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StorageData Documentation

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OpenQRM Appliance

Contents

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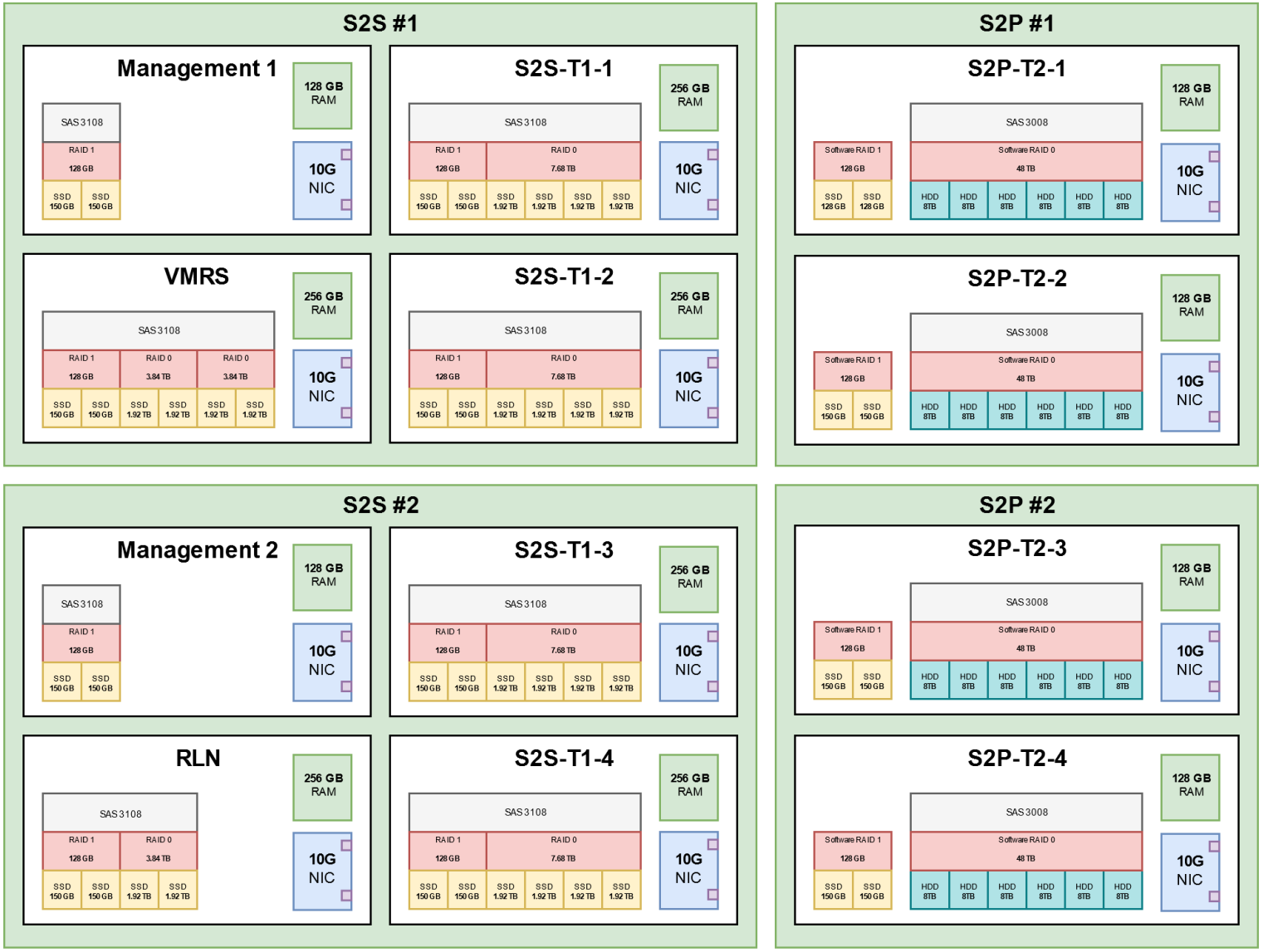
1.1 - Physical System Architecture

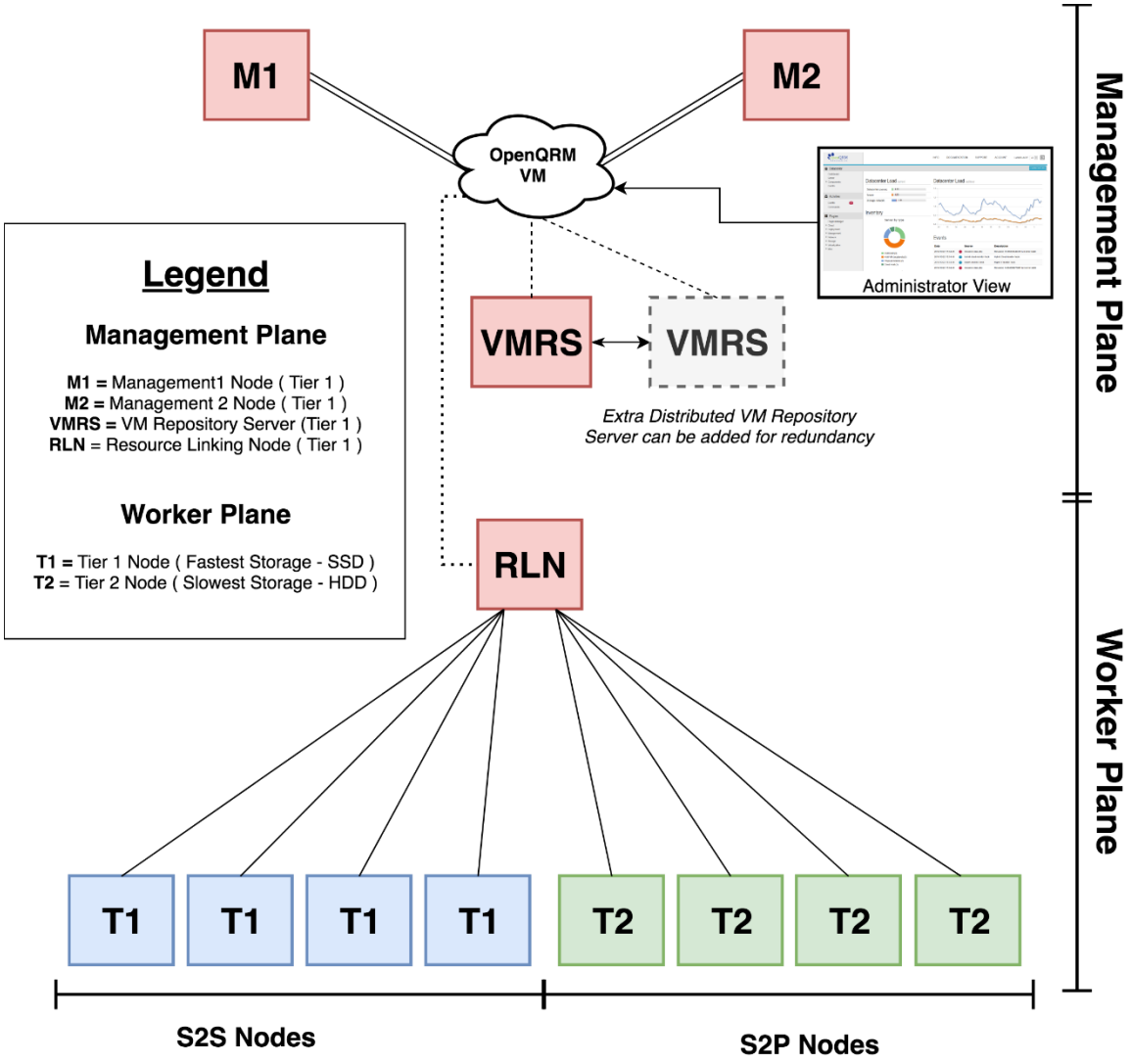


Hardware Links (Click to Follow Link)

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 [Inva
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/sda1        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
```

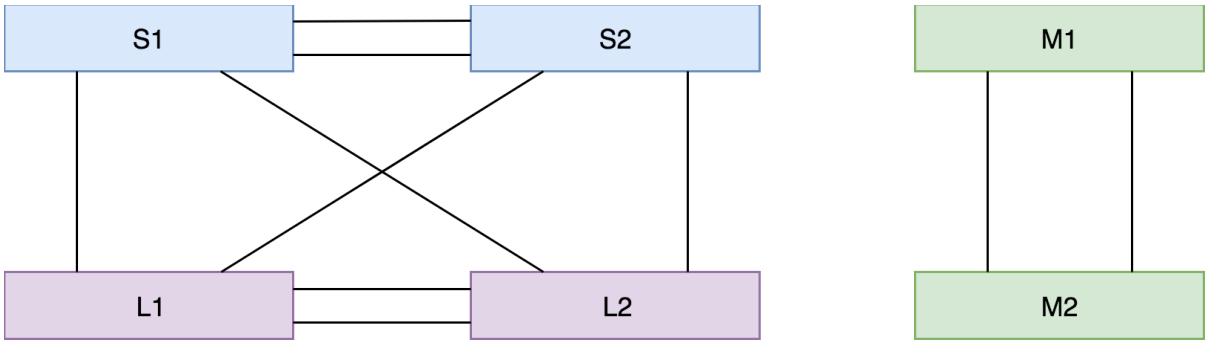
3.0 – Network Switches and Cumulus Set up

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.

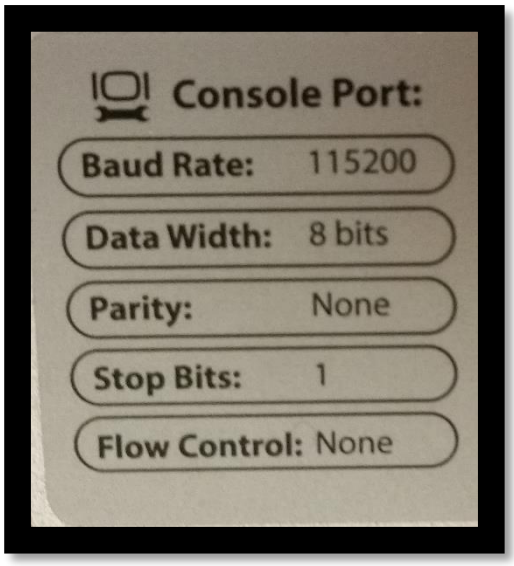
The uplink from the management switches should connect to a 40G backplane.

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                     IP: 127.0.0.1/8
       lo                                                IP: ::1/128
UP     eth0    100M  1500   Mgmt       Switch-1GE (08)   IP: 192.168.18.89/24(DH(
P)
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: 192.168.18.90/2
4(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      showmcqv4src  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

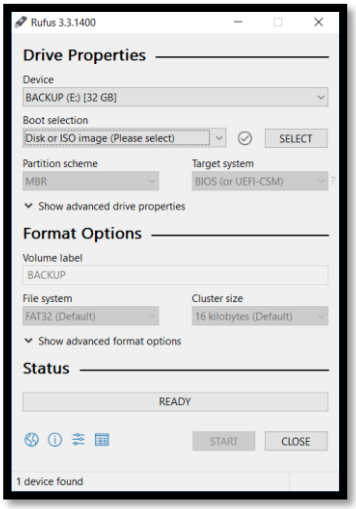
4.1 – Preparations

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.

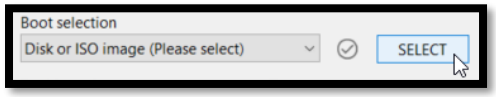
1 - Firstly, insert USB Drive.

2 - Start the Rufus Application.

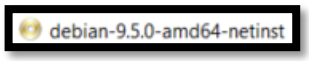


2 - The USB Flash drive should appear in the *Device* field. Be sure to select the correct drive in the drop-down menu.

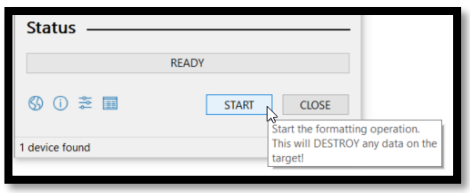
3 - Click the *Select* button



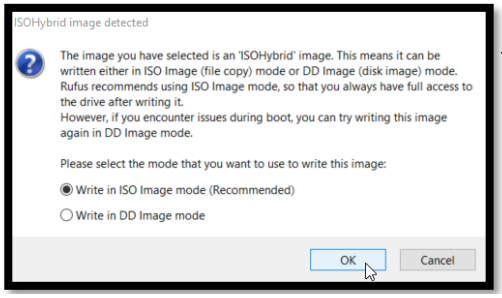
4 - Find and Select the Debian ISO



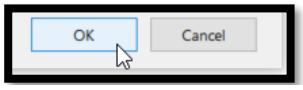
5 - Click the *Start* button



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



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

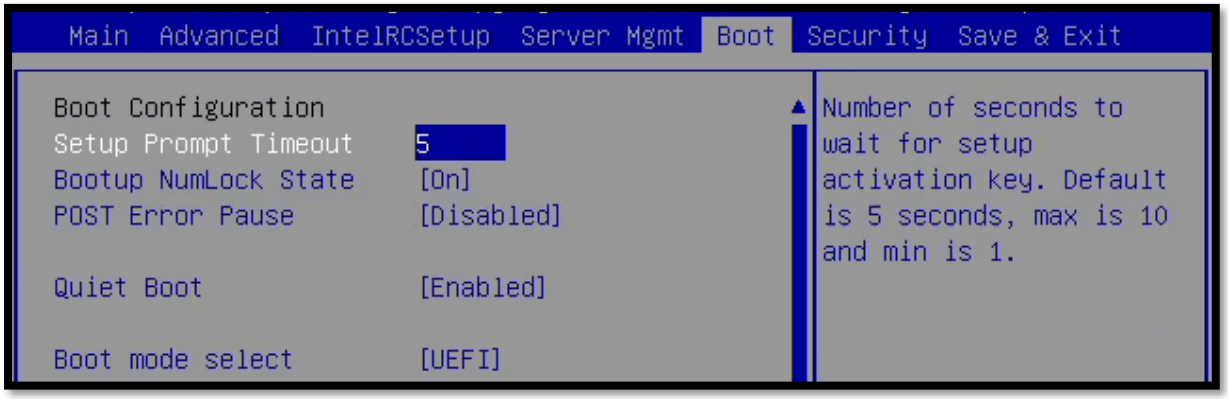


8 - The ISO will be written to the USB Flash Drive. Once completed, it will be ready for the node installation.

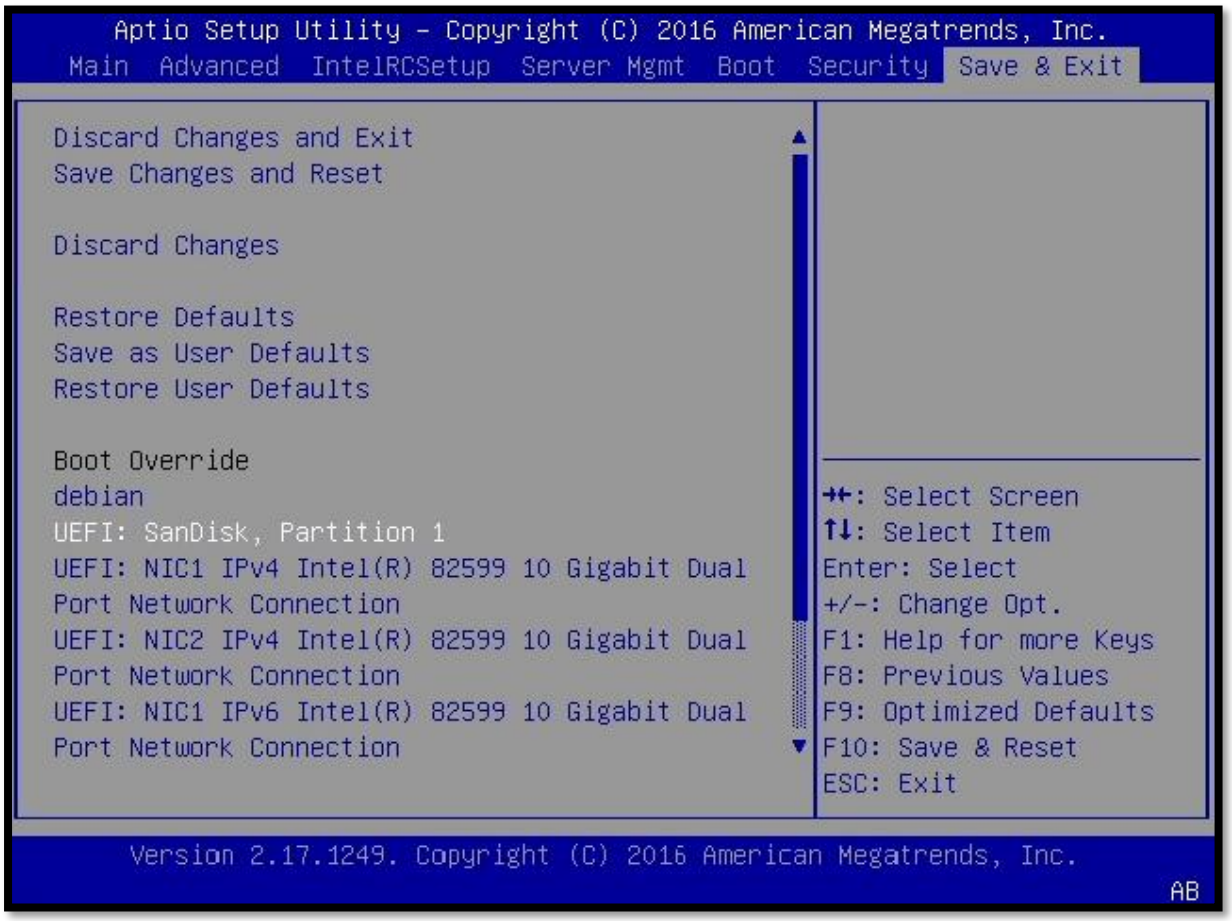
4.1.2 Preparing the node for USB Boot

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

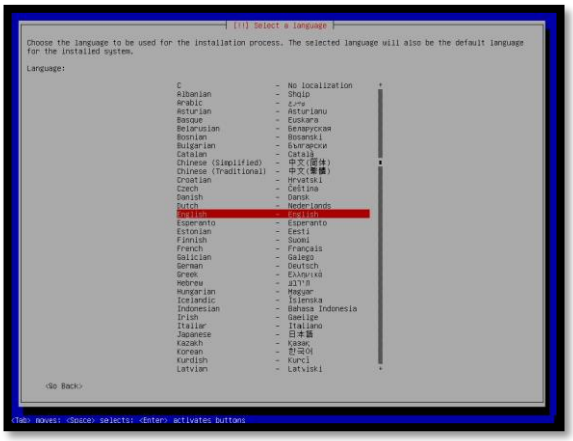
The boot screen for Debian should now appear. Select the *Install* Option.

4.2 – Debian Installation Process

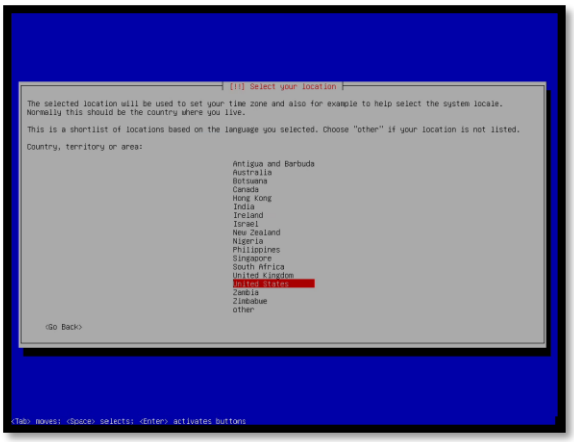
4.2.1 – Select Language, Location and Keyboard Layout

Note that this process may be slightly different depending on location

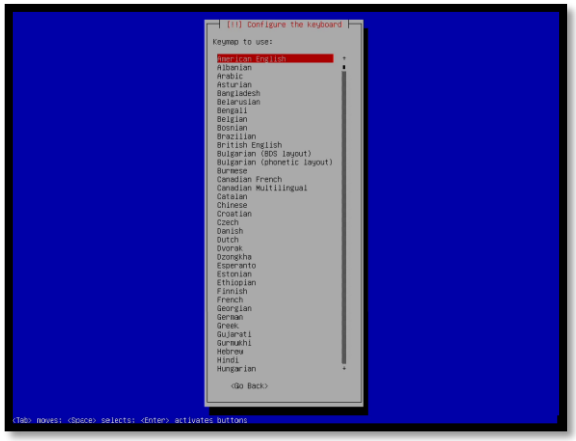
1 - Select Language



2 - Select Location

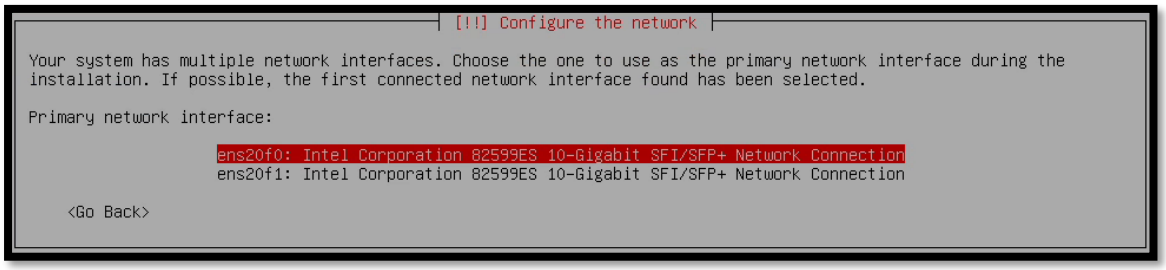


3 – Select Keyboard Layout

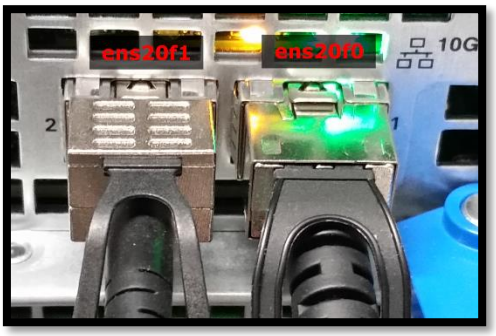


4.2.2 – Configure Networking

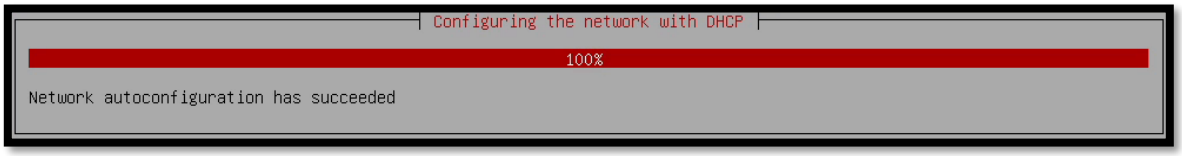
1 - Select *ens20f0* as the network adapter, this should be the first connection on the NIC.



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

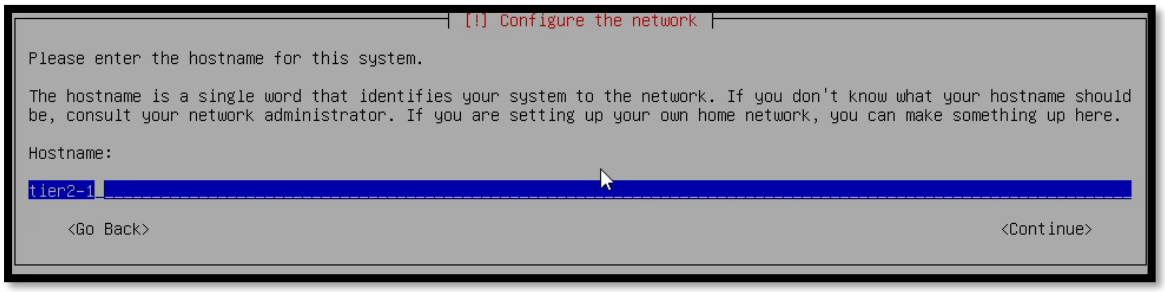


2 - After selecting the primary network interface, the network should be automatically configured



4.2.3 – Hostnames and Domain Names

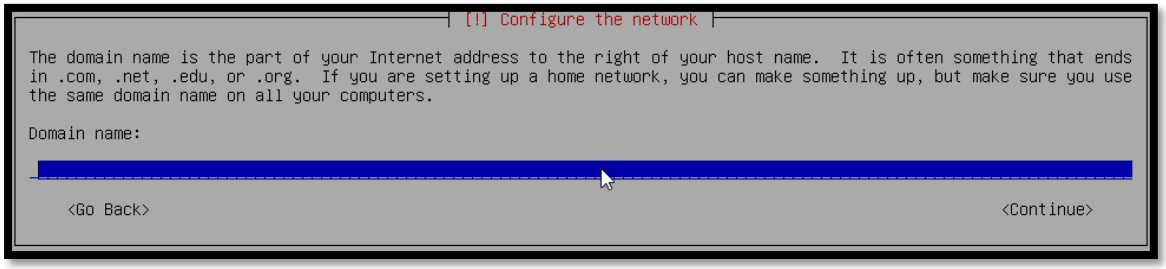
1 - This is where each node will differ slightly as each node will have a different hostname.



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

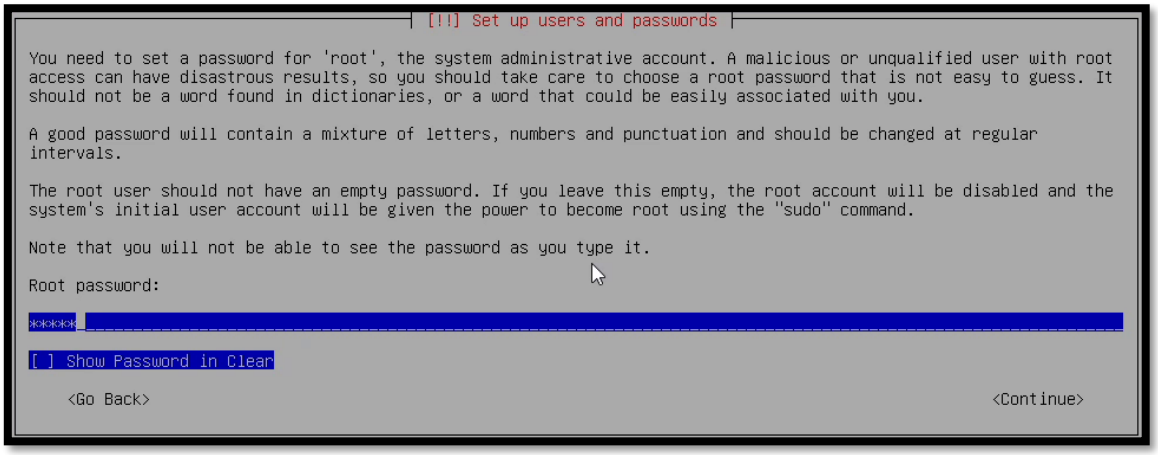
- **Management Plane Nodes**
  - management1
  - management2
  - vrms
  - rln
- **Worker Plane Nodes**
  - S2S-T1-1
  - S2S-T1-2
  - S2S-T1-3
  - S2S-T1-4
  - S2P-T2-1
  - S2P-T2-2
  - S2P-T2-3
  - S2P-T2-4

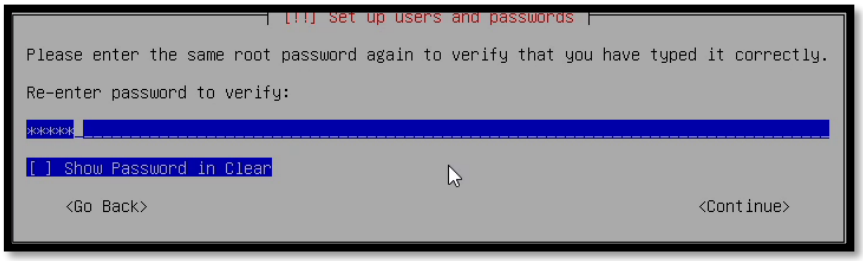
2 - Don't enter anything for this screen, press the *Enter* key to skip through.



4.2.4 – Set up Root Password

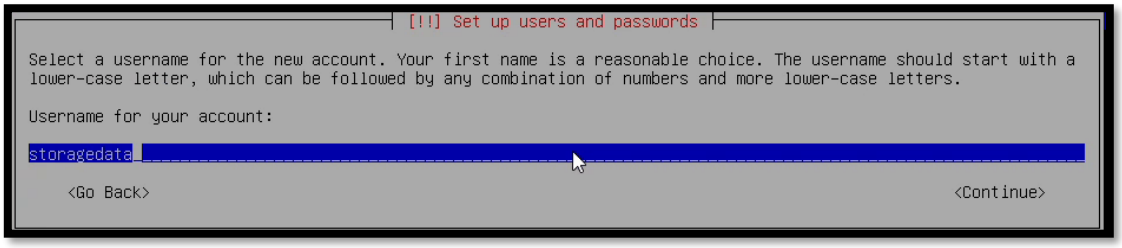
Set your password of choice. The password we used for our appliance build was *admin*.



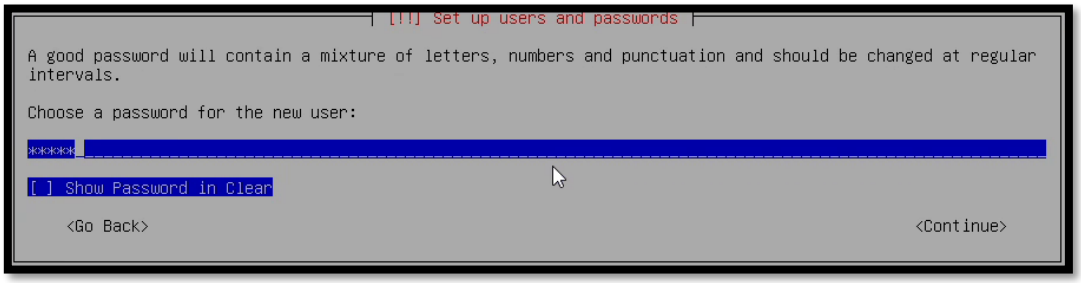


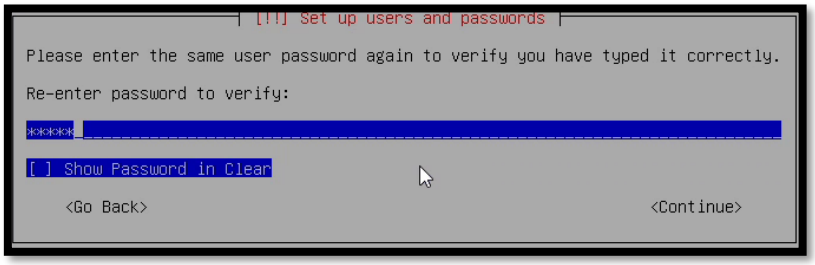
4.2.5 – Set up User name and User Password

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



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

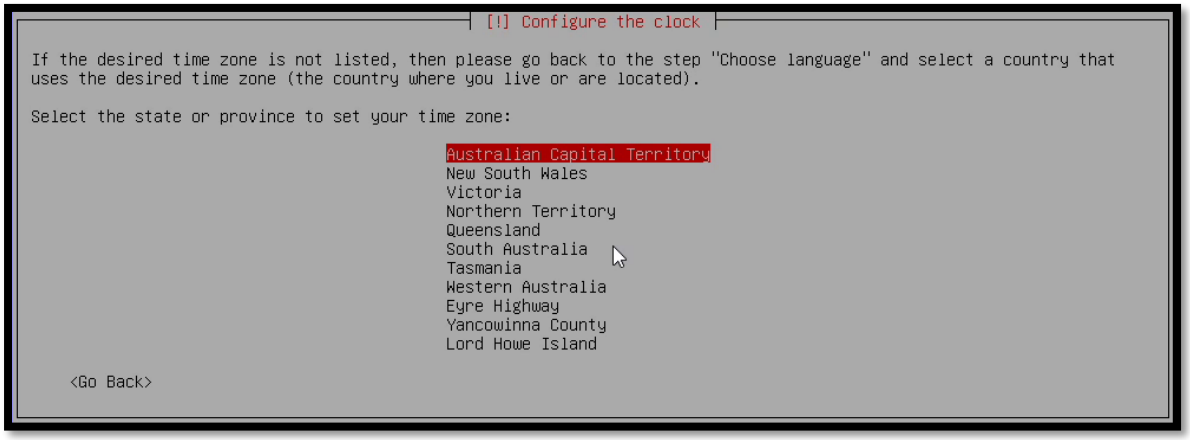




4.2.6 – Set up Location and Clock

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.

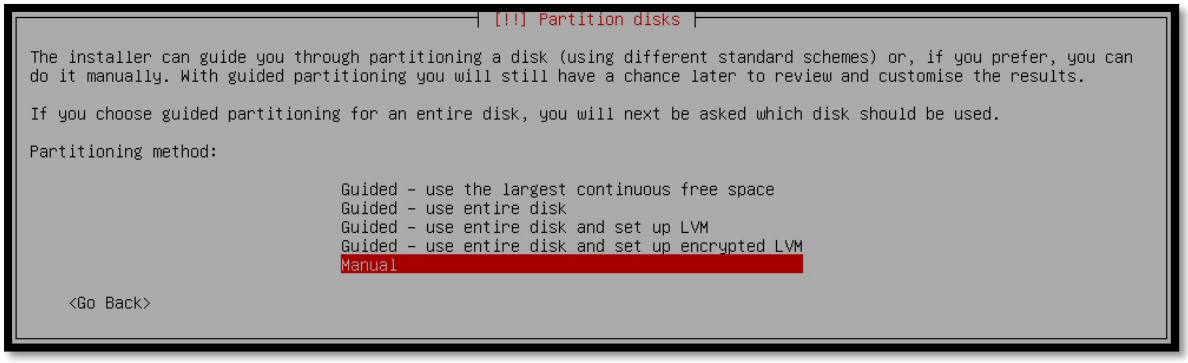
Please proceed to section 4.2.7.1 for nodes that use a 3108 card and section 4.2.7.2 for nodes that use a 3008 card.

4.2.7.1 – Nodes with 3108 Card

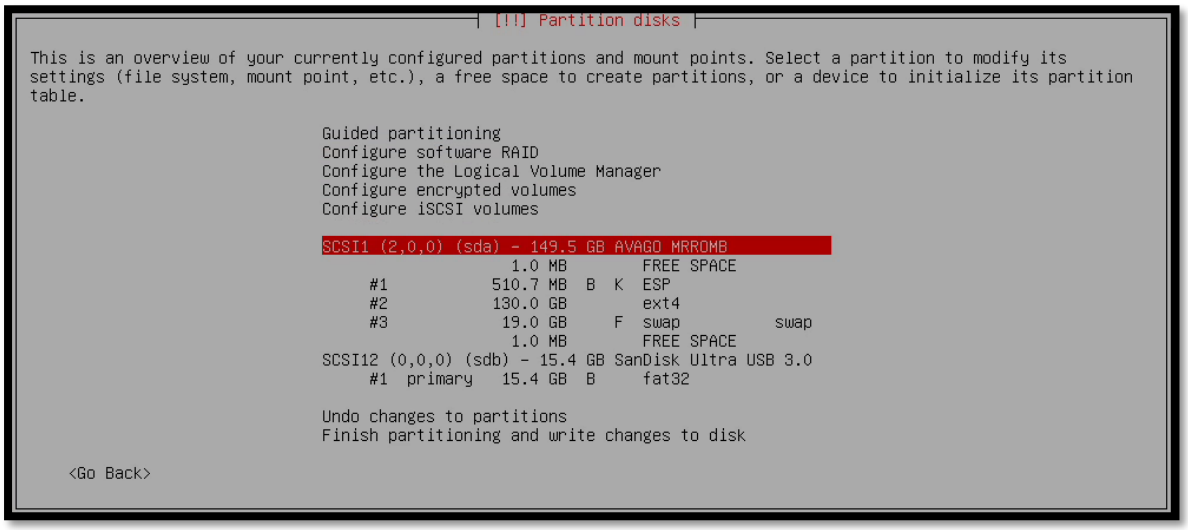
All nodes with the 3108 RAID Controller Card are partitioned the same way. These apply to the nodes:

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

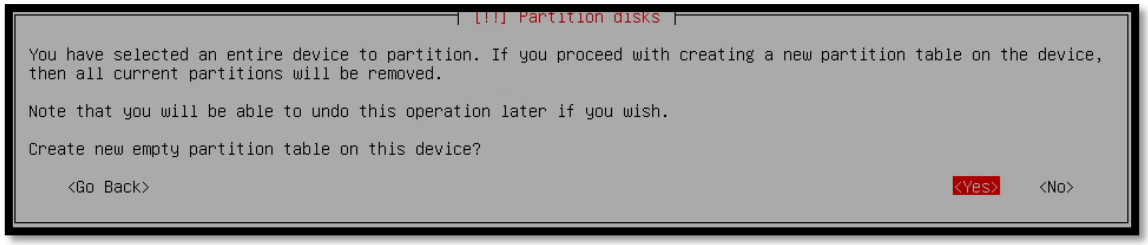
1 – Select *Manual* for the partitioning method.



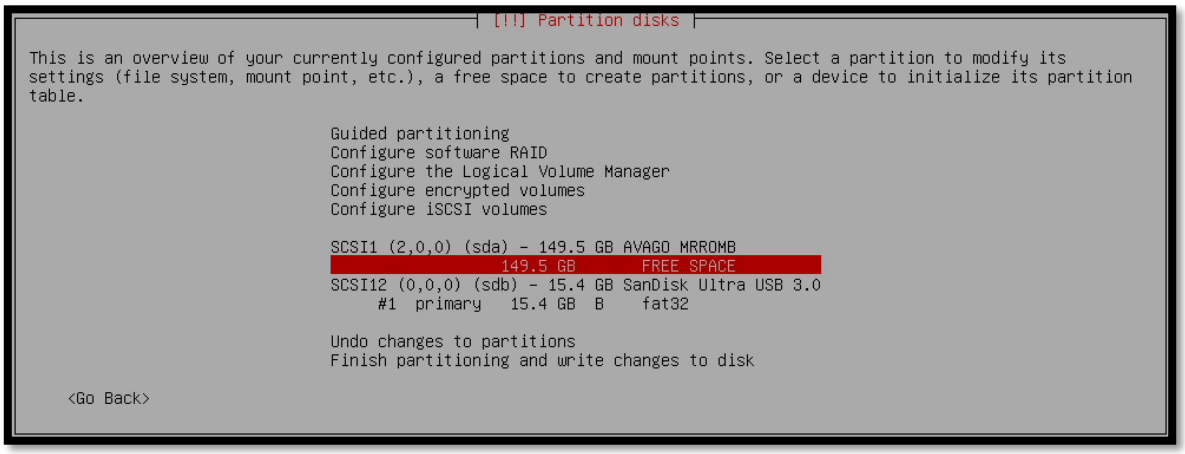
2 – Select the full 150GB drive as seen in the screenshot.



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

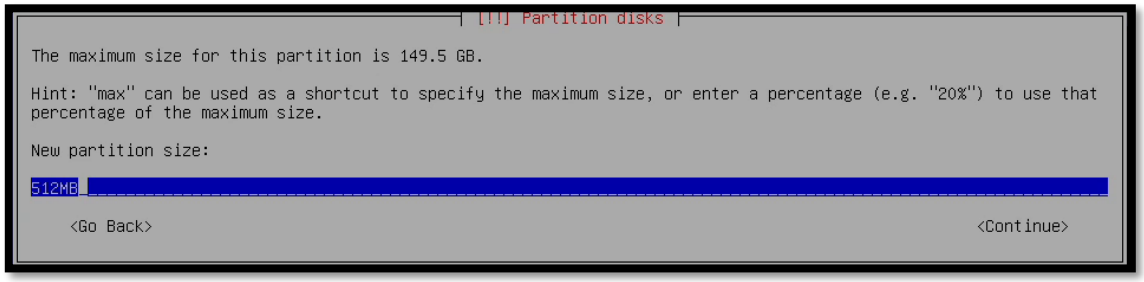


4 – Select the free space that was created on the 150GB Drive.



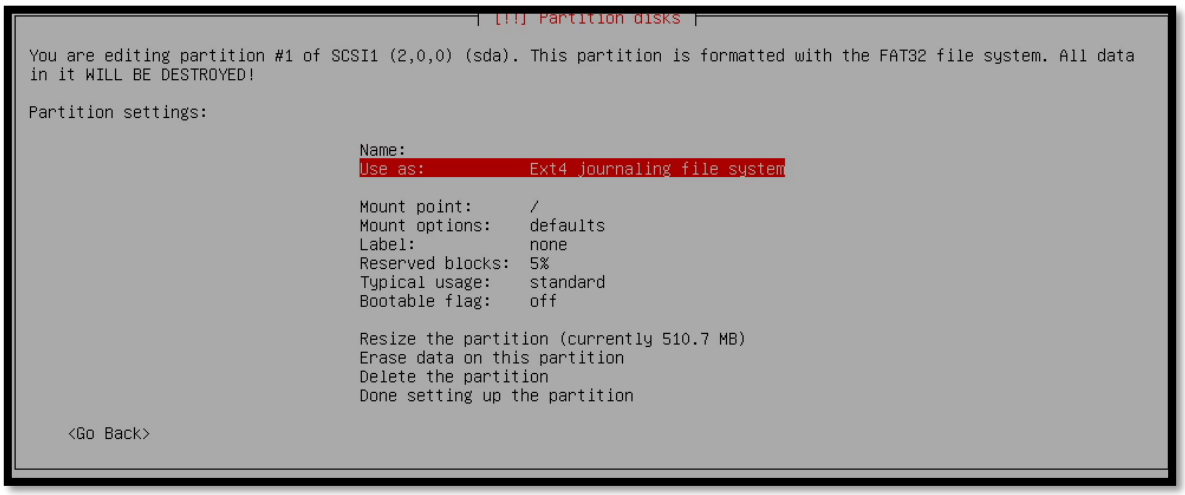
5 – Select *Create a new partition*

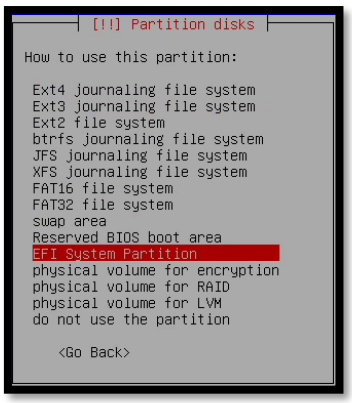
6 – Make this partition 512MB



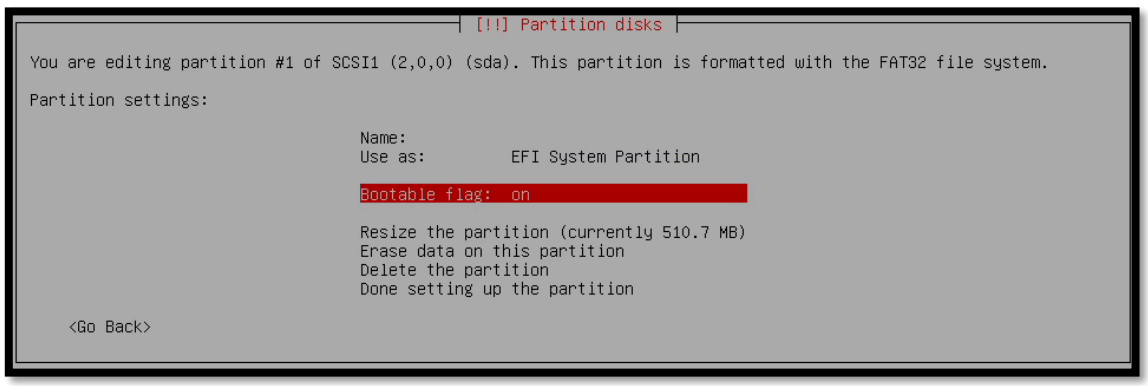
7 – Select *Beginning*

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

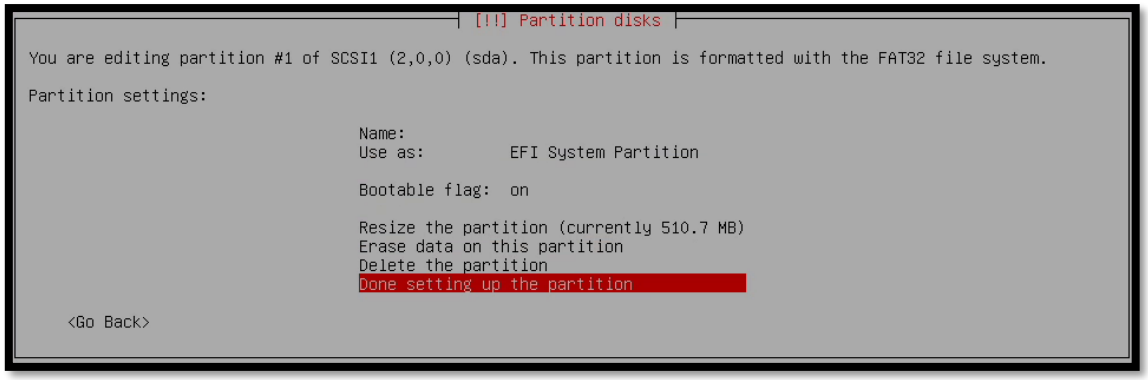




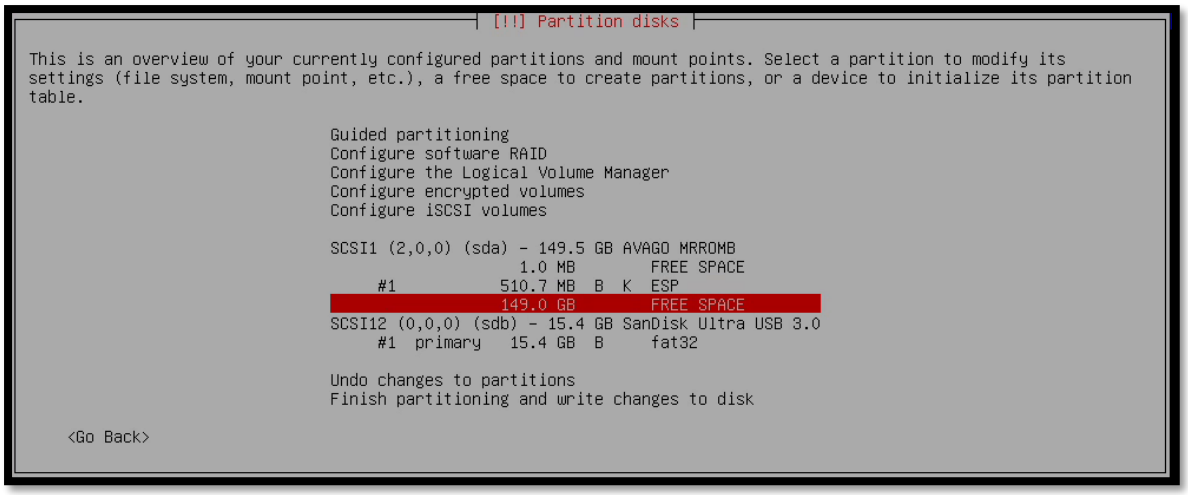
9 – Make sure that the bootable flag is *on*

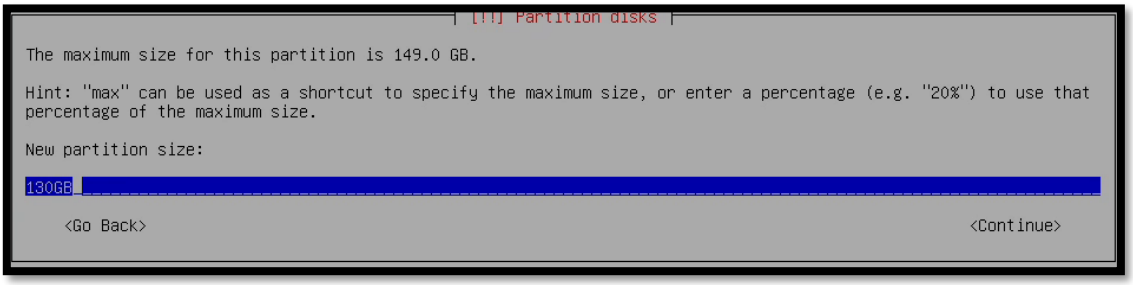


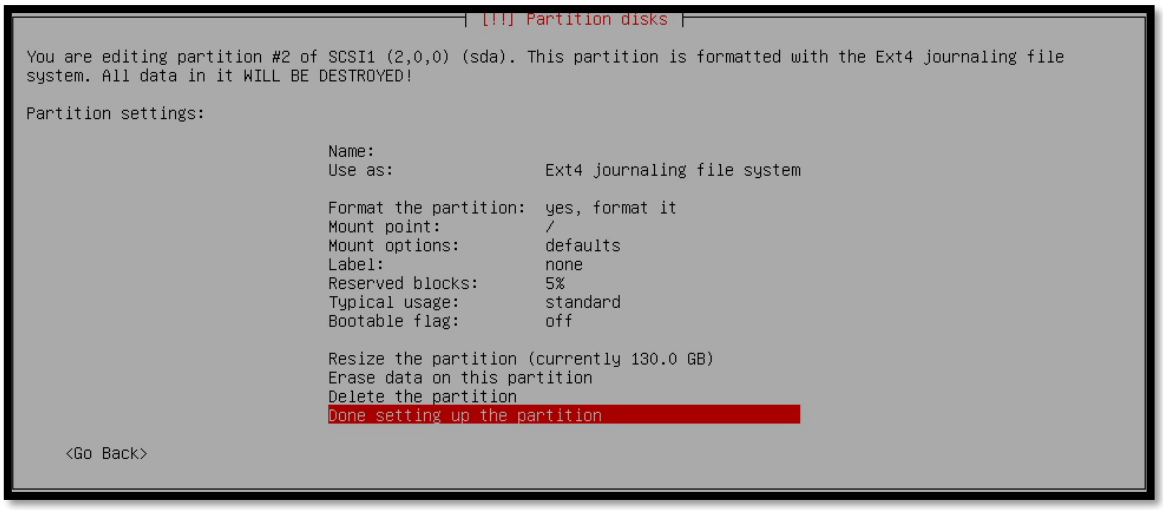
10 – Select *Done setting up the partition*



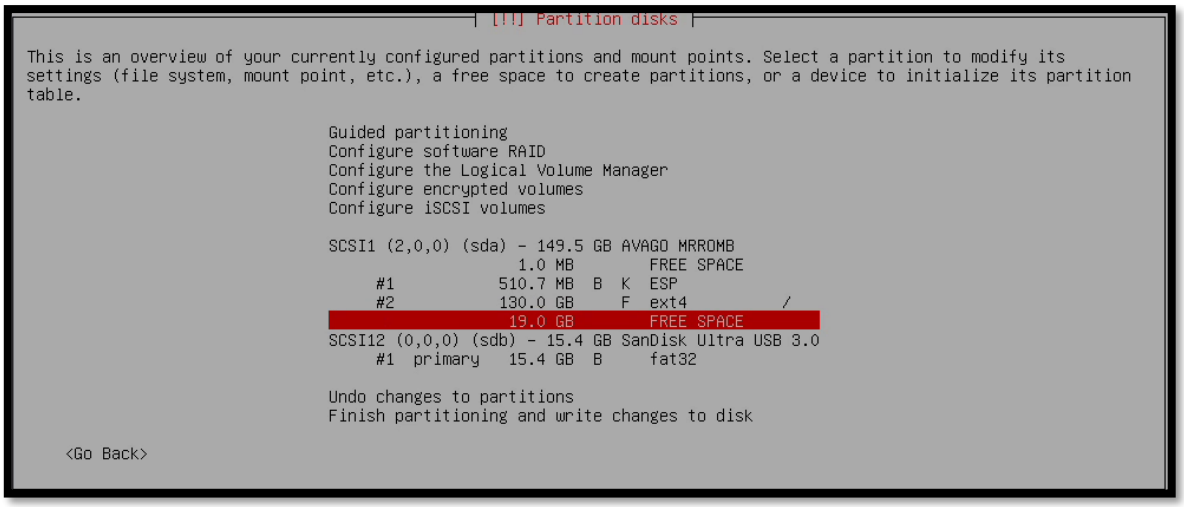
11 – Create a new ext4 partition with the size of 130GB. Follow steps 1 to 8, except change the fields to reflect the screenshots below.

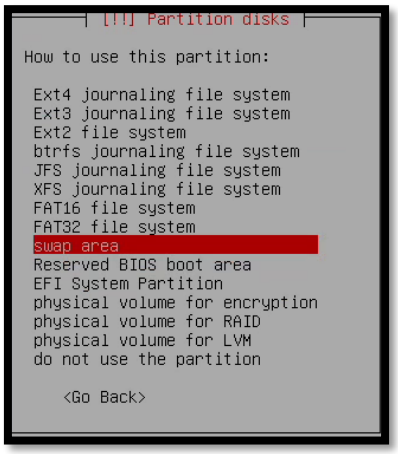


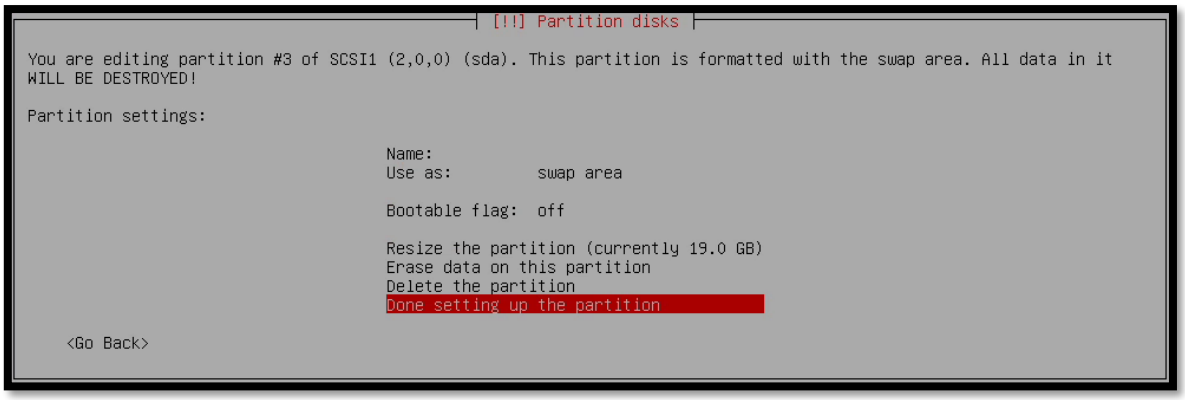




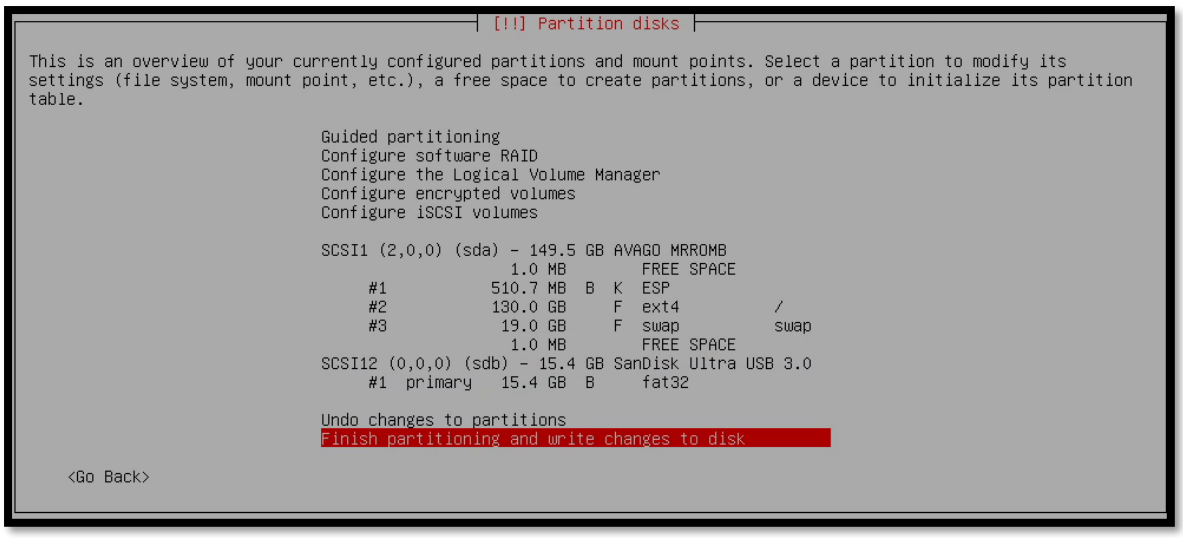
12 - Create a new swap partition with the size of 19GB. Follow steps 1 to 8, except change the fields to reflect the screenshots below.



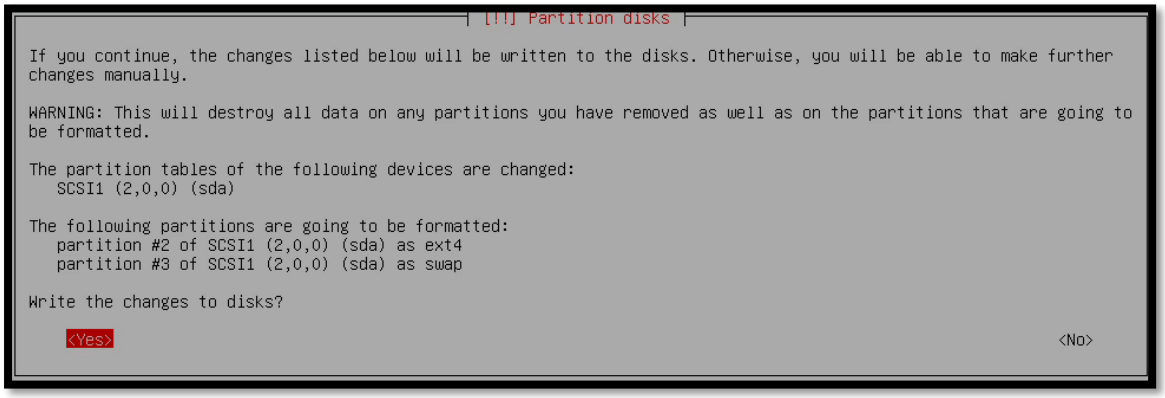




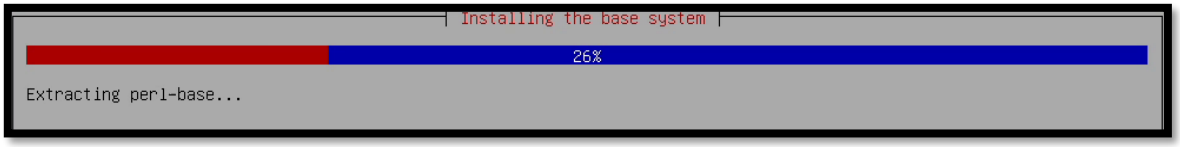
13 – Back on the main partitioning screen, you should see the three partitions that were created, their sizes and their types. Select *Finish partitioning and write change to disk*.



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.



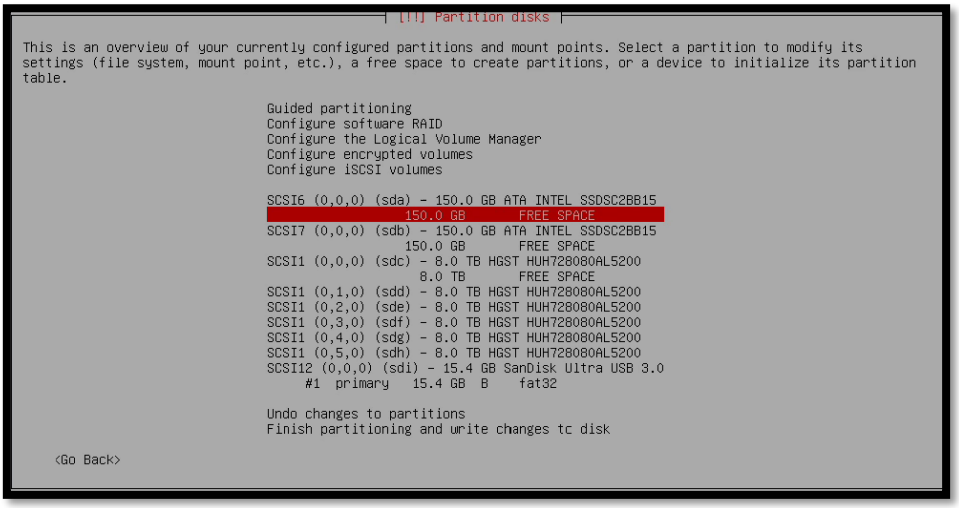
4.2.7.2 – Nodes with 3008 Card

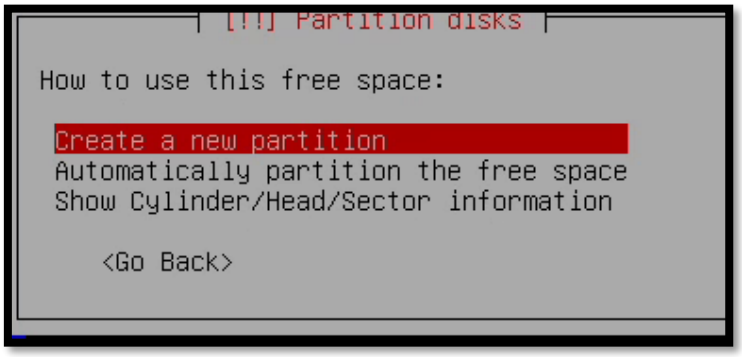
All nodes with the 3008 card are partitioned the same way. These apply to the nodes:

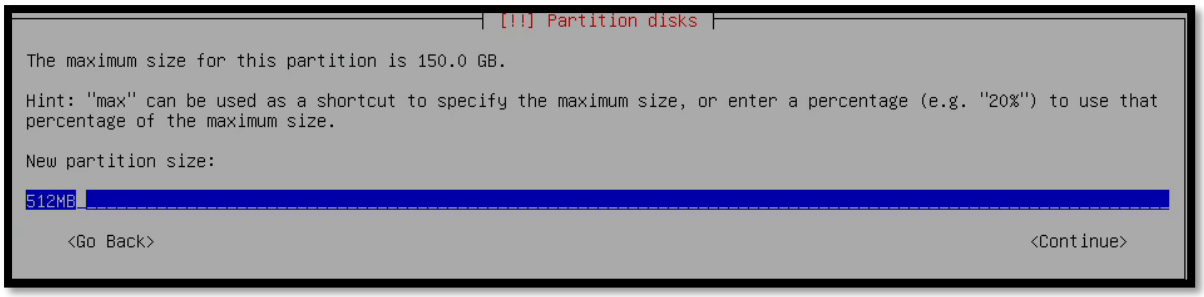
- S2P-T2-1
- S2P-T2-2
- S2P-T2-3
- S2P-T2-4

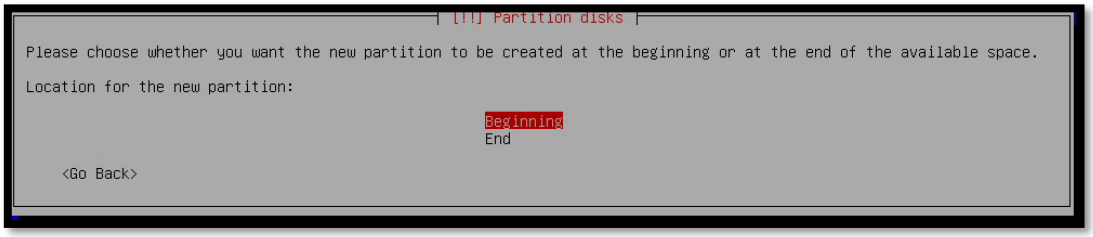
1 – Select *Manual* for the partitioning method.

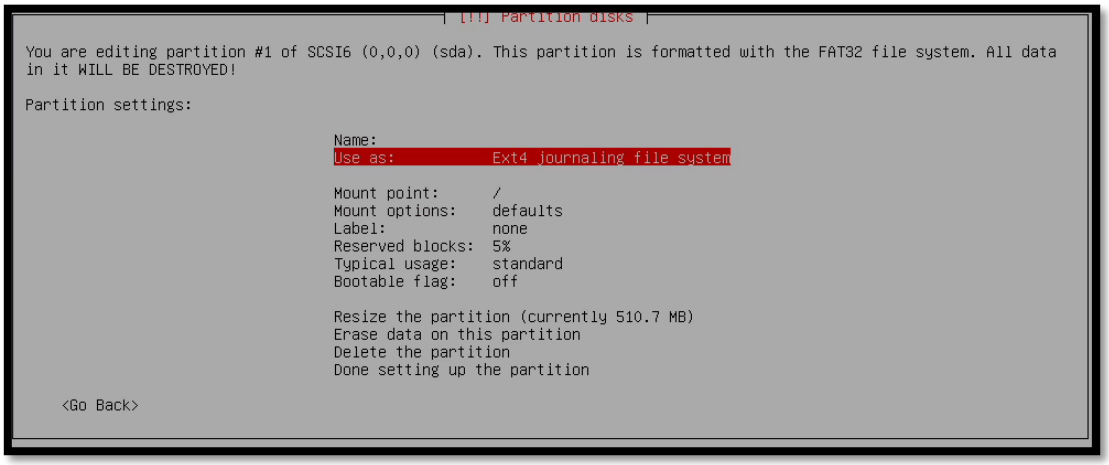
2 – Partition an EFI System Partition with the size of 512MB on the first drive

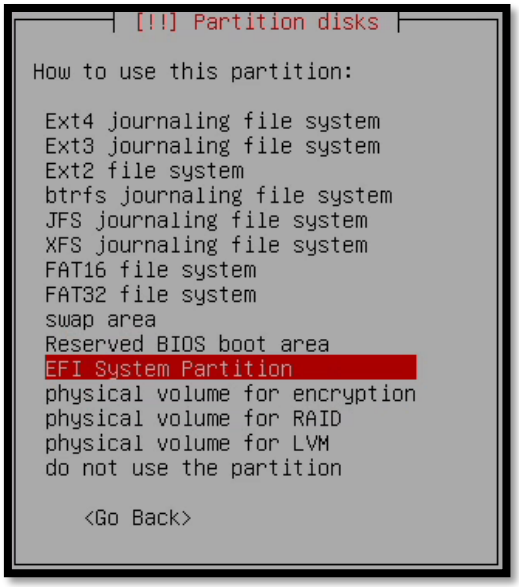


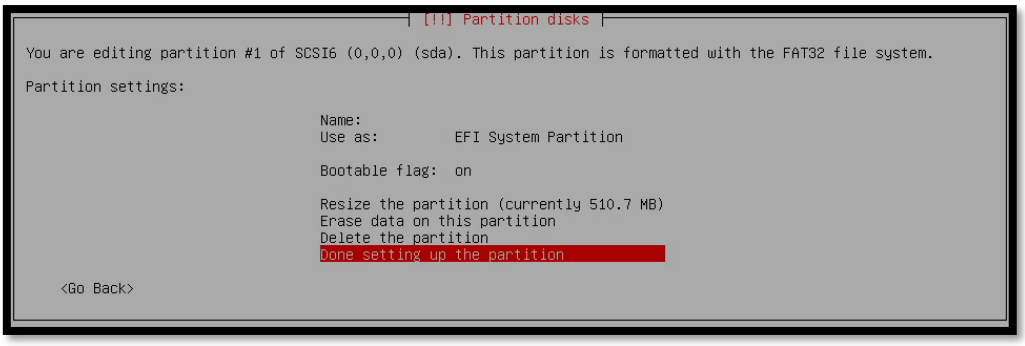



[!!] Partition disks
The maximum size for this partition is 150.0 GB.
Hint: "max" can be used as a shortcut to specify the maximum size, or enter a percentage (e.g. "20%") to use that percentage of the maximum size.
New partition size:
512MB
<Go Back>
<Continue>

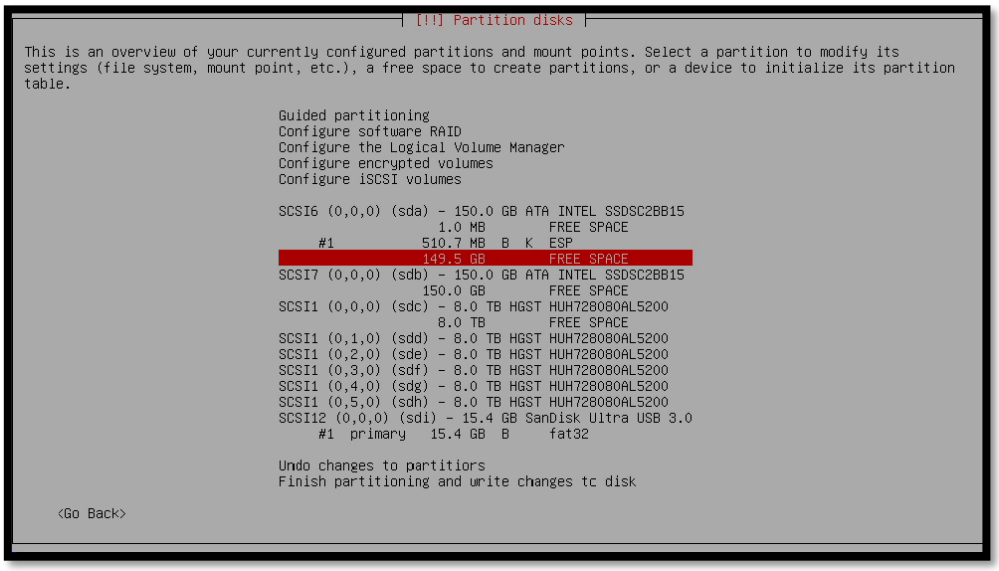

[!!] Partition disks
Please choose whether you want the new partition to be created at the beginning or at the end of the available space.
Location for the new partition:
Beginning
End
<Go Back>

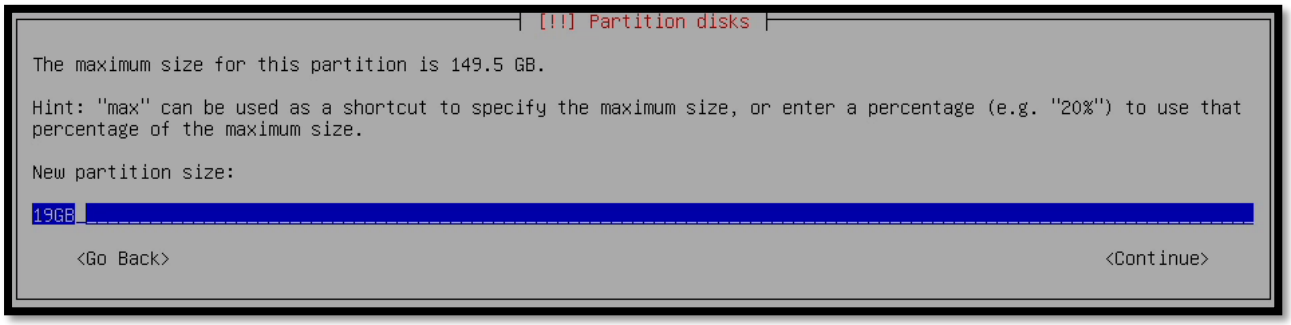

[!!] Partition disks
You are editing partition #1 of SCSI6 (0,0,0) (sda). This partition is formatted with the FAT32 file system. All data in it WILL BE DESTROYED!
Partition settings:
Name:
Use as: Ext4 journaling file system
Mount point: /
Mount options: defaults
Label: none
Reserved blocks: 5%
Typical 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>

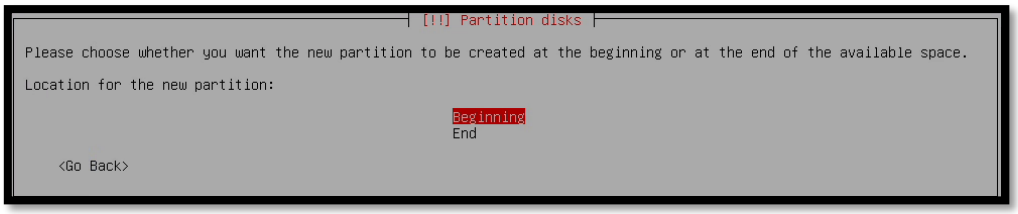

[!!] Partition disks
How to use this partition:
Ext4 journaling file system
Ext3 journaling file system
Ext2 file system
btrfs journaling file system
JFS journaling file system
XFS journaling file system
FAT16 file system
FAT32 file system
swap area
Reserved BIOS boot area
EFI System Partition
physical volume for encryption
physical volume for RAID
physical volume for LVM
do not use the partition
<Go Back>

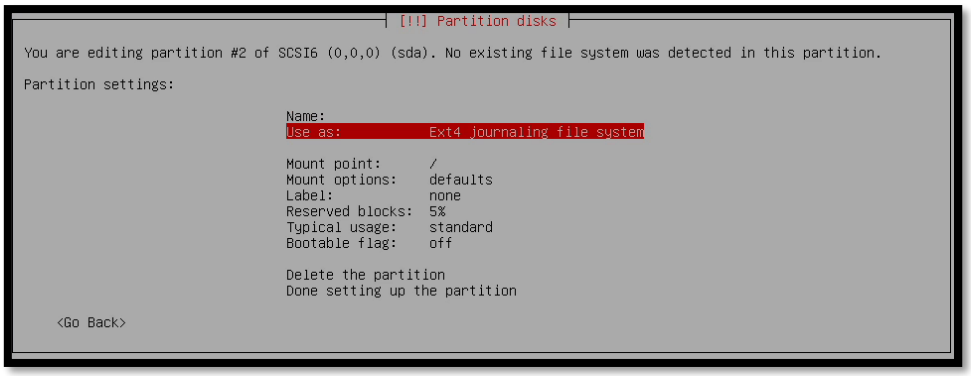


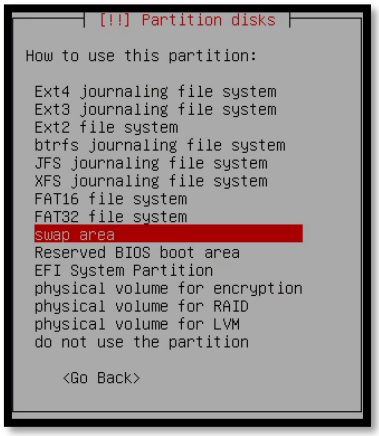
3 – Partition a swap area on the first OS SSD with a size of 19GB

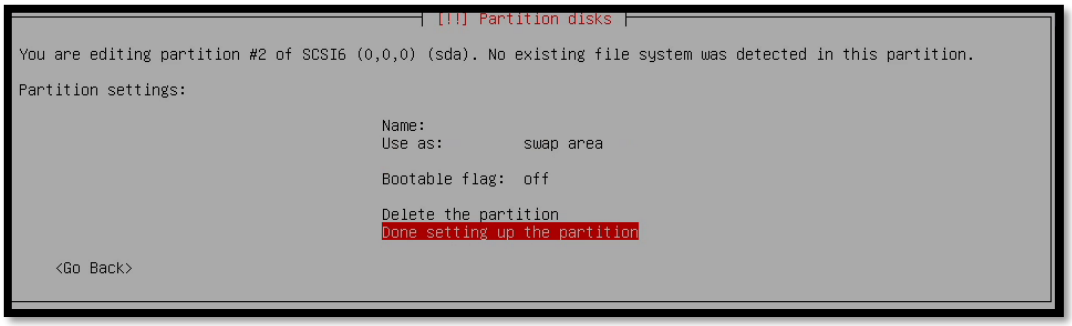




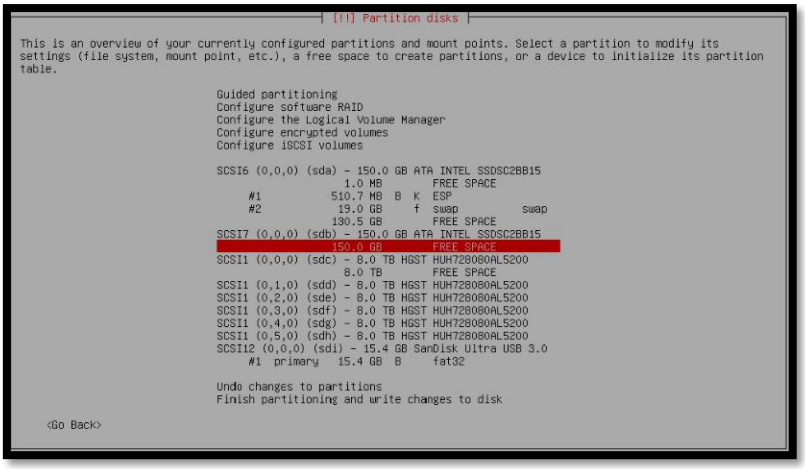




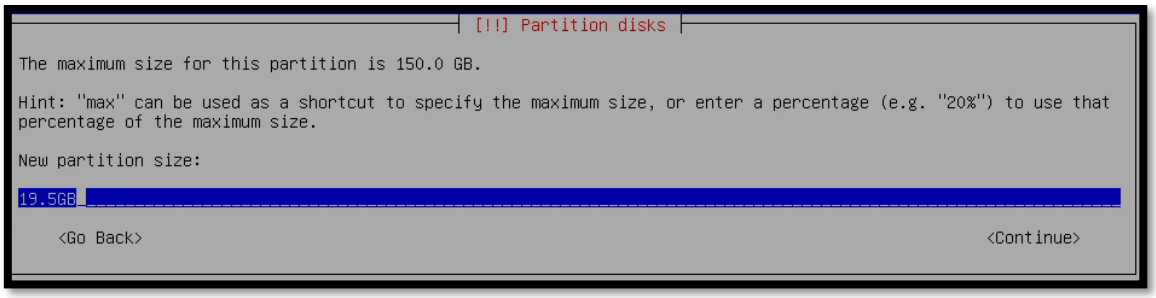


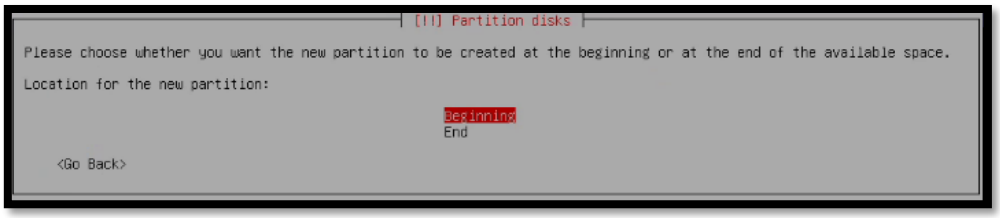


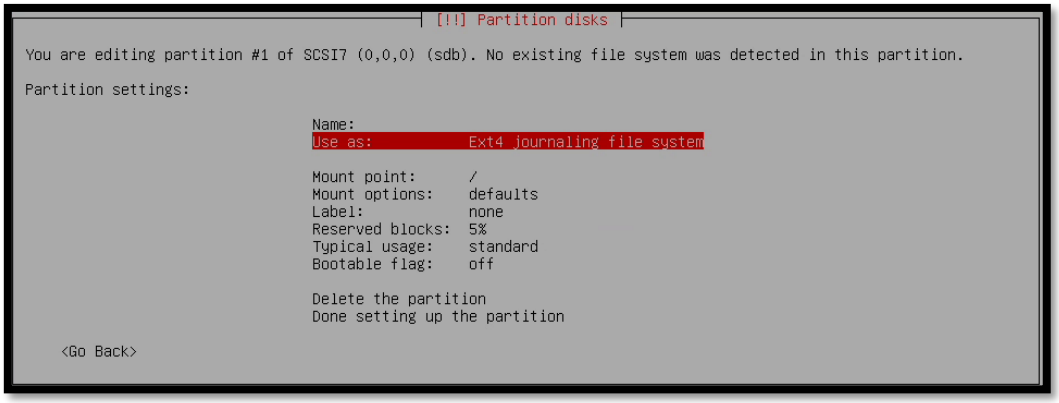
4 – Partition a swap partition on the second OS SSD with a size of 19.5GB

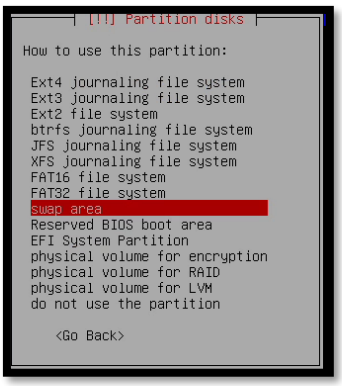


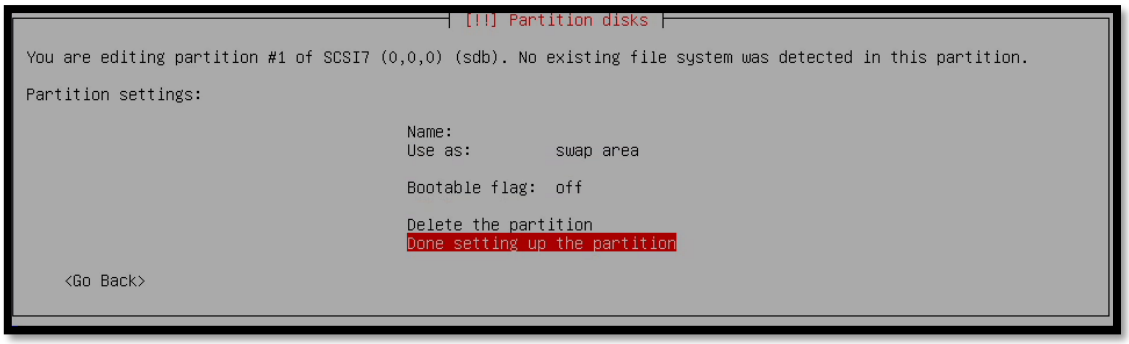

[!!] Partition disks
How to use this free space:
Create a new partition
Automatically partition the free space
Show Cylinder/Head/Sector information
<Go Back>


[!!] 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>

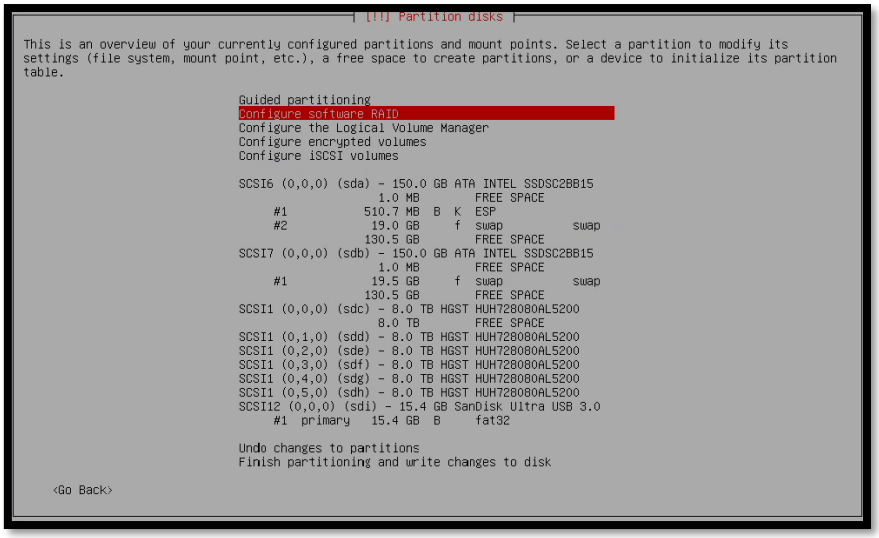

[!!] Partition disks
Please choose whether you want the new partition to be created at the beginning or at the end of the available space.
Location for the new partition:
Beginning
End
<Go Back>

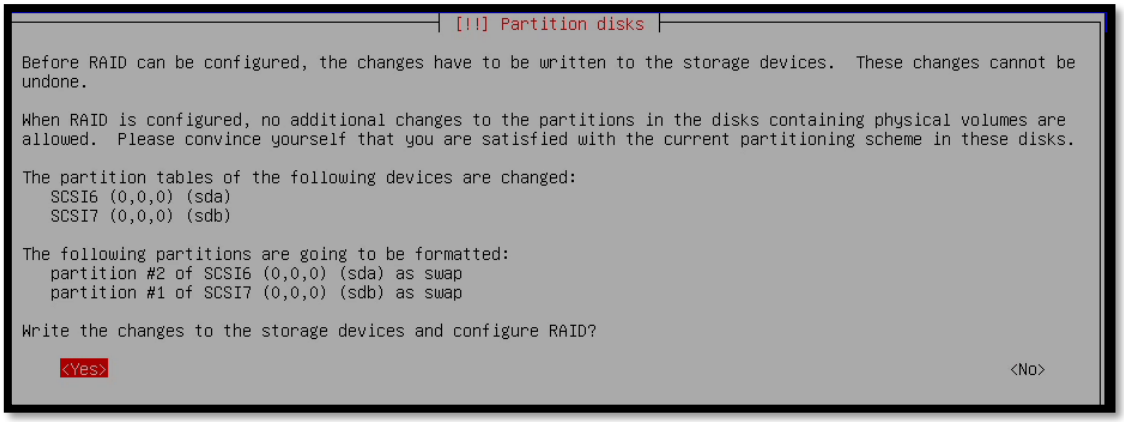

[!!] Partition disks
You are editing partition #1 of SCSI7 (0,0,0) (sdb). No existing file system was detected in this partition.
Partition settings:
Name:
Use as: Ext4 journaling file system
Mount point: /
Mount options: defaults
Label: none
Reserved blocks: 5%
Typical usage: standard
Bootable flag: off
Delete the partition
Done setting up the partition
<Go Back>

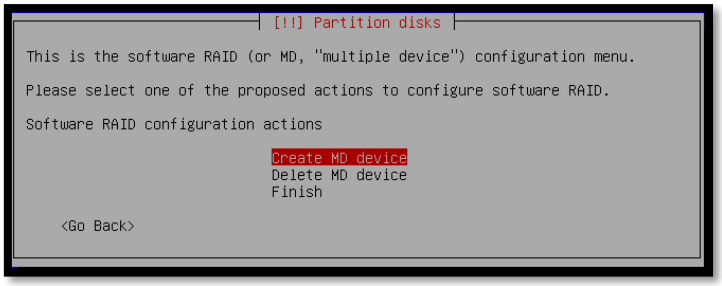

[!!] Partition disks
How to use this partition:
Ext4 journaling file system
Ext3 journaling file system
Ext2 file system
btrfs journaling file system
JFS journaling file system
XFS journaling file system
FAT16 file system
FAT32 file system
swap area
Reserved BIOS boot area
EFI System Partition
physical volume for encryption
physical volume for RAID
physical volume for LVM
do not use the partition
<Go Back>

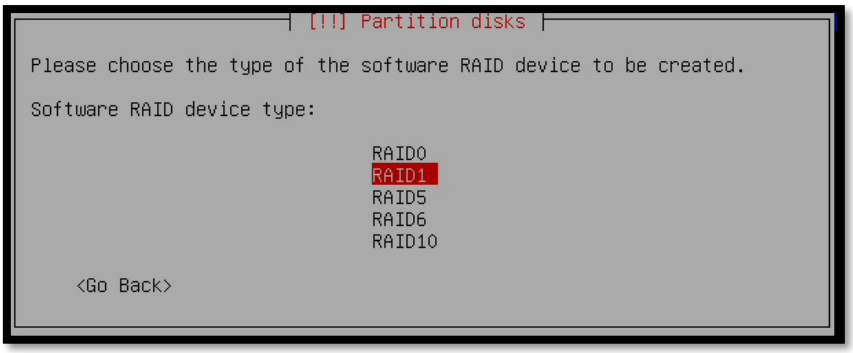


6 – Configure a RAID on the remaining disks, mimicking the configurations seen in the screenshots below





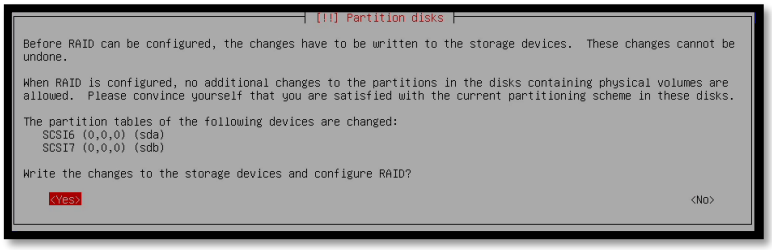


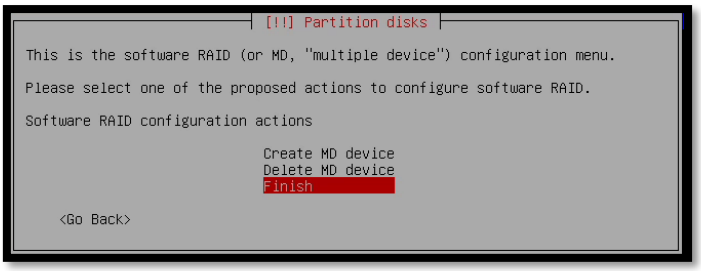

[!!] Partition disks
Please choose the type of the software RAID device to be created.
Software RAID device type:
RAID0
RAID1
RAID5
RAID6
RAID10
<Go Back>


[!!] 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>

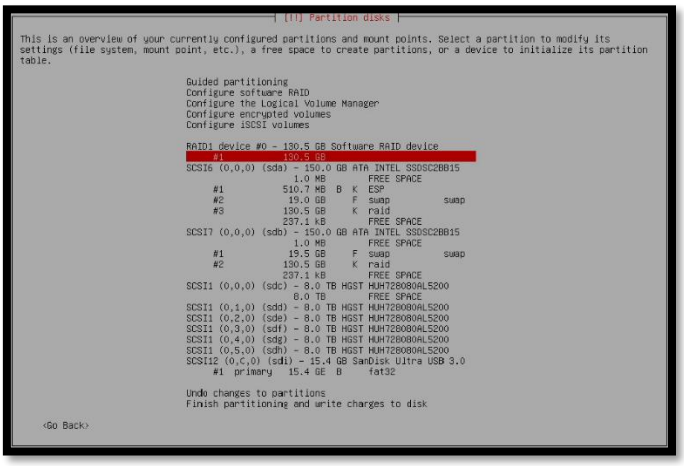

[!!] Partition disks
Number of spare devices for the RAID1 array:
0
<Go Back>
<Continue>

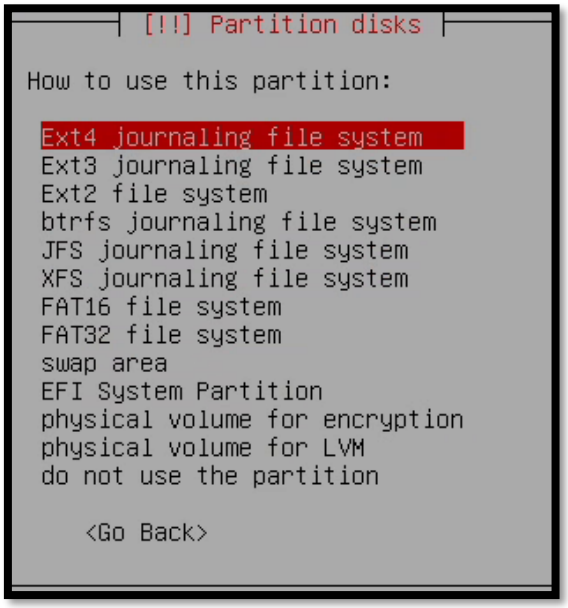

[!!] Partition disks
You have chosen to create a RAID1 array with 2 active devices.
Please choose which partitions are active devices. You must select exactly 2 partitions.
Active devices for the RAID1 array:
[ ] /dev/sda1 (510MB; ESP)
[ ] /dev/sda2 (19000MB; swap)
[*] /dev/sda free #1 (130528MB; FREE 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>

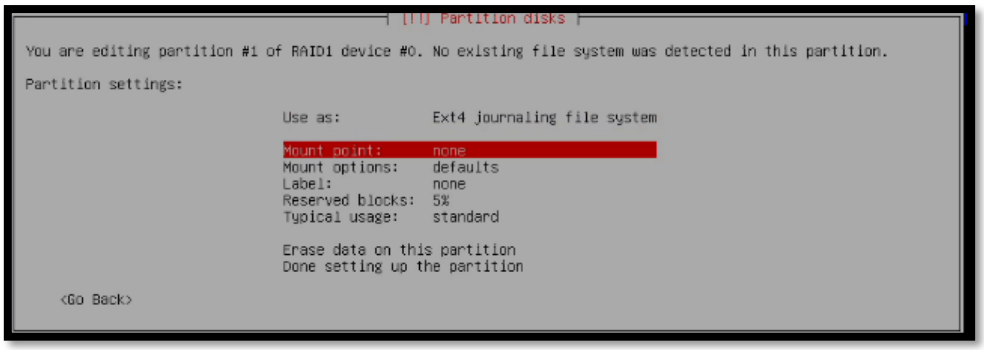

[!!] Partition disks
Before RAID can be configured, the changes have to be written to the storage devices. These changes cannot be undone.
When RAID is configured, no additional changes to the partitions in the disks containing physical volumes are allowed. Please convince yourself that you are satisfied 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>

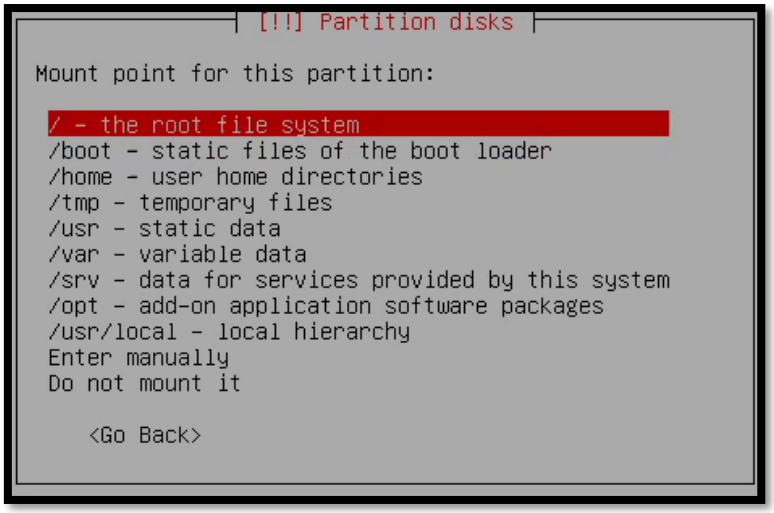


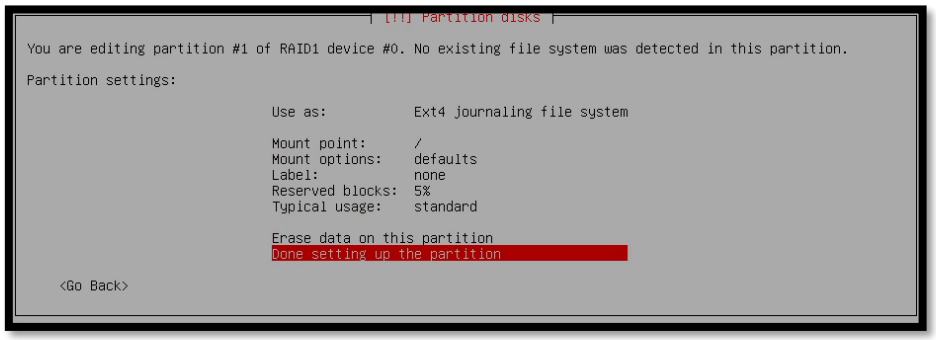
7 – Create an ext4 partition on the RAID 1 Drive with a size of 130GB



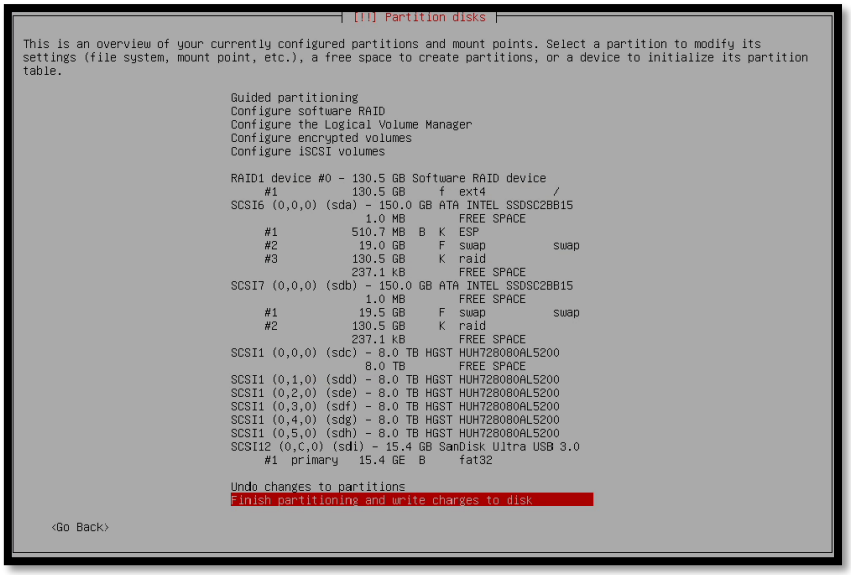



[!!] Partition disks
You are editing partition #1 of RAID1 device #0. No existing file system was detected in this partition.
Partition settings:
Use as: Ext4 journaling file system
Mount point: none
Mount options: defaults
Label: none
Reserved blocks: 5%
Typical usage: standard
Erase data on this partition
Done setting up the partition
<Go Back>

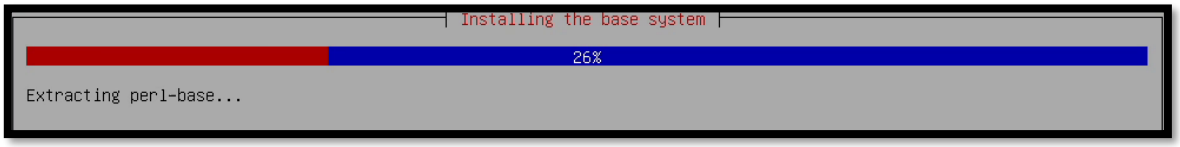

[!!] Partition disks
Mount point for this partition:
/ - the root file system
/boot - static files of the boot loader
/home - user home directories
/tmp - temporary files
/usr - static data
/var - variable data
/srv - data for services provided by this system
/opt - add-on application software packages
/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



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

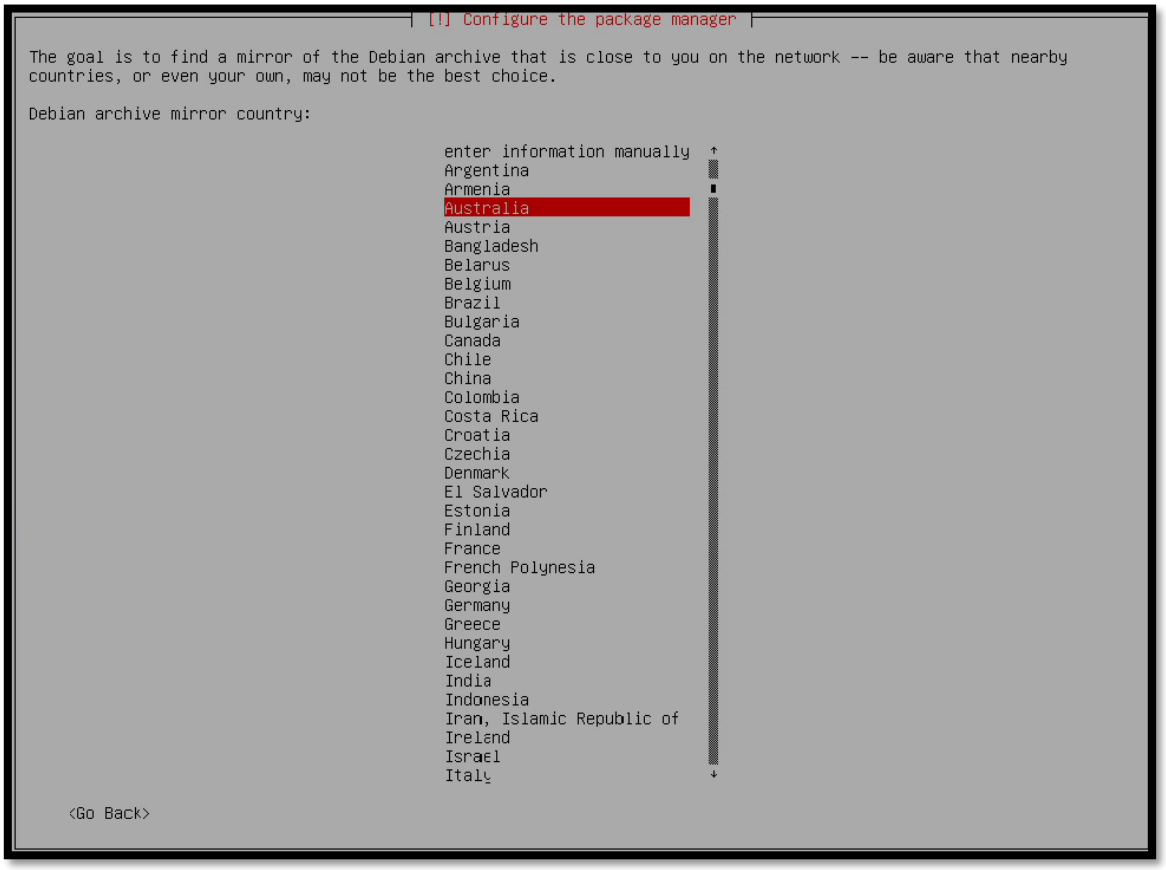


4.2.8 – Package Manager Configuration and Selecting packages

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.

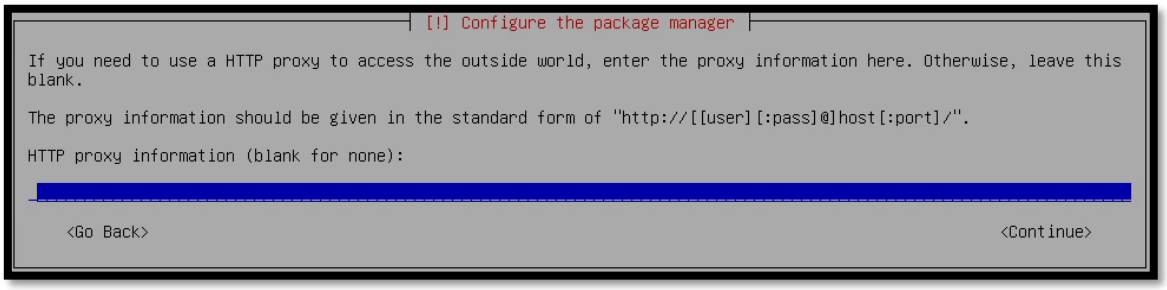
4.2.8.1 Selecting a mirror

1 – Select Closest/Residing Country



2 – Select mirror.

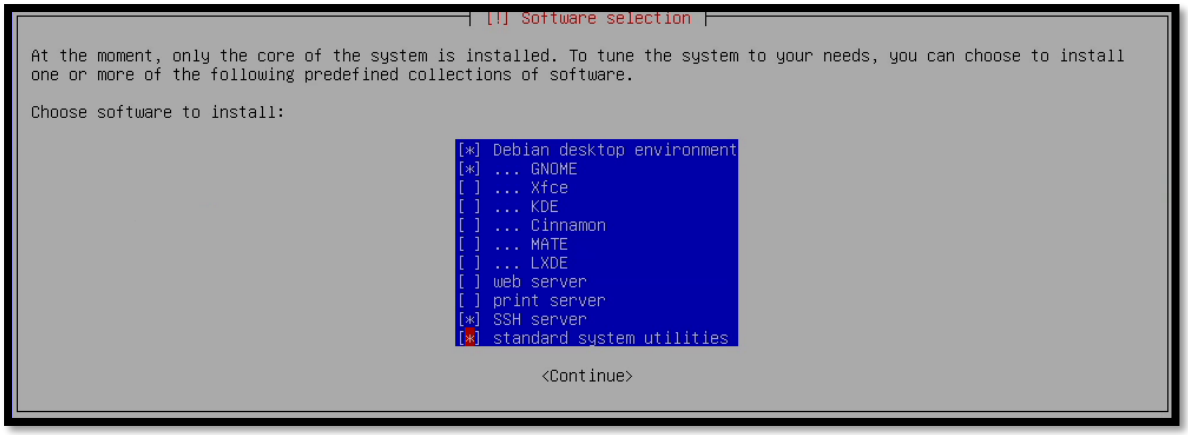
3 – This screen will appear during the package manager configuration. Press the *Enter* key to skip through



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

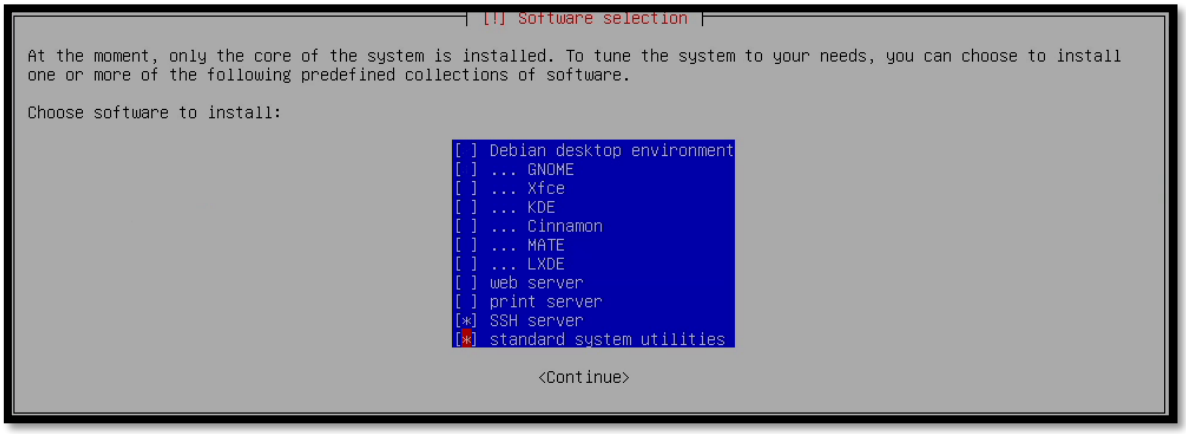
1 - **For the two management nodes,** we added a Debian desktop environment as well as the SSH Server and standard system utilities. Press the *Space bar* to select and unselect software packages. Press the *Enter* Key to Continue.



2 – Proceed to Section 4.2.8.4

4.2.8.3 – Software Selection – All other nodes

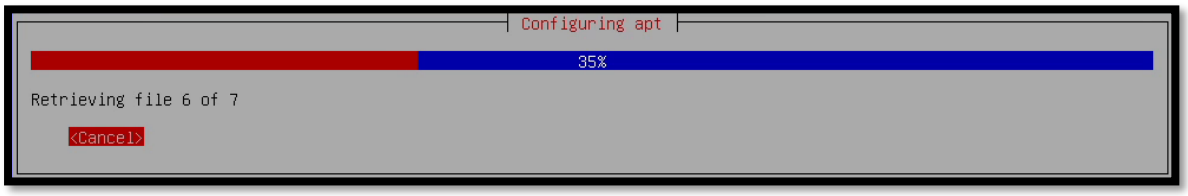
1 – **For all other nodes,** we only selected the SSH Server and Standard System Utilities. A Debian desktop environment is not required for these nodes. Press the *Space bar* to select and unselect software packages. Press the *Enter* Key to Continue.

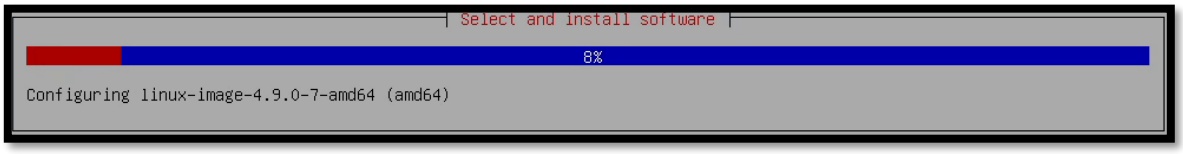


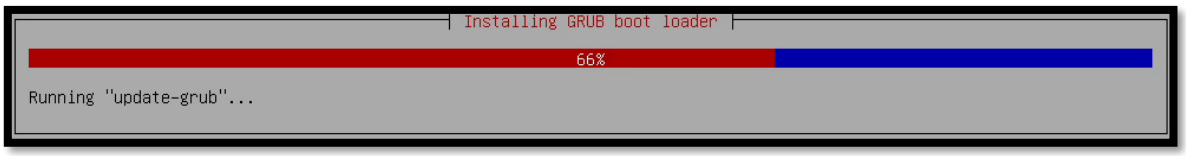
2 – Proceed to Section 4.2.8.4

4.2.8.4 – Updates from mirror

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

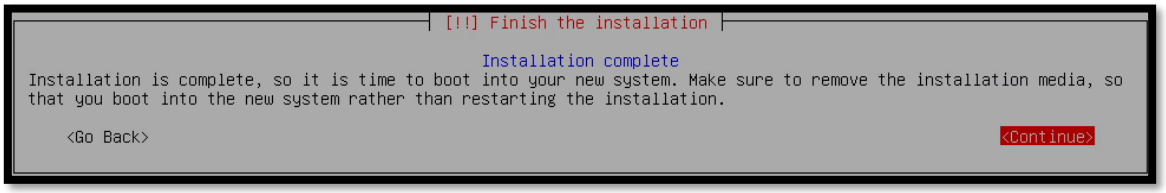






4.2.9 – Finalizing the Installation

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.

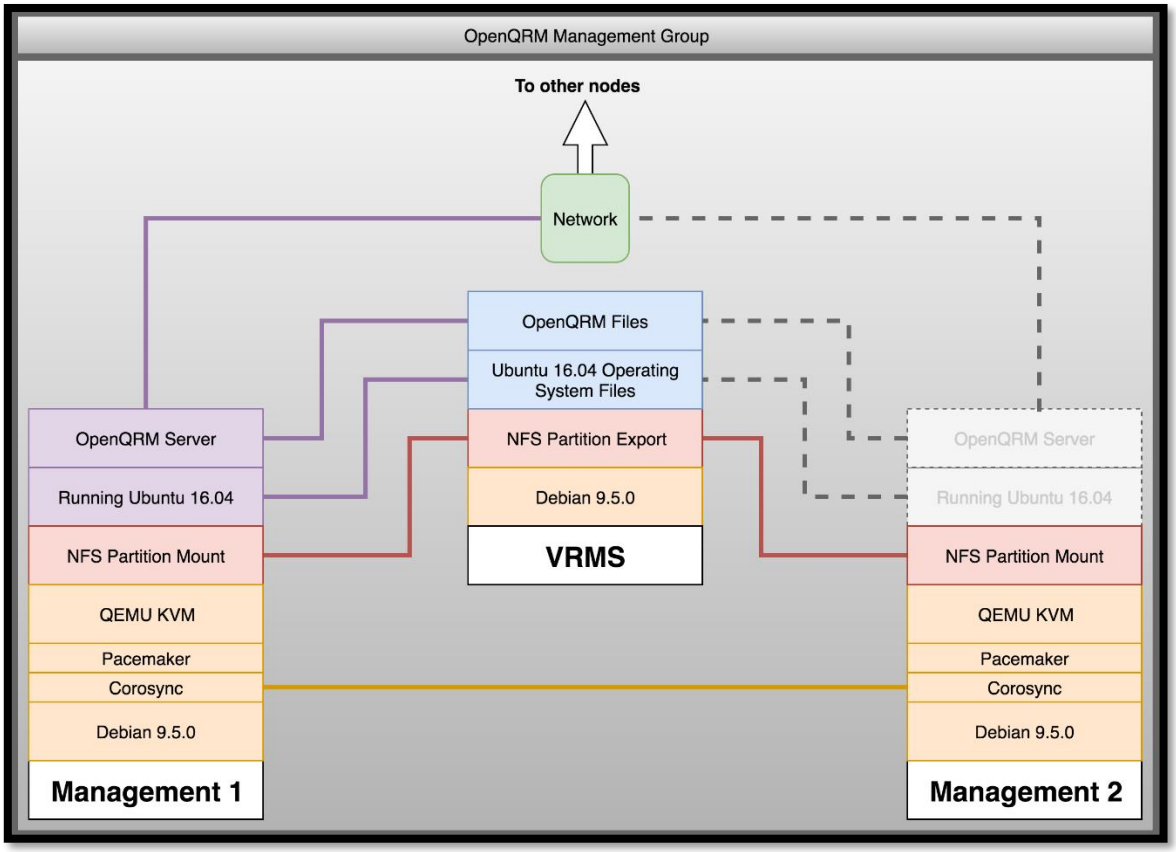


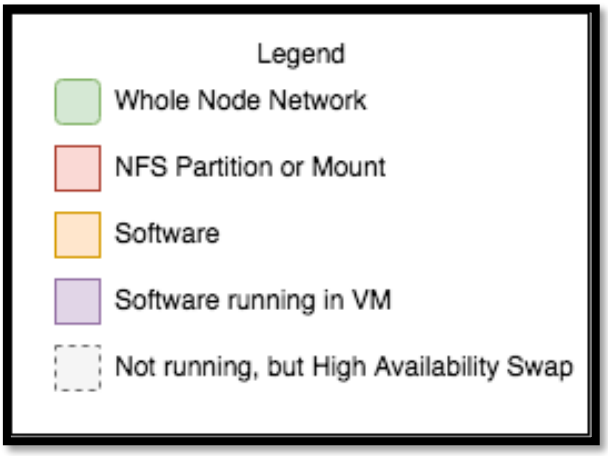
5.0 – OpenQRM Installation

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

5.1 – OpenQRM Management Group Architecture

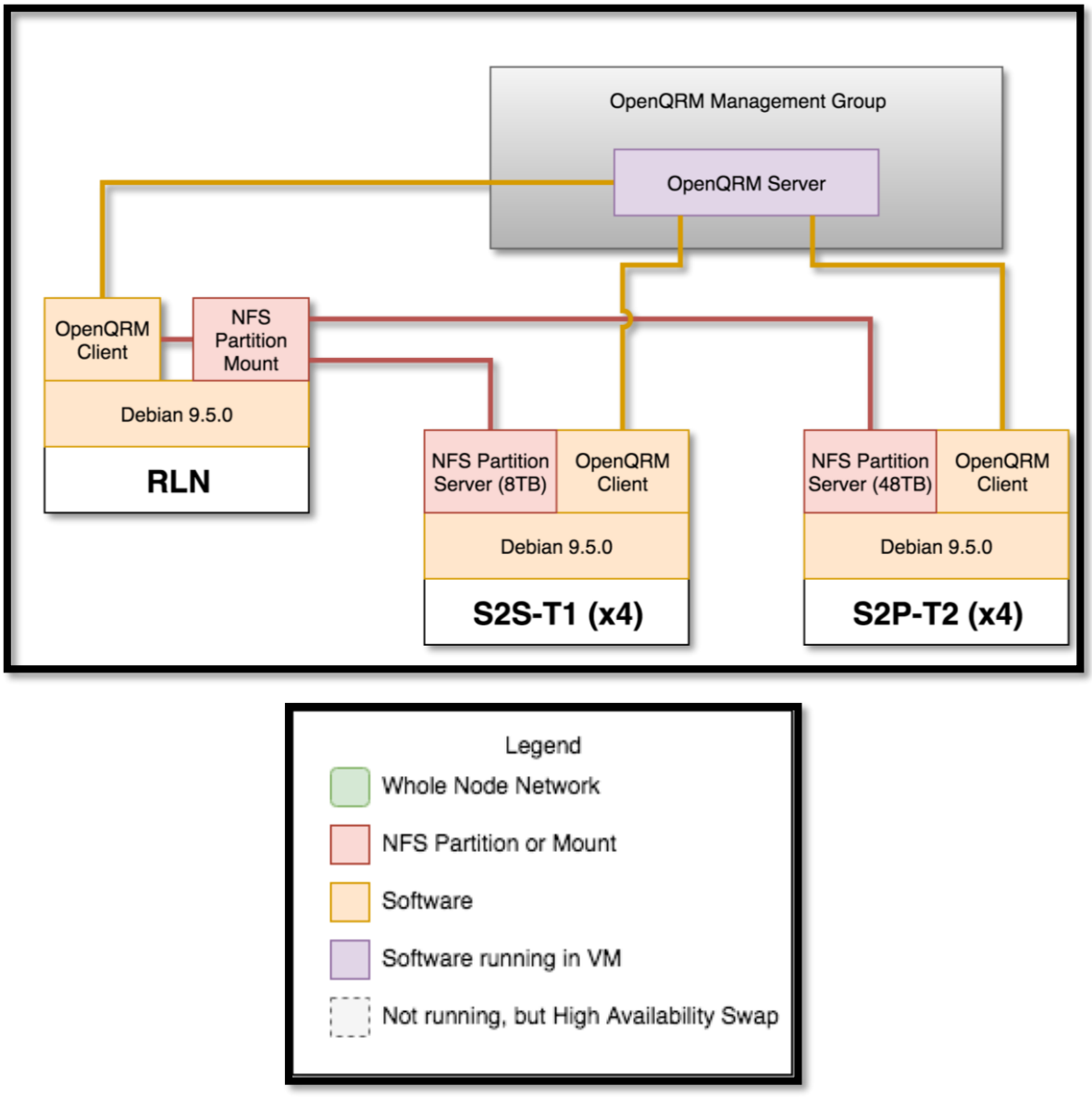
The OpenQRM Management Group includes the architecture for the two management nodes and how they manage their *High Availability* functionality. As seen in the diagram, the OpenQRM Server with the grey tint, is set up on the Management 2. This will take over if the OpenQRM Server running on Management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

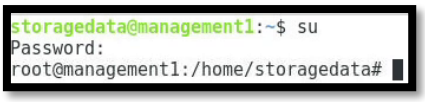


5.3 – OpenQRM Installation Preparation (Management Nodes)

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.

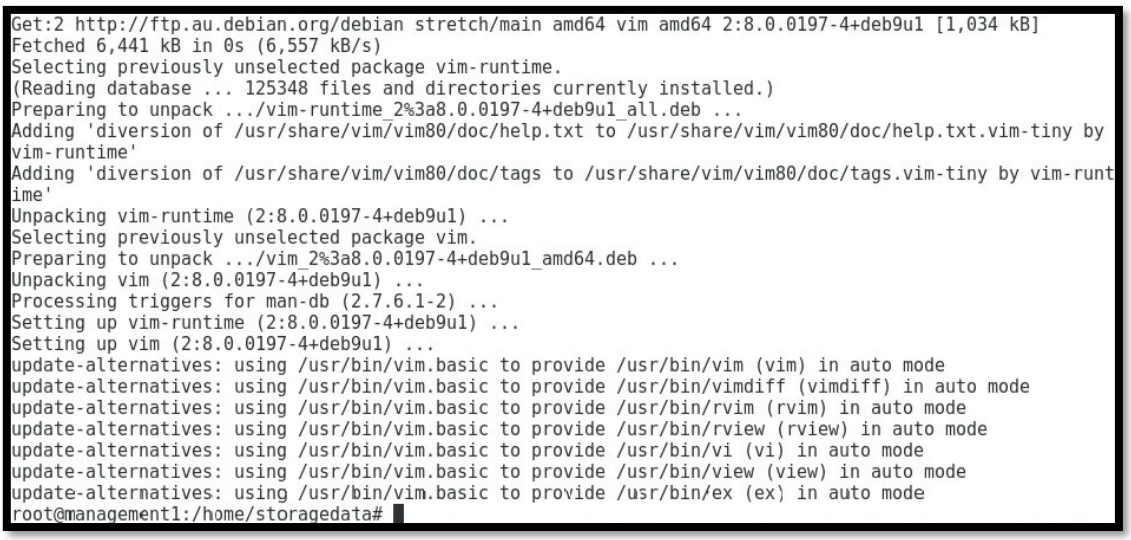


5.3.1 – Installing required packages

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*

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



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

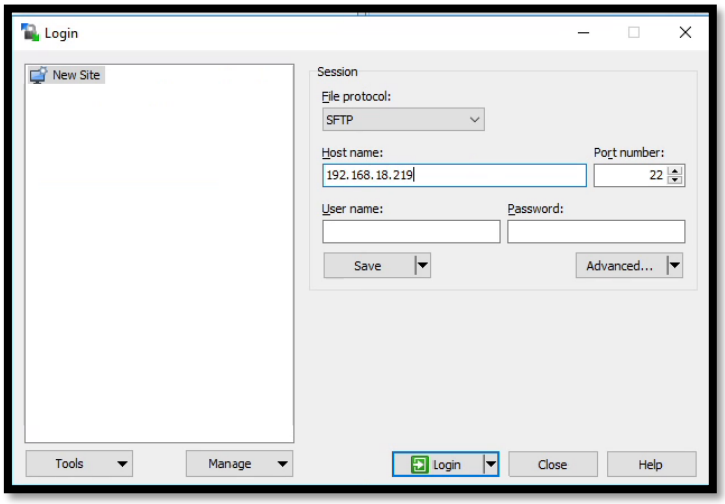
```
# This file describes the network interfaces available on your system
# and how to activate them. For more information, see interfaces(5).

source /etc/network/interfaces.d/*

# The loopback network interface
auto lo
iface lo inet loopback

# Automatic DHCP for ens20f1 so 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.

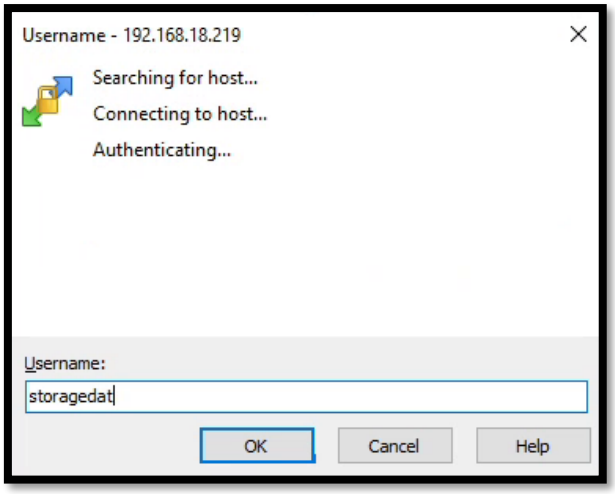


2 – Click the *Login* Button

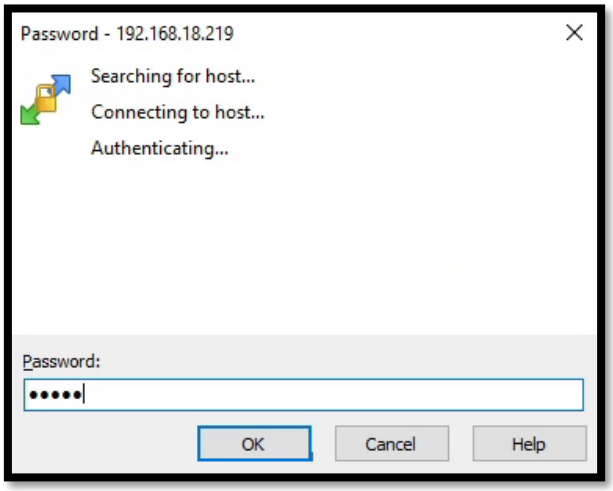
3 – This Dialog may appear.

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

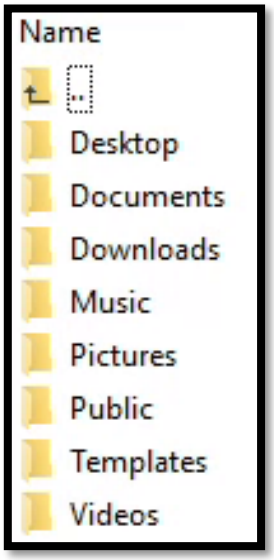
5 – Type in the username for the management node. In this case, it was *storagedata*.



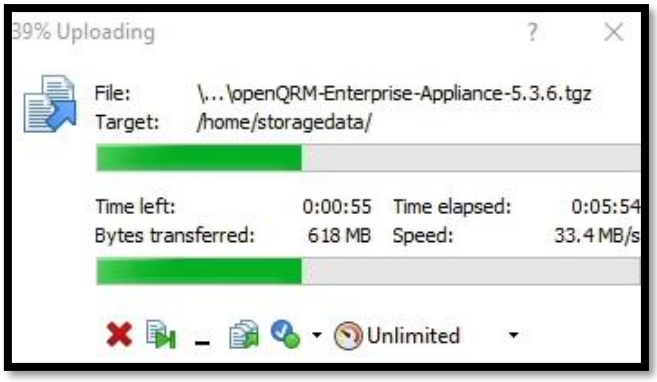
6 – Type in the password for the management node. In this case, it was *admin*



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

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

4 – Enter the following to get to the extracted directory

cd openQRM-Enterprise-Appliance

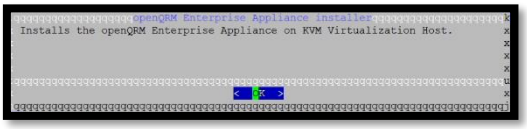
```
root@management1:/home/storagedata# cd openQRM-Enterprise-Appliance
```

5 – Start the installer application by entering the following command

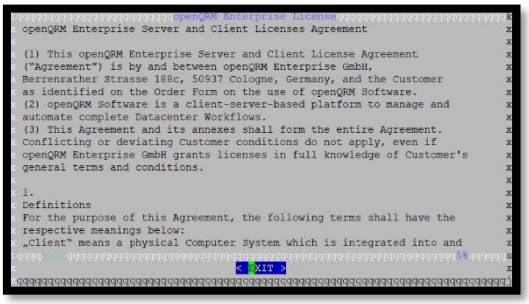
./openQRM-Enterprise-Appliance

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

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



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

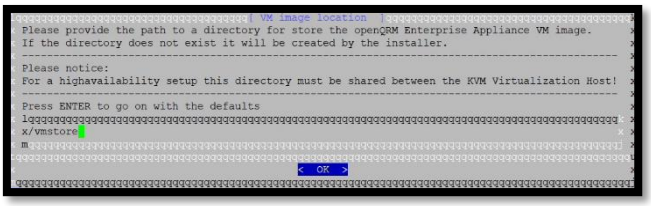


8 – Click *Yes* to accept the OpenQRM License

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*.

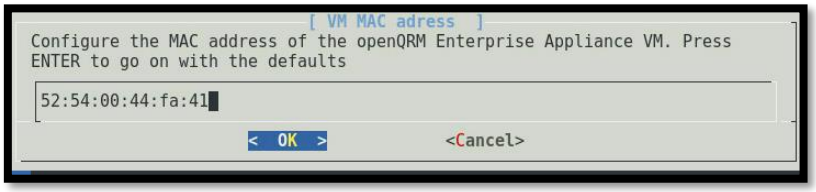


Please proceed to section 5.3.4.1 and then proceed to section 5.3.4.2.

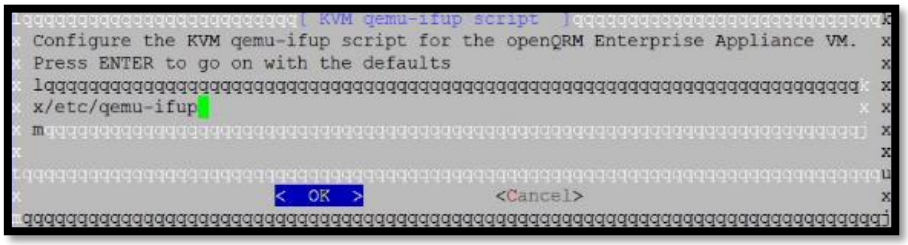
5.3.4.1 – Installation process continuation for Management 1

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.*

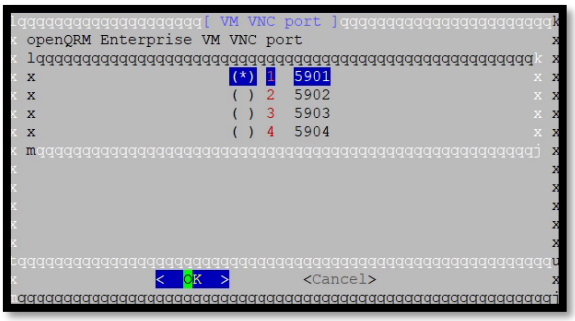


2 – The defaults here will be suitable. Click *OK*.

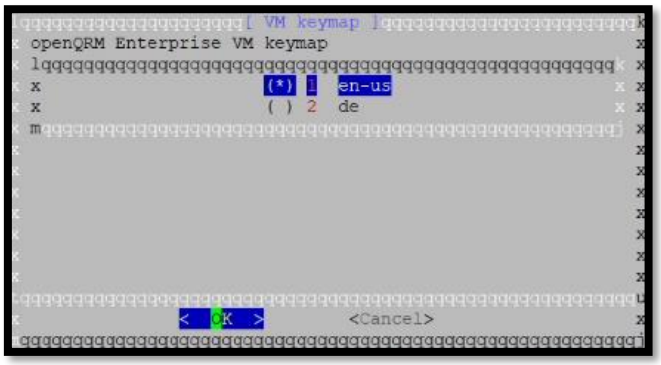


3 – Leave Port *5901* as the default. Click *OK*.

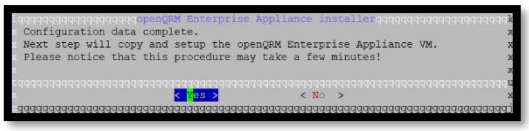
If another port is selected, record the port for later use

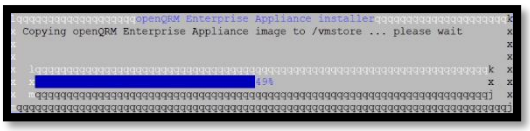


4 – Leave as default here. Click *OK.*

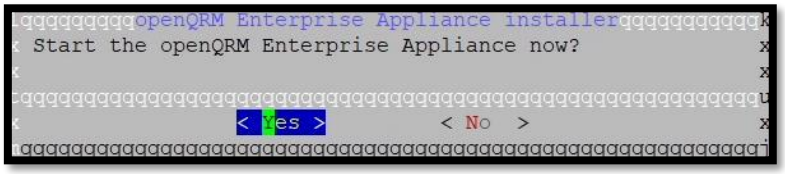


7 – Click *Yes* here, the OpenQRM Image will begin copying to the shared store.

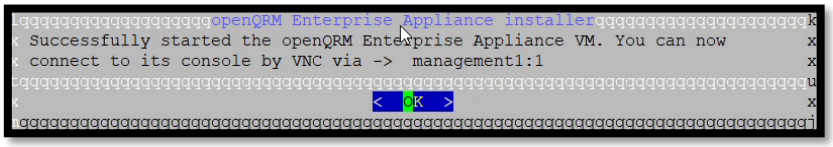


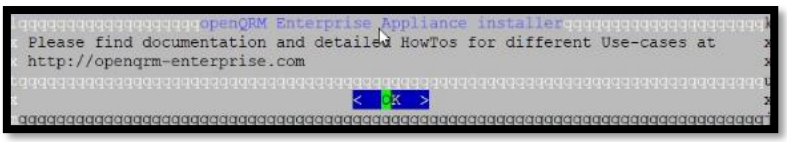


8 – Click *Yes* here to start the OpenQRM Appliance.



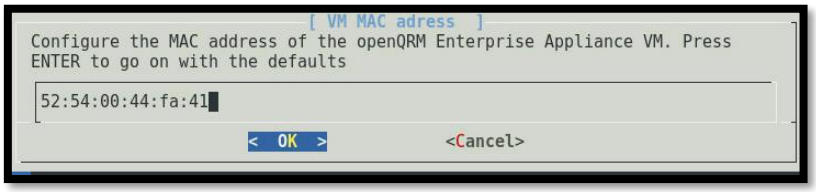
9 – Click *OK* on all the following dialogs dialog.



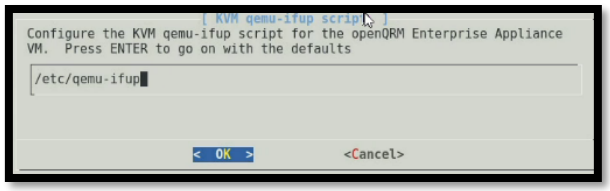


5.3.4.2 – Installation process for Management 2

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

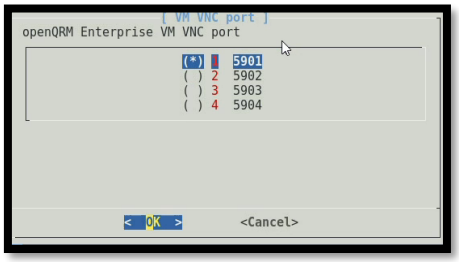


2 – Defaults are suitable. Click *OK* on all the dialogs shown below.

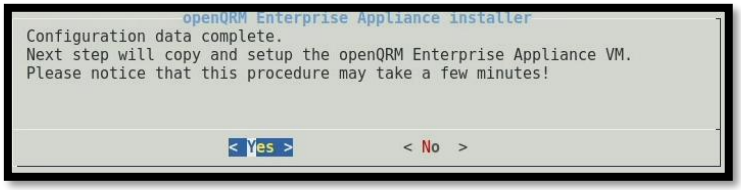


3 – Leave Port *5901* as the default. Click *OK*.

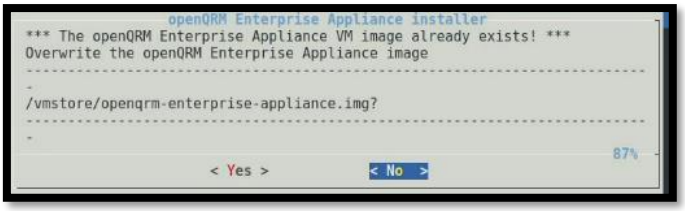
If another port is selected, record the port for later use.



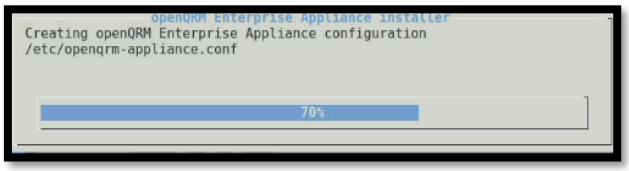
4 – Click *Yes* on this dialog



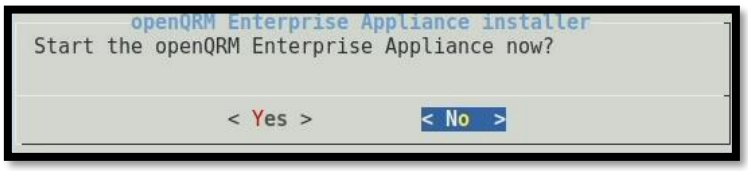
5 – Click *No* as we do not want to overwrite existing the image.



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

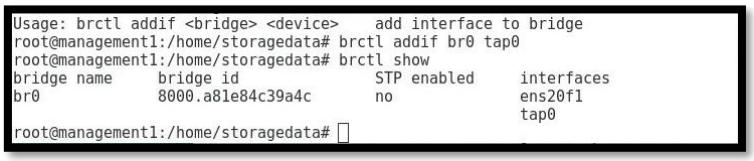
Please open a terminal on Management 1

1 – Enter the following into the terminal

brctl addif br0 tap0

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

b*rctl show*

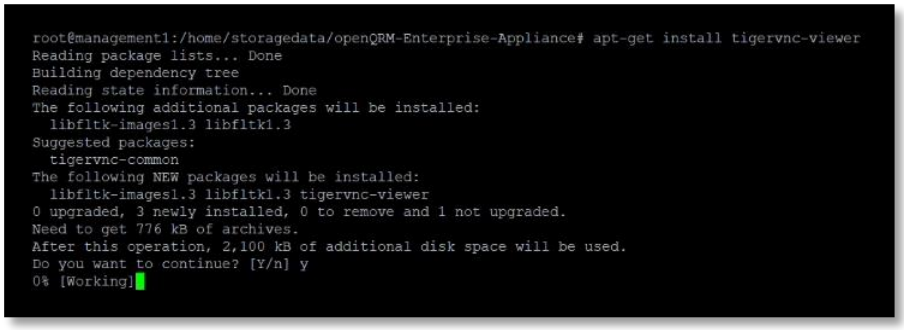


5.3.6 – Access OpenQRM VM through VNC

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

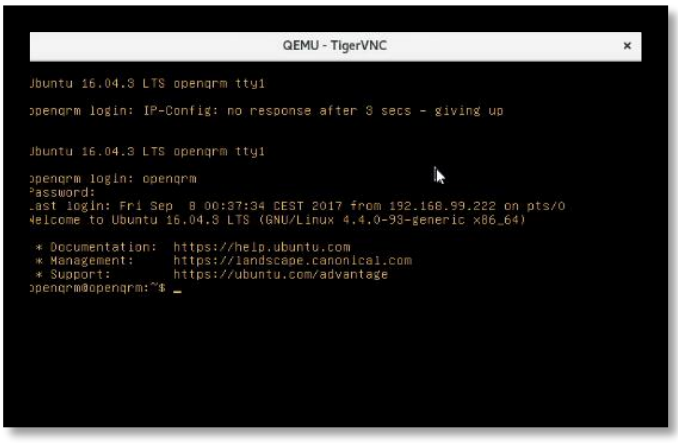


2 – Type the following into the terminal

vncviewer management:1

3 – Log into the OpenQRM VM using the following credentials

Username: *openqrm*
Password: *openqrm*



5.3.7 – OpenQRM Internal Network Configuration (OpenQRM VM)

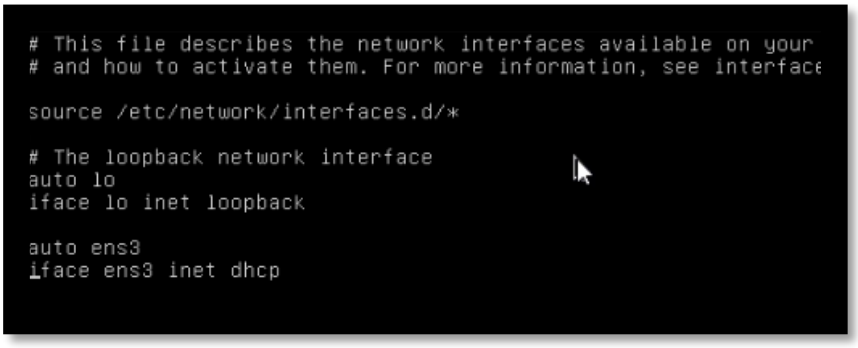
1 – Type the following to edit the Network Configuration file

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



2 – Reboot the OpenQRM machine by entering the following:

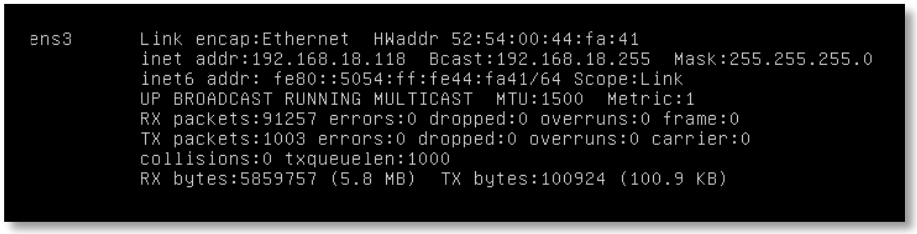
sudo reboot

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.



5.3.8 – Update OpenQRM (OpenQRM VM)

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

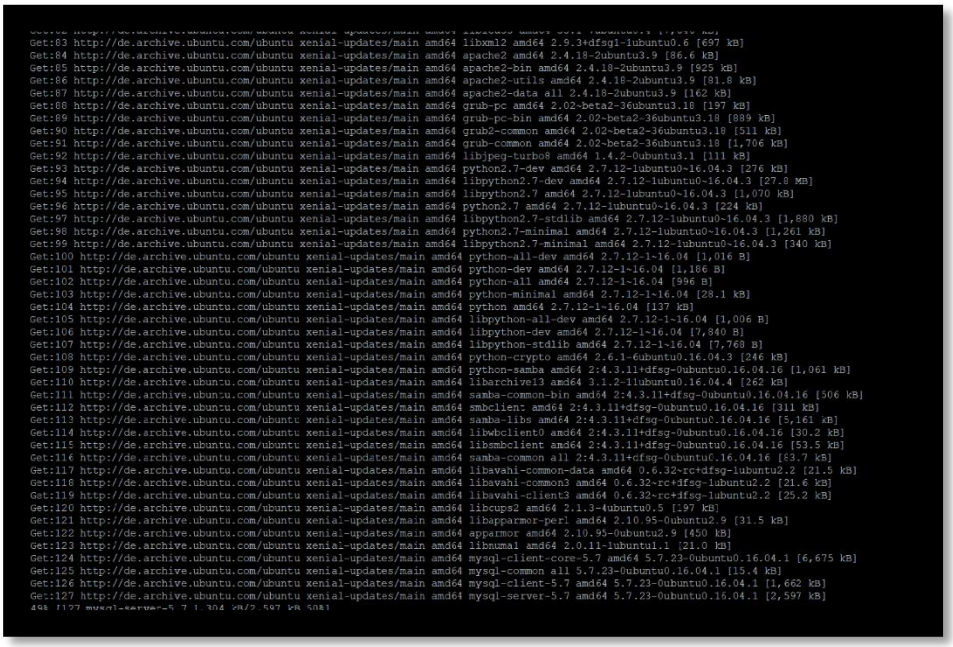
sudo apt-get update && sudo apt-get upgrade

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.



5.3.9 – Transferring OpenQRM Installation to OpenQRM VM

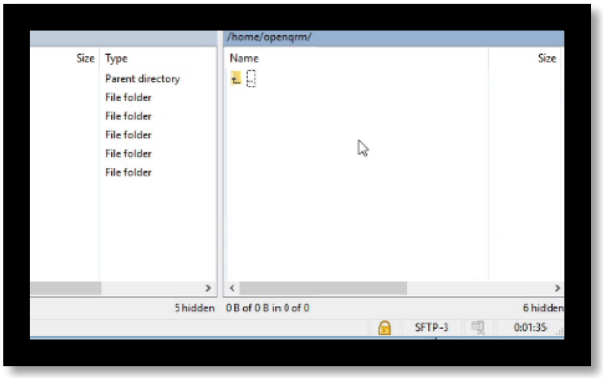
Please follow a similar process as seen in Section 5.3.3 for WinSCP.

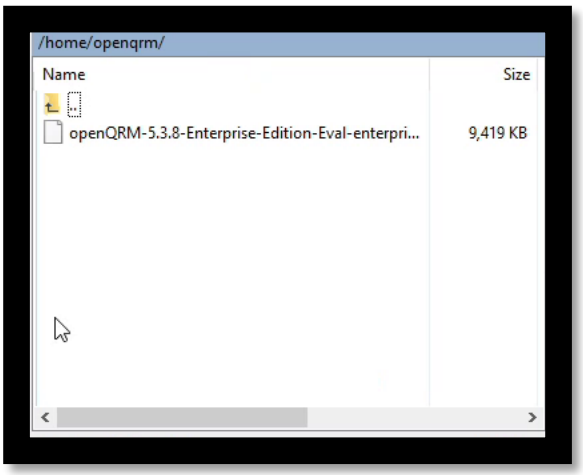
1 – From a machine connected on the same network, access the OpenQRM VM using the IP obtained from step 3 in Section 5.3.7 using WinSCP (or similar application).

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:

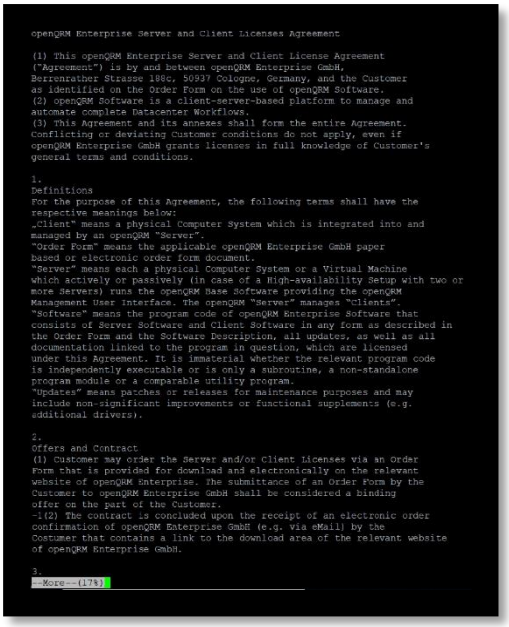
sudo ./install-openqrm.sh

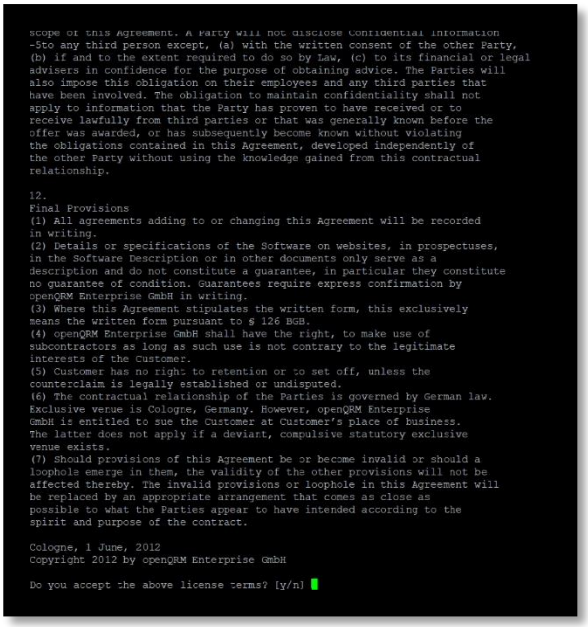
You may be prompted for a password. Use the following credentials:

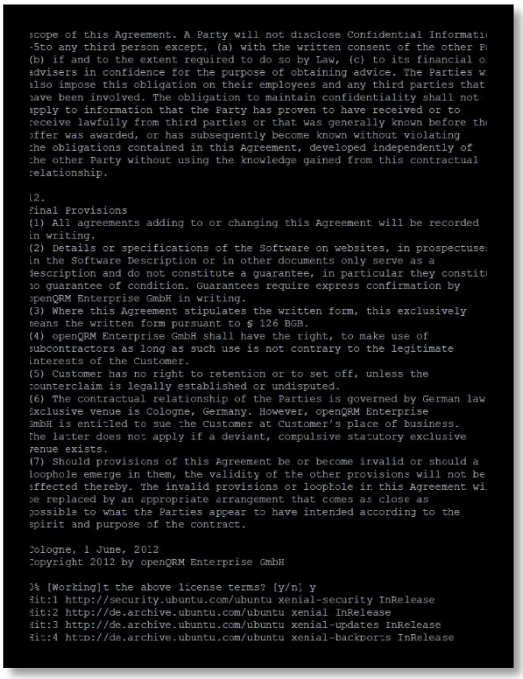
Username: openqrm
Password: openqrm

```
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
```

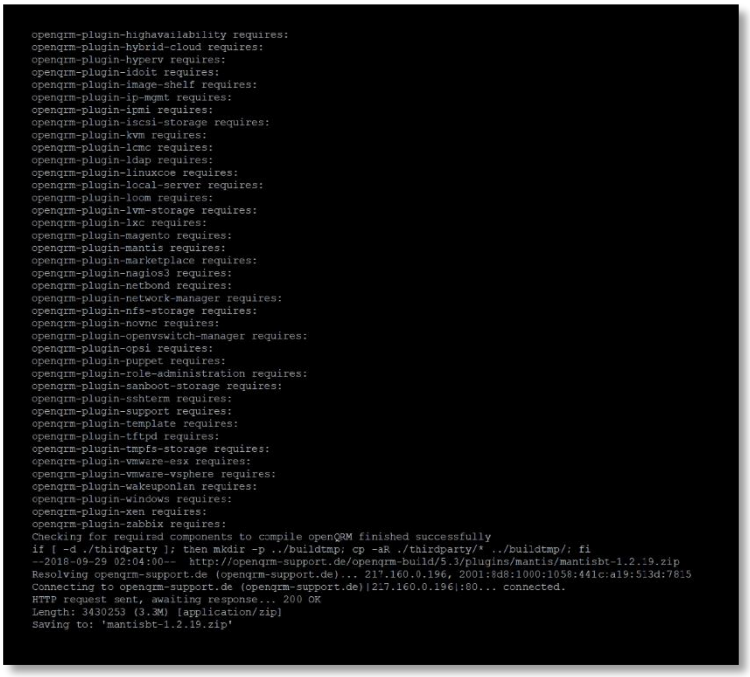
4 – Press *ENTER* to review the openQRM License. Enter *y* when the end of the license is reached to accept the license.

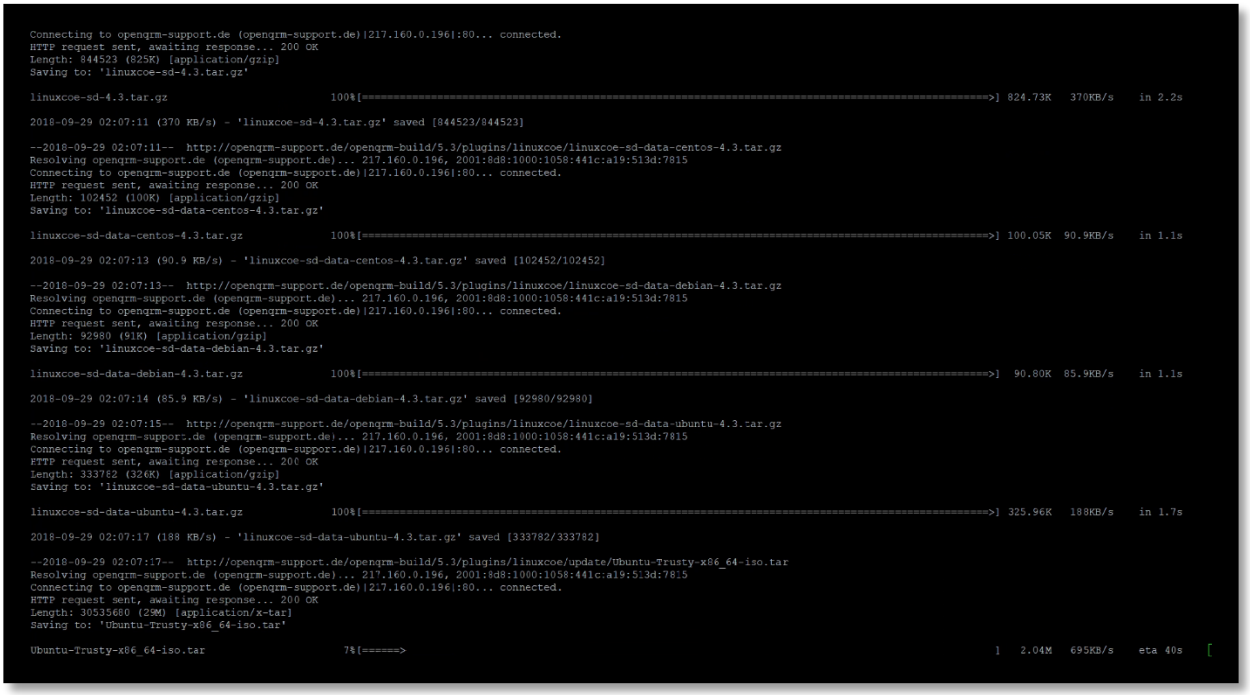




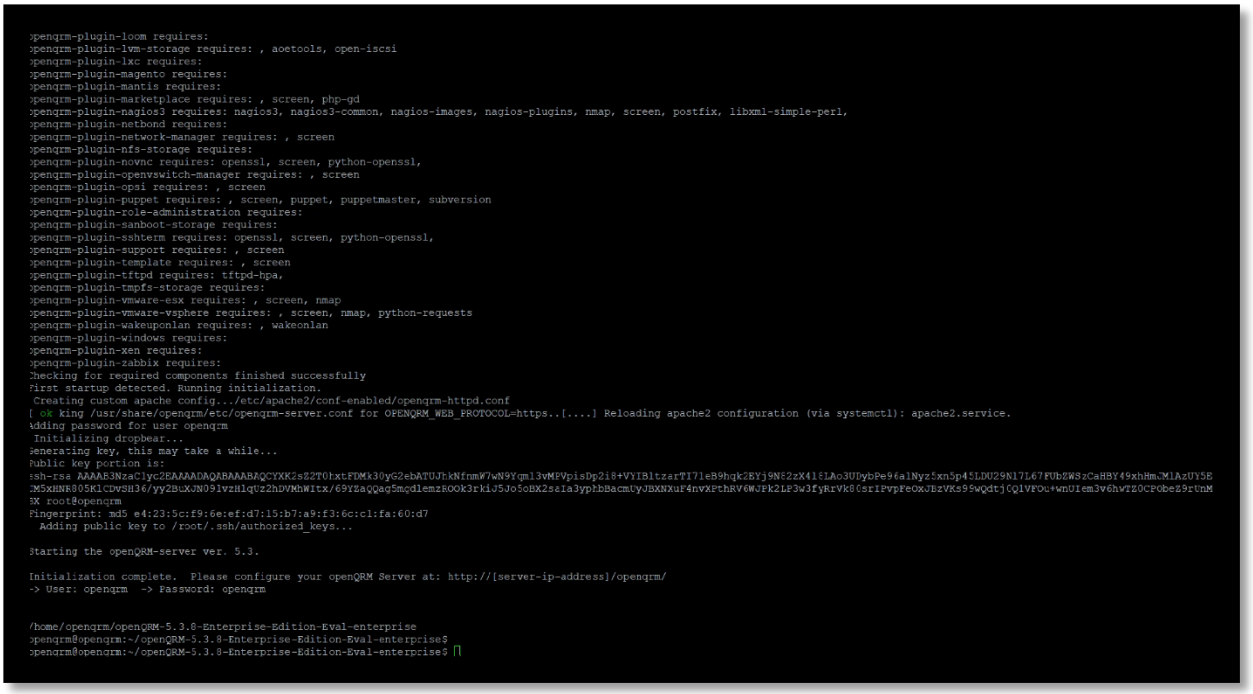


5 – Wait for the rest of the installation to complete





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



5.3.11 – OpenQRM Web Access

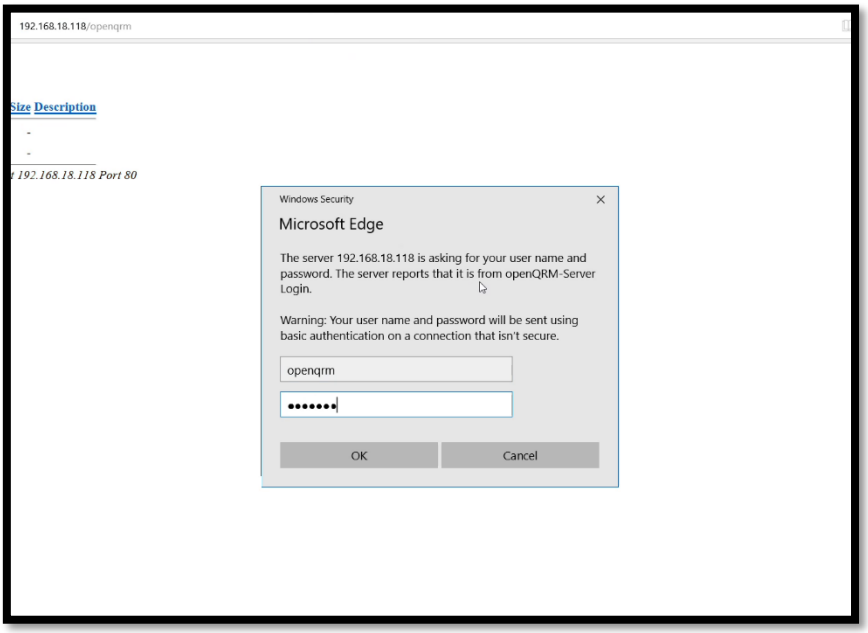
1 – On a machine running on the same network, open a web browser and enter the following into the URL bar:

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

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

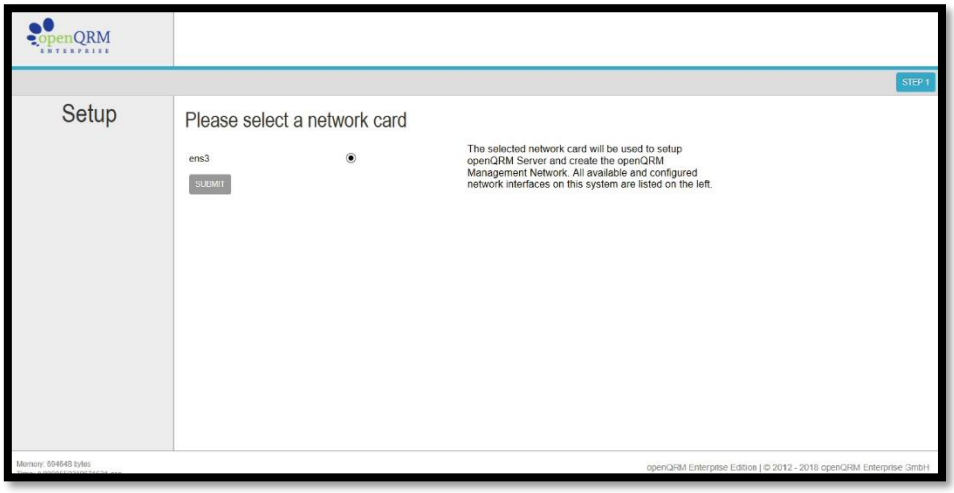
2 – There will be a dialog prompt for credentials. Use the follow credentials:

Username: *openqrm*
Password: *openqrm*

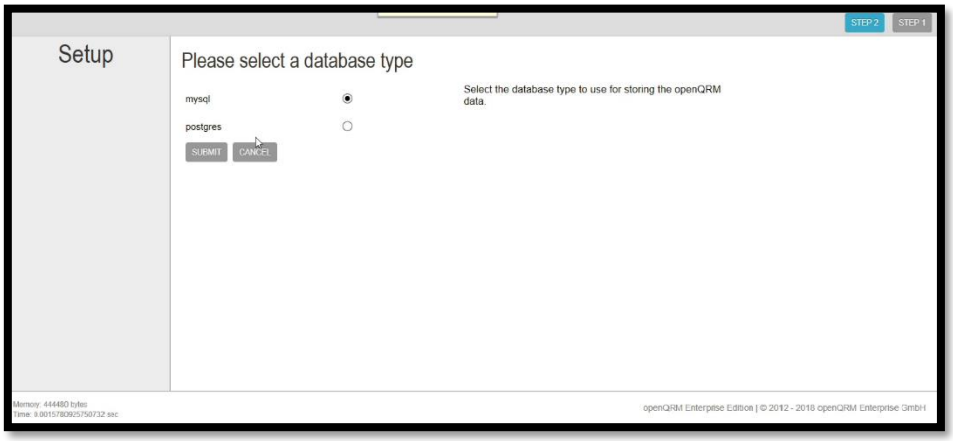


5.3.12 – OpenQRM Initial Configuration and Licensing

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



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

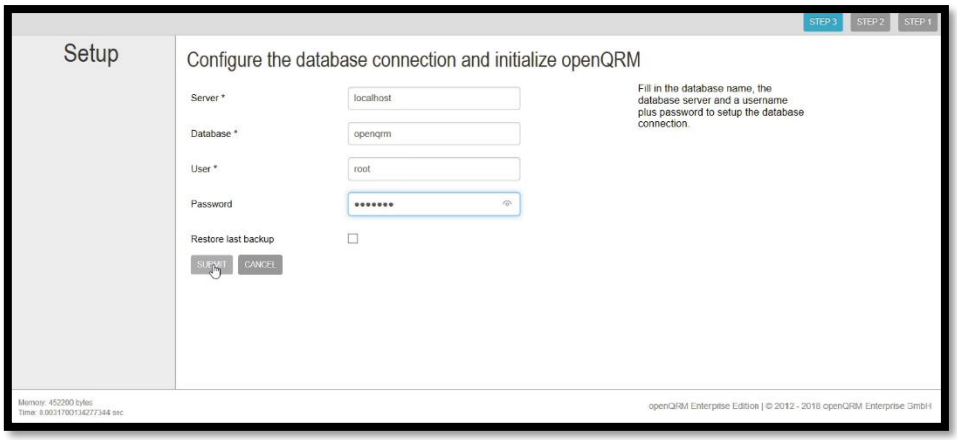


3 – Enter a user name and password of your choice. We used the following credentials:

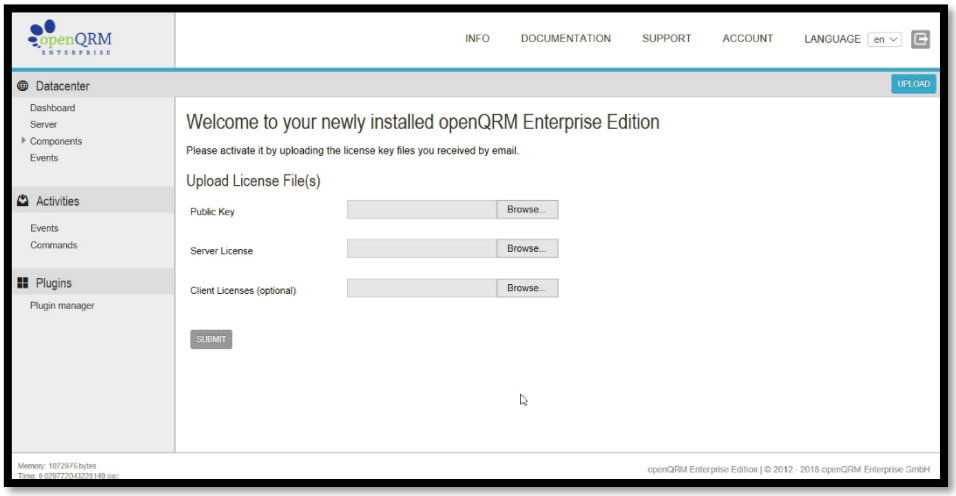
User: *root*

Password: *openqrm*

Click the *SUBMIT* button.

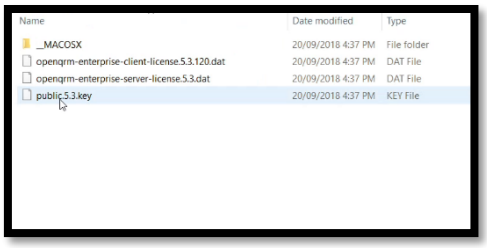


4 – This screen will now appear



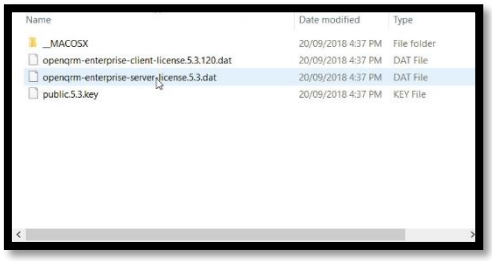
5 – Click the *Browse* button for *Public Key*

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



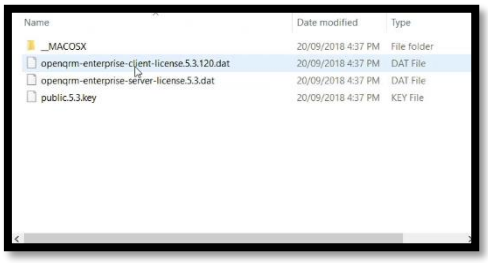
7 – Click the *Browse* button for *Server License*

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



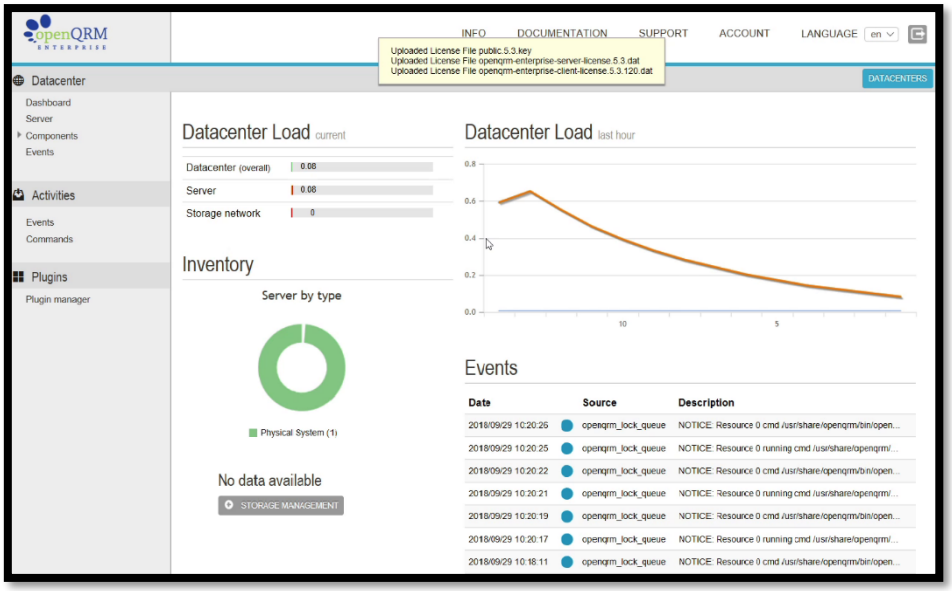
9 – Click the *Browse* button for Client Licenses

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



11 – Click the *SUBMIT* Button

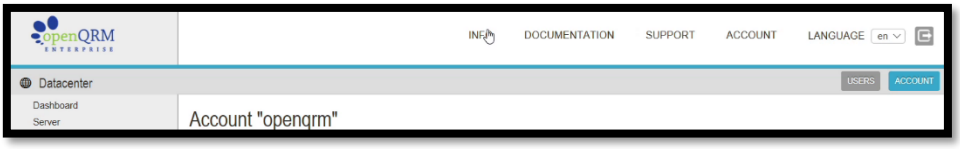
12 – The OpenQRM initial set up process is complete. The dashboard will now appear



5.3.13 – Extra Licensing in OpenQRM

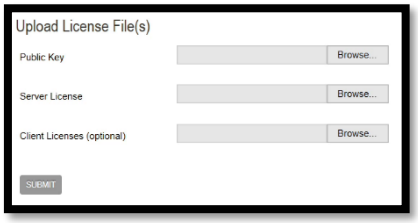
Multiple Licenses files can be added consecutively to OpenQRM. This is how more licenses can be added after the initial OpenQRM configuration process.

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.

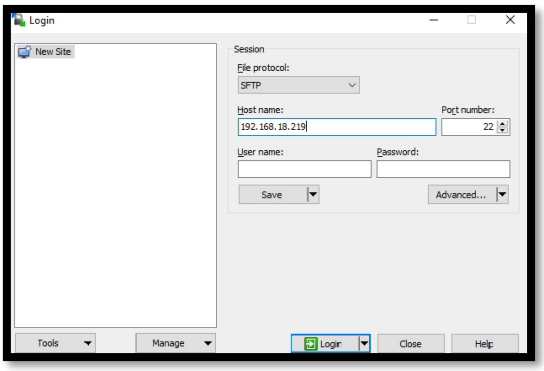
5.4.1 – Installing required packages

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

2 – Wait for the package installation to finish

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.

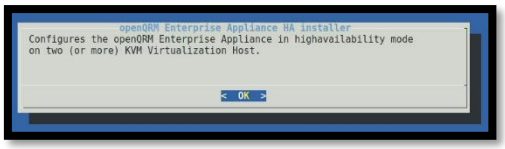


1 – Ensure that the current directory is the openQRM Install directory using the *cd* command.

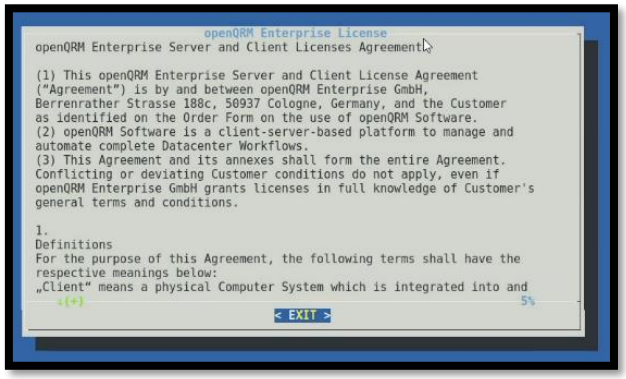
2 – Enter the following command to begin the Appliance High Availability Setup:

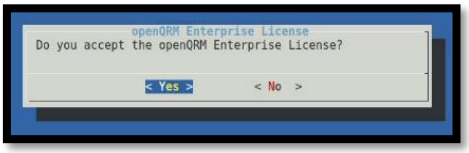
sudo ./openQRM-Enterprise-Appliance-HA-cluster-setup

3 – Select *OK* here

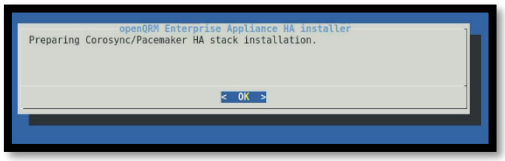


4 – Follow the installers steps to accept the license.





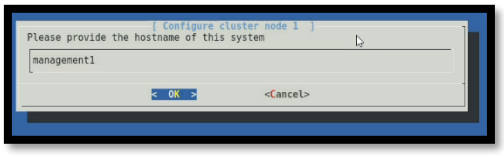
5 – Select *OK* here



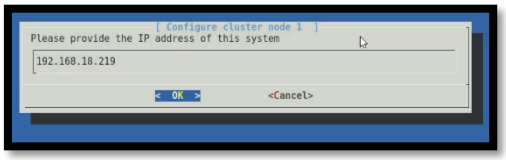
6 – Enter the hostname of the relevant system that the installer is running on.

For Management 1, use: *management1*

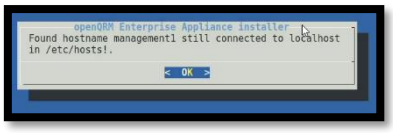
For Management 2, use: *management2*

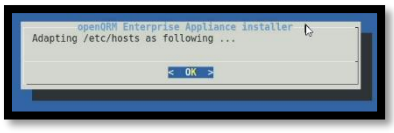


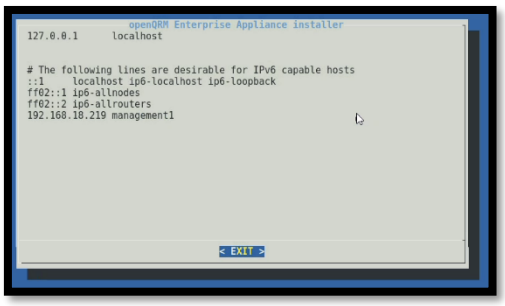
7 – Enter the IP of the relevant system that the installer is running on. This can be found by running *ifconfig* in a separate terminal.



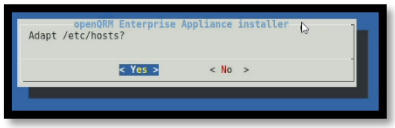
8 – Select *OK* or *EXIT* on the following screens to continue past them







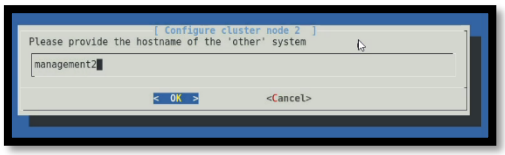
9 – Select *Yes* here



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*

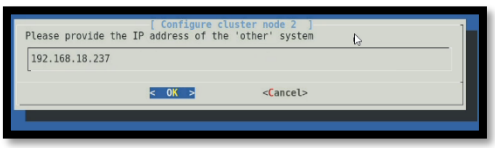


11 – Enter the IP of the relevant **'other'** system that the installer is running on. This means:

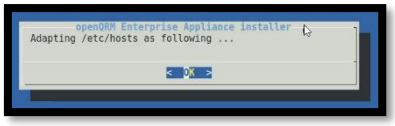
For Management 1, use the IP of Management 2

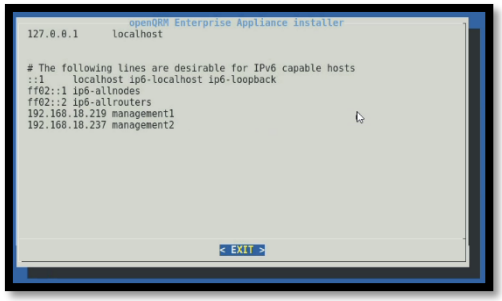
For Management 2, use the IP of Management 1

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

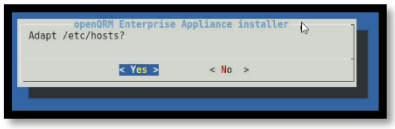


12 – Select *OK* or *EXIT* buttons to continue through the shown dialogs

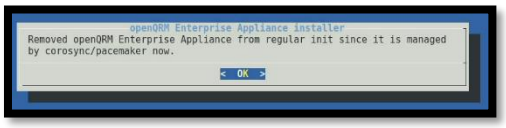


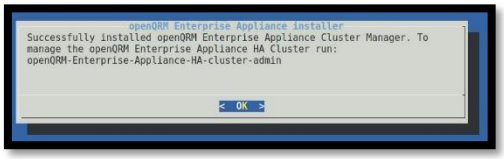


13 – Select *Yes* here



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

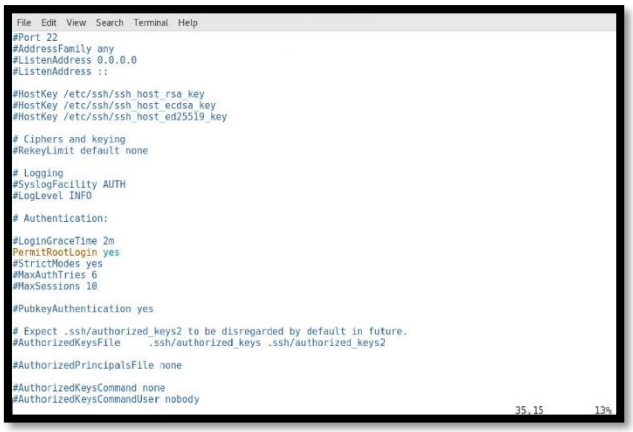
```
root@management1:/home/storagedata/openQRM-Enterprise-Appliance# vi /etc/ssh/sshd_config
```

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

PermitRootLogin yes

This should reflect the screenshot below.

Save and Exit.



3 – Enter the following command into the terminal:

service sshd restart

```
root@management1:/home/storagedata/openQRM-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.

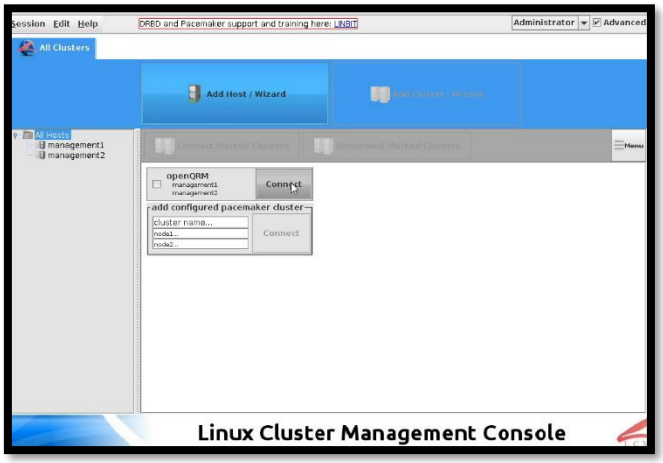
Please ensure that this section is performed in a desktop environment (i.e. not an SSH Terminal)

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

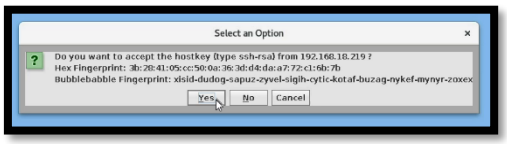
2 – Enter the following command to start up the Linux Cluster Management Console:

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

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

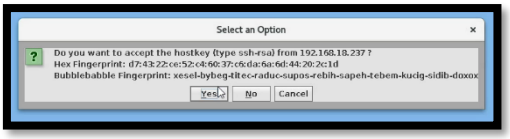


4 – Click *Yes* on this dialog



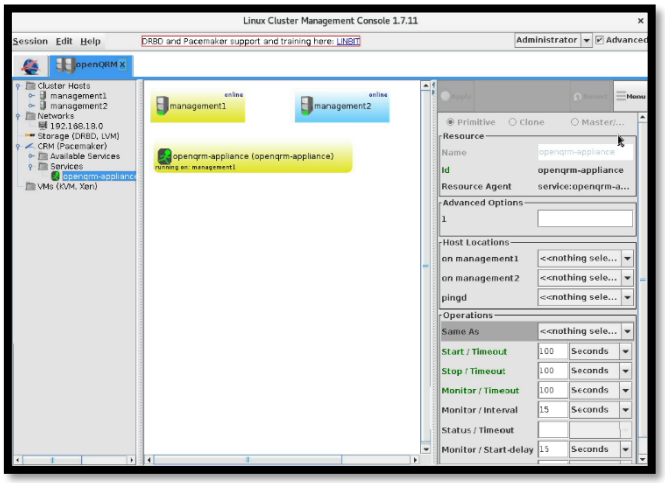
5 – Enter the root password for management 1 into the dialog shown. In this case it was *admin*

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

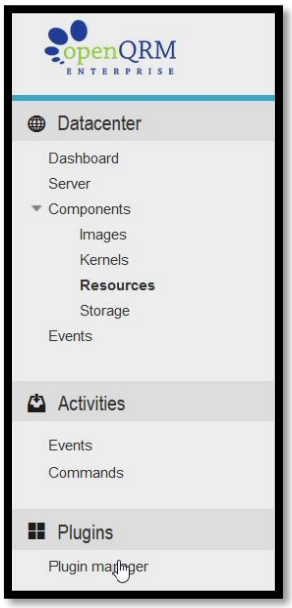


5.5 – OpenQRM Resource Configuration

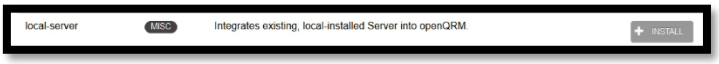
5.5.1 – OpenQRM local-server Plugin Installation

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

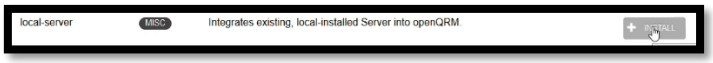
2 – Click on the *Plugin Manager* text on the left-hand panel



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

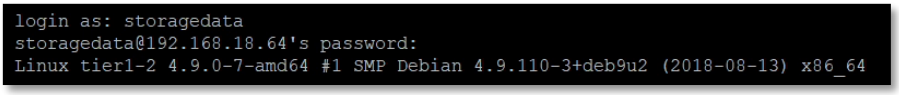
> *scp /usr/share/openqrm/plugin/local-server/bin/openqrm-local-server storagedata@**<IP of target machine>:/tmp/***

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.

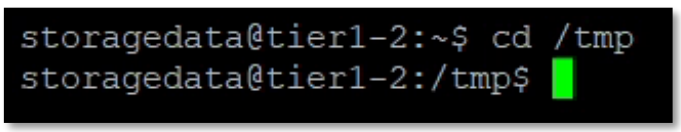
3 – When prompted with the following message, enter *yes*

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

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



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



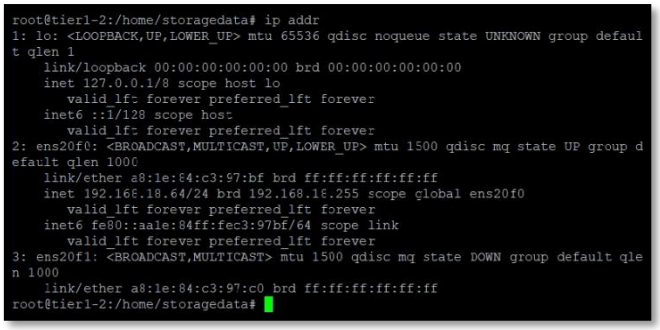
7 – Enter the following command to get the MAC Address of the connect network adapter

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*



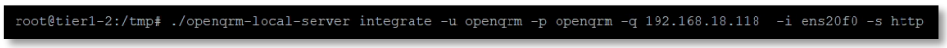
8 – Enter the following command into the terminal:

sudo ./openqrm-local-server intergrate -u openqrm -p openqrm -q ***<IP of OpenQRM Server>***

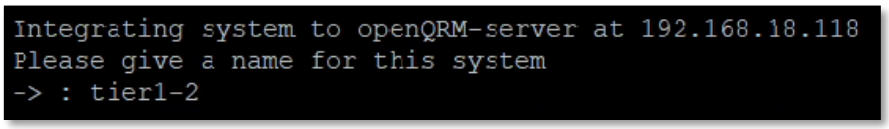
-i ***<Connected network adapter>*** *-s http*

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

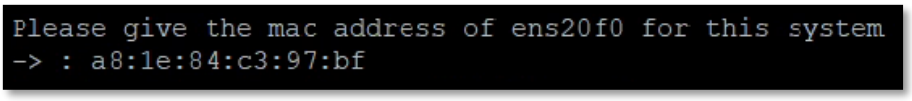
Replace **<Connected network adapter>** with the network adapter in Step 7.



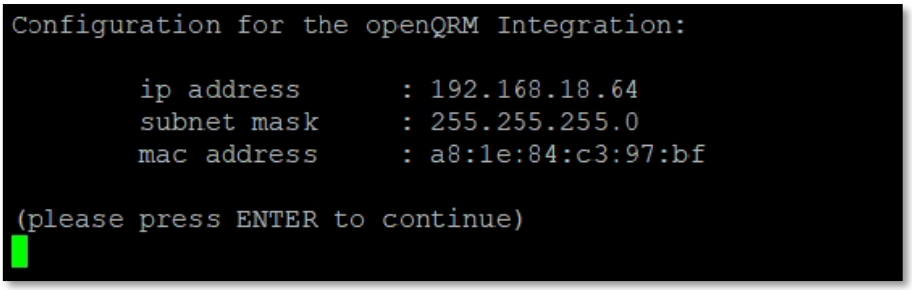
9 – Give a name for the system. This name will be used to identify this machine in OpenQRM.



10 – Enter the MAC address obtained from step 7



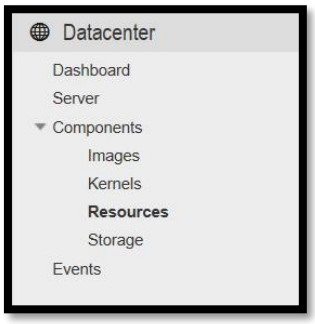
11 – The final Configuration is shown. Press *ENTER* to continue



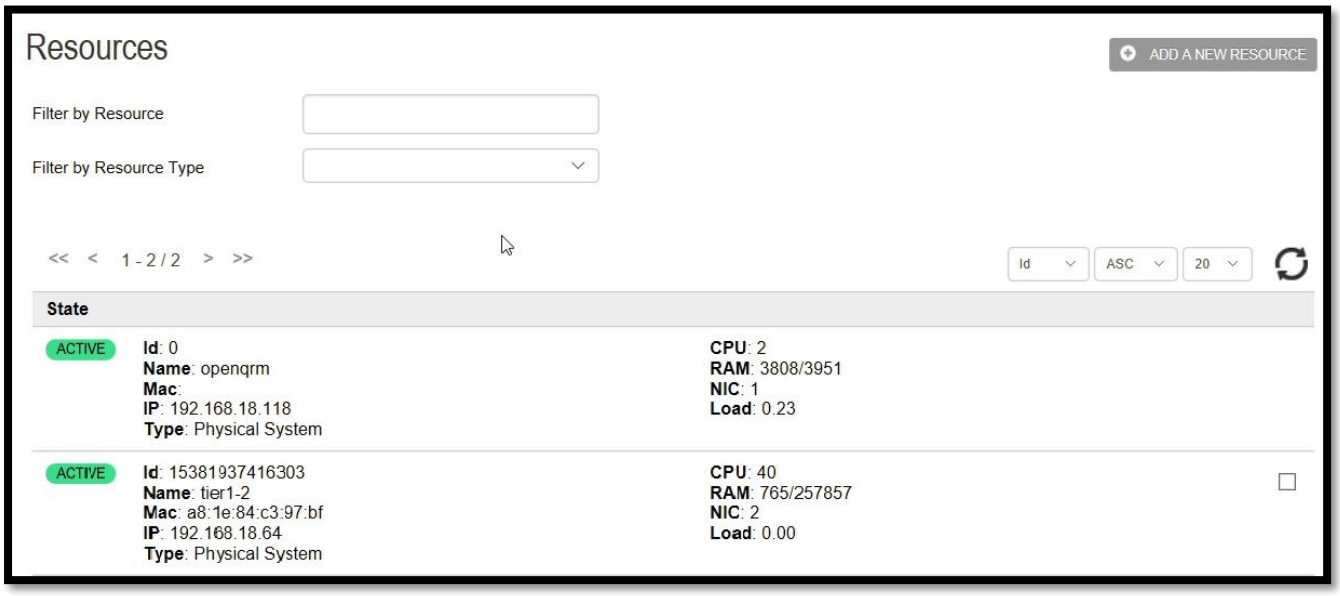
5.5.3 – Displaying resource list

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.



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