



AFS (Andrew File System) on Linux for S/390 and zSeries

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Session L05



Agenda

- What is AFS?
- Virtue, Vice and The Devil: Benefits and Drawbacks of AFS
- Where Do You Get It?
- Planning an AFS Install
- Adapting Applications for AFS



What is AFS?

- AFS is a distributed file system
 - Separate component file and authentication servers
 - Strong authentication server
 - Cache manager



AFS Implementation Concepts

- Cell – a group of machines under a single administrative control org
- Server – a physical machine providing AFS functions as part of a cell
- Server process – the internal components of the AFS software



AFS Data Concepts

- Volume – a group of files managed as a unit
- Replication – copying of popular volumes to multiple physical disk partitions
- Caching – storing parts of files in use on local disk



Virtue, Vice and the Devil

- | | |
|---|--|
| <ul style="list-style-type: none">■ Benefits of AFS<ul style="list-style-type: none">■ Strong security model■ Automatic survivability of file system access for replicated files■ Global filespace naming | <ul style="list-style-type: none">■ Drawbacks of AFS<ul style="list-style-type: none">■ Invasive install■ Complexity of back end server functions■ Authentication issues with applications |
|---|--|



Versions of AFS

- CMU
- Transarc/IBM
- University of Michigan (OS/390)
- OpenAFS
- ARLA/milko



OpenAFS

- Kernel interface module
- Client/server
- Very, very OLD code
- Deep ties to internal kernel structures
- Probably a bad choice for a port, but we didn't know it at the time...8-)



OpenAFS

- Compile Modules
 - Debug SuSE non-export of kernel memcpy function.
 - make takes literally hours to process due to ancient dependency checking.
 - Dealing with:

```
/* This code will be removed in the rewrite in 1989 */
```

in many, many places...



OpenAFS

- Compile Modules
 - Linux pthreads implementation incompatible with CMU pthreads.
 - Assumption of int = char representation.
 - '1' and x'00001' are NOT identical on S/390 (fixing improper casting of pointer)
 - Fencepost errors in buffer management



OpenAFS

- Compile Modules
 - Interface to setjmp() internal task buffer organized very differently on S/390 than other platforms
 - Implementation of context switch assembler routines (Linux assembler is NOT OS linkage compliant).



Where Do You Get It?

- Current 1.04 code is available at:
 - www.openafs.org
 - oss.software.ibm.com/developerworks/openafs
- Patches for S/390 and performance improvements (pre-1.04):
 - www.sinenomine.net/downloads



Where Do You Get It?

- Documentation files are available from IBM's developer site (oss.software.ibm.com).
- READ THE DOCUMENTATION.
- READ THE DOCUMENTATION.



Planning an AFS Install

- To practically implement AFS, you need a minimum of two machines (server and client)
- In production, plan to separate all AFS functions onto separate machines (see next slide)



AFS Roles and Processes

- Five major roles in an AFS cell:
 - System control server
 - Database server
 - Binary distribution server
 - File/volume server
 - Client system



Planning an AFS Install

- Before installing any machines in these roles, plan the location and distribution of your data.
 - File server machines on all major segments of network is recommended



Planning an AFS Install: File Servers

- Build system for I/O performance
- RAID desirable but not necessary
- Large RAM desirable (256M or greater)
- Network performance is critical.
- Separate partition for AFS data
- Plan to dedicate at least one file server to each major group of users



Planning an AFS Install: Database Servers

- RAID with snapshot capability recommended here.
- Multiple channel RAID recommended
- Maximum RAM possible.
- First DB server installed should have the lowest IP address available (saves MANY updates)



Planning an AFS Install: System Control and Binary Distribution

- Often combined with first database server
- Replicate on all DB servers (18M of disk isn't much to give for enhanced reliability)



Setting Up AFS

- Before you start:
 - Read the Quick Start guide completely. Some things you CAN'T back out of.
 - Ensure you have plenty of time to build the AFS code. Directions:
 - www.sinenomine.net/downloads



AFS and Kerberos

- Note that the internal Kerberos implementation in AFS is not mainstream Kerberos 4
- Docs in progress to describe minor adaptations to use mainstream K4 and K5 implementations



Adapting Applications for AFS

- Applications in the AFS environment need to handle some differences in these issues:
 - Authentication
 - Access Control List Management API
 - Ticket Expiration (new)



Adapting Applications for AFS

- Required for any application using common userid/password
- See AFS Administrator Guide appendix for details of code changes



Adapting Applications for AFS

- Ticket Expiration
 - New problem – AFS/Kerberos tickets expire
 - Long running applications need to cope with renewing authentication periodically



