

NFSv4 Test Matrix – 1.13

This spreadsheet summarizes testing efforts for NFSv4, and identify testing gaps.

Email nfsv4@linux-nfs.org with feedback or to take ownership of a task.

If you are doing NFSv4 testing, please let us know!

The matrix is divided into five categories, each on its own page in this spreadsheet.

Category

<i>Functional</i>	Ability to do what it's supposed to do. Standards compliance, regression, compatibility, static code analysis, etc.
<i>Interop</i>	Ability to work with other versions of nfs, other operating systems and other software/filesystems/etc. generally associated with NFS
<i>Robustness</i>	Remains stable and recovers even in extreme situations Stability, interoperability, error recovery, race conditions, etc.
<i>Performance</i>	Able to perform well under real and theoretical workloads Load, stress, destruction, scalability, etc.
<i>Security</i>	Resistant to being compromised and difficult to attack

Status Summary

Definitions

<i>New</i>	An owner has not been identified for the item and work has not started on it
<i>Open</i>	The task has been adopted, but either has not been started, or progress is not yet known
<i>In Progress</i>	Some work has been completed on the task
<i>Near Done</i>	The principle essence of the task has been finished, but there are some loose ends left
<i>Done</i>	The task has been fully completed

	New	Open	In Progress	Near Done	Done
Functional Testing					
<i>Current</i>	100	30	1	1	4
06/13/05	100	30	1	1	4
06/06/05	104	26	1	1	4
05/30/05	104	26	1	1	4
05/23/05	104	26	1	1	4
05/16/05	104	26	1	1	4
05/09/05	104	26	1	1	3
05/02/05	102	26	1	1	3
04/25/05	102	26	1	1	3
04/18/05	102	26	1	1	3
04/11/05	102	26	1	1	3
04/04/05	121	7	1	1	3
03/28/05	121	7	1	1	3
03/21/05	121	6	1	1	3
03/14/05	117	6	1	0	0
03/07/05	115	6	1	0	0
02/28/05	115	6	1	0	0
02/21/05	115	6	1	0	0

Intro

02/14/05	73	5	1	0	0
02/07/05	74	4	1	0	0
01/31/05	58	4	1	0	0
01/24/05	62	4	1	0	0
01/17/05	62	4	1	0	0
01/10/05	55	4	1	0	0
01/03/05	60	0	0	0	0

Interoperability Testing

<i>Current</i>	55	12	0	0	1
06/13/05	55	12	0	0	1
06/06/05	55	12	0	0	1
05/30/05	55	12	0	0	1
05/23/05	55	12	0	0	1
05/16/05	55	12	0	0	1
05/09/05	55	12	0	0	1
05/02/05	55	12	0	0	1
04/25/05	55	12	0	0	1
04/18/05	55	12	0	0	1
04/11/05	55	12	0	0	1
04/04/05	59	8	0	0	1
03/28/05	59	8	0	0	1
03/21/05	59	8	0	0	1
03/14/05	9	6	0	0	1
03/07/05	4	6	0	0	1
02/28/05	4	6	0	0	1
02/21/05	4	6	0	0	1
02/14/05	4	6	0	0	1
02/07/05	4	6	0	0	1
01/31/05	4	6	0	0	1
01/24/05	4	6	0	0	1

Robustness Testing

<i>Current</i>	29	6	1	2	6
06/13/05	29	6	1	2	6
06/06/05	37	4	1	0	0
05/30/05	37	4	1	0	0
05/23/05	37	4	1	0	0
05/16/05	37	4	1	0	0
05/09/05	37	4	1	0	0
05/02/05	37	4	1	0	0
04/25/05	37	4	1	0	0
04/18/05	37	4	1	0	0
04/11/05	37	4	1	0	0
04/04/05	37	4	1	0	0
03/28/05	37	4	1	0	0
03/21/05	40	1	1	0	0
03/14/05	40	1	1	0	0
03/07/05	40	1	1	0	0
02/28/05	40	1	1	0	0
02/21/05	40	1	1	0	0
02/14/05	39	1	1	0	0

Intro

02/07/05	39	1	1	0	0
01/31/05	36	1	1	0	0
01/24/05	36	1	1	0	0
01/17/05	40	7	1	0	1
01/10/05	30	7	1	0	0
01/03/05	38	0	0	0	0

Performance Testing

<i>Current</i>	33	10	3	0	1
06/13/05	33	10	3	0	1
06/06/05	33	10	3	0	1
05/30/05	33	10	3	0	1
05/23/05	33	10	3	0	1
05/16/05	33	10	3	0	1
05/09/05	33	11	4	0	1
05/02/05	33	11	4	0	1
04/25/05	33	11	4	0	1
04/18/05	33	11	4	0	1
04/11/05	33	11	4	0	1
04/04/05	31	11	4	0	1
03/28/05	25	2	1	0	6
03/21/05	25	2	1	0	6
03/14/05	25	2	1	0	6
03/07/05	25	2	1	0	6
02/28/05	25	2	1	0	6
02/21/05	25	2	1	0	6
02/14/05	25	2	1	0	6
02/07/05	25	2	1	0	6
01/31/05	21	2	1	0	6
01/24/05	21	2	1	0	6
01/17/05	21	2	1	0	6
01/10/05	12	0	0	0	0
01/03/05	12	0	0	0	0

Security Testing

<i>Current</i>	28	4	0	0	1
06/13/05	28	4	0	0	1
06/06/05	28	4	0	0	1
05/30/05	28	4	0	0	1
05/23/05	28	4	0	0	1
05/16/05	28	4	0	0	1
05/09/05	29	3	0	0	1
05/02/05	24	3	0	0	1
04/25/05	25	3	0	0	0
04/18/05	15	3	0	0	0
04/11/05	15	3	0	0	0
04/04/05	15	3	0	0	0
03/28/05	15	3	0	0	0
03/21/05	15	3	0	0	0
03/14/05	15	3	0	0	0
03/07/05	15	3	0	0	0
02/28/05	15	3	0	0	0

Intro

02/21/05	15	3	0	0	0
02/14/05	15	3	0	0	0
02/07/05	15	3	0	0	0
01/31/05	13	3	0	0	0
01/24/05	13	3	0	0	0
01/17/05	13	3	0	0	0
01/10/05	15	0	0	0	0
01/03/05	15	0	0	0	0

Intro

High	Med	Low	
	43	72	22

Intro

33

12

25

32

8

2

Intro

19

26

4

14

9

9

Intro

Functional Testing

PRI	ID	Tools / Tests	Status	Organization	Notes
	I.	FUNCTIONAL TESTING			
	I.A	Standards compliance/conformance verification (server)			
H	I.A.1	Test POSIX conformance	POSIX test suite	New	
L	I.A.2	Test protocol compliance/conformance against NFSv2 spec	Connectathon	New	
H	I.A.3	Test protocol compliance/conformance against NFSv3 spec	Connectathon	New	Quotas
H	I.A.4	Test protocol compliance/conformance against NFSv4 spec (RFC 3530)	Pynfs, POSIX	New	
H	I.A.5	Protocol implementation interoperability between Linux server and client	Connectathon	New	
	I.B	Regression testing			
H	I.B.1	Run applicable existing functionality tests on codebase periodically Cthon04 Newpynfs lozone Fssb	Connectathon,	Open	Bull OSDL Bull has interest in doing regression testing
L	I.B.2	Review common faults reported with NFSv3 and check if they still exist		New	
H	I.B.3	Cross-compile testing for variety of platforms on each NFSv4 patchset	DONE	OSDL	
	I.C	Installability			
H	I.C.1	Test install on Debian unstable of NFSv4 server & client, krb5, ldap, et al	DONE	CITI	
H	I.C.2	Test install on Fedora Core of NFSv4 server & client, krb5, ldap, et al	New		
H	I.C.3	Test install on SuSE of NFSv4 server & client, krb5, ldap, et al	DONE	OSDL	
H	I.C.4	Test install on Gentoo of NFSv4 server & client, krb5, ldap, et al	Near Done	OSDL	
H	I.C.5	Test install on SLES of NFSv4 server & client, krb5, ldap, et al	New		
H	I.C.6	Test install on RHEL of NFSv4 server & client, krb5, ldap, et al	New		
M	I.C.7	Test install on Ubuntu of NFSv4 server & client, krb5, ldap, et al	New		
M	I.C.8	Test install on Mandrake of NFSv4 server & client, krb5, ldap, et al	New		
M	I.C.9	Test install on Turbolinux of NFSv4 server & client, krb5, ldap, et al	New		
H	I.C.10	Test installation of heimdal vs. MIT krb5 implementations	DONE	OSDL+CITI	
	I.D	Integration testing			
M	I.D.1	Verify functional requirements met for NFSv4 server / RPC	New		http://www.eitoolkit.com/tools/implementation/system_integ_test_overview.ppt
M	I.D.2	Verify functional requirements met for NFSv4 server / Transport Switch	New		
M	I.D.3	Verify functional requirements met for NFSv4 server / GSS	New		
M	I.D.4	Verify functional requirements met for NFSv4 server / GSS / Kerberos	New		
M	I.D.5	Verify functional requirements met for NFSv4 server / GSS / SPKM	New		
M	I.D.6	Verify functional requirements met for NFSv4 server / ACLs	New		
M	I.D.7	Verify functional requirements met for NFSv4 client / NFSv4 server	New		
M	I.D.8	Verify functional requirements met for NFSv4 client / GSS	New		
M	I.D.9	Verify functional requirements met for NFSv4 client / GSS / Kerberos	New		
M	I.D.10	Verify functional requirements met for NFSv4 client / GSS / SPKM	New		
M	I.D.11	Verify functional requirements met for NFSv4 client / ACLs	New		
M	I.D.12	Verify functional requirements met for NFSv4 client / mount	New		
M	I.D.13	Verify functional requirements met for NFSv4 client / IDMAP	New		
	I.E	Serviceability			
M	I.E.1	Verify NFSv4 administrative functionality within Webmin	In Progress	Bull	http://nfsv4.bullopensource.org/doc/nfsv4_admin.frs.v03.html Verification has been done by Bull in 2004. Code has been done and delivered. ACL to be studied.
M	I.E.2	Verify NFSv4 debugging functionality within nfsdebug, et al	New		
M	I.E.3	Verify NFSv4 monitoring functionality within nagios	Open	Bull	Verification (and code) will be done by Bull in 2005
M	I.E.4	Verify informativeness of error/trace messages	New		
H	I.E.5	Verify sufficient monitoring functionality within Ethereal Parse delegation callbacks (CB_NULL, CB_RECALL, CB_GETATTR) Parse OPEN reply's with a granted READ or WRITE delegation	New		Unimplemented functionality Unimplemented functionality
M	I.E.6	Verify ability to get detailed state info from service	New		
M	I.E.7	Verify ability to list who has open/locked files (ala lsof)	New		
M	I.E.8	Verify ability to list active mount points and who has them open	New		Showmount?
H	I.E.9	Verify ability to force operations (close files, change states, unmount)	New		e.g. Umount -f
L	I.E.10	Verify ability for global visualization of mounts/locks/traffic (like top/ntop)	New		An SNMP interface?
L	I.E.11	Verify ability to trace NFS activity (like strace)	New		

Functional Testing

M	I.E.12	Verify ability to trace security rules (e.g., why did user X get auth'd)	New	
M	I.E.13	Verify admin access to session encryption key (so can e.g. decode protocol in Ethereal)	New	
I.F				
State transitions				
H	I.F.1	Client notification to server of locking, write, read, etc.	New	
H	I.F.2	Reboot recovery	New	
M	I.F.3	Delegation / delegation callbacks	New	
H	I.F.4	Open with shares / deny	New	
H	I.F.5	Bumping a sequence ID	New	
H	I.F.6	Network partition recovery	New	
M	I.F.7	Sharing file local accessors and remote accessors	New	
	I.F.8	Locking	New	
L		Blocking locks - fair queuing		
H		Non-blocking locks		
L		Mandatory locks		
I.G				
Portability to target architectures/platforms				
M	I.G.1	Test compilation and functionality on UP systems	New	TODO: zSeries?
L	I.G.2	Test compilation and functionality on SMP (2, 4, 8, 16, +) systems	New	
M	I.G.3	Test compilation and functionality on cluster system(s)	New	
L	I.G.4	Test compilation and functionality on IA-32 (2, 4, 8-way systems)	Open	OSDL
H	I.G.5	Test compilation and functionality on IA-64	Open	Bull
L	I.G.6	Test compilation and functionality on PPC-64 with Linux in 32-bit mode	New	Bull planning on contributing this in 2005 (Out of date)
H	I.G.7	Test compilation and functionality on PPC-64	Open	Bull
L	I.G.8	Test compilation and functionality on IA-32e, and if there are differences from IA-32	New	Bull planning on contributing this in 2005
L	I.G.9	Test compilation and functionality on Sparc	New	
I.H				
Ecosystem compatibility				
H	I.H.1	Verify compatibility with glibc	New	
M	I.H.2	Verify compatibility with NLM/NSM and NFSv3 locking	New	
H	I.H.3	Verify compatibility with Kerberos	New	
H	I.H.4	Verify compatibility with Ipsec	New	
H	I.H.5	Verify compatibility with POSIX ACLs	New	
H	I.H.6	Verify compatibility with NFS ACLs	New	
M	I.H.7	Verify compatibility with LDAP	New	
M	I.H.8	Verify compatibility with NIS	New	
H	I.H.9	Verify compatibility with automounter	Open	IBM
	I.H.10	Verify compatibility with pNFS	New	Development work required - leave on TODO list for now
H	I.H.11	Verify compatibility with basic system tools (file utils, core utils, util-linux, mount, sar, iostat)	New	
L	I.H.12	Verify compatibility with Active Directory	New	
M	I.H.13	Verify compatibility with Samba (CIFS Server)	New	
I.I				
Static code analysis				
		Lint, calltree, gcov, fenris, etc.		http://testingfaqs.org/t-static.html
M	I.I.1	Syntax	New	
M	I.I.2	Unreachable code, unconditional branches into loops	New	
M	I.I.3	Undeclared or uninitialized variables	New	
M	I.I.4	Parameter type mismatches	New	
L	I.I.5	Uncalled functions and procedures	New	
L	I.I.6	Non-usage of function results	New	
H	I.I.7	Possible array bound errors	New	
H	I.I.8	Misuse of pointers	New	
M	I.I.9	Sparse testing - random writes to a file as large as local file system	New	
I.J				
Localization/Internationalization testing				
M	I.J.1	Verify multi-character filenames are supported	New	
I.K				
Documentation update verification				
M	I.K.1	Check that web content at nfs.sf.net has updated nfsv4 info	New	
H	I.K.2	Check that NFS HOWTO is updated with sufficient nfsv4 info	New	
M	I.K.3	Check that all NFS man pages are updated with nfsv4 info	New	
H	I.K.4	Check that Network Admin Guide at tldp.org is updated for nfsv4	New	
M	I.K.5	Check that NFS docs for main distros are updated for nfsv4	New	
M	I.K.6	Check that an NFSv4 Security Best Practices document available	New	
H	I.K.7	Check the nfs performance section in howto	Open	Chuck

Functional Testing

M	I.K.8	Make sure section RPCGSS, set up kerberos explanations, etc. exist	New		is in FAQ but not HOWTO
M	I.K.9	List to check system for kerberos config's to make sure it's set up correctly	New		
M	I.K.10	Interoperability considerations - known issues, things to test	New		
M	I.K.11	Ensure there is inline documentation for all nfsv4 client code in kernel	New		
M	I.K.12	Ensure there is inline documentation for all nfsv4 sever code in kernel	New		
	I.L	Network transport protocols compatibility			iSCSI? x25?
H	I.L.1	Test compatibility with TCP protocol	Need to define New		
L	I.L.2	Test compatibility with SCTP protocol	How rpc, rdma,New		Requires the RPC transport switch be implemented first
M	I.L.3	Test compatibility with BIC-TCP protocol	Issues like recNew		Requires the RPC transport switch be implemented first
L	I.L.4	Test compatibility with RDMA/DAPL protocol	Ask Steve for icNew		Requires the RPC transport switch be implemented first
M	I.L.5	Test compatibility with UDP for NFS 2/3 backwards compatibility	Failover works New		
L	I.L.6	Test basic NFS functionality under IPv6	Open	Bull	
L	I.L.7	Test ecosystem under IPv6 (see section I.I)	Open	Bull	
L	I.L.8	Test compatibility with other network transport protocols (see section I.M)	Open	Bull	
L	I.L.9	Test NFSv2/3 with lpv6	Open	Bull	
	I.M	Automounter functionality - amd			amd not actively developed, but required for legacy support
H	I.M.1	Verify functionality of direct map support	Connectathon Open	IBM	
M	I.M.2	Verify functionality of indirect map support	Connectathon Open	IBM	
M	I.M.3	Verify functionality of multimount support, including hierarchical mounts	Connectathon Open	IBM	
M	I.M.4	Verify functionality of nested map support	Connectathon Open	IBM	Not implemented yet
M	I.M.5	Verify functionality of /net (-hosts) support	Connectathon Open	IBM	
M	I.M.6	Verify functionality of browse (ghosting) support	Connectathon Open	IBM	
	I.N	Automounter functionality - autofs4			actively developed; not full featured but is robust
H	I.N.1	Verify functionality of direct map support	Connectathon Open	IBM	
M	I.N.2	Verify functionality of indirect map support	Connectathon Open	IBM	
M	I.N.3	Verify functionality of multimount support, including hierarchical mounts	Connectathon Open	IBM	
M	I.N.4	Verify functionality of nested map support	Connectathon Open	IBM	Not implemented yet
M	I.N.5	Verify functionality of /net (-hosts) support	Connectathon Open	IBM	
M	I.N.6	Verify functionality of browse (ghosting) support	Connectathon Open	IBM	
	I.O	Automounter functionality - autong			actively developed; has good support for newer features
H	I.O.1	Verify functionality of direct map support	Connectathon Open	IBM	
M	I.O.2	Verify functionality of indirect map support	Connectathon Open	IBM	
M	I.O.3	Verify functionality of multimount support, including hierarchical mounts	Connectathon Open	IBM	
M	I.O.4	Verify functionality of nested map support	Connectathon Open	IBM	Not implemented yet
M	I.O.5	Verify functionality of /net (-hosts) support	Connectathon Open	IBM	
M	I.O.6	Verify functionality of browse (ghosting) support	Connectathon Open	IBM	
	I.P	Use Case Scenarios			
H	I.P.1	Database functionality on NFS	Open	OSDL	Netapp may be interested "The Factory"
L	I.P.2	Diskless boot functionality on NFS (going away)	New		
H	I.P.3	Clusters / migration / replication functionality (multiple clients)	New		
M	I.P.4	Functionality on Async I/O interface to file systems on client	New		
H	I.P.5	Web server	New		
M	I.P.6	User filesystem environment	New		
M	I.P.7	Mail spooling	New		
M	I.P.8	Wide area clustering	New		
M	I.P.9	Single client high performance computing	New		
M	I.P.10	Clustering servers to provide higher reliability	New		
	I.Q	ID mapping			
M	I.Q.1	LDAP – ID mapping, authenticating users	New		
L	I.Q.2	NIS	New		
H	I.Q.3	Cross realm mapping	NEED TEST New		

Interop Testing

<u>PRI</u>	<u>ID</u>		<u>Tools / Tests</u>	<u>Status</u>	<u>Notes</u>
	II	INTEROPERABILITY			
	II.A	Interoperability with other protocols			
	II.A.1	Kerberos – verify basic functionality. Mount w/ krb5, etc.			
H		MIT implementation	Open	Bull	Bull plans to do in 2005
M		Heimdal implementation	Open	Bull	Bull plans to do in 2005
L	II.A.2	Active Directory	New		
	II.A.3	IpSec – basic functionality w/ various VPNs, establishment, policies, best pUnknown			
H		IpSec v4	Open	Bull	Bull plans to do in 2005
M		IpSec v6	New		Not clear who will be using it
L		CCM – very new, low priority	New		Very new, low priority
L	II.A.4	SPKM – Interoperability with key management	New		
H	II.A.5	Interoperability of RPCSEC_GSS in general	DONE	CITI	Trond and Bruce have tested this at Connecta
	II.B	Specific architectural/platform interoperability issues			
	II.B.1	Interoperability between 32-bit and 64-bit for client and server			Testing on two platforms will be sufficient
H		Linux IA-32 client – AIX PPC server	Open	Bull	
H		Linux IA-32 client – Linux PPC server	Open	Bull	
L		Linux IA-32 client – Linux AMD server			Optional
L		Linux IA-32 client – Linux IA-64 server			Optional
H	II.B.2	Interoperability between little endian and big endian	Open	Bull	Bull plans to do Linux/AIX 5.3 in 2005
	II.C	Client Interoperability with target architectures/platforms			Need to define how to do interoperability testir
H	II.C.1	Interoperability for Linux IA-32 client – Solaris 10 server	Open	Bull	
H	II.C.2	Interoperability for Linux IA-32 client – NetApp Filer server	New		
H	II.C.3	Interoperability for Linux IA-32 client – EMC Filer server	New		
H	II.C.4	Interoperability for Linux IA-32 client – AIX 5.3 server	Open	Bull	
H	II.C.5	Interoperability for Linux IA-32 client – AMD server	New		
H	II.C.6	Interoperability for Linux IA-32 client – PolyServe clustered products	New		
M	II.C.7	Interoperability for Linux IA-32 client – Hummingbird server	New		
L	II.C.9	Interoperability for Linux IA-32 client – HP server	New		
L	II.C.10	Interoperability for Linux IA-32 client – SGI server	New		
L	II.C.11	Interoperability for Linux IA-32 client – Spinniker server	New		
	II.D	Server Interoperability with target architectures/platforms			Need to define how to do interoperability testir
L	II.D.1	Interoperability for Solaris 10 client – Linux IA-32 server	New		
L	II.D.2	Interoperability for NetApp client – Linux IA-32 server	New		
L	II.D.3	Interoperability for EMC client – Linux IA-32 server	New		
L	II.D.4	Interoperability for AIX 5.3 client – Linux IA-32 server	New		
L	II.D.5	Interoperability for AMD client – Linux IA-32 server	New		
L	II.D.6	Interoperability for Polyserve client – Linux IA-32 server	New		
L	II.D.7	Interoperability for Hummingbird client – Linux IA-32 server	New		
L	II.D.8	Interoperability for HP client – Linux IA-32 server	New		
L	II.D.9	Interoperability for SGI client – Linux IA-32 server	New		
L	II.D.10	Interoperability for Spinniker client – Linux IA-32 server	New		
	II.E	File systems			
M	II.E.1	Verify features of cachefs for NFSv4	New		Not currently NFSv4 ready; needs additional c

Interop Testing

H	II.E.2	Verify features of the Ext3 file system work under NFSv4	New	
M	II.E.3	Verify features of the XFS file system work under NFSv4	New	
M	II.E.4	Verify features of the Reiser file system work under NFSv4	New	
M	II.E.5	Verify features of the GFS file system work under NFSv4	New	
M	II.E.6	Verify features of cluster file systems (e.g. GFS) work under NFSv4	New	
L	II.E.7	Verify features of the Luster file system work under NFSv4	New	
L	II.E.8	Verify features of the GPFS file system work under NFSv4	New	
L	II.E.9	Verify features of the Sanfs file system work under NFSv4	New	
L	II.E.10	Verify features of the Polyserve file system work under NFSv4	New	
L	II.E.11	Verify features of the Netcache file system work under NFSv4	New	
L	II.E.12	Verify features of the Rainfinity file system work under NFSv4	New	
M	II.E.13	Analyze file system configuration issues, such as: Logical volume manager behind server RAID-5 problem with small write workloads (may be performance issue?) Compiling POSIX ACL's in and out	New	

II.F		Test ACL interoperability of Linux client for non-Linux servers		See I.R.3; need test
H	II.F.1	ACL compatibility for Linux IA-32 client - Solaris 10 client	New	
H	II.F.2	ACL compatibility for Linux IA-32 client - NetApp server	New	
H	II.F.3	ACL compatibility for Linux IA-32 client - EMC server	New	
H	II.F.4	ACL compatibility for Linux IA-32 client - AIX 5.3 server	New	
H	II.F.5	ACL compatibility for Linux IA-32 client - AMD server	New	
H	II.F.6	ACL compatibility for Linux IA-32 client - Polyserve server	New	
H	II.F.7	ACL compatibility for Linux IA-32 client - Hummingbird server	New	
H	II.F.8	ACL compatibility for Linux IA-32 client - HP server	New	
H	II.F.9	ACL compatibility for Linux IA-32 client - SGI server	New	
H	II.F.10	ACL compatibility for Linux IA-32 client - Spinniker server	New	

II.G		Test ACL interoperability of Linux server with non-Linux clients		See I.R.3; need test
H	II.G.1	ACL compatibility for Solaris 10 client - Linux IA-32 server	New	
H	II.G.2	ACL compatibility for NetApp client - Linux IA-32 server	New	
H	II.G.3	ACL compatibility for EMC client - Linux IA-32 server	New	
H	II.G.4	ACL compatibility for AIX 5.3 client - Linux IA-32 server	New	
H	II.G.5	ACL compatibility for AMD client - Linux IA-32 server	New	
H	II.G.6	ACL compatibility for Polyserve client - Linux IA-32 server	New	
H	II.G.7	ACL compatibility for Hummingbird client - Linux IA-32 server	New	
H	II.G.8	ACL compatibility for HP client - Linux IA-32 server	New	
H	II.G.9	ACL compatibility for SGI client - Linux IA-32 server	New	
H	II.G.10	ACL compatibility for Spinniker client - Linux IA-32 server	New	

II.H		Automounter interoperability		
M	II.H.1	Verify amd will work as a drop-in automounter service with nfsv4	Open	IBM
M	II.H.2	Verify autong will work as a drop-in automounter service with nfsv4	Open	IBM
M	II.H.3	Verify autofs4 will work as a drop-in automounter service with nfsv4	Open	IBM
L	II.H.4	Verify interoperability of nfsv4 and automounter with various map sources:	Open	IBM
		- Flat file	Connectathon	
		- Program file	Connectathon	
		- NIS	Connectathon	
		- NIS+		
		- LDAP using NIS style maps (RFC2307)		
		- LDAP using Linux style automounter maps		
		- LDAP using Yet-Another schema		

(RFC2307bis, deleted, but used by solaris 9 I

Interop Testing

athon and NFSv4 Bakeathon

1g – need more than just connectathon

1g – need more than just connectathon

development

Interop Testing

ast | checked)

Robustness Testing

PRI	ID		Tools / Tests	Status	Owner	Notes
	III	ROBUSTNESS TESTING				
	III.A	Basic stability assessments				
H	III.A.1	Run iozone for 2 wks on basic client/server operations, using: - Both data and metadata options - Cached and direct I/O - Various mount options	iozone	Done	Bull	
H	III.A.2	Run automounter use case for 2 wks on amd, autofs, and autong, using: - Large number of maps - Randomly mount and run workloads on an automounted partition - Use a variety of workloads, such as randomly chosen fs tests	e.g. Crashme	New		This exercises mountd, mount, http://people.delphiforums.com
H	III.A.3	Run NFS server for 2 wks with random configuration changes, using: - Interrupt server in various ways (reboot, power cycle, lan fail) - Change/reexport export rules at random - Trigger a client workload at arbitrary times - Analyze client recovery behaviors		Open	OSDL	
H	III.A.4	Run connectathon locking tests against NFS server for 2 weeks, using: - Multiple client machines - Reboot at random - Analyze client cache coherency behaviors - Analyze locking behaviors		New		
	III.A.5	Run fstress 2 weeks on basic client/server operations, using: - Long list random operations (1000 operations) - High number of processes (100)		Done	Bull	
	III.A.6	Run FFSB 1 day on basic client/server operations in stress configuration, using: - 1,200,000 files - 100 directories		Done	Bull	
	III.B	Resource limit testing				
L	III.B.1	Test stability of client in out of pid situation		New		
H	III.B.2	Test stability of client in out of memory situation	valgrind	New		IA-32
H	III.B.3	Test stability of client in out of disk space on server situation		Done	Bull	Simple error message: no spa
H	III.B.4	Test stability of client in out of inode situation		New		
H	III.B.5	Test stability of client in out of swap space situation		New		
H	III.B.6	Test stability of server in out of pid situation		New		
H	III.B.7	Test stability of server in out of memory situation	valgrind	New		IA-32
H	III.B.8	Test stability of server in out of disk space situation		Done	Bull	Simple error message: no spa
H	III.B.9	Test stability of server in out of inode situation		New		
H	III.B.10	Test stability of server in out of swap space situation		New		

Robustness Testing

III.C		Stress load testing			
H	III.C.1	Run LTP NFS fstress in a std config on each release	Fsstress	In Progress	Bull
H	III.C.2	Analyze load balancing, failure modes, etc. under different stress loads		New	
H	III.C.3	Destructive testing by measuring point of failure for various loads		New	
III.D		Scalability (robustness)			Bull may be doing some scalat
H	III.D.1	Find maximum number of connections to Linux IA-32 server	Fsstress, fsx	Open	Bull (partial)
M	III.D.2	Find maximum number of files for Linux IA-32 exported file system	Fsstress, fsx	New	
M	III.D.3	Find maximum file size on Linux IA-32	Fsstress, fsx	Done	Bull
H	III.D.4	Find maximum number of mounted file systems on client	Fsstress, fsx	Near done	Bull
M	III.D.5	Test robustness on NUMA when scaling CPU, mem, NIC, or disk count		New	Size is the maximal size the se More than 13,000
M	III.D.6	Test robustness on SMP when scaling CPU, mem, NIC, or disk count		Open	Bull (partial)
H	III.D.7	Test correctness of NFS client when backed by a large (>100GB) caches		New	
M	III.D.8	Find maximum number exported file systems on server		Near done	Bull
M	III.D.9	Find maximum size of exported file systems on server		New	No limit reached, btu the expor
III.E		Recovery from problems while under light/normal/heavy loads			
H	III.E.1	Test short & long term local network failure (unplugged cable, ifdown eth0, etc.)		Open	OSDL
H	III.E.2	Test short & long duration remote network partition		Open	OSDL
H	III.E.3	Test behavior during crash/reboot of server with clients holding various states		Open	OSDL
H	III.E.4	Test multiple clients using, locking, etc. same files		New	See ftp.cis.uoguelph.ca/pub/nf
H	III.E.5	Test behavior of server with failed storage device		New	
H	III.E.6	Test behavior during crash of client with open delegations and locks		New	
H	III.E.7	Test recovery from denied permission		New	
H	III.E.8	Test recovery from JUKEBOX/DELAY		New	
H	III.E.9	Test recovery from ESTALE		New	
H	III.E.10	Test server callback mechanism (c.f. III.E.1, III.E.2)		New	
III.F		Race conditions			
M	III.F.1	Test for race conditions and locking bugs on PPC64		New	(Polyserve?) Polyserve is interested in this Olaf Kirch says PPC64 is good
M	III.F.2	Test for race conditions on new architectures		New	(Polyserve?) Faster CPU, memory, and bus
III.G		Automounter robustness			For more info about Automoun
L	III.G.1	Test interruptible automounting in the following cases - indirect mount - direct mount - browsed mount - multimount offset		New	
H	III.G.2	Test concurrent access tests for races in automounter - Have multiple threads working in parallel		New	
H	III.G.3	Test replicated file system selection		New	
H	III.G.4	Test remounting after expire corner cases - Something (a process) sitting in the scaffolding - Common case for /net		New	Needs to be supported at nfs k

Robustness Testing

, automounter, and rpcbind

/gjc/crashme.html

ice left on device

ice left on device

Robustness Testing

ing for >3 days

ility testing

erver's local filesystem is able to manage. 8TB for NFSv4/XFS/IA32

t process is too slow to be acceptable after 3000 exports. 13000 exports reached

sv4/testing-stuff

l at exposing problems because of its weak CPU cache coherency semantics
es can expose race conditions

ter, see notes in nfsv4 list archive for 2/16/05

evel

Performance Testing

<u>PRI</u>	<u>ID</u>		<u>Tools / Tests</u>	<u>Status</u>	<u>Last Updated</u>
	IV.	PERFORMANCE TESTING			
	IV.A	Comparison of NFSv4 vs. NFSv3 for common use cases			
H	IV.A.1	Time to perform sequence of unique read/write operations	iozone	In Progress Bull	2004
H	IV.A.2	Time to perform sequence of cacheable read/write operations	iozone	In Progress Bull	2004
H	IV.A.3	Random reads/writes/opens from many clients to one server	iozone	In Progress Bull	2004
	IV.A.4	Industry standard loads	SpecSFS, Sperr	N/A	
M	IV.A.5	Time to read file from beginning to end and then rewrite it	iozone	New	
M	IV.A.6	Time for appending info to a log file sporadically over time		New	
H	IV.A.7	Metadata – open/close intensive workload	iozone	New	
H	IV.A.8	Metadata – directory scanning	iozone	New	
H	IV.A.9	Metadata – create/delete	iozone	New	
H	IV.A.10	Metadata – changing attributes (chown, chmod) while dir scanning	iozone	New	
M	IV.A.11	How many locks can be made and released over time		New	
M	IV.A.12	Comparison of speeds attainable for different NIC cards		New	
L	IV.B	Compare latency, throughput, etc. of NFSv4 on TCP vs. RDMA		New	
	IV.C	Test performance on different local filesystems			
M	IV.C.1	Analyze whether file system choice affects performance	iozone	DONE Bull	
L	IV.C.2	Test performance with Ext2 on server with metadata /acl's		New	
M	IV.C.3	Test performance with ext3 on server with metadata / acl's	Dbench, iozone	New	
M	IV.C.4	Test performance with Reiser3 on server with metadata / acl's		New	
M	IV.C.5	Test performance with xfs on server with metadata / acl's		New	
M	IV.C.6	Test performance with jfs on server with metadata / acl's		New	
M	IV.C.7	Test performance with Reiser4 on server with metadata /acl's		New	
	IV.D	Test performance on different cluster filesystems			
M	IV.D.1	Test performance when using GFS cluster file system		New	
M	IV.D.2	Test performance when using Luster cluster file system		New	
M	IV.D.3	Test performance when using GPFS cluster file system		New	
M	IV.D.4	Test performance when using Polyserve cluster file system		New	
	IV.E	Evaluation in various load scenarios			
H	IV.E.1	Test performance with large numbers of small (<4k) files	Webserver	Open Bull	
H	IV.E.2	Test performance with a few very large (>1G) files	Database	New	

Performance Testing

M	IV.E.3	4-16 clients generating high load on 1 server in lab environment	Mail/user dir	Open	Bull
M	IV.E.4	2000-5000 clients on 5-10 servers in production environment	Clusters	New	
H	IV.E.5	NFS "Cluster" scenario with 1000+ clients and several servers	Film industry, F	New	
M	IV.E.6	NFS front end with cluster backend; 100+ clients		New	
M	IV.E.7	Pure cluster; 100+ clients		New	
	IV.F	Evaluation in stress scenarios			
M	IV.F.1	Measure performance of server when in limited resource situations Low memory / heavy swap space usage High inode count situations		New	
M	IV.F.2	Measure performance of client when in limited resource situations Low memory / heavy swap space usage Low/saturated network bandwidth		New	
M	IV.F.3	Graceful failure mode		New	
H	IV.F.4	Measure memory/network/CPU efficiency of client for fixed workload	lozone or fsx	Open	Bull
	IV.G	Scalability (performance)			
			Other tests: fsstress, fsx, ffsb		
H	IV.G.1	Verify server scalability with clients generating various basic requests (AC)	lozone	New	
H	IV.G.2	Verify server scalability with clients using compound requests	lozone	New	
H	IV.G.3	Measure effects of scaling up number of connections Measure number of mounts per second on client and server	lozone	Open	Bull
H	IV.G.4	Measure effects of increasing number of files	lozone	Open	Bull
H	IV.G.5	Measure effects of increasing file size (with/without cache) Goal of 4G file; >amount of RAM	lozone	Open	Bull
H	IV.G.6	Measure effects when increasing size of on-the-wire NFS read or write op Mount options from the client side; find optimal settings Measure for stable latency behavior	lozone	Open	Bull
L	IV.G.7	Measure performance when scaling CPU count per node on SMP&NUMA	lozone	New	
L	IV.G.8	Measure performance when scaling memory per node on SMP&NUMA	lozone	New	
M	IV.G.9	Measure performance when scaling NIC count per node	lozone	New	
M	IV.G.10	Measure performance when scaling disk count per node	lozone	New	
H	IV.H	Identify best practices for performance tuning --- Auto-tuning for max performance during installation? Tuning NFS transfer size Details will need to be captured as we complete other testing		Open	Bull
	IV.J	Performance effects of security features			
M	IV.J.1	Measure performance when operating with IPSec integrity and privacy		Open	Bull
H	IV.J.2	Measure performance when operating with Kerberos 5 integrity and privacy		Open	Bull
M	IV.J.3	Measure performance when operating with SPKM integrity and privacy			
M	IV.J.4	Measure performance when operating with Lipkey integrity and privacy			

Performance Testing

Notes

There are currently no existing NFSv4 performance benchmarks, due to the robust features inherent in the protocol.

Done by Bull in 2004

Done by Bull in 2004

Done by Bull in 2004

No support is planned for NFSv4 in SpecSFS at this time

Fileop option

Only prototypes exist currently; possibly will be more fully implemented by end of 2005

V. Roqueta has found that filesystem performance affects NFS in a constant manner

<http://nfsv4.bullopensource.org/tools/tests/page2.php> - NFSv4 performances do not depend on the local file-system used

Goal needs clarification for Bull

Goal needs clarification for Bull

Performance Testing

NetApp may have an environment; Polyserve is interested in this

See Chuck for more info
32-bit

SMP

SMP
SMP

SMP

NUMA
NUMA
NUMA
NUMA

Another Bull project will work on a Tunables Framework and GUI

Security Testing

<u>PRI</u>	<u>ID</u>		<u>Tools / Tests</u>	<u>Status</u>
	V.A	SECURITY TESTING		
	V.A	Code audit		
M	V.A.1	Audit the NFSv4 server code		New
L	V.A.2	Audit the NFSv4 client code		New
M	V.A.3	Audit the rpcbind / portmap code		New
	V.A.4	Audit the krb5 code		DONE
M	V.A.5	Audit the idmapd code		New
H	V.A.6	Audit the mountd		New
H	V.A.7	Audit the RPC authentication code (gssd, authsys, etc.)		New
	V.B	Security regression testing		
M	V.B.1	Run Stanford/Coverity Checker periodically		New
M	V.B.2	Run SMATCH as regression test periodically		New
M	V.B.3	Run FlawFinder as regression test periodically		New
H	V.B.4	Run Sparse as regression test periodically		Open OSDL
	V.C	Administration tools		
H	V.C.1	Verify that only administrative users can access admin tools and config files		New
	V.D	Security features design review		
H	V.D.1	Review Authentication/ACL feature design		New
H	V.D.2	Review each security flavor feature design Krb5 Spkm3		New
L	V.D.3	Review security negotiation feature design		New
L	V.D.4	Review named attributes feature design		New
L	V.D.5	Review supporting advanced security flavors on the callback channel design		New
H	V.D.6	Penetration testing for client callback implementation		New
	V.E	Security feature testing		
H	V.E.1	Ensure a functionality test sufficiently tests Authentication/ACL		New

Security Testing

H	V.E.2	Ensure a functionality test sufficiently covers each security flavor Krb5 Spkm3	New	
L	V.E.3	Ensure a functionality test sufficiently covers security negotiation	New	
L	V.E.4	Ensure a functionality test sufficiently covers named attributes	New	
L	V.E.5	Ensure a functionality test sufficiently covers advanced security flavors on callback channel	New	
H	V.E.6	Ensure a functionality test sufficiently covers penetration testing for client callback implementation	New	
	V.J	Attack and penetration security review		
H	V.J.1	Identify security issues assuming attack from client-side NFSv4 client Denial of service Userland daemons Mount and other nfs utils	Open	Bull
M	V.J.2	Identify security issues assuming attack from server-side	Open	Bull
L	V.J.3	Identify security/privacy issues assuming listening by an active or passive third party	Open	Bull
	V.K	Cross realm		
M	V.K.1	Two v4 domains; kerberos, ACLs in one realm; file system in another	New	
	V.L	Documentation for Testing/Auditing		
H	V.L.1	Ensure there is high level design documentation of NFSv4 security Security mechanisms Client responsibilities Server responsibilities	New	
H	V.L.2	Ensure there is inline documentation for security related code in kernel	New	
H	V.L.3	Ensure there is inline documentation for GSS API (libgssapi, librpcsecgss)	New	
L	V.L.4	Ensure there is inline documentation for nfsv4 libraries	New	
	V.M	Security Use Case		
M	V.M.1	Verify proper functionality/security correctness of NFSv4 in a VPN environment	New	

Security Testing

Notes

Look at writings from John Viega

<http://opensourcetesting.org/security.php>

Assuming MIT krb5 libs are already reviewed

Perhaps run this in a test suite

U Mich has done some NFS2/3 ACL testing 10/04

Still needs some implementation work

Still needs some implementation work

Still needs some implementation work

Security Testing

Bull planning on creating a list of issues in 2005

Bull planning on creating a list of issues in 2005
Bull planning on creating a list of issues in 2005

Still experimental

Start with Bruce's paper

Venkat will write use case