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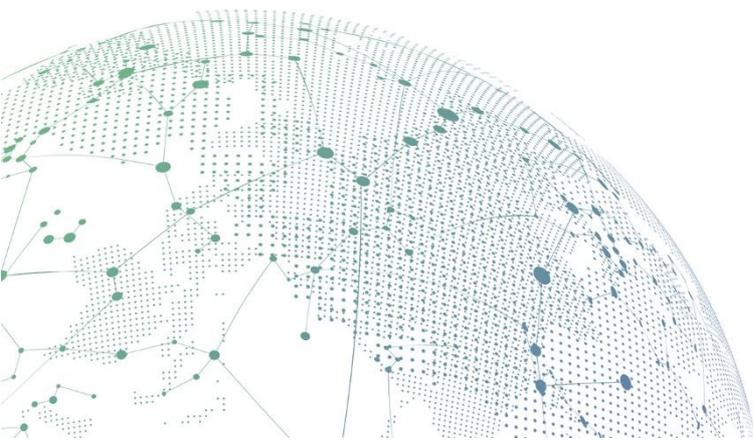
Witness server deployment and configuration on HCI

(Confidential and for internal use only)

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About This Document

This document describes witness server deployment and configuration in HCI.

Intended Audience

This document is intended for:

- System Administrator
- O&M Personnel

Note Icons

English Icon	Description
	Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
	Indicates a hazardous situation, which if not avoided, could result in minor or moderate injury.
	Indicates a hazardous situation, which if not avoided, could result in settings failing to take effect, equipment damage, or data loss. NOTICE addresses practices not related to personal injury.
	Calls attention to important information, best practices, and tips. NOTE addresses information not related to personal injury or equipment damage.

Change Log

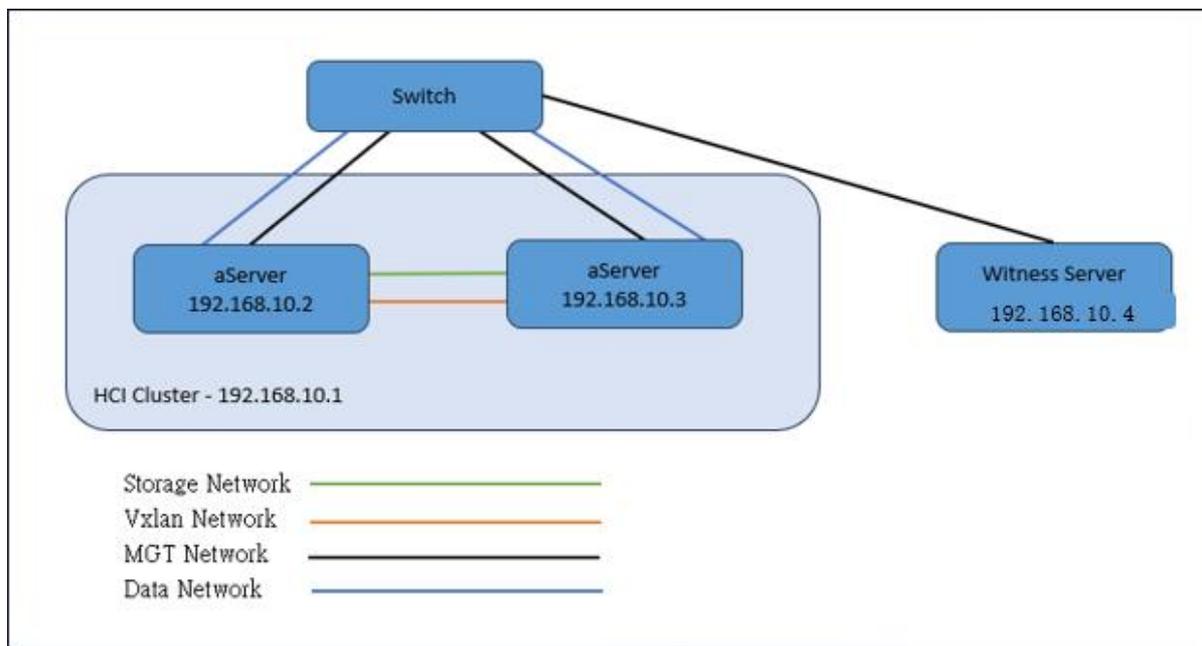
Date	Author	Document Version	Approver	Remark
Jun. 19, 2023	Chris Leung	01	Scott Zeng	This is the first release of this document.

CONTENT

<u>Chapter 1 Background</u>	1
<u>Chapter 2 Witness deployment Requirements</u>	2
<u>Chapter 3 Implementation process</u>	3
<u>Chapter 4 Summary</u>	19

Chapter 1 Background

Client have one of HCI cluster which is two node deployment, due to two node deployment without witness function, If HCI storage network is abnormal, the VS data may inconsistent and caused **split brain**, so client would like to deploy 2 + 1 witness environment.



Chapter 2 Witness deployment Requirements

- 2 + 1 witness deployment **only support on HCI 6.7.0R3 at this state (2023/Q2)**
- License is not necessary for 2 + 1 witness deployment on HCI 6.7.0R3
(Remark: it still need license such as aSv, aSan or aNet for two node HCI cluster)
- Witness OS support deploy on VMware/HCI environment and Physical Server and below are the minimum system spec:
 - CPU: 4Cores
 - Ram: 16 GB
 - disk: Enterprise SSD with capacity >=64G
 - Virtualization deployment requires no less than 1000 IOPs
- Witness OS only need to connect Management network (Make sure the subnet is same as HCI cluster management network)
- Witness OS support link aggregate and sub-vlan interface
- Make sure the installation of witness OS is correct version (6.7.0R3 have related witness OS for different scenario)

● HCI6.7.0_R3_EN

Related Articles: [Release Notes](#), [User Manual](#)

Support manage by SCP6.8.0.

Name	Description	Size	File MD5	Last Update	Download	Operation
HCI 6.7.0_R3_EN Installation ISO	Support whole new installation, burn this ISO file to USB disk or CD and install it as guided. It can also be used for Linux OS business migration. New function: Since HCI 6.0.0, it is supported to replace system disk using the ISO.	3.9G	D657825DF0CA389F28D90368901B167C	17 Oct 2022 15:54		Copy Link
HCI 6.7.0_R3_EN Upgrade Package	Support hot upgrade from HCI6.7.0_EN(with one minute of network impact). Support cold upgrade from version 6.0.0R5 and above due to major changes in kernel.	2.7G	F7808335F68CDB1C19D610F13136165C	17 Oct 2022 15:54		Copy Link
Witness Node Installation ISO	Fresh installation for Witness Node on physical server.	3.9G	5CD744031A6C7CE150842D7B06346472	17 Oct 2022 15:55		Copy Link
Witness Node HCI Deployment	Witness node virtual disk and configuration file for HCI version 6.7.0_R3_EN.	8.3G	9B89A31065A66B45AD4E111EB63EAB25	17 Oct 2022 15:56		Copy Link
Witness Node Upgrade Package	Support upgrade from older version of witness node.	2.7G	9276C62C07CD6E8438DFE0606D7C6670	17 Oct 2022 15:56		Copy Link
Witness Node VMware Deployment	Witness node VMware virtual disk and configuration file for HCI version 6.7.0_R3_EN.	8.2G	3FD50DC7BAD82552772CC4F3E23562B2	17 Oct 2022 15:56		Copy Link
2 Nodes VS Witness Node HCI Deployment	2 nodes VS witness node virtual disk and configuration file for HCI version 6.7.0_R3_EN.	7.9G	9CECA0E67054A98B1B1984BCDD03B25E	17 Oct 2022 15:57		Copy Link
2 Nodes VS Witness Node VMware Deployment	2 nodes VS witness node VMware virtual disk and configuration file for HCI version 6.7.0_R3_EN.	8G	033FEC5ED51A4CFC755EFCFA70C476311	17 Oct 2022 15:58		Copy Link

- Before adding the witness server to HCI cluster, make sure **the virtual storage is not configured yet** and HCI cluster only need to create storage network, **because it need to create virtual storage with witness server together**. If the HCI cluster have virtual storage, it need to factory reset HCI to remove virtual storage.

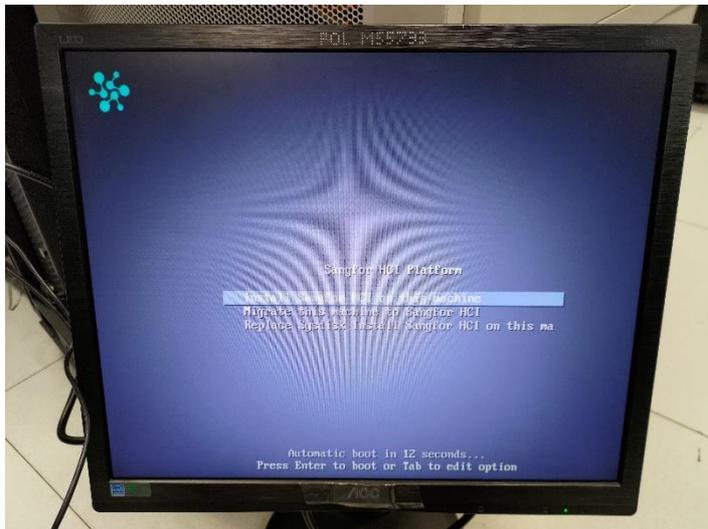
Chapter 3 Implementation process

Due to HCI cluster version is 6.7.0R3 and it is deploy on third party server, so it will download below version OS and burn to USB for installation.

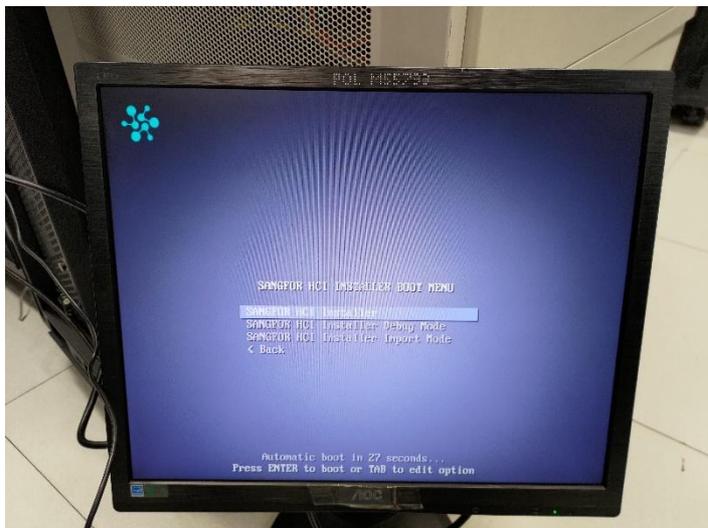
Witness Node Installation ISO	Fresh installation for Witness Node on physical server.	3.9G	5CD744031A6C7CE150842D7B06346472	17 Oct 2022 15:55		Copy Link
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(Remark: the server bios setting is same as normal HCI deployment)

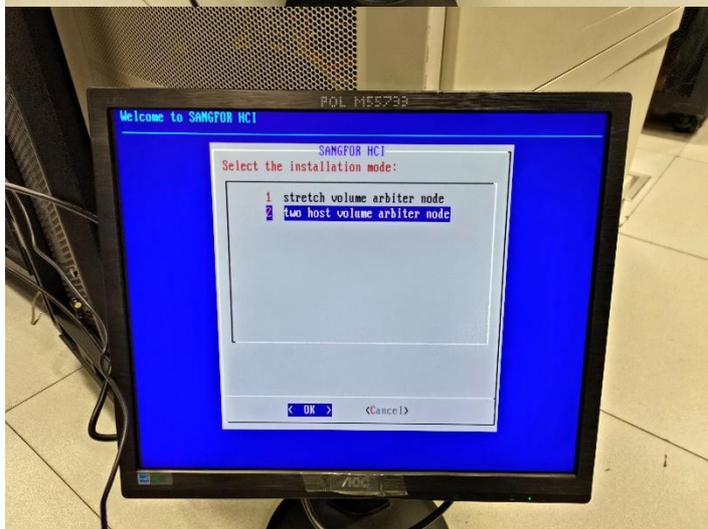
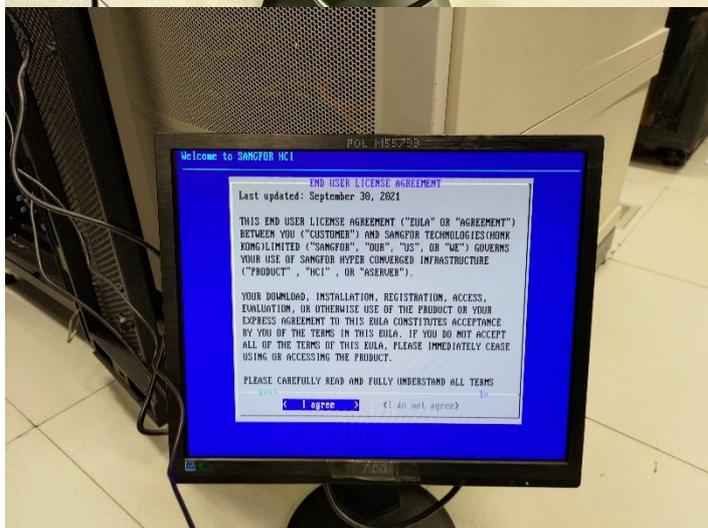
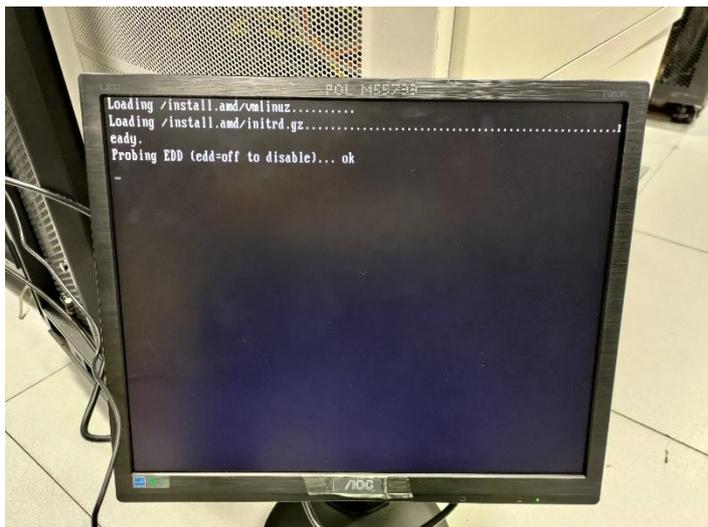
- **Below is witness implement process.**



Boot from USB and it should view above screen.

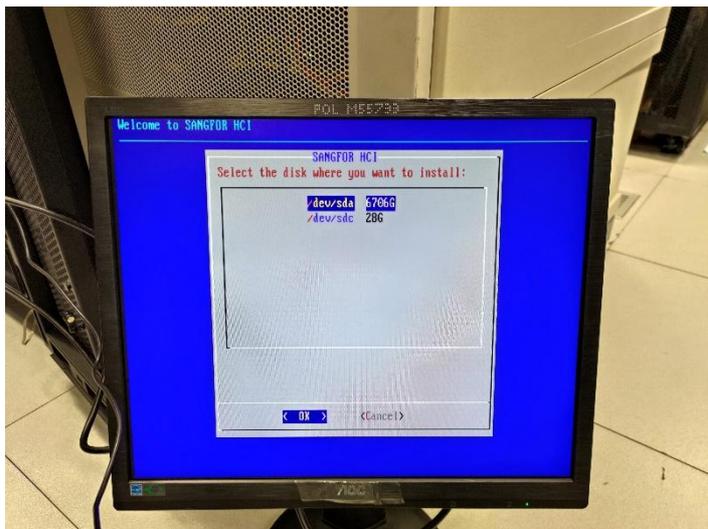


Witness server deployment and configuration on HCI



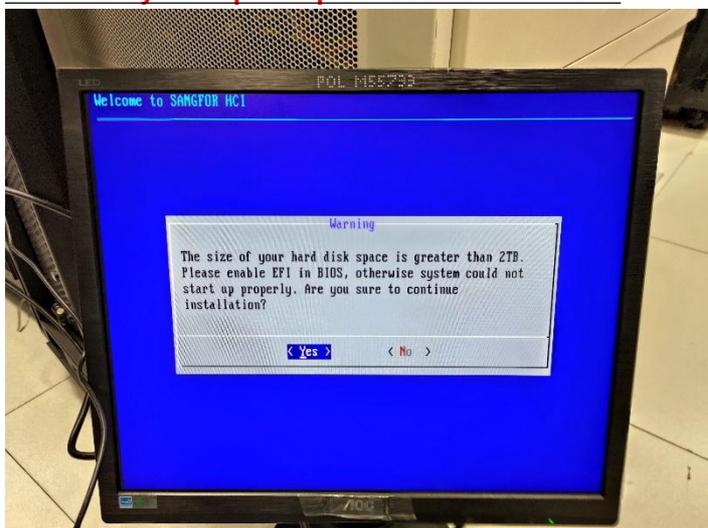
Choose 2. two host volume arbiter mode.

Witness server deployment and configuration on HCI

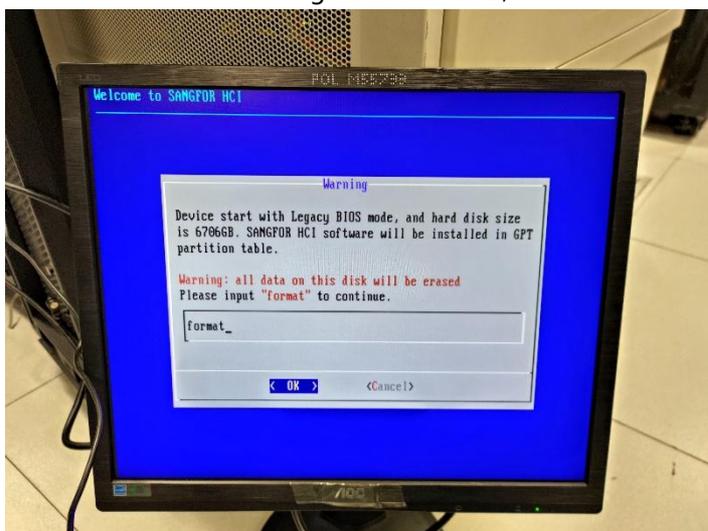


Choose the OS disk for installation

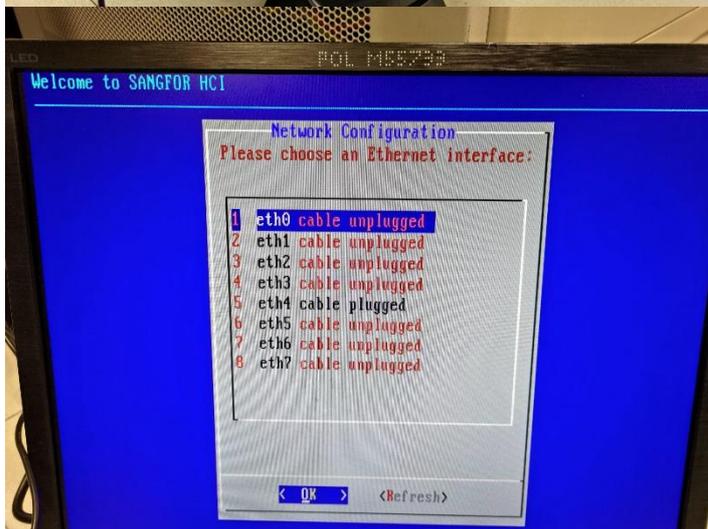
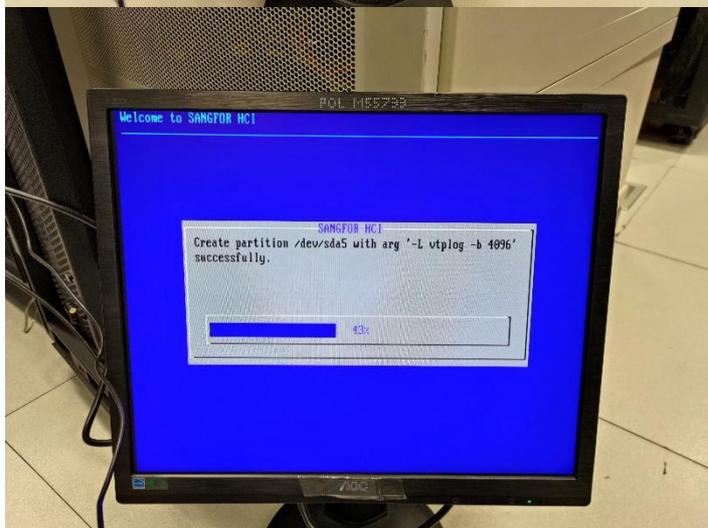
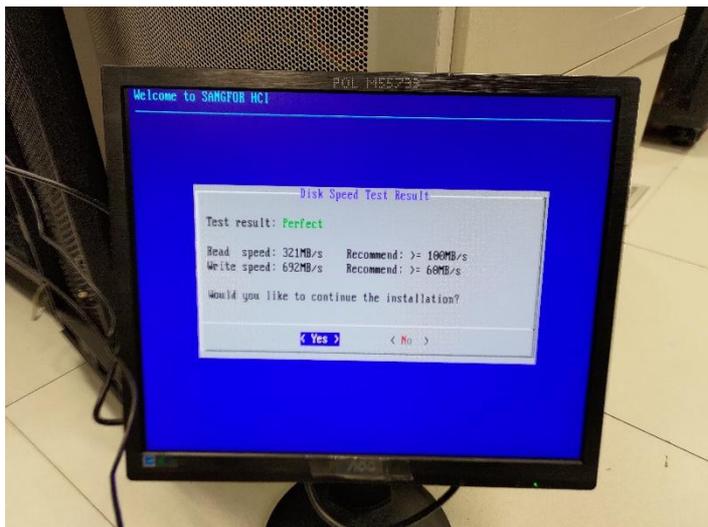
Remark: this is a testing environment, so we use non-SSD for this environment, please follow minimum system spec as production environment.



Remark: Due to OS disk is greater than 2TB, so it need to enable UEFI in this setup.

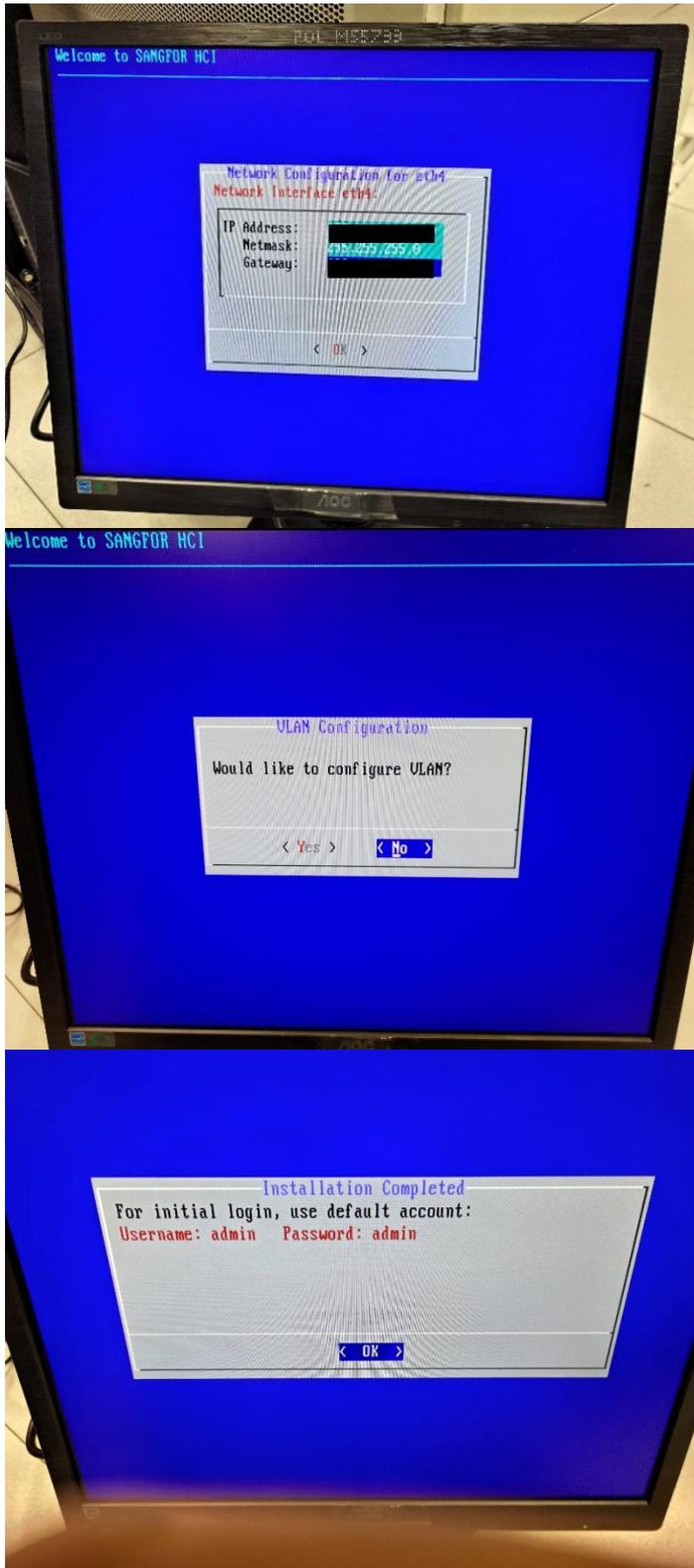


Witness server deployment and configuration on HCI

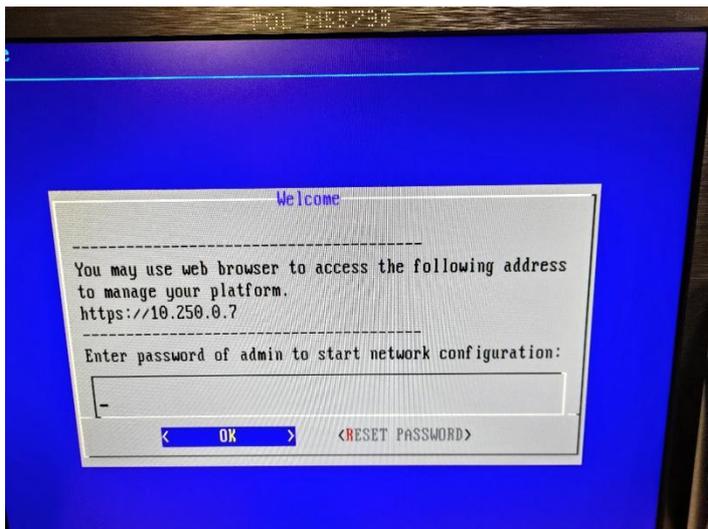


Choose the ethernet interface for IP setup

Witness server deployment and configuration on HCI

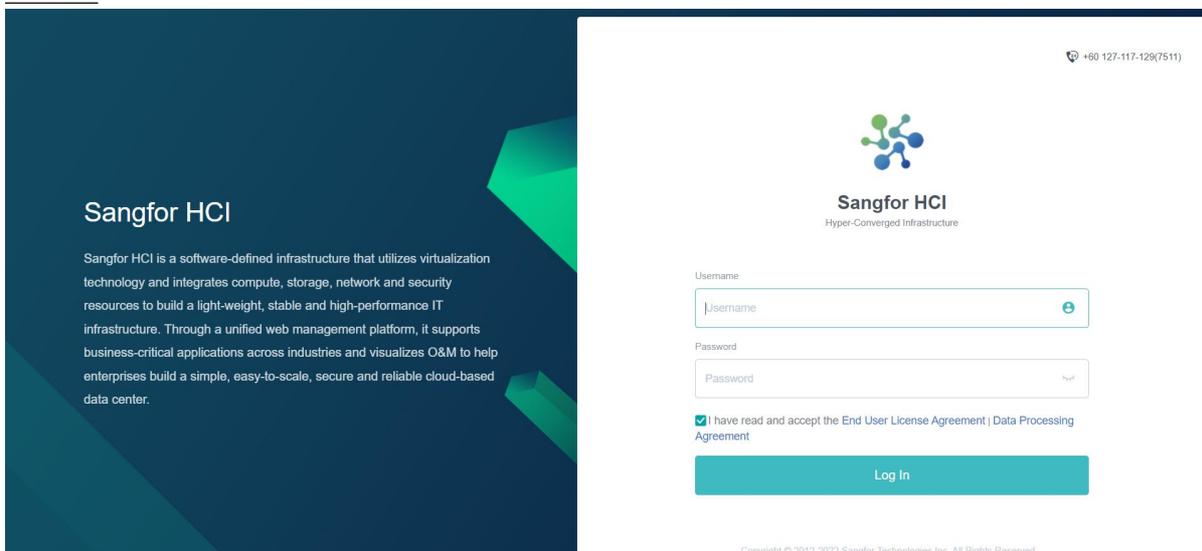


Witness server deployment and configuration on HCI

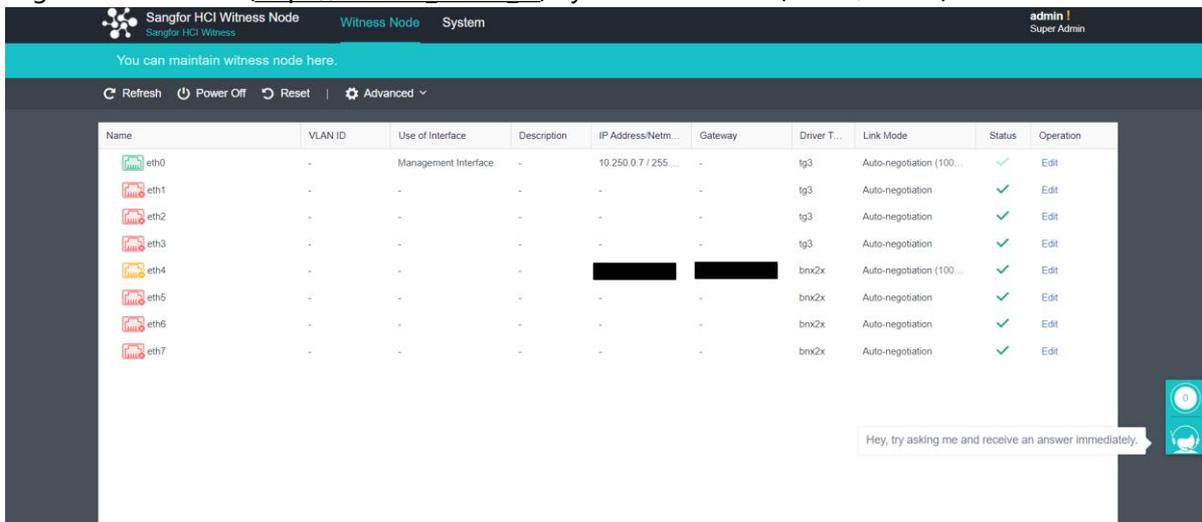


After reboot success, it will display above screen

Remark: it is normal situation when the IP is not configured onEth0, it will auto add IP - 10.250.0.7 on Eth0

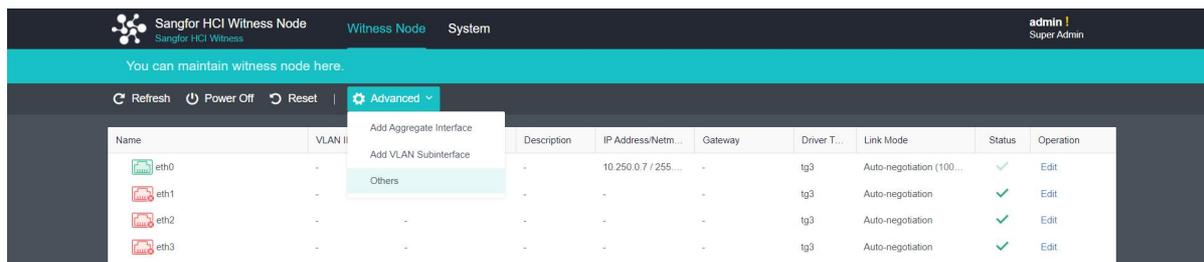


Login witness server (https://witness_server_IP) by default account (admin/admin)

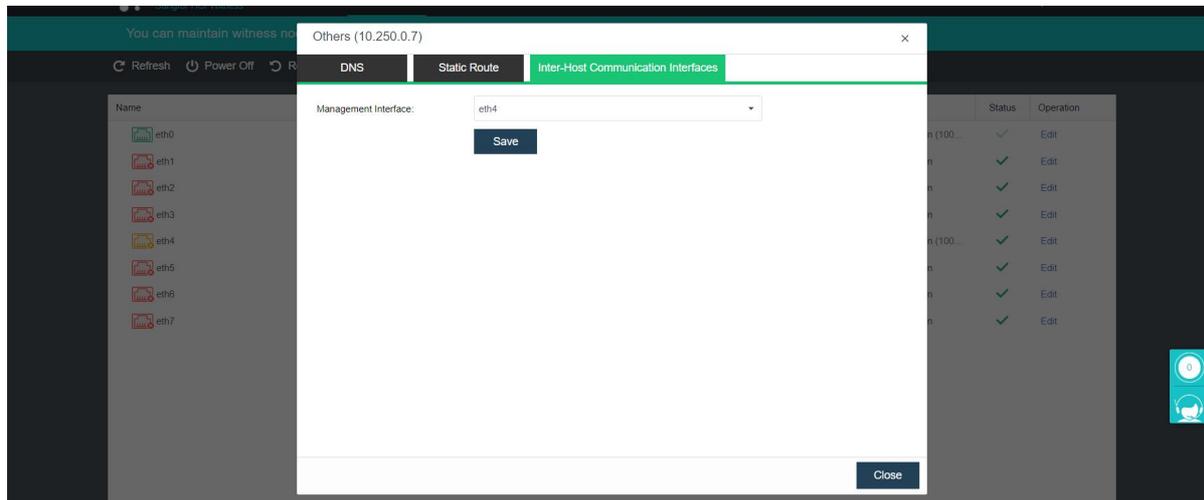


It can see the configured IP(eth4) and default IP(eth0), due to the management role is configured on eth0, so it need to move to eth4

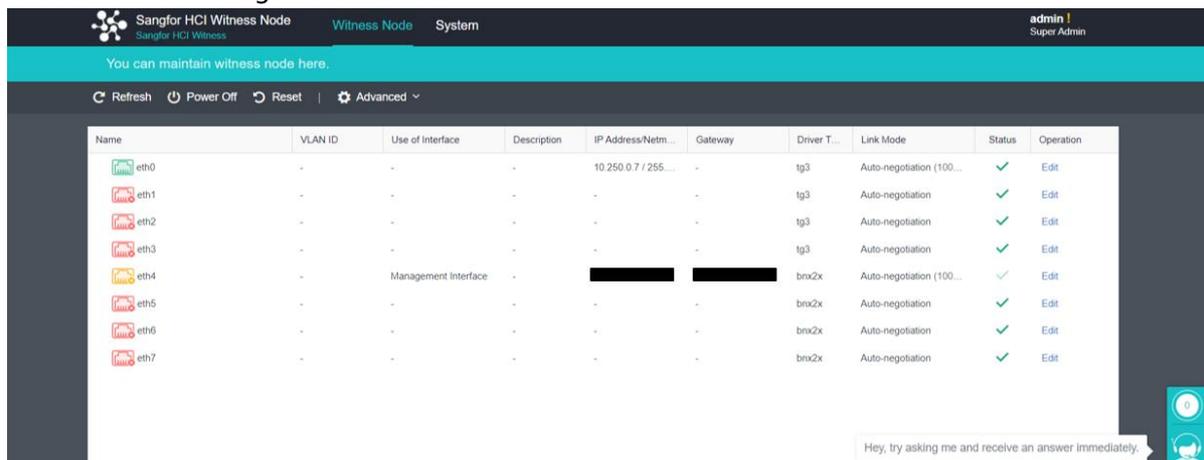
Witness server deployment and configuration on HCI



Select Witness Nodes > Advanced > Others

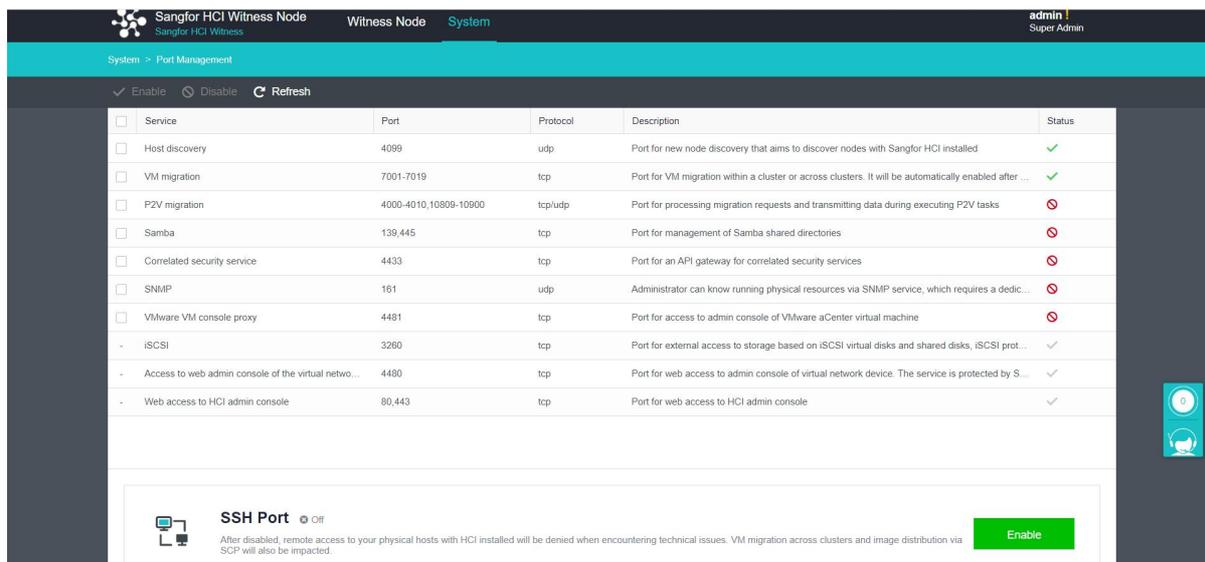


Choose Eth4 as management interface

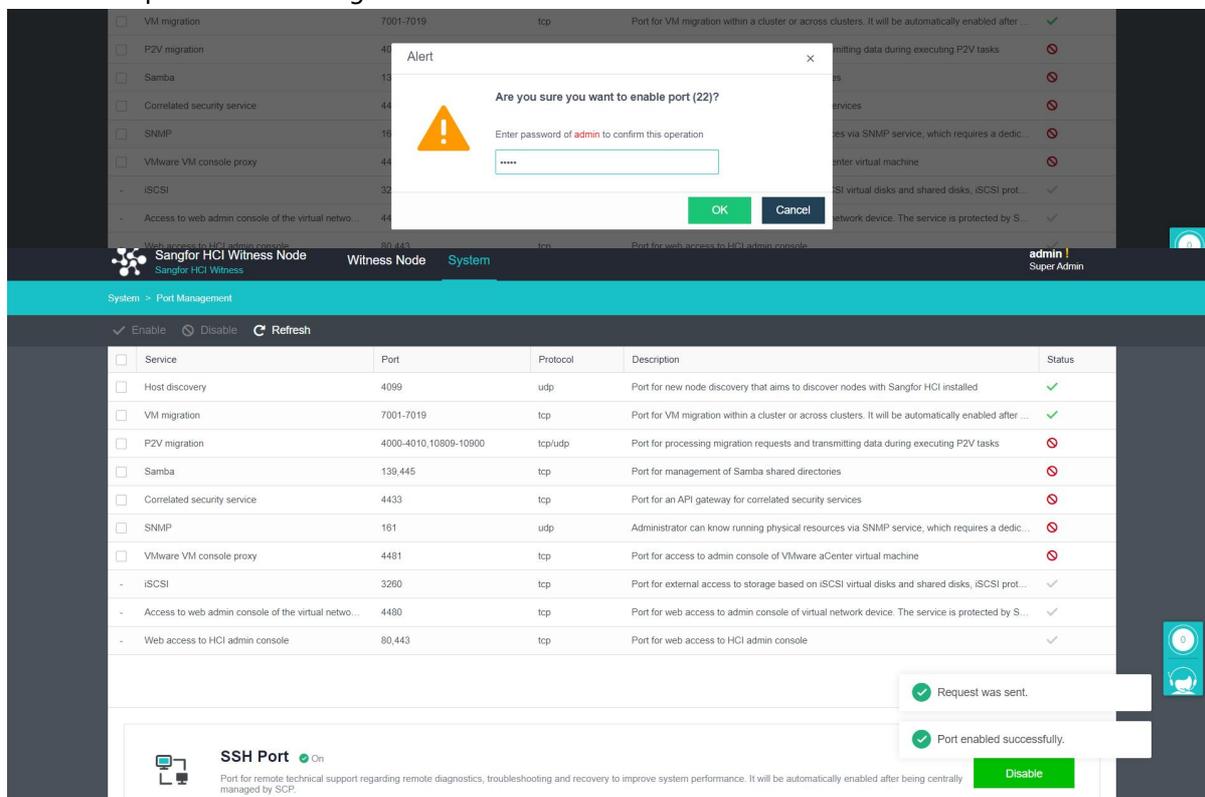


The management interface is move to Eth4 now

Witness server deployment and configuration on HCI



Enable SSH port before adding to HCI cluster



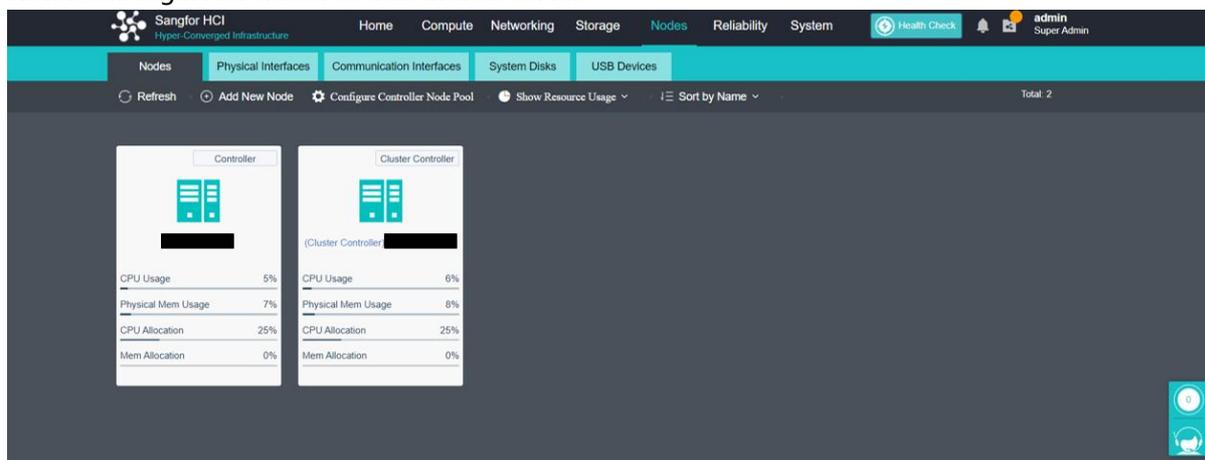
Now the witness server configuration is complete, it can go to HCI cluster for next step configuration.

Witness server deployment and configuration on HCI

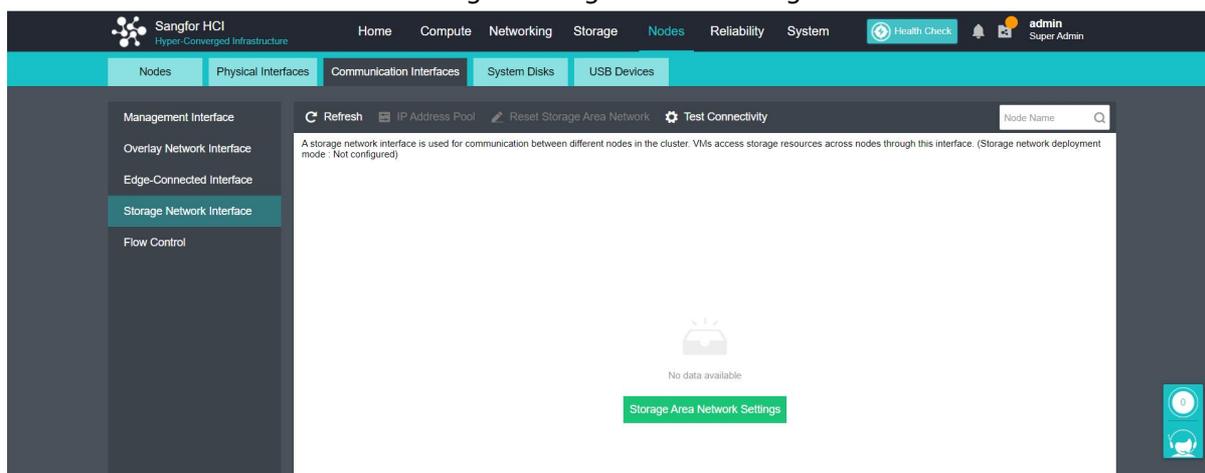
- Below is HCI cluster configure process.



Now it can login HCI cluster to add witness server

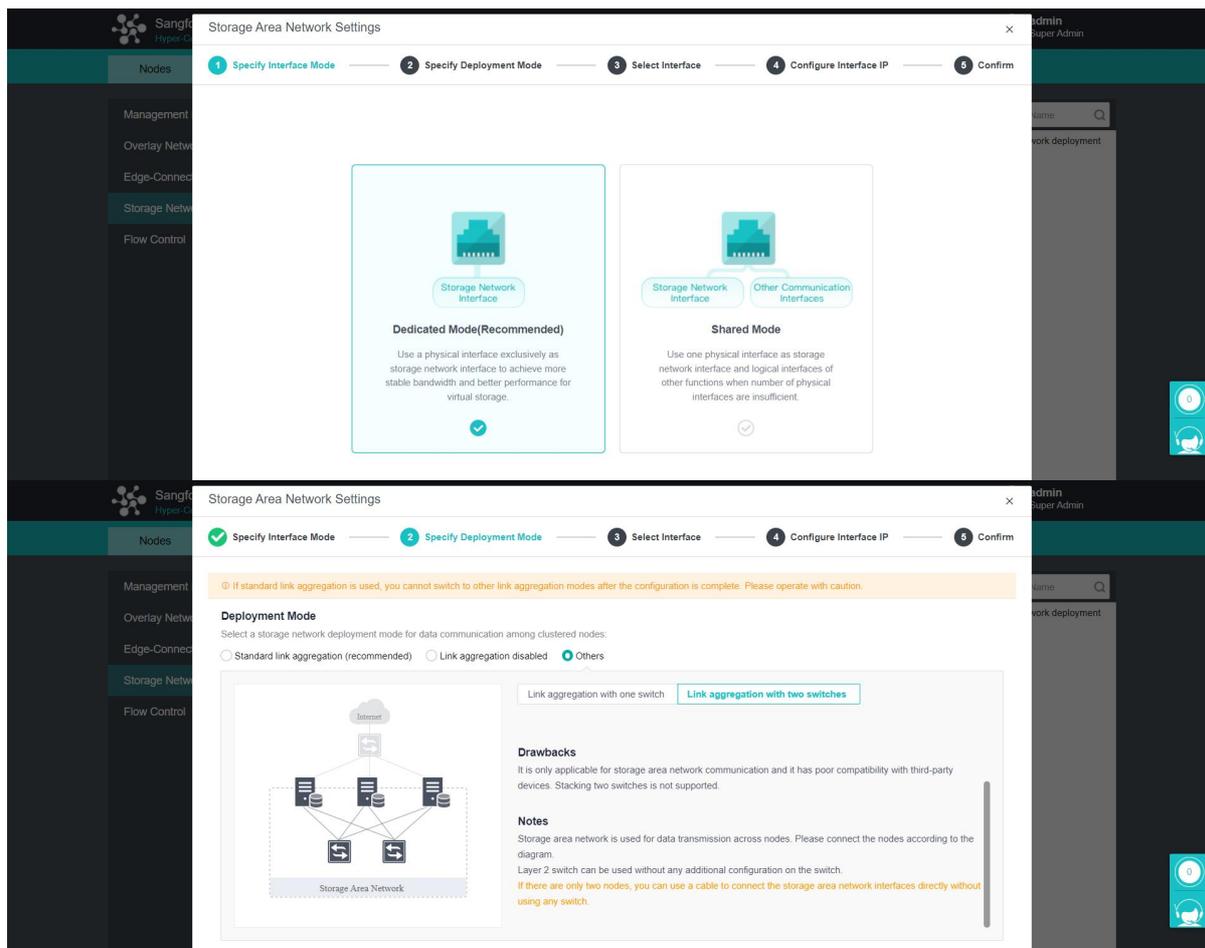


Goto communication interfaces to configure storage network setting.

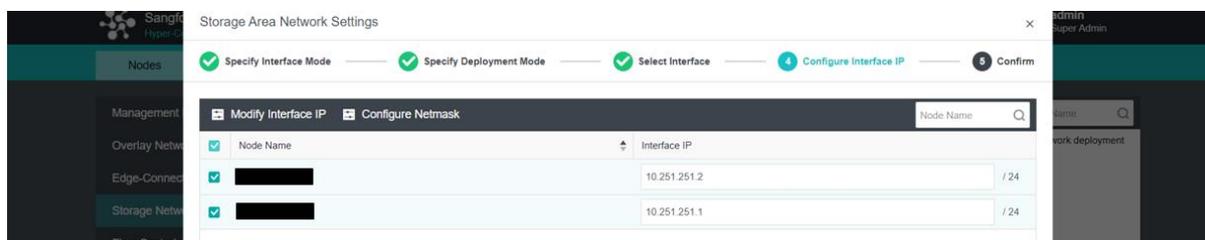
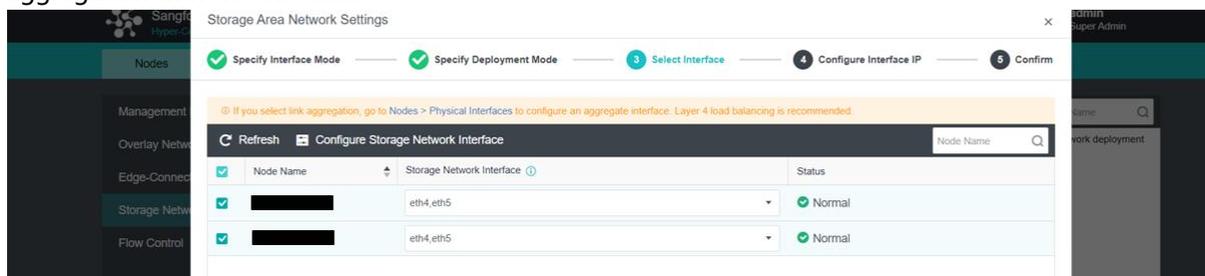


Create the storage area network

Witness server deployment and configuration on HCI



Due to two nodes, the server storage interfaces are direct connect, so it choose Other > Link aggregation with two switches.



Witness server deployment and configuration on HCI

The screenshot shows the 'Storage Area Network Settings' configuration window in Sangfor HCI. The window has a progress bar at the top with five steps: 'Specify Interface Mode' (checked), 'Specify Deployment Mode' (checked), 'Select Interface' (checked), 'Configure Interface IP' (checked), and 'Confirm' (active). Below the progress bar, there are two sections for configuration: 'Interface Mode' set to 'Dedicated Mode (recommended)' and 'Deployment Mode' set to 'Link aggregation with two switches'. A table titled 'Storage Network Interface and IP Address' lists two nodes with their respective interfaces and IP addresses.

Node Name	Storage Network Interface	Interface IP
[Redacted]	eth4, eth5	10.251.251.2 / 24
[Redacted]	eth4, eth5	10.251.251.1 / 24

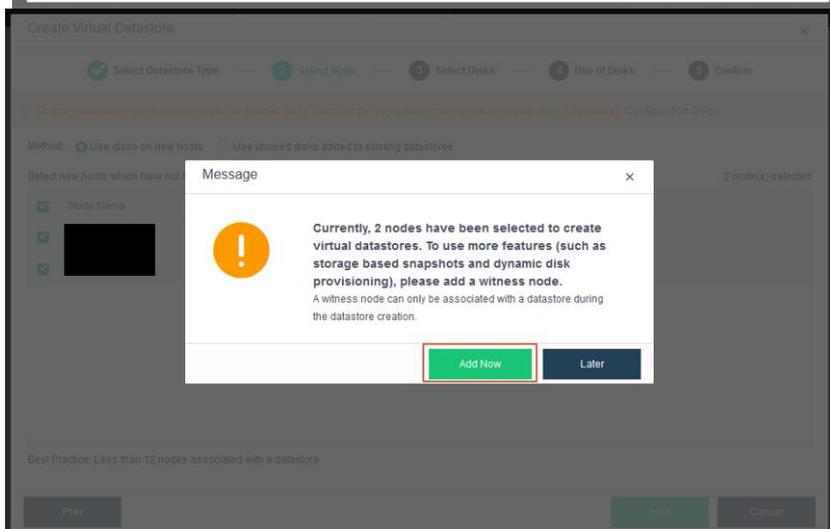
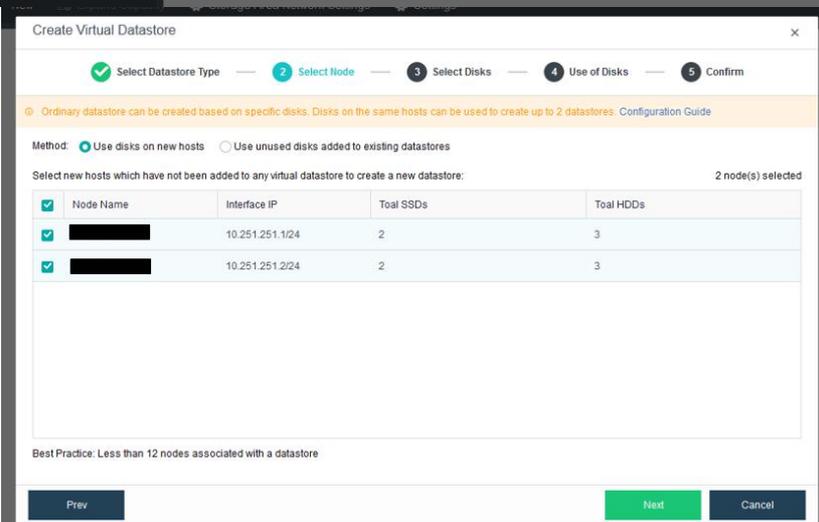
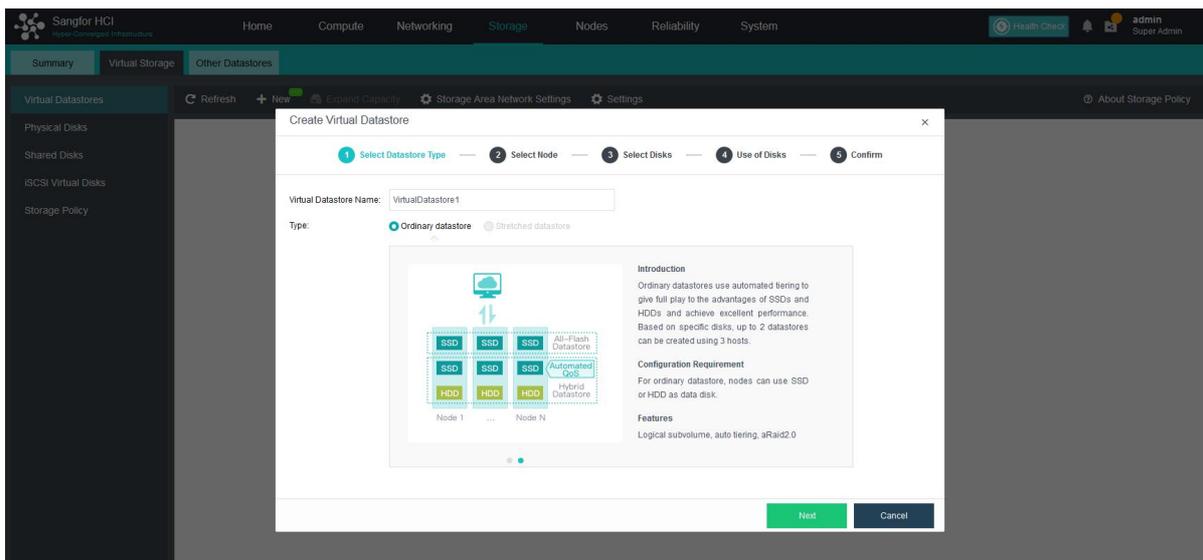
The main interface below the configuration window shows the 'Storage' section with sub-tabs for 'Physical Interfaces', 'Communication Interfaces', 'System Disks', and 'USB Devices'. The 'Storage Network Interface' sub-tab is active, displaying a table of configured interfaces with columns for Node Name, Storage Network Interface, Interface IP, Negotiated Rate, MTU, and Operation.

Node Name	Storage Network Interface	Interface IP	Negotiated Rate	MTU	Operation
[Redacted]	eth4, eth5	10.251.251.1/24	10000Mb/s	1500	Edit
[Redacted]	eth4, eth5	10.251.251.2/24	10000Mb/s	1500	Edit

After storage network setup is complete, it can configure virtual storage.

The screenshot shows the 'Virtual Storage' configuration page in Sangfor HCI. The page has a navigation bar with 'Summary', 'Virtual Storage', and 'Other Datastores'. The 'Virtual Storage' sub-tab is active, displaying a message: 'No virtual datastore was found. Click the button below to create one.' Below the message is a green button labeled 'Create Virtual Datastore'.

Witness server deployment and configuration on HCI



After select all host to build virtual storage and click "Next" , it will have a message to add witness node, click "Add Now"

Witness server deployment and configuration on HCI

The 'Add Witness Node' dialog box contains the following fields and buttons:

- Node IP: [Redacted]
- Username: admin
- Password: [Redacted]
- OK button (green)
- Cancel button (dark blue)

Enter witness management IP and witness server password

The 'Create Virtual Datastore' wizard is at Step 2: Select Node. It shows a progress bar with 5 steps: 1. Select Datastore Type (checked), 2. Select Node (active), 3. Select Disks, 4. Use of Disks, and 5. Confirm. A note states: 'Ordinary datastore can be created based on specific disks. Disks on the same hosts can be used to create up to 2 datastores. Configuration Guide'. The 'Method' section has two options: 'Use disks on new hosts' (selected) and 'Use unused disks added to existing datastores'. Below, a table lists available nodes:

Node Name	Interface IP	Total SSDs	Total HDDs
[Redacted]	10.251.251.1/24	2	3
[Redacted]	10.251.251.2/24	2	3
[Redacted] (Witness ...)	[Redacted]	0	1

3 node(s) selected

Best Practice: Less than 12 nodes associated with a datastore

Buttons: Prev, Next, Cancel

It will display witness server, also it can select to add.

The 'Create Virtual Datastore' wizard is at Step 3: Select Disks. It shows a progress bar with 5 steps: 1. Select Datastore Type (checked), 2. Select Node (checked), 3. Select Disks (active), 4. Use of Disks, and 5. Confirm. The 'Selected' count is 2 SSDs, 6 HDDs. A 'Quick Select' table is shown:

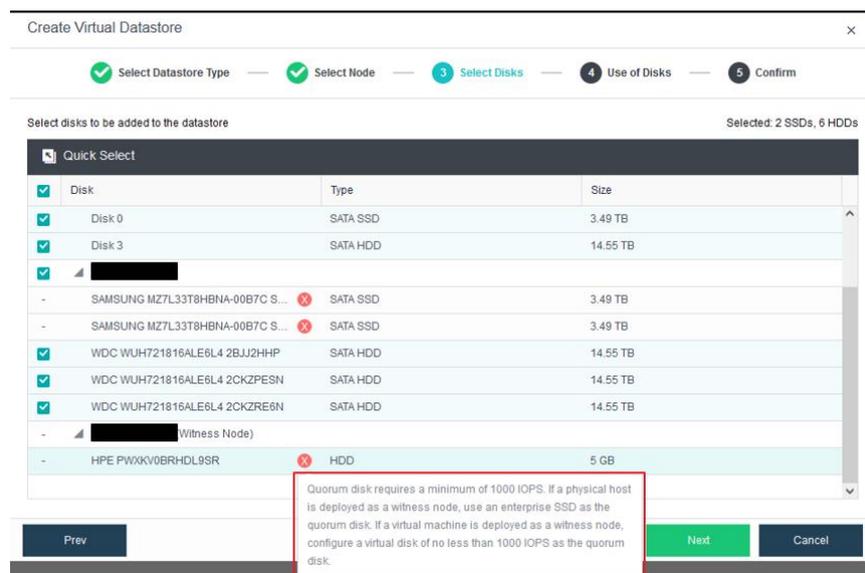
Disk	Type	Size
Disk 0	SATA SSD	3.49 TB
Disk 3	SATA HDD	14.55 TB
[Redacted]	SATA SSD	3.49 TB
SAMSUNG MZ7L33T8HBNA-00B7C S...	SATA SSD	3.49 TB
WDC WUH721816ALE6L4 2BJJ2HHP	SATA HDD	14.55 TB
WDC WUH721816ALE6L4 2CKZPESN	SATA HDD	14.55 TB
WDC WUH721816ALE6L4 2CKZRE6N	SATA HDD	14.55 TB
[Redacted] (Witness Node)	HDD	5 GB

A red box highlights a warning for the Samsung SSD: 'Hardware model may be incompatible. Please Test Compatibility'.

Buttons: Prev, Next, Cancel

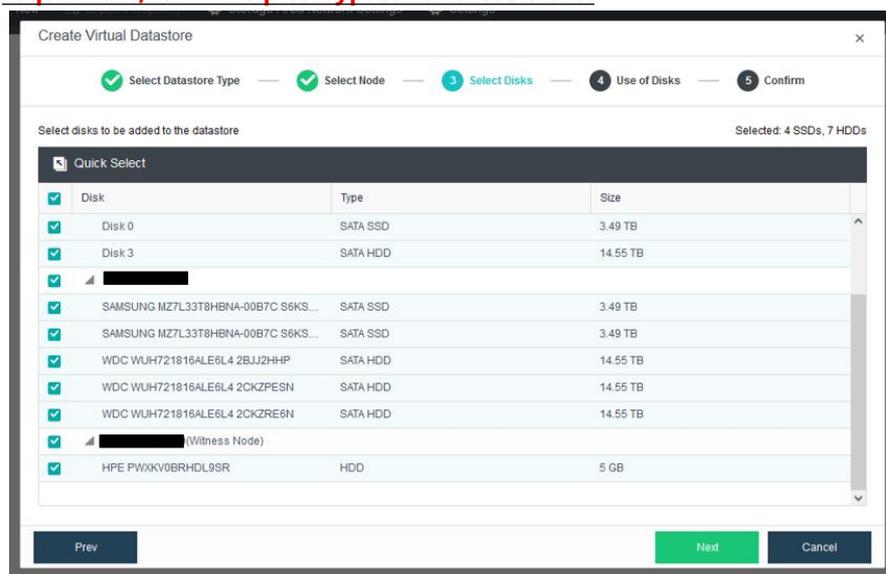
Click Next and it can view all nodes 's disks, however it may have incompatible issue of hardware model when it is third party server.

Witness server deployment and configuration on HCI



Also it may have above error message when witness server is not fulfill the minimum spec , so it can not process to next step.

It is better to contact Sangfor support for these situations. If support verify these disks is fulfill requirment, it will help to bypass for these disks.



Above screen is after bypass.

Remark: It is normal for the quorum disk of witness server to only use a capacity of 5GB.

Witness server deployment and configuration on HCI

Create Virtual Datastore

✓ Select Datastore Type —
 ✓ Select Node —
 ✓ Select Disks —
 4 Use of Disks —
 5 Confirm

Expand All Collapse All Restore Defaults About Disk Grouping

Node: [redacted] Data disk: 2 Cache disk: 2 Spare disk: 1 + New Disk Group

Disk Group	Disk	Type	Disk Size	Use of Disk	Operation
Group 1	Disk 1	SSD	3.5 TB	Cache disk	Edit Delete
	Disk 2	HDD	14.6 TB	Data disk	
Group 2	Disk 0	SSD	3.5 TB	Cache disk	Edit Delete
	Disk 3	HDD	14.6 TB	Data disk	
Free	Disk 4	HDD	14.6 TB	Spare disk	

Node: [redacted] Data disk: 2 Cache disk: 2 Spare disk: 1 + New Disk Group

Prev Next Cancel

Create Virtual Datastore

Confirm Configuration of Ordinary datastore (VirtualDatastore1):

2	58.21 TB	25%	29.09 TB	Not supported
Nodes	Raw Capacity	Cache Disk Ratio	2-replica Storage Capacity	3-replica Storage Capacity

Virtual Datastore:

Node Name	Disk Groups	Cache Disks	Data Disks	Spare Disks	Data Disk Size	Cache Disk Size
[redacted]	2	2	2	1	29.11 TB	6.99 TB
[redacted]	2	2	2	1	29.11 TB	6.99 TB

Witness Node:

Node IP	Quorum Disk Type	Quorum Disk Capacity
[redacted]	HDD	5 GB

Prev OK Cancel

Confirm the setting and click "OK"

Details

Status: 55%

Action: Create virtual datastore

Start Time: 2023-05-26 00:14:26

End Time:

Username: admin([redacted])

Node: [redacted]

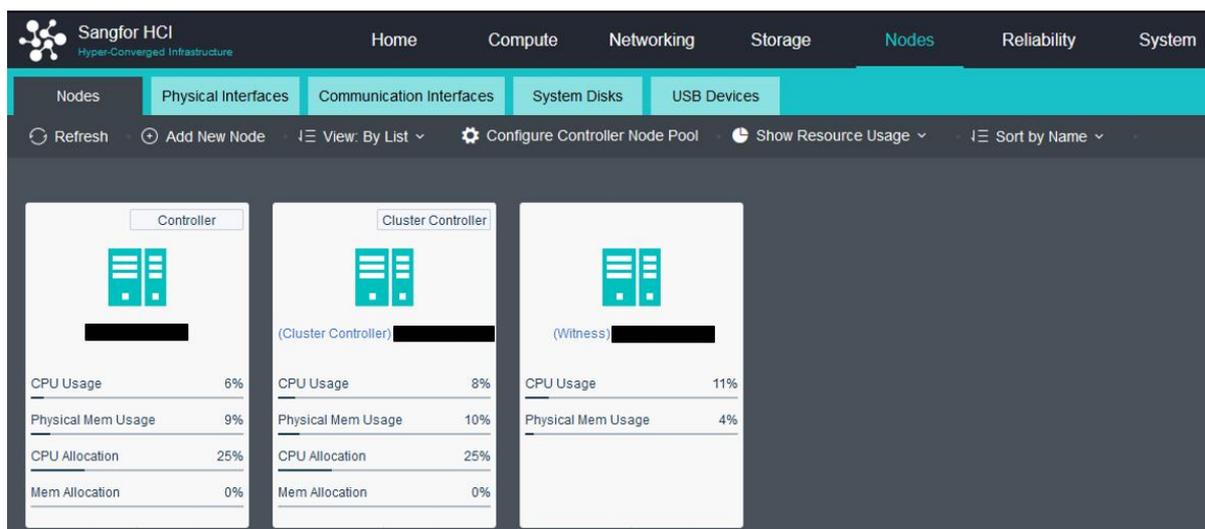
Object Type: storage_obj

Object: Virtual Datastore (VirtualDatastore1)

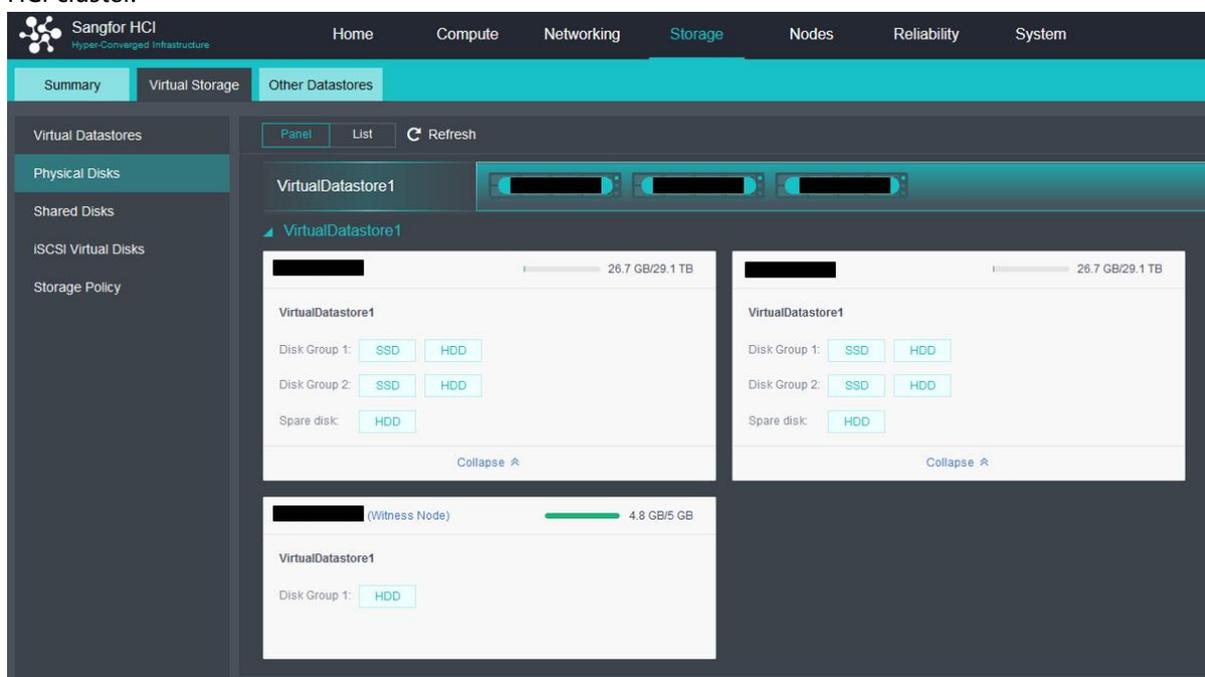
Description:

OK

Witness server deployment and configuration on HCI



After Virtual storage configuration success, it can view witness server on "Nodes" and it is already add to HCI cluster.



It also can view the witness node disk status on "Virtual Storage > Physical Disks" .
The witness server deployment is complete.

Remark: It is normal for the quorum disk of witness server to only use a capacity of 5GB.

Chapter 4 Summary

1. Data “Brain Split” is usually due to network failure and caused multiple replicas of data are isolated and unable to synchronize information with each other in time, and each replica writes and updates different data in isolation, resulting in data inconsistency between replicas, and is “each own data that the other does not”
2. After HCI5.2 and above version, it has witness mechanism for virtual storage. When the virtual storage data is inconsistent under abnormal conditions such as network interruption, witness mechanism can help HCI cluster to select the correct copy to avoid data split-brain.
3. The replica mechanism of aSAN makes data in addition to have multiple data replicas and with witness replicas at the same time. The witness replica is a special replica that only has a small amount of verification data and occupies a small amount of actual storage space. It is mainly used to prevent data replicas from brain-splitting.
4. The core principle of the witness mechanism is “the minority obeys the majority” . Which is when the number of accessible data replicas on the node where the virtual machine is running is less than half of the total number of replicas (data replicas + arbitration replicas), the virtual machine is prohibited from running on this node. Otherwise, virtual machines can run on that node.
5. if the number of HCI hosts is greater than or equal to 3, the witness mechanism will be enabled by default, so there is no manual configuration is required and no witness nodes need to be configured, only Stretched Cluster scenario or two node HCI cluster scenario (6.7.0R3 and 6.8.0) needs to be deploy witness node.