Hewlett Packard
Enterprise

HPE Synergy Administration

Student Guide

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HPE Synergy Administration

Student Guide
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Student Guide Contents

Module 0: Course Overview ..... M0 - 1
- Course Objectives ..... M0 - 2
- Prerequisites ..... M0 - 3
- What is synergy administration ..... M0 - 4
- Where's your focus ..... M0 - 5
- Module TRAINING objectives ..... M0 - 6
- Module 01: HPE synergy solution ..... M0 - 7
- Module 02: HPE SYNERGY Cabling ..... M0 - 8
- Module 03: HPE SYNERGY Networking ..... M0 - 9
- Module 04: HPE SYNERGY storage ..... M0 - 10
- Module 05: HPE Synergy Composability ..... M0 - 11
- Module 06: HPE SYNERGY firmware ..... M0 - 12
- Module 07: HPE SYNERGY analytics ..... M0 - 13
- Module 08: HPE SYNERGY MAINTENANCE and growth ..... M0 - 14
- Course level resources ..... M0 - 15
- Labs ..... M0 - 16
- THANK YOU ..... M0 - 17

Module 1: HPE Synergy Solution ..... M1 - 1
- HPE Synergy Hardware Administration skills ..... M1 - 2
- TRAINING objectives ..... M1 - 3
- Synergy Solution Overview ..... M1 - 4
- HPE Synergy planning steps ..... M1 - 5
- HPE Synergy configuration steps ..... M1 - 6
- HPE Synergy Configuration ..... M1 - 7
- HPE Synergy Architecture and Configuration ..... M1 - 8
- Composable whiteboard ..... M1 - 9
- HPE Synergy 12000 Frame overview ..... M1 - 10
- Flexible design for a seamless transition into the datacenter ..... M1 - 11
- Flexible design for a seamless transition into the datacenter ..... M1 - 12
- The Synergy Frame midplane I/O architecture (REAR VIEW) ..... M1 - 13
- Synergy 12000 midplane front ..... M1 - 14

Synergy 12000 midplane rear ..... M1 - 15
HPE Synergy power distribution ..... M1 - 16
HPE Synergy power modes ..... M1 - 17
HPE Synergy power supply placement (A=Circuit One, B=Circuit Two) ..... M1 - 18
Frame cooling ..... M1 - 19
Servers high level ..... M1 - 20
iLO 5 ..... M1 - 21
iLO Service Port ..... M1 - 22
HPE Silicon Root of Trust ..... M1 - 23
iLO Security States ..... M1 - 24
HPE Synergy interconnect modules ..... M1 - 25
HPE Synergy interconnect modules ..... M1 - 26
HPE Synergy in-frame storage solution ..... M1 - 27
HPE Synergy management appliances ..... M1 - 28
Synergy embedded management architecture ..... M1 - 29
HPE Synergy Composer/COmposer2 ..... M1 - 30
Secure Boot ..... M1 - 31
Secure Start ..... M1 - 32
HPE Synergy 2-port Frame Link Module ..... M1 - 33
HPE Synergy 2-port Frame Link Module ..... M1 - 34
HPE Synergy 2-port Frame Link Module ..... M1 - 35
HPE Synergy 4-port Frame Link Module Enhancements ..... M1 - 36
HPE Synergy 4-port Frame Link Module Enhancements ..... M1 - 37
Frame management cabling ..... M1 - 38
HPE Synergy cabling configurations ..... M1 - 39
Management ring topology ..... M1 - 40
Single-frame configuration cabling ..... M1 - 41
Two-frame configuration cabling ..... M1 - 42
Support Matrix ..... M1 - 44
Three-frame configuration cabling ..... M1 - 45
Up to 21 Synergy frames are supported in one management ring ..... M1 - 46
Remote management rings ..... M1 - 47
Power supply cabling ..... M1 - 48
Cabling power supplies for power feed redundancy ..... M1 - 49
Cabling power supplies for power feed redundancy ..... M1 - 50
Interconnect Link Topology ..... M1 - 51
Interconnect link topology ..... M1 - 52
Primary – Satellite Connectivity Configurations ..... M1 - 53
Accessing HPE Synergy Composer ..... M1 - 54

Access HPE Synergy Composer locally ..... M1 - 55
Access HPE Synergy Composer locally ..... M1 - 56
Access HPE Synergy Composer remotely (Alternative) ..... M1 - 57
Synergy Composer2 remote access through iLO ..... M1 - 58
HPE Synergy installation (Hardware Setup) ..... M1 - 59
Hardware Setup Inventory checklist ..... M1 - 60
HPE Synergy Composer browser access ..... M1 - 61
Hardware Setup ..... M1 - 62
Resources ..... M1 - 63
Review questions ..... M1 - 64
Learning check ..... M1 - 65
Learning check ..... M1 - 66
Learning check ..... M1 - 67
Learning check ..... M1 - 68
Learning check ..... M1 - 69
Learning check ..... M1 - 70
Learning check ..... M1 - 71
Learning check ..... M1 - 72
Labs ..... M1 - 73
HPE Synergy Hardware Administration skills ..... M1 - 74
TRAINING objectives ..... M1 - 75
Appendix ..... M1 - 76
FLM Foundational Requirements ..... M1 - 77
Support Matrix ..... M1 - 78
Synergy FLM configurations ..... M1 - 79
Labs ..... M1 - 80
Appendix ..... M1 - 81
Synergy Composer configurations ..... M1 - 82
Synergy Composer configurations ..... M1 - 83
Synergy Composer configurations ..... M1 - 84
HPE Synergy Gen9 compute modules ..... M1 - 85
HPE Synergy Gen9 compute modules ..... M1 - 86
HPE Synergy Gen9 compute module family comparison ..... M1 - 87
Compute Link Module for HPE Synergy 680 Gen9 ..... M1 - 88
HPE Synergy 620 Gen9 Compute Module ..... M1 - 89
THANK YOU ..... M1 - 90
Module 2: HPE Synergy Cabling ..... M2 - 1
HPE Synergy Network Administration Skills ..... M2 - 2
Training Objectives ..... M2 - 3

HPE synergy Ethernet modules ..... M2 - 4
HPE Virtual Connect SE 100Gb F32 Module ..... M2 - 5
VC SE 100Gb F32 Module for Synergy Advanced Features ..... M2 - 6
VC SE 100Gb F32 Module for Synergy ..... M2 - 7
HPE Virtual Connect SE 100Gb F32 Module ..... M2 - 8
Native FC uplink support ..... M2 - 9
Synergy Fabric – Compatibility & Coexistence Across Generations ..... M2 - 10
HPE Synergy 50Gb Interconnect Link Module ..... M2 - 11
HPE Virtual Connect SE 40Gb F8 Module ..... M2 - 12
HPE Virtual Connect SE 40Gb F8 Module ..... M2 - 13
Interconnect link modules cable options ..... M2 - 14
Master module options ..... M2 - 15
HPE Synergy 40Gb F8 Switch Module ..... M2 - 16
VC SE 40Gb F8 vs. Synergy 40Gb F8 Switch ..... M2 - 17
HPE VC SE 100Gb F32 vs HPE VC SE 40Gb F8 Modules ..... M2 - 18
Combine HPE Synergy 10/20Gb Interconnect Link ModuleS ..... M2 - 19
Other net interconnect modules ..... M2 - 20
HPE Synergy interconnect modules ..... M2 - 21
HPE Synergy 10Gb Pass Thru Module ..... M2 - 22
Interconnect link topology ..... M2 - 23
Primary – Satellite Connectivity Configurations ..... M2 - 24
HPE Virtual Connect traffic flow with HPE Synergy ..... M2 - 25
Synergy Fabrics ..... M2 - 26
Synergy Fabrics ..... M2 - 27
Compute module mezzanine and interconnect module connectivity ..... M2 - 28
Mezzanine and interconnect module connectivity ..... M2 - 29
Mezzanine and interconnect module connectivity ..... M2 - 30
Networking architecture ..... M2 - 31
ILT cabling rules for THE 20Gb and 10GB satellites ..... M2 - 32
Mixed speed 10Gb/20Gb satellite ICM support ..... M2 - 33
Mixed speed 25Gb/50Gb Connectivity ICM support ..... M2 - 34
VC SE 100Gb FE32 / VC SE 40Gb F8 MLAG ..... M2 - 35
M-LAG support ..... M2 - 36
M-LAG support ..... M2 - 37
Local port affinity ..... M2 - 38
FlexQbg ..... M2 - 39
Reviewing connectivity in OneView ..... M2 - 40
Resources ..... M2 - 41
Lab ..... M2 - 42

Review questions M2 - 43
Migration and Grow Use Cases M2 - 44
Learning check M2 - 45
Learning check M2 - 46
HPE synergy network administration skills M2 - 47
Trainng Objectives M2 - 48
Appendix M2 - 49
VC SE 100Gb F32 Module Supported Configurations/Topologies M2 - 50
VC SE 100Gb F32 Module Supported Configurations/Topologies M2 - 51
VC SE 100Gb F32 Module Supported Configurations/Topologies M2 - 52
Virtual Connect SE 100Gb F32 Module for HPE Synergy ILT M2 - 53
Virtual Connect SE 100Gb F32 Module for HPE Synergy ILT M2 - 54
Virtual Connect SE 100Gb F32 Module for HPE Synergy ILT M2 - 55
Virtual Connect SE 100Gb F32 Module for HPE Synergy ILT M2 - 56
Virtual Connect SE 100Gb F32 Module for HPE Synergy ILT M2 - 57
THANK YOU M2 - 58
Module 3: HPE Synergy Networking M3 - 1
HPE synergy network administration skills M3 - 2
TRAINING objectives M3 - 3
network connectivity settings M3 - 4
Setup configuration summary M3 - 5
HPE OneView initial settings M3 - 6
HPE OneView ID Service M3 - 7
Creating ID pools in Settings M3 - 8
Creating a management network M3 - 9
Networks and Network Sets M3 - 10
Creating networks in HPE OneView M3 - 11
HPE OneView Ethernet networks M3 - 12
Tunneled networks M3 - 13
Internal networks M3 - 14
Untagged networks M3 - 15
Creating network sets M3 - 16
Synergy Automated VLAN Provisioning (1 of 2) M3 - 17
Network deployment in a single step (2 of 2) M3 - 18
Logical interconnect groups M3 - 19
How OneView achieves datacenter management M3 - 20
Logical Interconnect Groups M3 - 21
Logical interconnect group example M3 - 22
ADVANCED VC FEATURES M3 - 23

Logical Interconnect Group and Enclosure Group ..... M3 - 24
Enclosure groups ..... M3 - 25
Enclosure groups ..... M3 - 26
Enclosure Group IP addressing 1 of 3 ..... M3 - 27
Enclosure Group IP addressing 2 of 3 ..... M3 - 28
Enclosure Group IP addressing 2 of 3 ..... M3 - 29
Creating an enclosure group example ..... M3 - 30
Logical enclosures ..... M3 - 31
Physical frames and Logical Enclosure ..... M3 - 32
Creating a logical enclosure Example ..... M3 - 33
Static IPv6 and IPv4 addresses assignment in use ..... M3 - 34
Logical Enclosure ..... M3 - 35
Logical interconnect is now inconsistent with its group example ..... M3 - 36
Make a logical interconnect consistent with the group ..... M3 - 37
Lacp load balancing ..... M3 - 38
Lacp load balancing ..... M3 - 39
Lacp load balancing methods ..... M3 - 40
Lacp failover trigger for Active-Standby Failover ..... M3 - 41
Lacp failover trigger for Active-Standby Failover ..... M3 - 42
Lacp failover trigger for Active-Standby Failover ..... M3 - 43
Port distribution for Uplink Sets with Greater than 16 ports ..... M3 - 44
LACP distribution for uplink ports ..... M3 - 45
Alerts ..... M3 - 46
CISCO ACI ..... M3 - 47
What is Cisco Application Centric Infrastructure ..... M3 - 48
Application Centric Infrastructure ..... M3 - 49
HPE Synergy and Cisco ACI ..... M3 - 50
resources ..... M3 - 51
Lab ..... M3 - 52
Review questions ..... M3 - 53
Learning check ..... M3 - 54
Learning check ..... M3 - 55
TRAINING objectives ..... M3 - 56
Appendix ..... M3 - 57
VC SE 100Gb F32 Module Supported Configurations/Topologies ..... M3 - 58
VC SE 100Gb F32 Module Supported Configurations/Topologies ..... M3 - 59
VC SE 100Gb F32 Module Supported Configurations/Topologies ..... M3 - 60
Virtual Connect SE 100Gb F32 Module for HPE Synergy ILT ..... M3 - 61
Virtual Connect SE 100Gb F32 Module for HPE Synergy ILT ..... M3 - 62

Virtual Connect SE 100Gb F32 Module for HPE Synergy ILT ..... M3 - 63
Virtual Connect SE 100Gb F32 Module for HPE Synergy ILT ..... M3 - 64
Virtual Connect SE 100Gb F32 Module for HPE Synergy ILT ..... M3 - 65
THANK YOU ..... M3 - 66
Module 4: HPE Synergy Storage ..... M4 - 1
HPE Synergy Storage Administration Skills ..... M4 - 2
TRAINING objectives ..... M4 - 3
SAN storage ..... M4 - 4
HPE VC SE 32 Gb FC Module and Brocade 32Gb FC SAN Switch ..... M4 - 5
HPE Synergy VC SE 32Gb FC Module ..... M4 - 6
HPE Synergy with Brocade 32Gb FC SAN Switches ..... M4 - 7
HPE Synergy BROCADE 32Gb FC Module ..... M4 - 8
Brocade 32Gb vs 16Gb Fibre Channel ICM for HPE Synergy ..... M4 - 9
Direct Attached Storage (flat San) ..... M4 - 10
Attach 3PAR, Nimble and Primera FC volumes directly to servers ..... M4 - 11
HPE Virtual Connect SE 100Gb F32 Module ..... M4 - 12
Storage Configuration ..... M4 - 13
SAN CONFIGURATION ..... M4 - 14
HPE OneView SAN convergence beyond the enclosure ..... M4 - 15
ADDING SAN Managers ..... M4 - 16
HPE OneView zoning ..... M4 - 17
Automated SAN zoning ..... M4 - 18
Associating a SAN with a network enables auto-zoning ..... M4 - 19
SAN resources ..... M4 - 20
SAN zone sets ..... M4 - 21
HPE OneView SAN policy is editable per SAN ..... M4 - 22
HPE OneView Storage Management ..... M4 - 23
Importing 3PAR array ..... M4 - 24
Configuring the 3PAR StoreServ array ..... M4 - 25
Configuring the 3PAR StoreServ array ..... M4 - 26
Configuring a StoreVirtual Array ..... M4 - 27
What is Primera 3PAR support? ..... M4 - 28
Adding a Primera Storage System into OneView ..... M4 - 29
Nimble Storage Integration ..... M4 - 30
HPE OneView with Nimble storage integration ..... M4 - 31
HPE Nimble Fibre Channel Support ..... M4 - 32
HPE OneView Nimble iSCSI Integration ..... M4 - 33
OneView configuration of Nimble volume data services ..... M4 - 34
Storage System Ports ..... M4 - 35

Expected SAN/Network ..... M4 - 36
Configuring storage system ports ..... M4 - 37
HPE oneview Port Group management ..... M4 - 38
SAN storage path load balancing to a multi-node/couplet ..... M4 - 39
Profile control of target ports ..... M4 - 40
StoreServ/Primera persistent ports and OneView port groups ..... M4 - 41
How does the SAN storage path load balancing work? ..... M4 - 42
Volumes and Volume Templates ..... M4 - 43
Volumes ..... M4 - 44
Storage volume templates ..... M4 - 45
Volume and volume template correlation ..... M4 - 46
Adding and Creating Volumes ..... M4 - 47
Create a storage volume ..... M4 - 48
Create a storage volume ..... M4 - 49
Adding a storage volume ..... M4 - 50
Growing volume capacity ..... M4 - 51
3PAR Thin Deduplication volume support ..... M4 - 52
SAN volume snapshots / clones (3Par Only) ..... M4 - 53
SAN volume actions to generate a snapshot ..... M4 - 54
Deleting the volume attachments and volumes ..... M4 - 55
D3940 ..... M4 - 56
HPE Synergy 12Gb SAS Connection Module ..... M4 - 57
HPE Synergy D3940 Storage Module ..... M4 - 58
HPE Synergy D3940 Storage Module ..... M4 - 59
Synergy storage connectivity diagram ..... M4 - 60
Creating logical jbods ..... M4 - 61
New Storage Adapters ..... M4 - 62
Gen10 Plus Storage Controller Naming ..... M4 - 63
Gen10 Plus Storage Controller Portfolio ..... M4 - 64
resources ..... M4 - 65
Lab ..... M4 - 66
Review questions ..... M4 - 67
HPE Synergy storage Administration skills ..... M4 - 68
TRAINING objectives ..... M4 - 69
THANK YOU ..... M4 - 70
Module 5: HPE Synergy Composability ..... M5 - 1
HPE Synergy Composability Administration skills ..... M5 - 2
TRAINING objectives ..... M5 - 3
Mezzanine cards ..... M5 - 4

Mezzanine port configurations ..... M5 - 5
Synergy Compute Gen10 backplane ..... M5 - 6
Server hardware type ..... M5 - 7
Server Hardware Types ..... M5 - 8
Server profile Templates ..... M5 - 9
Server profile templates ..... M5 - 10
Server profile templates ..... M5 - 11
Creating server profile from server profile template ..... M5 - 12
General, Server Profile, OS Deployment ..... M5 - 13
Firmware ..... M5 - 14
Creating an Ethernet connection ..... M5 - 15
Server Profile template Connections ..... M5 - 16
Storage ..... M5 - 17
Local storage RAID levels and controllers ..... M5 - 18
Boot Settings ..... M5 - 19
BIOS ..... M5 - 20
Compliance Checks Firmware and BIOS ..... M5 - 21
iLO Settings ..... M5 - 22
Use Cases ..... M5 - 23
Initial Firmware and Configuration Use Case ..... M5 - 24
Template for hypervisor deployment ..... M5 - 25
Maintenance Mode ..... M5 - 26
Select Virtual or Physical MAC addresses ..... M5 - 27
Select User-defined MAC addresses ..... M5 - 28
Creating an FC/FCoE connection ..... M5 - 29
Select Virtual or Physical WWNs ..... M5 - 30
Select User-defined WWNs ..... M5 - 31
PROFILES AND compliance ..... M5 - 32
Creating server profile from server profile template ..... M5 - 33
Compliance tracking at server profiles ..... M5 - 34
Server profile template partial compliance tracking ..... M5 - 35
Remediation of a compliance issues ..... M5 - 36
Reapply Server Profile ..... M5 - 37
resources ..... M5 - 38
Lab ..... M5 - 39
Review questions ..... M5 - 40
HPE Synergy Composability Administration Skills ..... M5 - 41
TRAINING objectives ..... M5 - 42

Module 6: Firmware ..... M6 - 1

HPE Synergy firmware Administration skills ..... M6 - 2
TRAINING objectives ..... M6 - 3
Introduction to HPE Synergy firmware and driver updates ..... M6 - 4
Firmware management features ..... M6 - 5
Three independent update zones ..... M6 - 6
What is an HA Redundant Network Configuration? ..... M6 - 7
OneVIew FIRMWARE Repository enhancements ..... M6 - 8
Acquiring Synergy firmware and drivers ..... M6 - 9
Affected component analysis ..... M6 - 10
Where to find firmware updates? (1 of 2) ..... M6 - 11
Where to find firmware updates? (2 of 2) ..... M6 - 12
storing SPPs and hot fixes ..... M6 - 13
HPE Synergy Hot fix bundling ..... M6 - 14
HPE Synergy bundle management ..... M6 - 15
Logical Enclosure Firmware Updates ..... M6 - 16
Logical Enclosure Firmware Update Options ..... M6 - 17
Logical Interconnect Firmware Update ..... M6 - 18
Logical Interconnect Firmware Update ..... M6 - 19
LI Firmware update options ..... M6 - 20
Orchestrated and Parallel LI Updates ..... M6 - 21
HPE Synergy Orchestrated versus parallel li update ..... M6 - 22
HPE Synergy LI firmware update (FROM le and LI Screen) ..... M6 - 23
HPE Synergy LI firmware update process ..... M6 - 24
HPE Synergy LI firmware update Process ..... M6 - 25
Firmware update during LE creation ..... M6 - 26
Creating a logical enclosure ..... M6 - 27
Compute Module firmware updates ..... M6 - 28
Offline FIRMWARE APPLIcation ..... M6 - 29
HPE Synergy compute module firmware update ..... M6 - 30
OneView shows the actions of iSUT/SUT ..... M6 - 31
Detailed progress for firmware update process in 5.0+ ..... M6 - 32
Terminating a firmware update task in 5.0+ ..... M6 - 33
Server profile ..... M6 - 34
Server profile ..... M6 - 35
Server firmware inventory ..... M6 - 36
Firmware updates of HPE Synergy Appliances ..... M6 - 37
HPE Synergy management appliances firmware update ..... M6 - 38
HPE Synergy Composer Memory upgrade ..... M6 - 39

Update Readiness Checker ..... M6 - 40
Tool usage ..... M6 - 41
Log file ..... M6 - 42
HPE Synergy management Composer firmware update ..... M6 - 43
Prepare to Upgrade ..... M6 - 44
Backup the Appliance(s) ..... M6 - 45
Composer health ..... M6 - 46
Check the Dashboard for Critical Errors ..... M6 - 47
Ensure all Interconnects are in a Configured State ..... M6 - 48
HPE Synergy Compliance Checking ..... M6 - 49
HPE OneView 5.00+ ..... M6 - 50
Firmware Compliance ..... M6 - 51
Firmware Compliance and Reporting ..... M6 - 52
Firmware Compliance Dashboard in 5.0+ ..... M6 - 53
OneView firmware compliance tracking ..... M6 - 54
OneView Logical Interconnect compliance tracking ..... M6 - 55
Firmware and driver update best practices ..... M6 - 56
Order of Operations Matter ..... M6 - 57
Recommended firmware update order ..... M6 - 58
HPE-recommended approach for updating firmware for shared infrastructure and compute modules ..... M6 - 59
Firmware update frequency ..... M6 - 60
Post-support period complexities for SPPs and Appliance Upgrades ..... M6 - 61
Alternative firmware update options ..... M6 - 62
Best practices for validating firmware updates ..... M6 - 63
Best practices for managing firmware ..... M6 - 64
Tools to Support Synergy Upgrades ..... M6 - 65
HPE Synergy Software Releases - Overview ..... M6 - 66
HPE Synergy Firmware Comparison Tool ..... M6 - 67
Synergy feature comparisons ..... M6 - 68
Synergy Composer upgrade paths ..... M6 - 69
Vibsdepot: HPE Custom Image mapping ..... M6 - 70
Resources ..... M6 - 71
REFERENCES ..... M6 - 72
REFERENCES ..... M6 - 73
Lab ..... M6 - 74
Review questions ..... M6 - 75
HPE Synergy firmware Administration skills ..... M6 - 76
TRAINING objectives ..... M6 - 77
THANK YOU ..... M6 - 78

Module 7: HPE SYNERGY Analytics ..... M7 - 1
HPE Synergy analytics ..... M7 - 2
TRAINING objectives ..... M7 - 3
Check the Dashboard for Critical Errors ..... M7 - 4
Activity ..... M7 - 5
Clearing alerts ..... M7 - 6
Firmware Compliance and Reporting ..... M7 - 7
Global Dashboard ..... M7 - 8
Unify visibility with HPE OneView Global Dashboard ..... M7 - 9
Remote data centers ..... M7 - 10
Installation requirements ..... M7 - 11
HPE OneView Global Dashboard features ..... M7 - 12
Remote support ..... M7 - 13
A new way to get connected ..... M7 - 14
HPE will know about your IT issue before you do ..... M7 - 15
iLO Amplifier Pack ..... M7 - 16
iLO Amplifier Pack Description ..... M7 - 17
iLO Amplifier Pack DASHBOARD ..... M7 - 18
HPE InfoSight partnership ..... M7 - 19
InfoSight for Servers ..... M7 - 20
What is HPE InfoSight ..... M7 - 21
What is InfoSight for Servers ..... M7 - 22
Wealth of server health and performance data ..... M7 - 23
Analytics tool use ..... M7 - 24
OneView Plugins ..... M7 - 25
Storage monitoring ..... M7 - 26
SAN Storage health dashboard ..... M7 - 27
Monitoring SAN resources ..... M7 - 28
Port Information ..... M7 - 29
Managing Storage ..... M7 - 30
storage pool subscribed capacity VALUE new in oneview 5.2+ ..... M7 - 31
SAN unexpected zoning analysis report ..... M7 - 32
SAN endpoints ..... M7 - 33
View profiles and data paths attached to a volume ..... M7 - 34
3Par and Primera persistent port status ..... M7 - 35
Lab ..... M7 - 36
Review questions ..... M7 - 37
HPE Synergy analytics Administration skills ..... M7 - 38
TRAINING objectives ..... M7 - 39

THANK YOU ..... M7 - 40
Module 8: HPE Synergy maintenance and Growth ..... M8 - 1
HPE Synergy Maintenance and Growth ..... M8 - 2
TRAINING objectives ..... M8 - 3
maintenance ..... M8 - 4
HPE OneView milestone releases ..... M8 - 5
Scheduled remote appliance backup ..... M8 - 6
Restoring the composer from a backup ..... M8 - 7
Create a support dump and review ..... M8 - 8
View ciDebug log from ui ..... M8 - 9
HPE Synergy Composer factory reset (1 of 3) ..... M8 - 10
HPE Synergy Composer factory reset (2 of 3) ..... M8 - 11
HPE Synergy Composer factory reset (3 of 3) ..... M8 - 12
Reimage the HPE Synergy Composer appliance ..... M8 - 13
Composer2 Zero Touch Provisioning using DHCP ..... M8 - 14
Efuse available on Composer CLI ..... M8 - 15
Easier system board replacement procedures ..... M8 - 16
SHA-256 Certificate support for Composer2 ..... M8 - 17
Additional HTTP security headers ..... M8 - 18
Enabling Maintenance Mode for Servers in production ..... M8 - 19
Disabling Maintenance Mode for Servers ..... M8 - 20
Dashboard showing resources in Maintenance mode ..... M8 - 21
Adding frames ..... M8 - 22
Scale up to 21 Synergy frames with one management ring ..... M8 - 23
Management architecture is highly optimized ..... M8 - 24
Remote management ring ..... M8 - 25
Scale up to 21 Synergy frames with remote management rings ..... M8 - 26
Adding a remote management ring ..... M8 - 27
Adding a remote management ring ..... M8 - 28
Upgrading to new Hardware ..... M8 - 29
Migration Synergy Composer to Synergy Composer2 ..... M8 - 30
Flm move to 4 port ..... M8 - 31
Extending Connectivity with Synergy 4-port FLM ..... M8 - 32
Scaling with new 4-port FLM Frames ..... M8 - 33
Migration of Synergy FLM components (1 of 2) ..... M8 - 34
Migration of Synergy FLM components (2 of 2) ..... M8 - 35
Changing ethernet fabric ..... M8 - 37
Growing an LE ..... M8 - 38
Scaling with 10/20Gb or 25/50Gb Interconnect Link Modules ..... M8 - 39

Scaling with 10/20Gb or 25/50gb Interconnect Link Modules ..... M8 - 40
Migration and Grow Use Cases ..... M8 - 41
New LIG | EG, reparent LE ..... M8 - 42
Scaling with 10/20Gb or 25/50gb Interconnect Link Modules ..... M8 - 43
Scaling a logical enclosure ..... M8 - 44
HPE Synergy scaling ..... M8 - 45
Scaling with 25/50 Gb interconnect link modules ..... M8 - 47
Resources ..... M8 - 48
Lab ..... M8 - 49
Review questions ..... M8 - 50
HPE Synergy growth planning skills ..... M8 - 51
TRAINING objectives ..... M8 - 52
THANK YOU ..... M8 - 53


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HPE SYNERGY ADMINISTRATION
COURSE OVERVIEW
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COURSE OBJECTIVES

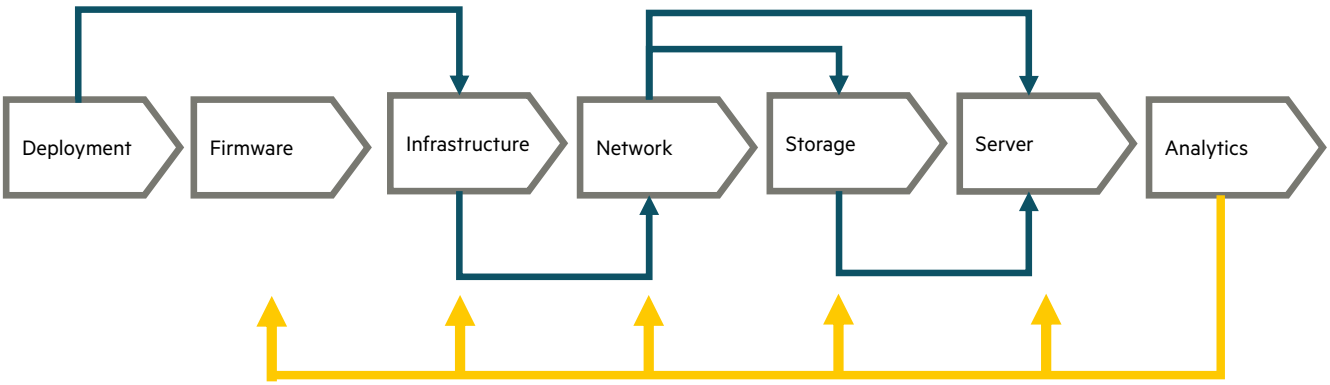
- Introduce Composable Infrastructure (basic concepts) and HPE Synergy domains
- Explore the functional architecture of the HPE Synergy environment
  - Management infrastructure (HPE Synergy Composer and Frame Link Modules)
  - Compute modules
  - Interconnect modules
  - Local storage systems
  - Power and cooling
- Review the HPE Synergy Portfolio and equipment capabilities
- Explain the basics of the HPE Synergy Master/Satellite interconnects topology and cabling

PREREQUISITES

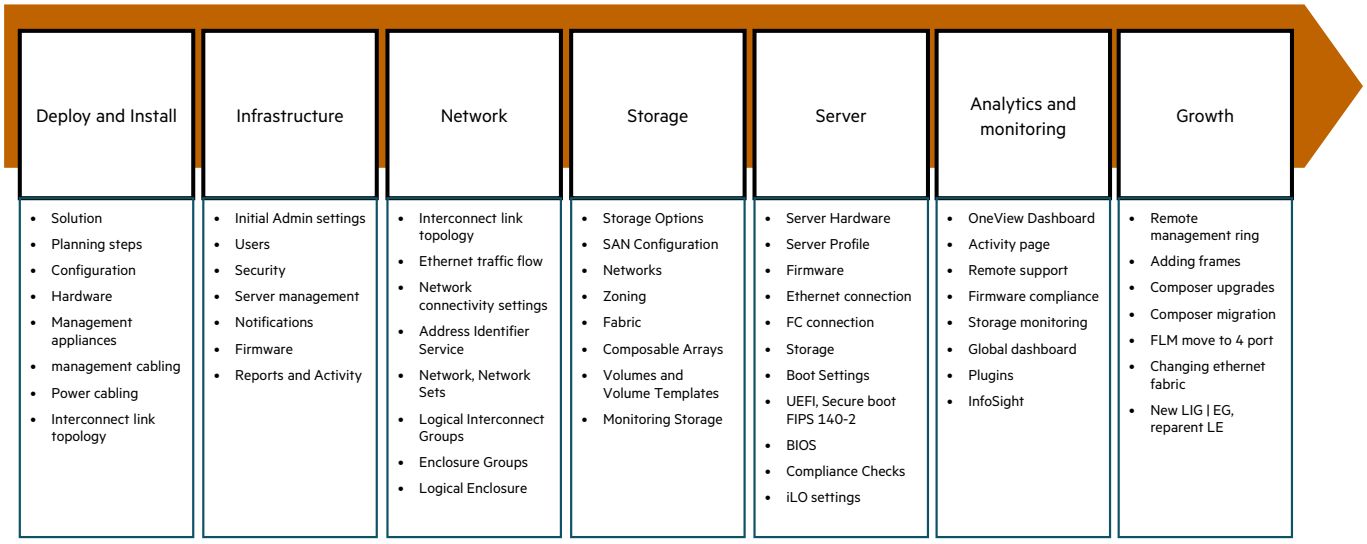
- H0LN2AAE HPE Synergy Overview WBT
- H0LP6AAE HPE OneView Overview and Configuration for Synergy

WHAT IS SYNERGY ADMINISTRATION

Solution Implementation and Administration



WHERE'S YOUR FOCUS



MODULE TRAINING OBJECTIVES

- For best training experience:
- During this training apply HPE Synergy OneView Administration skills to perform tasks in lab.
- Course review questions will check your knowledge of skill and task including Facts, Terms, Definitions and Concepts.
- The course is designed to follow typical systems administration responsibilities and tasks performed once installation completed.
- Skill performance is demonstrated at the end of the modules by using the OneView interface and configuration documentation to perform identified skills
- Upon completion of each module, create a personal learning plan and module summary

MODULE 01: HPE SYNERGY SOLUTION

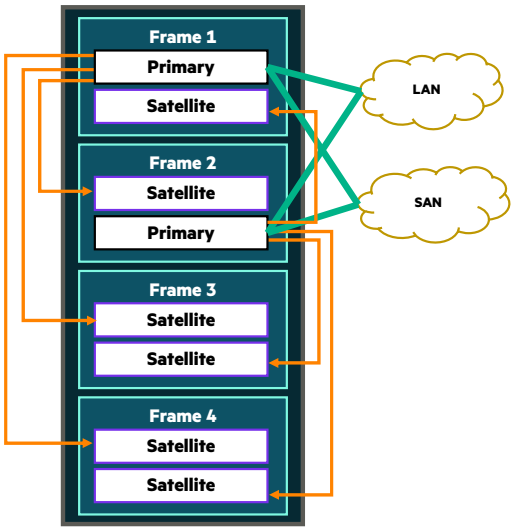
Topics

- Solution overview
  - Planning steps
  - Configuration steps
- Hardware overview
- Management appliances
- Frame management cabling
- Power cabling
- Interconnect link topology
- Accessing Composer

MODULE 02: HPE SYNERGY CABLING

Topics

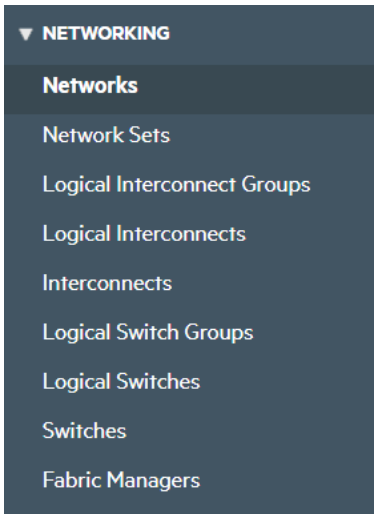
- Ethernet Modules
- Interconnect link topology
- Ethernet traffic flow



MODULE 03: HPE SYNERGY NETWORKING

Topics

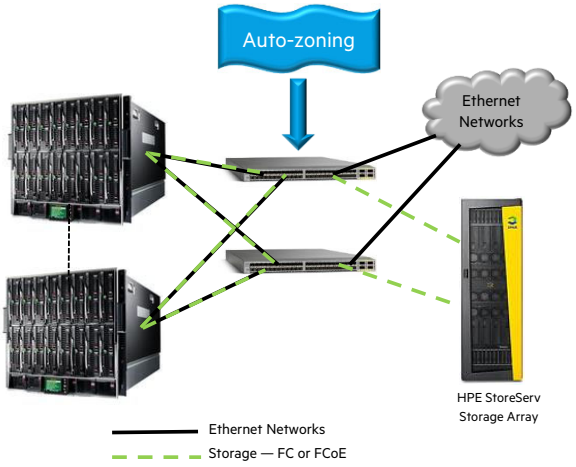
- Network connectivity settings
- Address Identifier Service
- Network, Network Sets
- Logical Interconnect Groups
- Enclosure Groups
- Logical Enclosure
- Interconnect settings, LACP load balancing



MODULE 04: HPE SYNERGY STORAGE

Topics

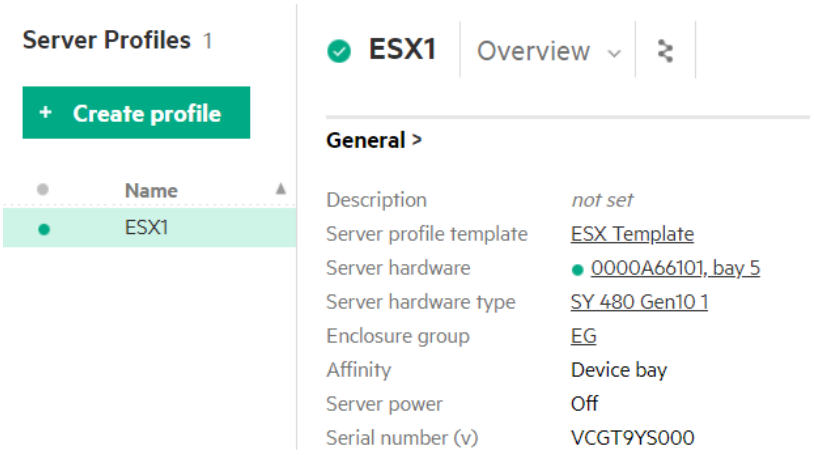
- Storage Options
  - Storage Array
  - D3940
- SAN Configuration
- Storage Management
- SAN Manager
- Networks
- Zoning
- Fabric
- Composable Arrays
- Volumes and Volume Templates



MODULE 05: HPE SYNERGY COMPOSABILITY

Topics

- Server Hardware
  - Gen10 Compute, iLO 5
  - Server Admin Skills Matrix
- Server Hardware Types
- Server Profile Template
- Server Profile
- Physical addressing
- Compliance



MODULE 06: HPE SYNERGY FIRMWARE

Topics

- Current OneView Updates
- Acquiring Firmware
- Interconnect Firmware Updates
- Compute Firmware
- OS Tools
- Appliance Firmware
- Upgrading Hardware
- Preparing to Upgrade
- Best Practices
- Tools
- Compliance
- References

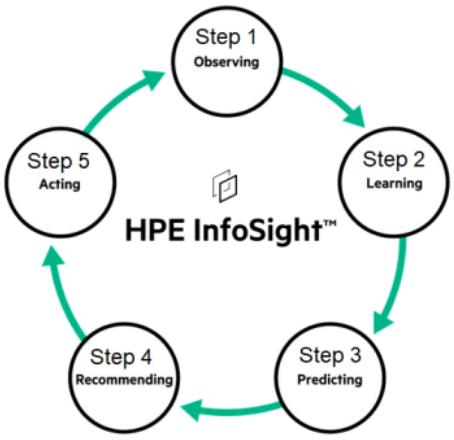
HPE Synergy Management Combinations and supported HPE Synergy Custom SPPs

HPE Synergy Management Combinations	HPE Synergy Custom SPPs			
	Recommended HPE Synergy Custom SPP	Additionally supported	End-of-support (January 2021)	End-of-support (December 2021)

MODULE 07: HPE SYNERGY ANALYTICS

Topics

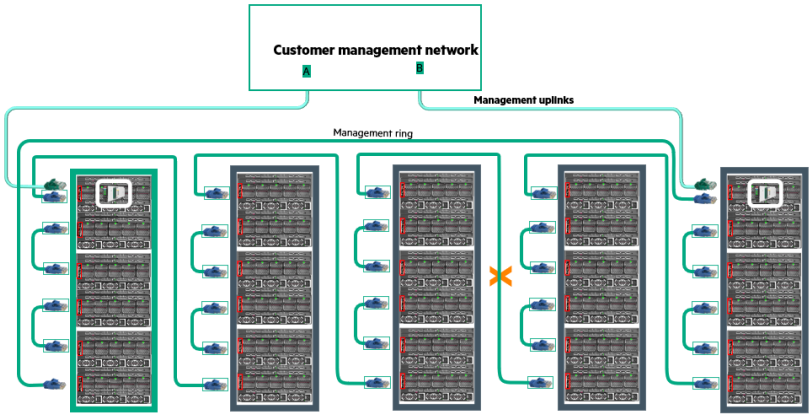
- Dashboard
- OneView Activity
- Remote support
- Firmware compliance dash
- Interconnect monitoring
- Storage monitoring
- iLO security dash
- Global dash
- Plugins
- OV next version tool
- InfoSight



MODULE 08: HPE SYNERGY MAINTENANCE AND GROWTH

Topics

- Remote management ring
- Adding frames
- Composer upgrades
- Composer migration
- Flm move to 4 port
- Changing ethernet fabric
- New LIG | EG, reparent LE



COURSE LEVEL RESOURCES

- where get the info, tool, sites, videos

For in-class discussion

LABS

THANK YOU


Hewlett Packard
Enterprise
HPE SYNERGY SOLUTION
H0LN3S E.00
Module 1
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HPE SYNERGY HARDWARE ADMINISTRATION SKILLS

Topic Areas

- Solution overview
  - Planning steps
  - Configuration steps
- Hardware overview
- Management appliances
- Frame management cabling
- Power cabling
- Interconnect link topology
- Accessing Composer

HPE Synergy Hardware Administration skills

Topic areas

Solution overview

- Planning steps
- Configuration steps

Hardware overview

Management appliances

Frame management cabling

Power cabling

Interconnect link topology

Accessing Composer

TRAINING OBJECTIVES

- Upon completion of the module apply HPE Synergy Hardware Administration skills to perform tasks in lab to validate a Synergy deployment and initial hardware setup.
- Course review questions will provide you an opportunity check your knowledge of skill and task: Facts, Terms, Definitions and Concepts.
- The course modular structure organizes skill topics to follow typical systems administration responsibilities for tasks performed once installation completed. What's in it for you, at the end of this module, is identifying those skills you need to perform on the job with your Synergy implementation.
- Successful Skill performance is demonstrated at the end of this module by using the OneView interface and configuration documentation to perform the listed skills
- Upon completion of the module create a personal learning plan and module summary thinking about the following questions:
  - What are the new skills that were covered?
  - Who on the team will perform the skills in the module?
  - What questions do you need answers?

Training objectives

Upon completion of the module apply HPE Synergy Hardware Administration skills to perform tasks in lab to validate a Synergy deployment and initial hardware setup.

Course review questions will provide you an opportunity check your knowledge of skill and task: Facts, Terms, Definitions and Concepts.

The course modular structure organizes skill topics to follow typical systems administration responsibilities for tasks performed once installation completed. What's in it for you, at the end of this module, is identifying those skills you need to perform on the job with your Synergy implementation.

Successful Skill performance is demonstrated at the end of this module by using the OneView interface and configuration documentation to perform the listed skills

Upon completion of the module create a personal learning plan and module summary thinking about the following questions:

- What are the new skills that were covered?
- Who on the team will perform the skills in the module?
- What questions do you need answers?

SYNERGY SOLUTION OVERVIEW

HPE Synergy 12000 Frame

HPE SYNERGY PLANNING STEPS

Design, Deliver, Deploy

- Planning and Config
- Order and Validation
- Customer Intent Document
- Site Planning
- Factory Integration
- Onsite Installation (Factory Express option)
- Delivery
- Site setup and cable
- OneView setup
- Validating firmware

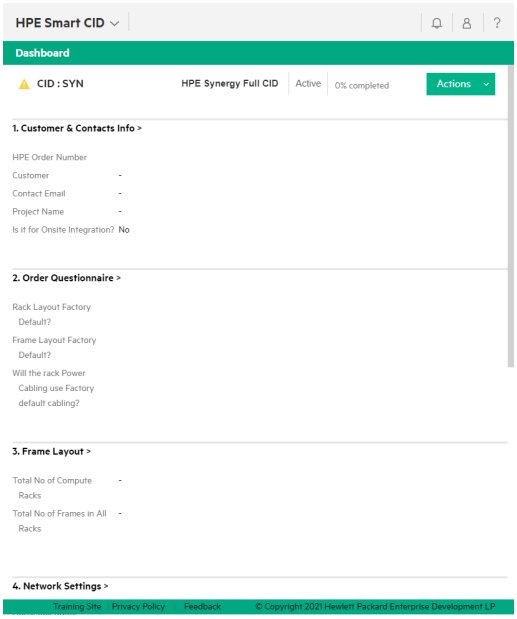
HPE SYNERGY CONFIGURATION STEPS

- HPE Synergy Architecture and Configuration
  - Overview
  - HPE Synergy 12000 Frame
  - HPE Synergy Management Appliances
  - Frame front components and device bays
  - Frame rear components
  - Ethernet Fabric Primary – Satellite architecture

HPE SYNERGY CONFIGURATION

Customer Intent Document
https://smartcid.itcs.hpe.com/

1. Customer Info
2. Order Questionnaire
3. Frame Layout
4. Network Settings
5. Composer
6. Enclosure Group
7. Server Profiles
8. Data Canter Details



Customer Intent Document

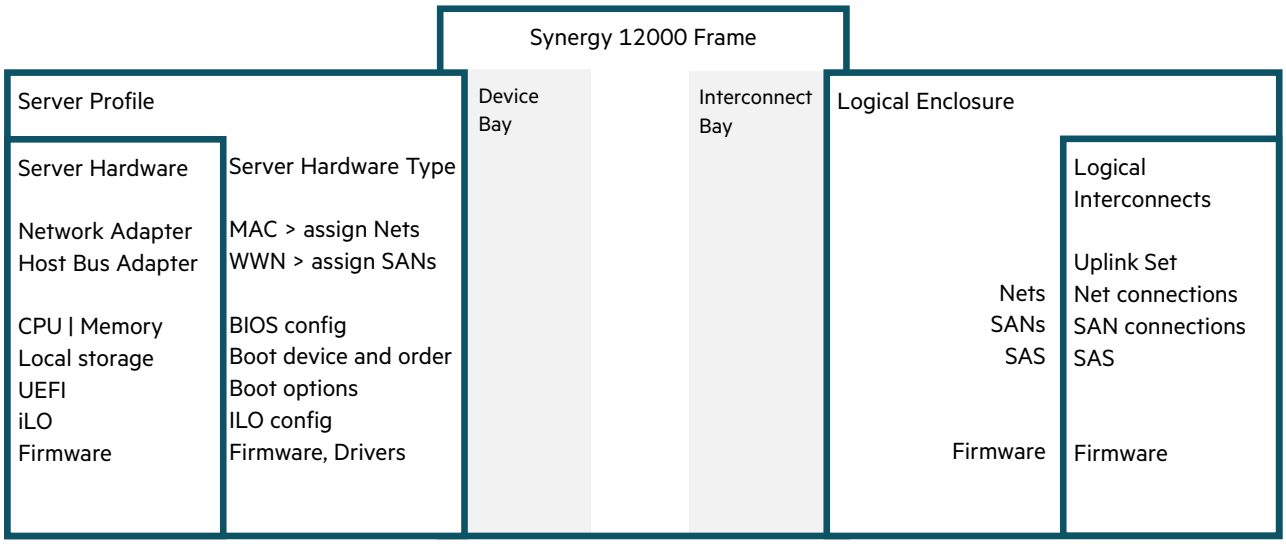
What it is:

How created:

When used:

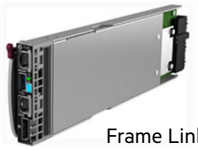
HPE SYNERGY ARCHITECTURE AND CONFIGURATION

COMPOSABLE WHITEBOARD



HPE SYNERGY 12000 FRAME OVERVIEW

- One or two HPE Synergy Frame Link Modules
- One or two HPE Synergy Composers (HPE Synergy Composer hosts HPE OneView)
- Other components such as servers, interconnects, power supplies, and fans
- HPE Synergy Composer(s)



Frame Link Module

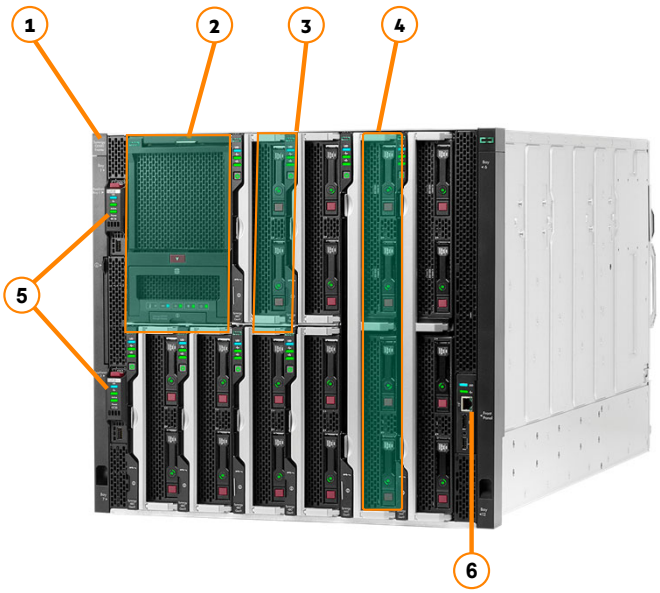
Synergy Composer

- HPE Synergy 12000 Frame overview
- HPE Synergy is the first platform built from the ground up for Composable Infrastructure. A single HPE Synergy frame supports:
  - One or two HPE Synergy Frame Link Modules
  - One or two HPE Synergy Composers (HPE Synergy Composer hosts HPE OneView)
  - Other components such as servers, interconnects, power supplies, and fans
  - HPE Synergy Composer(s) – the brains of the Synergy solution
- One or more Synergy frames can be cabled together and managed by the active HPE Synergy Composer within those Synergy frames. With the standard 10U rack space, it can fit into the same space of many converged systems today.

FLEXIBLE DESIGN FOR A SEAMLESS TRANSITION INTO THE DATACENTER

HPE Synergy 12000 Frame (front view)

1. Chassis—10U
2. Double-wide storage module
3. Half-height compute module
4. Full-height compute module
5. Redundant management appliance modules
6. Front panel / HPE Synergy Console



Flexible design for a seamless transition into the datacenter—HPE Synergy 12000 Frame (front view)

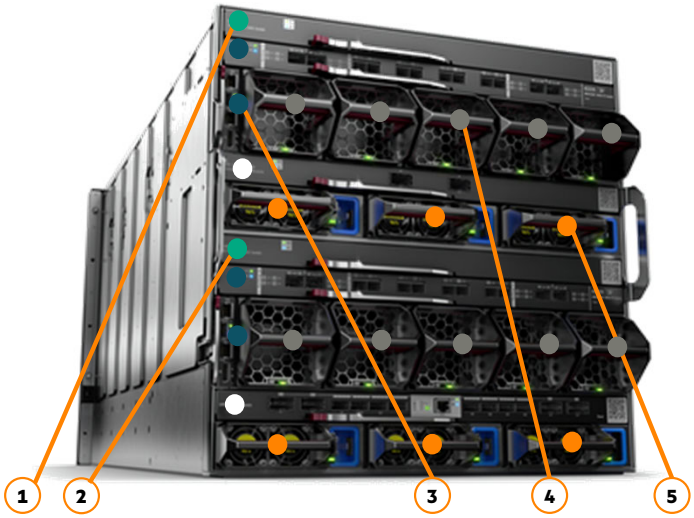
This is a front view of the HPE Synergy 12000 Frame.

- The new flexible design of the HPE Synergy 12000 Frame supports multiple types of half-height, full-height and a number of double-wide compute and storage modules.
- With two management appliance bays in every frame, Synergy offers full redundancy of management infrastructure, which leaves room for future appliances in multi-frame environments. Management appliances at the time of writing this are HPE Synergy Composer and HPE Synergy Image Streamer.
- The front panel on every frame offers direct connection to the HPE Synergy Console. On multiple linked frames, it provides a single management connect point to all frames.

FLEXIBLE DESIGN FOR A SEAMLESS TRANSITION INTO THE DATACENTER

HPE Synergy 12000 Frame (rear view)

1. Three primary interconnect module (ICM) bays
2. Redundant interconnect module bays
3. Redundant Frame Link Module bays
4. Ten system fan modules (included)
5. Six titanium 2650W power supplies



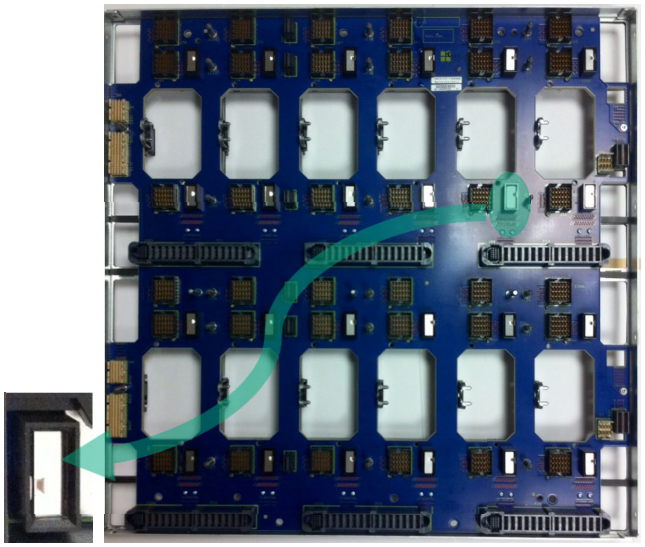
Flexible design for a seamless transition into the data center—HPE Synergy 12000 Frame (rear view)

- This is the rear view of the HPE Synergy 12000 Frame. At the rear, HPE Synergy 12000 Frame supports three primary and three redundant interconnect modules, two Frame Link Modules, ten system fan modules and six Titanium-class 2650W power supplies.
- Management appliance bays link directly to the Frame Link Modules in the rear to provide detailed information on compute, storage, and fabric resources for management composability of the HPE Synergy Composer appliance with HPE OneView.

THE SYNERGY FRAME MIDPLANE I/O ARCHITECTURE (REAR VIEW)

Next generation bandwidth and capabilities

- Signal integrity
  - Supports data rates of up to 28Gb/s per lane, 4 lanes/port
  - Delivers over 15Tb/s of cross-sectional bandwidth
  - Offers deterministic routing for all compute modules and ICMs (hard-wired signal routing)
  - Supports 3 redundant fabrics
- Supports direct-connect architecture
  - No active components (except for EEPROM)
  - No cables and a separate, heavy, expensive power bus plate
- Future Photonic strategies supported
  - Structures in place for compute module-to-ICM direct connections



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The Synergy Frame midplane I/O architecture—Next generation bandwidth and capabilities

The Synergy Frame midplane is designed to remove complexity, size, and weight, while improving bandwidth for the next generations of compute and fabric needs.

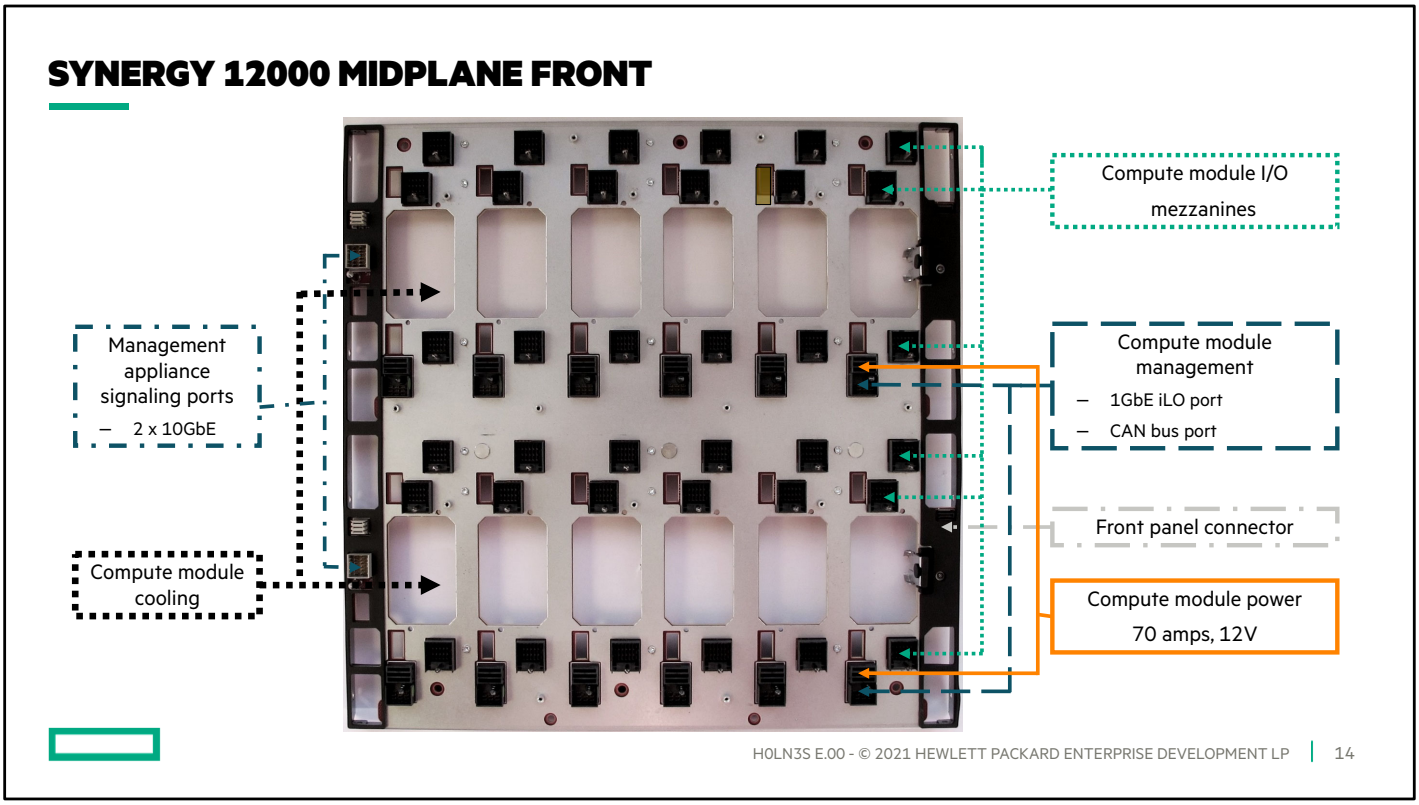
The Synergy direct-connect architecture is designed in such a way that it contains no cables, no interposers (except for fans), and no separate, heavy, or expensive power bus plates, while still providing full redundancy of power, fabrics, and management.

NOTE: The Synergy midplane does not contain active components, except for an EEPROM FRU chip that stores the identification information.

Signal integrity creates an opportunity for higher data rates. So, the Synergy midplane can pass data of up to 28Gbps per lane. This gives you more than 16 terabits of bandwidth across the midplane.

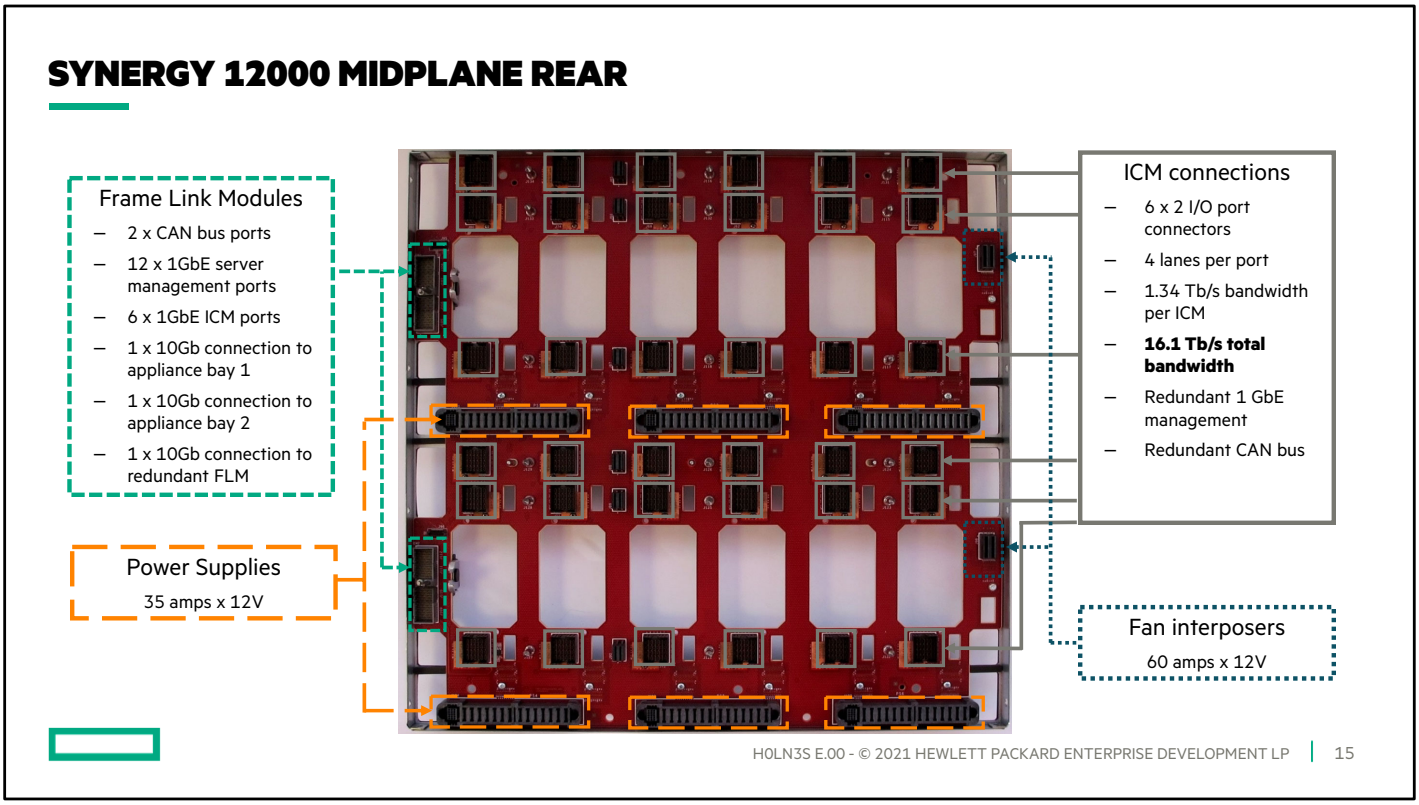
Other features of the midplane design include:

- Module cooling support
- A true air-gapped management network
- Ports already left in place for future Photonics strategies



Synergy 12000 midplane front

- This slide displays the Synergy 12000 midplane front.
- Note: A Controller Area Network (CAN) bus is a vehicle bus standard designed to allow microcontrollers and devices to communicate with each other in applications without a host computer.

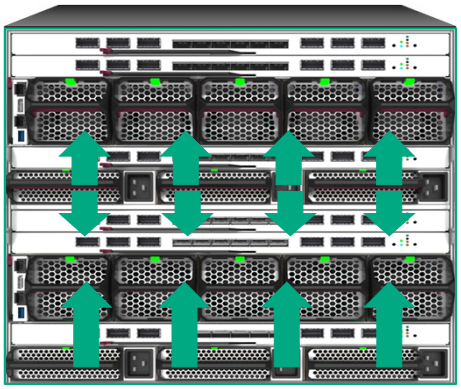


Synergy 12000 midplane rear

– Here, you can take notice of the Synergy 12000 midplane rear.

HPE SYNERGY POWER DISTRIBUTION

- Up to six HPE 2650W or newer Titanium-class hot-plug AC power supplies
  - Input voltage range (Vrms): 200 – 240
  - Frequency range (Hz) (nominal): 50 – 60
- 7950 W of redundant power support (with six HPE 2650W power supplies installed)
- PCB-based power distribution
- No power bus plate
- Shared power distribution pool
- No low voltage option
- Specific grouping of power supplies is not required



Improved power distribution

- The HPE Synergy 12000 Frame supports up to six HPE 2650 W Titanium-class hot-plug AC power supplies. These power supplies have the input voltage range from 200 to 240 V and the frequency range from 50 to 60 Hertz.
- When all six power supplies are installed, they provide 7950 W of redundant power support.
- In Synergy, the inexpensive PCB-based power distribution is used to get power from distributed power supplies to distributed loads. The power bus plate is removed, and power distribution is handled within the midplane itself.
- Each Synergy power supply provides its power into the shared power distribution circuit. The power sensing and power sharing circuits within each of the power supplies ensure that each power supply is providing equal amounts of power into the shared power pool. Synergy does not require a specific grouping of power supplies, although as per the configuration guide, some power supply unit (PSU) placements are preferred and provide the best cooling and power distribution.

HPE Synergy 2900W – 3400W (SKU# 876929-B21) Hot Plug Platinum Power Supply

This is a new power supply module with the following enhancements:

- 13% - 28% larger capacity than existing HPE Synergy power supplies
- Flexible VAC input range supported from 200VAC to 240VAC.
- Efficiency comparable with existing HPE Synergy Titanium power supplies
- Works with existing frame

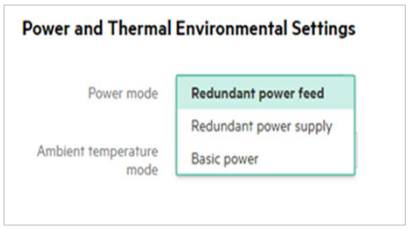
- Component power (e.g. CPU, memory, storage) continues to rise for foreseeable future
- Allows full frame compute capacity with higher powered Synergy modules
- Currently supported for 240V AC
- Support for 200-220V AC

HPE Synergy 2650W Carrier Grade Power Supply (SKU# 798099-B21)

HPE Synergy 12000 Frame - Carrier Grade
The HPE Synergy 12000 Frame has been certified to NEBS Level 3. The certified configuration covers the compute modules, interconnect modules, and other components that passed the NEBS Level 3 and ETSI EN 300 386-2 certifications.
For more information, see HPE Synergy 12000 Frame - Carrier Grade Supplement
https://h20195.www2.hpe.com/v2/gethtml.aspx?docname=a00019671enw

HPE SYNERGY POWER MODES

- Three modes:
  - Basic Power Mode
  - Redundant power feed (N+N)
  - Redundant power supply (N+1)
- Frame Link Module (FLM) manages power in an HPE Synergy frame
  - Tracks and updates the available power
  - Determines if enough power is delivered to the frame
  - Communicates with power supplies and provides the power usage information
  - Uses the maximum power estimates



HPE Synergy power modes

– There are three power modes for Synergy: 1) Basic Power Mode 2)Redundant power feed (N+N), and 3) Redundant power supply (N+1). Which mode should be used is driven by your power distribution setup and needs. The Synergy frame defaults to the redundant power feed mode since this is the most common configuration that you are expected to use but can be changed to redundant power supply if the frame is intended to be used with a single power feed. Both odd and even power supply counts (2, 3, 4, 5, and 6) are valid for the N+1 power mode, but odd counts (3, 5) are basically ignored in the N+N mode. If an odd number of power supplies is installed in a frame that is configured for redundant power feed mode, all power supplies are providing power to the frame, but the capacity of the odd power supply is not used to determine the overall power capacity of the frame.

-- In HPE OneView 5.2+, the HPE Synergy frame power subscription management is enhanced by an additional "Basic power" management mode.

– In Basic power mode, the amount of power that can be allocated to the enclosure components is equal to the total power supply capacity of all the installed and operational power supplies.

– Therefore, power capacity boost is not available and server throttling is disabled in this mode.

– In this mode, when the power usage of the enclosure exceeds the capacity of all operational power supplies, the power supplies may go offline and servers may shut down unexpectedly.

So care must be taken to ensure that the power usage of the frame does not exceed the power capacity of frame.

– The Frame Link Module (FLM) is the primary entity that manages power in a Synergy frame. As modules are inserted and removed from the frame, the FLM tracks and updates the available power and determines whether there is enough power being delivered to the frame to power the modules installed in the frame. The FLM communicates with power supplies to provide the power usage information to the user through HPE OneView. The FLM uses the maximum power estimates and not the actual power usage of the module. For example, if a particular configuration of an HPE Synergy 480 Compute Module could use 600W under realistic workloads, the FLM will use 600W as the power needs for that module, regardless of the module's actual usage. That is, the module could be running an application that underutilizes the compute module and where its actual power usage is much less than its maximum, but the FLM will continue to use the realistic maximum power estimate.

HPE SYNERGY POWER SUPPLY PLACEMENT

(A=CIRCUIT ONE, B=CIRCUIT TWO)

Number of power supplies	Power modes	Power supply bay (power feed)
1	Not supported	—
2	Redundant power supply mode	1(A) and 3(A)
	Redundant power feed mode	1(A) and 3(B)
3 [1]	Redundant power supply mode	1(A), 3(A), and 5(A)
4	Redundant power supply mode	1(A), 3(A), 4(A), and 6(A)
	Redundant power feed mode	1(A), 3(B), 4(A), and 6(B)
5 [1]	Redundant power supply mode	1(A), 2(A), 3(A), 4(A), and 6(A)
6	Redundant power supply mode	1(A), 2(A), 3(A), 4(A), 5(A), and 6(A)
	Redundant power feed mode	1(A), 2(A), 3(B), 4(A), 5(B), and 6(B)

[1] If an odd number of power supplies are installed in a frame that is configured for redundant power feed mode, all power supplies are providing power to the frame, but the capacity of the odd power supply is not used to determine the overall power capacity of the frame.

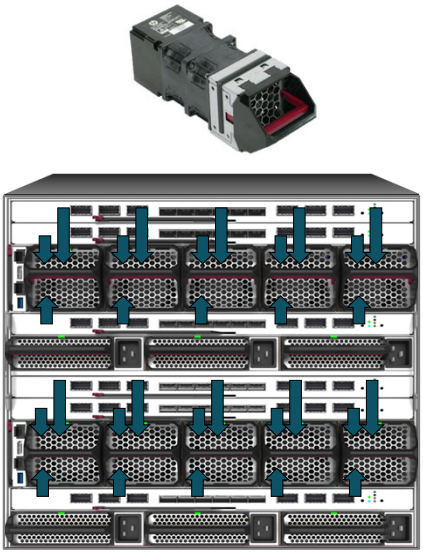
HPE Synergy power supply placement

- There are no power supply bay placement restrictions of power supplies in the frame. However, for best cooling and power distribution, Hewlett Packard Enterprise recommends the best practice for power supply usage as displayed in this table.

FRAME COOLING

- **Deterministic airflow** for compute and interconnect modules
- Fan Filler blanks **are not required**
- No fan rules (all ten fans are installed in each frame)
- Fan **redundancy**
  - **Top** five fans cool the **upper** six compute modules, appliance bay, FLM, and interconnect modules 1,2, and 3
  - **Bottom** five fans cool the **lower** six compute modules, appliance bay, FLM, and interconnect modules 4, 5, and 6
  - 4+1 redundancy for cooling under **all conditions**
  - Variable conditions—Total cooling requirements may differ

NOTE: Losing more than one fan in a row results in a serious thermally degraded frame state. You cannot power on additional modules until a serious thermally degraded frame state is resolved.



Frame cooling

- In Synergy, the air flow path is consistent, regardless of the ICM bay. Characteristics of the design include:
- Deterministic airflow for compute modules and ICMs: Airflow is determined by the number of compute modules and interconnect modules (ICMs) installed.
- Filler blanks are not required: The airflow flaps open automatically and only when compute modules are installed, which means that blanks are not necessary to maintain optimum airflow. However, blanks can be installed.
- Fan rules: HPE ships all 10 fans installed into each frame so that you do not have to deal with fan rules or the cooling firmware algorithms.
- Fan redundancy: In the Synergy 12000 Frame, the top five fans are used to cool the upper six front modules, the upper appliance bay, the upper FLM, and ICMs 1, 2, and 3. The bottom five fans are used to cool the lower six front modules, the lower appliance bay, the lower FLM, and ICMs 4, 5, and 6. There is no common plenum that shares the cooling of the upper five fans with the lower five fans.
- All conditions: For both the upper and the lower half of the frame, the five fans provide 4+1 redundancy for cooling under all conditions. Four fans are adequate to cool the components installed into that half of the frame.
- Variable conditions: Total cooling requirements are dependent on the number of components installed, the workloads they are running, and the ambient input air temperature. Up to four fans can fail and leave one fan to cool one or two servers at 50% load in a 20°C data center.
- A single fan failure in either (or both) of the two rows of fans does not affect the cooling of all supported configurations of Synergy. In that case, a degraded frame alert is generated indicating that a fan has failed. If more than one fan fails per row, then a more serious thermal alert is issued and no additional modules will be allowed to power on. The FLM makes no qualification as to whether the remaining operational fans can adequately cool the frame, and so, it will take the alert to that next level of severity and halt any ability to power on more units within that thermally degraded frame until the thermal alert is resolved. No modules are ever turned off as a result of fans failing or fans being removed from the frame; however, you will not be able to add modules until this serious thermally degraded frame state is resolved.

SERVERS HIGH LEVEL

HPE Synergy 480 Gen10	HPE Synergy 660 Gen10
Intel® Xeon® Scalable processor - 2nd gen 2-socket (1st Gen also available) Cores: 4 – 28 in varying increments	Intel® Xeon® Scalable processor - 2nd gen 4-socket (1st Gen also available) Cores: 4 – 28 in varying increments
24 DIMM - Large memory tier Up to 4.5 TB addressable memory per socket	2 - 48 DIMM LRDIMM max 6 TB RDIMM max 3 TB
3 I/O mezzanine connectors 10/20/25Gb Converged Network Adapters 16/32Gb Host Bus Adapters	6 I/O mezzanine connectors 10/20/25Gb Converged Network Adapters 25/50Gb Ethernet Adapter 16/32Gb Host Bus Adapters
RAID: Software, Essential, Performance, Premium Backplane supporting NVMe	
HPE iLO 5, iLO RESTful API, UEFI, TPM, Graphics Accelerators, MXM Expansion	

iLO 5

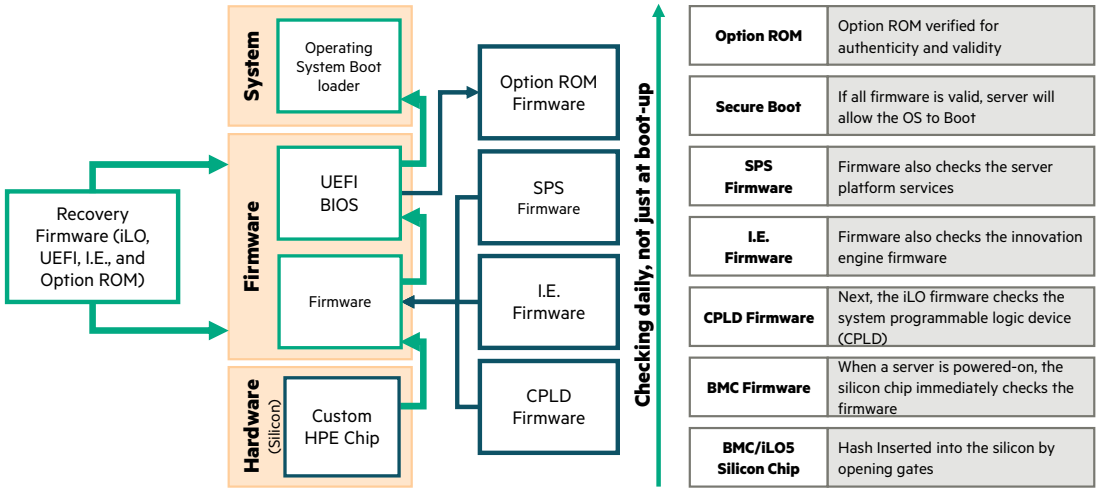
ILO SERVICE PORT

Gen10 servers and above only:

- The iLO Service port is a USB port connected to the iLO and is located on the front panel of the server
- Users can connect their laptops to this port VIA a USB-Ethernet adapter and get full access to the Integrated remote console. (HPE recommends using the HPE part Q7Y55A)
- Users can also connect a USB drive to this port and download service logs to it

HPE SILICON ROOT OF TRUST

- HPE ProLiant Gen10 with iLO 5 and iLO Advanced License Key



 | 23

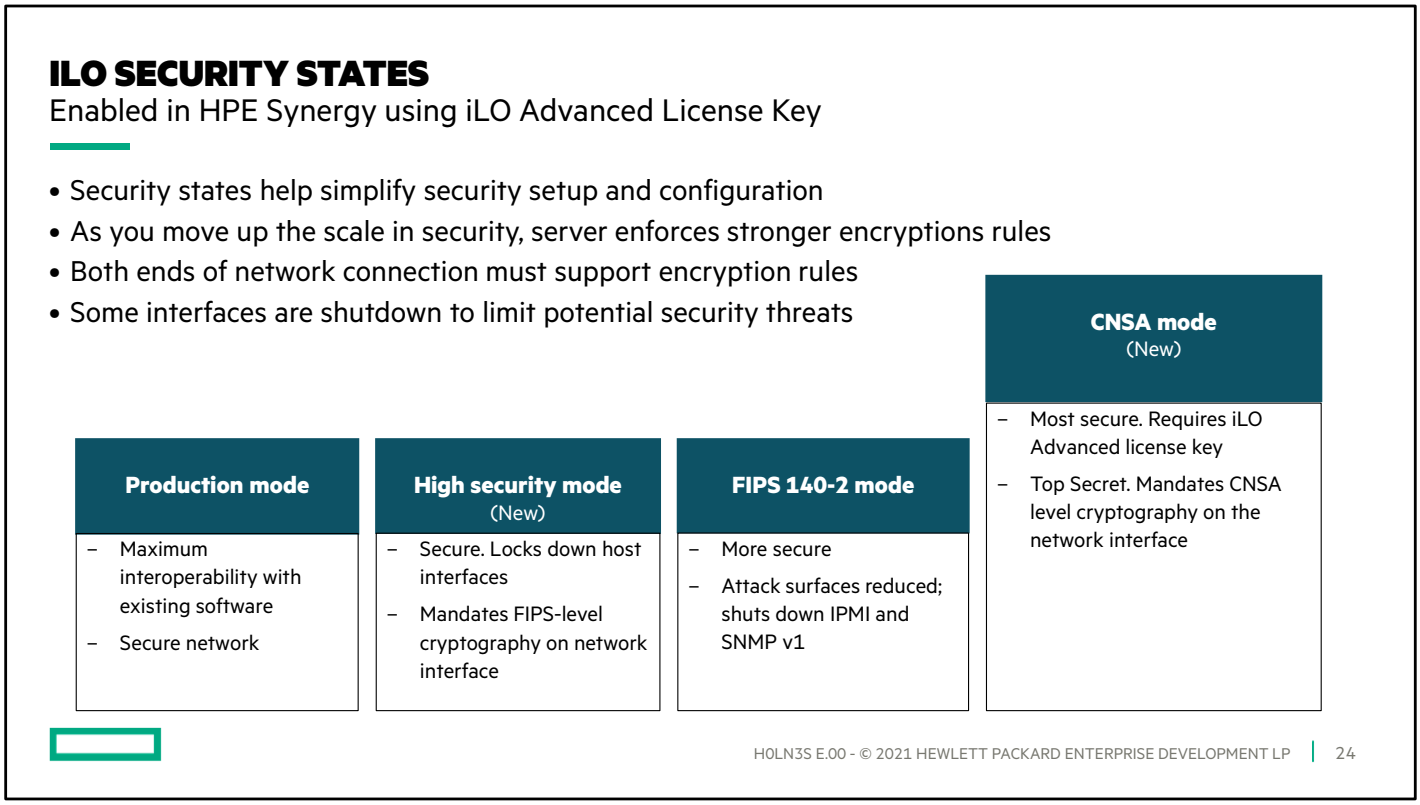
Secure Start and Manual Recovery

The silicon root of trust is the foundation for the entire Secure Start and Manual Recovery process, providing the extraordinary ability to verify the digital signatures through the entire boot process.

When the system boots, iLO 5 validates and boots its own firmware first, then validates the system BIOS. Because the silicon root of trust is inextricably tied into the iLO 5 hardware, every validated signature throughout the boot process can be trusted. If by chance iLO 5 finds tampering or corruption at any point in the process, trusted firmware is immediately available for Secure Recovery.

First, if iLO 5 finds that its own firmware has been compromised, it will load its own authenticated firmware from an integrated backup. The iLO 5 firmware recovery is always available and always automatic—regardless of license. Remember that the silicon root of trust in hardware is how the iLO 5 firmware is verified, so it can always be trusted.

Second, if iLO 5 finds that the system BIOS has been compromised, iLO 5 will try to recover it from a backup copy. If the backup copy is also compromised, iLO 5 will alert the customer that the system BIOS is compromised. By default with iLO standard, customers can connect to iLO 5 and manually recover to authenticated firmware. Customers have the option for iLO 5 to automatically recover authentic firmware if they upgrade to the iLO Advanced Premium Security Edition license.



iLO Security States

The capabilities of HPE iLO Standard that comes with every ProLiant Gen10 server gives customers the ability to configure your server in one of three security states. With the iLO Advanced Premium Security Edition license, customers that need the highest-level encryption capabilities of CNSA have a fourth security state available to them.

As you move up the scale in security, the server enforces stronger encryption rules for webpages, SSH, and network communications. Note that both ends of each network connection must support the encryption rules, or they cannot communicate, and some interfaces are shut down to limit potential security threats.

The security states include:

Production

HighSecurity

FIPS

SuiteB/CNSA

HPE SYNERGY INTERCONNECT MODULES

Composable Fabric

- HPE Virtual Connect SE 40Gb F8 Module
- HPE Synergy 40Gb F8 Switch Module

- HPE Virtual Connect SE 100 Gb F32 Module

- HPE Synergy 10Gb Interconnect Link Module

- HPE Synergy 20Gb Interconnect Link Module
- HPE Synergy 25/50Gb Interconnect Link Module

HPE Synergy interconnect modules—Composable Fabric

- Note: In the upcoming slides, your instructor will recap the knowledge that you obtained from the prerequisite WBTs.
  - HPE Virtual Connect SE 40Gb F8 Module and HPE Synergy 40Gb F8 Switch Module operate as master modules, based on composable fabric is designed for Composable Infrastructure.
  - HPE Synergy 10Gb Interconnect Link Module and HPE Synergy 20Gb Interconnect Link Module operate as satellite modules.

Designed for Data Centers requiring high performance, scalability and reliability, HPE Synergy VC SE 100Gb F32 Module also delivers improved support for Image Streamer with dedicated bandwidth and better over-subscription ratio on uplink and cluster ports. This Synergy VC SE 100Gb F32 Module extends cable/transceiver options to support higher bandwidth using industry standard interconnect technology and form factor.

- Twelve 25/50G downlinks
- Eight 40/100G/32G FC QSFP28 uplinks
- 2.8 Tbps non-blocking switching capacity
- Predictable low port-port latency (~300ns)

Outstanding performance

- High-speed, high-performance fabric for traditional enterprise and private cloud environments
- Rack Scale Fabric architecture for flexibility in scaling

Comprehensive feature set

- Advanced Ethernet features to support hybrid IT environment (advanced L2 features - PVLAN, RoCEv1)
- Advanced SAN features via support for FC and FCoE

Industry standard uplink connectivity

- Compatible with standard-based upstream switches using variety of 40Gb QSFP+ and 100Gb QSFP28 cables and transceivers

HPE SYNERGY INTERCONNECT MODULES

FC Fabric, SAS, Pass-through modules

- HPE Virtual Connect SE 16Gb FC Module
- Brocade 16Gb Fibre Channel SAN Switch Module
- HPE Synergy 12Gb SAS Connection Module
- HPE Synergy Virtual Connect SE 32Gb FC Module
- Brocade 32Gb FC SAN Switch
- HPE Synergy 10Gb Pass-Through Module
- Mellanox SH2200 Switch Module for HPE Synergy

HPE Synergy interconnect modules—FC Fabric, SAS, Pass-through modules

- HPE Virtual Connect SE 16Gb FC Module for HPE Synergy is a Storage Area Network (SAN) interconnect with a wire-once, change-ready technology. The Fibre Channel (FC) module, in conjunction with HPE Synergy Composer powered by HPE OneView, allows workloads to be moved or managed without modifying the network.
- Brocade 16Gb Fibre Channel SAN Switch Module for HPE Synergy provides high-performance, low-latency networking with cut-through mode FC SAN capabilities.
- HPE Synergy 12Gb SAS Connection Module allows connecting compute modules to internal storage via SAS connectivity.
- HPE Synergy 10Gb Pass-Through Module provides full compute module connectivity to an existing network switch. It is an alternative to managing the switch outside the frame with the operating system of your choice. Bear in mind, however, that you will need a switch port for every network connection from the frame.

HPE VC SE 32 Gb FC Module and Brocade 32Gb FC SAN Switch—Composable and Switched FC Fabric Innovations

Composable and Traditional Fiber Channel interconnect modules are shown, with Gen6 FC support for Breakthrough Application Performance and Operational Stability.

New full-featured, NVMe-OF ready adapters are shipping for new fabrics:

- 24x 16/32Gb capable downlink ports
- 8x 8/16/32Gb SFP+ capable uplink ports
- 2x 8/16/32Gb QSFP+ capable uplink ports
- Total usable uplinks 12
- Support for Brocade FOS 8.1.x

16Gb and 32Gb HPE Fibre Channel Mezzanine cards for HPE Synergy are supported

HPE Synergy 3530C 16Gb Fibre Channel Host Bus Adapter

HPE Synergy 3830C 16Gb Fibre Channel Host Bus Adapter

HPE Synergy 5830C 32Gb Fibre Channel Host Bus Adapter

HPE Synergy 5330C 32Gb Fibre Channel Host Bus Adapter

HPE SYNERGY IN-FRAME STORAGE SOLUTION

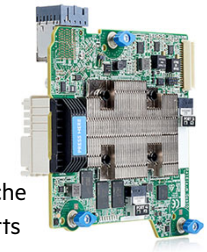
D3940 Storage Module

Has slots for two I/O adapters inside the drawer
Acts as the interface to the disks
Connects to the HPE Synergy 12Gb SAS Connection Module
Comes with One I/O adapter by default

12Gb SAS Connection module

Connects to the RAID storage controllers in a compute module

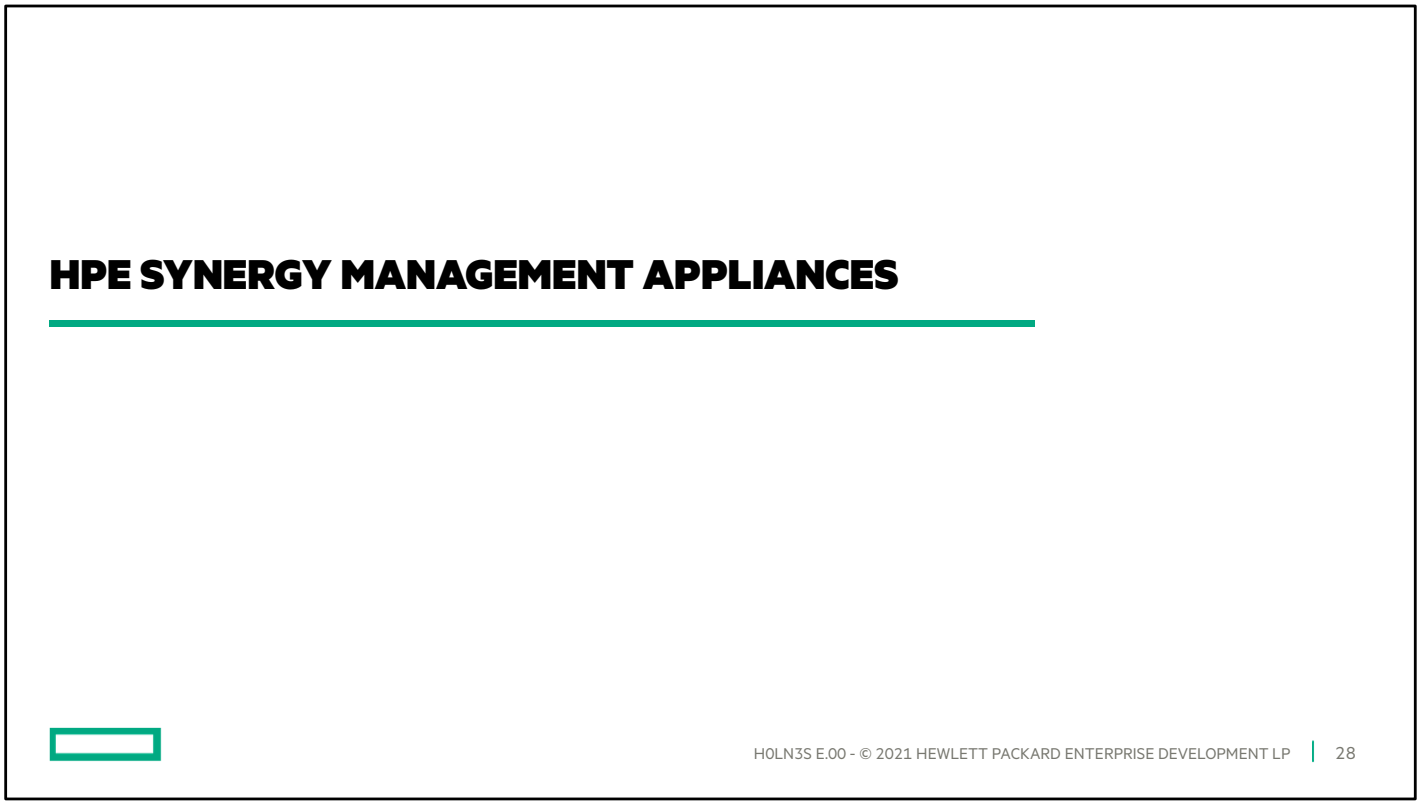
Smart Array P416ie-m Controller (for Gen10)



- 12 Gb/s SAS or 6 Gb/s SATA
- PCI express 3.0 x 8 link width
- 2 GB 72-bit wide DDR4-2100 flash-backed write cache
- Internal: 8 SAS/SATA lanes across 2 x 4 slim SAS ports
- External: 8 SAS/SATA lanes across an external SAS port

HPE Synergy in-frame storage solution (1/2)

- To enable the in-frame storage functionality, you need to use three components: HPE Synergy D3940 Storage Module, HPE Synergy 12 Gb SAS Connection Module and an HPE Smart Array P542D (for Gen9 compute modules) or HPE Smart Array P416ie-m controllers (for Gen10 compute modules). (See the next slide).
- HPE Synergy D3940 Storage Module has slots for two I/O adapters inside the drawer. An I/O adapter acts as the interface to the disks in the storage module. The I/O adapter connects to the HPE Synergy 12Gb SAS Connection Module which in turn connects through the HPE Synergy Frame midplane to the RAID storage controllers in a compute module. A single I/O adapter is included with each HPE Synergy D3940 Storage Module. Adding a second I/O adapter and second connection module provides a redundant path to SAS drives inside the storage module, ensuring high availability.



HPE Synergy management appliances

SYNERGY EMBEDDED MANAGEMENT ARCHITECTURE

Next generation bandwidth and capabilities

Management architecture

- Is embedded into every Synergy frame
- Scales from one to 21 frames
- Secures an air-gapped 10GbE management network between frames
- Ensures an uplink management connectivity
  - Two cables, regardless of the level of scale chosen
- Is redundant even in a single frame

Management appliances

- Dual hot-plug integrated appliance bays for redundancy
- 10Gb integrated connectivity directly to Frame Link Module
- HPE Synergy Composer
- More options to come

Frame Link Module

Synergy Composer

– Synergy embedded management architecture—Next generation bandwidth and capabilities

Synergy management architecture is embedded into every Synergy frame to offer a better management solution across one or many frames. Synergy architecture allows you to scale from one to 21 frames. Reliable and fast management is provided over any sized domain through a secure, air-gapped, 10GbE management network established between multiple frames. The uplink management connectivity is ensured both in small or large connected domains with only two cables. Redundancy is ensured at a single frame or many linked frames.

– Management appliances, otherwise known as Synergy appliances:

– Provide redundancy (every frame offers two hot-plug, integrated appliance bays)

– Have 10Gb network directly connected to a Frame Link Module for inter- or intra-frame management communications

– HPE Synergy management appliances include HPE Synergy Composer (HPE OneView management appliance) and HPE Synergy Image Streamer, which is a device used to create, store, and boot OS images to servers. The internal communication is also used for server provisioning.

– All this sets a path for more options to come in the future.

– Note: Image Streamer is getting deprecated, hence it is out of the scope of material to be covered. If your role requires you to learn more about Image Streamer, please see the Appendix and/or get a seat in the Image Streamer (Management) course.

HPE SYNERGY COMPOSER/COMPOSER2
Overview

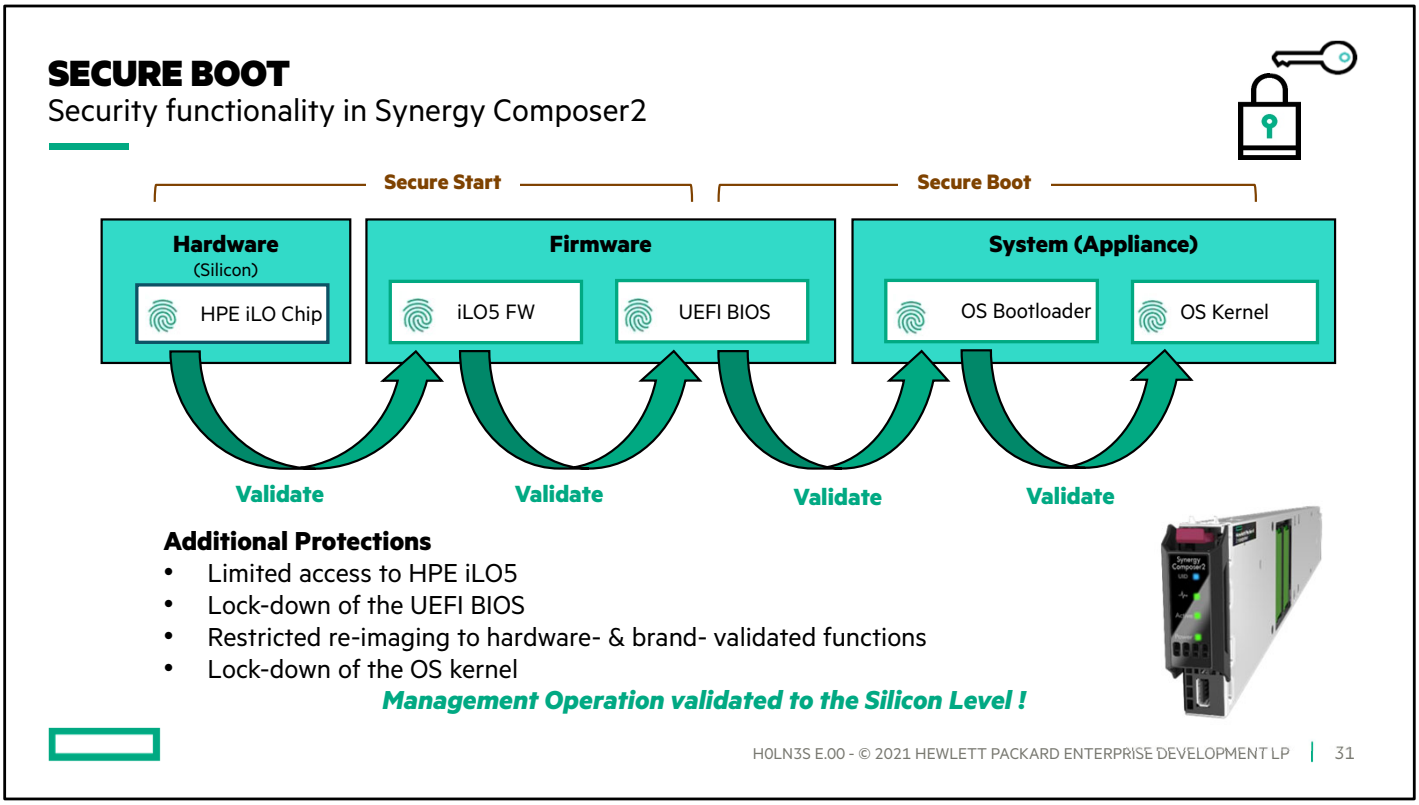
- Key management appliance for the HPE Synergy solution
- Runs HPE OneView
- At least one HPE Synergy Composer module must be installed - two for redundancy)

- Composer2 has:
  - Gen10 iLO5 firmware on the Composer
  - Two new physical NICs (with 4-port FLM) (currently not enabled)
  - Gen10 BIOS configuration with UEFI boot mode only
  - New security and supportability features

HPE Synergy 12000 Frame

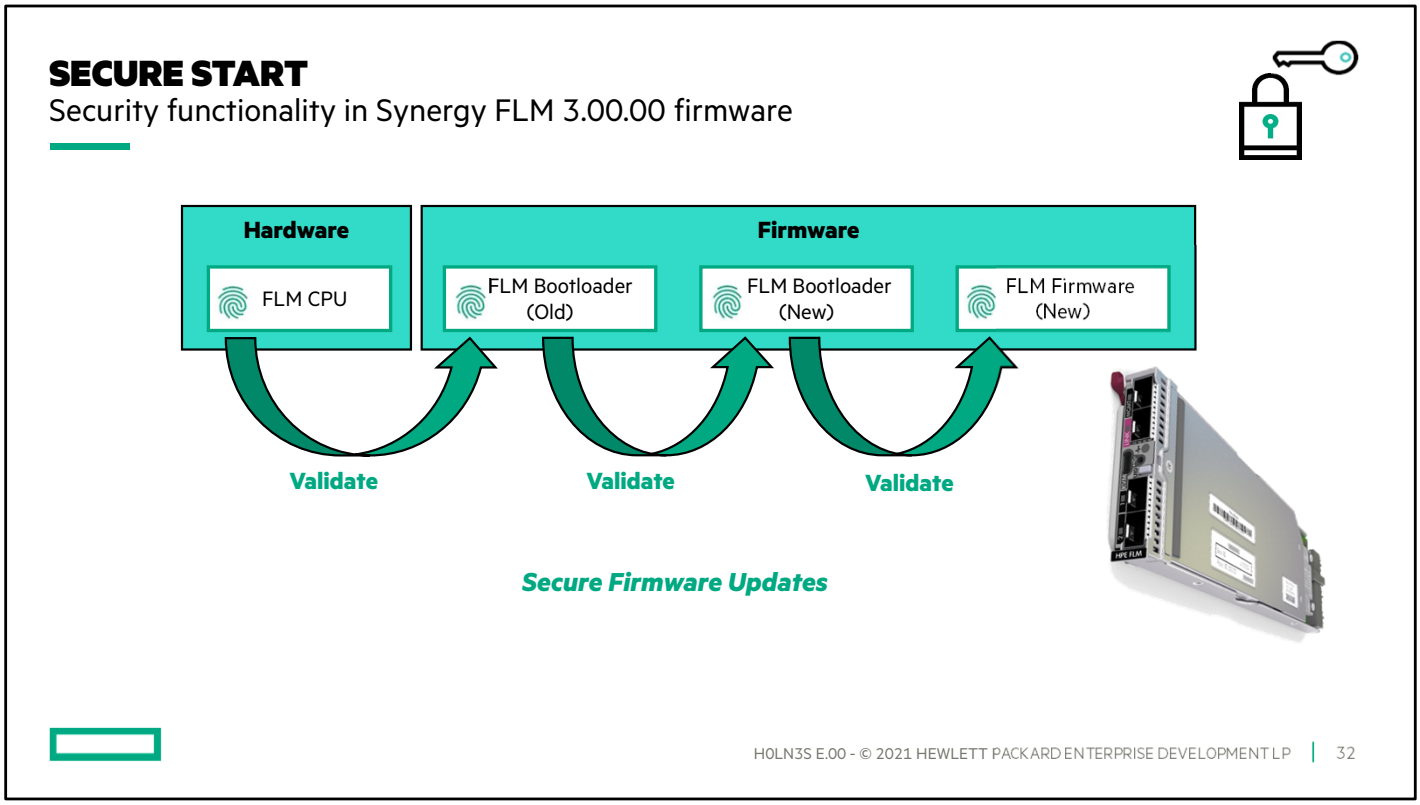
HPE Synergy Composer—Overview

- HPE Synergy Composer is the key management appliance for the HPE Synergy solution. It runs HPE OneView to configure, manage, and update the HPE Synergy environment.
- A management ring for an HPE Synergy system must have at least one HPE Synergy Composer module installed, although HPE highly recommends installing two HPE Synergy Composer modules for redundancy.
  - HPE Synergy Composer2
  - For customers who need to manage many HPE Synergy rings or resources and prefer to manage all these resources from a single appliance or cluster (vs. multiple appliances with OneView Global Dashboard providing some aggregated views), Synergy Composer2 offers enhanced scalability over the current Synergy Composer offering.
  - HPE Synergy Composer2 also offers enhanced security and supportability features over the current offering.
  - In addition, the support life and parts availability for the original Composer model is quickly reaching end-of-life, therefore HPE Synergy Composer2 will soon be the only available option for new HPE Synergy installations and replace repairs in existing installations.
  - Customers have a simple mechanism to migrate their configuration and data from existing Composer installations to the new Composer2.
  - HPE OneView 5.0 or later can take advantage of new features offered by the hardware, without regression in performance, High Availability, scale… etc.
  - The new hardware provides around 30% performance improvement in typical tasks including - discovery, reboot and profile apply.
  - The scalability is maintained at 21 Frames.
  - HPE Synergy Composer2 can now store 7-10 SPP bundles in internal repository.



Secure Boot

- Secure Boot processes are designed into the Synergy Composer2 management appliance
  - 'Secure Start' validates the iLO5 FW & the UEFI BIOS
  - 'Secure Boot' validates the OS Bootloader and OS kernel (and kernel modules & drivers) of the Composer2 appliance
  - Synergy-specific validation of the OS Bootloader
- iLO5 - limited access
  - Remote console
  - Remote re-image
  - Remote power
  - Read-only access to iLO config
- BIOS/UEFI – locked down
  - RBSU actions disabled
  - UEFI Key DB modification disabled
  - BIOS REST API disabled
- Intelligent Provisioning – re-image only
  - Re-image zip file validation for Synergy-only appliance
  - HW version (v1 or v2) validation
  - 'Brand' validation, Composer or Image Streamer on matching HW
- OS Kernel – locked down
  - securelevel 1 enforced with Secure Boot



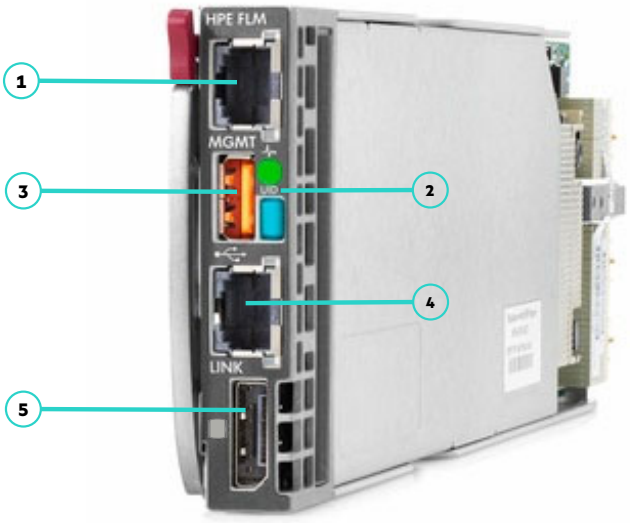
Secure Start—Security functionality in Synergy FLM 3.00.00 firmware

Secure Start processes are designed into the Synergy Frame Link Modules using 3.00.00 firmware

- Previous firmware always validates new firmware before switching boot path
- Active FLM bootloader and firmware are always read-only for attack resilience
- No loadable modules are allowed

HPE SYNERGY 2-PORT FRAME LINK MODULE
Components

1. MGMT port (10GBASE-T)
2. LEDs—UID and health
3. USB—Keyboard access for HPE OneView
4. LINK port (10GBASE-T)
5. Monitor (display) port



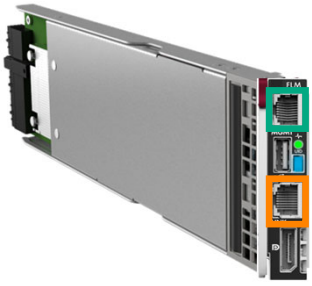
HPE Synergy 2-port Frame Link Module—Components

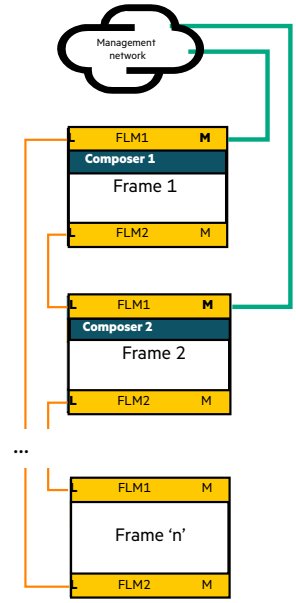
- On the above slide, you can see a 2-port frame link module and its components, which are marked by numbers.
- These components include:
  - MGMT port (10GBASE-T)—Used as an uplink to the customer management network and for the Image Streamer data
  - LEDs—Show UID and health status
  - USB—Provides keyboard access for HPE OneView
  - LINK port (10GBASE-T)—Only used to create the multi-frame management ring topologies
  - Monitor (display) port—Provides the monitor access for HPE OneView

HPE SYNERGY 2-PORT FRAME LINK MODULE

Overview

- Provides shared frame services (Power, Cooling and Management connectivity)
- Delivers the frame link topology (the ring architecture) through 10GBASE-T RJ-45 jacks and CAT6 cables
- Provides automatic resource discovery, management commands, inventory reporting, and resource status
- Provides a walk-up diagnostic and configuration link through the DisplayPort and USB connections





HPE Synergy 2-port Frame link module—Overview

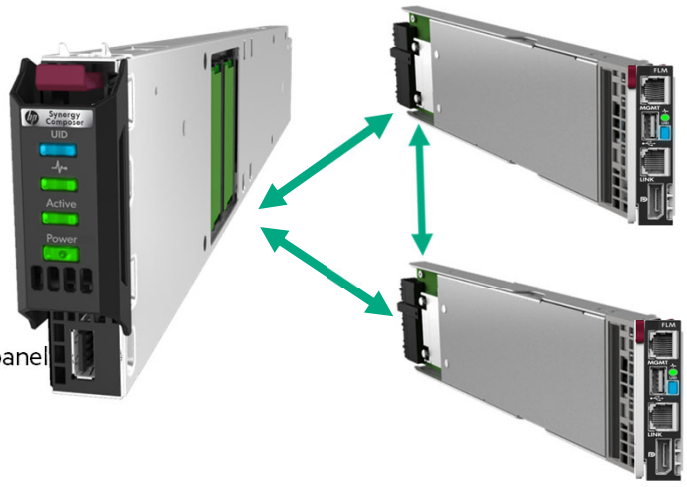
- The frame link module (FLM), the intelligence behind the frame and the management architecture:
  - Provides shared frame services, such as power, cooling, discovery, and inventory of all installed components on the management interface.
  - Delivers the frame link topology (the ring architecture) through 10GBASE-T RJ-45 jacks and CAT6 cables, providing resource discovery, management commands, inventory reporting, and resource status.
  - Provides a walk-up diagnostic and configuration link through the DisplayPort and USB connections. DisplayPort and USB port are referenced as the Synergy Console, either at the rear or at the front panel of the frame.

- Interconnecting frame link modules allows you to create a dedicated, separate management network that prevents the cross-contamination of production data with management information. A 10 Gb management-focused network allows you to view and manage a single frame or many frames, and thus hundreds of resources across the frames.

HPE SYNERGY 2-PORT FRAME LINK MODULE

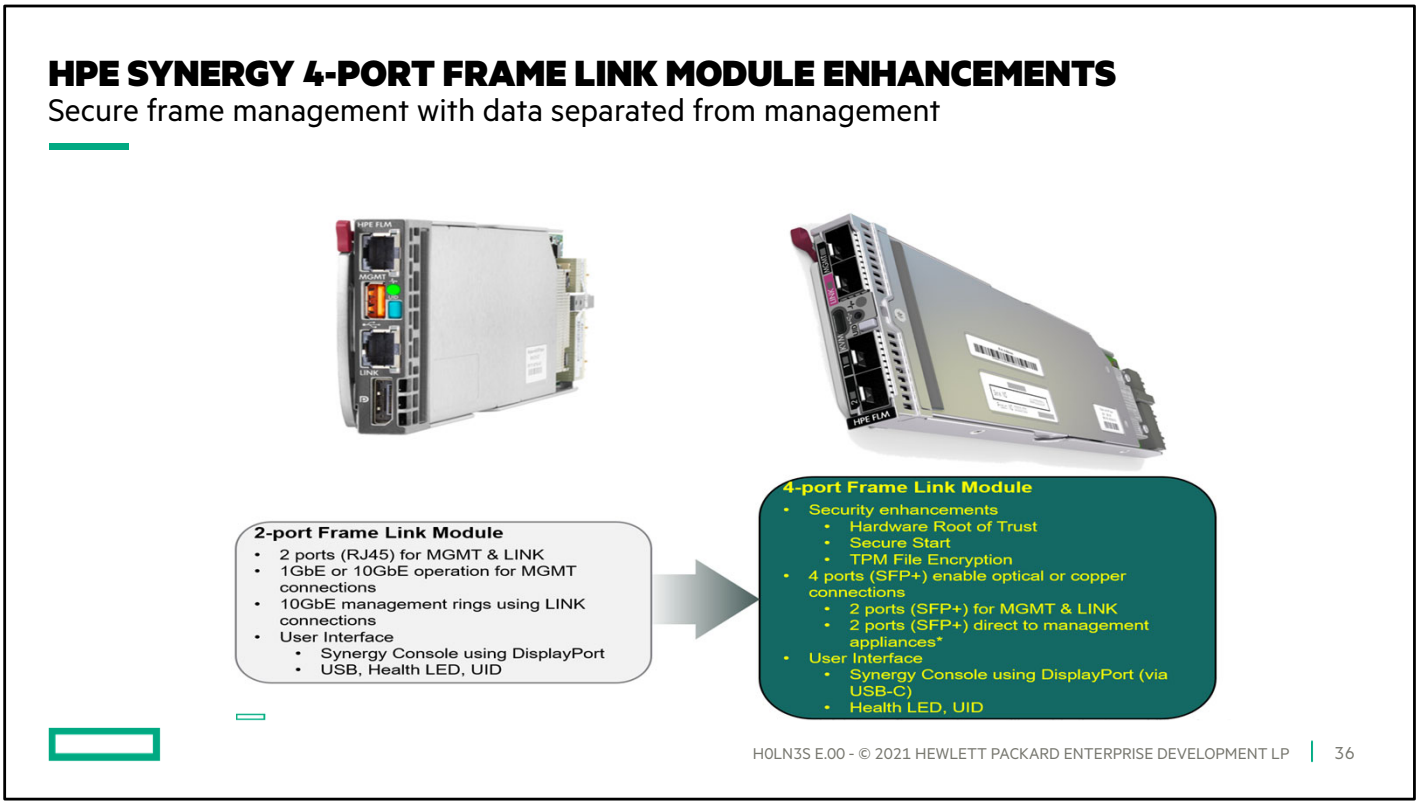
Connectivity and ports

- Internal
  - FLM to FLM—single 10 Gb/s
  - 1 Gb/s to ICM bays 1-6
  - 1 Gb/s to compute module (iLOs) bays 1-12
  - 10 Gb/s to HPE Synergy management bay 1
  - 10 Gb/s to HPE Synergy management bay 2
- External
  - 10 Gb/s MGMT ports (will work as 1 Gb/s)
  - 10 Gb/s LINK ports
  - USB, DisplayPort (for front panel and FLM back panel)
  - 100 Mb/s front panel Ethernet port



HPE Synergy 2-port Frame link module—Connectivity and ports

- On the slide above is a list of internal and external frame link module connections.
- Frame link modules “talk” to each iLO in every compute module and ask for configuration details and status, and provide those details to HPE Synergy Composer or HPE OneView. The same is done to every interconnect module installed.



HPE Synergy 4-port Frame Link Module Enhancements—Secure frame management with data separated from management

Current Synergy 2-port FLM

- MGMT port (for management connections) on the FLM links at 10 GbE instead of 1 GbE to support a greater number of users/administrators, as well as provide faster downloading of virtual media for firmware/software updates. MGMT port (for management connections) on the FLM is able to auto-negotiate down to 1 GbE to mate with ToR switches.
- LINK ports (for management rings) will still remain 10 GbE.

Synergy 4-port Frame Link Module (FLM)

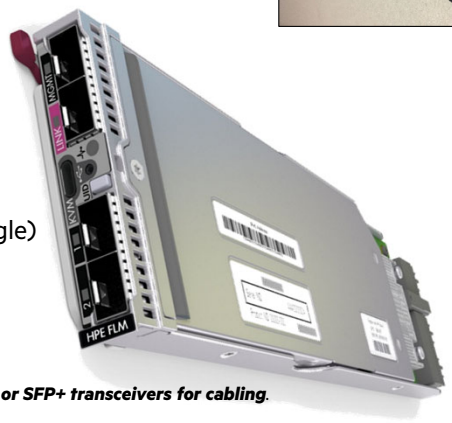
- Physical-size is the same as current 2-port FLM
  - Current 2-port F to New 4-port FLM*
  - 10GBaseT to 10G-SFI
  - RJ45 ports to SFP+ ports
  - Fixed Copper solution to Copper-or-Optical solution
- User Interfaces
  - USB -to- 'Micro USB' (USB-C),
  - Health LED,
  - UID (Blue-light unique identifier -- remote light)
  - Micro-USB (USB-C) connection for DisplayPort uses a 'dongle' [SKU# P06458-B21]

- (continued on the next page)

HPE SYNERGY 4-PORT FRAME LINK MODULE ENHANCEMENTS

- Security for Synergy FLM
  - Hardware Root of Trust
  - Trusted Platform Module (TPM) circuitry
- Optical connections
  - Four* SFP+ ports enable optical or copper connections
  - Enables direct optical links to switches
  - Capability for distant connections
- Compatibility with 2-port FLM
  - MGMT & LINK ports
  - USB-C-type connector (with DisplayPort connection via dongle)
  - Health LED, UID

P06458-B21



*** HPE Synergy 4-Port Frame Link Modules require supported SFP+ DAC cables or SFP+ transceivers for cabling.***

 | 37

HPE Synergy 4-port Frame Link Module Enhancements

HPE Synergy 4-Port Frame Link Modules require supported SFP+ DAC cables or SFP+ transceivers for cabling. For more information, see the product QuickSpecs on the Hewlett Packard Enterprise website.

- NOTE: The main interface on both FLM types to the Synergy Console (to HPE OneView) is via DisplayPort, but the 4-port FLM using a 'dongle' [SKU# P06458-B21] to the DisplayPort.
- FLMs give the user access to a USB port and a Display port. It's a single USB connector, so the user needs a hub to get both keyboard and mouse
- The 4-port FLM does NOT have full USB-C support…it's simply using the USB-C connector.

FLM User Interfaces [Rear of Synergy Frame]

- 2-port FLM: Synergy Console (DisplayPort), USB, Health LED, UID
- 4-port FLM: Synergy Console (DisplayPort via USB-C), Health LED, UID
  - NOTE: The Synergy Console access to HPE OneView is by RJ45 on the Synergy Frame Front Panel.
    - Laptop access is only through the RJ-45 connector on the Front Panel module.
    - The Front Panel also gives the user access to a USB port and a Display port. It's a single USB connector, so the user needs a hub to get both keyboard and mouse

FRAME MANAGEMENT CABLING

HPE SYNERGY CABLING CONFIGURATIONS

- Management network cabling
- Production network cabling (interconnect link topology)
- Power cabling

HPE Synergy cabling configurations

- When cabling the HPE Synergy components, there are four separate cabling configurations to focus on:
  - Management network cabling
  - Production network cabling (interconnect link topology)
  - Power cabling

MANAGEMENT RING TOPOLOGY
Key considerations

A management ring:

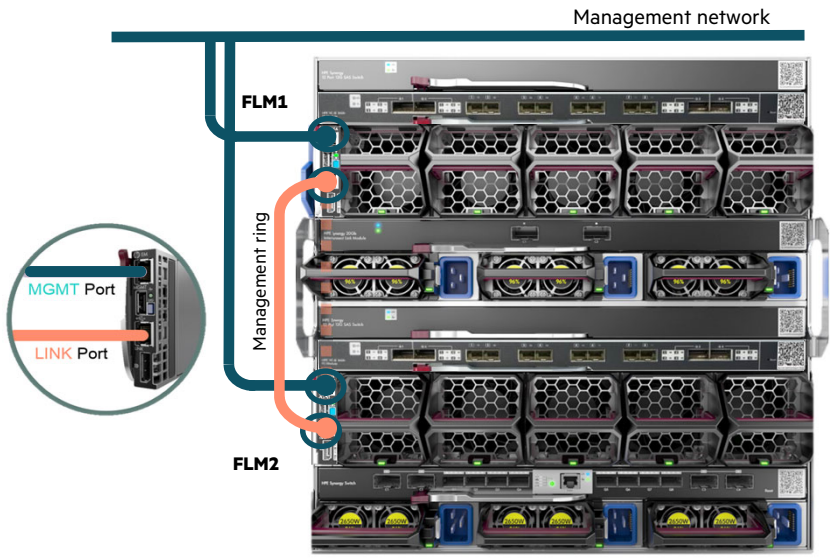
- Provides a 10Gb **fault-tolerant** connectivity—Cabling errors do not hinder operation
- Enables **automatic discovery**—Happens in HPE OneView through the FLM LLDP discussion
- Provides **loop prevention**—A hardware switch separates MGMT and LINK ports

Management ring topology—Key considerations

- Among the many benefits of using a ring topology are fault tolerance, automatic discovery of components, and loop prevention.
- A management ring provides a 10 Gb fault-tolerant connectivity. This means that a 10Gb fabric is used, and if a cabling error occurs, it will not affect the operation, but will bring an error in HPE OneView.
- Automatic discovery of components is also provided. Auto-discovery happens in HPE OneView through the FLM LLDP discussion; LLDP stops at next switch.
- In Frame Link Modules, there is no software switch, unlike with the OA. Frame Link Modules have an embedded hardware switch with separate MGMT and LINK ports, which protects against loops on the ring and on the MGMT ports connected to the external management network.
- FLMs can be connected through a patch panel with CAT6A or CAT7 cables within the maximum distance of up to 100 ft between rows/racks. Connecting through a switch is not allowed.

SINGLE-FRAME CONFIGURATION CABLING

- Upper frame link module MGMT port to management network
- LINK ports of each FLM must be interconnected
- Make sure all LEDs are green
  - Fans, power supplies
  - FLMs
  - Front panel



Single-frame configuration cabling

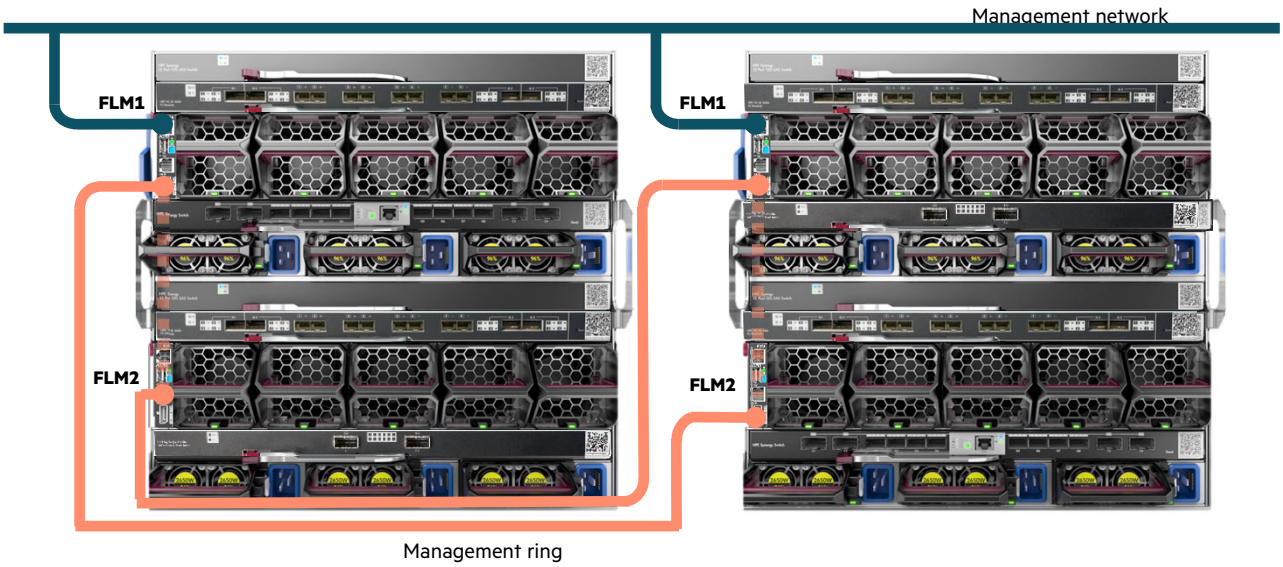
– Let us start with a single-frame configuration cabling, which is illustrated at the right of the slide.

– There are internal links to devices and interconnects from the frame link module, which is accessible through the management uplink. Internal links between FLMs are represented by the dotted orange line. Each port on a management appliance is connected to a separate FLM through dual 10 Gb/s ports for high availability (HA).

– To create a management ring in a single-frame configuration, both frame link modules must be installed. These two frame link modules must be interconnected by LINK ports. The upper frame link module MGMT port must be connected to your management network if HPE Synergy Composer is in the upper appliance bay.

– When the cabling is finished, make sure that all LEDs are green (fan, power supply, FLM, and front panel LEDs).

TWO-FRAME CONFIGURATION CABLING



Two-frame configuration cabling

- This is an example of two-frame configuration cabling. When creating a management network topology, it is of vital importance to use the MGMT and LINK ports on a frame link module properly.
- MGMT port
- MGMT port is a 10G-BASE-T port, which also auto-negotiates to a 1G-BASE-T standard. It is automatically configured to be one of the following:
  - External management network uplink in the FLM that is placed in the same bay as HPE Synergy Composer.
  - NOTE: If HPE Synergy Composer is located in appliance bay 1, the FLM1 MGMT port must be used as a management network uplink.
  - External management network uplink in the FLM that is placed in a bay in which no management appliance is inserted. This allows you to link multiple frames across racks to have additional MGMT ports connected to the datacenter management network.
- LINK port
- LINK ports provide information for automatic discovery of an adjacent frame and must never be connected to a data center switch port.
- In case of 2-port FLM, LINK port is a 10G-BASE-T port. It can only be connected directly to another 2-port FLM LINK port, or a 4-port FLM LINK port in another frame through a 10G-BASE-T (RJ45) <> SFT+ transceiver. In multiple frames, you need two FLMs of the same type (2-port FLM or 4-port FLM in each frame if you want to achieve high availability.
-
- (continued on the next page)

- (continued from the previous page)

- In case of 4-port FLM, LINK port is an SFT+ port. It can only be connected directly to another 4-port FLM LINK port, or a 2-port FLM in another frame through an SFT+ <> 10G-BASE-T (RJ45) transceiver. 2-port FLMs and 4-port FLMs cannot be mixed in the same frame but can coexist in the same management ring with additional transceivers where needed.
- Production and management network separation
- The Synergy architecture is designed to separate the management traffic from the production network, which increases reliability and security of the overall solution. Owing to this separation, the data center resources remain operational even in the unlikely event of an appliance outage. In the above example, the MGMT ports of the upper FLMs are connected to a management network, and the LINK ports of upper and bottom FLMs in both frames are interconnected.

SUPPORT MATRIX

System configurations: Synergy Composer/Composer2/Image Streamer with HPE OneView 5.0+

Case#	Use Case	Composer version	Frames with Composer	Frames without Composer	Frames w/ Image Streamer	Frames w/ Image Streamer and Composer	Frames w/ Image Streamer and Composer2
1	Migrate: Composer-Composer2	Composer2	2-port FLM	2-port FLM	Not Applicable	Not Applicable	Not Applicable
2	Migrate & Grow: Add new frames	Composer2	2-port FLM	Either	Not Applicable	Not Applicable	Not Applicable
4	New deployments	Composer2	4-port FLM	4-port FLM*	Not Applicable	Not Applicable	Not Applicable
6	Current Configurations	Composer	2-port FLM	2-port FLM	Not Applicable	Not Applicable	Not Applicable
7	Grow: Add new frames	Composer	2-port FLM	Either	Not Applicable	Not Applicable	Not Applicable

Migrate = Upgrade from Composer1 to Composer2
Grow = Add new frames to your configuration

** These frames are expected to work with 2-port FLMs but have not been tested.*

Support Matrix

This is a support matrix table of system configurations for your reference.

Not all combinations are supported, it depends on the use case (numbered in the first column).

Foundational Requirements are:

Composers of the same generation must be paired within a Management Ring. You cannot have one Composer and one Composer2 in the management ring.

FLMs of the same generation must be used within a Frame. So, FLMs cannot be mixed in the same Frame.

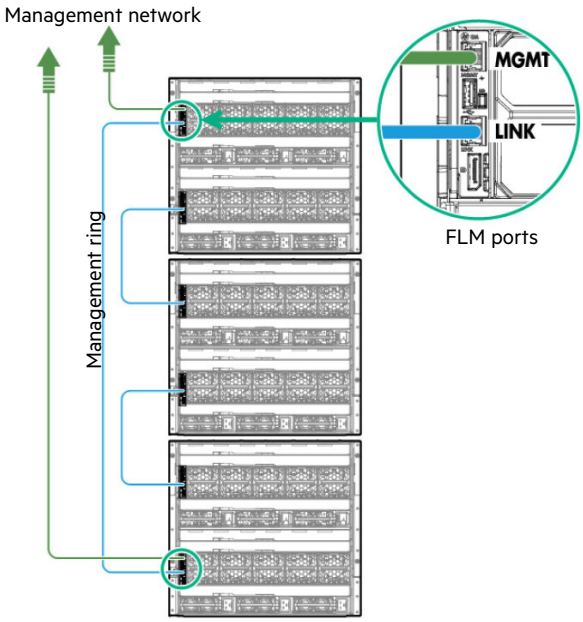
Frames within the same management ring can have mixed Frames of 2-port FLMs and/or 4-port FLMs . So, FLMs can be mixed in the management ring but not in the same Frame.

Frames with original Composers must use 2-port FLMs. 4-port FLMs can be used in other Frames without original Composer.

Frames with Image Streamer appliances require 2-port FLMs. New Image Streamer model may be released in future.

THREE-FRAME CONFIGURATION CABLING

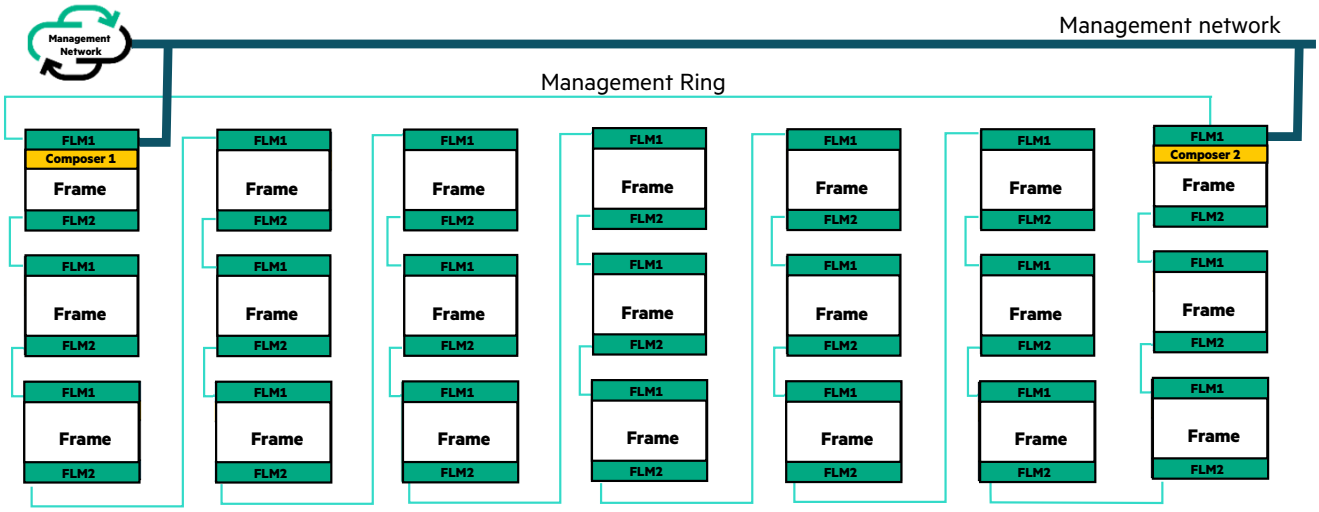
- Connect the LINK ports on all Frame Link Modules
- Connect the MGMT port of two of the installed Frame Link Modules to the management network
  - Two uplinks to the management network (ToR switch) are required for remote management purposes
  - Use the MGMT port of the FLMs corresponding to the installed HPE Synergy Composers



Three-frame configuration cabling

- This is an example of three-frame configuration cabling. For better redundancy, HPE Synergy Composers should be in separate frames, and corresponding FLM MGMT ports should be used for uplinks to the management network. Green lines in the picture on the right indicate the MGMT connections to the management network where the MGMT port from the (bay 1) Frame Link Module in the top frame and the MGMT port from the (bay 2) Frame Link Module in the bottom frame connect to the management network.
- Blue lines indicate connections between FLM LINK ports forming the management ring. Both connection types require a minimum of CAT6A patch cable.

UP TO 21 SYNERGY FRAMES ARE SUPPORTED IN ONE MANAGEMENT RING

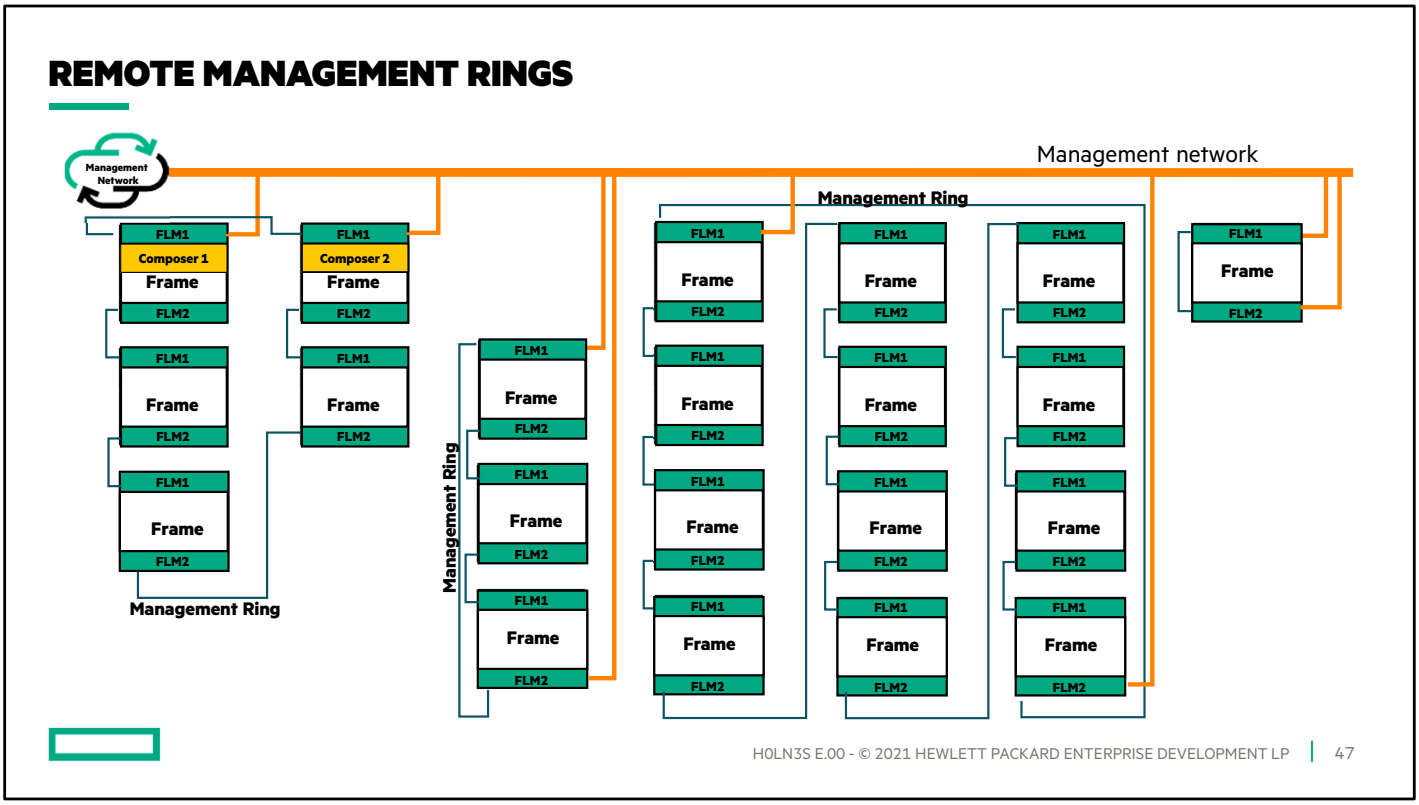


Up to 21 Synergy frames are supported in one management ring

As mentioned in module 1, each HPE Synergy Composer domain can contain up to 21 frames, for example 3 frames in each of 7 racks under one management infrastructure. One HPE Synergy Composer pair can manage up to 21 frames in a single management ring.

A management ring is formed by mutually connecting the LINK ports of the FLMs in every frame. (Remember, the FLMs in a frame are also mutually connected internally, as we have shown in module 1).

Again, bear in mind that the uplinks to the management network are established from the FLMs corresponding to HPE Synergy Composers (in the same frames, upper bays) using the FLM MGMT ports.



Remote management rings

What happens if you do not have space to fit all 21 frames in a single management ring? It is important to remember that a pair of redundant HPE Synergy Composers is required in the first management ring. Then, you can add the other (up to 21) frames in remote management rings. As long as all of these are within the same subnet, they can be managed by a single HPE Synergy Composer OneView pair (for redundancy) from the first management ring.

On this picture, you can see three management rings and one single-frame configuration, all redundantly connected to the management network with a pair of uplinks to the same management network.

POWER SUPPLY CABLING

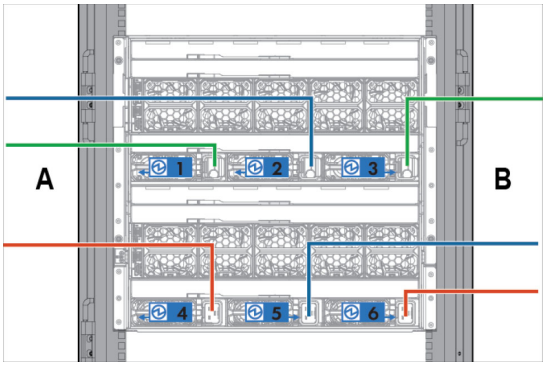
Power supply cabling

CABLING POWER SUPPLIES FOR POWER FEED REDUNDANCY

Single frame

- Connect 1+1, 2+2 or 3+3 power supplies to phase A+B
- Best practice:
  - Power supplies 1, 2, and 4 to the A-side power distribution unit
  - Power supplies 3, 5, and 6 to the B-side power distribution unit
- Frames power up automatically when power is supplied
- The power and health LEDs on the front panel, HPE Synergy Composer appliance, and frame link modules illuminate green

NOTE: The number of supported power supplies in the frame ranges from a minimum of one to a maximum of six.



Cabling power supplies for power feed redundancy—Single frame

- The frame can be cabled for nonredundant, circuit redundant and power supply redundant power.
- Power line redundancy can be achieved by connecting 1+1, 2+2, or 3+3 power supplies to phase A+B.
- To cable a frame for power line redundancy, use the following recommendations as a best practice:
  - Connect power supplies 1, 2, and 4 to the A-side power distribution unit.
  - Connect power supplies 3, 5, and 6 to the B-side power distribution unit.
  - After power is supplied to the frame, it powers up automatically.
- The power and health LEDs on the front panel, the HPE Synergy Composer appliance, and frame link modules illuminate green to indicate there are no errors or alert conditions.

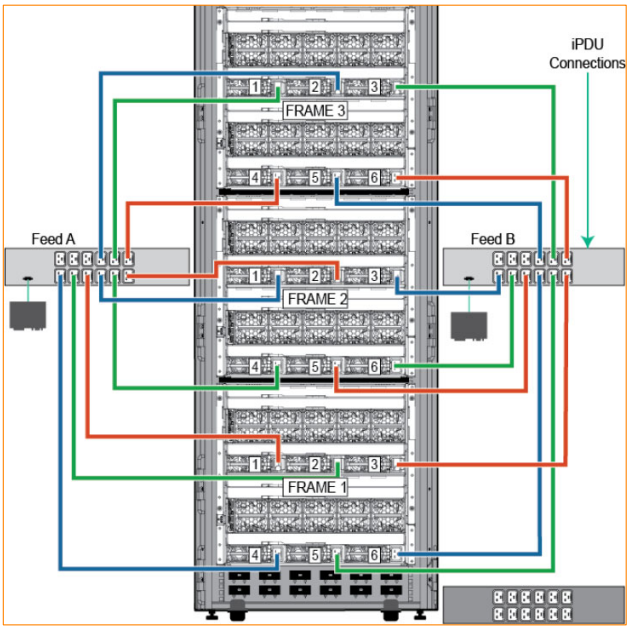
CABLING POWER SUPPLIES FOR POWER FEED REDUNDANCY

Multiple frames

- Cabling multiple frames for redundancy using best practices (example)

NOTE: Power supplies may be placed anywhere in the frame without restriction, however, HPE recommends that you use the placement practices shown in the following table.

Number of power supplies	Power supply bay (Power feed)
1	—
2	1(A) and 3(A) 1(A) and 3(B)
3	1(A), 3(A), and 5(A)
4	1(A), 3(A), 4(A), and 6(A) 1(A), 3(B), 4(A), and 6(B)
5	1(A), 2(A), 3(A), 4(A), and 6(A)
6	1(A), 2(A), 3(A), 4(A), 5(A), and 6(A) 1(A), 2(A), 3(B), 4(A), 5(B), and 6(B)



Cabling power supplies for power feed redundancy—Multiple frames

- On the slide, you can see best practices for cabling multiple frames for redundancy.
- NOTE: This is an example of a redundant power feed configuration. Your configuration can vary depending on the power distribution units (PDUs) installed.
- NOTE: The number of supported power supplies in the frame ranges from a minimum of two to a maximum of six power supplies. There are no restrictions to the placement of any number of power supplies in the frame at any location. All power supplies must be of the same type. Mixed-type power supply configurations are not supported.
- NOTE: If an odd number of power supplies is installed in a frame that is configured for redundant power feed mode, all power supplies will provide power to the frame, but the capacity of the odd power supply will not be used to determine the overall power capacity of the frame.

INTERCONNECT LINK TOPOLOGY

Interconnect link topology

INTERCONNECT LINK TOPOLOGY

- Defines the boundaries of a Logical Enclosure: “Logical Enclosure: A collection of one to five frames that are physically connected through interconnect link cables.”
- Physically cabled connection of interconnects in a Master/Satellite fabric
- HPE Synergy interconnect link module in one Synergy frame is connected to a HPE VC Master Module in another Synergy frame
- Current topologies consist of **up to five** Synergy frames in a highly-available, redundant and non-redundant A-side or B-side configuration
- It is currently supported to mix 10Gb and 20Gb satellites using the 40Gb F8 Master.

Note: Remember—when creating an interconnect link topology, a master module in one frame is connected to a satellite module in **another** frame.

Interconnect link topology

Defines the boundaries of a Logical Enclosure: “Logical Enclosure: A collection of one to five frames that are physically connected through interconnect link cables.”

Physically cabled connection of interconnects in a Master/Satellite fabric

HPE Synergy interconnect link module in one Synergy frame is connected to a HPE VC Master Module in another Synergy frame

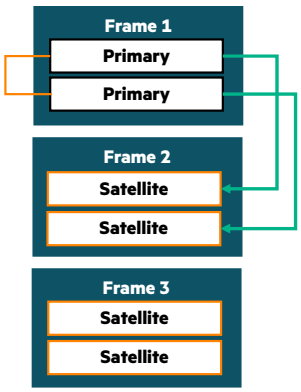
Current topologies consist of up to five Synergy frames in a highly-available, redundant and non-redundant A-side or B-side configuration

It is currently supported to mix 10Gb and 20Gb satellites using the 40Gb F8 Master.

- NOTE: Non-redundant side means that only one HPE VC SE Master Module per side can be configured in a logical interconnect group (LIG). If you need more master modules on one side, create separate LIGs.

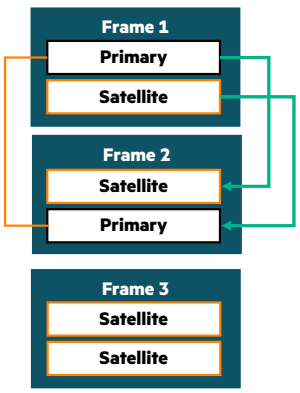
PRIMARY – SATELLITE CONNECTIVITY CONFIGURATIONS

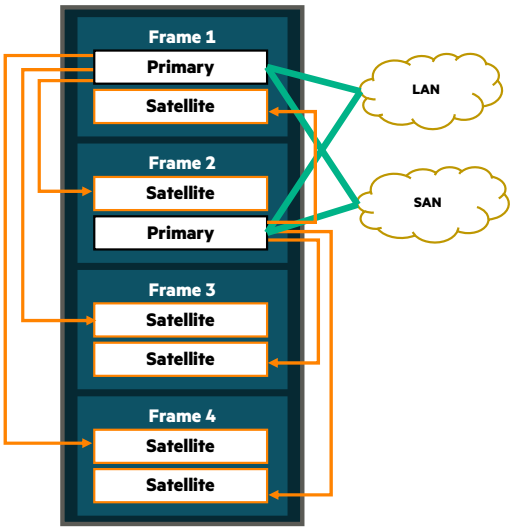
- Redundant or Dual Primary



Outage required to move Primary to another frame

HA or Split Primary





Primary – Satellite Connectivity Configurations

ACCESSING HPE SYNERGY COMPOSER

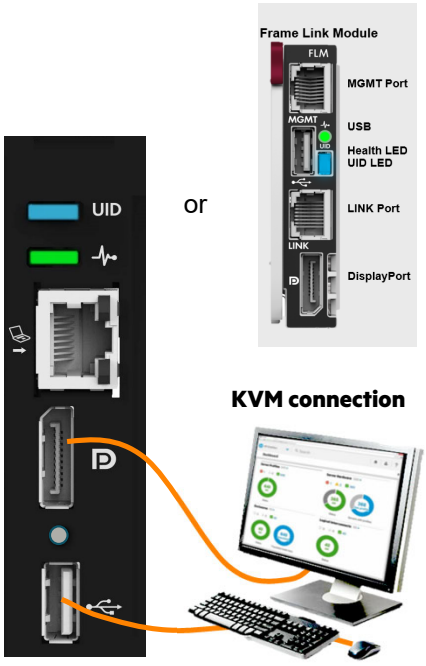
Accessing HPE Synergy Composer

ACCESS HPE SYNERGY COMPOSER LOCALLY

Using a KVM connection to the front panel

- A DisplayPort requires:
  - A monitor to get a DisplayPort entry
  - A DisplayPort to DisplayPort cable or a DisplayPort to VGA adapter
  - An Active DisplayPort adapter for HDMI, DVI, or VGA
- USB connection requires
  - A USB hub if not embedded in monitor
  - A USB keyboard and USB Mouse

NOTE: In a multi-frame setup, it works only from the frame front panel where an HPE Synergy Composer is located.



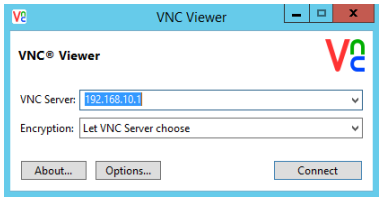
Access HPE Synergy Composer locally—Using a KVM connection to the front panel

- HPE Synergy Composer can be accessed locally using a KVM connection to the front panel. You can use:
- A DisplayPort, which requires:
  - A monitor to get a DisplayPort entry
  - A DisplayPort to DisplayPort cable or DisplayPort to VGA adapter
  - An active DisplayPort adapter for HDMI, DVI, or VGA
- USB connections, which require:
  - A USB hub if not embedded in the monitor
  - A USB keyboard and mouse
- NOTE: In a multi-frame setup, accessing HPE Synergy Composer via a KVM connection works only from the front panel of a frame where an HPE Synergy Composer is located.

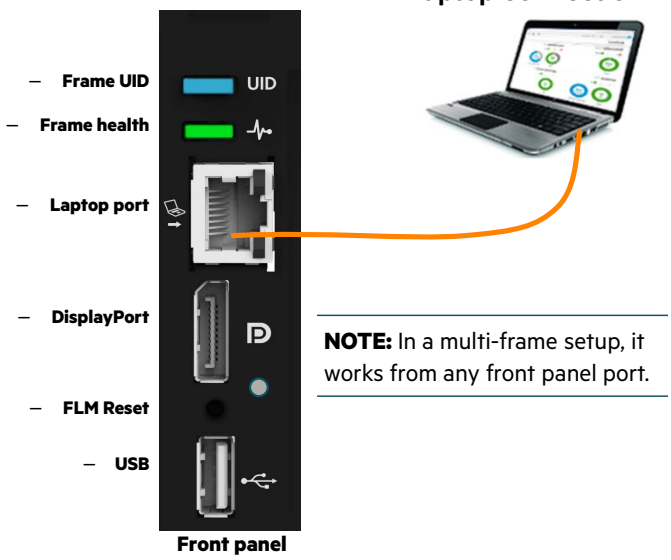
ACCESS HPE SYNERGY COMPOSER LOCALLY

Using a laptop connection to the front panel

- Front panel console RJ45 port
  - A laptop, DHCP enabled
  - An RJ45 CAT5 cable
  - A VNC-Viewer (for example): https://www.realvnc.com/download/viewer/
- FLM DHCP assigns a 192.168.10.* IPv4
- Connect to FLM via VNC 192.168.10.1:5900



- You can also access using 192.168.10.1:5800 from a web browser



NOTE: In a multi-frame setup, it works from any front panel port.

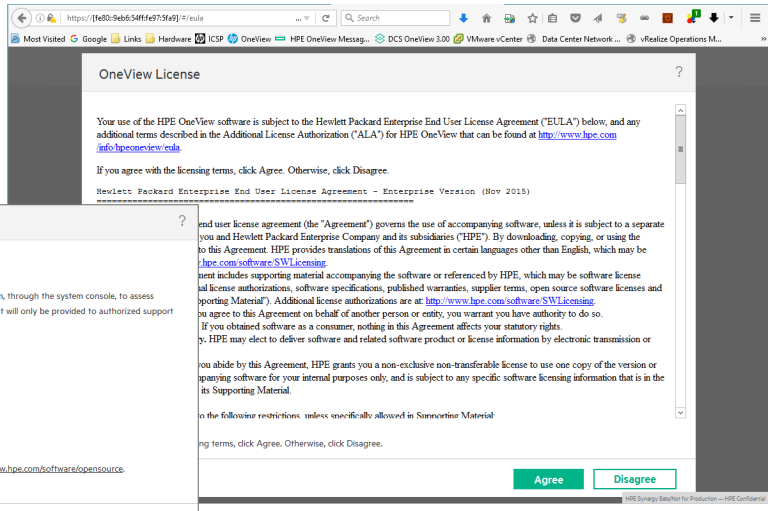
Access HPE Synergy Composer locally—Using a laptop connection to the front panel

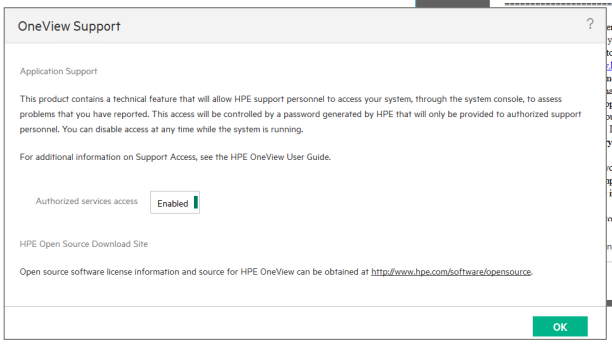
- In addition, HPE Synergy Composer can be accessed using a laptop connection to the front panel, as shown on the slide above. The front panel console RJ45:
  - Requires a laptop, DHCP-enabled
  - Requires an RJ45 CAT5 cable
  - Requires VNC-Viewer, for example: https://www.realvnc.com/download/viewer/
- FLM DHCP assigns a 192.168.10.* IPv4. Connect to FLM via VNC 192.168.10.1:5900. If a VNC Viewer cannot connect, make sure you have no IP conflict with your VMware workstation VMnet.
- This kind of connection works only from the RJ45 port on the front panel (and not from the FLM ports).
- NOTE: In a multi-frame setup, accessing HPE Synergy Composer using a laptop connection and a VNC Viewer works from the front panel port of any frame in the management ring.
- You can also access 192.168.10.1:5800 from a web browser

ACCESS HPE SYNERGY COMPOSER REMOTELY (ALTERNATIVE)

Access HPE Synergy Composer browser by using the IPv6 address

- Launch a browser and enter the IPv6 address in square brackets like: https://[fe80::536f:b475:27ec:fa86]
- Accept the EULA
- Accept the Authorized services access



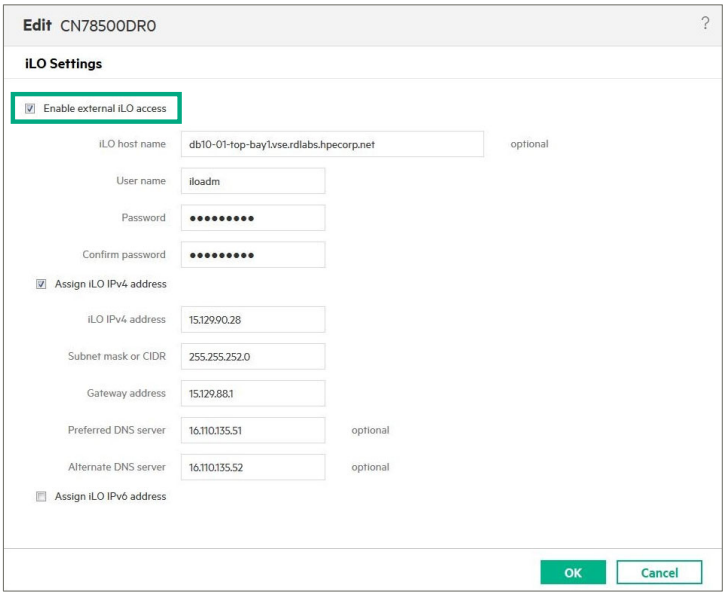


Access HPE Synergy Composer remotely—Access HPE Synergy Composer browser by using the IPv6 address

- HPE Synergy Composer can also be accessed remotely after claiming the frame, even before the networking parameters are set, by using the previously discovered HPE Synergy Composer IPv6 link local address.
- Follow these steps:
- Launch a browser and enter the IP address just recorded in square brackets like: https://[fe80::536f:b475:27ec:fa86]
- Accept the EULA.
- Accept the Authorized services access.

SYNERGY COMPOSER2 REMOTE ACCESS THROUGH ILO

Synergy Composer2



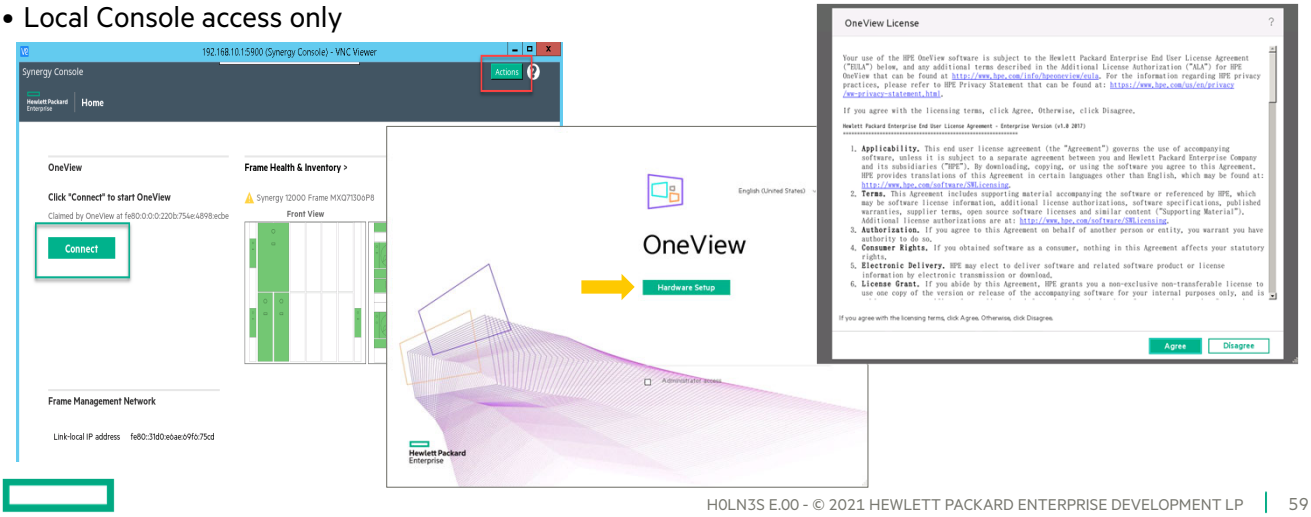
Synergy Composer2 remote access through iLO

- HPE Synergy Composer2 does have an iLO that can be connected to a customer network. The iLO Remote Access feature in HPE OneView 5.0 provides lights out access to Synergy Composer2 so you can update, troubleshoot, and restore from a remote client.
- All the HPE Synergy Composer2 nodes that are present in the enclosures managed by HPE OneView can be configured for remote access on the Management network, including standby or standalone Composer2 nodes.
- You can configure Composer2 iLO with an externally accessible local user account with limited privileges to the following functions:
  - Virtual Power on/off the appliance
  - Connect though remote console
  - Log in to the maintenance console
  - Launch virtual media mount
  - Perform a support dump from maintenance console to a virtual USB
  - Restore from a virtual USB
  - Start install or upgrade from virtual USB
- This configuration enables you to manage the Composer2 remotely and perform specific Composer2 management operations that previously required accessing the Composer console locally in the data center.

- (continued on the next page)

HPE SYNERGY INSTALLATION (HARDWARE SETUP)

- No credentials needed, no module passwords to collect
- Point-and-click access to any server console or iLO without configuring the iLO IP address or password
- Local Console access only



HPE Synergy installation (Hardware Setup)

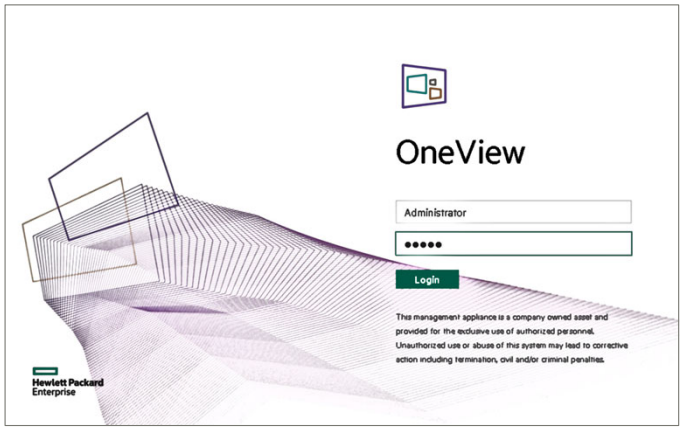
- You do not need to capture factory passwords from each module or configure IP addresses for each frame. Also, there is a point-and-click access to any server console or iLO without configuring the iLO IP address or password. The Synergy Console can be used to access the iLO web interface or server consoles for troubleshooting or diagnostics.
- Manual addition of frames that are not linked in a local management ring is done from the Hardware Setup screen, by selecting the Add Remote Enclosures option in the Actions menu and using the frame IPv6 address displayed on that frame's Synergy Console Information screen. Remote frames must be on the same management network subnet as HPE Synergy Composer.

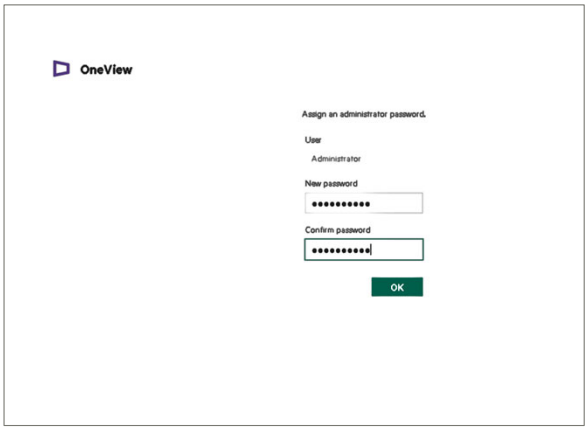
HARDWARE SETUP INVENTORY CHECKLIST

HPE Synergy 12000 Frame

HPE SYNERGY COMPOSER BROWSER ACCESS

1. The setup first-time login using Administrator / admin
2. Prompts to reset the initial password





 | 61

HPE Synergy Composer browser access

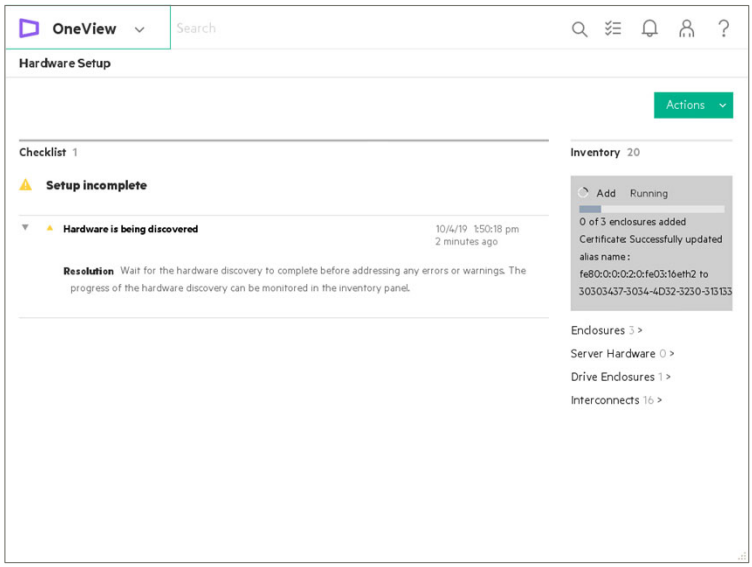
- Access HPE Synergy Composer with a supported web browser.
- Log in using the default HPE Synergy Composer credentials: Administrator / admin
- Set the initial password.

HARDWARE SETUP
Inventory checklist

After the inventory process is complete

- Confirm the inventory
- Check the logs and follow the corrective actions, if required
- Wait until a “Setup Complete” message appears

NOTE: Wait until the Hardware Setup process has finished before resolving errors and warnings because they might resolve themselves during the setup process.



 | 62

Hardware Setup—Inventory checklist

- After the networking settings is done, the inventory process is executed:
  - Confirm that the inventory includes all installed components.
  - Check the logs and make sure no corrective action is required, for example FLM cabling error, and so on.
  - Follow the corrective actions to troubleshoot all errors until a “Setup Complete” message appears.
- NOTE: Wait until the Hardware Setup process has finished before resolving errors and warnings because they might resolve themselves during the setup process.

RESOURCES

- Options to get additional info, tool, sites, videos

REVIEW QUESTIONS

LEARNING CHECK

One HPE Virtual Connect SE 40Gb F8 Module with 10Gb satellite modules (ILMs) can support up to _____ compute modules.

A. 12
B. 24
C. 36
D. 60

Learning check

– One HPE Virtual Connect SE 40Gb F8 Module with 10Gb satellite modules (ILMs) can support up to _____ compute modules.

A. 12
B. 24
C. 36
D. 60

LEARNING CHECK

How many 40Gbps ports are available for uplinks on an HPE Virtual Connect SE 40Gb F8 Module?

A. 4
B. 6
C. 8
D. 12

Learning check

– How many 40Gbps ports are available for uplinks on an HPE Virtual Connect SE 40Gb F8 Module?

A. 4
B. 6
C. 8
D. 12

LEARNING CHECK

Are the native FC uplink ports supported on an HPE VC SE 40Gb F8 Module?

A. No
B. No, but they will be supported in the future
C. Yes, only with the FC license upgrade
D. Yes, out-of-the-box

Learning check

– Are the native FC uplink ports supported on an HPE VC SE 40Gb F8 Module?

A. No

B. No, but they will be supported in the future

C. Yes, only with the FC license upgrade

D. Yes, out-of-the-box

LEARNING CHECK

What is the transfer speed of the HPE Virtual Connect SE 100 Gb F32 Module interconnect link ports?

A. 40 Gb/s
B. 50 Gb/s
C. 100 Gb/s
D. 300 Gb/s

Learning check

– What is the transfer speed of the HPE Virtual Connect SE 100 Gb F32 Module interconnect link ports?

A. 40 Gb/s
B. 50 Gb/s
C. 100 Gb/s
D. 300 Gb/s

LEARNING CHECK

One HPE Synergy D3940 Storage Module can be directly attached to _____ compute module(s).

A. 1
B. up to 6
C. up to 10
D. up to 12

Learning check

– One HPE Synergy D3940 Storage Module can be directly attached to _____ compute module(s).

A. 1
B. up to 6
C. up to 10
D. up to 12

LEARNING CHECK

HPE Synergy 12Gb SAS Connection Module has _____ uplink ports.

A. 8
B. 12
C. 16
D. No

Learning check

– HPE Synergy 12Gb SAS Connection Module has _____ uplink ports.

A. 8

B. 12

C. 16

D. No

LEARNING CHECK

The appliance bays and Frame Link Modules are connected _____ .

A. Internally at 1Gbps
B. Internally at 10Gbps
C. Externally at 10Gbps
D. Externally at 40Gbps

Learning check

– The appliance bays and Frame Link Modules are connected _____.

A. Internally at 1Gbps

B. Internally at 10Gbps

C. Externally at 10Gbps

D. Externally at 40Gbps

LEARNING CHECK

Which type of ports does the 4-port Frame Link Module have?

A. 4 x RJ45
B. 4 x SFP+
C. 2 x RJ45 and 2 x SFT+

Learning check

– Which type of ports has the 4-port Frame Link Module?

A. 4 x RJ45

B. 4 x SFP+

C. 2 x RJ45 and 2 x SFT+

LABS

HPE SYNERGY HARDWARE ADMINISTRATION SKILLS

Topic Areas

- Solution overview
  - Planning steps
  - Configuration steps
- Hardware overview
- Management appliances
- Frame management cabling
- Power cabling
- Interconnect link topology
- Accessing Composer

HPE Synergy Hardware Administration skills

Topic areas

Solution overview

- Planning steps
- Configuration steps

Hardware overview

Management appliances

Frame management cabling

Power cabling

Interconnect link topology

Accessing Composer

TRAINING OBJECTIVES

- Upon completion of the module apply HPE Synergy Hardware Administration skills to perform tasks in lab to validate a Synergy deployment and initial hardware setup.
- Course review questions will provide you an opportunity check your knowledge of skill and task: Facts, Terms, Definitions and Concepts.
- The course modular structure organizes skill topics to follow typical systems administration responsibilities for tasks performed once installation completed. What's in it for you, at the end of this module, is identifying those skills you need to perform on the job with your Synergy implementation.
- Successful Skill performance is demonstrated at the end of this module by using the OneView interface and configuration documentation to perform the listed skills
- Upon completion of the module create a personal learning plan and module summary thinking about the following questions:
  - What are the new skills that were covered?
  - Who on the team will perform the skills in the module?
  - What questions do you need answers?

Training objectives

Upon completion of the module apply HPE Synergy Hardware Administration skills to perform tasks in lab to validate a Synergy deployment and initial hardware setup.

Course review questions will provide you an opportunity check your knowledge of skill and task: Facts, Terms, Definitions and Concepts.

The course modular structure organizes skill topics to follow typical systems administration responsibilities for tasks performed once installation completed. What's in it for you, at the end of this module, is identifying those skills you need to perform on the job with your Synergy implementation.

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Upon completion of the module create a personal learning plan and module summary thinking about the following questions:

- What are the new skills that were covered?
- Who on the team will perform the skills in the module?
- What questions do you need answers?

APPENDIX

FLM FOUNDATIONAL REQUIREMENTS

- Composers of the same generation must be paired within a Management Ring. You cannot have one Composer and one Composer2 in the same management ring.
- FLMs of the same generation must be used within a Frame.
  Frames within the same management ring can have Frames using 2-port FLMs and Frames using 4-port FLMs. FLMs can be mixed in the management ring, but not in the same Frame.
- Frames with original Composers must use 2-port FLMs, other Frames in the ring can use 4-port FLMs.
- Frames with Image Streamer appliances require 2-port FLMs, other Frames in the ring can use 4-port FLMs.

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Frames with Image Streamer appliances require 2-port FLMs, other Frames in the ring can use 4-port FLMs.

SUPPORT MATRIX

System configurations: Synergy Composer/Composer2/Image Streamer with HPE OneView 5.0+

Case#	Use Case	Composer version	Frames with Composer	Frames without Composer	Frames w/ Image Streamer	Frames w/ Image Streamer and Composer	Frames w/ Image Streamer and Composer2
1	Migrate: Composer-Composer2	Composer2	2-port FLM	2-port FLM	Not Applicable	Not Applicable	Not Applicable
2	Migrate & Grow: Add new frames	Composer2	2-port FLM	Either	Not Applicable	Not Applicable	Not Applicable
4	New deployments	Composer2	4-port FLM	4-port FLM*	Not Applicable	Not Applicable	Not Applicable
6	Current Configurations	Composer	2-port FLM	2-port FLM	Not Applicable	Not Applicable	Not Applicable
7	Grow: Add new frames	Composer	2-port FLM	Either	Not Applicable	Not Applicable	Not Applicable

Migrate = Upgrade from Composer1 to Composer2
Grow = Add new frames to your configuration

** These frames are expected to work with 2-port FLMs but have not been tested.*

 | 78

Support Matrix

This is a support matrix table of system configurations for your reference.

Not all combinations are supported, it depends on the use case (numbered in the first column).

Foundational Requirements are:

Composers of the same generation must be paired within a Management Ring. You cannot have one Composer and one Composer2 in the management ring.

FLMs of the same generation must be used within a Frame. So, FLMs cannot be mixed in the same Frame.

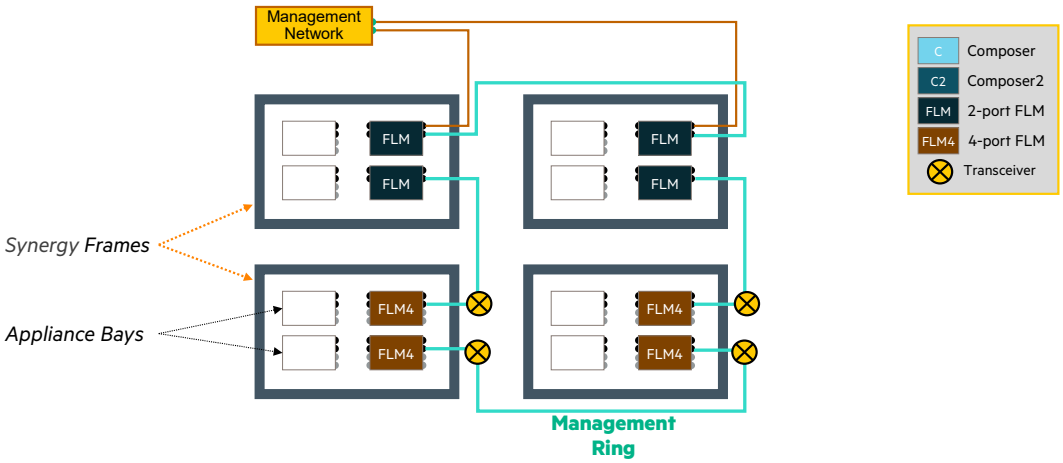
Frames within the same management ring can have mixed Frames of 2-port FLMs and/or 4-port FLMs . So, FLMs can be mixed in the management ring but not in the same Frame.

Frames with original Composers must use 2-port FLMs. 4-port FLMs can be used in other Frames without original Composer.

Frames with Image Streamer appliances require 2-port FLMs. New Image Streamer model may be released in future.

SYNERGY FLM CONFIGURATIONS

Mixed 2-port and 4-port FLMs



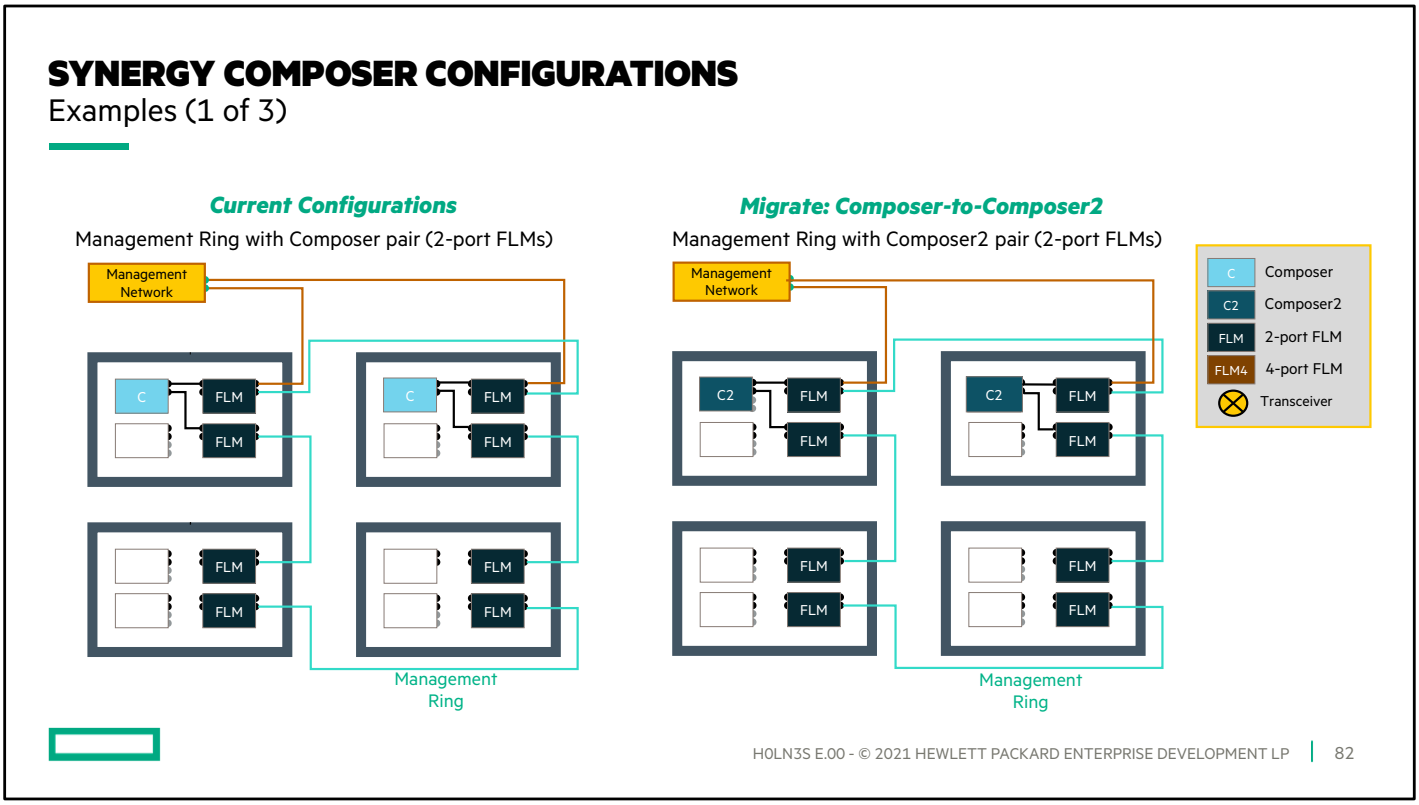
 | 79

Synergy FLM configurations—Mixed 2-port and 4-port FLMs

- This is a basic diagram example of 4-Frame single management ring with mixed 2-port and 4-port FLMs. As mentioned, Frames with 2-port FLMs and Frames with 4-port FLMs can exist in the same Management Ring, only the same FLM generation must be used within a Frame.
- MGMT & LINK ports of the 4-port FLM function the same as in the 2-port FLM, except the port types are different. In 4-port FLMs it is SFP+, while in 2-port FLM ports are using RJ45 standard.
- Note: The two additional ports of the 4-port FLM will be enabled in a future release.
- Since new 4-port FLMs are using the SFP+ port type for long-range connections, a transceiver is required to bridge the two connection types in the management ring. Usually two transceivers are enough in one management ring, if the FLMs are grouped together by type.

LABS

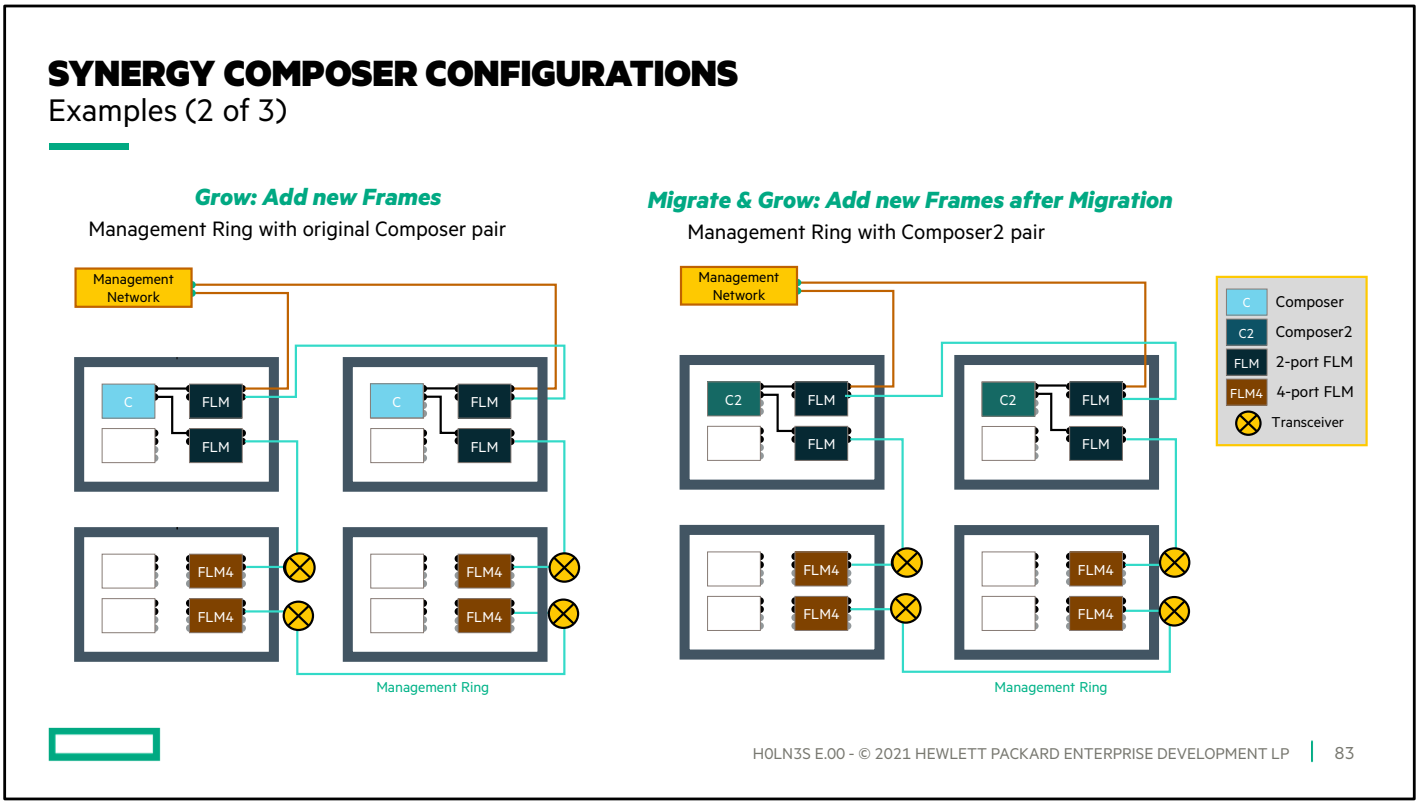
APPENDIX



Synergy Composer configurations—Examples (1 of 3)

This is an example of migration case from original Composer pair to new Composer2 pair in a 2-port FLMs management ring.

As mentioned, the same generation of Composers must be paired within a Management Ring, and original Composer appliances must have 2-port FLMs in that same Frame.



Synergy Composer configurations—Examples (2 of 3)

This is an example when you need to grow the environment by adding new frames with 4-port FLMs (a diagram on the left).

- Since new 4-port FLMs use SFP+ connections, two transceivers are added in the Management Ring.

A growing with migration from Composer to Composer2 is shown in the diagram on the right. This is a supported use case also, since Composer2 supports 2-port FLMs.

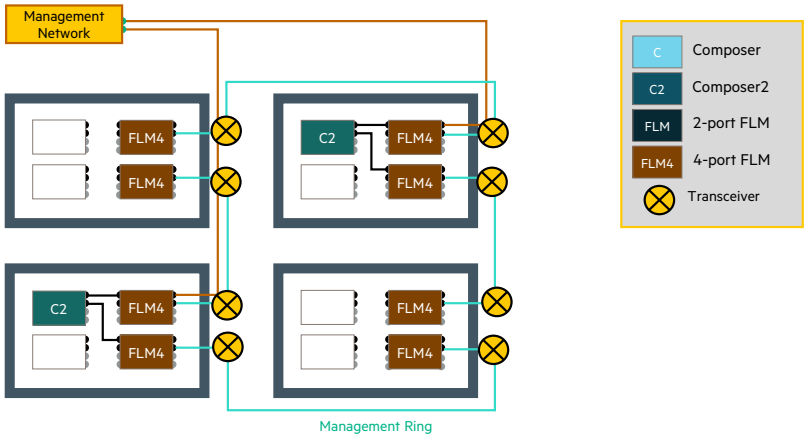
SYNERGY COMPOSER CONFIGURATIONS
Example (3 of 3)

Requirements

- The same generation of Composers must be paired within a Management Ring
- Original Composer appliances must have 2-port FLMs in that same Frame

New Deployment

Management Ring with Composer2 pair (4-port FLMs)



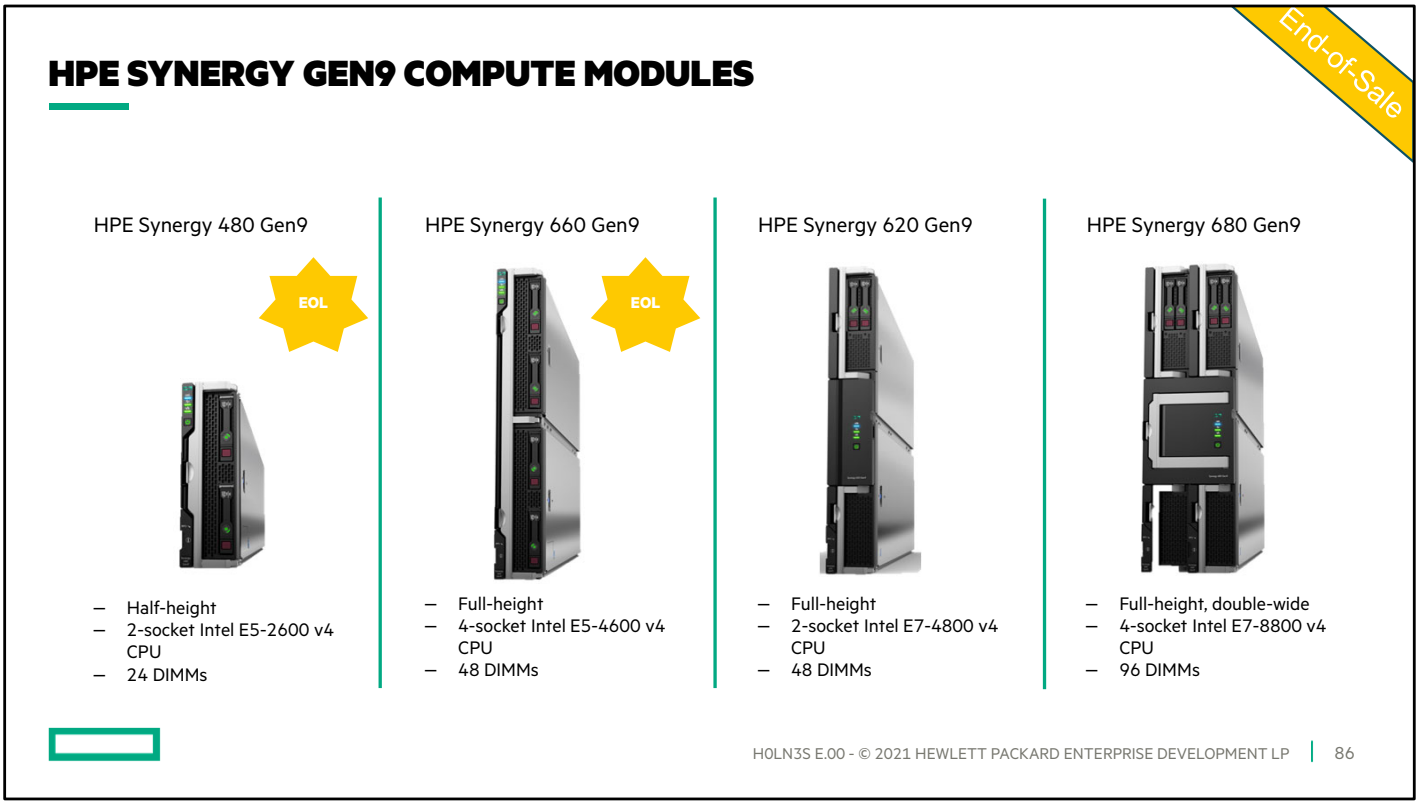
Synergy Composer configurations—Examples (3 of 3)

This is a new deployment use case, when HPE Synergy Composer2 and 4-port FLMs are used.

There is no need for transceivers in this case.

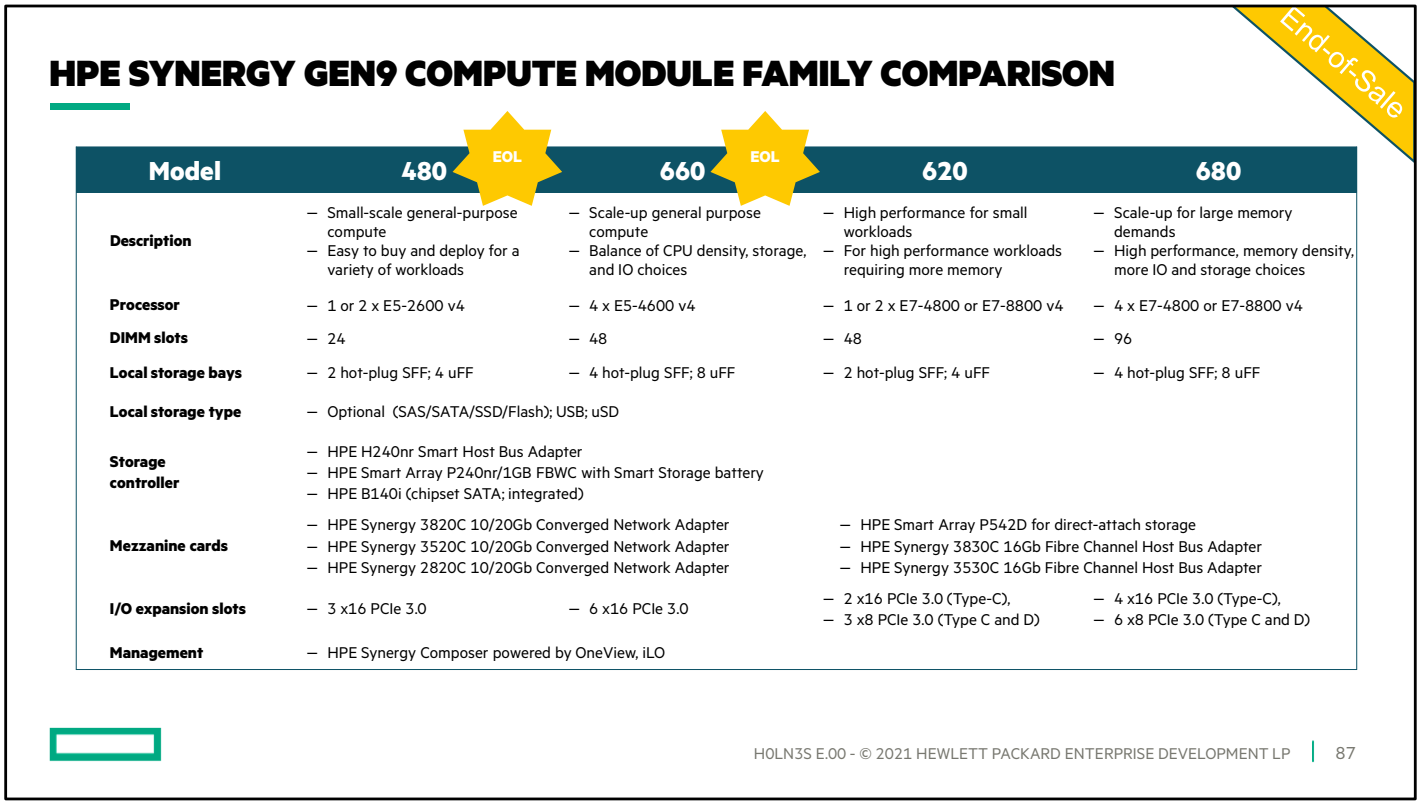
HPE SYNERGY GEN9 COMPUTE MODULES

HPE Synergy Gen9 compute modules



HPE Synergy Gen9 compute modules

- NOTE: Your instructor will use this slide to recap the knowledge that you obtained from the prerequisite WBTs.
- The HPE Synergy 480 Gen9 Compute Module is a half-height compute module that has twenty-four DIMM slots and supports the entire Intel E5-2600 v4 (Broadwell EP) processor family without any DIMM slot restrictions. Greater consolidation and efficiency are achieved through an increase in virtual machine density per compute module.
- The HPE Synergy 660 Gen9 Compute Module is a full-height, high-performance compute module with high-density Intel Xeon E5-4600 v4 (Broadwell EP) processors, 48 DIMM slots, and flexible I/O fabric connectivity. HPE Synergy 660 offers a large memory footprint and powerful processors to support more demanding workloads like in-memory and structured databases.
- The HPE Synergy 620 Compute Module is a full-height, two-socket compute module with 48 DIMM slots that supports the Intel Xeon E7-4800 v4 (Broadwell EX) processor family.
- HPE Synergy 680 Gen9 Compute Module is a full-height, double-wide, four-socket compute module with 96 DIMM slots that supports Intel Xeon E7-8800 v4 processor family. This compute module comprises two full-height, single-wide compute modules; the one on the left is called the Primary (Monarch), and the one on the right is called the Expansion.
- HPE Synergy 620 and 680 Gen9 Compute Modules are ideal for financial, insurance, healthcare, manufacturing, and retail enterprises that require mission-critical levels of availability, extended versatility, and real-time performance.
- Note: HPE Synergy 480 Gen9 and HPE Synergy 660 Gen9 compute modules are in the End-Of-Life (EOL) status since 04/30/2018



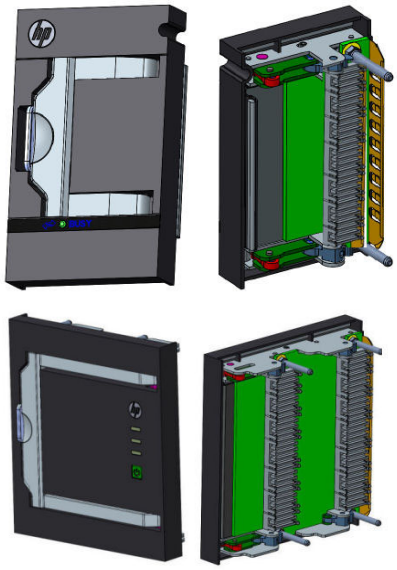
Model	480	660	620	680
Description	– Small-scale general-purpose compute – Easy to buy and deploy for a variety of workloads	– Scale-up general purpose compute – Balance of CPU density, storage, and IO choices	– High performance for small workloads – For high performance workloads requiring more memory	– Scale-up for large memory demands – High performance, memory density, more IO and storage choices
Processor	– 1 or 2 x E5-2600 v4	– 4 x E5-4600 v4	– 1 or 2 x E7-4800 or E7-8800 v4	– 4 x E7-4800 or E7-8800 v4
DIMM slots	– 24	– 48	– 48	– 96
Local storage bays	– 2 hot-plug SFF; 4 uFF	– 4 hot-plug SFF; 8 uFF	– 2 hot-plug SFF; 4 uFF	– 4 hot-plug SFF; 8 uFF
Local storage type	– Optional (SAS/SATA/SSD/Flash); USB; uSD			
Storage controller	– HPE H240nr Smart Host Bus Adapter – HPE Smart Array P240nr/1GB FBWC with Smart Storage battery – HPE B140i (chipset SATA; integrated)			
Mezzanine cards	– HPE Synergy 3820C 10/20Gb Converged Network Adapter – HPE Synergy 3520C 10/20Gb Converged Network Adapter – HPE Synergy 2820C 10/20Gb Converged Network Adapter		– HPE Smart Array P542D for direct-attach storage – HPE Synergy 3830C 16Gb Fibre Channel Host Bus Adapter – HPE Synergy 3530C 16Gb Fibre Channel Host Bus Adapter	
I/O expansion slots	– 3 x16 PCIe 3.0	– 6 x16 PCIe 3.0	– 2 x16 PCIe 3.0 (Type-C), – 3 x8 PCIe 3.0 (Type C and D)	– 4 x16 PCIe 3.0 (Type-C), – 6 x8 PCIe 3.0 (Type C and D)
Management	– HPE Synergy Composer powered by OneView, iLO			

HPE Synergy Gen9 compute module family comparison

- This table presents some technical information and comparison of the HPE Synergy Compute Module Gen9 family.
- In addition to the previously mentioned characteristics, it is important to stress out that HPE Synergy Gen9 compute modules support a variety of storage controllers and mezzanine cards.
- HPE B140i Dynamic Smart Array (chipset SATA) is integrated into compute modules, and you can optionally choose to have HPE H240nr Smart Host Bus Adapter or HPE Smart Array P240nr.
- Mezzanine cards that you can install include different Converged Network Adapters for networking, Host Bus Adapters for storage, and HPE Smart Array P542D for direct-attach storage. These mezzanine cards are inserted into PCIe 3.0 expansion slots, whose number depends on the model of a compute module. Both C (single-wide) and D (double-wide) type mezzanine cards are supported.
- HPE Synergy Gen9 compute modules can be managed through HPE Synergy Composer that is powered by HPE OneView, or through iLO.
- Note: Type C — Type C mezzanine cards can be installed on either Type C or Type D mezzanine connectors. Type D — Type D mezzanine cards can only be installed on Type D connectors.

COMPUTE LINK MODULE FOR HPE SYNERGY 680 GEN9

- Completes the QPI links between or among the processors in the compute modules
- Carries the QPI links between the CPUs
- Links I2C buses, system clocks, and other signal groups between the two compute modules
- Contains health LED, UID LED, and NIC LED
- Has an EEPROM circuit for FRU ID information storage



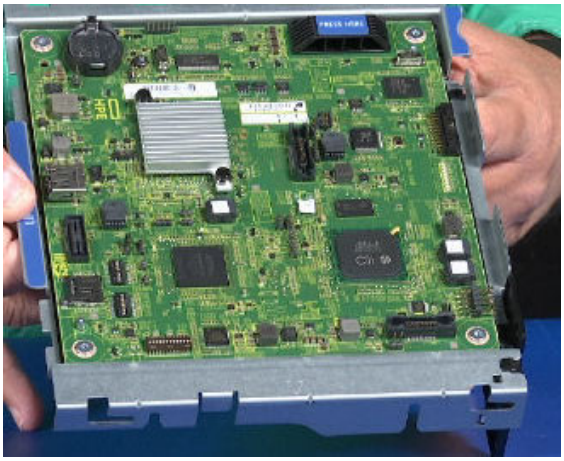
Compute Link Module for HPE Synergy 680 Gen9

- HPE Synergy 620 and 680 Gen9 Compute Modules have a Compute Module Link connector attached to the front panel. Front and back views of the Compute Module Link for HPE Synergy 620 Gen9 Compute Module is shown in the upper picture on the right of the screen, while the Compute Module Link for HPE Synergy 680 Gen9 Compute Module is shown in the bottom picture.
- The purpose of the Compute Link Module is to complete the Quick Path Interconnect (or QPI) links between or among the processors in the compute modules, carry the QPI links between the CPUs, and link I2C buses, system clocks, and other signal groups between the two compute modules.
- The front-panel power button, health LED, UID LED, and NIC LED also are contained on the front of the Compute Module Link. The Compute Module Link also has a EEPROM circuit for FRU ID information storage.
- The Compute Module Link for HPE Synergy 620 Gen9 compute module serves as a terminator for the QPI connections since the two processors in that compute module are already connected through the QPI links in the system board.

HPE SYNERGY 620 GEN9 COMPUTE MODULE

Management Daughter Card

- Hosts the Platform Controller Hub (PCH) for I/O connectivity and the iLO4 processor for system monitoring and management
- Connects to the system board with a mezzanine-type connector
- Contains:
  - Platform Controller Hub (PCH)
  - iLO 4 management processor and NVRAM
  - System battery
  - Internal USB 3.0 connector
  - Internal MicroSD connector
  - Controller Area Network (CAN) microcontroller
  - System maintenance switch

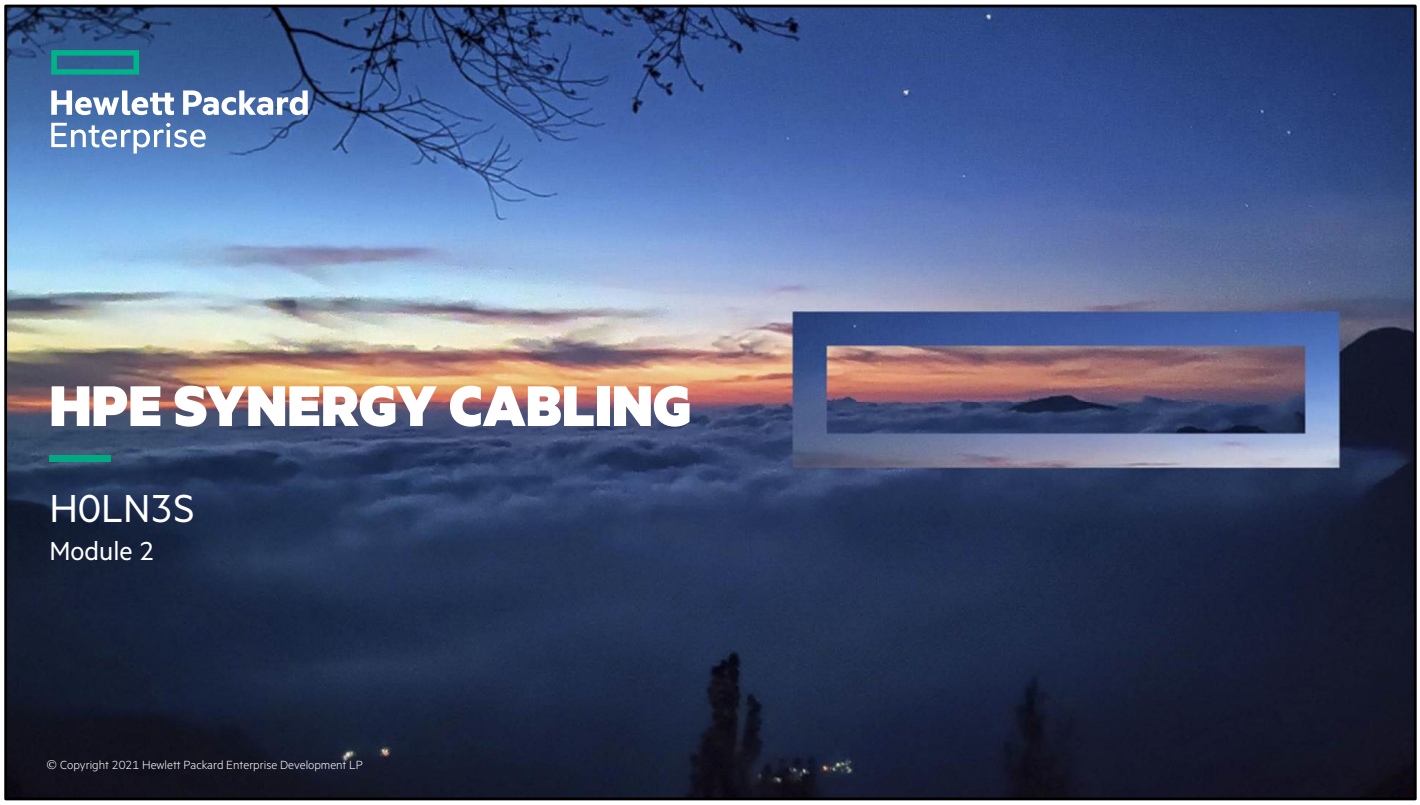


 | 89

HPE Synergy 620 Gen9 Compute Module—Management Daughter Card

- HPE Synergy 620 and 680 Gen9 Compute Modules also have a Management Daughter Card (MDC). In HPE Synergy 680 Compute Module, only the Primary compute module has an MDC.
- MDC is designed to move most of the major management subsystem components off of the system board to allow more room on the system board for system component placement and signal routing. MDC hosts the Platform Controller Hub (PCH) for I/O connectivity and the iLO4 processor for system monitoring and management.
- It connects to the system board with a mezzanine-type connector, which is the same high-density connector used for the mezzanine I/O cards at the rear of the blade.
- MDC contains the following components:
- Platform Controller Hub
- iLO 4 management processor and NVRAM
- System battery
- Internal USB 3.0 connector
- Internal MicroSD connector
- Controller Area Network (CAN) microcontroller
- A system maintenance switch

THANK YOU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H0LN3S
Module 2
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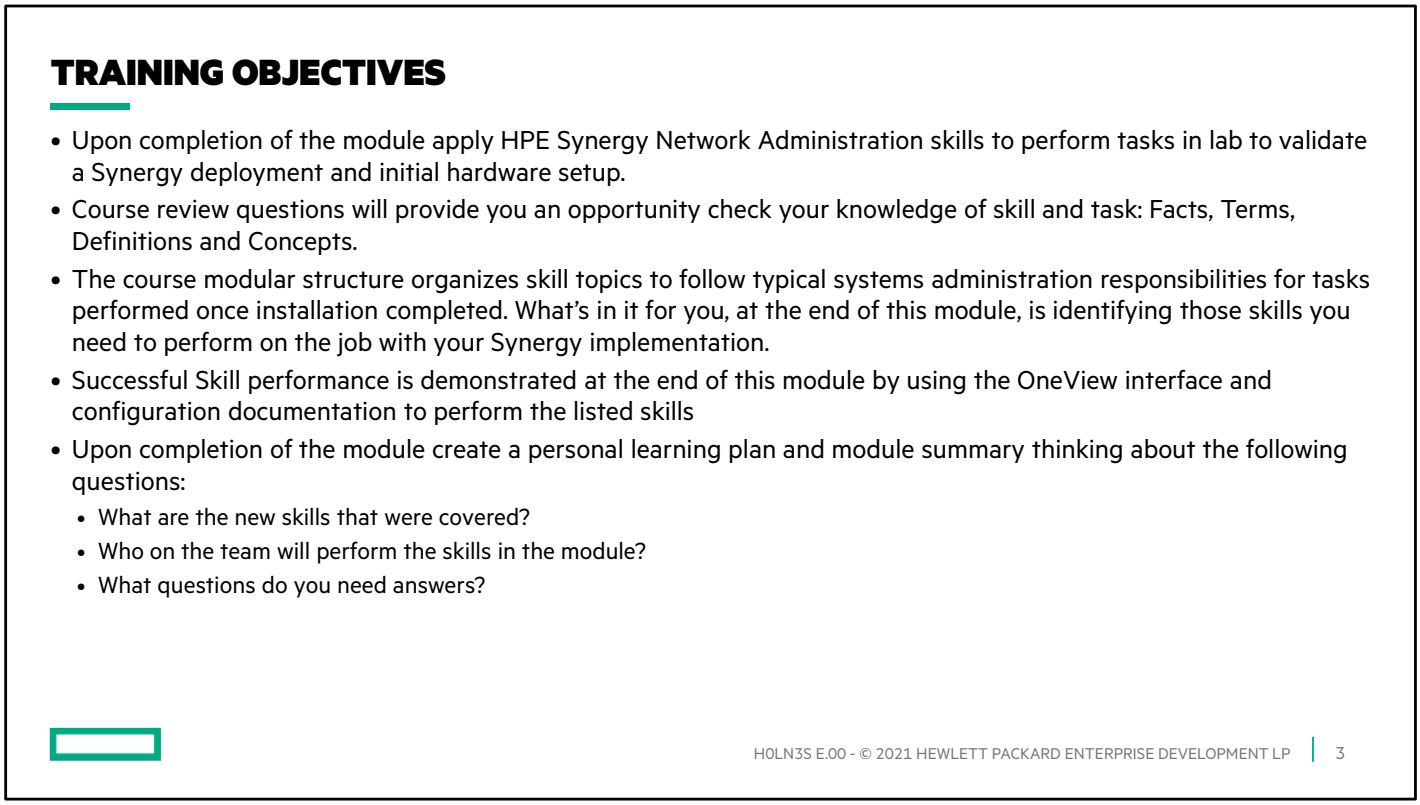
HPE SYNERGY NETWORK ADMINISTRATION SKILLS

- Topic areas

- Ethernet Modules
- Interconnect link topology
- Ethernet traffic flow



Training objectives

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The course modular structure organizes skill topics to follow typical systems administration responsibilities for tasks performed once installation completed. What's in it for you, at the end of this module, is identifying those skills you need to perform on the job with your Synergy implementation.

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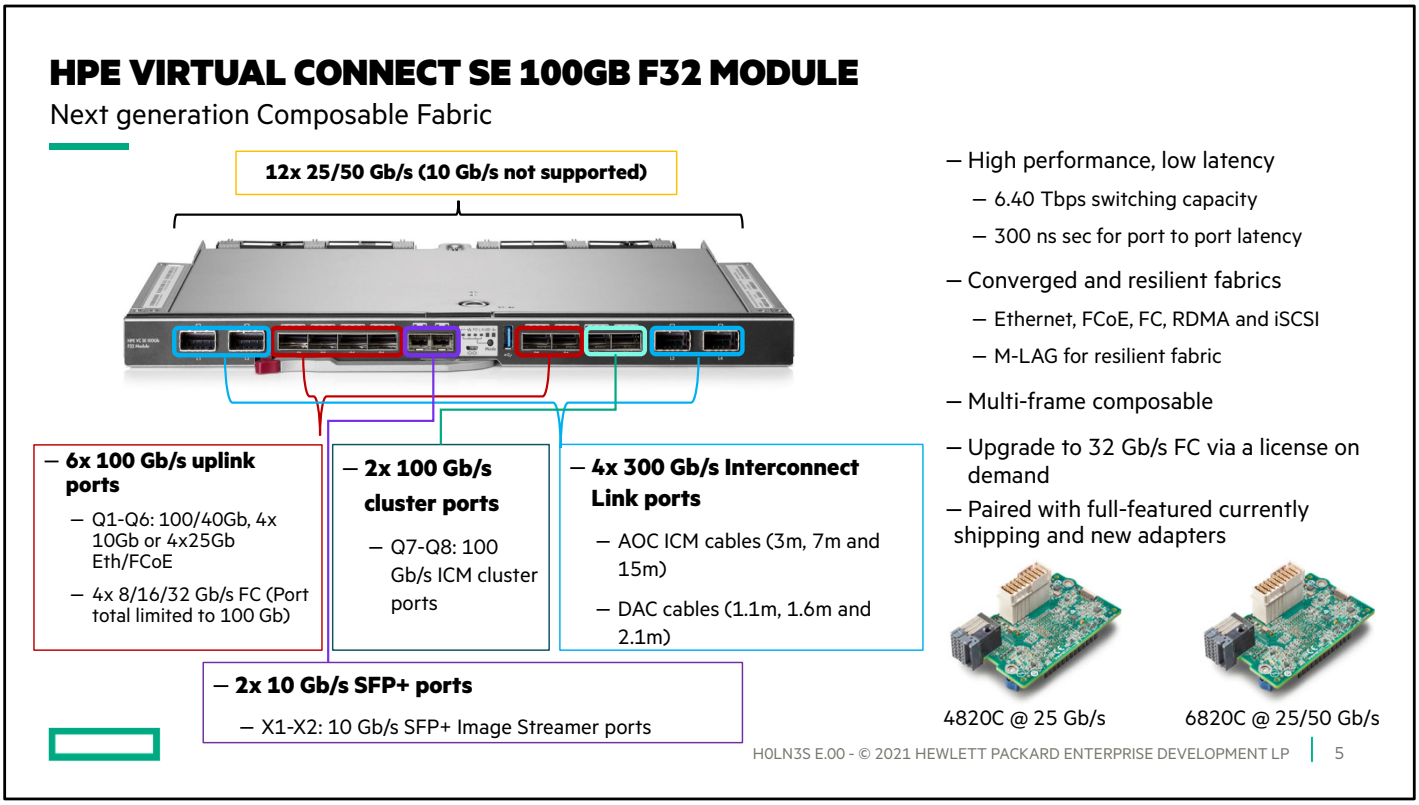
HPE SYNERGY ETHERNET MODULES

Master modules



HPE Virtual Connect SE 100Gb F32 Module—Next generation Composable Fabric

HPE Virtual Connect SE 100Gb F32 Module has 12 downlink ports to compute modules operating on 25 Gb/s or 50 Gb/s.

(Notice that 10 Gb/s is not supported, so you must provide the appropriate mezzanine adapters in the servers. In 50 Gb/s mode, you can still establish the 25 Gb/s connection.)

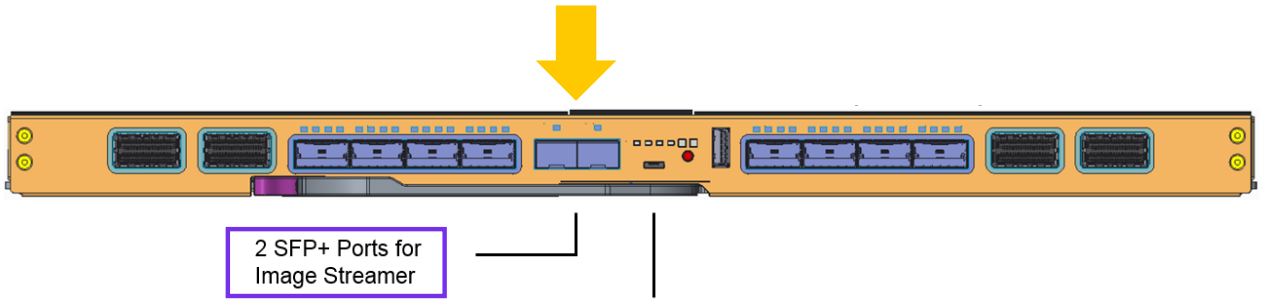
On the face plate, this module has 6x 100 Gb/s QSFP uplink ports at 100 Gb/s or 40 Gb/s, which can be split into 4 x 10 Gb/s or 4 x 25 Gb/s connections for Ethernet or FCoE. Also, Fiber Channel connections are supported as 4 x 8 Gb/s or 4 x 16 Gb/s or 4 x 32 Gb/s. (Notice that 4 x 32 Gb/s exceeds the port capacity of 100 Gb/s, so the connections can be established at 32 Gb/s at physical layer, but the total throughput is limited to 100 Gb/s per port, i.e. 25 Gb/s per connection.)

There are two cluster ports Q7 and Q8, operating at 100 Gb/s used for clustering between the master modules in the same logical interconnect.

Two ports on the left-hand side and two ports on the right-hand side are interconnect link ports to connect the satellite frames, supporting 300 Gb/s (12 x 25 Gb/s) throughput each, connecting to 3 frames at 50 Gb/s, or up to 5 frames at 25 Gb/s.

Now, there are also two 10 Gb/s SFP+ dedicated ports for the Image Streamer in the middle. You can cable them to the Frame Link Modules which are connected to the Image Streamer appliance. So, all the uplink ports can be used for uplink connectivity.

VC SE 100GB F32 MODULE FOR SYNERGY ADVANCED FEATURES



- Private VLANs to isolate east-west traffic
- Large Network Sets to eliminate VLAN limits
- sFlow to provide statistics in an industry standard way
- RoCE v1/v2 for MS Azure/MS Storage Spaces Direct
- FlatSAN or FC Direct Attach with 3PAR and Nimble
- Configurable LAG load-balancing
- Remote SPAN (RSPAN)
- Ping and Traceroute
- SNTP client synchronized clock
- Note: Remote Support not available in this release

VC SE 100Gb F32 Module for Synergy Advanced Features

Advanced L2 Features with new Synergy VC SE 100Gb F32 Module are:

- Private VLANs to isolate east-west traffic between compute modules
- Large Network Sets to eliminate VLAN limits and enable full interoperability with third party solutions including Cisco ACI
- sFlow to monitor flows and provide statistics in an industry standard way
- RoCE v1/v2 to integrate with MS Azure and MS Storage Spaces Direct
- FlatSAN or FC Direct Attach with 3Par and Nimble storage systems for policy-driven storage resource provisioning
- Configurable LAG load-balancing based on L2/L3 header parameters for better integrations with 3rd party solutions

- Enhanced troubleshooting and supportability with the following capabilities:
  - Remote SPAN (RSPAN) to extend port monitoring capability and send monitored traffic to an external switch.
  - Ping and Traceroute for troubleshooting the device accessibility and reachability
  - SNTP client configuration to synchronize clock with the network devices and provide means for measuring packet delays
- Notice that Remote Support will be available in the next release.

VC SE 100GB F32 MODULE FOR SYNERGY

Supported Interconnect Link Cables

Type	SKU P/N	Assembly P/N	PRODUCT
CXP28 DAC	876680-B21	876682-001	HPE SY 300Gb Interconnect Link 2.1m DAC
CXP28 AOC	876689-B21	876691-001	HPE SY 300Gb Interconnect Link 3m AOC
CXP28 AOC	876692-B21	876694-001	HPE SY 300Gb Interconnect Link 5m AOC
CXP28 AOC	876698-B21	876700-001	HPE SY 300Gb Interconnect Link 15m AOC

AOC Cable

DAC Cable

CXP Connector: 12 x 25 Gbit/s links

IMPORTANT: The older cables will not work as they have incompatible transceivers.

VC SE 100Gb F32 Module for Synergy—Supported Cables/Modules

This is a list of CXP28 Cable Options for connecting VC SE 100Gb F32 Module for Synergy master module with satellites.

SKU is reduced to simplify configurations:

- CXP28 DAC 876677-B21 876679-001 HPE SY 300Gb Interconnect Link 1.6m DAC
- CXP28 AOC 876695-B21 876697-001 HPE SY 300Gb Interconnect Link 10m AOC

IMPORTANT: The older cables will not work as they have incompatible transceivers.

HPE VIRTUAL CONNECT SE 100GB F32 MODULE

12x 25/50Gb (10Gb and 20Gb not supported)

- **Status LED control and mode button**
  - The modes are indicated by the mode LEDs and selectable by the mode button
  - **FC**: Port LEDs indicate port configured as FC
  - **Ethernet**: Port LEDs indicate port configured as Ethernet
  - **PID**: Port LEDs are used as port locator
  - **L/A**: Port LEDs indicate link and activity

HPE Virtual Connect SE 100Gb F32 Module

The HPE Virtual Connect SE 100Gb F32 Module LED status short descriptions are shown.

NATIVE FC UPLINK SUPPORT

- Native FC:
  - Is supported on the initial release of HPE Virtual Connect SE 40Gb F8 Module on Q1-Q6
  - Is not currently supported on the HPE Synergy 40Gb F8 Switch Module
- FC Upgrade License is required *per ICM* to enable the functionality
- Both Fabric-attach and Direct-attach to 3PAR are supported

Master ICM native FC uplink support

- Native FC is supported on initial release of HPE Virtual Connect SE 40Gb F8 Module on Q1-Q6. Native FC is not supported with the initial release of HPE Synergy 40Gb F8 Switch Module.
- A Synergy 8Gb FC Upgrade License is required per ICM bay to enable the functionality. Both Fabric-attach and Direct-attach to storage are supported.

SYNERGY FABRIC – COMPATIBILITY & COEXISTENCE ACROSS GENERATIONS

VC SE 40Gb F8 Module vs VC SE 100Gb F32 Module

Compatibility

Master/Satellite Architecture

	10Gb ILM	20Gb ILM	25/50Gb ILM
VC SE 40Gb F8 Module	√	√	X
VC SE 100Gb F32 Module	X	X	√

Compute/Adapter Support

	2820C/3820C 10Gb/20Gb	4820C	6810C (unmanaged)	6820C	6410C (unmanaged)	4610C (unmanaged)
Compute GenX	Gen9/Gen10	Gen10	Gen9/Gen10	Gen10	Gen9/Gen10	Gen10
VC SE 40Gb F8 Module	√ (10/20Gb)	√ (10/20Gb)	X (25/50Gb)	X (25/50Gb)	X (25/50Gb)	X (10/25Gb)
VC SE 100Gb F32 Module	X (10/20Gb)	√ (25Gb)	X (25/50Gb)	√ (25/50Gb)	X (25/50Gb)	X (10/25Gb)

Synergy Fabric – Compatibility & Coexistence Across Generations—VC SE 40Gb F8 Module vs VC SE 100Gb F32 Module

Previous generation 10 Gb/s and 20 Gb/s Interconnect Link Modules only work with the same generation master module. They cannot be used with the next generation VC SE 100 Gb/s master which can be configured only with 25 Gb/s and 50 Gb/s ILMs.

Also, VC SE 40Gb F8 and VC SE 100Gb F32 modules may not co-exist in the same Logical Enclosure and may not be connected to the same set of compute modules as shown in the tables. (For example: VC SE 40Gb F8 module in interconnect bays 3 and 6 connecting to a compute module's mezzanine 3, and in the second logical interconnect a VC SE 100Gb F32 module in interconnect bays 2 and 5 connecting to a compute module's mezzanine 2. Such combinations are not officially tested and supported.)

In the next table is shown compatibility between compute modules CNAs and ICMs/ILMs. As you see, the previous generation of 10/20 Gb/s CNAs work with the previous generation ICMs/ILMs since the next generation ICMs/ILMs do not support those speeds but only 25 Gb/s and 50 Gb/s which require new CNAs.

The exception is the newly released 4820C adapter which can support both fabric generations since it can work at 10 Gb/s, 20 Gb/s (on previous ICM/ILMs), and 25 Gb/s (on new ICM/ILMs).

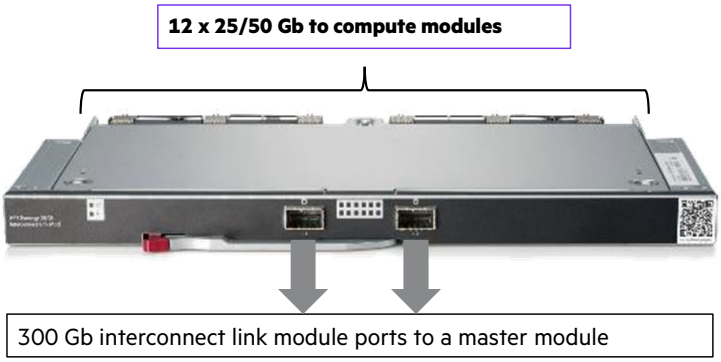
The 6810C is non-Flex adapter works with Mellanox switch and is not supported for Virtual Connects even it supports those speeds but it's not a CNA.

The Intel 6410C adapter is not supported because it has no partitioning of the physical ports, also for the Mellanox 4610C adapter.

In general, Gen9 compute modules are not supported to work with the next fabric generation, only Gen10 and newer compute modules with appropriate adapters.

HPE SYNERGY 50GB INTERCONNECT LINK MODULE

For VC SE 100Gb F32 Module



HPE Synergy 50Gb Interconnect Link Module—For VC SE 100Gb F32 Master Module

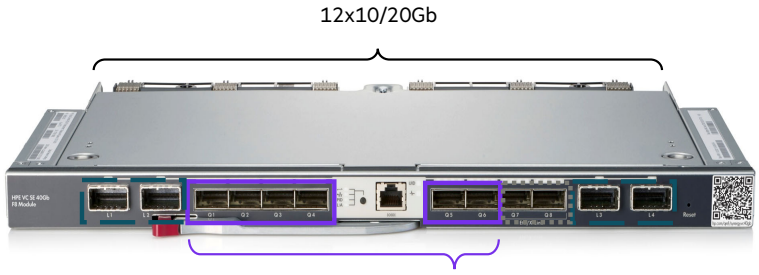
HPE Synergy 50Gb Interconnect Link Module is a single SKU supporting both 25Gb and 50Gb speeds and captures the 50G value premium using upgrade license on both master/satellite modules. These new ICMs will maintain the same fabric domain scale as the previous generation with 5 frames @ 25G, 3 frames @ 50G. This module will provide all the same key parity capabilities as the previous platform including some new enhancements like Private VLANs, RoCE, large network sets (up to 4K VLANs), and RSPAN among many others.

HPE VIRTUAL CONNECT SE 40GB F8 MODULE

HPE Synergy 12000 Frame

HPE VIRTUAL CONNECT SE 40GB F8 MODULE

Industry's first fabric to address Composable Infrastructure



- **4 x 120Gb Interconnect Link ports**
  - AOC ICM cables (3m, 7m, 10m and 15m)
  - DAC cables (1m, 1.6m and 2.1m)
- **6 x 40Gb uplink ports**
  - Q1-Q6: 40Gb, 4x10Gb Eth/FCoE, or 4x8Gb FC
- **2 x 40Gb cluster ports**
  - Q7-Q8: 40Gb ICM cluster ports (exclusively reserved)

- High performance, low latency
  - 2.56 Tbps switching capacity
  - 1.0 µsec for port to port
- Converged network and resilient fabric
  - Ethernet, FCoE, FC, and iSCSI
  - M-LAG for resilient fabric
- Composable for multiple frames
  - Optimize the bandwidth for workloads
  - Adding new frames does not impact traffic on existing frames
- Upgrade to 8Gb license on demand
- SmartLink on the downlink ports is supported in this release (OV 4.0+)
- Direct connect (flat SAN) supported in this release (OV 3.1+)

HPE Virtual Connect SE 40Gb F8 Module—Industry's first fabric to address Composable Infrastructure

- HPE Virtual Connect SE 40Gb F8 Module operates as a master module. It has 8 QSFP+ uplinks; six are unified (FC and Ethernet) and dedicated for the upstream switches. Ports Q7 and Q8 are exclusively reserved for ICM clustering, (which, when all other additional prerequisites are met, enable M-LAG between two VC modules) and cannot be used as the Ethernet uplink ports.
- An FC license is needed to leverage FC interface on uplinks.
- Four link ports, with 120Gb bandwidth each, are reserved for connecting to interconnect link modules (ILMs). You can connect up to four 10Gb satellite modules or two 20Gb satellite modules to a single VC or master module.
- Six QSFP+ ports provide various options regarding cables:
  - QSFP+ transceivers for plain 40Gb or a splitter—4 x 10Gb Ethernet or 4 x 8Gb FC
  - AOC and DAC for plain 40Gb and a splitter (4 x 10Gb)
  - QSFP+ to SFP+ for the 10Gb or 8Gb connectivity using transceivers or DAC cables
- The HPE Virtual Connect SE 40Gb F8 Module has 12 downlinks ports. Each downlink port can operate at 10/20Gb and 40Gb.
- Note: The SmartLink option on the downlinks is supported with this release
- Note: The 40Gb downlinks will be enabled with 40Gb adapters availability in future, and a 40Gb license will be needed to activate the 40Gb downlinks on Virtual Connect.
- Because this module is a Virtual Connect module, it is compatible with Virtual Connect features like edge-safe, profiles, support for Flex-10/20, and so on. Also, it supports M-LAG on uplinks and has better firmware upgrade with minimal traffic disruption. VC capabilities can be extended to satellite frames.
- Note: Direct connect (flat SAN) supported in this release.

INTERCONNECT LINK MODULES CABLE OPTIONS

Interconnect link cables with 120Gb bandwidth designed for composable fabric

AOC Cable

- Supported length: 3m, 5m,10m, and15m

DAC Cable

- Supported length: 1.1m, 1.6m, and 2.1m

- CXP connector: 12 x 10 Gb/s links

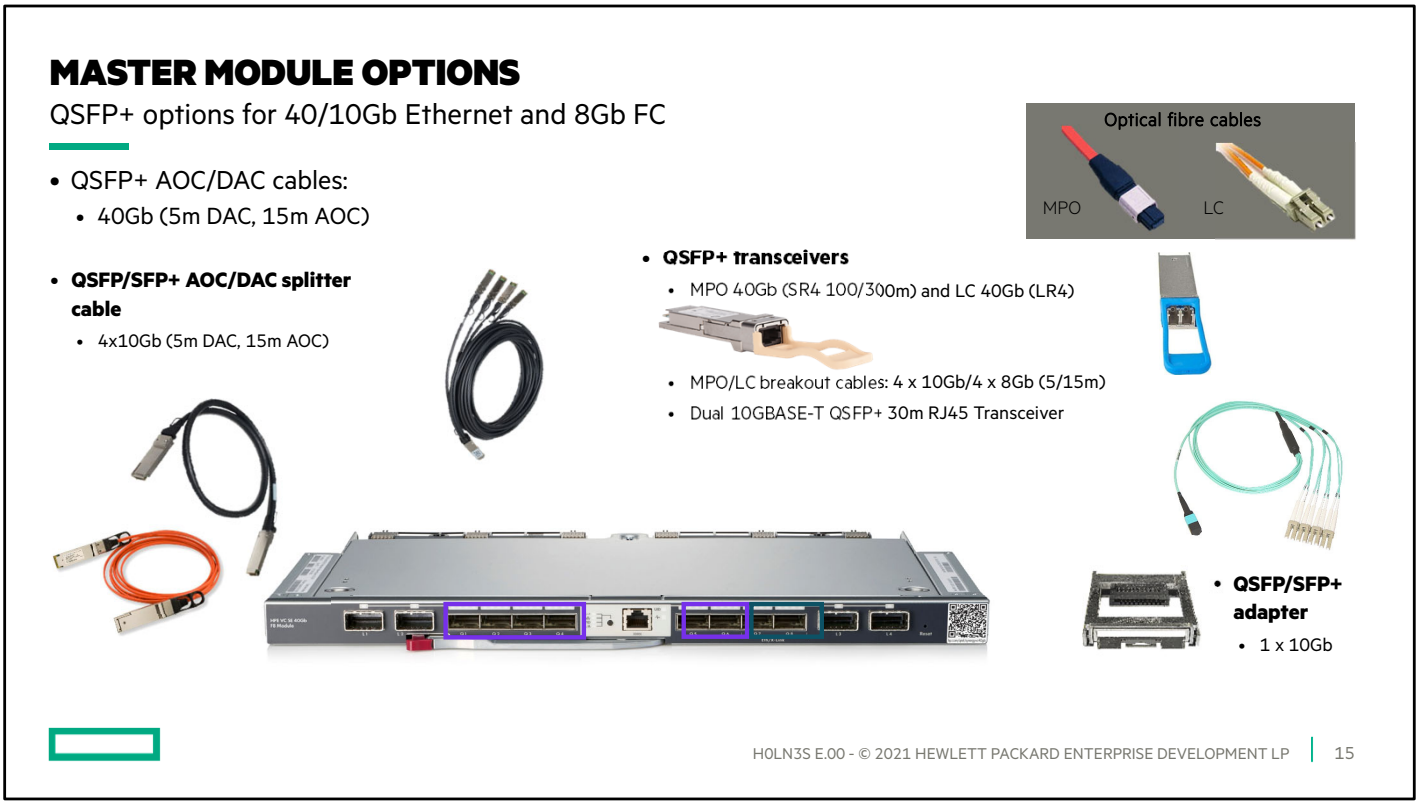
Interconnect link module cable options—Interconnect link cables with 120Gb bandwidth designed for composable fabric

- Two types of interconnect link cables are offered to connect master and satellite modules:
  - The AOC cables span a distance of up to 15 meters
  - The DAC cables, due to the electrical signal integrity issues, cannot go beyond 2.1 meters of distance

Additional information

- To obtain additional information, download the HPE Synergy Cabling Interactive Guide at
- http://www.hpe.com/info/synergy-cabling-guide.

- Also, see the HPE Synergy Cables and Connectors Selection Guide (Technical White Paper).

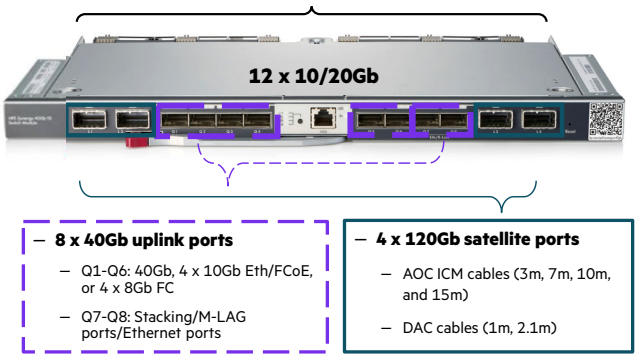


Master module options—QSFP+ options for 40/10Gb Ethernet and 8Gb FC

- Virtual Connect offers a rich set of options for uplinks. Six QSFP+ uplink ports support the following options:
  - QSFP+ transceivers
    - SR4, LR4, SR4 300m for 1 x 40Gb and 4 x 10Gb Ethernet
    - Unified SR4 for 1 x 40, 4 x 10 and 4 x 8 (FC)
    - BiDi over LC that can interoperate with BiDI from Cisco and other vendors is planned
  - AOC cables—Various length offering up to 15m both 1 x 40Gb and a splitter (4 x 10Gb)
  - DAC cables—Various length offering up to 3m both 1 x 40Gb and a splitter (4 x 10Gb)
  - QSFP+ to SFP+ adapter
    - Supports SFP+ transceivers and DAC cables
    - Supports SFP+ FC transceiver
    - 10GBASE-T transceiver
  - QSFP+ to dual 10GBASE-T transceiver
- The ICM cluster ports can be connected via the AOC or DAC QSFP+ cables.

HPE SYNERGY 40GB F8 SWITCH MODULE

- A composable fabric Ethernet switch for HPE Synergy
- ***Not Composable with OneView (commands can be scripted)***



- High performance, low latency
  - 2.56 Tbps switching capacity
  - Low latency
- Converged network and resilient fabric
  - L2 industry compatible network connection
  - Ethernet, FCoE, and iSCSI
  - M-LAG for resilient fabric
  - Not managed by HPE OneView
- Composable across multiple Synergy 12000 Frames
  - Optimize the bandwidth for workloads
  - Adding new frames does not impact traffic on existing frames

HPE Synergy 40Gb F8 Switch Module—A composable fabric Ethernet switch for HPE Synergy

- HPE Synergy 40Gb F8 Switch Module also operates as a master module. It is not managed by HPE Synergy Composer.
- It has 8 QSFP+ uplinks; six are unified (FC and Ethernet) and dedicated for the upstream switches. Ports Q7 and Q8 can be used either as ICM cluster ports or as uplinks.
- Note: FC/FCoE is not available at launch time. This has not been fully tested yet.
- Four link ports with 120Gb bandwidth each are reserved for connecting to interconnect link modules (ILMs). You can connect up to four 10Gb satellite modules or two 20Gb satellite modules to a single master module.
- In addition, six QSFP+ ports provide various options:
  - QSFP+ transceivers for plain 40Gb or a splitter—4 x 10 or 4 x 8 FC
  - AOC and DAC for plain 40Gb and a splitter (4 x 10)
  - QSFP+ to SFP+ for the 10Gb or 8Gb connectivity using transceivers or DAC cables
- HPE Synergy 40Gb F8 Switch Module has 12 downlinks ports. Each downlink port can operate at 10/20Gb and 40Gb.
- Note: The 40Gb downlinks will be enabled with the 40Gb adapters availability in future, and a 40Gb license will be needed to activate the 40Gb downlinks on Virtual Connect.
- Similarly to the HPE Virtual Connect for Synergy, the HPE Synergy 40Gb F8 Switch Module can be combined with satellite modules to extend the composable fabric capabilities to satellite frames. This module provides an industry-standard layer-2 interface to the upstream network switch environments and offers a full range of Ethernet switch features, including the DCBx for FCoE support.

VC SE 40GB F8 VS. SYNERGY 40GB F8 SWITCH

Capability	VC SE 40Gb F8	Synergy 40Gb F8 Switch
Edge-safe	– Enabled by OneView, expressed as a user intent	– Not managed by OneView – Supports MSTP/RSTP
Default configuration	– All ports administratively disabled, only LLDP enabled, collect neighbor information for determining and enforcing port roles	– Platform-specific behavior
OneView management	– Full lifecycle management and expression of desired state via EG/LE and LIG/LI	– Only basic infrastructure operations—power, reset, UID, static IP, monitoring of the power and health
Master/Satellite	– Discovery, analysis, port mapping info, and troubleshooting	– Discovery, analysis, port mapping info, and troubleshooting
Server Profiles and Connections	– Profiles with all BIOS settings and SPT – Enet, FC/FCoE, iSCSI connections with vMACs, vWWNs, boot from SAN, b/w allocation – FlexNICs – 8 s-channels per port via Flex-10Qbg	– Profiles with all BIOS settings and SPT – No profile connections – Ethernet and iSCSI on physical ports only – NPAR via adapter tools
Automated storage provisioning and zoning	– Via storage connections on the server profile – (FC, FCoE, and iSCSI)	– No automated storage provisioning, unmanaged SAN, use third-party tools without profile connections
ICM clustering	– Up to two ICMs per cluster (ports Q7 and Q8 reserved for ICM clustering)	– Up to two ICMs per cluster (ports Q7 and Q8 can be used either as cluster ports or as uplinks)
Platform CLI access	– Read-only platform CLI, special net operator user configured by OneView	– Full access to CLI, manual configuration or third-party management software tools
FC uplink licensing	– Implicit, via FC uplink set – FC licenses added manually or embedded	– FC licenses not supported yet with this module
FW management	– Updates orchestrated by OneView	– Updates done by third-party tools or native CLI

VC SE 40Gb F8 vs. Synergy 40Gb F8 Switch

The internal hardware is the same for both devices. The differences are in firmware.

This is a list of the differences between HPE Virtual Connect SE 40Gb F8 Module and HPE Synergy 40Gb F8 Switch Module.

HPE VC SE 100GB F32 VS HPE VC SE 40GB F8 MODULES

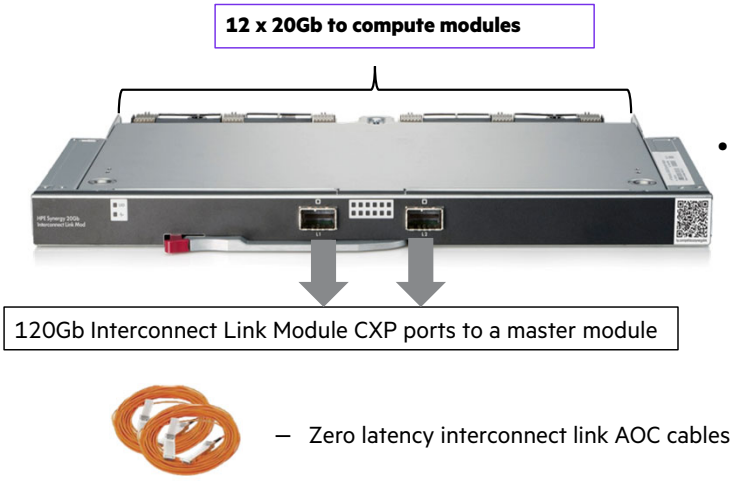
Key Differences

	HPE VC SE 40Gb F8	HPE VC SE 100Gb F32
Switch ASIC	BCM56850 (Trident2)	BCM56960 (Tomahawk1)
Bi-directional switching capacity	2.56 Tbps	6.40 Tbps
Switch ASIC Pipeline	Single Pipeline design	Quad-Pipe Design
CPU	Broadcom XLPII V0.3 FPU V0.3 @ 800MHz Runs with 2 threads each on 2 cores	Intel(R) Atom(TM) CPU C3538 @ 2.10GHz 4 cores, no CPU threads
RAM	4GB DDR3 (about 2.5GB usable)	8GB DDR4
Boot Flash	8MB NOR	2x16MB SPI
Storage	1GB Raw NAND	32GB M.2 SATA3 SSD
Storage F/S performance (R/W)	5.4/4.8 MB/s	224/39 MB/s
CPU-to-ASIC bandwidth (Rx/TX)	35/70 Mbps	47/142 Mbps
eth0 performance (Rx/Tx)	680/920 Mbps	930/930 Mbps
Q1 - Q6 PHYs Speed	BCM84744 (3x2) (Montreal) 10/40 Gb Ethernet 2/4/8/Auto Gb FC	BCM88060 (3x2) (Montreal2) 10/25/40/100 Gb Ethernet 8/16/32 Gb FC
Q7 - Q8 PHYs	BCM82328 (1x2), 40G Hi-Gig	BCM88060 (1x2), 100G Hi-Gig

This table shows the differences between HPE VC SE 100Gb F32 and HPE VC SE 40Gb F8 Modules.

COMBINE HPE SYNERGY 10/20GB INTERCONNECT LINK MODULES

The simplest way to extend fabric resources pool to satellite frames for 20Gb



- High performance, low latency
  - Twelve compute modules with 20Gb connectivity
  - 2 x 120Gb uplink ports
  - Low latency (less than 8 nanoseconds)
  - Ethernet, FCoE, FC, and iSCSI
- Composable for multiple frames
  - Up to 3 frames can be stacked with master modules when only 20Gb satellites are used
  - Up to 4 frames can be stacked with master modules when we mix 10Gb and 20Gb satellites

– Zero latency interconnect link AOC cables

HPE Synergy 20Gb Interconnect Link Module—The simplest way to extend fabric resources pool to satellite frames for 20Gb

- HPE Synergy 20Gb Interconnect Link Module is a 20Gb satellite module and it only connects to the master module. This interconnect link module has two 120Gb uplinks and twelve 20Gb downlinks to compute modules.
- The uplinks are connected to a master module with zero latency AOC or DAC interconnect link cables.
- HPE Synergy 20Gb Interconnect Link Module has no intelligence other than a silicon timer to amplify the signal. Because there is no processing of any signal with any silicon logic, the latency of the 20Gb satellite modules is almost negligible. The satellite module can be thought of as a link extender from compute modules to the master module.
- All the to-and-from traffic from compute modules in a satellite frame is processed within the master module.

OTHER NET INTERCONNECT MODULES

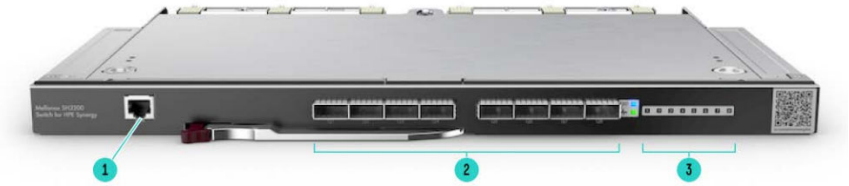
Mellanox, Pass Thru Module

Other interconnect modules

HPE SYNERGY INTERCONNECT MODULES

Mellanox SH2200 Switch Module for HPE Synergy

- Downlink ports to compute modules 25 GbE or 50 GbE
- Eight uplink ports 40/100 GbE
  - Each 100 GbE port can be split into four 25 GbE ports
  - QSFP28 ports
- Ultra-low latency <300 ns
- Managed by
  - Command line interface (CLI)
  - Web GUI
  - Mellanox NEO software
- Monitored by HPE OneView



1. Console port
2. 40/100Gb QSFP28 Ethernet uplink ports
3. Status LEDs

Figure 1 Mellanox SH2200 Switch Module for HPE Synergy Bezel

HPE SYNERGY 10GB PASS THRU MODULE

12x10Gb to compute modules

- **12x 10Gb capable uplink ports**
  - Q1-Q12: 10Gb, 10Gb Ethernet/FCoE
  - QSFP+/SFP+ adapter required for 10Gb connections, one per QSFP+ port
  - SFP+ transceivers
  - SFP+ DAC cables
  - SFP+ to 10GbaseT RJ45 transceivers

- High performance, low latency
  - 12 direct network connections
  - Line rate performance
  - Standard Ethernet as well as FCoE
- No management required
  - HPE Synergy Composer:
    - Monitor performance
    - Hardware diagnostics, error reporting
    - Firmware updates
- Unmanaged support by HPE OneView
- QSFP but only 10Gb

HPE Synergy 10Gb Pass Thru Module

- The HPE Synergy 10Gb Pass Thru Module is designed for the HPE Synergy 12000 Frame for those that require a non-blocking, one-to-one connection between each HPE Synergy compute module and the network. The pass-thru module provides 12 uplink ports that can accept QSFP+ connectors and SFP+ connectors using a QSFP+ to SFP+ adapter.

- The HPE Synergy 10Gb Pass-Thru Module can support 10Gb connections on a port-by-port basis. Optical as well as direct attach copper (DAC) cables are also supported. Both standard Ethernet as well as Converged Enhanced Ethernet (CEE) traffic to an FCoE capable switch is possible when using the appropriate HPE Synergy Converged Network Adapter.

- Note: One QSFP+ to SFP+ adapter is required for each port to be connected on the 10Gb Pass-Thru module. Standard 10Gb cables and SFP+ modules can then by added for a range or 10Gb connection choices.

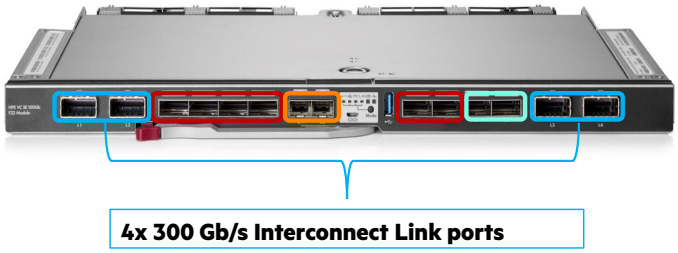
- The following adapters are supported with 10Gb Pass Thru Module:
  - HPE Synergy 3520C 10/20Gb Converged Network Adapter (QLogic)
  - HPE Synergy 2820C 10Gb Converged Network Adapter (Emulex)
  - HPE Synergy 3820C 10/20Gb Converged Network Adapter (Emulex)

INTERCONNECT LINK TOPOLOGY

Interconnect link topology based on HPE VC SE 100Gb F32 network module

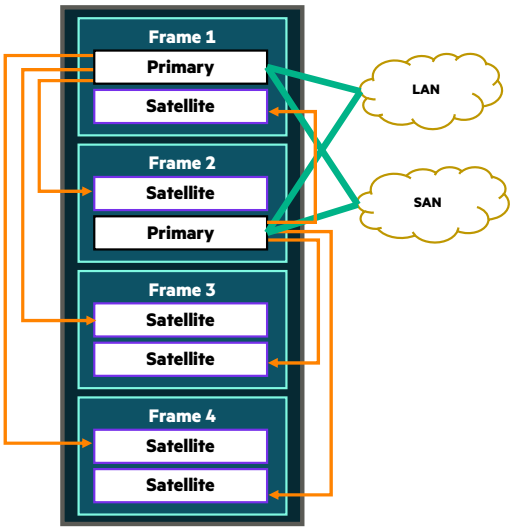
PRIMARY – SATELLITE CONNECTIVITY CONFIGURATIONS

Virtual Connect SE 100Gb F32 Module for HPE Synergy



4x 300 Gb/s Interconnect Link ports

HPE Synergy 25/50Gb Interconnect Link Module



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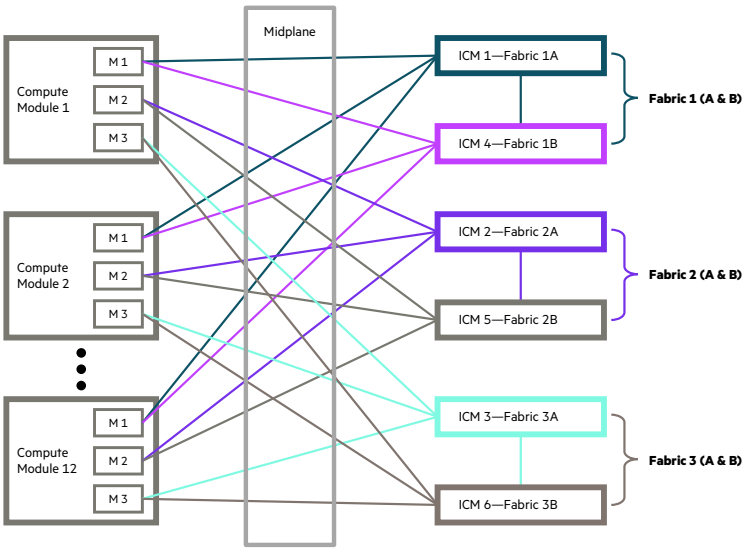
Primary – Satellite Connectivity Configurations

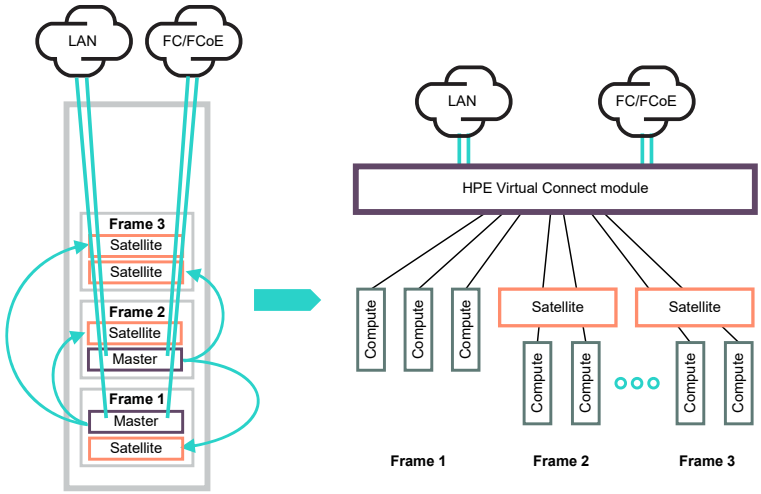
HPE VIRTUAL CONNECT TRAFFIC FLOW WITH HPE SYNERGY

HPE Synergy 12000 Frame

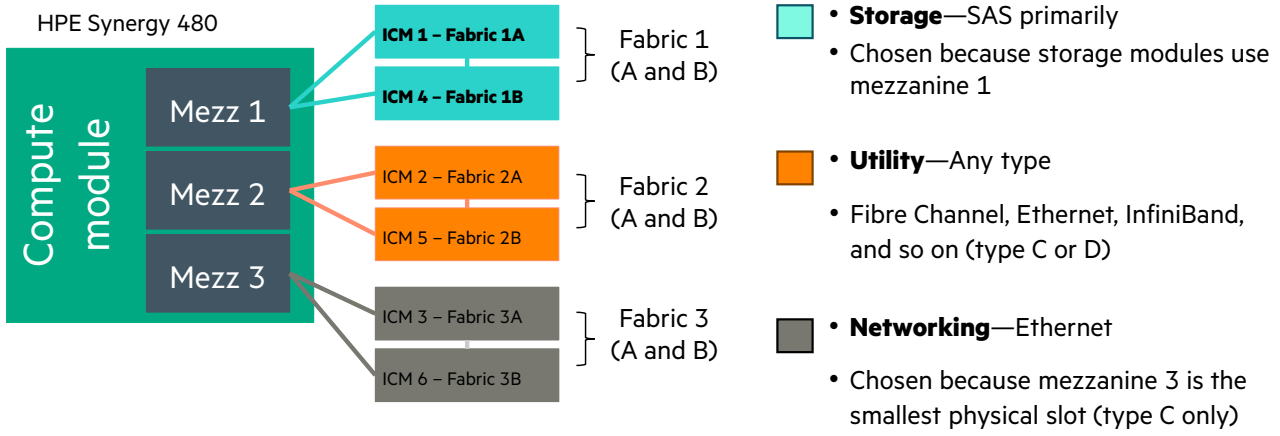
SYNERGY FABRICS



SYNERGY FABRICS



COMPUTE MODULE MEZZANINE AND INTERCONNECT MODULE CONNECTIVITY—BEST PRACTICES FOR PLACING MEZZANINE CARDS



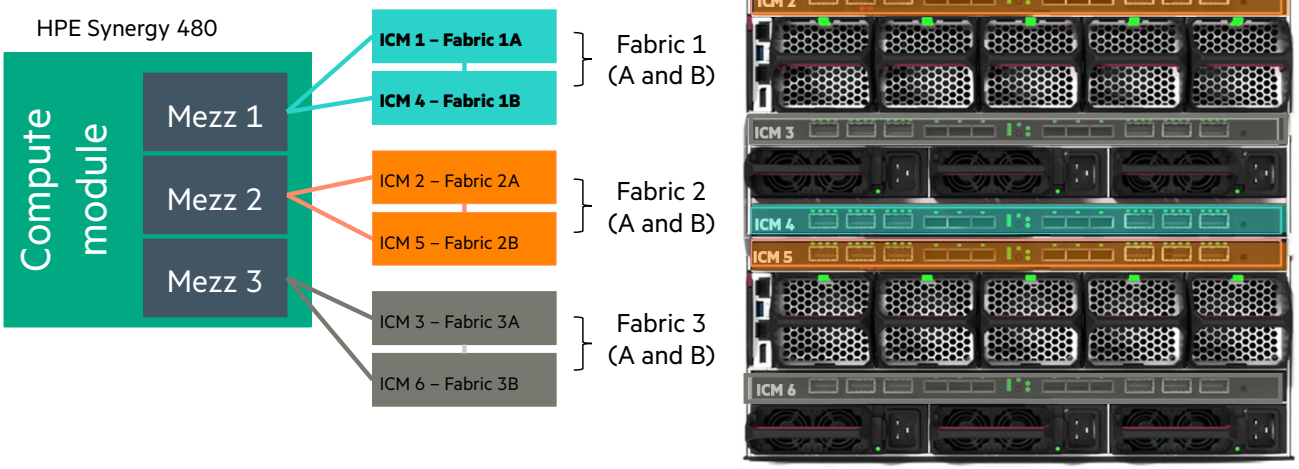
Compute module mezzanine and interconnect module connectivity—Best practices for placing mezzanine cards

You are allowed to configure your interconnects as you see fit, if the layout is supported.

Mezzanine 1 slot is dedicated to the storage module connection (if present), because the storage module is using slot 1.

The best practice is to use the slot 3 for networking (usually it is the smallest mezzanine card, type-C, and slot 3 has limited space) and slot 2 for all other purposes.

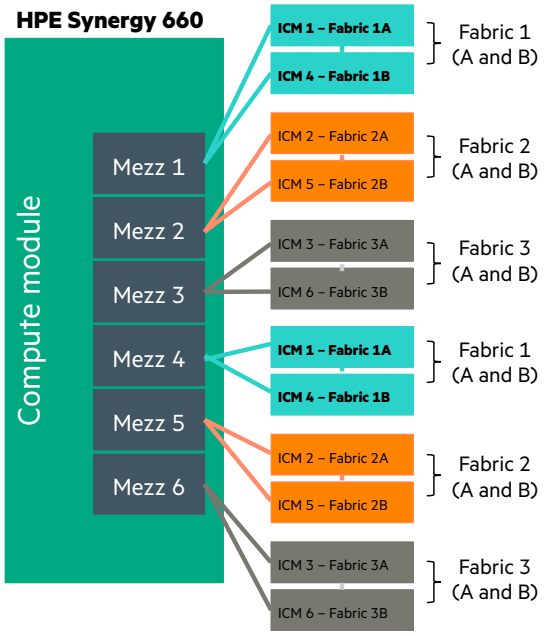
MEZZANINE AND INTERCONNECT MODULE CONNECTIVITY



Mezzanine and interconnect module connectivity

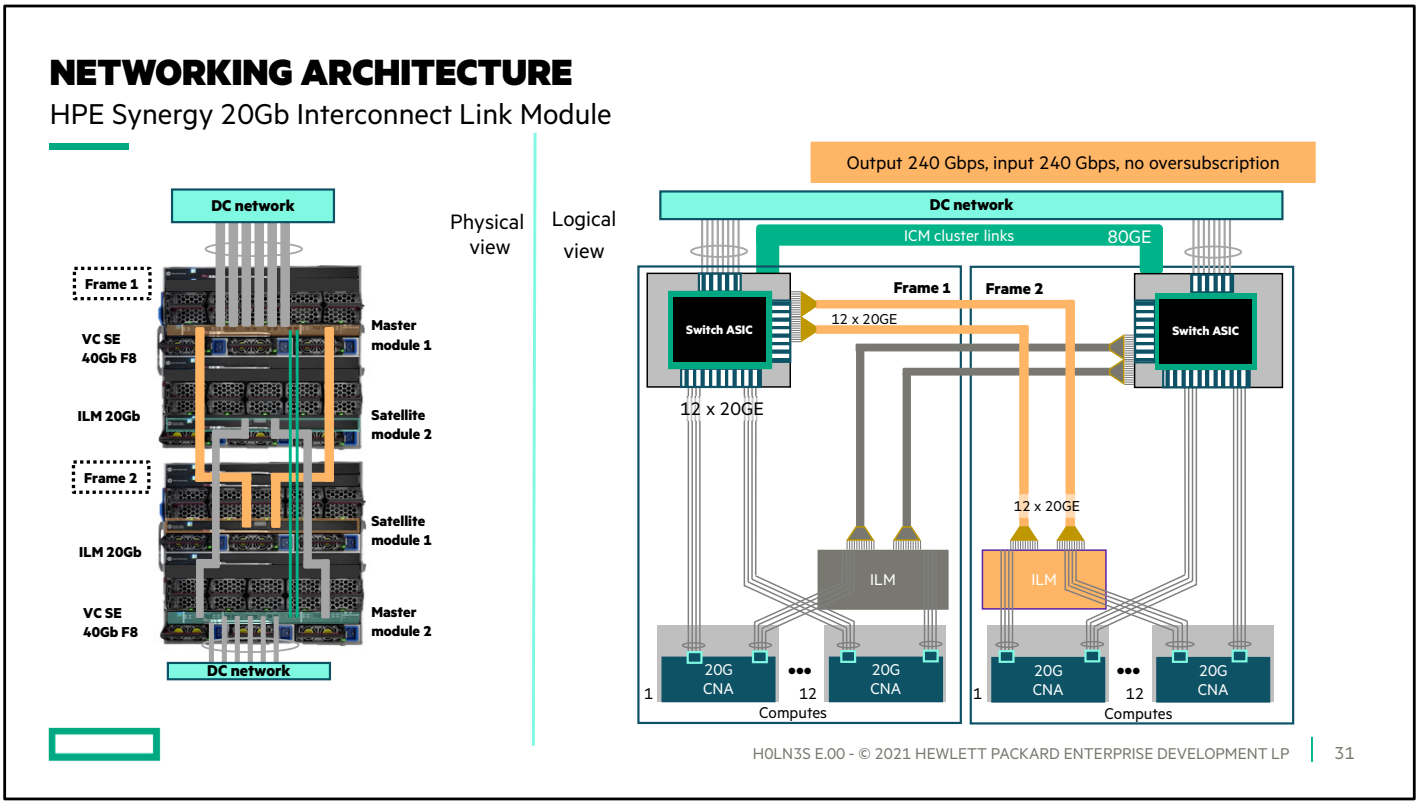
- Six full-width interconnect modules provide three redundant (A and B) fabrics in a single frame.
- Interconnects have both a fabric number and a side which are based on the placement of the interconnect bays in the frame. The bays are paired based on the mezzanine card to which the pair connects.
- Redundancy is used to prevent loss of connectivity in the event of a failure.

MEZZANINE AND INTERCONNECT MODULE CONNECTIVITY



Mezzanine and interconnect module connectivity

- On the slide above, you can see examples of ICM-to-compute module connections for the HPE Synergy 660 Compute Module Gen9/Gen10



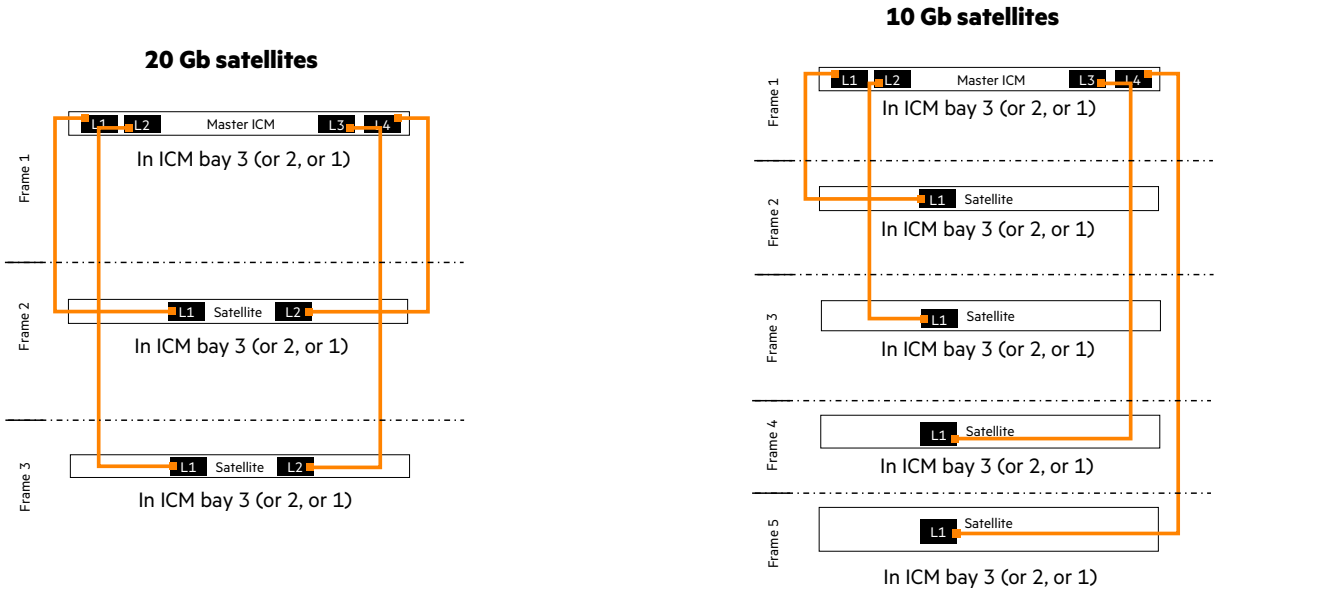
Networking architecture—HPE Synergy 20Gb Interconnect Link Module

This is an example of two frames with two master modules and two HPE Synergy 20Gb Interconnect Link Modules.

The first HPE Synergy 20Gb Interconnect Link Module should be connected to L1 and L4 120Gb ports of the master ICM and the second HPE Synergy 20Gb Interconnect Link Module should be connected to L2 and L3 ports.

The satellite downlink ports (12 x 20Gbps) match the 2 x 120Gbps interconnect module link ports to the master module, so there is no oversubscription.

ILT CABLING RULES FOR THE 20GB AND 10GB SATELLITES



ILT cabling rules for a 20Gb Interconnect Link Module

- The slide above shows the effect of two 20Gb satellite modules connected to the master module. The only difference in this case is that the master and satellite stacking domain is limited to 3 frames (master module has four interconnect link ports and every ILM 20Gb uses two of them); that means only up to 36 compute modules can be connected to the master modules.
- The master and satellite appear as one big flat logical VC with thirty-six 20Gb downlinks to compute modules and six QSFP+ uplinks, as Q7-Q8 are dedicated ICM cluster ports and are reserved for M-LAG.

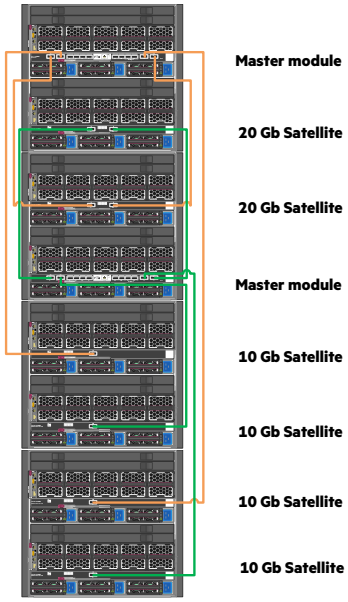
Remember—all satellite modules are in different frames and use the same bay number as their master module.

MIXED SPEED 10GB/20GB SATELLITE ICM SUPPORT

Four-frame topologies

- Use cases:
  - For maximum compute capacity using Master/Satellite architecture
  - Mixed type workloads requiring varying network capacity

	Frame 1	Frame 2	Frame 3	Frame 4
Side-A	Master	20 Gb Satellite	10 Gb Satellite	10 Gb Satellite
Side-B	20 Gb Satellite	Master	10 Gb Satellite	10 Gb Satellite
	20 Gb		10 Gb	10 Gb



Mixed speed 10Gb/20Gb satellite ICM support—Four-frame topologies (1 of 3)

- Mixed speed 10Gb/20Gb satellites with the HPE VC SE 40Gb F8 master module are supported. Use cases include:
  - Fully populated rack with HPE Synergy frames for maximum compute capacity using Master/Satellite architecture.
  - Mixed type workloads requiring varying network capacity.

MIXED SPEED 25GB/50GB CONNECTIVITY ICM SUPPORT

Four-frame topologies

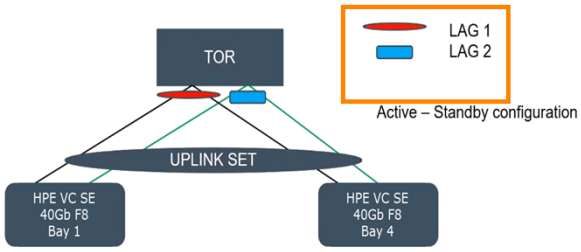
- Same scenario with the 50 Gb satellites is **NOT** supported

Not Supported

	Frame 1	Frame 2	Frame 3	Frame 4
Side-A	Master	50 Gb	25 Gb	25 Gb
Side-B	50 Gb	Master	25 Gb	25 Gb
		50 Gb	25 Gb	25 Gb

VC SE 100GB FE32 / VC SE 40GB F8 MLAG

- Load balancing is the practice of distributing a workload across multiple physical links to improve performance and link utilization. Load-balancing technique leads to better traffic distribution and more equal utilization of the bandwidth of the NIC, VC module and upstream switches
- Depending on the configuration of the ICs and the ToR, you may get one MLAG per Uplink set or multiple MLAGs



- **HPE VC SE 100Gb F32 Module**
- **HPE VC SE 40Gb F8 Module**

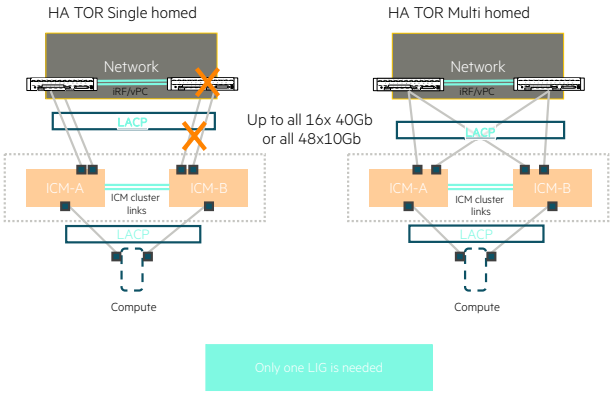
Load balancing is a practice of distributing a workload across multiple physical links to improve performance and link utilization. Load-balancing technique leads to better traffic distribution and more equal utilization of the bandwidth of the NIC, VC module and upstream switches.

The link aggregation groups (or, LAGs) increase the uplink bandwidth proportional to the number of member interfaces. Another advantage of link aggregation is increased availability, because the LAG is composed of multiple member links. If one member link fails, the LAG continues to carry traffic over the remaining links.

M-LAG SUPPORT

Multi-Module Link Aggregation Group

- To form an Uplink M-LAG, make sure that:
  - The switch must be 802.1d compliant
  - There are iRF/vPC top of rack links
  - There are interconnect module cluster links (using Q7 and Q8 ports)
  - A single LIG/LI and an uplink set spanning both master ICMs is defined
- M-LAG Uplink constraints:
  - A logical interconnect group (LIG) cannot contain networks with the same VLAN ID; there is no more VLAN translation with VC Synergy



IMPORTANT: As of OneView 4.0+, M-LAG on compute modules is also supported but not required

M-LAG support—Multi-Module Link Aggregation Group

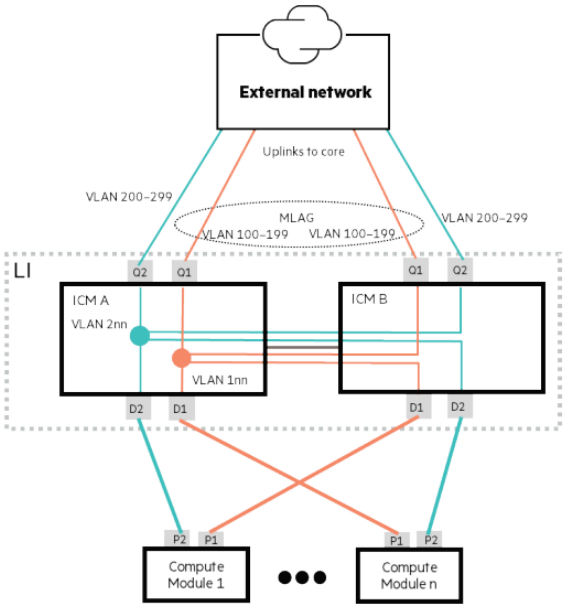
- Multichassis Link Aggregation (MLAG) is the ability of two and sometimes more switches to act like a single switch when forming link bundles. This allows a host to uplink up to two switches for physical diversity, while still having a single bundle interface to manage.
- Notice that a logical interconnect group (LIG) cannot contain networks with the same VLAN ID; there is no more VLAN translation with VC Synergy (M-LAG constraint).
- To form an M-LAG, you need to make sure that the following prerequisites are met:
  - The switch must be 802.1d compliant, meaning that it doesn't forward LLDP packets from one switch port to another
  - LACP between different interconnect modules is created
  - There are iRF/vPC Top of Rack links
  - There are interconnect module cluster links (using Q7 and Q8 ports)
  - A single LIG/LI and a single uplink set spanning both master ICMs must be defined
- A logical interconnect group (LIG) cannot contain networks with the same VLAN ID; there is no more VLAN translation with VC Synergy (M-LAG constraint). Also, M-LAG on compute modules is also supported today but it is not required.

- (continued on the next page)

M-LAG SUPPORT

HPE Virtual Connect traffic flow with HPE Synergy

- Typical Logical Interconnect configuration with two Interconnect Module
- The Q1 ports handling traffic of VLAN 100 thru 199
- Both ICMs are members of a common uplink set
- Form Link Aggregation Group or Active-Standby pair.
- Edge-safe operation
- To qualify as being edge-safe:
- Behave as a leaf node (that is, edge or access port) to the external network
- Have port assigned roles with well-defined forwarding semantics
- Not forward traffic across uplinks



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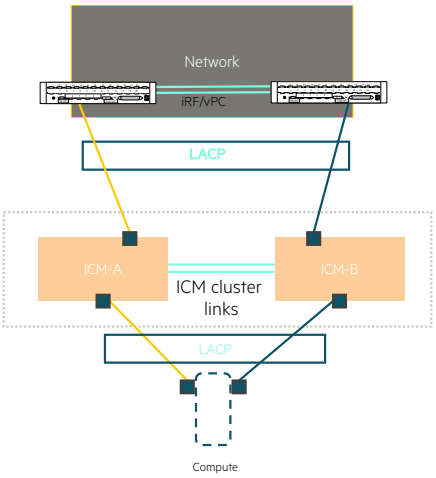
Notice that a logical interconnect group (LIG) cannot contain networks with the same VLAN ID; there is no more VLAN translation with VC Synergy (M-LAG constraint).

- Notes:
  - All switches in an IRF domain are represented as a single virtual switch that can be managed using a single Internet Protocol (IP) address (with one single configuration file). In other words, a network administrator has to manage one virtual switch.
  - The Link Aggregation Control Protocol (LACP or IEEE 802.3ad) is a method to control the bundling of several physical ports together to form a single logical channel.
  - ISSU is short for In-Service Software Upgrade.

LOCAL PORT AFFINITY

- Prior to HPE OneView 4.0, local port affinity (LPA) was not available, in which case each ICM would load balance traffic across the ICM uplinks, sending half of the traffic from each ICM over the stacking links.
- This can result in congestion on the stacking links since there is greater northbound bandwidth available than with inter-ICM.
- To address this potential source of congestion, HPE implemented the local port affinity feature, which will only send traffic over the stacking link if there are no available uplinks in the local ICM



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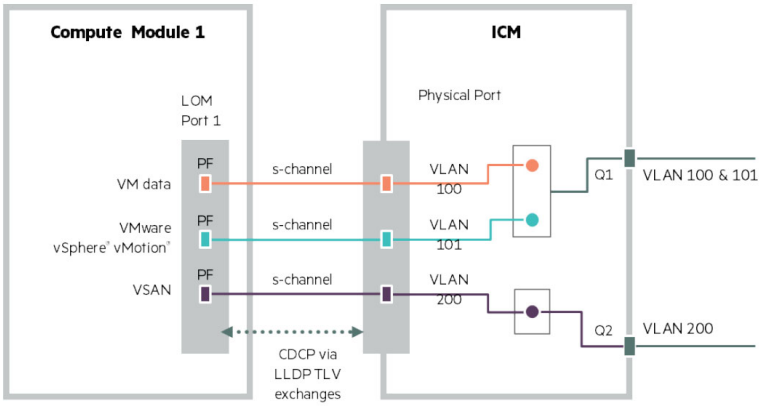
FLEXQBG

- FlexQbg support HPE Flex10Qbg technology leverages the Edge Virtual Bridging (EVB, or the IEEE802.1Qbg) standard to create s-channels and physical functions (PFs) in the compute module. Extensions of the Link Layer Data Protocol (LLDP) such as Data Center Bridging Exchange (DCBX) and Channel Discovery and Configuration Protocol (CDCP) use Type, Length, and Value (TLV) elements to allocate s-channels.

- HPE FlexQbg adds the following functions to the 802.1Qbg standard:
  - Control link status of channel
  - Channel description: type, traffic class, BW (max. and min.), channel ID



REVIEWING CONNECTIVITY IN ONEVIEW

- Servers > Enclosures
  - Interconnects
  - Interconnect Link Topology
  - Satellite cxn
- Networking > Interconnects
  - Hardware
  - Interconnect Link Ports: connection, connector
  - Uplink ports (available after config applied)

RESOURCES

- where get the info, tool, sites, videos

LAB

REVIEW QUESTIONS

MIGRATION AND GROW USE CASES

Migration from 10/20 configuration to 25/50 configuration

- Rolling or in-place migration is not supported
- Migration process requires a complete systems shutdown
  1. Power-off all compute modules and un-assign server profiles
  2. Delete LIs
  3. Replace adapters
  4. Rebuild LIs
  5. Rebuild server profiles

Grow

- Supported grow from 2xFrame up to 5xFrames
- Mixing of the 25Gb and 50Gb is not supported

Migration and Grow Use Cases

Migration

There are currently no plans to support rolling or in-place migration from VC SE 40Gb F8 module to VC SE 100Gb F32 module

If needed, migration process requires a complete systems shutdown followed by a “rip and replace” operation including swapping out of the network adapters:

1) Power-off all compute modules and un-assign server profiles

2) Delete Logical Interconnects

3) Replace adapters

4) Rebuild Logical Interconnects with VC SE 100Gb F32 modules

5) Rebuild server profiles

Grow

– Grow is supported from 2xFrame up to 5xFrames, but mixing of the 25Gb and 50Gb is not supported

LEARNING CHECK

Which ports on an HPE VC SE 100Gb F32 master ICM are used by the first 50Gb ILM satellite module?

A. Q7 and Q8
B. L1 and L2
C. L1 and L4
D. Q1 and Q2

Learning check

Which ports on an HPE VC SE 100Gb F32 master ICM are used by the first 50Gb ILM satellite module?

A. Q7 and Q8

B. L1 and L2

C. L1 and L4

D. Q1 and Q2

LEARNING CHECK

What is the supported throughput of the HPE VC SE 100Gb F32 interconnect link ports?

A. 40 Gb/s
B. 50 Gb/s
C. 100 Gb/s
D. 300 Gb/s

Learning check

What is the supported throughput of the HPE VC SE 100Gb F32 interconnect link ports?

A. 40 Gb/s

B. 50 Gb/s

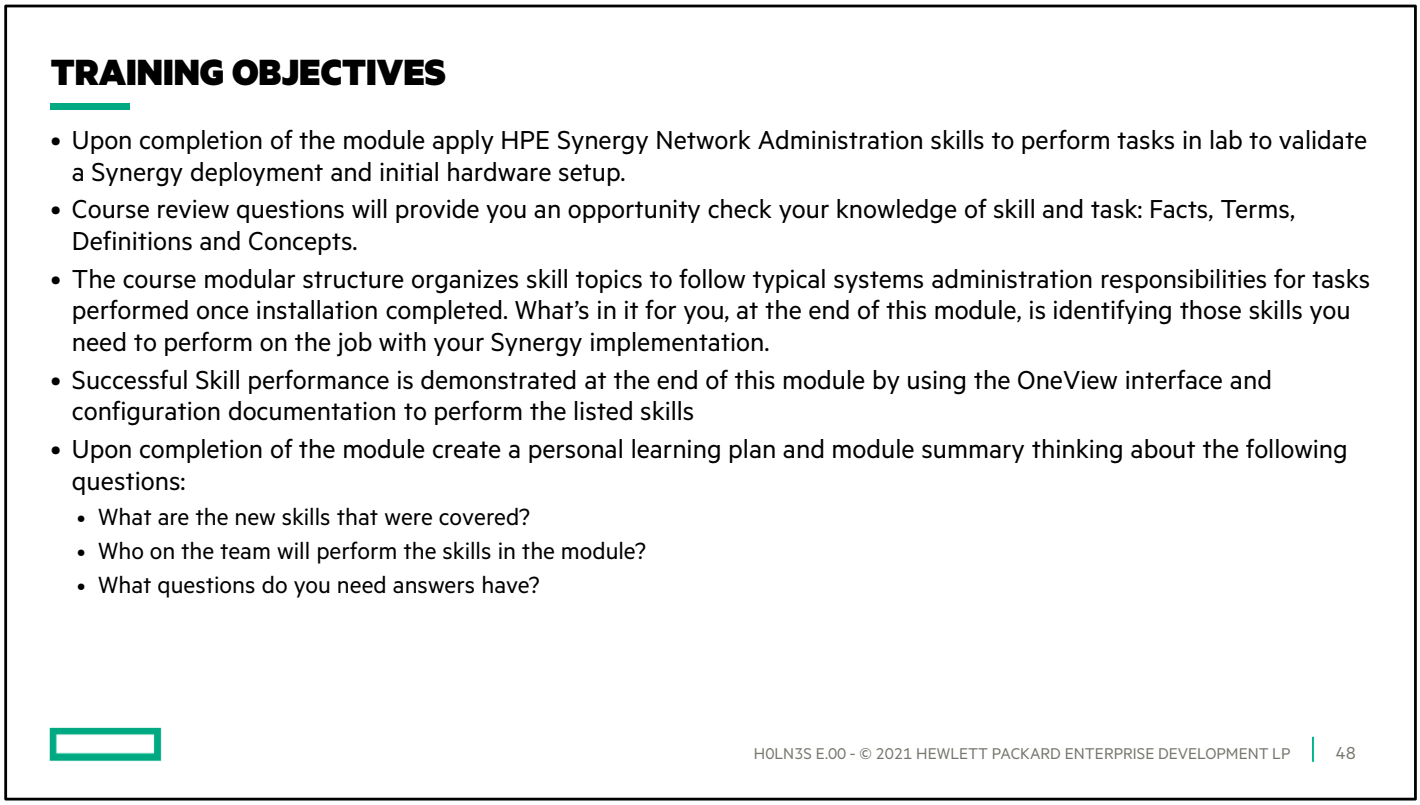
C. 100 Gb/s

D. 300 Gb/s

HPE SYNERGY NETWORK ADMINISTRATION SKILLS

Topic areas

- Ethernet Modules
- Interconnect link topology
- Ethernet traffic flow
- Network connectivity settings
- Address Identifier Service
- Network, Network Sets
- Logical Interconnect Groups
- Enclosure Groups
- Logical Enclosure
- interconnect settings, LACP load balancing



Training objectives

Upon completion of the module apply HPE Synergy Network Administration skills to perform tasks in lab to validate a Synergy deployment and initial hardware setup.

Course review questions will provide you an opportunity check your knowledge of skill and task: Facts, Terms, Definitions and Concepts.

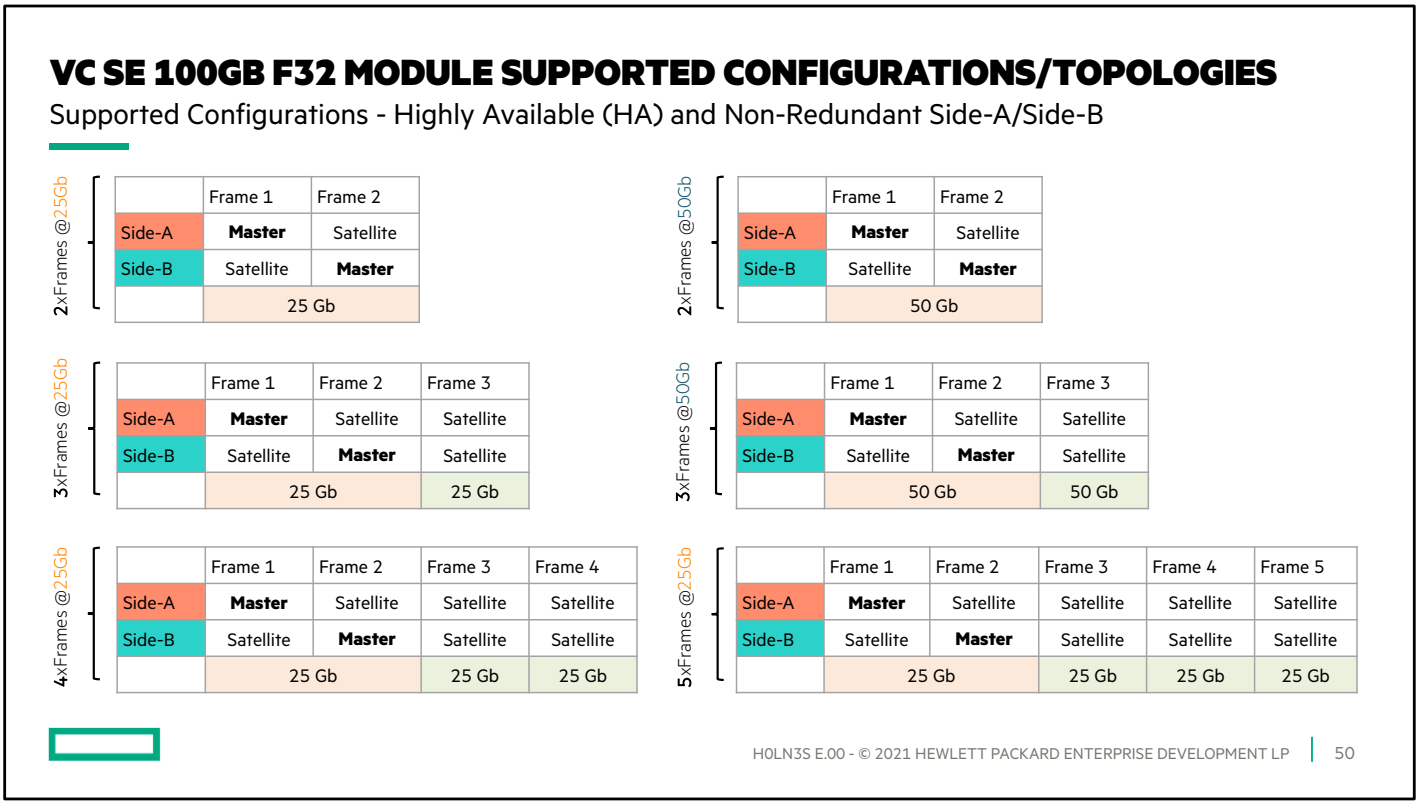
The course modular structure organizes skill topics to follow typical systems administration responsibilities for tasks performed once installation completed. What's in it for you, at the end of this module, is identifying those skills you need to perform on the job with your Synergy implementation.

Successful Skill performance is demonstrated at the end of this module by using the OneView interface and configuration documentation to perform the listed skills

Upon completion of the module create a personal learning plan and module summary thinking about the following questions:

- What are the new skills that were covered?
- Who on the team will perform the skills in the module?
- What questions do you need answers?

APPENDIX



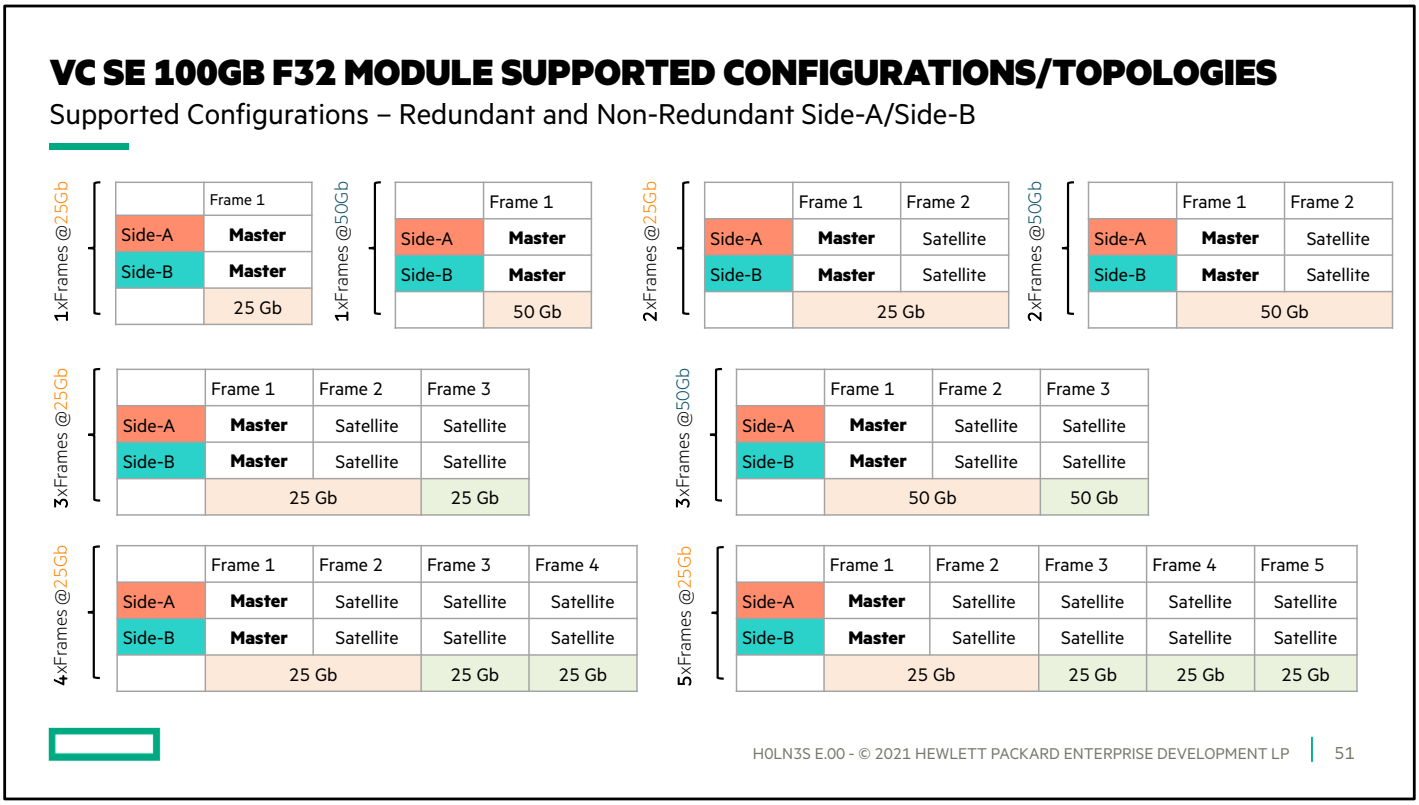
VC SE 100Gb F32 Module Supported Configurations/Topologies—Supported Configurations - Highly Available (HA) and Non-Redundant Side-A/Side-B

These tables show the supported master/satellite topologies with the next fabric generation.

The tables show for Highly Available (HA) configurations, where master modules are not in the same frames but aggregated together through the clustering technology, and Non-Redundant Side-A/Side-B configurations which look the same except there is no clustering enabled. Instead, there are separate logical interconnects for side-A and side-B which are then physically isolated.

2-Frame and 3-Frame topologies can support both 25 Gb/s and 50 Gb/s connectivity, while 4-Frame and 5-Frame configurations can use the 25 Gb/s connectivity only.

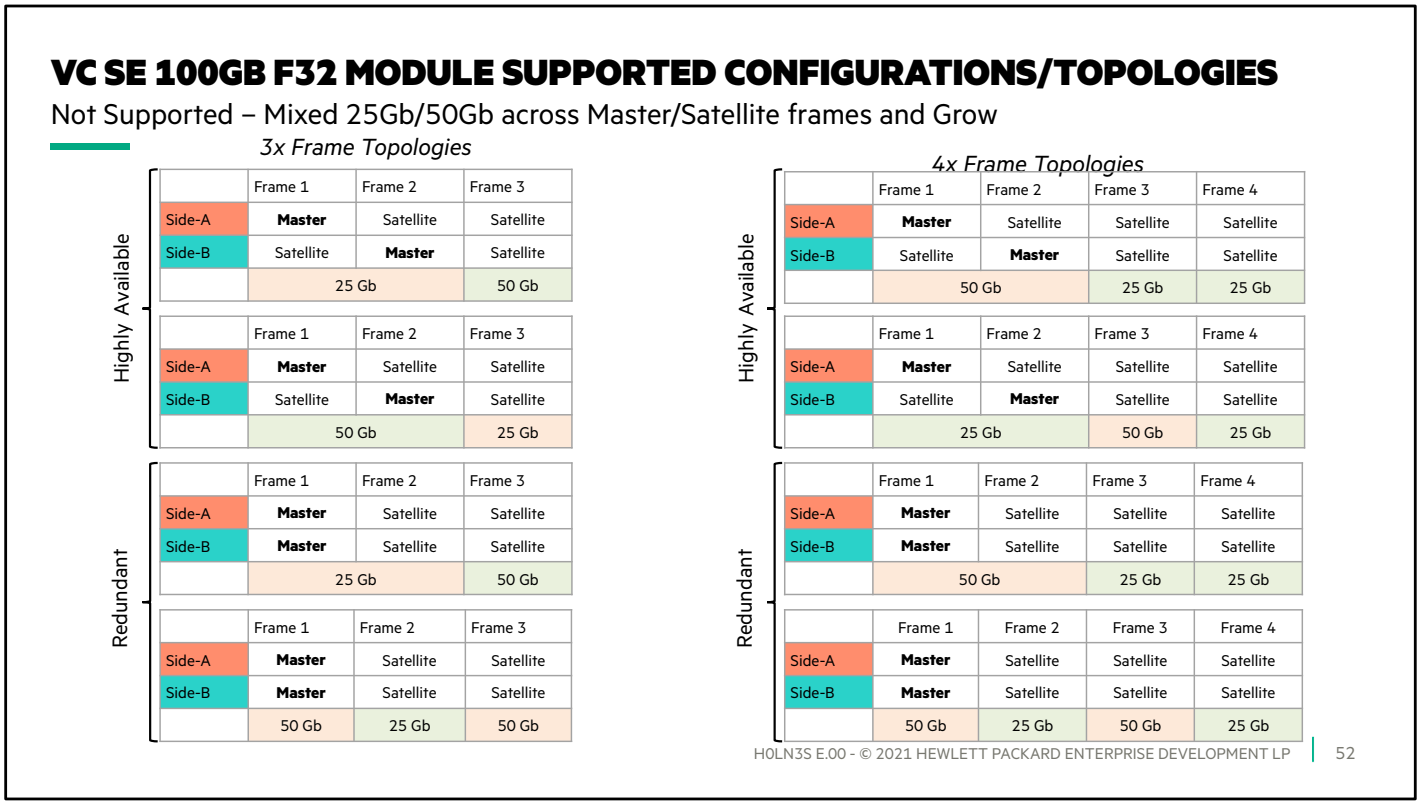
In this type of configurations, Frames 1 and 2 run at the same speed, since the two ports of the same compute module adapter must have the same speeds to not break the NIC teaming of the OS driver.



VC SE 100Gb F32 Module Supported Configurations/Topologies—Supported Configurations – Redundant and Non-Redundant Side-A/Side-B

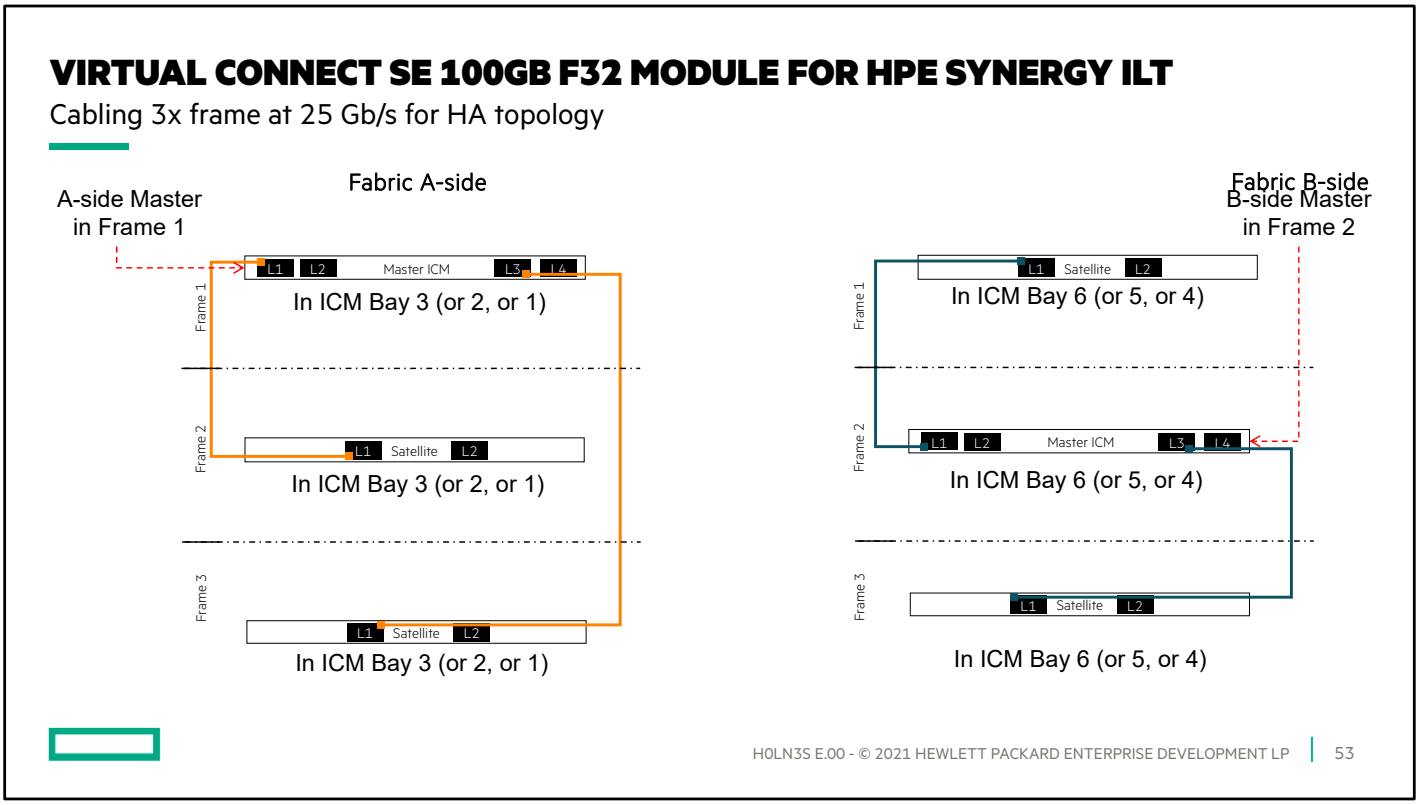
These tables show the Redundant configurations, and Non-Redundant Side-A/Side-B with similar topology only without clustering and separate logical interconnects.

In the Redundant configurations there is no High Availability across the frames since both masters are in the same in the same frame but still have clustering redundancy between A and B sides in the same logical interconnect. However, it is not HA because if that frame fails both master modules fail. They can be also in a single frame.



VC SE 100Gb F32 Module Supported Configurations/Topologies—Not Supported – Mixed 25Gb/50Gb across Master/Satellite frames and Grow

Topologies with mixed 25 Gb/s and 50 Gb/s are not officially tested and supported at the moment of this release. HPE OneView will generate alerts in these cases.



Virtual Connect SE 100Gb F32 Module for HPE Synergy ILT—Cabling 3x frame at 25 Gb/s for HA topology

To cable three frames in a 25 Gb/s High-Availability ILT configuration you will connect:

For A-side fabric

- Port L1 on Master ICM in frame 1 (bay 3, or 2, or 1) links to L1 on 1st Satellite ICM in the frame 2 and the same bay position.
- Port L3 on Master ICM in frame 1 (bay 3, or 2, or 1) links to L1 on 2nd Satellite ICM in the frame 3 and the same bay position.
  For B-side fabric
- Port L1 on Master ICM in frame 2 (bay 6, or 5, or 4) links to L1 on 1st Satellite ICM in the frame 1 and the same bay position.
- Port L3 on Master ICM in frame 2 (bay 6, or 5, or 4) links to L1 on 2nd Satellite ICM in the frame 3 and the same bay position.

Important:

Notice a slight change in master port order compared to the previous VC SE 40 Gb/s F8 master topology.

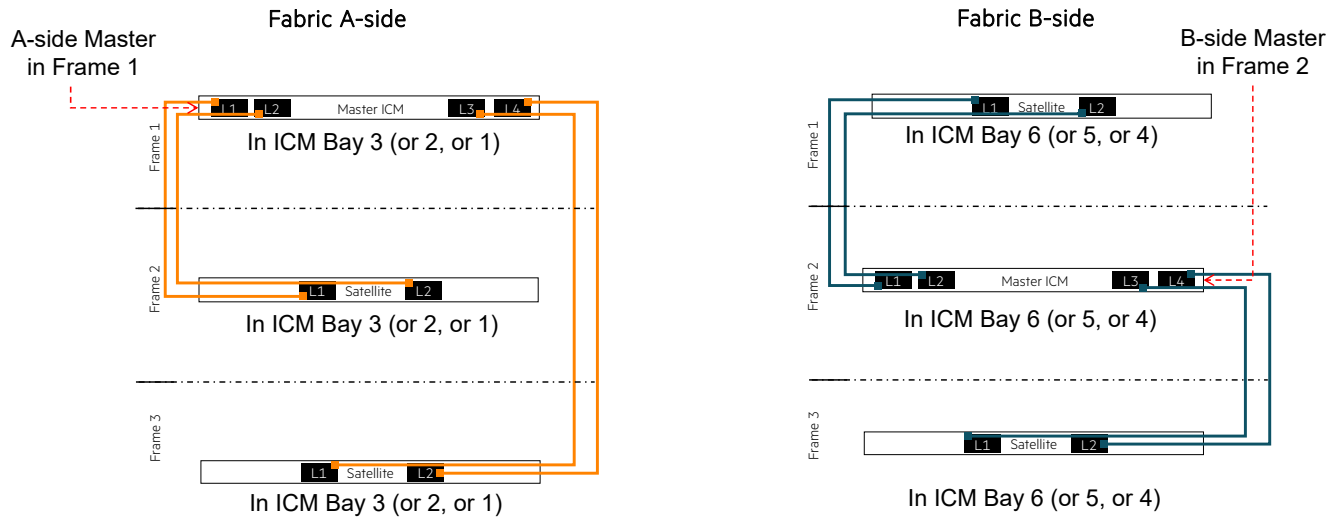
For the second satellite you will use the master port L3, while in the previous generation master port L4 was used.

This change in numbering is because of the satellites “multi-personality”, since the same satellite type can be used for both speeds.

In that way, master module ports L1 and L2 always connect to frames 2 and 4, while ports L3 and L4 connect to frames 3 and 5.

VIRTUAL CONNECT SE 100GB F32 MODULE FOR HPE SYNERGY ILT

Cabling 3x frame at 50 Gb/s for HA topology



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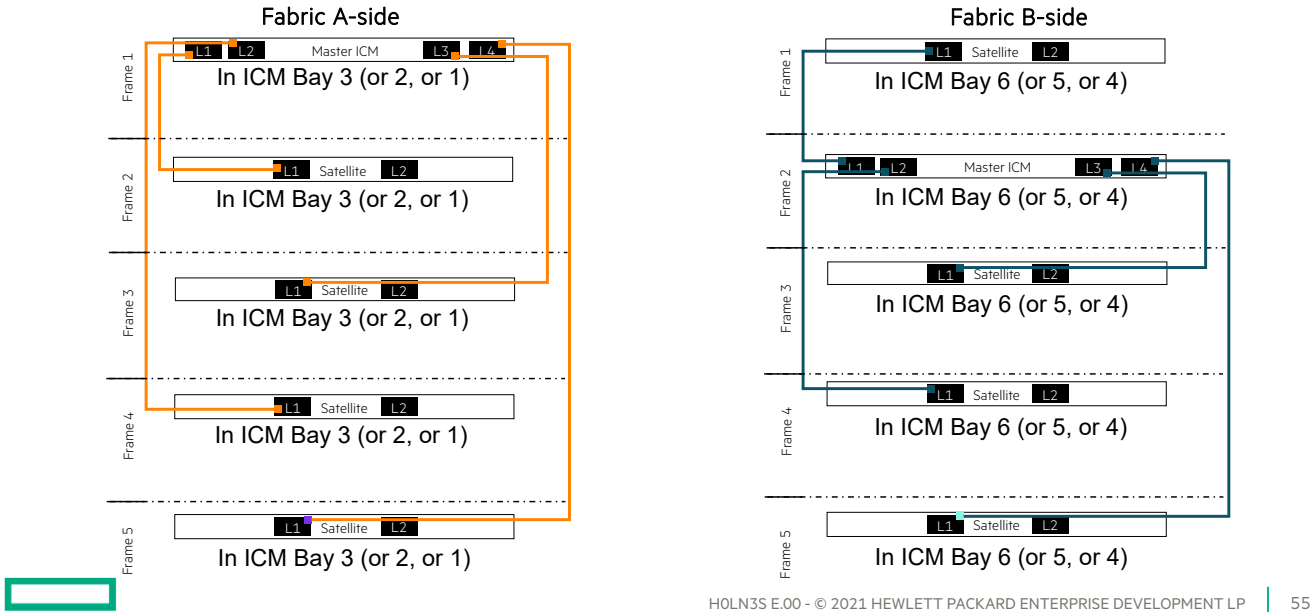
To cable three frames in a 50 Gb/s High-Availability ILT configuration you will connect:

For A-side fabric

- Ports L1 and L2 on Master ICM in frame 1 (bay 3, or 2, or 1) link to L1 and L2 on 1st Satellite ICM in the frame 2 and the same bay position.
- Ports L3 and L4 on Master ICM in frame 1 (bay 3, or 2, or 1) link to L1 and L2 on 2nd Satellite ICM in the frame 3 and the same bay position.
  For B-side fabric
- Ports L1 and L2 on Master ICM in frame 2 (bay 6, or 5, or 4) link to L1 and L2 on 1st Satellite ICM in the frame 1 and the same bay position.
- Ports L3 and L4 on Master ICM in frame 2 (bay 6, or 5, or 4) link to L1 and L2 on 2nd Satellite ICM in the frame 3 and the same bay position.
- Notice that Master ICM ports 1 and 3 now connect to Satellites port 1, while Master ICM ports 2 and 4 connect to Satellites port 2.

VIRTUAL CONNECT SE 100GB F32 MODULE FOR HPE SYNERGY ILT

Cabling 5x frame at 25 Gb/s for HA topology



Virtual Connect SE 100Gb F32 Module for HPE Synergy ILT—Cabling 5x frame at 25 Gb/s for HA topology

To cable five frames High-Availability ILT configuration, at only supported 25 Gb/s, you will connect:

For A-side fabric

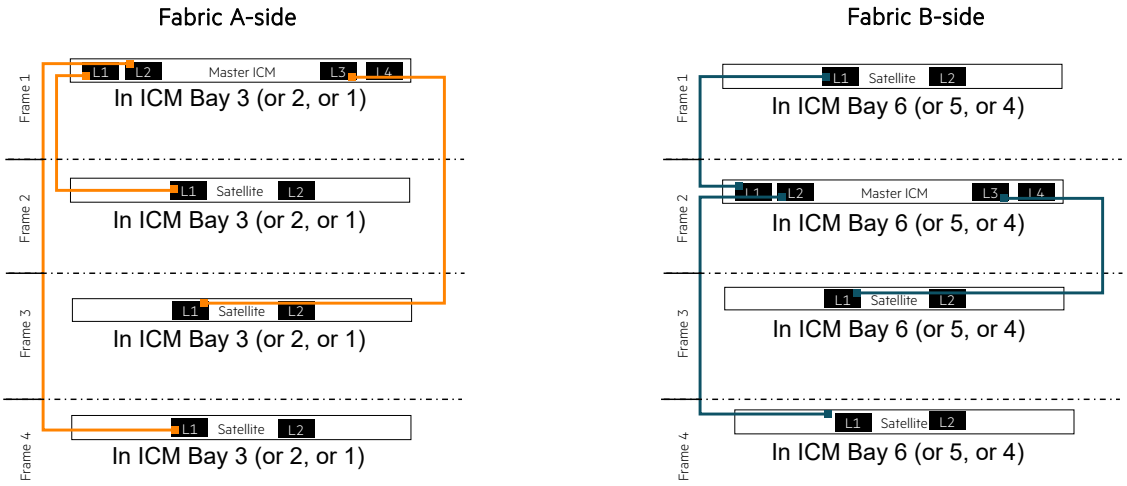
- Ports L1, L2, L3, and L4 on Master ICM in frame 1 (bay 3, or 2, or 1) link to L1 port on 1st, 3rd, 2nd, and 4th Satellite ICMs (in frames 2, 4, 3, and 5) respectively, in the same bay position.

For B-side fabric

- Ports L1, L2, L3, and L4 on Master ICM in frame 2 (bay 6, or 5, or 4) link to L1 port on 1st, 3rd, 2nd, and 4th Satellite ICMs (in frames 1, 4, 3, and 5) respectively, in the same bay position.
- Note: HPE OneView will perform the cabling detection and checking with an alert and guidance if something is not connected as required.

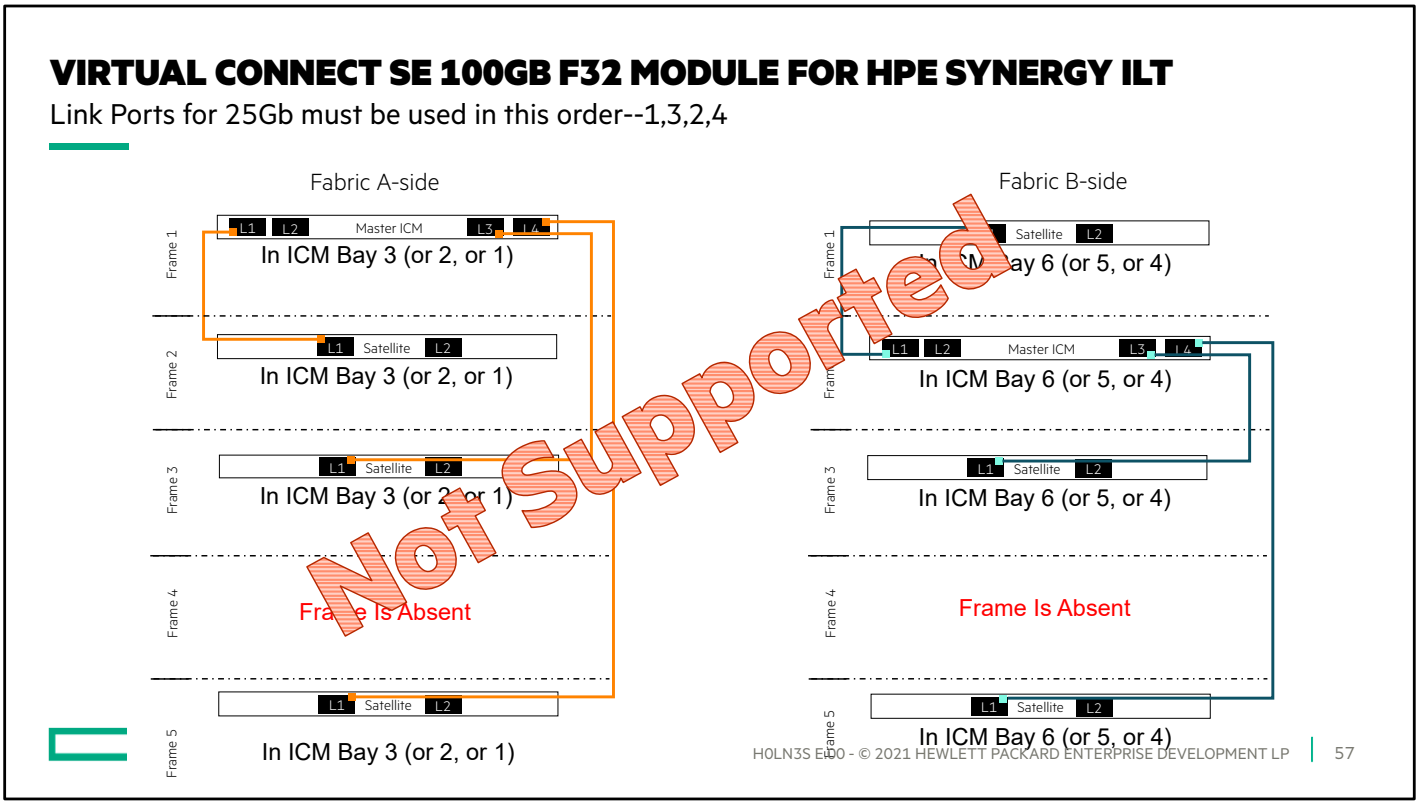
VIRTUAL CONNECT SE 100GB F32 MODULE FOR HPE SYNERGY ILT

Cabling 4x frame at 25 Gb/s for HA topology



Virtual Connect SE 100Gb F32 Module for HPE Synergy ILT—Cabling 4x frame at 25 Gb/s for HA topology

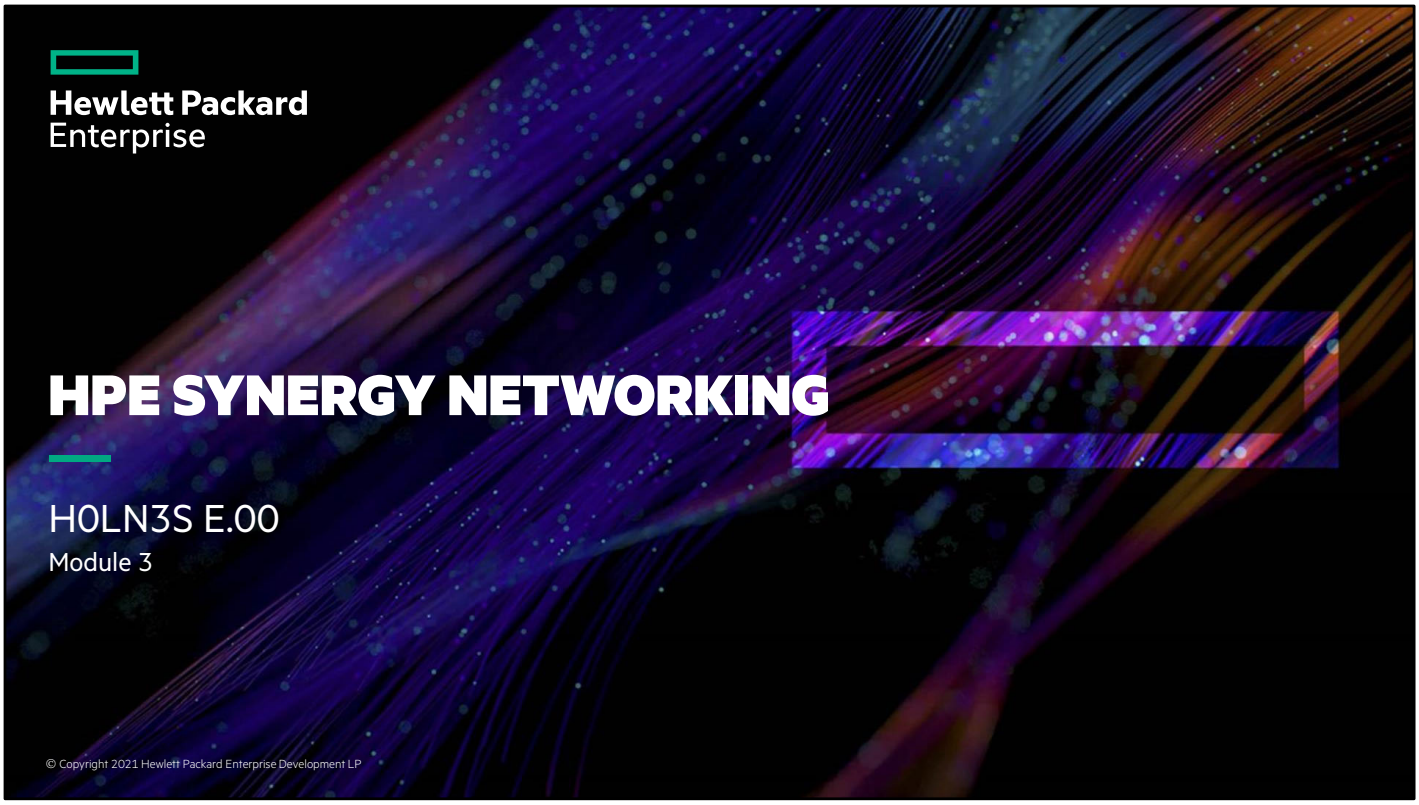
This is a supported 4-frame ILT topology, with Master ICM port L4 reserved for the 5th frame grow, when needed.



Virtual Connect SE 100Gb F32 Module for HPE Synergy ILT—Cabling 4x frame at 25 Gb/s for HA topology

Notice that numbering must be followed, so you cannot add 5th Frame (and connect Satellite to Master port L4) if 4th Frame is missing.

THANK YOU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HPE SYNERGY NETWORK ADMINISTRATION SKILLS

Topic areas

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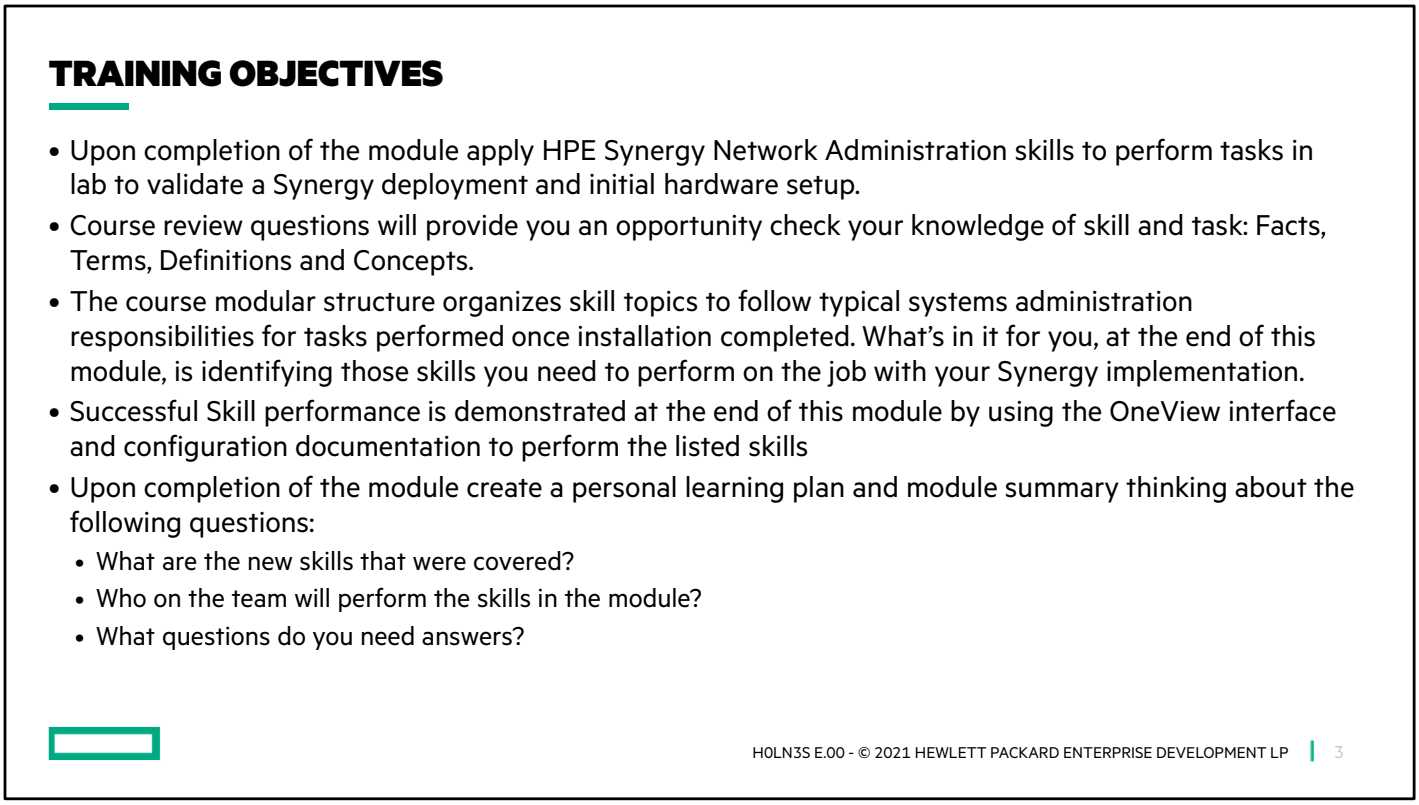
- Address Identifier Service
- Network, Network Sets
- Logical Interconnect Groups
- Enclosure Groups
- Logical Enclosure
- interconnect settings, LACP load balancing



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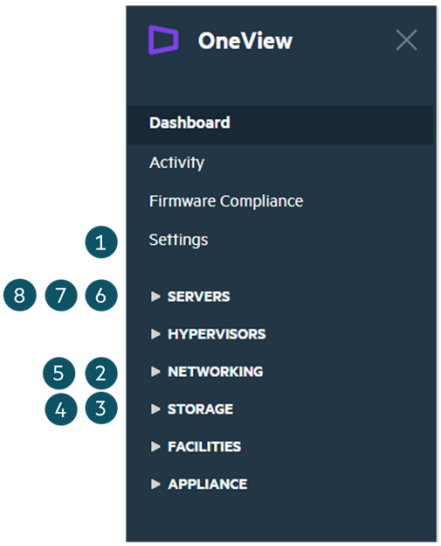
NETWORK CONNECTIVITY SETTINGS

HPE Synergy 12000 Frame

SETUP CONFIGURATION SUMMARY

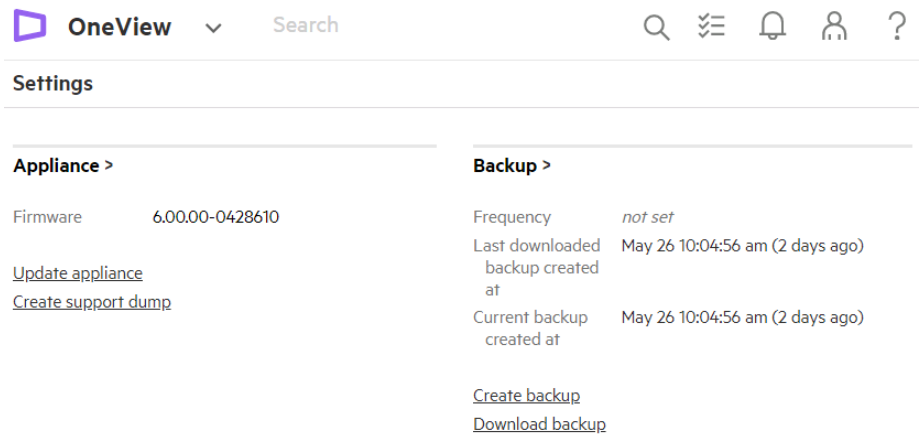
1. Create IP address pools for management network.
2. Create networks and network sets.
3. Import SAN managers.
4. Import storage components.
5. Create LIGs.
6. Create enclosure groups.
7. Create logical enclosures.
8. Create server profiles and templates.



HPE ONEVIEW INITIAL SETTINGS

HPE Synergy Administrative configurations

- HPE OneView Settings
- Appliance
- Networking
  - Appliance and management IP
  - Appliance certificate
  - Address Identifier
  - SNMP
- Firmware
- Time and Locale
- Automated Backups
- Security
  - Users and Groups, Scopes, AD/LI
- Remote Support and Proxy



HPE ONEVIEW ID SERVICE

OneView provides three virtual ID Pools

- OneView supports large address spaces
- Pools are composed of individual address/ID ranges
- Pools may be enabled or disabled
- A pool is a collection of ranges
- Exclusion lists

Server Profile bay assignment

- MAC
- WWN
- Virtual Serial Number
- Virtual UUID
- iLO IP

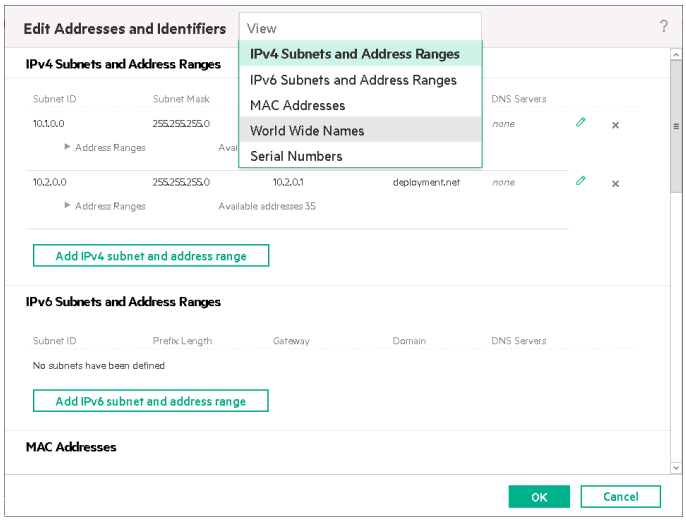
HPE OneView ID Service

- OneView provides three virtual ID Pools
  - An ID pool is a collection of one or more ranges that can be randomly generated or user-specified to provide large address spaces. By default, three virtual pools of contiguous MAC addresses, WWNs, and serial numbers are created automatically when you initialize the appliance. The pools are comprised of address and ID ranges, which you can individually enable or disable. You can delete any unused ranges. ID pool ranges do not conflict with physical IDs, provided the virtual ranges that are created exclude the physical ID ranges.

CREATING ID POOLS IN SETTINGS

- IPv4 and IPv6 addresses
- Media Access Control (MAC) address
- Serial numbers
- Worldwide Names (WWN)

Resource	Maximum
MAC ranges	66,240
WWN ranges	15,360
Virtual SN (serial number) ranges	1,280



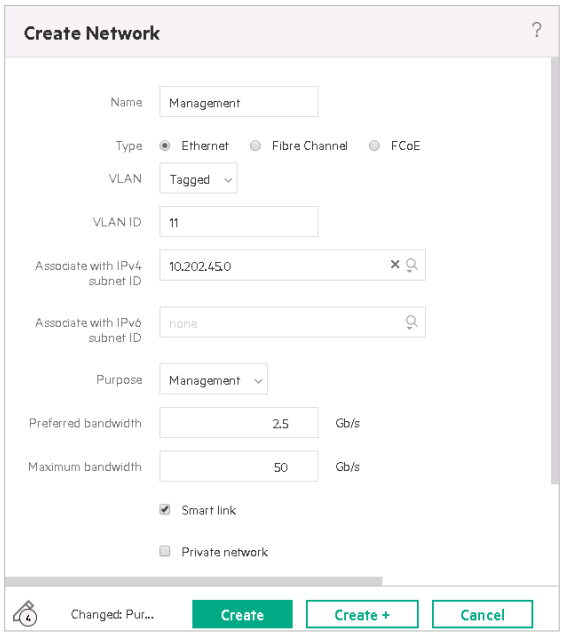
Creating ID pools in Settings

- An ID pool is a collection of one or more ranges that you can randomly generate or specify to provide large address spaces. By default, one virtual ID pool each of contiguous MAC addresses, WWNs, and serial numbers are created automatically when you initialize the appliance.
- The pools are composed of address and ID ranges. You can individually enable or disable a range, or delete any unused ranges. ID pool ranges do not conflict with physical IDs, provided the virtual ranges you create exclude the physical ID ranges.
- A Media Access Control (MAC) address is a unique identifier assigned to network devices. It is often referred to as the hardware or physical address. The HPE OneView appliance generates MAC addresses in pools of 128 to 1,048,576 elements. By default, the appliance has 1,048,576 MAC addresses.
- Serial numbers are generated in pools of 128 to 46,656 elements. By default, the HPE OneView appliance has 46,656 serial numbers.
- A Worldwide Name (WWN) is a unique identifier assigned to storage devices connected to a network. WWNs are generated in pools of 128 to 1,048,576 elements. By default, the HPE OneView appliance has 1,048,576 WWNs.

CREATING A MANAGEMENT NETWORK

- The management network is used for:
  - Compute module (CM) iLO ports access
  - Interconnect module (ICM) management ports access
- An administrator creates a management network as follows:
  - Must be associated to the automatically created by OneView subnet that has the same gateway and DNS server configurations as HPE OneView
  - Defined as a tagged network (highly recommended)
  - Should have a purpose of Management
    - Should not be used for any other purpose

NOTE: The management network IPv4 configuration is specified when creating the Enclosure Group.



Creating a management network

- After defining the IP address ranges for the Image Streamer requirements, the administrator creates a management network. The management network:
  - Is used for compute module (CM) iLO ports access, interconnect module (ICM) management ports access and Image Streamer management
  - Must have the same subnet, gateway, and DNS server configurations as HPE OneView.
  - Should be defined in HPE OneView as a tagged network, with the purpose of management, and should have an IP pool in selected subnet ID large enough to support the configuration of all the devices managed by OneView. Do not use the management network for any other purpose.
- NOTE: The management network IPv4 configuration is specified when creating the Enclosure Group.
- NOTE: The term enclosure is a holdover from HPE OneView's shared history with c7000 and it is still used in the HPE OneView UI. However, in HPE Synergy-related official documentation, the term frame is used to denote a physical enclosure.

NETWORKS AND NETWORK SETS

Networks
- Server Profile: to assign connectivity to NIC, HBA on Compute Node
- Uplink Set: assign connectivity identifying what port on interconnect carries traffic

Network Set
- Configuration acting like a container identifying multiple networks or vLans
- Assign to individual flex-nic on compute node
  - One-to-one: one network assigned to a flex-nic
  - Many-to-one: one network set assigned to a flex-nic

- Network must be configured in Logical Interconnect to use in Server Profile

Networks and Network Sets

Networks

Server Profile: to assign connectivity to NIC, HBA on Compute Node

Uplink Set: assign connectivity identifying what port on interconnect carries traffic

Network Set

Configuration acting like a container identifying multiple networks or vLans

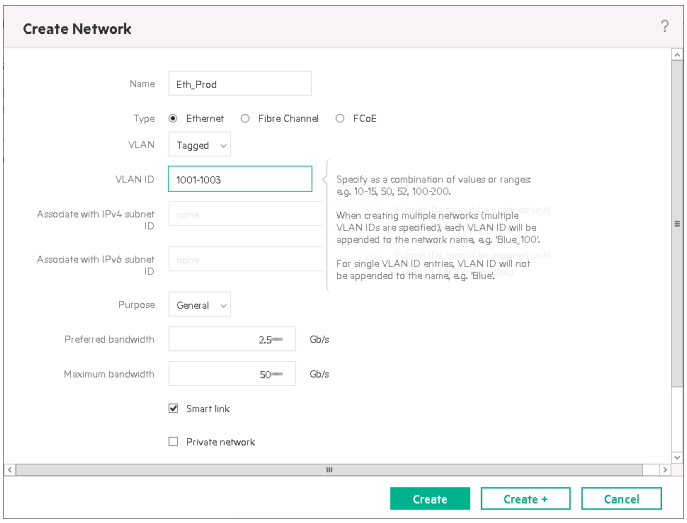
Assign to individual flex-nic on compute node

- One-to-one: one network assigned to a flex-nic
- Many-to-one: one network set assigned to a flex-nic

Network must be configured in Logical Interconnect to use in Server Profile

CREATING NETWORKS IN HPE ONEVIEW

- Interconnect modules support:
  - Ethernet networks
    - Tagged
    - Untagged
    - Tunnel networks
  - Fibre Channel networks
    - Fabric-attach (SAN) Fibre Channel
    - Direct-attach (flat SAN) Fibre Channel connections
  - Fibre Channel over Ethernet (FCoE) networks



Creating networks in HPE OneView

- The purpose of networks in HPE OneView is to allow server-to-data center, data center-to-server, and server-to-server communication.

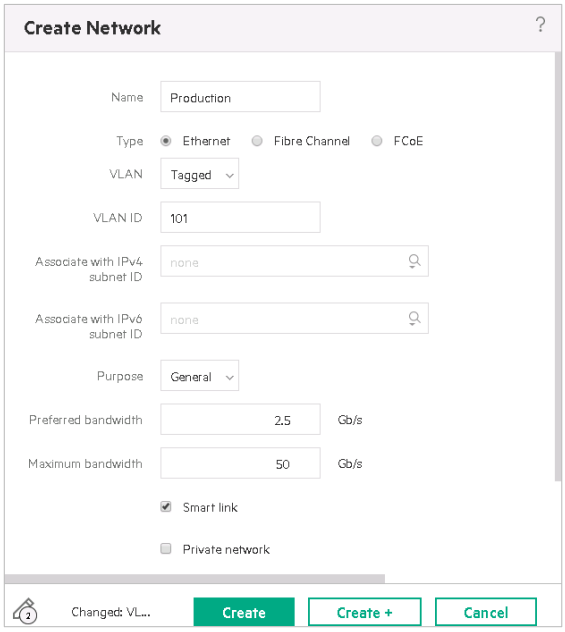
- The Virtual Connect interconnect modules in frames support the following types of data center networks:
  - Ethernet for data networks, including tagged, untagged, or tunnel networks.
  - Fibre Channel for storage networks, including fabric-attach (SAN) Fibre Channel (FC) connections and direct-attach (flat SAN) Fibre Channel connections.
  - Fibre Channel over Ethernet (FCoE) for storage networks where storage traffic is carried over a dedicated Ethernet VLAN.

- A network is available on a logical interconnect (LI) either by using it in an uplink set or configuring it as an internal network. Internal networks are networks with no external visibility, used for server-to-server communication. Networks used in uplink sets do not qualify as internal networks.

HPE ONEVIEW ETHERNET NETWORKS

- VLAN tagged networks

Tagged Networks can only carry frames with specified VLAN (802.1Q) tags. All other frames with different VLAN tags, or no tags, are dropped at the uplink port and are not presented to servers.



HPE OneView Ethernet Networks

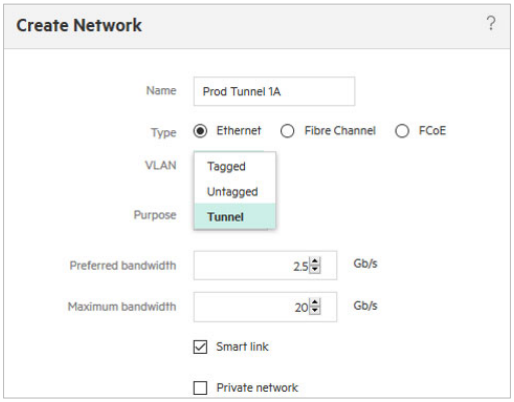
VLAN tagged networks

- Tagged Networks can only carry frames with specified VLAN (802.1Q) tags. All other frames with different VLAN tags, or no tags, are dropped at the uplink port and are not presented to servers. This provides the maximum amount of control the user can have over the traffic that is allowed to enter into the Logical Interconnect. This means it also accelerates the traffic and speed of the server since the server only receives what is aimed specifically for him.
  - Tagged networks can be used in an Active/Active configuration and the Smart Link and Private attributes can be applied to all network types (if needed).

TUNNELED NETWORKS

- Tunneled networks carry frames with any VLAN (802.1Q) tags
- All frames are forwarded on uplinks and downlinks
  - A tunnel network can only be a member of one tunnel uplink set
  - Tunnels are useful for customers who have more VLANs than can be assigned in OneView (1000).
  - Active/Active configurations are supported
  - SmartLink and Private attributes apply to tunnel networks
  - OneView supports QoS in tunnels
- Tunnel networks have limitations:
  - You cannot filter server membership in a VLAN
  - Any L2/L3 devices that bridge VLANs together like firewalls or load balancers may see the same source MAC

Tip:
- Tunneling with load balancers?
- Disable gratuitous ARP or don't tunnel.



Tunneled Networks

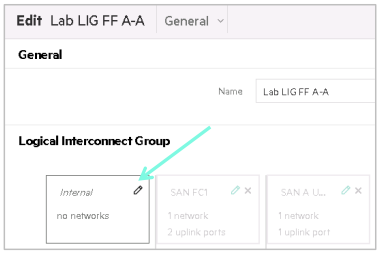
- Tunnel Networks carry frames with any VLAN (802.1Q) tags
  - A tunnel network is a single dedicated network with a dedicated set of uplink ports used to pass a group of VLANs without changing the OS assigned VLAN tags. Use tunnel networks if you want to expand beyond the current total of 1000 networks per logical interconnect and 162 networks per downlink port, or if you want to control the resources and QoS.

Notes:

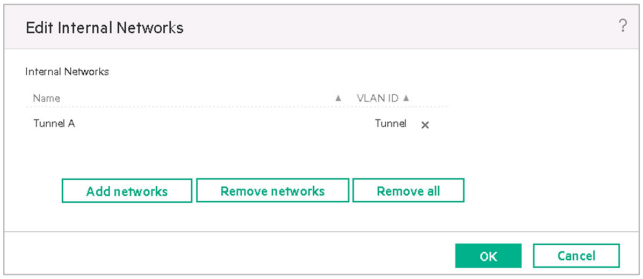
- The entire tunnel is treated as a single object by VCM. So you can't reach inside and pull out your management and vMotion networks and handle them separately.
  - As such, you can only assign the entire bundle to one FlexNIC on a given Physical NIC Port. (You will probably have an A Side Tunnel on Port 1, and a B side tunnel on Port 2)
  - Thus the entire bundle/tunnel will appear on the same vmnic inside ESXi.
  - If you want to have multiple FlexNICs and have management and vMotion on different vmnics, you would need to have multiple uplinks from each chassis. One for the customer traffic in tunnel mode, and then at least one Uplink Set for the management, vMotion, etc. networks you want to put on other FlexNICs.
- There is a known issue with certain kinds of L2 load balancers that spoof a MAC address and have that MAC spoofed on two different VLANs.
  - Because VCM in Tunnel mode cannot see the VLANs, it makes all its forwarding decisions based on the MAC and so if you confuse it with the same MAC learned on two different ports, you will get unexpected behaviors.
  - Virtual Connect must enable VLAN mapped mode when Interfacing with Layer 2 bridging devices
    - http://h20564.www2.hpe.com/hpsc/doc/public/display?docId=emr_na-c02684783

INTERNAL NETWORKS

- Servers to servers communication within same logical interconnect
- Networks with no external visibility
- Networks used in uplink sets cannot also be added as internal networks



Notes:
- Define all internal networks on only one logical interconnect in the enclosure. Duplicate internal networks on more than one logical interconnect can result in servers connectivity issues.
- Internal networks must be Active/Standby.



Internal networks

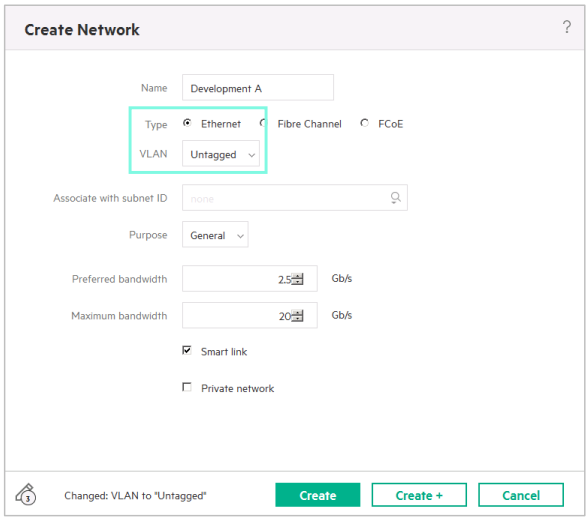
- An internal network is a network that has no uplink ports and is used for server-to-server communications within a logical interconnect. Servers that communicate with each other over internal networks do so without the traffic hitting any uplinks.

Important:

- Duplicate networks in the internal networks list on more than one logical interconnect can result in the inability for the servers in the enclosure to communicate. Therefore, it is recommended to define all your internal networks on one logical interconnect in the enclosure.

UNTAGGED NETWORKS

- Untagged networks carry frames with no VLAN (802.1Q) tags
- An untagged network has its own dedicated uplink port.
- Only frames without VLAN tags are passed on uplinks and downlinks.
- You can implement untagged networks in an Active/Active configuration; this requires two networks.
- You can apply SmartLink and Private attributes to untagged networks.
- OneView supports iSCSI connections.



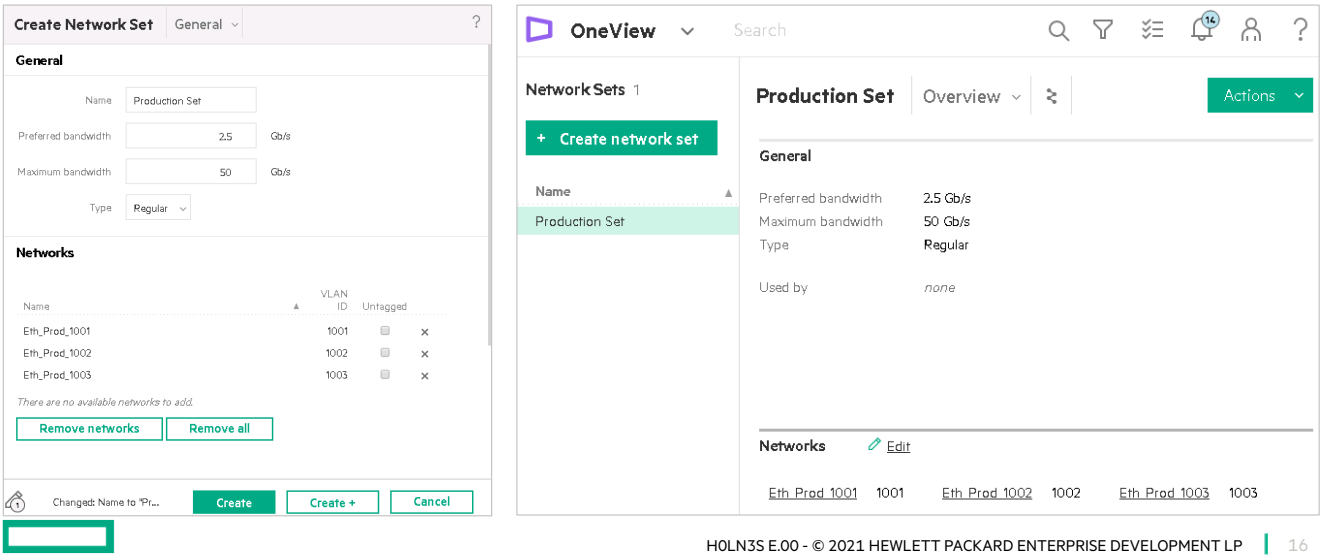
Untagged networks

Untagged networks carry frames with no VLAN (802.1Q) tags

- An untagged network is a single dedicated network without a VLAN tag with a dedicated set of uplink ports. Untagged networks are used to pass traffic without VLAN tags through the domain. Any tagged packets are dropped. Forwarding is done by MAC address. You may want an untagged network for iSCSI storage traffic or if you want to set up networks without configuring VLANs.
- An untagged network cannot be a member of a network set, so only a single untagged network can be on a profile connection. Untagged networks can only be a member of an untagged uplink set. Only a single untagged network can be a member of an untagged uplink set. Multiple untagged networks are supported in a domain.
- A network set can be used in an Active/Active configuration (requires two networks and uplink sets in a single-LIG Active/Active configuration).

CREATING NETWORK SETS

- Network sets represent a collection of networks and can be used for creating server connections (profiles) or uplinks

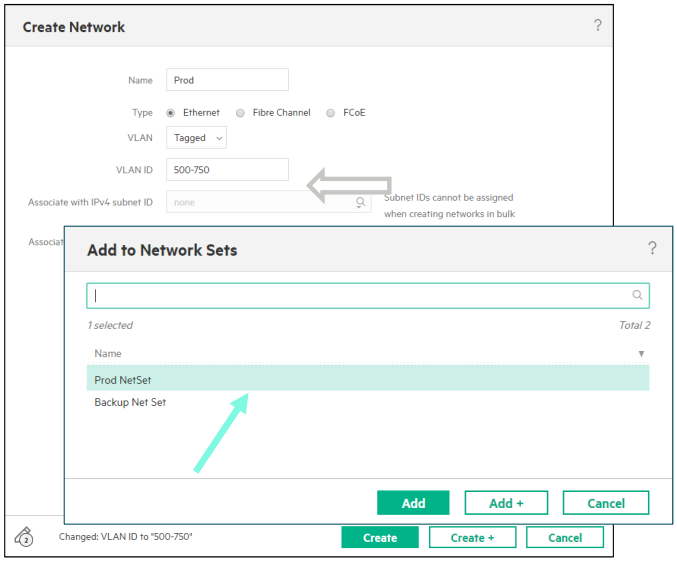


Creating network sets

- A network set is a collection of tagged Ethernet networks that form a named group to simplify a server profile configuration. Network sets are useful in virtual environments where each server profile connection needs to access multiple networks. Use network sets in server profile connections to make all networks on a connection's downlink port available. Network sets define how packets will be delivered to the server when a server Ethernet connection is associated with the network set.
- Instead of assigning a single network to a connection in a server profile, you can assign a network set to that connection. When a connection in a server profile specifies a network set, it can access any of the member networks. Additionally, if a network is added to or deleted from a network set, server profiles that specify the network set are isolated from the change.
- Network sets are the server profile attributes. When assigning networks, following this flow:
  - Assign networks to an uplink set (designate uplink ports to use).
  - Assign networks to a network set (group networks together).
  - Assign network sets to server ports (multiple networks to a server port).
- NOTE: A network set can now also be a member of an uplink set.

SYNERGY AUTOMATED VLAN PROVISIONING (1 OF 2)

- Simplifies the network creation task
- Allows direct association of the network with one or more already existing network sets
- Extremely useful when networks are created in bulk
- Drastically reduces the amount of time and number of clicks it takes to create the networks and populate the network sets

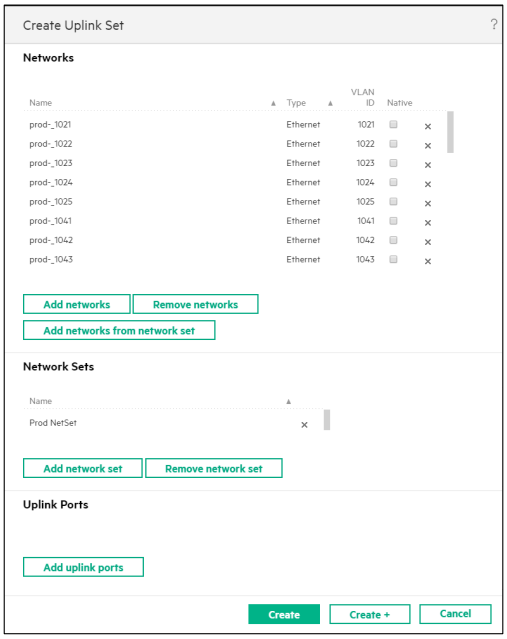


Synergy Automated VLAN Provisioning—HPE OneView 5.0 enhancement

- In HPE OneView 5.0, network administrators have a simplified task of network creation and association of this network with the network set. When a network is created, user will have an option of associating this network directly with already existing network set. This capability becomes very useful when networks are created in bulk.
- Second benefit is to streamline network deployment. Today, once network is created, user has to add it to the LIG, LI, and only then to a network set for server to utilize this network.
- With this feature, adding a network to a network set will deploy it across the LIG and LI automatically, making it immediately accessible for a server workloads.

NETWORK DEPLOYMENT IN A SINGLE STEP (2 OF 2)

- If a Network set is added to the uplink set at the time of creation, network set modifications are propagated to the uplink sets.
- Reduces time, effort, and risk of error
- Network set changes automatically deployed across
  - Uplink sets on LIG/LI
  - Server profiles where network set is provisioned



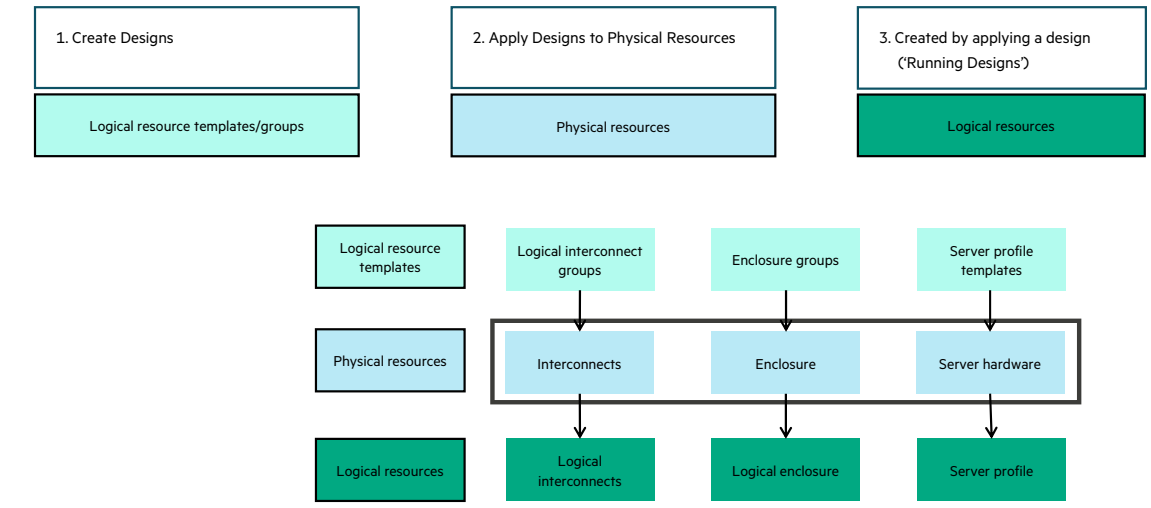
- Network deployment in a single step—HPE OneView 5.0 enhancement
- Direct association of a network set with an uplink set immediately propagates all network set modifications to the uplink sets.
- It reduces time, effort, and risk of error when adding networks to an uplink set.
- When a network is added and associated with an existing network set, it will be automatically deployed across both the uplink sets on LIG/LI and server profiles where network set is provisioned.

LOGICAL INTERCONNECT GROUPS

Logical interconnect groups

HOW ONEVIEW ACHIEVES DATACENTER MANAGEMENT

Three different resource types

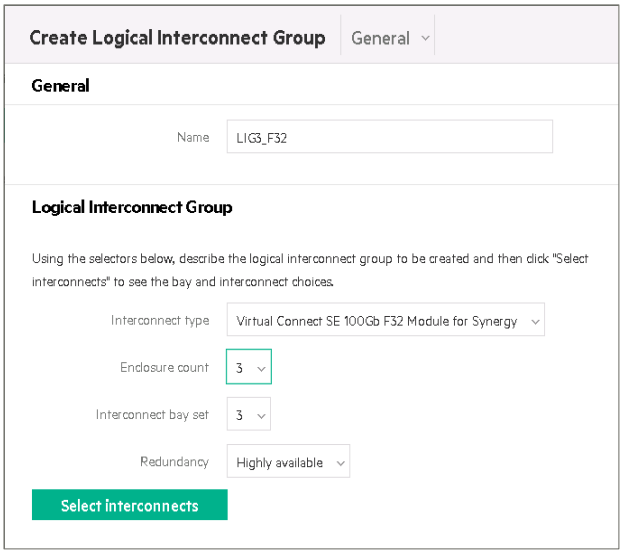


How OneView achieves datacenter management

- HPE OneView manages the customer datacenter environment by having a resource oriented approach. Everything you see and create in OneView is a resource.
- There are three major types of resources used to manage the entire OneView ecosystem.
- These three resource types are discussed in the upcoming pages.

LOGICAL INTERCONNECT GROUPS
Overview

- Acts as a template for creating a logical interconnect for a set of physical interconnects in a set of frames
  - Multiple-enclosure logical interconnect groups (LIGs) for Ethernet capable modules
  - Single-enclosure LIGs for both Ethernet, FC and SAS modules
- LIG requirements
  - Cannot span interconnect bay sets
  - For Ethernet-based LIGs - only one HPE VC SE 40 Gb or HPE VC SE 100Gb F32 module and matching for each interconnect bay set side
  - For Ethernet-based LIGs redundancy mode should be selected
    - High availability (Masters in different frames)
    - Redundant (Masters in the same frame)
    - Nonredundant side A
    - Nonredundant side B



Logical Interconnect Groups—Overview

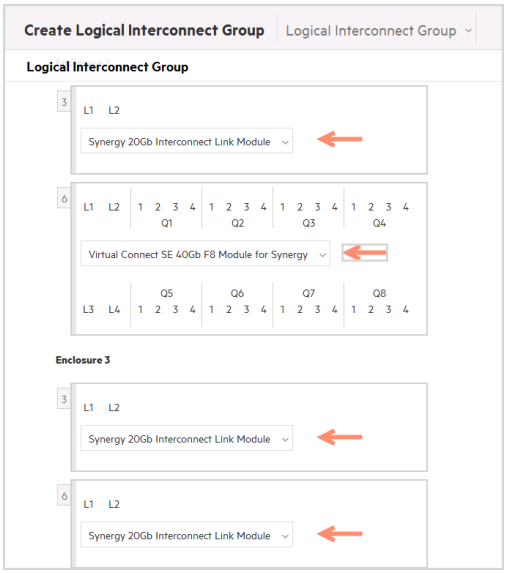
- A logical interconnect group (LIG) acts as a template (recipe) for creating a logical interconnect for a set of physical interconnects in a set of frames. One or more logical interconnect groups are associated with an enclosure group (EG) and are used to define the logical interconnect (LI) configuration representing the available networks, uplink sets, downlinks, I/O bay occupancy, and other interconnect settings for a set of physical interconnects in a set of enclosures. The advantage of configuring multiple LIGs in an enclosure group is to create an air-gap separation between Ethernet networks and allow the isolation of network traffic.
- A multiple-enclosure logical interconnect group must match the interconnect link topology within the set of linked enclosures. All bays must be properly populated in all enclosures in the interconnect link topology. A multiple-enclosure logical interconnect group must include an HPE VC SE 40Gb F8 Module or HPE VC SE 100Gb F32 Module and matching HPE Synergy Interconnect Link Modules.
- A single-enclosure logical interconnect group, such as a Serial Attached SCSI (SAS) logical interconnect group, pertains only to the enclosure group to which it is applied. A single-enclosure logical interconnect group can be applied to individual bays in individual enclosures in the interconnect link topology.
- When creating a logical interconnect group, these are the requirements:
  - Interconnects in a logical interconnect group cannot span interconnect bay sets. Thus, a logical interconnect group can be specified for bays 1 and 4, 2 and 5, or 3 and 6.
  - Only one HPE Virtual Connect SE 40Gb or HPE VC SE 100Gb F32 Module for HPE Synergy for each interconnect bay set side.
  - You must choose a redundancy mode. When the redundancy mode is set, it cannot be changed.
    - High availability—Two interconnects on opposite sides of two enclosures, both of which are available to all enclosures connected with interconnect link modules.
    - Redundant—The same interconnect type on both sides of a single enclosure.
    - Nonredundant side A—One interconnect in a single side A bay (1, 2, or 3) in an enclosure that can be connected to other enclosures that have an interconnect link module in the same bay.
    - Nonredundant side B—One interconnect in a single side B bay (4, 5, or 6).

LOGICAL INTERCONNECT GROUP EXAMPLE

Configuring a LIG for VC Ethernet Modules

Discussion: What is in Bay 3 of Frame 1?

- Interconnect type
  - Virtual Connect SE 40Gb F8 Module for Synergy
  - Virtual Connect SE 100Gb F32Module for Synergy
- Enclosure count
  - Up to 5 when 10 or 25Gb satellite modules are used
  - Up to 3 when 20 or 50 Gb satellite modules are used
- Interconnect bay set
  - Any interconnect bay set would work
- The mezzanines' placement in the other connected frames should correspond to the master's placement



Logical interconnect group—Configuring a LIG for VC Master Modules

- To create a logical interconnect group for VC Master Modules, you would select:
  - Interconnect type—Virtual Connect SE 40Gb F8 Module for Synergy or Virtual Connect SE 100Gb F32Module for Synergy
  - Enclosure count— could be up to 5 when 10 or 25Gb satellite modules are used or up to 3 when 20 or 50 Gb satellite modules are used
  - Interconnect bay set—1, 2 or 3 as any of them would work

The mezzanines' placement in the other connected frames should correspond to the master's placement which means that if the Master module is placed in bay 3 of the first frame, the satellites that connect to this master should also be places in bay 3 of the other connected frames

When configuring the LIG, some uplink sets should be defined to provide connectivity for the compute modules in the frames to the rest of the datacenter networks. The uplinks could be of type:
- Ethernet

- Fibre Channel

- Tunnel

- Untagged

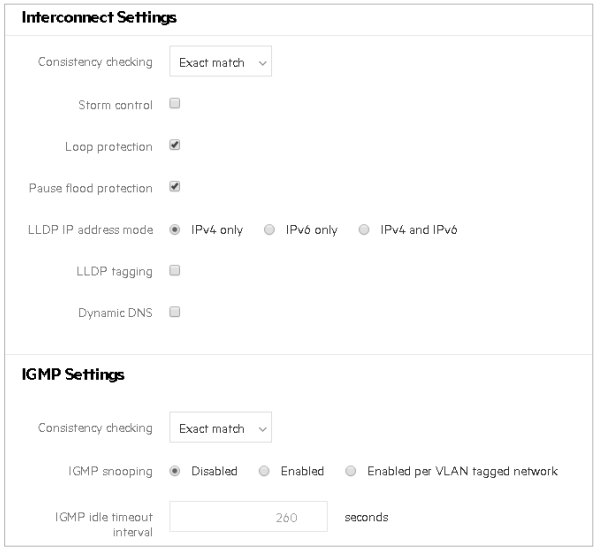
- Image Streamer

When defining the uplink set, you need to choose a network of the selected type (or network set in the case of Ethernet uplink) and specify the uplink port(s) to be used for external connectivity.

ADVANCED VC FEATURES

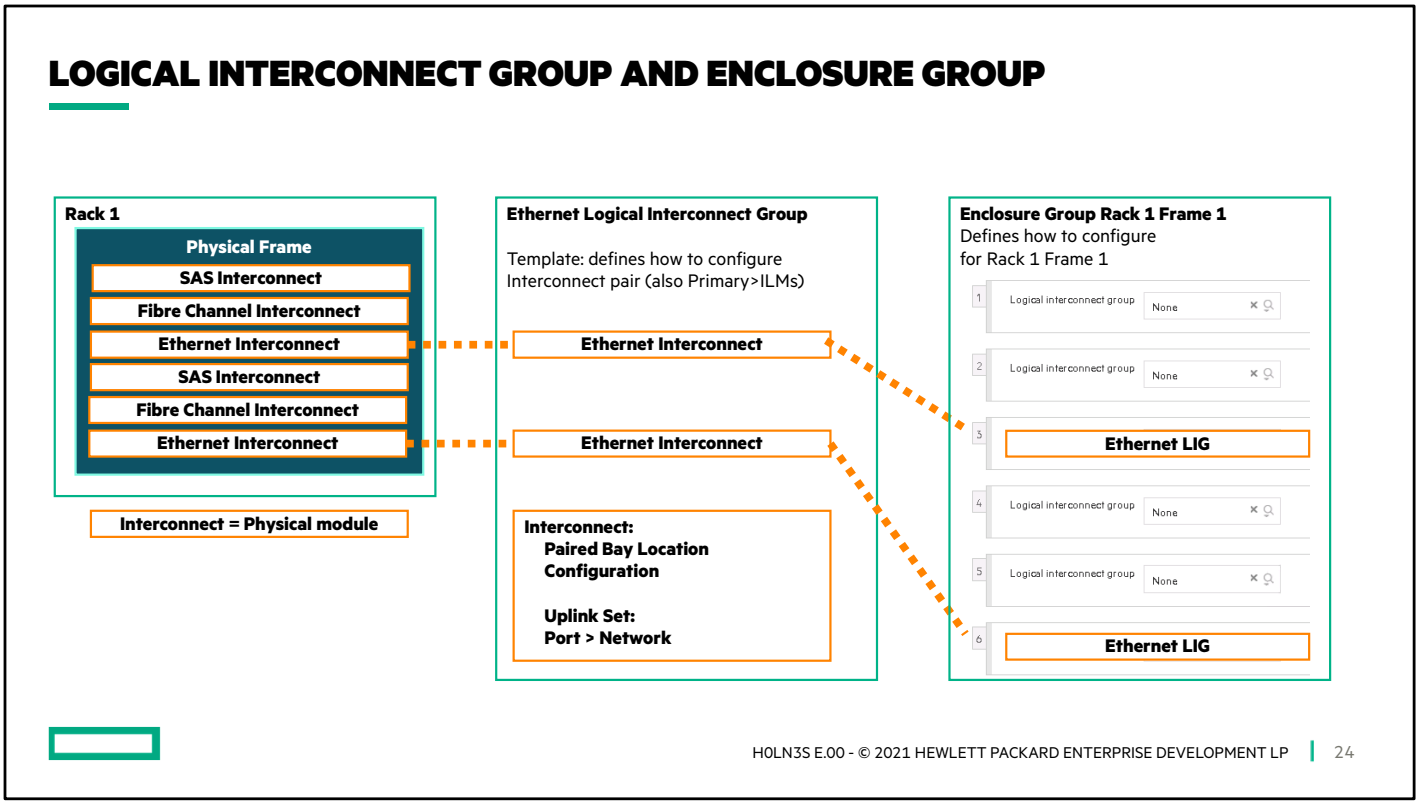
When configuring a LIG for the VC SE 40Gb F8 or the VC SE 100Gb F32 module, you can configure advanced features like:

- Loop and Pause flood protection settings
- LLDP settings
- IGMP settings
- Utilization Sampling
- sFlow
- SNMP
- Quality of Service (QoS)
- NTP Client



Some advanced VC Features are briefly explained below:

- Pause flood protection, when enabled, detects pause flood conditions on uplink ports, detects and protects pause flood conditions on server downlink ports, and disables the server downlink port.
- The loop protection feature enables detection of loops on the subport, and then disables the subport.
- HPE OneView network loop protection uses two methods to detect loops:
- The interconnect monitors the subports for special packets transmitted from upstream devices.
- The interconnect reviews and intercepts common loop detection frames used in other switches, such as Cisco and ProCurve to prevent loop protection on the upstream switch, where externally generated frames are used to detect a loop condition.
- When network loop protection is enabled on the Logical Interconnects screen, and a loop detection frame is received on a subport, the subport is disabled immediately until an administrative action is taken.
- The administrative action involves resolving the loop condition and clearing the loop protection error condition. The loop detected status on a server can be cleared by editing the server profile and unassigning all networks from the connection corresponding to the server in the loop detected state or by selecting the Reset port protection action on the Interconnects screen
- LLDP tagging, when enabled, uses the management IP address of the lowest numbered Ethernet bay location in the logical interconnect. This IP address is transmitted in tagged LLDP frames on the downlink ports and untagged frames on the uplinks and stacking link ports.
- The Utilization Sampling settings control the data collection rate for all port statistics on the Interconnects screen. The port statistics display as graphs when you hover your pointer over the Utilization screen component.
- The utilization data collected is based on the sample count and the sample interval value. The default values provide an hour's worth of data. You can increase or decrease the frequency of the sample interval, and increase or decrease the number of samples to be stored. The adjustment of either value controls the length of the overall time for which data is available.
- Quality of Service (QoS) is a set of service requirements that the network must meet to ensure an adequate service level for data transmission. The goal of QoS is to provide a guaranteed delivery system for network traffic.
- The QoS feature enables you to configure traffic queues for different priority network traffic, categorize and prioritize ingress traffic, and adjust priority settings for egress traffic. You can use these settings to ensure that important traffic is prioritized and handled first, before less important traffic. After categorizing and classifying the network traffic, you can assign priorities and schedule transmission



Logical Interconnect Groups and Uplink Sets

- The logical interconnect group represents the physical and logical configuration of connections to data center networks for each logical interconnect in the group. This configuration includes the following:
  - The interconnect types, interconnect configurations, and interconnect downlink capabilities
  - The uplink sets, which map uplink ports to Ethernet or Fibre Channel networks
  - The available networks
- In the resource model:
  - A logical interconnect group is associated with an enclosure group instead of an individual enclosure.

Logical Interconnect Group

Template identifying configuration for anticipated Frames in Synergy Fabric Configuration

- Fabric Configuration: One or more frames providing upstream datacenter connectivity
- Ethernet, Fibre Channel, FCoE, SAS

Configurations

- Enclosures/Frames: what interconnected expected in what bay
- Uplink Sets: what network(s) on what port of the interconnect
- Interconnect Settings: loop, IGMP protection and others

Enclosure Group

- Configure for Enclosure/Frame in group

- Identify Logical Interconnect Group for each Interconnect bay on frame

- Logical Interconnect Groups defining multiple bays will automatically populate

-Can be combination of Ethernet, Fibre Channel and SAS across one or more frames

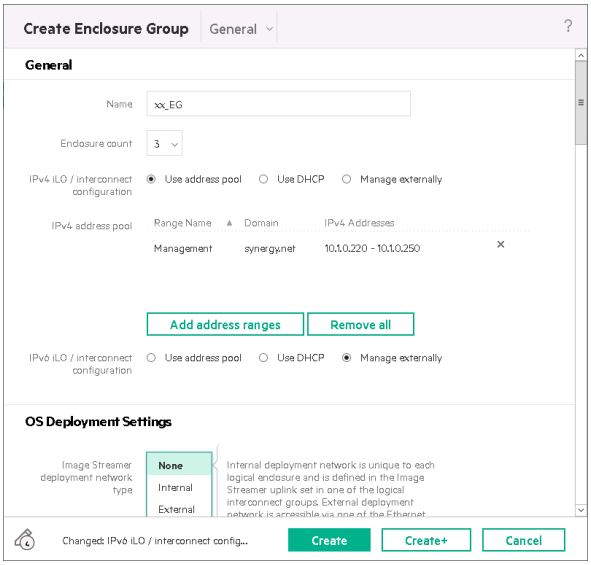
ENCLOSURE GROUPS

Enclosure groups

ENCLOSURE GROUPS
Overview

- Each enclosure group is associated with one or more logical interconnect groups
- General parameters include:
  - Name
  - Enclosure count
  - IPv4 and IPv6 management address configuration
  - Deployment network type
    - Internal (multi-frame configuration)
    - External (single-frame POC configuration)

NOTE: Manage externally can not be used to provide IP addresses to VC modules.



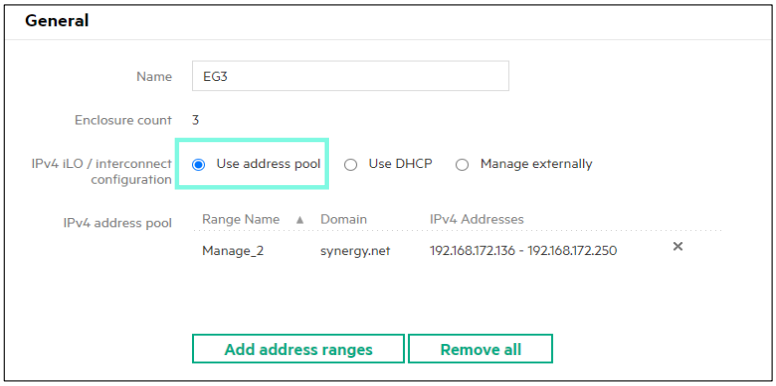
Enclosure groups—Overview

- A part of the procedure to manage a frame includes specifying the enclosure group to which it will belong. Each enclosure group is associated with one or more logical interconnect groups that act as a recipe for creating and configuring the logical interconnects. That configuration is then applied to each enclosure added as a member of the enclosure group. The screenshot on the slide displays a Create Enclosure Group screen where you define general parameters.
- The enclosure group serves as a link between the frames/enclosures that are part of the group and their uplink configuration specified in the associated LIG(s).
- General parameters include:
  - Name
  - Enclosure count
  - IPv4 and IPv6 management address configuration
  - Deployment network type
    - Internal (multi-frame configuration)
    - External (single-frame POC configuration)

ENCLOSURE GROUP IP ADDRESSING 1 OF 3

Using an Address Pool

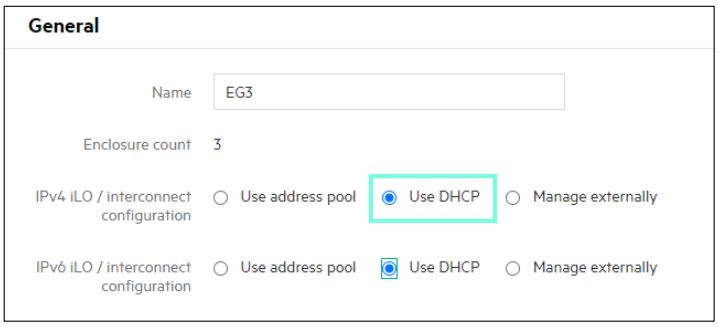
- A pre-configured subnet and range must be created
- If using an address pool, you will choose a range from the subnet
- Each interconnect and management processor that requires an IP address is allocated an address from the configured IP address range.
- When an IP address from the address pool is assigned to a device, the IP address is associated with the bay in which the device resides.
- The IP address is maintained during hardware changes to the associated bay



ENCLOSURE GROUP IP ADDRESSING 2 OF 3

Using an Address Pool

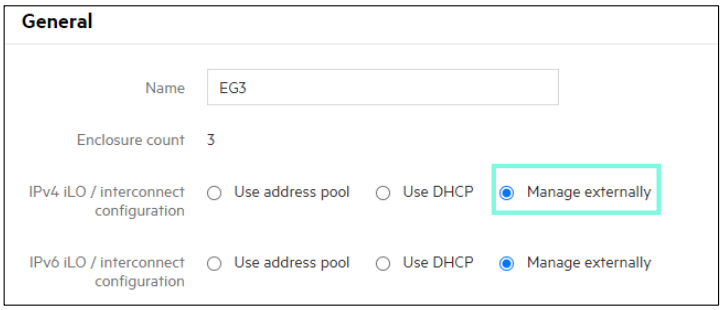
- Each interconnect and management processor that requires an IP address is configured to obtain that address through Dynamic Host Configuration Protocol (DHCP)



ENCLOSURE GROUP IP ADDRESSING 2 OF 3

Using an Address Pool

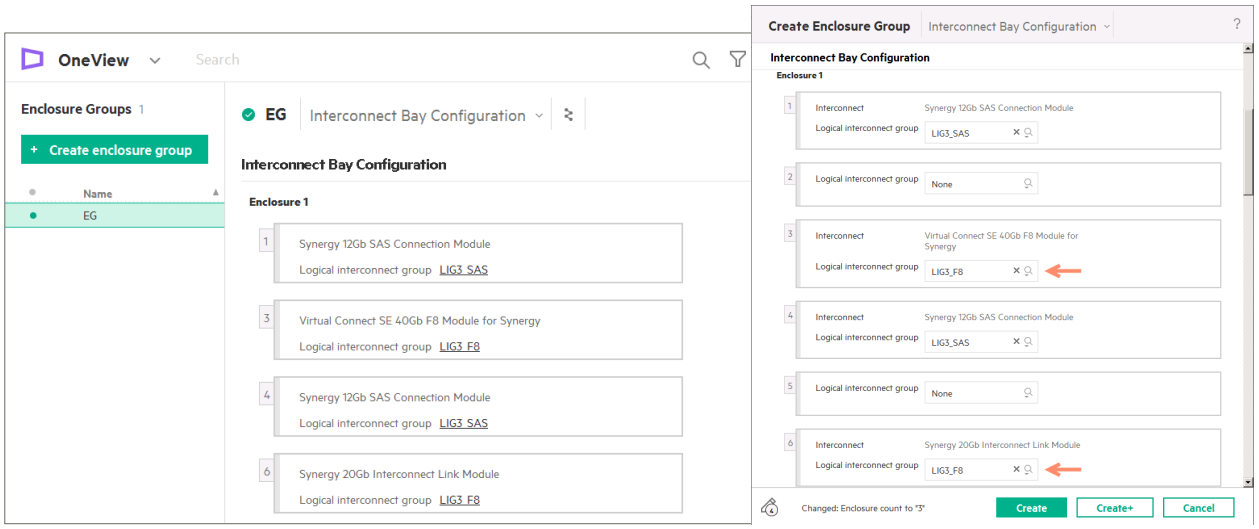
- Configuration of the IP addresses is managed outside of HPE OneView. No changes are made by HPE OneView
- VC Modules can not have their IP addresses set manually. The CLI of the VC modules is read-only



NOTICE: All 3 addressing methods can be overridden when an LE is created. As of OneView 5.2, you are able to manually specify static IP addresses for any iLO or interconnect.

CREATING AN ENCLOSURE GROUP EXAMPLE

Adding LIGs to an enclosure group



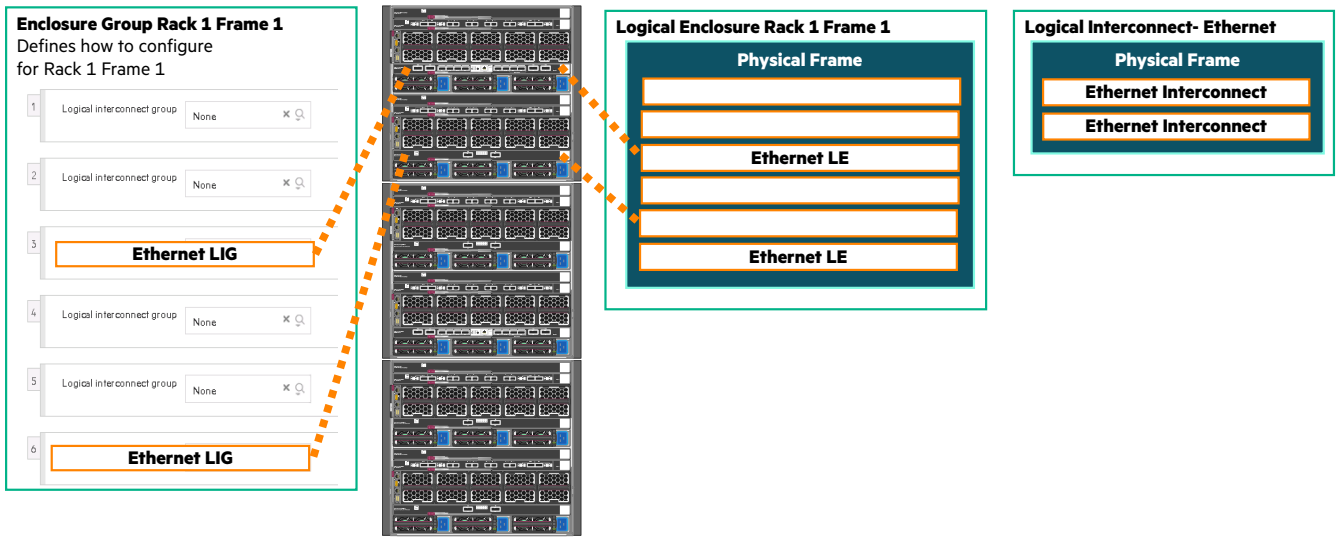
Creating an enclosure group—Adding a VC SE 40GB F8 LIG to an enclosure group

- The screenshots show adding LIGs to an enclosure group.

LOGICAL ENCLOSURES

Logical enclosures

PHYSICAL FRAMES AND LOGICAL ENCLOSURE



 | 32

Physical frames and Logical Interconnect Group

Process of creating Logical Interconnect Group establishes a configuration for Interconnect modules expected in a single or multi frame environment.

HPE Synergy Composer running HPE OneView discovers hardware in management ring.

This hardware is discovered and information presented in HPE OneView for all devices that configured in Logical Interconnect groups.

These can be Ethernet, Fibre Channel or SAS fabric configurations.

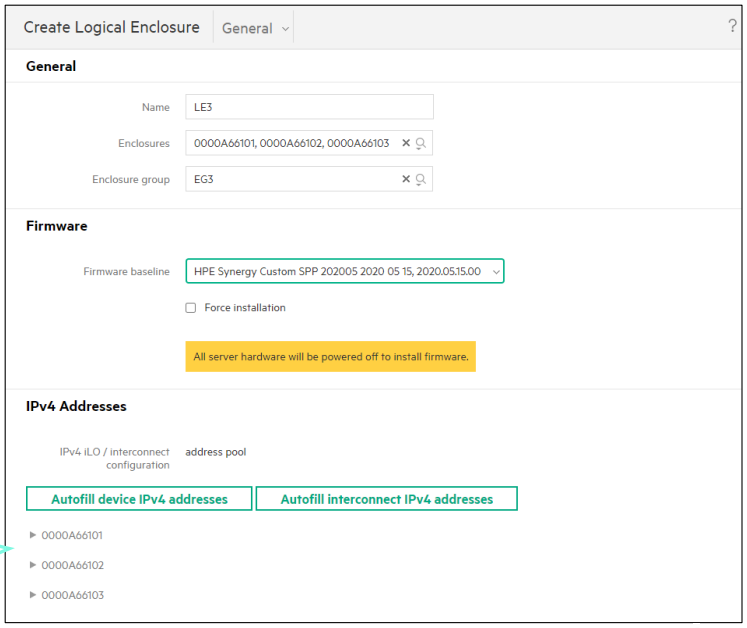
Fibre Channel and SAS fabrics consist of Interconnects in a single frame.

Ethernet fabrics can consist of 1 or up to 5 frames depending on speed of Interconnect Link Module (Satellite) and number placed in remote satellite frames.

CREATING A LOGICAL ENCLOSURE EXAMPLE

Overview

- A logical enclosure:
  - Requires an EG design that matches the physical configuration of the frames
  - Specifies a LIG design for each managed bay set contained in the EG design
  - Creates a logical interconnect for each LIG design applied from the EG design
  - Can specify a Firmware baseline for the Frames
  - Can provide static IP address assignments that override the EG address assignment choice



An example of a **three-frame** LE

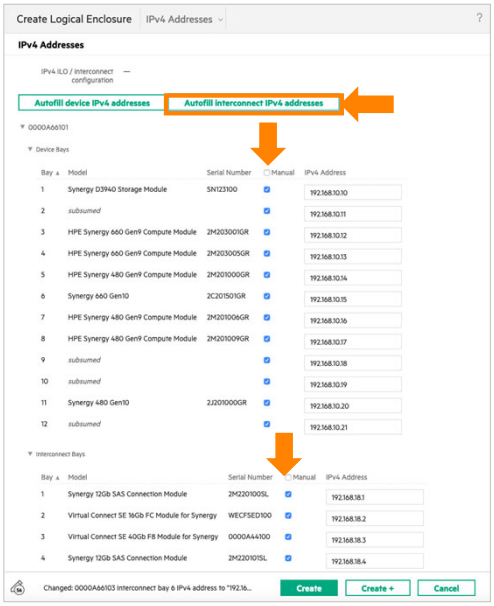
 33

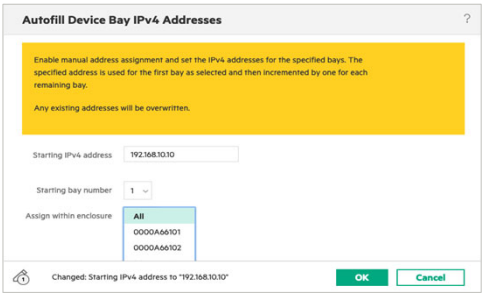
- Creating a logical enclosure—Overview
- A logical enclosure (LE) contains the configuration intended for a set of physical enclosures. It also automatically creates a logical interconnect (LI) for each logical interconnect group defined in an enclosure group.
- A logical enclosure is created by specifying the enclosures and the enclosure group template. Firmware baseline is an optional setting.
- In this example, a three-frame logical enclosure with storage module is created as instructed in a SAS LIG and EG.

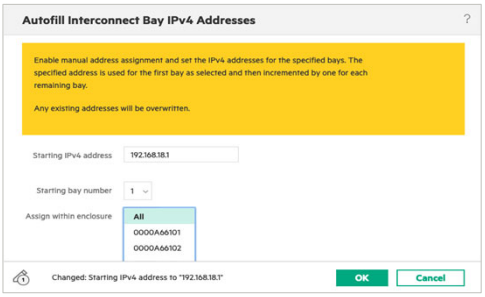
- All the Synergy hardware that gets discovered during the Hardware Discovery process stays in a Monitored state until the LE is created. As soon as the LE is created - the managed enclosures, interconnects and compute modules get into Managed state and you can start defining server profiles. Assigning server profiles is not possible for servers in Monitored state, which means the creation of the LE a very important step in the Synergy configuration workflow.

STATIC IPV6 AND IPV4 ADDRESSES ASSIGNMENT IN USE

- Addresses can be manually input or auto-filled from a user provided range







The LE screen contains <click1> an expander for each enclosure in the ILT. This allows the <click2> specification of static IPv4 or IPv6 addresses per interconnect and device bay.

All addresses specified must come from a subnet previously created by the Network Administrator.

This function will override the existing Enclosure Group IP Addressing Mode setting (IP Pool, Managed Externally, or DHCP). You may choose to explicitly apply IP addresses to only a subset of the interconnect and devices in your Synergy frame.

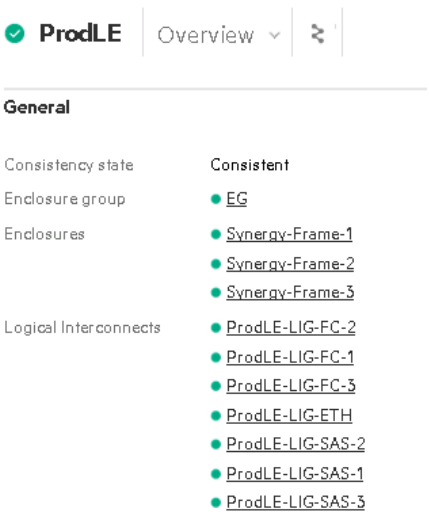
<click3> You can also use autofill IP addresses for device and/or interconnect bays <click4>. On the dialog for autofill, you define starting IP address, starting bay, and which Synergy frames should be included in this autofill for IP address assignment.

LOGICAL ENCLOSURE

Logical Enclosure

- Assign Enclosures/Frames (physical) an Enclosure Group
- Applies the configurations in the Logical Interconnect Groups to the physical interconnects
- Creates Logical Interconnect
  - All interconnects that were defined as part of LIG and included in the Enclosure Group
- Creates Interconnect
  - Represents each physical Interconnect in Frame

Consistency: physical frames and configuration matching Logical Interconnect Groups



Logical Enclosure

Assign Enclosures/Frames (physical) an Enclosure Group

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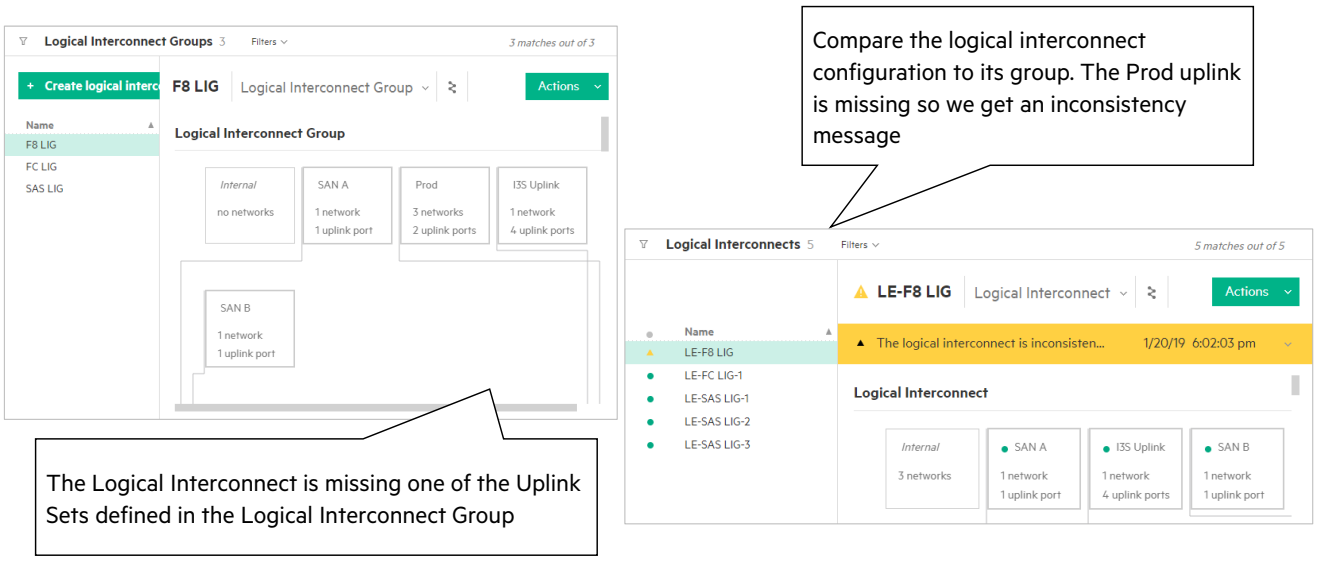
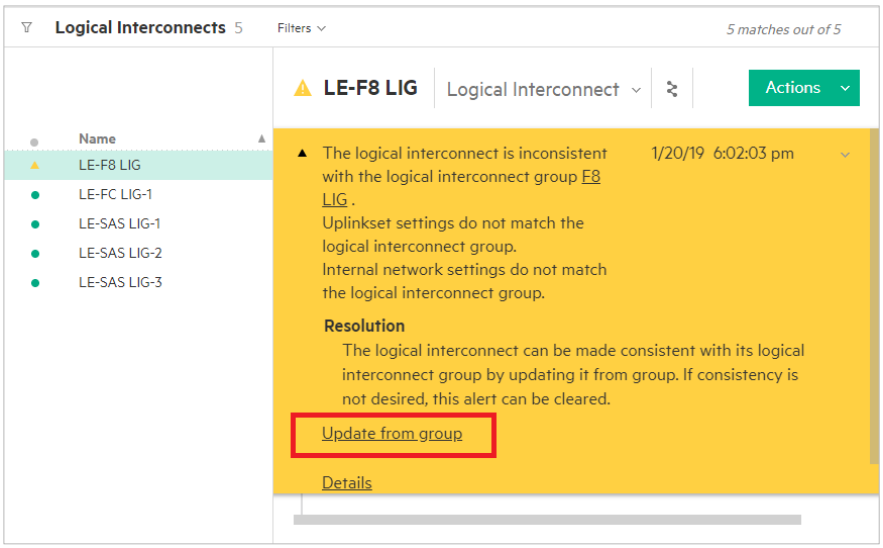
LOGICAL INTERCONNECT IS NOW INCONSISTENT WITH ITS GROUP EXAMPLE



Logical interconnect is now inconsistent with its group

- Compliance checking is the validation of a logical interconnects to ensure that it matches the configuration of their parent logical interconnect groups. The appliance monitors both the logical interconnect and logical interconnect group, comparing the two and checking the following for consistency:
  - Ethernet interconnect settings (see the online help for details):
    - Enabling Fast MAC cache failover
    - Enabling MAC refresh intervals
    - Enabling Internet Group Management Protocol (IGMP) snooping
    - Setting IGMP idle timeout intervals
    - Enabling loop and pause flood protection
  - Uplink sets
  - Interconnect maps
  - If both configurations match, the logical interconnect Consistency state field is set to Consistent and is considered to be compliant.
  - Noncompliance results in an alert for the logical interconnect, and the Consistency state field is set to Inconsistent with group. It is also set to Inconsistent with group whenever you edit the logical interconnect or the logical interconnect group, even if your edit does not lead to a difference between the two.

MAKE A LOGICAL INTERCONNECT CONSISTENT WITH THE GROUP



Make a logical interconnect consistent with the group

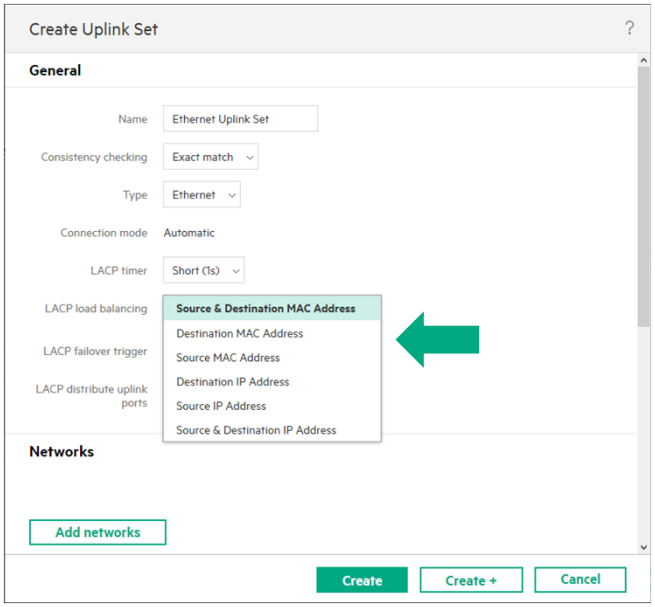
- To bring a noncompliant (inconsistent with group) logical interconnect configuration back into compliance (consistent) with the logical interconnect group, you must reapply the settings from the Logical Interconnect Group.

LACP LOAD BALANCING

HPE Synergy 12000 Frame

LACP LOAD BALANCING

- In order to effectively increase the bandwidth of the LAG, traffic needs to be balanced across the member links
- The balancing is done by the LAG hashing algorithm, which is designed to have the member links used increasingly equally as the traffic profile gets more diverse



HPE OneView 5.2 enhancements are to support new capabilities for the HPE VC SE 100Gb FE32 and VC SE 40Gb F8 ICMs associated with traffic load-balancing and distribution.

In order to effectively increase the bandwidth of the LAG, traffic needs to be balanced across the member links.

The balancing is done by the LAG hashing algorithm, which is designed to have the member links used increasingly equally as the traffic profile gets more diverse.

The LACP load-balancing configuration is available only for uplink sets created using : Ethernet, Tunnel, and Untagged network types.

LACP LOAD BALANCING METHODS

LACP Load-Balancing Value	Hash Key Fields
Source and Destination MAC Address	Source/Destination Mac + VLAN + EtherType + Source Module ID/Port
Destination MAC Address	Destination Mac+ VLAN + EtherType + Source Module ID/Port
Source MAC Address	Source MAC + VLAN + EtherType + Source Module ID/Port
Destination IP Address	Destination IP + Destination UDP/TCP Port
Source IP Address	Source IP + Source UDP/TCP Port
Source and Destination IP Address	Source IP/Destination IP + Source/ Destination TCP/UDP Port

The configuration enables distribution of the Ethernet traffic among all the uplink ports in an uplink set depending on the hash value created out of the hash key fields.

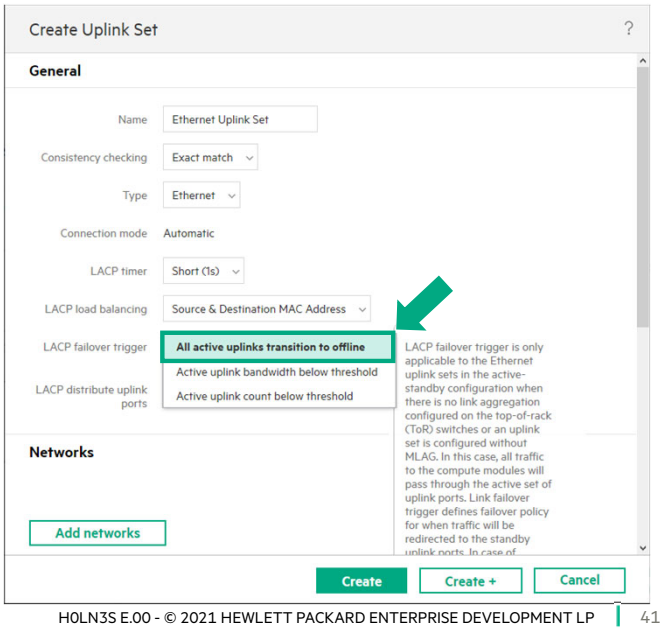
During traffic transmission; apart from the selected value, other fields like VLAN, EtherType, and so on are also considered.

This table lists the various LACP load-balancing options available, and the related hash keys for each value.

LACP FAILOVER TRIGGER FOR ACTIVE-STANDBY FAILOVER

LACP failover – all active uplink ports are down

- When there is no link aggregation configured on the top-of-rack (ToR) switches or the Masters are configured without MLAG, you may end up with some ports in an active state and others in a standby state
- All traffic to the compute modules will pass through the active set of uplink ports
- Link failover trigger defines failover policy for when traffic will be redirected to the standby uplink ports



LACP failover trigger is only applicable to the Ethernet uplink sets in the active-standby configuration when there is no link aggregation configured on the top-of-rack (ToR) switches or the ICMs are configured without MLAG. In this case, all traffic to the compute modules will pass through the active set of uplink ports.

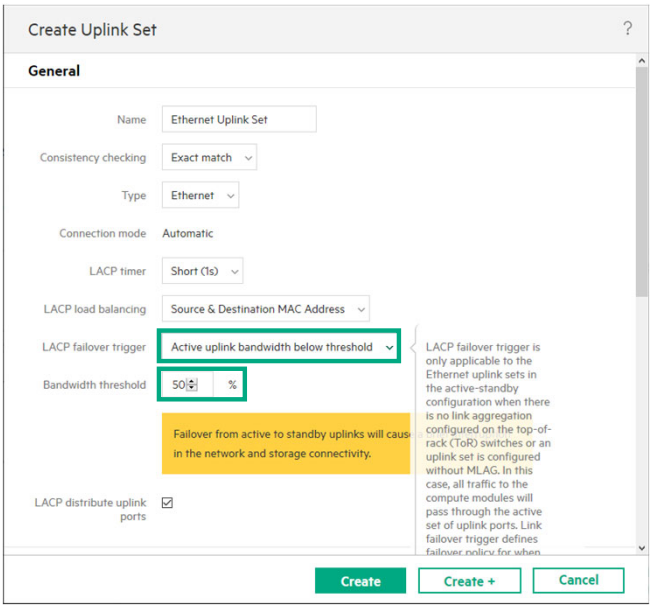
Link failover trigger defines failover policy for when traffic will be redirected to the standby uplink ports. In case of failover trigger based on bandwidth/uplink count, link failover can be triggered either by reduction in active uplink bandwidth or increase in standby uplink bandwidth.

In OneView 5.2, you can configure several LACP failover trigger options.

The default setting is “All active uplinks transition to offline”. In this case, failover is triggered when all active uplink ports are offline.

LACP FAILOVER TRIGGER FOR ACTIVE-STANDBY FAILOVER

LACP failover – bandwidth is reduced

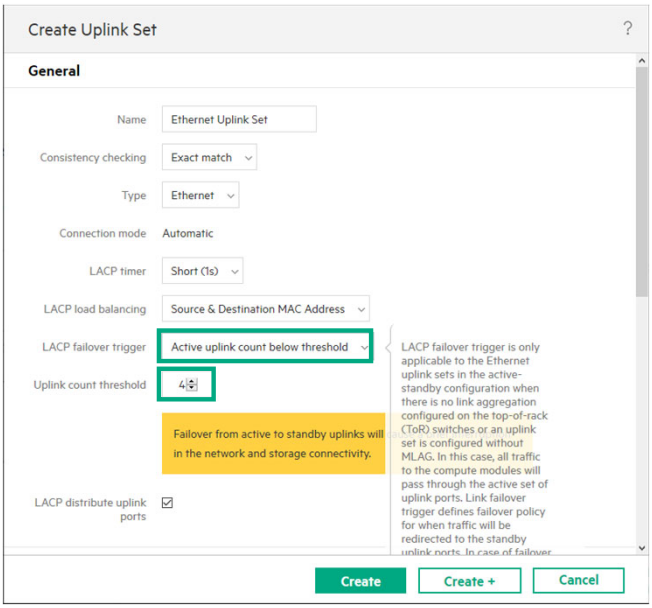


If you select “Active uplink bandwidth below threshold”, failover is triggered when active uplink bandwidth reduces below the threshold and/or standby uplink bandwidth increases above the threshold.

You can enter the bandwidth threshold percentage to trigger the failover. Default is 50%.

LACP FAILOVER TRIGGER FOR ACTIVE-STANDBY FAILOVER

LACP failover – the number of active uplink ports is reduced



The next option is “Active uplink count below threshold”. In this case, failover is triggered when the number of uplinks in the active LAG is reduced below the threshold. When both active and standby LAGs do not satisfy the minimum uplink criteria, failover is triggered the same as All active uplinks transition to offline.

You can enter the uplink count threshold to trigger the failover. Valid values are 1 through 16.

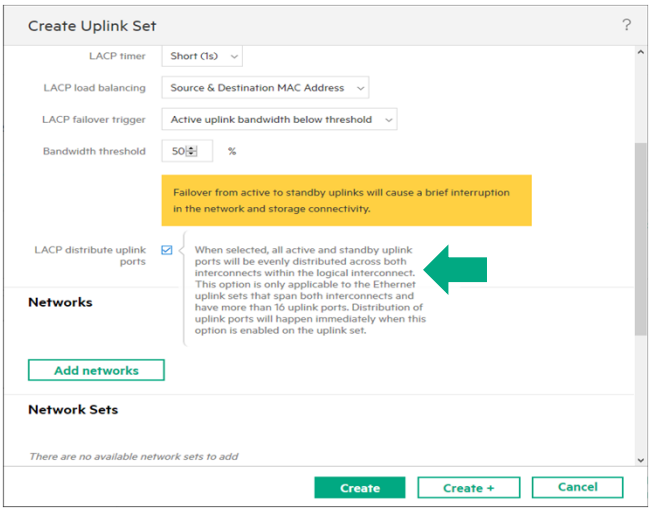
Keep in mind that failover from active to standby uplinks will cause a brief interruption in the network and storage connectivity.

PORT DISTRIBUTION FOR UPLINK SETS WITH GREATER THAN 16 PORTS

LACP distribution for uplink ports

- Only 16 ports can be active ports in an uplink set
- Uplink Sets with more than 16 ports can have their active and standby ports evenly distributed across VC modules
- The distribution of active ports depends on the number of ports added from each interconnect module
- If editing an existing LI/LIG, ICM firmware might bring down active ports in one Interconnect and bring up ports on the other to evenly distribute active uplink ports.

- **HPE VC SE 100Gb F32 firmware v2.1+**
- **HPE VC SE 40Gb F8 firmware v1.6+**



To use the LACP distribute uplink ports feature, when you create an uplink set for the Ethernet, Tunnel, or Untagged network type:

- LACP distribute uplink ports options is now checked by default. When enabled, OneView uses SNMP calls to evenly distribute all active and standby uplink ports across Interconnects within the logical interconnect.
  - If you upgraded OneView and previous version did not support this feature, the checkbox will be disabled for existing uplink sets.
- However this option take effect when installed firmware version is appropriate and provided number of ports in an Uplink Set is more than 16.

- Notice that when you try to edit LIG or LI to add more uplink ports (counting more than 16 after modify), ICM's firmware might bring down active ports in one Interconnect and bring up on the other to evenly distribute active uplink ports.

LACP DISTRIBUTION FOR UPLINK PORTS

- LACP distribution of active and standby ports depends on the number of uplink ports assigned to each Master

Port distribution model				
	ICM-A		ICM-B	
Number of ports in uplink set	Number of active member ports	Number of standby member ports	Number of active member ports	Number of standby member ports
8	4	0	4	0
9	4	0	5	0
16	8	0	8	0
16	10	0	6	0
17	9	1	7	0
17	7	0	9	1
16	0	0	16	0
20	8	2	8	2

The distribution of active ports occurs when the number of uplink ports is more than 16 in an uplink set and depends on the number of ports added from each interconnect module.

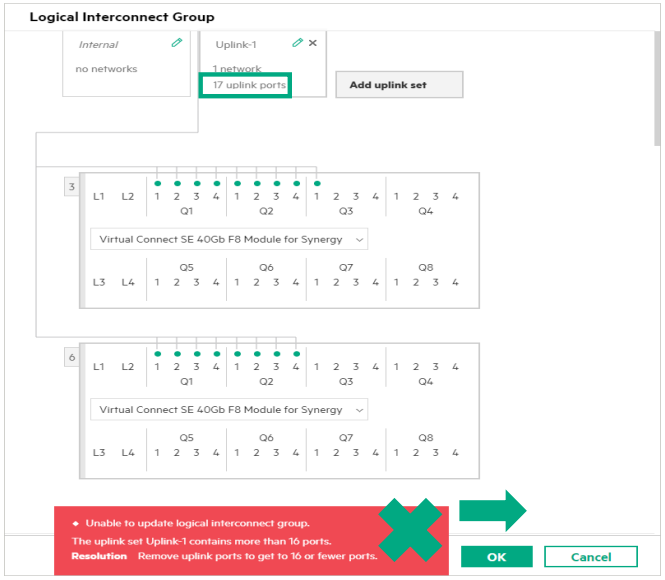
Examples of port distribution are shown in this table.

LACP distribute uplink ports is applicable for Ethernet networks only.

ALERTS

LACP distribution for uplink ports

- The prior limitation of a maximum of 16 ports in an Uplink Set is removed
- This error message will no longer happen



This feature does not introduce any new alerts. However, existing limitation of maximum up to 16 ports in an Uplink Set is removed so this error message will not be observed here on.

CISCO ACI

WHAT IS CISCO APPLICATION CENTRIC INFRASTRUCTURE

- ACI implements a policy based approach in order to abstract traditional networking constructs. ACI is based on two primary components which include Nexus 9000 series switches and Application Policy Infrastructure Controllers (APICs).
- The Nexus 9000 platform provides the physical infrastructure while the APIC is a clustered policy management system responsible for all aspects of fabric configuration and monitoring. The Nexus switches leverage a traditional Broadcom Advanced Integrated Switching Circuit (ASIC) as well as a custom Cisco ASIC that is only used when ACI mode is enabled and ACI code is running on the Nexus switches.
- ACI uses a policy model to control communication between systems components and applications. The policy model introduces a number of different constructs which include End Point Groups (EPG), Application Profiles, Contracts, Filters, as well as objects associated with external connectivity (for both Layer 2 and Layer 3).

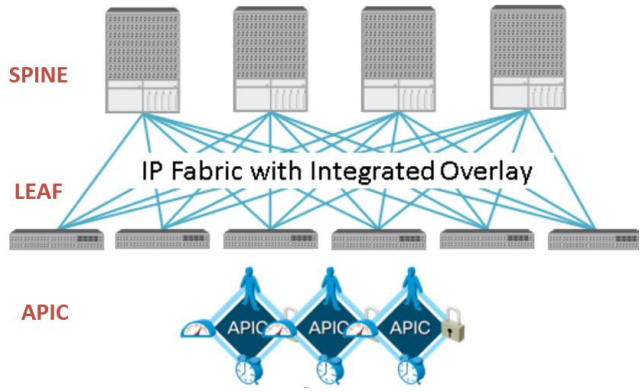
What is Cisco Application Centric Infrastructure (ACI)

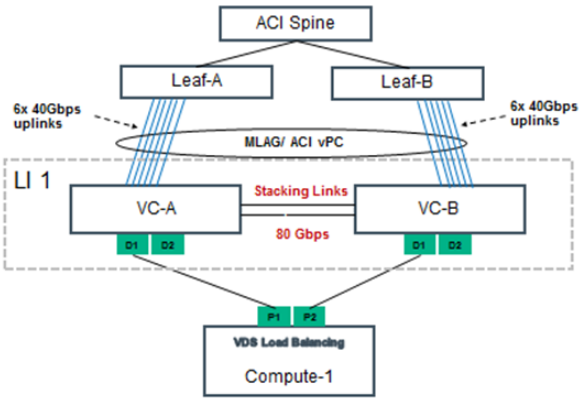
- Cisco ACI is the solution that emerged, following CISCO's acquisition of Insieme. ACI is seen by many as Cisco's software-defined networking (SDN) offering for data center and cloud networks.

- ACI is a tightly coupled policy-driven solution that integrates software and hardware. The hardware for Cisco ACI is based on the Cisco Nexus 9000 family of switches. The software and integration points for ACI include: Data Center Pod, Data Center Policy Engine, and Non-Directly Attached Virtual and Physical Leaf Switches.

- For additional background see:
  - https://www.sdxcentral.com/data-center/definitions/what-is-cisco-aci/
  - https://community.cisco.com/t5/data-center-documents/cisco-aci-architecture-simplified/ta-p/3145891
  - https://www.cisco.com/c/en/us/td/docs/switches/datacenter/aci/apic/sw/1-x/aci-fundamentals/b_ACI-Fundamentals/b_ACI-Fundamentals_appendix_01111.html

APPLICATION CENTRIC INFRASTRUCTURE





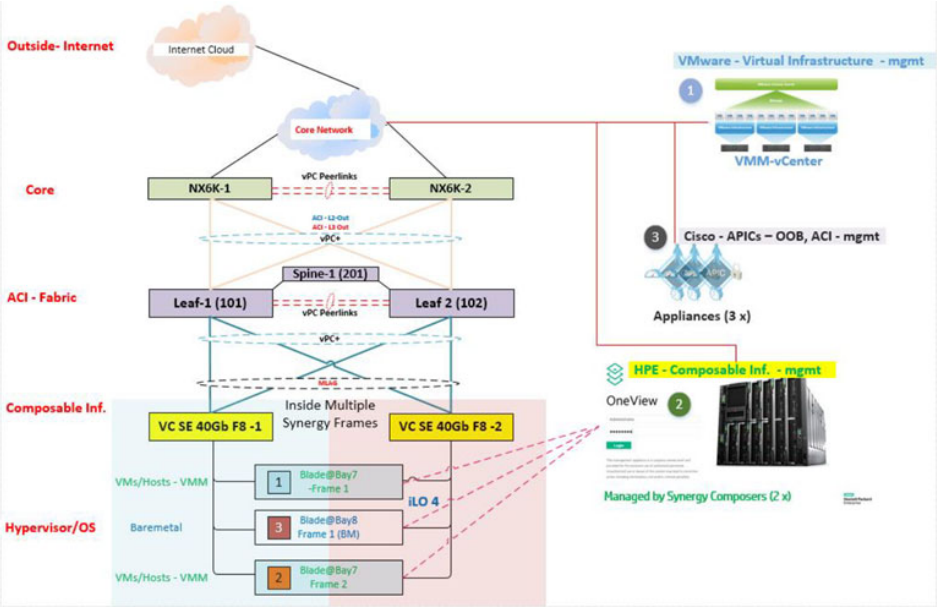
Application Centric Infrastructure

- ACI Fabric:
  - Cisco Nexus 9504 switch (in ACI mode) acting as the spine node
  - Cisco Nexus 9396 switches (ACI mode) acting as the leaf nodes
  - Cisco Application Policy Infrastructure Controller (APIC) appliances logically clustered and used for ACI management

- The ACI architecture leverages a spine and leaf topology with all endpoint devices connected into the leaf nodes. Endpoint devices can include existing infrastructure switches, routers, load balancers, servers, and other various devices. The spine nodes only connects leaf nodes and no other devices are directly connected to the spine.

- The ACI fabric is enabled through a set of policies delivered from the APIC and pushed down into the Nexus 9000 series switches. ACI Policies are built from a set of logical constructs.
  - Logical constructs take all the underlying configurations behind the scenes of the network and abstract them for use in a large scale deployment (as opposed to simply configuring one switch). ACI itself is a large scale fabric but when you look at how the policy of ACI is designed, you can see an architectural approach that is similar to other Cisco Data Center products.

HPE SYNERGY AND CISCO ACI



HPE Synergy and Cisco ACI

- The Cisco Nexus 9504 spine node and two Nexus 9396 leaf nodes form the ACI fabric. The Spine node is connected only to the leaf nodes and the out of band management switch, while the leaf nodes terminate all the endpoint devices. In the ACI fabric each leaf node is dual homed and connected [two 10 GB Ethernet] to a pair of Nexus 6Ks via a virtual port channel (vPC) configuration. These north bound extension and also layer 3 routed out.
- Two additional 10 GB Ethernet links from each leaf node are connected to two Virtual Connect SE 40 GB F8 Interconnect Modules (VC) in the HPE Synergy Ethernet data fabric. These VC interconnects constitute the Synergy data fabric and are configured to form a highly available multi-chassis link aggregation (MLAG) group to the Cisco leaf nodes.
- Embedded Synergy Composers provide a redundant management appliance to manage the Synergy infrastructure.
- VMware vCenter is used for Cisco ACI VMM integration and to manage the Virtual Infrastructure
- The spine node, both leaf nodes, and all three APIC appliances are physically connected to the management switch. The APICs are logically clustered during initialization to provide a redundant management point for the Cisco ACI infrastructure.
- In this solution, VMware vSphere ESXi hosts were installed for vSphere VMM integration, and Microsoft Window OS was installed for bare-metal OS integration on compute nodes in the Synergy Frame 12000 system.

RESOURCES

- where get the info, tool, sites, videos

LAB

REVIEW QUESTIONS

LEARNING CHECK

Which ports on an HPE VC SE 100Gb F32 master ICM are used by the first 50Gb ILM satellite module?

A. Q7 and Q8
B. L1 and L2
C. L1 and L4
D. Q1 and Q2

Learning check

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B. L1 and L2

C. L1 and L4

D. Q1 and Q2

LEARNING CHECK

What is the supported throughput of the HPE VC SE 100Gb F32 interconnect link ports?

A. 40 Gb/s
B. 50 Gb/s
C. 100 Gb/s
D. 300 Gb/s

Learning check

What is the supported throughput of the HPE VC SE 100Gb F32 interconnect link ports?

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TRAINING OBJECTIVES

- Upon completion of the module apply HPE Synergy Network Administration skills to perform tasks in lab to validate a Synergy deployment and initial hardware setup.
- Course review questions will provide you an opportunity check your knowledge of skill and task: Facts, Terms, Definitions and Concepts.
- The course modular structure organizes skill topics to follow typical systems administration responsibilities for tasks performed once installation completed. What's in it for you, at the end of this module, is identifying those skills you need to perform on the job with your Synergy implementation.
- Successful Skill performance is demonstrated at the end of this module by using the OneView interface and configuration documentation to perform the listed skills
- Upon completion of the module create a personal learning plan and module summary thinking about the following questions:
  - What are the new skills that were covered?
  - Who on the team will perform the skills in the module?
  - What questions do you need answers have?

Training objectives

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- Who on the team will perform the skills in the module?
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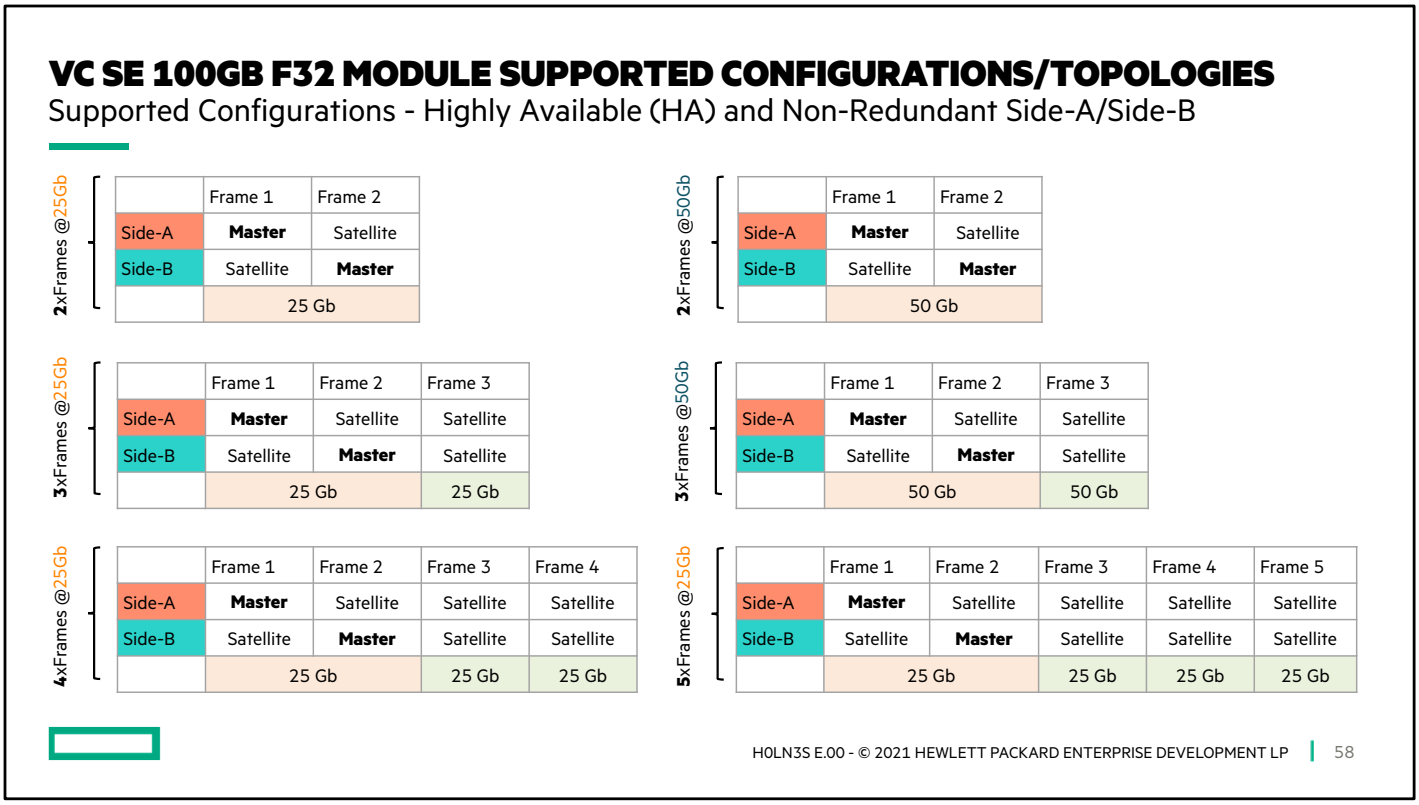
APPENDIX



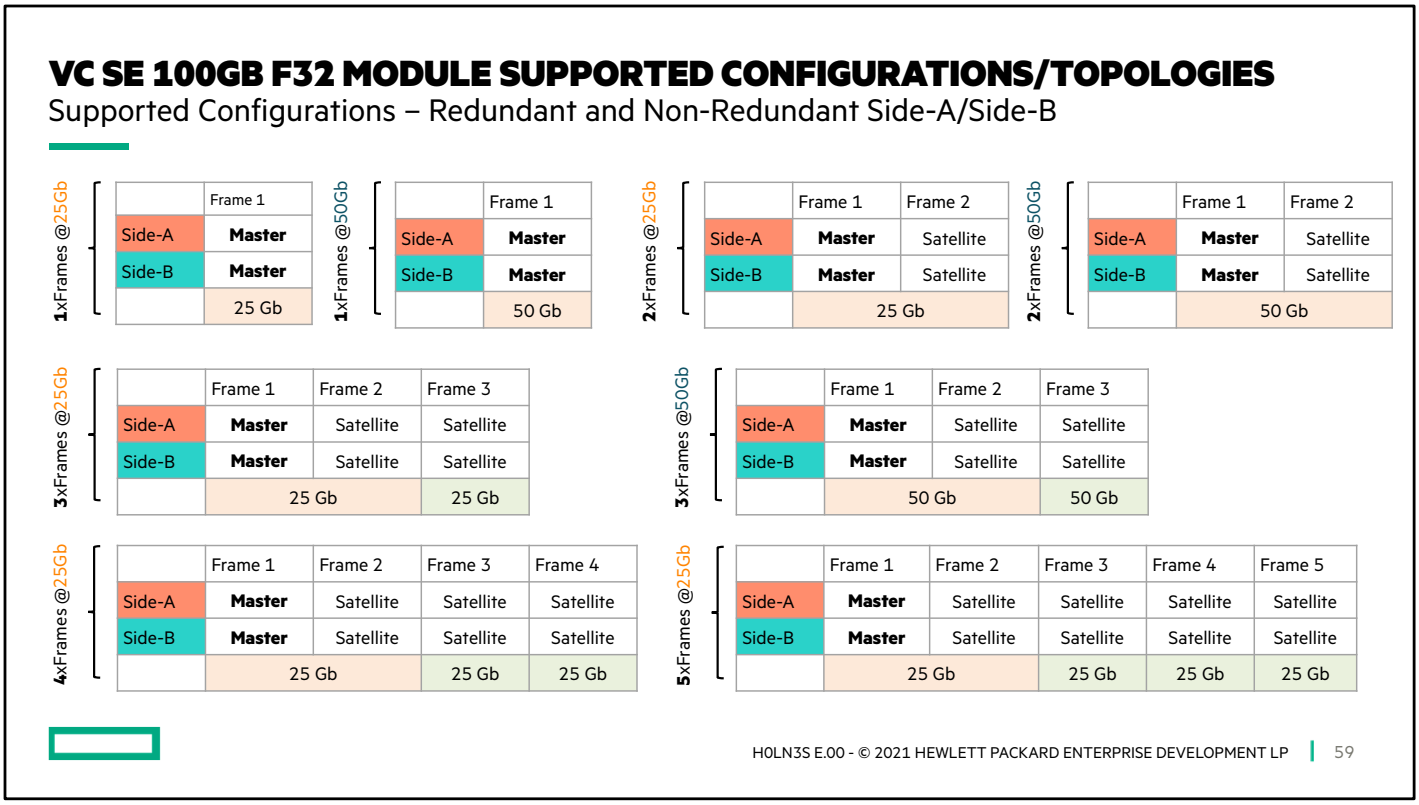
VC SE 100Gb F32 Module Supported Configurations/Topologies—Supported Configurations - Highly Available (HA) and Non-Redundant Side-A/Side-B

These tables show the supported master/satellite topologies with the next fabric generation.

The tables show for Highly Available (HA) configurations, where master modules are not in the same frames but aggregated together through the clustering technology, and Non-Redundant Side-A/Side-B configurations which look the same except there is no clustering enabled. Instead, there are separate logical interconnects for side-A and side-B which are then physically isolated.

2-Frame and 3-Frame topologies can support both 25 Gb/s and 50 Gb/s connectivity, while 4-Frame and 5-Frame configurations can use the 25 Gb/s connectivity only.

In this type of configurations, Frames 1 and 2 run at the same speed, since the two ports of the same compute module adapter must have the same speeds to not break the NIC teaming of the OS driver.



VC SE 100Gb F32 Module Supported Configurations/Topologies—Supported Configurations – Redundant and Non-Redundant Side-A/Side-B

These tables show the Redundant configurations, and Non-Redundant Side-A/Side-B with similar topology only without clustering and separate logical interconnects.

In the Redundant configurations there is no High Availability across the frames since both masters are in the same in the same frame but still have clustering redundancy between A and B sides in the same logical interconnect. However, it is not HA because if that frame fails both master modules fail. They can be also in a single frame.

VC SE 100GB F32 MODULE SUPPORTED CONFIGURATIONS/TOPOLOGIES

Not Supported – Mixed 25Gb/50Gb across Master/Satellite frames and Grow

3x Frame Topologies

Highly Available

	Frame 1	Frame 2	Frame 3
Side-A	**Master**	Satellite	Satellite
Side-B	Satellite	**Master**	Satellite
	25 Gb		50 Gb

	Frame 1	Frame 2	Frame 3
Side-A	**Master**	Satellite	Satellite
Side-B	Satellite	**Master**	Satellite
	50 Gb		25 Gb

Redundant

	Frame 1	Frame 2	Frame 3
Side-A	**Master**	Satellite	Satellite
Side-B	**Master**	Satellite	Satellite
	25 Gb		50 Gb

	Frame 1	Frame 2	Frame 3
Side-A	**Master**	Satellite	Satellite
Side-B	**Master**	Satellite	Satellite
	50 Gb	25 Gb	50 Gb

4x Frame Topologies

Highly Available

	Frame 1	Frame 2	Frame 3	Frame 4
Side-A	**Master**	Satellite	Satellite	Satellite
Side-B	Satellite	**Master**	Satellite	Satellite
	50 Gb		25 Gb	25 Gb

	Frame 1	Frame 2	Frame 3	Frame 4
Side-A	**Master**	Satellite	Satellite	Satellite
Side-B	Satellite	**Master**	Satellite	Satellite
	25 Gb		50 Gb	25 Gb

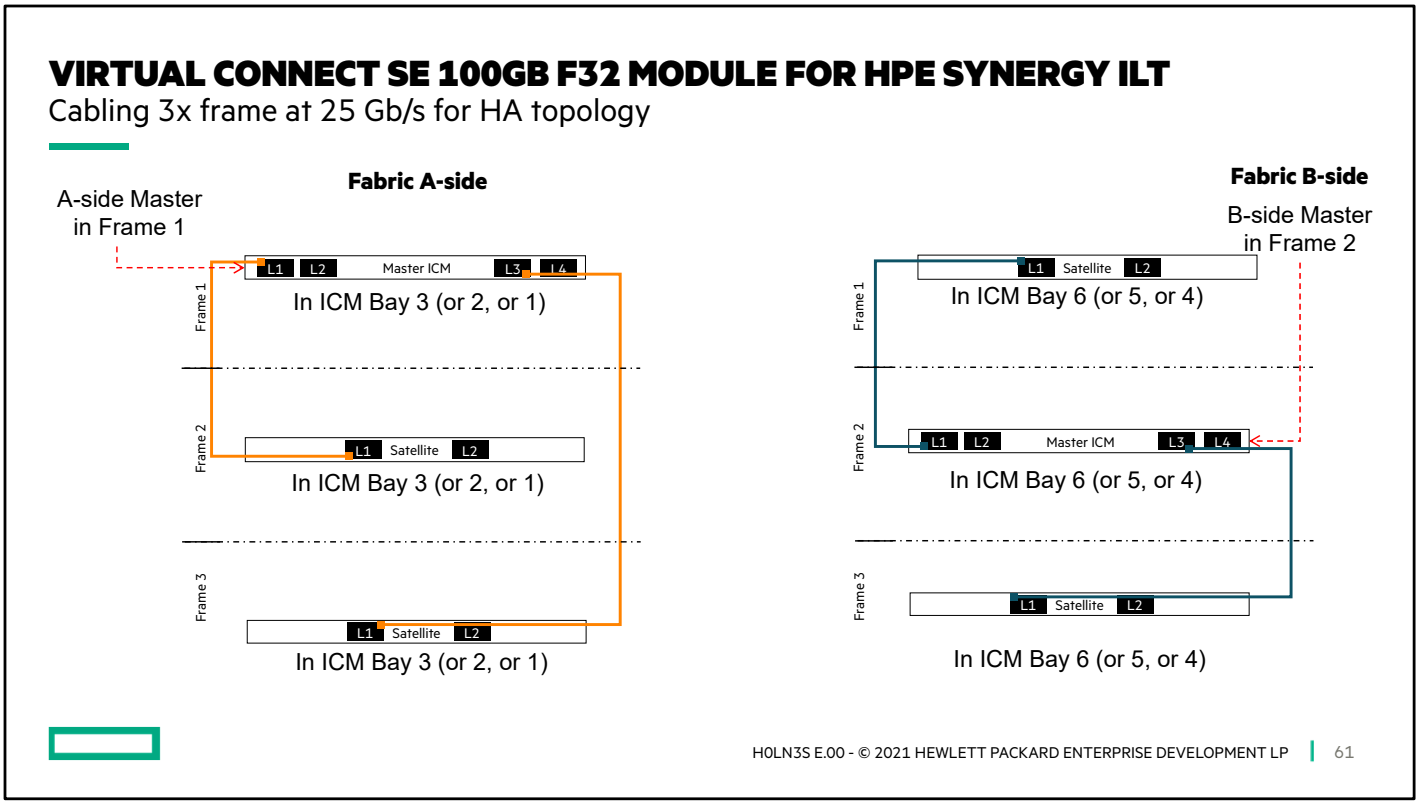
Redundant

	Frame 1	Frame 2	Frame 3	Frame 4
Side-A	**Master**	Satellite	Satellite	Satellite
Side-B	**Master**	Satellite	Satellite	Satellite
	50 Gb		25 Gb	25 Gb

	Frame 1	Frame 2	Frame 3	Frame 4
Side-A	**Master**	Satellite	Satellite	Satellite
Side-B	**Master**	Satellite	Satellite	Satellite
	50 Gb	25 Gb	50 Gb	25 Gb

VC SE 100Gb F32 Module Supported Configurations/Topologies—Not Supported – Mixed 25Gb/50Gb across Master/Satellite frames and Grow

Topologies with mixed 25 Gb/s and 50 Gb/s are not officially tested and supported at the moment of this release. HPE OneView will generate alerts in these cases.



Virtual Connect SE 100Gb F32 Module for HPE Synergy ILT—Cabling 3x frame at 25 Gb/s for HA topology

To cable three frames in a 25 Gb/s High-Availability ILT configuration you will connect:

For A-side fabric

- Port L1 on Master ICM in frame 1 (bay 3, or 2, or 1) links to L1 on 1st Satellite ICM in the frame 2 and the same bay position.
- Port L3 on Master ICM in frame 1 (bay 3, or 2, or 1) links to L1 on 2nd Satellite ICM in the frame 3 and the same bay position.
  For B-side fabric
- Port L1 on Master ICM in frame 2 (bay 6, or 5, or 4) links to L1 on 1st Satellite ICM in the frame 1 and the same bay position.
- Port L3 on Master ICM in frame 2 (bay 6, or 5, or 4) links to L1 on 2nd Satellite ICM in the frame 3 and the same bay position.

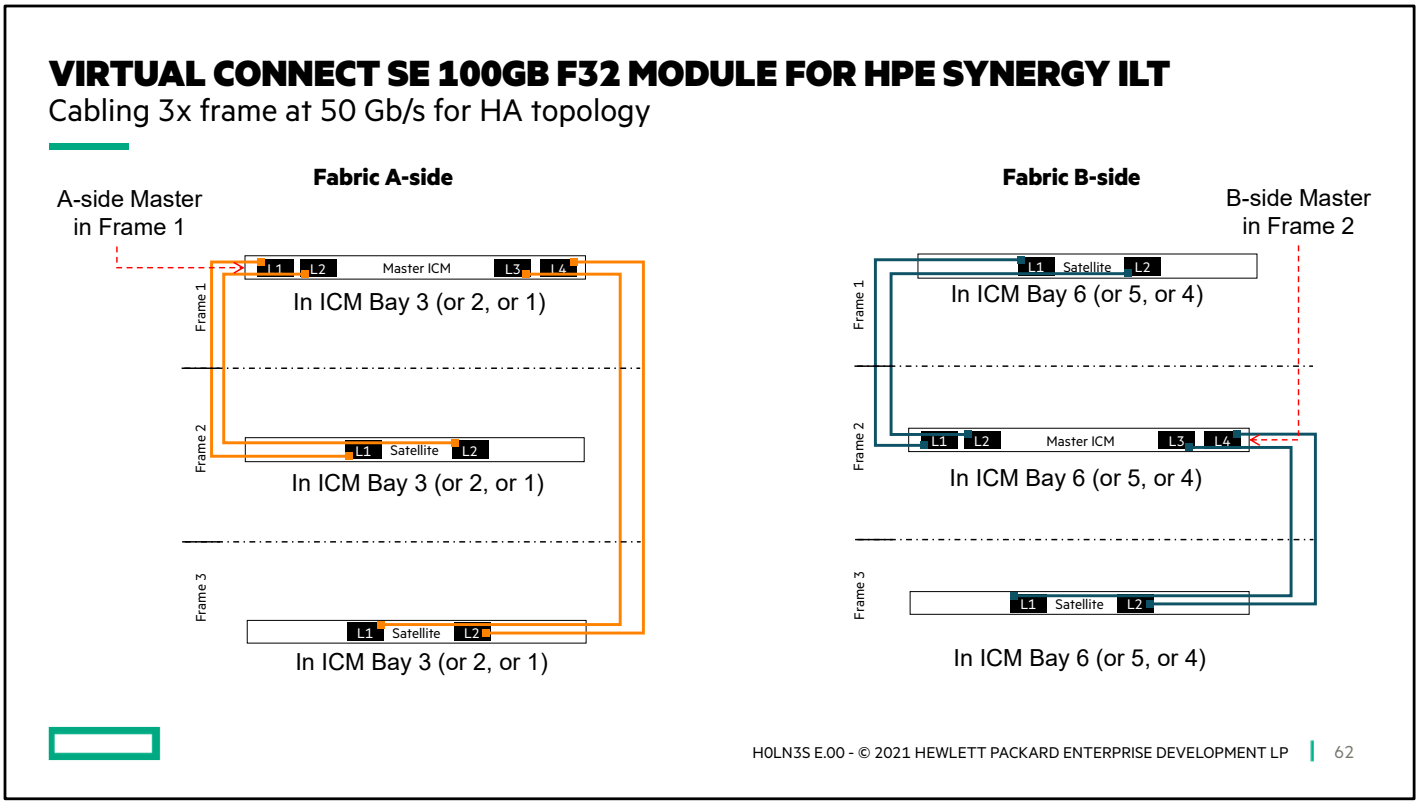
Important:

Notice a slight change in master port order compared to the previous VC SE 40 Gb/s F8 master topology.

For the second satellite you will use the master port L3, while in the previous generation master port L4 was used.

This change in numbering is because of the satellites “multi-personality”, since the same satellite type can be used for both speeds.

In that way, master module ports L1 and L2 always connect to frames 2 and 4, while ports L3 and L4 connect to frames 3 and 5.

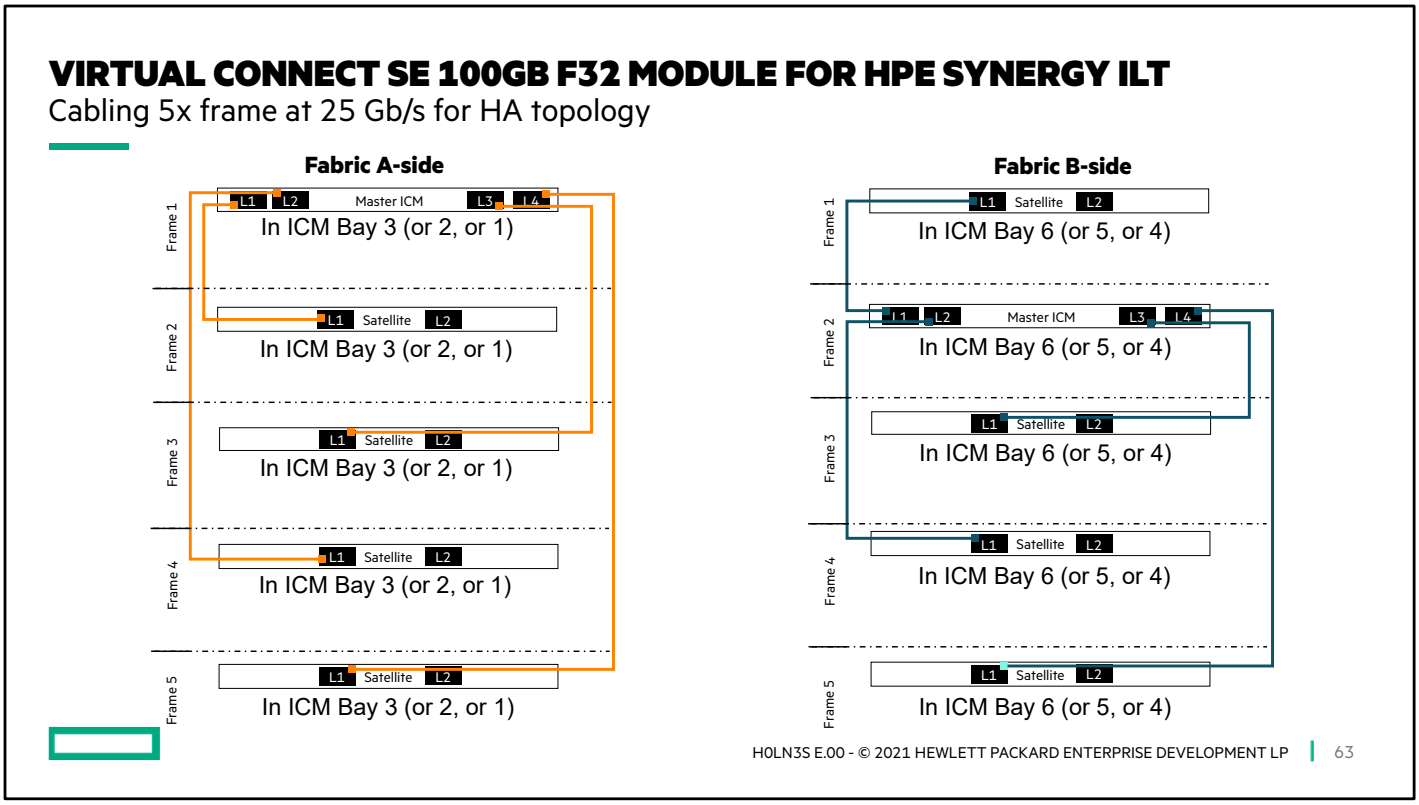


Virtual Connect SE 100Gb F32 Module for HPE Synergy ILT—Cabling 3x frame at 50 Gb/s for HA topology

To cable three frames in a 50 Gb/s High-Availability ILT configuration you will connect:

For A-side fabric

- Ports L1 and L2 on Master ICM in frame 1 (bay 3, or 2, or 1) link to L1 and L2 on 1st Satellite ICM in the frame 2 and the same bay position.
- Ports L3 and L4 on Master ICM in frame 1 (bay 3, or 2, or 1) link to L1 and L2 on 2nd Satellite ICM in the frame 3 and the same bay position.
  For B-side fabric
- Ports L1 and L2 on Master ICM in frame 2 (bay 6, or 5, or 4) link to L1 and L2 on 1st Satellite ICM in the frame 1 and the same bay position.
- Ports L3 and L4 on Master ICM in frame 2 (bay 6, or 5, or 4) link to L1 and L2 on 2nd Satellite ICM in the frame 3 and the same bay position.
- Notice that Master ICM ports 1 and 3 now connect to Satellites port 1, while Master ICM ports 2 and 4 connect to Satellites port 2.



Virtual Connect SE 100Gb F32 Module for HPE Synergy ILT—Cabling 5x frame at 25 Gb/s for HA topology

To cable five frames High-Availability ILT configuration, at only supported 25 Gb/s, you will connect:

For A-side fabric

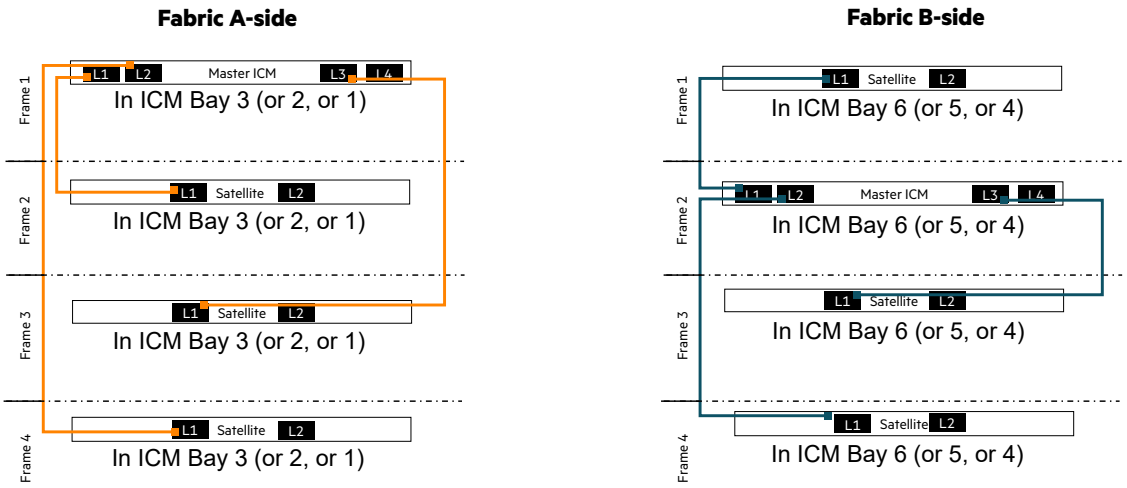
- Ports L1, L2, L3, and L4 on Master ICM in frame 1 (bay 3, or 2, or 1) link to L1 port on 1st, 3rd, 2nd, and 4th Satellite ICMs (in frames 2, 4, 3, and 5) respectively, in the same bay position.

For B-side fabric

- Ports L1, L2, L3, and L4 on Master ICM in frame 2 (bay 6, or 5, or 4) link to L1 port on 1st, 3rd, 2nd, and 4th Satellite ICMs (in frames 1, 4, 3, and 5) respectively, in the same bay position.
- Note: HPE OneView will perform the cabling detection and checking with an alert and guidance if something is not connected as required.

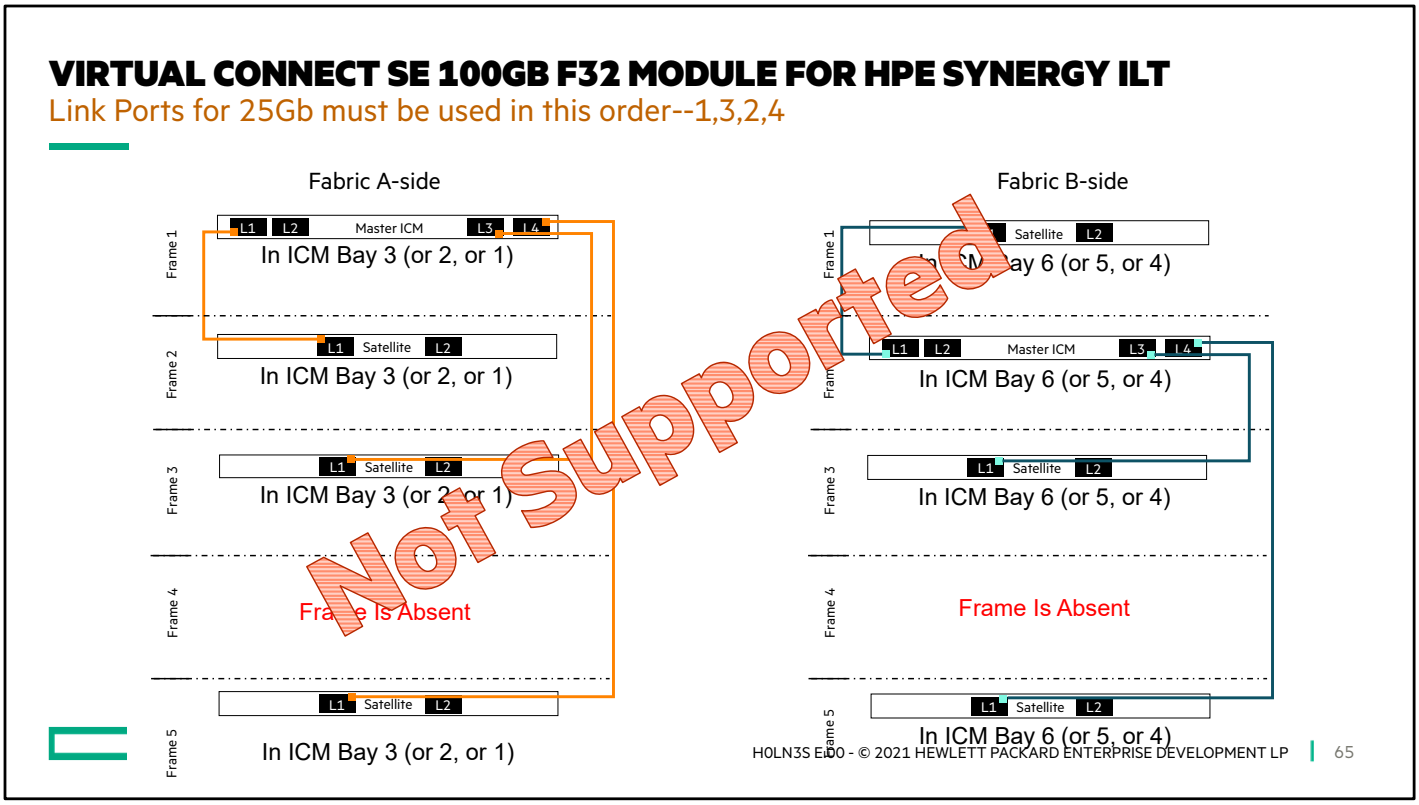
VIRTUAL CONNECT SE 100GB F32 MODULE FOR HPE SYNERGY ILT

Cabling 4x frame at 25 Gb/s for HA topology



Virtual Connect SE 100Gb F32 Module for HPE Synergy ILT—Cabling 4x frame at 25 Gb/s for HA topology

This is a supported 4-frame ILT topology, with Master ICM port L4 reserved for the 5th frame grow, when needed.



Virtual Connect SE 100Gb F32 Module for HPE Synergy ILT—Cabling 4x frame at 25 Gb/s for HA topology

Notice that numbering must be followed, so you cannot add 5th Frame (and connect Satellite to Master port L4) if 4th Frame is missing.

THANK YOU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H0LN3S E.00
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HPE SYNERGY STORAGE ADMINISTRATION SKILLS

Topic areas

- SAN Configuration
- Storage Management
- SAN Manager
- Networks
- Zoning
- Fabric
- Composable Arrays
- Volumes and Volume Templates
- Storage Options
  - Storage Array
  - D3940

TRAINING OBJECTIVES

- Upon completion of the module apply HPE Synergy Storage Administration skills to perform tasks in lab to validate a Synergy deployment and initial hardware setup.
- Course review questions will provide you an opportunity check your knowledge of skill and task: Facts, Terms, Definitions and Concepts.
- The course modular structure organizes skill topics to follow typical systems administration responsibilities for tasks performed once installation completed. What's in it for you, at the end of this module, is identifying those skills you need to perform on the job with your Synergy implementation.
- Successful Skill performance is demonstrated at the end of this module by using the OneView interface and configuration documentation to perform the listed skills
- Upon completion of the module create a personal learning plan and module summary thinking about the following questions:
  - What are the new skills that were covered?
  - Who on the team will perform the skills in the module?
  - What questions do you need answers?

Training objectives

Upon completion of the module apply HPE Synergy Storage Administration skills to perform tasks in lab to validate a Synergy deployment and initial hardware setup.

Course review questions will provide you an opportunity check your knowledge of skill and task: Facts, Terms, Definitions and Concepts.

The course modular structure organizes skill topics to follow typical systems administration responsibilities for tasks performed once installation completed. What's in it for you, at the end of this module, is identifying those skills you need to perform on the job with your Synergy implementation.

Successful Skill performance is demonstrated at the end of this module by using the OneView interface and configuration documentation to perform the listed skills

Upon completion of the module create a personal learning plan and module summary thinking about the following questions:

- What are the new skills that were covered?
- Who on the team will perform the skills in the module?
- What questions do you need answers?

SAN STORAGE

HPE Synergy 12000 Frame

HPE VC SE 32 GB FC MODULE AND BROCADE 32GB FC SAN SWITCH

Composable and Switched FC Fabric Innovations

HPE Synergy Virtual Connect SE 32Gb FC Module

Brocade 32Gb FC SAN Switch

16Gb and 32Gb HPE Fibre Channel Mezzanine cards for HPE Synergy are supported

- HPE Synergy 3530C 16Gb Fibre Channel Host Bus Adapter
- HPE Synergy 3830C 16Gb Fibre Channel Host Bus Adapter
- HPE Synergy 5830C 32Gb Fibre Channel Host Bus Adapter
- HPE Synergy 5330C 32Gb Fibre Channel Host Bus Adapter

HPE VC SE 32 Gb FC Module and Brocade 32Gb FC SAN Switch—Composable and Switched FC Fabric Innovations

Composable and Traditional Fiber Channel interconnect modules are shown, with Gen6 FC support for Breakthrough Application Performance and Operational Stability.

New full-featured, NVMe-OF ready adapters are shipping for new fabrics:

- 24x 16/32Gb capable downlink ports
- 8x 8/16/32Gb SFP+ capable uplink ports
- 2x 8/16/32Gb QSFP+ capable uplink ports
- Total usable uplinks 12
- Support for Brocade FOS 8.1.x

HPE SYNERGY VC SE 32GB FC MODULE

Best in class Data Center performance and security

Native 24p Fibre Channel Virtual Connect
module for Synergy Composable Servers

2 Quad Ports 8/16/32

8 SFP+ Ports 8/16/32

Synergy VC SE 32G FC (876259-B21)
24-ports

Supported with:

–Synergy 480/660 Gen10 Servers

–3530C/3830C 16Gb FC HBA Mezzanine Adapters

–5330C/5830C 32Gb FC HBA Mezzanine Adapters

Ideal for:

- Enterprise, private/public cloud customers to meet growing deployment of all-flash storage arrays for high performance workloads
- Transition to next generation (Gen6) 32Gbps technology providing faster flash, better virtualization and lossless and reliable networking.
- Compatible with both 16Gbps & 32Gbps Synergy FC Adapters

Key Features:

- Up to 384Gbps of Data Throughput
- Fully integrated with OneView. Uses OV for provisioning and monitoring
- NPIV connectivity for seamless interoperability with any SAN Fabric
- Compatible with Brocade Hardware-based Trunking Technology
- Advanced Security features (FIPS, Trusted Root, Certificate Management, etc.)
- Port Mirroring, enhanced mapping capabilities, advanced telemetry
- **16 external 8/16/32-Gbps ports (Max 12 usable)**

HPE Synergy VC SE 32Gb FC Module—Best in class Data Center performance and security

- HPE Virtual Connect SE 32Gb FC module is a next generation composable Virtual Connect Fibre Channel interconnect based on 32Gb technology. Ideal for enterprise and private/public cloud customers, this interconnect will meet growing deployment of all-flash storage arrays for high performance workloads. It is well suited for the environments that rely on virtualization with the demands of lossless and reliable networking. Some of the key features include up to 384Gbps of data throughput, NPIV connectivity for seamless interoperability with any SAN Fabric vendor gear, and native compatibility with Brocade's hardware-based trunking technology. In addition, this interconnect is designed for security and advanced troubleshooting.

HPE SYNERGY WITH BROCADE 32GB FC SAN SWITCHES

Industry Leading Data IO Performance - Push limits of All Flash Array Storage

Not Available with Cisco UCS

BROADCOM

Native 28p Fibre Channel Switch modules for Synergy Composable Servers

20-port w. PP+ (Q2E57A)

20-port (Q2E56A)

12-port (Q2E55A)

Supported with:

- Synergy 480/620/660/680 Gen9 Servers
- Synergy 480/660 Gen10 Servers
- 5330C/3330C/5830C/3830C FC HBA Mezzanine Adapters

Ideal for:

- Enterprise, private/public cloud to meet growing deployment of all-flash storage arrays for workloads. NVMe_FC Ready.
- Dramatically increase the VM density on Gen9 or Gen10 blade servers while providing deep insights on individual VM performance through VM Insight.
- Transition to next generation 32Gbps (Gen6) FC technology while backward compatibility to 8 & 16Gbps SANs and forward compatible to future speeds.
- Three specialized models to best fit into any customer SAN environment.
- Providing low-latency, fast IO, high virtualization on a lossless reliable network.

Key Features:

- Up to 28 ports. Scalable from 12 to 28 ports using Ports-on-Demand license
- Up to 896Gb Switching Bandwidth supporting 32Gbps, 16Gbps, & 8Gbps SANs
- Dual function (Full function native Switch mode or NPIV Access Gateway mode)
- QSFP connectivity for lower power, lower cost, and more reliable connection
- Deep Virtualization monitoring capabilities with Fabric Insight and VM Insight

HPE SYNERGY BROCADE 32GB FC MODULE

BROADCOM

Cost efficient, easy to manage, resilient fabric in a scalable architecture

2 Quad Ports 8/16/32

8 SFP+ Ports 8/16/32

Brocade 32Gb FC SAN Switch Module for HPE Synergy

- Powered by Brocade Gen6 Switching ASIC purpose built for edge and integrated applications
- Up to 24* internal server facing copper ports auto negotiate to 32G or 16G
- Up to 16 external ports running at 32Gb or 16Gb or 8Gb configured in 8 SFP+ ports and 2 high density QSFP ports
- Custom designed for HPE Synergy Frame
  - "Zero footprint" hot-pluggable modular design
  - Powered & cooled by shared infrastructure
  - Dual mode Access Gateway or Full Fabric
  - Managed via CANMIC & Oneview
  - Manageable via WebTools, APIs and CLI
- FOS v8.2.0_gft to merge into FOS 9.0

Synergy fabric innovation centers around a disaggregated rack-scale architecture that reduces complexity, increases performance, simplifies operations and improves availability.

Transcription:

We are introducing what we call a rack scaled topology or architecture. And it is very cost-efficient, easy to manage, and resilient fabrics architecture that allows you to build out fabrics at the rack level or even multi-rack level. It allows you to reduce complexity with virtual connect or flex 10, flex 20, all those technologies over time, we have been continuously driving at reducing cables simplifying the devices that you have to deal with in your network edge. We are continuing to do that and we are giving you a very easy way to improve our performance by having a fabric for a full rack that is completely flat. And allows you to have great east-west traffic on low latency within that fabric environment and rack environment. With this architecture, we will deliver on simplifying operations from a number of aspects not only from a firmware management perspective but also from this perspective of scaling. If I want to add more frames, we are going to make it very easy to add those into the fabric in a non-disruptive way. And, how many of you all today have virtual connect in your environment? Okay. And I'm guessing that some of you have been looking for the ability to aggregate the uplinks being able to have multi-module link aggregation so that you get fatter pipes and better resiliency on the uplinks to your Cisco or HP networking whatever network that multi-module lack capability will be delivering with Synergy so that gives you not only resilient story but it gives you the ability to have a better performance.

BROCADE 32GB VS 16GB FIBRE CHANNEL ICM FOR HPE SYNERGY

Higher VM Densities, NVMe-oF Ready, Higher ROI

BROADCOM

	32Gb FC Module	16Gb FC Module
Pre- Bundled Transceivers (SFP+)	4 or 2 32G SFP+	No
NVMe-oF Capable/Ready	Yes	Yes
VM Density (VMs per server)	Very high	Good
VM and IO Insight Software for deeper insights/analytics	Yes	No
Aggregate Throughput	384 Gbps	192 Gbps
Switching Bandwidth	896 Gbps	576 Gbps
compatibility	8/16/32Gb and future Gen7/Gen8	8/16 Gb
Power Consumption (typical)	50W	95W

DIRECT ATTACHED STORAGE (FLAT SAN)

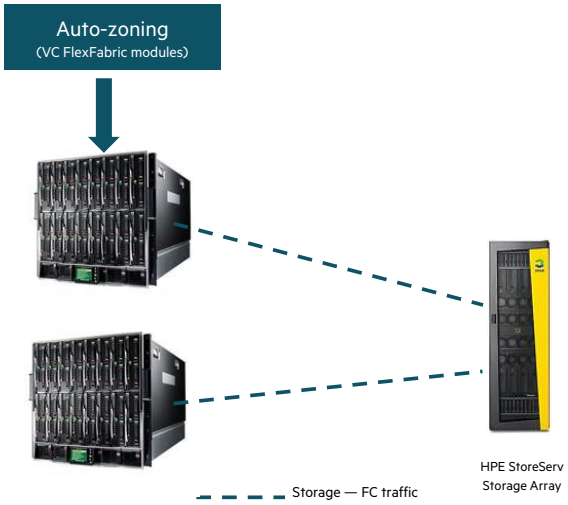
ATTACH 3PAR, NIMBLE AND PRIMERA FC VOLUMES DIRECTLY TO SERVERS

Performed outside HPE OneView:

1. Configure storage array
2. Cable Each Master Module to a separate storage controller

Performed from HPE OneView:

1. Import Storage System and Storage pools
2. Create FC Direct Attach network
3. Create FC uplink set containing the FC network into your enclosure Logical Interconnect Group.
4. Apply configuration to Logical Interconnect(s)
5. Create server profile with FC connections to the FC network
   - Optional for data volumes: From Server Profile SAN Storage section, create/attach volumes to the server
6. Assign server profile to a server with supported CNA adapter



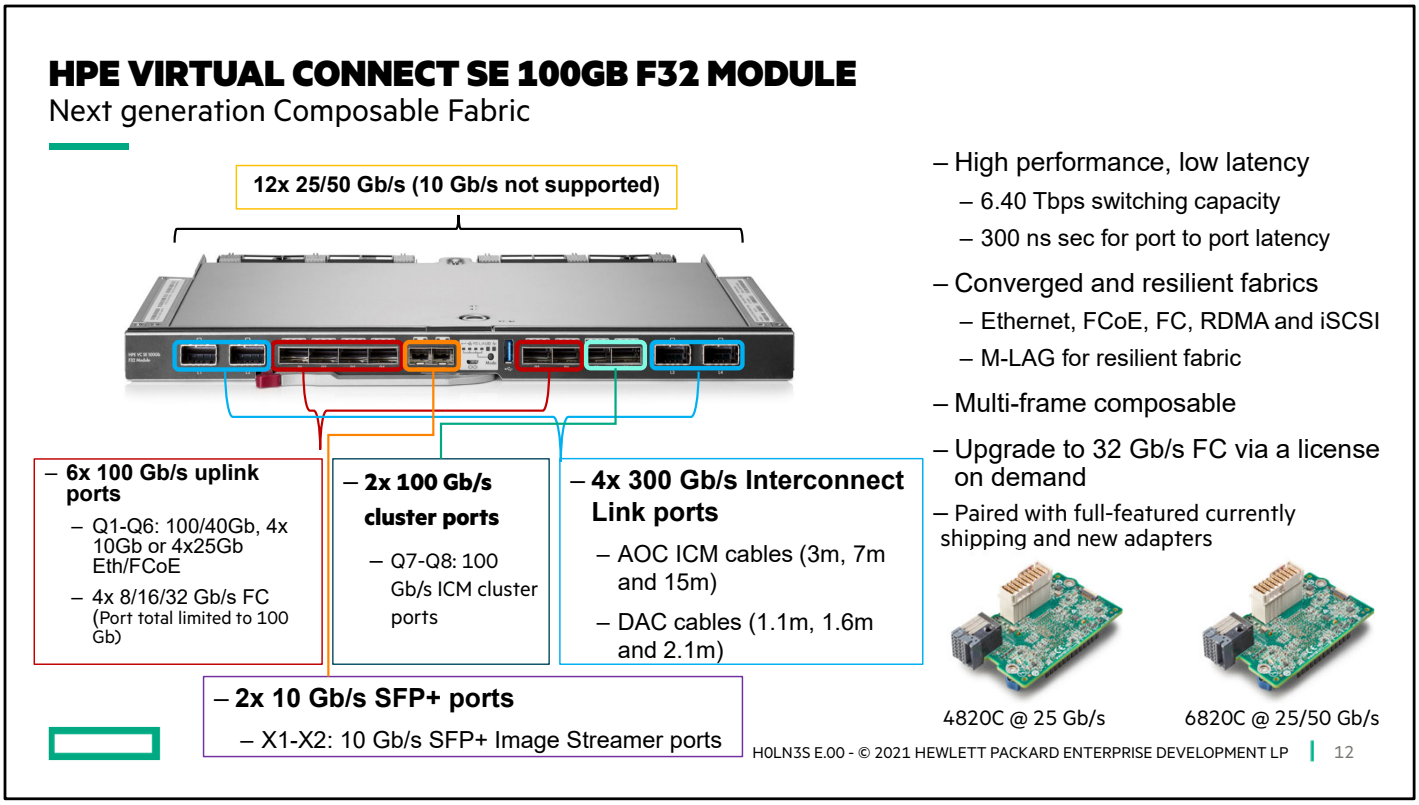
Attach 3PAR, Nimble and Primera volumes directly to servers

- These are the steps to attach 3PAR. Nimble and Primera volumes to servers over a Direct Attach SAN:

Performed outside HPE OneView:

- Configure storage array
- Cable Each Master module to a separate storage controller

- Performed from HPE OneView:
  - Import Storage System and Storage pools
  - Create FC Direct Attach network
  - Create FC uplink set containing the FC network into your enclosure Logical Interconnect Group.
  - Apply configuration to Logical Interconnect(s)
  - Create server profile with FC connections to the FC network
    - Optional for data volumes: From Server Profile SAN Storage section, create/attach volumes to the server
  - Assign server profile to a server with supported CNA adapter



HPE Virtual Connect SE 100Gb F32 Module—Next generation Composable Fabric

HPE Virtual Connect SE 100Gb F32 Module has 12 downlink ports to compute modules operating on 25 Gb/s or 50 Gb/s.

(Notice that 10 Gb/s is not supported, so you must provide the appropriate mezzanine adapters in the servers. In 50 Gb/s mode, you can still establish the 25 Gb/s connection.)

On the face plate, this module has 6x 100 Gb/s QSFP uplink ports at 100 Gb/s or 40 Gb/s, which can be split into 4 x 10 Gb/s or 4 x 25 Gb/s connections for Ethernet or FCoE. Also, Fiber Channel connections are supported as 4 x 8 Gb/s or 4 x 16 Gb/s or 4 x 32 Gb/s. (Notice that 4 x 32 Gb/s exceeds the port capacity of 100 Gb/s, so the connections can be established at 32 Gb/s at physical layer, but the total throughput is limited to 100 Gb/s per port, i.e. 25 Gb/s per connection.)

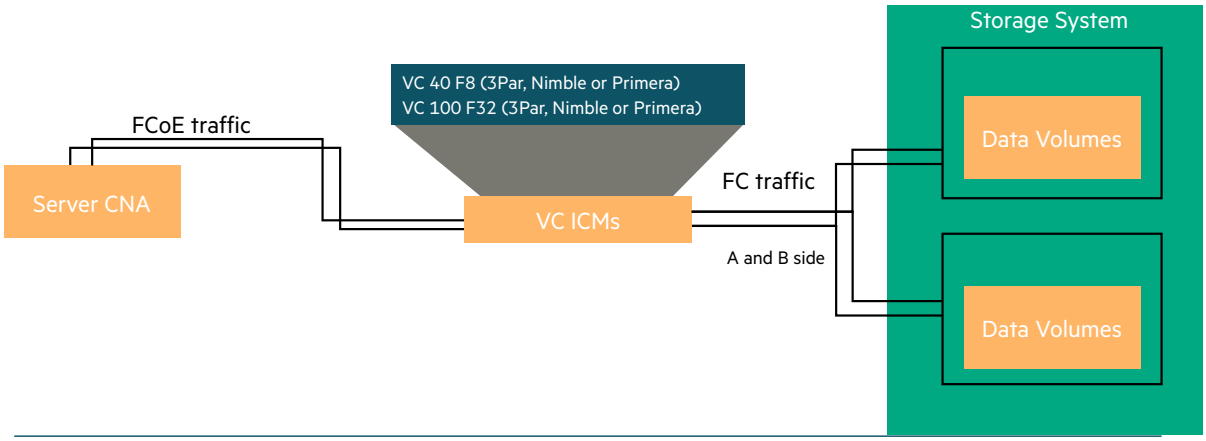
There are two cluster ports Q7 and Q8, operating at 100 Gb/s used for clustering between the master modules in the same logical interconnect.

Two ports on the left-hand side and two ports on the right-hand side are interconnect link ports to connect the satellite frames, supporting 300 Gb/s (12 x 25 Gb/s) throughput each, connecting to 3 frames at 50 Gb/s, or up to 5 frames at 25 Gb/s.

Now, there are also two 10 Gb/s SFP+ dedicated ports for the Image Streamer in the middle. You can cable them to the Frame Link Modules which are connected to the Image Streamer appliance. So, all the uplink ports can be used for uplink connectivity.

STORAGE CONFIGURATION

Virtual Connect Modules directly attached to 3PAR, Nimble or Primera



NOTE: Using VC modules to transport FC traffic requires a CNA in the server. In Direct Attach scenarios, VC 40 F8 or 100 F32 modules automate zoning. Refer to OneView Support Matrix for details.

Virtual Connect Modules directly attached to 3PAR, Nimble or Primera (DAS)

- This is called Direct Attach Storage, aka DAS, and also known as Flat SAN.
  - This configuration is used when connecting Virtual ConnectConverged Modules directly to a 3PAR, Nimble or Primera Storage System.
  - In this scenario, Virtual Connect Converged Modules connect directly to a storage system, and a CNA is required on the server.

- The configuration is simplified from the datacenter perspective, since there is no need to use SAN switches.
  - Like before, the VC converged modules will pass traffic from multiple servers onto the same port if desired, but the VC converged Modules will perform a lightweight zoning for the server ports to get connected to SAN.
  - There is no additional configuration to be made to configure zoning – it is all automated from the VC converged modules.

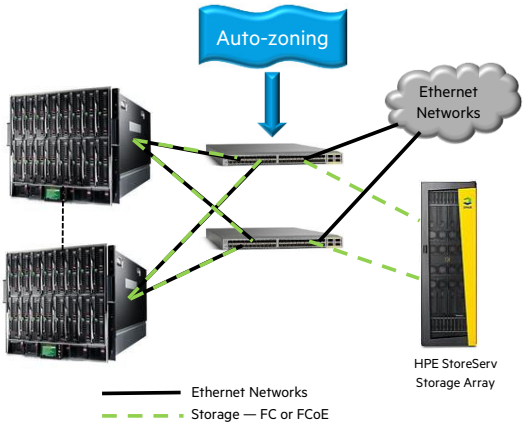
NOTE: Using VC converged modules to transport FC traffic requires a CNA in the server. In Direct Attach scenarios, VC converged modules automate zoning. Refer to OneView Support Matrix for details. Primera can only use HPE Virtual ConnectFlexFabric -20/40 F8 interconnect modules for c-Class.

SAN CONFIGURATION

HPE Synergy 12000 Frame

HPE ONEVIEW SAN CONVERGENCE BEYOND THE ENCLOSURE

FC or FCoE SAN zoning automation for increased Ethernet convergence



- SAN fabric support
  - FC SANs
  - FC + FCoE Hybrid SANs
  - Pure End-to-End FCoE SANs
  - Direct-Attach VC 40 F8 and 100 F32-to-storage
- When available, FCoE fabric attach (SAN switch) connections connect to storage devices with automated zoning.
- SANs can be associated with one or more FCoE networks.

IMPORTANT: Direct attach FCoE — from Virtual Connect to a 3PAR or Primera FCoE port is not supported by OneView

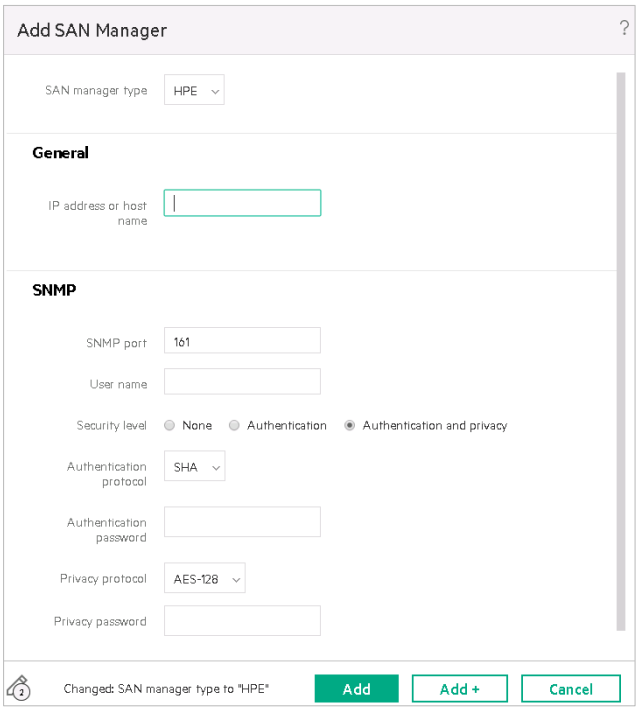
HPE OneView SAN convergence beyond the enclosure

FC or FCoE SAN zoning automation for increased Ethernet convergence

– OneView automation enables an IT generalist to define and provision storage volumes, automatically zone the SAN as part of the provisioning process, and attach the volumes to server profiles. Storage automation is supported for Fibre Channel SANs as well as direct attach architecture where HPE 3PAR StoreServ Storage systems are connected directly to an enclosure via Fibre Channel.

ADDING SAN MANAGERS

- SAN Managers provide the ability to automate Fibre Channel switch configuration (zoning) via OneView, and to assist with validating the expected storage connectivity model when importing a storage system.
- Supported SAN managers include:
  - Brocade Network Advisor
  - HPE FlexFabric 5700, 5900, 7900, and 12000 switches
  - Cisco Nexus 5000/6000 families, Cisco MDS family



Configuring SAN Managers

- OneView supports the automated volume provisioning and fabric zoning of 3PAR storage systems. To provide additional automated 3PAR StoreServ automation, a SAN Manager must be installed.

Best Practice: SAN managers

- Always use a single switch to perform all zoning operations, regardless of the management software you use to perform the zoning.
- Before adding a SAN Manager and importing the storage, initialize one or more 3PAR storage systems that have existing storage pools, and any Virtual Domains configured.

CAUTION:

- Performing zone operations from multiple switches without executing a full zone set distribution might result in the loss of zoning data.

Notes:

- Switch vendors support fabric world wide name (FWWN) or node port world wide name (PWWN) zone memberships. OneView only uses PWWN for zone membership.
- When connecting to a StoreServ system, OneView requires a general account with super privileges because the 3PAR requires these privileges in order to manage hosts/vLUNs/exports even within a domain.

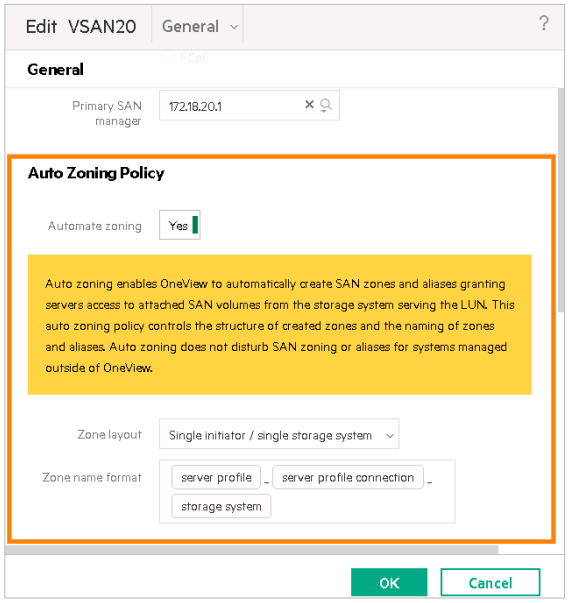
Adding a SAN manager

- SAN managers are a resource in HPE OneView that represent a connection to an external entity through which SANs are discovered and managed. The external entity can be vendor-specific management software or a physical switch.
- SANs are created outside of HPE OneView in the SAN manager vendor's management interface. SANs can be discovered and managed in HPE OneView using the SAN manager resource. The imported SAN manager allows HPE OneView to automate zoning (connections between FC endpoints).
  - The supported SAN managers include Brocade Network Advisor, some HPE switches, and Cisco Nexus 5000/6000/MDS families.
- NOTE: Check the Support Matrix document for exact models.
- To add a SAN manager, fill in the following:
  - IP address or host name of the SAN manager instance
  - Port for the SAN manager instance (BNA default port is 5989; HPE and Cisco use port 161 and authentication levels)
  - NOTE: Check whether SSL is being used (BNA).
  - User name and password of the SAN manager instance
- Upon a successful addition of a SAN manager:
  - The SAN manager is added in the ready state
  - The SAN manager attributes are listed
  - All managed SANs discovered by that SAN manager are listed
- This is the Add SAN Manager screen, with an entry in the SAN manager type field. After selecting the SAN manager type, enter the IP address and the credentials that are required for the switch. Then, enter the SNMP credentials.

HPE ONEVIEW ZONING

The zoning policy configuration is set within the managed SAN

- Zones are structured and named according to the SAN's zoning policy.
- Edit the SAN to set the policy for all zones and aliases created on the SAN.
- You control the "format" of names for zones and aliases there.
- The zone policy format strings let you instruct OneView to use a combination of fixed characters and "variables" where OneView will substitute names, such as the server profile name, etc. into the name when constructing a unique zone name.



HPE OneView zoning

Zoning policy

- OneView performs zoning only when you add a connection to a server profile and attach a SAN storage volume to it. When you do this, OneView will determine if the current zoning allows connectivity. If current zoning does not allow connectivity, OneView will create the necessary zoning based on the specified zoning policy.

- Storage provisioning and management with automated zoning is available. Storage devices connect to the enclosures using the following:
  - Fibre Channel fabric attach (SAN switch) connections
  - Fibre Channel over Ethernet (FCoE) fabric attach (SAN switch) connections
  - Fibre Channel direct attach (flat SAN) connections
  - iSCSI connections

Zoning best practice:

- Best practice for zoning is to limit the target ports, so you don't overload it/them with initiator logins. Port Groups are part of the storage management features and control how initiators are zoned to individual ports based on the port group configuration of the storage system host ports.
- Automated SAN zoning will maintain zones on the SAN to configure the server initiator with the configured array target ports over the lifetime of the server volume attachments.
- OneView includes the option to maintain not only zones but also aliases for the server and array endpoints within the SAN zone set. This is enabled by editing the SAN properties.

AUTOMATED SAN ZONING

Automatic SAN zoning requires Virtual Connect modules and managed storage

- *OneView manages zoning only when it manages storage volumes as well, which requires OneView managed storage.*
- Automated zoning enables OneView to automatically create, edit, and delete zones on a zoned SAN when you attach storage volumes to servers through a volume attachment in a server profile.
- **Yes** zoning is automated.
  - By default, OneView takes full control of the zone naming and contents based on the zoning policy for the SAN. Use automated zoning when you want OneView to configure new zones for volume attachments to server profiles.
  - Existing zones are not modified unless the SAN storage attributes defined in a server profile change.
- **No** zoning is not modified by OneView.
  - You must manually manage zoning.

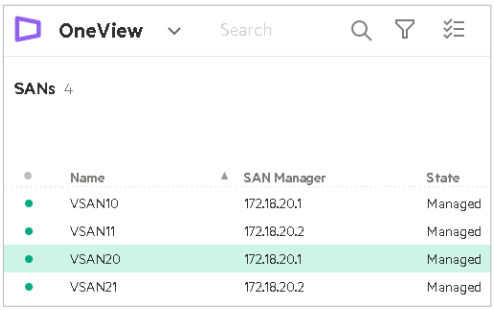
Automated SAN zoning

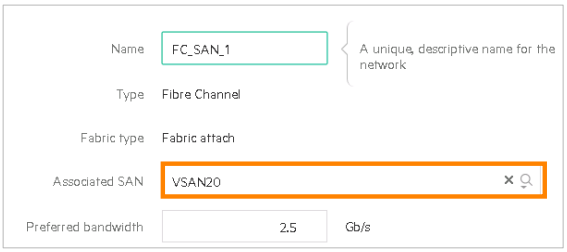
Automatic SAN zoning requires Virtual Connect modules and managed storage.

- HPE OneView automatically manages SAN zoning through server profile volume attachments.
  - Automatic zoning requires that OneView manages the SAN connectivity of the servers, and that management requires Virtual Connect modules and 3PAR storage.
  - In OneView, you can specify the name format of the zones and aliases that will be created when you associate a storage volume to a server profile via a volume attachment. By specifying zone name and alias formats using text strings and server profile objects, you can generate names that are meaningful and conform with your naming conventions.

ASSOCIATING A SAN WITH A NETWORK ENABLES AUTO-ZONING

- Successful association of the SAN with a network:
  - Displays the network in the Managed SANs list
  - Displays the association in the Map View
- To enable zoning automation, associate a SAN with a network by creating or editing a network and entering the following:
  - Name of the network
  - Choose network type as Fibre Channel
  - Choose Fabric type as Fabric attach
  - Pick a SAN from the Associate with SAN drop down
- Association results in the SAN state being changed from Discovered to Managed



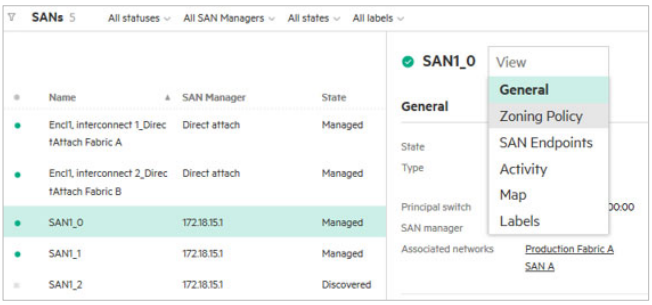


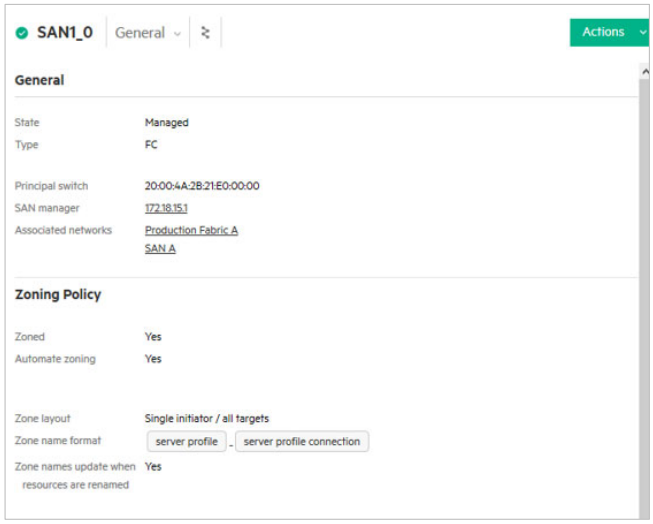
Associating a SAN with a network enables auto-zoning

- Associating a SAN with a network enables zoning automation on the network as well as end-to-end connectivity verification. It also assists with validating the expected storage connectivity model when importing a storage system.
- Associate a SAN with a network by creating a network and filling in the following:
  - Name of the network
  - Choose network Type as Fibre Channel
  - Choose Fabric type as Fabric attach
  - Pick a SAN from the Associate with SAN drop down
- Successful association of SAN with a network
  - Displays the network in the Managed SANs list
  - Displays the association in the Map View

SAN RESOURCES

- The SAN Overview consolidates:
  - Discovered and managed SANs
  - Zoning policy
  - SAN endpoints table
  - Activity view
  - Map view





SAN resources

- A managed SAN on a SAN manager can be associated with one or more Fibre Channel (FC) and/or one or more Fibre Channel over Ethernet (FCoE) networks.

When you select the action to "Reapply configuration" to the SAN, you will see a warning message explaining that configuration will regenerate all managed zoning using the current SAN zoning policy settings.

You can also get the estimated time to completion.

When you click “Yes, reapply”, HPE OneView re-edits all SAN services into the zoneset using the current SAN zoning policy.

Reapplying configuration to the SAN is non-disruptive to storage access by running servers. This feature is supported by following SAN Managers: FOS, Cisco, BNA, and HPE.

Furthermore:

- "Reapply configuration" will reconfigure managed zones/aliases. It will not touch unmanaged zones/aliases configured on the SAN.

- "Reapply configuration" is ONLY performed on managed SANs with SAN zoning policy property Automate zoning=True.

-The user must have storage or infrastructure administrator privileges to execute "Reapply configuration”.

- The ”Reapply Configuration" action is greyed out on the Actions menu when:
  - SAN is not Managed
  - SAN zoning policy Automate zoning=False
  - The user does not have storage administration privileges

SAN ZONE SETS

- A zone set is a set of zones you can configure by activating a zone set from the SAN manager.
- OneView modifies the active zone set when performing zoning or alias configuration.
  - Zone sets are not exposed in OneView.
- Active zone set: — The zone set currently enforced by the fabric.
- Inactive zone set: — The inactive zone sets for the SAN. Only one zone set can be activate at a time.

SAN manager	Term for Inactive zone set
HPE	Standby zone set
Cisco	Local zone set
Brocade (BNA)	Zone configurations

SAN zone sets

Best Practice: SAN managers

- Always use the full zone set distribution commands and settings when making zone changes. HPE OneView does this on the SAN manager and SAN through which it is managing by default.

Zone naming and aliases

- OneView uses rules-based zone naming to give you full control of your zone names. You can use zone naming to incorporate your current naming structure, which HPE OneView will use during the automated zoning process.
- OneView enables you to create aliases for initiators, targets, and target groups, which HPE OneView displays in place of their WWPNs.

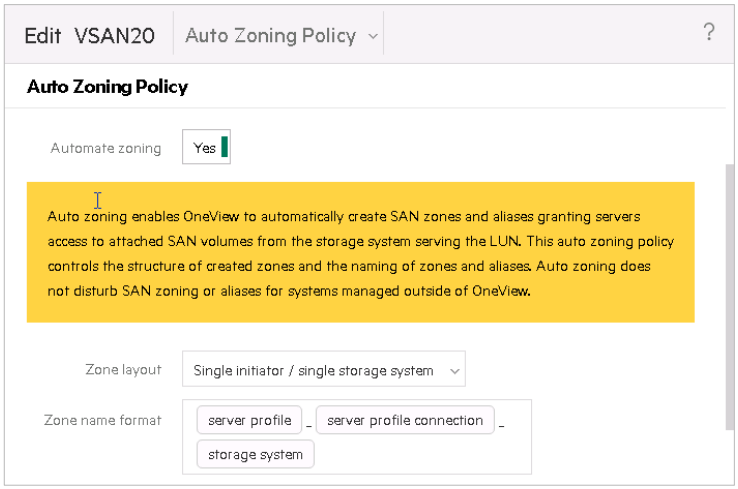
Manage pre-existing aliases

- ON — when zoning configuration changes for managed endpoints (i.e. managed server initiators OR managed 3PAR ports), if those WWNs already have aliases for them in the SAN zone set, the aliases will be renamed according to the “Initiator alias format” or “Target alias format” in the SAN zoning policy, and will be deleted when the last zone referencing them is deleted by OneView.
  - As the help text indicates, it is only *managed* endpoint aliases which become managed.
  - Foreign endpoint aliases are unaffected.
- OFF — existing aliases will not be renamed according to the “Initiator alias format” or “Target alias format” in the SAN policy and will not be deleted when the last zone referencing them is deleted by OneView.

HPE ONEVIEW SAN POLICY IS EDITABLE PER SAN

Adapting OneView Auto-zoning to data center SAN practices

- Zone structure policy
  - Single initiator / all targets
  - Single initiator / single storage system
  - single initiator/single target
- Optional alias generation
  - Alias format control
  - Alias names created from infrastructure names



Notes:

- **Single initiator / single target** is best practice.
- OneView will configure zones with a single server initiator and single array target per zone structure.

HPE OneView SAN policy is editable per SAN

Adapting OneView Auto-zoning to data center SAN practices

- With the optional alias generation, alias names are generated from infrastructure names
  - Server profile names
  - Server profile connection names
  - Server initiator WWNs
  - Storage system target port names
  - Storage target WWNs
  - Storage system port group names
  - Storage system names

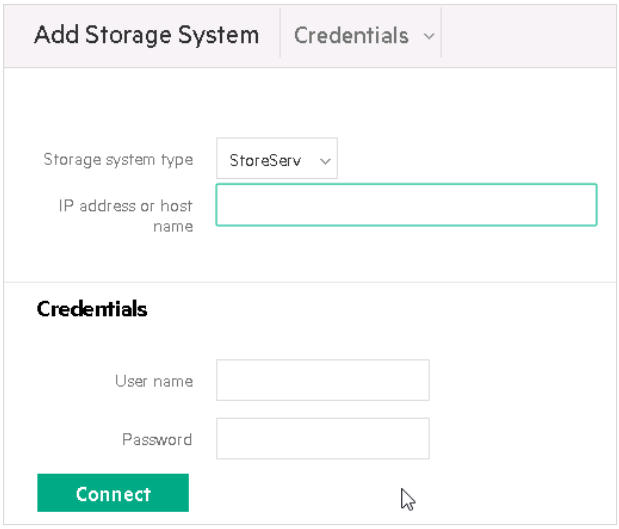
Zoning policies

- OneView enables you to set a zoning policy for your managed SANs. You can choose
  - single initiator/all targets, single initiator/single storage system, or
  - single initiator/single target.
- The generic best practice is using per initiator zones, that is individual zones for each server initiator pWWN and placed into the same zone as the intended target disk array controller pWWN(s); and that each zone contains no more than a single server initiator pWWN.

HPE ONEVIEW STORAGE MANAGEMENT

IMPORTING 3PAR ARRAY

- Connect to a storage system by specifying:
  - IP address or host name of the system
  - Username of the storage system
  - Password for the specified user
- A successful connection adds the storage system in a connected state.



Tip:

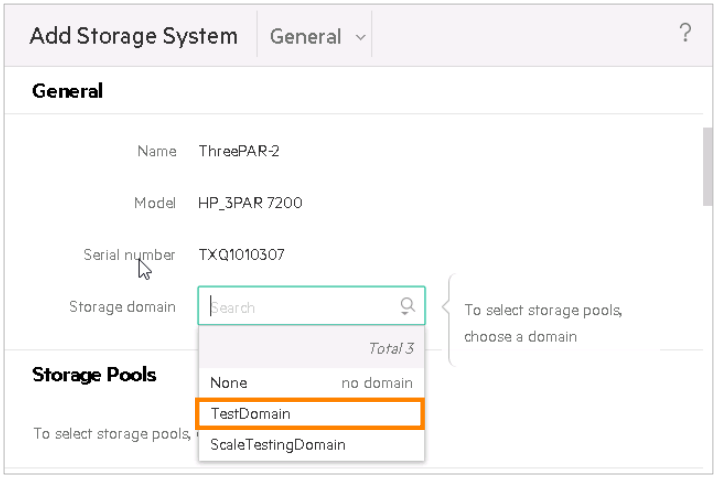
- **Don't change the CPG name.** Why? CPG's do not have an internal OneView ID; the resource name is the ID OneView uses.
- If the CPG hasn't been added to OneView, then renaming it shouldn't cause an issue.

Import a 3PAR StoreServ array

- Connect to a storage system by specifying:
  - IP address or host name of the 3PAR system
  - Username of the storage system (needs super user or edit all domain user privileges, not just domains of interest but all domains on 3PAR), the same credentials you would use to login to the 3PAR Management Console
  - Password for the specified user

CONFIGURING THE 3PAR STORESERV ARRAY
Add a storage domain

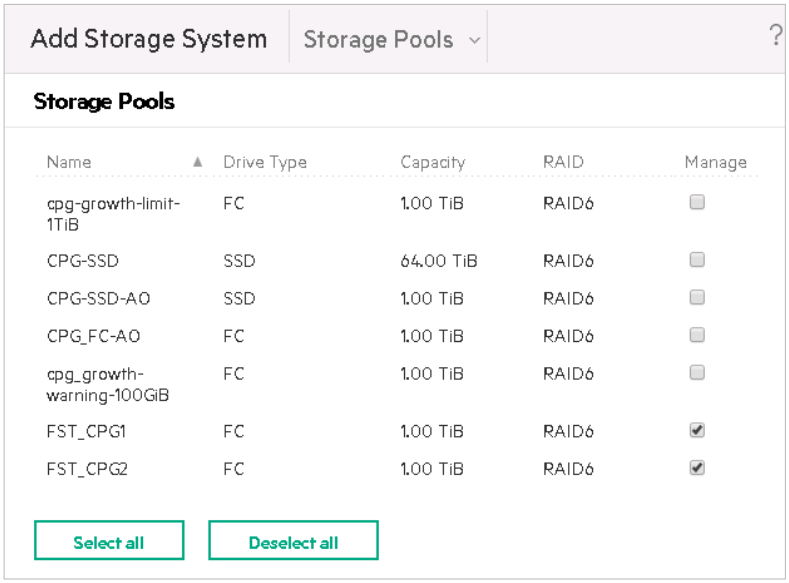
- Connect to the storage system.
- Select the storage virtual domain from the dropdown box.



Configuring the 3PAR StoreServ array

- Add a storage domain
  - After adding the storage system, proceed to the next step:
    - Virtual domain of the storage system to be managed by the appliance (only one), or no domain

CONFIGURING THE 3PAR STORESERV ARRAY
Add storage pools



Configure the 3PAR StoreServ array

Add storage pools

- Storage pools can be added:
  - While adding the storage system after selecting domain, on the same screen
  - Or after adding the storage system, from a dedicated Storage Pools screen
  - You can add multiple storage pools

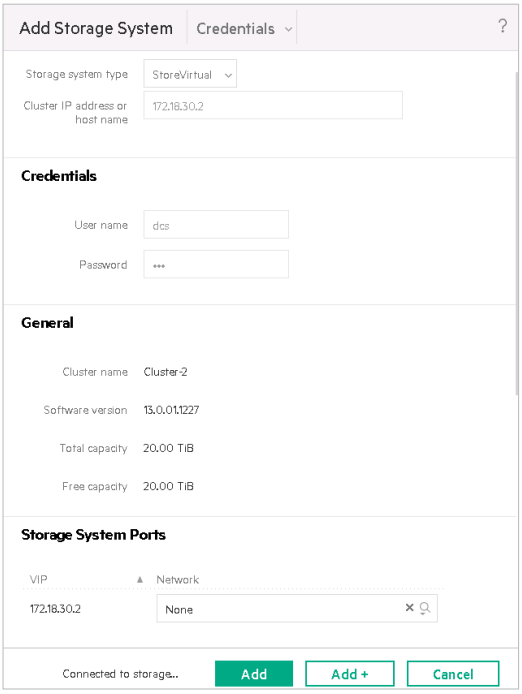
- If the storage pools were not selected during storage system array add task, you can select to add storage pools from a dedicated dialog.
  - Add storage pool from storage pools resource page
  - Choose the storage system
  - Search combo gives a list of all the storage systems managed by OneView
  - Choose the storage pool
  - Search combo gives a list of all the unmanaged storage pools

Notes:

- The storage system is added even if some or all of the storage pools are not added for some reason.
- Child tasks are created for adding storage pools.

CONFIGURING A STOREVIRTUAL ARRAY

- Managed storage functions work similarly across both 3PAR and StoreVirtual storage systems.
- One difference is that StoreVirtual storage system ports are identified by virtual IP addresses (VIPs).
- Associate Virtual IP to network
  - Each discovered cluster Virtual IP needs to be associated to the network it can be accessed on.
  - This is the network that server profiles must connect to in order to access volumes from the storage system using the VIP.



Configuring a StoreVirtual Array

– HPE OneView supports managed storage volumes from HPE 3PAR StoreServ and HPE StoreVirtual storage systems, with managed storage functions working similarly across both storage systems. One difference is that StoreVirtual storage system ports are identified by virtual IP addresses (VIPs). In order for server profiles to configure volume access to a StoreVirtual volume, its VIPs must be associated with an Ethernet network which the VIP is accessible on.

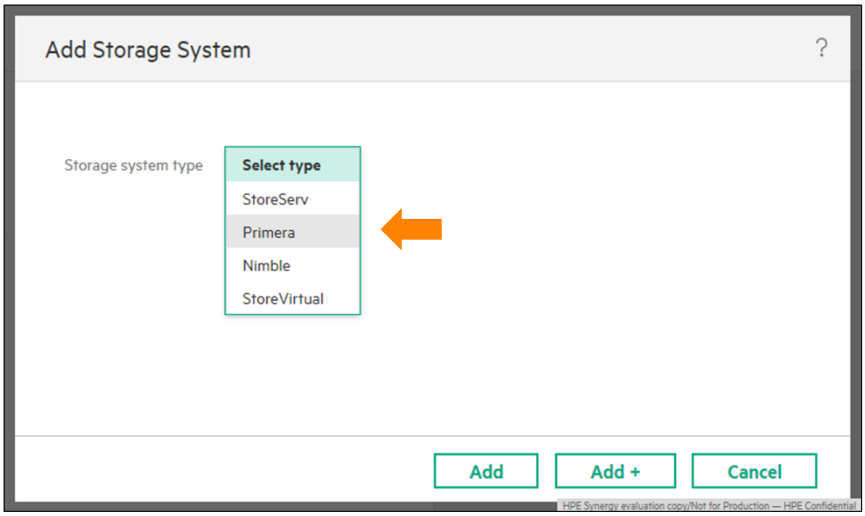
StoreVirtual deployment and lifecycle management

– StoreVirtual managed volumes
  – The ability to support StoreVirtual Storage Systems and configure provision full/thin volumes from its storage pool.
  – Support for Storage Volume Templates to provision volumes from StoreVirtual storage pools and set/enforce volume settings.

– iSCSI boot and data volume support
  – Server profile / SPT configured iSCSI SAN volume attach of StoreVirtual managed volumes. Configures server and storage system for volume access as either boot or data volume, auto-configuring iSCSI iQN, CHAP, MCHAP and LUN properties.
  – Supports using server HW accelerated or software iSCSI access.

WHAT IS PRIMERA 3PAR SUPPORT?

- All Primera models
- Fibre Channel only (no iSCSI)
- Same profile driven functionality
- Synergy - Fabric Attach & Direct Attach
- FC SAN auto-zoning capability
- (BNA/FOS), Cisco, and HPE switches



Primera support is nearly identical to the capabilities in the HPE 3PAR support including:

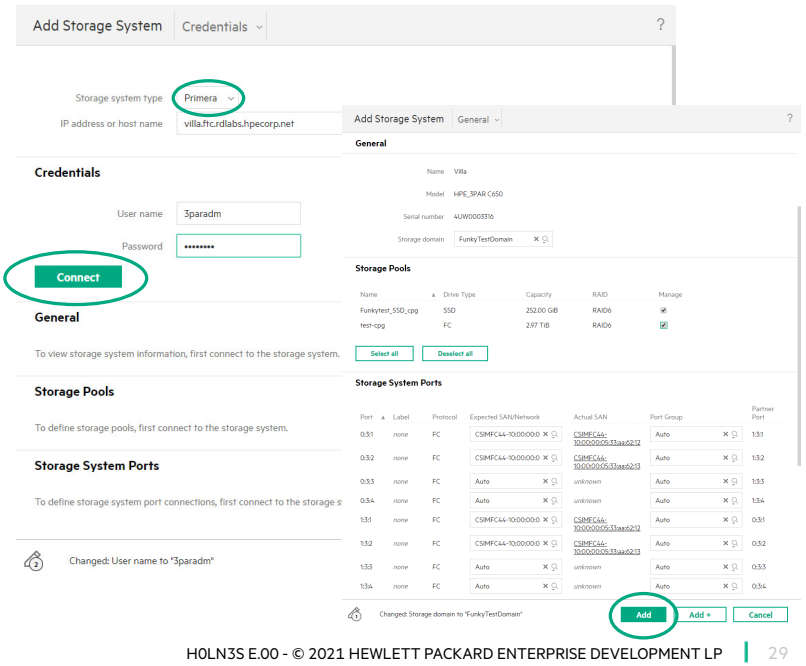
- Storage System and Storage Pool resources, Volume lifecycle management, Volume template support and SP/SPT volume attachment integration.
- New “Primera” Storage system type supports all Primera models
- Fibre Channel protocol is only supported, no iSCSI support
- Same profile driven automated volume provisioning / data path configuration functionality as supported with 3PAR

- Primera is supported with Synergy, DL/Apollo and c-Class servers
  - For Synergy - Fabric Attach & Direct Attach (or FlatSAN) are supported
  - Also, for C7000 - Fabric Attach & Direct Attach
  - And for ProLiant DL and Apollo – Fibre Channel HBA and External FC Fabric are supported

- OneView FC SAN auto-zoning capability operates as usual
- Auto zoning with Brocade (BNA and FOS), Cisco and HPE SAN switches is supported with Primera managed volume attachments.

ADDING A PRIMERA STORAGE SYSTEM INTO ONEVIEW

- A Primera Storage System is added into OneView by selecting “Add Storage System”
  - New “Primera” Storage system type
  - Enter the IP address and login credentials
  - Select “Connect”
  - Select a discovered “Storage domain”
- OneView will discover the Storage System Storage Pools, Ports and Port connectivity to managed SANs
  - Select the Storage Pools to manage in OneView
  - Specify port connectivity to SANs or FC Networks (that aren’t discovered)
  - Define any desired port groups
  - Select “Add”



Intent of the slide: Show how to add a Primera storage system into OneView

Adding a Primera storage system into OneView is very similar as with 3PAR:

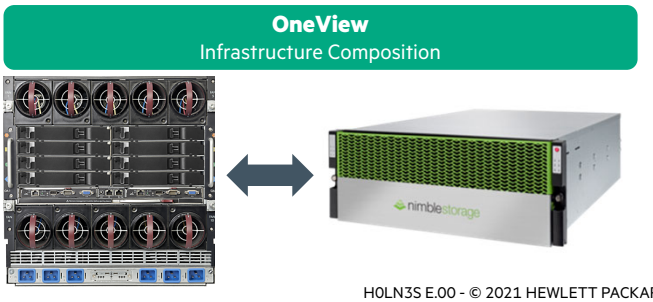
The one notable difference is using the new “Primera” storage system type

NIMBLE STORAGE INTEGRATION

HPE ONEVIEW WITH NIMBLE STORAGE INTEGRATION

Composing servers with Nimble storage in just a few clicks

- Multi-release integration goals:
  - Composing servers with Nimble array volumes for boot and data storage
  - Leverage the server profile and template management experience - adding Nimble storage resources
  - Auto configure Fibre Channel or iSCSI data paths between servers and Nimble volumes
  - Support the full range of server types: Synergy, c-Class, and Rack Servers
  - Support the full range of Nimble All-flash and Adaptive flash array models
  - Enable users to take advantage of the Nimble suite of data services and InfoSight integration

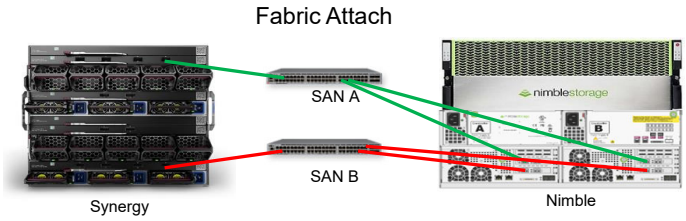


HPE OneView with Nimble storage integration

- Nimble Storage represents a new integration point for OneView.
- The goals for the integration are to leverage the OneView server profile experience when using Nimble storage, specifically providing automation for volume provisioning and data path configuration with servers.
- These goals will be delivered over multiple OneView releases.

HPE NIMBLE FIBRE CHANNEL SUPPORT

- HPE Nimble Fibre Channel Support
  - This feature provides automated Fibre Channel (FC) SAN storage volume provisioning for HPE Nimble storage systems.
  - Utilizing HPE OneView server profiles, you can automatically zone the FC fabric and provision Nimble shared, private data or boot volumes.
  - SAN auto-zoning capability supported on Brocade, Cisco, HPE SAN switches
  - Direct attach also supported



IMPORTANT: Refer to hpe.com/storage/spock for interoperability and support requirements.

HPE Nimble Fibre Channel Support

- Direct attach to Nimble volumes is supported with Virtual Connect SE 100Gb F32 Module for Synergy and HPE Virtual Connect SE 40Gb F8 Module for Synergy.

- HPE Nimble Storage dHCI extends the HyperConverged experience to workloads with unpredictable growth, allowing independent scaling of compute and storage. This gives enterprises the flexibility of converged and the simplicity of HCI – accelerating time-to market on an architecture built for the unpredictable.

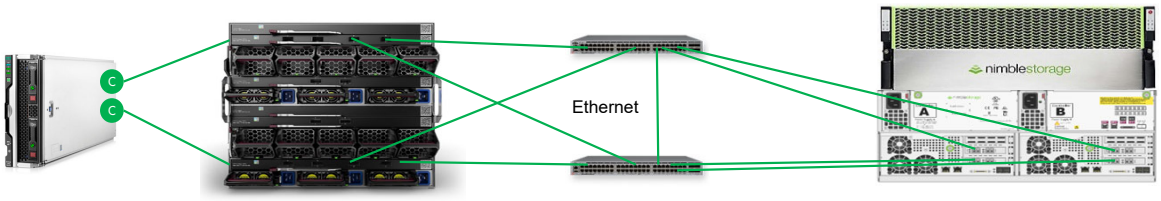
- Hyperconverged control collapses storage and compute silos and all data services can be managed exclusively in VMware vCenter. Resilient design center for 99.9999% availability (with Nimble Storage) with no single point of failure and advanced data integrity to tolerate three simultaneous dive failures

- Low-latency performance as low as 200 microseconds data response with automatic QoS to ensure fast performance for every app Industry-leading data efficiency with advanced data reduction and a modern OS providing up to 21x data reduction

HPE ONEVIEW NIMBLE ISCSI INTEGRATION

- New Nimble variants of OneView resources
  - Nimble Storage Systems, Nimble Storage Pools, Nimble Storage Volumes, Nimble Volume Templates

- Server profile integrated volume provisioning and iSCSI data path configuration
  - Shared, private or boot volumes
  - Server iSCSI boot configuration:
    - HW offload iSCSI initiator configuration (via server profile iSCSI type connection)
    - OS / SW iSCSI initiator configuration (via server profile Ethernet type connection, requires UEFI boot mode)



Nimble iSCSI Integration

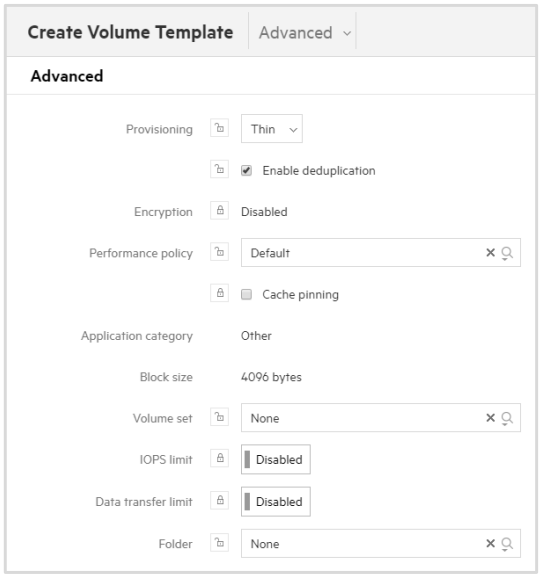
- The first phase of Nimble integration is releasing in OneView 4.20, and will include Server Profile integrated volume provisioning and attachment to server configuration with iSCSI over Ethernet.
- OneView will support Nimble volume provisioning and configuring server attachment to private or shared Nimble data volumes; as well as server boot-from-Nimble-volume configuration.
- Boot configuration supports configuring HW accelerated iSCSI offload or support for using an OS SW iSCSI initiator.

- c-Class:
  - HPE VC FlexFabric 10Gb/24-Port Module
  - HPE VC FlexFabric 20/40 F8 Module
  - HPE Flex Fabric adapters

- Synergy:
  - HPE VC SE 40Gb F8 Module, HPE VC SE 100Gb F32
  - CNA Network Adapters
    - HPE Synergy 2820C, 3820C, 4820C, 6820C

ONEVIEW CONFIGURATION OF NIMBLE VOLUME DATA SERVICES

- OneView configurable volume settings:
  - Thin/Full provisioning
  - Volume deduplication
  - Volume encryption
  - Performance policies
  - Application category
  - Compression
  - Cache pinning
  - Volume set membership
  - Protection Template
    - Snapshot schedules
    - Replication (local or nimble cloud volume)
  - IOPS limit setting
  - Data transfer limit setting
  - Folder membership
  - Group Quota
  - Group QoS limits



Nimble iSCSI Integration

- Nimble volume templates contain all of the Nimble volume settings, the same as what can be set on volume on the array itself.
- When Volume Templates are used to provision volumes from Nimble storage pools, the template allows Nimble specific volume settings to be specified with a default value and optionally locked to a specific value to suggest or enforce Nimble volume setting standards.

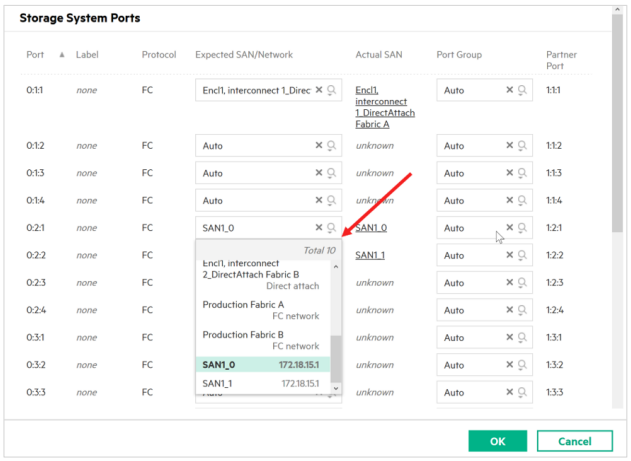
STORAGE SYSTEM PORTS

HPE OneView and Storage System Ports

EXPECTED SAN/NETWORK

Assigning FC SANs/Networks to storage system host ports

- Only storage system ports on networks to which a server profile has connections can be configured for storage paths
- OneView uses the storage system port(s) based on Expected SAN/Network field setting
- Setting the Expected SAN/Network value:
  - Ports whose connectivity cannot be detected on a managed SAN will have their Expected SAN/Network value set to Auto.
  - Ports whose connectivity is detected on a managed SAN will have its Expected SAN/Network value set to the connected network.
  - When a port is connected to an unmanaged network, set its Expected value to None in order to prevent OneView from trying to configure the port.



Expected SAN/Network

Assigning FC SANs/Networks to storage system host ports

- When adding SAN volume attachments to server profiles, only storage system ports on networks to which the profile has connections can be configured for storage paths by HPE OneView. HPE OneView uses the storage system port according to its Expected SAN/Network field setting.

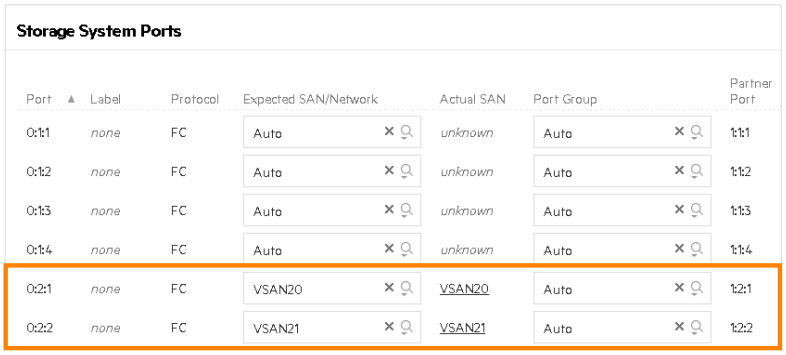
- On the Storage System Ports section of the Add storage system screen, set each port's Expected SAN/Network value to the SAN or Network which is connected to the storage system port. Ports whose connectivity is detected on a managed SAN will already have its Expected SAN/Network value set. Ports whose connectivity cannot be detected on a managed SAN will have their Expected SAN/Network value set to Auto, which will cause the port's value to be set to the first managed SAN on which the port is detected. When a port is connected to an unmanaged network, it will need its Expected SAN/Network value to be set manually to an unassociated Network.

- Any storage system port which you do not want HPE OneView to configure storage access through, such as HPE StoreServ federation or replication ports, should be set to None.

CONFIGURING STORAGE SYSTEM PORTS

Creating storage system port groups

- Port Groups partition storage ports connected to a SAN into smaller groups
- Helpful for:
  - Load balancing
  - Simplifying automatic zoning
  - Controlling a servers attachment to a SAN
- By default, OneView will make all of the storage system ports available.
- It's important to configure port groups.
  - If you have not configured the port groups in the storage system, OneView zones all 3PAR ports connected to the same fabric.



Configuring storage system ports

Creating storage system port groups

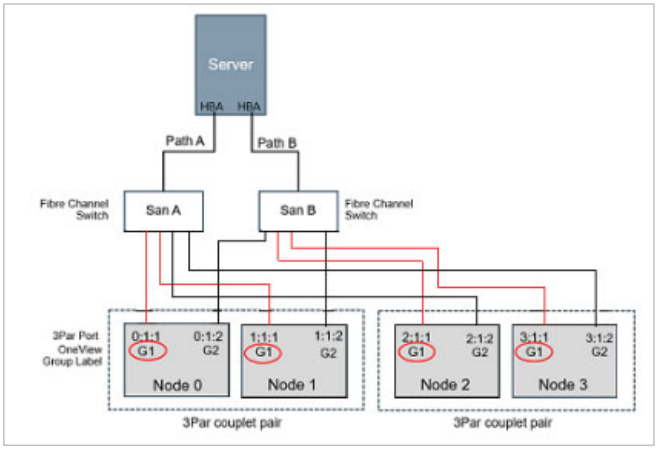
Port Group characteristics include:

- Port Groups are the mechanism in OneView to control which array target ports on a SAN are configured per server when attaching SAN storage volumes to servers.
- Port Groups aid automated zoning to select sub-sets of target ports to zone with initiators when performing volume-attachments.
- While adding a storage system, all the storage ports are displayed. If a SAN Manager is imported and associated with available SANs (in case of a fabric attach), the existing connectivity is displayed.
- Port Groups are used to partition the array target ports on a SAN, configuring only a single group of ports on a SAN for each volume attachment.
- The default is to put all ports on an array connected to a SAN in a single Port Group, so you will see all ports being configured for each attachment over a SAN by default.
- When HPE OneView attaches a volume to a server, for each storage path, OneView configures all storage system ports connected to the SAN (connecting the storage system to the server) as storage targets. If the storage administrator wishes to partition the storage system ports into smaller groups to be configured to each server, then assign a group name to the ports to be configured together.
- When Port Groups are defined, OneView will (by default) choose the least configured port group to attach volumes to a server, achieving a load balancing across the storage system's ports.

HPE ONEVIEW PORT GROUP MANAGEMENT

The port group identified for the first volume path is preferred for all additional paths for the same volume on that profile

- The illustration shows how the port group assignments change from a per fabric SAN assignment to a per volume attachment assignment. The port group used for the SAN A fabric, is the same for the SAN B fabric.



IMPORTANT: If the SAN B fabric does not have a port group with the same name, HPE OneView uses the port group with the least number of profiles assigned.

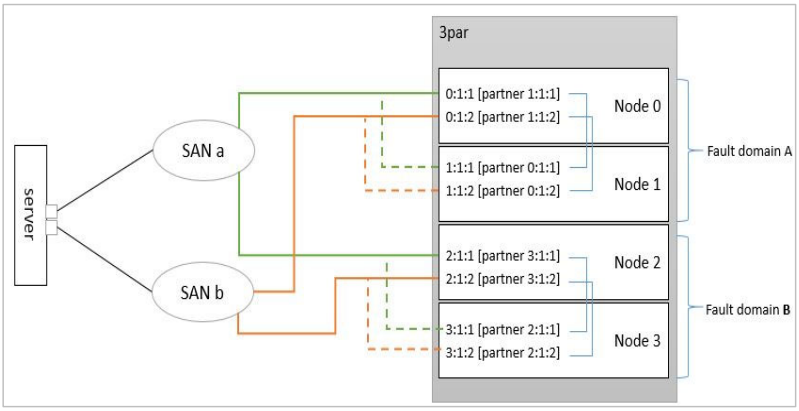
The port group identified for the first volume path is preferred for all additional paths for the same volume on that profile

IMPORTANT: If the SAN B fabric does not have a port group with the same name, HPE OneView uses the port group with the least number of profiles assigned.

SAN STORAGE PATH LOAD BALANCING TO A MULTI-NODE/COUPLET

Load balancing across nodes and couplets

- The port group identified for the first volume path will use the same port group name for all additional paths for the same volume.
- Supported
  - 3PAR/Primera
  - StoreVirtual
  - Nimble FC and iSCSI



The purpose of this new feature is to create a mechanism to allow storage administrators to cause "Auto" configured redundant storage paths from a server to a 3PAR storage system to not all connect to the same 3PAR "couplet".

This is a bad practice, as it results in ALL storage paths becoming degraded on 3PAR node failure, rather than only a single path being degraded.

SAN volume attachment configuration path provides load balancing across 3PAR nodes and couplets for "best practice" fault tolerance auto-configuration of paths.

The port group identified for the first volume path will use the same port group name for all additional paths for the same volume.

You can create and assign server profiles from a Server Profile Template with SAN storage (boot and data). Their volume attach path configuration will automatically load balance across the SAN and storage system resources.

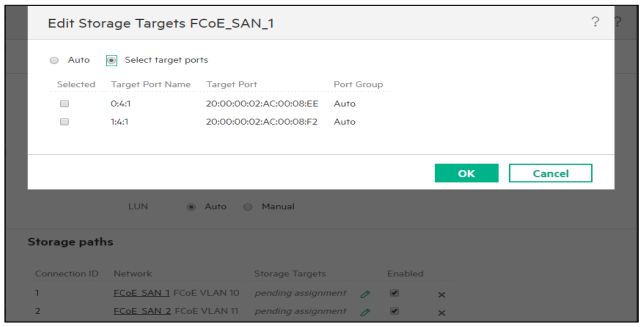
You can also name SAN volumes created by Server Profiles (SP) generated from Server Profile Templates (SPT) to have names derived from the profile name to match your data center naming standards.

This feature supports:
3PAR/Primera, StoreVirtual, Nimble FC and iSCSI attachments

PROFILE CONTROL OF TARGET PORTS

By default, storage targets are assigned automatically

- The Auto target port selection algorithm chooses the least configured port group connecting to a SAN.
  - This automatically configures the storage system and SAN zoning to enable the volume to be accessed through them.
- Or, you also have the ability to override the automatic port group selection process and have whatever
  array target ports you want used by a server.
- By selecting this option in a profile, the WWPN, target port name, and port group are displayed.
  - Manual target selection is supported for Fabric-attach paths only, not Direct-attach paths.



Storage target port selection

By default, storage targets are assigned automatically

- The algorithm for auto target port selection directs OneView to choose the least configured port group connecting to a SAN and configure the storage system and SAN zoning to enable the volume to be accessed through them. You can override this and manually select which array target ports you want used by a server.

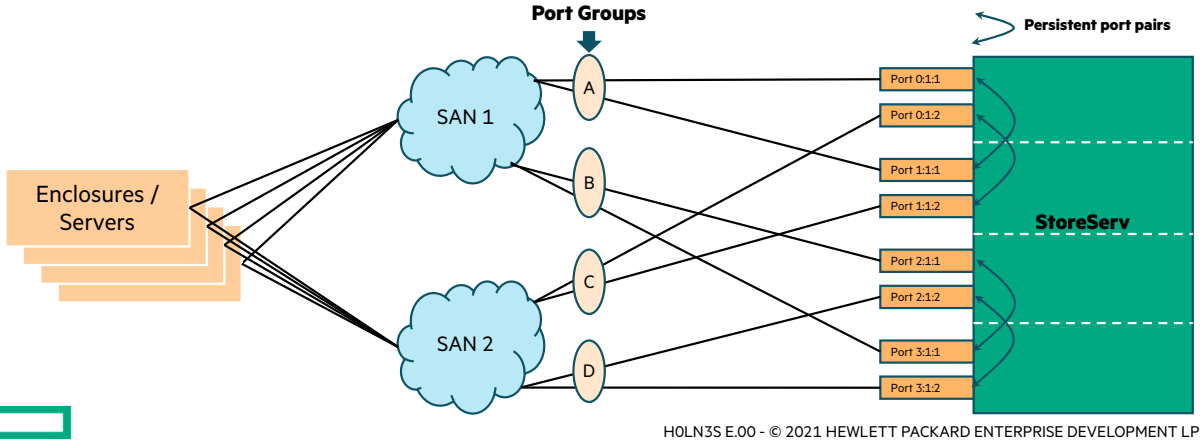
- A boot from SAN (BFS) configuration, specified in a server profile or server profile template, enables the primary/secondary assignment and storage system target port selection to be load (connection) balanced uniformly over SANs and storage system targets.

Best Practices:

- The best practice for Port Group configuration is application dependent. If your desire is two array target ports to be configured for each server initiator, you should:
  - Cable 3PAR peer port pairs to the same SAN, so if they fail over, they continue to be logged into the same SAN.
  - Configure each 3PAR peer port pair into its own Port Group.
    - For example, configure ports 0:1:1 and 1:1:1 into one group. Configure 0:2:1 and 1:2:1 into a second group, etc..
  - After configuring Port Groups, “Auto” volume attaches to servers will load balance server configuration across the Port Groups

STORESERV/PRIMERA PERSISTENT PORTS AND ONEVIEW PORT GROUPS

- A server initiator/path exists on a single SAN, so StoreServ Persistent Port pairs should be cabled to the same SAN so ports do not connect to a different SAN when failing over.
- OneView will allocate target ports for a server initiator by **balancing the connections** across port groups on the same SAN.
- A server's port connecting to SAN 1 will attach via group A or B; SAN 2 will attach via group C or D.



StoreServ persistent ports and HPE OneView port groups

- An example of defining port groups with 3PAR that yields two targets being allocated for each attachment.

- The default (auto) port grouping on the storage system is to *not* group the ports, and allocate all ports connecting to a SAN for each volume attachment. They are randomized in the profile, so you are probably seeing some variance of port selection.

- To configure port groups, edit the storage system ports and assign a port group name to each port, then OneView when using "auto" target port selection, will deterministically allocate ports from one of your defined groups.

Important:

- Port group assignment is based on server profile creation with the initiators, which does take into account the current port group allocation of initiators.
- It will not balance over time as port group assignment is static, nor take into account SLA's or utilization data. You can modify the port group allocation by assigning specific port groups to the initiators.

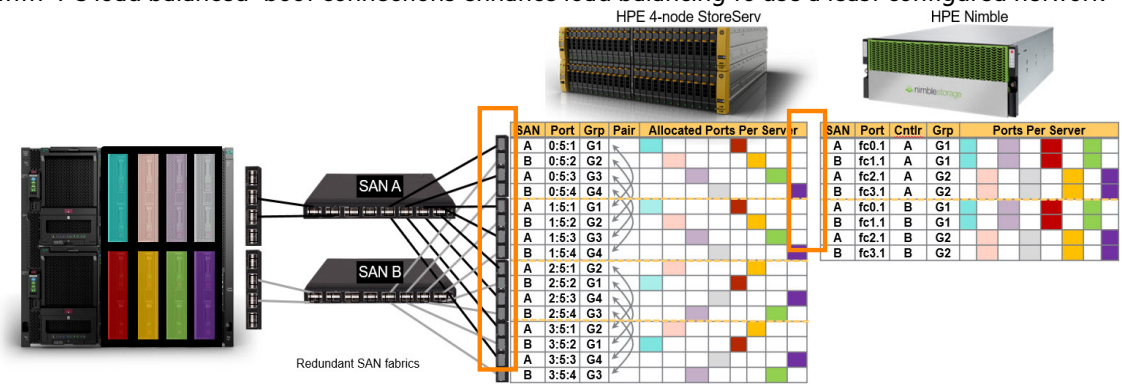
OneView supports load balancing the FibreChannel boot connection.

- In the 4.0 release it is only definable within the server profile template (SPT), not the server profile (SP) (this will change in a future release). The balance decision happens at SP creation time.

HOW DOES THE SAN STORAGE PATH LOAD BALANCING WORK?

Path Load Balancing using the same port group for each path

- Load balancing capabilities with HPE Primera/Storeserve and Nimble storage systems
- Best practice data path configuration auto configured
- Profile volume attach paths prefer boot targets on different storage system nodes
- Profile volume attach paths spread boot & data path port group selection
- Profiles with "FC load balanced" boot connections enhance load balancing to use a least configured network



Automatic port group assignment improves the predictability and consistency for port group usage by:
• Knowing the volume path across all fabric connections
• Enabling the administrator to define the ports manually to include all the storage controllers in an array
• Placing alternative paths to the volume from any redundant SAN into the same port group
• And requiring manual port group creation for new storage system additions

- Load balancing capabilities with HPE Primera/Storeserve and Nimble storage systems
- Best practice data path configuration auto configured
- Profile volume attach paths prefer boot targets on different storage system nodes
- Profile volume attach paths spread boot & data path port group selection
- Profiles with "FC load balanced" boot connections enhance load balancing to use a least configured network

HPE OneView enhanced load balancing capabilities with HPE Primera storage systems:

- Follows best practice data path configuration will be auto configured when using 2-8 node storage systems.
- Profile volume attach paths will prefer boot targets on different storage system nodes when selecting boot targets for multiple paths to the boot volume
- Profile volume attach paths will spread boot & data path port group selection to maximize use of storage system fault domains (for > 2 node systems) Fibre Channel protocol only (no iSCSI support)
- Profiles with "FC load balanced" boot connections will enhance load balancing of primary/secondary assignment across network/sans to use a least configured network load balancing approach

As a storage administrator, you can construct port groups to result in couplet path balancing so storage paths over different SANs contain ports to different couplets.
In this example, port group G1 causes a storage path on SAN A to connect to ports on the first couplet (0/1), whereas a storage path on SAN B will connect to ports on the second couplet (2/3).
When performing “Auto” target selection in a server profile, a single port group selection is made for all storage paths per server per array, not an independent port group selection made per storage path.

Note that port group selection is still performed using a “least configured” algorithm.
Also, manual port selection is still supported in server profiles and is not forced to align with port groups.
In this example, each column under “Allocated Ports Per Server” shows the ports allocated for each server on the left, according to their color representation in the diagram.

VOLUMES AND VOLUME TEMPLATES

Volumes and volume templates

VOLUMES

- Volumes are logical storage spaces provisioned in storage pools
  - You can create, attach, un-attach and delete virtual volumes.
  - You can create and manage snapshots.
  - No other storage system management actions can be performed from OneView.
- A volume represents a logical disk provisioned from a storage pool on a storage system.
  - You can attach volumes to one or more servers by configuring a volume attachment in the server profile.
  - The volume attachment manages Host creation and volume creation and volume presentation on the storage system as well as SAN zoning on SANs (when automatic zoning is enabled) that connect the server and storage system.
- You can use volume templates to define a standard configuration for storage volumes.
  - Volume templates enable you to choose which configuration settings are locked, making them persistent on volumes created from the volume template.

Volumes

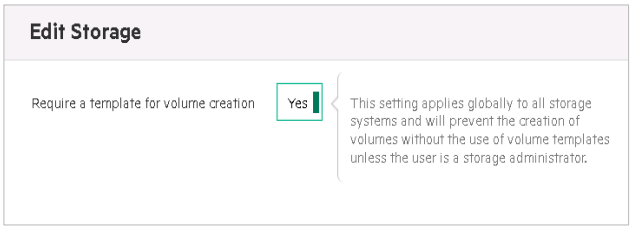
- VVs (Virtual volumes) draw their resources from storage disk pools and are exported as logical unit numbers (LUNs) to hosts. Virtual volumes are the only data layer visible to the hosts. You can create physical copies or software snapshots of virtual volumes on supported storage systems. Full copies remain available if the original base volume becomes unavailable. Before creating virtual volumes, you must first create Storage Pools to allocate space to the virtual volumes.
  - Using volume templates, you can create multiple volumes with the same configuration.
  - You can increase (grow) the capacity of a volume by editing it. You cannot decrease the capacity of a volume.

Volume management

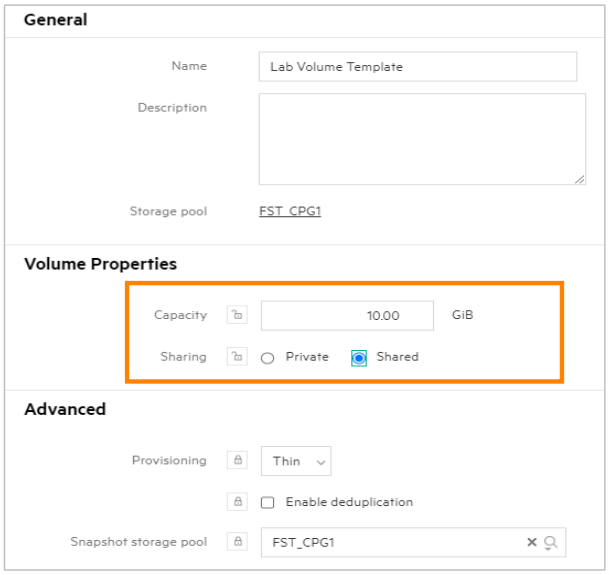
- You can use HPE OneView to manage the full life cycle of your volumes. You can add existing volumes, create new volumes, grow volumes, and remove or delete volumes using HPE OneView.
- You can also create volume snapshots, create a volume from a snapshot, and revert a volume to a snapshot using OneView.

STORAGE VOLUME TEMPLATES

- Storage administrators can create storage volume templates.
  - You can force users to create volumes using only available storage volume templates (A global setting available in the Settings → Storage menu).



Note: Private volumes are the only supported Ephemeral type.



 45

Storage volume templates

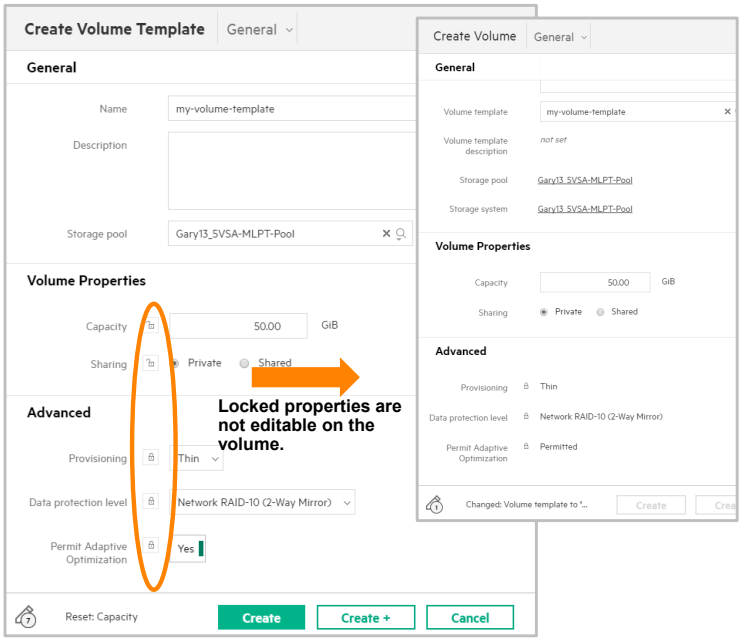
- A volume template is a logical resource that enables you to create a standard configuration from which multiple volumes can be created.
  - Storage volume templates can be created only by Storage administrators, but will enable Server administrators to provision volumes based on the created volume template.
  - 3PAR StoreServ pools support different volume properties than StoreVirtual pools

Notes:

- The volume creation dialog has an attribute to select a volume template.
- Enforce a policy for other users to create volumes from storage volume templates only. In that case users cannot create volumes by defining own parameters, only by selecting one of the available volume templates.
- A template can enforce
  - Storage pool
  - Capacity: default 10GB
  - Provisioning Type: Thin provision or Full (or Thick) provision
  - Sharing Type: Private or Shared volume
  - Snapshot storage pool

VOLUME AND VOLUME TEMPLATE CORRELATION

- Individual property level enforcement LOCKS
- Volume to Volume Template compliance checking
- Consistent Shared Storage UX
  - Same volume properties in:
    - Server Profiles
    - Server Profile Templates
    - Volume Templates
    - Volumes
  - Server Profiles and Server Profile Templates can utilize Volume Templates
  - Enforcement locks enforced everywhere.



Volume and volume template correlation

- Individual volume template property enforcement LOCKS
  - Locked settings can not be edited away from the template locked value
- Volume to volume template compliance checking
  - Non-compliant volume properties can only be left unchanged or changed to the template specified value

Consistent shared storage user experience

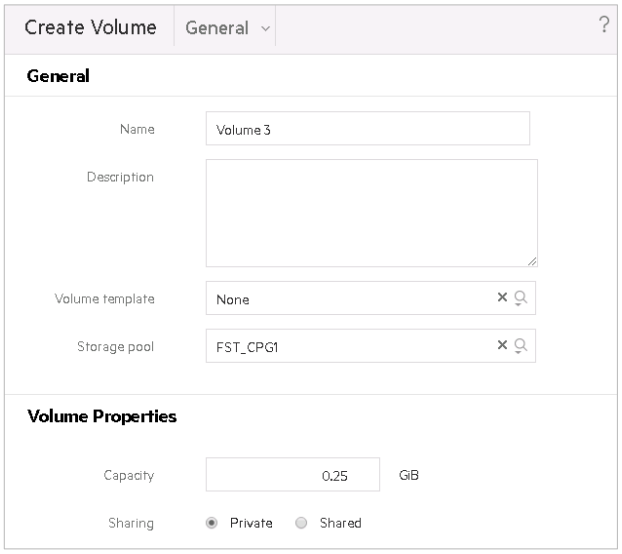
- Same volume properties in:
  - Server profiles
  - Server profile templates
  - Volume templates
  - Volumes
- Server profiles and server profile templates can utilize volume templates
  - Enforcement locks enforced everywhere!

ADDING AND CREATING VOLUMES

Adding and Creating External Volumes

CREATE A STORAGE VOLUME

No template constraint



- Default attributes:
  - Provisioning Type: Thin
  - Sharing Type: Private
- OneView creates the volume in the storage array using REST API calls.
  - Tries to match the volume name given on the device
  - Appends a unique hex value in case of duplicates.
- Storage Pools must be available within OneView before you can create a volume.

Create a storage volume

No template constraint

- Building a volume without a template can be done by the server administrators and the storage administrators.
  - Choose the storage pool that you want to provision this volume from, capacity, provisioning type and sharing type, the name of the volume and the description.

Default attributes

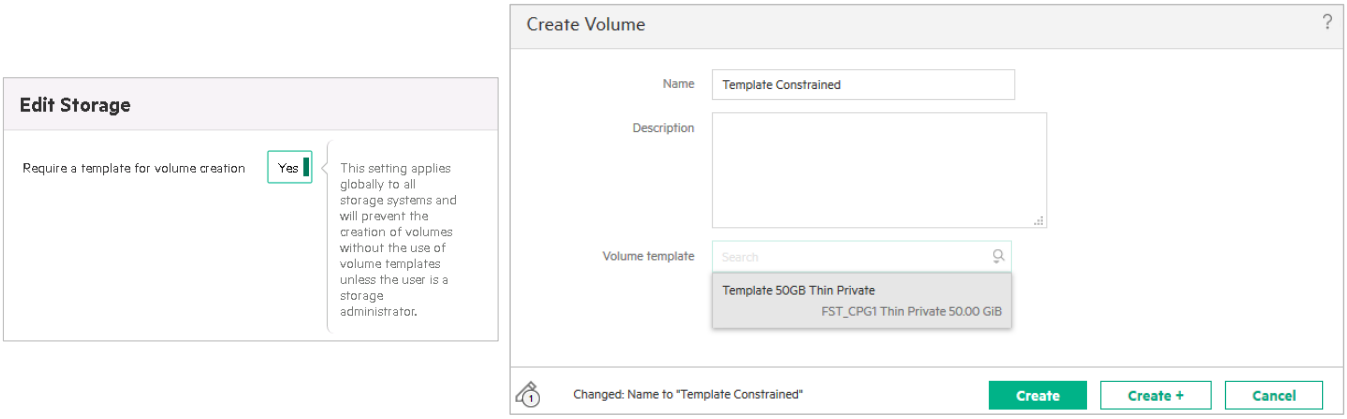
- Provisioning Type: Thin
- Sharing Type: Private

Notes:

- OneView tries to match the volume name given on the device as possible (some special characters are not accepted by 3PAR).
- Appends a unique hex value in case of volume name duplicates on the storage system (the name in OneView will be displayed as defined).
- Storage pool needs to be managed by OneView and in “green” status before creating a volume on that pool.

CREATE A STORAGE VOLUME
Template constrained

- You can create storage volumes only by using a storage template.
  - The template automatically populates options in the new volume.

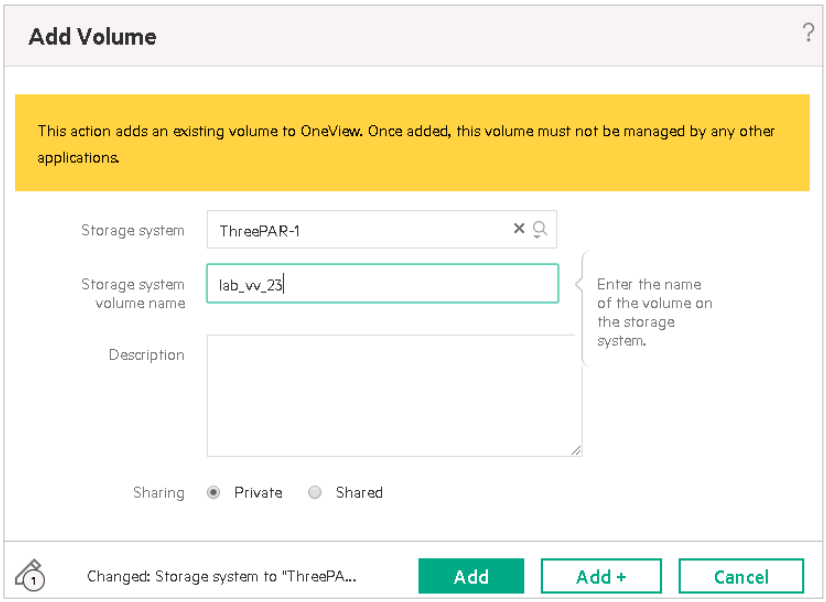


Create storage volume

Template constrained

– If the option “Require template for volume creation” is not enabled a user can choose to create a storage volume directly or through a template. Choosing a template will automatically populate options for a new volume. The capacity might be changed, other options are used from the template.

ADDING A STORAGE VOLUME



You can add an existing storage volume into OneView

Volume ID is the unique storage system volume name.

OneView does not differentiate between volume created and volume added.

Does not add any existing volume attachments.

Adding a storage volume

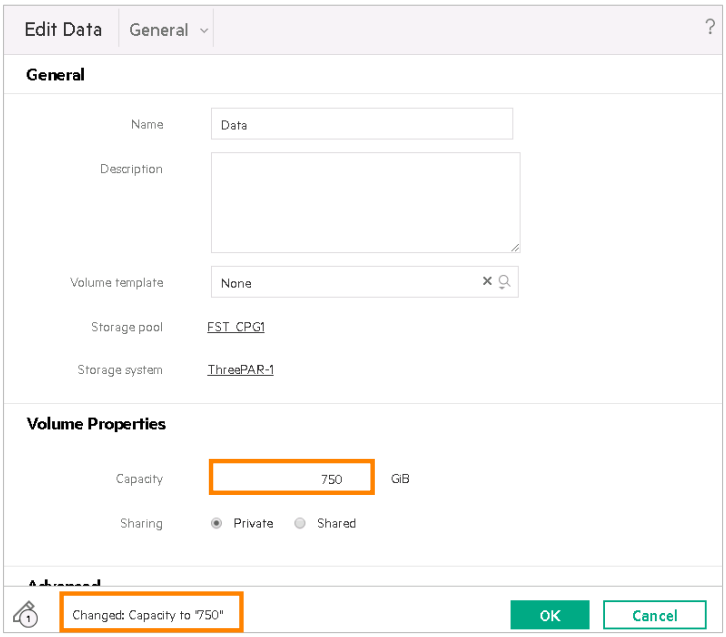
- Besides creating a new volume in OneView, the user can choose to add an existing volume from the storage system into OneView provisioning pool.
  - For that, the user will have to provide the storage system volume name, as well as providing the OneView name and description for that volume, and selecting a sharing type.
  - After adding, there is no difference between volumes created and volumes added in Storage Resource Manager.

Notes:

- The existing attachments of the volume are not added; a volume is added but attachments are left as is. There is also a message that says that once a volume is added, it should not be managed by any other application.
- You can edit some of the attributes that are displayed on the storage volume resource page: the WWN, the provisioning type, provision capacity, allocated capacity, sharing type, whether it is private or shared, the system that it belongs to, a storage pool that it belongs to, the RAID level, and the storage system volume name.
- The added volume will display if server profiles are referencing (using) this volume.

GROWING VOLUME CAPACITY

- Edit volume capacity (cannot be decreased)
- Up to available pool capacity (fully provisioned)
- Up to 64TB (thin provisioned)



Growing volume capacity

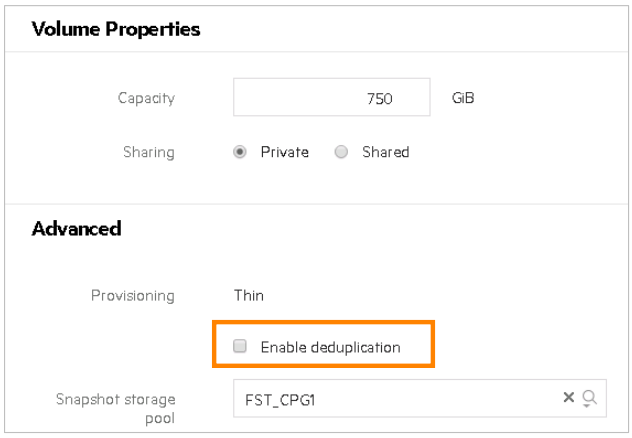
- Volumes created in OneView have a max size of 64TB. Customers wanting to create larger volumes (using newer Inform OS versions which support > 16TB) will have to either create the volume first in StoreServ Management Console (SSMC), then add it into OneView and attach it to a profile, or create from the Server Profile as 16TB, then after creation, grow the volume in SSMC to the desired size.

3PAR THIN DEDUPLICATION VOLUME SUPPORT

OneView can generate Primera and 3PAR Thin Deduplicated volumes

- Requires Thin Dedup capable CPG's
  - Currently Thin Dedup are supported on SSD pools only

OneView Resource	OneView Ability
Volumes	Create Thin Dedup private and shared volumes
Volume Templates	Specify and/or enforce Thin Dedup property setting
Server Profiles	Create Thin Dedup private volumes
Server Profile Templates	Specify private volumes with Thin Dedup property setting

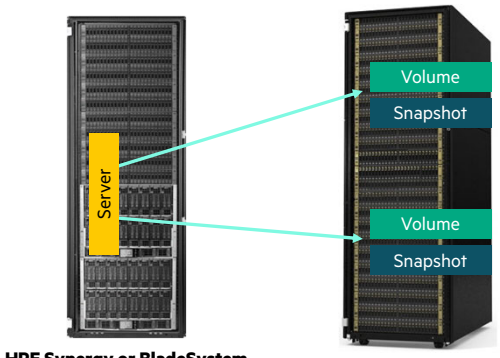


3PAR and Primera Thin Deduplication virtual volume (TDVV) support

- TDVVs can only reside on SSD storage. Any system with an SSD tier can take advantage of thin deduplication. The option to provision TDVVs is not available unless an SSD CPG has been selected.
  - Deduplication is performed on the data contained within the virtual volumes of a CPG. For maximum deduplication, store data with duplicate affinity on virtual volumes within the same CPG.
  - 3PAR Adaptive Optimization (AO) does not support TDVVs.
  - When using an HPE 3PAR array as external storage to a third-party array, deduplication may not function optimally.

SAN VOLUME SNAPSHOTS / CLONES (3PAR ONLY)

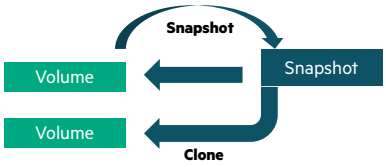
SAN volume snapshot and clone operations to server admins



HPE Synergy or BladeSystem

HPE Storage
3PAR StoreServ

- SAN Volume snapshots and clones
  - Server admin can create and use snapshots and clones of SAN volumes directly within OneView
  - Single snapshot/clone experience across storage arrays



IMPORTANT: OneView makes the snapshot request (via the 3PAR REST API), which will fail if the storage system doesn't have a snapshot license.

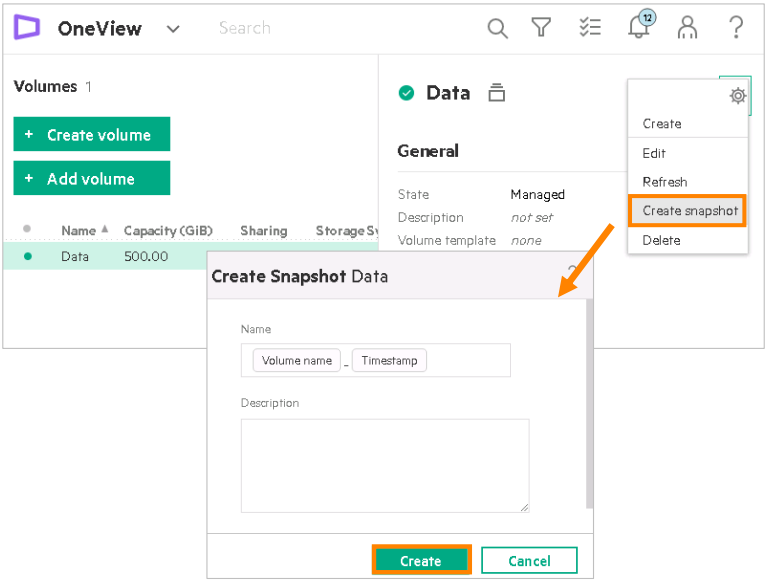
SAN volume snapshots / clones

- 3Par Only
- You can use a snapshot as a backup of a volume, and then use the snapshot to revert a volume to the backup version, or to create new volumes from the snapshot.

SAN VOLUME ACTIONS TO GENERATE A SNAPSHOT

The “Create snapshot” action is available for 3Par SAN volumes

- Enable a Snapshot storage pool when configuring a volume.
- The default name is based on the volume name.
- Snapshot description (optional)
- Post Snapshot operations:
  - Revert the volume to the state of the snapshot
  - Create a new volume from the snapshot
  - Delete the snapshot



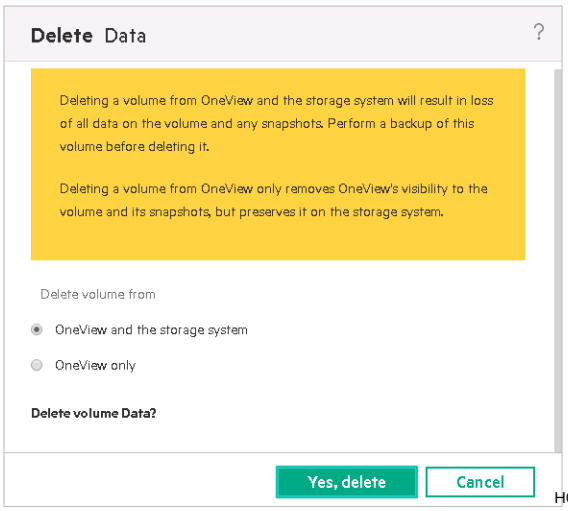
SAN volume actions to generate a snapshot

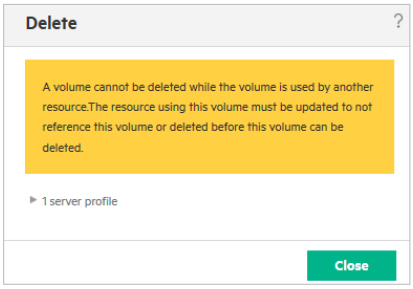
The “Create snapshot” action is available for 3PAR SAN volumes

- A snapshot is a virtual copy of a base volume. The base volume is the original volume that is copied. Unlike a physical copy, which is a duplicate of an entire volume, a virtual copy only records changes to the base volume. This allows an earlier state of the original virtual volume to be recreated by starting with its current state and rolling back all the changes that have been made since the virtual copy was created.
  - A snapshot is a static copy of a volume at the point the snapshot is created. Snapshots are not updated to reflect changes in the volume since the snapshot was taken. A new volume created from a snapshot will be the same size as the snapshot and will contain all of the data in the snapshot. The new volume has no relationship with the volume that was used to create the snapshot.
  - Reverting a volume to a snapshot will revert to the data the volume contained when the snapshot was taken. The size of the volume will remain the same as when it was reverted. For example, if you take a snapshot of a 50GB volume, grow the volume to 100GB, and then revert to the snapshot, the volume will be 100GB with the data from the 50GB snapshot.
  - Reverting to a snapshot of a volume will cause all data created or changed since the snapshot was taken to be lost. Backup your data to prevent data loss.
  - Snapshots are not updated to reflect changes in the volume since the snapshot was taken.

DELETING THE VOLUME ATTACHMENTS AND VOLUMES

- Deleting a volume options:
  - Only from the OneView provisioning list
  - From OneView and the storage system





- If the volume is associated with a server profile, OneView will not allow you to remove it

Deleting the volume attachments and volumes

- There are two methods to delete an attachment:
  - A normal delete operation which will delete just the attachment, and if it fails for a reason, the error is thrown back to the user
  - If, after confirming that the profile and the associated volume is not in use, you have the option to force delete a server profile which will attempt to remove all the references from Storage Resource Manager.

- When deleting a volume on OneView:
  - The user can choose to have the volume only removed from the OneView provisioning list, but left on the storage system for some other use
  - It can be also physically removed from the storage system causing all data to be lost

D3940

HPE SYNERGY 12GB SAS CONNECTION MODULE

- Connects Synergy compute modules to D3940 Storage Module (presented later)
- Connects composable direct attached storage for up to 10 compute modules in a single frame
- Creates virtual JBODs, remaps connections, or changes personality
- Provides twelve internal SAS ports each consisting of four 12Gb/s SAS channels

- HPE Synergy 12Gb SAS Connection Module
- HPE Synergy 12Gb SAS Connection Module connects Synergy compute modules to the HPE Synergy D3940 Storage Module. In conjunction with the HPE Synergy D3940 Storage Module, HPE Synergy 12Gb SAS Connection Module connects composable direct-attached storage for up to 10 compute modules in a single frame.
- HPE Synergy 12Gb SAS Connection Module dynamically creates virtual JBODs for any compute module in the HPE Synergy 12000 Frame, remaps connections, or changes personality, and all that is done with stored profiles.
- Each 12Gb SAS module provides twelve internal SAS ports, each consisting of four 12Gb/s SAS channels, ensuring a non-blocking fabric and enabling full solid-state disk performance.
- Each Synergy frame that contains at least one HPE Synergy D3940 Storage Module must also contain at least one HPE Synergy 12Gb SAS connection module.
- SAS connection modules can only be populated in ICM bays 1 and 4. There can be no more than two SAS connection modules in each frame.

HPE SYNERGY D3940 STORAGE MODULE

Overview

- Provides composable direct-attached storage for up to 10 HPE Synergy compute modules
- Is optimized for software-defined storage
- Connects through the Synergy 12Gb SAS Connection Module
- Uses a high performance SAS connection (sixteen 12Gb/s SAS lanes)
- Supports 12Gb SAS or 6 Gb SATA HDD and SSD Smart Drives
- Permits multiple drive types configuration
- Supports up to 40 hot plug SFF SAS/SATA/SAS SSD/SATA SSD disk drives
- Scales to 160-200 SFF drives with four-five storage modules
- Supports HPE OneView

NOTE: Up to **four storage modules per frame** are supported with Gen9 servers, because iLO 4 can monitor 71 physical drives on a controller. **Up to five storage modules** are supported with Gen10 (iLO5).

HPE Synergy D3940 Storage Module—Overview

HPE Synergy D3940 Storage Module is a 40 SFF drive bay module that can be integrated into HPE 12000 Synergy frames. Through the HPE Synergy 12Gb SAS Connection Module, it provides composable direct-attached storage for up to 10 HPE Synergy compute modules in a single frame. Synergy storage is optimized for software-defined storage.

HPE Synergy D3940 Storage Modules support a family of 12Gb SAS or 6 Gb SATA HDD and SSD Smart Drives. Synergy storage supports a variety of workloads by permitting multiple drive types to be configured in the same storage module. Any number of drive bays can be composed with any compute module allowing for efficient utilization of available drives. Synergy storage can scale to 160 SFF drives with four storage modules (for Gen9 servers) or up to 200 SFF drives with five storage modules (for Gen10 half-height servers) in a single HPE Synergy 12000 Frame. HPE Synergy D3940 Storage Module is optimized for solid state using a high performance SAS connection with sixteen 12 Gb/s SAS lanes. This allows integrated Synergy storage to deliver as much as 8 times the bandwidth of other JBOD options reaching up to 2 million IOPs. Furthermore, it supports between up to forty hot-plug SFF SAS/SATA/SAS SSD/SATA SSD disk drives in a half-height, double-wide storage module. This solution delivers data transfer rates up to 12Gb/s for 12Gb and 6Gb SAS, SATA, SAS SSD, and SATA SSD. Configuration and setup from HPE Synergy Composer is also supported. HPE Synergy D3940 supports HPE StoreVirtual VSA software to create a robust shared storage environment inside and across Synergy frames.

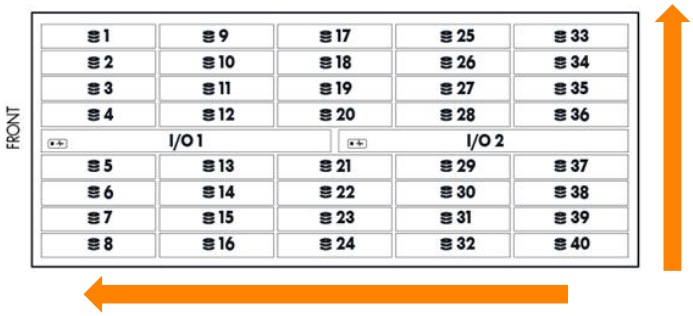
Note: Up to four storage modules per frame are initially supported with Gen9 servers, because iLO 4 can monitor 71 physical drives on a controller. Up to five storage modules are supported with Gen10 half-height compute modules using iLO 5 and supporting up to 200 drives per controller.

HPE SYNERGY D3940 STORAGE MODULE

Drive placement

- Populate drives from back to front for better cooling
- Blanks not required
- Disk drives are hot-pluggable
- Disk drives tray can be opened in-service

NOTE: The limit for cooling the drives is up to 5 minutes. Then, close the tray for one minute at least.

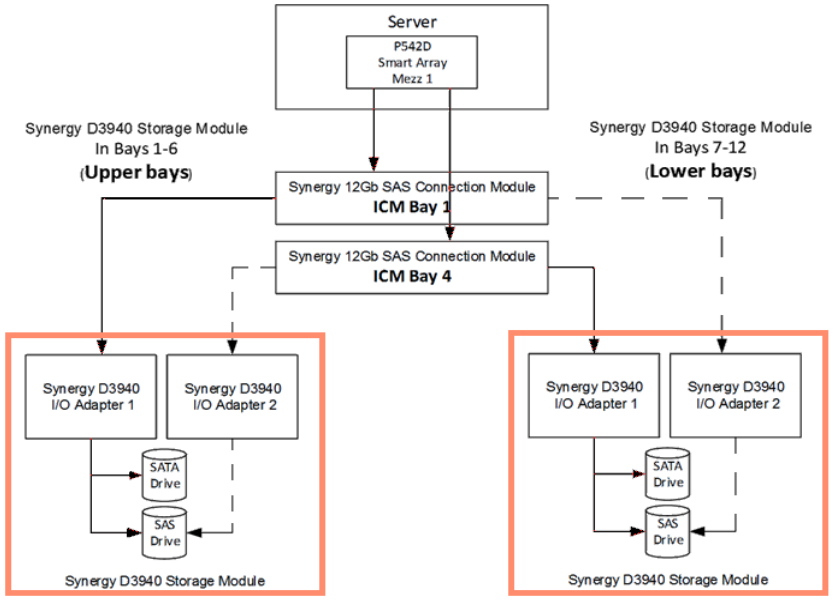


 59

HPE Synergy D3940 Storage Module—Drive placement

- Populate drives from back to front for better cooling and shorter airflow path. Using the drive numbering image, begin populating bays 33 through 40, and continue to populate back to front, finishing with bays 1 through 8. Blanks are not needed or provided. Disk drives are hot-pluggable. The modular design of the storage module allows it to slide out from the frame to service drives or I/O adapters without interrupting operation of other drives within the module. Hence, the disk drive tray can be opened in-service.
- NOTE: The limit for cooling the drives is up to 5 minutes; after that, a warning is issued and an alarm sounds. It is recommended to close the tray for one minute at least to cool the drives.

SYNERGY STORAGE CONNECTIVITY DIAGRAM



NOTE: Smart Array P542D and P416ie are Type-D mezzanine cards and can access both local drives and D3940 Storage.

NOTE: SAS modules can only be populated in ICM bays 1 and 4, maximum 2 per frame.

NOTE: Redundancy requires 2 I/O Adapters, 2 SAS ICMs and SAS Drives.

NOTE: Using one SAS ICM requires that it be on the same side of the frame as the D3940. (Upper or Lower)

NOTE: Servers in a frame can access a D3940 anywhere in the same frame regardless of redundancy.

NOTE: Smart Array P542D and P416ie are Type-D mezzanine cards and can access both local drives and D3940 Storage.

NOTE: SAS modules can only be populated in ICM bays 1 and 4, maximum 2 per frame.

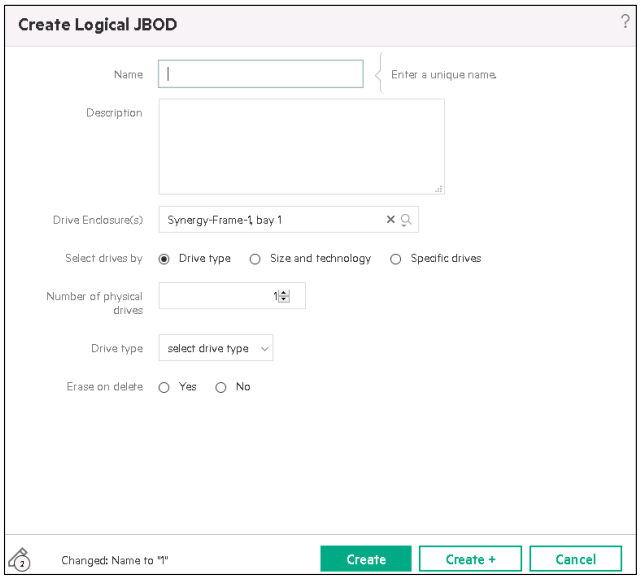
NOTE: Redundancy requires 2 I/O Adapters, 2 SAS ICMs and SAS Drives.

NOTE: Using one SAS ICM requires that it be on the same side of the frame as the D3940. (Upper or Lower)

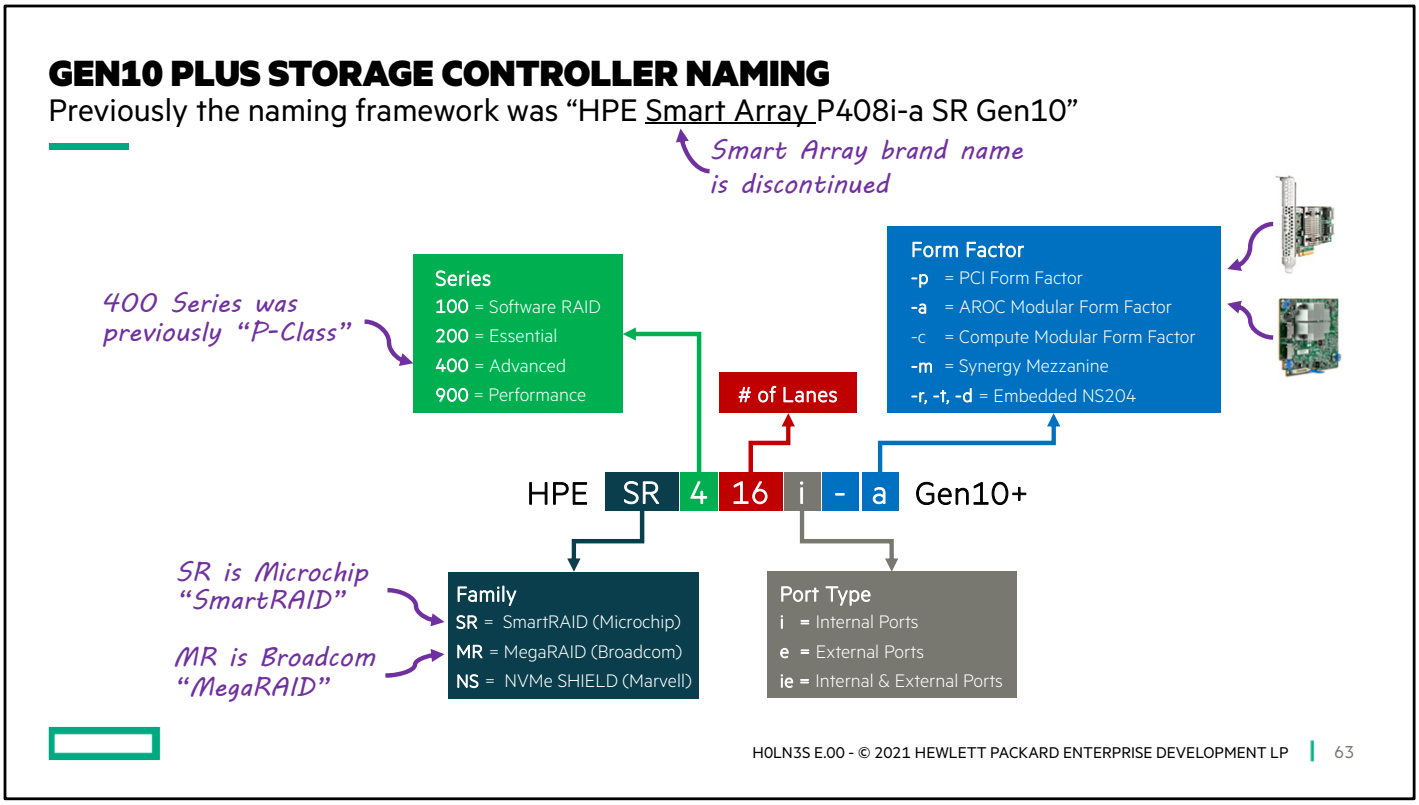
NOTE: Servers in a frame can access a D3940 anywhere in the same frame regardless of redundancy.

CREATING LOGICAL JBODS

- Cover steps



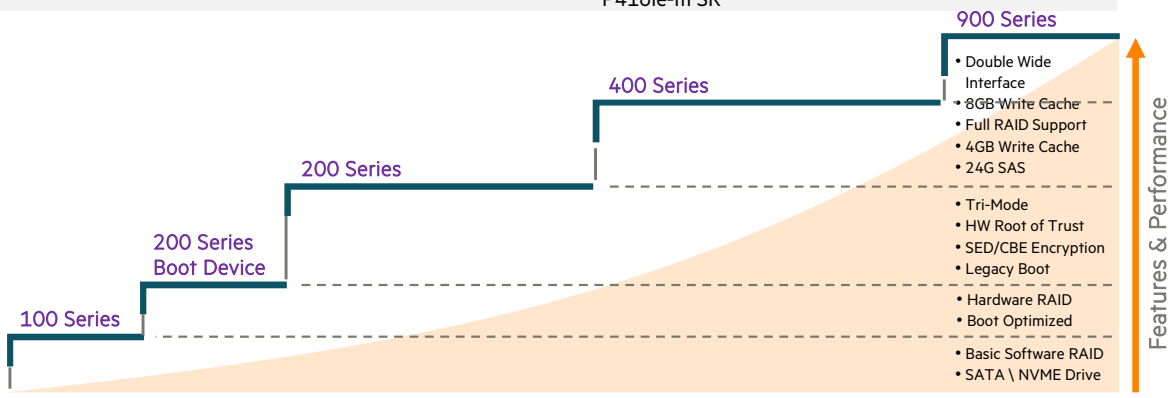
NEW STORAGE ADAPTERS



Gen10 plus introduces some changes to controller naming

GEN10 PLUS STORAGE CONTROLLER PORTFOLIO

	SW RAID	Essential			Advanced			Performance
ProLiant & Apollo	SR100i Intel VROC	NS204i-p NS204i-r NS204i-t	E208i-a SR E208i-p SR E208e-p SR	MR216i-a MR216i-p	P408i-a SR P816i-a SR P408i-p SR P408e-p SR	MR416i-a MR416i-p	SR416i-a	SR932i-p
Synergy	SR100i	NS204i-d	E208i-c SR		P204i-c SR P416ie-m SR			



RESOURCES

- where get the info, tool, sites, videos

LAB

REVIEW QUESTIONS

HPE SYNERGY STORAGE ADMINISTRATION SKILLS

Topic areas

- Storage Options
  - Storage Array
  - D3940
- SAN Configuration
- Storage Management
- SAN Manager
- Networks
- Zoning
- Fabric
- Composable Arrays
- (working with non-Composable Array slide?)
- Volumes and Volume Templates
- Monitoring Storage

TRAINING OBJECTIVES

- Upon completion of the module apply HPE Synergy Storage Administration skills to perform tasks in lab to validate a Synergy deployment and initial hardware setup.
- Course review questions will provide you an opportunity check your knowledge of skill and task: Facts, Terms, Definitions and Concepts.
- The course modular structure organizes skill topics to follow typical systems administration responsibilities for tasks performed once installation completed. What's in it for you, at the end of this module, is identifying those skills you need to perform on the job with your Synergy implementation.
- Successful Skill performance is demonstrated at the end of this module by using the OneView interface and configuration documentation to perform the listed skills
- Upon completion of the module create a personal learning plan and module summary thinking about the following questions:
  - What are the new skills that were covered?
  - Who on the team will perform the skills in the module?
  - What questions do you need answers?

Training objectives

Upon completion of the module apply HPE Synergy Storage Administration skills to perform tasks in lab to validate a Synergy deployment and initial hardware setup.

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- What questions do you need answers?

THANK YOU


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HPE SYNERGY COMPOSABILITY
H0LN3S E.00
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HPE SYNERGY COMPOSABILITY ADMINISTRATION SKILLS

- Server Hardware
  - Gen10 Compute, iLO 5
- Server Hardware Types
- Server Profile Template
- Server Profile
- Physical addressing
- Compliance

TRAINING OBJECTIVES

- Upon completion of the module apply HPE Synergy Composability Administration skills to perform tasks in lab to validate a Synergy deployment and initial hardware setup.
- Course review questions will provide you an opportunity check your knowledge of skill and task: Facts, Terms, Definitions and Concepts.
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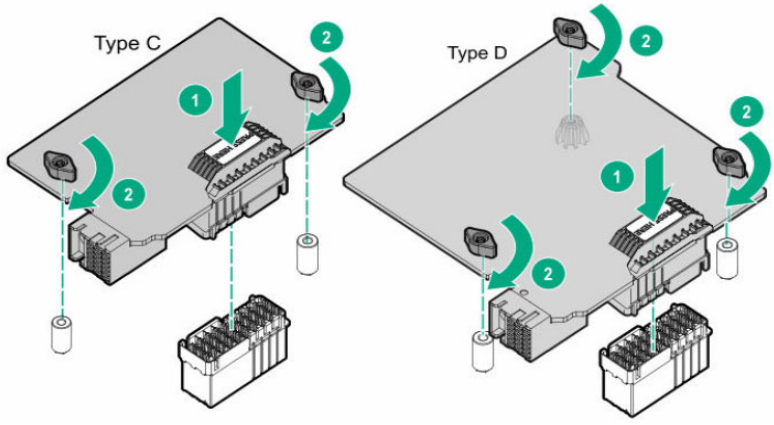
- What questions do you need answers?

MEZZANINE CARDS

HPE Synergy Gen10 compute modules

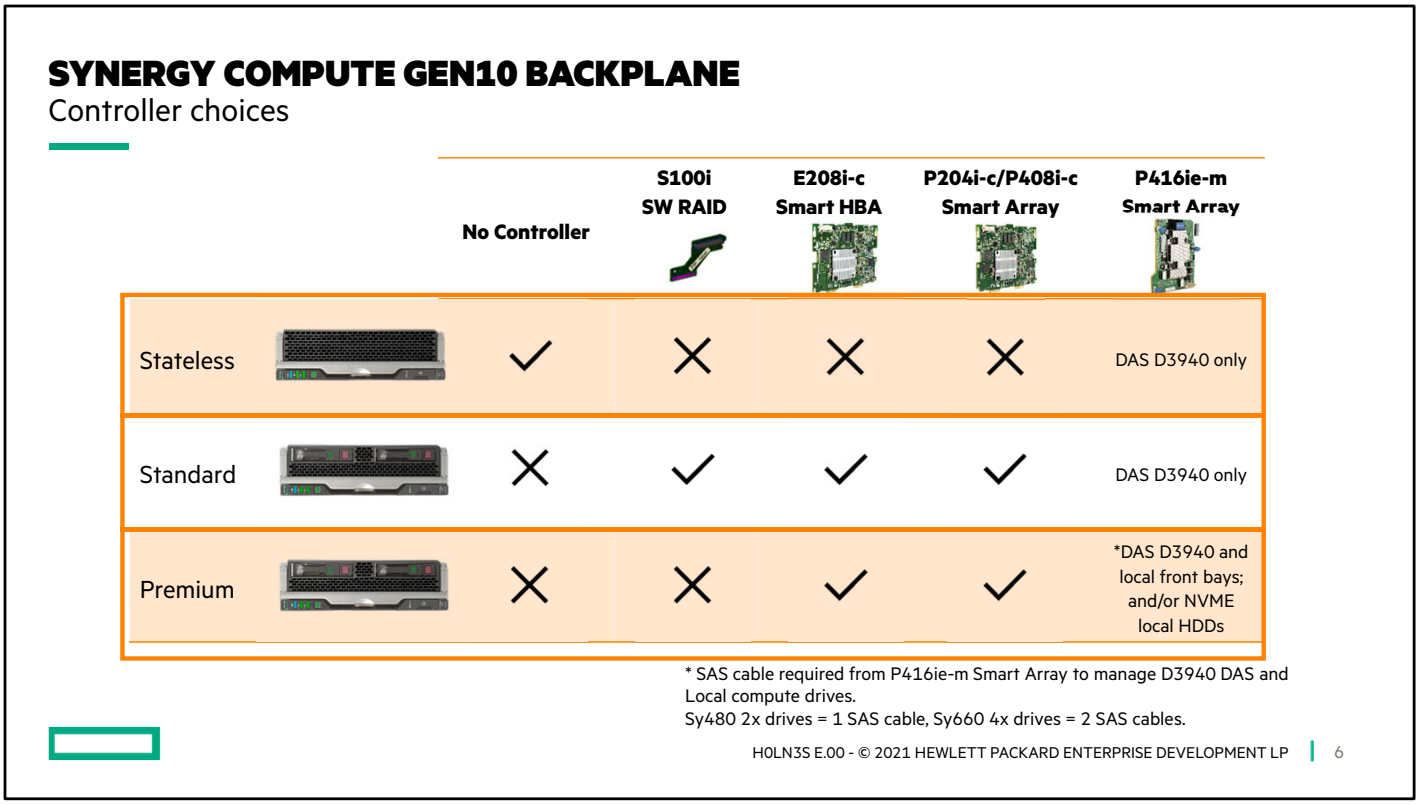
MEZZANINE PORT CONFIGURATIONS

- Mezzanine cards for HPE Synergy compute modules come in the following sizes:
- Type C — Type C mezzanine cards can be installed on either Type C or Type D mezzanine connectors.
- Type D — T nectors.



Mezzanine cards for HPE Synergy compute modules come in the following sizes:

- Type C — Type C mezzanine cards can be installed on either Type C or Type D mezzanine connectors.
- Type D — Type D mezzanine cards can be installed only on Type D connectors.



Synergy Compute Gen10 backplane—Controller choices

This is a review of the HPE Synergy Gen10 compute module backplane and controller choices.

For a stateless chassis, there is no controller for local storage on the compute module, but adding a Smart Array P416ie-m mezzanine card allows a DAS connection to the D3940 Storage Module.

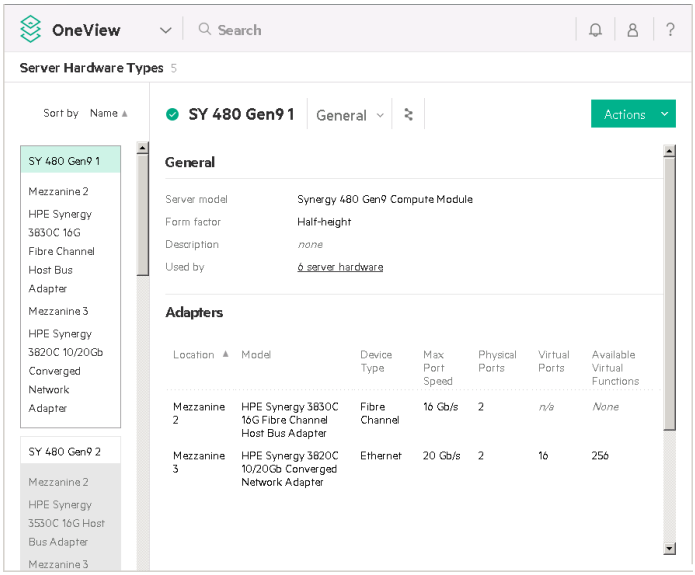
For the standard backplane chassis, the controller options include software RAID using the embedded S100i controller, or the E208i-c Smart HBA mezzanine controller card, or the P204i-c or P408i-c Smart Array mezzanine controller card. It is also possible to use the Smart Array P416ie-m mezzanine card to connect to the D3940 Storage Module.

And for the premium backplane chassis, the controller options include: the E208i-c Smart HBA mezzanine controller card, and the P204i-c or P408i-c Smart Array mezzanine controller card, and the Smart Array P416ie-m mezzanine card, which connects to the D3940 Storage Module.

SERVER HARDWARE TYPE

SERVER HARDWARE TYPES

- Server Hardware Generation and Mezzanine Cards installed
- Defines which settings are available to Server Profiles
- HPE OneView creates new server hardware types when a frame is discovered



Server hardware types

- A server hardware type captures details about the physical configuration of server hardware, and defines which settings are available to the server profiles assigned to that type of server hardware. For example, the server hardware type for the HPE Synergy 480 Gen9 Compute Module includes a complete set of default BIOS settings for that server blade hardware configuration.
- HPE OneView creates new server hardware types when a frame is discovered.

SERVER PROFILE TEMPLATES

SERVER PROFILE TEMPLATES

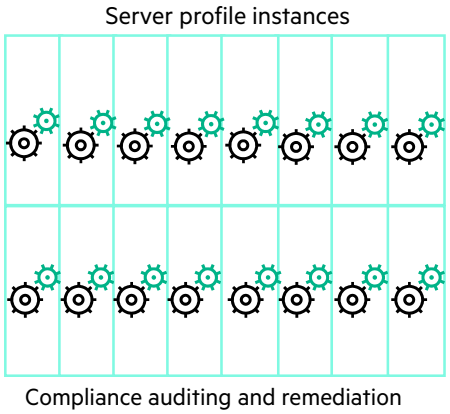
- Key aspects of a server configuration
- Local storage
  - Embedded Smart Array
  - Mezzanine Smart Array
- SAN storage
- Boot settings
- BIOS settings
- Advanced
  - Unique IDs
- Basic server identification information
- Compliance Checking
- Firmware
- OS deployment
- Connections
  - Untagged Ethernet
  - Tagged Ethernet
  - Tunnel Ethernet
  - FCoE mapped to fabric-attach networks
  - FCoE mapped to DualHop FCoE networks
  - Native Fibre Channel

Server profiles—Key aspects of a server configuration

- Server profiles and server profile templates enable you to provision hardware quickly and consistently according to your best practices. Store your best practice configuration in a server profile template and then use the server profile template to create and deploy server profiles.
- Server profiles enable your experts to specify a server configuration before the server arrives. When the server hardware is installed, your administrators can quickly bring the new server under management.
- A server profile captures key aspects of a server configuration in one place, including:
  - Basic server identification information
  - Firmware versions
  - Operating system deployment settings
  - Connections to networks:
    - Untagged Ethernet
    - Tagged Ethernet
    - Tunnel Ethernet
    - FCoE mapped to fabric-attach networks
    - FCoE mapped to DualHop FCoE networks
    - Native Fibre Channel
  - Local storage
    - Embedded Smart Array
    - Mezzanine Smart Array
  - SAN storage
  - Boot settings
  - BIOS settings
  - Advanced
    - Physical or virtual UUIDs, MAC and WWN addresses

SERVER PROFILE TEMPLATES

- Server profiles inherit from template – you control the change rollout
- Server profile template



- All server profile settings
  - Firmware baseline and OS drivers
  - UEFI / BIOS settings
  - Boot order
  - Network connectivity
  - Local RAID settings
  - SAN storage volumes
- Server profile templates cannot be assigned to server hardware directly

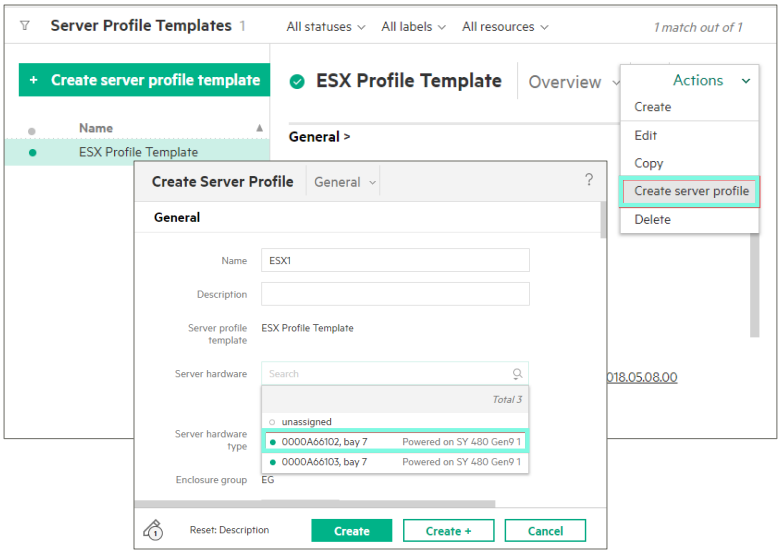
Server profile templates

- Server profile templates help to monitor, flag, and update server profiles in HPE OneView. A server profile template serves as a structural reference when creating a server profile and defines the centralized source for the configuration of firmware, connections, local storage, SAN storage, boot, BIOS, profile affinity, and hides unused FlexNICs. Typically, you capture best-practice configurations in a server profile template, and then create and deploy server profiles.
- When you create a server profile template, you can specify the server hardware type and the enclosure group. You cannot change the server hardware type and the enclosure group after creating the template. All profiles generated from the same template will have the same server hardware type and enclosure group.
- A server profile continues to maintain an association to its server profile template after being created from a server profile template. Any drift in configuration consistency between the server profile template and server profiles is monitored and made visible on both the server profile template and the associated server profiles.
- All configuration settings inherited from the template – just provide server profile name and choose the server hardware (or leave unassigned).
- There is also the option to change settings to deviate from server profile templates.

CREATING SERVER PROFILE FROM SERVER PROFILE TEMPLATE

- To create a server profile from a template:
  1. Select a server profile template
  2. Click **Actions** → **Create server profile**
  3. Provide a name for the server profile
  4. Select a bay/server hardware to assign
  5. (Optional) Select **Override server profile template**, if you want to override any settings in the server profile template
  6. Click the **Create** button

NOTE: Of course, creating one-off server profile without a template is also possible, as in previous HPE OneView versions.



Creating server profile from server profile template

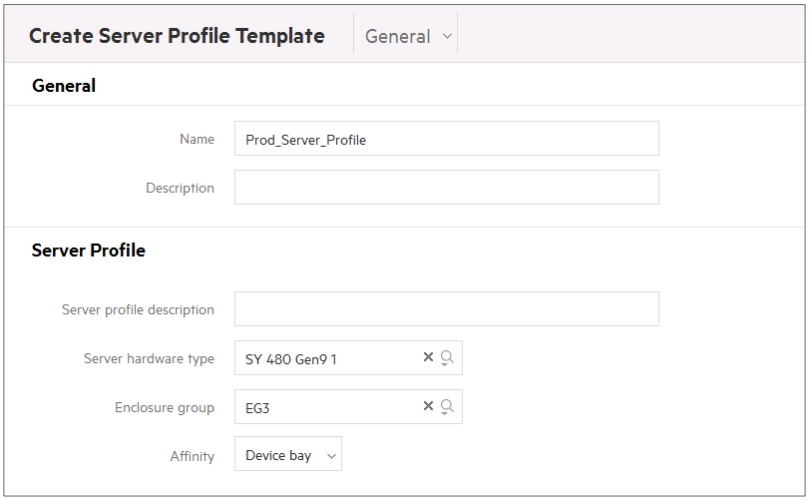
- To create a server profiles from a template:
- From the main menu, select Server Profile Templates and select a template from the list of available templates.Click Actions → Create server profile in the menu on the upper right.
- Provide a unique name and optional description for this new server profile.
- Select a server hardware to assign (enclosure and enclosure bay), or select unassigned if that profile will not be applied immediately.
- Note: When you select an enclosure and enclosure bay, the appliance automatically determines the appropriate profile settings based on the server hardware detected in that enclosure bay. The server hardware physical UUID appears next to the server hardware label.
- Note: When you select an IP address, you are selecting a DL server hardware. The server hardware type is automatically determined. Enclosure group does not apply to this type of server. You can choose the firmware and BIOS settings for DL servers.
- (Optional) Select Override server profile template, if you want to override any settings in the server profile template.
- Click the Create button.

GENERAL, SERVER PROFILE, OS DEPLOYMENT

General
Name and Description

Server profile
Server profile description
Server hardware type
Enclosure group
Affinity

OS Deployment
Only used with Image Streamer



General, Server Profile, OS Deployment

General

Name

Description

Server profile

Server profile description

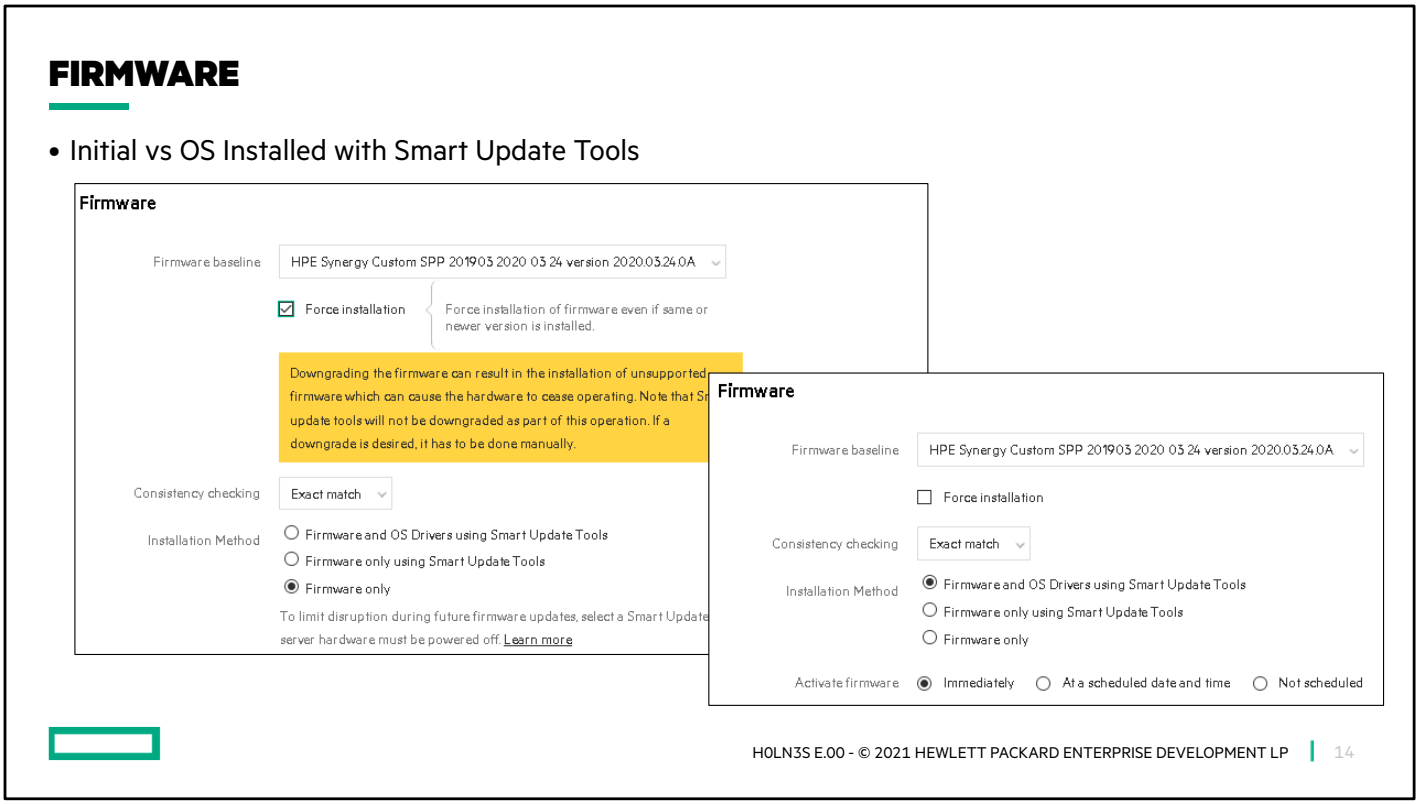
Server hardware type

Enclosure group

Affinity

OS Deployment

Only used with Image Streamer



Firmware

Initial vs OS Installed with Smart Update Tools

Firmware baseline: identifies the HPE synergy custom SPP to be used

Force installation: select reapply same version name of the firmware

Consistency checking: validate when profile is created that the specified firmware version has been applied to the server

Installation method:

Firmware only is selected the first time I server is installed, or if the goal is to reinstall just the firmware on the server.

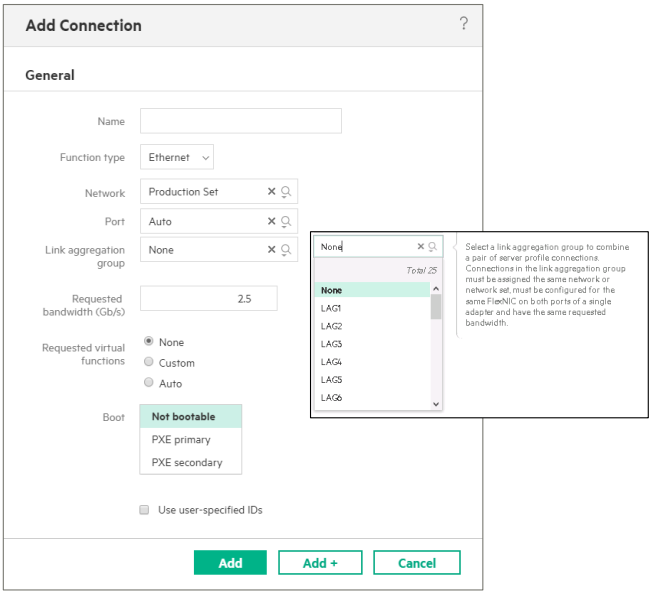
The other two options allow HPE OneView communicate with the smart update tools running on the operating system on the server.

When the smart update tools are selected activate firmware options can be used that give the server admin on that operating system scheduled control over when firmware and drivers will be installed.

CREATING AN ETHERNET CONNECTION

1. Provide a connection name (optional)
2. Select Ethernet connection type (default)
3. Select a network or a Network Set (or unassigned)
4. Select a FlexNIC port
5. Optional: Select a Link aggregation group; default: None
6. Enter a bandwidth
7. Optional: Request virtual functions
8. Optional: Select the PXE boot preference
9. Optional: Assign a user-specified MAC address

NOTE: Only PF1 (a function) will support PXE functions (otherwise server will fail to PXE boot).



Creating an Ethernet connection

- Setting network connections via a server profile is supported for ProLiant server blades but is not supported for rack mount servers.
- When creating an Ethernet connection, select the following:
- Ethernet device type (default)
- Network or network set that is appropriate for server profile Ethernet connection
- Bandwidth:
  - Defaults to the preferred bandwidth of the selected the network or network set.
  - Can be set between 0.1 Gb/s and the maximum bandwidth of the selected network or network set in 0.1 Gb/s increments.
  - FlexNIC port:
  - A new feature in HPE OneView (it is not available in VCM).
  - It defaults to “Auto.”
  - PXE boot:
    - The Primary and Secondary PXE boot options can be selected if the server profile is used to manage the boot order.
    - The first FlexNIC on each physical function supports PXE.
    - It defaults to “Not bootable.”
- Note: Only PF1 (a function) will support PXE functions (otherwise server will fail to PXE boot). Therefore, make sure to assign your PXE deployment network to PF1 on your server profile. (HPE OneView will not know which one it is since nothing special about this network to differentiate in HPE OneView.)

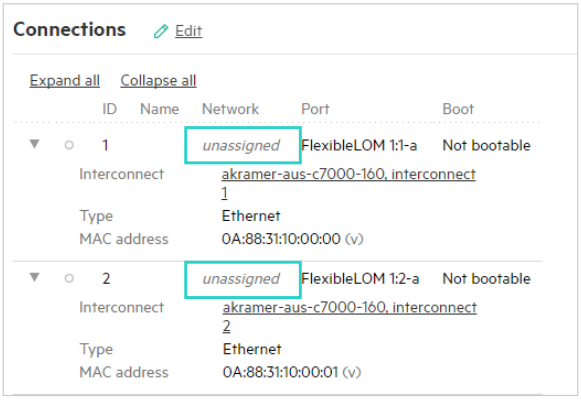
SERVER PROFILE TEMPLATE CONNECTIONS

Without Assigned Network

Server Admin can reserve server 'port' and assign networks later while server power is on.

Use cases:

- Server connectivity pre-provisioning
- Adding new ports causes the PCIe enumeration to change
- Virtual MAC addresses are not known until the connections are created.
- Allows user to disable profile connection without powering off the server.



Server Admin can reserve server and assign networks later while server power is on.

Use cases:

Server connectivity pre-provisioning – customer knows number of connections (NIC ports) the server will require, but does not want server to be ‘chatty’ on the production networks during OS provisioning.

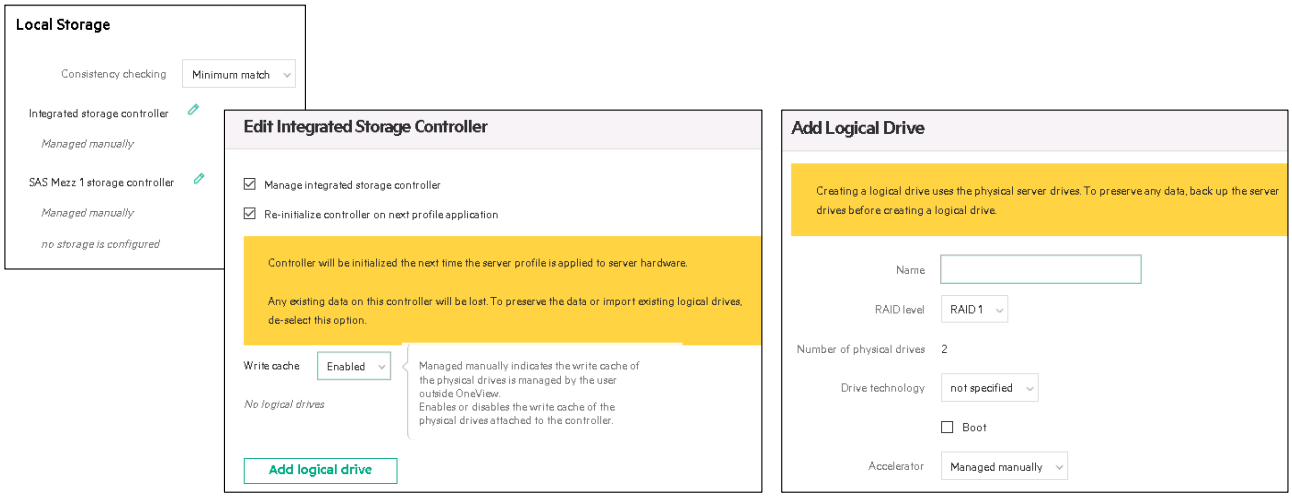
Adding new ports causes the PCIe enumeration to change, and also requires significant delays due to POST time. This feature eliminates need to power off the server to add connectivity to the production networks.

Virtual MAC addresses are not known until the connections are created. Allocating virtual MACs prior to server acquisition and OS install further optimizes customer processes.

Allows user to disable profile connection without powering off the server.

STORAGE

- Local, D3940 on Mezz 1, SAN



Storage

Local storage configuration options for the array controller in the server include the following:

Manage integrated storage controller

Reinitialize controller on next profile application

Right cache

Add logical drive options:

Name

RAID level

Number of physical drives

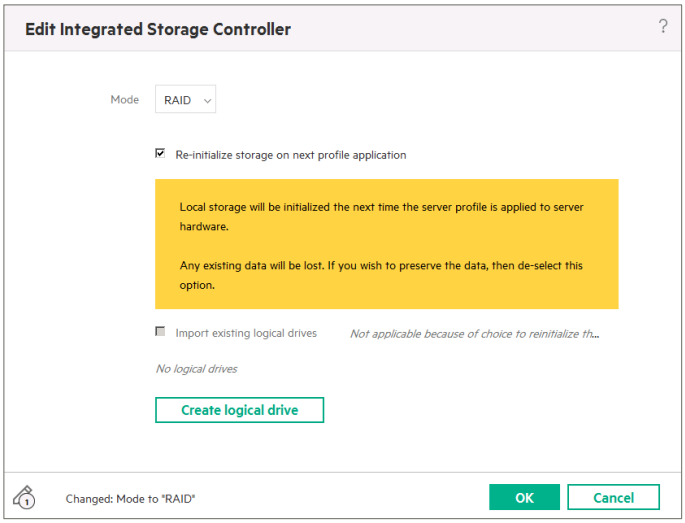
Drive technology

Specify as bootable

Accelerator options

LOCAL STORAGE RAID LEVELS AND CONTROLLERS

- Use RAID to define logical drives or HBA to present drives to the controller
- Check the specifications of each controller to verify which RAID levels are supported
  - Manage the RAID 50/60 controller manually
- Number of drives:
  - RAID 0 minimum of 1 drive, increments of 1
  - RAID 1 requires 2 drives
  - RAID 10 requires 4 drives, increments of 2
  - RAID 1 ADM requires 3 drives
  - RAID 5 minimum of 3 drives, increments of 1
  - RAID 6 minimum of 4 drives, increments of 1

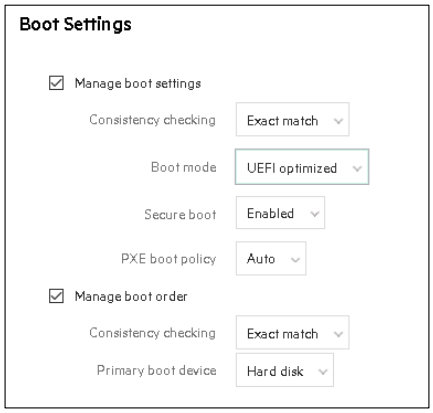


Local storage RAID levels and controllers

- You can use RAID to define logical drives or HBA to present drives directly to the controller. The RAID levels which the controller can support are defined in the specifications of each controller.
- You must check the specifications of each controller to verify which RAID levels the controller supports. Supported RAID levels depend on the server hardware type and on the physical server configuration. Ensure you have enough physical drives present for the selected RAID level.
- Note: Although RAID 50 and RAID 60 are supported by some controllers, they are not supported by HPE OneView. To use RAID 50 or RAID 60, set the controller to manage manually in HPE OneView.
- The required number of drives:
  - RAID 0 minimum of 1 drive, increments of 1
  - RAID 1 requires 2 drives
  - RAID 10 requires 4 drives, increments of 2
  - RAID 1 ADM requires 3 drives
  - RAID 5 minimum of 3 drives, increments of 1
  - RAID 6 minimum of 4 drives, increments of 1

BOOT SETTINGS

Boot
- Boot device and boot order
- First time boot
- UEFI Shell settings
- Legacy BIOS



Boot

Boot device and boot order

First time boot

UEFI Shell settings

Legacy BIOS

BIOS

BIOS settings allow for quick configuration of BIOS options for the server at server profile template or profile levels.

Workload profiles provide common best practice BIOS configurations that can be quickly selected to set up the server.

Those settings can be further customized within the template and then applied to multiple servers.

Consistency checking enables monitoring of server BIOS adding against the server profile settings.

HPE OneView can be configured to alert or ignore any differences between the BIOS in the profile and the actual server config.

COMPLIANCE CHECKS FIRMWARE AND BIOS

- Server Profile Template, Server Profile implications
- HPE OneView reports firmware and BIOS settings inconsistencies
  - Installed firmware versions compared to versions in the specified Firmware baseline
  - Actual BIOS settings values compare to server profile settings
- Dismissible warning alert is generated
- Server profile refresh also checks for firmware and BIOS inconsistencies

Server Profile Template

- SP created from this SPT will notify deltas at this level

Server Profile - Created from SPT applied to bay

– Will notify deltas if not consistent with SPT

– At this and SPT level

– Server

- If someone makes BIOS change on server

Where a reboot is not required

- Alerts **ONLY** at Profile level

Compliance Checks Firmware and BIOS

HPE OneView reports firmware and BIOS settings inconsistencies

- Installed firmware versions compared to versions in the specified Firmware baseline
- Actual BIOS settings values compare to server profile settings

Dismissible warning alert is generated

Server profile refresh also checks for firmware and BIOS inconsistencies

Server Profile Template

SP created from this SPT will notify deltas at this level

Server Profile - Created from SPT applied to bay

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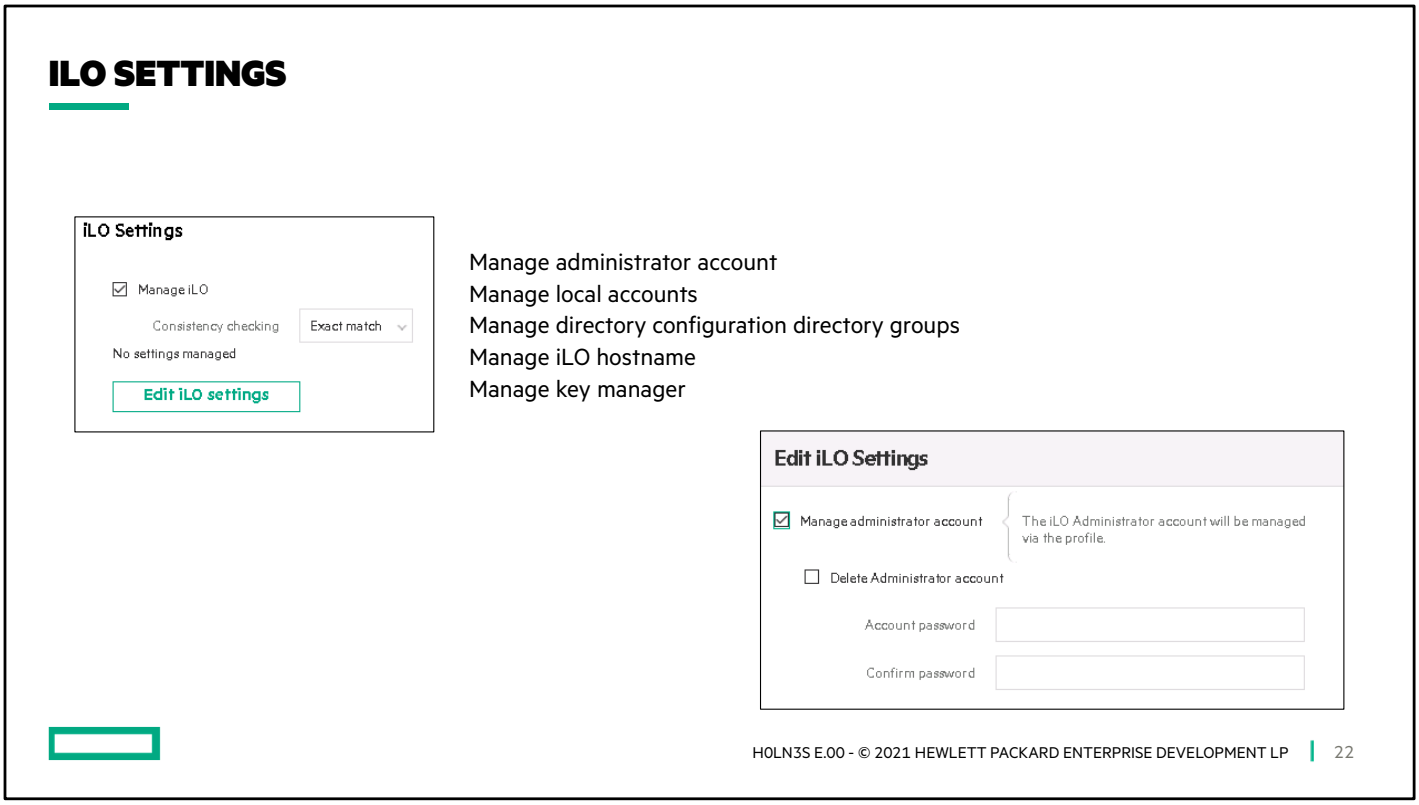
Server

If someone makes BIOS change on server

Where a reboot is not required

Alerts ONLY at Profile level



iLO Settings

iLO Settings provide access to the following ILO configurations:

Manage administrator account : set the administrator password or remove the administrator account

Manage local accounts: the fine local accounts, privileges, credentials

Manage directory configuration and manage directory groups: AD/LDAP/X.509 integration

Manage iLO hostname: set or change the hostname for the iLO

Manage key manager: configure info to use an enterprise security manager (ESKM)

USE CASES

INITIAL FIRMWARE AND CONFIGURATION USE CASE

- Deploy firmware and initial config to server
- Name, Server Hardware Type, Affinity
- Firmware: SPP or Server only bundle
  - Force install considerations
  - Consistency checking
- Boot Settings Manage boot mode: checked, Consistency checking: Exact match
  - Boot mode: UEFI optimized, Secure Boot managed manually (non-changeable)
  - Manage boot order: checked, Consistency checking: Exact match, Primary boot device: Hard disk
- BIOS settings: Manage BIOS: checked, workload profile low power
- iLO Settings: Manage iLO: checked, Consistency checking: Exact match, configure all settings
- Connectivity: optional

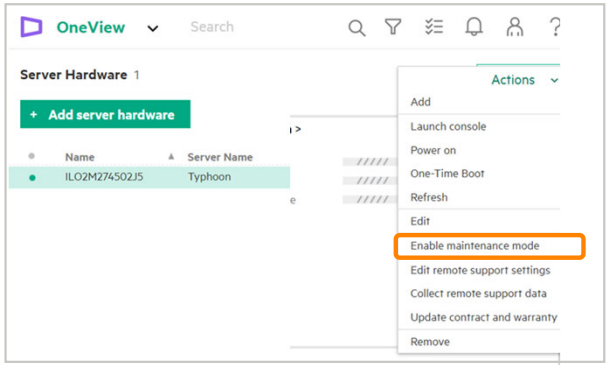
Initial Firmware and Configuration

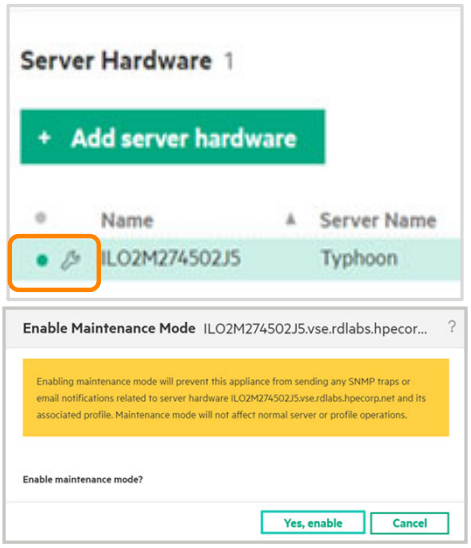
TEMPLATE FOR HYPERVISOR DEPLOYMENT

- Name, Server Hardware Type, Affinity
- Firmware: already set, Consistency checking: Exact match
- Boot Settings Manage boot mode: checked, Consistency checking: Exact match
- BIOS settings: Manage BIOS: checked, workload VM Max Performance
- iLO Settings: already set, Consistency checking: Exact match
- Connectivity: assign LAN, SAN

MAINTENANCE MODE

- Suppress unwanted emails and activity alerts for routine server maintenance
- Reduced number of emails and alerts and a visual indicator of maintenance state
- Indicate Server is being configured





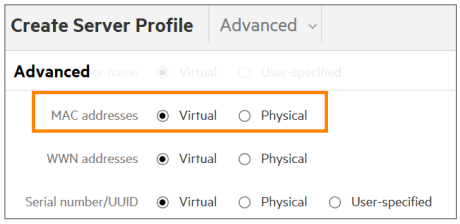
Maintenance Mode

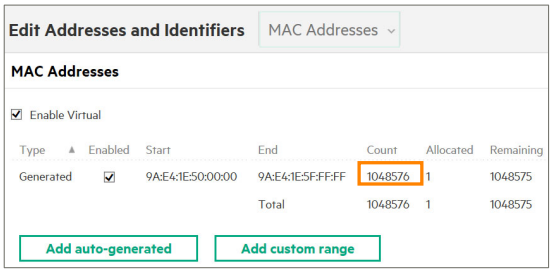
Suppress unwanted emails and activity alerts for routine server maintenance

SELECT VIRTUAL OR PHYSICAL MAC ADDRESSES

Advanced Server Profile options

- HPE OneView can apply a virtual MAC address to the adapter port (FlexNIC). This is the default
  - HPE OneView-applied MAC addresses move with the profile to different server hardware
  - The HPE OneView value masks the physical value of the adapter, when the profile is assigned
  - The MAC address is set when the connection is created, and it cannot be modified
- HPE OneView-assigned MAC addresses
  - By default, HPE OneView allocates locally administered MAC addresses
  - HPE OneView-selected and user-defined ranges can be added
- Select Physical if you want to use the physical MAC address of the adapter. Physical addresses do not move when the profile moves





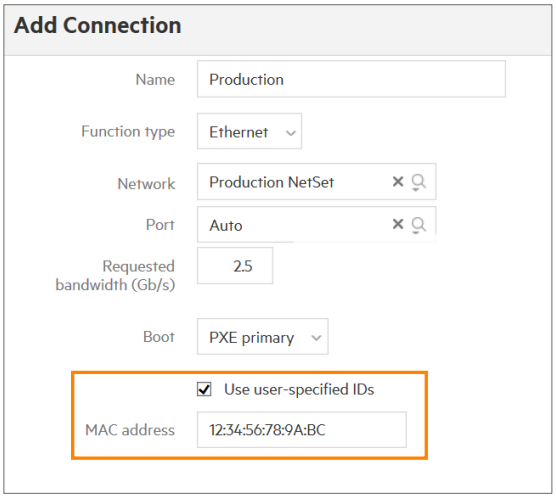
Ethernet connections—Select Virtual or Physical MAC addresses

- HPE OneView can apply a virtual MAC address to the adapter port (FlexNIC). Virtual is the default and is selected from the Advanced section of a Server Profile page during its creation.
- HPE OneView-applied MAC addresses are transportable to different server hardware. This feature supports server replacement and server profile movement.
- The HPE OneView value overwrites the value of the adapter, and then the profile is assigned. The physical MAC address is restored when the profile is removed.
- The MAC address is set when the connection is created. It cannot be modified.
- HPE OneView-assigned MAC addresses
- By default, HPE OneView allocates locally administered MAC addresses. HPE OneView divides the 2 to the power of 46 available addresses into 2 to the power of 26 (67,108,864) ranges, each containing 2 to the power of 20 (1,048,576) entries. A range is then randomly selected during the appliance initialization. You can check for duplications or conflicts with other appliances.
- In addition, HPE OneView-selected and user-defined ranges can be added.
- Select the Physical option to use the physical MAC address of the adapter.

SELECT USER-DEFINED MAC ADDRESSES

Per Ethernet connection option

- The server profile selection can be overridden at the connection level with a user-defined option
  - Useful when migrating server profiles from Virtual Connect or recovering an accidentally deleted HPE OneView server profile
- User-specified MAC addresses
  - Can be contained in a HPE OneView-selected range
  - Must be unique (checked against Virtual and User-Defined values)
  - Are not checked for duplication with physical MAC addresses
  - Are not checked for duplication with other HPE OneView appliances

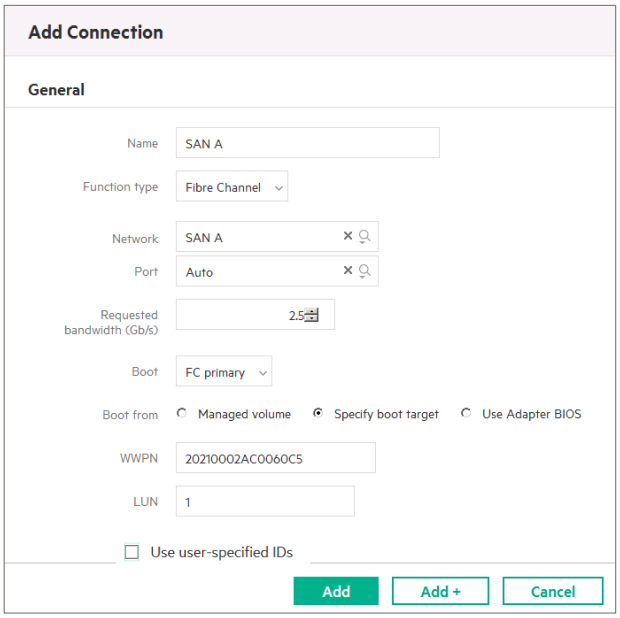


User-defined MAC addresses – per Ethernet connection option

- The server profile addressing selection can be overridden at the Ethernet connection level with the user-defined option. This feature is useful when migrating server profiles from Virtual Connect Manager or when recovering an accidentally deleted HPE OneView server profile.
- User-specified MAC addresses can be contained in an HPE OneView-selected range. They must be unique (that is, checked against other Virtual and User-Defined values). They are not checked for duplication with physical MACs nor are they checked for duplication in other HPE OneView appliances.

CREATING AN FC/FCOE CONNECTION

1. Provide a connection name
2. Select Fibre Channel connection type
3. Select a Fibre Channel network
4. Select an FCoE-capable port or Auto
5. Enter a bandwidth
6. Optional: Select a boot target
7. Optional: assign user-specified WWPN/WWNN



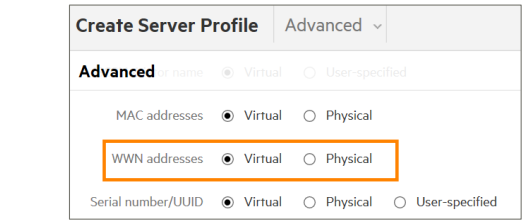
Creating an FC/FCoE connection

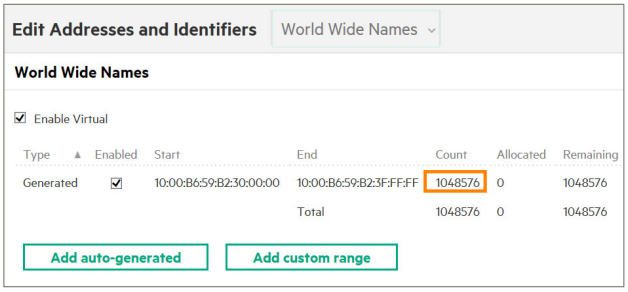
- When creating a server profile with Fibre Channel or Fibre Channel over Ethernet (FCoE) connections, select the following:
  - Fibre Channel function type—When adding an FCoE network to a profile connection, select Fibre Channel.
  - Network—A Fibre Channel or FCoE network can be accessed by a Fibre Channel device, networks are filtered to both Fibre Channel and FCoE when Type is set to Fibre Channel.
  - Preferred bandwidth—This option defaults to the preferred bandwidth of the selected the network or network set. It can be set between 0.1 Gb/s and the maximum bandwidth of the selected network or network set in 0.1 Gb/s increments.
  - Port—It defaults to “Auto.”
  - Boot preference—Primary and Secondary options can be specified if the server profile is used to manage the boot order. The second function (b) on each physical port supports FC/FCoE. This options defaults to “Not bootable.”

SELECT VIRTUAL OR PHYSICAL WWNS

Advanced Server Profile option

- HPE OneView can apply WWNs to the physical function
  - HPE OneView-applied WWNs move with the profile to different server hardware
  - The HPE OneView values mask the physical value of the adapter, when the profile is assigned
  - The WWNs are set when the connection is created, and they cannot be modified
- HPE OneView-assigned WWNs
  - By default, HPE OneView allocates locally administered WWNs
  - HPE OneView divides the 246 available addresses into 226 (67,108,864) ranges, each containing 220 (1,048,576) entries
  - A range is randomly selected during the appliance initialization
  - HPE OneView-selected and user-defined ranges can be added
- Select Physical to use the physical WWNs of the adapter





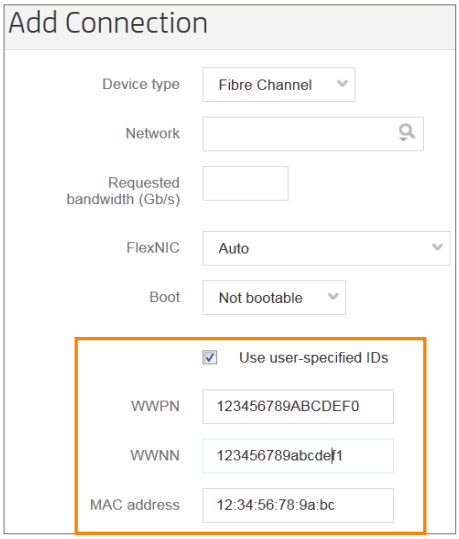
FC/FCoE connections—WWN management is similar to MAC address management

- HPE OneView can apply Virtual WWNs to adapter FC connections. HPE OneView-applied WWNs are transportable to different server, which means that it supports server replacements and server profile movements.
- The HPE OneView values mask the physical values of the adapter when a profile is assigned. The physical WWNs are restored when the profile is removed.
- The WWNs are set when the connection is created. They cannot be modified without removing the connection and re-creating it again.
- By default, HPE OneView allocates locally administered WWNs. HPE OneView divides the 246 available addresses into 226 (67,108,864) ranges, each containing 220 (1,048,576) entries. A range is randomly selected during the appliance initialization. You can check for duplications and conflicts with other appliances.
- In addition, HPE OneView-selected and user-defined ranges can be added.
- Select the Physical option in the Advanced Server Profile section to use the WWNs of the physical adapter instead of the HPE OneView virtual WWNs.

SELECT USER-DEFINED WWNS

Per Fibre Channel connection option

- The server profile selection can be overridden at the connection level with the user-defined option
- User-specified WWNs
  - Can be contained in an HPE OneView-selected range
  - Must be unique (checked against the Virtual and User-Defined values)
  - Are not checked for duplication with physical WWNs and MAC addresses
  - Are not checked for duplication with other HPE OneView appliances
- For FCoE connections, a MAC address must also be specified



User-defined WWNs – Per Fibre Channel connection option

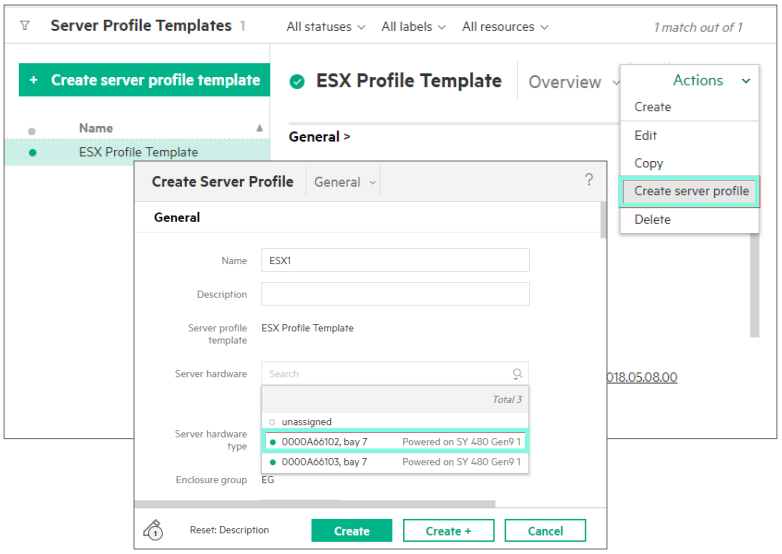
- The server profile WWN selection can be overridden at the Fibre Channel connection level with the user-defined option. This is useful when migrating server profiles from Virtual Connect Manager or when recovering an accidentally deleted HPE OneView server profile.
- User-specified WWNs and MAC addresses can be contained in an HPE OneView-selected range. They must be unique (that is, checked against other Virtual and User-Defined values). They are not checked for duplication with physical WWNs and MAC addresses, nor are they checked for duplication with other HPE OneView appliances.
- For FCoE connections, all three values must be specified on the screen: WWPN, WWNN, and MAC address.
- Multiple N_Port ID Virtualization (NPIV) items are not supported at this time.

PROFILES AND COMPLIANCE

CREATING SERVER PROFILE FROM SERVER PROFILE TEMPLATE

- To create a server profile from a template:
  1. Select a server profile template
  2. Click **Actions** → **Create server profile**
  3. Provide a name for the server profile
  4. Select a bay/server hardware to assign
  5. (Optional) Select **Override server profile template**, if you want to override any settings in the server profile template
  6. Click the **Create** button

NOTE: Of course, creating one-off server profile without a template is also possible, as in previous HPE OneView versions.

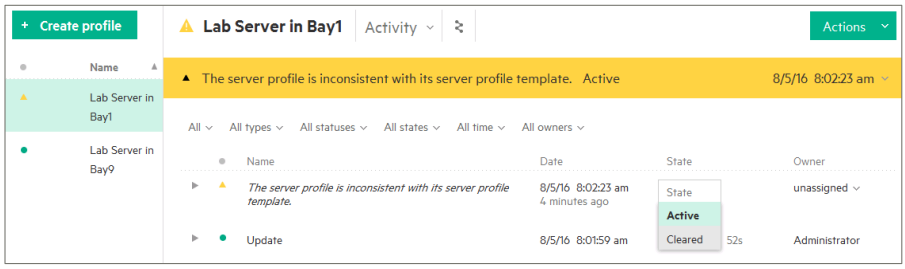


Creating server profile from server profile template

- To create a server profiles from a template:
- From the main menu, select Server Profile Templates and select a template from the list of available templates.Click Actions → Create server profile in the menu on the upper right.
- Provide a unique name and optional description for this new server profile.
- Select a server hardware to assign (enclosure and enclosure bay), or select unassigned if that profile will not be applied immediately.
- Note: When you select an enclosure and enclosure bay, the appliance automatically determines the appropriate profile settings based on the server hardware detected in that enclosure bay. The server hardware physical UUID appears next to the server hardware label.
- Note: When you select an IP address, you are selecting a DL server hardware. The server hardware type is automatically determined. Enclosure group does not apply to this type of server. You can choose the firmware and BIOS settings for DL servers.
- (Optional) Select Override server profile template, if you want to override any settings in the server profile template.
- Click the Create button.

COMPLIANCE TRACKING AT SERVER PROFILES

- You can edit a server profile template or derived server profile
- Configuration changes between server profiles and templates are tracked for compliance
- Compliance status is evaluated and generates an alert for each inconsistent server profile
- A non-compliance status can be suppressed (ignored) by clearing the compliance alert
- Changes to Server Profile Templates do not affect the configuration of any derived server profiles, only trigger a compliance check

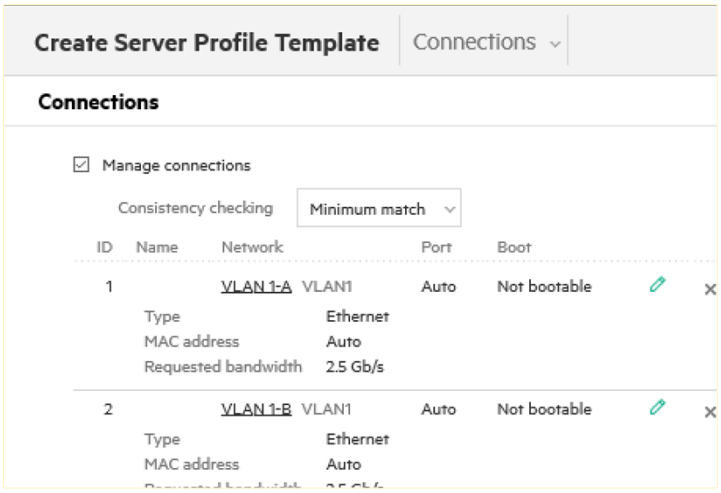


Compliance tracking at server profiles

- You can edit a server profile template or derived server profile any time after they have been created.
- Configuration changes between server profiles and corresponding templates are tracked for compliance.
- When you edit a server profile template, the appliance analyzes the changes and updates the template configuration. Then, all the server profiles created from the template are evaluated for compliance and a notification is given indicating the number of profiles that will be affected by the change. The profiles are marked as non-compliant and an alert for inconsistency is generated.
- A non-compliance status can be suppressed (ignored) by clearing the compliance alert.
- Changes to Server Profile Templates do not affect the configuration of any server profiles based on it. It will trigger a compliance check, but no changes to profiles.

SERVER PROFILE TEMPLATE PARTIAL COMPLIANCE TRACKING

- Provide minimum requirements
- Customers can define minimum requirements or not to track
- Three settings
- Granular control of each profile section
- Exceptions



Allows consistency checking to be controlled for each section of the server profile template. All sections allow consistency to be fully checked, as in earlier OneView releases, or suppressed. Some sections, such as connections, allows consistency to be checked only for items defined in the template; extra items in the server profile are ignored.

Customers can define minimum requirements or not to track

Three settings

- Minimum match
- Exact match
- Not checked

Granular control of each profile section

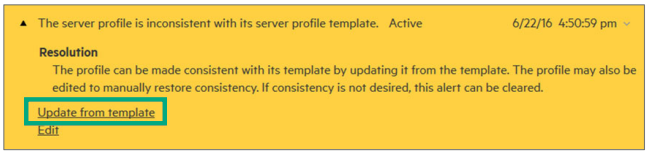
- OS Deployment
- Firmware
- Connections
- Local Storage
- SAN Management

Exceptions

- BIOS
- Boot Mode
- iLO

REMEDIATION OF A COMPLIANCE ISSUES

- A Server profile can be made consistent by using the **Update from Template** option
  - A preview of the changes that are going to be made are shown
- User also has the option of manually remediating by editing the server profile
- Some changes do not support manual remediation
  - Private SAN volumes
  - Server Hardware type and/or Enclosure group
  - Local storage configuration



- Server profiles may remain powered on during remediation based on the edits required
- Selecting **Manage manually** in the template for any section allows server profiles to choose any configuration settings for that section without causing non-compliance
- For shared storage, server profiles can have additional shared volumes

Remediation of a compliance issues

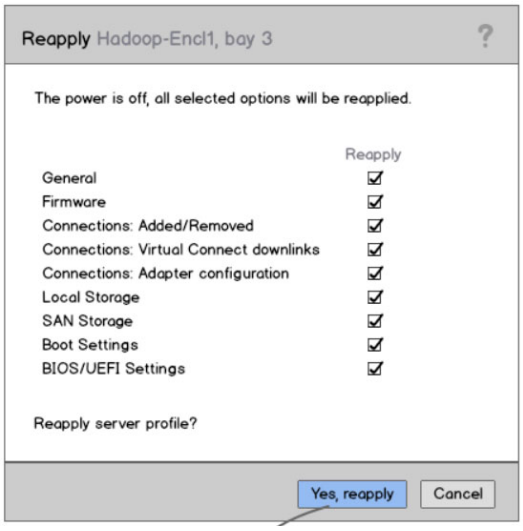
- A server profile that has a consistency alert can be remediated by using the Update from Template option.
- A preview of the changes that are going to be made are shown. Accepting them update the server profile.
- User has an option of manually remediating by editing the server profile (or template) until makes them consistent.
- Certain configuration changes do not support only manual remediation when inconsistent:
  - Private SAN volumes
  - Server Hardware type and/or Enclosure group
  - Local storage configuration
- Server profiles may remain powered on during remediation based on the edits required.
- Selecting Manage manually in the template for any section (for ex. firmware baseline) allows server profiles to choose any configuration settings for that section without causing non-compliance.
- For shared storage, server profiles can have additional shared volumes and not cause compliance issues. A template requires all volumes attached to the template to be present in the profiles for them to remain consistent but can have additional volumes.

REAPPLY SERVER PROFILE

- Repair or re-provision policy without multiple, time consuming operations

Use Case: HBA replaced, now how do I re-apply firmware only from the Server Profile?

- Customers often take time consuming process to fix configuration errors
- Just want a simple method to reapply specific components
- Reduce operational steps, make more simple
- Will re-orchestrate configuration
- Useful for fixing Server Profile Connections without multi-step process
- Not Destructive, will not delete data



Repair or re-provision policy without multiple, time consuming operations

Customers often take time consuming process to fix configuration errors

Just want a simple method to reapply specific components

Reduce operational steps, make more simple

Will re-orchestrate configuration to Un-provision or Provision

Useful for fixing Server Profile Connections without multi-step process

Not Destructive, will not delete data

RESOURCES

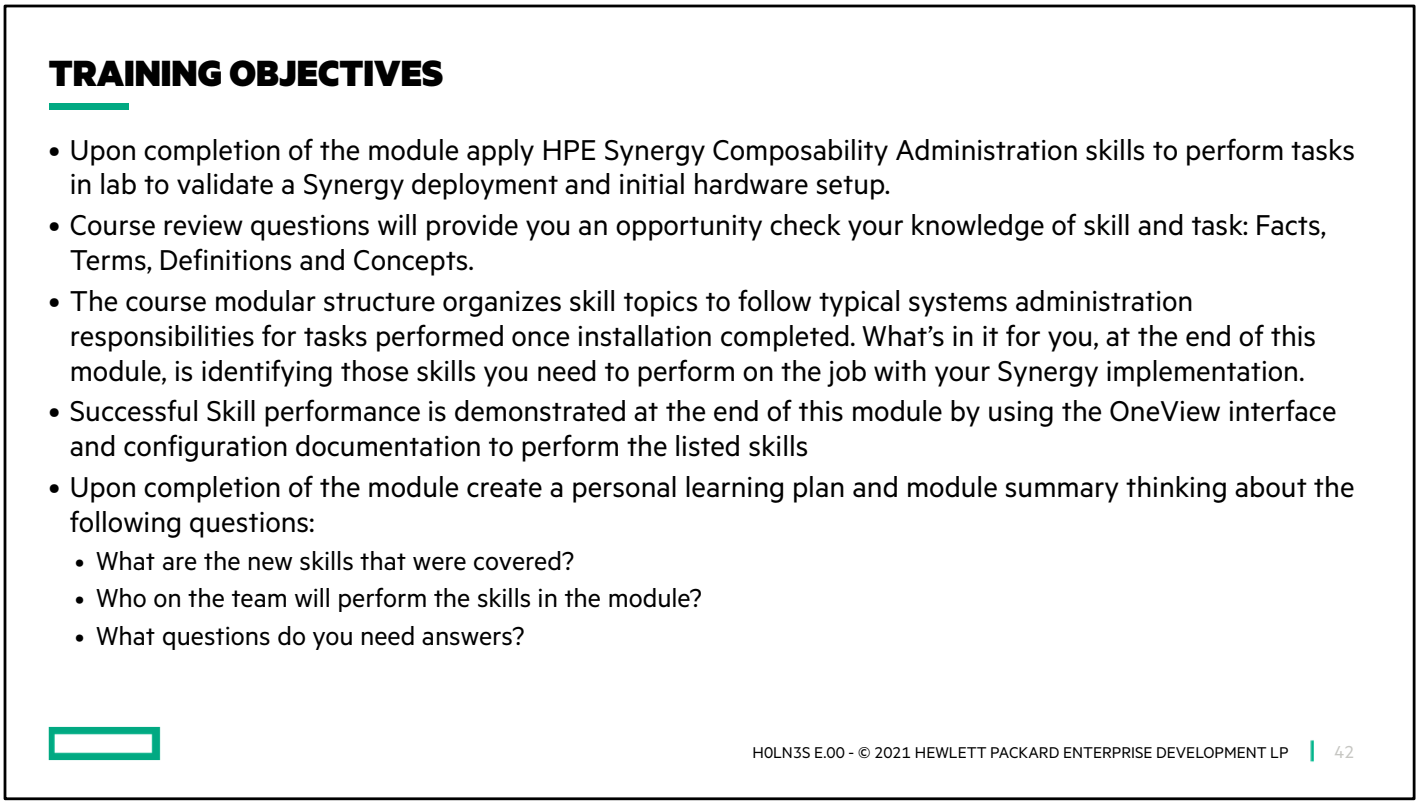
- where get the info, tool, sites, videos

LAB

REVIEW QUESTIONS

HPE SYNERGY COMPOSABILITY ADMINISTRATION SKILLS

- Server Hardware
- Gen10 Compute, iLO 5
- Gen9
- Server Hardware Types
- Server Profile Template
- Server Profile
- Physical addressing
- Compliance



Training objectives

Upon completion of the module apply HPE Synergy Composability Administration skills to perform tasks in lab to validate a Synergy deployment and initial hardware setup.

Course review questions will provide you an opportunity check your knowledge of skill and task: Facts, Terms, Definitions and Concepts.

The course modular structure organizes skill topics to follow typical systems administration responsibilities for tasks performed once installation completed. What's in it for you, at the end of this module, is identifying those skills you need to perform on the job with your Synergy implementation.

Successful Skill performance is demonstrated at the end of this module by using the OneView interface and configuration documentation to perform the listed skills

Upon completion of the module create a personal learning plan and module summary thinking about the following questions:

- What are the new skills that were covered?
- Who on the team will perform the skills in the module?
- What questions do you need answers?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FIRMWARE
H0LN3S E.00
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HPE SYNERGY FIRMWARE ADMINISTRATION SKILLS

Topic areas

- Current OneView Updates
- Acquiring Firmware
- Interconnect Firmware Updates
- Compute Firmware
- OS Tools
- Appliance Firmware
- Upgrading Hardware
- Preparing to Upgrade
- Best Practices
- Tools
- Compliance
- References

Outline

Current OneView Updates

Acquiring Firmware

Interconnect Firmware Updates

Compute Firmware

OS Tools

Appliance Firmware

Upgrading Hardware

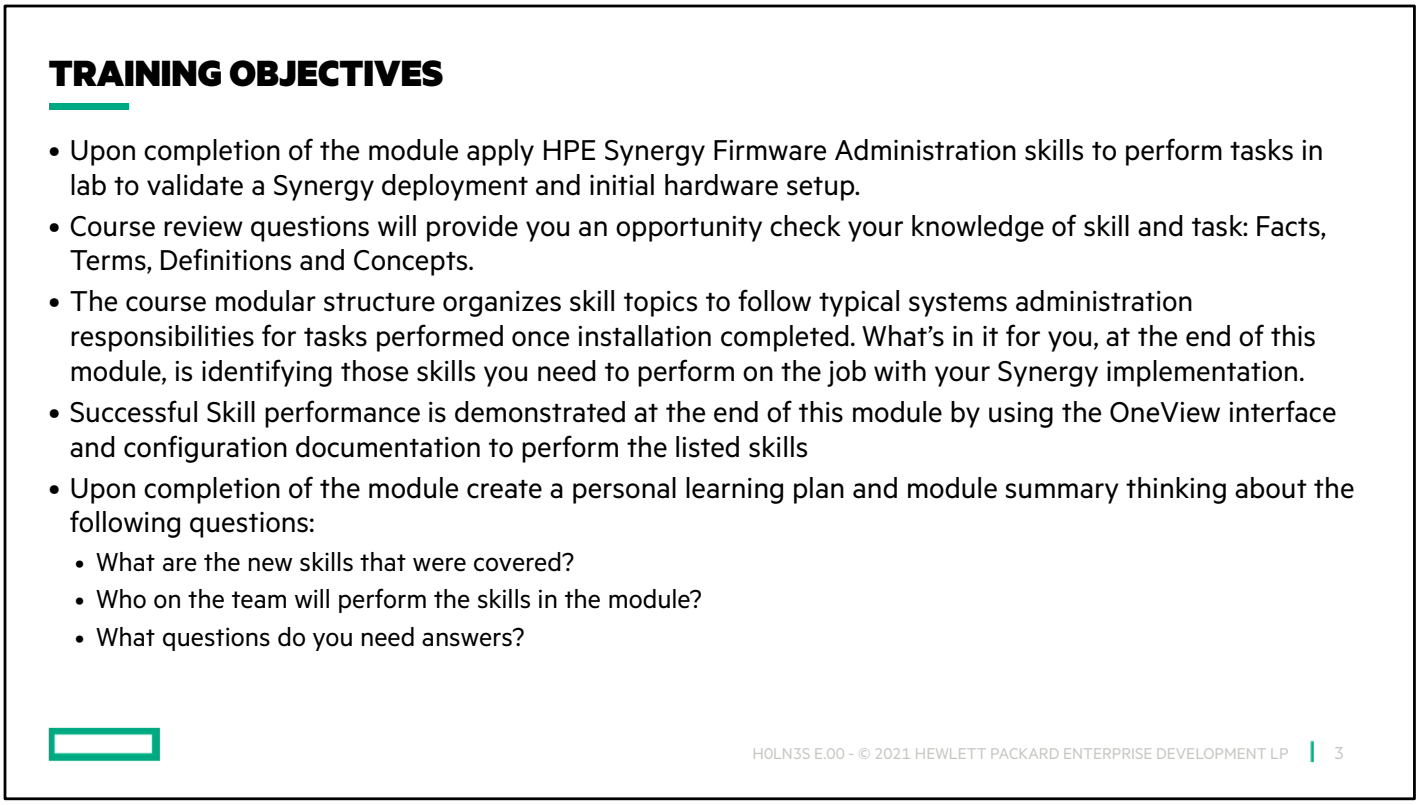
Preparing to Upgrade

Best Practices

Tools

Compliance

References



Training objectives

Upon completion of the module apply HPE Synergy Firmware Administration skills to perform tasks in lab to validate a Synergy deployment and initial hardware setup.

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INTRODUCTION TO HPE SYNERGY FIRMWARE AND DRIVER UPDATES

Introduction to HPE Synergy firmware and driver updates

FIRMWARE MANAGEMENT FEATURES

- Use HPE OneView to:
  - Manage firmware and
  - Reduce interactions and errors
  - Minimize downtime
  - Define firmware baselinesFirmware bundles Firmware updates:
  - Disruptive:
  - Non-disruptive

NOTE: *Disruptiveness* in a firmware update process refers to the impact the update has on an application, and not simply to whether the packets will be lost.

Firmware management features

HPE Synergy Composer powered by HPE OneView provides reliable and simplified firmware and driver management across many HPE Synergy components. HPE OneView manages firmware update to reduce manual interactions, errors, and minimize downtime.

Using the firmware management features built in to the HPE OneView, you can define firmware baselines and perform firmware updates across many resources. A firmware bundle also known as a Service Pack for ProLiant (SPP), is a comprehensive collection of firmware and system software components. Firmware bundles enable you to update firmware on HPE ProLiant servers, controllers, storage, and enclosures.

- Firmware updates can be disruptive or non-disruptive. Disruptiveness refers to the impact the update has on an application, and not simply to whether the packets will be lost.
- A disruptive firmware update means that the packet loss is sufficient to cause the network- or application-level errors for TCP connections (for example, timeouts and session errors).
- A non-disruptive update means that the packet latency or loss is not sufficient to result in unrecoverable network errors or net performance degradation for networked applications (assumed TCP and loss-tolerant UDP applications).

THREE INDEPENDENT UPDATE ZONES

Key concepts

1. **Management appliances**
   - HPE Synergy Composer, Image Streamer
2. **Frame shared infrastructure**
3. **Compute modules**
4. **Uptime**
   - Assuming a healthy, redundant configuration is configured, you can perform an update:
     - Online
     - Out of band
     - Non-disruptively
     - Independent of other shared-infrastructure component versions
     - Fully automated

Three independent update zones and bundles—Key concept

- There are three independent update zones, each a separate bundle:
  - Management appliances, which include HPE Synergy Composer and Image Streamer.
  - Frame-shared infrastructure (infrastructure that is common to all compute modules in the frame), which includes the HPE OneView “managed” components, such as FLM, VC eNet and FC, SAS switch, and a storage drawer. However, it does not include the HPE OneView “unmanaged” components, such as an F8 switch, or a Brocade switch. The frame-shared infrastructure firmware update can be done assuming healthy, redundant configuration, as well as staging and activation are done:
    - Online (while apps are running)
    - Out of band (without an OS login)
    - Non-disruptively (to production workloads)
    - Independent of other shared-infrastructure component versions and compute module payload versions
    - Fully automated (no manual intervention required)
  - Compute modules:
    - Online staging, activation may require a reboot
    - Out of band (without OS login)
    - Minimally-disruptive (to production workloads; single reboot is tolerated)
    - Independent of the frame payload version, i.e. no inter-payload version dependencies (limited functional dependencies)
    - Fully automated (no manual intervention required)

WHAT IS AN HA REDUNDANT NETWORK CONFIGURATION?

- Using a LIG design, the Network has to attach to both an A side and a B Side Module Uplink Port.
- If either module fails, the network will remain available on a surviving Uplink Port.
- OneView can detect this state.

- The Profiles require a connection to the network on both an odd (A side) and an even (B side) port.
- If a Server port or an interconnect downlink port fails, the server will maintain connectivity to the network using the surviving port.
- OneView can detect this state.

- The Operating system is required to have the connections to the network in a team/bond for Ethernet or MPIO for fibre channel networks.
- If a physical connection is lost, the server will be able to failover to the surviving connection.
- OneView can't detect this state.

For a Server to maintain connectivity to a network in the event of a failure:

The network must be attached to an A and a B side Uplink port.

The Profile must attach to the Network on an odd and even port.

OS redundancy must be configured.

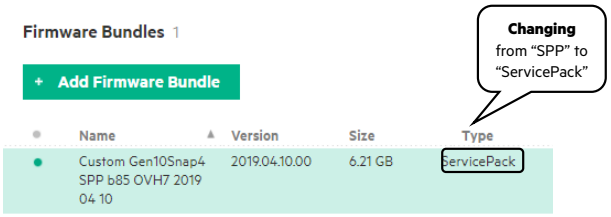
ONEVIEW FIRMWARE REPOSITORY ENHANCEMENTS

OneView FIPS / CNSA and remote repository

"I want to enable remote firmware repositories in FIPS mode"

- Customers who are using or rolling out FIPS/CNSA practices in their datacenters can now secure their external firmware repositories.
  - Earlier versions of OneView could not communicate with external repositories running in high security (FIPS/CNSA) mode.

Change in OneView Firmware Bundle Type String



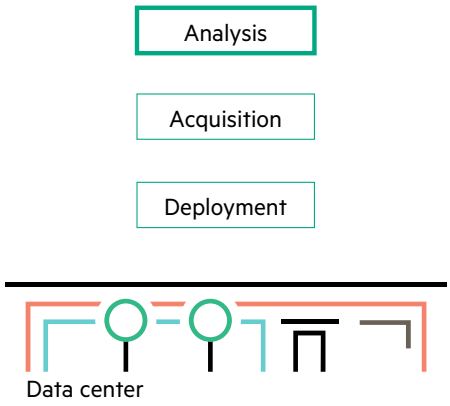
ACQUIRING SYNERGY FIRMWARE AND DRIVERS

Acquiring Synergy firmware and drivers

AFFECTED COMPONENT ANALYSIS

Determine if an update is applicable to your data center

- HPE Synergy Software Releases - Overview
  - http://www.hpe.com/info/synergy-sw-release-information
- Analysis using Customer Advisory (CA)
  - http://www.hpe.com/downloads/synergy
- Analysis using Synergy Reports or Compliance Dashboard
- Analysis using release notes
  - www.hpe.com/info/synergy-docs



Affected component analysis—Determine if an update is applicable to your data center.

– The update process involves, analysis, acquisition, and deployment. It is important to determine if an update or a fix is applicable to your datacenter. It is not recommended to apply all updates that are released.

A Customer Advisory (CA) is published to help determine whether the fix is needed in your environment. Each hot fix is listed on the “Hot Fix and Advisories” page associated with a specific SPP. These pages are available from the SPP download page, http://www.hpe.com/downloads/synergy. The Customer Advisory can be reviewed to determine whether the hot fix applies and determine which components are to be downloaded.

HPE OneView provides detailed hardware and firmware inventory information about the resources it manages through reports as well as the Firmware Compliance Dashboard. By analyzing the server hardware version and the version available in the SPP, you can determine if the update is applicable to the server hardware.

Before you update the appliance, read the release notes at http://www.hpe.com/downloads/synergy to learn about supported upgrade paths, components in the bundle, new features delivered in the update, best practices, limitations, troubleshooting hints and tips, enhancements, critical firmware components, supported operating systems and whether you must restart the appliance after it is updated.

WHERE TO FIND FIRMWARE UPDATES? (1 OF 2)

All Synergy Components in One location

- HPE Synergy
  - Synergy SPP Download Page http://www.hpe.com/downloads/synergy
- Subscription services
  - Hewlett Packard Enterprise offers a subscription service that can provide a notification of firmware updates
- Monitor hpe.com/downloads/Synergy for updates

HPE Synergy Management Combinations and supported HPE Synergy Custom SPPs

HPE Synergy Management Combinations	HPE Synergy Custom SPPs			
	Recommended HPE Synergy Custom SPP	Additionally supported	End-of-support (January 2021)	End-of-support (December 2021)
Recommended for latest fixes and features				
Composer (HPE OneView) 5.5 & Image Streamer 5.4	2020.07.02	2020.05.02 2019.03.20200324a		
Recommended "Milestone" baseline				
Composer (HPE OneView) 5.4 & Image Streamer 5.4	2020.07.02	2020.05.02 2019.03.20200324a		
Additional supported HPE Synergy Management Combinations				
Composer (HPE OneView) 5.4 & Image Streamer 5.20.01	2020.07.02	2020.05.02 2019.03.20200324a	2020.07.01 2020.05.01 2019.03.20200324	

Where to find firmware updates?

All Synergy Components in One location

- Many common issues can be resolved by updating the firmware. Today, you must manually monitor hpe.com, that is, the documentation, release notes, and Customer Advisories. What is more, monitoring requires:
  - Warranty or support contract (credentials)
  - Pre-production test
  - Phased production rollout
- Firmware updates and additional information can be found in the following ways:
  - Subscription services:
    - Hewlett Packard Enterprise offers a subscription service that can provide a notification of firmware updates. For more information, see the "Subscription services" documents.

WHERE TO FIND FIRMWARE UPDATES? (2 OF 2)

- Synergy SPP
- Hot fixes
  - Released outside the normal SPP release cycle
  - http://www.hpe.com/downloads/synergy
- SPP Supplements
  - http://www.hpe.com/servers/spp
- HPE OneView for HPE Synergy Firmware and Driver Update Guide
  - September 2020
- https://support.hpe.com/hpesc/public/docDisplay?docId=c05212310
- Access for Customers and Partners requires Passport and entitlement.

Where to find firmware updates? A firmware bundle, also known as an SPP, is a comprehensive collection of firmware and system software components, all tested together as a single solution stack that includes drivers, agents, utilities, and firmware packages.

- You can apply SPPs as baselines to frames, interconnects, and server profiles, establishing a desired version for firmware and drivers across devices. Each SPP deliverable contains the Smart Update Manager (SUM) and firmware smart components.
- Hot fixes are software and firmware component updates that have an additional release outside the normal SPP release cycle and that address specific issues. Each hot fix is listed on the "Hot Fix and Advisories" page associated with a specific SPP. These pages are available from the SPP download page at the site that is displayed on the slide.
- An SPP Supplement is a bundle containing software components, firmware components, or both. The supplement provides support for a functionality that is required outside a normal SPP release cycle. Maintenance Supplement Bundles (MSB) are used with an associated SPP and this bundle includes any supplements or hot fixes that are issued since the associated SPP release.
- You can also use REST APIs to upload a hot fix and create a custom SPP. See the HPE OneView REST API Scripting Help for HPE Synergy, at http://www.hpe.com/info/synergy-docs for more information.

STORING SPPS AND HOT FIXES

HPE-recommended approach

- An external http repository can be configured in OneView
- Shared by multiple instances of OneView
- Size is only limited by the web server storage.
- For HPE Synergy Composer, the internal repository space is limited to 12GB
  - An external firmware repository can be added when required.
- For HPE Synergy Composer2, the internal repository space is limited to 62GB
  - An external firmware repository can be added when required.
- For applying hot fixes:
  - Add the required hot fixes and build a custom SPP within HPE OneView.

Procuring SPPs and hot fixes—HPE-recommended approach

For HPE Synergy Composer, the internal repository space is limited to 12GB

- An external firmware repository can be added when required.

For HPE Synergy Composer2, the internal repository space is limited to 62GB

- An external firmware repository can be added when required.

An external http repository can be configured in OneView and shared by multiple instances of OneView. Size is only limited by the web server storage.

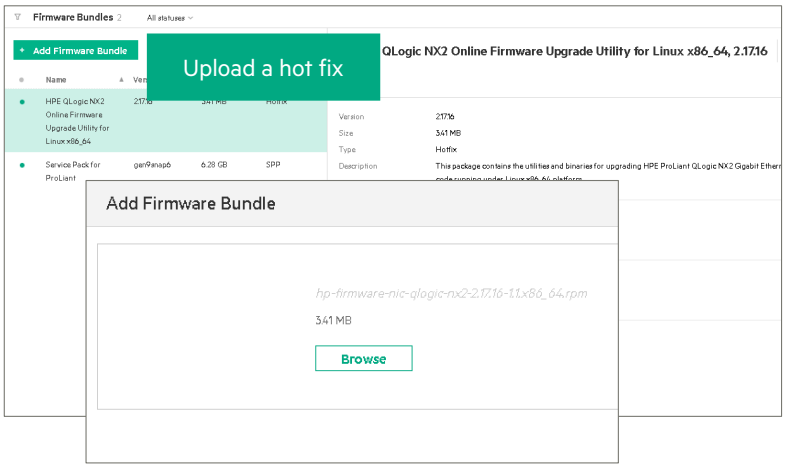
For applying hot fixes:

- Add the required hot fixes and build a custom SPP within HPE OneView.

HPE SYNERGY HOT FIX BUNDLING

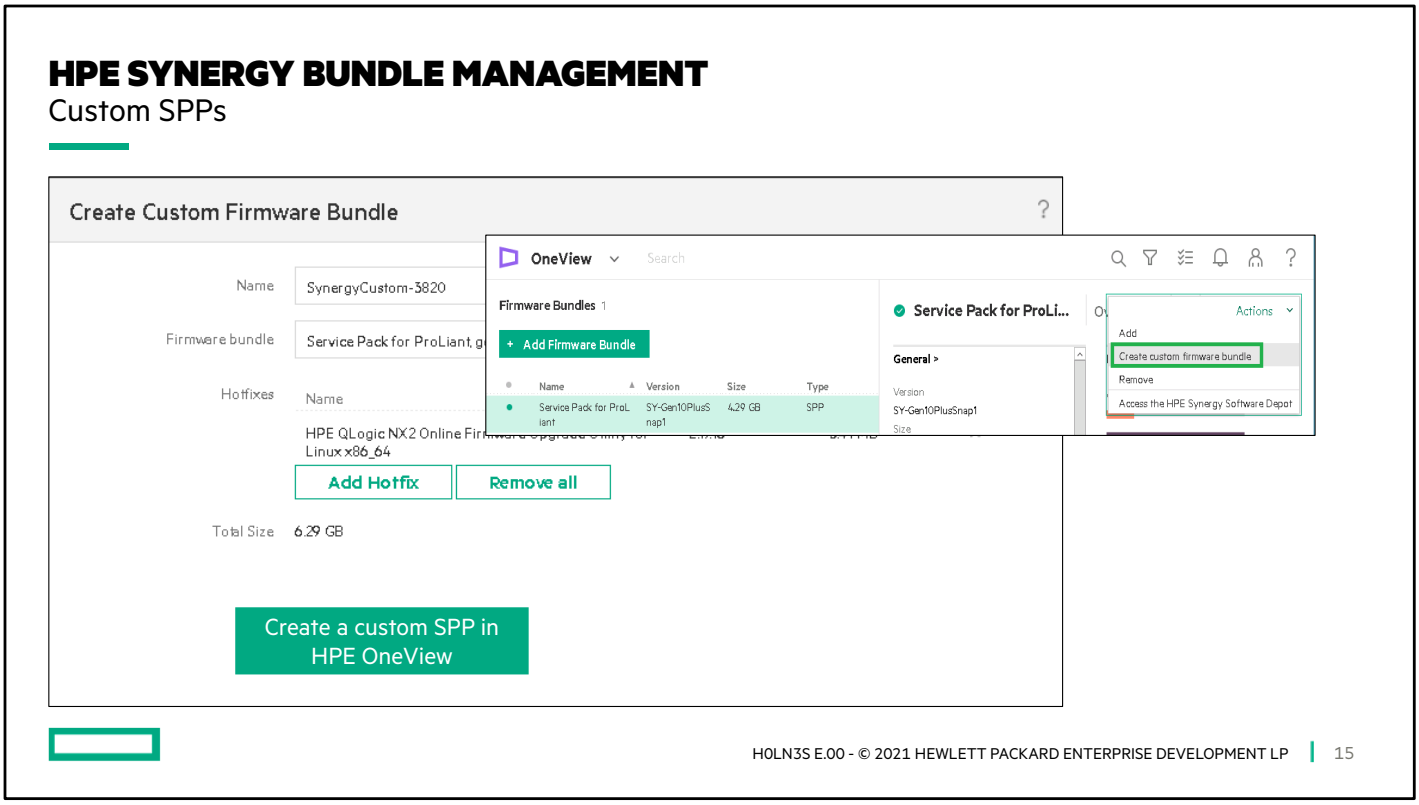
Add a hot fix to the repository

- Hotfixes can be uploaded using the same process used to upload an SPP



HPE Synergy bundle management—Add a hot fix to the repository

- Then, add any hot fix to the repository.



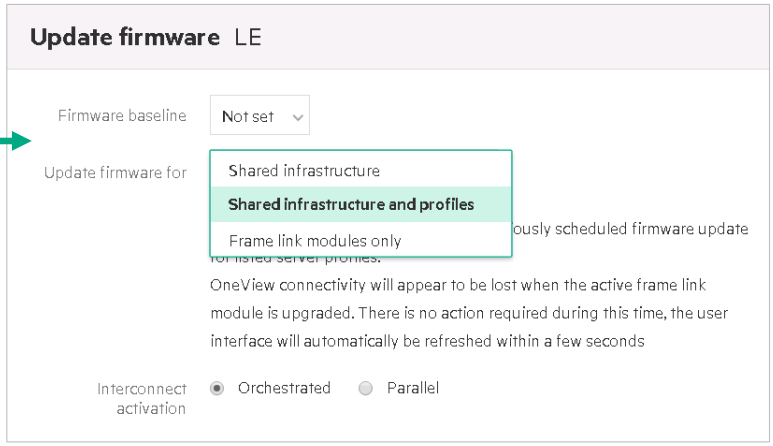
HPE Synergy bundle management—Custom SPPs

- Create a custom Firmware bundle in HPE OneView.
  - Choose an existing baseline
  - Use the Actions menu to create a custom firmware baseline with that baseline as the starting point
  - Add one or more hot fixes to your new baseline

LOGICAL ENCLOSURE FIRMWARE UPDATES

LOGICAL ENCLOSURE FIRMWARE UPDATE OPTIONS

- Perform a firmware update in one of the following ways:
  - Frame link modules only
  - Shared Infrastructure
  - Shared Infrastructure and Profiles. For Servers, this will be the outcome



- HPE Synergy Virtual Connect Interconnect Module
  - August 2020

https://support.hpe.com/hpesc/public/docDisplay?docId=a00104956en_us

Logical Enclosure Firmware Update Options

Perform a firmware update in one of the following ways:

- Frame link modules only
- Shared Infrastructure
  - FLMs, VCs, ILMs, SAS Modules, 3940 Adapters, and Pass-thru modules
  - Updates all logical interconnects (LIs) in a logical enclosure (LE) using either parallel or orchestrated activation
- Shared Infrastructure and Profiles. For Servers, this will be the outcome:
  - For Server Profiles set to use SUT or iSUT, the SUT tools will immediately see the new baseline and act according to their setup
  - For Server Profiles set to Firmware only AND for Servers without Profiles, those servers will be booted to the chosen SPP
  - NOTE: Logical interconnects can also be made up of SAS or VC FC interconnects such as HPE VC SE 16Gb FC Module. However, an LI cannot have a mixture of Ethernet and FC modules.

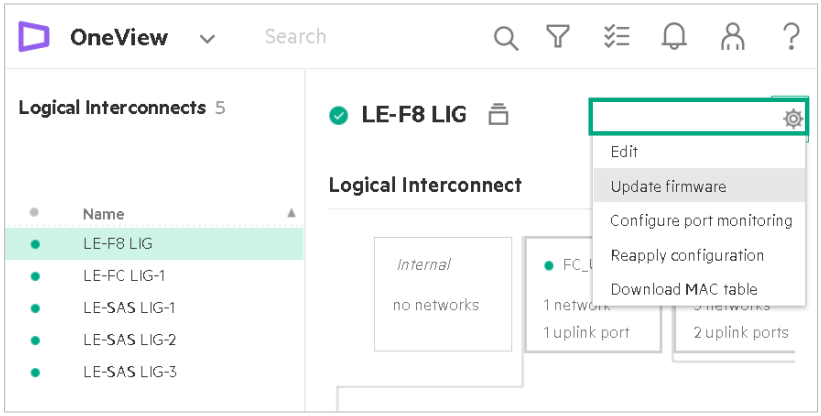
HPE Synergy Virtual Connect Interconnect Module

- August 2020
- https://support.hpe.com/hpesc/public/docDisplay?docId=a00104956en_us

LOGICAL INTERCONNECT FIRMWARE UPDATE

LOGICAL INTERCONNECT FIRMWARE UPDATE

- Perform a firmware update in the following way:
  - Via the Logical Interconnect screen
    - All interconnect modules (ICMs) in the logical interconnect are updated with new firmware Includes SAS and VCFC LIs
    - ICMs have to be configured/managed

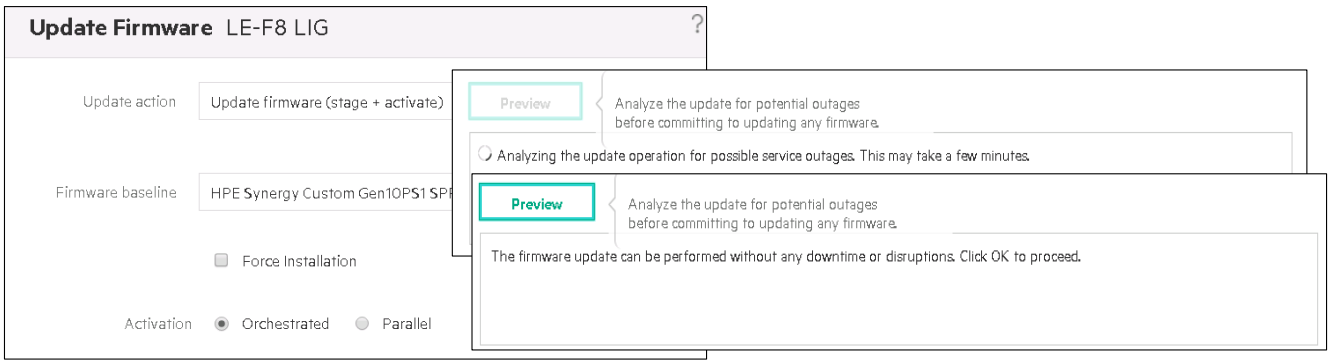


Firmware update methods—Perform an update from the LI or LE screen in HPE OneView

- Firmware update can be performed in the following ways via HPE OneView:
  - From the Logical Interconnect screen
    - All interconnect modules (ICMs) in the logical interconnect (LI) are updated with new firmware
    - Interconnect modules in a logical interconnect can be HPE VC SE 40Gb F8 Module, HPE Synergy interconnect link modules, or both
    - Interconnect modules have to be in a configured state to do a firmware update
  - NOTE: Logical interconnects can also be made up of SAS or VC FC interconnects such as HPE VC SE 16Gb FC Module. However, an LI cannot have a mixture of Ethernet and FC modules.

LI FIRMWARE UPDATE OPTIONS

- Orchestrated and Parallel Update Options
- Preview function to evaluate outage risks



LI Firmware update options

Orchestrated and Parallel Update Options

Preview function to evaluate outage risks

ORCHESTRATED AND PARALLEL LI UPDATES

HPE SYNERGY ORCHESTRATED VERSUS PARALLEL LI UPDATE

- HPE VC SE Master and interconnect link modules, VC FC and SAS interconnects
- Historically, 2 types of Upgrades:
  - Minor-patches, bug fixes, small feature upgrades
  - Major-Major change revision such as 5.0 to 5.2
- **Orchestrated**
  - *Non-disruptive, takes more time*
  - For minor and major firmware upgrades
  - Usually available on all upgrades from 4.1+
- **Parallel**
  - *Disruptive, goes quickly*
  - Required for pre 4.1 major firmware updates
  - Done during a maintenance window as networks will be down
  - *Some upgrades may still require it-always check the release notes*

HPE Synergy Orchestrated versus parallel li update

HPE VC SE Master and interconnect link modules, VC FC and SAS interconnects

Historically, 2 types of Upgrades:

- Minor-patches, bug fixes, small feature upgrades
- Major-Major change revision such as 5.0 to 5.2

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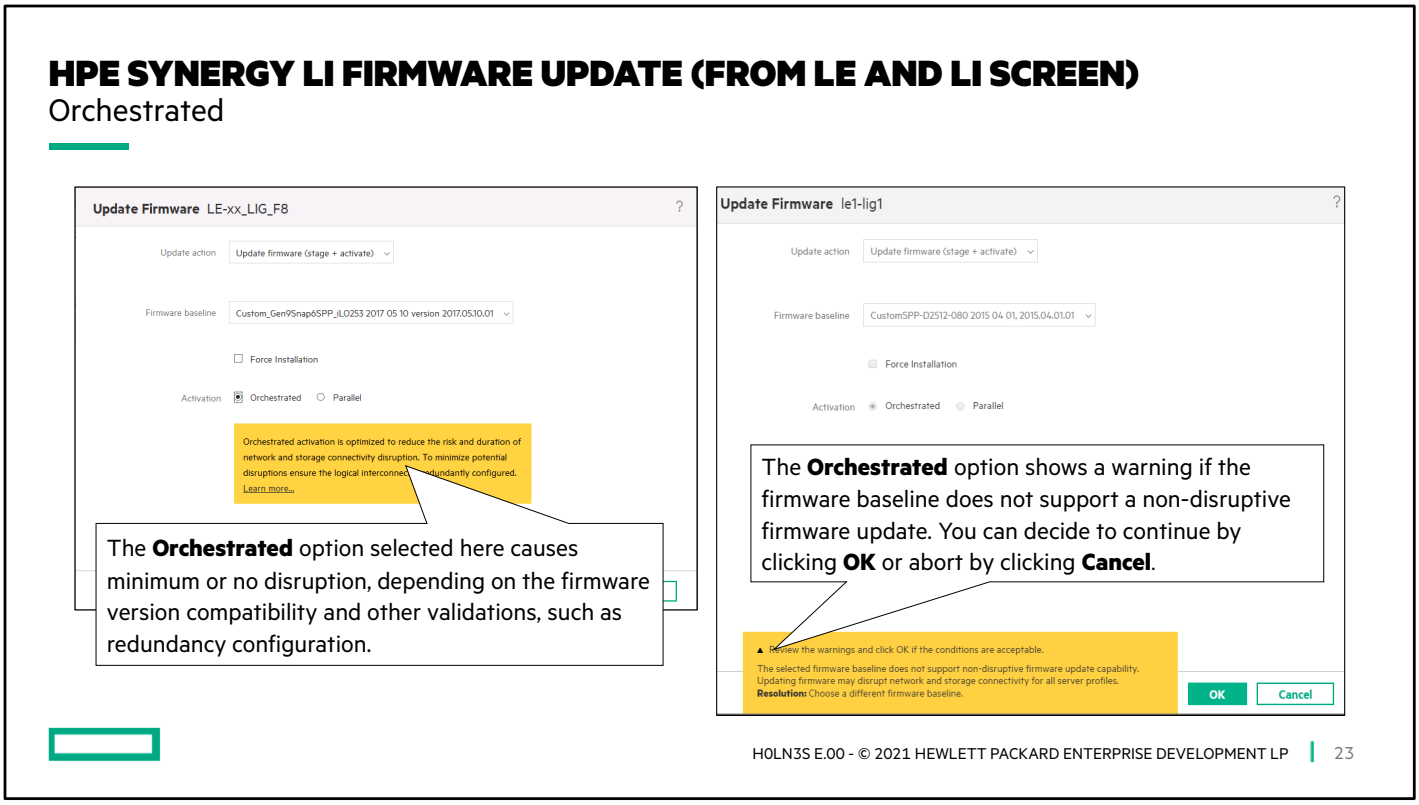


HPE Synergy LI firmware update (FROM le and LI Screen)

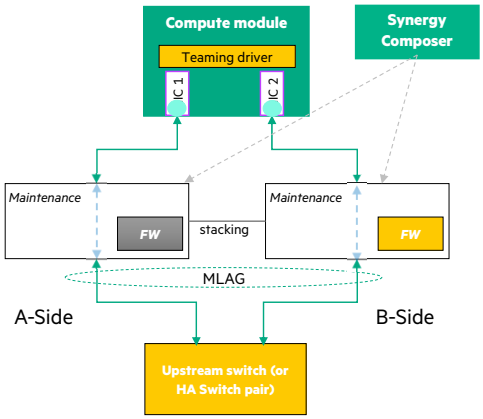
The orchestrated activation option allows non-disruptive updates of interconnects, as at any point in time there will be at least one connection link that is active. As mentioned, it is applicable to minor and major version updates and bug fixes. This activation method is least disruptive to the workload and there is no dependency on the server or ToR (Top-of-Rack) configuration. There is no data path interruption and no packet loss.

A validation occurs to determine whether the firmware update is non-disruptive to the workload or not. If the validation is successful, the orchestrated update is performed. If not, a warning is displayed, explaining the cause and its resolution.

Typically, compatible firmware versions allow a warm and soft reboot (in case of VC modules). The CPU reboots with a stateful restart of protocol daemons.

HPE SYNERGY LI FIRMWARE UPDATE PROCESS

Orchestrated



NOTE: Terms *master* and *standby* are used here to describe the MLAG cluster. One Master is 'Active' while the other is 'Standby'

HPE Synergy Composer orchestrates a firmware update:

1. Stages firmware image on both ICMs in parallel
2. Places both ICMs into maintenance mode to prevent changes
3. Updates the firmware on B-side ICM (a Standby member of the M-LAG cluster)
4. ICM reboots management ASIC while continuing to pass traffic
5. Waits for B-side ICM (Standby) to finish rebooting management ASIC
6. Forces the M-LAG role change
7. A-side ICM becomes Standby and B-side ICM becomes Master
8. Updates firmware on A-side ICM (Standby member of M-LAG)
9. ICM reboots the management processor while continuing to pass traffic
10. Waits for A-side ICM (standby) to finish rebooting management ASIC
11. Removes both ICMs from maintenance mode

HPE Synergy LI firmware update process

For Orchestrated firmware version updates (in most cases), only the management ASIC will be rebooted, without disrupting the traffic flow.

- For Parallel firmware updates when a complete reboot is required, there will be a warning about a temporary service outage before proceeding. Newer firmware updates do not usually require this.
- HPE Synergy Composer orchestrates the firmware update in the following manner:
  - Stages firmware image on both interconnect modules (ICMs) in parallel.
  - Places both ICMs into maintenance mode to prevent user-driven configuration changes.
  - Updates firmware on B-side ICM (Standby member of the M-LAG cluster. ICM reboots management ASIC, while continuing to pass traffic.
  - Waits for B-side ICM (standby) to finish rebooting management ASIC.
  - Forces the M-LAG role change. A-side ICM becomes Standby and B-side ICM becomes Master.
  - Updates the firmware on A-side ICM (Standby member of M-LAG). ICM reboots the management processor while continuing to pass traffic.
  - Waits for A-side ICM (Standby) to finish rebooting management ASIC.
  - Removes both ICMs from maintenance mode.

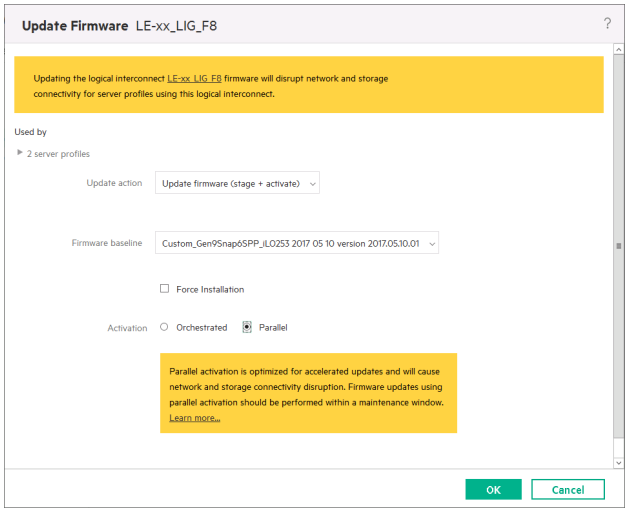
HPE SYNERGY LI FIRMWARE UPDATE PROCESS

Update options:

1. Only stage the firmware to ICMs for later activation
2. Perform both staging and activation
3. Perform activation (already staged)

Force installation to downgrade the LI FW to a lower version.

Parallel option selected here is disruptive, quickest option for a firmware update.



HPE Synergy LI firmware update Process—Parallel

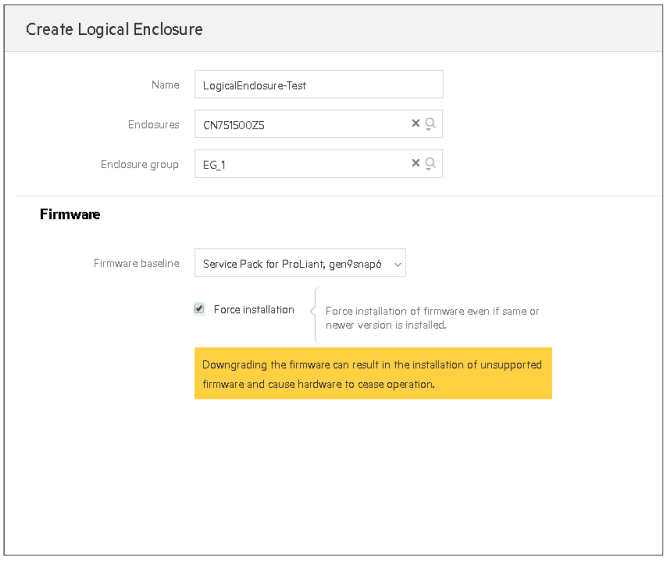
- On the other hand, when you perform a parallel firmware update, all interconnect modules in a logical interconnect (LI) are updated simultaneously. This is disruptive to traffic and storage connectivity, and packet forwarding is interrupted in all interconnect modules belonging to an LI. So, this mode of firmware update should be performed within a management window. Also, it does not depend on the interconnect module stacking, or the server (or upstream) switch configuration.
- Server applications are unreachable on networks during a firmware update. Interconnect modules complete their initialization, reform the stacking links, and synchronize databases.
- No configuration changes are permitted while interconnect modules are being updated. HPE OneView updates the configuration on interconnect modules and begins forwarding traffic.

FIRMWARE UPDATE DURING LE CREATION

CREATING A LOGICAL ENCLOSURE

HPE-recommended approach

- Create a logical enclosure during initial bare-metal provisioning
- Specify a Synergy SPP baseline
- All shared infrastructure and servers are updated with this baseline
- Available Force option allows for downgrading or reprogramming the current version



Creating a logical enclosure—HPE-recommended approach

- This is what HPE recommends when creating a logical enclosure:
  - Create a logical enclosure during initial bare-metal provisioning
  - Specify a Synergy SPP baseline
  - All shared infrastructure and servers are updated with this baseline
  - Available Force option allows for downgrading or reprogramming the current version

COMPUTE MODULE FIRMWARE UPDATES

OFFLINE FIRMWARE APPLICATION

- Gen 9
  - OneView instructs the server to boot from ISO and uses SUM to perform the update
- Gen 10
  - OneView talks to the iLO of the server
  - Server POSTs to get the latest firmware inventory
  - OneView identifies the needed SPP
  - The SPP gets mounted to the iLO
  - The firmware install from the iLO repository through:
    - iLO
    - UEFI
    - OS
  - Firmware validation

Gen 9

- OneView instructs the server to boot from ISO and uses SUM to perform the update

Gen 10

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- OneView identifies the needed SPP
- The SPP gets mounted to the iLO
- The firmware install from the iLO repository through:
  - iLO
  - UEFI
  - OS
- Firmware validation

HPE SYNERGY COMPUTE MODULE FIRMWARE UPDATE

- Set a firmware baseline on compute modules through HPE OneView Profiles
- Leverage SUT and iSUT to update firmware and OS drivers:
  - OnDemand (used for Windows and Linux systems) – command line access is available by logging into the server locally
  - AutoStage (used for Windows and Linux systems)
  - AutoDeploy (used for VMware ESXi, Windows and Linux systems)
  - AutoDeployReboot (used for VMware ESXi, Windows and Linux systems)
- For Windows and Linux, set iSUT to staging mode outside of the usual maintenance window to reduce:
  - Service interruption
  - Operational costs
  - Downtime
- For VMWare, AutoDeploy mode is recommended

HPE Synergy compute module firmware update.

Through HPE OneView, you can set a firmware baseline—a desired state for firmware versions—on compute modules. Firmware and drivers for Windows and Linux can be staged and then activated during an application maintenance window. This ability to perform firmware staging and development tasks outside of the actual maintenance window reduces service interruption, operational costs, and planned downtime.

HPE OneView along with Smart Update Tools (iSUT and SUT) provides a minimally disruptive method of updating firmware and operating system drivers on a compute module. Integrated Smart Update Tools is a service that runs on Windows, Linux and VMWare operating systems. iSUT for Windows and Linux performs an online, non-disruptive mechanism to stage components on the host server and deploy firmware and operating system drivers on servers in conjunction with HPE OneView.

iSUT for VMWare runs on a VMWare OS hosted on a Gen10+ server. It provides an online mechanism to stage components on the host server and deploy firmware and operating system drivers on remote VMware ESXi servers in conjunction with HPE OneView. As the minimum setting for VMWare is AutoDeploy, this will be a disruptive update for the host.

Smart Update Tools for VMware ESXi (HPE SUT for VMware ESXi) is a service that runs on Red Hat Enterprise Linux (RHEL) 7.0 for Gen8 and Gen9 systems and provides an online mechanism to stage components on the host server and deploy firmware and operating system drivers on remote VMware ESXi servers in conjunction with HPE OneView. As the minimum setting for VMWare is AutoDeploy, this will be a disruptive update for the host.

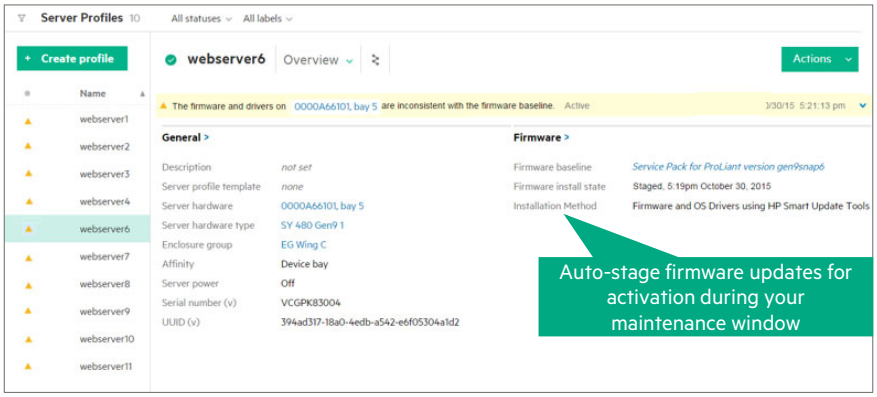
The modes in SUT and iSUT are installation choices and cannot be configured from HPE OneView. HPE OneView only controls the baseline that can be exposed for SUT and iSUT to use. HPE SUT and iSUT are available as a command-line (CLI) application that runs remotely to communicate with all of the HPE OneView hosts.

For Windows and Linux, iSUT runs in OnDemand, AutoStage, AutoDeploy, or AutoDeployReboot mode. For VMWare hosts SUT and iSUT can run in AutoDeploy or AutoDeployReboot modes. For a complete list of modes and parameters, see the user guide at the link given on the slide.

Use SUT in the server profile and set iSUT mode to Auto Stage for Windows and Linux systems, and Auto Deploy for VMware ESXi systems. Reboot to activate the firmware during a maintenance window.

ONEVIEW SHOWS THE ACTIONS OF ISUT/SUT

- OneView can not deploy or configure SUT or iSUT
- OneView will show an action taken by SUT or iSUT

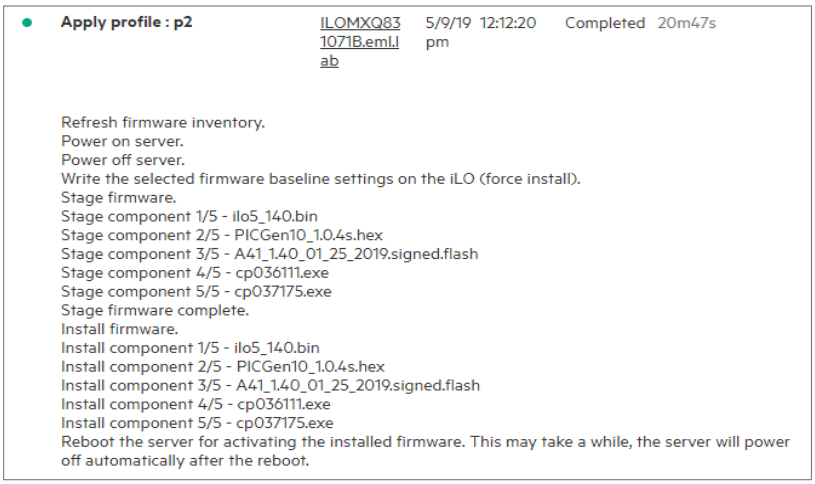


OneView shows the actions of iSUT/SUT

OneView does not deploy or configure SUT or iSUT

OneView will show an action taken by SUT or iSUT

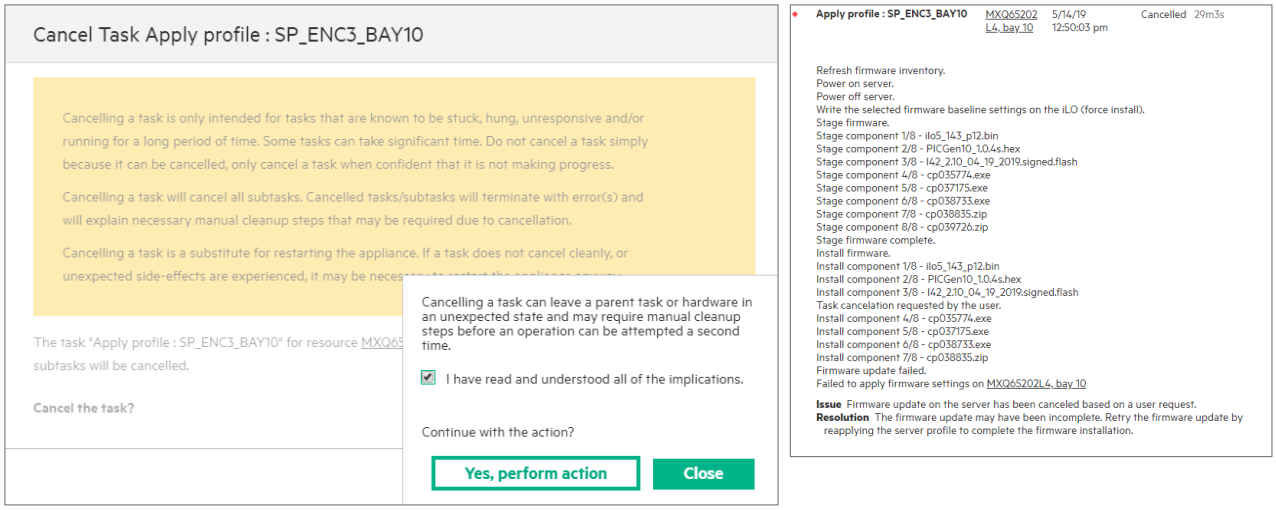
DETAILED PROGRESS FOR FIRMWARE UPDATE PROCESS IN 5.0+



Detailed progress indicators for firmware update process

- Also, HPE OneView 5.0 and later shows detailed progress indicators for the firmware update process, including the total number of components being updated along with the progression of components completed, the current component being installed, and indicators of those remaining to be completed.

TERMINATING A FIRMWARE UPDATE TASK IN 5.0+



Terminating a firmware update task

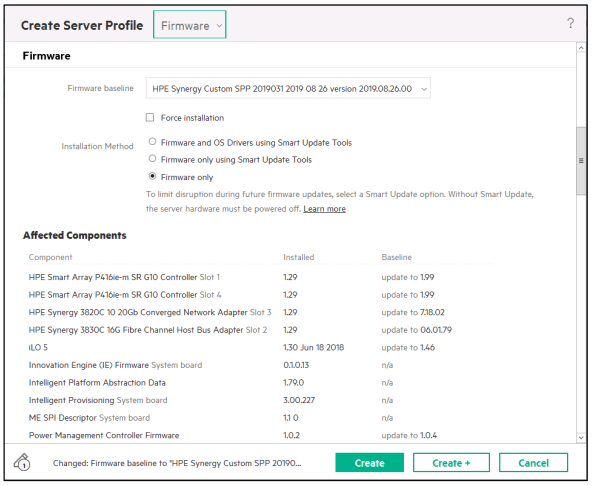
Firmware updates take a lot of time. While they're running you might realize a mistake that you need to correct or if a firmware update fails, you might need to clear it. In these cases, rebooting the appliance is not a recommended procedure, because it might create some other issues.

- Starting with HPE OneView 5.0, you can cancel an ongoing server firmware update task and the resource managers owning the task will clean it up.
- HPE OneView enables the cancel option during the firmware staging and install operations, and you can access the Cancel process from the server firmware details in the OneView activity page.
- Note: Terminating a firmware update task is not the best practice but the last resort option.

SERVER PROFILE
Can apply a baseline to check for compliance

Applying a baseline shows compliance of firmware component versions with a selected baseline SPP

- OK: Installed matches baseline version
- n/a: Not updated using OneView

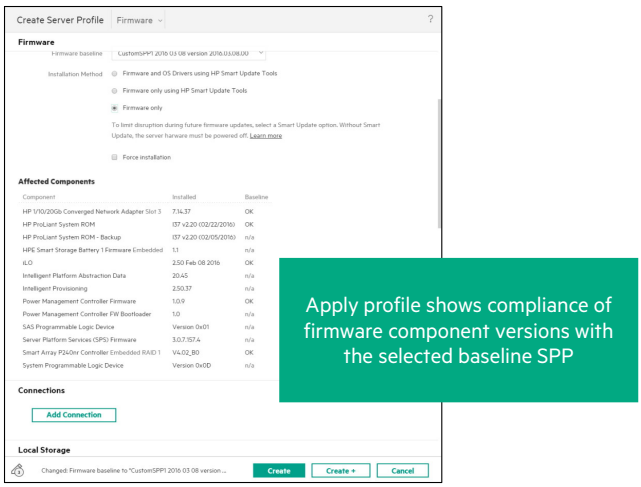


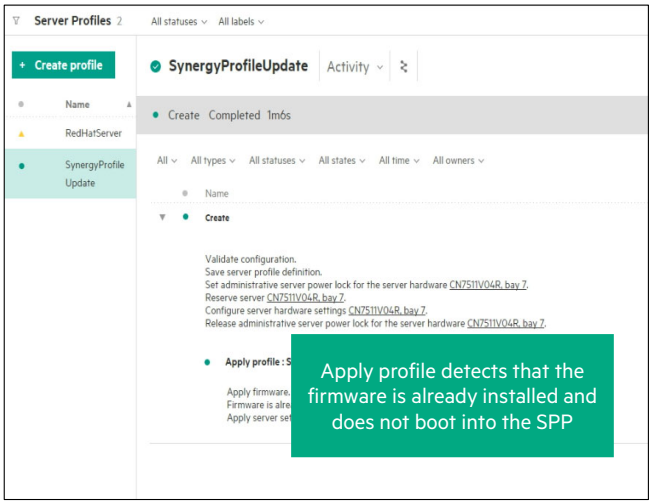
Server profile—Apply a baseline to check for compliance

- Applying a baseline shows compliance of firmware component versions with a selected baseline SPP:
  - OK : Installed matches the baseline version
  - n/a : Not updated using HPE OneView

SERVER PROFILE

Applying a baseline when the baseline is already installed

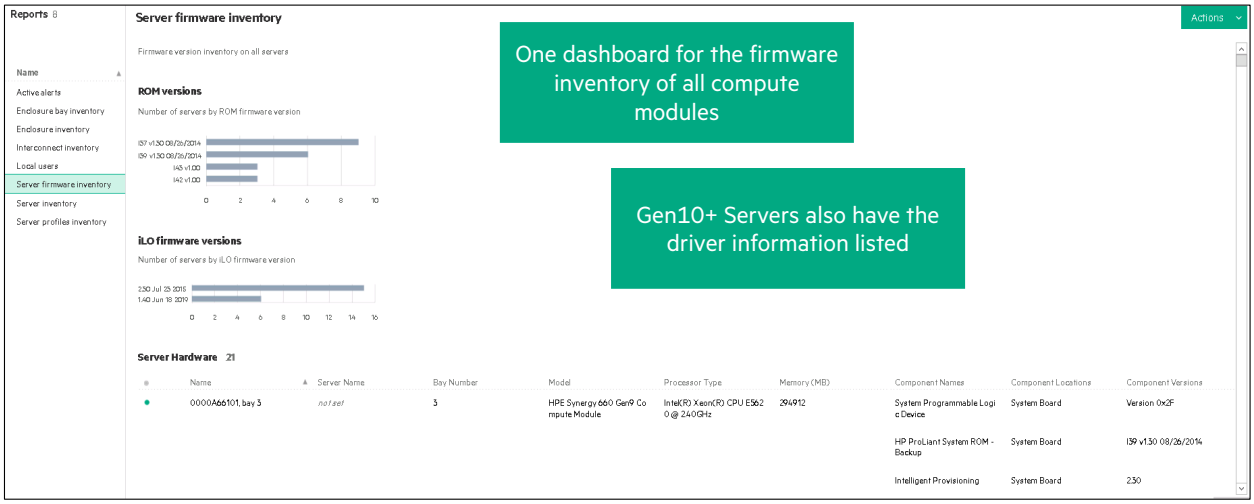




Server profile—Apply a baseline (Already installed)

- In case that the baseline is already installed:
  - Apply profile shows compliance of firmware component versions with a selected baseline SPP.
  - Apply profile detects that the firmware is already installed and does not boot into the SPP.

SERVER FIRMWARE INVENTORY
Reports



One dashboard for the firmware inventory of all compute modules

Gen10+ Servers also have the driver information listed

Server firmware inventory—Reports

- There is one dashboard for the firmware inventory of all compute modules in the Reports section.

FIRMWARE UPDATES OF HPE SYNERGY APPLIANCES

Firmware updates of HPE Synergy components

HPE SYNERGY MANAGEMENT APPLIANCES FIRMWARE UPDATE

- HPE Synergy Composer
  - Nondisruptive to the production workloads
  - System under management is not affected
  - HPE OneView is temporarily taken offline
- HPE Synergy Image Streamer
  - Connectivity between boot and run volumes is maintained in the HA pair
  - Management activities are temporarily taken offline

HPE Synergy management appliances firmware update (1 of 3)

- Firmware updates of HPE Synergy Composer are non-disruptive to the production workloads and the update process does not affect the operations of system under management. Taking an appliance offline does not affect the managed resources.
- In an HPE Synergy Composer appliance cluster, HPE OneView is taken offline temporarily by an activate standby operation. HPE OneView resumes operation after the standby appliance becomes the active appliance.
- In an HPE Synergy Image Streamer High-Availability pair, the boot and run volume storage maintains continuous connectivity to compute modules during an appliance pair update. Boot and run volume deployment and other image management activities are taken offline temporarily and they resume operation once the appliance pair update is complete.

HPE SYNERGY COMPOSER MEMORY UPGRADE

Additional 16 GB memory for 5.2+ Upgrade

- When running 5.2+, the Composer will run out of resources managing over 12 frames
- Upgrade by adding 16 GB memory ***before*** upgrading to 5.2

- **Note**: HPE Synergy Composer2 does not need this improvement

Synergy Composer

- Processor: 2-core / 4-threads @ 2.4GHz
- Memory: 16GB
- Storage: 240GB SATA SSD
- Scaling: 21-frames

If you update HPE OneView to version 5.2, Legacy Synergy Composer will run out of resources if it has to manage more than 12 frames.

To mitigate this issue HPE is providing field upgrades on Legacy Synergy Composer to add 16 GB memory.

Legacy Composer must receive this additional memory before upgrading to 5.2. If you do not upgrade the memory, you will not be able to upgrade HPE OneView above version 5.0.

HPE Synergy Composer2 does not need this upgrade.

UPDATE READINESS CHECKER

Check for potential update issues on the HPE Synergy Composer

Helps prevent running an update that will fail

Check my update readiness: Make sure my appliance is ready for an update and that my update will not fail.

Takes < 5min

Is non-disruptive

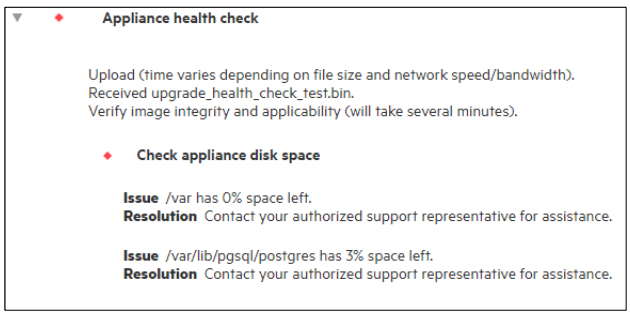
What does it check?

Appliance disk space, expired certificates, number of database connections, & number of open file descriptors.

Download latest: **hpe.com/support/ov-urc**

```
OneView Appliance Health Check
Version 1.0-dev-20-01-14
Perform appliance health checks on OneView appliance (16.125.77.149).
Uploading tools to appliance and running checks (this may take some time).
.........................
Downloaded results to [C:\Users\tkopren\Desktop\appliance-health-check.log].

Issue(s) identified:
Check appliance disk space
    ISSUE:          /var has 0% space left.
    RESOLUTION:     Contact your authorized support representative for assistance.
    ISSUE:          /var/lib/pgsql/postgres has 3% space left.
    RESOLUTION:     Contact your authorized support representative for assistance.
```



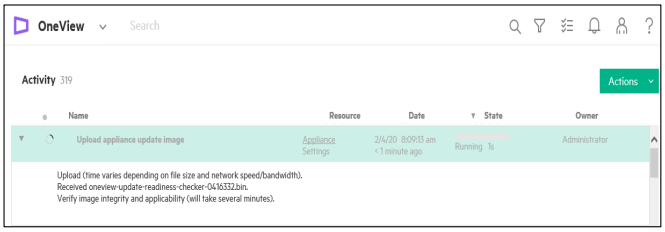
TOOL USAGE

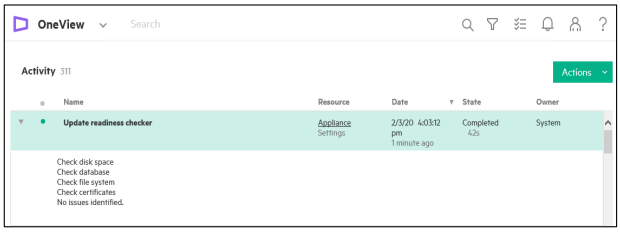
- ov-urc.exe -ovHostname urc-test.oneview.local -username Administrator

```
D:\URC>ov-urc.exe -ovHostname urc-test.oneview.local -username Administrator
HPE OneView Update Readiness Checker
Version 1.0-416491
Perform appliance checks on OneView appliance 'urc-test.oneview.local'.
Enter password:
Uploading tools to appliance and running checks. This may take some time.
.................
Saved results to 'D:\URC\ov-update-readiness-checker.log'.

No issues identified.

D:\URC>_
```



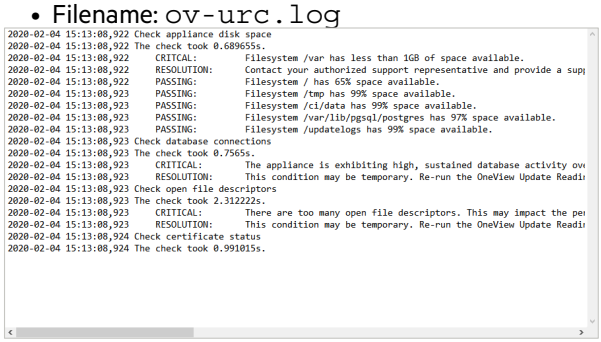


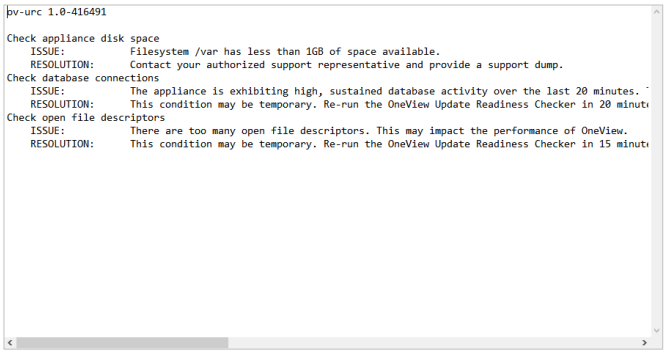
Normal usage will be similar to the command line displayed on screen. Notice that tool does not allow a password to be passed in on command line so it will prompt for password.

Example shows run execution with no identified issues.

LOG FILE

- Log file
  - `ov-update-readiness-checker.log`
- In OneView support dump
  - In folder: `/ci/logs`
  - Filename: `ov-urc.log`





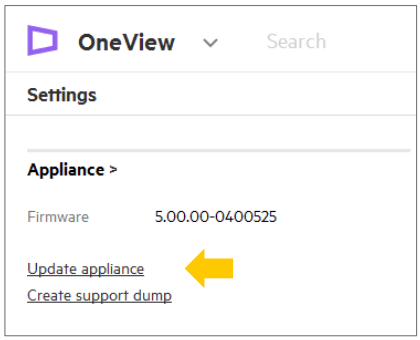
Tool will output a viewable log in the directory the tool is run from (or where directed if using the command line option).

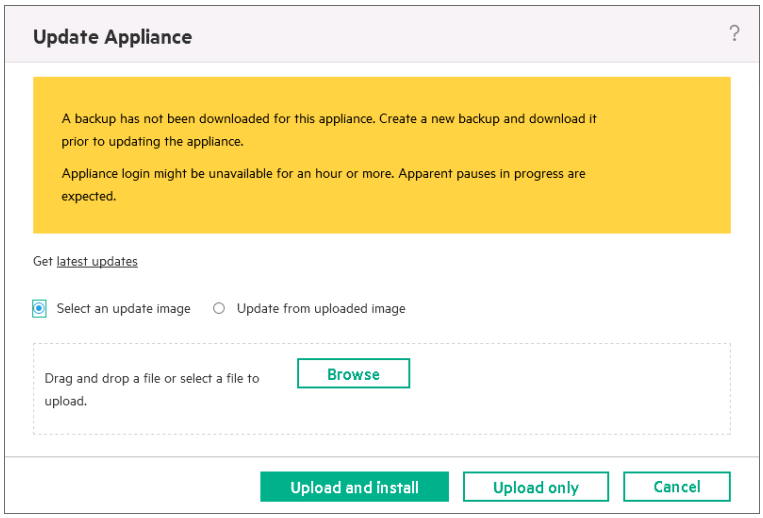
- Filename is ov-update-readiness-checker.log
- Example log is displayed on the right.

Included in the OneView support dump is a more detailed log. Intent is to have helpful hints or techniques to help assist remediation of any issue that is identified by the tool.

- Warning thresholds are only reported in the ov-urc.log and not in the customer log, OneView UI or tool console output.
- Example log is displayed below. Notice that the log included in the support dump will only have data from the last run of the tool.

HPE SYNERGY MANAGEMENT COMPOSER FIRMWARE UPDATE





http://www.hpe.com/downloads/synergy

HPE Synergy management Composer firmware update (2 of 3)

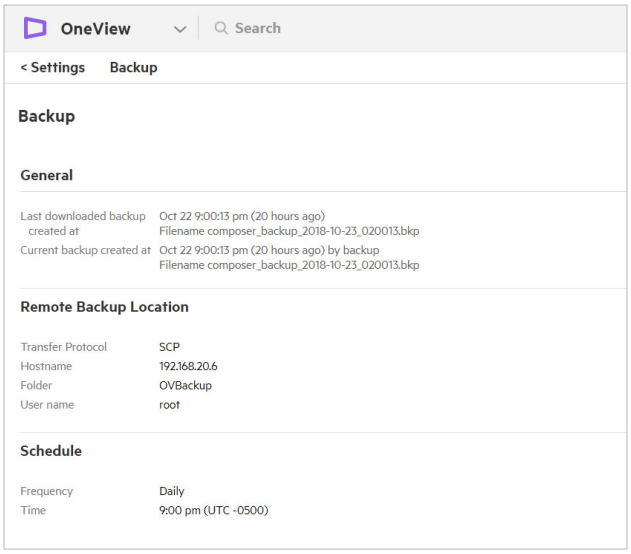
- Updating HPE Synergy Composer is similar to updating HPE OneView using an image update.
- This slide shows where to start the appliance update for HPE Synergy Composer (http://www.hpe.com/downloads/synergy).

PREPARE TO UPGRADE

BACKUP THE APPLIANCE(S)

HPE OneView Backups are important

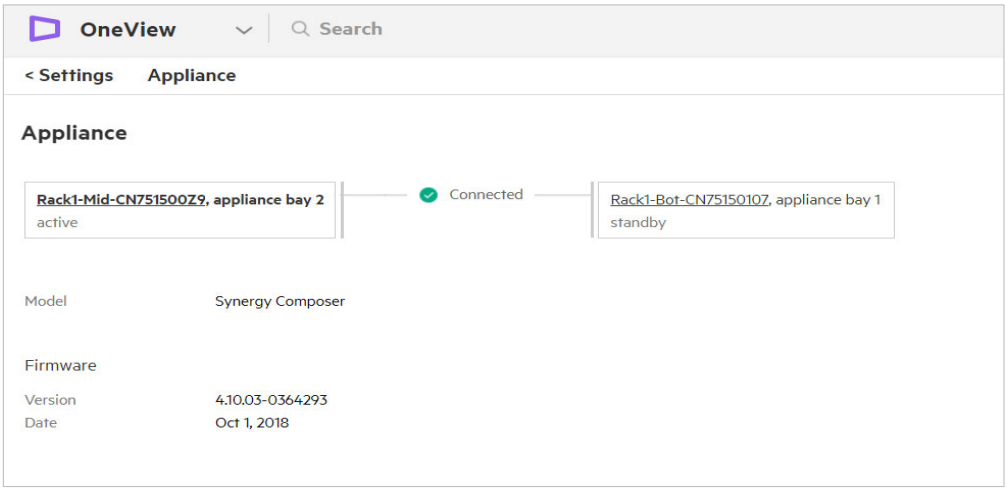
Automated backup to Linux or Windows repositories



** Caution: OS Volumes can't be backed up from Composer (HPE OneView)*

COMPOSER HEALTH

Ensure the Composers are in a healthy state



CHECK THE DASHBOARD FOR CRITICAL ERRORS

Resolve any critical issues on:

- Server Profiles
- Logical Enclosures
- Logical Interconnects

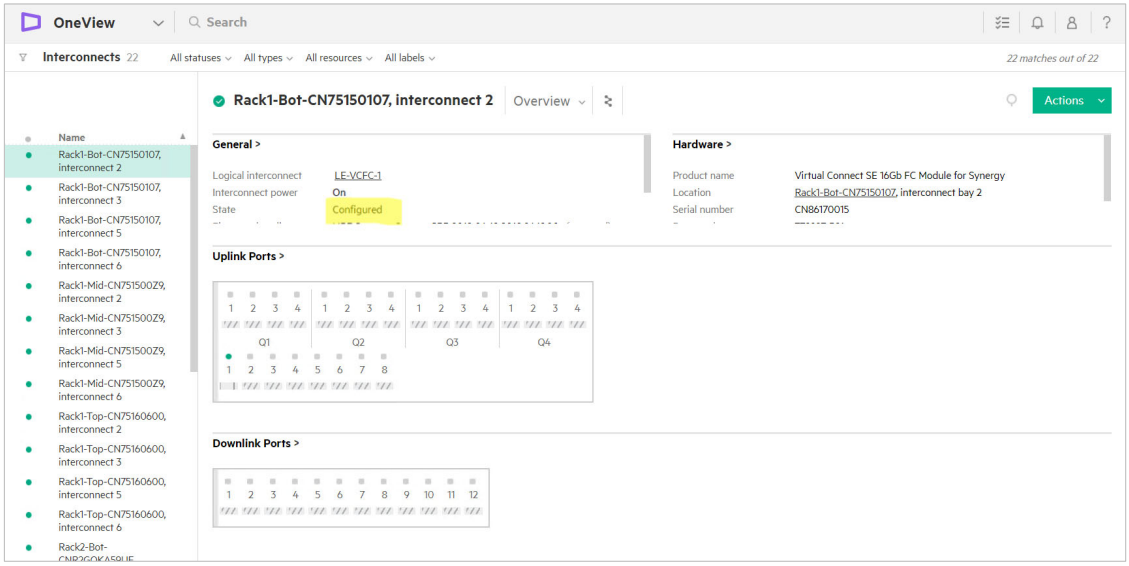
Resolve any critical issues on:

Server Profiles

Logical Enclosures

Logical Interconnects

ENSURE ALL INTERCONNECTS ARE IN A CONFIGURED STATE



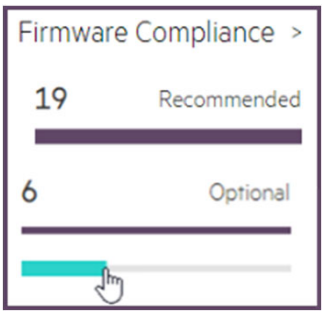
HPE SYNERGY COMPLIANCE CHECKING

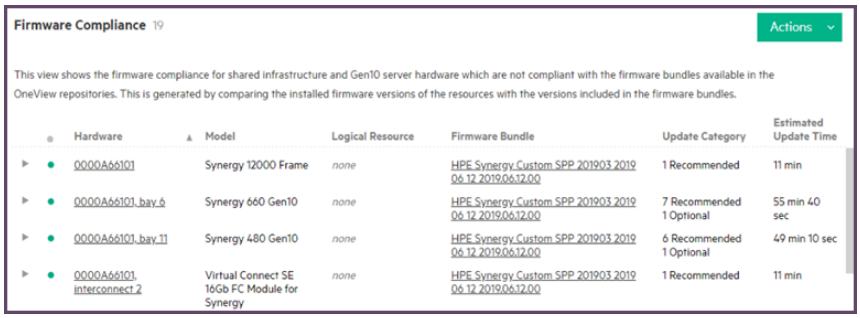
Operating System Driver and Firmware Profile and BIOS

HPE ONEVIEW 5.00+

Firmware compliance at scale

- HPE OneView 5.00 introduced an innovative concept for managing firmware compliance at scale for all Gen10 servers (racks included) as well as shared infrastructure for HPE BladeSystem and Synergy.





HPE OneView 5.00

- This approach provides a quick and easy way to identify critical security updates at scale. This feature automates compliance reporting and helps protect against configuration drift (which ensures configuration consistency across the infrastructure).
- Additionally, this feature enables the user to apply various filter views and export into Excel and CSV formats.

Note:

- The Estimated Update Time column in the display shows the approximate time for each hardware type to complete the update. The update time can vary depending on the ongoing operations in HPE OneView at that point in time.

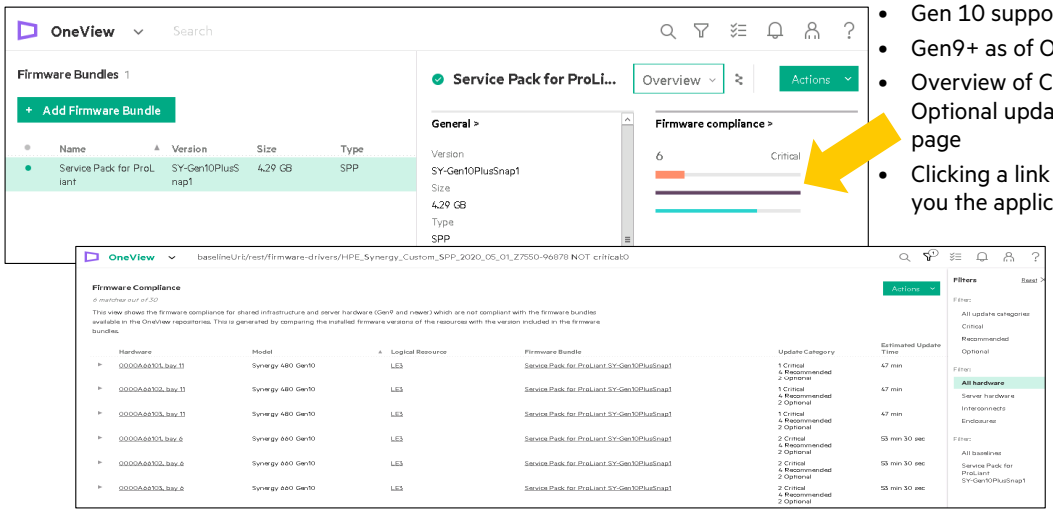
FIRMWARE COMPLIANCE

- From the OneView Help
  - The Firmware Compliance display lists the latest pending firmware updates and their firmware compliance reports for all the firmware bundles, hardware, and firmware components.
  - Firmware Compliance provides the detailed view with the ability to perform the following functions:
    - Search for firmware updates and filter them using attributes such as hardware name, update category, hardware type, and firmware bundle.

Firmware Compliance

- The firmware and driver update process includes automated dashboard-based compliance reporting.
- OneView Synergy 5.0 Help
  - https://techlibrary.hpe.com/docs/enterprise/servers/oneview5.0/cicf/en/index.html#home.html

FIRMWARE COMPLIANCE AND REPORTING



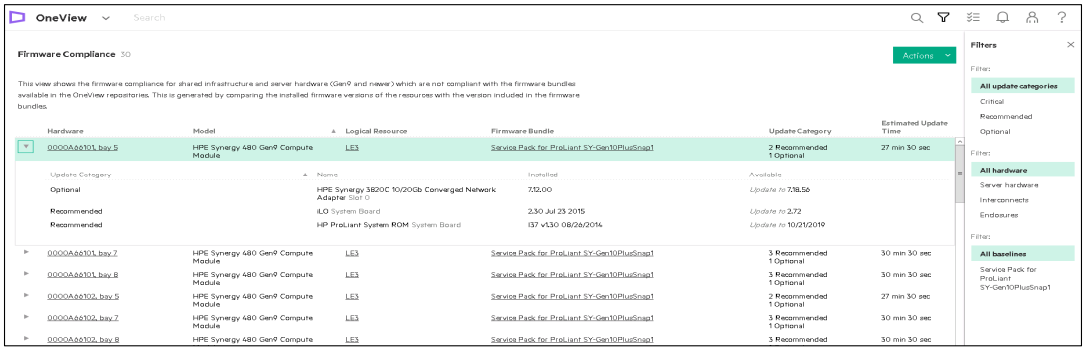
- Gen 10 supported in 5.0
- Gen9+ as of OneView 5.2
- Overview of Critical, Recommended and Optional updates from Firmware Bundles page
- Clicking a link acts as a filter and shows you the applicable items needing updates

Firmware Compliance and Reporting

- Beginning in version 5.0, HPE OneView provides a detailed view of all pending firmware and driver updates in the Firmware Bundles screen. OneView will compare the installed firmware versions of the managed hardware with the new component versions in the added SPP and will generate a compliance report that summarizes the pending update based on that particular SPP.
- Starting with HPE OneView 5.2, this full set of compliance dashboard is extended to OneView supported Gen9 servers.
- This Information can help you plan for maintenance windows for particular hardware components. For instance, if there is a critical ROM fix, you can flash these at the earliest opportunity. On the other hand, if the update just includes feature enhancements, then you may want to wait to apply it.
- All Ring components are required to be maintained at a matching SPP and Appliance firmware level. Server ROMs are the only item allowed to be upgrade outside of the SPP/Appliance combination baseline

FIRMWARE COMPLIANCE DASHBOARD IN 5.0+

See complete or filtered view of current and proposed firmware updates



- The detailed view shows the compliance for each item
- Shows both the installed version and the baseline version for easier comparison
- Organizes the updates by the severity
- Can filter this view using the firmware baseline, severity or by the hardware type
- The detailed report can be exported into an excel or a csv format

Firmware Compliance Dashboard—See complete or filtered view of current and proposed firmware updates

The Firmware Compliance Dashboard is a OneView interactive experience enabling the users to quickly visualize and manipulate various views of their managed environment.

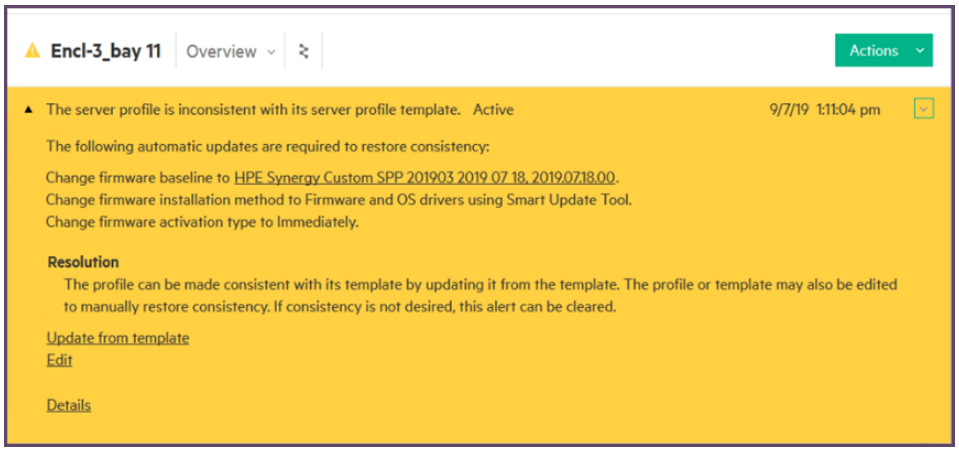
With powerful search and filter tools a user can determine current and proposed firmware changes based on the current baseline or any number of additional SPP's.

A simple click down on a server will show the sub-components of current and proposed updates.

Use of Boolean expressions allows for quick search of any firmware component's current version.

ONEVIEW FIRMWARE COMPLIANCE TRACKING

- Templates in HPE OneView provide “monitor, flag, and remediate” capabilities which you can use to enforce configuration compliance in server profiles.

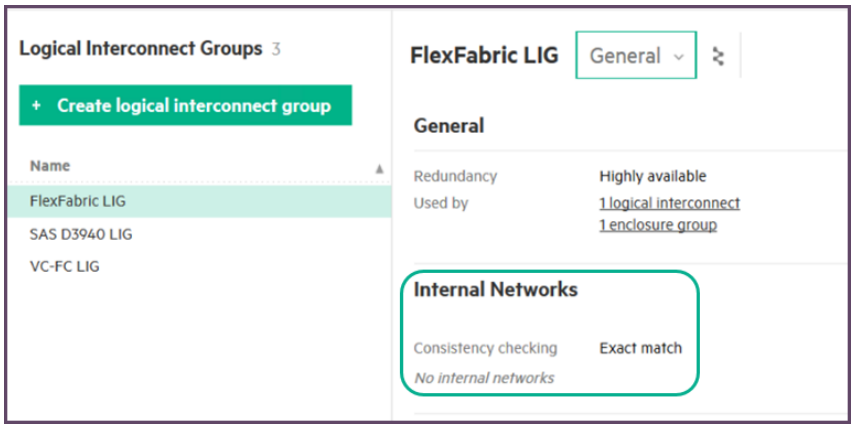


OneView profile compliance tracking

- Profile templates in HPE OneView provide “monitor, flag, and remediate” capabilities which you can use to enforce configuration compliance in server profiles. Multiple server profiles cloned from a single template can be monitored for configuration compliance. When inconsistencies are detected, an alert is generated to indicate that the offending profile is out-of-compliance with its template and that it needs remediation. Likewise, when updates are made at the template level, all profiles derived from that template are flagged as inconsistent and needing remediation. The user then has complete control over the remediation process to bring individual or multiple systems back into compliance.
  - Template operations can also be used from the graphical user interface or from the unified API using PowerShell or Python scripts.

ONEVIEW LOGICAL INTERCONNECT COMPLIANCE TRACKING

Logical Interconnect Group compared to Logical Interconnect



OneView Logical Interconnect compliance tracking

FIRMWARE AND DRIVER UPDATE BEST PRACTICES

Firmware and driver update best practices

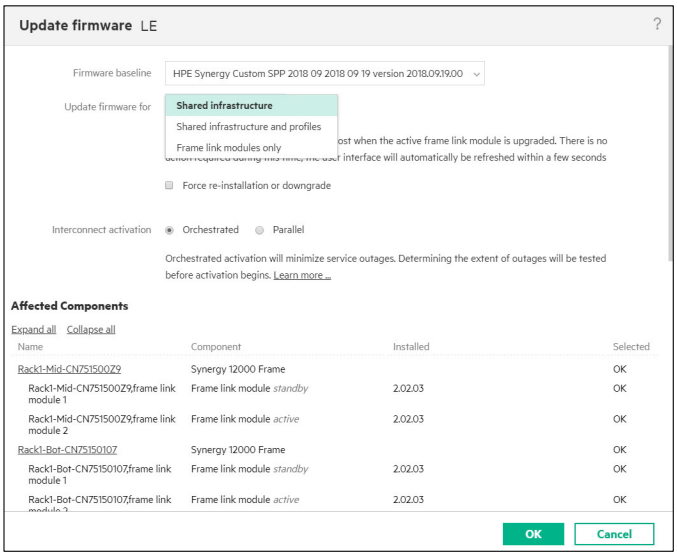
ORDER OF OPERATIONS MATTER

HPE OneView/Composer Updates

Logical Enclosure / Logical Interconnects

Server Profiles
- Server Profile Templates
- Individual Server Profiles

Always match firmware, drivers and Appliances



HPE OneView/Composer Updates

Logical Enclosure / Logical Interconnects

Server Profiles
- Server Profile Templates
- Individual Server Profiles

Always match firmware, drivers and Appliances

RECOMMENDED FIRMWARE UPDATE ORDER

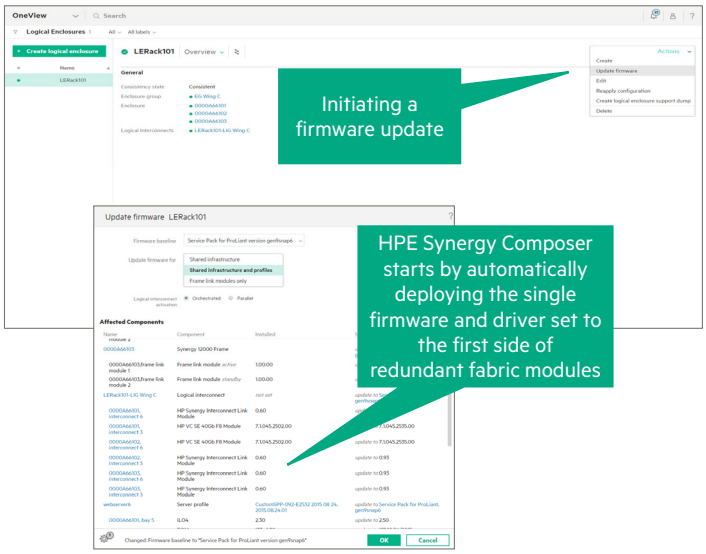
1. Update HPE Synergy Composer
2. Update Image Streamer
3. Update shared infrastructure (non-disruptive to application workloads)
   a. HPE Synergy Frame Link Module
   b. Interconnect modules
   c. Drive enclosure I/O adapters
4. Address “unmanaged” interconnects
   a. HPE Synergy 40Gb F8 Switch Module
   b. Brocade switch
5. Stage an update of compute modules without a baseline
6. Activate new firmware and drivers (admin selection)
   a. Immediate
   b. Scheduled
   c. At next manual reboot
   d. Only when the server/app admin triggers the update
7. Apply fixes

Recommended firmware update order

- This is the recommended order for updating the firmware on HPE Synergy components:
  - Update HPE Synergy Composer
  - Update Image Streamer
  - Update shared infrastructure (non-disruptive to application workloads)
    - HPE Synergy Frame Link Module
    - Interconnect modules
    - Drive enclosure I/O adapters
  - Address “unmanaged” interconnects:
    - HPE Synergy 40Gb F8 Switch Module
    - Brocade switch
  - Stage an update of compute modules that do not have firmware/driver baseline assigned in a server profile
  - Activate new firmware and drivers based on the admin selection:
    - Immediate
    - Scheduled
    - At next manual reboot
    - Only when the server/app admin triggers the update locally and reboots
  - Apply fixes

HPE-RECOMMENDED APPROACH FOR UPDATING FIRMWARE FOR SHARED INFRASTRUCTURE AND COMPUTE MODULES

- Perform a logical enclosure firmware update
- Select **Shared Infrastructure and profiles** and **orchestrated** modes
  - Updates FLMs, ICMs, and compute modules
  - ICM updates will be done in an orchestrated manner
- Create server profiles with the **Firmware and driver using HP Smart Update Tools** option
- HPE iSUT to be installed with the **AutoStage** mode in Windows and Linux.
- Use **AutoDeploy** mode for VMWare. This will require a maintenance window for VMWare hosts

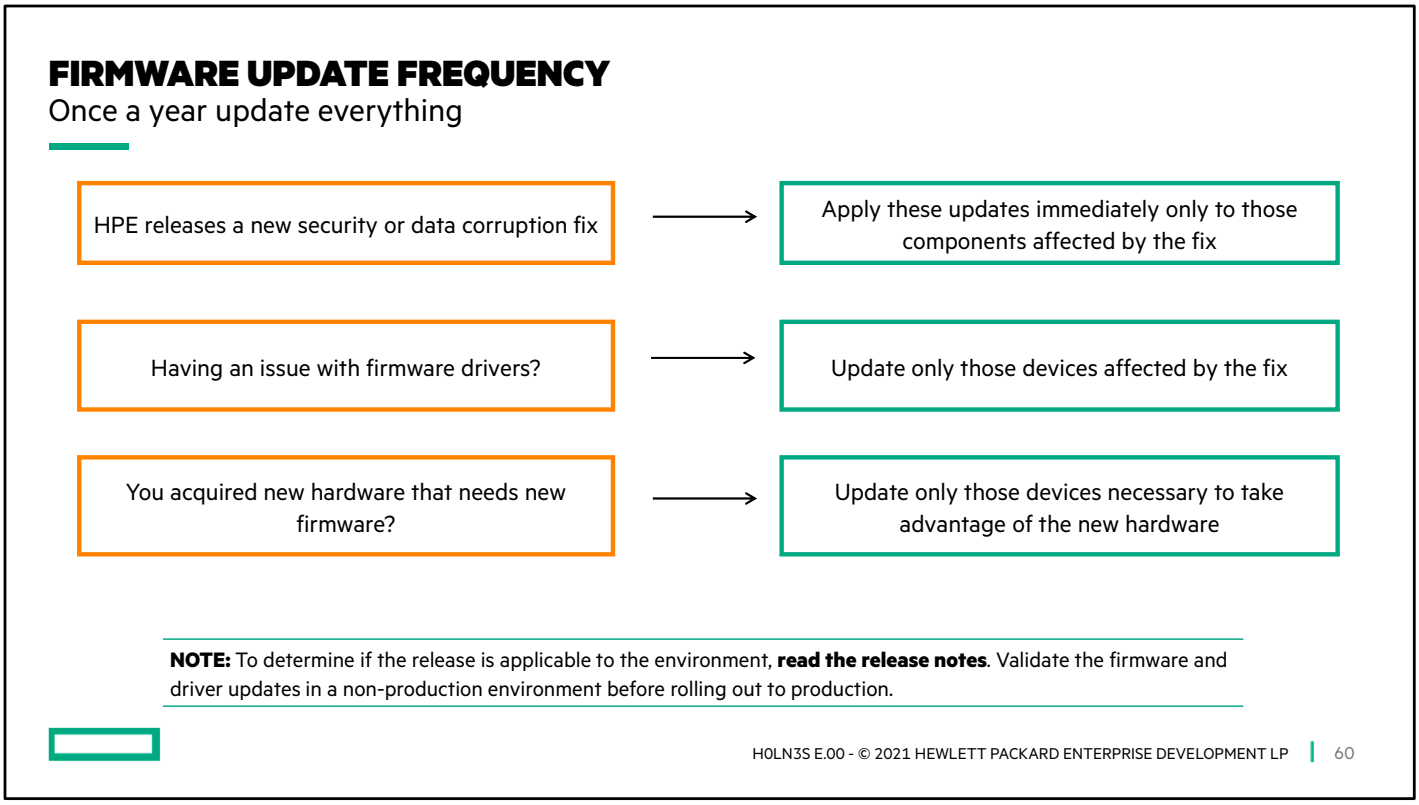


HPE-recommended approach for updating firmware for shared infrastructure and compute modules (1 of 2)

Hewlett Packard Enterprise recommends that you update shared infrastructure and compute modules by initiating the update process through a logical enclosure. From the logical enclosure, you can update HPE Synergy Frame Link Modules, interconnects, SAS interconnects, and the compute modules and their associated server profiles to set the firmware to a specified baseline. To update both shared infrastructure and compute modules, choose shared infrastructure and profiles as the firmware update option in the Update firmware page of a logical enclosure. For a non-disruptive firmware update of interconnects, choose Orchestrated as the type of firmware activation for Logical interconnect activation. Server profiles need to be created using the option Firmware and driver using HP Smart Update Tools. Smart Update Tools (HPE SUT) should be installed with the AutoStage mode.

Use AutoDeploy mode for VMWare. This will cause a reboot for VMWare hosts

HPE Synergy Composer starts by automatically deploying the single firmware and driver set to the first side of redundant fabric modules. Once the first side updates, the process repeats on the second side. Throughout the update, traffic continues to pass through all fabric modules without loss of a single packet, so operations are not impacted.

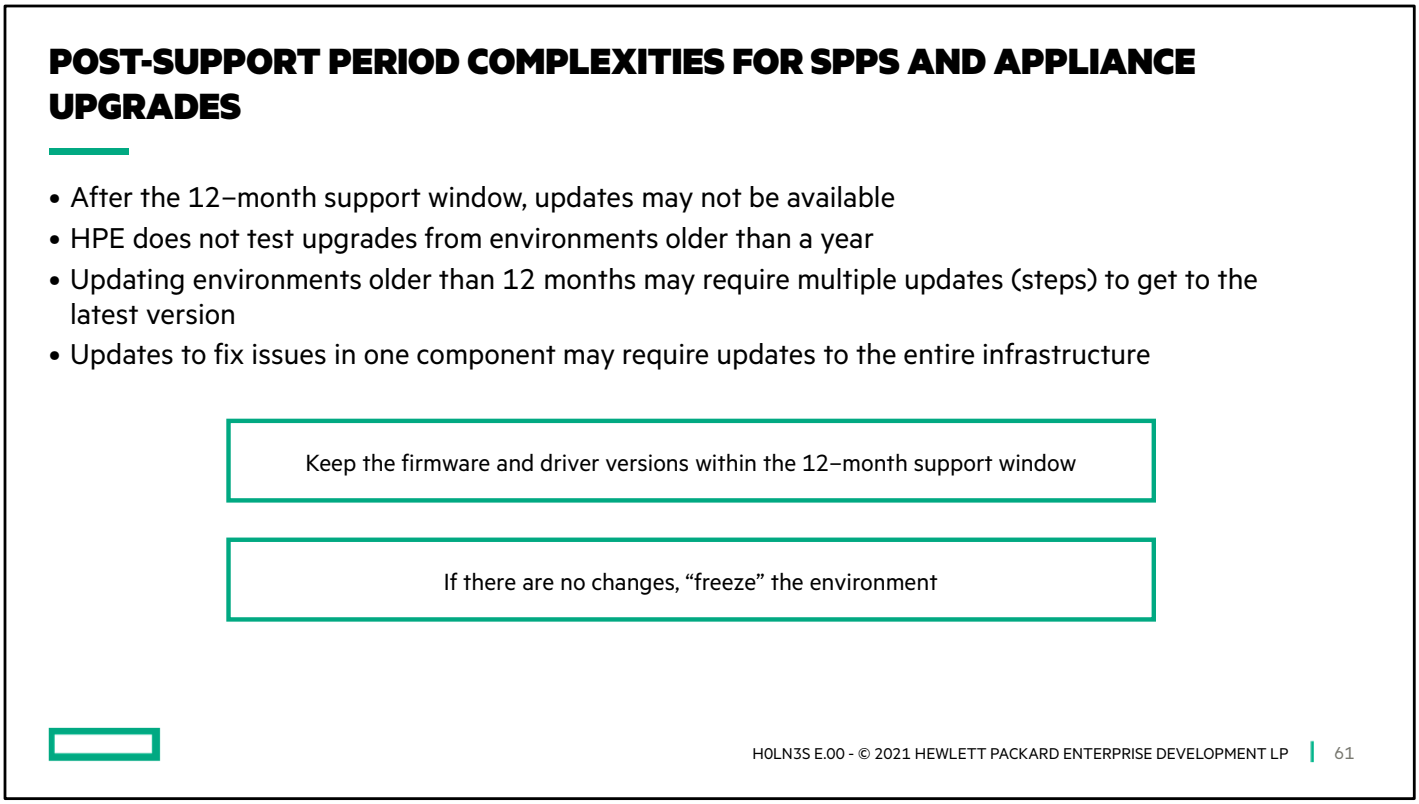


Firmware update frequency—Once a year update everything

Hewlett Packard Enterprise supports each firmware update version for 12 months from the release date. A common misconception about newly released firmware updates is that it is mandatory or urgent. In general, it is not necessary to update to a newer version before the support period expires. You only need to update before the 12–month support window expires if you experience any of the following:

- HPE releases a critical security or data corruption fix—In rare instances, firmware and driver updates are released to eliminate security vulnerabilities and data corruption issues. HPE recommends that you apply these updates immediately only to those components affected by the fix
- You have an issue with firmware or drivers for which a fix is available—Update only those devices affected by the fix
- You acquire new hardware or a feature that needs newer firmware (drivers)—Update only those devices necessary to take advantage of the new hardware or functionality

NOTE: To determine if the release is applicable to the environment, read the release notes. Validate the firmware and driver updates in a non-production environment before rolling out to production.



Post-support period complexities for SPPs and Appliance Upgrades

Hewlett Packard Enterprise recommends that you keep the firmware and driver versions within the 12–month support window to avoid potential complexity required to update from an older version. For example:

- Updates to fix issues in firmware after the 12–month support window may not be available or identified.
- Hewlett Packard Enterprise tests updates from supported configurations and does not test updates from older environments.
- Updates to environments older than 12 months can become complex and it may require multiple updates to get to the latest version.
- Updates to fix issues in one component may require updates to the entire infrastructure to maintain a supported environment.

- However, if there are no changes made in the supported environment, you can “freeze” that environment that is, do not apply any additional updates. These stable environments remain supported even after the 12– month support period expires.

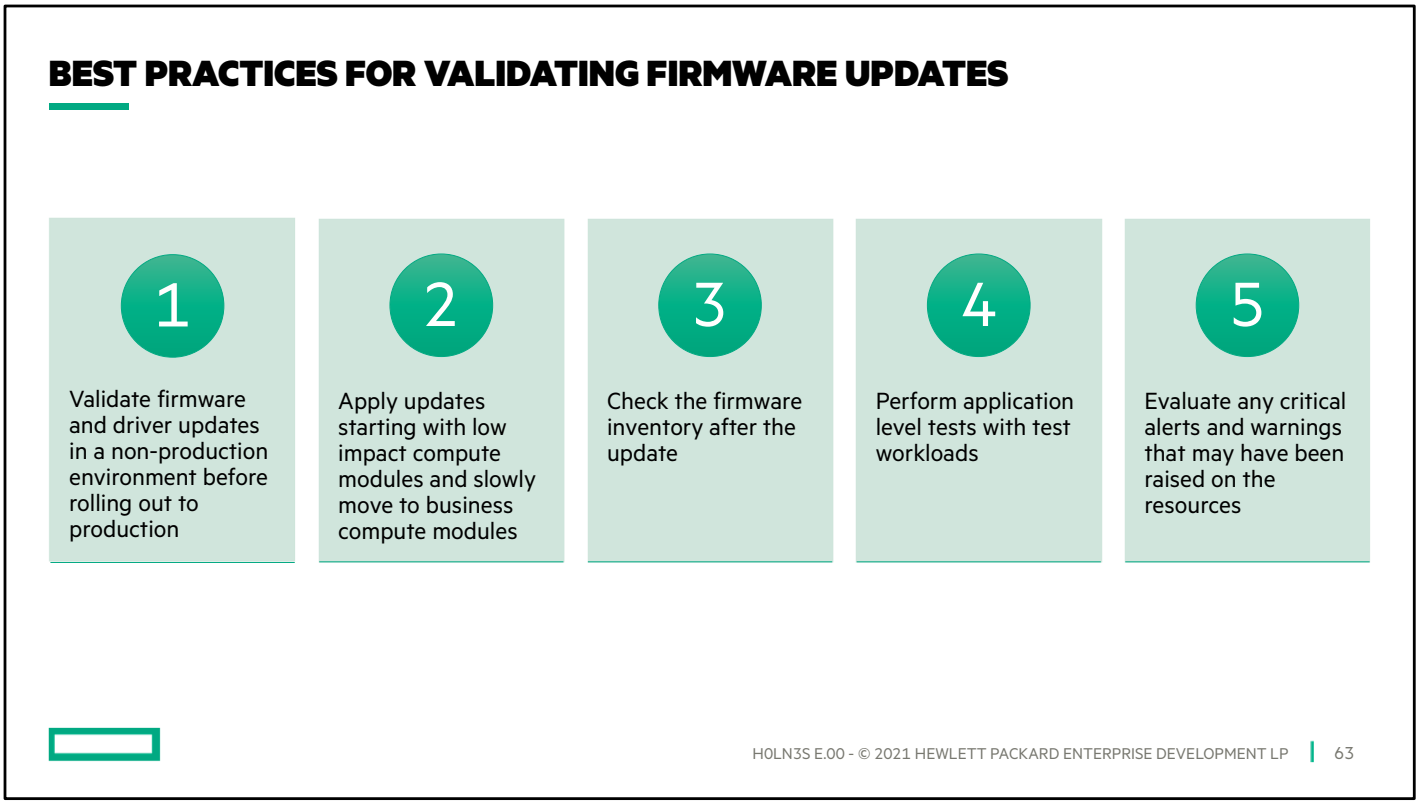
ALTERNATIVE FIRMWARE UPDATE OPTIONS

- Update HPE Synergy Composer and HPE OneView only if compatible with current SPP
- Update shared infrastructure or shared infrastructure hot fix only
  - Update only the shared infrastructure from a logical enclosure—Select the **Shared Infrastructure** option
  - Update only the HPE Synergy Frame Link Modules from a logical enclosure—Select **Frame link modules only** option
  - Update only interconnects from a logical interconnect—Apply an SPP to a logical interconnect
  - For more information, visit HPE OneView Help for HPE Synergy at https://www.hpe.com/info/synergy-docs
- Update compute modules or a compute module hot fix only
  - Through server profiles or server profile templates

NOTE: For detailed information on alternative firmware update options, check the *Best Practices for HPE Synergy Firmware and Driver Updates* document.

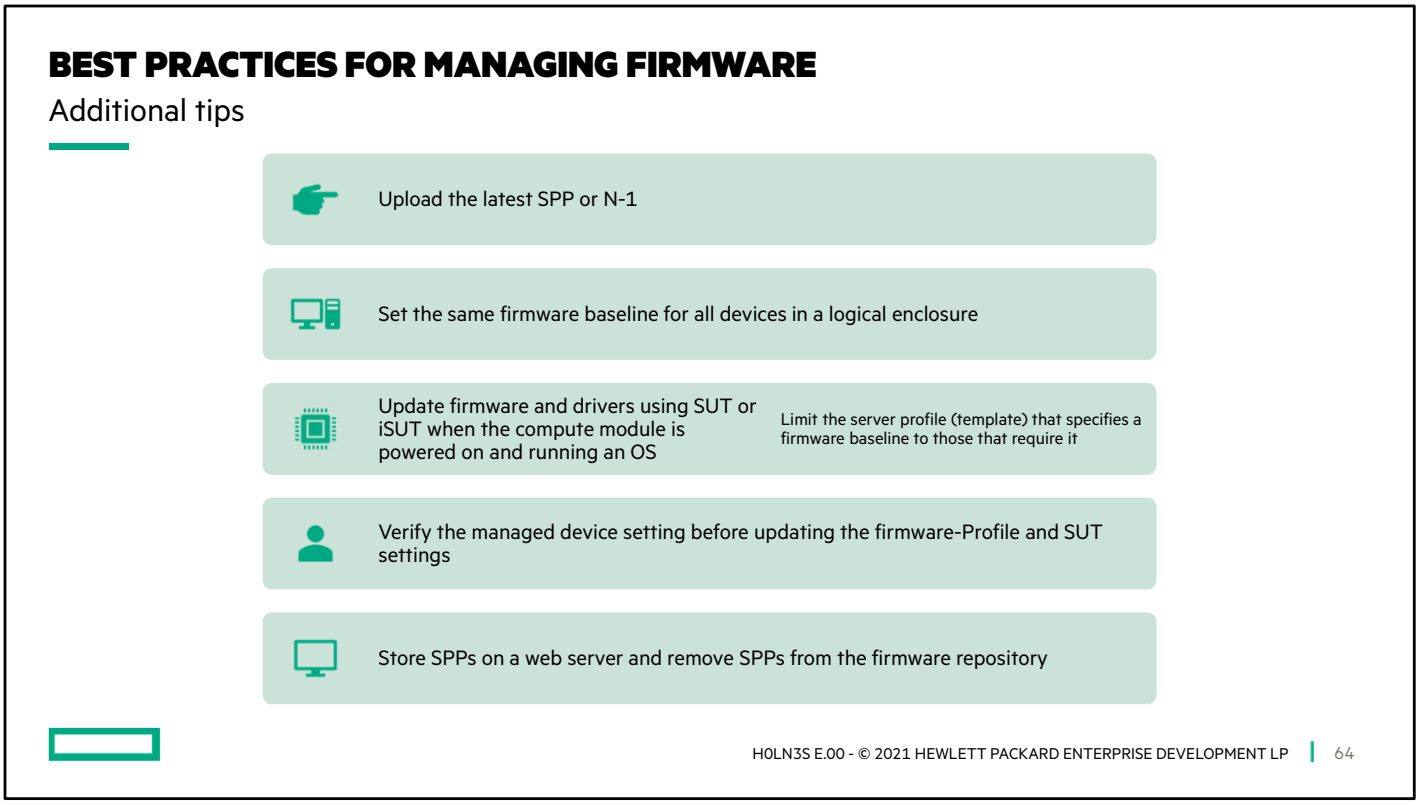
Alternative firmware update options

- Alternatively, you can choose other methods of updating firmware for shared infrastructure and compute modules which need a different firmware version than what is applied to a logical enclosure.
- For example, you can choose to update HPE Synergy and HPE OneView only by upgrading directly from the latest HPE OneView version to any SPP compatible version of HPE OneView.
- Or, you can choose to update one or more components of the shared infrastructure:
  - Update only the shared infrastructure from a logical enclosure—Select the option Shared Infrastructure when configuring the firmware update option for the logical enclosure.
  - Update only the HPE Synergy Frame Link Modules from a logical enclosure—Select Frame link modules only as the firmware update option for a logical enclosure.
  - Update only interconnects from a logical interconnect—Apply an SPP to a logical interconnect, which results in all associated interconnects having the same firmware baseline. This operation, by default, updates firmware only on those member interconnects that are running a different version of firmware, and ignores the interconnects that are running the same firmware version.
- For more information on the aforementioned options, consult the "Update firmware from a logical enclosure" topic in the HPE OneView Help for HPE Synergy at the site given on the slide.
- You can choose to update compute modules through server profiles or server profile templates. Edit the existing server profile or server profile template or create a new server profile or server profile template and specify the version of the SPP.



Best practices for validating firmware updates

- These are the best practices for validating firmware updates:
  - Validate firmware and driver updates in a non-production environment before rolling out to production.
  - In production, apply updates starting with low impact compute modules and slowly move to business compute modules.
  - Check the firmware inventory after the update to make sure that the firmware version matches the desired version.
  - To make sure that the applications perform in the desired manner after the upgrade, perform application level tests with test workloads.
  - Evaluate any critical alerts and warnings that may have been raised on the resources for any recommended actions.



Best practices for managing firmware—Additional tips

- Here is a short recap of some additional best practices that can come in handy:
  - Upload the latest SPP or N-1
  - Set the same firmware baseline for all devices in a logical enclosure
  - Update firmware and drivers using SUT when the compute module is powered on and running an OS
    - Limit the server profile (template) that specifies firmware baseline to those that require it
  - Verify the managed device setting before updating the firmware—Do not update the firmware using SUM or another external tool, on a managed device unless the firmware baseline is set to Manage manually.
  - Store SPPs in a separate location from the appliance and remove SPPs from the firmware repository—HPE OneView does not back up the firmware repository; store SPPs in a repository that is not on the appliance. After an HPE OneView restore is performed, retrieve the backed up SPPs and then upload into HPE OneView.

TOOLS TO SUPPORT SYNERGY UPGRADES

HPE SYNERGY SOFTWARE RELEASES - OVERVIEW
Guidance

- Upgrade Paths
  - For Synergy Management combinations of Synergy Composer and Synergy Image Streamer.
- HPE Synergy Firmware Comparison Tool
  - Compare the contents of HPE Synergy Custom SPPs.
- Synergy Firmware Feature Comparisons
  - Compare new features in Synergy management combinations by supported Synergy Custom SPP versions.

HPE Synergy Software Releases – Overview

- References
  - http://www.hpe.com/downloads/Synergy
  - http://www.hpe.com/info/synergy-sw-release-information
- HPE Synergy Software Releases (Whitepaper)
  - https://support.hpe.com/hpsc/doc/public/display?docId=a00061395en_us

HPE SYNERGY FIRMWARE COMPARISON TOOL

Select Management Combinations

- A management combination includes a specific version of HPE Synergy Composer and HPE Synergy Image Streamer firmware.
- An HPE Synergy Custom SPP includes specific firmware and driver versions.

Management Combinations
HPE Synergy Composer 5.0 / HPE Synergy Image Streamer 5.0
HPE Synergy Composer 5.00.00.02 / HPE Synergy Image Streamer 5.00.00
HPE Synergy Composer 5.00.00.01 / HPE Synergy Image Streamer 5.00.00
HPE Synergy Composer 5.00.00 / HPE Synergy Image Streamer 5.00.00
HPE Synergy Composer 4.2 / HPE Synergy Image Streamer 4.2
HPE Synergy Composer 4.20.02 / HPE Synergy Image Streamer 4.20.01
HPE Synergy Composer 4.20.01.01 / HPE Synergy Image Streamer 4.20.00
HPE Synergy Composer 4.20.01 / HPE Synergy Image Streamer 4.20.00

HPE Synergy Firmware Comparison Tool

- https://techhub.hpe.com/eginfolib/synergy/sw_release_info/Firmware_Comparison_Tool.html

SYNERGY FEATURE COMPARISONS

HPE Synergy 5.00 management combination

- The table provides new supported features for the noted HPE Synergy Management Combination and Synergy Custom SPPs.

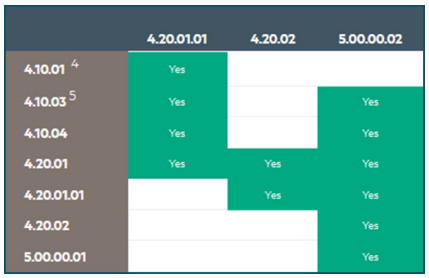
HPE Synergy Custom SPP	2018.11.20190611	2019.03.20190718 2019.03.20190825 2019.03.20191029	2019.03.20190826	2019.09.20190925 2019.09.20190926
HPE Synergy Custom SPP -- Core SPP Date	Nov-18	Mar-19	Mar-19	Sep-19
New HPE Synergy Hardware				
HPE VC SE 100Gb F32 Module for HPE Synergy (FW version)	—	—	2.0.0.1006	2.0.0.1006
HPE Synergy 50Gb Interconnect Link Module (25/50Gb Satellite module)	—	—	Supported	Supported
HPE Synergy 6820C 25/50Gb Converged Network Adapter	—	—	Supported	Supported
HPE Synergy Composer2 Management Appliance	—	—	Supported	Supported
HPE Synergy 4-port Frame Link Module	—	—	Supported	Supported

Synergy feature comparisons

- The table provides new supported features for the noted HPE Synergy Management Combination and Synergy Custom SPPs.
  - https://techhub.hpe.com/eginfolib/synergy/sw_release_info/synergy_feature_5_00.html

SYNERGY COMPOSER UPGRADE PATHS

- The following example highlights Composer only. When using the table for Composer and Image Streamer, use the table once for Composer and then repeat for Image Streamer for the appropriate management combination.
  - Hover over the starting version on the left side of the table, version (from) column.
  - Follow the row across to identify the furthest Yes cell.
    The Yes cell indicates the latest version that you can upgrade (to).
  - When scrolling through the table, the vertical bar highlights the management combinations.
- My baseline is 4.10.03; can I install 5.00.01 directly?



	4.20.01.01	4.20.02	5.00.00.02
4.10.01 [4]	Yes		
4.10.03 [5]	Yes		Yes
4.10.04	Yes		Yes
4.20.01	Yes	Yes	Yes
4.20.01.01		Yes	Yes
4.20.02			Yes
5.00.00.01			Yes

TIP: HPE only validates and supports N-2 direct updates. For example, you would be able to update to 5.1 from 4.20.

Synergy Composer upgrade paths

- Use the table to determine the upgrade path for HPE Synergy Composer and HPE Synergy Image Streamer Management combinations.
- In the table, the columns align to show Synergy Management combinations. "Yes" cells indicate a supported upgrade path. Empty cells indicate that an upgrade path is not supported.
- https://techhub.hpe.com/eginfolib/synergy/sw_release_info/Upgrade_Table.html

VIBSDEPOT: HPE CUSTOM IMAGE MAPPING

- HPE vibsdepot is a repository that provides access to HPE developed bundles along with device drivers packages that are part of the HPE Customized VMware images.
  - These bundles and associated vibs can be used with VMware applications and tools like VMware Update Manager (VUM), ESXCLI and Image Builder.
- Vibsdepot can help you understand supported OS/driver versions.
- You can download the HPE custom ESXi images from vibsdepot.
- The associated Software Delivery Repository offers similar support for Linux.
  - It hosts yum, zypper, and apt repositories for Linux-related software packages

Caution: HPE vibsdepot is focused on ProLiant not Synergy!

Vibsdepot.hpe.com

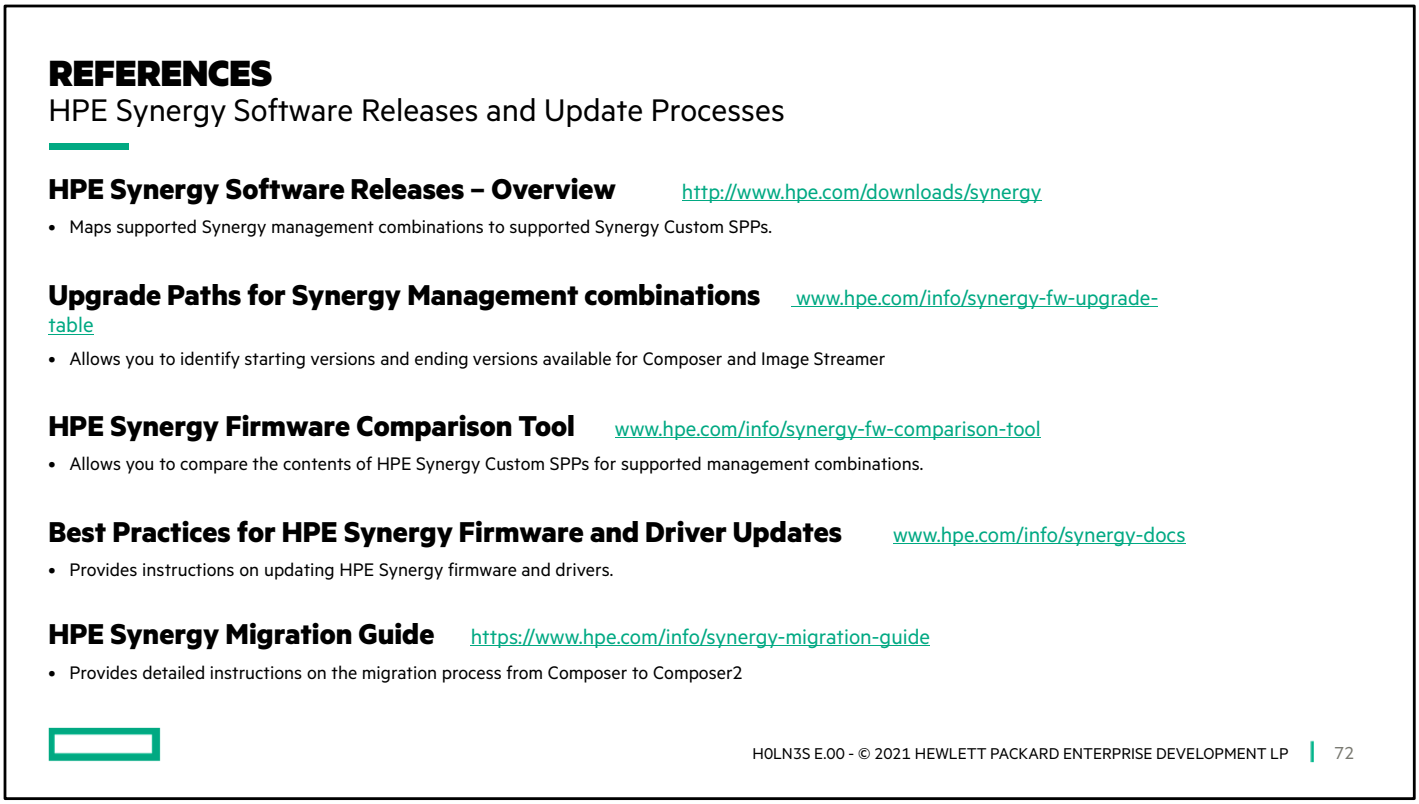
- Use the links to view detailed information on where to obtain the appropriate firmware, drivers and software for the supported OS releases and server generations for the SPP release.

- Use the links to view the table that maps the HPE Custom Images for the OS release to the vibsdepot directory and the matching SPP release for Gen9 and later servers.

- The vibsdepot directory contains all the drivers and software added to the referenced HPE Custom Image, or the drivers and software for a hot-fix for the referenced HPE Custom Image as described in the footnotes. The SPP contains the drivers included in the referenced HPE Custom Image and the matching FW components. Starting with the 2018.03.0 SPP, the HPE value-add software included in the referenced HPE Custom Image is also included in the SPP.

RESOURCES

- where get the info, tool, sites, videos



REFERENCES

HPE Synergy Software Releases – Overview http://www.hpe.com/downloads/synergy

Maps supported Synergy management combinations to supported Synergy Custom SPPs.

Upgrade Paths for Synergy Management combinations www.hpe.com/info/synergy-fw-upgrade-table

Allows you to identify starting versions and ending versions available for Composer and Image Streamer

HPE Synergy Firmware Comparison Tool www.hpe.com/info/synergy-fw-comparison-tool

Allows you to compare the contents of HPE Synergy Custom SPPs for supported management combinations.

Best Practices for HPE Synergy Firmware and Driver Updates www.hpe.com/info/synergy-docs

Provides instructions on updating HPE Synergy firmware and drivers.

HPE Synergy Migration Guide https://www.hpe.com/info/synergy-migration-guide

Provides detailed instructions on the migration process from Composer to Composer2

REFERENCES

VMware Support for HPE Synergy Software Releases

- Provides guidance for VMware versions and vSAN support.
- For VMware support:
  https://www.vmware.com/resources/compatibility/search.php
- For VMWare vSAN support:
  https://www.vmware.com/resources/compatibility/search.php?deviceCategory=vsan

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LAB

REVIEW QUESTIONS

HPE SYNERGY FIRMWARE ADMINISTRATION SKILLS

Topic areas

- Current OneView Updates
- Acquiring Firmware
- Interconnect Firmware Updates
- Compute Firmware
- OS Tools
- Appliance Firmware
- Upgrading Hardware
- Preparing to Upgrade
- Best Practices
- Tools
- Compliance
- References

Outline

Current OneView Updates

Acquiring Firmware

Interconnect Firmware Updates

Compute Firmware

OS Tools

Appliance Firmware

Upgrading Hardware

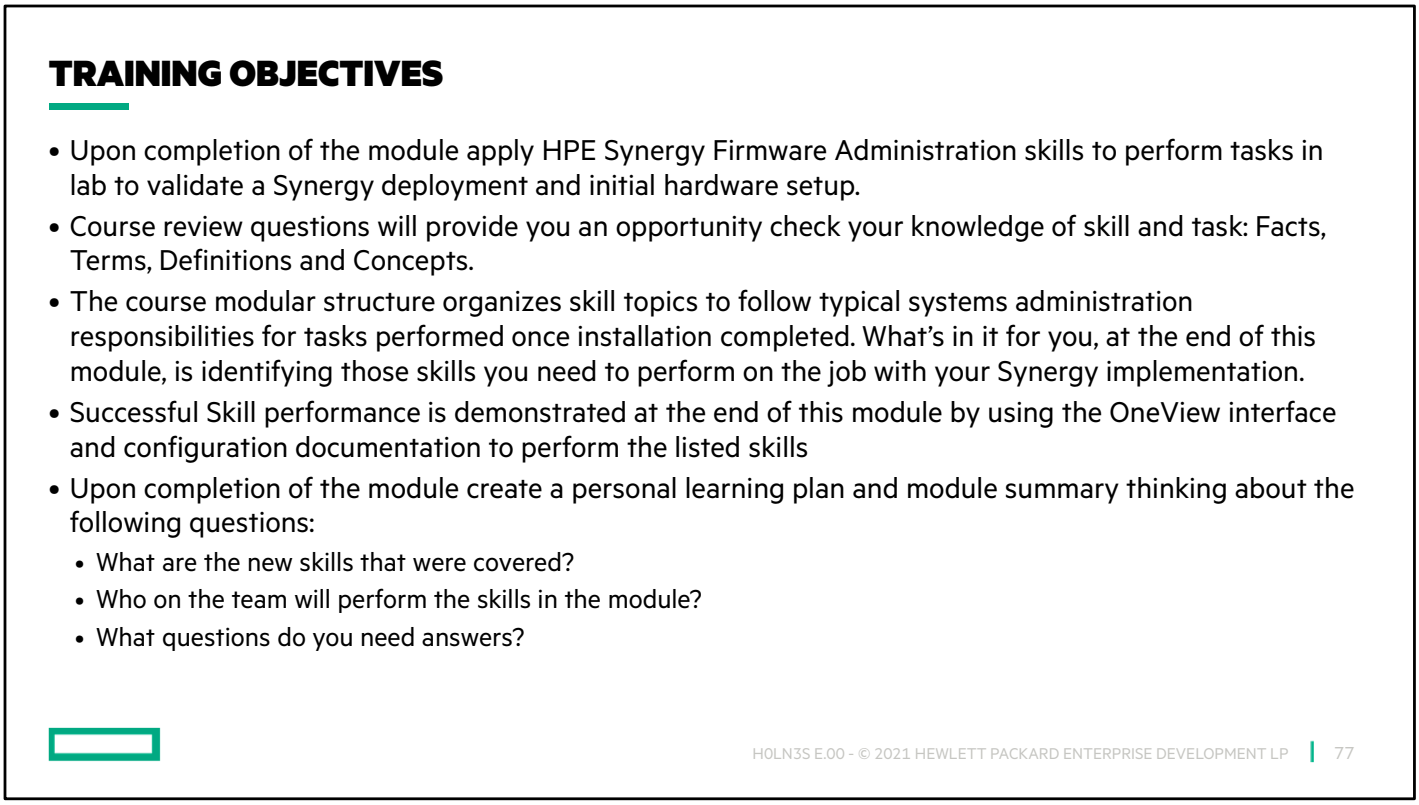
Preparing to Upgrade

Best Practices

Tools

Compliance

References



Training objectives

Upon completion of the module apply HPE Synergy Firmware Administration skills to perform tasks in lab to validate a Synergy deployment and initial hardware setup.

Course review questions will provide you an opportunity check your knowledge of skill and task: Facts, Terms, Definitions and Concepts.

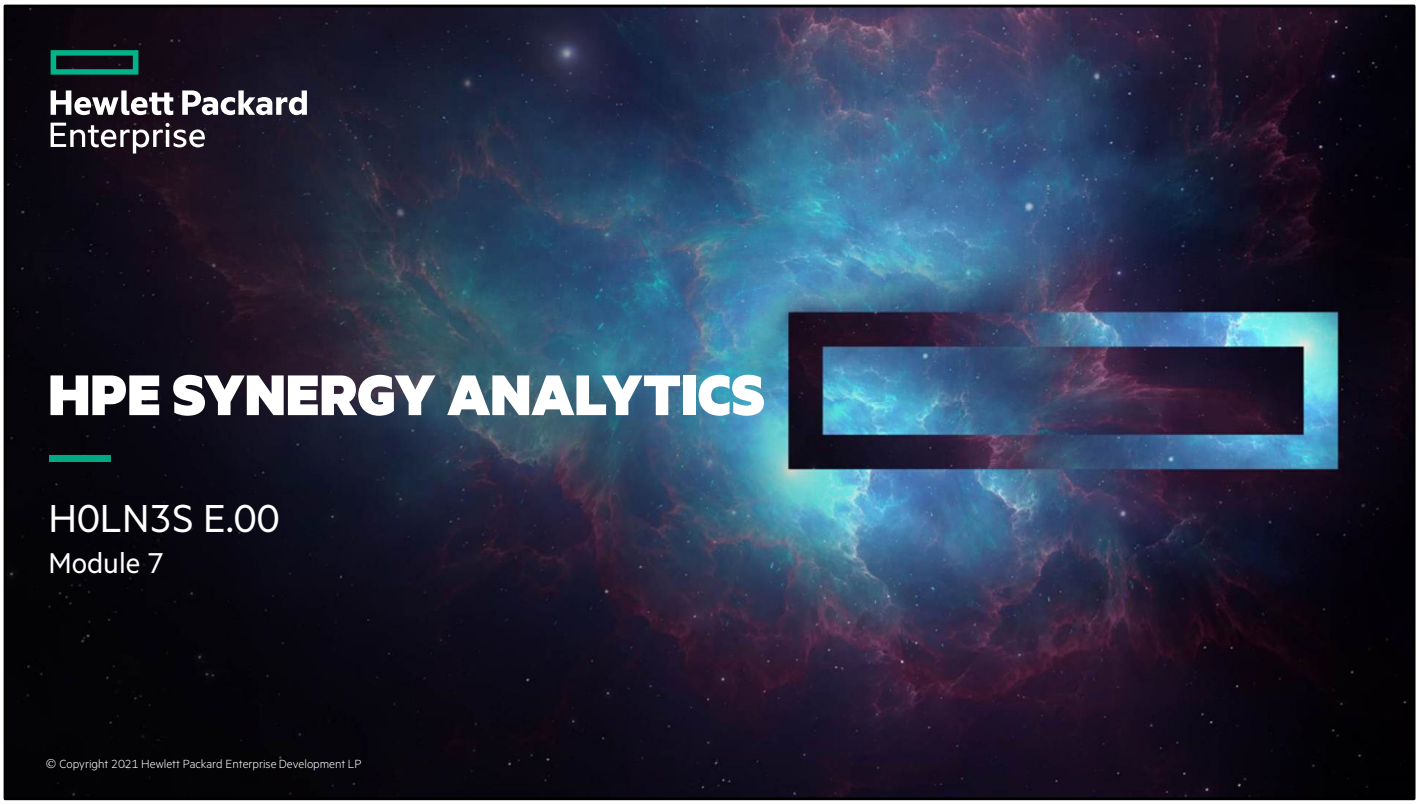
The course modular structure organizes skill topics to follow typical systems administration responsibilities for tasks performed once installation completed. What's in it for you, at the end of this module, is identifying those skills you need to perform on the job with your Synergy implementation.

Successful Skill performance is demonstrated at the end of this module by using the OneView interface and configuration documentation to perform the listed skills

Upon completion of the module create a personal learning plan and module summary thinking about the following questions:

- What are the new skills that were covered?
- Who on the team will perform the skills in the module?
- What questions do you need answers?

THANK YOU


Hewlett Packard
Enterprise
HPE SYNERGY ANALYTICS
H0LN3S E.00
Module 7
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HPE SYNERGY ANALYTICS

Topic areas

- OneView dashboard
- OneView activity
- Global dashboard
- Firmware compliance dashboard
- Remote support
- InfoSight
- Plugins
- Storage monitoring

TRAINING OBJECTIVES

- Upon completion of the module apply HPE Synergy Analytics Administration skills to perform tasks in lab to validate a Synergy deployment and initial hardware setup.
- Course review questions will provide you an opportunity check your knowledge of skill and task: Facts, Terms, Definitions and Concepts.
- The course modular structure organizes skill topics to follow typical systems administration responsibilities for tasks performed once installation completed. What's in it for you, at the end of this module, is identifying those skills you need to perform on the job with your Synergy implementation.
- Successful Skill performance is demonstrated at the end of this module by using the OneView interface and configuration documentation to perform the listed skills
- Upon completion of the module create a personal learning plan and module summary thinking about the following questions:
  - What are the new skills that were covered?
  - Who on the team will perform the skills in the module?
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Training objectives

Upon completion of the module apply HPE Synergy Analytics Administration skills to perform tasks in lab to validate a Synergy deployment and initial hardware setup.

Course review questions will provide you an opportunity check your knowledge of skill and task: Facts, Terms, Definitions and Concepts.

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Successful Skill performance is demonstrated at the end of this module by using the OneView interface and configuration documentation to perform the listed skills

Upon completion of the module create a personal learning plan and module summary thinking about the following questions:

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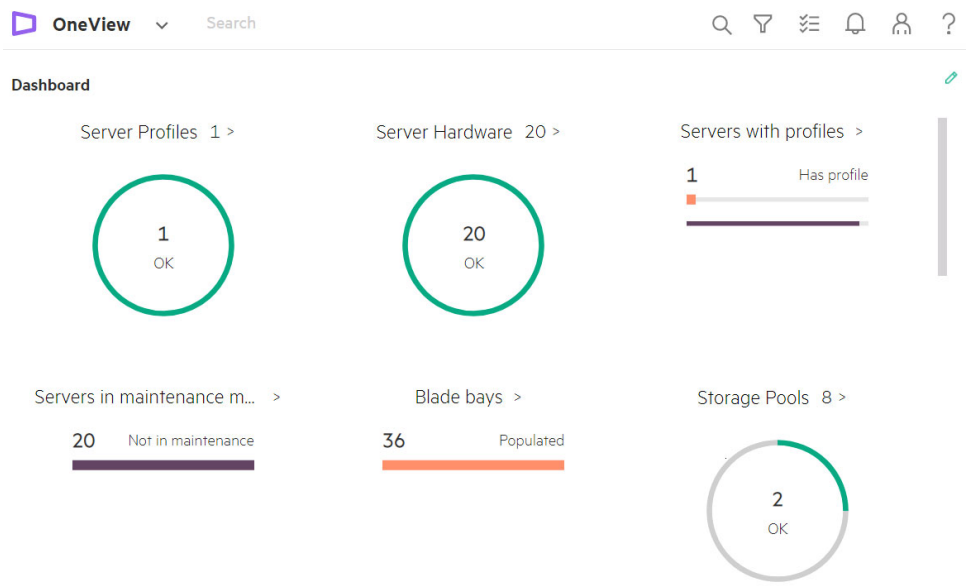
CHECK THE DASHBOARD FOR CRITICAL ERRORS

Resolve any critical issues on:

- Server Profiles
- Logical Enclosures
- Logical Interconnects



As a first step to understanding the current situation in your environment, check the OneView dashboard and resolve any critical issues on:

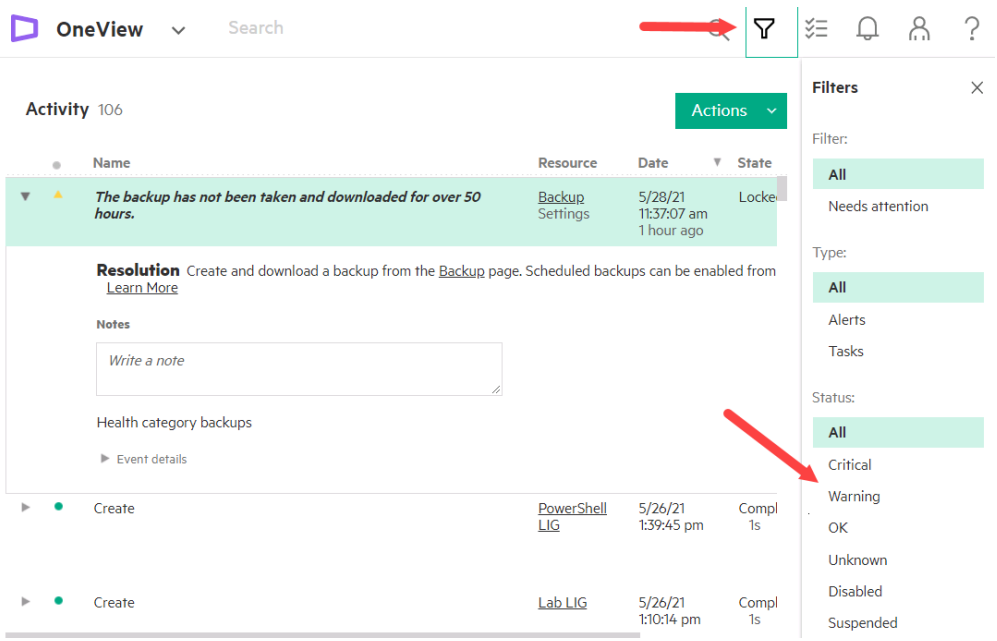
Server Profiles

Logical Enclosures

Logical Interconnects

ACTIVITY

- Check the OneView Activity page for warnings and errors
- Follow the red to investigate problems



Check the OneView Activity page for warnings and errors

Follow the red to investigate problems

Filter the activities based on type or criticality to get a better sense of the data

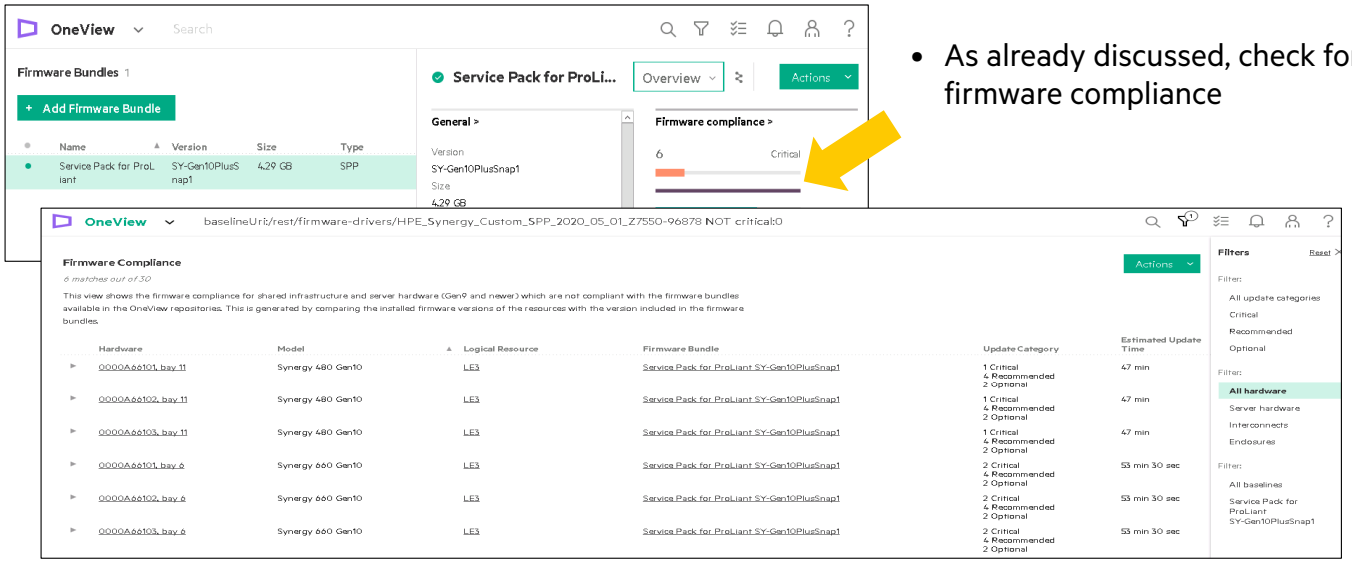
CLEARING ALERTS

- You can clear an activity when it no longer needs to be tracked.
  - The appliance clears certain activities automatically when they have been completed or resolved.
  - Cleared activities do not affect the resource's health status and they are not counted in the displayed summaries.
  - You can restore a cleared activity to the active state.
  - If you clear an active alert (warning), and the underlying condition has not been resolved, OneView will regenerate the alert.

Clearing alerts

- Resolving locked alerts generated by a resource:
  - Expand the alert and follow the recommended action described in Resolution.
  - If you need more information, expand the Event details and see the details for CorrectiveAction.
  - When the resource detects a change, it will automatically change the alert status to Cleared.

FIRMWARE COMPLIANCE AND REPORTING



- As already discussed, check for firmware compliance

Firmware Compliance and Reporting

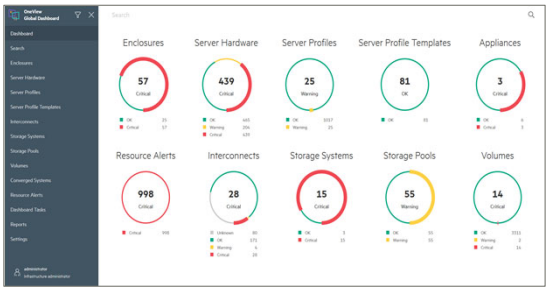
- Beginning in version 5.0, HPE OneView provides a detailed view of all pending firmware and driver updates in the Firmware Bundles screen. OneView will compare the installed firmware versions of the managed hardware with the new component versions in the added SPP and will generate a compliance report that summarizes the pending update based on that particular SPP.
- Starting with HPE OneView 5.2, this full set of compliance dashboard is extended to OneView supported Gen9 servers.
- This Information can help you plan for maintenance windows for particular hardware components. For instance, if there is a critical ROM fix, you can flash these at the earliest opportunity. On the other hand, if the update just includes feature enhancements, then you may want to wait to apply it.
- All Ring components are required to be maintained at a matching SPP and Appliance firmware level. Server ROMs are the only item allowed to be upgrade outside of the SPP/Appliance combination baseline

GLOBAL DASHBOARD

UNIFY VISIBILITY WITH HPE ONEVIEW GLOBAL DASHBOARD

Supporting up to 75 appliances and thousands of systems

- Provide unified view of health and alerting of resources managed by HPE OneView including HPE Synergy, HP ProLiant DL & MP, Apollo, BladeSystem, Primera, 3PAR Nimble, and HPE SimpliVity
- Instant search results for devices of interest
- In-context launch to HPE OneView, iLO and OA with single sign-on
- Flexible access to health and inventory data with HPE Global Dashboard API
- Rich, integrated reporting across all appliances
- Delivered as a virtual appliance at no extra cost



Unify visibility with HPE OneView Global Dashboard

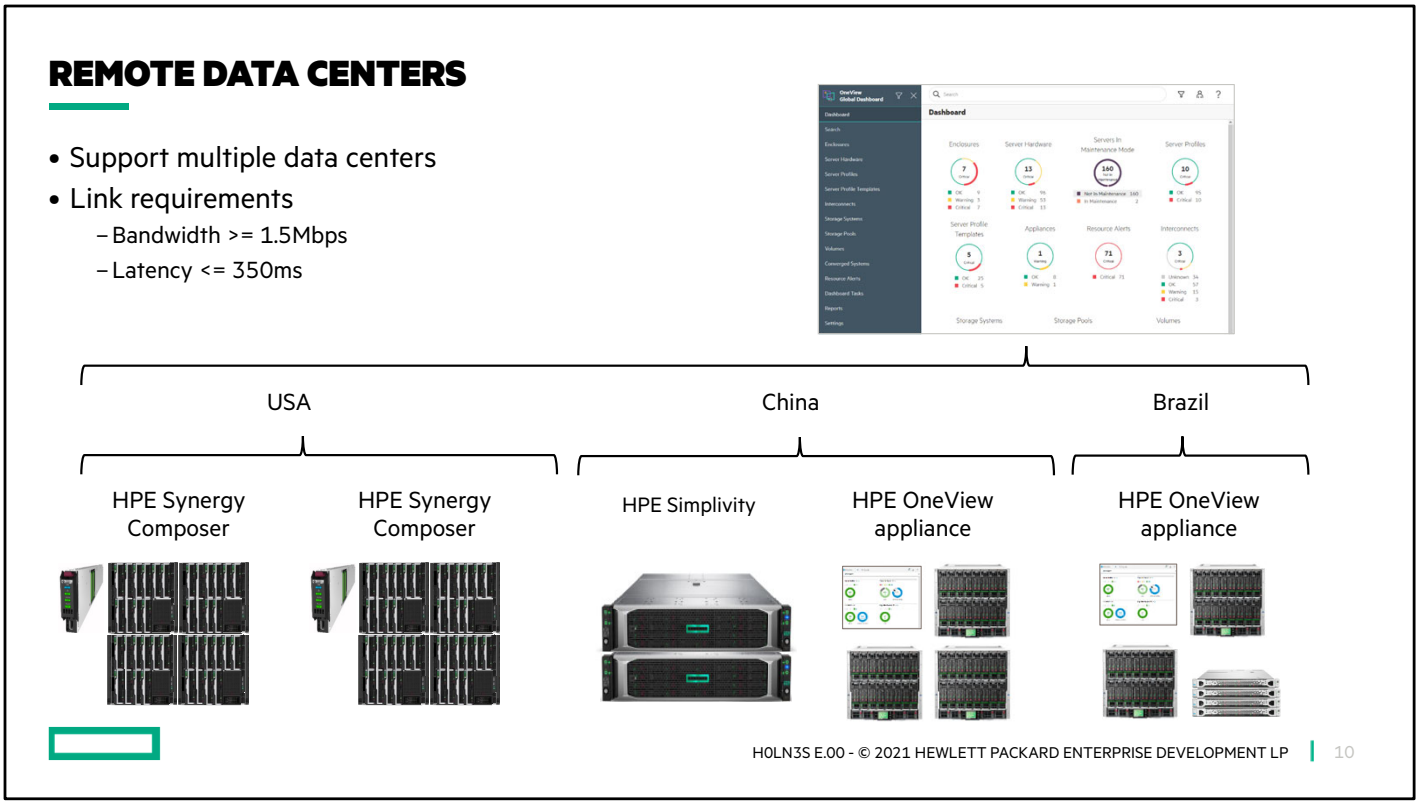
Supporting up to 75 appliances and thousands of systems

HPE OneView Global Dashboard provides a unified view of health and alerting of resources managed by HPE OneView

It's completely searchable – all data in all appliances is compiled into elastic search.

HPE OneView Global Dashboard supports Single sign- on to the HPE OneView appliances and iIO . So, if you need to make some changes on a server you are able to very easily access the OV specific instance or the ILO for that specific server, and drill down to the server to make the needed changes.

HPE OneView Global Dashboard supports all HPE OneView supported versions (HPE OneView versions that are no longer supported – are not supported by HPE OneView Global Dashboard)



Remote data centers

- HPE OneView Global Dashboard supports multiple remote data centers, if the following link requirements are satisfied:
  - Bandwidth is greater than or equal to 1.5Mbps
  - Latency is less than or equal to 300ms

Though the Global Dashboard can support WAN links with the specs outlined above, you still need sufficient bandwidth and latency tolerance when connecting to a remote appliance from your remote management system.

- The Global Dashboard will not proxy firmware management or connect to an iLO Remote Console (IRC).
- Global Dashboard cannot replicate or move a SPP from one appliance to another.

Notes:

Global Dashboard uses a TLS connection for all remote communication.

When Global Dashboard talks to HPE OneView, it does via REST and the SCMB connections – both of which are secured via TLS.

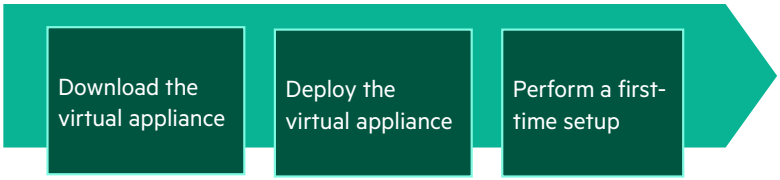
HPE OneView Global dashboard won't transport profiles between different OneView instances.

- WWID/MAC are only transportable within the single OV appliance.

Global Dashboard does not talk to the OneView in an HC380. An HC380 does not have a SCMB or similar mechanism, so Global Dashboard uses REST over TLS when querying an HC380.

INSTALLATION REQUIREMENTS

- Global Dashboard:
  - Shipped as a virtual appliance
  - Can be downloaded from HPE Software Depot
  - Delivered as a VMware OVA, Hyper-V archive, or KVM tar.gz
- The deployment is supported on a VMware vSphere, Microsoft Hyper-V host, or Linux KVM host
- Host requirements:
  - Four 2 GHz or greater virtual CPUs
  - 16 GB of memory dedicated to the appliance
  - 200 GB of thick-provisioned disk space
  - A connection to the management LAN



Installation requirements

HPE OneView Global Dashboard is shipped as a virtual appliance. It can be downloaded from HPE Software Depot.

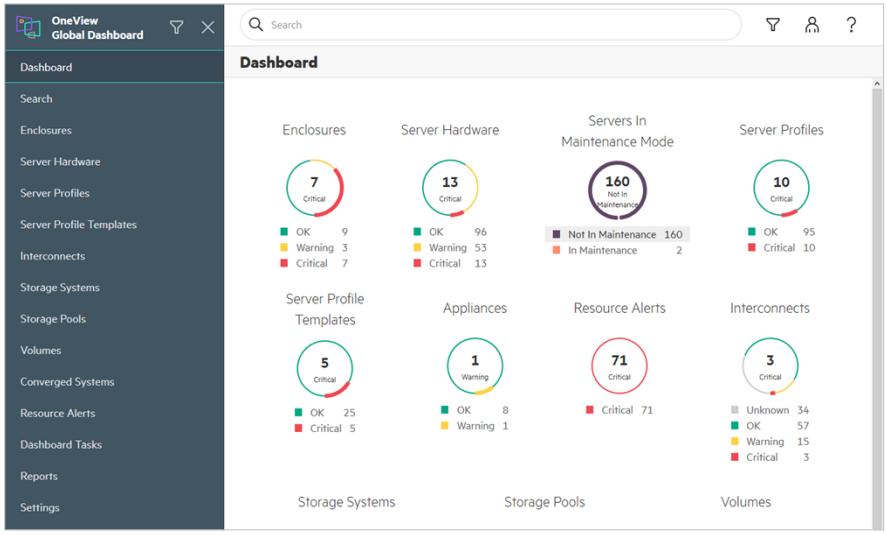
Global Dashboard is delivered as an OVA, Hyper-V archive or KVM tar.gz

The deployment is supported on a VMware vSphere, Microsoft Hyper-V host or Linux KVM host

- Host requirements include:
  - Four 2 GHz or greater virtual CPUs
  - 16 GB of memory dedicated to the appliance
  - 200 GB of thick-provisioned disk space
  - A connection to the management LAN

HPE ONEVIEW GLOBAL DASHBOARD FEATURES

Dashboard user interface



Green	A healthy status
Yellow	An event has occurred that might require your attention
Red	A critical condition that requires your immediate attention

HPE OneView Global Dashboard features

Dashboard user interface

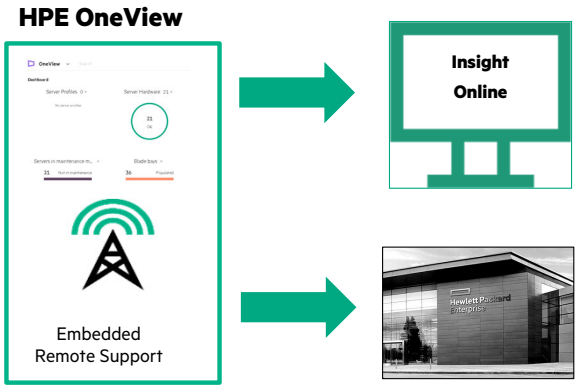
- Provides a visual representation of the general health and status of the appliances and managed resources across all data centers.

REMOTE SUPPORT

- What is remote support?

A NEW WAY TO GET CONNECTED

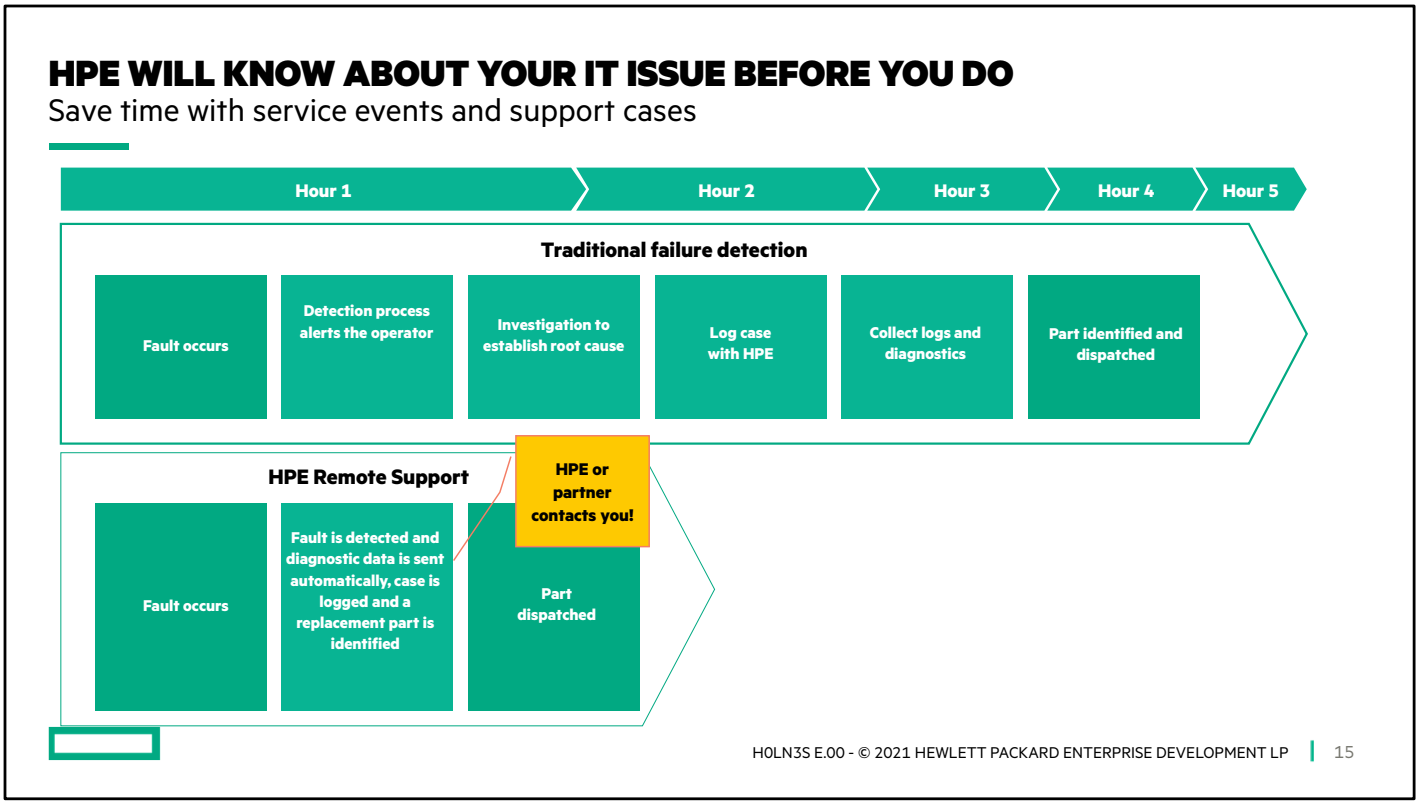
Remote Support integrated with HPE OneView



- **Simple** and fast activation
- **Agentless** and operating system independent
- **Automated** cases and spare parts sent to your door
- **Secure** access to Insight Online personalized dashboard and mobile app
- **Available for** c-Class enclosures**,** Gen8 and Gen9 servers including DL and Apollo
- **Available for** Synergy Frame and compute modules
- **Additional platform support** in future releases

A new way to get connected—Remote support integrated with HPE OneView

- HPE OneView provides integrated remote support that is part of the HPE OneView appliance. By registering for remote support in HPE OneView, you enable Proactive Care and an automatic case creation for hardware failures on Gen8 and newer servers and enclosures. Remote support enables the Proactive Scan reports, as well as Firmware and Software Analysis reports with recommendations that are based on the collected configuration data.
- For Gen8, Gen9 and Gen10 servers, it will utilize the agentless remote support that is part of iLO 4 and iLO 5.
- In the initial release, HPE OneView Remote Support is available for HPE Synergy frames and compute modules, and most ring item, refer to the support matrix. The key remote support features include:
  - **Appliance Registration** for remote support—One click to activate; it is easier to get connected than ever before
  - Customer **opt-in**, contact information, and support partner details
  - **24x7 monitoring** and **pre-failure alerts** to protect your investment—Service incident forwarding and tracking in HPE OneView
  - **Automated case creation** (no 1-800 calls) and sending spare parts to your door (less time spent on support cases); case status updates are available
  - **Secure access to Insight Online** personalized dashboard and mobile app allows you to keep track of cases and equipment from anywhere
  - **Collections**, including Active Health System data
  - **AHS log** included in the automated event transmittal
  - **Available for C-Class enclosures**Gen8, Gen9 and Gen10 servers, **Synergy** Frames and compute modules and Synergy interconnects .**Phased** implementation



HPE will know about your IT issue before you do—Save time with service events and support cases

- Let us look at two illustrative scenarios:

1. In the first scenario, an IT issue triggered by a traditional failure detection involves a minimum sequence of **6 steps** and perhaps **5 hours** just to get to the point in time where the part is identified and dispatched.
   a. A fault occurs.
   b. The detection process alerts the operator.
   c. The investigation to establish the root cause ensues.
   d. The case is logged with HPE.
   e. Logs and diagnostics are collected.
   f. The part is identified and dispatched.
2. In the second scenario, leveraging standard Internet security protocols and principles, Remote Support automatically forwards all actionable events back to HPE or your HPE Authorized Channel Partner reducing that sequence to **3 steps** resulting in the same part being dispatched in about **2 hours**.
   a. A fault occurs.
   b. The fault is detected, diagnostic data is sent automatically, the case is logged and a replacement part is identified.
   c. The part is dispatched.

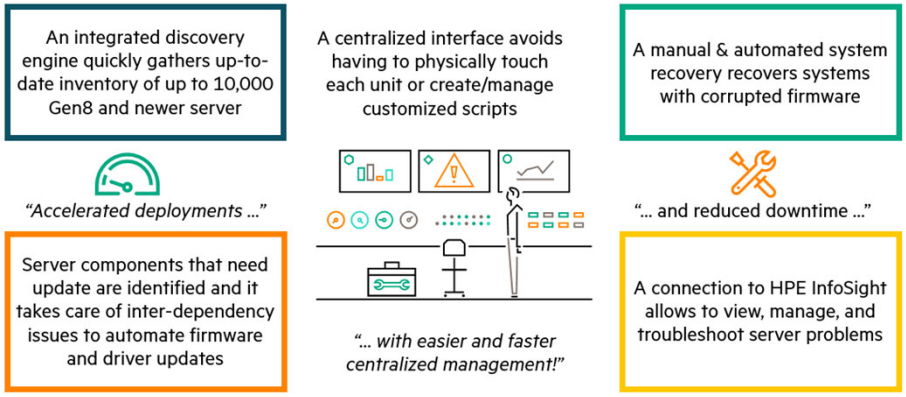
- In both scenarios, information is sent to HPE or your HPE Authorized Channel Partner, a case is logged, troubleshooting and part identification take place, and the part is dispatched, but by utilizing HPE Insight Remote Support, **downtime is significantly reduced**.
- When utilizing HPE Remote Support, it is not unusual for HPE or your HPE Authorized Channel Partner to know about an IT-triggered event and begin addressing the issue before you or your IT team is even aware of the event that occurred.

ILO AMPLIFIER PACK

For more: course ID 01126265

iLO Amplifier Pack Description

- Designed for large enterprise and service provider environments, the iLO Amplifier Pack gives customers the power to discover, inventory and update their HPE ProLiant and Apollo Gen8, Gen9, Gen10, Gen10 Plus, Moonshot, and Edgeline servers at rapid speed and scale.
- The iLO Amplifier Pack is a virtual appliance. It is available as a free download from www.hpe.com for all HPE server customers, and it does NOT require a separate license.



Important: The iLO Advanced license on managed servers may be required to complete certain tasks.

The iLO Essentials and iLO Scale-Out licenses are treated the same as iLO Standard license.

For instance, servers with those licenses get limited updates, no iLO Federation groups, and no alerts via email or IFTTT.

Designed for large enterprise and service provider environments, the iLO Amplifier Pack gives customers the power to discover, inventory and update their HPE ProLiant and Apollo Gen8, Gen9, Gen10, Gen10 Plus, Moonshot, and Edgeline servers at rapid speed and scale.

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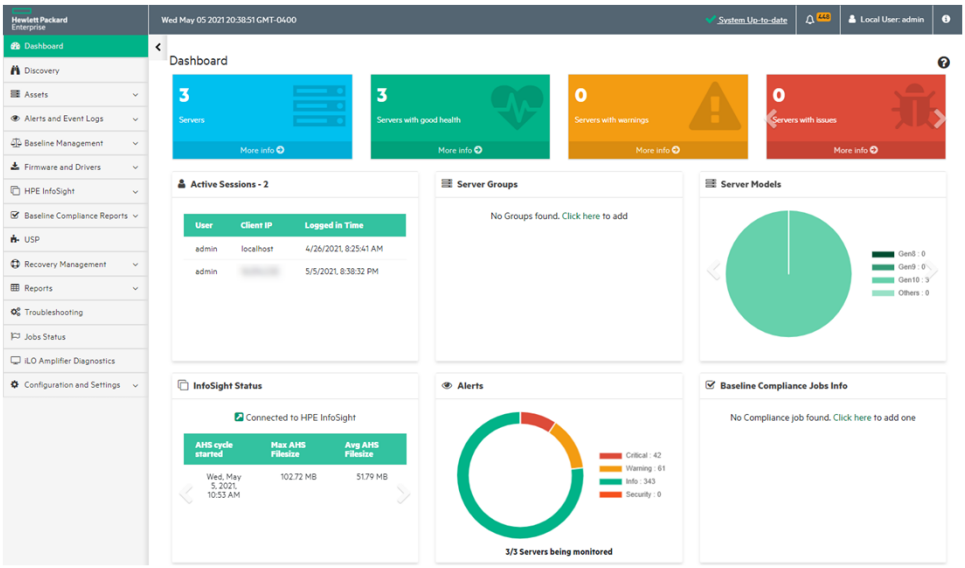
ILO AMPLIFIER PACK DASHBOARD

- The Dashboard page displays the servers health summary and various other widgets.
- These widgets provide information about the active sessions, server groups, server models, HPE InfoSight status and AHS transmission details, various alerts, and the SPP baseline compliance tasks.



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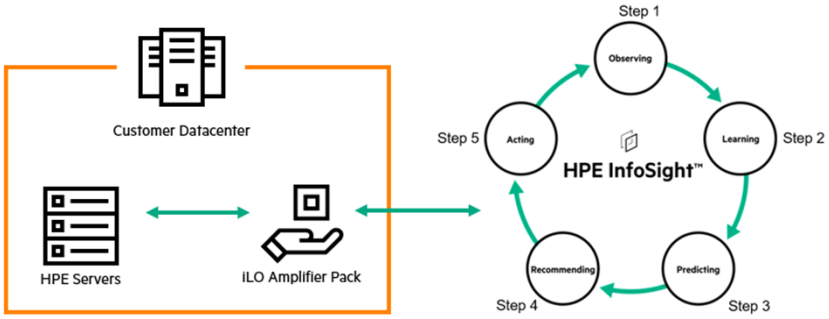
HPE INFOSIGHT PARTNERSHIP

- HPE InfoSight is an artificial intelligence (AI) platform that eliminates the pain of managing infrastructure. HPE InfoSight employs cloud-based machine learning to predict and prevent problems across the infrastructure stack and ensures optimal performance and efficient resource use.
- The iLO Amplifier Pack provides a mechanism by which ProLiant servers information is passed from a customer site to the HPE InfoSight backend.



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The iLO Amplifier Pack provides a mechanism by which ProLiant servers information is passed from a customer site to the HPE InfoSight backend.

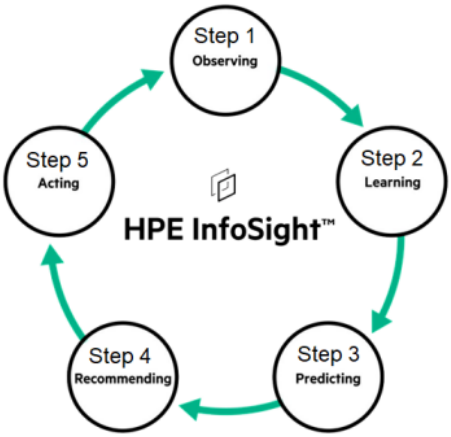
INFOSIGHT FOR SERVERS

For more: course ID 0001130261

WHAT IS HPE INFOSIGHT

Improving efficiency through AI

- HPE InfoSight is an online portal which uses Artificial Intelligence to help simplify operations and improve performance at customer datacenter sites in 5 steps:
- **Step 1: Observing** what's going on in Customers environment by using the thousands of data points and sensors built into the HPE server and storage products.
- **Step 2: Learning** from that observation and combining those observations from the customer environment, along with the observations of other people who are deploying similar capabilities, the AI is applying advanced pattern recognition to the sensor data collected across all devices globally.



- **Step 3: Predicting** outcomes based on the telemetry data, means anticipating problems based on the observations and learnings.
- **Step 4: Recommending** changes in customers environment. Changes in HPE capabilities and products and/or changes in host-based capabilities, are intelligent decisions that prevent issues, improve performance, and optimize resources.
- **Step 5: Acting** on those recommendations, resulting in a much better experience, not only for the HPE products, but the whole tool chain inside the datacenter.

Important: Not all HPE products in the above categories are supported, and some minimum firmware requirements are needed. The list of supported products can change without prior notice. Customers should refer to the HPE InfoSight documentation for a specific category of devices for the most up-to-date list of supported HPE products in its category.

More Information

HPE InfoSight Overview Training

HPE acquired InfoSight as part of the Nimble Acquisition in 2017. InfoSight is an artificial intelligence that transforms how infrastructure is managed and supported.

This transformation was very successful for Nimble customers. As result, HPE announced its intention of extending the HPE InfoSight support to additional HPE portfolios.

This is how in 2019 InfoSight was extended to support HPE Servers.

HPE InfoSight Overview Training

An additional InfoSight course is available to customers, titled HPE InfoSight Overview (course ID 0001130260).

This course is recommended as a prerequisite to the present training as it provides an overview of InfoSight and what it can do for the different types of devices it supports, including use cases.

HPE InfoSight Software Configuration

HPE InfoSight is NOT a software that customers would deploy within their datacenter; each category of devices is monitored and sends its data using a different mechanism to HPE InfoSight in the HPE backend through the Internet.

Refer to the specific category of devices InfoSight documentation for the most up-to-date method used to manage and send data to InfoSight.

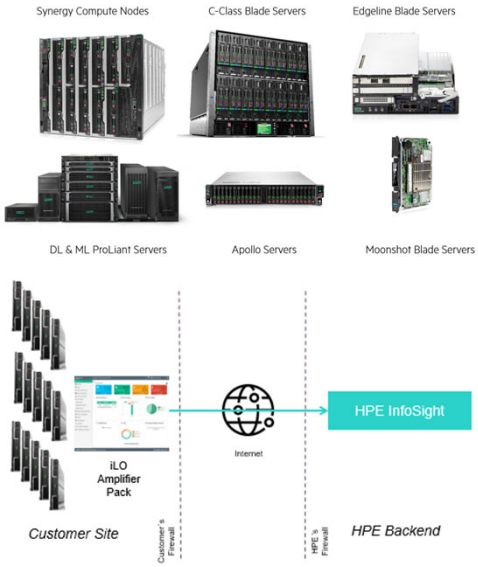
HPE InfoSight Getting Started Guide

Please refer to the HPE InfoSight Getting Started Guide to view the most up-to-date information pertaining to the initial configuration of HPE InfoSight.

WHAT IS INFOSIGHT FOR SERVERS

InfoSight supports HPE servers

- Using the information collected from servers, HPE InfoSight is able to detect specific conditions that otherwise could have been misdiagnosed as requiring hardware replacement, costing time and money to both HPE and our customers.



InfoSight for servers monitoring & data collection mechanism

- For HPE servers, the mechanism used to monitor and send data to HPE InfoSight backend is the iLO Amplifier Pack, which needs to be deployed and configured at the customer site.
- Once the connection is enabled, by default all monitored servers are automatically monitored in HPE InfoSight. Subsequently data is also automatically collected and analyzed.

More Information

More information regarding the initial HPE InfoSight for Servers configuration steps required are discussed in an upcoming segment ot this course.

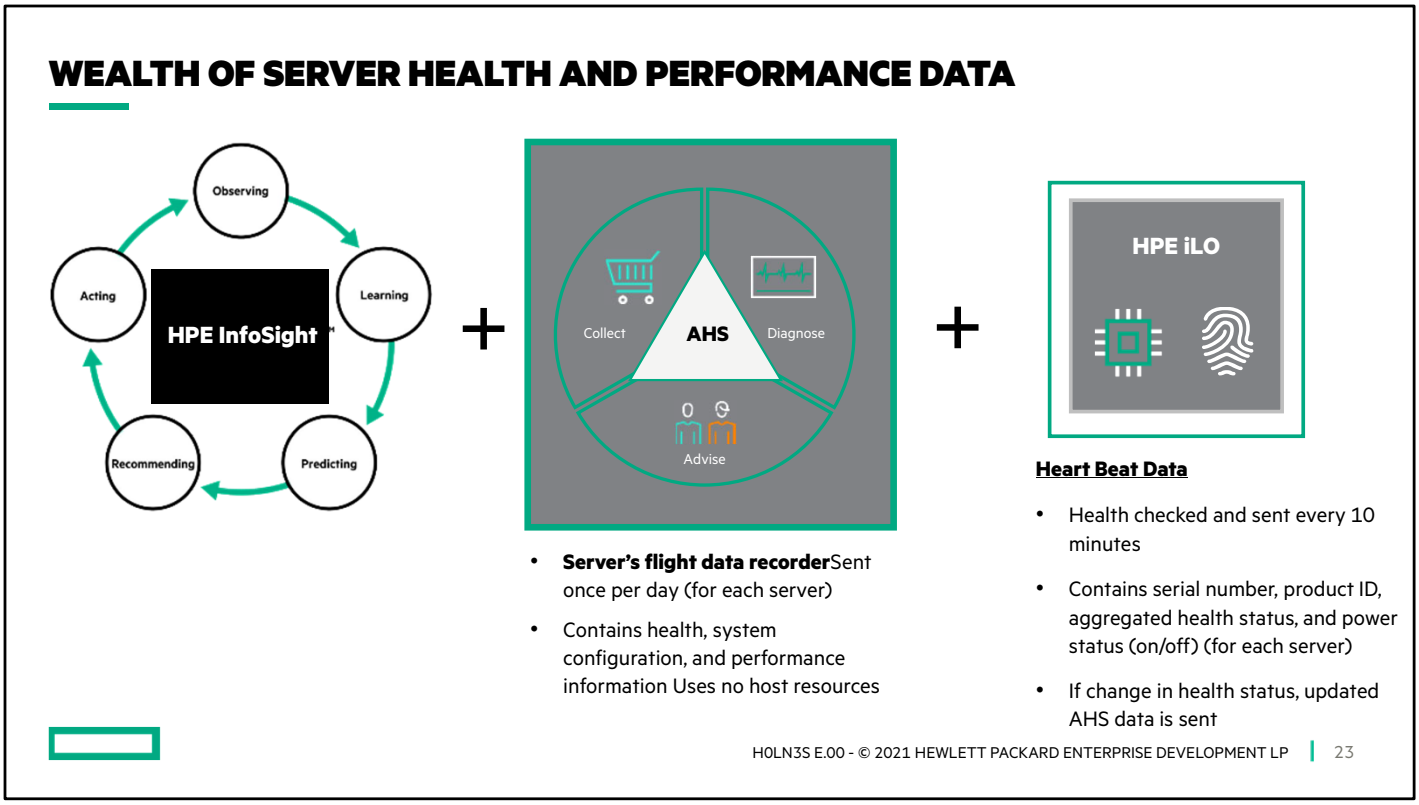
InfoSight for Servers benefit example

InfoSight for Servers goes beyond the typical monitoring of server issues. With InfoSight for Servers, HPE is combining the cloud-based machine learning of InfoSight with the health and performance monitoring of AHS and iLO to optimize performance and predict and prevent problems on your Gen10, Gen9, and Gen8 ProLiant, Synergy, and Apollo servers

For instance, InfoSight is able to recognize that a given SMART Array failure on a specific server model could be resolved by upgrading firmware instead of replacing a part.

Knowing this, InfoSight is able to recognize this condition, as well as inform the customer. And not just to the first server it encounters like this but to any servers, at any customer site that has same condition.

Hence, the more scenarios it observes, the more InfoSight Artificial Intelligence learns, the more it can predict and recommend and act on. That is the power of the Artificial Intelligence behind InfoSight.



Intent of Slide: To show the necessary elements that make up HPE InfoSight for Servers

HPE InfoSight for Servers has 3 major components:

#1. InfoSight for Servers

- With InfoSight for Servers, HPE is combining the cloud-based machine learning of InfoSight with the health and performance monitoring of Active Health System (AHS) and iLO to optimize performance and predict and prevent problems on your Gen10, Gen9, and Gen8 ProLiant, Synergy, and Apollo servers.

#2. AHS (Active Health System)

- AHS is like a "flight recorder" for your server that provides continuous, proactive health monitoring and recording 1000s of system parameters and diagnostic telemetry data 24x7 on the server.

- AHS is available on Gen10, Gen9, and Gen8 servers with iLO 5 and iLO 4.

#3. iLO (Integrated Lights-Out)

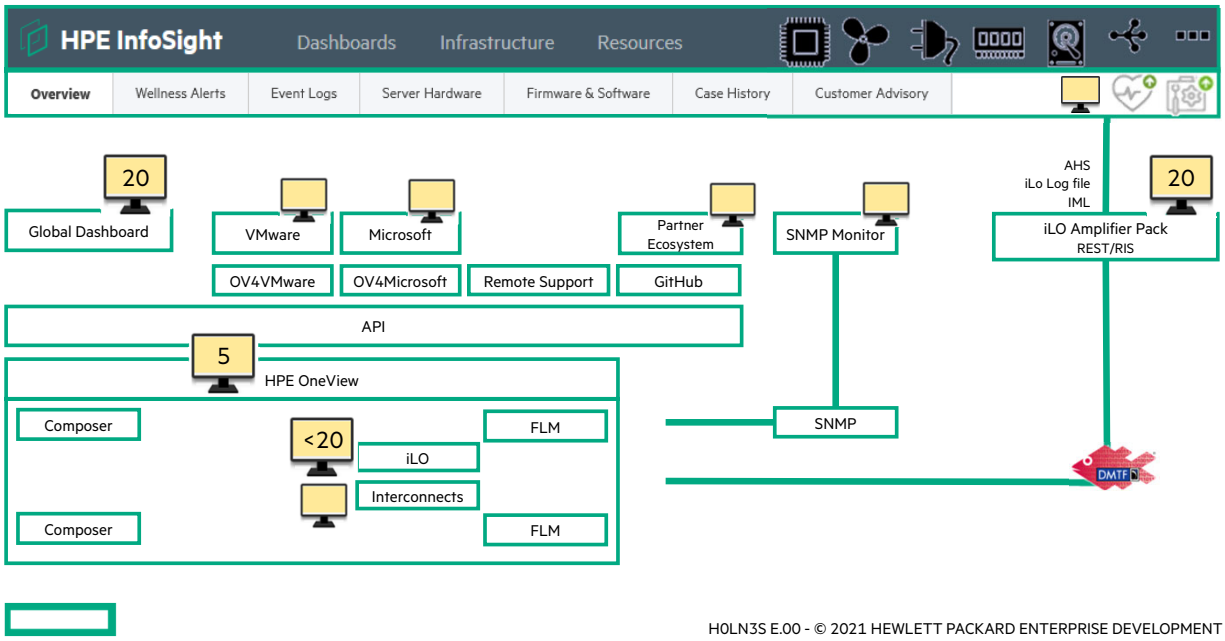
- iLO is HPE's management processor that is embedded on the ProLiant, Apollo, and Synergy servers.

iLO and AHS are tightly integrated and work together to gather and record the 1000s of system parameters and diagnostic telemetry data

Access to AHS is through iLO (customers access the AHS data through iLO)

It's important to note that although InfoSight for Servers is new, the capturing and recording of health, configuration, and performance sensor and telemetry data at the individual server level has been around since AHS was introduced in Gen8 with iLO 4. What's new with InfoSight for Servers is the automatic collection of this data into InfoSight.

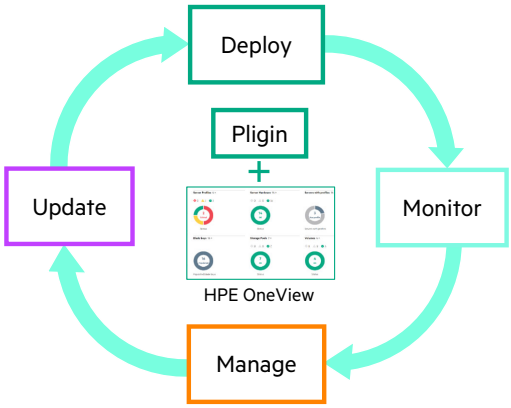
ANALYTICS TOOL USE

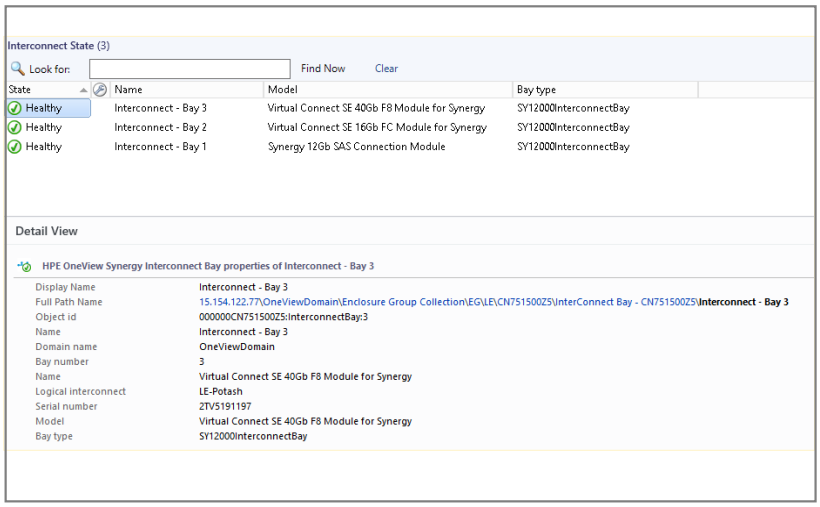


Summarized picture of the different tools we have in place working together to provide the best possible analytics capabilities to the customer.

ONEVIEW PLUGINS

- Plugins like OneView for VMware vCenter, VMware and OneView for Microsoft Systems Center help clients use the benefits of OneView, without having to get to know its interface.





Plugins like OneView for VMware vCenter, VMware and OneView for Microsoft Systems Center help clients use the benefits of OneView, without having to get to know its interface.

Multiple management tools increases administrative complexity

Steep learning curve for administrators

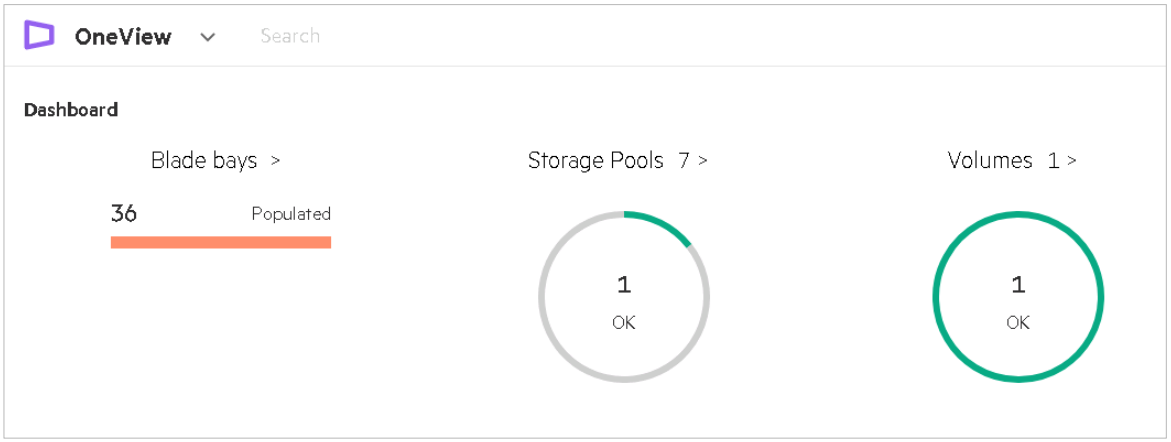
Lack of consistency in deployments and updates

Limited visibility into overall IT infrastructure health

STORAGE MONITORING

SAN STORAGE HEALTH DASHBOARD

- SAN storage dashboard aggregates the health of all SAN storage attached to the server



SAN Storage health dashboard

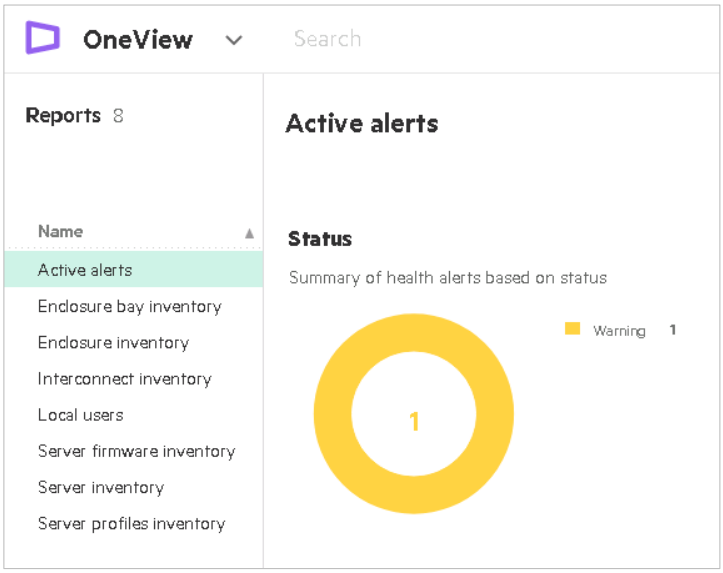
- SAN storage dashboard aggregates the health of all SAN storage attached to the server

Main Dashboard

- All storage options are shown on the main Dashboard.
- The Dashboard has Storage pools and Volumes graphics and displays status (for example: if a storage pool is overprovisioned, the volume is deleted or moved to a different domain).
- Communication issues to the storage system are displayed as critical for all storage managed resources.
- Storage pool status is updated based on the provisioning status of the storage pool.

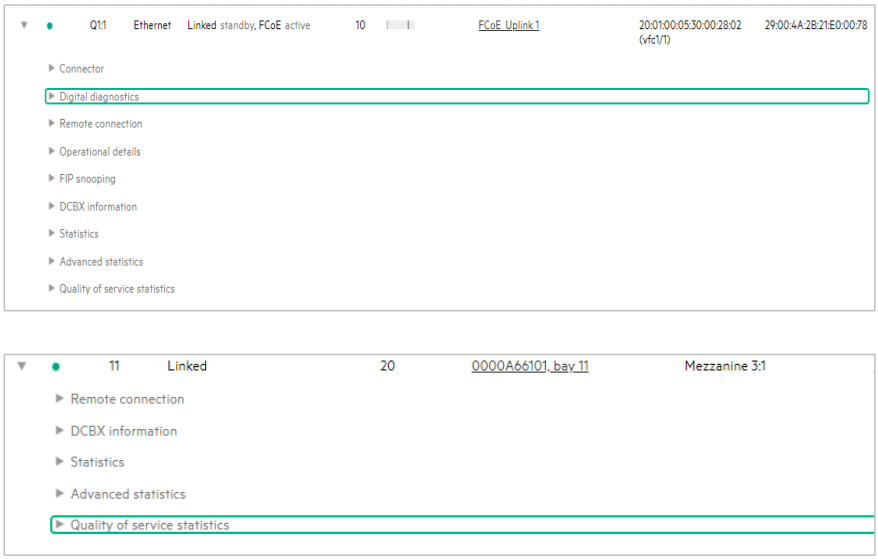
MONITORING SAN RESOURCES

- Active alerts Report
- Activity view



- Storage Activities can be filtered for on the Activity page.
- Active alerts Report will also show Active alerts which are storage related

PORT INFORMATION



- Uplink and downlink port Information:
  - Statistics
  - DCBX Information
  - QoS
  - LLDP Information
  - FIP Snooping for FCoE

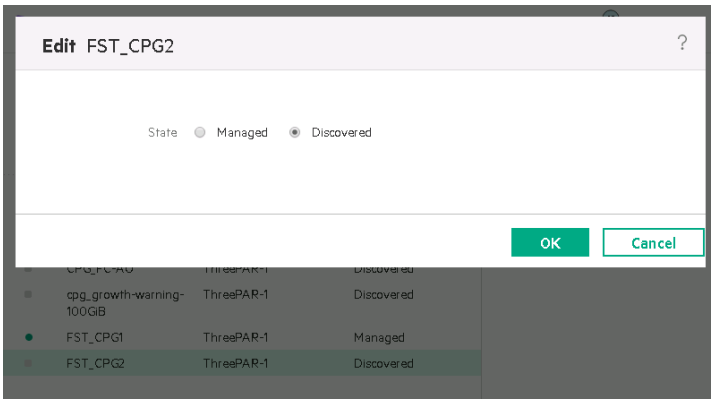
Monitoring SAN resources

Storage system port diagnostics

– Some diagnostics are provided for the storage system ports in OneView, during addition or later after editing the storage system with new storage ports.

MANAGING STORAGE
Storage Pool alerts

- You may spend as much time managing free space as managing profiles
- It is easy to over allocate
  - *Thin-provisioning is like a mortgage, and it demands pay-back*
- Warning levels and error levels
  - Alerts are displayed on the dashboard when the Storage Pool reaches the threshold limit
- Available actions on the Storage Pool resource
  - Edit a Storage Pool to make it Managed/Discovered
  - Refresh a Storage Pool
  - Remove a Storage Pool



Managing Storage

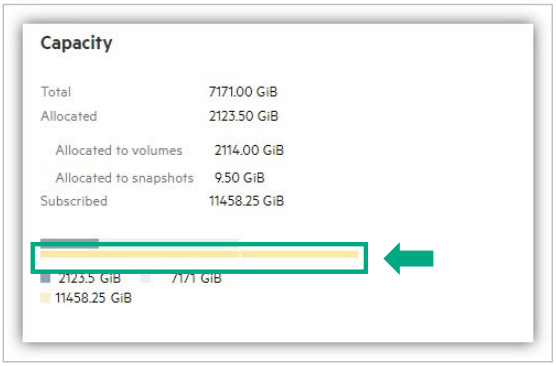
Storage Pool alerts

- You can create volumes or provision volumes from the storage pools that are created (imported).
  - Volumes cannot be created on Critical storage pools (for example: if a storage pool is moved to a different virtual domain, or is overprovisioned exceeding the threshold limit)

Notes:

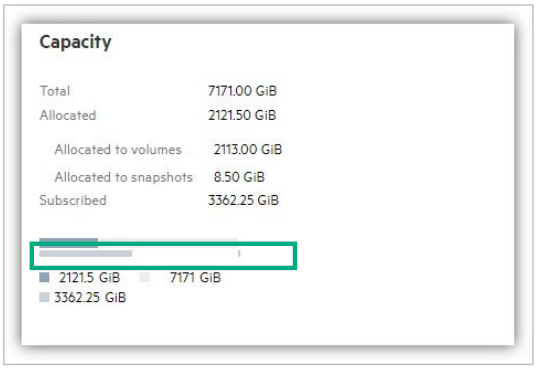
- Some alerts are warnings which can be cleared by user, and some are locked alerts which must be resolved.
- Alerts are displayed when the Storage Pool reaches the threshold limit if set by the user on the 3PAR device
- Actions on the Storage Pool resource:
  - Add another Storage Pool
  - Refresh a Storage Pool, to get all the attributes updated
  - Remove a Storage Pool, if there are no associated volumes (removing a Storage Pool does not imply removing storage volumes)

STORAGE POOL SUBSCRIBED CAPACITY VALUE NEW IN ONEVIEW 5.2+



- Example, the storage is 7 TB
- ~2TB is allocated to volumes, ~ 11 TB of capacity is provisioned (subscribed)
  - **Result the pool is "over-subscribed", indicated in yellow**

- The capacity value works with virtual storage pools to manage thin provisioning, deduplication, and compression to determine when it is over-subscribed.
- Based on this value, storage administrators can understand storage pool over- or under-subscription and place new volumes based on the capacity of the storage pool.



- Storage pool shows when the pool is not over-subscribed

Subscribed Capacity values are added to virtual array storage pool values that are reported prior to HPE OneView 5.2.

The subscribed capacity value is the total amount of capacity provisioned to servers for all volumes and snapshots.

This value may exceed the pool's total capacity when the pool is over-subscribed.

The capacity value works with virtual storage pools to manage thin provisioning, deduplication, and compression to determine when it is over-subscribed.

Based on this value, storage administrators can understand storage pool over- or under-subscription and place new volumes depending on the capacity of the storage pool.

Some storage system firmware versions or license values do not support calculating subscribed capacity, so this value is optionally displayed.

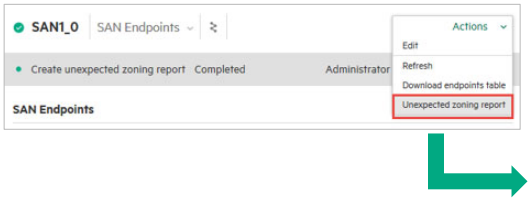
The storage administrator also has access to subscription ratio per pool value, which is SubscribedCapacity divided by TotalCapacity and presented as a value.

This feature is supported on 3PAR, Primera, and Nimble.

SAN UNEXPECTED ZONING ANALYSIS REPORT

Finds unexpected zoning for managed server initiators

- On-demand creation of SAN unexpected zoning report for all managed initiators on the SAN
  - Identifies managed initiators whose zoning does not contain the expected members
  - Extra access being granted
  - Missing access



SAN unexpected zoning analysis report

Finds unexpected zoning for managed server initiators

About Unexpected Zoning Reports

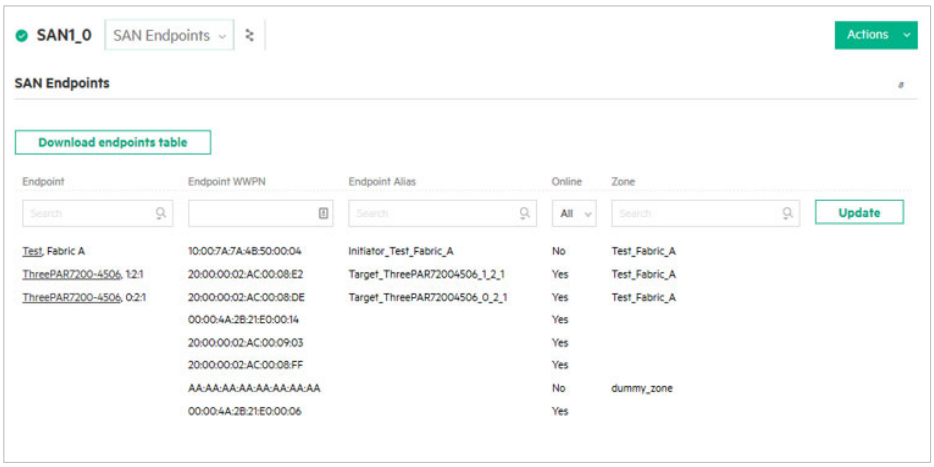
- You can generate a diagnostic report of zoning issues found in zones for server profile initiators that are under management. Expected zoning is based on the zoning policies that have been specified in HP OneView.

Unexpected zoning report

- Extra endpoints: Endpoints not managed by OneView that appear in zones associated with managed initiators or managed endpoints.
  - Remove extra endpoints that are not needed
  - Place extra initiators in separate zones
  - Add extra endpoints (that are connections to storage volumes that should be managed by OneView) to the associated server profile
- Duplicate endpoints: Expected endpoints managed by OneView in association with a managed initiator where the endpoint appears more than once. All instances of the endpoint are listed.
- Remove duplicate endpoint so that only single access remains
- Missing endpoints: Endpoints managed by OneView that are expected to be zoned to a managed initiator, but are not. Typically, a missing endpoint is accompanied by an alert on any resource expecting the endpoint to be zoned. The alert includes instructions for resolving the issue. You can also manually correct the issue.
- Expected endpoints: Endpoints that are under management that are expected to be zoned to a managed initiator, but are not. Typically, a missing endpoint is accompanied by an alert on any resource expecting the endpoint to be zoned. The alert includes instructions for resolving the issue. You can also manually correct the issue using the SAN manager management software.

SAN ENDPOINTS

- Table of all SAN endpoints, aliases, zones and endpoint online status
- Filterable, downloadable table with hyperlinks to OneView resources



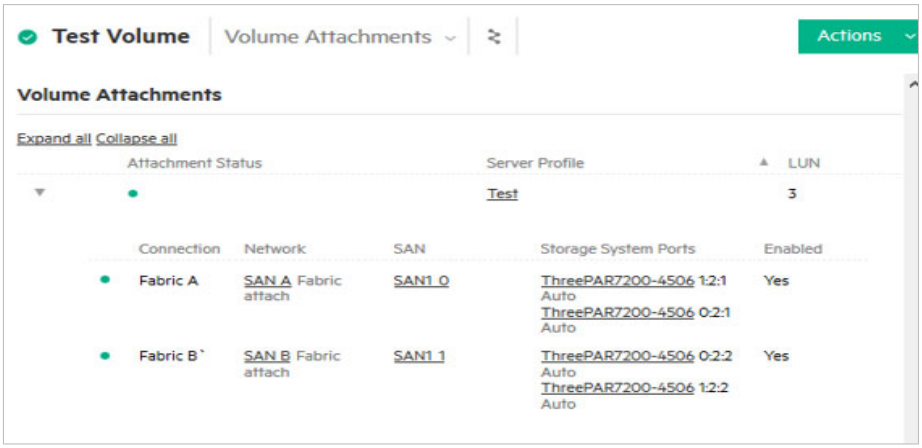
View the SAN endpoints

- You can download a table of endpoints for a managed SAN from the Actions menu. The table downloads as a zipped CSV file.

- The SAN Endpoints table:
  - Contains all SAN endpoints, aliases, zones and endpoint online status.
  - Displays which endpoints will be affected if taking a SAN offline for maintenance reasons.
  - The table is filterable and downloadable with hyperlinks to HPE OneView resources.

VIEW PROFILES AND DATA PATHS ATTACHED TO A VOLUME

- Volume Attachments view shows all data paths from all servers to the volume
- Hyperlinks to a server profile, SAN and the storage system from each data path

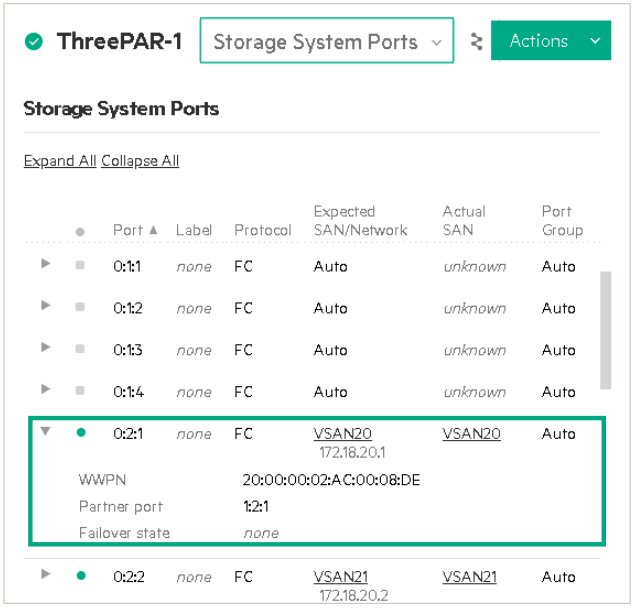


View profiles and data paths attached to a volume

- A data path is the connectivity between a host disk or computer and a storage subsystem.
- The Volume Attachments view shows all data paths from all servers to the volume. There are hyperlinks to Server Profile, SAN and Storage System from each data path.
- Volume Attachments
  - View all profiles and data paths to a SAN volume
  - Gives you the visibility of server volume attachments per Volume (it displays all servers configured to access a volume)
  - Enables you to monitor/alert on volume for unexpected server access
    - Detection and alert of unexpected server access configured on Storage System
    - Admin clearable alert for expected situations

3PAR AND PRIMERA PERSISTENT PORT STATUS

- Persistent port information being reported in OneView
  - Port health aggregating physical port health AND connectivity health
    - Degraded during:
      - port take-over
      - Port physical failures
      - Port disconnection from expected SAN failure (un-cabled)
  - Display of partner port and failover state



3Par and Primera persistent port status

3Par and Primera port status aggregated to server profile volume attachments

- The managed fabric is the one associated with the FC SAN. If you have a SAN manager and you have all the FC SANs associated with a VC FC network, then that is a managed fabric.

- If there is a VC FC network that is not associated with any of the FC SANs, then that is an unmanaged fabric where the user wants to provision storage volumes on the SAN but does not expect us to create zones on it. If it is trying to use an unsupported switch, the Storage Resource Manager will still provision those volumes to the server but it is just that the zones will not be created.

Notes:

- If there is actual connectivity to the port which we cannot get aligned, then the actual SAN observation would be unknown.
- If we can determine exactly what SAN it is, then the actual SAN will be populated with the managed fabric screen, so we could determine what SAN is associated on that port.

LAB

REVIEW QUESTIONS

HPE SYNERGY ANALYTICS ADMINISTRATION SKILLS

Topic areas

- Dashboard
- OneView Activity
- Remote support
- Firmware compliance dash
- Interconnect monitoring
- Storage monitoring
- Ilo security dash
- Global dash
- Plugins
- OV next version tool
- InfoSight

TRAINING OBJECTIVES

- Upon completion of the module apply HPE Synergy Analytics Administration skills to perform tasks in lab to validate a Synergy deployment and initial hardware setup.
- Course review questions will provide you an opportunity check your knowledge of skill and task: Facts, Terms, Definitions and Concepts.
- The course modular structure organizes skill topics to follow typical systems administration responsibilities for tasks performed once installation completed. What's in it for you, at the end of this module, is identifying those skills you need to perform on the job with your Synergy implementation.
- Successful Skill performance is demonstrated at the end of this module by using the OneView interface and configuration documentation to perform the listed skills
- Upon completion of the module create a personal learning plan and module summary thinking about the following questions:
  - What are the new skills that were covered?
  - Who on the team will perform the skills in the module?
  - What questions do you need answers have?

Training objectives

Upon completion of the module apply HPE Synergy Analytics Administration skills to perform tasks in lab to validate a Synergy deployment and initial hardware setup.

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THANK YOU


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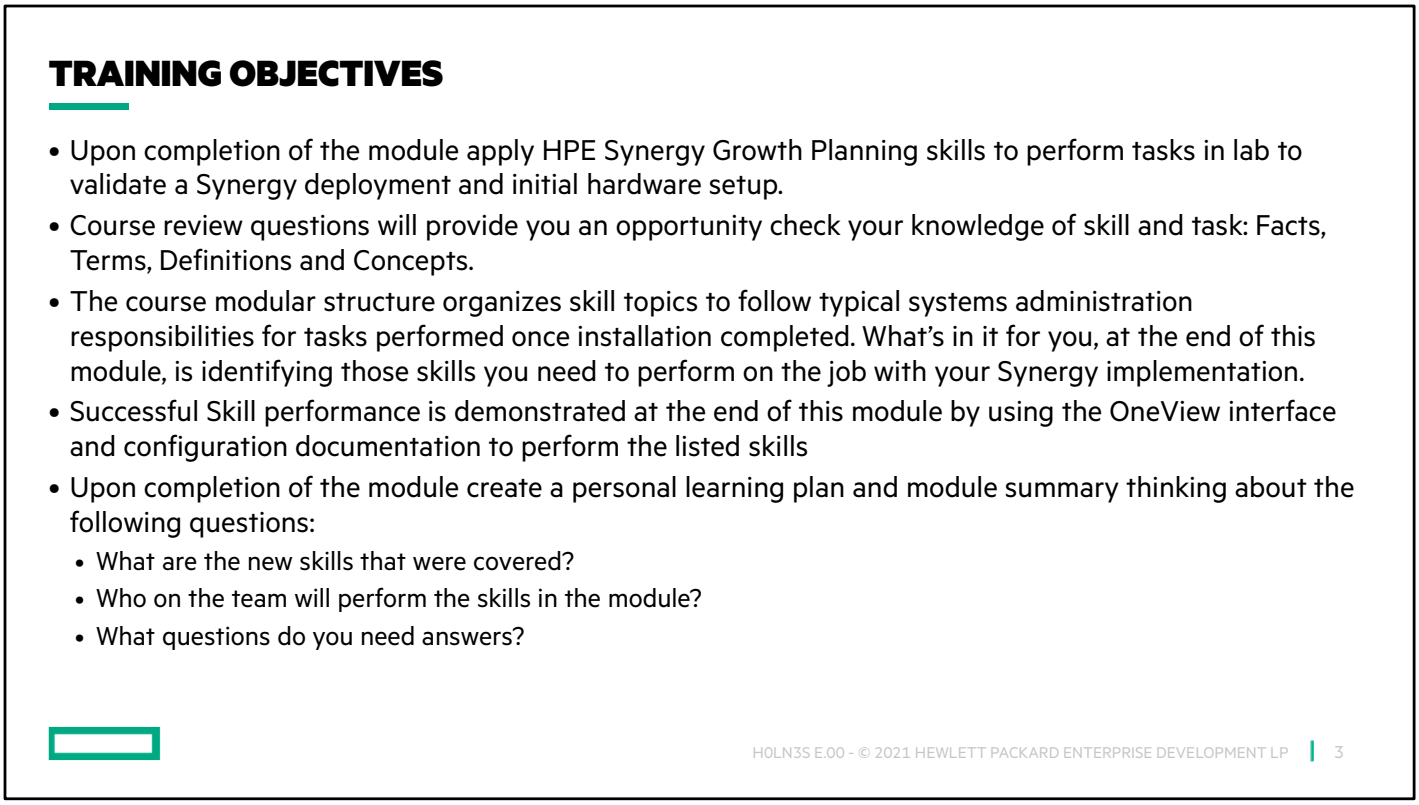
HPE SYNERGY MAINTENANCE AND GROWTH

Topic areas

- Maintenance topics
- Remote management ring
- Adding frames
- Composer upgrades
- Composer migration
- Flm move to 4 port
- Changing ethernet fabric
- New LIG | EG, reparent LE



Training objectives

Upon completion of the module apply HPE Synergy Growth Planning skills to perform tasks in lab to validate a Synergy deployment and initial hardware setup.

Course review questions will provide you an opportunity check your knowledge of skill and task: Facts, Terms, Definitions and Concepts.

The course modular structure organizes skill topics to follow typical systems administration responsibilities for tasks performed once installation completed. What's in it for you, at the end of this module, is identifying those skills you need to perform on the job with your Synergy implementation.

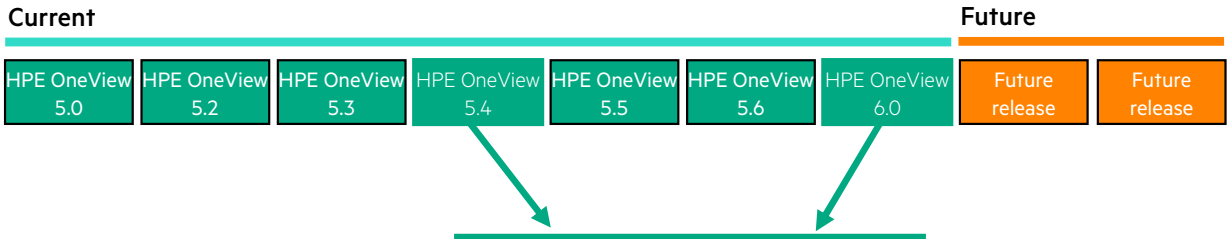
Successful Skill performance is demonstrated at the end of this module by using the OneView interface and configuration documentation to perform the listed skills

Upon completion of the module create a personal learning plan and module summary thinking about the following questions:

- What are the new skills that were covered?
- Who on the team will perform the skills in the module?
- What questions do you need answers?

MAINTENANCE

HPE ONEVIEW MILESTONE RELEASES



Milestone Releases

A milestone release is a release with enhanced update architecture that is pre-requisite prior to updating to a following release.

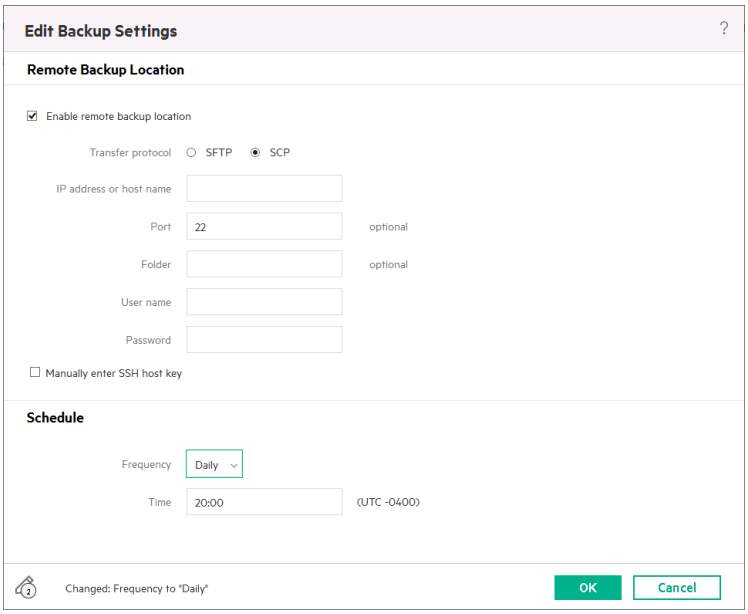
Note: This roadmap is subject to change without notice.

Need to set expectation that next OV release is coming soon.

SCHEDULED REMOTE APPLIANCE BACKUP

In case your OneView configuration gets corrupted for whatever reason and OneView wouldn't boot up properly, if there is no OneView backup to recover from, you would get into a very bad situation and would have to start configuring everything from scratch.

There is no way for OneView to gather the previously configured settings from the managed devices, hence the regular OneView backups are of great importance.



Scheduled remote appliance backup

- It is important to have strict backup routines.
- This is the setup screen for the automated, scheduled backup procedure.
- You must define the transfer protocol (SFTP or SCP), remote backup location (server), and the schedule of when to perform an automated backup to that location. You can also manually enter the SSH Host Key option.
- Next, you choose a daily backup or a weekly one on selected days.

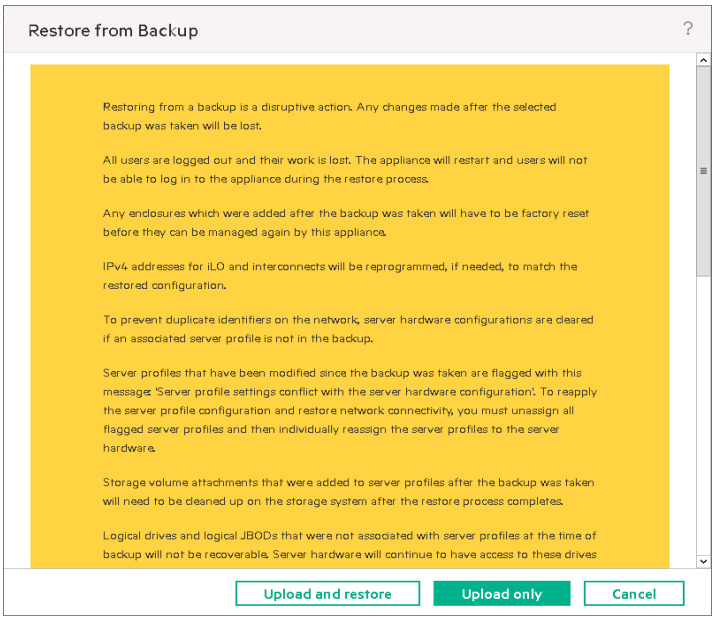
In case your OneView configuration gets corrupted for whatever reason and OneView wouldn't boot up properly, if there is no OneView backup to recover from, you would get into a very bad situation and would have to start configuring everything from scratch.

There is no way for OneView to gather the previously configured settings from the managed devices, hence the regular OneView backups are of great importance.

RESTORING THE COMPOSER FROM A BACKUP

- Restoring the Composer replaces
  - All management data
  - Most of the configuration settings
- During a restore operation:
  - The appliance is not operational
  - It might take several hours to complete
  - Once started, it cannot be canceled
  - Login requests are blocked
- SPPs will need to be uploaded after a restore
- Network settings must be redone as they are not restored

IMPORTANT: A restore operation is the last resort to recover from catastrophic failures.



Restoring an appliance from a backup

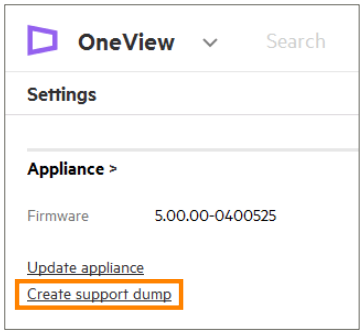
- Restoring the Composer from a backup file replaces all management data and most configuration settings with the data and settings in the backup file, including user names and passwords, audit logs, and available networks.
  - The appliance is not operational during the restore operation and it can take several hours to perform; the more resources and devices to restore, the longer the restore operation takes.
  - A restore operation cannot be canceled or undone after it has been started.
  - The appliance blocks login requests while a restore operation is in progress.

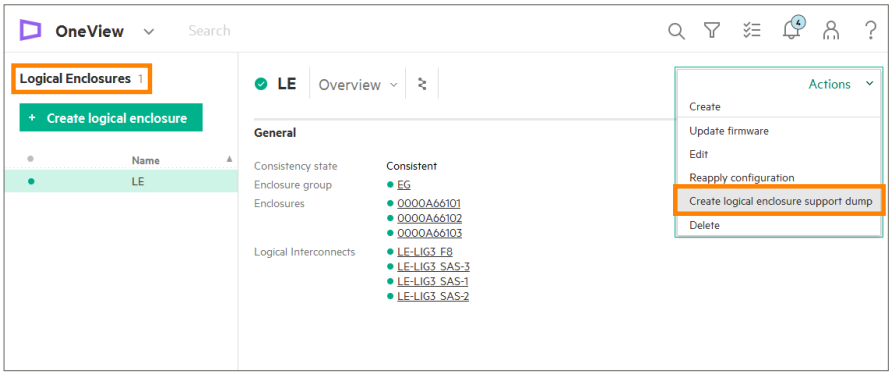
IMPORTANT: A restore operation is required to recover from catastrophic failures, and is not intended for fixing minor problems that can be resolved in other ways.

- During the restore operation:
  - The active appliance is restored from the backup file.
  - The standby appliance joins the active appliance, forming the clustered appliance.
  - The standby appliance has its data synchronized with the restored active appliance.
- These network settings are not restored:
  - The host name of the clustered appliance
  - The IP address of the clustered appliance
  - The gateway IP and the subnet mask
  - The IP address of the DNS server
- NOTE: The Synergy Composer and Frame Link Module are paired with credentials and a claimed management IP address. The Synergy Composer needs the credentials to access and manage the FLM. The synchronization happens during the initial discovery of hardware when both are in the factory-fresh state. HPE Synergy Composer can only recover the FLM credentials by restoring a backup.

CREATE A SUPPORT DUMP AND REVIEW

- Appliance/CI support dump—Contains the HPE Synergy Composer logs
- LE (logical enclosure) support dump—Contains the HPE Synergy Composer (Optional), FLM, and ICM logs



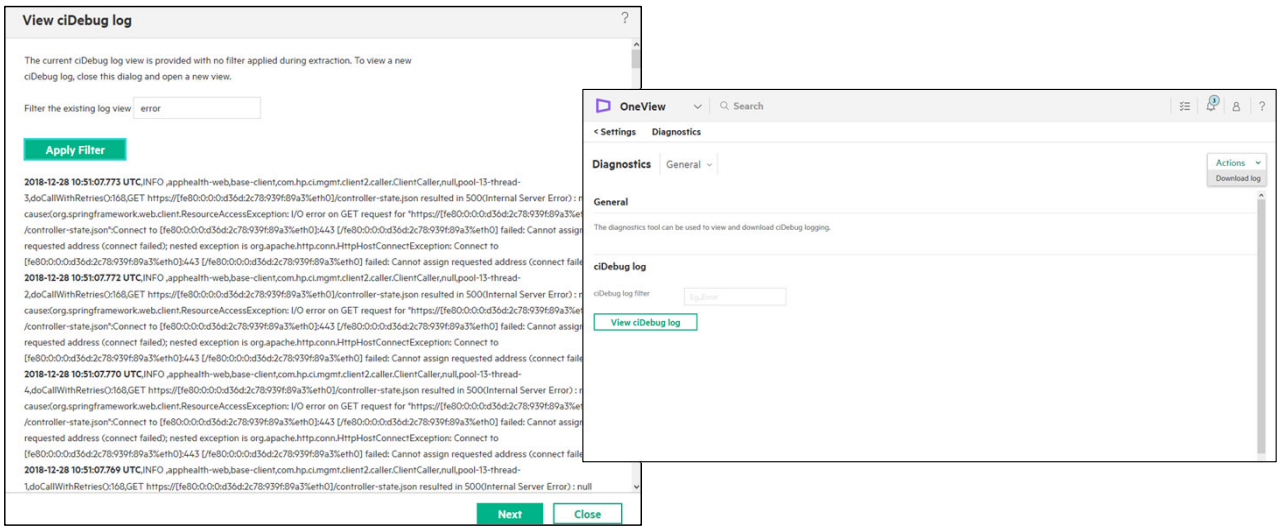


Create a support dump and review

- There are two types of support dumps:
  - Appliance support dump—Contains the HPE Synergy Composer logs
  - LE (logical enclosure) support dump—Contains the HPE Synergy Composer (Optional), frame link module (FLM), and interconnect module (ICM) logs

VIEW CIDEBUG LOG FROM UI

- Settings→Diagnostics



- **View ciDebug log**
- You can also access the ciDebug log as Administrator. To view the ciDebug log, from the main menu select **Settings** and, in the Diagnostics panel, select **View diagnostics tools page**.
- Once on the Diagnostics page, you can optionally use the ciDebug log filter field to restrict the results that the log will display. The filter field is case sensitive.

Next, click **View ciDebug log**.

The dialog displays 100 messages per page. Use the **Next** and **Previous** buttons to switch between pages.

- You can also search through the log results as a second level of filtering. To do this, enter the filter parameters in the **Filter existing log view** field, and then click **Apply filter**. You can also decide to clear the log filter.

To download the ciDebug log only, instead of a mini dump or full support dump files, from the Diagnostics page, click **Actions > Download log**. The ciDebug log then begins downloading.

HPE SYNERGY COMPOSER FACTORY RESET (1 OF 3)

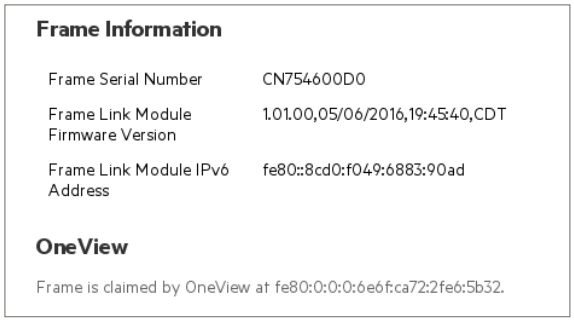
- When a frame is under management, it is automatically reclaimed if the Frame Link Modules are factory-reset
- Perform a full Composer factory reset PLUS FLM factory reset
- Only HPE OneView “knows” the assigned credentials for the FLM
  - Perform the FLM factory reset for all frames prior to the HPE OneView factory reset (recommended)
  - Otherwise, factory-reset the FLM using the physical pin-hole reset button
- Two ways to reset HPE OneView (Composer):
  1. Navigate to **Settings**, then **Appliance**, and then select the **Factory Reset** option
  2. Log in to the maintenance page with the local administrator credentials and select the **Factory Reset** option

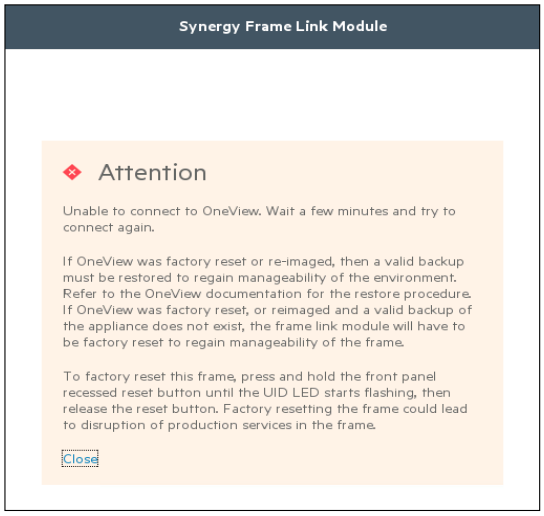
HPE Synergy Composer factory reset (1 of 3)

- When a frame is under management, it will automatically be reclaimed when the Frame Link Modules are factory-reset.
- The supported way to factory-reset HPE OneView (Composer) and prevent it from reclaiming the frames of the ring is to do a full factory reset and an (FLM) factory reset.
- Because the only credentials for the FLM are known by HPE OneView, it is recommended that you do the FLM factory reset for all frames prior to the HPE OneView factory reset. Otherwise, you will need to factory-reset the FLM using the physical pin-hole reset button.
- To reset HPE OneView, do one of the following:
  - Navigate to **Settings**, then **Appliance**, then select the **Factory Reset** option.
  - Log in to the maintenance page with the local administrator credentials. Select the **Factory Reset** option.

HPE SYNERGY COMPOSER FACTORY RESET (2 OF 3)

- If the reset sequence is wrong, you might see this when connecting to HPE Synergy Composer from VNC





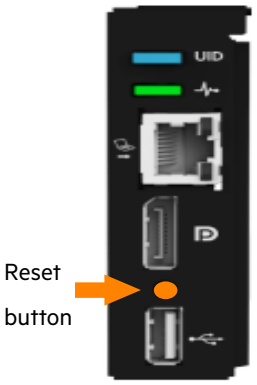
HPE Synergy Composer factory reset (2 of 3)

- If the reset sequence is wrong, you might see two screens when trying to connect to HPE Synergy Composer from VNC.

HPE SYNERGY COMPOSER FACTORY RESET (3 OF 3)

- If you forgot to do it in the correct order, select one of the following options to reset the FLMs after the Composer reset:
  - **Option 1**: Press the **reset** button on the front of the Synergy frame and hold it for 10 seconds
  - **Option 2**: Install the FLM modules in a different frame
  - **Option 3**: Log in to FLM as `maintenance`, get a challenge password, and run this command:

```
curl -i -X POST
http://localhost/rest/v1/EnclosureManager/1
-d '{"Action":"ResetToFactory"}'
```

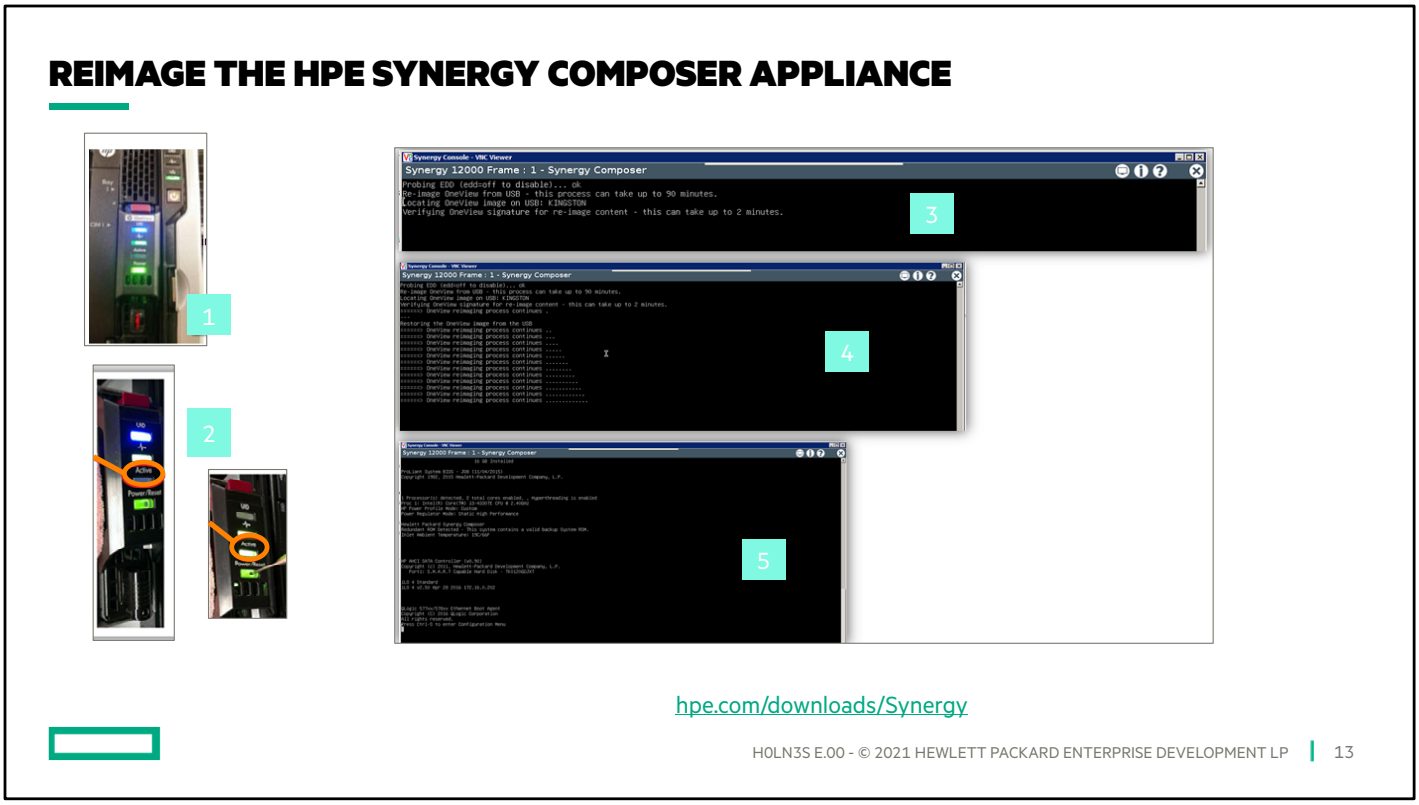


HPE Synergy Composer factory reset (3 of 3)

- If you forgot to do it in the right order, then perform one of the following options after the HPE OneView reset:
  - **Option 1**: Press the **reset** button on the front of the Synergy frame and hold it for 10 seconds. This will reset the FLMs to factory defaults.
  - **Option 2**: Log in to FLM as a maintenance user and get a challenge password. Run the following command to remove the claim:

```
curl -i -X POST http://localhost/rest/v1/EnclosureManager/1 -d
'{"Action":"ResetToFactory"}'
```

  - **Option 3**: Install an FLM module in a different frame.



Reimage the HPE Synergy Composer appliance

Reimaging an HPE Synergy Composer ensures that it has the same firmware version as any other HPE Synergy Composer in the configuration. To reimage an HPE Synergy Composer that you either want to add to the current configuration or that must replace a defective Synergy Composer, follow this procedure:

1. Install a USB flash drive with the image and signature files to the HPE Synergy Composer front-panel USB connector.
2. Long-press the **reset** button (a little hole inside the power button).
3. The green light stays on for 10 seconds, and then flashes.
4. Follow the reimaging procedure.

   IMPORTANT: This operation destroys the data on the reimaged HPE Synergy Composer. If you intend to restore the HPE Synergy Composer settings from a backup file after it is reimaged, and that backup file contains the management configuration for the frames it managed, you should not reset the managed frames to factory settings.

To prepare a USB drive for reimaging an HPE Synergy Composer:

1. Format the USB flash drive for one FAT32 partition
2. Create only 1 primary partition (delete any existing partitions if necessary).
3. If prompted, specify the maximum value for capacity.
4. If prompted, specify an allocation unit size of 4096 bytes.
5. If prompted, accept the default values for the first and the last block.
6. Download the compressed image from this website: hpe.com/downloads/Synergy.
7. Unzip the compressed image and copy the contents of the compressed image to the USB flash drive.

COMPOSER2 ZERO TOUCH PROVISIONING USING DHCP

HPE Gen10 Plus Snap 4 – OneView 6.0

- Out of the box, the DHCP service is enabled on Composer2 with OneView 6.0 installed
  - IPv4 and IPv6 are supported
  - DHCP Timeouts is supported
- The DHCP address can be obtained from:
  - Composer Kiosk, maintenance console
  - DHCP Server logs
    - Option 60 record = “Synergy Composer2”
    - Option 61 record= “<Enclosure SN>:<Composer2 SN>”, e.g. “0AXRH8G18H:CN7801001D”
- The DHCP address can be used to complete First Time Setup remotely
  - The DHCP service is disabled when FTS completes
- Notes:
  - Composer2s are installed in different frames in HA configurations; Composer2 HA pairs cannot be detected using DHCP records
  - If Factory Reset Is performed without preserving appliance network settings, DHCP is re-enabled

EFUSE AVAILABLE ON COMPOSER CLI

- **`efuse (deviceBay | interconnectBay | managerBay | applianceBay) <enclosure-name | enclosure-uuid> <bay-number>`**

- Options
  - **`deviceBay`** Electrically reset a device bay in a frame
  - **`interconnectBay`** Electrically reset an interconnect bay in a frame
  - **`managerBay`** Electrically reset a manager bay in a frame
  - **`applianceBay`** Electrically reset an appliance bay in a frame
  - **`<enclosure-name>`** Specify the name of the enclosure
  - **`<enclosure-uuid>`** Specify the UUID of the enclosure
  - **`<bay-number>`** Specify the bay-number

Arguments listed in parenthesis () and separated by the pipe symbol | are mutually exclusive choices. Fields listed in angle brackets <> should be replaced with the value indicated.

The purpose of this E-Fuse (or, “electronic fuse”) new feature is to provide an easy way to power reset any enclosure bay by momentarily turning off the power and then turning it back on from the Synergy Console.
This command provides a remote and quick way to “reseat” a device without having to physically remove and reinsert the device back, which can accelerate the troubleshooting and resolution of issues.

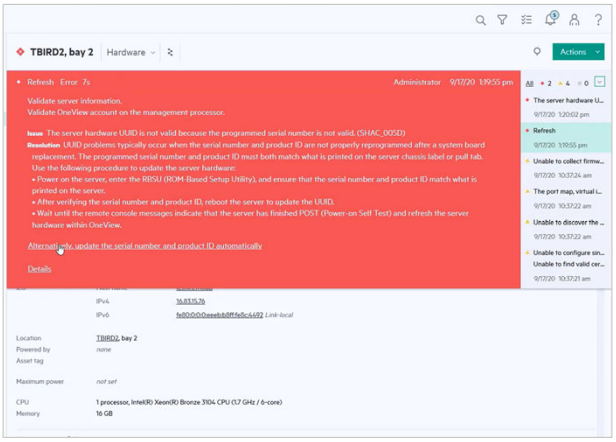
HPE BladeSystem c7000 already has the ability to E-Fuse any bay, and now is provided to HPE Synergy Console view as well.

E-Fuse and its usage instructions are displayed for console view when you type "help" or "?" on console-view prompt.

EASIER SYSTEM BOARD REPLACEMENT PROCEDURES

Eliminate the power hold when invalid UUID is detected

Reprogram Synergy compute node serial and part number



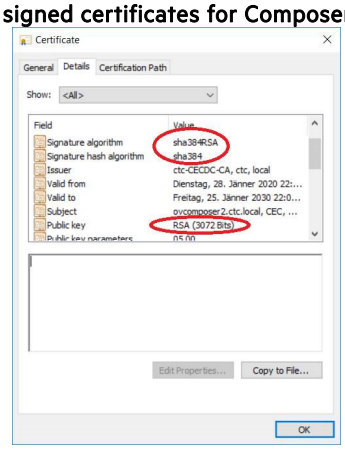
HPE OneView helps customers simplify a number of system management operations. However, it has caused some significant pain when system boards need to be replaced due to failed components. We have listened and heard from the field and customers the challenge and waste of time it takes to perform what should be a relatively straightforward service process. In the HPE OneVIew 5.30 release, OneView no longer will maintain a power lock, and immediately allow the service engineer to power on the server to go into RBSU or System Setup to reprogram the original serial number.

HPE OneView will now detect when an HPE Synergy compute node UUID is null or invalid. This allows the administrator to recover from this event by importing the new iLO self-signed certificate (replacing the old one), and then to program the original serial and part numbers. This process is then fully automated and validated prior to releasing control back to the administrator. The next slide will demonstrate this operation in action.

SHA-256 CERTIFICATE SUPPORT FOR COMPOSER2

- My PKI cannot generate certificates with SHA-384 digital signature required for Composer2
- Many companies require and can generate only SHA-256 strength certificates
- HPE Synergy Composer2 appliances require CNSA-strength certificates, specifically an RSA certificate with a bit length of 3072, and a SHA-384 digital signature
- Some certificate authorities ignore or override CSR-requested parameters and use SHA-256 digital signatures instead of SHA-384.
- OneView now supports both SHA 256- and SHA –384 certificates

OneView will allow SHA-256 digital signed certificates for Composer2



Customers adopting Composer2 had identified that their Public Key Infrastructure, are not sufficiently upgraded to, generate a SHA-384 CA-signed certificate which Composer2 mandates. Hence OneView will make the change to accept the same type of certificate SHA-256 that was prevalent with Composer1. Infact both SHA-256 and 384 will work

ADDITIONAL HTTP SECURITY HEADERS

"My security scanners have flagged the following http headers and I need them mitigated for our management reports"

HPE OneView will honor the following HTTP headers for enhanced security and for mitigating scanner flags

- like Qualys QID 11827

  - X-XSS-Protection
  - X-Content-Type-Options
  - HTTP Strict-Transport-Security
  - X-Frame-Options

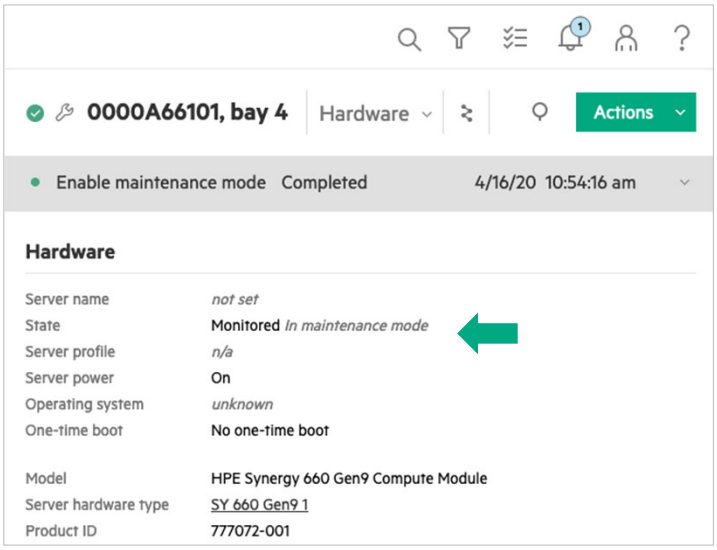
Foundation: Continuously Secure Management Appliance

Continuous evaluation and mitigation of vulnerabilities and adoption of latest cryptographic standards

Customers have identified that OneView's web server has been flagged by scanners like Qualys with QID 11827. The flags have indicated that four aforesaid security headers have to be honored by OneView to mitigate flags. OneView has enhanced it web server and henceforth scanners will not flag these issues

ENABLING MAINTENANCE MODE FOR SERVERS IN PRODUCTION

- In maintenance mode OneView disables:
  - Email notifications for servers in maintenance mode
  - Forwarding traps to destinations
  - Email notifications for SPs assigned to servers in maintenance mode
- When assigning a Server Profile, email notifications will be suppressed
- When unassigning a Server Profile, email notifications will resume



To place a server in maintenance mode, select the server and click “Enable maintenance mode” from the Actions menu.

A dialog presents to confirm the maintenance mode enablement.

While the server is in Maintenance mode, OneView will disable the following:

- Email notifications from going out for servers that are in maintenance mode.
- Forwarding traps to destinations.
- Email notifications from going out for server profiles that are assigned to servers that are in maintenance mode.

When assigning a server profile to a server in maintenance mode, email notifications for the profile will be suppressed.

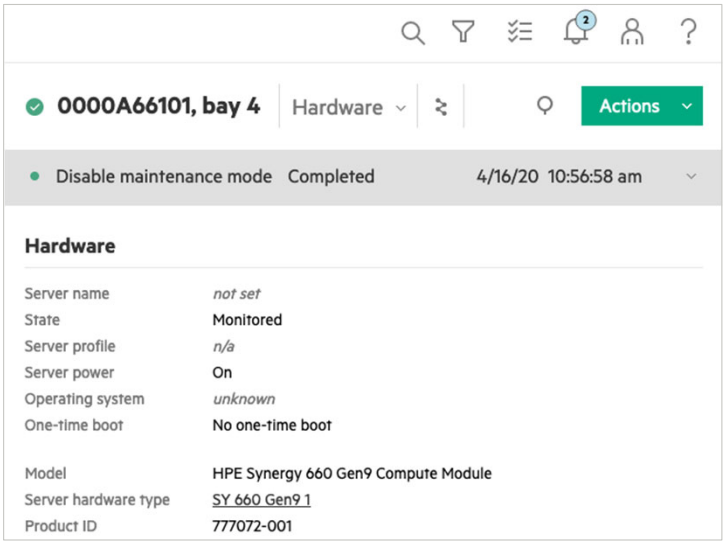
When unassigning a server profile from a server in maintenance mode, email notifications for the profile will resume.

While a server is in maintenance mode, its panel reflects that status change.

This does not integrate with software "maintenance mode" features like vSphere Maintenance Mode or Windows Failover Cluster Pause Node. The OneView UI status will reflect all state changes and alerts recieved.

DISABLING MAINTENANCE MODE FOR SERVERS

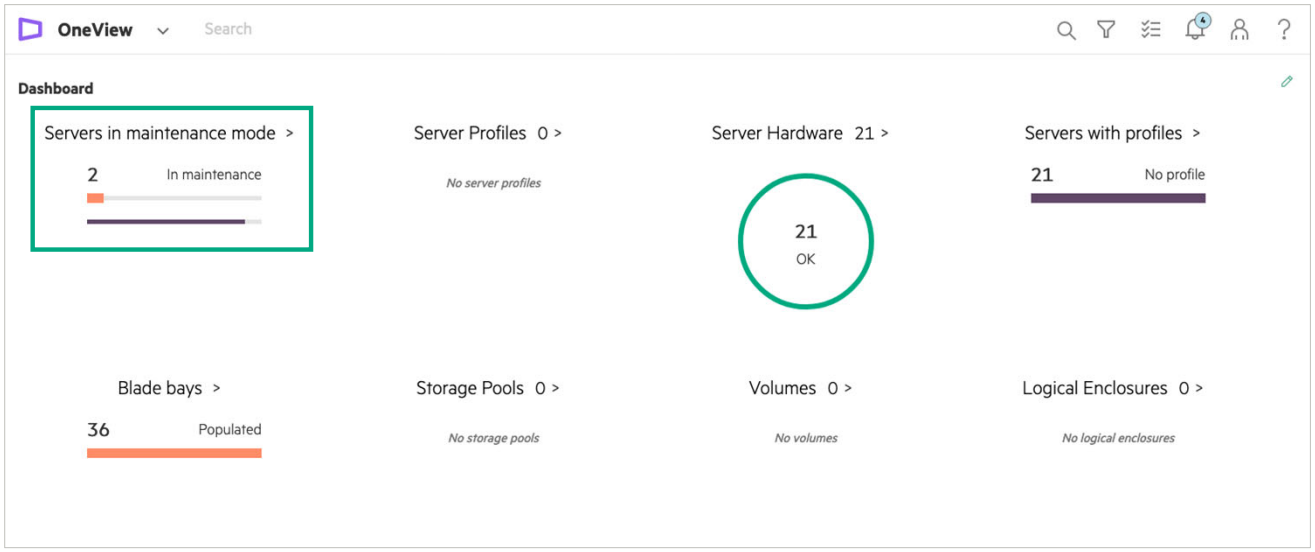
- After returning to normal operations:
  - Email notifications for servers and server profiles resume
  - Forwarding traps to destinations starts



When you bring back the server from Maintenance mode to <click2> normal operations:

- Email notifications for servers and server profiles start going out from that point
- Forwarding traps to destinations also resumes

DASHBOARD SHOWING RESOURCES IN MAINTENANCE MODE

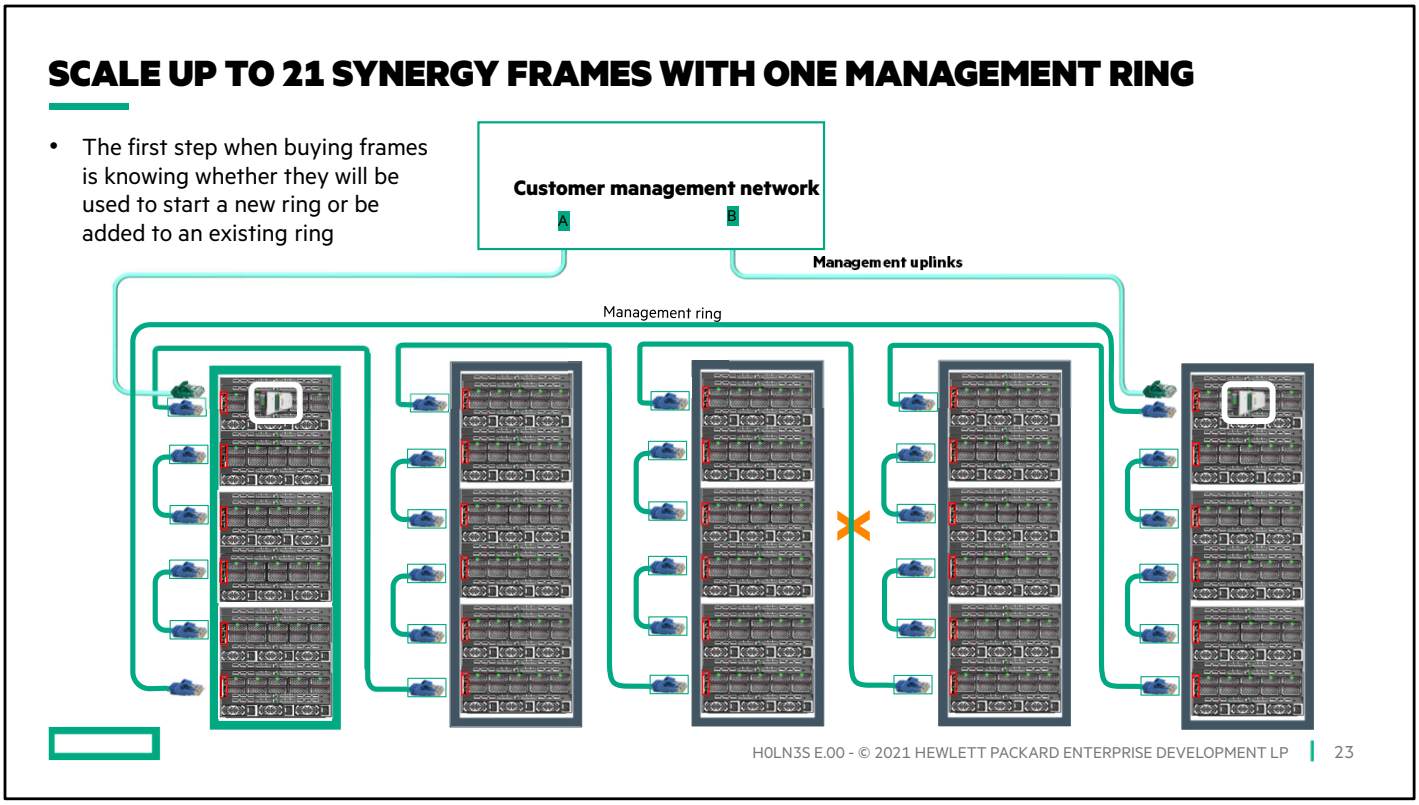


When the OneView dashboard shows server-hardware resources that are in maintenance mode:

- You can use the link "Servers in Maintenance Mode“ to show the list of servers that are in maintenance mode.

ADDING FRAMES

HPE Synergy 12000 Frame

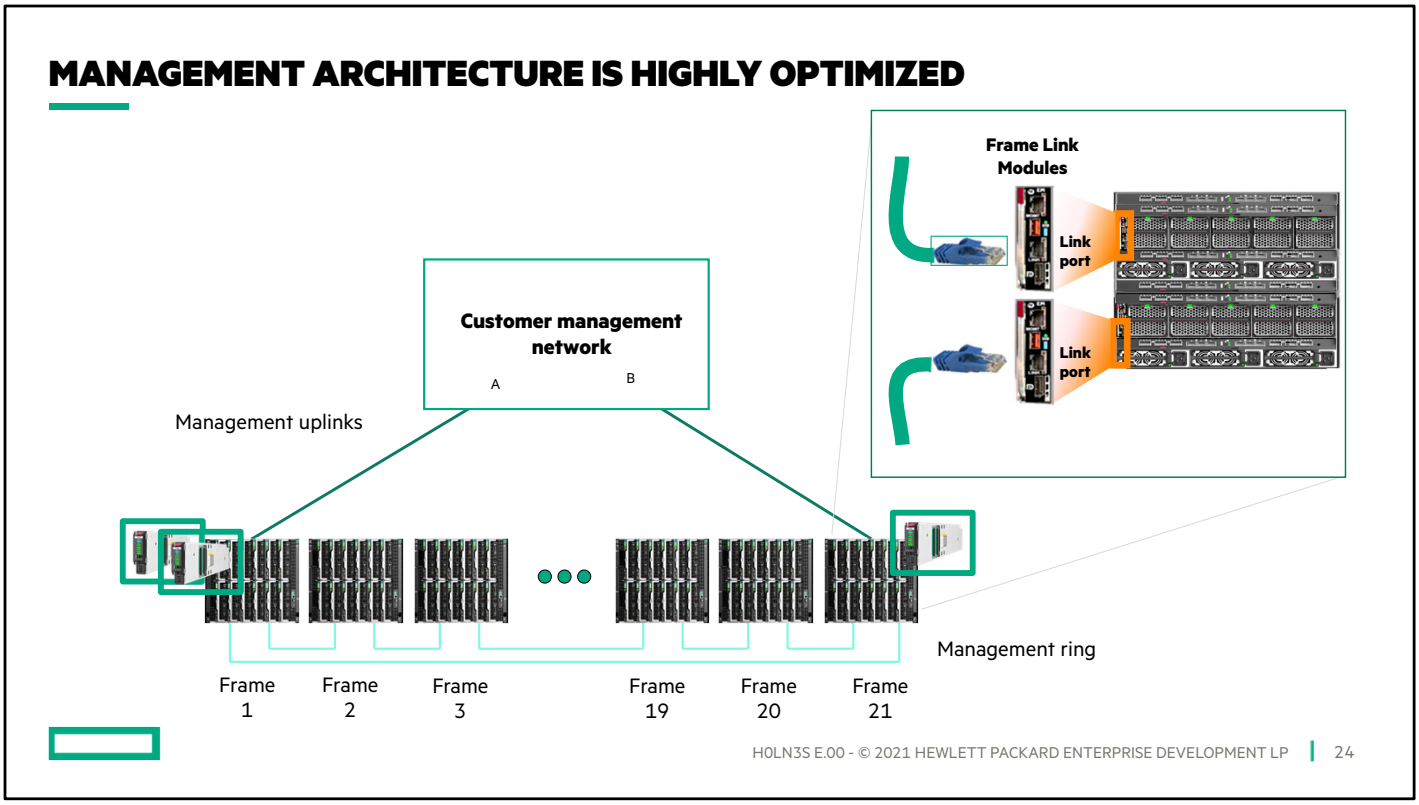


Scale up to 21 Synergy frames with one management ring

As explained, one HPE Synergy Composer can manage up to 21 frames in a single management ring. An HPE Synergy frame is automatically added during the Hardware Setup procedure (executed only once for one HPE Synergy system). If that Synergy frame is connected to a group of linked Synergy frames (the management ring), each Synergy frame in the group is discovered.

The management ring is highly available—disconnecting one cable does not cause a failure. After the initial hardware setup is completed, adding any new frames to the management ring is easy—just reinsert the cables between LINK ports of FLMs to include the new frames into the management ring and they will be recognized automatically without starting hardware setup again.

It is recommended that new frames have their FLMs reset to make sure that they have any prior claim by a Composer removed.

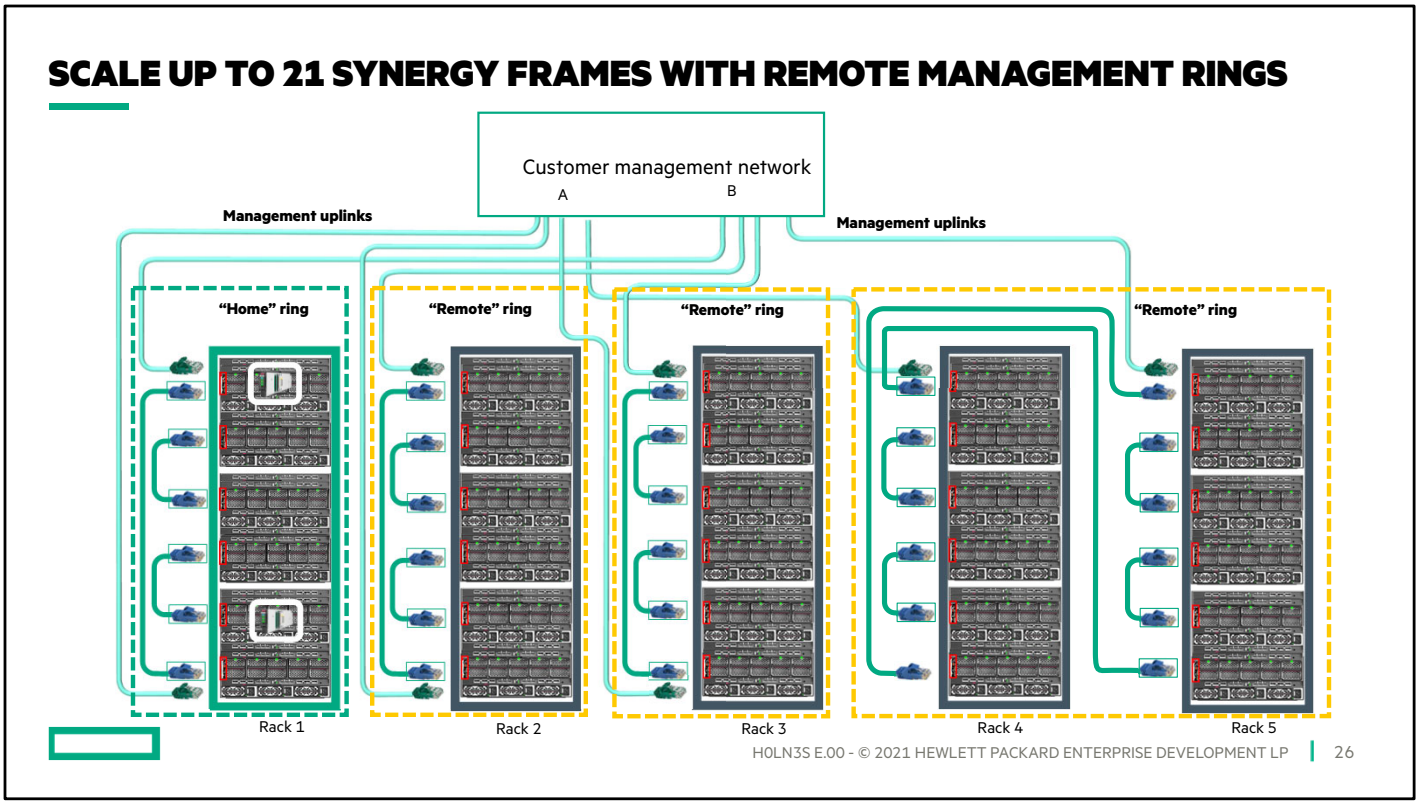


Management architecture is highly optimized

- Notice that when upscaling the management rings, only two management uplinks are still required per one management ring.
- These uplinks should be connected from the FLMs located corresponding to the HPE Synergy Composers locations in the management ring.
- All other FLM MGMT ports can be also used for management uplinks (if not used by Image Streamers); however, that is not enforced, which results in a much more optimized cabling and a simpler management infrastructure.

REMOTE MANAGEMENT RING

HPE Synergy 12000 Frame



Scale up to 21 Synergy frames with remote management rings

If you do not have space to fit all 21 frames in a single management ring, you can add other frames in remote management rings.

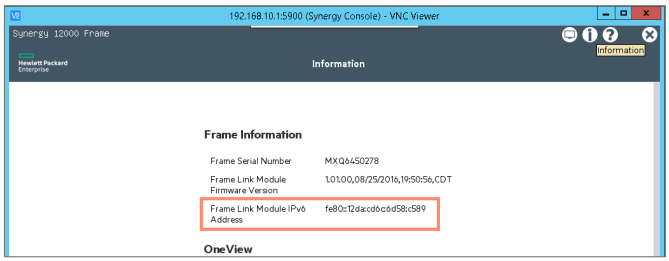
Management rings can have different sizes as long as the total number of frames is up to 21.

All of these management rings within the same subnet can be managed by a single HPE Synergy Composer pair.

ADDING A REMOTE MANAGEMENT RING
Prerequisites

- You have the required privileges: An infrastructure administrator or a hardware setup user (HardwareSetup)
- You have cabled the MGMT ports of the remote frame link topology to the management LAN
- The remote frame link topology is in the same subnet as the primary frame link topology to be reachable by HPE Synergy Composers
- You have obtained the IPv6 address from any of the Frame Link Modules in a remote frame link topology

NOTE: To obtain the IPv6 address from a Frame Link Module in a remote frame link topology, connect to the HPE Synergy console of any frame in the **remote frame link topology** and access the Information screen.

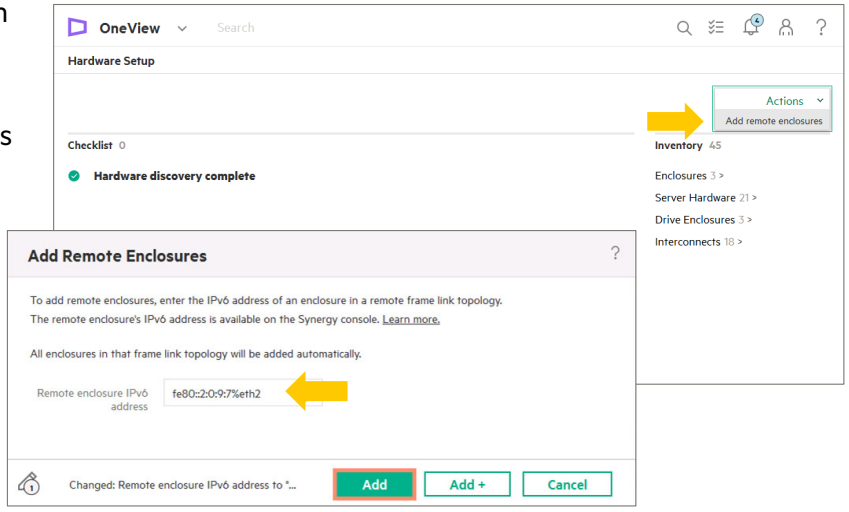


Adding a remote management ring—Prerequisites

- To add remote frames under HPE Synergy Composer management, the following prerequisites need to be met:
  - You have the required privileges: An infrastructure administrator or a hardware setup user (HardwareSetup).
  - You have cabled the MGMT ports of the remote frame link topology to the management LAN.
  - The remote frame link topology is in the same subnet as the primary frame link topology to be reachable by HPE Synergy Composers.
  - NOTE: Frame Link Modules (FLMs) use the link-local IPv6 addresses to communicate. These addresses are not routable, so they must be in the same L2 network.
  - You have obtained the IPv6 address from any of the Frame Link Modules in a remote frame link topology.
- NOTE: To obtain the IPv6 address from a Frame Link Module in a remote frame link topology, connect to the HPE Synergy console of any frame in the remote frame link topology and access the Information screen.

ADDING A REMOTE MANAGEMENT RING
Procedure

- Access the **Hardware Setup** screen
- Open the **Actions** menu
- Select **Add remote enclosure**
- Enter any remote FLM IPv6 address



NOTE: HPE Synergy Composers are not required or allowed in remote rings.

 | 28

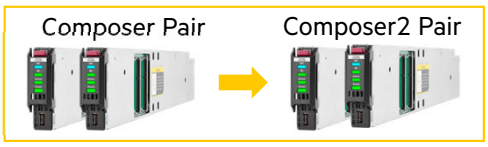
Adding a remote management ring—Procedure

- The Add remote enclosures option enables you to bring remote frame link topologies under management of HPE OneView. This allows HPE OneView to manage frames that are spread across racks and rows in the datacenter.
- NOTE: HPE Synergy Composers are not required in the remote frames making up the remote ring.
- To add a remote management ring under management of HPE OneView, follow these steps:
- Access the Hardware Setup screen.
- Open the Actions menu.
- Select Add remote enclosure.
- Enter any remote FLM IPv6 address.
- All other devices in that remote management ring will be then added automatically to HPE Synergy Composer in a primary management ring.

UPGRADING TO NEW HARDWARE

MIGRATION SYNERGY COMPOSER TO SYNERGY COMPOSER2

Foundational requirement: Composer appliances within a Synergy management ring must be of the same generation.



Process Planning

- Requires HPE Composer (HPE OneView) downtime and a maintenance window.
- HPE Composer management will be lost during this process
- Servers & applications are expected to be able to run
- There will be no expansion of applications that are 'elastic'

Component Migration Process

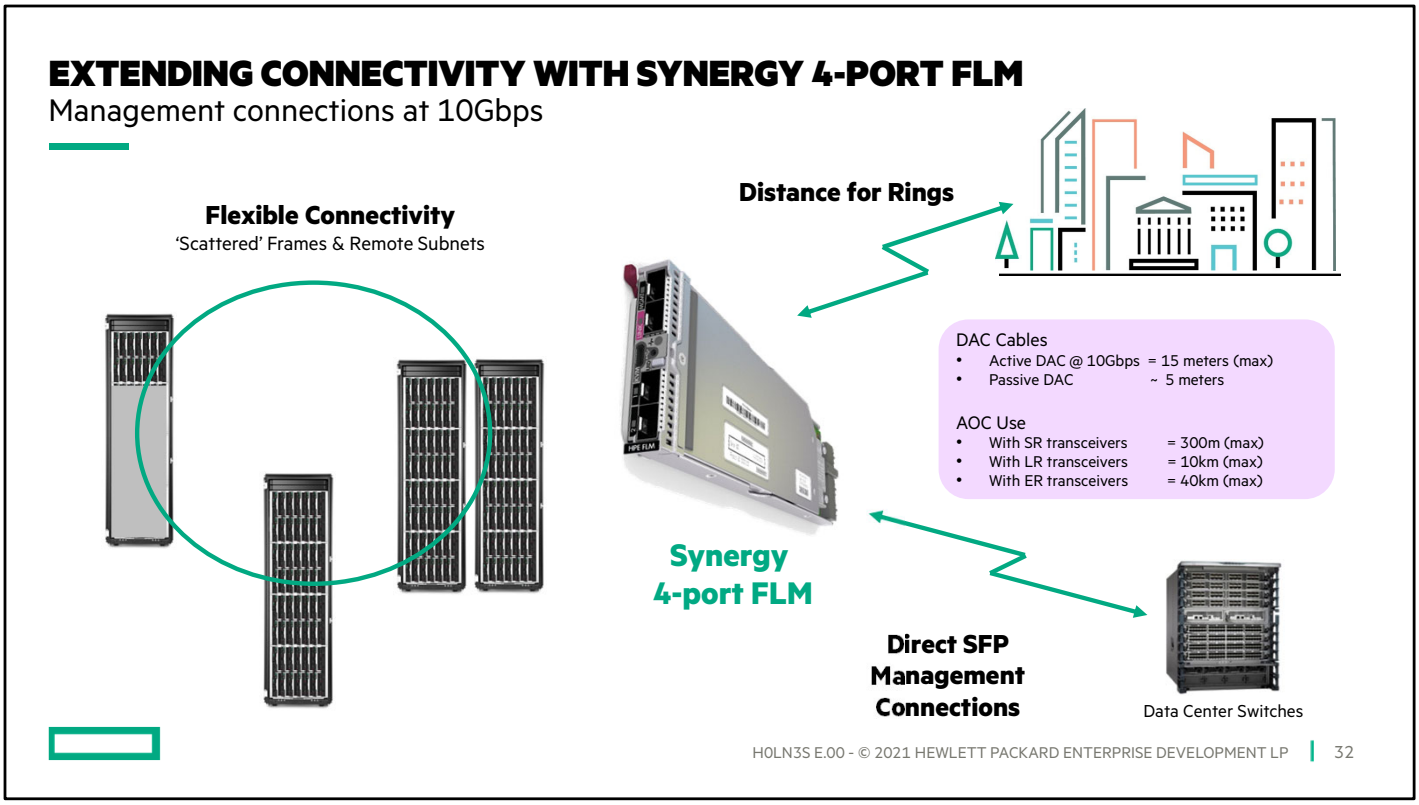
- HPE Composer pair must be updated to the HPE OneView 5.0 release.
- Execute a Backup of the HPE Composer pair.
- HPE Composer pair are powered down and removed from the Synergy Frame.
- HPE Composer2 pair are installed in the Synergy Frame and powered-on.
- Set up the HPE Composer2 pair to operate on the same HPE OneView 5.0 release.
- Execute a Restore to the HPE Composer2 pair.
- Upload SPPs.

Downtime & Maintenance Window: Composer1 pair → Composer2 pair

- Foundational requirement: Composer appliances within a Synergy management ring must be of the same generation.
- This process requires an HPE Composer (HPE OneView) downtime and a maintenance window .
- Most servers & applications can continue to run during this process:
  - Systems that have already been provisioned can continue to run.
  - No performance data, activities, or event alerts will come from HPE Composer during this process.
  - Applications that are 'elastic' (like DevOps, or those which are based on automation 'run books') will not be able to expand during this process because HPE Composer is offline.
- This process requires that:
  - HPE Composer pair must be updated to the HPE OneView 5.0 release.
  - Execute a Backup of the HPE Composer pair.
  - HPE Composer pair are powered down and removed from the Synergy Frame.
  - HPE Composer2 pair are installed in the Synergy Frame and powered-on.
  - Set up the HPE Composer2 pair to operate on the same HPE OneView 5.0 release.
  - Execute a Restore to the HPE Composer2 pair.
- Upload SPPS

FLM MOVE TO 4 PORT

HPE Synergy 12000 Frame



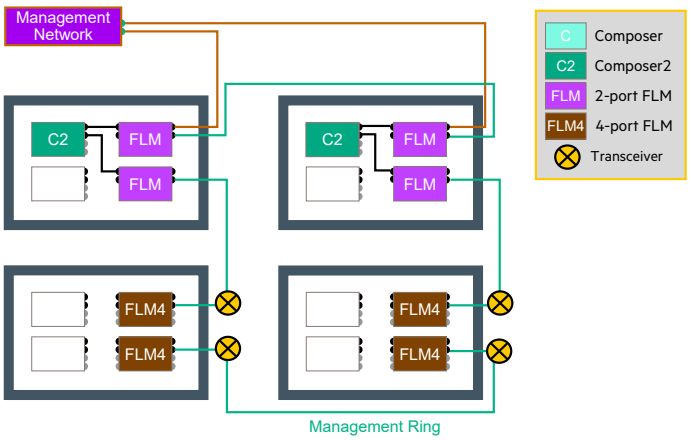
Extending Connectivity with Synergy 4-port FLM—Management connections at 10Gbps

Synergy 4-port FLM provides new benefits for users:

- Flexible Ring Connectivity – enabling connections to 'Scattered' Frames & Remote Subnets
- SFP Management Connections
  - Provides Management port compatibility with data center switches, most of which already have SFP connections (from Cisco & other networking vendors which control their own transceivers)
  - Many users of 10 Gb/s management networks already use SFP connections
- Distance for Management Rings
  - NOTE: Current 2-port FLMs use RJ45 connectors which are limited to ~30m of distance.
  - DAC Cables
    - Active DAC @ 10Gb = 15 meters (max)
    - Passive DAC =~5 meters.
  - AOC Use
    - With SR transceivers to 300m (max)
    - With LR transceivers to 10km (max)
    - With ER transceivers to 40km (max)

SCALING WITH NEW 4-PORT FLM FRAMES
Example

- Mixing 2-port FLMs and 4-port FLMs in the same Frame is not supported
- Mixing the Frames with 2-port FLMs and Frames with 4-port FLMs in the same Management Ring is supported
- 4-port FLMs use SFP+ connections instead of RJ45, so transceivers are required in the Management Ring
- HPE Synergy Composer is not compatible with 4-port FLMs in the same Frame
- HPE Synergy Composer2 is compatible with both 2-port FLMs and 4-port FLMs



Scaling with new 4-port FLM Frames—Example

Mixing 2-port FLMs and 4-port FLMs in the same Frame is not supported but mixing the Frames with 2-port FLMs and Frames with 4-port FLMs in the same Management Ring is supported.

As explained earlier, when you need to grow the environment by adding new frames with 4-port FLMs (a diagram on the right), since new 4-port FLMs use SFP+ connections for longer range connectivity, so transceivers must be added in the Management Ring.

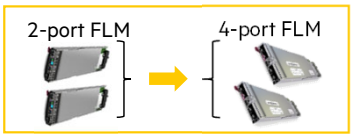
HPE Synergy Composer is not compatible with new 4-port FLMs and must be paired with 2-port FLMs in the same Frame.

HPE Synergy Composer2 is compatible with both 2-port FLMs and 4-port FLMs.

MIGRATION OF SYNERGY FLM COMPONENTS (1 OF 2)

Synergy 2-port FLM to 4-port FLM

- Foundational requirements:
  - Frame Link Modules within a Synergy Frame must be of the same generation.
  - Frames containing an original Composer or Streamer can only have 2-port FLMs
- Process Planning
  - Recommend HPE Composer (HPE OneView) downtime and a maintenance window as a precaution.
    - There is a known issue with the SAS switch and D3940 Storage Module.
    - NOTE: Remote frames require modified processes. (See slide notes.)
  - FLM upgrades must be done *one-frame-at-a-time and must complete successfully before proceeding* to the next frame.
  - Loss of management LAN access can be expected for that frame (but not other frames) while the FLMs are removed from the frame. Loss of production traffic is not expected.



Migration of Synergy FLM components—Synergy 2-port FLM to 4-port FLM

Foundational requirements:

- Frame Link Modules within a Synergy Frame must be of the same generation.
- Frames containing an original Composer or Streamer can only have 2-port FLMs

- Process Planning
- Recommend HPE Composer (HPE OneView) downtime and a maintenance window as a precaution.
  - There is a known issue with the SAS switch and D3940 Storage Module.
  - NOTE: Remote frames require modified processes. (See slide notes.)
- FLM upgrades must be done one-frame-at-a-time and must complete successfully before proceeding to the next frame.
- Loss of management LAN access can be expected for that frame (but not other frames) while the FLMs are removed from the frame. Loss of production traffic is not expected.

MIGRATION OF SYNERGY FLM COMPONENTS (2 OF 2)

Synergy 2-port FLM to 4-port FLM

- Component Migration Process
  - Upgrade to Composer version 5.0+ and the new Synergy Custom SPP which supports the 4-port FLM.
  - For any Synergy Frame which DOES NOT contain a Composer:
    1) Remove both 2-port FLM units from the Synergy Frame, then
    2) Insert both 4-port FLM units into the Synergy Frame.
  - HPE Composer (HPE OneView) communicates appropriate settings to the new 4-port FLM units
    - Any frame in a functioning ring managed by HPE OneView will be automatically claimed and brought back under management.
  - For any Synergy Frame which DOES contain a Composer:
    1) Migrate from Composer-to-Composer2
    2) Upgrade to the new Synergy Custom SPP
    3) Migrate FLMs in frames with Composer2

- Component Migration Process
- Upgrade to HPE Composer (HPE OneView 5.0) and the new Synergy Custom SPP which supports the 4-port FLM.
- FLM upgrades must be done one-frame-at-a-time and must complete successfully before proceeding to the next frame.
- For any Synergy Frame which DOES NOT contain Composer: 1) Remove both 2-port FLM units from the Synergy Frame, then 2) Insert both 4-port FLM units into the Synergy Frame.
- HPE Composer (HPE OneView) communicates appropriate settings to the new 4-port FLM units
  - Any frame in a functioning ring managed by HPE OneView will be automatically claimed and brought back under management.
  - NOTE: To HPE OneView it appears as if the FLMs were factory reset. HPE OneView will attempt to re-configure the 4-port FLMs.
- For any Synergy Frame which DOES contain Composer: 1) Migrate from Composer-to-Composer2 2) Upgrade to the new Synergy Custom SPP, and 3) Migrate FLMs in frames with Composer2.

Downtime and a maintenance window as a precaution

- If you replace 2-port FLMs with 4-port FLMs, this could cause down time for HPE OneView.
- The reason is that the FLM is the 3rd member for HA, and when it is replaced with another FLM, then the action may force the cluster to reform.
- NOTE: This is not due to the 4-port FLM. Anytime you replace FLMs, there is an impact on HPE OneView because the FLM is the networking link and the 3rd member for our cluster [quorum voting].

- Remote frames will have a different process. If the remote frame is in a ring with other managed & accessible FLMs, it will be auto-reclaimed when HPE OneView detects it due to NeighborChanged RIS events that provide the new password/credentials.
- Single remote frames will have an additional step.
- NOTE: There is no FLM left to which to send the NeighborChanged events.
- If there is no neighbor, then re-adding the frame is required to provide the new LLIPV6 address after the factory reset.
- Time Duration (estimate)
- The actual claim once the FLM comes back takes approximately a few seconds -- followed by an Enclosure Refresh of ~2 minutes.
- An exception to this would be encountered if the domain scan timed-out because the IP address was never reachable.

CHANGING ETHERNET FABRIC

HPE Synergy 12000 Frame

GROWING AN LE
Use Cases

There are three cases to consider:

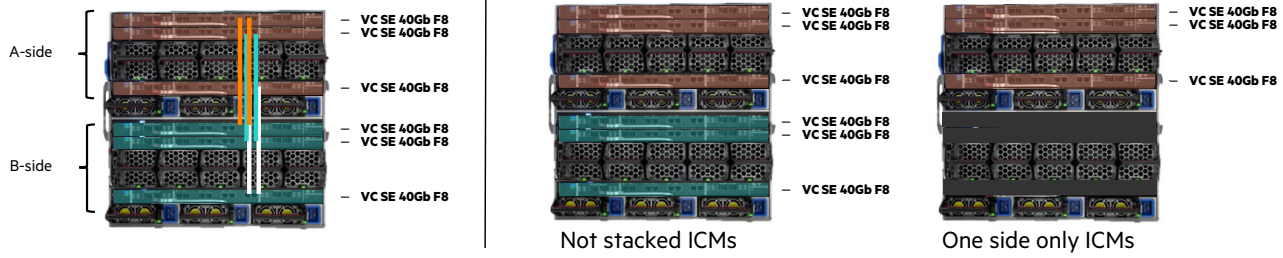
1. Case A: Growing from 1 Redundant Enclosure → 2 Highly Available Enclosures
2. Case B: Growing from 1 Redundant Enclosure → 2 Redundant Enclosures
3. Case C: Growing from 2 → 3 or more Enclosures

If you plan to grow from one enclosure to three or more, the process must be performed in two phases. First, you must grow from a one-frame configuration to a two-frame configuration. Subsequently, you can grow from a two-frame configuration to three or more frames.

SCALING WITH 10/20GB OR 25/50GB INTERCONNECT LINK MODULES

HA scaling from one to two frames (1 of 2)

- Key aspects of frictionless scaling:
  - Add a frame to an existing LE/LI by re-associating the LE to a new EG **without causing any outage**
  - **Non-disruptive** to the servers running workloads in the original frame
  - Growing from one to two frames in HA configuration requires movement of a Master Module (master ICM) from frame one to frame two
    - Growing to a redundant configuration is also supported, however a HA configuration is recommended for more reliability
  - Starting configuration for HA grow: single-frame topology, stacked ICMs only



Supported

Not stacked ICMs

One side only ICMs

Not supported

Scaling with 10/20Gb Interconnect Link Modules—Scale from one to two frames

- One of the key aspects of scaling is the ability to add frames to an existing logical enclosure (LE) or logical interconnect (LI) dynamically by re-associating the LE to a new enclosure group (EG) without causing an outage to the existing environment.
- The “non-disruptive” aspect of this operation refers to the servers running workloads in the frames that are part of the original LE/LIs and will remain in the LE after the growth.
- Additionally, when growing from one to two frames, the Master Module (also called the master ICM) is recommended to be moved from frame 1, bay 6, to frame 2, bay 6, to create a high availability (HA) configuration. Redundant configuration is supported in this release (when all master modules are in the same frame), but HA configuration is recommended for more reliability, so it is recommended to physically move the master module from the B-side of the fabric in frame 1 to frame 2 during the process.
- Starting configuration is a single-frame topology and only stacked ICMs are supported. ICMs that are not stacked or single ICM configurations are not supported.

If you plan to grow from one enclosure to three or more, the process must be performed in two phases. First, you must grow from a one-frame configuration to a two-frame configuration. Subsequently, you can grow from a two-frame configuration to three or more frames.

• When growing from one frame to two frames, if your applications require a deterministic network outage less than 50 milliseconds, Hewlett Packard Enterprise recommends that you perform the grow operation during a maintenance window. When VPLAG (LACP on server downlinks) is configured in server profiles, a link-down event resulting from the removal of the VC interconnect module in frame one will result in a near-instantaneous reconfiguration of the VPLAG by Virtual Connect. However, the actual network outage duration is dependent on uplink LAG failover timing and on specific operating system drivers. Therefore the duration of the failover may vary significantly.

SCALING WITH 10/20GB OR 25/50GB INTERCONNECT LINK MODULES

Scale from one to two frames (2 of 2)

- HPE Synergy Composer performs an analysis before allowing you to proceed
  - All server profile connections on both A and B sides of the fabric are completely redundant
  - All logical interconnect uplink sets have uplink ports spanning both ICM Masters in OK status with the same networks accessible
  - The second frame is already added into the Frame Link Topology, and it is discovered and monitored
  - Existing Frame LIGs for SAS and VC stay identical
  - New frames will not have any LIG beside Master/Satellite ILT
  - (Additional LIGs for the new frames can be added after the grow operation)

Scaling with 10/20Gb or 25/50Gb Interconnect Link Modules—Scale from one to two HA frames

- HPE Synergy Composer (HPE OneView) performs the following analysis before allowing you to proceed with the growth:
  - All server profile connections on both A and B sides of the fabric are completely redundant from both Ethernet and FC/FCoE perspective.
  - All logical interconnect uplink sets have uplink ports spanning both ICMs; all uplink ports are in the OK status, and the same networks are accessible from both ICMs.
  - The analysis of the logical interconnect groups (LIGs) ensures that old and new LIG configurations are completely identical, apart from the newly added frame.
  - It is assumed that the second frame was already added into the Frame Link Topology, discovered and brought in as “monitored.”
  - The existing enclosures in the new enclosure group must be configured the same as they are in the original enclosure group (including the Fibre Channel and SAS logical interconnect groups). The new Synergy frame must only be assigned to the new virtual connect logical interconnect group. Do not include any Fibre Channel or SAS logical interconnect groups for the new enclosures at this stage. New Fibre Channel or SAS logical interconnect groups can be added later after the network portion of the grow procedure is complete.

MIGRATION AND GROW USE CASES

Migration from 10/20 configuration to 25/50 configuration

- Rolling or in-place migration is not supported
- Migration process requires a complete systems shutdown
  1. Power-off all compute modules and un-assign server profiles
  2. Delete LIs
  3. Replace adapters
  4. Rebuild LIs
  5. Rebuild server profiles

Grow

- Supported grow from 2xFrame up to 5xFrames
- *Mixing of the 25Gb and 50Gb is not supported*

Migration and Grow Use Cases

Migration

There are currently no plans to support rolling or in-place migration from VC SE 40Gb F8 module to VC SE 100Gb F32 module

If needed, migration process requires a complete systems shutdown followed by a “rip and replace” operation including swapping out of the network adapters:

1) Power-off all compute modules and un-assign server profiles

2) Delete Logical Interconnects

3) Replace adapters

4) Rebuild Logical Interconnects with VC SE 100Gb F32 modules

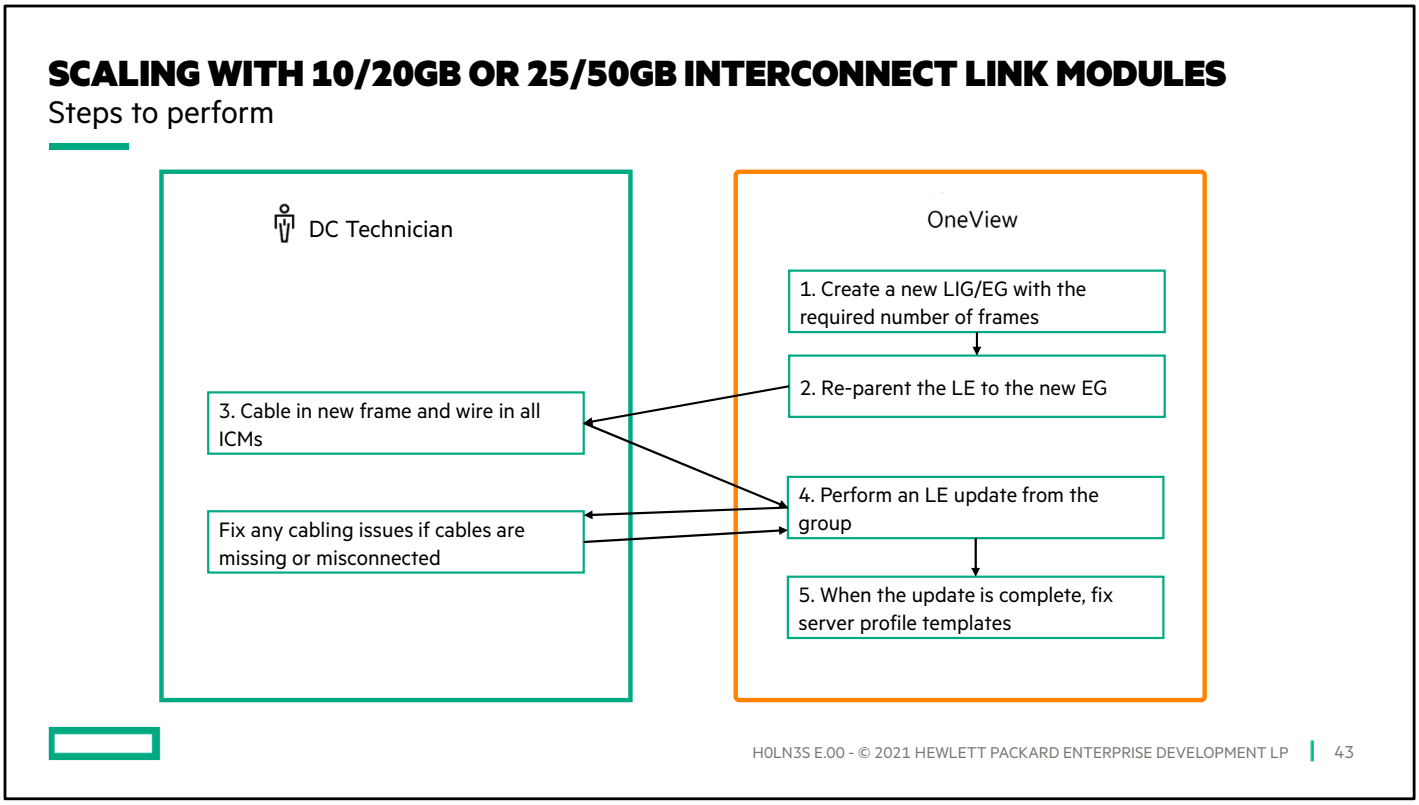
5) Rebuild server profiles

Grow

- Grow is supported from 2xFrame up to 5xFrames, but mixing of the 25Gb and 50Gb is not supported

NEW LIG | EG, REPARENT LE

HPE Synergy 12000 Frame



Scaling with 10/20Gb Interconnect Link Modules—Steps to perform

- You can extend networking to satellite frames without adding hops. Master/Satellite architecture allows the addition of frames using a true line-rate link extension when adding satellite interconnects. Add 20Gb Interconnect satellites to the VC 40Gb module/switch.

Follow the high-level process steps:

- Create a new EG and LIG(s) with an additional second frame.
- Edit the logical enclosure and associate it with the new EG.
- Cable in the second frame into a frame link topology. Remove the stacking links. Remove the master ICM from frame 1, bay 6, and insert the satellite ICM. Insert the master ICM into frame 2, bay 6, and insert the satellite ICM into frame 2, bay 3. Cable the stacking links and interconnect link topology. HPE Synergy Composer will detect issues and guide you to a proper resolution. Update from the group. LE completes the process without disruption of traffic to existing workloads on A side of the fabric for frame 1.
- Do not remove any cables from the VC interconnect module in Frame 1 ICM Bay 6. Unseat the VC interconnect module 6 approximately 1 inch (2 cm) out of the frame.
- c. Wait for HPE OneView to recognize that the module has been removed. This logical removal operation can take several minutes to complete.
- d. If necessary, the stacking link cables can now be removed. You can also remove the uplink cables, if necessary.
- e. Move the VC interconnect module in Frame 1 ICM Bay 6 to Frame 2 ICM Bay 6, but do not seat the module at this time.
- f. While the VC interconnect module in Frame 2 Bay 6 is unseated, reconnect (or replace, if necessary) the stacking link cables as well as any uplink cables that might have been removed. Do not connect the interconnect link cables at this time. Now, fully insert the VC interconnect module into the bay. Wait for the interconnect module to be recognized and the resulting HPE OneView Add and Create operations to complete before continuing.
- g. Insert the new interconnect link modules into Frame 1 ICM Bay 6 and into Frame 2 ICM Bay 3. Wait for the modules to be recognized and added into HPE OneView. Do not connect the interconnect link cables yet.
- h. Once the modules have been configured, connect the interconnect link cables and wait for the port status to become green in the enclosure interconnect link topology page. Proceed to the next step.
- During the process, if you had profiles associated with SPTs, you will need to create a copy of the SPT and re-associate.
- NOTE: Crossing the stack cables is allowed, but not needed for HPE Synergy.

SCALING A LOGICAL ENCLOSURE

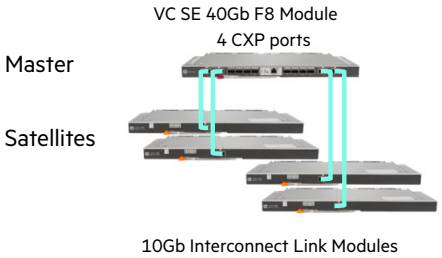
In-service scaling from 2 to 3, 4 or 5 frames using the Master/Satellite topology

Scaling a logical enclosure—In-service scaling from 2 to 3, 4 or 5 frames using the Master/Satellite topology

HPE SYNERGY SCALING
Adding new satellite frames

Grow from 2 to 5 frames

1. Create (copy) new larger LIG and EG
2. Edit the LE and change the EG reference
3. Read the info and confirm the change
4. Apply new EG for validation
5. LE becomes inconsistent with EG
6. Cable the new frames as part of the ILT
7. Update the LE from group if ILTs healthy
8. Server profiles update



Maximum number of frames in a logical enclosure is **5**

IMPORTANT: Mixing of the 25Gb and 50Gb modes is not supported.

HPE Synergy scaling—Adding new satellite frames

- Non-disruptive logical enclosure (LE) extensions allow a single-step growth from 2 to 3 to 4 and to 5, or multi-step growth from 2 to 4, from 2 to 5, and from 3 to 5. Only two VC SE 40Gb F8 cluster link fabrics in highly available configuration are supported as part of the growth. Single-hop, intra-frame and inter-frame connections are maintained. Also, there is an ultra-low latency for east-west traffic.
- The mechanics for growing from two-frame HA configuration to three-frame configurations (or 4, or 5) is much simpler because the master ICMs are already in different frames (high availability configuration):
  - Create a new logical interconnect group (LIG) and a new enclosure group (EG) that are larger in size, that is, span more frames than the original LIG and EG, but are otherwise almost identical in all other aspects of configuration. This means that you only add the satellite frames. The reason behind creating new ones and not growing the existing ones is that there may be more than one instance of a logical enclosure (LE) deployed from the same EG, and you do not want to grow all of them at once.
  - Edit the LE and change the EG references. You are given a pop-up dialog describing what will happen and you are asked to confirm. At this point, nothing yet happened, so you can cancel out or change back.
  - Apply the new EG selection. Compatibility validation ensues. If any issues are detected, you receive a message and an instruction on how to fix the problem.
  - The LE becomes inconsistent with the EG and you are instructed to perform an update from the group on the LE. You can still revert the LE to the old EG at this point, because nothing happened yet.
  - An update is not allowed until the interconnect link topology (ILT) is healthy, so you have to make sure that the satellite frame is cabled in correctly.
  - Cable the new frames as part of the ILT before you can update from group in OneView
  - During an update from group, HPE OneView also re-validates and proceeds with the update.
  - Perform an update from the group on the LE.
  - Server profiles are updated to use the new EG reference as well.
  - (continued on the next page)

- (continued from the previous page)

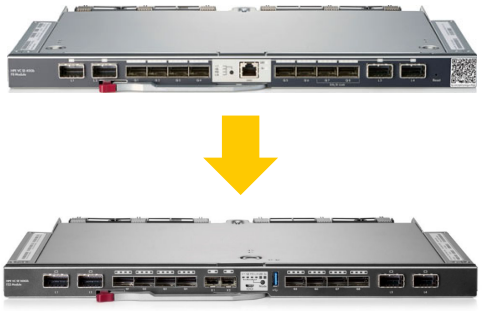
- All these steps are done with no disruption to the existing workloads.
- The mechanics for growing from one-frame to two-frame configuration are slightly different (when all master modules are in the same frame), so you would have to move the master modules from the B-side of the fabric in frame 1 to frame 2 during the process when going to an HA configuration.

SCALING WITH 25/50 GB INTERCONNECT LINK MODULES

Migration Use Case

- ***Rolling or in-place migration from HPE VC SE 40Gb F8 module to HPE VC SE 100Gb F32 module is not supported***
- Migration process requires a complete systems shutdown and swapping out of the network adapters
  1. Power-off all compute modules and un-assign server profiles
  2. Delete Logical Interconnects
  3. Replace adapters
  4. Rebuild Logical Interconnects with VC SE 100Gb F32 modules
  5. Rebuild server profiles

HPE VC SE 40Gb F8 Module



HPE VC SE 100Gb F32 Module

Scaling with 25/50 Gb interconnect link modules—Migration Use Case

- Rolling or in-place migration from HPE VC SE 40Gb F8 module to HPE VC SE 100Gb F32 master/satellite topology is not supported.
- If desired, migration process requires a complete systems shutdown followed by a “rip and replace” operation including swapping out of the network adapters:
- Power-off all compute modules and un-assign server profiles.
- Delete Logical Interconnects.
- Replace adapters.
- Rebuild Logical Interconnects with VC SE 100Gb F32 modules.
- Rebuild server profiles.

RESOURCES

- where get the info, tool, sites, videos

LAB

REVIEW QUESTIONS

HPE SYNERGY GROWTH PLANNING SKILLS

Topic areas

- Remote management ring
- Adding frames
- Composer upgrades
- Composer migration
- Flm move to 4 port
- Changing ethernet fabric
- New LIG | EG, reparent LE

TRAINING OBJECTIVES

- Upon completion of the module apply HPE Synergy Growth Planning skills to perform tasks in lab to validate a Synergy deployment and initial hardware setup.
- Course review questions will provide you an opportunity check your knowledge of skill and task: Facts, Terms, Definitions and Concepts.
- The course modular structure organizes skill topics to follow typical systems administration responsibilities for tasks performed once installation completed. What's in it for you, at the end of this module, is identifying those skills you need to perform on the job with your Synergy implementation.
- Successful Skill performance is demonstrated at the end of this module by using the OneView interface and configuration documentation to perform the listed skills
- Upon completion of the module create a personal learning plan and module summary thinking about the following questions:
  - What are the new skills that were covered?
  - Who on the team will perform the skills in the module?
  - What questions do you need answers have?

Training objectives

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THANK YOU