

Using iSCSI Storage with Windows Home Server

With the removal of Drive Extender (DE) many people have been looking for alternatives for it in WHS2011. Some are going the route of a DE replacement like Drive Harmony, others are looking into Hardware or Software Raid, and some are looking at 3rd party hardware devices like the Drobo. In this article I am going to present a third option that the IT world has been using for a few years that can have several advantages for the enthusiast and that is free SAN/NAS server that then connects to WHS2011 (or even other Servers/Desktops) using iSCSI.

Unlike traditional SANS which use expensive Fiber connections, iSCSI SANs use traditional switches and network equipment to present remote storage like a local drive. What this means for you is instead of Windows seeing the external storage as an SMB share i.e. Z: being a mapped drive from [\\NAS\Share](#) it is presented as a true hard disk to the OS, that you can then partition, format and access like a local drive. From personal experience this also gives you better performance due to being lower on the OSI mode as the drive is seen more at the hardware level for IO compared to the presentation/application layer of SMB. In my case when I first started using this setup for local backup disk storage for Backup Exec, it was cutting by backup times by more than 50% using the exact same hardware and software just changing from SMB to iSCSI.

To start our project we going to build us a SAN (Storage Attached Network) using a Free Linux based software package called OpenFiler, which you can download from www.openfiler.com. The hardware requirements for OpenFiler are pretty low, you can pretty much run it on any leftover PC you have or even a VM if you want to test it. At both work and home I actually am booting my OpenFiler SANs off of 8GB USB stick (newer versions appear to want around 10GB for the install) for the boot drive, leaving all of the attached hard drives available as SAN space. You can Google for these instructions easily but the ones I have used multiple times are listed here: <http://forums.openfiler.com/viewtopic.php?id=2676>. FreeNAS is another software package that supports iSCSI and they will install to a USB automatically I just have not used it (during my initial testing I ran into LDAP issues with our AD but for iSCSI only you will not need.) I will recommend if you are going to be using multiple servers attached to the SAN that you have multiple NICs in the OpenFiler server as well as 2 NICs on each server your connecting with plus a separate switch for the SAN connections between the servers. One is to segregate your Disk I/O traffic from your network traffic, but the second reason is so we can turn on MultiPath I/O on. MultiPath I/O build some fault tolerance into the design so that a single network cable disconnected does not disconnect us from the disk storage.

I have my OpenFiler Server setup to be accessed by 3 Servers, to increase robustness we have 4 nics on the server. 1 for the management interface, and 3 are for iSCSI connections. On the servers I have 3 NICs on 2 of them and just 1 Nic on the 3rd server just have 2 leaving my datacenter connections looking like this following chart

	OpenFiler			Servers	
LAN	172.16.0.0	255.255.0.0	SQL2_Port1	10.26.2.11	255.255.255.0
iSCSI_Lan1	10.26.1.0	255.255.255.0	SQL2_Port2	10.26.3.11	255.255.255.0
iSCSI_Lan2	10.26.2.0	255.255.255.0	Mail_Port1	10.26.3.13	255.255.255.0
iSCSI_Lan3	10.26.3.0	255.255.255.0	Mail_Port2	10.26.1.13	255.255.255.0
			Hype_Port1	10.26.1.12	255.255.255.0

This gives 2 of the servers multiple paths for the iSCSI network but not the third server. Also due to the way the SQL is set up on a cluster, it's IPs for the Openfiler network are actually secondary IPs on those NICs with the primary IPs pointing to another SAN we have for the shared storage space needed for SQL.

Once you have downloaded Openfiler either burn the ISO to a CD or USB key and boot the your new SAN server off of it. You will get the following screen



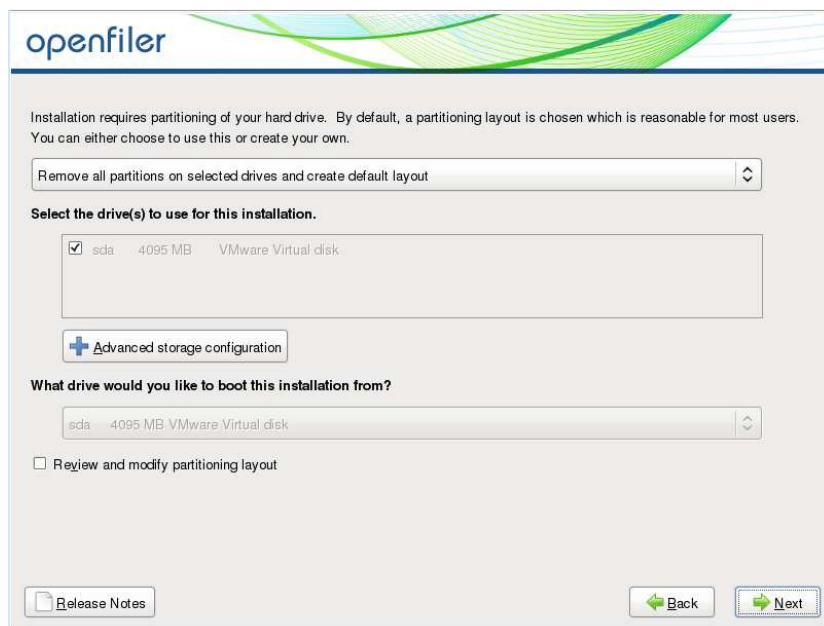
Following the instructions [here](#) if wanting to boot off of a USB, otherwise hit Enter, the system will then boot to the following screen



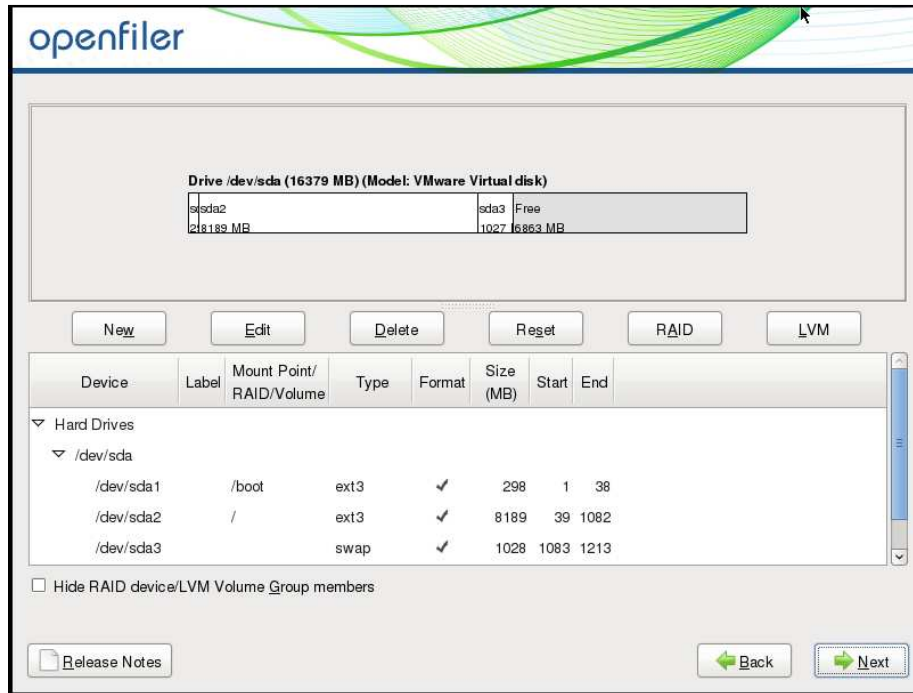
Click Next,

Select your language and then Next

You might get a message stating that you disk will be formatted click yet and you will get the following screen



Since I am building this in a VM I only have a 16GB partition so far but if you are just going to run off your internal hard drives you will want to review and modify your partitioning layout by clicking the check box. This is so that the you can make sure openfiler is not trying to take all of the hard drive for its install.



Click next for a few screen until you get to the network devices, you will probably want to at this time add a static IP for the management connection as well as a host name.

Active on Boot	Device	IPv4/Netmask	IPv6/Prefix	Edit
<input checked="" type="checkbox"/>	eth0	172.16.2.199/24	Auto	
<input type="checkbox"/>	eth1	DHCP	Auto	

Hostname
Set the hostname:
 automatically via DHCP
 manually (e.g., host.domain.com)

Miscellaneous Settings
Gateway:
Primary DNS:
Secondary DNS:

Click Next and select you timezone, root password and then click install to actually install the image.

After the install reboot as directed and you will get to the following screen

```

  //  //  //  //  //  //  //  //  //  //  //
 //
 //
-----
|      Commercial Support: http://www.openfiler.com/support/      |
| Administrator Guide: http://www.openfiler.com/buy/administrator-guide |
| Community Support: http://www.openfiler.com/community/forums/    |
| Internet Relay Chat: server: irc.freenode.net    channel: #openfiler |
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|      (C) 2001-2011 Openfiler. All Rights Reserved.              |
| Openfiler is licensed under the terms of the GNU GPL, version 2  |
| http://www.gnu.org/licenses/gpl-2.0.html                        |
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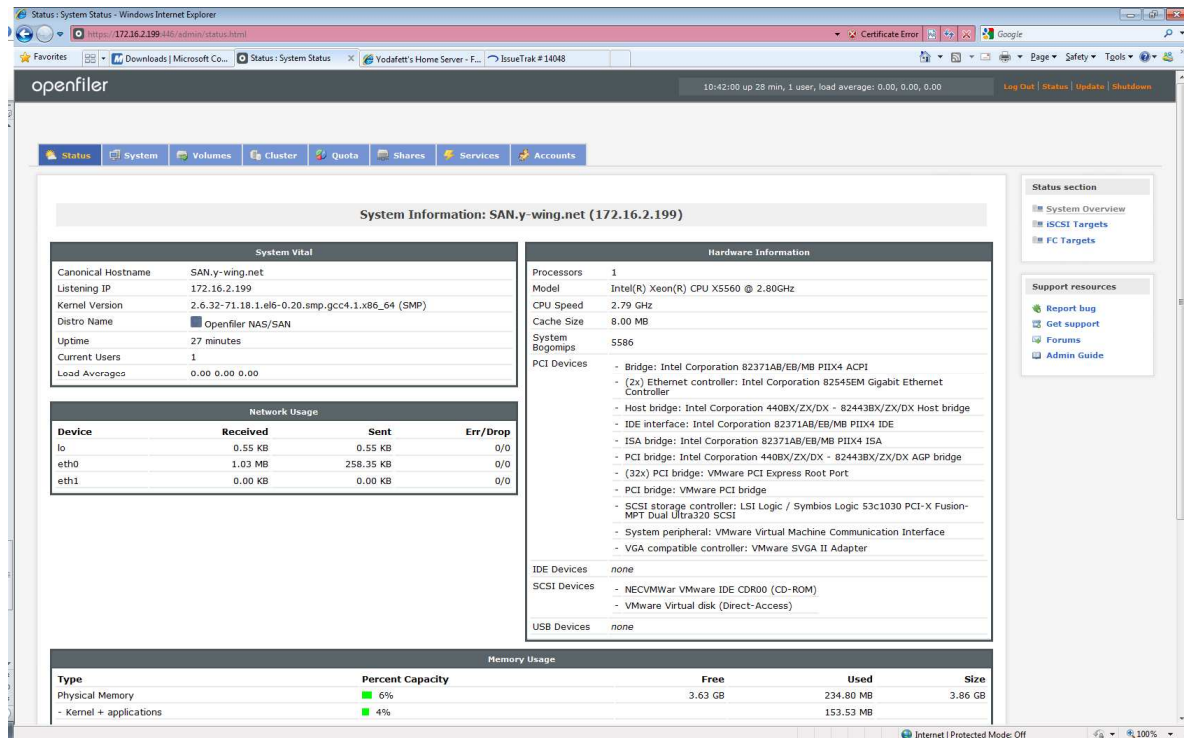
Welcome to Openfiler ESA, version 2.99.1

Web administration GUI: https://172.16.2.199:446/

SAN login: _
```

In your web browser type the Web Administration GUI address from the screen listed above and click continue on the certificate issue that shows up. Sign in with a username of Openfiler and a password of

password. You will get a screen like below. For now click on the Systems TAB.



If you have added any NICs to the server go head and give them an address at this time, preferably on a separate subnet than you regular data network. For this demo I am setting everything up on a single network but show also how you can segregate your data with a second IP on your WHS yet still only have 1 nic in it.

For now, in the Network Access Configuration add the IPs of the iSCSI adapter of the servers your going to be connecting to it as well as the IP of the openfiler network adapter that you will be sending the data through. If using onl a single IP on the Openfiler server and on WHS2011 just put the IP of each PC in it. (note iSCSI requires static IP)

Network Access Configuration

Delete	Name	Network/Host	Netmask	Type
<input type="checkbox"/>	SAN	172.16.2.199	255.255.255.0	Share
<input type="checkbox"/>	WHS	172.16.2.198	255.255.255.0	Share
New	<input type="text"/>	<input type="text"/>	0.0.0.0 <input type="button" value="v"/>	Share <input type="button" value="v"/>

Next click on the Services tab and enable iSCSI target as well as Start that service

Service	Boot Status	Modify Boot	Current Status	Start / Stop
CIFS Server	Disabled	Enable	Stopped	Start
NFS Server	Disabled	Enable	Stopped	Start
RSync Server	Disabled	Enable	Stopped	Start
HTTP/Dav Server	Disabled	Enable	Running	Stop
LDAP Container	Disabled	Enable	Stopped	Start
FTP Server	Disabled	Enable	Stopped	Start
iSCSI Target	Enabled	Disable	Running	Stop
UPS Manager	Disabled	Enable	Stopped	Start
UPS Monitor	Disabled	Enable	Stopped	Start
iSCSI Initiator	Disabled	Enable	Stopped	Start
ACPI Daemon	Enabled	Disable	Running	Stop
SCST Target	Disabled	Enable	Stopped	Start
FC Target	Disabled	Enable	Stopped	Start
Cluster Manager	Disabled	Enable	Stopped	Start

Next click on the volumes tab, You will first need to create a new physical volume group (think DE, this is pooled storage) Click Volumes on the right hand side. In this a 40, 50 , and 100 GB that I create as Raid Members, then add all 3 of them as a striped array (RAID 0) via the Software Raid Menu Option

Software RAID Management									
Array	Level	Array Size	Device Size	State	Synchronization	Manage	Add	Used In	Delete
/dev/md0	RAID-0	181.19 GB	0 bytes	Clean	Synchronized	View members	All RAID partitions are used	array VG	In use

Create a new RAID array

 No existing RAID partitions were found, or all existing RAID partitions are used. You can [create new RAID partitions](#).



Member devices of array "/dev/md0": RAID-0							
Number	Member	Device	Faulty	Active	Synchronized	Spare	Remove
0	0	/dev/sdb1	NO	YES	YES	NO	Member
1	1	/dev/sdcl	NO	YES	YES	NO	Member
2	2	/dev/sdd1	NO	YES	YES	NO	Member

[Close Window](#)

This gives me 181.19 GB of space. We then go to the Volume Groups menu on the left hand side and add the new array to a Volume group (name it what you want) This has a few options, If you needed drive space on WHS as well as 2 VM servers you wanted to run you could create 1 big SAN server running on a Atom or I3 processor just to hold your data in a giant Raid 5 array and then carve out slices of that array for your VMs/Home Server as needed (Making this a true SAN)

After this click on the Add Volume menu option on the right, and create a volume for the SAN to server to the WHS, you will want to creat it as block for the Filesystem/Volume type for iSCSI. If you were going to use the SAN against multiple PC you would want to carve out your spacing that yo would want to assign to each PC at this point.

Create a volume in "array"

Volume Name (*no spaces*. Valid characters [a-z,A-Z,0-9]):	<input type="text" value="SANDISK1"/>
Volume Description:	<input type="text" value="SANDISK1"/>
Required Space (MB):	<input type="text" value="185504"/> 
Filesystem / Volume type:	<input type="text" value="block (iSCSI,FC,etc)"/> 

After you create your volume then click the iSCSI targets menu on the right and click Add on the Target IQN name

Add new iSCSI Target

Target IQN	Add
<input type="text" value="iqn.2006-01.com.openfiler:tsn.0f28495584e2"/>	<input type="button" value="Add"/>

Click next on LUN Mapping, If you have created multiple Volumes you can now choose which volumes to map to which LUNs. If you want a server to always get 2 separate partitions you can map them using a single LUN

Next click on the Network ACL tab, You will need to allow both the WHS server network adapter as well as the OpenFile Network adapter to have access to the IQN

iSCSI host access configuration for target "iqn.2006-01.com.openfiler:tsn.bf0191edbf4"

Name	Network/Host	Netmask	Access
SAN	172.16.2.199	255.255.255.0	Allow
WHS	172.16.2.198	255.255.255.0	Allow

Next on you WHS you will need to allow the iSCSI service through the firewall

Allow programs to communicate through Windows Firewall

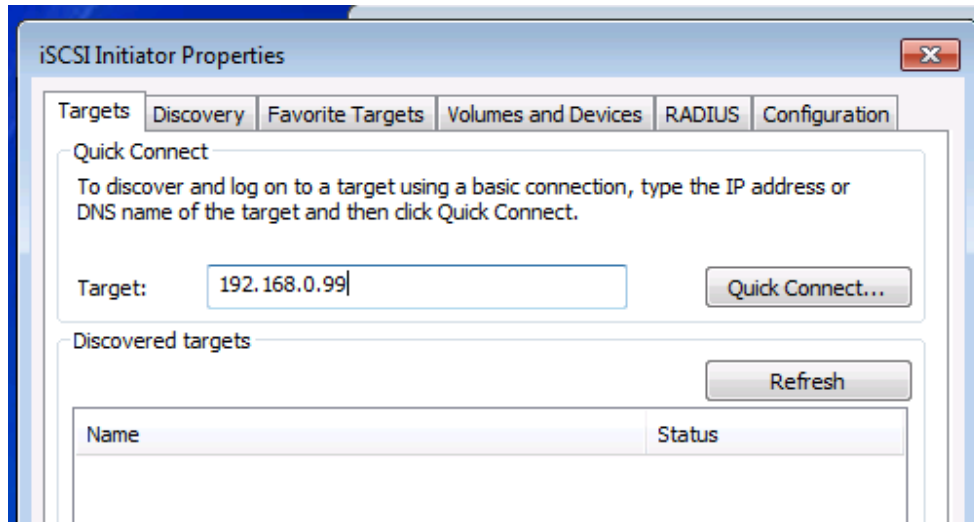
To add, change, or remove allowed programs and ports, click Change settings.

What are the risks of allowing a program to communicate?

Allowed programs and features:

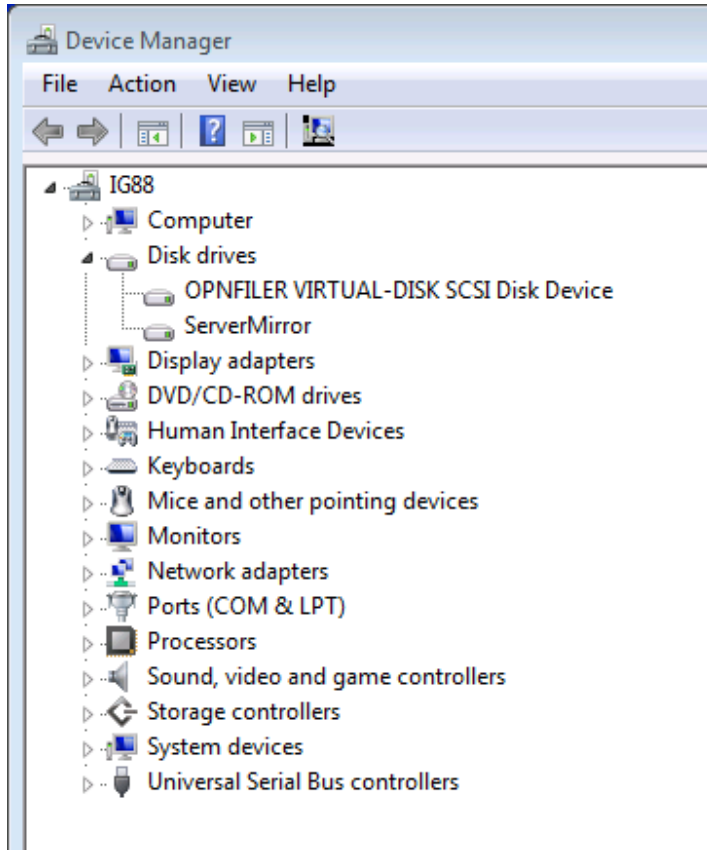
Name	Home/Work (Private)	Public
<input checked="" type="checkbox"/> Certification Authority	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/> COM+ Network Access	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> COM+ Remote Administration	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/> Core Networking	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> DFS Management	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/> Distributed Transaction Coordinator	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/> File and Printer Sharing	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/> HomeGroup	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/> iSCSI Service	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/> Key Management Service	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Netlogon Service	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/> Network Discovery	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Then go to Start – Administrative Tools – iSCSI initiator. It will ask if you wish to start the service, say yes. It will now be set to autostart the service on restart. Type the IP address of the SAN Server in the Target field and hit Quick Connect.



You should now get a window showing the IQN of the OpenFile Server click Done. Next check your Favorite Targets to make sure that the IQN is listed there so it will try and reconnect on reboot.

The disk now shows up as a standard disk in device manager and can be managed as one



Including in the WHS dashboard –

Server Folders		Hard Drives		AWIECO DriveInfo	
Name	Capacity	Used space	Free space	Status	
Hard drives					
(C:)	60 GB	27.9 GB	32.1 GB		
(D:)	1337.2 GB	629.3 GB	707.8 GB		
SAN Disk (I:)	56.8 GB	0.1 GB	56.8 GB		

You now have an option to reuse that old PC in the corner to be used as a SAN for not just WHS but as attached storage on a Windows 7 PC, ESX Server or