</td>
<td>Serve from up to 400 Object Storage Servers.</td>
<td>Yes</td>
<td>Can serve any filesystem.</td>
</tr>
<tr>
<td>Server platform support</td>
<td>Broad</td>
<td>Windows servers available but not supported</td>
<td>Linux</td>
<td>Solaris planned.</td>
<td>Broad</td>
<td>Hummingbird Maestro Windows Server</td>
</tr>
<tr>
<td>Volume Management</td>
<td>Yes</td>
<td>Transparent movement of</td>
<td>No</td>
<td>Online data migration</td>
<td>Extension</td>
<td>Not always available</td>
</tr>
<tr>
<td>Filesystem snapshots</td>
<td>Limited</td>
<td>Typically one “backup”.</td>
<td>No</td>
<td>Planned for 3.0.</td>
<td>No</td>
<td>Implemented by the backend.</td>
</tr>
<tr>
<td>Quotas</td>
<td>Yes</td>
<td>Granular to container (“volume”) level.</td>
<td>Yes</td>
<td></td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>POSIX Extended Locking</td>
<td>No</td>
<td>Planned.</td>
<td>Yes</td>
<td></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Transport</td>
<td>Advisory</td>
<td>Whole file only.</td>
<td>Yes</td>
<td>No lockf/flock yet.</td>
<td>Yes</td>
<td>Mandatory and Advisory.</td>
</tr>
<tr>
<td>Replication</td>
<td>Read-Only</td>
<td>Read-Write planned.</td>
<td>Local</td>
<td>RAID, not multi-server yet.</td>
<td>Extension</td>
<td>Not widely available.</td>
</tr>
<tr>
<td>Disconnected Mode</td>
<td>No</td>
<td>In progress</td>
<td>No</td>
<td>Planned for 1.8.</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Object Storage</td>
<td>No</td>
<td>Integration to begin soon.</td>
<td>Yes</td>
<td>That’s largely the point!</td>
<td>Extension</td>
<td>In pNFS/NFS v4.1.</td>
</tr>
<tr>
<td>Location Transparency</td>
<td>Yes</td>
<td>Even cross-installation.</td>
<td>Yes</td>
<td>Location of Object Storage Servers is transparent.</td>
<td>No</td>
<td>Referrals offer limited functionality.</td>
</tr>
<tr>
<td>Security</td>
<td>Yes</td>
<td>56 bit fcrypt.</td>
<td>No</td>
<td>Planned for 1.8.</td>
<td>Yes</td>
<td>GSSAPI RPC.</td>
</tr>
<tr>
<td>Authentication</td>
<td>Yes</td>
<td>Kerberos 4 and Kerberos 5.</td>
<td>No</td>
<td>Kerberos support in Lustre</td>
<td>Yes</td>
<td>GSSAPI / Kerberos 5.</td>
</tr>
<tr>
<td>Multiplatform</td>
<td>Yes</td>
<td>Windows, Mac, Linux, most Unix variants.</td>
<td>No</td>
<td>Limited Windows pCIFS client. No Mac client yet.</td>
<td>Yes</td>
<td>Proprietary Windows client; Not in MacOS</td>
</tr>
<tr>
<td>Scalability</td>
<td>Yes</td>
<td>Thousands of clients per server in practice.</td>
<td>Yes</td>
<td>30000 clients per node.</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Open Source</td>
<td>Yes</td>
<td>IBM Public License V1.0.</td>
<td>Yes</td>
<td>GPL.</td>
<td>Available</td>
<td>Citi reference implementation is GPL.</td>
</tr>
</tbody>
</table>
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
How Does OpenAFS Achieve the 100% Solution?

- [http://www.openafs.org/roadmap.html](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
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
Further questions can be addressed to openafs-elders@openafs.org
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