



# Dell Fluid File System

## Version 3

### Support Matrix

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# 1 Introduction

This document provides information about supported software and hardware configurations as well as usage requirements and recommendations for Dell FluidFS v3 products.

This document is valid as of FluidFS version 3.0.930714.

## Contacting Dell Technical Support and Customer Service

Dell support service is available to answer your questions about FS Series appliances.

- For FS8600 support, email the Copilot team at [support@compellent.com](mailto:support@compellent.com) or see the Copilot support page for direct phone access. Have your HSN/SSN number, case number or service tag available to validate support coverage.
- For FS7500, FS7600, or FS7610 support, visit: <http://eqsupport.dell.com>
- For NX3500, NX3600, or NX3610 support, visit: <http://support.dell.com>

If you have an Express Service Code, have it ready. The code helps the Dell automated support telephone system direct your call more efficiently.

## Notes, Cautions, and Warnings

- A **NOTE** indicates important information that helps make better use of the FluidFS system.
- A **CAUTION** indicates either potential damage to hardware or loss of data and tells you how to avoid the problem.
- A **WARNING** indicates a potential for property damage, personal injury, or death.

**NOTE:** Unless otherwise specified, all information in this document is applicable to the latest version of the firmware and software listed below.

## Glossary

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Table 2-1: Glossary of Terms

<b>Term</b>	<b>Definition</b>
FluidFS (FluidFS firmware)	A special purpose, Dell proprietary, operating system providing enterprise class NAS services using Dell PowerVault, EqualLogic, or Compellent SAN storage systems
FluidFS controller	A Dell hardware device capable of running the FluidFS firmware
NAS (FluidFS) appliance	A Dell hardware product containing two FluidFS controllers in a single enclosure
FluidFS system / cluster	Multiple FluidFS controllers appropriately connected and configured together into a single functional unit
NAS reserve / pool	The SAN storage system LUNs (and their aggregate size) allocated and provisioned to a FluidFS system
NAS volume / container	File system (single-rooted directory/folder and file hierarchy), defined using FluidFS management functions over a portion of the NAS reserve
CIFS share	A file system sub-hierarchy available to CIFS clients via the CIFS (SMB) protocol
NFS export	A file system sub-hierarchy available to NFS clients via the NFS protocol

## 2 FluidFS Models and Platforms

Tables 2-1, 2-2 and 2-3 below list the platforms and configurations supported by Compellent, EqualLogic, and PowerVault systems.

### Compellent Models

Table 2-1: Supported Compellent Platforms and Configurations

Feature	FluidFS Model		
	FS8600 FC		FS8600 iSCSI
Client interface and speed	<b>1GbE</b>	<b>10GbE</b>	<b>10GbE</b>
Client ports – per appliance	8	4	4
SAN storage interface and speed	FC 8Gb		iSCSI 10GbE
SAN ports – per appliance	4		4
Ethernet Network port type	RJ45	SFP+	SFP+
Minimum SAN storage firmware version	6.3.10		
Minimum Enterprise Manager version	2014 R1		
SAN storage models	SC40 or SC8000		
Maximum NAS appliances	4		
Maximum SAN arrays	2		
Maximum NAS reserve (pool) size	2PB		

### Supported H/W upgrades

Starting from FluidFS 3.0.920760, FS8600 1GbE FC configurations can be upgraded to 10GbE FC by replacing the Network Interface Cards. Please consult Dell Support for the implementation of this upgrade.

## EqualLogic Models

Table 2-2: Supported EqualLogic Platforms and Configurations

Feature	FluidFS Model	
	FS7500, FS7600	FS7610
Client interface and speed	1GbE	10GbE
Client ports – per appliance	8	4
SAN storage interface and speed	iSCSI 1GbE	iSCSI 10GbE
SAN ports – per appliance	8	4
Interconnect ports – per appliance	FS7500 – 10 / FS7600 – N/A	N/A
Ethernet Network port type	RJ45	SFP+ (Intel modules only) / RJ45
Total SAN switch ports – per appliance	FS7500 – 18 / FS7600 - 8	4
Minimum SAN storage firmware version	7.0.0 <sup>1</sup>	
SAN storage models	Any PS array	
Maximum NAS appliances	2	
Maximum SAN arrays	1 group <sup>2</sup>	
Maximum NAS reserve (pool) size	509TB	

Note: The Group Manager graphical interface (GUI) is based on the Java platform and can be accessed from any computer with a web browser and a connection to the EqualLogic SAN network. Please consult the *Dell EqualLogic Group Manager Administrator's Manual* for more details.

### Supported H/W upgrades

Starting from FluidFS 3.0.920760, FS7600 (1GbE) systems can be upgraded to FS7610 (10GbE) by replacing the Network Interface Cards. Please consult Dell Support for the implementation of this upgrade.

<sup>1</sup> All members of the EqualLogic storage group should be running firmware version 7.0 or later.

<sup>2</sup> FluidFS can access a single (Default) pool in an EqualLogic group. The group can contain multiple members.



## PowerVault Models

Table 2-3: Supported PowerVault Platforms and Configurations

Feature	FluidFS Model	
	NX3500, NX3600	NX3610
Client interface and speed	1GbE	10GbE
Client ports – per appliance	8	4
SAN storage interface and speed	iSCSI 1GbE	iSCSI 10GbE
SAN ports – per appliance	8	4
Interconnect ports – per appliance	NX3500 – 10 / NX3600 – N/A	N/A
Ethernet Network port type	RJ45	RJ45
Total SAN switch ports – per appliance	NX3500 – 18 / NX3600 - 8	4
Minimum SAN storage firmware version	7.84.47.60	
SAN storage models	MD3200i MD3220i MD3260i MD3600i MD3620i MD3660i	MD3260i MD3600i MD3620i MD3660i
Maximum NAS appliances	1	2
Maximum SAN arrays	1	2
Maximum number of virtual disks	32	
Virtual disk RAID levels	1/10, 5, 6	
Maximum virtual disk size	32TB	
Maximum NAS reserve (pool) size	1024TB	

Dell PowerVault FluidFS version 3 systems can be managed from the following Web browsers:

- Google Chrome 31.0 or higher
- Internet Explorer 9 or higher
- Mozilla Firefox 21.0 or higher

## 3 Software Upgrade Path

Table 3-1 provides the currently supported next-version upgrade paths, by current version and platform.

Table 3-1 Supported Upgrade Paths

Current Version Number	Next FluidFS Version (by platform)		
	Compellent	EqualLogic	PowerVault
1.0.400	N/A	N/A	2.0.7680
1.0.402	N/A	2.0.7680	N/A
1.0.407 / 1.0.424	N/A	1.0.425	1.0.425
1.0.425	N/A	2.0.7680	2.0.7680
2.0.4700	N/A	N/A	2.0.7680
2.0.4720	N/A	2.0.7680	N/A
2.0.5110 / 2.0.5120	2.0.7680	N/A	2.0.7680
2.0.6110	2.0.7680	N/A	2.0.7680
2.0.6220	N/A	2.0.7680	2.0.7680
2.0.6520 / 2.0.6550	N/A	N/A	2.0.7680
2.0.6730	2.0.7680 / 3.0.920760	N/A	2.0.7680
2.0.6740	N/A	2.0.7680 / 3.0.920760	N/A
2.0.6940	2.0.7680	N/A	2.0.7680
2.0.7040	2.0.7680	N/A	2.0.7680
2.0.7170	2.0.7680 / 3.0.920760	2.0.7680 / 3.0.920760	2.0.7680
2.0.7630	3.0.920760 / 3.0.930714	3.0.920760 / 3.0.930714	3.0.920760 / 3.0.930714
2.0.7680	3.0.920760 / 3.0.930714	3.0.920760 / 3.0.930714	3.0.920760 / 3.0.930714
3.0.8690	3.0.920760 / 3.0.930714	3.0.920760 / 3.0.930714	N/A
3.0.8700 / 3.0.8701	3.0.920760	3.0.920760	N/A
3.0.910390	3.0.920760	3.0.920760	N/A
3.0.911021	3.0.920760 / 3.0.930714	3.0.920760 / 3.0.930714	N/A
3.0.920760	3.0.930714	3.0.930714	3.0.930714
3.0.921013 / 3.0.922022	3.0.930714	3.0.930714	3.0.930714
3.0.930714	-	-	-

### NOTES:

1. N/A – Not applicable. Current Version was not released on the specific platform
2. In general, new major versions are initially supported on new systems only, while upgrades are supported after some delay. Check with Dell support before upgrading to new major version.
3. Before upgrading, ensure that the respective SAN storage firmware version supports FluidFS version 3 as specified in Chapter 3.

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## 4 FluidFS File-System Metrics

The numbers shown in tables 4-1 and 4-2 indicate the maximum supported configurations. The system will not always prevent the system from or warn you about these numbers being exceeded.

Table 4-1: FluidFS System Metrics

Feature	Maximum per FluidFS system
NAS volumes / containers	1024
Files and/or directories	64 billion per appliance
File size	10TB
File/directory name length	255 bytes <sup>3</sup> per path component <sup>4</sup>
Local users	100
Local groups	100

Table 4-2: FluidFS NAS Volume/Container Metrics

Feature	Maximum per NAS volume or container / system
NAS volume size	Available NAS reserve (minimum 20MB)
Snapshots	1024 / 10,000
Snapshot schedules	512 / 1024

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<sup>3</sup> UTF-8 characters might require multiple bytes per character.

<sup>4</sup> Full-path-length limitation is imposed by the client OS and/or protocol implementation.

## 5 Customer Environment Protocols Support

Table 5-1: Identity Management Services

Functionality	Service Provider	Status
Join AD domain <sup>5</sup>	Active Directory Windows 2003, 2003R2, 2008, 2008R2, 2012	Supported
Authenticate SMB client joined to same AD domain	Active Directory Windows 2003, 2003R2, 2008, 2008R2, 2012	Supported
Authenticate SMB client joined to different domain in same AD forest, with 2-way trust between the domain	Active Directory Windows 2003, 2003R2, 2008, 2008R2, 2012	Supported
Authenticate SMB client joined to different domain, with 1-way trust between the domains (FluidFS domain trusts Client domain, but not vice versa)	Active Directory Windows 2003, 2003R2, 2008, 2008R2, 2012	Supported
Signed communication (when required by Active Directory)	Active Directory Windows 2003, 2003R2, 2008, 2008R2	Supported
Anonymous LDAP bind <sup>6</sup>	OpenLDAP 2.1, 2.2, 2.3, 2.4	Supported
Anonymous LDAP bind	Active Directory Windows 2003, 2003R2, 2008, 2008R2	Not supported
Authenticated LDAP bind	Active Directory Windows 2008 R2, OpenLDAP 2.1, 2.2, 2.3, 2.4	Supported
Authenticated LDAP server	Active Directory Windows 2008 R2	Supported
Encrypted LDAP communication	Active Directory Windows 2008 R2	Supported
Bind to NIS domain	Any Linux platform, any version	Supported
Bind to NIS domain	Services for UNIX Windows 2008	Supported
Bind to NIS+ domain	Any platform	Not supported
Authenticate NFSv4 client	Active Directory Windows 2003, 2003R2, 2008, 2008R2, 2012	Supported
Authenticate NFSv4 client	Linux/UNIX Kerberos	Not supported

Table 5-2: Other Services

Functionality	Service Provider	Status
DNS	Windows 2003, 2003R2, 2008, 2008R2 Any Linux platform	Supported
NTP	Any platform, including EqualLogic group	Supported

<sup>5</sup> Domain or OU Administrator credentials are required

<sup>6</sup> Assuming allowed by the LDAP server

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## 6 SMB (CIFS) Support

FluidFS version 3 supports SMB1, SMB2 and SMB2.1 protocols. Please note that “natural” SMB3 clients (like Windows 8 and Windows Server 2012) are negotiated to SMB2.1.

Table 6-1: Highest SMB Version Supported - by Client OS

Client OS	SMB Version
Windows XP, Windows 2000	SMB 1.0
Windows Vista SP1	SMB 2.0
Windows 7	SMB 2.1
Windows 8, 8.1	SMB 2.1
Windows Server 2003, 2003 R2	SMB 1.0
Windows Server 2008	SMB 2.0
Windows Server 2008 R2	SMB 2.1
Windows Server 2012	SMB 2.1
AIX 6.1, 7.1	SMB 1.0
CentOS 5.8 – 6.3	SMB 1.0
Debian GNU/Linux 6	SMB 1.0
Fedora DE 14 – 15	SMB 1.0
Fedora DE 16 – 17	SMB 2.0
HPUX 11i v3	SMB 1.0
MAC OSX 10.7, 10.8, 10.9	SMB 2.0
Oracle Linux 5.8, 6.2	SMB 1.0
RHEL 5.5 – 6.3	SMB 1.0
Solaris 10, 11	SMB 1.0
Ubuntu 10.10, 11.10	SMB 1.0
Ubuntu 12.04 LTS	SMB 2.0

### NOTES:

1. Lower-than-maximum SMB level connections are also supported.
2. Setting ACL from Linux SMB clients is not supported.

Table 6-2: Supported CIFS configurations

Feature	Maximum per NAS volume or container / system
CIFS shares	1024 / 1024
Concurrent connections	10,000 <sup>7</sup> (per appliance)

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<sup>7</sup> Each appliance can support this number of CIFS connections, even if one of the controllers is not available.

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## 7 NFS Support

FluidFS version 3 supports NFSv3 and NFSv4 protocols only. NFSv2 clients are not supported.

Table 7-1: Highest NFS Version Supported - by Client OS

Client OS	NFS Version
NFS Services Windows 2008, 2008R2	NFSv3
NFS Services Windows 8.1	NFSv3
AIX 6.1, 7.1	NFSv4
CentOS 5.8	NFSv3
CentOS 6.2, 6.3	NFSv4
Debian GNU/Linux6	NFSv4
Fedora 14, 15, 16 DE	NFSv3
Fedora 17 DE	NFSv4
HPUX 11i v2	NFSv3
HPUX 11i v3	NFSv4
MAC OS x 10.7	NFSv3
MAC OS x 10.8, 10.9	NFSv4
Open SUSE 11.4, 12.2	NFSv3
Oracle Enterprise Linux 5.5 - 6.2	NFSv3
RHEL 5.4 – 5.7, 5.9 – 6.2	NFSv3
RHEL 5.8, 6.3	NFSv4
Solaris 10 U8	NFSv3
Solaris 11.1	NFSv4
Suse Linux Enterprise 10 SP4	NFSv3
Suse Linux Enterprise 11 SP1, SP2	NFSv4
Ubuntu 10.10, 11.10	NFSv3
Ubuntu 12.04 LTS	NFSv4
VMware ESX 4.1, 5.1	NFSv3
XenServer 5.6 SP1, 6.1	NFSv3

### NOTES:

1. Lower-than-maximum NFS level connections are also supported.
2. For NFSv4 clients, only Active Directory authentication is currently supported. See Chapter 6, *Customer Environment Protocols Support*.
3. NFSv4 built-in ACLs are not supported.
4. For NFSv4 clients, AUTH\_SYS, Krb5, Krb5i, and Krb5p modes are supported
5. FluidFS v3 supports up to 1024 NFS exports per NAS volume/container and/or system

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## 8 User and Group Quotas

Table 8-1: Supported Quota Configurations

Feature	Maximum per NAS volume or container / system
Quota rules	1000 / 1000

**NOTES:**

1. Quotas for AD and NIS/LDAP users are independent of each other, even if users are mapped, automatically or manually. For NAS volumes with mixed security styles, separate quotas should be set for Active Directory and LDAP / NIS users.
2. For NAS volumes with NTFS or UNIX style permissions, one unique quota should be set for each user. For mapped users, the usage and limits are applied using the target identity and will be shared with the native Windows or UNIX account.
3. In general, Dell recommends using the NTFS security style in mixed environments.

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## 9 FluidFS Replication

Replication partners must have the same number of FluidFS controllers and the same number of processors on each controller.

Replication partners can differ in network interface speeds (1Gb or 10Gb).

Replication requires establishing *Replication Partnership*, which determines the *Replication Protocol Level* and must have been established when both systems were running the same major FluidFS version. After establishing Replication Partnership, the target system may be upgraded to a higher (even major) version (the Protocol Level remains unchanged).

Replication Protocol Level determines the way replication is performed, specifically the TCP ports that are used to communicate between the replication partners. See below for the TCP ports used by each Replication Protocol Level.

Please note that upgrading to version 3 does not by itself upgrade the Replication Protocol Level. An explicit GUI/CLI command is necessary (Not available on EqualLogic based systems - Dell Support assistance is required) and requires that both Replication Partners are running FluidFS v3.

As a best practice, replication between systems running different major versions should be performed only for short-term upgrade scenarios and is not recommended as a normal operating state.

Table 9-1 lists replication-compatible systems, assuming they satisfy all other conditions.

Table 9-1: Replication-Compatible models

Source / Target	NX3500 NX3600	NX3610	FS7500 FS7600 FS7610	FS8600 FC FS8600 iSCSI
NX3500 NX3600	Yes	No	No	No
NX3610	No	Yes	No	No
FS7500 FS7600 FS7610	No	No	Yes	No
FS8600 FC FS8600 iSCSI	No	No	No	Yes

Each model can replicate to any model within the same class.



Table 9-2 lists the supported FluidFS replication features.

**Table 9-2: FluidFS Replication Support**

Attribute	Support
Maximum number of replication partners	16
Maximum number of replicated NAS volumes/containers	256
Maximum number of concurrent replications (rest are queued)	10 outgoing and 20 incoming
Maximum replication policies	512
Single NAS volume/container to single NAS volume/container	Yes
Single NAS volume/container to multiple NAS volumes/containers	No
Cascading replication of a NAS volume/container	No

FluidFS replication requires that the following target-system TCP ports are accessible, through the firewall, from the source system.

**Table 9-3: FluidFS Replication TCP Ports by Trust Level**

Functionality	Protocol Level 2 (V2 to V2 / V3)	Protocol Level 3 (V3 to V3)
Stunnel		10550, 10551
Setup and proxy	26, 10560	9445 (Compellent and PowerVault models only)
Data	10561-10568	

**NOTE:** EqualLogic-based replications also require port 3260 (iSCSI).

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## 10 Antivirus Support

Table 10-1 lists the supported antivirus applications.

Table 10-1: Antivirus Application Support

Vendor	Product
Symantec	ScanEngine 5.2, Protection Engine 7.0
Sophos	Endpoint Security and Control 10.0
McAfee	VirusScan Enterprise 8.8, VirusScan Enterprise for Storage 1.0.2
TrendMicro	InterScan Web Security Suite 3.1

Table 10-2: Maximum Antivirus Server Configurations Per FluidFS System

Feature	FluidFS Model		
	FS8600	FS7500, FS7600, FS7610	NX3500, NX3600, NX3610
Antivirus servers	10	4	4

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## 11 Space Pre-Allocation

This section provides a good estimation of the pre-allocated (reserved) space for various filesystem functions. It can assist with the estimation of disk space requirements and space growth of FluidFS systems.

Table 11-1 reserved space by function

File-System Function	Allocated per	Reserved space
Cache relocation	Pair/Appliance	144GB *
Mapping Structures	Pair/Appliance	16GB *
Continuous metadata journaling	Pair/Appliance	96GB *
Safety buffers	Pair/Appliance	20GB
Data Reduction	Pair/Appliance	100GB **
Space management	LUN	4GB
Data Integrity health scan	Total Space	0.5%

\* For NX3500 pairs the value should be halved

\*\* V3 only (V2 systems do not support Data Reduction). Please notice that the Data Reduction space (100GB per pair) is pre-allocated during upgrade to V3. If there is not enough free space to accommodate this growth, the upgrade may fail.

The amount of reserved space can also be estimated using the table below:

NAS Pool Size	Percentage of Reserved Space
10TB - 20TB	2% - 4%
20TB - 50TB	1% - 2%
> 50TB	< 1 %

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## 12 Backup/Restore - NDMP

Table 12-1 lists the supported Backup/Restore applications.

Table 12-1: Backup and Restore Applications

Application	Supported Version
CommVault Simpana	9.x
Dell Quest NetVault	9.0
EMC NetWorker	8.x
IBM Tivoli Storage Manager	6.3
Symantec BackupExec	2010R3, 2012
Symantec NetBackup	7.x

Refer to the DMA documentation for the minimal revision/service pack supporting Dell FluidFS systems.

Table 12-2: NDMP Backup Agent Information

Functionality	Supported Range
NDMP version	V2, V3, V4
DMA address type	IPv4 only
DMA servers	FS8600, NX3500, NX3600, NX3610 systems - Up to 10 FS7500, FS7600, FS7610 systems - up to 3
Concurrent backup/restore sessions (per controller)	Up to 48
DMA username length	1 - 63 bytes (accepts Unicode)
DMA password length	1-32 characters <sup>8</sup>

Table 12-3 describes the NDMP environmental variables supported by FluidFS v3.

Refer to the DMA documentation for a listing of the variables supported by the DMA. If the DMA does not set any of the variables, the NDMP server will operate with the default value.

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<sup>8</sup> For EqualLogic-based systems, the DMA password length is 1~31.

Table 12-3: Supported NDMP Environment Variables

Variable Name	Description	Default
TYPE	Specifies the type of backup/restore application. The valid values are "dump" and "tar." For "dump" type backup, the NDMP Server will generate inode-based file history. For "tar" type backup, the NDMP Server will generate file based file history. Values are case sensitive.	dump
FILESYSTEM	Specifies the path to be used for backup. The path must be a directory.	Not applicable
LEVEL	Specifies the dump level for the backup operation. Valid values are 0 to 9.	0
HIST	Specifies how file history is to be generated. The supported values are "d", "f", "y", and "n." The value "d" specifies that node/dir format file history will be generated. The value "f" specifies that file based file history will be generated. The value "y" specifies that the default file history type (which is the node/dir format) will be generated. The value "n" means that no file history will be generated	Y
DIRECT	Specifies whether the restore is a Direct Access Retrieval. Valid values are "Y" and "N."	Y
UPDATE	Specifies whether the dump level and dump time for a backup operation should be updated on the NDMP Server so subsequent backups can reference the dump level from previous backups. Valid values are "Y" and "N."	Y
EXCLUDE	Specifies a pattern for matching files that are not to be backed up. The environment variable is a list of strings separated by comma. Each entry will be used to match to nodes encountered during backup. The string can contain an asterisk (*) as the wild card character. At most, 32 comma-separated strings are supported. Entries containing "," should be escaped with the "\" character. Entries containing the "\" character should also be escaped with the "\" character.	No default
RECURSIVE	Specifies whether the restore should be recursive or not. Valid values are "Y" and "N." If this variable is set to "N", only the files that are the immediate children of the restore target are restored.	Y
RESTORE_OVERWRITE	Specifies whether the restore operation should overwrite existing files with the backup data. Valid values are "Y" and "N".	Y

Variable Name	Description	Default
LISTED_INCREMENTAL	<p>This environment controls behavior similar to the “listed incremental” option of the tar application. This variable specifies whether additional directory listing is added to the backup stream during incremental backup so that the recovery operation can handle files and directories deleted between the incremental backups.</p> <p>During backup, if this variable is set, additional directory listing will be added to the backup data stream. Because of the additional process required, this could affect the backup data stream size and performance.</p> <p>During recovery, if this variable is set and if the backup data stream was generated with this variable turned on, NDMP server will handle deleting files and directories that are deleted between incremental backups.</p> <p>Setting this variable requires additional processing time and enlarges the backup data stream size (how much it change will depend on the number of elements in the backup data set). If this feature is not important to the end user, it should not be set.</p>	N
BASE_DATE	<p>This variable is used by TSM for token-based backup, as an alternative to using the LEVEL environment variable.</p> <p>When BASE_DATE is set to “0”, a full backup is performed.</p> <p>After a full backup completes, a token can be retrieved by retrieving the DUMP_DATE environment variable. This token can then be passed in later backup as value of BASE_DATE. The backup performed in this case will be an incremental backup relative to the time when the token was generated.</p> <p>When BASE_DATE is set to “-1”, token-based backup is disabled.</p>	-1
DEREF_HARD_LINK	<p>This environment variable controls whether hard link files data content are backed up for all instances of the same file. Valid values are “Y” and “N”.</p>	N

## 13 Services and Ports

FluidFS systems provide and access services through the ports listed in the following tables. Firewall settings should allow communication to/from these ports. Actual ports used depend on the enabled protocols and features. All port numbers are fixed unless specified otherwise.

### FluidFS provided services

The following services/ports are provided by FluidFS systems on the client network.

Port Number	Protocol	Function / Service Name
22	TCP	Secure Shell (SSH)
26	TCP	FluidFS Replication (from FluidFS v2 systems)
80	TCP	Web UI (Not relevant to EqualLogic based systems)
111	TCP and UDP	RPC portmapper
161	UDP	SNMP agent
162	UDP	SNMP trap
427	TCP and UDP	Server Location Protocol
443	TCP	Web UI (Not relevant to EqualLogic systems)
445	TCP and UDP	SMB/CIFS
2049 – 2057 <sup>2</sup>	TCP and UDP	nfsd
3260	TCP	FluidFS Replication (EqualLogic based systems. <b>SAN network</b> )
4000 – 4007 <sup>2</sup>	TCP and UDP	statd
4050 – 4057 <sup>2</sup>	TCP and UDP	nlockmgr (NLM )
5001 – 5008 <sup>2</sup>	TCP and UDP	mount
5051 – 5058 <sup>2</sup>	TCP and UDP	quota
9445	TCP	FluidFS Replication (trust setup) Compellent and PowerVault based systems.
10000 <sup>1</sup>	TCP	NDMP
10550-10551, 10560-10568	TCP	FluidFS Replication
35451	TCP	External manager agent. Compellent based systems.
44421	TCP	FTP
44430 – 44439	TCP	FTP (Passive)

1. Default port number. Can be reconfigured.
2. On NX3500 systems these ranges should be shortened by 4

### FluidFS accessed services

The following services/ports on the client network are potentially accessed by FluidFS systems.

Port Number	Protocol	Function / Service Name
53	TCP	DNS
88	TCP and UDP	Kerberos v5
111	TCP and UDP	RPC portmapper
123	UDP	NTP
135	TCP	Active Directory
138	UDP	NetBIOS Datagram service
139	TCP	NetBIOS Session service
389	TCP and UDP	LDAP
464	TCP and UDP	Kerberos
543	TCP	Kerberos remote login
544	TCP	Kerberos remote shell
636	TCP	LDAP over TLS/SSL
RPC/portmapper dependent	UDP	NIS
749	TCP	Kerberos administration
1344 <sup>1</sup>	TCP	Antivirus - ICAP
3268	TCP	LDAP Global Catalog
3269	TCP	LDAP Global Catalog over TLS/SSL

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1. Default port number. Can be reconfigured.



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## 14 SNMP

FluidFS supports SNMP v2c and provides a custom MIB, for integration with SNMP-based management frameworks. The interface/MIB provides read access to the following data:

- System and controller status
- CPU utilization
- I/O statistics
- NFS statistics

## 15 Internationalization

### NAS Access

FluidFS v3 supports the Unicode /UTF-8 encoding allowing concurrent access from any UTF-8 compatible client. All NAS interfaces expect UTF-8 characters for file, folder/directory, share and other names.

Consequently, all names are internally maintained and managed in UTF-8 format. While individual file and directory names are each limited to 255 **bytes**, the number of **characters** might be further limited, depending on the language being used, due to the variable-width nature of the UTF-8 encoding.

### Management Access

Management data items, such as volume names, share names, directory names, user names, description fields, and so on, are all maintained in UTF-8 format.

The Compellent Enterprise Manager, EqualLogic Group Manager, and PowerVault NAS Manager Web UI all provide full UTF-8 support.

For CLI access, UTF-8 terminal applications, like XTERM, should be used. Terminal applications that do not support UTF-8 characters, such as KTERM, are not recommended.

### Potential Compatibility Issues

Some characters appear in multiple code points so the client OS actually determines the one that is used. When incompatible client OS's access the same file, the result may be either that incompatible characters are not displayed or they are substituted by characters similar in shape.

Table 15-1 details potentially incompatible characters.

Table 15-1: Potentially Incompatible Characters

Character	Windows	UNIX	Macintosh
WAVE DASH (~)	U+FF5E (FULLWIDTH TILDE)	U+301C (WAVE DASH)	U+301C (WAVE DASH)
DOUBLE VERTICAL LINE (  )	U+2225 (PARALLEL TO)	U+2016 (DOUBLE VERTICAL LINE)	U+2016 (DOUBLE VERTICAL LINE)
MINUS SIGN (-)	U+FF0D (FULLWIDTH HYPHEN MINUS)	U+2212 (MINUS SIGN)	U+2212 (MINUS SIGN)
OVERLINE ( ¯ )	U+FFE3 (FULLWIDTH MICRON)	U+FFE3 (FULLWIDTH MICRON)	U+203E (OVERLINE)
CENT SIGN (¢)	U+FFE0 (FULLWIDTH CENT SIGN)	U+00A2 (CENT SIGN)	U+00A2 (CENT SIGN)
POUND SIGN (£)	U+FFE1 (FULLWIDTH POUND SIGN)	U+00A3 (POUND SIGN)	U+00A3 (POUND SIGN)
NOT SIGN (¬)	U+FFE2 (FULLWIDTH NOT SIGN)	U+00AC (NOT SIGN)	U+00AC (NOT SIGN)

