NSS File System on Linux

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Agenda

- Linux Storage Overview
- Novell File System on Linux
- Running NSS on Linux
- File Protocols on Linux
- NetStorage single Web view
- Q&A

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Linux Storage Overview

Linux Storage Architecture

Linux File System Design Goals

- Multiple hardware devices - provide access to many different hardware devices
- Multiple logical file systems - support many different logical file systems
- Multiple executable formats - support several different executable file formats (like a.out, ELF, java)
- Homogeneity - present a common interface to all of the logical file systems and all hardware devices
- Performance - provide high-speed access to files
- Safety - do not lose or corrupt data
- Security - restrict user access to access files; restrict user total file size with quotas

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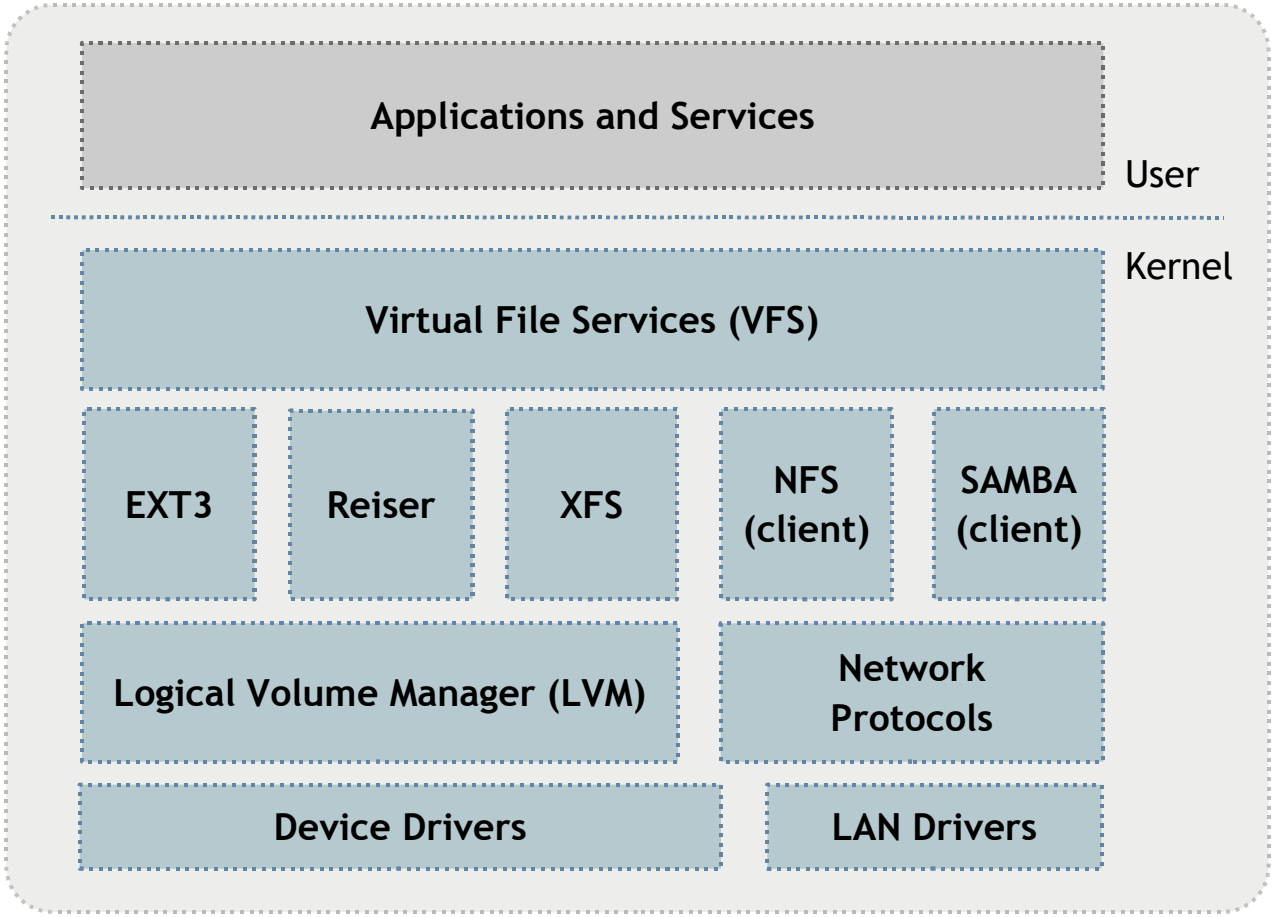
Linux Architecture



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Linux File Systems

Linux File Systems

- All are POSIX semantics compliant
  - Case Sensitive
  - Single data stream
  - Unix namespace (only)
  - Simple access controls
    - Read, Write, and eXecute for Owner, Group, and World
- All Compete
  - Performance
  - Scalability

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Why So Many?

- EXT2
- EXT3
- Reiser
- XFS
- JFS
- UFS
- Veritas
- GFS
- GPFS
- PolyServe

etc.

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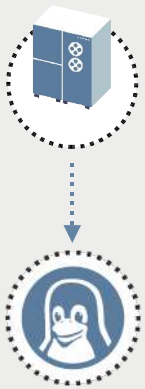
1- Backward Compatibility

Migration from UNIX

- Mount UNIX Data Directly
  - Support same disk format as UNIX data
  - Direct Mount
  - No data copy
- Same or Similar Management Tools
  - Familiar interfaces
  - Familiar functions
  - Little to no retraining required

Examples

JFS, XFS, UFS, Veritas, EXTx, Reiser



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2- Performance & Scalability

Performance

- Fast File System
  - "Speed Wars"
  - Speed with large data sets

Scalability

- Parallel File System
  - Lots of throughput for large HPC Clusters
  - Large Databases
- Millions of Files
  - Lots of files in a subdirectory

Examples

PolyServe, Lustre, CVxFS, GFS, GPFS

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Novell File System on Linux

Novell Storage Services (NSS)

Novell File System

- Designed for Shared File Serving
  - The PC LAN File System for Workgroup collaboration
  - 20 Years of features
- Novell Traditional FS
  - NetWare® 2.x-4.x
  - Feature rich workhorse
    - But not scalable to 100 Gigabyte systems
- NSS File System
  - Introduced in NetWare 5
  - Scalable, Journal based File System

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NSS is not just “another” file system!

Rich Features in NSS

- Security
  - Visibility Feature
- Access Control
  - Trustee Model
  - Rich and Granular
- Manageability
  - Trustees as opposed to Access Control Lists
  - Inheritance
- Heterogeneous Client Support
  - Multiple simultaneous namespace
  - Rich File and Directory Attributes

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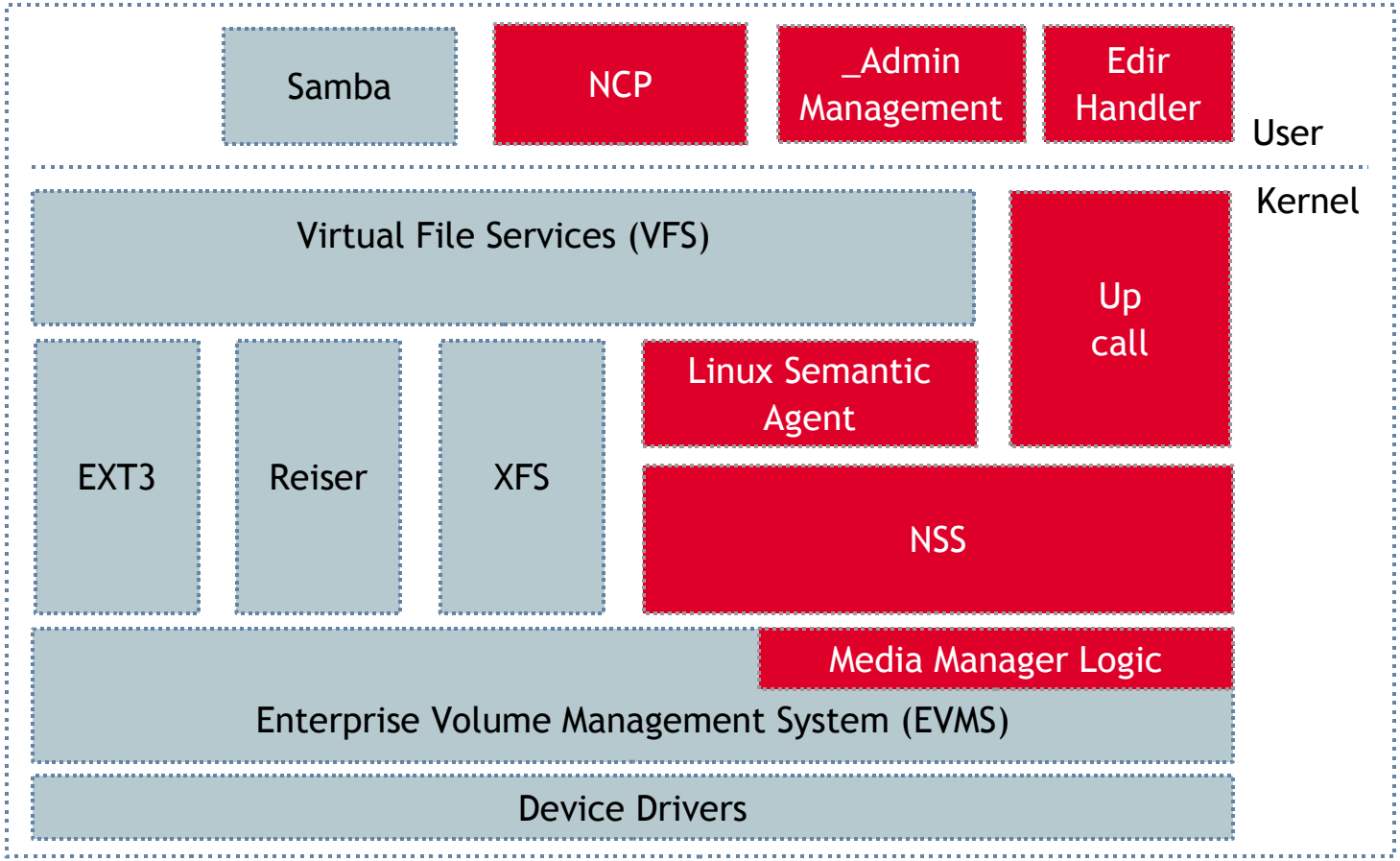
NSS on Linux Architecture



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NSS is Unique

NSS is Unique compared to all others

- Backlink is fundamental (the zNode)
  - Filename is an attribute of the file
  - Children know their parents
- *This is key to the unique features in NSS*

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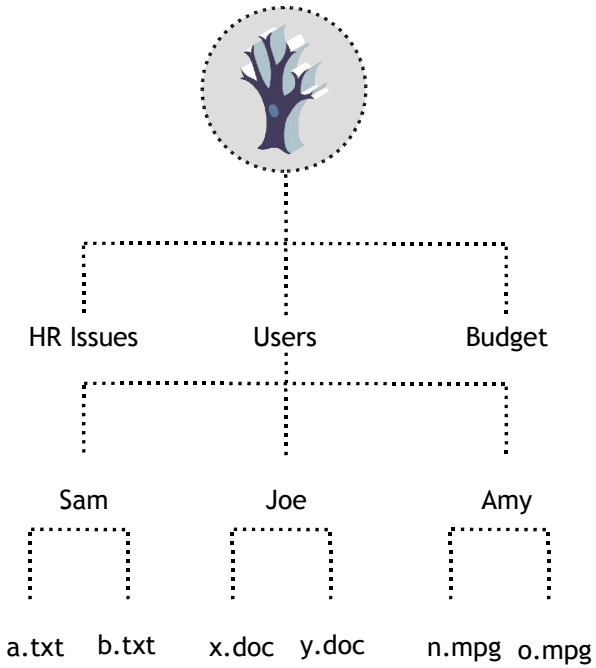
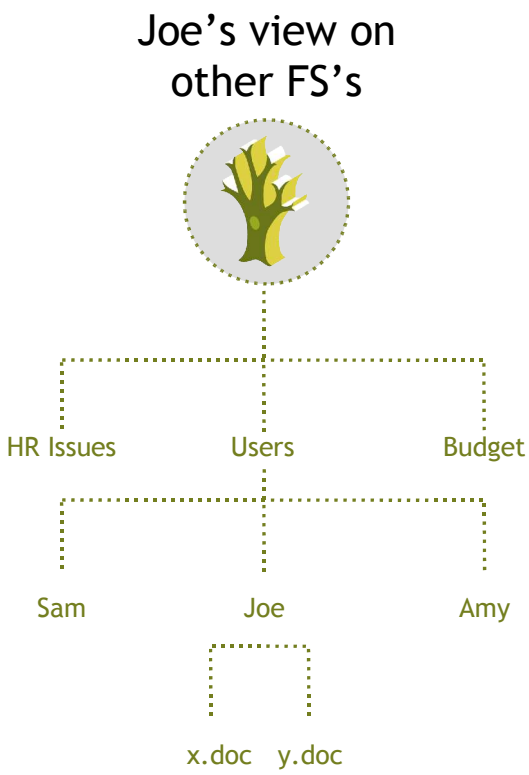
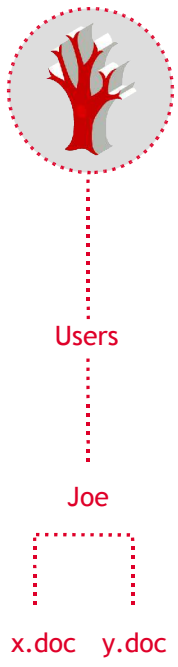
Unique NSS Features—Visibility







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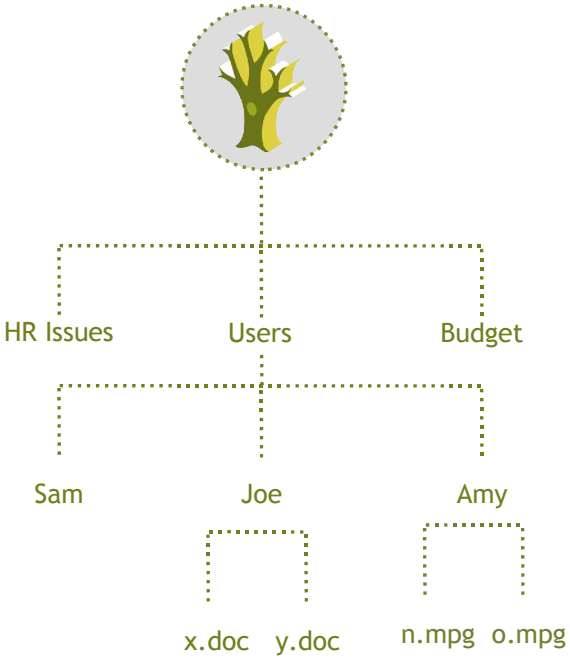
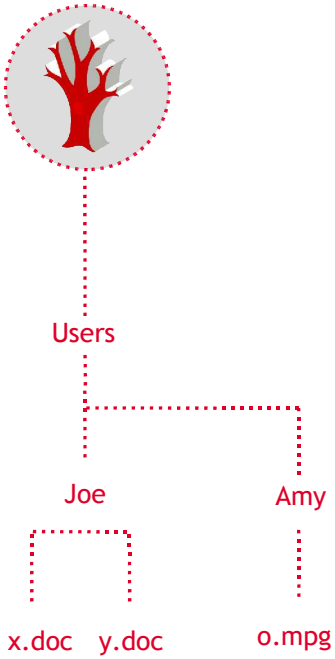
Visibility—Continued

Amy wants Joe to see o.mpg

Joe's view on other FS's



Joe's view on NSS



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Value of NSS Visibility

Security

- Users only see what they are supposed to
  - Consolidate file systems
  - Easily share what needs to be shared
    - Avoid security breeches

Simple Management

- Predictable management
  - No need for a “share per user”
  - Less time & effort needed

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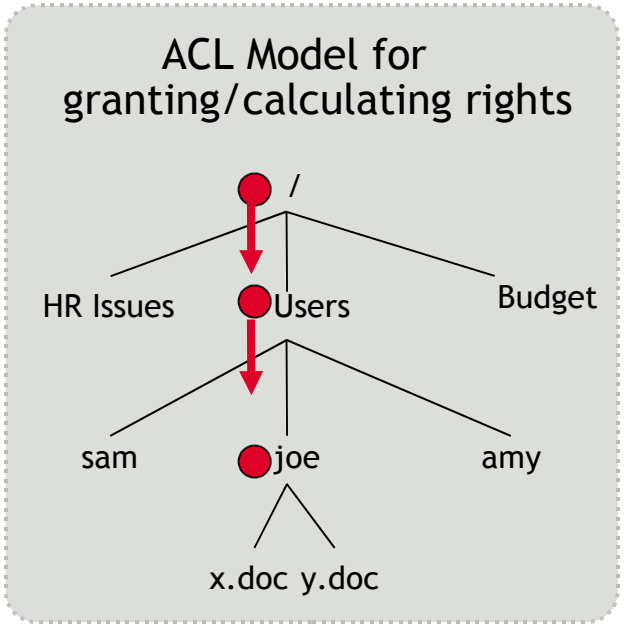
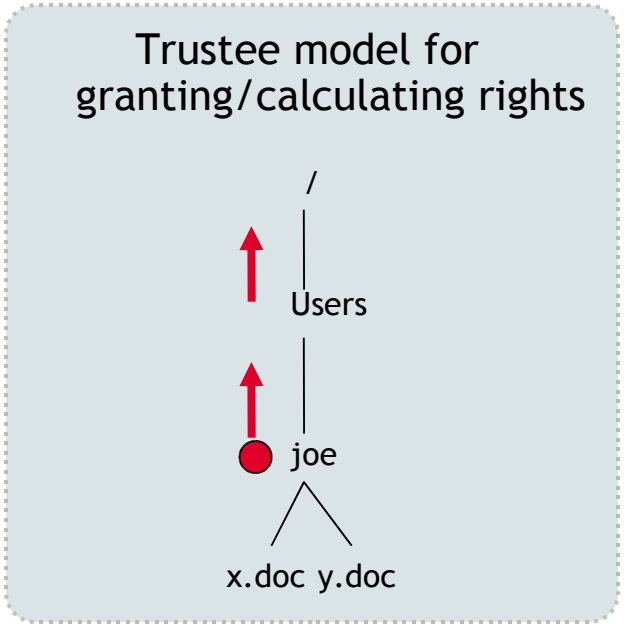
Rights Calculation

In other FS's, admin must stamp each directory in the path to Joe's home directory. In NSS, only need to stamp trustee on Joe's home directory.





Multiple Trustees can be assigned all with different rights

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Value of Trustee Model

Simple Management

- Automatic and quick
  - Only one trustee needed, not whole path
  - Less time spent managing access
- Manage changing organizations
  - Easy to maintain changing access needs
  - Avoids security mistakes

Flexibility

- Many Trustees
  - Different users/groups with different rights to a directory/file
  - Simple/quick to add, remove or change

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Unique NSS Features—Access Control

NSS - Trustee Rights	Linux/UNIX - ACLs
Supervisor (grant rights to others)	Set UID (advanced)
Read	Read
Write	Write
Create	-
Erase	-
Modify (change file attributes)	-
FileScan (view)	-
Access Control (change rights)	-

Note: in NSS, X (execute) is a file attribute, not a right.

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Value of Trustee Rights

Granular Management

- More options
  - Grant access to only exactly what is needed
- Support heterogeneous clients
  - Supports Windows rights model
    - Windows NTFS rights is a derivative of NetWare® 2.x rights model
  - Supports Macintosh rights model

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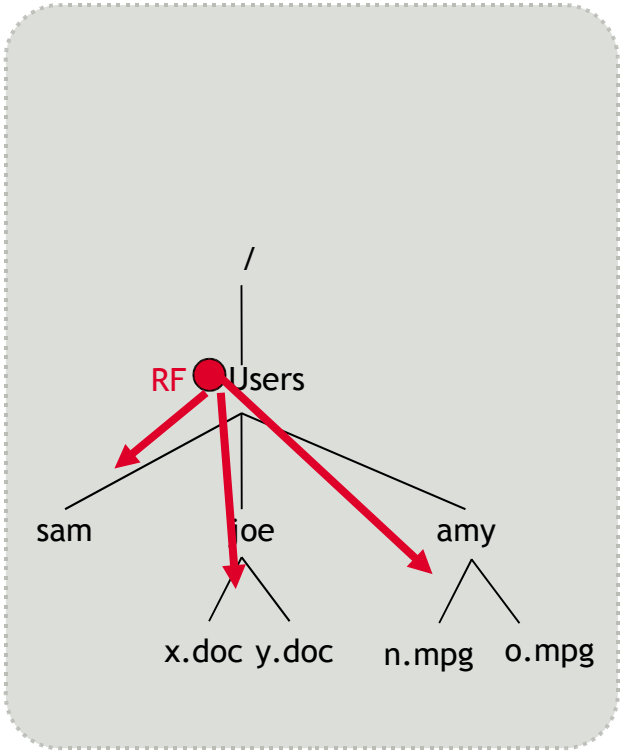
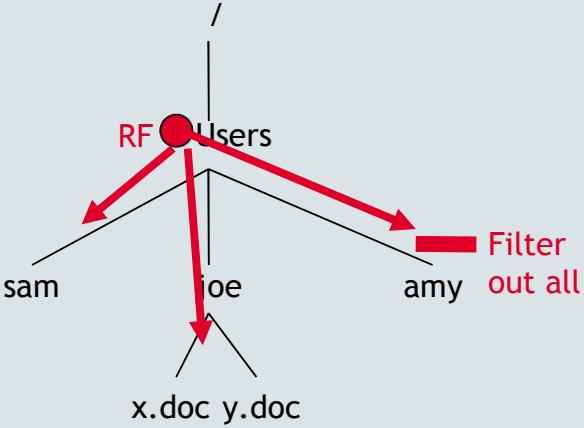
Unique NSS Features—Inheritance

Trustee rights granted flow down directory tree unless filtered. Simplifies management.



Filtering out all (or subset inherited rights at “amy”



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Value of Inheritance & IRF

Simplifies Management

- Inheritance automatically gives rights down
  - No need to explicitly stamp ACLs down a directory tree.
  - Subdirectories created inherit specific from above, not a global UMASK value.
    - More deterministic

Inherited Rights Filters

- Fine Grained control when needed
  - Block inherited rights to hide just one subdirectory tree
    - Example: A staging directory

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Unique NSS Features—Rich Attributes

Novell Storage Services - File Attribute Utility

NetWare Information | NetWare Rights | Effective Rights | Extended Attributes / Data Streams | Users

Location: data:rjones\IO105_EUR.ppt
Size: 421 KB
Size On Disk: 424 KB
Server Name: rush.provo.novell.com

Created: 12/17/2003 03:46:51 AM Change...
Accessed: 06/11/2004 12:22:50 PM Change...
Modified: 12/17/2003 03:46:51 AM Change...
Meta Data Modified: 11/16/2004 06:35:45 AM Change...
Archived: Never Change...

Creator: .CN=rjones.O=dev.T=RUSHTREE. Look Up...
Archiver: Unknown User Look Up...
Modifier: .CN=rjones.O=dev.T=RUSHTREE. Look Up...
Meta Data Modifier: .[Supervisor]. Look Up...

Attributes

☐ Read Only	☐ No Sub Allocation	☐ Admin Link	☐ Do Not Compress
☐ Hidden	☐ Transactional	☐ Link	☐ Compress Immediate
☐ System	☐ Not Virtual	☐ Remote Data Access	☐ Data Stream Compress
☐ Execute	☐ Purge Immediate	☐ Remote Data Inhibit	☐ No Stream Compress
☑ Archive	☐ Rename Inhibit	☐ Shareable	☐ Copy Inhibit
☑ Meta Data Archive	☐ Delete Inhibit	☐ Sub Directory	☐ Volatile - No Op Locks

Refresh | Apply | Browse... | Exit

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Unique NSS Features—Name Space

Rich Name Space Types

- Multiple data streams per file (full Windows & Mac support)
- 4 simultaneous name spaces
  - UNIX (case sensitive)
  - 8.3 DOS (case insensitive)
  - Windows Long (case insensitive)
  - Macintosh (case insensitive)

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Unique NSS Features
–Directory Restrictions

Directory Space restrictions

- Limit the amount of space a given directory and its subdirectories can consume
- *Not offered in other file systems*

User Space restrictions

- Limit the amount of space a given user can consume on a volume
- Like other file systems

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Unique NSS Features—Salvage

Salvage

- Implemented in the file system - available to all services.
  - Unlike GUI Trash can which is only implemented in the GUI system (eg: Windows Explorer)
- If a program, virus, or terminal session (command prompt) deletes a file, it can be recovered!

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Unique NSS Features—File Events

Event File List

- Tracks and logs changes to files and their metadata
  - For application developers
- Enables Novell Archive and Versioning Server
- Key technology for Information Lifecycle Management Applications

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Unique NSS Features
—Directory Integration

Rich multi-user managability/security – tied into Novell eDirectory™

- Novell eDirectory GUIDs used for Trustees
- Enterprise wide identity management

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Unique NSS Features—Confidentiality

Data Shredding

(meets US government requirements)

- Configurable up to seven passes of different byte patterns
- Feature built into file system, not an add-on

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Value Summary

Secure, Rich, Managable Shared-File System

- The best choice for PC File Serving/sharing
  - Designed to manage volumes accessed by thousands of users
  - Unsurpassed Security: Users only see what they are supposed to see
  - Easy/quick to modify access rights
- Compatibility
  - Full semantic support for a wide range of client and server OSes.
  - Rich metadata capabilities: Superset of all other systems.

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Will Novell support NSS Only?

No.

Pick the right tool for the right job:

- Choose the workload!
  - For clustered database: Pick a good clustered Linux FS like Polyserve
    - SEE TUT293
  - For simple database: Pick default Linux FS like Reiser or EXT3
    - SEE TUT106
  - For Shared User data: Pick NSS
  - For HPC: Pick Lustre
- Also look at staff training/familiarity
  - For Mainframe Data migration: Pick VxFS (Veritas) or JFS (IBM) based on existing data format & training on Unix systems

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Running NSS on Linux

For the NetWare Savvy

Familiar tools and commands

NSS Management Utility (NSSMU)

- /opt/novell/nss/sbin/nssmu
- Same look and feel as on NetWare
- Note: Create partitions through the “Pools” menu
  - Use evmsgui for advanced partition management

NSS Console (NSSCON)

- /opt/novell/nss/sbin/nsscon
- The NSS set parameters and functions of the NetWare Console

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For the NetWare Savvy—Continued

Familiar tools and commands

NSS Start-up Parameters

- /opt/novell/nss/conf/nssstart.cfg
- The Start-up Parameters for NSS (can cut and past from NetWare)

Rights Utility

- /opt/novell/nss/sbin/rights
- View, modify and set Trustee rights from commandline/script

Attributes Utility

- /opt/novell/nss/sbin/attrib
- View, modify and set NSS Attributes from commandline/script

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For the Linux Savvy

Familiar tools and commands

mkfs

- Standard Linux create file system command
- mkfs –t nsspool –n <poolname> <device>
- mkfs –t nssvol –n <volumename> <pool>
- Note: NSS volumes created using mkfs cannot be mounted by NetWare Servers (they are in Linux partitions, not NetWare partitions)

mount

- mount –t nsspool <mountpoint> <device> -o name = <poolname>,[shared]
- mount –t nssvol <mountpoint> <poolname> -o name=<volumename>,[ns= unix, long, mac, or dos]

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For the Linux Savvy—continued

Familiar tools and commands

Cd, ls, chmod, etc.

- Standard Linux shell commands
- Note: chmod only works with POSIX rights, use rights command for Trustee management

EVMS (Enterprise Volume Management System)

- evmsgui
- Volume Manager to manage NetWare partitions and containers that were created by NetWare

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NSS on Linux – Single Disk Servers

Issues with single disk device machines

Use only for demo machines which have 1 disk only

- EVMS is required to manage NSS partitions
- So must install OES Linux using EVMS
  - Procedure in the documentation
    - For experts only

Recommend a SAN, with NSS on its own LUNs

- Simplifies installation & management
- Install OS using default volume manager

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Backup NSS

SMS & TSA

- Same as on NetWare, full metadata support
- Compatible backups

Future

- Open Source SMS
- Standards based
- Specific features/functions for backup
- Features for Information Lifecycle Management
  - Event tracking
- Focused on higher level applications
  - Granular data types
    - Database records
  - Data associations preserved
    - Emails in a mail box

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Backup Vendors

Backup Vendor support pledged at Novell Open Enterprise Server Ship

- CommVault
- BakBone

Backup Vendor support pledged in Q1 of Novell Open Enterprise Server Ship

- SyncSort
- Veritas

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Virus Scanning Vendors

Virus Scanning Vendor support pledged at Novell Open Enterprise Server Ship

- Trend Micro
- Computer Associates

Virus Scanning Vendor support pledged in one quarter of Novell Open Enterprise Server Ship date

- McAfee

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File System Factory

FSF for policy based automated Storage Management

- Automate storage Provisioning & Deprovisioning
- Storage follows users/groups
- Load balance home directories automatically

FSF Brainshare Sessions

- BUS145
- TUT348

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Futures

Future Directions

64-bit native execution

- Opteron, EM64T CPUs native

Tighter semantic integration with Protocols

- Samba, NFS v4, NetAtalk

Exabyte volumes

- NSS current volume size limit is 8 TB

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File Protocols on Linux

SAMBA

SAMBA = Open Source Windows Networking Protocols

- CIFS plus Domain Controller emulation
  - Native File Access for Windows using Open Source

Samba v3 initially, with Authentication via eDirectory

- Primary Domain Controller to Windows Clients.
  - eDirectory as the Identity management base

Map to NSS through POSIX Initially

- Lack file system management via CIFS verbs
  - Must use NetStorage to manage FS trustees
- Do benefit from NSS inheritance and Visibility

Samba configuration parameters managed by eDirectory

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SAMBA v4

Samba v4 enhancements

- Defined interface between protocol and file system
  - Will be able to plug into semantically rich file system
  - Novell will integrate into NSS for richness directly to the Protocol.
- Improved AD Protocol support
  - Hooked into eDirectory

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NFS

Open Source NFS v2 & v3 today

- Hooking authentication into eDir Kerberos KDC

NFS v4 in the future

- OSS currently working on NFS v4
- Hooked into eDir Kerberos KDC
- Authentication system enterprise wide
- Not on NetWare Kernel.

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NCP

Novell NetWare Core Protocol

- For NetWare Client Workstations
  - Latest Win 9x (v3.40)
  - Win NT/2k/XP (v4.83, 4.9x)
- NDSRSA authentication
- SYS Volume support
  - /usr/novell/sys public and login files
- TCP/IP only
- Can work with file systems other than NSS in degraded mode

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Apple Filing Protocol

NetATalk

- Download from Open Source
- Future Authentication hooked to eDir (older 2 way and newer Kerberos)
- Officially supported in future OES release

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FTP

Standard FTP OSS of Linux

- Authentication hooked into eDirectory
  - via LUM/PAM

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NetStorage Single Web View

NetStorage Overview

Features

HTML View

- Virtual Office
- Direct URL
- Copy/Delete/Rename/New
- Upload/Download
- Properties/Trustees
- File Version/Archive

WebDAV

- Windows & internet Explorer
- Konquor

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NetStorage Features

Copy, Move, Rename, Delete, New Folder

Download

- Edit
- View

UpLoad

Properties

- File Attributes
- NetWare Trustees
- UNIX/Linux ACLs

Archive

- View file versions
- Restore a version

WebDAV

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Storage Locations

For non Novell Open Enterprise Server, non-loginscript storage

- Windows Servers
- UNIX/Linux servers
- Other

Storage from different sources and platforms aggregated into a single Web view

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Home Directory

Novell eDirectory Home Directory attribute

- Shows Home Directory in view

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Mapped Drives

Executes NetWare Login Script

- Displays all resources that would be mapped as drives by the login script on a Novell Client.
- Does not execute ALL Login Script logic
  - Does handle conditionals that don't depend on environment variables
    - Group membership, time, date
  - Does not handle program execution

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Novell iFolder

Shows files in users iFolder

- Must supply passphrase to decrypt

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NetStorage Value

Web interface

- Securely access files from any browser/platform
- Internet access from anywhere/any machine

Single view to all storage

- Files from OES, Windows, Linux, iFolder, etc.
- Reduce searching

Management

- Manage trustee rights, POSIX ACLs
- Recover deleted files
- Retrieve file versions
  - Archive and Versioning server

From any platform!

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Questions and Answers

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