

StorageData Documentation

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OpenQRM Appliance

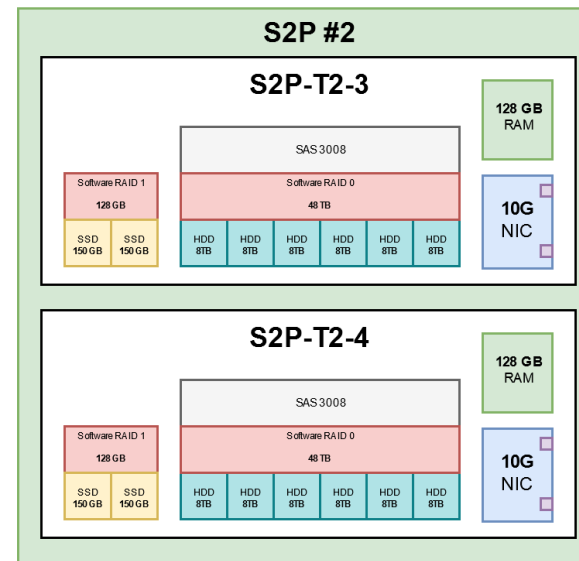
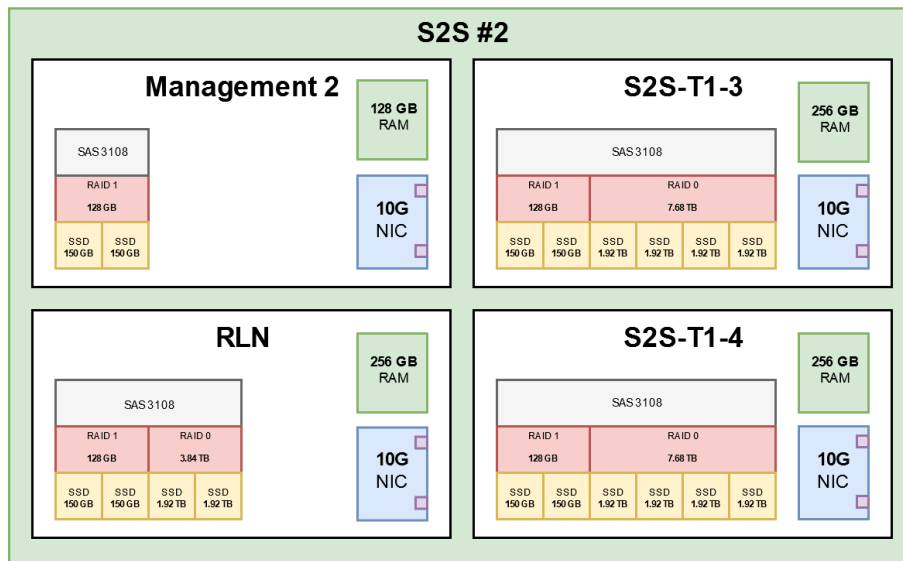
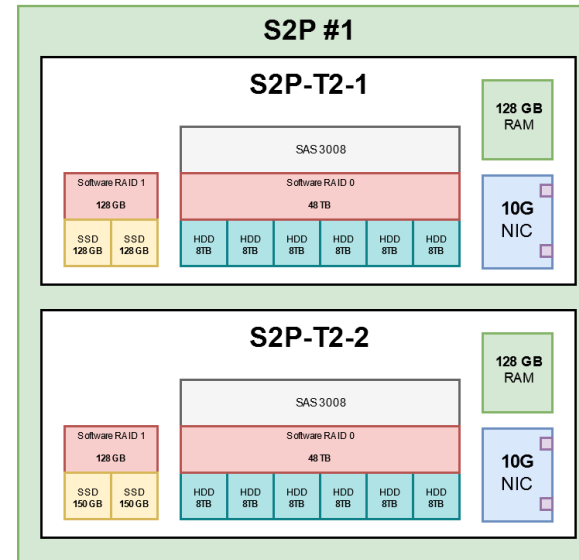
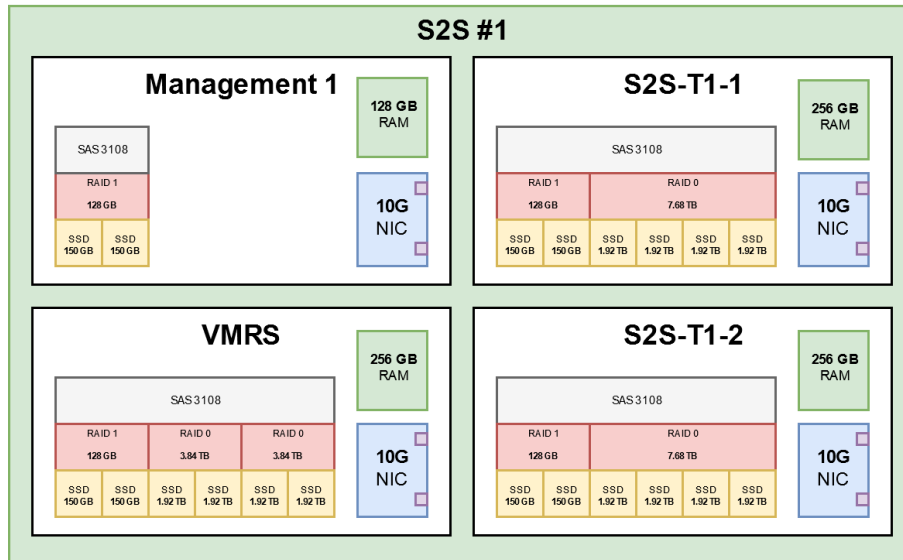
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1.1 - Physical System Architecture



Hardware Links (Click to Follow Link)

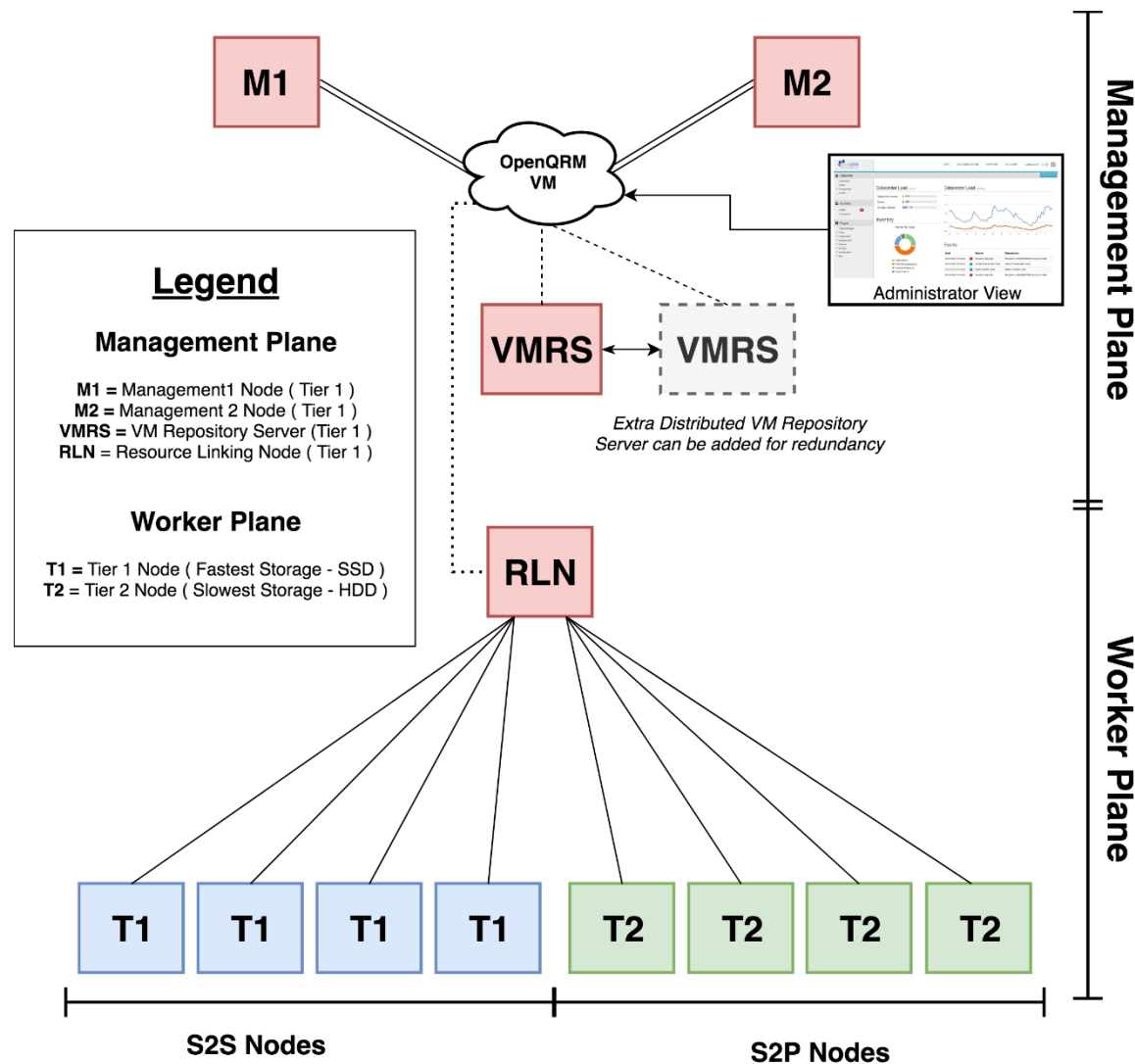
[S2S \(T41S-2U\)](#)

2U 4-Node Server Featuring Highest Compute Density

[S2P \(T21P-4U\)](#)

Ultra-Dense Extreme Performance Storage Server

1.2 – OpenQRM High Level Architecture



Management Plane

The Management Plane is where OpenQRM Client runs on a virtual machine.

The OpenQRM Client executes on the two management nodes (**M1** and **M2**) and the OpenQRM VM Image is stored in a VM Repository Server (**VMRS**) to create proper redundancy.

Note that another VM Repository Server can be added for extra redundancy.

Worker Plane

The Worker Plane contains the [S2S Tier 1 \(T1\)](#) and [S2P Tier 2 \(T2\)](#) Worker nodes involving both storage and compute resources.

The Resource Linker node exposes storage and compute resources from the Tier 1 (**T1**) and Tier 2 (**T2**) Nodes to OpenQRM through the OpenQRM KVM and local-server plugin.

2.0 – Hardware Checks

This is a list of hardware that resides in each node and how it should appear when viewing hardware population and information

2.1 – CPU

Every Node, whether it is an S2P or S2S Node, houses two Xeon E5-2630 v4 CPUs

```
root@management1:/home/storagedata# dmidecode | grep Intel | grep CPU
Version: Intel(R) Xeon(R) CPU E5-2630 v4 @ 2.20GHz
Version: Intel(R) Xeon(R) CPU E5-2630 v4 @ 2.20GHz
```

2.2 – RAM

RAM Differs depending on the node. RAM information was checked through the BMC

2.2.1 – Management Nodes

ID ↕	Status ↕	Socket ↕	Module Size ↕	Model ↕	Frequency ↕
1	Present	DIMM A0	32768MB	DDR-4 RAM - DDR4 normal Voltage (1.2V)	2133MHz
2	Present	DIMM A1	32768MB	DDR-4 RAM - DDR4 normal Voltage (1.2V)	2133MHz

9	Present	DIMM E0	32768MB	DDR-4 RAM - DDR4 normal Voltage (1.2V)	2133MHz
10	Present	DIMM E1	32768MB	DDR-4 RAM - DDR4 normal Voltage (1.2V)	2133MHz

2.2.2 – Tier 1 Nodes

ID ↕	Status ↕	Socket ↕	Module Size ↕	Model ↕	Frequency ↕
1	Present	DIMM A0	32768MB	DDR-4 RAM - DDR4 normal Voltage (1.2V)	2133MHz
2	Present	DIMM A1	32768MB	DDR-4 RAM - DDR4 normal Voltage (1.2V)	2133MHz
3	Present	DIMM B0	32768MB	DDR-4 RAM - DDR4 normal Voltage (1.2V)	2133MHz
4	Present	DIMM B1	32768MB	DDR-4 RAM - DDR4 normal Voltage (1.2V)	2133MHz

9	Present	DIMM E0	32768MB	DDR-4 RAM - DDR4 normal Voltage (1.2V)	2133MHz
10	Present	DIMM E1	32768MB	DDR-4 RAM - DDR4 normal Voltage (1.2V)	2133MHz
11	Present	DIMM F0	32768MB	DDR-4 RAM - DDR4 normal Voltage (1.2V)	2133MHz
12	Present	DIMM F1	32768MB	DDR-4 RAM - DDR4 normal Voltage (1.2V)	2133MHz

2.2.3 – Tier 2 Nodes

3	Present	DIMM B0	32768MB	DDR-4 RAM - DDR4 normal Voltage (1.2V)	2133MHz
4	Present	DIMM B1	32768MB	DDR-4 RAM - DDR4 normal Voltage (1.2V)	2133MHz

11	Present	DIMM F0	32768MB	DDR-4 RAM - DDR4 normal Voltage (1.2V)	2133MHz
12	Present	DIMM F1	32768MB	DDR-4 RAM - DDR4 normal Voltage (1.2V)	2133MHz

2.3 – NIC

All nodes are running the same Dual SFP NIC.

```
root@tier2-3:/home/storagedata# lspci | grep SFP
01:00.0 Ethernet controller: Intel Corporation 82599ES 10-Gigabit SFI/SFP+ Netwo
rk Connection (rev 01)
01:00.1 Ethernet controller: Intel Corporation 82599ES 10-Gigabit SFI/SFP+ Netwo
rk Connection (rev 01)
```

2.4 – Storage Card

2.4.1 – Management and Tier 1 Nodes

Management and Tier 1 nodes all house a 3108 storage card

```
root@tier2-3:/home/storagedata# lspci | grep LSI
04:00.0 RAID bus controller: LSI Logic / Symbios Logic MegaRAID SAS-3 3108 [Inve
der] (rev 02)
```

2.4.2 – Tier 2 Nodes

Tier 2 Nodes house a 3008 storage card

```
root@storagedata:/home/storagedata# lspci | grep LSI
05:00.0 Serial Attached SCSI controller: LSI Logic / Symbios Logic SAS3008 PCI-E
xpress Fusion-MPT SAS-3 (rev 02)
```

2.5 – Disks

Please refer to the Physical Architecture diagram in Section 1.1 for further disk information.

2.5.1 – Management Nodes

```
root@management1:/home/storagedata# fdisk -l
Disk /dev/sda: 139.2 GiB, 149484994560 bytes, 291962880 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 4096 bytes
I/O size (minimum/optimal): 4096 bytes / 4096 bytes
Disklabel type: gpt
Disk identifier: 5A301B9E-E4AB-4997-A90A-AFD08AB6802B

Device            Start      End    Sectors   Size Type
/dev/sda1         2048      999423    997376    487M EFI System
/dev/sda2         999424  254906367 253906944 121.1G Linux filesystem
/dev/sda3        254906368 291960831 37054464  17.7G Linux swap
```

2.5.2 – S2S-T1-1/2/3/4

```
root@storagedata:/home/storagedata# fdisk -l
Disk /dev/sda: 139.8 GiB, 150039945216 bytes, 293046768 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 4096 bytes
I/O size (minimum/optimal): 4096 bytes / 4096 bytes
Disklabel type: dos
Disk identifier: 0x72dc23cd

Device      Boot Start          End      Sectors   Size Id Type
/dev/sdal               2048 293046271 293044224 139.8G fd Linux raid autodetect

Disk /dev/sdb: 139.8 GiB, 150039945216 bytes, 293046768 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 4096 bytes
I/O size (minimum/optimal): 4096 bytes / 4096 bytes
Disklabel type: dos
Disk identifier: 0x6e71b981

Device      Boot Start          End      Sectors   Size Id Type
/dev/sdb1    *           2048 293046271 293044224 139.8G fd Linux raid autodetect
```

2.5.3 – S2P-T2-1/2/3/4

```
Disk /dev/sdi: 7.3 TiB, 8001563222016 bytes, 15628053168 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 4096 bytes
I/O size (minimum/optimal): 4096 bytes / 4096 bytes
```

```
Disk /dev/md0: 139.6 GiB, 149904424960 bytes, 292782080 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 4096 bytes
I/O size (minimum/optimal): 4096 bytes / 4096 bytes
```

```
Disk /dev/sdd: 7.3 TiB, 8001563222016 bytes, 15628053168 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 4096 bytes
I/O size (minimum/optimal): 4096 bytes / 4096 bytes
```

```
Disk /dev/sde: 7.3 TiB, 8001563222016 bytes, 15628053168 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 4096 bytes
I/O size (minimum/optimal): 4096 bytes / 4096 bytes
```

```
Disk /dev/sdf: 7.3 TiB, 8001563222016 bytes, 15628053168 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 4096 bytes
I/O size (minimum/optimal): 4096 bytes / 4096 bytes
```

```
Disk /dev/sdg: 7.3 TiB, 8001563222016 bytes, 15628053168 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 4096 bytes
I/O size (minimum/optimal): 4096 bytes / 4096 bytes
```

```
Disk /dev/sdh: 7.3 TiB, 8001563222016 bytes, 15628053168 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 4096 bytes
I/O size (minimum/optimal): 4096 bytes / 4096 bytes
```

```
Disk /dev/md1: 43.7 TiB, 48008571912192 bytes, 93766742016 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 4096 bytes
I/O size (minimum/optimal): 524288 bytes / 3145728 bytes
```

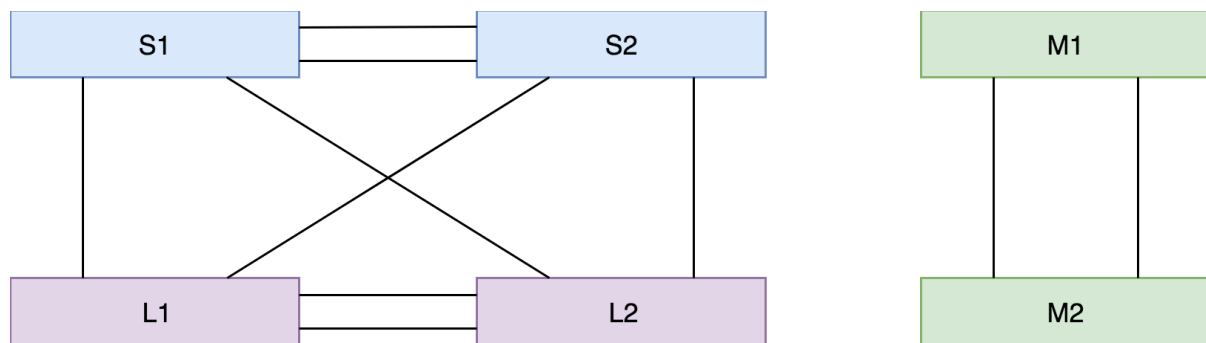
3.0 – Network Switches and Cumulus Set up

3.1 – Network Topology Introduction

The network topology for the OpenQRM cluster can be configured with switch redundancy on both Management and Data path traffic. The commands and tutorial documentation to achieve this are described in the “Cumulus Linux User Guide”, which can be downloaded from the following link to the Cumulus Website:

<https://docs.cumulusnetworks.com/display/DOCS/Cumulus%2BLinux%2BUser%2BGuide>

3.2 – Network Topology Explanation



The management switches (M1 and M2) provide 1G ports to connect the BMC port of each node.

The leaf switches (L1 and L2) connects 25G ports to the 10G data ports of each node (The 25G ports are downgraded to 10G before data ports are connected to the switch). The Spine switches (S1 and S2) are used to aggregate the data path to the leaf switches. The MLAG configurations of both the data and management paths provides network redundancy for the appliance.

The uplink from the management switches should connect to a 1G backplane.

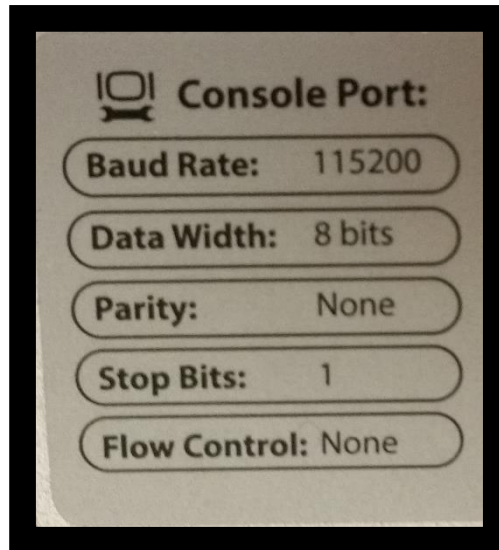
The uplink from the management switches should connect to a 40G backplane.

Within the lab setup, all switches were configured (M1/M2, L1/L2, S1/S2) and connected the BMC and data ports respectively.

3.3 – Configuring Management Switches

1 – Firstly, connect a *serial to USB* cable to the console port behind the switch and an ethernet cable to the eth0 port.

2 – *PuTTY* (Refer to section 7.0 for download link) is an example of an application that can be used to access the Com ports on the switches. Refer to the information panel on the switch for console port connection information.



3 – Refer to “Serial Console Management” and “Wired Ethernet Management” sections of the cumulus user manual to configure the management ports.

4 – Once the eth0 port has been configured, the switch can be accessed through an SSH Client (Such as *PuTTY*) and configure ports individually.

5 – As seen in the screenshot below, the BMC of two nodes are connected to two switch ports (*swp2* and *swp3*). Their state is shown as *up* after configurations have been set.

```
cumulus@cumulus:~$ sudo net show interface
[sudo] password for cumulus:
State  Name   Spd   MTU   Mode      LLDP      Summary
-----
UP     lo      N/A   65536 Loopback
UP     lo
UP     eth0    100M  1500  Mgmt      Switch-1GE (08) IP: 192.168.18.89/24 (DHCP)
UP     swp1    1G    1500  Access/L2 Switch-1GE (28) Master: vlan (UP)
UP     swp2    1G    1500  Access/L2 Master: vlan (UP)
UP     swp3    1G    1500  Access/L2 Master: vlan (UP)
```

6 – The switch port (*swp1*) is connected to an external switch as an uplink. This also provides DHCP for the whole 1G management path.

3.4 – Configuring Data Path (Leaf/Spine) Switches

3.4.1 – Connections and Configuration

1 – Connect each spine switch to the uplink via 40G QSFP or a 10G break-out cable. This will provide uplink traffic for all data path nodes via the leaf switches.

Refer to the chapter “Configuring Breakout Ports with Splitter Cables” in the user manual to configure the uplink traffic.

2 – Each node has 2 ports to carry data with a 10G SFP Interface. In the MLAG setup; one port should be connected to one leaf switch with the other port connecting the other leaf switch.

As an example, the first 10G port on a management node can be connected to the swp1 of the first leaf switch and the second 10G port can be connected to the swp1 of the second leaf switch. This configuration provides redundancy at the network card level for the data path.

3 – In the Lab environment, the leaf port is connected to the spine with the 40G swp49 and all 10G ports are configured in bridge mode to carry the data traffic from the nodes to the leaf switch and to the uplink.

```
cumulus@cumulus:~$ sudo net show interface
[sudo] password for cumulus:
State Name Spd MTU Mode LLDP Summary
-----
UP lo N/A 65536 Loopback IP: 127.0.0.1/8
lo IP: ::1/128
UP eth0 1G 1500 Mgmt Switch-1GE (12) IP: 192.168.18.90/24 (DHCP)
UP swp1 40G 1500 Access/L2 Switch-40GE (11) Master: bridge(UP)
UP swp2 40G 1500 Access/L2 cumulus (swp49) Master: bridge(UP)
DN swp3 100G 1500 NotConfigured
DN swp4 100G 1500 NotConfigured
DN swp5 100G 1500 NotConfigured
DN swp6 100G 1500 NotConfigured
DN swp7 100G 1500 NotConfigured
DN swp8 100G 1500 NotConfigured
DN swp9 100G 1500 NotConfigured
DN swp10 100G 1500 NotConfigured
DN swp11 100G 1500 NotConfigured
DN swp12 100G 1500 NotConfigured
DN swp13 100G 1500 NotConfigured
DN swp14 100G 1500 NotConfigured
DN swp15 100G 1500 NotConfigured
DN swp16 100G 1500 NotConfigured
DN swp17 100G 1500 NotConfigured
DN swp18 100G 1500 NotConfigured
DN swp19 100G 1500 NotConfigured
DN swp20 100G 1500 NotConfigured
DN swp21 100G 1500 NotConfigured
DN swp22 100G 1500 NotConfigured
DN swp23 100G 1500 NotConfigured
DN swp24 100G 1500 NotConfigured
DN swp25 100G 1500 NotConfigured
DN swp26 100G 1500 NotConfigured
DN swp27 100G 1500 NotConfigured
DN swp28 100G 1500 NotConfigured
DN swp29 100G 1500 NotConfigured
DN swp30 100G 1500 NotConfigured
DN swp31 100G 1500 NotConfigured
DN swp32 100G 1500 NotConfigured
UP bridge N/A 1500 Bridge/L2
```

Spine switch port configuration

```
cumulus@cumulus:~$ brctl sh
show showmacs showmqv4src showstp
cumulus@cumulus:~$ brctl show
bridge name bridge id STP enabled interfaces
bridge 8000.d8c4974d7e8d yes swp1
swp2
```

Spine switch bridge configuration

```
cumulus@cumulus:~$ sudo net show interface
[sudo] password for cumulus:
State Name Spd MTU Mode LLDP Summary
-----
UP lo N/A 65536 Loopback IP: 127.0.0.1/8
lo IP: ::1/128
UP eth0 1G 1500 Mgmt Switch-1GE (07) IP: 192.168.18.91/24
(DHCP)
UP swp1 10G 1500 Access/L2 Master: bridge (UP)
DN swp2 25G 1500 NotConfigured
DN swp3 25G 1500 NotConfigured
DN swp4 25G 1500 NotConfigured
DN swp5 25G 1500 NotConfigured
DN swp6 25G 1500 NotConfigured
DN swp7 25G 1500 NotConfigured
DN swp8 25G 1500 NotConfigured
DN swp9 25G 1500 NotConfigured
DN swp10 25G 1500 NotConfigured
DN swp11 25G 1500 NotConfigured
DN swp12 25G 1500 NotConfigured
DN swp13 25G 1500 NotConfigured
DN swp14 25G 1500 NotConfigured
DN swp15 25G 1500 NotConfigured
DN swp16 25G 1500 NotConfigured
DN swp17 25G 1500 NotConfigured
DN swp18 25G 1500 NotConfigured
DN swp19 25G 1500 NotConfigured
DN swp20 25G 1500 NotConfigured
DN swp21 25G 1500 NotConfigured
DN swp22 25G 1500 NotConfigured
DN swp23 25G 1500 NotConfigured
DN swp24 25G 1500 NotConfigured
DN swp25 25G 1500 NotConfigured
DN swp26 25G 1500 NotConfigured
DN swp27 25G 1500 NotConfigured
DN swp28 25G 1500 NotConfigured
DN swp29 25G 1500 NotConfigured
DN swp30 25G 1500 NotConfigured
DN swp31 25G 1500 NotConfigured
DN swp32 25G 1500 NotConfigured
DN swp33 25G 1500 NotConfigured
```

```
DN swp34 25G 1500 NotConfigured
DN swp35 25G 1500 NotConfigured
DN swp36 25G 1500 NotConfigured
DN swp37 25G 1500 NotConfigured
DN swp38 25G 1500 NotConfigured
DN swp39 25G 1500 NotConfigured
DN swp40 25G 1500 NotConfigured
DN swp41 25G 1500 NotConfigured
DN swp42 25G 1500 NotConfigured
DN swp43 25G 1500 NotConfigured
DN swp44 25G 1500 NotConfigured
DN swp45 25G 1500 NotConfigured
DN swp46 25G 1500 NotConfigured
DN swp47 25G 1500 NotConfigured
DN swp48 25G 1500 NotConfigured
UP swp49 40G 1500 Access/L2 cumulus (swp2) Master: bridge (UP)
DN swp50 100G 1500 NotConfigured
DN swp51 100G 1500 NotConfigured
DN swp52 100G 1500 NotConfigured
DN swp53 100G 1500 NotConfigured
DN swp54 100G 1500 NotConfigured
DN swp55 100G 1500 NotConfigured
DN swp56 100G 1500 NotConfigured
UP bridge N/A 1500 Bridge/L2
```

Leaf Switch Port configuration

```
cumulus@cumulus:~$ brctl sh
show          showmacs      showmcqv4src  showstp
cumulus@cumulus:~$ brctl show
bridge name    bridge id                STP enabled    interfaces
bridge         8000.d8c4971c171a        yes            swp1
               -                                     swp49
```

3.4.2 – Commands

1 – Default Credentials for Login:

Username: cumulus
Password: CumulusLinux!

2 – Command List for Spine Switch Configuration (Please run use *sudo* when required)

```
cumulus@cumulus:~$ net show interface all
cumulus@switch:~$ net add interface swp1-32
cumulus@switch:~$ net pending
cumulus@switch:~$ net commit
cumulus@cumulus:~$ net add interface swp1 link speed 40000
cumulus@cumulus:~$ net add interface swp1 link autoneg off
cumulus@cumulus:~$ net commit
cumulus@cumulus:~$ net add interface swp2 link speed 40000
cumulus@cumulus:~$ net add interface swp2 link autoneg off
cumulus@cumulus:~$ net commit
cumulus@cumulus:~$ net add bridge bridge ports swp1,2
cumulus@cumulus:~$ net pending
cumulus@cumulus:~$ net commit
cumulus@cumulus:~$ sudo net show interface swp2
cumulus@cumulus:~$ sudo net add bridge bridge ports swp1,2,49
cumulus@cumulus:~$ net pending
cumulus@cumulus:~$ net commit
```

3 – Command List for Leaf Switch Configuration (Please run use *sudo* when required)

```
cumulus@cumulus:~$ net show interface all
cumulus@cumulus:~$ net add interface swp1-56
cumulus@cumulus:~$ net pending
cumulus@cumulus:~$ net commit
cumulus@cumulus:~$ net add interface swp49 link speed 40000
cumulus@cumulus:~$ net add interface swp49 link autoneg off
cumulus@cumulus:~$ net commit
cumulus@cumulus:~$ net add interface swp1 link speed 10000
cumulus@cumulus:~$ net add interface swp1 link autoneg off
cumulus@cumulus:~$ net commit
cumulus@cumulus:~$ net add interface swp2 link speed 10000
cumulus@cumulus:~$ net add interface swp2 link autoneg off
cumulus@cumulus:~$ net commit
cumulus@cumulus:~$ sudo ip link set swp1 up
cumulus@cumulus:~$ net pending
cumulus@cumulus:~$ net commit
cumulus@cumulus:~$ sudo ifdown swp1
cumulus@cumulus:~$ sudo ifup swp1
cumulus@cumulus:~$ sudo net show interface swp1
```

4.0 – Debian Install Process

Due to the Debian process's similarity to each other, I will show one install process that can be done on all nodes and then show the differences

4.1 – Preparations

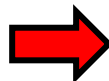
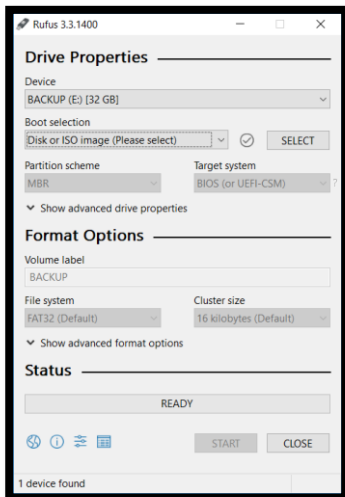
4.1.1 Preparing Installation Media

Firstly, a Debian 9.5.0 ISO Image needs to be copied to a DVD, USB Flash Drive or other storage media that be connected to the associated nodes for installation. In this installation, the Windows version of Rufus 3.3.1400 was used with a USB Flash drive. Thus, the copying of the Debian Image will be shown below using Rufus 3.3.1400.

1 - Firstly, insert USB Drive.



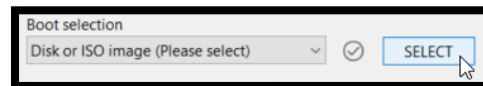
2 - Start the Rufus Application.



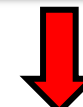
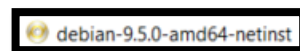
2 - The USB Flash drive should appear in the Device field. Be sure to select the correct drive in the drop-down menu.



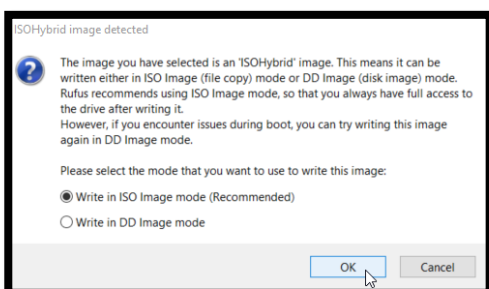
3 - Click the Select button



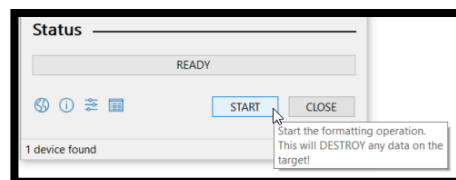
4 - Find and Select the Debian ISO



6 - The following message may appear, select *Write in ISO Image mode (Recommended)* if it has not already and click the OK button.



5 - Click the Start button



7- Another Message will appear warning that all data on the drive will be destroyed. Click the OK button.

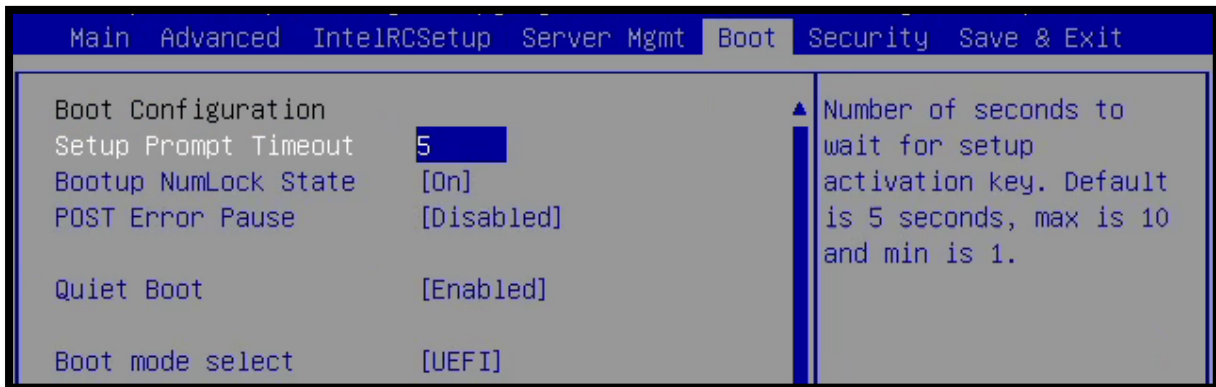


8 - The ISO will be written to the USB Flash Drive. Once completed, it will be ready for the node installation.

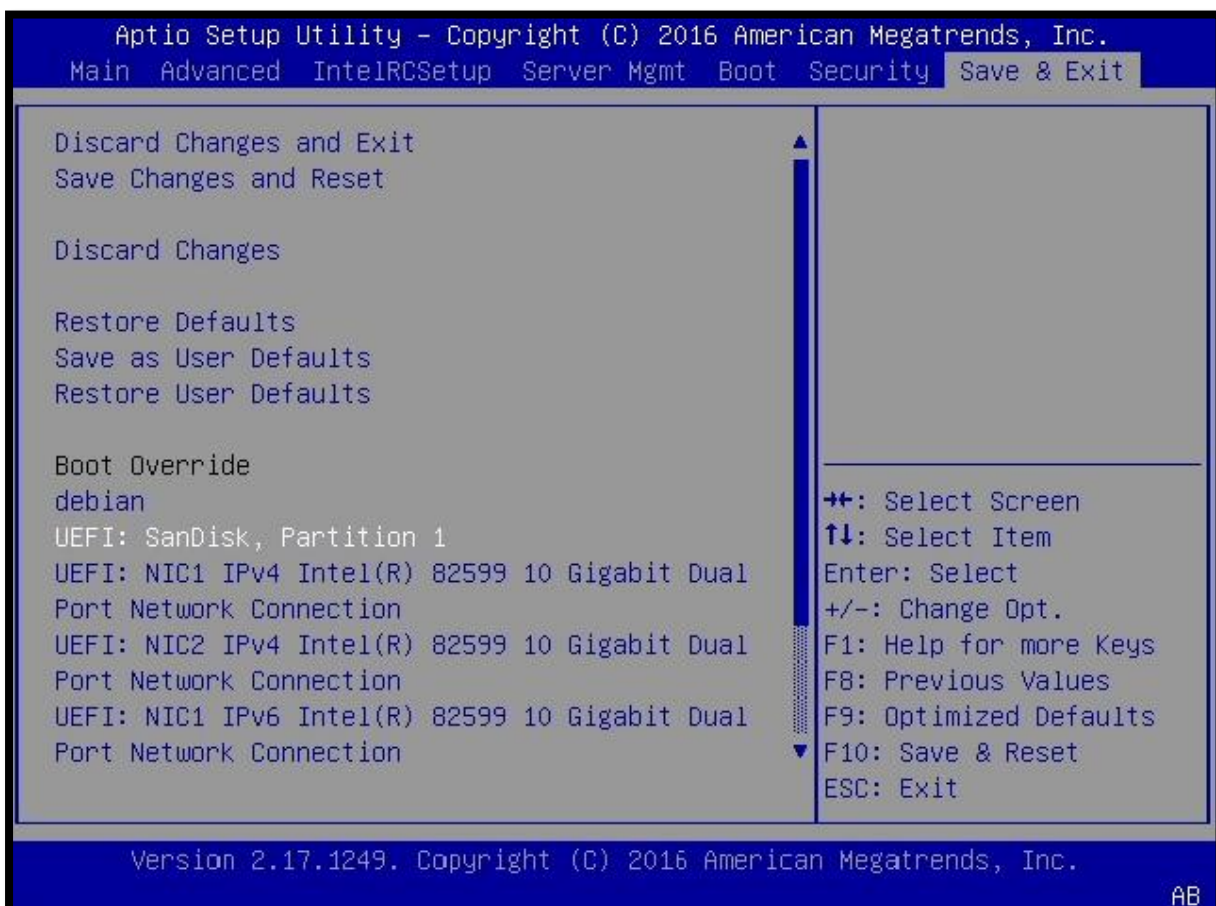
4.1.2 Preparing the node for USB Boot

The nodes may need to be configured to boot from the USB. Insert the USB Flash Drive Boot into the BIOS.

1 - Firstly, make sure that UEFI mode is enabled on the associated node. This can be seen under the *Boot Category* and in the *Boot Mode Select Option*. *Boot Mode Select* should be set to *UEFI*. A Reboot may be required for the option to take effect if it had to be changed.

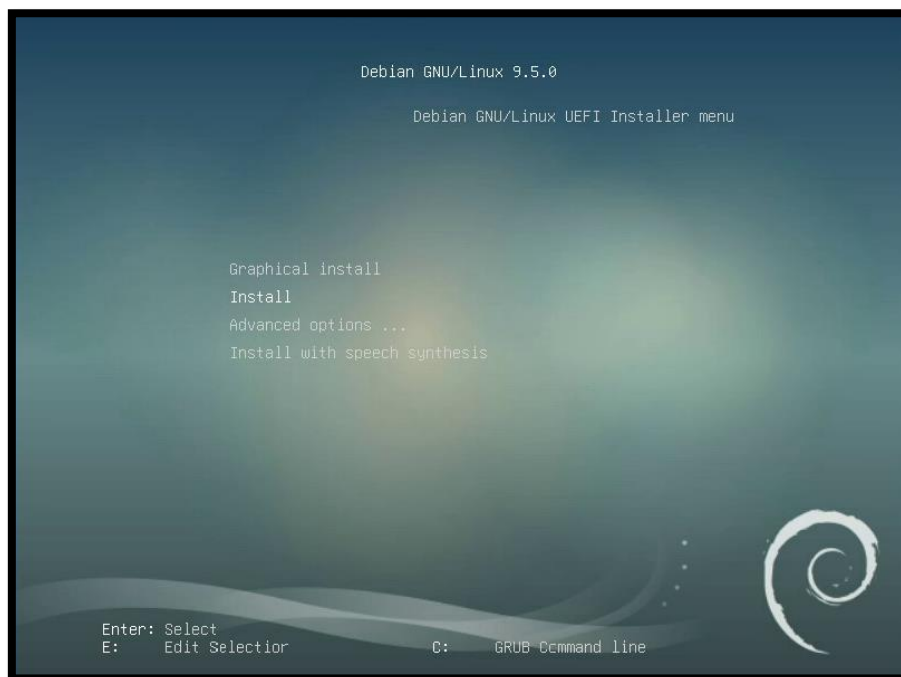


2 - Now head to the *Save & Exit* Category and the USB Drive should appear within the list near the bottom of the BIOS screen. Select this USB Drive to boot to it.



4.1.3 – Boot Screen

The boot screen for Debian should now appear. Select the *Install* Option.

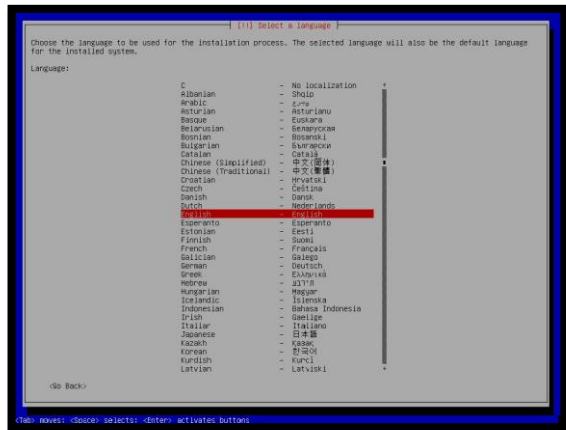


4.2 – Debian Installation Process

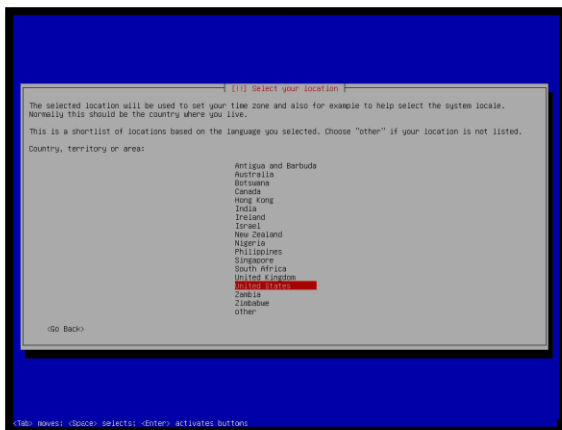
4.2.1 – Select Language, Location and Keyboard Layout

Note that this process may be slightly different depending on location

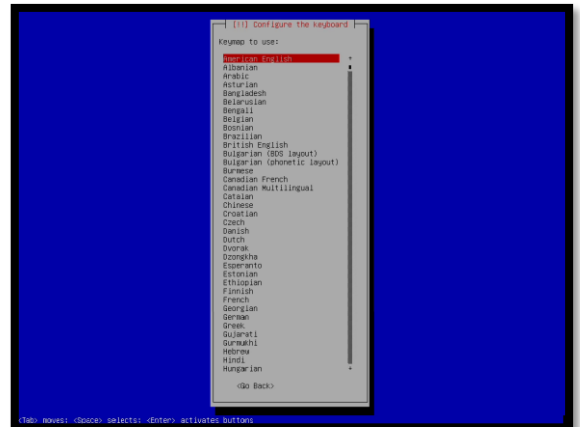
1 - Select Language



2 - Select Location

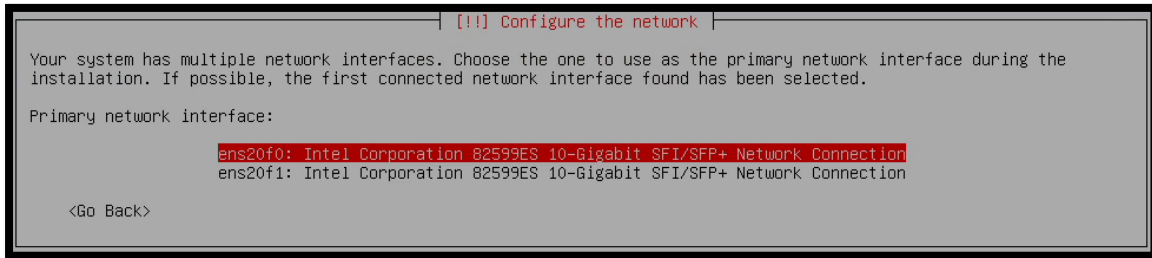


3 – Select Keyboard Layout

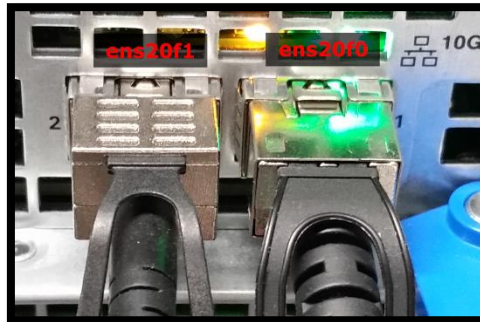


4.2.2 – Configure Networking

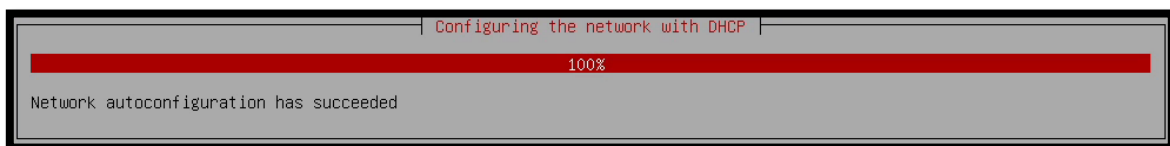
1 - Select *ens20f0* as the network adapter, this should be the first connection on the NIC.



This should correspond to the physical connection on the NIC on the back of the node.



2 - After selecting the primary network interface, the network should be automatically configured



4.2.3 – Hostnames and Domain Names

1 - This is where each node will differ slightly as each node will have a different hostname.

Configure the network

Please enter the hostname for this system.

The hostname is a single word that identifies your system to the network. If you don't know what your hostname should be, consult your network administrator. If you are setting up your own home network, you can make something up here.

Hostname:

tier2-1

<Go Back> <Continue>

These were the hostnames can be used for each of the nodes involved in the architecture:

- **Management Plane Nodes**
 - management1
 - management2
 - vrms
 - rln
- **Worker Plane Nodes**
 - S2S-T1-1
 - S2S-T1-2
 - S2S-T1-3
 - S2S-T1-4
 - S2P-T2-1
 - S2P-T2-2
 - S2P-T2-3
 - S2P-T2-4

2 - Don't enter anything for this screen, press the *Enter* key to skip through.

Configure the network

The domain name is the part of your Internet address to the right of your host name. It is often something that ends in .com, .net, .edu, or .org. If you are setting up a home network, you can make something up, but make sure you use the same domain name on all your computers.

Domain name:

<Go Back> <Continue>

4.2.4 – Set up Root Password

Set your password of choice. The password we used for our appliance build was *admin*.

!!! Set up users and passwords

You need to set a password for 'root', the system administrative account. A malicious or unqualified user with root access can have disastrous results, so you should take care to choose a root password that is not easy to guess. It should not be a word found in dictionaries, or a word that could be easily associated with you.

A good password will contain a mixture of letters, numbers and punctuation and should be changed at regular intervals.

The root user should not have an empty password. If you leave this empty, the root account will be disabled and the system's initial user account will be given the power to become root using the "sudo" command.

Note that you will not be able to see the password as you type it.

Root password:

[] Show Password in Clear

<Go Back> <Continue>

!!! Set up users and passwords

Please enter the same root password again to verify that you have typed it correctly.

Re-enter password to verify:

[] Show Password in Clear

<Go Back> <Continue>

4.2.5 – Set up User name and User Password

1 – Set the user name. For our build we used *storedata*

[!!] Set up users and passwords

Select a username for the new account. Your first name is a reasonable choice. The username should start with a lower-case letter, which can be followed by any combination of numbers and more lower-case letters.

Username for your account:

<Go Back> <Continue>

2 – Set up the user password. Again, we used *admin*

[!!] Set up users and passwords

A good password will contain a mixture of letters, numbers and punctuation and should be changed at regular intervals.

Choose a password for the new user:

☐ Show Password in Clear

<Go Back> <Continue>

[!!] Set up users and passwords

Please enter the same user password again to verify you have typed it correctly.

Re-enter password to verify:

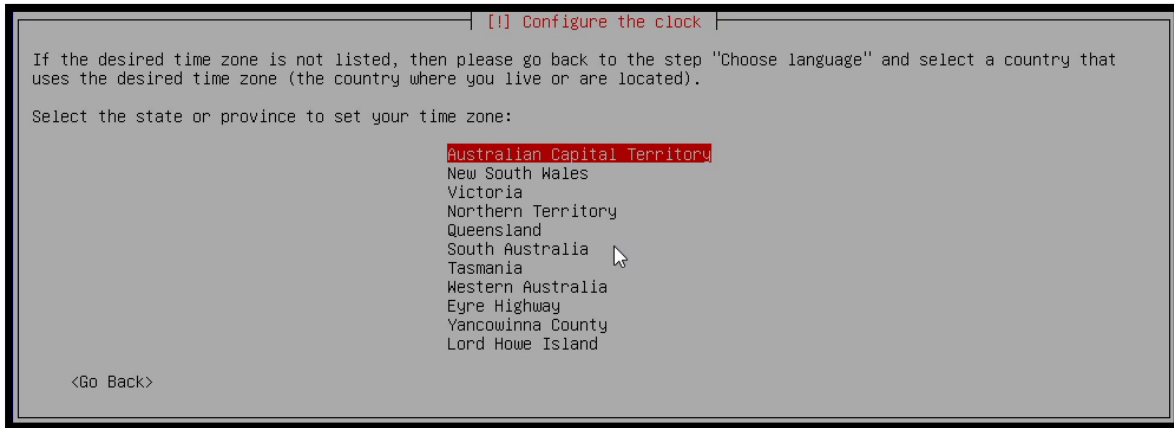
☐ Show Password in Clear

<Go Back> <Continue>

4.2.6 – Set up Location and Clock

These are the screens that appeared for us as we are in Australia. Thus, this will differ slightly depending where you are in the world.

1 – Select your Time Zone



4.2.7 – Partitioning the Storage for the Operating System

The partitioning of storage differs across many different nodes. Hence, this section is split up in the different ways to partition storage for the different nodes.

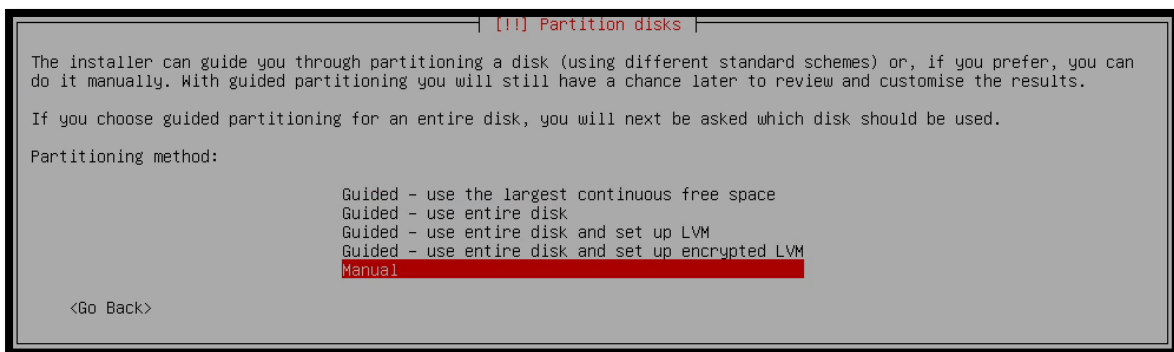
Please proceed to section [4.2.7.1](#) for nodes that use a 3108 card and section [4.2.7.2](#) for nodes that use a 3008 card.

4.2.7.1 – Nodes with 3108 Card

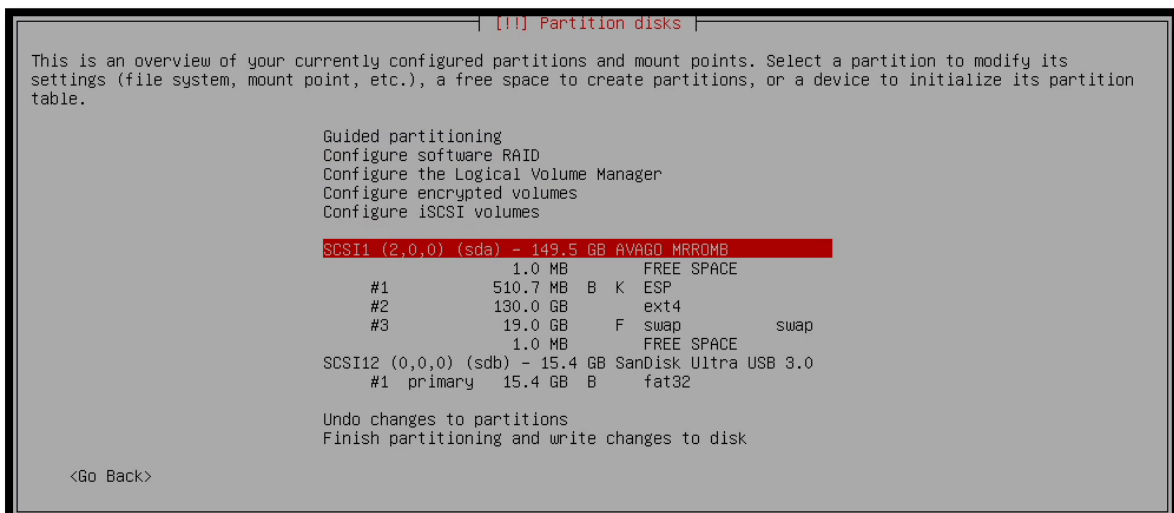
All nodes with the 3108 RAID Controller Card are partitioned the same way. These apply to the nodes:

- Management 1
- Management 2
- VMRS
- RLN
- S2S-T1-1
- S2S-T1-2
- S2S-T1-3
- S2S-T1-4

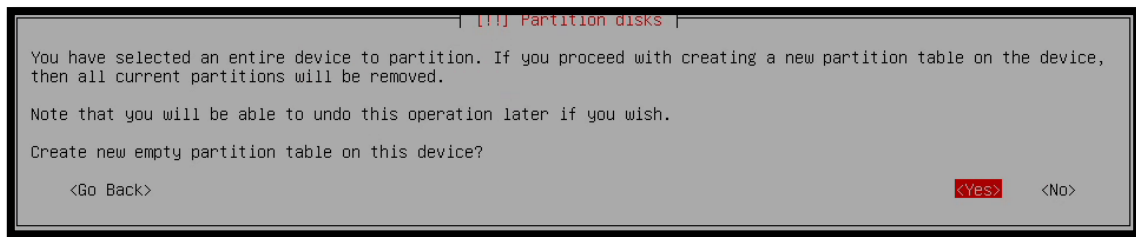
1 – Select *Manual* for the partitioning method.



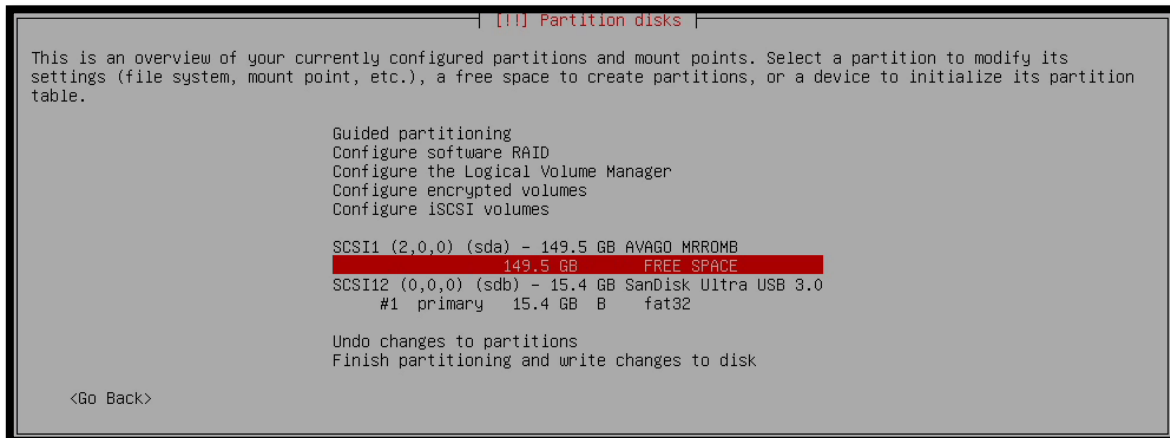
2 – Select the full 150GB drive as seen in the screenshot.



3 – Select Yes if this message appears. Do note that all data will be erased from the drive.



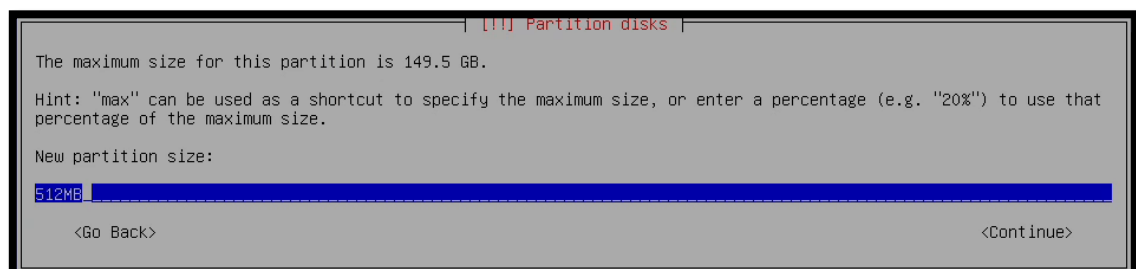
4 – Select the free space that was created on the 150GB Drive.



5 – Select *Create a new partition*



6 – Make this partition 512MB



7 – Select *Beginning*

!!! Partition disks

Please choose whether you want the new partition to be created at the beginning or at the end of the available space.

Location for the new partition:

Beginning
End

<Go Back>

8 – Set the type of Partition to *EFI System Partition*

!!! Partition disks

You are editing partition #1 of SCSI1 (2,0,0) (sda). This partition is formatted with the FAT32 file system. All data in it WILL BE DESTROYED!

Partition settings:

Name:
Use as: Ext4 journaling file system

Mount point: /
Mount options: defaults
Label: none
Reserved blocks: 5%
Typical usage: standard
Bootable flag: off

Resize the partition (currently 510.7 MB)
Erase data on this partition
Delete the partition
Done setting up the partition

<Go Back>

!!! Partition disks

How to use this partition:

Ext4 journaling file system
Ext3 journaling file system
Ext2 file system
btrfs journaling file system
JFS journaling file system
XFS journaling file system
FAT16 file system
FAT32 file system
Swap area
Reserved BIOS boot area
EFI System Partition
physical volume for encryption
physical volume for RAID
physical volume for LVM
do not use the partition

<Go Back>

9 – Make sure that the bootable flag is on

!!! Partition disks

You are editing partition #1 of SCSI1 (2,0,0) (sda). This partition is formatted with the FAT32 file system.

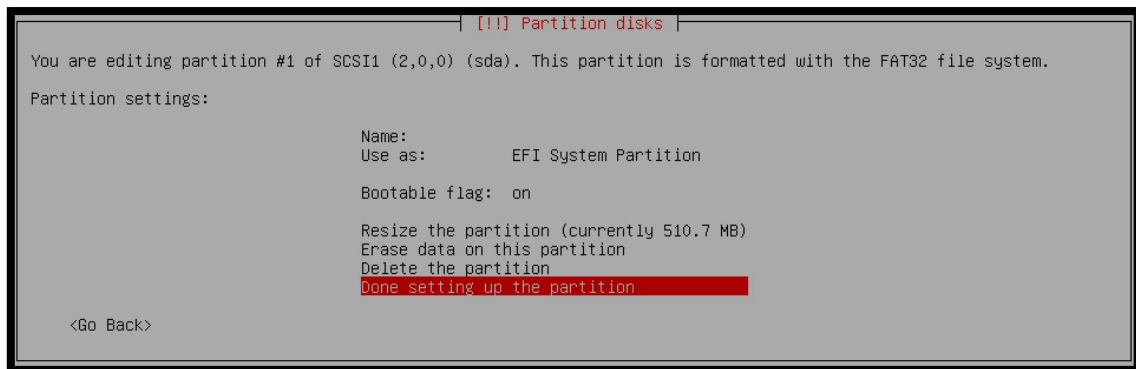
Partition settings:

Name:
Use as: EFI System Partition
Bootable flag: on

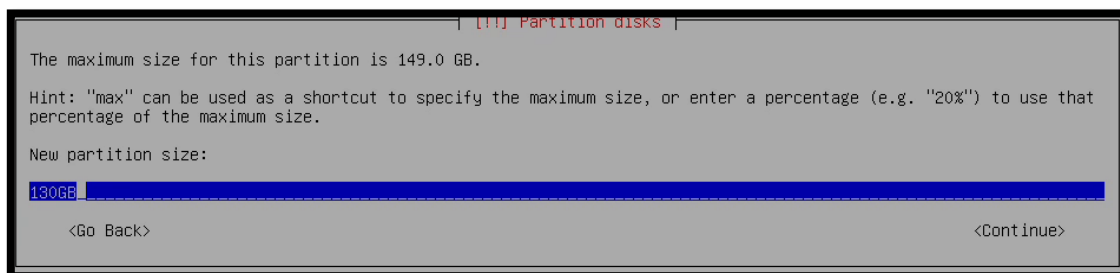
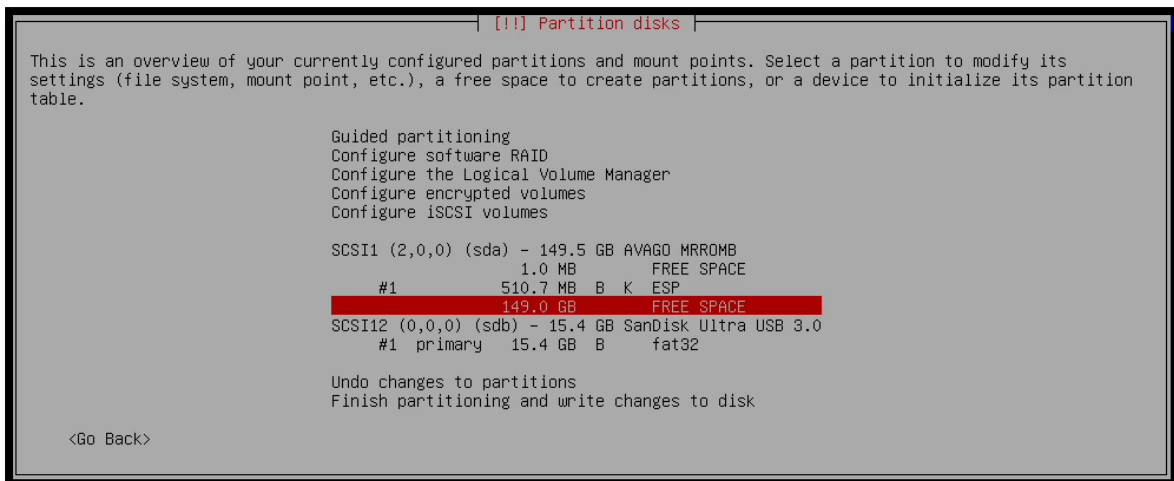
Resize the partition (currently 510.7 MB)
Erase data on this partition
Delete the partition
Done setting up the partition

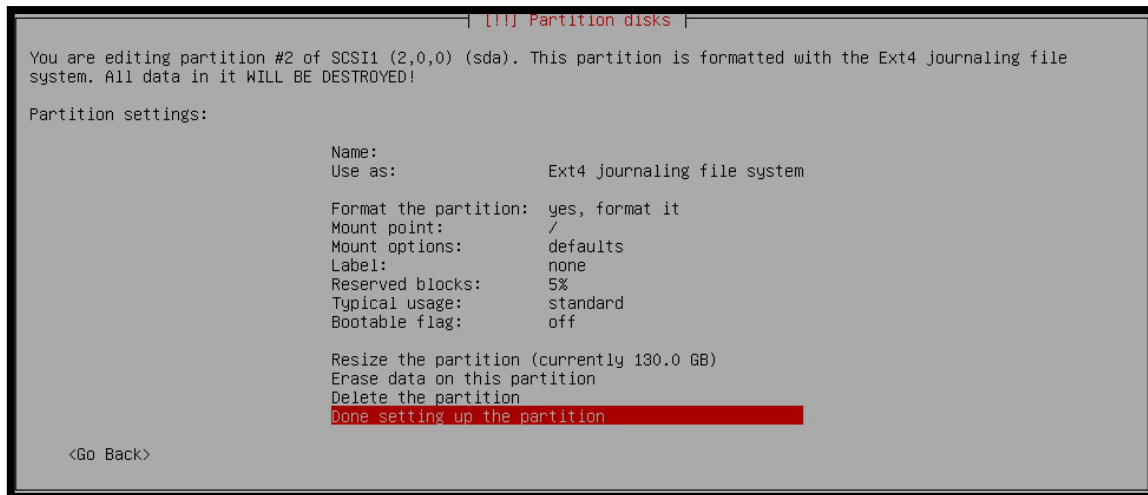
<Go Back>

10 – Select *Done setting up the partition*

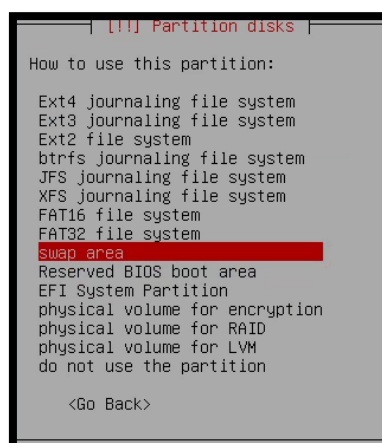
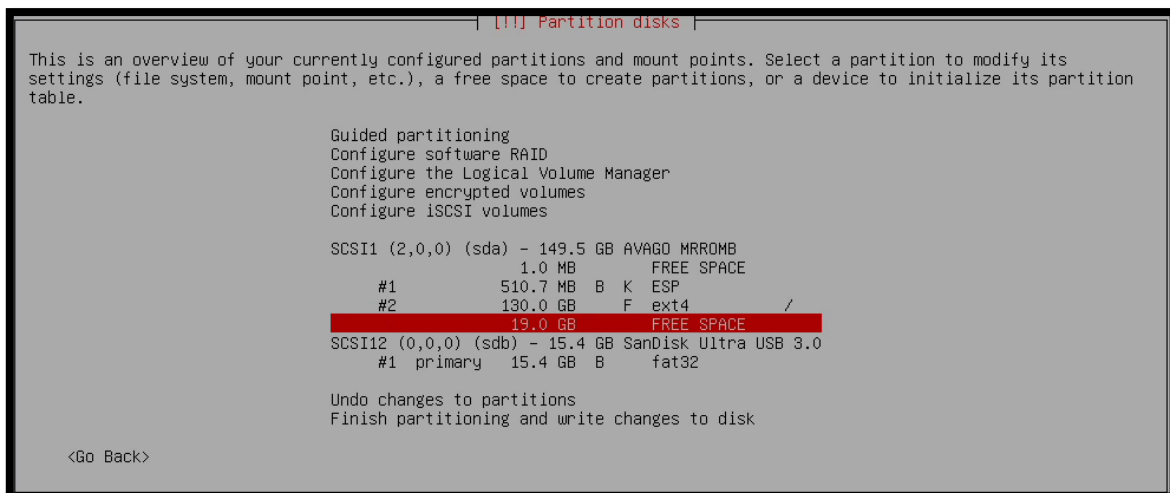


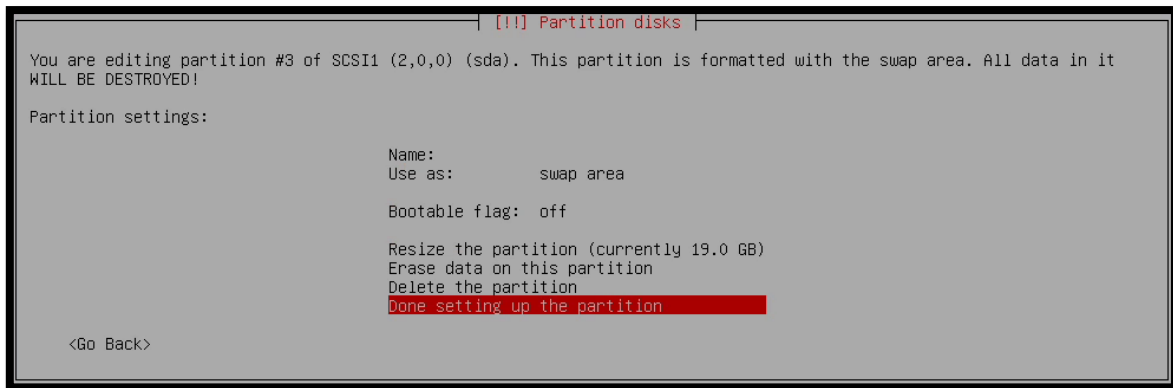
11 – Create a new ext4 partition with the size of 130GB. Follow steps 1 to 8, except change the fields to reflect the screenshots below.



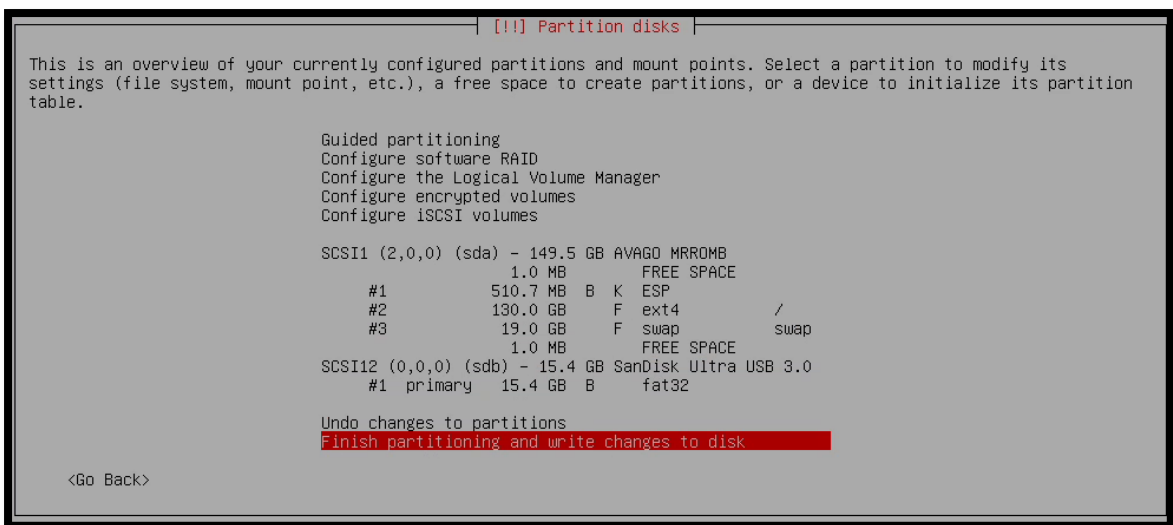


12 - Create a new swap partition with the size of 19GB. Follow steps 1 to 8, except change the fields to reflect the screenshots below.

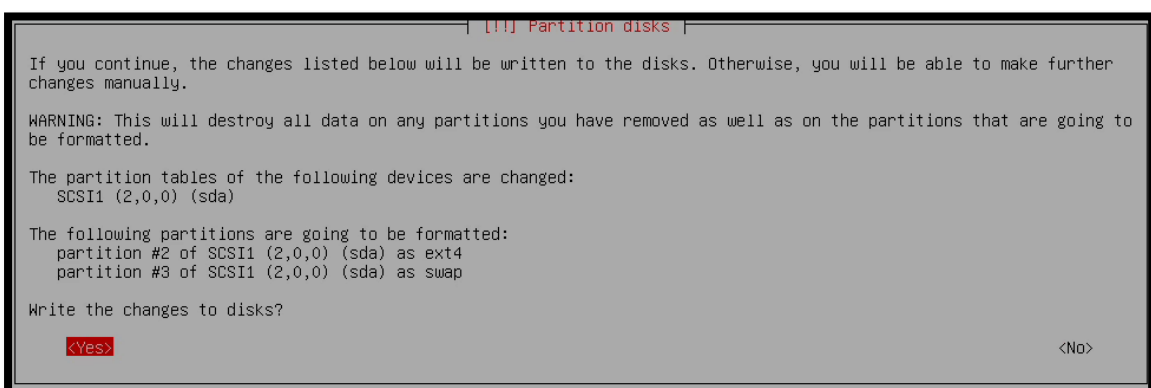




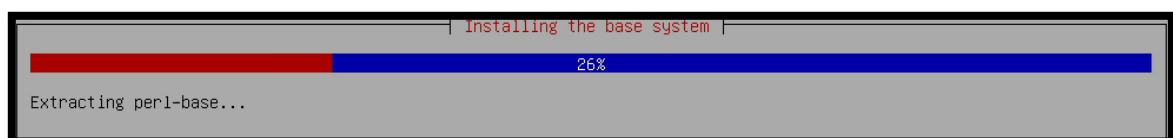
13 – Back on the main partitioning screen, you should see the three partitions that were created, their sizes and their types. Select *Finish partitioning and write change to disk*.



14 – Select <Yes> to write the partition changes to disk



15 – The partitioning will begin, and core files will be installed. This may take some time.

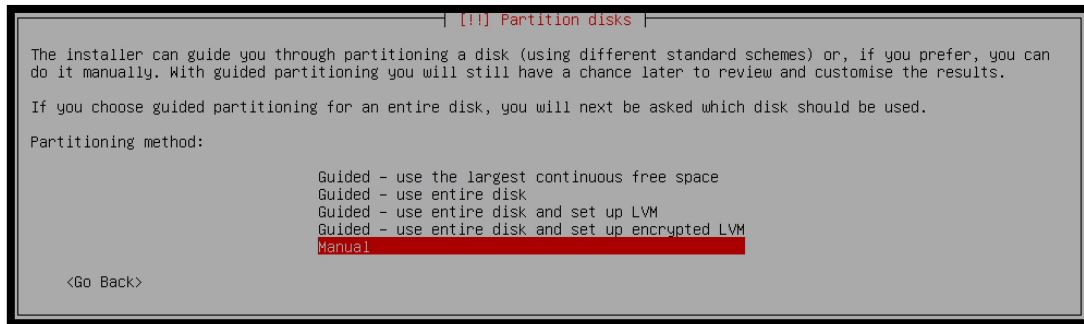


4.2.7.2 – Nodes with 3008 Card

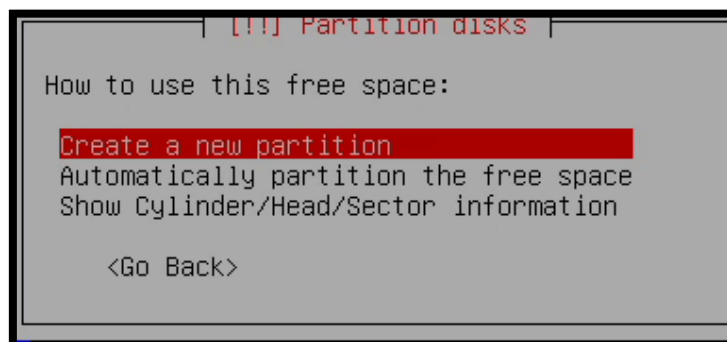
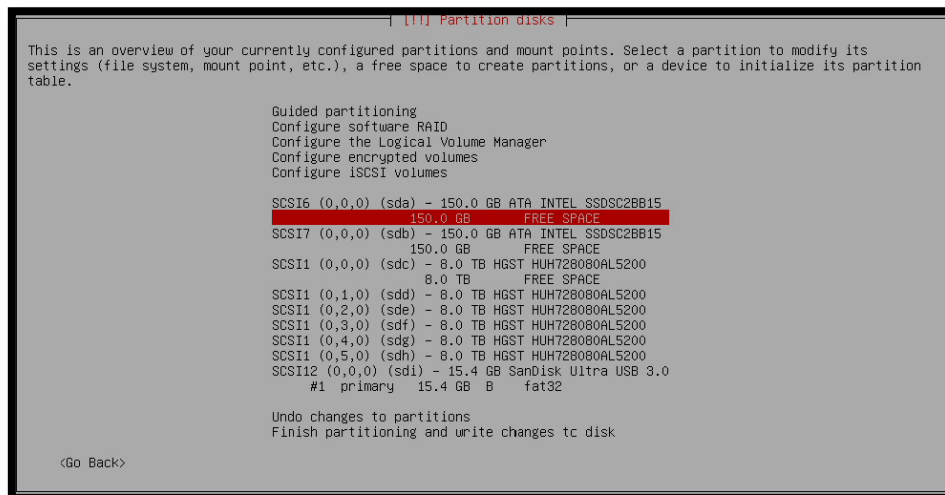
All nodes with the 3008 card are partitioned the same way. These apply to the nodes:

- S2P-T2-1
- S2P-T2-2
- S2P-T2-3
- S2P-T2-4

1 – Select *Manual* for the partitioning method.



2 – Partition an EFI System Partition with the size of 512MB on the first drive



!!! Partition disks

The maximum size for this partition is 150.0 GB.

Hint: "max" can be used as a shortcut to specify the maximum size, or enter a percentage (e.g. "20%") to use that percentage of the maximum size.

New partition size:

512MB

<Go Back> <Continue>

!!! Partition disks

Please choose whether you want the new partition to be created at the beginning or at the end of the available space.

Location for the new partition:

Beginning
End

<Go Back>

!!! Partition disks

You are editing partition #1 of SCSI6 (0,0,0) (sda). This partition is formatted with the FAT32 file system. All data in it WILL BE DESTROYED!

Partition settings:

Name:
Use as: Ext4 journaling file system

Mount point: /
Mount options: defaults
Label: none
Reserved blocks: 5%
Typical usage: standard
Bootable flag: off

Resize the partition (currently 510.7 MB)
Erase data on this partition
Delete the partition
Done setting up the partition

<Go Back>

!!! Partition disks

How to use this partition:

Ext4 journaling file system
Ext3 journaling file system
Ext2 file system
btrfs journaling file system
JFS journaling file system
XFS journaling file system
FAT16 file system
FAT32 file system
swap area
Reserved BIOS boot area
EFI System Partition
physical volume for encryption
physical volume for RAID
physical volume for LVM
do not use the partition

<Go Back>

[[!]] Partition disks

You are editing partition #1 of SCSI6 (0,0,0) (sda). This partition is formatted with the FAT32 file system.

Partition settings:

Name:
Use as: EFI System Partition

Bootable flag: on

Resize the partition (currently 510.7 MB)
Erase data on this partition
Delete the partition
Done setting up the partition

<Go Back>

3 – Partition a swap area on the first OS SSD with a size of 19GB

[[!]] Partition disks

This is an overview of your currently configured partitions and mount points. Select a partition to modify its settings (file system, mount point, etc.), a free space to create partitions, or a device to initialize its partition table.

Guided partitioning
Configure software RAID
Configure the Logical Volume Manager
Configure encrypted volumes
Configure iSCSI volumes

SCSI6 (0,0,0) (sda)	-	150.0 GB	ATA	INTEL SSDSC2BB15
		1.0 MB		FREE SPACE
#1		510.7 MB	B	K ESP
		149.5 GB		FREE SPACE
SCSI7 (0,0,0) (sdb)	-	150.0 GB	ATA	INTEL SSDSC2BB15
		150.0 GB		FREE SPACE
SCSI11 (0,0,0) (sdc)	-	8.0 TB	HGST	HUH728080AL5200
		8.0 TB		FREE SPACE
SCSI11 (0,1,0) (sdd)	-	8.0 TB	HGST	HUH728080AL5200
SCSI11 (0,2,0) (sde)	-	8.0 TB	HGST	HUH728080AL5200
SCSI11 (0,3,0) (sdf)	-	8.0 TB	HGST	HUH728080AL5200
SCSI11 (0,4,0) (sdg)	-	8.0 TB	HGST	HUH728080AL5200
SCSI11 (0,5,0) (sdh)	-	8.0 TB	HGST	HUH728080AL5200
SCSI12 (0,0,0) (sdi)	-	15.4 GB	SanDisk	Ultra USB 3.0
#1 primary		15.4 GB	B	fat32

Undo changes to partitions
Finish partitioning and write changes to disk

<Go Back>

[[!]] Partition disks

The maximum size for this partition is 149.5 GB.

Hint: "max" can be used as a shortcut to specify the maximum size, or enter a percentage (e.g. "20%") to use that percentage of the maximum size.

New partition size:

19GB

<Go Back> <Continue>

[[!]] Partition disks

Please choose whether you want the new partition to be created at the beginning or at the end of the available space.

Location for the new partition:

Beginning
End

<Go Back>

```

[!!!] Partition disks
You are editing partition #2 of SCSI6 (0,0,0) (sda). No existing file system was detected in this partition.
Partition settings:
Name:
Use as: Ext4 journaling file system
Mount point: /
Mount options: defaults
Label: none
Reserved blocks: 5%
Typical usage: standard
Bootable flag: off
Delete the partition
Done setting up the partition
<Go Back>

```

```

[!!!] Partition disks

How to use this partition:

Ext4 journaling file system
Ext3 journaling file system
Ext2 file system
btrfs journaling file system
JFS journaling file system
XFS journaling file system
FAT16 file system
FAT32 file system
swap area
Reserved BIOS boot area
EFI System Partition
physical volume for encryption
physical volume for RAID
physical volume for LVM
do not use the partition

<Go Back>

```

```

[!!!] Partition disks
You are editing partition #2 of SCSI6 (0,0,0) (sda). No existing file system was detected in this partition.
Partition settings:

Name:
Use as:          swap area

Bootable flag: off

Delete the partition
Done setting up the partition

<Go Back>

```

4 – Partition a swap partition on the second OS SSD with a size of 19.5GB

```

[1] Partition disks ]

This is an overview of your currently configured partitions and mount points. Select a partition to modify its
settings (file system, mount point, etc.), a free space to create partitions, or a device to initialize its partition
table.

Guided partitioning
Configure software RAID
Configure the Logical Volume Manager
Configure encrypted volumes
Configure iSCSI volumes

SCSI6 (0,0,0) (sda) - 150.0 GB ATA INTEL SSDSC2BB15
    1.0 MB    FREE SPACE
#1      510.7 MB B K ESP
#2      19.0 GB  f swap
        190.5 GB    FREE SPACE
SCSI7 (0,0,0) (sdb) - 150.0 GB ATA INTEL SSDSC2BB15
    150.0 GB    FREE SPACE
SCSI11 (0,0,0) (sdc) - 8.0 TB HGST HUH728080AL5200
    8.0 TB      FREE SPACE
SCSI11 (0,1,0) (sdd) - 8.0 TB HGST HUH728080AL5200
SCSI11 (0,2,0) (sde) - 8.0 TB HGST HUH728080AL5200
SCSI11 (0,3,0) (sdf) - 8.0 TB HGST HUH728080AL5200
SCSI11 (0,4,0) (sdg) - 8.0 TB HGST HUH728080AL5200
SCSI11 (0,5,0) (sdh) - 8.0 TB HGST HUH728080AL5200
SCSI12 (0,0,0) (sdi) - 15.4 GB SanDisk Ultra USB 3.0
#1 primary 15.4 GB B fat32

Undo changes to partitions
Finish partitioning and write changes to disk

<Go Back>

```

!!! Partition disks

How to use this free space:

Create a new partition
Automatically partition the free space
Show Cylinder/Head/Sector information

<Go Back>

!!! Partition disks

The maximum size for this partition is 150.0 GB.

Hint: "max" can be used as a shortcut to specify the maximum size, or enter a percentage (e.g. "20%") to use that percentage of the maximum size.

New partition size:

19.5GB

<Go Back> <Continue>

!!! Partition disks

Please choose whether you want the new partition to be created at the beginning or at the end of the available space.

Location for the new partition:

Beginning
End

<Go Back>

!!! Partition disks

You are editing partition #1 of SCSI7 (0,0,0) (sdb). No existing file system was detected in this partition.

Partition settings:

Name:
Use as: Ext4 journaling file system

Mount point: /
Mount options: defaults
Label: none
Reserved blocks: 5%
Typical usage: standard
Bootable flag: off

Delete the partition
Done setting up the partition

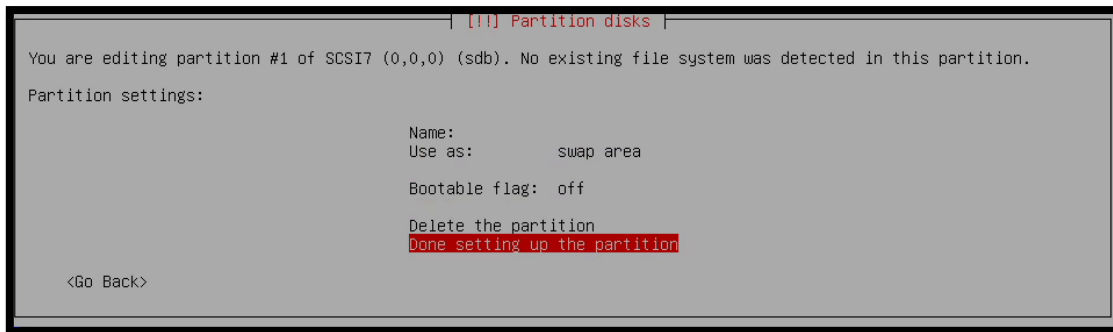
<Go Back>

!!! Partition disks

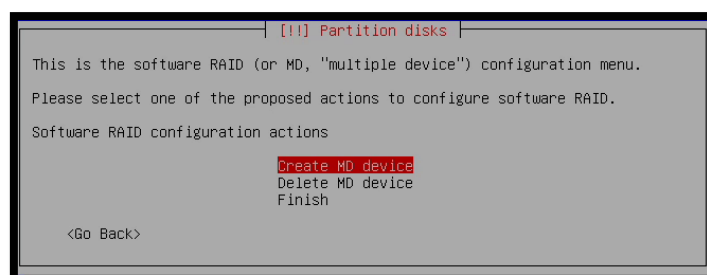
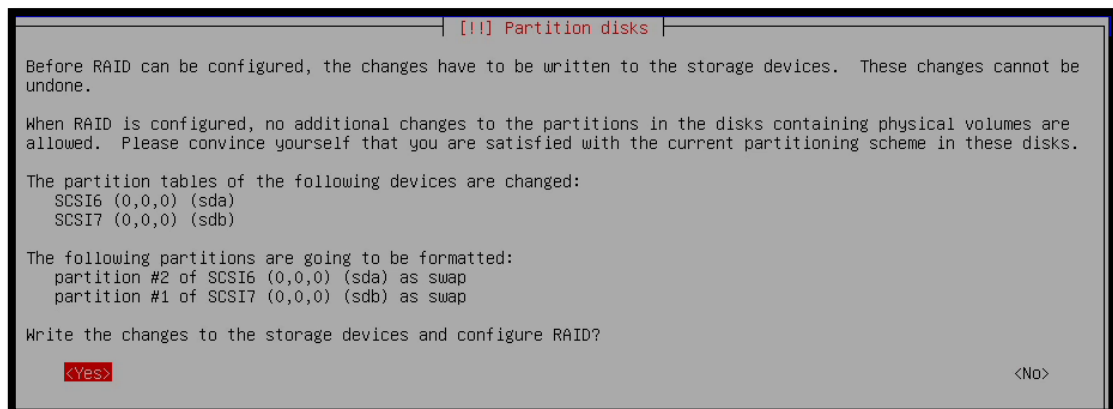
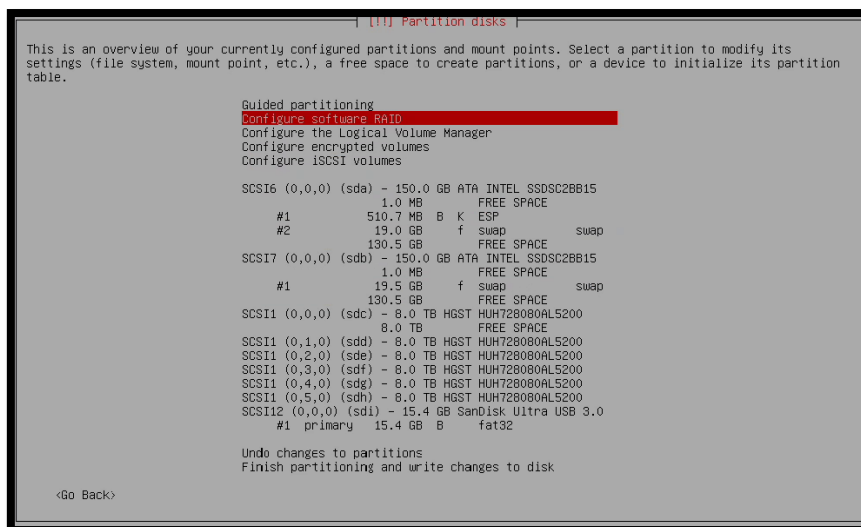
How to use this partition:

Ext4 journaling file system
Ext3 journaling file system
Ext2 file system
btrfs journaling file system
JFS journaling file system
XFS journaling file system
FAT16 file system
FAT32 file system
swap area
Reserved BIOS boot area
EFI System Partition
physical volume for encryption
physical volume for RAID
physical volume for LVM
do not use the partition

<Go Back>



6 – Configure a RAID on the remaining disks, mimicking the configurations seen in the screenshots below



!!! Partition disks

Please choose the type of the software RAID device to be created.

Software RAID device type:

RAID0
RAID1
RAID5
RAID6
RAID10

<Go Back>

!!! Partition disks

The RAID1 array will consist of both active and spare devices. The active devices are those used, while the spare devices will only be used if one or more of the active devices fail. A minimum of 2 active devices is required.

NOTE: this setting cannot be changed later.

Number of active devices for the RAID1 array:

2

<Go Back> <Continue>

!!! Partition disks

Number of spare devices for the RAID1 array:

0

<Go Back> <Continue>

!!! Partition disks

You have chosen to create a RAID1 array with 2 active devices.

Please choose which partitions are active devices. You must select exactly 2 partitions.

Active devices for the RAID1 array:

[]	/dev/sda1	(510MB; ESP)
[]	/dev/sda2	(19000MB; swap)
[*]	/dev/sda free #1	(130528MB; FREE SPACE)
[]	/dev/sdb1	(19499MB; swap)
[*]	/dev/sdb free #1	(130539MB; FREE SPACE)
[]	/dev/sdc free #1	(8001563MB; FREE SPACE)
[]	/dev/sdi1	(15375MB; fat32)

<Go Back> <Continue>

!!! Partition disks

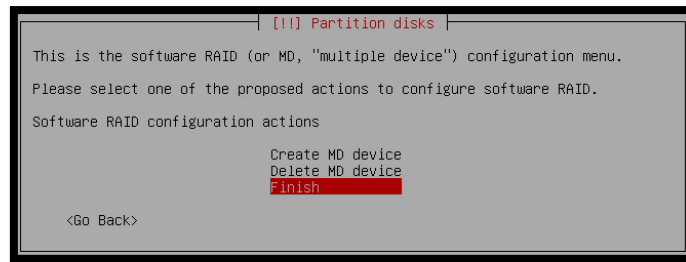
Before RAID can be configured, the changes have to be written to the storage devices. These changes cannot be undone.

When RAID is configured, no additional changes to the partitions in the disks containing physical volumes are allowed. Please convince yourself that you are satisfied with the current partitioning scheme in these disks.

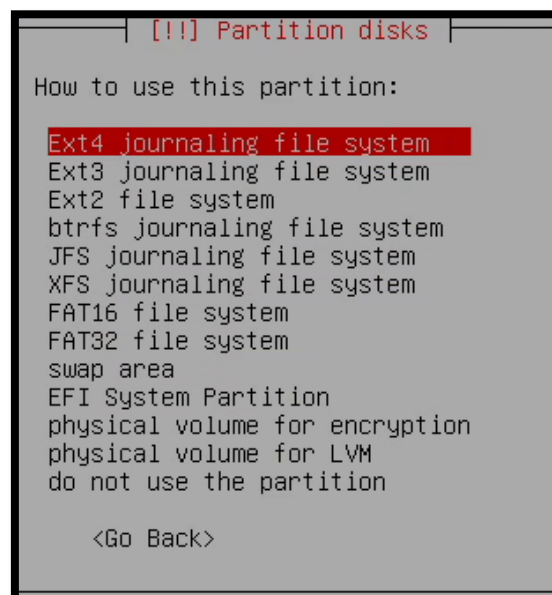
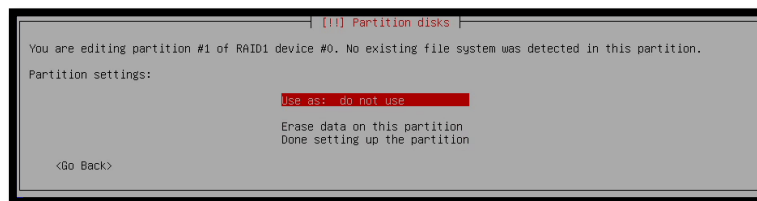
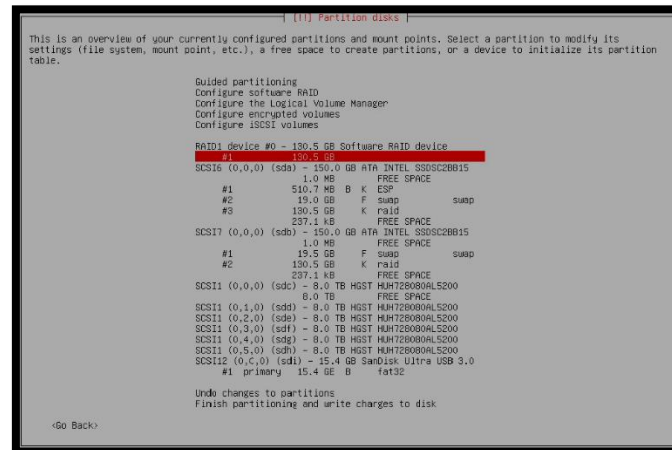
The partition tables of the following devices are changed:
SCSI6 (0,0,0) (sda)
SCSI7 (0,0,0) (sdb)

Write the changes to the storage devices and configure RAID?

<Yes> <No>



7 – Create an ext4 partition on the RAID 1 Drive with a size of 130GB



```
[[!]] Partition disks

You are editing partition #1 of RAID1 device #0. No existing file system was detected in this partition.

Partition settings:

Use as:                Ext4 journaling file system
Mount point:           none
Mount options:         defaults
Label:                 none
Reserved blocks:       5%
Typical usage:         standard

Erase data on this partition
Done setting up the partition

<Go Back>
```

```
[[!]] Partition disks

Mount point for this partition:

/ - the root file system
/boot - static files of the boot loader
/home - user home directories
/tmp - temporary files
/usr - static data
/var - variable data
/srv - data for services provided by this system
/opt - add-on application software packages
/usr/local - local hierarchy
Enter manually
Do not mount it

<Go Back>
```

```
[[!]] Partition disks

You are editing partition #1 of RAID1 device #0. No existing file system was detected in this partition.

Partition settings:

Use as:                Ext4 journaling file system
Mount point:           /
Mount options:         defaults
Label:                 none
Reserved blocks:       5%
Typical usage:         standard

Erase data on this partition
Done setting up the partition

<Go Back>
```

8 – Finalize the configuration

```
[ !! ] Partition disks |
This is an overview of your currently configured partitions and mount points. Select a partition to modify its
settings (file system, mount point, etc.), a free space to create partitions, or a device to initialize its partition
table.

Guided partitioning
Configure software RAID
Configure the Logical Volume Manager
Configure encrypted volumes
Configure iSCSI volumes

RAID1 device #0 - 130.5 GB Software RAID device
#1 130.5 GB # ext4 /
SCSI6 (0,0,0) (sda) - 150.0 GB ATA INTEL SSDSC2BB15
1.0 MB FREE SPACE
#1 510.7 MB B K ESP
#2 19.0 GB F swap swap
#3 130.5 GB K raid
237.1 kB FREE SPACE
SCSI7 (0,0,0) (sdb) - 150.0 GB ATA INTEL SSDSC2BB15
1.0 MB FREE SPACE
#1 19.5 GB F swap swap
#2 130.5 GB K raid
237.1 kB FREE SPACE
SCSI1 (0,0,0) (sdc) - 8.0 TB HGST HUHT28080AL5200
8.0 TB FREE SPACE
SCSI1 (0,1,0) (sdd) - 8.0 TB HGST HUHT28080AL5200
SCSI1 (0,2,0) (sde) - 8.0 TB HGST HUHT28080AL5200
SCSI1 (0,3,0) (sdf) - 8.0 TB HGST HUHT28080AL5200
SCSI1 (0,4,0) (sdg) - 8.0 TB HGST HUHT28080AL5200
SCSI1 (0,5,0) (sdh) - 8.0 TB HGST HUHT28080AL5200
SCSI12 (0,C,0) (sdi) - 15.4 GB SanDisk Ultra USB 3.0
#1 primary 15.4 GB B fat32

Undo changes to partitions
Finish partitioning and write changes to disk
<Go Back>
```

```
[ !! ] Partition disks |
If you continue, the changes listed below will be written to the disks. Otherwise, you will be able to make further
changes manually.

The partition tables of the following devices are changed:
RAID1 device #0

The following partitions are going to be formatted:
partition #1 of RAID1 device #0 as ext4

Write the changes to disks?
<Yes> <No>
```

9 – The partitioning will begin, and core files will be installed. This may take some time.

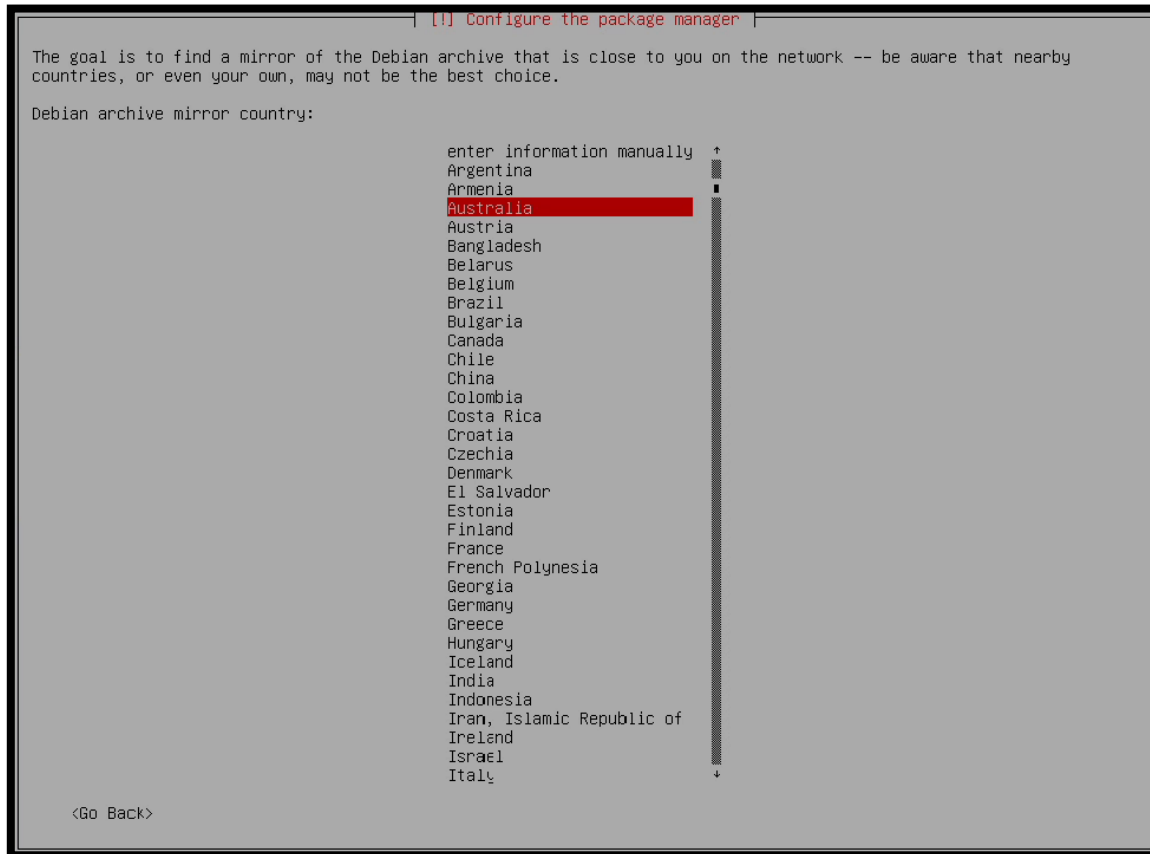
```
| Installing the base system |
26%
Extracting perl-base...
```

4.2.8 – Package Manager Configuration and Selecting packages

This involves selecting the closest mirror to receive the best update speeds for required packages. We selected Australia as that is where we reside. Try to pick a mirror that is closest to you.

4.2.8.1 Selecting a mirror

1 – Select Closest/Residing Country



2 – Select mirror.



3 – This screen will appear during the package manager configuration. Press the *Enter* key to skip through

A screenshot of a terminal window with a grey background and a black border. At the top, a title bar reads "[!] Configure the package manager". The main text in the terminal says: "If you need to use a HTTP proxy to access the outside world, enter the proxy information here. Otherwise, leave this blank." followed by "The proxy information should be given in the standard form of 'http://[user][:pass]@host[:port]/'." and "HTTP proxy information (blank for none):". Below this text is a long, solid blue horizontal bar representing the input field. At the bottom left of the terminal is the text "<Go Back>" and at the bottom right is "<Continue>".

- 4 – Proceed to Section [4.2.8.2](#) for management nodes
 Proceed to Section [4.2.8.3](#) for all other nodes

4.2.8.2 Software Selection – Management Nodes

1 - **For the two management nodes**, we added a Debian desktop environment as well as the SSH Server and standard system utilities. Press the *Space bar* to select and unselect software packages. Press the *Enter Key* to Continue.

```
[!] Software selection

At the moment, only the core of the system is installed. To tune the system to your needs, you can choose to install
one or more of the following predefined collections of software.

Choose software to install:

[*] Debian desktop environment
[*] ... GNOME
[ ] ... Xfce
[ ] ... KDE
[ ] ... Cinnamon
[ ] ... MATE
[ ] ... LXDE
[ ] web server
[ ] print server
[*] SSH server
[*] standard system utilities

<Continue>
```

2 – Proceed to Section [4.2.8.4](#)

4.2.8.3 – Software Selection – All other nodes

1 – **For all other nodes**, we only selected the SSH Server and Standard System Utilities. A Debian desktop environment is not required for these nodes. Press the *Space bar* to select and unselect software packages. Press the *Enter Key* to Continue.

```
[!] Software selection

At the moment, only the core of the system is installed. To tune the system to your needs, you can choose to install
one or more of the following predefined collections of software.

Choose software to install:

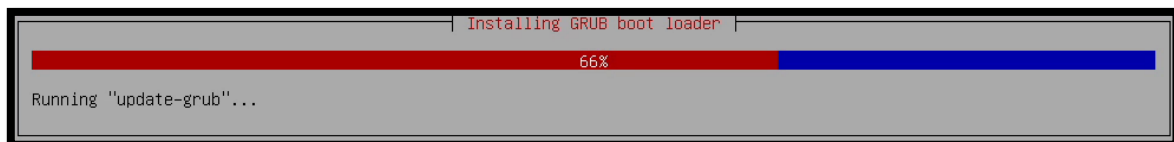
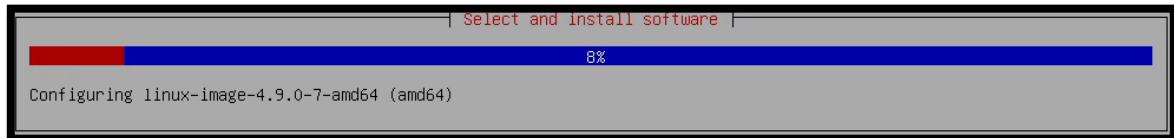
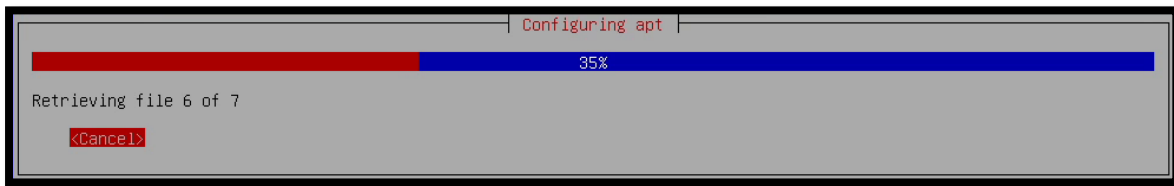
[ ] Debian desktop environment
[ ] ... GNOME
[ ] ... Xfce
[ ] ... KDE
[ ] ... Cinnamon
[ ] ... MATE
[ ] ... LXDE
[ ] web server
[ ] print server
[*] SSH server
[*] standard system utilities

<Continue>
```

2 – Proceed to Section [4.2.8.4](#)

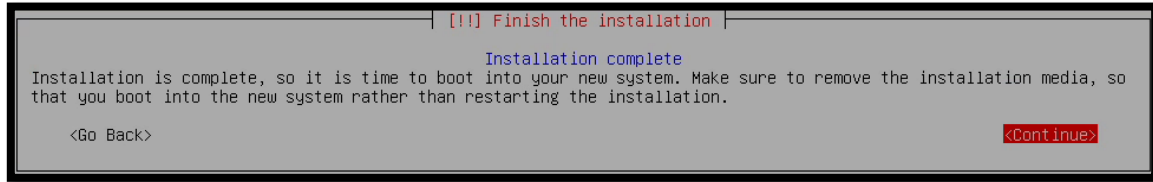
4.2.8.4 – Updates from mirror

Updates and required base packages will now download from the chosen mirror. This will take some time.



4.2.9 – Finalizing the Installation

1 – Once the installation is complete. This screen will appear. Simply select *Continue* to end the installation process. Now remove the USB Flash Drive to prevent the Debian installer from booting again.

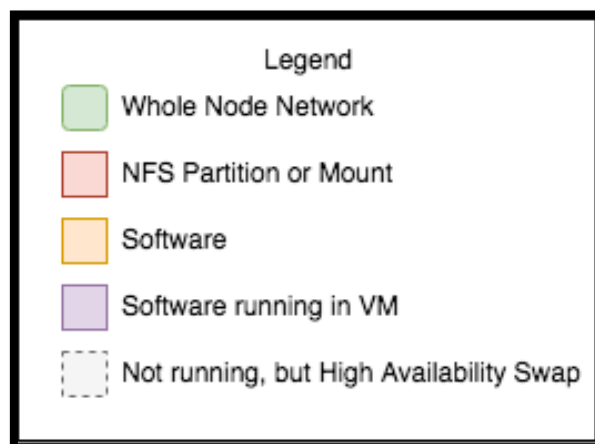
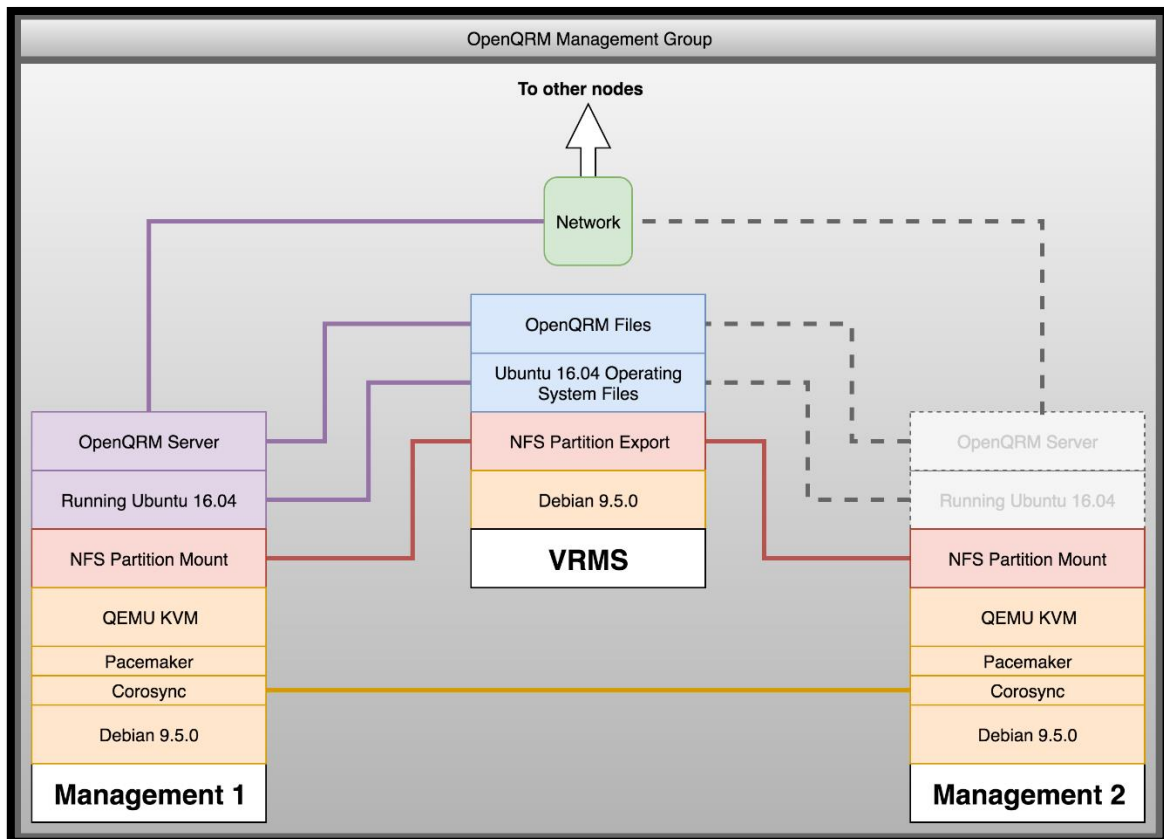


5.0 – OpenQRM Installation

This section will cover the Entire OpenQRM Installation for all nodes.

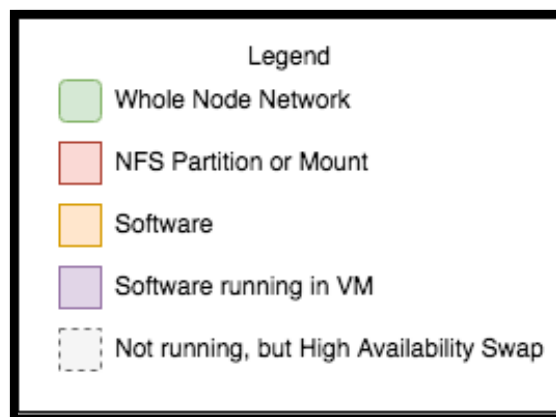
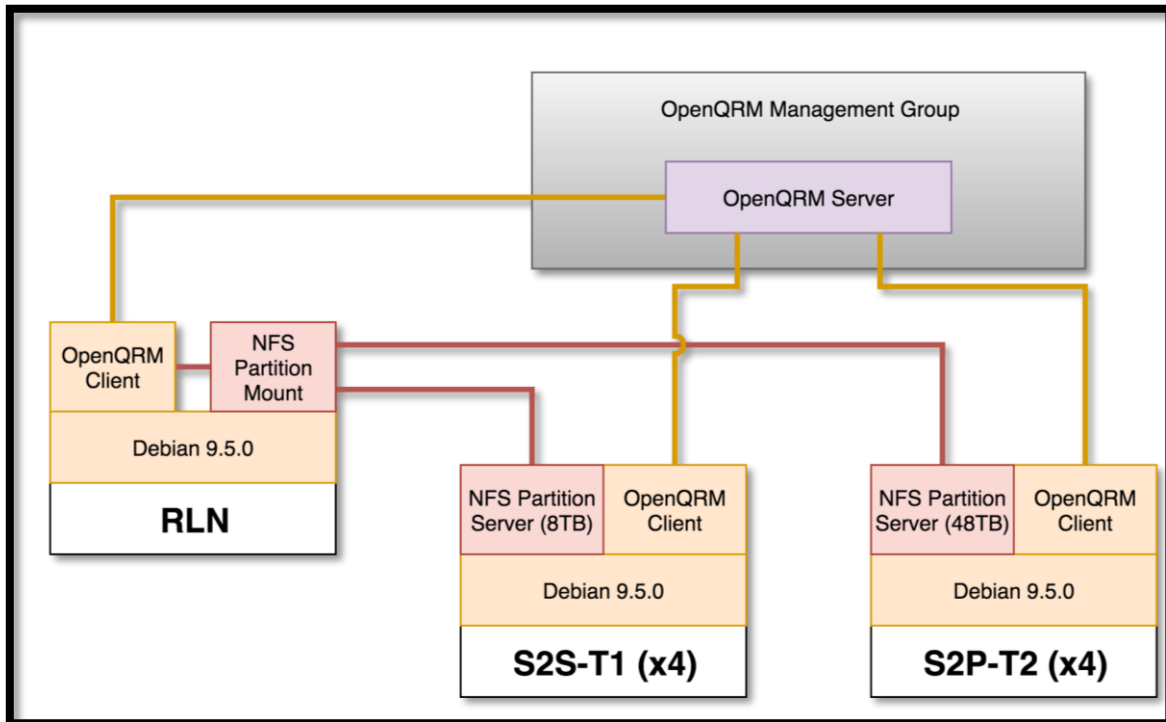
5.1 – OpenQRM Management Group Architecture

The OpenQRM Management Group includes the architecture for the two management nodes and how they manage their *High Availability* functionality. As seen in the diagram, the OpenQRM Server with the grey tint, is set up on the Management 2. This will take over if the OpenQRM Server running on Management 2 were to stop running.



5.2 – OpenQRM Worker Architecture

The OpenQRM Server (In purple) includes the functionality of the HA and other services in the OpenQRM Management Group. All Major Storage partitions (8TB for S2S-T1-1/2/3/4 Nodes and 48 TB for S2P-T2-1/2/3/4 Nodes) for each node have been exported as an NFS to the RLN Node. This is to allow OpenQRM create large combined storage pool using all the node's storage available.



5.3 – OpenQRM Installation Preparation (Management Nodes)

Debian (with a graphical desktop) should now be installed on both Management Nodes. This will follow the installation of both nodes, differences will be noted throughout this guide.

- 1 – Open a terminal on the management node or SSH using an SSH Client
- 2 – Make sure you have root privileges. Enter *su* into the terminal and provide the password *admin* when prompted.

```
storedata@management1:~$ su
Password:
root@management1:/home/storedata#
```

5.3.1 – Installing required packages

- 1 – Enter the following into the terminal (All one line):

- *apt-get update && apt-get upgrade && apt-get install vim net-tools bridge-utils nfs-common -y*

```
root@management2:/home/storedata# apt-get update && apt-get upgrade && apt-get
install vim net-tools bridge-utils nfs-common
```

The system will update itself and install all the required packages. This will take some time

```
Get:2 http://ftp.au.debian.org/debian stretch/main amd64 vim amd64 2:8.0.0197-4+deb9u1 [1,034 kB]
Fetched 6,441 kB in 0s (6,557 kB/s)
Selecting previously unselected package vim-runtime.
(Reading database ... 125348 files and directories currently installed.)
Preparing to unpack .../vim-runtime_2%3a8.0.0197-4+deb9u1_all.deb ...
Adding 'diversion of /usr/share/vim/vim80/doc/help.txt to /usr/share/vim/vim80/doc/help.txt.vim-tiny by
vim-runtime'
Adding 'diversion of /usr/share/vim/vim80/doc/tags to /usr/share/vim/vim80/doc/tags.vim-tiny by vim-runt
ime'
Unpacking vim-runtime (2:8.0.0197-4+deb9u1) ...
Selecting previously unselected package vim.
Preparing to unpack .../vim_2%3a8.0.0197-4+deb9u1_amd64.deb ...
Unpacking vim (2:8.0.0197-4+deb9u1) ...
Processing triggers for man-db (2.7.6.1-2) ...
Setting up vim-runtime (2:8.0.0197-4+deb9u1) ...
Setting up vim (2:8.0.0197-4+deb9u1) ...
update-alternatives: using /usr/bin/vim.basic to provide /usr/bin/vim (vim) in auto mode
update-alternatives: using /usr/bin/vim.basic to provide /usr/bin/vimdiff (vimdiff) in auto mode
update-alternatives: using /usr/bin/vim.basic to provide /usr/bin/rvim (rvim) in auto mode
update-alternatives: using /usr/bin/vim.basic to provide /usr/bin/rview (rview) in auto mode
update-alternatives: using /usr/bin/vim.basic to provide /usr/bin/vi (vi) in auto mode
update-alternatives: using /usr/bin/vim.basic to provide /usr/bin/view (view) in auto mode
update-alternatives: using /usr/bin/vim.basic to provide /usr/bin/ex (ex) in auto mode
root@management1:/home/storedata#
```

5.3.2 – Network Setup

1 – Enter the following into the terminal

- `brctl addbr br0`
- `brctl addif br0 ens20f1`
- `brctl show`

The following table should appear after entering `brctl show`

bridge name	bridge id	STP enabled	interfaces
br0	8000.a81e84c39a4c	no	ens20f1

This confirms that the bridge has been successfully added

2 – Open `/etc/network/interfaces` in a text editor. I used vim to edit this file:

- `vi /etc/network/interfaces`

Modify this file to reflect the screenshot below

```
# This file describes the network interfaces available on your system
# and how to activate them. For more information, see interfaces(5).

source /etc/network/interfaces.d/*

# The loopback network interface
auto lo
iface lo inet loopback

# Automatic DHCP for ens20f1 as its available for the bridge
auto ens20f1
iface ens20f1 inet dhcp

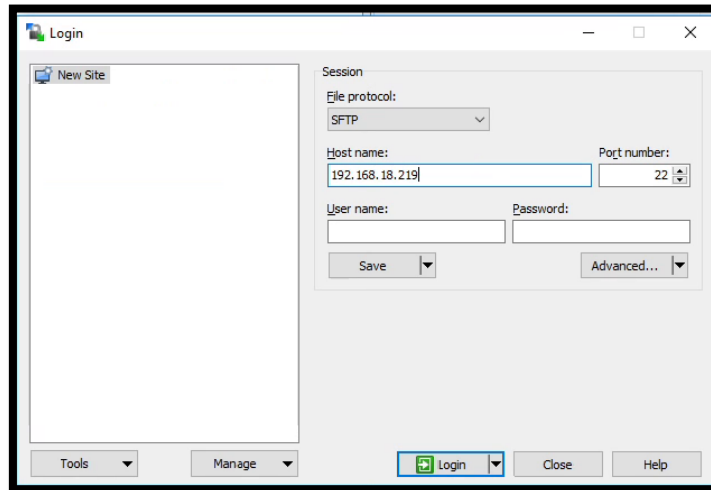
# Set up bridge for VM
auto br0
iface br0 inet dhcp
    bridge_ports ens20f1
```

3 – Reboot the system

5.3.3 – Copying the OpenQRM Installer

The OpenQRM Installation file can be copied to the first management node in many ways. I used an application called **WinSCP**. This is how I copied the OpenQRM Installation file.

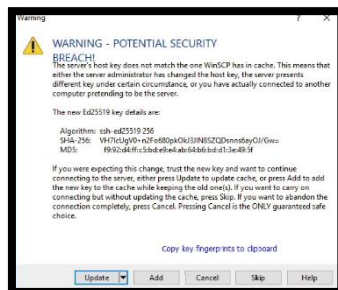
1 – Open **WinSCP** and type the IP address of first Management node. It was *192.168.18.219* in this case.



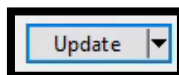
2 – Click the *Login* Button



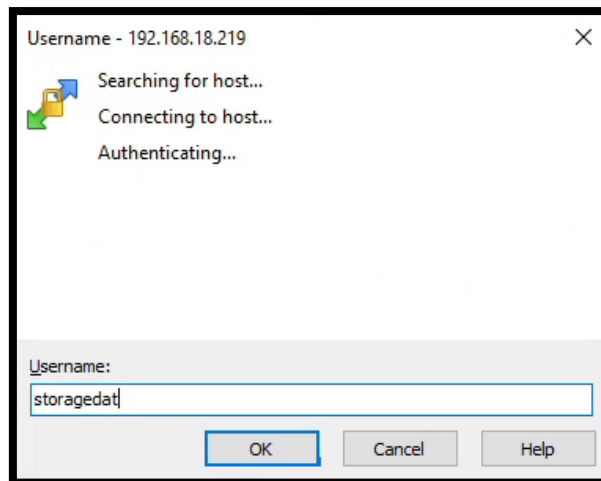
3 – This Dialog may appear.



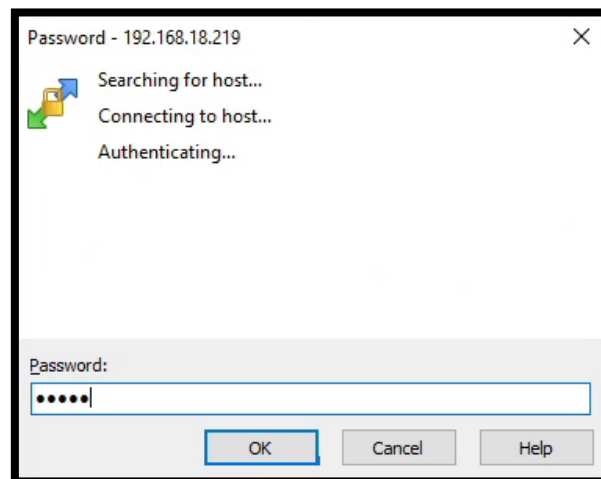
4 – If it does appear, click the *Update* button



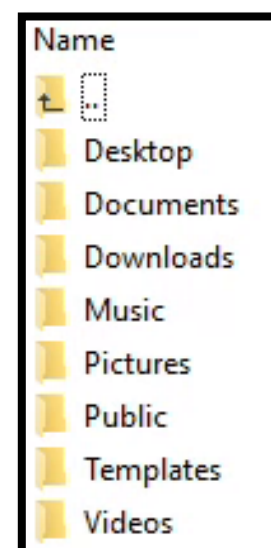
5 – Type in the username for the management node. In this case, it was *storedata*.



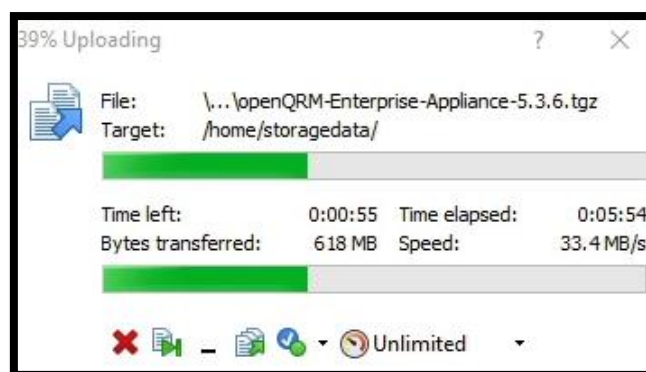
6 – Type in the password for the management node. In this case, it was *admin*



7 – WinSCP should set the default directory to show. Drag and drop the *OpenQRM-Enterprise-Appliance-X.X.X.tgz* file into the *storedata* home directory in WinSCP.



8 – Wait until the transfer is finished



5.3.4 – Running the OpenQRM Installer

Note: Even though the style of the screenshots looks can look slightly different to each other (as the installer can run through the Debian GUI or an SSH terminal), the dialog boxes and options will still perform the same way.

1 – Make sure you are in the home directory. In this case, it would be `/home/storagedata`

If you are not in this directory, then enter `cd /home/storagedata` into the console.

2 – Entering `dir` should reveal the `.tgz` file in the home directory

```
root@management1:/home/storagedata# dir
Desktop  Documents  Downloads  Music  openQRM-Enterprise-Appliance-5.3.6.tgz  Pictures  Public  Templates  Videos
```

3 – Enter the following into the terminal:

```
tar -xzf openQRM-Enterprise-Appliance-5.3.6.tgz
```

Note that the 5.3.6 in the file name can be subject to change if another version of OpenQRM is used.

```
ot@management1:/home/storagedata# tar -xzf openQRM-Enterprise-Appliance-5.3.6.tgz
ot@management1:/home/storagedata#
```

4 – Enter the following to get to the extracted directory

```
cd openQRM-Enterprise-Appliance
```

```
root@management1:/home/storagedata# cd openQRM-Enterprise-Appliance
```

5 – Start the installer application by entering the following command

```
./openQRM-Enterprise-Appliance
```

```
root@management1:/home/storagedata/openQRM-Enterprise-Appliance# ./openQRM-Enterprise-Appliance-setup
```

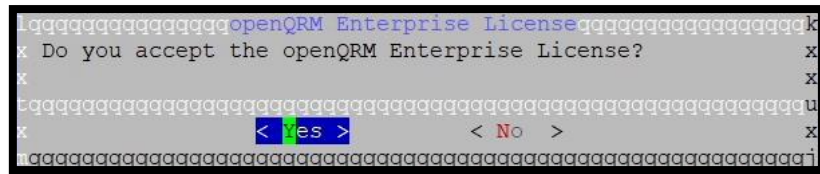
6 – The first screen of the installer will appear, Click *OK*

```
openQRM Enterprise Appliance Installer
Installs the openQRM Enterprise Appliance on KVM Virtualization Host.
[OK]
```

7 – Read the OpenQRM License and Click *Exit* to continue

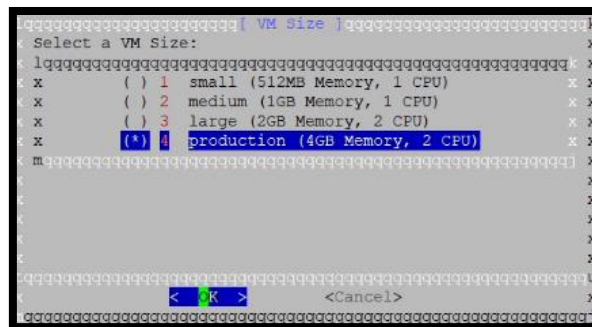
```
openQRM Enterprise Server and Client Licenses Agreement
(1) This openQRM Enterprise Server and Client License Agreement
("Agreement") is by and between openQRM Enterprise GmbH,
Berrenrather Strasse 188c, 50937 Cologne, Germany, and the Customer
as identified on the Order Form on the use of openQRM Software.
(2) openQRM Software is a client-server-based platform to manage and
automate complete Datacenter Workflows.
(3) This Agreement and its annexes shall form the entire Agreement.
Conflicting or deviating Customer conditions do not apply, even if
openQRM Enterprise GmbH grants licenses in full knowledge of Customer's
general terms and conditions.
1.
Definitions
For the purpose of this Agreement, the following terms shall have the
respective meanings below:
"client" means a physical computer system which is integrated into and
[Exit]
```

8 – Click *Yes* to accept the OpenQRM License

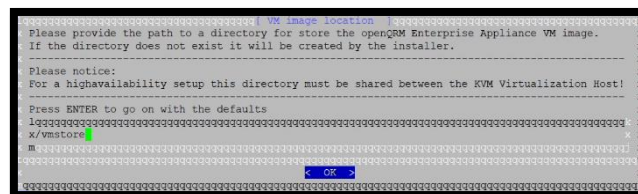


9 – Select the highest option for the VM Size (*Production*) and Click OK.

Production was chosen as most modern machines would be able to run at this level. Select the lower options if you feel that your machine will not be able to handle the OpenQRM VM.



10 – Put in the location of the NFS store that will hold the OpenQRM Image. In this case we used `/vmstore`.

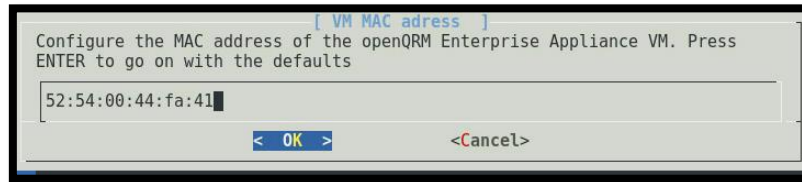


Please proceed to section 5.3.4.1 and then proceed to section 5.3.4.2.

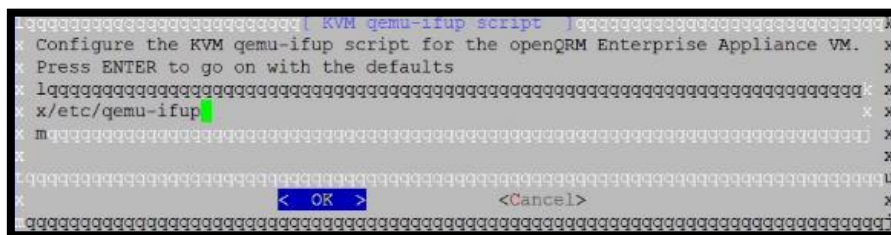
5.3.4.1 – Installation process continuation for Management 1

1 – A Default MAC Address will be generated for this dialog. Write down, save or screenshot the MAC Address entered here, as it will be required later in this guide.

Click **OK**.



2 – The defaults here will be suitable. Click **OK**.



3 – Leave Port 5901 as the default. Click **OK**.

If another port is selected, record the port for later use



4 – Leave as default here. Click **OK**.



7 – Click **Yes** here, the OpenQRM Image will begin copying to the shared store.

```
openQRM Enterprise Appliance installer
Configuration data complete.
Next step will copy and setup the openQRM Enterprise Appliance VM.
Please notice that this procedure may take a few minutes!
< Yes >
```

```
openQRM Enterprise Appliance installer
Copying openQRM Enterprise Appliance image to /vmstore ... please wait
100%
```

8 – Click Yes here to start the OpenQRM Appliance.

```
openQRM Enterprise Appliance installer
Start the openQRM Enterprise Appliance now?
< Yes > < No >
```

9 – Click OK on all the following dialogs.

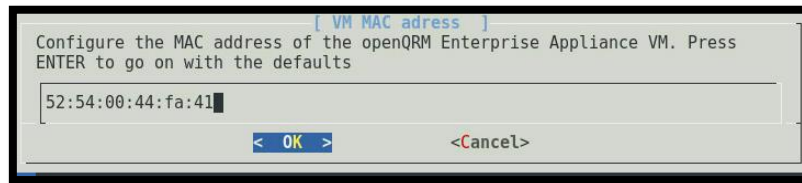
```
openQRM Enterprise Appliance installer
Successfully started the openQRM Enterprise Appliance VM. You can now
connect to its console by VNC via -> management1:1
< OK >
```

```
openQRM Enterprise Appliance installer
You can further adapt the configuration for the openQRM Enterprise Appliance
by editing /etc/openqrm-appliance.conf
< OK >
```

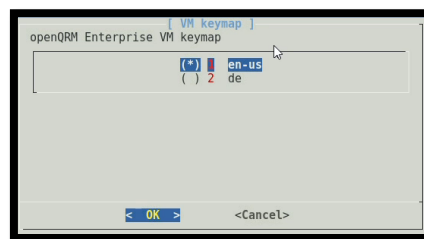
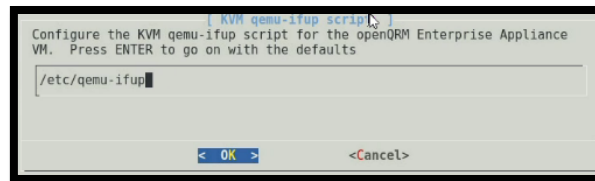
```
openQRM Enterprise Appliance installer
Please find documentation and detailed HowTos for different Use-cases at
http://openqrm-enterprise.com
< OK >
```

5.3.4.2 – Installation process for Management 2

1 – Enter the MAC Address that was saved from Step 1 in section 5.3.4.1. Click **OKs**

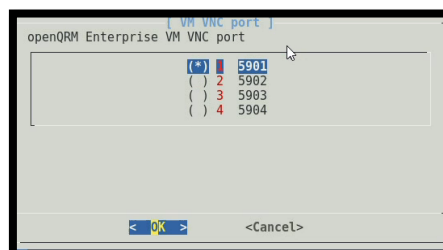


2 – Defaults are suitable. Click **OK** on all the dialogs shown below.



3 – Leave Port **5901** as the default. Click **OK**.

If another port is selected, record the port for later use.



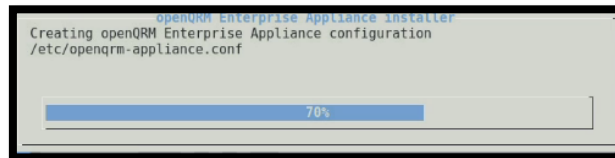
4 – Click **Yes** on this dialog



5 – Click *No* as we do not want to overwrite existing the image.



6 – The Installer will now copy any required configurations



7 – Click *No* on this dialog, as the OpenQRM Client is already running on the Management 1 Node



5.3.5 – Small Network Changes

Please open a terminal on Management 1

1 – Enter the following into the terminal

brctl addif br0 tap0

```
root@management1:/home/storagedata# brctl addif br0 tap0
root@management1:/home/storagedata#
```

2 – Enter the following to confirm that tap0 has been added as an interface

brctl show

```
Usage: brctl addif <bridge> <device>    add interface to bridge
root@management1:/home/storagedata# brctl addif br0 tap0
root@management1:/home/storagedata# brctl show
bridge name    bridge id    STP enabled    interfaces
br0            8000.a81e84c39a4c    no            ens20f1
                                     tap0
root@management1:/home/storagedata#
```


5.3.6 – Access OpenQRM VM through VNC

Please make sure the terminal is running inside the desktop environment of management 1 (i.e. do not use an SSH terminal).

1 – Install a VNC Viewer by entering the following into the Management 1 Terminal.

apt-get install tigervnc-viewer

```
root@management1:/home/storagedata/openQRM-Enterprise-Appliance# apt-get install tigervnc-viewer
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  libfltk-images1.3 libfltk1.3
Suggested packages:
  tigervnc-common
The following NEW packages will be installed:
  libfltk-images1.3 libfltk1.3 tigervnc-viewer
0 upgraded, 3 newly installed, 0 to remove and 1 not upgraded.
Need to get 776 kB of archives.
After this operation, 2,100 kB of additional disk space will be used.
Do you want to continue? [Y/n] y
0% [Working]
```

2 – Type the following into the terminal

vncviewer management:1

```
root@management1:/home/storagedata# vncviewer management1:1
```

3 – Log into the OpenQRM VM using the following credentials

Username: *openqrm*

Password: *openqrm*

```
QEMU - TigerVNC
Jbuntu 16.04.3 LTS openqrm tty1
openqrm login: IP-Config: no response after 3 secs - giving up

Jbuntu 16.04.3 LTS openqrm tty1
openqrm login: openqrm
Password:
Last login: Fri Sep  8 00:37:34 DEST 2017 from 192.168.99.222 on pts/0
Welcome to Ubuntu 16.04.3 LTS (GNU/Linux 4.4.0-93-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/advantage
openqrm@openqrm:~$
```

5.3.7 – OpenQRM Internal Network Configuration (OpenQRM VM)

1 – Type the following to edit the Network Configuration file

```
sudo vi /etc/network/interfaces
```

You may be prompted for a password. Use the follow credentials:

Password: *openqrm*

Change the network file to mimic the screenshot below

```
# This file describes the network interfaces available on your
# and how to activate them. For more information, see interface

source /etc/network/interfaces.d/*

# The loopback network interface
auto lo
iface lo inet loopback

auto ens3
iface ens3 inet dhcp
```

2 – Reboot the OpenQRM machine by entering the following:

```
sudo reboot
```

3 – Once rebooted, enter the following to obtain the IP of the OpenQRM VM on the network

```
ifconfig
```

As seen in this screenshot, the IP is **192.168.18.118**. The IP shown in your configuration may differ.

Please record this IP somewhere for later use.

```
ens3      Link encap:Ethernet  HWaddr 52:54:00:44:fa:41
          inet addr:192.168.18.118  Bcast:192.168.18.255  Mask:255.255.255.0
          inet6 addr: fe80::5054:ff:fe44:fa41/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:91257 errors:0 dropped:0 overruns:0 frame:0
          TX packets:1003 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:5859757 (5.8 MB)  TX bytes:100924 (100.9 KB)
```

5.3.8 – Update OpenQRM (OpenQRM VM)

1 – Enter the following into the VNC Viewer terminal in order to update the OpenQRM VM

sudo apt-get update && sudo apt-get upgrade

You may be prompted for a password. Use the following credentials:

Password: *openqrm*

```
openqrm@openqrm:~$ sudo apt-get update && sudo apt-get upgrade
[sudo] password for openqrm: █
```

2 – Wait for this process to finish, it may take a while.

```
Get:83 http://de.archive.ubuntu.com/ubuntu xenial-updates/main amd64 libxml2 amd64 2.9.3+dfsg1-1ubuntu0.6 [697 kB]
Get:84 http://de.archive.ubuntu.com/ubuntu xenial-updates/main amd64 apache2 amd64 2.4.18-2ubuntu3.9 [86.6 kB]
Get:85 http://de.archive.ubuntu.com/ubuntu xenial-updates/main amd64 apache2-bin amd64 2.4.18-2ubuntu3.9 [925 kB]
Get:86 http://de.archive.ubuntu.com/ubuntu xenial-updates/main amd64 apache2-util amd64 2.4.18-2ubuntu3.9 [81.8 kB]
Get:87 http://de.archive.ubuntu.com/ubuntu xenial-updates/main amd64 apache2-data all 2.4.18-2ubuntu3.9 [162 kB]
Get:88 http://de.archive.ubuntu.com/ubuntu xenial-updates/main amd64 grub-pc amd64 2.02-beta2-36ubuntu3.18 [197 kB]
Get:89 http://de.archive.ubuntu.com/ubuntu xenial-updates/main amd64 grub-pc-bin amd64 2.02-beta2-36ubuntu3.18 [889 kB]
Get:90 http://de.archive.ubuntu.com/ubuntu xenial-updates/main amd64 grub-common amd64 2.02-beta2-36ubuntu3.18 [511 kB]
Get:91 http://de.archive.ubuntu.com/ubuntu xenial-updates/main amd64 grub-common amd64 2.02-beta2-36ubuntu3.18 [1,706 kB]
Get:92 http://de.archive.ubuntu.com/ubuntu xenial-updates/main amd64 libjpeg-turbo8 amd64 1.4.2-0ubuntu3.1 [111 kB]
Get:93 http://de.archive.ubuntu.com/ubuntu xenial-updates/main amd64 python2.7-dev amd64 2.7.12-1ubuntu0-16.04.3 [276 kB]
Get:94 http://de.archive.ubuntu.com/ubuntu xenial-updates/main amd64 libpython2.7-dev amd64 2.7.12-1ubuntu0-16.04.3 [27.8 kB]
Get:95 http://de.archive.ubuntu.com/ubuntu xenial-updates/main amd64 libpython2.7 amd64 2.7.12-1ubuntu0-16.04.3 [1,070 kB]
Get:96 http://de.archive.ubuntu.com/ubuntu xenial-updates/main amd64 python2.7 amd64 2.7.12-1ubuntu0-16.04.3 [224 kB]
Get:97 http://de.archive.ubuntu.com/ubuntu xenial-updates/main amd64 libpython2.7-stdlib amd64 2.7.12-1ubuntu0-16.04.3 [1,880 kB]
Get:98 http://de.archive.ubuntu.com/ubuntu xenial-updates/main amd64 python2.7-minimal amd64 2.7.12-1ubuntu0-16.04.3 [1,261 kB]
Get:99 http://de.archive.ubuntu.com/ubuntu xenial-updates/main amd64 libpython2.7-minimal amd64 2.7.12-1ubuntu0-16.04.3 [340 kB]
Get:100 http://de.archive.ubuntu.com/ubuntu xenial-updates/main amd64 python-all-dev amd64 2.7.12-1-16.04 [1,016 B]
Get:101 http://de.archive.ubuntu.com/ubuntu xenial-updates/main amd64 python-dev amd64 2.7.12-1-16.04 [1,186 B]
Get:102 http://de.archive.ubuntu.com/ubuntu xenial-updates/main amd64 python-all amd64 2.7.12-1-16.04 [996 B]
Get:103 http://de.archive.ubuntu.com/ubuntu xenial-updates/main amd64 python-minimal amd64 2.7.12-1-16.04 [28.1 kB]
Get:104 http://de.archive.ubuntu.com/ubuntu xenial-updates/main amd64 python amd64 2.7.12-1-16.04 [137 kB]
Get:105 http://de.archive.ubuntu.com/ubuntu xenial-updates/main amd64 libpython-all-dev amd64 2.7.12-1-16.04 [1,006 B]
Get:106 http://de.archive.ubuntu.com/ubuntu xenial-updates/main amd64 libpython-dev amd64 2.7.12-1-16.04 [7,840 B]
Get:107 http://de.archive.ubuntu.com/ubuntu xenial-updates/main amd64 libpython-stdlib amd64 2.7.12-1-16.04 [7,768 B]
Get:108 http://de.archive.ubuntu.com/ubuntu xenial-updates/main amd64 python-crypto amd64 2.6.1-6ubuntu0.16.04.3 [246 kB]
Get:109 http://de.archive.ubuntu.com/ubuntu xenial-updates/main amd64 python-samba amd64 2:4.3.11+dfsg-0ubuntu0.16.04.16 [1,961 kB]
Get:110 http://de.archive.ubuntu.com/ubuntu xenial-updates/main amd64 libarchive13 amd64 3.1.2-1ubuntu0.16.04.4 [262 kB]
Get:111 http://de.archive.ubuntu.com/ubuntu xenial-updates/main amd64 samba-common-bin amd64 2:4.3.11+dfsg-0ubuntu0.16.04.16 [506 kB]
Get:112 http://de.archive.ubuntu.com/ubuntu xenial-updates/main amd64 smbclient amd64 2:4.3.11+dfsg-0ubuntu0.16.04.16 [311 kB]
Get:113 http://de.archive.ubuntu.com/ubuntu xenial-updates/main amd64 samba-libs amd64 2:4.3.11+dfsg-0ubuntu0.16.04.16 [5,161 kB]
Get:114 http://de.archive.ubuntu.com/ubuntu xenial-updates/main amd64 libwbclient0 amd64 2:4.3.11+dfsg-0ubuntu0.16.04.16 [30.2 kB]
Get:115 http://de.archive.ubuntu.com/ubuntu xenial-updates/main amd64 libwbclient amd64 2:4.3.11+dfsg-0ubuntu0.16.04.16 [53.5 kB]
Get:116 http://de.archive.ubuntu.com/ubuntu xenial-updates/main amd64 samba-common all 2:4.3.11+dfsg-0ubuntu0.16.04.16 [83.7 kB]
Get:117 http://de.archive.ubuntu.com/ubuntu xenial-updates/main amd64 libavahi-common-data amd64 0.6.32-rc+dfsg-1ubuntu2.2 [21.3 kB]
Get:118 http://de.archive.ubuntu.com/ubuntu xenial-updates/main amd64 libavahi-common3 amd64 0.6.32-rc+dfsg-1ubuntu2.2 [21.6 kB]
Get:119 http://de.archive.ubuntu.com/ubuntu xenial-updates/main amd64 libavahi-client3 amd64 0.6.32-rc+dfsg-1ubuntu2.2 [25.2 kB]
Get:120 http://de.archive.ubuntu.com/ubuntu xenial-updates/main amd64 libcups2 amd64 2.1.3-1ubuntu0.5 [197 kB]
Get:121 http://de.archive.ubuntu.com/ubuntu xenial-updates/main amd64 libapparmor-perl amd64 2.10.95-0ubuntu2.9 [31.5 kB]
Get:122 http://de.archive.ubuntu.com/ubuntu xenial-updates/main amd64 apparmor amd64 2.10.95-0ubuntu2.9 [450 kB]
Get:123 http://de.archive.ubuntu.com/ubuntu xenial-updates/main amd64 libnss3 amd64 2.0.11-1ubuntu1 [21.0 kB]
Get:124 http://de.archive.ubuntu.com/ubuntu xenial-updates/main amd64 mysql-client-core-5.7 amd64 5.7.23-0ubuntu0.16.04.1 [6,675 kB]
Get:125 http://de.archive.ubuntu.com/ubuntu xenial-updates/main amd64 mysql-common all 5.7.23-0ubuntu0.16.04.1 [15.4 kB]
Get:126 http://de.archive.ubuntu.com/ubuntu xenial-updates/main amd64 mysql-client-5.7 amd64 5.7.23-0ubuntu0.16.04.1 [1,662 kB]
Get:127 http://de.archive.ubuntu.com/ubuntu xenial-updates/main amd64 mysql-server-5.7 amd64 5.7.23-0ubuntu0.16.04.1 [2,597 kB]
debconf: unable to initialize frontend: Dialog
debconf: falling back to frontend: Readline
debconf: unable to initialize frontend: Readline
debconf: falling back to frontend: Teletype
debconf: unable to initialize frontend: Teletype
debconf: falling back to frontend: Noninteractive
```

5.3.9 – Transferring OpenQRM Installation to OpenQRM VM

Please follow a similar process as seen in Section 5.3.3 for WinSCP.

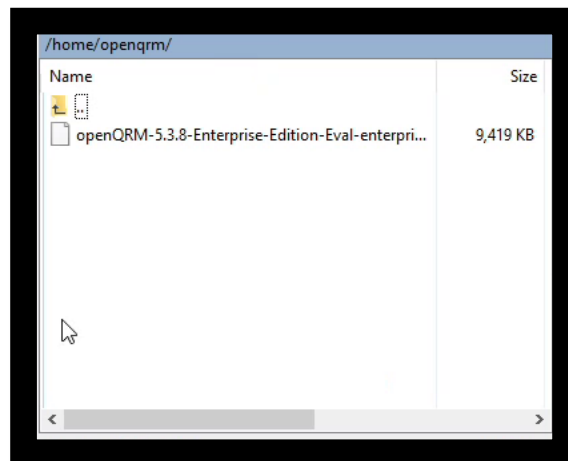
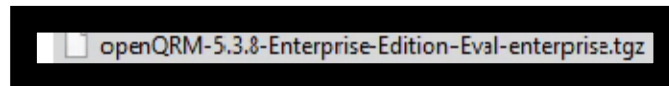
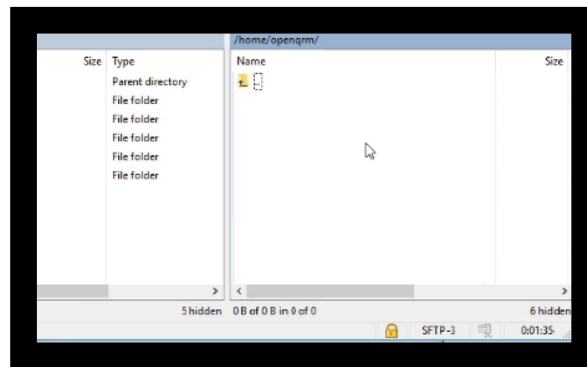
1 – From a machine connected on the same network, access the OpenQRM VM using the IP obtained from step 3 in Section 5.3.7 using WinSCP (or similar application).

Use the following credentials

Username: *openqrm*

Password: *openqrm*

2 – Transfer the OpenQRM installation file into the OpenQRM VM's Home directory



5.3.10 – OpenQRM Installer Extraction and Installation (OpenQRM VM)

1 – Ensure that the current directory is the home directory. Entering the *dir* command should show the archive file that was transferred in Section 5.3.9.

```
openqrm@openqrm:~$ dir
openQRM-5.3.8-Enterprise-Edition-Eval-enterprise.tgz
```

2 – Extract this archive by entering the following into the terminal:

```
tar -xvzf openQRM-5.3.8-Enterprise-Edition-Eval-enterprise.tgz
```

Note that the .tgz file may have a slightly different name that will have to be accommodated for in the extract command.

```
openqrm@openqrm:~$ dir
openQRM-5.3.8-Enterprise-Edition-Eval-enterprise.tgz
openqrm@openqrm:~$ tar -xvzf openQRM-5.3.8-Enterprise-Edition-Eval-enterprise.tgz
```

3 – Use the *cd* command to proceed into the extracted directory. Enter the following into the terminal:

```
sudo ./install-openqrm.sh
```

You may be prompted for a password. Use the following credentials:

Username: openqrm
Password: openqrm

```
openqrm@openqrm:~$ cd openQRM-5.3.8-Enterprise-Edition-Eval-enterprise
openqrm@openqrm:~/openQRM-5.3.8-Enterprise-Edition-Eval-enterprise$ dir
install-openqrm.sh licensekeys openQRM-changelog.txt openQRM-Enterprise-License.txt openQRM
openqrm@openqrm:~/openQRM-5.3.8-Enterprise-Edition-Eval-enterprise$ sudo ./install-openqrm.sh
```

4 – Press **ENTER** to review the openQRM License. Enter **y** when the end of the license is reached to accept the license.



5 – Wait for the rest of the installation to complete

```
openqrm-plugin-highavailability requires:
openqrm-plugin-hybrid-cloud requires:
openqrm-plugin-hyperv requires:
openqrm-plugin-idoit requires:
openqrm-plugin-image-shelf requires:
openqrm-plugin-ip-mgmt requires:
openqrm-plugin-iscsi requires:
openqrm-plugin-iscsi-storage requires:
openqrm-plugin-kvm requires:
openqrm-plugin-lcm requires:
openqrm-plugin-lisp requires:
openqrm-plugin-linuxcoe requires:
openqrm-plugin-local-server requires:
openqrm-plugin-loom requires:
openqrm-plugin-lvm-storage requires:
openqrm-plugin-lxc requires:
openqrm-plugin-magento requires:
openqrm-plugin-mantis requires:
openqrm-plugin-marketplace requires:
openqrm-plugin-majors requires:
openqrm-plugin-netbond requires:
openqrm-plugin-network-manager requires:
openqrm-plugin-nfs-storage requires:
openqrm-plugin-novnc requires:
openqrm-plugin-openvswitch-manager requires:
openqrm-plugin-opsi requires:
openqrm-plugin-puppet requires:
openqrm-plugin-role-administration requires:
openqrm-plugin-sambot-storage requires:
openqrm-plugin-ssherm requires:
openqrm-plugin-support requires:
openqrm-plugin-template requires:
openqrm-plugin-tftpd requires:
openqrm-plugin-tftp-storage requires:
openqrm-plugin-vmware-esx requires:
openqrm-plugin-vmware-vsphere requires:
openqrm-plugin-wakeuponlan requires:
openqrm-plugin-xen requires:
openqrm-plugin-zabbix requires:
Checking for required components to compile openQRM finished successfully
if [ -d ./thirdparty ]; then mkdir -p ../buildtmp; cp -aR ./thirdparty/* ../buildtmp; fi
--2018-09-29 02:04:00-- http://openqrm-support.de/openqrm-build/5.3/plugins/mantis/mantisbt-1.2.19.zip
Resolving openqrm-support.de (openqrm-support.de)... 217.160.0.196, 2001:8d8:1000:1058:441c:a19:513d:7815
Connecting to openqrm-support.de (openqrm-support.de)|217.160.0.196|:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 3430253 (3.3M) [application/zip]
Saving to: 'mantisbt-1.2.19.zip'
```

```
Connecting to openqrm-support.de (openqrm-support.de)|217.160.0.196|:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 844523 (825K) [application/gzip]
Saving to: 'linuxcoe-sd-4.3.tar.gz'

linuxcoe-sd-4.3.tar.gz      100%[=====>] 824.73K  370KB/s  in 2.2s

2018-09-29 02:07:11 (370 KB/s) - 'linuxcoe-sd-4.3.tar.gz' saved [844523/844523]

--2018-09-29 02:07:11-- http://openqrm-support.de/openqrm-build/5.3/plugins/linuxcoe/linuxcoe-sd-data-centos-4.3.tar.gz
Resolving openqrm-support.de (openqrm-support.de)... 217.160.0.196, 2001:8d8:1000:1058:441c:a19:513d:7815
Connecting to openqrm-support.de (openqrm-support.de)|217.160.0.196|:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 102452 (100K) [application/gzip]
Saving to: 'linuxcoe-sd-data-centos-4.3.tar.gz'

linuxcoe-sd-data-centos-4.3.tar.gz  100%[=====>] 100.05K  90.9KB/s  in 1.1s

2018-09-29 02:07:13 (90.9 KB/s) - 'linuxcoe-sd-data-centos-4.3.tar.gz' saved [102452/102452]

--2018-09-29 02:07:13-- http://openqrm-support.de/openqrm-build/5.3/plugins/linuxcoe/linuxcoe-sd-data-debian-4.3.tar.gz
Resolving openqrm-support.de (openqrm-support.de)... 217.160.0.196, 2001:8d8:1000:1058:441c:a19:513d:7815
Connecting to openqrm-support.de (openqrm-support.de)|217.160.0.196|:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 92980 (91K) [application/gzip]
Saving to: 'linuxcoe-sd-data-debian-4.3.tar.gz'

linuxcoe-sd-data-debian-4.3.tar.gz  100%[=====>] 90.80K  85.9KB/s  in 1.1s

2018-09-29 02:07:14 (85.9 KB/s) - 'linuxcoe-sd-data-debian-4.3.tar.gz' saved [92980/92980]

--2018-09-29 02:07:15-- http://openqrm-support.de/openqrm-build/5.3/plugins/linuxcoe/linuxcoe-sd-data-ubuntu-4.3.tar.gz
Resolving openqrm-support.de (openqrm-support.de)... 217.160.0.196, 2001:8d8:1000:1058:441c:a19:513d:7815
Connecting to openqrm-support.de (openqrm-support.de)|217.160.0.196|:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 333782 (326K) [application/gzip]
Saving to: 'linuxcoe-sd-data-ubuntu-4.3.tar.gz'

linuxcoe-sd-data-ubuntu-4.3.tar.gz  100%[=====>] 325.96K  188KB/s  in 1.7s

2018-09-29 02:07:17 (188 KB/s) - 'linuxcoe-sd-data-ubuntu-4.3.tar.gz' saved [333782/333782]

--2018-09-29 02:07:17-- http://openqrm-support.de/openqrm-build/5.3/plugins/linuxcoe/update/Ubuntu-Trusty-x86_64-iso.tar
Resolving openqrm-support.de (openqrm-support.de)... 217.160.0.196, 2001:8d8:1000:1058:441c:a19:513d:7815
Connecting to openqrm-support.de (openqrm-support.de)|217.160.0.196|:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 3053560 (2.9M) [application/x-tar]
Saving to: 'Ubuntu-Trusty-x86_64-iso.tar'

Ubuntu-Trusty-x86_64-iso.tar      74%[=====>] 1 2.04M  695KB/s  eta 40s [
```

6 – Installation is now complete and the OpenQRM server is running.

```
xpenqrm-plugin-loom requires:
xpenqrm-plugin-lvm-storage requires: , aetools, open-iscsi
xpenqrm-plugin-lxc requires:
xpenqrm-plugin-magento requires:
xpenqrm-plugin-mantis requires:
xpenqrm-plugin-marketplace requires: , screen, php-gd
xpenqrm-plugin-nagios3 requires: nagios3, nagios3-common, nagios-images, nagios-plugins, nmap, screen, postfix, libxml-simple-perl,
xpenqrm-plugin-netbond requires:
xpenqrm-plugin-network-manager requires: , screen
xpenqrm-plugin-nfs-storage requires:
xpenqrm-plugin-novnc requires: openssl, screen, python-openssl,
xpenqrm-plugin-openswitch-manager requires: , screen
xpenqrm-plugin-opsi requires: , screen
xpenqrm-plugin-puppet requires: , screen, puppet, puppetmaster, subversion
xpenqrm-plugin-role-administration requires:
xpenqrm-plugin-sambot-storage requires:
xpenqrm-plugin-sshterm requires: openssl, screen, python-openssl,
xpenqrm-plugin-support requires: , screen
xpenqrm-plugin-template requires: , screen
xpenqrm-plugin-tftpd requires: tftpd-hpa,
xpenqrm-plugin-tmpfs-storage requires:
xpenqrm-plugin-vmware-esx requires: , screen, nmap
xpenqrm-plugin-vmware-vsphere requires: , screen, nmap, python-requests
xpenqrm-plugin-wakeuponlan requires: , wakeonlan
xpenqrm-plugin-windows requires:
xpenqrm-plugin-xen requires:
xpenqrm-plugin-zabbix requires:
Checking for required components finished successfully
First startup detected. Running initialization.
Creating custom apache config.../etc/apache2/conf-enabled/openqrm-httpd.conf
[ ok ] king /usr/share/openqrm/etc/openqrm-server.conf for OPENQRM_WEB_PROTOCOL=https...[.....] Reloading apache2 configuration (via systemctl): apache2.service.
Adding password for user openqrm
  Initializing dropbear...
Generating key, this may take a while...
Public key portion is:
ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAQCAQCXK2s22T0xtFDMx30yG2ebATUJtKNfmW7wN9Vqml3WMPVpsDp2i8+VYIBltzarTl7leB9hgk2BYj9Nf22K4l6LAo3U0YbPe9ealNyzfxn5p45LD029N17L67FUB2WSzCa8BY49xhHmCM1AzUY5B
ZX root@openqrm
Fingerprint: ad5 e423:5eef8:6eef8d7415:b7a9:53:6c1c1fa:60:d7
  Adding public key to /root/.ssh/authorized_keys...

Starting the openQRM-server ver. 5.3.

Initialization complete. Please configure your openQRM Server at: http://[server-ip-address]/openqrm/
-> User: openqrm -> Password: openqrm

/home/openqrm/openqrm-5.3.8-Enterprise-Edition-Eval-enterprise
openqrm@openqrm:~/openqrm-5.3.8-Enterprise-Edition-Eval-enterprise$
openqrm@openqrm:~/openqrm-5.3.8-Enterprise-Edition-Eval-enterprise$
```


5.3.11 – OpenQRM Web Access

1 – On a machine running on the same network, open a web browser and enter the following into the URL bar:

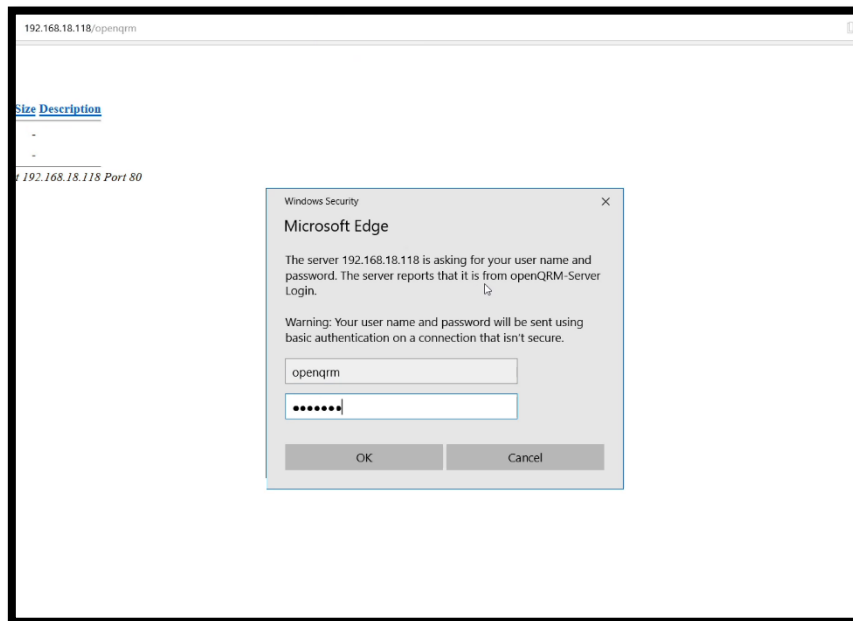
http://<IP of OpenQRM Server>/openqrm

Replace <IP of OpenQRM Server> with the IP recorded in step 3 within Section 5.3.7.

2 – There will be a dialog prompt for credentials. Use the follow credentials:

Username: *openqrm*

Password: *openqrm*



5.3.12 – OpenQRM Initial Configuration and Licensing

1 – There should only be one option for the network card. Click the *SUBMIT* button.

The screenshot shows the OpenQRM Setup interface. On the left is a sidebar with the 'Setup' menu. The main area is titled 'Please select a network card'. It features a radio button next to 'ens3', which is selected. Below this is a 'SUBMIT' button. To the right, a text block explains: 'The selected network card will be used to setup openQRM Server and create the openQRM Management Network. All available and configured network interfaces on this system are listed on the left.' The top right corner shows 'STEP 1'. The bottom status bar indicates 'Memory: 504648 bytes' and 'openQRM Enterprise Edition | © 2012 - 2016 openQRM Enterprise GmbH'.

2 – Leave the option as *mysql*. Click the *SUBMIT* button

The screenshot shows the OpenQRM Setup interface at Step 2. The sidebar shows 'Setup'. The main area is titled 'Please select a database type'. It has two radio buttons: 'mysql' (selected) and 'postgres'. Below these are 'SUBMIT' and 'CANCEL' buttons. A text block on the right states: 'Select the database type to use for storing the openQRM data.' The top right corner shows 'STEP 2' and 'STEP 1'. The bottom status bar indicates 'Memory: 444480 bytes' and 'openQRM Enterprise Edition | © 2012 - 2016 openQRM Enterprise GmbH'.

3 – Enter a user name and password of your choice. We used the following credentials:

User: *root*

Password: *openqrm*

Click the *SUBMIT* button.

Setup

Configure the database connection and initialize openQRM

Server * localhost

Database * openqrm

User * root

Password *****

Restore last backup ☐

SUBMIT CANCEL

Memory: 45200 bytes
Time: 9.0031700136277344 sec

openQRM Enterprise Edition | © 2012 - 2016 openQRM Enterprise GmbH

4 – This screen will now appear

openQRM ENTERPRISE

INFO DOCUMENTATION SUPPORT ACCOUNT LANGUAGE en

Dashboard

Server

Components

Events

Activities

Events

Commands

Plugins

Plugin manager

Upload License File(s)

Public Key Browse...

Server License Browse...

Client Licenses (optional) Browse...

SUBMIT

Memory: 1072976 bytes
Time: 4.000777043029148 sec

openQRM Enterprise Edition | © 2012 - 2016 openQRM Enterprise GmbH

5 – Click the *Browse* button for *Public Key*

Public Key Browse...

6 – Select the public key file, like what is shown below

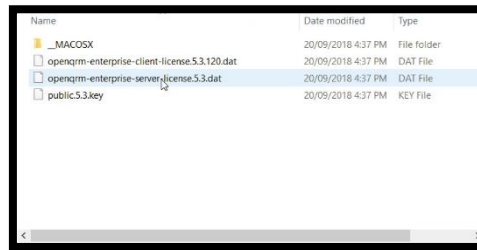
Name	Date modified	Type
._MACOSX	20/09/2018 4:37 PM	File folder
openqrm-enterprise-client-license.5.3.120.dat	20/09/2018 4:37 PM	DAT File
openqrm-enterprise-server-license.5.3.dat	20/09/2018 4:37 PM	DAT File
public5.3.key	20/09/2018 4:37 PM	KEY File

7 – Click the *Browse* button for *Server License*



A screenshot of a web form with a label "Server License" and a text input field. To the right of the input field is a blue "Browse" button with a mouse cursor hovering over it.

8 – Select the server license file, like what is shown below.

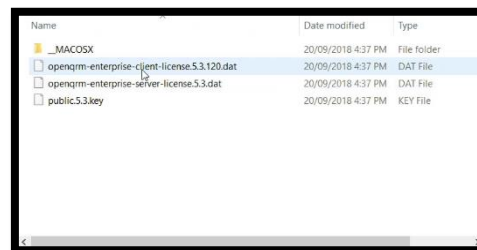


9 – Click the *Browse* button for Client Licenses



A screenshot of a web form with a label "Client Licenses (optional)" and a text input field. To the right of the input field is a blue "Browse" button with a mouse cursor hovering over it.

10 – Select the client license file, like what is shown below.

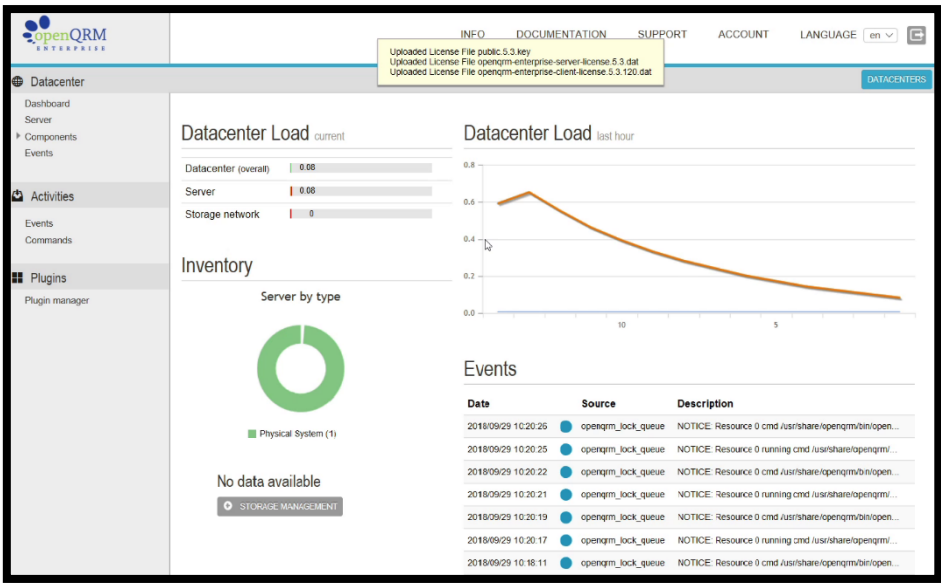


11 – Click the *SUBMIT* Button



A screenshot of the "Welcome to your newly installed openQRM Enterprise Edition" screen. It instructs the user to activate the software by uploading license key files. There are three upload fields: "Public Key", "Server License", and "Client Licenses (optional)". Each field has a text input showing the path "C:\Users\Greg\Desktop\HyperScale" and a "Browse..." button. At the bottom left is a "SUBMIT" button with a mouse cursor hovering over it.

12 – The OpenQRM initial set up process is complete. The dashboard will now appear



5.3.13 – Extra Licensing in OpenQRM

Multiple Licenses files can be added consecutively to OpenQRM. This is how more licenses can be added after the initial OpenQRM configuration process.

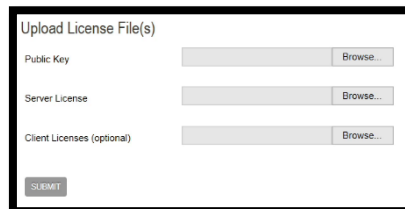
1 – Near the top of Web UI, Click the *INFO* button.



2 – A Dialog will appear. Click the *UPLOAD LICENSE FILES* button



3 – A screen will now appear that appears similar to the one seen section 4.3.12



5.4 – OpenQRM HA Installation (Management Nodes)

This process is performed on both Management Nodes. Please perform this installation process on Management 1 first.

5.4.1 – Installing required packages

1 – Enter the following into the terminal to obtain the correct packages required for installation

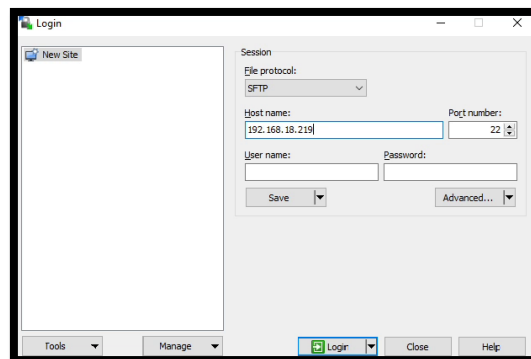
```
root@management1:/home/storagedata/openQRM-Enterprise-Appliance# apt-get install pacemaker corosync
```

2 – Wait for the package installation to finish

```
Setting up snmp (5.7.3+dfsg-1.7) ...  
Setting up cluster-glue (1.8.12-5) ...  
addgroup: The group 'haclient' already exists as a system group. Exiting.  
The system user 'haclient' already exists. Exiting.  
Created symlink /etc/systemd/system/multi-user.target.wants/sgd.service → /lib/systemd/system/sgd.service.  
Setting up libstone2:amd64 (2.4.2-3+deb9u1) ...  
Setting up libstone2:amd64 (1.1.16-1) ...  
Setting up libcrmservice3:amd64 (1.1.16-1) ...  
Setting up libtransition2:amd64 (1.1.16-1) ...  
Setting up libpe-status10:amd64 (1.1.16-1) ...  
Setting up libpe-rules2:amd64 (1.1.16-1) ...  
Setting up fence-agents (4.8.25-1) ...  
Setting up liblrm1:amd64 (1.1.16-1) ...  
Setting up resource-agents (1:4.0.0-rc1-4) ...  
Setting up libcib4:amd64 (1.1.16-1) ...  
Setting up libcrcluster4:amd64 (1.1.16-1) ...  
Setting up corosync (2.4.2-3+deb9u1) ...  
Created symlink /etc/systemd/system/multi-user.target.wants/corosync.service → /lib/systemd/system/corosync.service.  
Setting up pacemaker-resource-agents (1.1.16-1) ...  
Setting up libpengine10:amd64 (1.1.16-1) ...  
Setting up pacemaker (1.1.16-1) ...  
Created symlink /etc/systemd/system/multi-user.target.wants/pacemaker.service → /lib/systemd/system/pacemaker.service.  
Setting up pacemaker-cli-utils (1.1.16-1) ...  
Processing triggers for libc-bin (2.24-11+deb9u3) ...  
Processing triggers for systemd (232-25+deb9u4) ...
```

5.4.2 – High Availability Cluster Setup

The High Availability Cluster Installer should already be present in the Management Node's home directory when it was copied using WinSCP in section 5.3.3.



1 – Ensure that the current directory is the openQRM Install directory using the `cd` command.

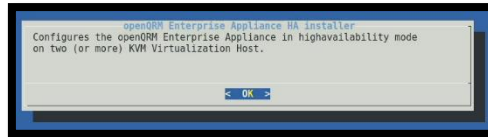
```
root@management1:/home/storagedata/openQRM-Enterprise-Appliance# dir  
.  
..  
init  
openQRM-Enterprise-Appliance-HA-cluster-admin  
openQRM-Enterprise-Appliance-HA-cluster-setup  
openQRM-Enterprise-Appliance.img  
openQRM-Enterprise-Appliance-setup  
openQRM-Enterprise-License.txt  
README
```

2 – Enter the following command to begin the Appliance High Availability Setup:

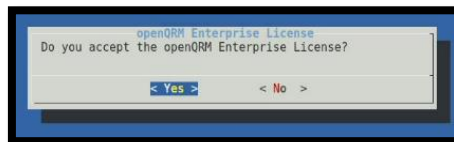
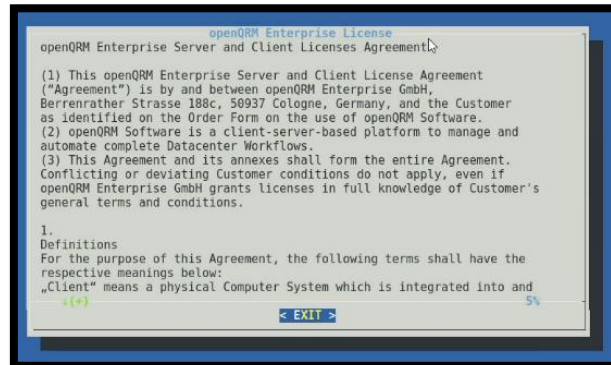
sudo ./openQRM-Enterprise-Appliance-HA-cluster-setup

```
root@management1:/home/storagedata/openQRM-Enterprise-Appliance# ./openQRM-Enterprise-Appliance-HA-cluster-setup
```

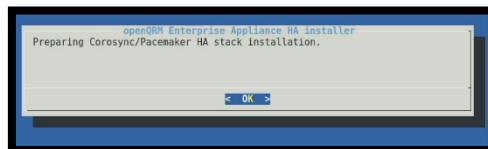
3 – Select OK here



4 – Follow the installers steps to accept the license.



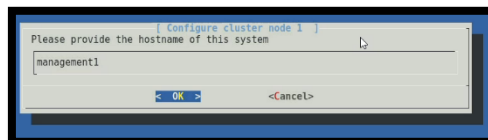
5 – Select OK here



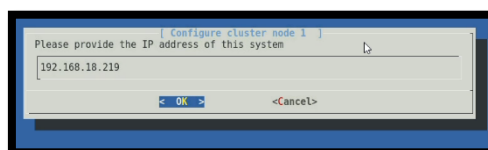
6 – Enter the hostname of the relevant system that the installer is running on.

For Management 1, use: *management1*

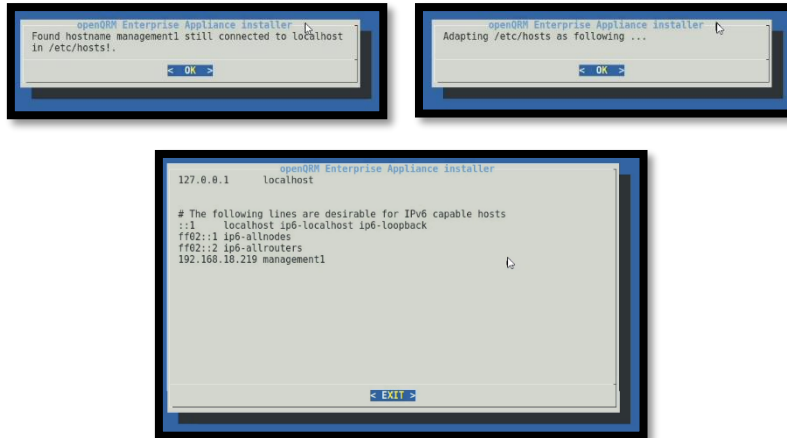
For Management 2, use: *management2*



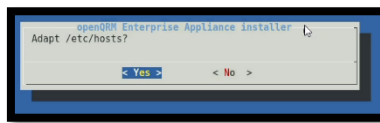
7 – Enter the IP of the relevant system that the installer is running on. This can be found by running *ifconfig* in a separate terminal.



8 – Select OK or EXIT on the following screens to continue past them



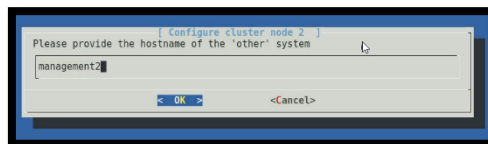
9 – Select Yes here



10 – Enter the relevant name of the other system. This can differ depending which management node this is running on.

For Management 1, use: *management2*

For Management 2, use: *management1*

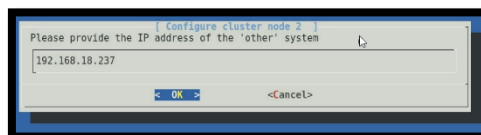


11 – Enter the IP of the relevant '**other**' system that the installer is running on. This means:

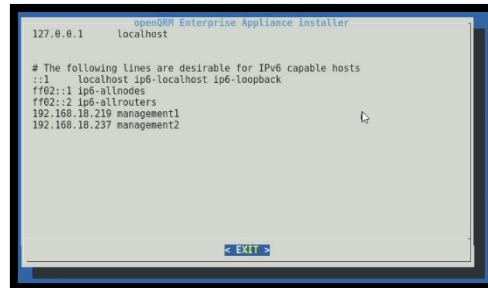
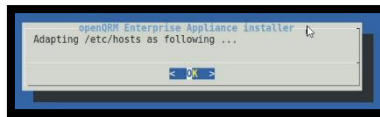
For Management 1, use the IP of Management 2

For Management 2, use the IP of Management 1

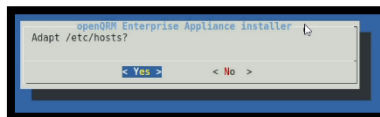
This can be found by running *ifconfig* in a separate terminal.



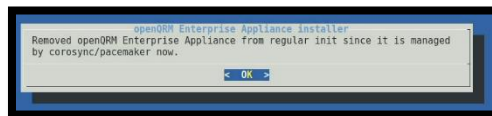
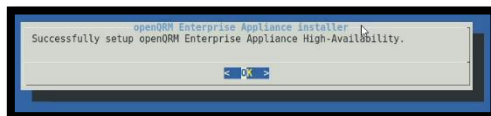
12 – Select *OK* or *EXIT* buttons to continue through the shown dialogs



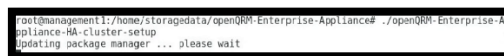
13 – Select *Yes* here



14 – Select *OK* on the following dialogs



15 – High Availability Cluster Installation is now complete



5.4.3 – SSH Configuration for Management Node

This is required for the Linux Cluster Manager to read system information from both Management Nodes.

Please perform this section on both Management nodes

1 – Enter the following to edit the SSH config file:

```
sudo vi /etc/ssh/sshd_config
```

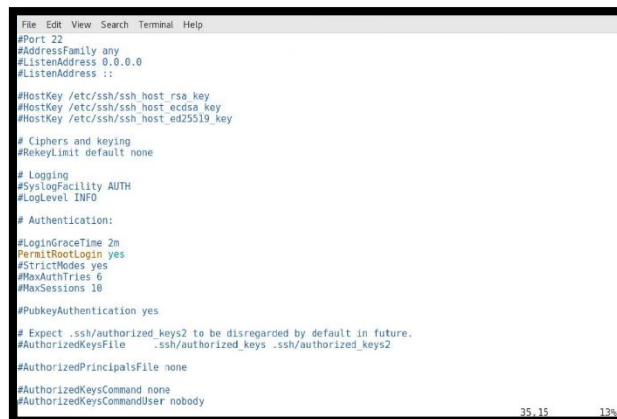
```
root@management1:/home/storagedata/openORM-Enterprise-Appliance# vi /etc/ssh/sshd_config
```

2 – Find the line with the parameter *PermitRootLogin*. Change the whole line to:

```
PermitRootLogin yes
```

This should reflect the screenshot below.

Save and Exit.



```
File Edit View Search Terminal Help
#Port 22
#AddressFamily any
#ListenAddress 0.0.0.0
#ListenAddress ::

#HostKey /etc/ssh/ssh_host_rsa_key
#HostKey /etc/ssh/ssh_host_ecdsa_key
#HostKey /etc/ssh/ssh_host_ed25519_key

# Ciphers and keying
#RekeyLimit default none

# Logging
#SyslogFacility AUTH
#LogLevel INFO

# Authentication:
#LoginGraceTime 2m
PermitRootLogin yes
StrictModes yes
#MaxAuthTries 6
#MaxSessions 10

#PubkeyAuthentication yes

# Expect .ssh/authorized_keys2 to be disregarded by default in future.
#AuthorizedKeysFile .ssh/authorized_keys .ssh/authorized_keys2

#AuthorizedPrincipalsFile none

#AuthorizedKeysCommand none
#AuthorizedKeysCommandUser nobody
35,15 13%
```

3 – Enter the following command into the terminal:

```
service sshd restart
```

```
root@management1:/home/storagedata/openORM-Enterprise-Appliance# service sshd restart
```

5.4.4 – High Availability Cluster Admin Setup

This Utility is executed on the first Management node, but it can be executed on the second Management node in the future if required.

Please ensure that this section is performed in a desktop environment (i.e. not an SSH Terminal)

1 – Ensure that the current directory is the openQRM install directory using the `cd` command.

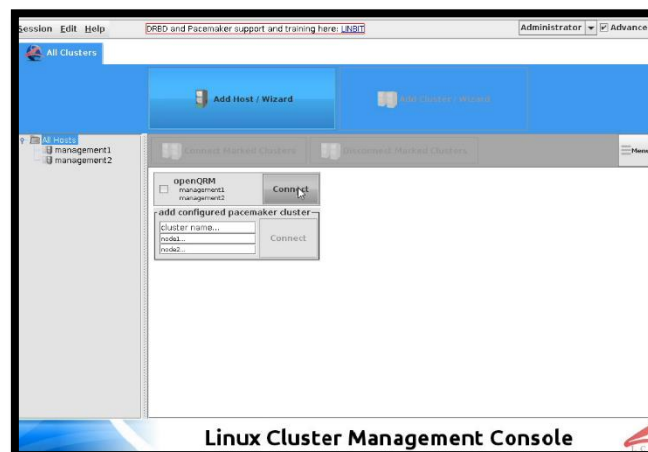
```
root@management1:/home/storagedata/openQRM-Enterprise-Appliance# cd /  
root@management1:/#  
root@management1:/# cd /home/storagedata/openQRM-Enterprise-Appliance#  
root@management1:/home/storagedata/openQRM-Enterprise-Appliance# ls  
bin  
init  
openQRM-Enterprise-Appliance-HA-cluster-admin  
openQRM-Enterprise-Appliance-HA-cluster-setup  
openQRM-Enterprise-Appliance-ling  
openQRM-Enterprise-Appliance-setup  
openQRM-Enterprise-License.txt  
README
```

2 – Enter the following command to start up the Linux Cluster Management Console:

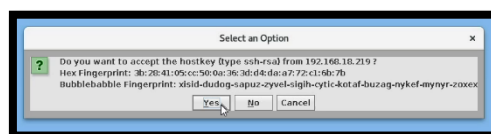
sudo ./openQRM-Enterprise-Appliance-HA-cluster-admin

```
root@management1:/home/storagedata/openQRM-Enterprise-Appliance# ./openQRM-Enterprise-Appliance-HA-cluster-admin
```

3 – Click the *Connect* button in the management console



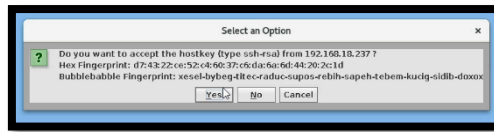
4 – Click Yes on this dialog



5 – Enter the root password for management 1 into the dialog shown. In this case it was *admin*

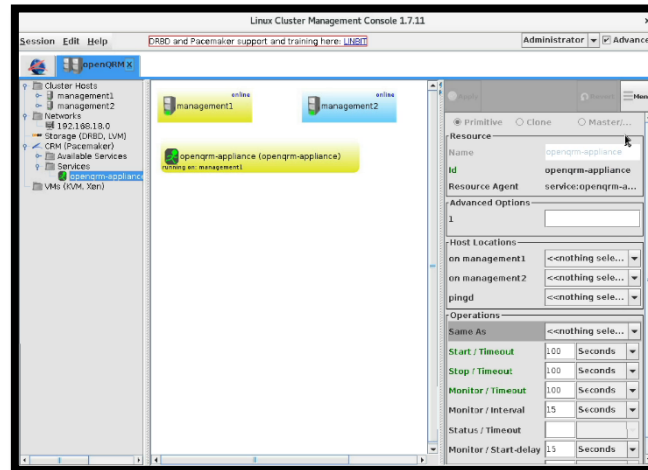


6 – Click Yes on the following dialog



7 – As seen in section 5.4.6, the OpenQRM High Availability Setup is Diagrammatically shown.

5.4.6 – Checking Cluster Status

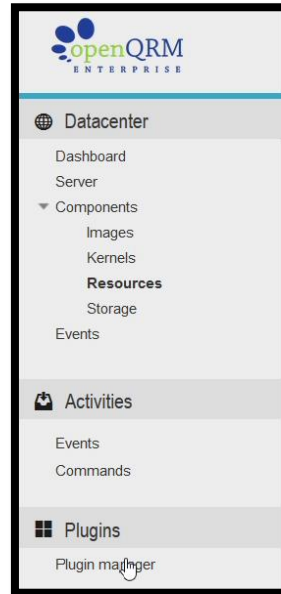


5.5 – OpenQRM Resource Configuration

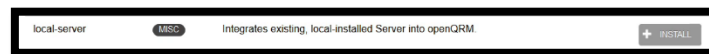
5.5.1 – OpenQRM local-server Plugin Installation

1 – Login into the OpenQRM Web UI Dashboard like it was done in section 5.3.11.

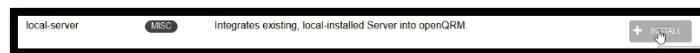
2 – Click on the *Plugin Manager* text on the left-hand panel



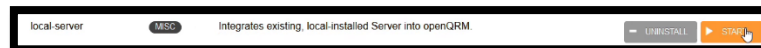
3 – Find the *local-server* plugin in the given list



4 – Click the *INSTALL* button



5 – Once the install process has completed. Click the *START* button.



6 – The local-server plugin will now be available.

5.5.2 – Exposing Node Resources to the local-server Plugin

This process will need to be repeated for all nodes that will be used as a resource of any type. This includes:

- RLN
- S2S-T1-1
- S2S-T1-2
- S2S-T1-3
- S2S-T1-4
- S2P-T2-1
- S2P-T2-2
- S2P-T2-3
- S2P-T2-4

1 – Please Open the OpenQRM VM using a VNC Viewer as seen in section 5.3.6 or through an SSH Client using the IP recorded from Section 5.3.7.

2 – Enter the following into the OpenQRM VM Terminal

```
scp /usr/share/openqrm/plugin/local-server/bin/openqrm-local-server storedata@<IP of target machine>:/tmp/
```

Please replace **<IP of target machine>** with the IP of the machine that will have its resources utilized. In this example, the IP of the *RLN* was used.

```
openqrm@openqrm:~/openqrm-5.3.0-Enterprise-Edition-Eval-enterprise$ scp /usr/share/openqrm/plugins/local-server/bin/openqrm-local-server storedata@192.168.18.64:/tmp/
The authenticity of host '192.168.18.64 (192.168.18.64)' can't be established.
ECDSA key fingerprint is SHA256:g32R1r50ejXqIzRKvQqG03he4M0bIp6Aa1r5WtER.
```

3 – When prompted with the following message, enter *yes*

```
Are you sure you want to continue connecting (yes/no)? y
```

4 – Enter the password for the storedata user. In this case, it was *admin*

```
storedata@192.168.18.64's password:
```

5 – Now Login or SSH into the node that the file was copied to.

```
login as: storedata
storedata@192.168.18.64's password:
Linux tier1-2 4.9.0-7-amd64 #1 SMP Debian 4.9.110-3+deb9u2 (2018-08-13) x86_64
```

6 – Ensure that the current directory is */tmp* using the *cd* command. This is where the file is transferred to

```
storedata@tier1-2:~$ cd /tmp
storedata@tier1-2:/tmp$
```

7 – Enter the following command to get the MAC Address of the connect network adapter

ip addr

In this case, it was *a8:1e:84:c3:97:bf*

Save this MAC Address for later use

Also save which network adapter is in use. In this case it is *ens20f0*

```
root@tier1-2:/home/storagedata# ip addr
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: ens20f0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc mq state UP group default
    link/ether a8:1e:84:c3:97:bf brd ff:ff:ff:ff:ff:ff
    inet 192.168.18.64/24 brd 192.168.18.255 scope global ens20f0
        valid_lft forever preferred_lft forever
    inet6 fe80::a81e:84ff:fe33:97bf/64 scope link
        valid_lft forever preferred_lft forever
3: ens20f1: <BROADCAST,MULTICAST> mtu 1500 qdisc mq state DOWN group default qlen 1000
    link/ether a8:1e:84:c3:97:c0 brd ff:ff:ff:ff:ff:ff
root@tier1-2:/home/storagedata#
```

8 – Enter the following command into the terminal:

```
sudo ./openqrm-local-server integrate -u openqrm -p openqrm -q <IP of OpenQRM Server>
-i <Connected network adapter> -s http
```

Replace **<IP of OpenQRM Server>** with the IP recorded in step 3 within Section 4.3.7.

Replace **<Connected network adapter>** with the network adapter in Step 7.

```
root@tier1-2:/tmp# ./openqrm-local-server integrate -u openqrm -p openqrm -q 192.168.18.118 -i ens20f0 -s http
```

9 – Give a name for the system. This name will be used to identify this machine in OpenQRM.

```
Integrating system to openQRM-server at 192.168.18.118
Please give a name for this system
-> : tier1-2
```

10 – Enter the MAC address obtained from step 7

```
Please give the mac address of ens20f0 for this system
-> : a8:1e:84:c3:97:bf
```

11 – The final Configuration is shown. Press *ENTER* to continue

```
Configuration for the openQRM Integration:

ip address       : 192.168.18.64
subnet mask     : 255.255.255.0
mac address      : a8:1e:84:c3:97:bf

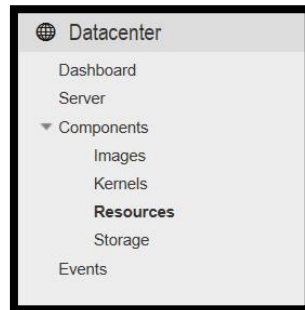
(please press ENTER to continue)

```


5.5.3 – Displaying resource list

All resources added in Section 5.5.2 will appear now in a list. This is how to access that list.

1 – Find and Click the *Resources* text under the *Components* drop down list on the left-hand panel.



2 – A list of all resources added will now be displayed.

Resources

Filter by Resource

Filter by Resource Type

▼

ADD A NEW RESOURCE

<<

<

1 - 2 / 2

>

>>

Id ▼

ASC ▼

20 ▼

↺

State		
ACTIVE	Id: 0 Name: openqrm Mac: IP: 192.168.18.118 Type: Physical System	CPU: 2 RAM: 3808/3951 NIC: 1 Load: 0.23
ACTIVE	Id: 15381937416303 Name: tier1-2 Mac: a8:1e:84:c3:97:bf IP: 192.168.18.64 Type: Physical System	CPU: 40 RAM: 765/257857 NIC: 2 Load: 0.00

6.0 – Hardware Links

- [S2S \(T41S-2U\)](#)
2U 4-Node Server Featuring Highest Compute Density
- [S2P \(T21P-4U\)](#)
Ultra-Dense Extreme Performance Storage Server

7.0 – Software References

1. **Rufus**
For properly copying bootable ISO images to USB Flash Drive Media
rufus.akeo.ie
Accessed 2018/10/1
2. **PuTTY**
Windows SSH Client
www.putty.org
Accessed 2018/10/2
3. **WinSCP**
SFTP and FTP Client. Useful for copying files to other machines
winscp.net
Accessed 2018/10/19