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The Evolution of the NFS Protocol:

NFSv4, NFSv4.1, NFSv4.2, Secure NFS

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NFS Version 4.0

- NFS version 3 most used! Why Change it???
 - Performance!
- Version 4 is now the default protocol version for RHEL6
- Its all Legal!
 - IETF: RFC3530: <http://tools.ietf.org/html/rfc3530>



NFS Version 4.0 – Noteworthy Features

- Version 4 is a Stateful Protocol.
 - Delegations
- Mandated Security
- Referrals
- Firewall Friendly (kinda!)

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NFS version 4 – Gotchas!

- “All My files are owned by NOBODY!!!”
 - Idmapping: steved@redhat.com ==> 3606
 - DNS problem 90% of the time
 - 'Domain=' in /etc/idmapd.conf
- Mounting Legacy servers.
 - Mount negotiation start at v4
 - For Legacy server use **/etc/nfsmount.conf** mount negotiation



NFS version 4 – More Gotchas!

- Microsoft 2012 Servers
 - No version 4.0 support Only v4.1,v3,v2
 - mount -o minorversion=1
 - RHEL6.4 & RHEL Z-streams



NFS version 4.1

- Sessions
 - Session IDs
- Parallel NFS (pNFS)
 - File Layout (NAS environment) - Netapp
 - Block Layout (SAN environment) - EMC
 - Object Layout (High Perf environment) – Panasas
- IETF: RFC5661
 - <http://tools.ietf.org/html/rfc5661>



NFS version 4.1 In RHEL

- RHEL6 Client
 - Tech Preview in 6.2
 - pNFS: File layouts only
- RHEL7 Client
 - All layouts supported.



NFS version 4.1 In RHEL

- RHEL7 4.1 Sever
 - No pNFS support
 - Firewall Friendly Callbacks
 - Exactly Once Semantics (sessions)



NFS version 4.1 – Make it work!

- Enabling 4.1/pNFS on the client
 - `mount -o minorversion=1`
- Does the server support pNFS
 - `nfs4filelayout_init: NFSv4 File Layout Driver Registering..`
 - “`pnfs=<layout>`” in `/proc/self/mountstats`



NFS version 4.2

- Labeled NFS
 - Security contexts
- Server to Server Copy
 - offload to server copy operation
- Sparse Files

- IETF: Internet-Draft
 - <http://tools.ietf.org/html/draft-ietf-nfsv4-minorversion2-11>



Federated File System (FedFS)

- Constructs File Namespaces Across Servers
 - With V4 Referrals
 - File Set location stored in LDAP
 - Admin interface used RPC
 - Root of global name space found via DNS



Federated File System (FedFS)

- Global Names
 - /Protocol/Fedfs-domain/Directory/file
EX: /nfs4/redhat.com/home/steved/.bashrc
 - SMB/CIFS Globally Useful Names support (TBD)



Federated File System (FedFS)

- Manage NFS namespace with Referrals
 - [http://wiki.linux-nfs.org/wiki/index.php/ FedFsUtilsProject](http://wiki.linux-nfs.org/wiki/index.php/FedFsUtilsProject)
- Home Page:
 - <http://wiki.linux-nfs.org/wiki/index.php/FedFsUtilsProject>
 - 0.8.0 is early alpha, just for testers
 -
- Fedfs-utils (in Fedora 17)
 - <http://fedoraproject.org/wiki/Features/FedFS>



Clustered Linux Server

- Clusterizing Delegations
- Cluster Coherent Locking
- Failover
 - Per-export Failover
 - Active/Active NFSv4
- NFS/SAMBA exporting the same data



Secure NFS

- #1 Issue! Kerberos Tickets Expiring
 - Renew renewable tickets
 - Renew an expired tickets
- Kkrenow - Renew a Kerberos v5 ticket
- Identity-Policy-Audit (IPA)



Secure NFS – krenew HOWTO

- `yum install --enablerepo=epel kstart`
 - Extra Packages for Enterprise Linux (EPEL)
 - http://fedoraproject.org/wiki/EPEL/FAQ#Using_EPEL
- Get a Renewable Kerberos Ticket
 - `kinit -r 10d`
- Wake up every ten mins and renew the ticket if needed
 - `krenew -K 10 -t`
- See `krenew(1)` for more examples.



Secure NFS – IPA Server

- Install package
 - `yum install ipa-server`
- Install server bits
 - `ipa-server-install`
- All configuration is done with 'admin' ticket
 - `kinit admin`
- Create 'nfs' keytab principles
 - `ipa-getkeytab -k /etc/krb5.keytab -s <ipserver> -p nfs/`hostname`@REDHAT.COM`



Secure NFS – IPA Server

- Start Secure NFS server
 - `SECURE_NFS="yes"` in `/etc/sysconfig/nfs`
 - `service nfs start`
- Add users
 - `ipa user-add ksteved`
 - `ipa passwd ksteved`



Secure NFS – IPA client

- Install package
 - yum install ipa-client
- Install client bits
 - Ipa-client-install
- Start Secure NFS GSS deamon
 - SECURE_NFS="yes" in /etc/sysconfig/nfs
 - service rpcgssd start
- Secure mount are now possible!!!



Secure NFS – IPA client

- Enable sssd pam & Create Home dirs
 - `authconfig --update --enablesssd --enablesssdauth --enablemkhomedir`
- `service sshd restart`
- `ssh ksteved@ipa-client.com`



Secure NFS – IPA client

- Have SSSD renew the Tickets (see man sssd-krb5)
 - auth_provider = krb5
 - krb5_server = 192.168.1.1
 - krb5_realm = EXAMPLE.COM
 - krb5_renewable_lifetime = 50d
 - krb5_renew_interval = 3600
- service sssd restart



Questions

- Past Summit Talks
 - <http://people.redhat.com/steved/Summits/>
Debugging tips/tools/Scenarios, Trace Point examples, Metric Tools, Security and FSCache HOWTO...
- NFSv4.1 new features: Sessions, Parallel NFS (pNFS)
 - <http://www.iaps.com/nfsv4.1-new-features.html>
- Parallel NFS (pNFS)
 - <http://www.pnfs.com/>



Resources

- Visit the Red Hat Customer Portal for content
- Visit storage alley and meet the core architects!
- Talks
 - Wed 10:40 - *A Deep Dive into Red Hat Storage*
 - Wed 2:30 – *Distributed File System Choices*
 - Wed 4:50 & Thurs 1:20 – *GlusterFS Overview*
 - Thurs 10:40 – *Introduction to Red Hat Storage*
 - **Thurs 4:30 - The Future of NFS: pNFS (Campground)**
 - Thurs 4:50 – *Red Hat Storage Roadmap & Futures*
 - Fri 9:45 – *Red Hat Storage Performance*

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Stay connected through the Red Hat Customer Portal

Red Hat Enterprise Linux 6 – Choosing the Right File System for Your Enterprise



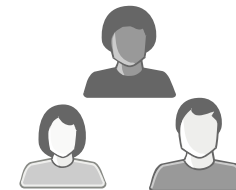
Watch video

Deploying Highly Available NFS on Red Hat Enterprise Linux 6



Read Ref Arch

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