DataDirect
N E T W O R K S

WOS Access NFS

Proof of Concept
Installation

2012.4

Rev. 0.4

Revision History

Date	Changes	Modified By
4/02/2012	Initial Version	Donald
4/10/2012	Added new contents, corrected some errors/typos	Donald
4/11/2012	Corrected errors/typos in HA setup section and etc.	Donald

Contents

1. Scope

- This document is served as a template for POC installation and configuration for WOS NFS Access.
- Free to modify to serve specific POC project

2. Point of Contacts

DDN Contacts

- Sales Management: _____
- Technical Manager: _____
- Technical Lead: _____

Customer Contacts

- _____
- _____
- _____

3. Product Description

References

- WOS Quick Start Guide   Contact: Dan Olster
- WOS User Guide   Contact: Dan Olster
- WOS Access NFS Administration Guide   Contact: Joe Bounour
- XXXX WOS Cloud Test Plan   Contact: LLiver Jose
- WOS Access NFS Education Modules   Contact: May Huboky
- WOS section in DDN Community

Version Information:

- WOS Access NFS: 1.0.1
- RedHat RHEL or CentOS: 6.2 x86_64

WOS Access NFS is a bundled server and software solution designed specifically to front the DDN Web Object Scaler (WOS) cluster with a POSIX compatible NFS interface that provides a federated view of NFS namespace across multiple gateways and WOS nodes. WOS Access NFS supports high availability requirements with redundant servers in an active/passive configuration and enables customers to scale out to multiple gateways across multiple sites. With WOS nodes combined with WOS Access NFS Gateways, distributed users can collaborate at local speeds across multiple locations using NAS protocols.

Key features of WOS Access NFS include:

- NFS v3 and v4 compatibility
- Synchronized NFS namespace across remote sites with up to four active gateways
- Multiple namespaces and mount points
- Local read and write cache
- Disaster Recovery (DR) protected
- High Availability (HA) Failover – active/passive gateways per site
- Write once/publish many
- Simplified but intuitive Graphical User Interface(GUI)

Figure 2-1 shows the diagram for a sample two-site installation with HA gateways.
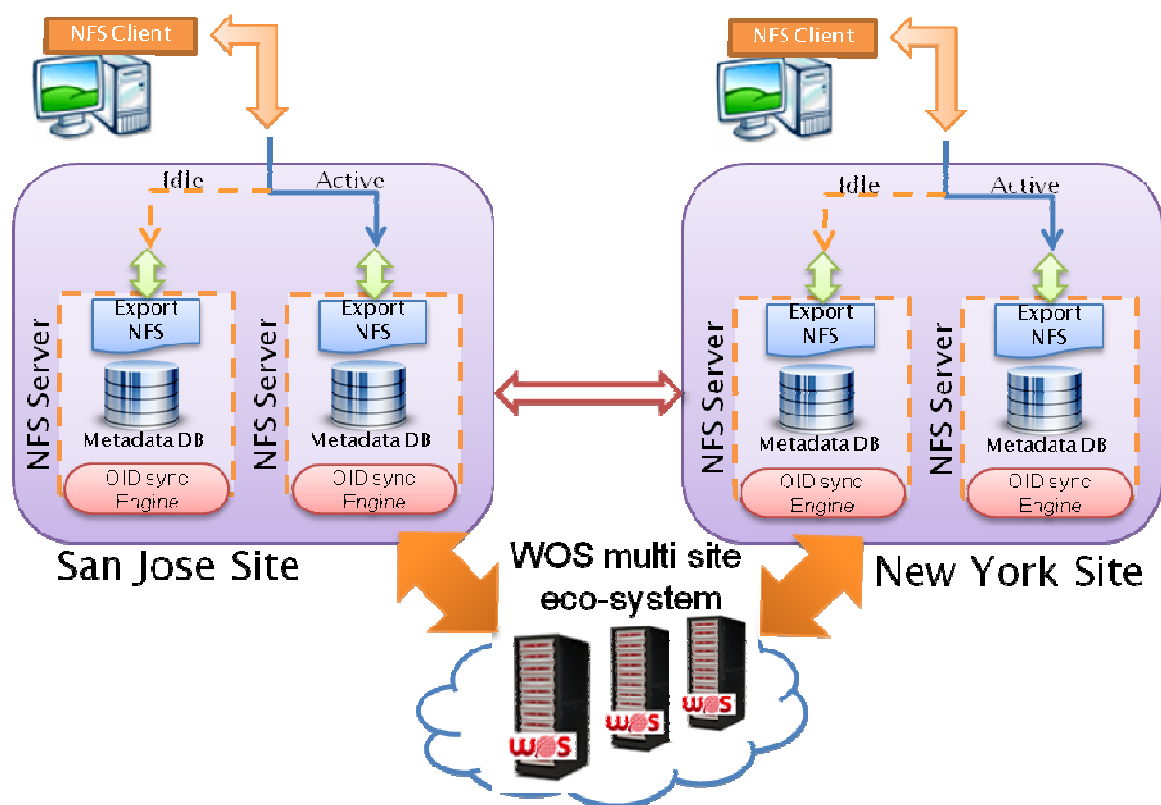
Figure 3.1 - WOS Access NFS Architecture

3.1 Building Blocks

DDN provides:

Name	Function	DDN Part Number	Notes
WOS 6000	4U 60-disk 2-node object storage enclosure,	WE-HD-120 WE-HD-180 WE-HD-27-S WE-HD-36-S	
WOS 1600	3U 16-disk 1-node object storage enclosure	WN-SD-16 WN-SD-32 WN-SD-7-S WN-SD-9-S	
NFS Gateway server	1u server with OS and NFS gateway software	WAN-BDL-GW WAN-BDL-2GW	
Misc.	Ethernet cables and etc.		

Customer Provides:

Name	Function	Notes
Network Switch	Connect Ethernet ports among NFS gateway servers, WOS storage nodes, and NFS client nodes	
NFS client nodes	NFS client workstations, Windows, Linux, Unix, Mac, and etc.	
Misc.	Ethernet cables and etc.	

The following sections show some combinations for possible POC installs. As a product, NFS gateways are designed to be located in geo-distributed sites. Yet it does not prevent you from having multiple nfs gateways collocate at same site as long as NS is synchronized among them to provide single name space.

3.2 Single Gateway Setup in One Site
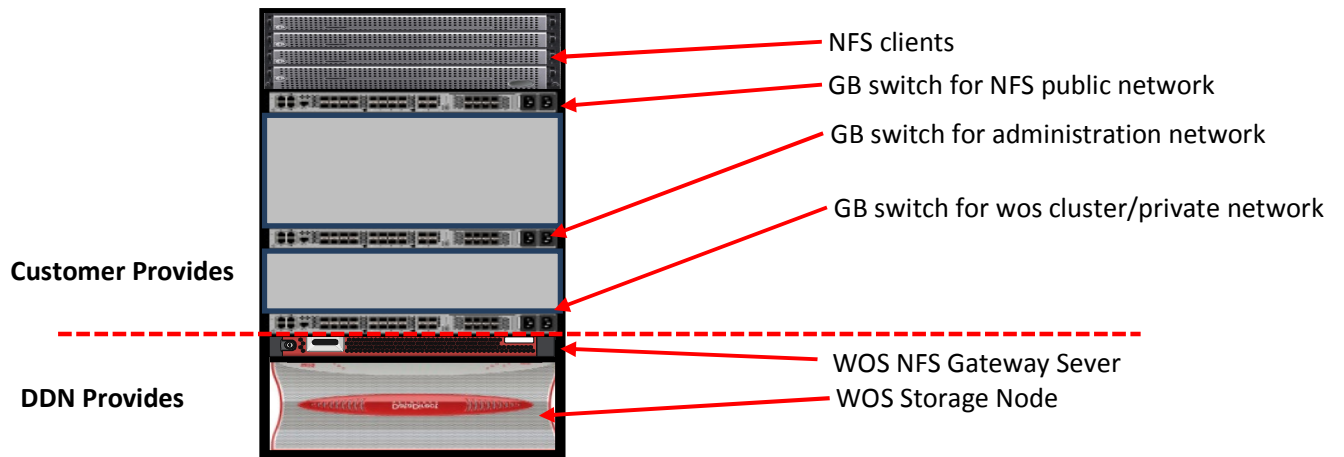
Figure 3.2 – WOS NFS Gateway POC

3.3 HA Setup in One Site
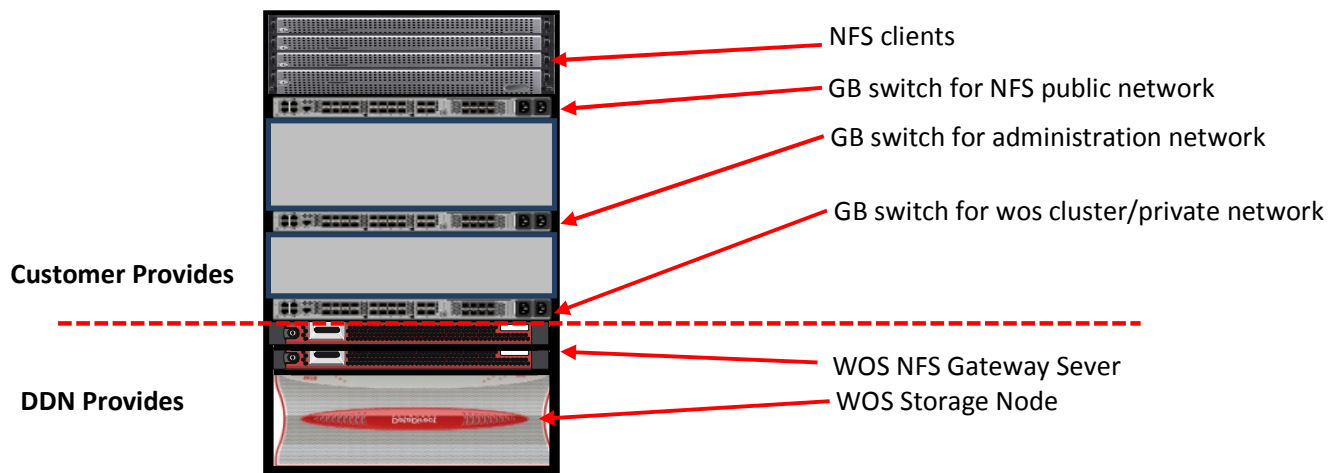
Figure 3.3 – WOS NFS Gateway HA POC

3.4 Single Gateway Setup in Two Sites

Site Chatsworth

Site Sunnyvale
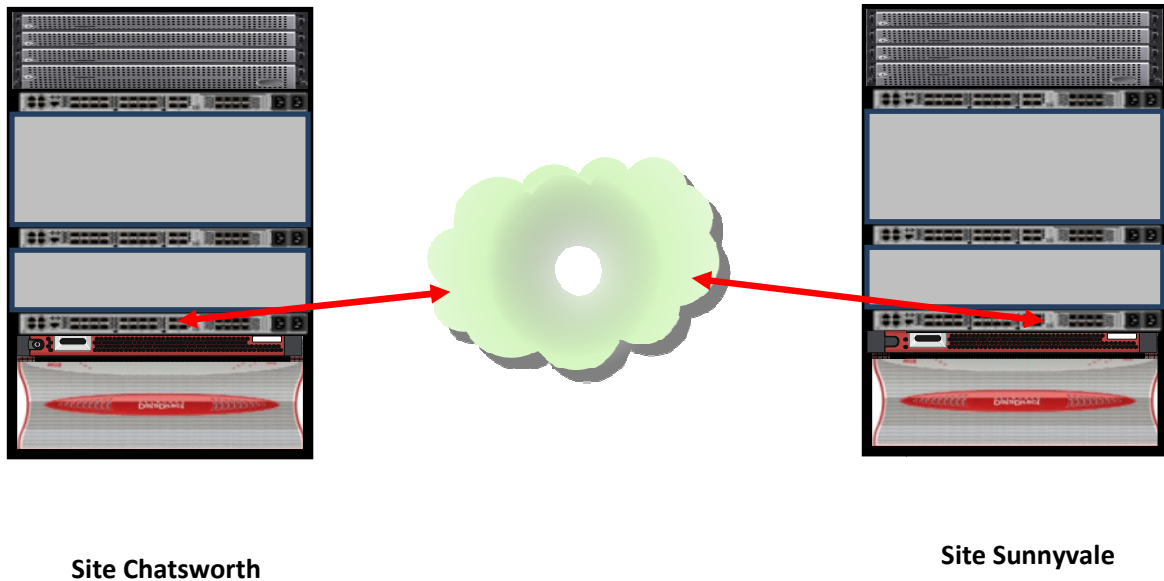
Figure 2.4 – WOS NFS Gateway Two-Site POC

3.5 Single Gateway Setup in Three Sites

3.6 Single Gateway Setup in Four Sites

3.7 HA Setup in One Site and Single Gateway in another Site

Site Chatsworth

Site Sunnyvale with HA
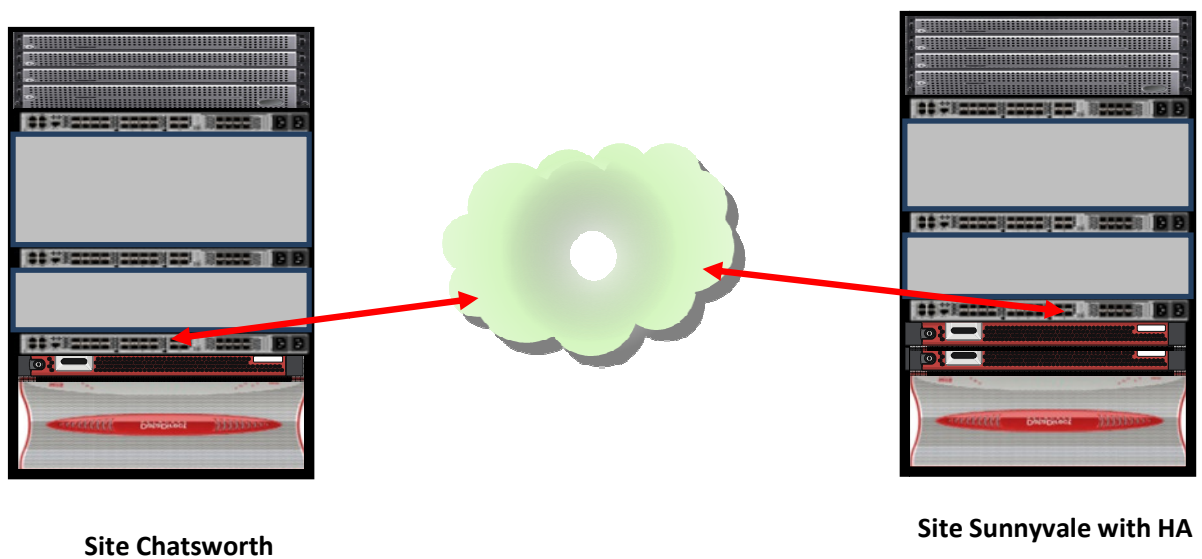
Figure 2.5 – WOS NFS Gateway Two-Site HA POC

3.8 HA Setup in One Site and Single Gateway in Two other Sites

3.9 HA Setup in Two Sites

4. Pre Deployment

Pre-installation checklist is shown below.

Ensure that you have the following items before going onsite for the POC installation.

- ☐ Installation and Planning Guide (IPG)
  - ☐ Work with customer to fill it out as much as possible
- ☐ Build of Material (BOM)
  - ☐ WOS storage nodes, including disks, rack rails, and etc
  - ☐ NFS gateway servers
  - ☐ Network cables
  - ☐ Null Serial port cables
- ☐ Tools needed at installation
  - ☐ Screw drivers, Philips and slotted
  - ☐ Cordless screw driver or drill kits
  - ☐ Gloves
  - ☐ Protection glasses
  - ☐ Noise canceling ear muff/phone/plugs
  - ☐ Knee pads
- ☐ Software needed at installation
  - ☐ Latest firmware for WOS storage
  - ☐ Latest WOS NFS gateway packages
  - ☐ CentOS 6.2 or RedHat RHEL 6.2 64-bit
- ☐ IP addresses WOS storage nodes/units:
  - ☐ 1 IP per WOS node
  - ☐ 2 IPs for WOS 6000 (it includes 2 WOS nodes)
  - ☐ 1 IP for WOS 1600
  - ☐ Subnet mask
  - ☐ Gateway IP
- ☐ IP addresses for NFS gateway server:
  - ☐ 3 IPs for NFS gateway
    - ☐ public port eth0 connected with NFS clients network
    - ☐ private port eth1 connected with wos cluster network
    - ☐ adm port eth2 connected with general purpose management network
  - ☐ 1 IP for iDRAC6:
    - ☐ baseboard remote management port connected with general purpose management network
  - ☐ Subnet masks
  - ☐ Gateway IPs
- ☐ NTP server IP address: at least one NTP server IP for time sync'ing.
- ☐ DNS server IP

5. Physical Installation

Please prepare the following tools in advance before going onsite for the installation

- Screw drivers, Philips and slotted
- Cordless screw driver or drill kits
- Gloves
- Protection glasses
- Noise canceling ear muff/phone/plugs
- Knee pads

5.1 WOS Storage Node Installation

Please refer to section 1-3 of WOS Quick Start Guide for physical installation details of WOS storage units.

Some points need attention:

- Keep enough clearance space in the back and front of the rack, 20 inches in the back and 40 inches in the front.
- Keep the storage nodes at the bottom of the rack as much as possible, as it's very heavy when loaded with disk drives.
- The sliding rail kit came with WOS works well with square-hole 4-post racks. If customer can only provide round-hole/threaded-hole rack, need special attention.
- Take controller and power supply modules out from the chassis, if it's too heavy to carry.
- Always arrange two people, if possible, for the installation

5.2 WOS NFS Gateway Installation

These are Dell R610 re-branded with DDN faceplate. Here are the steps to install the gateway server on the rack:

1. Attach the rails to the rack. The rails came with the server will work with most square-hole racks. Please pay attention to IPG when gathering site information from customer. If customer can only provide round-hole racks, then need to arrange in advance with operation, or ask customer to provide rails or shelf for the install. This had better be done before on-site.
2. Load the server on rails.
3. Install the cable management arm.
4. Connect power cords and network cables.
5. Connect the server to a keyboard, monitor/video, and mouse (KVM).
6. Power up the server to check no hardware issue.

5.3 Network Connection

The installation calls for 3 independent networks. For performance, maintenance, and troubleshooting purpose, these networks need to be on separate subnets, and either on separate network switches or on separate VLANs:

1. **WOS NFS public network**: this network is for network traffic between NFS gateway and NFS clients.
2. **WOS cluster network**: this network is for network traffic among WOS nodes, WOS nodes and NFS gateways, and among NFS gateways. We also name it **private network**. For multi-site installation, this network also needs to reach remote WOS cluster nodes through VPN. It's not recommended to connect other non-WOS equipment in this network.
3. **Administration network**: this is for system monitoring through ssh, http and etc. NFS gateway servers are connected with this network. WOS nodes can be monitored through NFS gateway.

Contact with network admin at customer site to locate the network switches, and ports to use for the above networks and ports on WOS nodes and WOS NFS gateway servers. Hook up network cables per the site requirements.

Network switch ports needed:

- WOS storage node:
  - 4 ports per node for performance.
  - 1 port per node minimum.
  - Note: WOS 6000 came with 2 nodes.
- WOS NFS Gateway server:
  - 4 ports per server.

6. Installation of CentOS/RHEL

DDN Provides 1U NFS gateway server which is a Dell re-branded R610. The server has an iDRAC6 card for remove access control which provides a virtual host console function which is very helpful in case not able to find a KVM combo around.

Once the power is up in the server, the iDRAC6 card Ethernet port is available. The default IP of the port is 192.168.0.120. Configure your laptop to connect to it first. The login credential is username: root, password: calvin.

Click on Power tab on the top menu bar, check the box saying Power On System(default), and click on Apply button on the right bottom side of the screen.

Click Properties tab on the top menu bar, in the Virtual Console Preview section, click the Launch button. This will bring up a java window which shows current console output. We can watch the BIOS boot-up of the server from here.

6.1 Configure iPERC Raid Controller Card

WOS NFS Gateway 1.0.1 GA release needs large high performance local disk cache. We'll need to create a single VD with 4 disks in RAID-5 mode on the server's raid card bios setup.

- CTRL+R to get into configuration screen at BIOS boot-up stage
- Press F2 to create new VD in the Virtual Disk Management window
    - RAID Level: RAID-5
    - Physical Disk: select all by SPACE key
    - Basic Settings:: VD Name: :System Disk
    - Advanced Settings:
        - Element Size: 64KB. Default, no change
        - Read Policy: No Read Ahead. Default, no change
        - Write Policy: Write Through. Default is writeback.
        - Initialize: check the box
- Exit and save the configuration, and reboot.

6.2 Configure iDRAC6 Card

Configure the iDRAC6 card is optional but nice to have in POC, and definitely a must in real deployment.

Press CTRL + E to get into configuration screen at BIOS bootup stage, and set the following parameters in the example below:

- LAN Parameters::IPv4 Settings
    - IP Address: 192.168.0.101
    - Subnet Mask: 255.255.255.0
    - Default Gateway: 192.168.0.1

- o DNS 1: 8.8.8.8
- o DNS 2: 8.8.4.4
- LAN User Configuration
  - o root account password: {dktyvn}

Reboot the server after saved the changes.   You also need to re-connect to the iDRAC6 card with the new IP.

6.3 Install CentOS/RHEL

The supported version of RHEL/CentOS version is 6.2 64-bit.

- Use 'wosnfs' as the root password.
- Select Minimum Packages to install. The installer of NFS gateway software will later pull needed software packages by itself.
- If need to install any other packages, you can always use "yum –y install" to do it.

7. Configuration of WOS NFS Gateway in Single Site

Please refer to Figure 2.2 for the physical diagram of this Single NFS Gateway Single Site installation.

In this configuration, we have three networks to connect WOS storage nodes and WOS NFS Gateway server with the rest of the world:

1. Public Network: port eth0 of the WOS NFS gateway server is connected with this network and the NFS clients. NFS traffic is on this network.

2. WOS Private Network: port eth1 of WOS NFS gateway server and ethernet ports of WOS storage nodes are connected with this network. Traffic among WOS storage nodes and traffic between WOS storage nodes and WOS NFS gateway server are on this network.
Note: each WOS storage node can be configured with 1 ethernet port or bonding of 4 ethernet ports. The later needs network switch to support LACP 802.3ad Link Aggregation and be configured.

3. Administration Network: port eth2 of WOS NFS gateway server is connected with this network. The purpose of this network is to separate the traffic for daily system monitoring, and management and etc. from NFS and WOS traffic. This is also easy for trouble-shooting in case issues occur.

The Following table shows the IP allocation for this configuration. It's a sample and can vary in the field of POC. As a good practice, prepare a table like this, and ask customer to fill in before going onsite.

Hostname	Public Network IP(eth0)	WOS Private Network IP(eth1)	Admin Network IP(eth2)	Admin Network IP(iDRAC6)
network-sw				192.168.2.254
wos-nfs-gw*	192.168.0.100	**192.168.1.100***	192.168.2.100	192.168.2.101
wos-node-1		192.168.1.120		
wos-node-2		192.168.1.121		
subnet mask	255.255.255.0	255.255.255.0	255.255.255.0	255.255.255.0
gateway IP	192.168.0.1	192.168.1.1 (don't care)	192.168.2.99	192.168.2.99

7.1   Configuration of WOS Storage Nodes

The following sections 5.1.X are mostly quoted from WOS Quick Start Guide. Please refer to the most recent version of the guide for more detail information.

7.1.1   Initial Serial Port Configuration on First Node

1. Connect a null serial cable between a PC and the CLI connector on the WOS node
2. Load a serial console program(putty, minicom) and use the following settings for the serial connection: **115200, 8N1, no flow control**
3. Power up WOS node, and once the "wos login:" prompt appears, login with name "admin", and password "admin"
4. Enter "help" to get a list of available commands
5. Enter "configure" to begin the configuration wizard. You will be prompted to enter the node's IP address, subnet mask, gateway IP address, and the node name. Node name is simply a text string to help you identify the node from the web interface. The IP address for this first node will be the primary IP address of WOS storage cluster. You will need it during serial port configuration of all subsequent nodes for the WOS cluster:
        _____192.168.1.120_____.
6. You are then asked if the node is being added to an existing WOS cloud (WOS cluster is a better term). Since this is the first node, enter 'n'.
7. You are then asked if you want to configure 802.3ad Link Aggregation on the node's Ethernet ports. Be sure if select 'y' here, also needs to configure the switch to enable 802.3ad.
8. The next step is to confirm the settings you have entered. Enter 'y' to accept.
9. The last step, if you select 'y' in step 8, is to set the clock. Follow the on-screen instructions to enter your time zone, date, local time. Hit <Enter> when prompted to reboot the system.
10. The node will then reboot.

Note: when the node is not configured to use 802.3ad Link Aggregation, the Ethernet port is the right most port on the 4-port NIC card at back of the WOS 6000 node. Please refer to Quick Start Guide for a picture of the Ethernet port layout at the back of a WOS 6000/1600 node.

Please see a screen shot of the process in next page.

```
wos.wos login: admin
Password:
WOS> help
                   restore    Restore node to factory state
                 configure    Create or modify configuration
                      quit    Exit
                  settings    View/change node settings
                      ping    Verify connectivity to cluster
                    reboot    Reboot this node
                  shutdown    Safe shutdown
                      show    Show current configuration
                  password    Change password
WOS> show
        IP address:          NOT_SET
        Netmask:             NOT_SET
        Gateway:             NOT_SET
        Name:                NOT_SET
        Primary Cluster IP:  NOT_SET
        Link aggregation:    Disabled
        Firmware revision:   v2.0.1_1.5765
WOS> configure

Enter IP address of this node: 192.168.1.120

Enter netmask for this node: 255.255.255.0

Enter gateway IP address for this node: 192.168.1.1

Enter name for this node: wos-node-1

Are you adding this node to an existing cluster? (y/N): N

This node's IP address will be the Primary Cluster Address.
Please make a note of its IP address for use in configuring additional nodes.

In order to use multiple gigabit Ethernet connections to this node,
your switch must be configured for 802.3ad link aggregation.

Is your switch configured for 802.3ad link aggregation? (y/N): N
Please refer to your Quick Start Guide and connect a single Ethernet cable to your
switch.


Please confirm your responses:

        IP address:          192.168.1.120
        Netmask:             255.255.255.0
        Gateway:             192.168.1.1
        Name:                wos-node-1
        Primary Cluster IP:  192.168.1.120
        Link aggregation:    Disabled
        Firmware revision:   v2.0.1_1.5765

Is this information correct? (y/N): y
Applying configuration...
Configuration applied.

The last step before rebooting the system is to set the clock.
```

```
The last step before rebooting the system is to set the clock.

Note: You can enter any piece of the name of any timezone from the standard zoneinfo database.
If you are not sure what to choose, try the names of the closest major cities.
Alternatively, enter your offset from UTC, i.e. -8 for Pacific Standard.

Enter the local timezone (GMT-8):

Enter the local date in 'Month DayOfMonth Year' format (ex: Jan 1 2009) (Mon Apr 9 2012): April 9
2012
Is Mon Apr 9 2012 correct? (y/N): y

Enter the local time in 12- or 24-hour format (relative to the timezone you just selected)
(04:47:03 PM): 17:41:00 PM
You must enter a valid time.

Enter the local time in 12- or 24-hour format (relative to the timezone you just selected)
(04:47:12 PM): 17:42:00
Is 05:42:00 PM correct? (y/N): y

Clock is now set to Mon Apr  9 17:42:04 GMT-8 2012.

Node will now be rebooted.  Hit 'enter' to continue.
System will now reboot.  This could take several minutes.

Broadcast message from root (ttyS0) (Mon Apr  9 17:42:07 2012):

The system is going down for reboot NOW!
ÿÿç¿ÿ¿ÿ7µ¯·ž-¨¢
                ¤



               ÿ
wos.wos login:
```

7.1.2   Initial Serial Port Configuration on Second and Following Nodes

The initial serial port configuration on second and subsequent nodes is the same as described in 5.1.1, except step 6. When prompted if the node is being added to an existing WOS cloud, select 'y'.

Please check out the screen shot for this process below.

```
WOS> configure

Enter IP address of this node: 192.168.1.121

Enter netmask for this node: 255.255.255.0

Enter gateway IP address for this node: 192.168.1.1

Enter name for this node: wos-node-2

Are you adding this node to an existing cluster? (y/N): y

Enter the Primary Cluster Address (available from UI): 192.168.1.120

In order to use multiple gigabit Ethernet connections to this node,
your switch must be configured for 802.3ad link aggregation.

Is your switch configured for 802.3ad link aggregation? (y/N): n
Please refer to your Quick Start Guide and connect a single Ethernet cable to your switch.


Please confirm your responses:

        IP address:            192.168.1.121
        Netmask:               255.255.255.0
        Gateway:               192.168.1.1
        Name:                  wos-node-2
        Primary Cluster IP:    192.168.1.120
        Link aggregation:      Disabled
        Firmware revision:     v2.0.1_1.5765

Is this information correct? (y/N): y
Applying configuration...
Configuration applied.

Node will now be rebooted.  Hit 'enter' to continue.
System will now reboot.  This could take several minutes.

Broadcast message from root (ttyS0) (Mon Apr  9 17:00:59 2012):

The system is going down for reboot NOW!
ÿÿ~ÿïùÿµ½*µi
            j!
              *ÿ¡
wos.wos login:
```

### 7.1.3 GUI Configuration: Verifying Initial Status

After all WOS storage nodes are done with initial serial port configuration and restarted, start a web browser and in the URL address line, enter the WOS cluster primary IP address, followed by ":8088", which designates the proper port number for WOS GUI home page.

A pop up window will ask for login credentials. Enter the default username "admin" and password "admin"

The WOS summary page will appear. There are five other tab pages you can click to on top of the web page, Statistics, Nodes, Policies, Maintenance, Preferences.

Click through the tabs to get familiar, and make sure all look normal.

Please refer the following screen shot for an initial login screen. Notice that there two new nodes displayed in the alert area at the bottom of the screen.
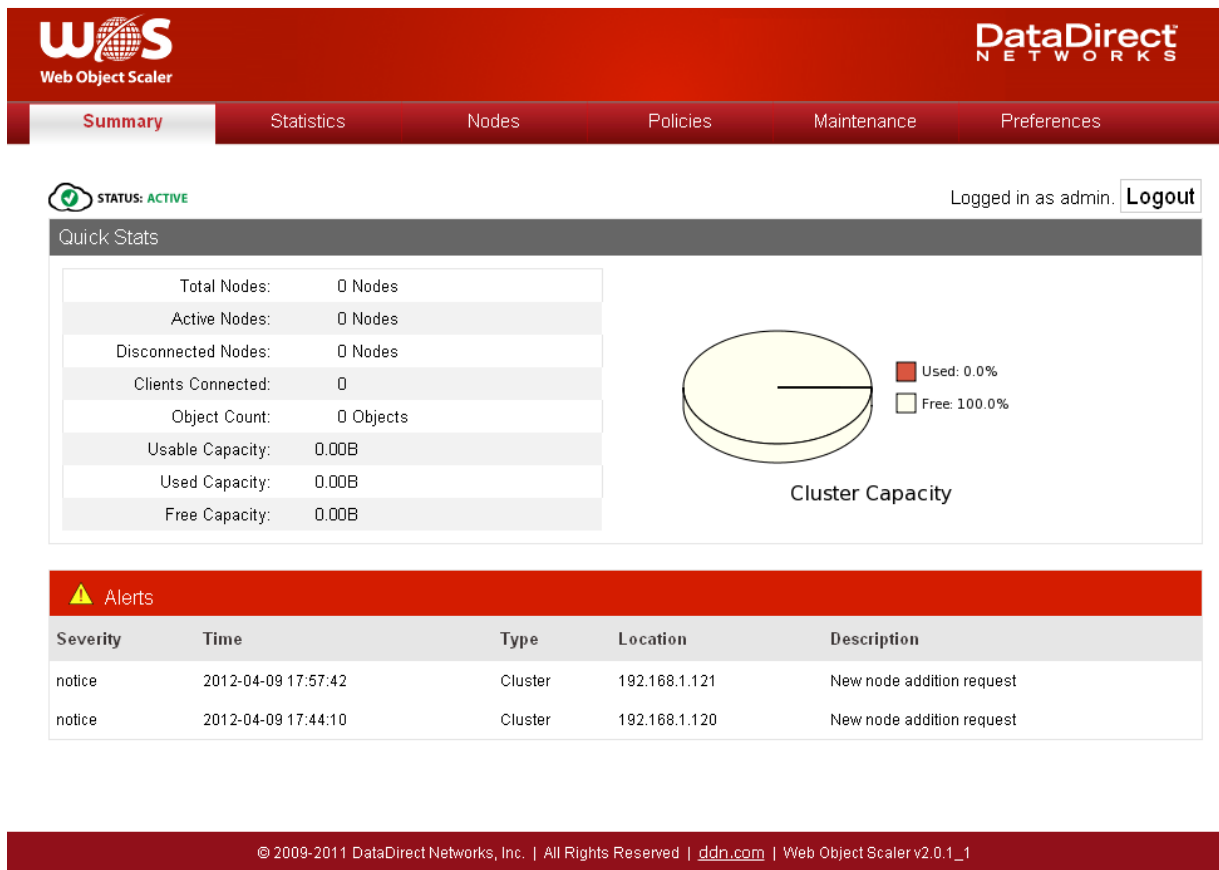
Notes: It's very important that to go to the Maintenance page and scroll down to the bottom to make sure no error messages there in the logs section, like missing disks and etc. Please see picture in the next page which shows 4 missing disks in one of the nodes. In this case, the node is put into "Paused" state. To get out from the state, you need to SSH to the CLI and enter "settings". Then enter

"AllowMissingDrives" and answer "y" to turn it on. You can then un-pause your node, and it should come up fine. You'll then need to find out why there are missing disks and etc.

Python API Guide :	wos-v2.0.1_1-py_api_guide.pdf
Python Dev Kit :	wos-v2.0.1_1-py_sdk.tgz
REST API Guide :	wos-v2.0.1_1-rest_api_guide.pdf

Logs

Lines to Display: [10] [Update]

```
Apr 9 19:37:29 wos WOS: alert: from 192.168.1.121: Drive subsystem error (002). Node has been paused. Contact DDN Support.
Apr 9 19:37:29 wos WOS: alert: from 192.168.1.121: Drive not present; slot 54
Apr 9 19:37:29 wos WOS: alert: from 192.168.1.121: Drive not present; slot 53
Apr 9 19:37:29 wos WOS: alert: from 192.168.1.121: Drive not present; slot 52
Apr 9 19:37:29 wos WOS: alert: from 192.168.1.121: Drive not present; slot 51
Apr 9 19:37:08 wos WOS: notice: from 192.168.1.121: New node addition request - cleared
Apr 9 19:28:56 wos WOS: notice: from 192.168.1.121: New node addition request
Apr 9 19:16:18 wos WOS: notice: from 192.168.1.120: New node addition request - cleared
Apr 9 19:15:14 wos WOS: notice: from 192.168.1.120: New node addition request
Apr 9 18:57:06 wos WOS: alert: from 192.168.1.120: Drive not present; slot 60 - cleared
```

7.1.4 GUI Configuration: Updating Firmware

At the bottom of the page, the revision number of the WOS firmware is displayed at the end of "All Rights Reserved" line. If the revision number is lower than the firmware you have, you need to upgrade the firmware.

Click on Maintenance tab, the section titled Firmware Update is on the left. Click Choose File button to select the firmware file from your PC/laptop. Click Install button to start the upgrade process. See figure 7.1
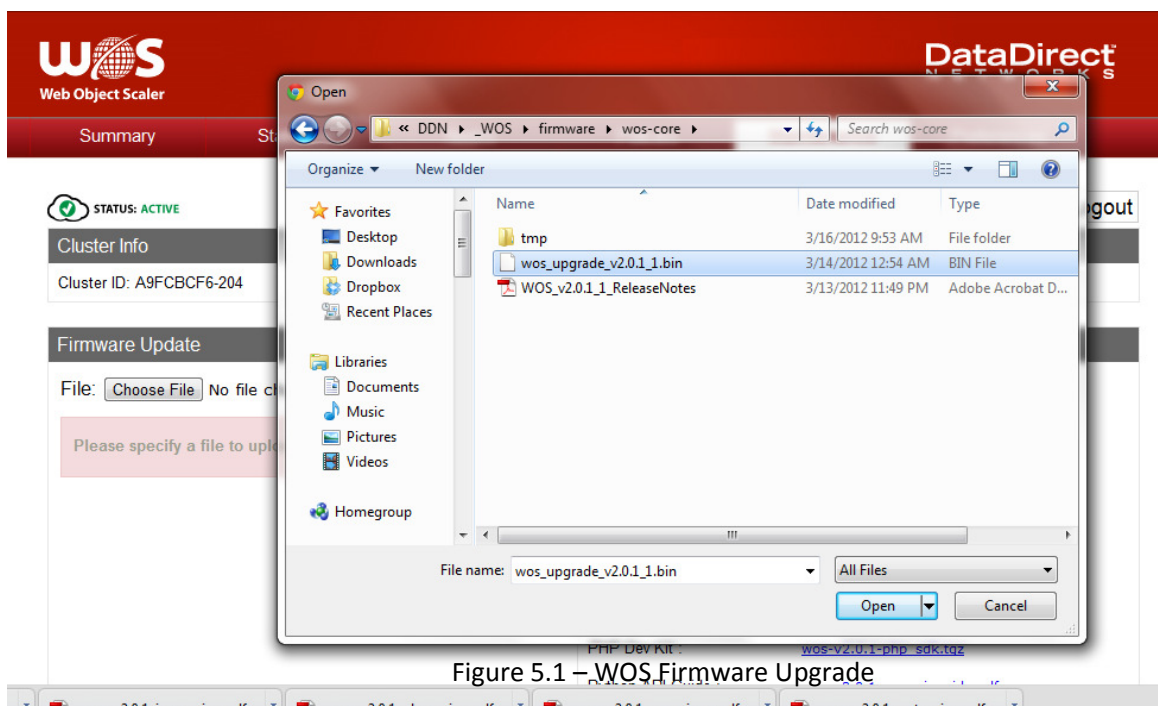
Figure 7.1 – WOS Firmware Upgrade

Firmware will be transferred to WOS node with primary IP. In the status line of the browser, it will normally show the progress of the transfer. See figure 7.2.
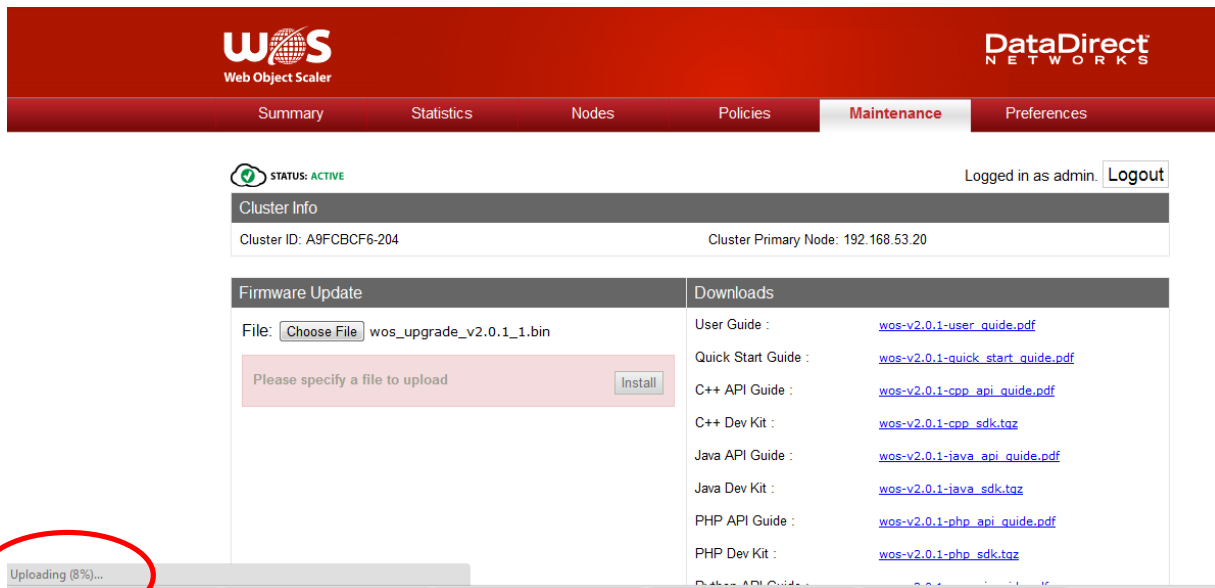
Figure 7.2 – WOS Firmware Upgrade Progress

Once the transfer is done, it will prompt you to restart the WOS node.

If there are multiple WOS nodes in the WOS cluster, you only need to upgrade the primary WOS node once. All the other WOS nodes will be upgraded by the primary node automatically. See figure 7.3.

Figure 7.3 – WOS Firmware Upgrade – multi nodes

7.1.5   GUI Configuration: Creating One Zone and Adding Nodes

Select "Nodes" tab from the menu bar at the top of the screen.

Right-click on "MyCluster" and select "Rename" from the pull-down menu

Enter the name of the WOS cluster: TestCluster

Create a new zone by right-clicking on the "TestCluster" name and select "Add Zone" from the pull-down menu
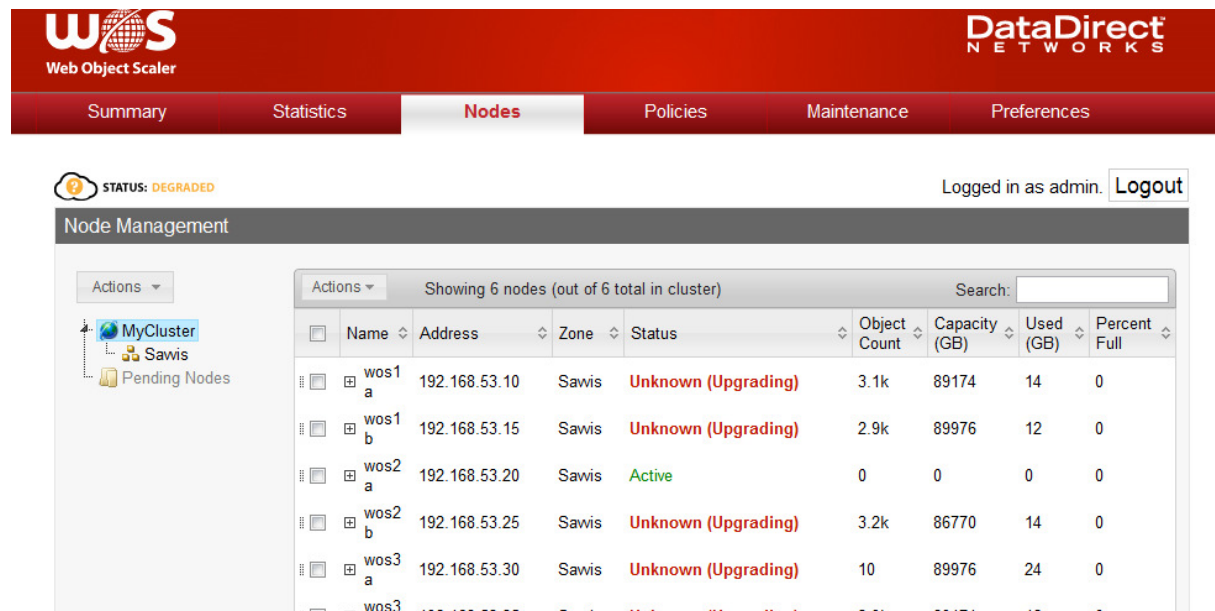
A Zone will be added to the tree beneath the "TestCluster" name. Rename the zone by right-clicking on the zone name and selecting "Rename". Rename the zone to "Chatsworth".

Next need to assign the nodes into newly created zone Chatsworth. Select "Pending Nodes" folder beneath zone name "TestCluster". It will expose the nodes that have been discovered by the cluster, but not yet assigned into a zone. Check the check box on the right of IP addresses of the two nodes discovered, and click on Actions button, select "Accept 2 nodes into Chatsworth" to add them into the zone. You'll be prompted to confirm addition of node(s) into zone. Click "OK" to accept.

7.1.6   GUI Configuration: Creating the Test Policy

Select "Policies" tab from the menu bar on top of the screen.

Click "Create Policy" button. Please create a policy called "TEST", with replica of 2 in the only zone named TestCluster.

7.1.7   GUI Configuration: Getting Documents and API Packages

Click "Maintenance" tab from the menu bar on top of the screen. To the right of the screen, in the Downloads section, a list of documents and APIs is presented. You can get the most recent version of the following files:

1. User guide
2. Quick Start Guide
3. C++ API Guide
4. C++ Dev Kit
5. Java API Guide
6. Java Dev Kit
7. PHP API Guide
8. PHP Dev Kit
9. Python API Guide
10. Python Dev Kit
11. C++ API Guide

7.1.8 Verifying WOS Storage Cluster I/O

To verify that the WOS cluster named TestCluster is operational, you can use CURL to issue simple commands through WOS RESTful API.

To put an object:

curl –v –data "test 1,2,3" –H x-ddn-policy:"TEST" http://<TestCluster primary IP address>/cmd/put

To get the object (substitute the OID you received above for the OID used below):

Curl –v http://<TestCluster primary IP address>/objects/APW-He6omUHed7D5-ColmI

7.2 Configuration of WOS NFS Gateway

This section is to describe the steps need to configure the WOS NFS service on the gateway server node. It includes:

1   Modify the configuration file
2   Start the WOS NFS related services
3   Mount clients

7.2.1   Prerequisites for software installation

- The gateway server is installed with REHL or Centos 6.2 64-bt with Minimal packages option
- em1, em2 and em3 are up with pre-configured IP addresses and connected with right networks:
  - edit /etc/sysconfig/network-script/ifcfg-em1, ifcfg-em2 and ifcfg-em3
  - ifup em1; ifup em2; ifup em3
- The gateway server must have internet access, as the installation script uses online RPM repositories(EPEL: Extra Packages for Enterprise Linux 6)
- Hostname must be configured before installing WOS Access NFS package
  Edit /etc/sysconfig/network for taking effect on reboot. Run 'hostname wos-nfs-gw ', and re-login for immediate effect.
- Edit /etc/hosts file to add the hostname line with the gateway IP

  ```
  127.0.0.1 localhost.localdomain localhost
  192.168.0.100 wos-nfs-pub wos-nfs-gw.ddn.com
  192.168.1.101 wos-nfs-gw
  192.168.1.120 wos-node-1 woscluster
  192.168.1.121 wos-node-2
  ```

- Edit /etc/resolve.conf to add nameserver 8.8.8.8 and 8.8.4.4
-
- Stop Apache qpidd daemon if it's running. It conflicts with rabbitmq.
- # service qpidd stop & chkconfig –del qpidd
- Make sure wget rpm is installed. Otherwise, install it using yum.
  - rpm –qa | grep wget
  - yum –y install wget
- Make sure openssh-clients is installed:
  - rpm –qa | grep openssh-clients
  - yum –y install openssh-clients

7.2.2   Install the software package

In the software package wosnas-nfs-1.1.0-GA.tgz provided by DDN, there is a software installer. Use it to install the gateway.

- Create an installation directory:
  ```
  # mkdir /root/WOSNFS
  ```
- Copy the tgz file to this directory:

  ```
  [root@wos-nfs-gw WOSNFS]# pwd
  /root/WOSNFS
  [root@wos-nfs-gw WOSNFS]# ls
  wosnas-nfs-1.1.0-GA.tgz
  [root@wos-nfs-gw WOSNFS]#
  ```

- Uncompress the package and start the installation

  ```
  [root@wos-nfs-gw WOSNFS]# tar zxf wosnas-nfs-1.1.0-GA.tgz
  [root@wos-nfs-gw WOSNFS]# cd wosnas-nfs-1.1.0-GA
  [root@wos-nfs-gw wosnas-nfs-1.1.0-GA]# ./install.sh
  ```

- Check that service rpcbind is started:

  ```
  [root@wos-nfs-gw WOSNFS]# service rpcbind status
  [root@wos-nfs-gw WOSNFS]# service rpcbind start
  ```

The WOS Access NFS gateway software is now deployed but not configured.

7.2.3   Configure Access NFS server to connect with WOS storage

The configuration file for WOS Access NFS gateway is at /opt/ddn/nas/etc/wosnas.nfsd.conf.

1. Replace $WOS_CLUSTER$ with the WOS cluster TestCluster's primary IP address in wosnas-nfsd.conf.
   OVFS_WOS_CLUSTER = "woscluster" ; # Mandatory WOS cluster address
2. Replace WOS_POLICY with the WOS policy TEST in wosnas-nfsd.conf.
   OVFS_WOS_POLICY = "TEST" ; # Mandatory WOS policy name
3. Enable WOS file read streaming mode in wosnas-nfsd.conf. Default is TRUE. Just FYI.
   OVFS_WOS_USE_READ_STREAMS = "TRUE"; # enable WOS read streaming
4. Specify the site ID OVFS_WOS_SITEID parameter in wosnas-nfsd.conf. Default is 1. Just FYI.
   OFVS_WOS_SITEID=1;

7.2.4   Start MetaData database and NFS service

In order for the above changes in configuration to take place, need to restart two services: metadata database and NFS services.

```
# service postgresql restart
# service wosnas-nfsd restart
```

7.2.5 Confirm NFS Service Running and Mount Point Good

- From Command line:

```
# service wosnas-nfsd status
# showmount –e
# ps –ef | grep wosnas-nfs
```

- From NFS gateway GUI:
  - o Point your web browser to the gateway's any IP addresses, and bring up the login page of the gateway GUI. The login username is "admin", and password is "admin"
  - o Check Summary and Services page for the newly configured services.
  - o You can also do most of the configuration from GUI, except for metadata synchronization and HA, which have to be done through CLI
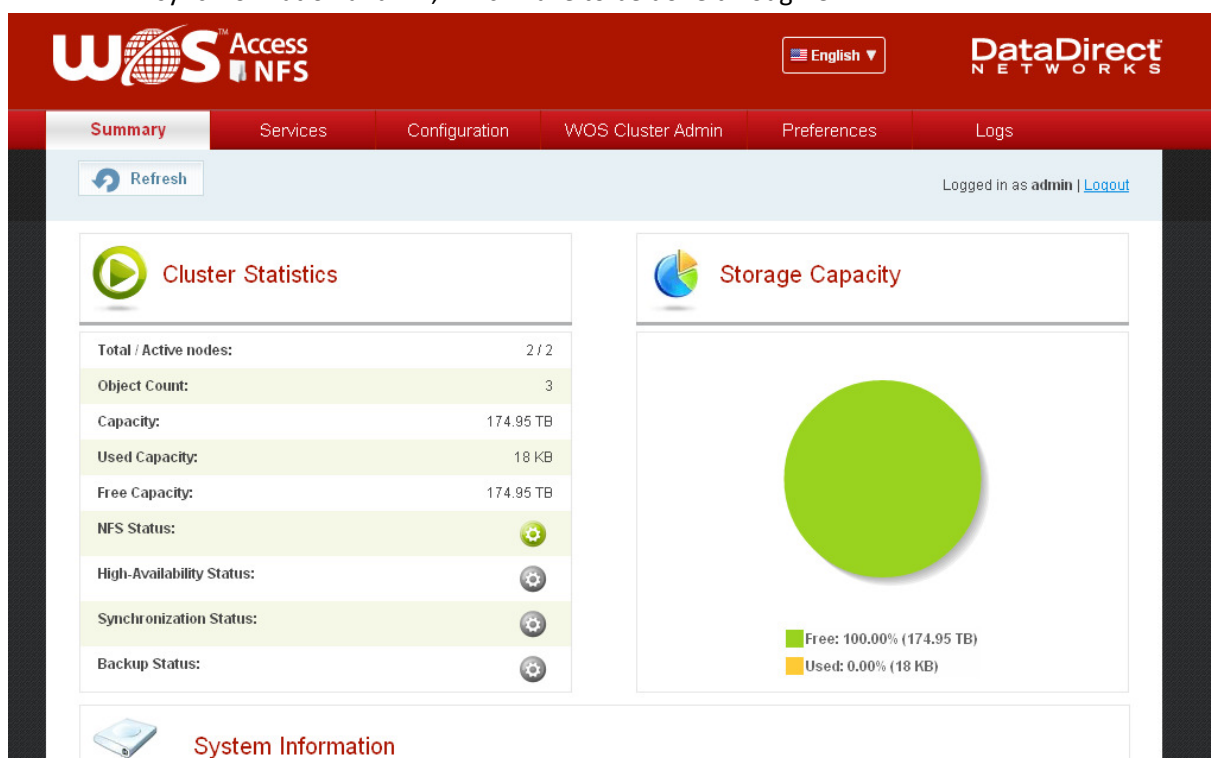
7.2.6 Mount NFS Mount Point from NFS Client

Log into a linux NFS client, and mount the WOS NFS gateway's export point:

```
# mkdir /mnt/wos
# mount –o vers=3, proto=tcp wos-nfs-gw-pub:/mnt/wos /mnt/wos
```

8 Configuration of HA WOS NFS Gateway in Single Site

Configuration of HA NFS gateway includes the following three steps, with major sub steps included:

1. Configure NFS service in each server node in the HA pair.
   a. Modify configuration file
   b. Restart metadata DB and NFS services
2. Configure name space (NS) synchronization in the two server nodes.
   a. Modify configuration file
   b. Restart NS service
   c. Add nodes in to NS sync group
3. Configure the HA cluster which includes the two server nodes.
   a. Modify configuration file
   b. Restart HA service
   c. Add nodes to the HA cluster

8.1 Install and Configure Gateway Servers

Follow section 7 to install and configure the first and second NFS gateway server. Configure the network settings based on the following table:

Hostname	Public Network IP(eth0)	WOS Private Network IP(eth1)	Admin Network IP(eth2)	Admin Network IP(iDRAC6)
network-sw				192.168.2.254
wos-nfs-gw-vip	192.168.0.66			
wos-nfs-gw-1*	192.168.0.100	192.168.1.100*	192.168.2.100	192.168.2.101
wos-nfs-gw-2*	192.168.0.102	192.168.1.102*	192.168.2.102	192.168.2.103
wos-node-1		192.168.1.120		
wos-node-2		192.168.1.121		
subnet mask	255.255.255.0	255.255.255.0	255.255.255.0	255.255.255.0
gateway IP	192.168.0.99		192.168.2.99	192.168.2.99

Note: modify the /etc/hosts, /etc/sysconfig/network files on each server to reflect the changes above.

Now, we need to check the following prerequisites for NS synchronization for on both gateway servers.

8.2 Prerequisites for HA Configuration on both Server Nodes
- Disable firewall:

```
# /etc/init.d/iptables stop
# chkconfig –list iptables
# chkconfig iptables off
```

- Disable SELinux:
  o In /etc/selinux/config: change to "SELINUX=disabled"

- o Run # setenforce 0
- Disable NetworkManager service. Note: OS minimal install does not include this package already.

> # /etc/init.d/NetworkManager stop
> # chkconfig –list NetworkManager
> # chkconfig NetworkManager off

- /etc/hosts contains both servers' names and IP addresses

> 127.0.0.1 localhost.localdomain localhost
> 192.168.0.66 wos-nfs-gw-vip wos-nfs-gw-vip.ddn.com
> 192.168.0.100 wos-nfs-gw-1-pub wos-nfs-gw-1-pub.ddn.com
> 192.168.0.102 wos-nfs-gw-2-pub wos-nfs-gw-2-pub.ddn.com
> 192.168.1.100 wos-nfs-gw-1
> 192.168.1.102 wos-nfs-gw-2
> 192.168.1.120 wos-node-1 woscluster
> 192.168.1.121 wos-node-2

- Setup password-less ssh access between the two servers using public key method
  - o On wos-nfs-gw-1, run these commands:
    - # ssh-keygen –t rsa
    - # cat ~/.ssh/id_rsa.pub | ssh root@wos-nfs-gw-2 'cat - >> ~/.ssh/authorized_keys'
    - # ssh wos-nfs-gw-2   make sure can login without password
  - o On wos-nfs-gw-2, run these commands:
    - # ssh-keygen –t rsa
    - # cat ~/.ssh/id_rsa.pub | ssh root@wos-nfs-gw-1 'cat - >> ~/.ssh/authorized_keys'
    - # ssh wos-nfs-gw-1   make sure can login without password
- Make sure ntpd is running on both gateway server nodes with right time
  Run following commands if needed:
  - # yum install ntp
  - # service ntpd start
  - # chkconfig ntpd on
  - # ntpdate-u <NTPD IP got from customer or a public if permitted>
- Make sure WOS NFS gateway service is running properly:
  - # showmount –e
  - # service wosnas-nfsd status

8.3 Postresql Database Configuration on both Nodes

- Add nodes in replication group records to /var/lib/pgsql/data/pg_hba.conf

```
# IPv4 local connections:
#host    DATABASE  USER  CIDR-ADDRESS  METHOD
host    all      all      127.0.0.1/32        trust
host    all      all      192.168.1.120/20     trust
host    all      all      192.168.1.121/20     trust
```

Note: must use IP addresses, no hostname, and also note that we have using the WOS cluster private IPs

- Restart postgresql service to make the change taking effect:
  - # service postgresql restart

8.4 Add First Node to MetaData DataBase Sync Group

This is the first node to be added to a sync group, run the following command on **first gateway node**:

nodectl –j wosnfs@wos-nfs-gw-1 –n 1

NOTE: must use hostname wos-nfs-gw-1 here as displayed by 'hostname' command.

8.5 Add the Second Node to the Sync Group

- Do the following on **gateway #2**
- Stop NFS Service
  # service wosnas-nfsd stop
- Empty Metadata database

 # echo "DROP DATABASE ovfs" | psql -U postgres; /opt/ddn/nas/etc/ovfsdb_install.sh
 # service postgresql restart

- Add the second server to the sync group
  # nodectl –j wosnfs@wos-nfs-gw-1 wosnfs@wos-nfs-gw-2 –n 2

NOTE: must use hostname 'wos-nfs-gw-1' and 'wos-nfs-gw-2' here as displayed by 'hostname' command.

8.6 Check Sync Service Status

- Check sync status:
  # nodectl –s
- Sync help
  # nodectl –h
- Get a list of all nodes in the ns sync group:
  # rabbitmqctl cluster_status

8.7 Edit the Primary Node HA Configuration File

The configuration file is at /opt/ddn/nas/etc/cluster.conf in gateway node wos-nfs-gw-1. Make the following changes in the file:

- Specify the virtual IP address (VIP) and the NIC interface it's on. The VIP is on public network and the interface should be eth0:

  ```
  VIP=192.168.0.66
  VIP_INTERFACE=em1
  VIP_MASK=20
  ```

- Specify the HA cluster name:
  o CLUSTER_NAME=HAClusterTest
- Specify the primary and secondary nodes

  ```
  PRIMARY_NODENAME=wos-nfs-gw-1
  SECONDARY_NODENAME=wos-nfs-gw-2
  ```

- Specify the NIC interfaces and unicast port for heartbeat on primary and secondary nodes. Note to use interface eth1 here as these traffic are on private network.

  ```
  AIS_NETADDR=em2
  AIS_REMOTE_NETADDR=em2
  ```

- Specify the name of mounted file system to be monitored on primary and secondary nodes. Use "df" command to find the system disk volume to monitor.

  ```
  PRIMARY_DEV_NAME= /dev/mapper/VolGroup-lv_root
  SECONDARY_DEV_NAME= /dev/mapper/VolGroup-lv_root
  ```

8.8 Install/Enable the HA Cluster based on the Configuration File

Run this command to set up the HA cluster on the primary gateway node wos-nfs-gw-1:

```
# /opt/ddn/nas/bin/HA-cluster.sh –install --config
```

The command runs the corosync and the pacemaker on both nodes, creates a cluster name HAClusterTest with 2 nodes, wos-nfs-gw-1 and wos-nfs-gw-2, and starts monitoring a group of resources on both nodes. Only need to run once in the primary gateway node. Configuration files and etc will be sync'd up with second nodes.

Using the following command to check the HA cluster status:

```
# crm status
```

9. Configuration of WOS NFS Gateway in the Second Site

The steps for installation of WOS and WOS NFS Gateway in second site are similar to those in the first site, but need to know the following:

- The two sites are connected with internet and likely through VPN
- The WOS cluster private network on each site should be routable and ping-able to each other. This is to ensure WOS storage traffic, NS synchronization traffic and HA traffic can go through the two sites.
- Single WOS cluster across the two sites with 2 zones defined in WOS GUI on primary WOS node.
- The same single WOS policy is configured on all nfs gateways' nfs configuration files.
- Single name space (NS) synchronization group configured to include all nfs gateways in NS configuration files.

  Details and sample setup TBD

10. Post-Install Considerations

11. Functional Tests
TBD

12. Performance Tests
TBD

13. Resiliency Tests

- Email notification in case of failure
- Drive Failure
  - Pull a drive
    - Observe alert in GUI and email notification (point out that next release will have SNMP trap) Observe slot-down in node details
    - Confirm objects remain accessible
    - Confirm non-compliant count for affected policies return to 0 (could happen quickly if few objects are stored)
  - Replace drive
    - Observe alert in GUI is cleared
    - Observe all drives active in node details
- Power-Supply Failure
  - Remove A/C power from one power-supply
  - Observe alert in GUI and email notification
  - Confirm system continues to operate normally
- Node failure
  - Pull a controller
    - Set the Node Down Delay on the Preferences tab to 5 minutes
    - Disengage one controller (leave in bay, but retract approximately 1 in., don't remove complete – air-flow reasons)
    - (After short delay ~1min.) Observe "Node not responding" alert in GUI and via email notification
    - Confirm objects stored with multi-replica policies remain accessible
    - Confirm non-compliant count for affected policies
    - After 5 minutes, confirm an additional alert is generated indicating the node is Disconnected. Recovery operations will begin at this point
    - Confirm after several more minutes that the non-compliant object count is 0 or has dropped from the original value on its way to 0

- Replace a controller
  - Reinsert the controller
  - Confirm that after several minutes the affected node returns to an Active state in the GUI
- Network failure
  - Remove a network cable from a node
    - All the steps here should be the same as with node failure test
- WAN outage
  - Pull network from all nodes in a zone
  - Confirm WOS reports this as a suspected WAN outage
- WOS NFS Gateway resiliency
  - Gateway availability / Removal
  - Network availability
    - remove network cable on HA active node and watch passive node takes over NFS service
- Other possibilities
  - Site power-outage test

14.   Manageability Tests

- Remove a node from WOS cluster: works with replica-2 and up.
- Decommission a node:
- Move part or all site to a different location
- Graceful shutdown

15.   Acceptance Criteria

TBD