NFSv4 Test Matrix – 1.7

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.
Priorities are listed where there is a rough concensus. Ones still pending concensus are marked with a ?.

Category

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

Status Summary

Definitions

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

	New	Open	In Progress	Near Done	Done
Functional Testing					
Current	*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
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

Current	*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

Current	*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
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

Current	*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

Current	*15*	*3*	*0*	*0*	*0*
04/04/05	15	3	0	0	0
03/28/05	15	3	0	0	0

			Intro		
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
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

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 testsuite	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 c	Open		
H	I.A.5	Protocol implementation interoperability between Linux server and client	Connectathon	New		
	I.B	**Regression testing**			Bull	Bull has interest in doing regression testing
H	I.B.1	Run applicable existing functionality tests on codebase periodically	Connectathon,	Open	OSDL	
L	I.B.2	Review common faults reported with NFSv3 and check if they still exist		New		
	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**				http://www.eitoolkit.com/tools/implementation/system_integ_test_overview.ppt
	I.D.1	Verify functional requirements met for NFSv4 server / RPC		New		
	I.D.2	Verify functional requirements met for NFSv4 server / Transport Switch		New		
	I.D.3	Verify functional requirements met for NFSv4 server / GSS		New		
	I.D.4	Verify functional requirements met for NFSv4 server / GSS / Kerberos		New		
	I.D.5	Verify functional requirements met for NFSv4 server / GSS / SPKM		New		
	I.D.6	Verify functional requirements met for NFSv4 server / ACLs		New		
	I.D.7	Verify functional requirements met for NFSv4 client / NFSv4 server		New		
	I.D.8	Verify functional requirements met for NFSv4 client / GSS		New		
	I.D.9	Verify functional requirements met for NFSv4 client / GSS / Kerberos		New		
	I.D.10	Verify functional requirements met for NFSv4 client / GSS / SPKM		New		
	I.D.11	Verify functional requirements met for NFSv4 client / ACLs		New		
	I.D.12	Verify functional requirements met for NFSv4 client / mount		New		
	I.D.13	Verify functional requirements met for NFSv4 client / IDMAP		New		
	I.E	**Serviceability**				http://nfsv4.bullopensource.org/doc/nfsv4.admin.frs.v03.html
H?	I.E.1	Verify NFSv4 administrative functionality within Webmin		In Progress	Bull	Verification has been done by Bull in 2004. Code has been done and delivered. ACL to be studied.
H?	I.E.2	Verify NFSv4 debugging functionality within nfsdebug, et al		New		
H?	I.E.3	Verify NFSv4 monitoring functionality within nagios		Open	Bull	Verification (and code) will be done by Bull in 2005
H?	I.E.4	Verify informativeness of error/trace messages		New		
	I.E.5	Verify sufficient monitoring functionality within Ethereal		New		
		Parse delegation callbacks (CB_NULL, CB_RECALL, CB_GETATTR)				Unimplemented functionality
		Parse OPEN repy's with a granted READ or WRITE delegation				Unimplemented functionality
	I.E.6	Verify ability to get detailed state info from service		New		
	I.E.7	Verify ability to list who has open/locked files (ala lsof)		New		
	I.E.8	Verify ability to list active mount points and who has them open		New		Showmount?
	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?
	I.E.11	Verify ability to trace NFS activity (like strace)		New		
	I.E.12	Verify ability to trace security rules (e.g., why did user X get auth'd)		New		
	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		

				Functional Testing		
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 queing				
H		Non-blocking locks				
L		Mandatory locks				
	I.G	**Portability to target architectures/platforms**				TODO: zSeries?
M	I.G.1	Test compilation and functionality on UP systems		New		
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	Bull planning on contributing this in 2005
L	I.G.6	Test compilation and functionality on PPC-64 with Linux in 32-bit mode		New		(Out of date)
H	I.G.7	Test compilation and functionality on PPC-64		Open	Bull	Bull planning on contributing this in 2005
L	I.G.8	Test compilation and functionality on IA-32e, and if there are differences from IA-32		New		
L	I.G.9	Test compilation and functionality on Sparc		New		
	I.I	**Ecosystem compatibility**				
H	I.I.1	Verify compatibility with glibc		New		
M	I.I.2	Verify compatibility with NLM/NSM and NFSv3 locking		New		
H	I.I.3	Verify compatibility with Kerberos		New		
H	I.I.4	Verify compatibility with Ipsec		New		
H	I.I.5	Verify compatibility with POSIX ACLs		New		
H	I.I.6	Verify compatibility with NFS ACLs		New		
M	I.I.7	Verify compatibility with LDAP		New		
M	I.I.8	Verify compatibility with NIS		New		
H	I.I.9	Verify compatibility with automounter		Open	IBM	
	I.I.10	Verify compatibility with pNFS		New		Development work required - leave on TODO list for now
H	I.I.11	Verify compatibility with basic system tools (file utils, core utils, util-linux, mount, sar, iostat		New		
L	I.I.12	Verify compatibility with Active Directory		New		
M	I.I.13	Verify compatibility with Samba (CIFS Server)		New		
	I.J	**Static code analysis**	Lint, calltree, gcov, fenris, etc.			http://testingfaqs.org/t-static.html
M	I.J.1	Syntax		New		
M	I.J.2	Unreachable code, unconditional branches into loops		New		
M	I.J.3	Undeclared or uninitialized variables		New		
M	I.J.4	Parameter type mismatches		New		
L	I.J.5	Uncalled functions and procedures		New		
L	I.J.6	Non-usage of function results		New		
H	I.J.7	Possible array bound errors		New		
H	I.J.8	Misuse of pointers		New		
M	I.J.9	Sparse testing – random writes to a file as large as local file system		New		
L?	I.K	**Localization/Internationalization testing**		New		
		Need to gather info on what people need				
		Tests that could point out possible problems?				
		Alerting people to the issue				
		Localization of error messages(?)				
		nfs-utils - general problem				
	I.L	**Documentation update verification**				
M	I.L.1	Check that web content at nfs.sf.net has updated nfsv4 info		New		
H	I.L.2	Check that NFS HOWTO is updated with sufficient nfsv4 info		New		
M	I.L.3	Check that all NFS man pages are updated with nfsv4 info		New		
H	I.L.4	Check that Network Admin Guide at tldp.org is updated for nfsv4		New		
M	I.L.5	Check that NFS docs for main distros are updated for nfsv4		New		
M	I.L.6	Check that an NFSv4 Security Best Practices document available		New		
H	I.L.7	Check the nfs performance section in howto		Open	Chuck	
M	I.L.8	Make sure section RPCGSS, set up kerberos explanations, etc. exist		New		is in FAQ but not HOWTO
M	I.L.9	List to check system for kerberos config's to make sure it's set up correctly		New		
M	I.L.10	Interoperability considerations - known issues, things to test		New		

	I.M	**Network transport protocols compatibility**				iSCSI? x25?	
H	I.M.1	Test compatibility with TCP protocol	Need to define	New			
L	I.M.2	Test compatibility with SCTP protocol	How rpc, rdma,	New		Requires the RPC transport switch be implemented first	
M	I.M.3	Test compatibility with BIC-TCP protocol	Issues like recc	New		Requires the RPC transport switch be implemented first	
L	I.M.4	Test compatibility with RDMA/DAPL protocol	Ask Steve for ic	New		Requires the RPC transport switch be implemented first	
M	I.M.5	Test compatibility with UDP for NFS 2/3 backwards compatibility	Failover works	New			
L	I.M.6	Test basic NFS functionality under IPv6		New			
L	I.M.7	Test ecosystem under IPv6 (see section I.I)		New			
L	I.M.8	Test compatibility with other network transport protocols (see section I.M)		New			
L	I.M.9	Test NFSv2/3 with Ipv6		New			
	I.N	**Automounter functionality - amd**				amd not actively developed, but required for legacy support	
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 - autofs4**				actively developed; not full featured but is robust	
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	**Automounter functionality - autong**				actively developed; has good support for newer features	
H	I.P.1	Verify functionality of direct map support	Connectathon	Open	IBM		
M	I.P.2	Verify functionality of indirect map support	Connectathon	Open	IBM		
M	I.P.3	Verify functionality of multimount support, including hierarchical mounts	Connectathon	Open	IBM		
M	I.P.4	Verify functionality of nested map support	Connectathon	Open	IBM	Not implemented yet	
M	I.P.5	Verify functionality of /net (-hosts) support	Connectathon	Open	IBM		
M	I.P.6	Verify functionality of browse (ghosting) support	Connectathon	Open	IBM		
	I.Q	**Use Case Scenarios**					
H	I.Q.1	Database functionality on NFS		New		Netapp may be interested	"The Factory"
L	I.Q.2	Diskless boot functionality on NFS (going away)		New			
H	I.Q.3	Clusters / migration / replication functionality (multiple clients)		New			
M	I.Q.4	Functionality on Async I/O interface to file systems on client		New			
H	I.Q.5	Web server		New			
M	I.Q.6	User filesystem environment		New			
M	I.Q.7	Mail spooling		New			
M	I.Q.8	Wide area clustering		New			
M	I.Q.9	Single client high performance computing		New			
M	I.Q.10	Clustering servers to provide higher reliability		New			
	I.R	**ID mapping**					
M	I.R.1	LDAP – ID mapping, authenticating users		New			
L	I.R.2	NIS		New			
H	I.R.3	Cross realm mapping	NEED TEST	New			

PRI	ID		Tools / Tests	Status		Notes
	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 p	Unknown			
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 d

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:		New		
		Logical volume manager behind server				
		RAID-5 problem with small write workloads (may be performance issue?)				
		Compiling POSIX ACL's in and out				
	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 l

ıthon and NFSv4 Bakeathon

ıg – need more than just connectathon

ıg – need more than just connectathon

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ast I checked)

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	New		
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 http://people.de
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.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		New		
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		New		
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		
	III.C	**Stress load testing**				
H	III.C.1	Run LTP NFS fstress in a std config on each release	Fsstress	In Progress	Bull	Bull: “Actual te

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 doi
H	III.D.1	Find maximum number of connections to Linux IA-32 server	Fsstress, fsx	New		
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	New		
H	III.D.4	Find maximum number of mounted file systems on client	Fsstress, fsx	New		
M	III.D.5	Test robustness on NUMA when scaling CPU, mem, NIC, or disk count		New		
M	III.D.6	Test robustness on SMP when scaling CPU, mem, NIC, or disk count		New		
H	III.D.7	Test correctness of NFS client when backed by a large (>100GB) cachefs		New		
M	III.D.8	Find maximum number exported file systems on server		New		
M	III.D.9	Find maximum size of exported file systems on server		New		
	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	See ftp.cis.uog
H	III.E.4	Test multiple clients using, locking, etc. same files		New		
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**				Polyserve is int
M	III.F.1	Test for race conditions and locking bugs on PPC64		New		Olaf Kirch says
M	III.F.2	Test for race conditions on new architectures		New		Faster CPU, m
	III.G	**Automounter robustness**				For more info a
L	III.G.1	Test interuptible automounting in the following cases - indirect mount - direct mount - browsed mount - multimount offset		New		
H	III.G.2	Test concurrent access tests for races - 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 su

mountd, mount, automounter, and rpcbind

elphiforums.com/gjc/crashme.html

sts does not end” http://nfsv4.bullopensource.org/tools/tests/NFSv4_tests.html

ing some scalability testing

uelph.ca/pub/nfsv4/testing-stuff

erested in this
PPC64 is good at exposing problems because of its weak CPU cache coherency semantics
emory, and buses can expose race conditions

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

pported at nfs level

PRI	ID		Tools / Tests	Status		Last Updated	Notes
	IV.	**PERFORMANCE TESTING**					There are curre due to the robu
	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	Done by Bull in
H	IV.A.2	Time to perform sequence of cacheable read/write operations	Iozone	In Progress	Bull	2004	Done by Bull in
H	IV.A.3	Random reads/writes/opens from many clients to one server	Iozone	In Progress	Bull	2004	Done by Bull in
	IV.A.4	Industry standard loads	SpecSFS, Spe	N/A			No support is p
M	IV.A.5	Time to scan file from beginning to end and then rewrite it	Cthon?	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			Fileop option
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			Only prototypes
	IV.C	**Test performance on different local filesystems**					V. Roqueta has
M	IV.C.1	Analyze whether file system choice affects performance	Iozone	DONE	Bull		http://nfsv4.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 perfomance 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		Goal needs cla
H	IV.E.2	Test performance with a few very large (>1G) files	Database	New			Goal needs cla
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			NetApp may ha

H		IV.E.5	NFS “Cluster” scenario with 1000+ clients and several servers	Film industry, H	New		
M		IV.E.6	NFS front end with cluster backend; 100+ clients		New		
M		IV.E.7	Pure cluster; 100+ clients		New		
			- Ensure overloaded server handles load gracefully				
			- Are there resource problems with thousands of idle clients?		Need help from user community		
			- How many mountpoints can client handle?				
			- How many exports can a single server provide?				
			- If clients use 1 socket per server, does multiple servers help scalability?				
		IV.F	**Evaluation in stress scenarios**				
M		IV.F.1	Measure performance of server when in limited resource situations		New		
			Low memory / heavy swap space usage				
			High inode count situations				
M		IV.F.2	Measure performance of client when in limited resource situations		New		
			Low memory / heavy swap space usage				
			Low/saturated network bandwidth				
M		IV.F.3	Graceful failure mode		New		See Chuck for
H		IV.F.4	Measure memory/network/CPU efficiency of client for fixed workload	Iozone or fsx	Open	Bull	32-bit
		IV.G	**Scalability (performance)**	Other tests: fsstress, fsx, ffsb			
H	H?	IV.G.1	Verify server scalability with clients generating various basic requests (AC	Iozone	New		
	H?	IV.G.2	Verify server scalability with clients using compound requests	Iozone	New		
	H?	IV.G.3	Measure effects of scaling up number of connections	Iozone	Open	Bull	SMP
	H?	IV.G.4	Measure effects of increasing number of files	Iozone	Open	Bull	SMP
	H?	IV.G.5	Measure effects of increasing file size	Iozone	Open	Bull	SMP
	H?	IV.G.6	Measure effects when increasing size of on-the-wire NFS read or write op	Iozone	Open	Bull	SMP
		IV.G.7	Measure effects of increased numbers of mounted file systems	Iozone	Open	Bull	SMP
	L?	IV.G.8	Measure performance when scaling CPU count per node on NUMA	Iozone	New		NUMA
	L?	IV.G.9	Measure performance when scaling memory per node on NUMA	Iozone	New		NUMA
	L?	IV.G.10	Measure performance when scaling NIC count per node on NUMA	Iozone	New		NUMA
	L?	IV.G.11	Measure performance when scaling disk count per node on NUMA	Iozone	New		NUMA
	H?	IV.H	**Identify best practices for performance tuning**		Open	Bull	Another Bull pr
			--- Auto-tuning for max performance during installation?				
			Tuning NFS transfer size				
			What else?				
	H?	IV.I	**Performance Non-Regression Testing**		In Progres	Bull	Bull is doing thi
			Should items be moved/copied from IV.A to here?				
		IV.J	**Performance effects of security features**				
	H?	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	

ently no existing NFSv4 performance benchmarks,
st features inherent in the protocol.

2004
2004
2004
lanned for NFSv4 in SpecSFS at this time

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

s found that filesystem performance affects NFS in a constant manner
opensource.org/tools/tests/page2.php - NFSv4 performances do not depend on the local file-system used

rification for Bull
rification for Bull

ave an environmentment

more info

oject will work on a Tunables Framework and GUI

s 2004,2005

PRI	ID		Tools / Tests	Status	
	V.A	**SECURITY TESTING**			
	V.A	**Security inspection tools**			
	V.A.1	Stanford/Coverity Checker(?)		New	
	V.A.2	SMATCH	http://freshmea	New	
	V.A.3	FlawFinder	http://www.dwh	New	
H?	V.B	**Security feature review**			
H?	V.B.1	Review Authentication/ACL		New	
H?	V.B.2	Review each security flavor		New	
H?	V.B.3	Trust assumptions on LAN vs. WAN		New	
	V.C	**Interface input inspection**		New	
		TODO: Needs clarification			
	V.D	**Packet inspection**		New	
		TODO: Needs clarification			
M?	V.E	**Code audit**			
H?	V.E.1	32-bit overflows, underflows, integer ranges, pointer analysis, etc.	Lint, splint, gco	New	
H?	V.E.2	64-bit overflows, underflows, integer ranges, pointer analysis, etc.		New	
H?	V.E.3	Logic holes		New	
	V.F	**Data integrity validation**		New	
	V.G	**Privacy validation**		New	
	V.H	**Attack and penetration security review**			
H?	V.H.1	Review security assuming attack from client-side		Open	Bull
H?	V.H.2	Review security assuming attack from server-side		Open	Bull
L?	V.H.3	Review security/privacy assuming listening by third party		Open	Bull
L?	V.H.4	Review security assuming penetration of the client-side tools (mount, etc.)		New	

H?	V.H.5	Review security assuming penetration of the server	New

Cross realm

Two v4 domains; kerberos, ACLs in one realm; file system in another

Notes
Look at writings from John Viega
http://opensourcetesting.org/security.php

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

Esp. sunrpc_gss

TODO: How is this done?
Bull planning on working on this in 2005
Bull planning on working on this in 2005
Bull planning on working on this in 2005

New v4 Feature	Avail in kernel version
Basic file operations	2.6.4
Compound RPCs	?
Locking	2.6.4
Locks propagation from applications	
krb5	2.6.4
krb5i	2.6.6-rc1
krb5p	2.6.7-rc2-CITI_NFS4_ALL-1
Server reboot recovery (client)	2.6.4
Server reboot recovery (server)	?
POSIX ACLs (client)	2.6.4-CITI-NFS4_ALL-1
POSIX ACLs (server)	2.6.9-rc1
Full NFSv4 ACLs (client)	2.6.4-CITI-NFS4_ALL-1
Full NFSv4 ACLs (server)	?
Delegations (client)	2.6.9-rc1
Delegations (server)	2.6.4-CITI-NFS4_ALL-1
Timeout of client leases	
Named attributes (client)	?
Named attributes (server)	?
Security negotiation	?
AUTH_SYS security mechanism	
SPKM3 security mechanism	
Automounting on fsid change	?
RPC over streaming network protocols such as TCP	
Legacy support for RPC via datagrams	
File migration and replication	
UTF-8 encoding	
Delegation support integration with Cluster filesystems	
Delegation support integration with Local Access	
Share reservations support for cluster file systems	
Data migration and replication support	
Single protocol spec	
Internationalization	
File handles	
Error definitions	
Minor versioning	
NFSv4 Requests	

NFSv4 Procedures
NFSv4 Callback Procedures

Notes

reading, writing, etc.

allows combining several basic NFS ops (LOOKUP, OPEN, READ, etc.) into a single complex RPC operation

advisory/lease-based byte-range locking using fcntl; in nfsv4 this is done by the nfsv4 protocol itself rather than a separate protocol.

For cluster file systems, bute-range locks can be propagated to underlying file systems for better granularity

Authentication only: The header of each request and response is signed. You know who sent you this thing but you don't really know for sure what's in it.

Integrity: The header and body of each request and response is signed. So you know who sent this thing and what was in it.

Privacy: The header of each request is signed, and the body is encrypted, so you know everything you knew with krb5i, but everyone else knows less.

Client apps should continue running after server reboots and maintain consistent states

Standardized use of ACLs across POSIX and Windows environments

Client notifies server of file state intentions

Server can delegate local ops on a file to a client; improves latency and increases use of client-side caching

Clients must continue extending open and lock leases.

Allows client to associate app-specific data with a regular file or directory

Allow automatic negotiation of security flavor using SECINFO and the WRONGSEC error

Client should automatically create new mountpoints when fsid changes

UTF-8 encoding of ACLs, user/group names, and named attributes

Support end-to-end delegation with cluster file systems for Linux

Integrate correctly with local file access, while remaining consistent with cluster file system

Grants client access to open a file and exclude open to others

Supports transparent data migration and replication across applications

Combines various protocols (stat, NLM, mount, ACL, and NFS) into single protocol spec