

To get there, together

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0496/20.59.02*



REALDOLMEN
to get there, together





**Hewlett Packard
Enterprise**



Welcome to the HPE Synergy Webinar

Geert Kuijken, Solution Architect
Hewlett Packard Enterprise

March 2017

Agenda



HPE Synergy Deep Dive

- Composable Infrastructure
- Synergy: “a better blade”
- Synergy Frame
- Synergy Management: HPE One View with Composer/Streamer
- Synergy Fabric
- Synergy Compute
- Synergy Storage
- Wrap-up



Introduction:

Composable Infrastructure principles

THE SYNERGY STORY IS SIMPLE



Platform

HPE Synergy



Environments

Traditional apps
Idea Economy apps



Elements

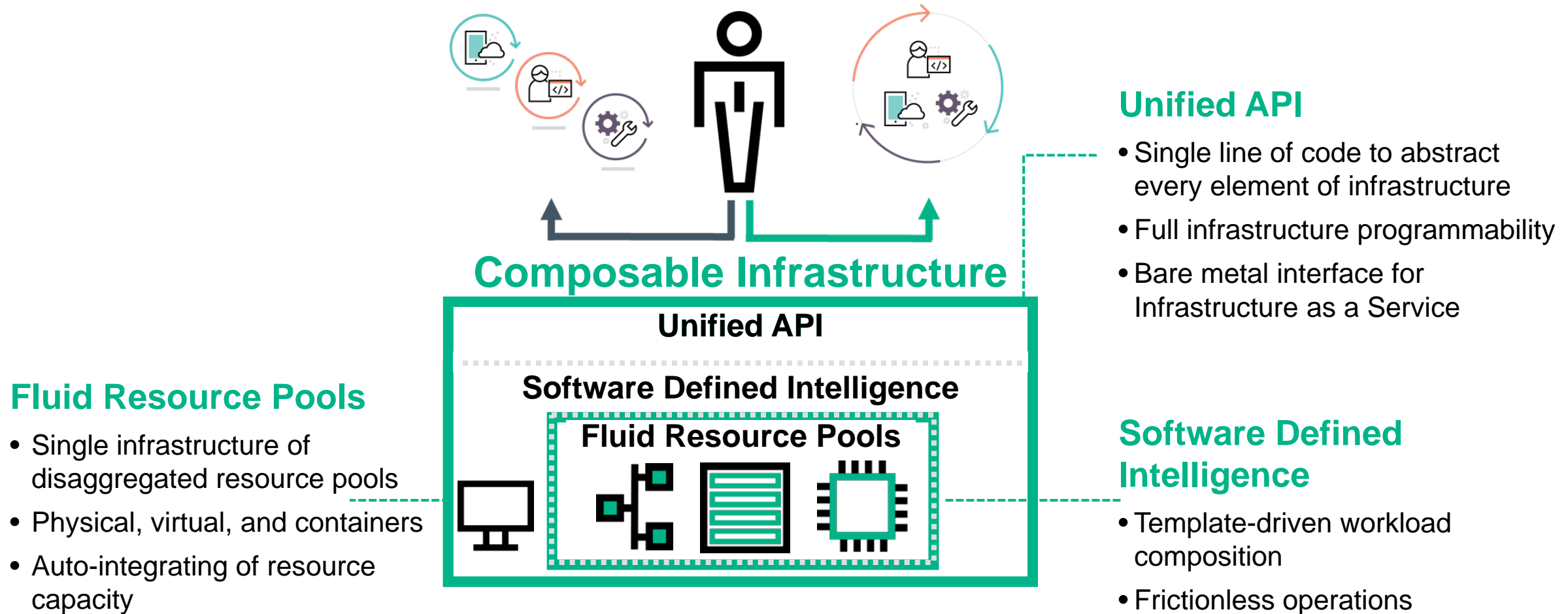
Fluid Resource Pools
Software Defined Intelligence
Unified API



Benefits

Reduce cost
Deploy at cloud speed
Simplify operations
Develop more apps

THREE ARCHITECTURAL DESIGN PRINCIPLES



HPE Composable Infrastructure Partner Program

Integrating HPE Composable Infrastructure API

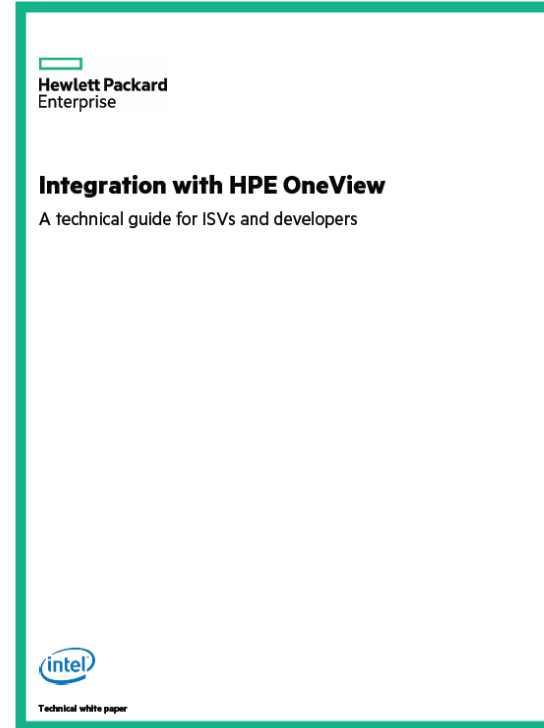
Why build interoperability with HPE OneView?

- To establish a means to **consume** data from **HPE OneView** (infrastructure configuration, topology, and health)
- To **control and automate** changes in IT infrastructure (save time by automating processes)
- To **feed** information such as alerts from your applications into **HPE OneView** (streamline the troubleshooting and remediation)
- To **eliminate scripting** to low-level tools and interfaces.

Technical integration guide available for developers

Partner Marketplace

- http://h22168.www2.hpe.com/composable_infra/partner_program/us/en/marketplace.html



ANSIBLE
by Red Hat™



HARPA
ITALIA

Microsoft

puppet

SUSE

ARISTA

EATON



nlyte™

SALTSTACK

turbonomic



MagicFlex
Smart Analysis



Schneider
Electric

vmware®



HPE Synergy:

A “better blade” architecture

HPE Synergy: Extensible design

Much more than the next generation blade architecture

Blade Enclosure = miniature datacenter

- Each enclosure contains redundant management hardware
- Each enclosure contains redundant active networking components



Synergy Frame = extensible datacenter

- Multiple frames share redundant management hardware
 - Fewer control points
 - Lower cost
- Multiple frames share redundant active networking components
 - Lower cost, fewer uplinks
 - Fewer networking hops
 - Lower latencies

**Better management,
Better networking,
More bandwidth,
Composable storage,**



Architecture for the next 10 years!



HPE Synergy Components:

Frame

Composer and Streamer

Composable Fabric

Composable Compute

Composable Storage



HPE Synergy Frame Architecture

Integrate into today's data centers

- Same physical footprint as BladeSystem c7000
 - Use deep racks (1200mm)
- Compatible with existing power and cooling facilities
- Simple, all-passive, fully redundant design

Future Ready Design for tomorrow

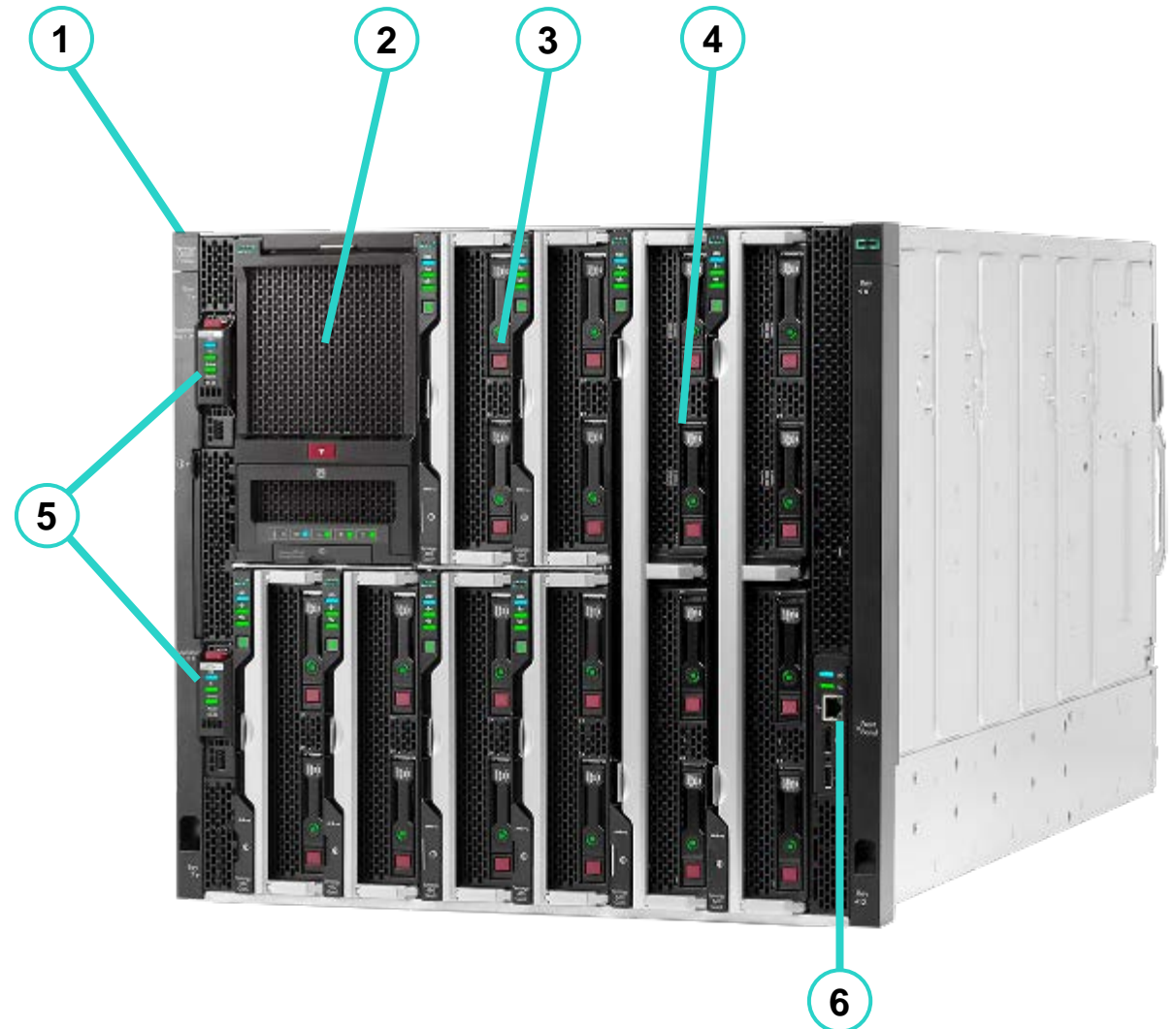
- 55% more module volume
- 2.5x more efficient cooling
- 25% more power per resource
- Photonics pre-enabled mid-plane



HPE Synergy Frame Architecture

Front view

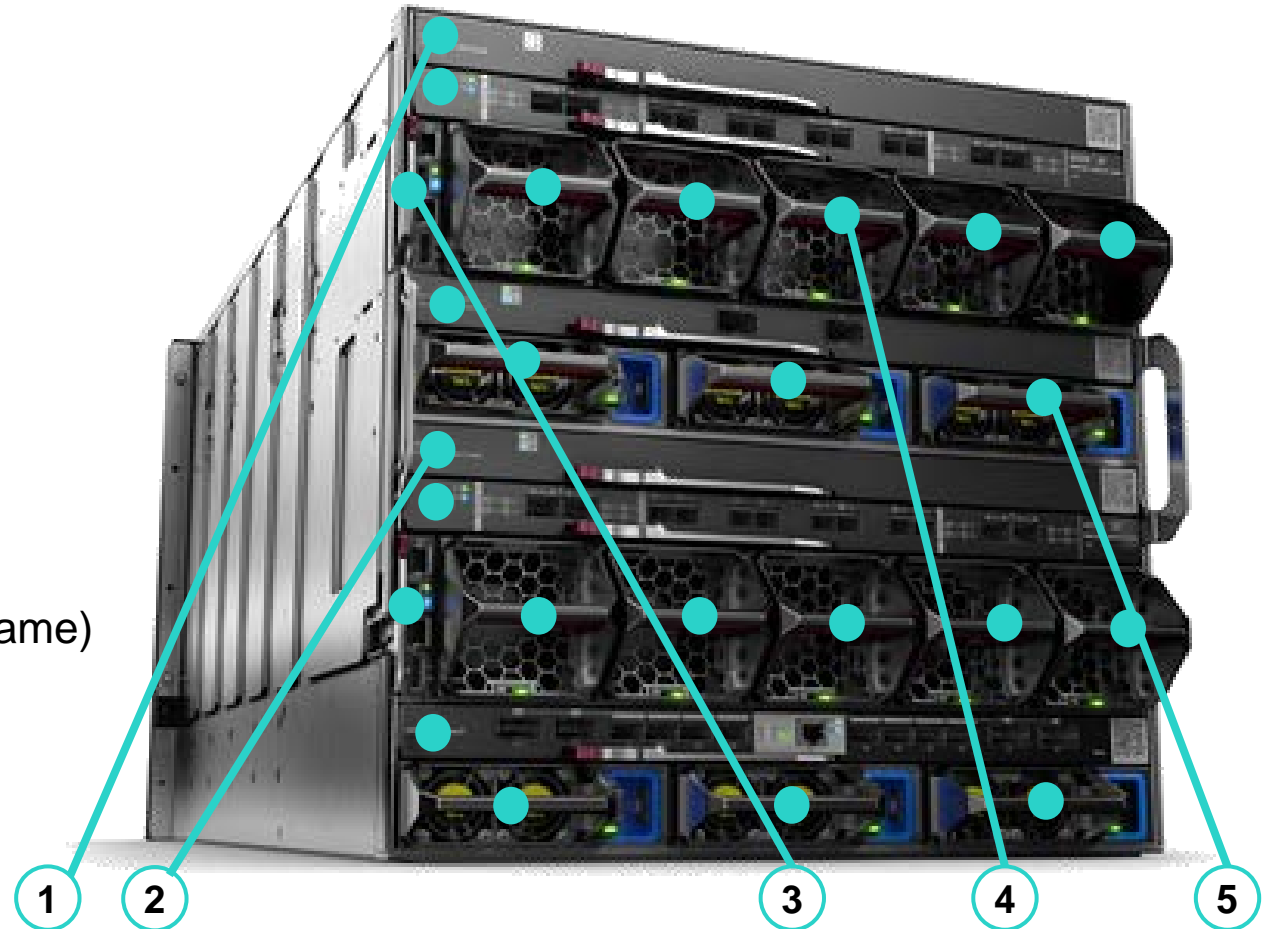
- ① Sized to fit in existing infrastructure
- ② Double Wide Storage Node
- ③ Half Height Compute Node
- ④ Full Height Compute Node
- ⑤ Redundant Management Appliance Modules
- ⑥ Front Panel / HPE Synergy Console



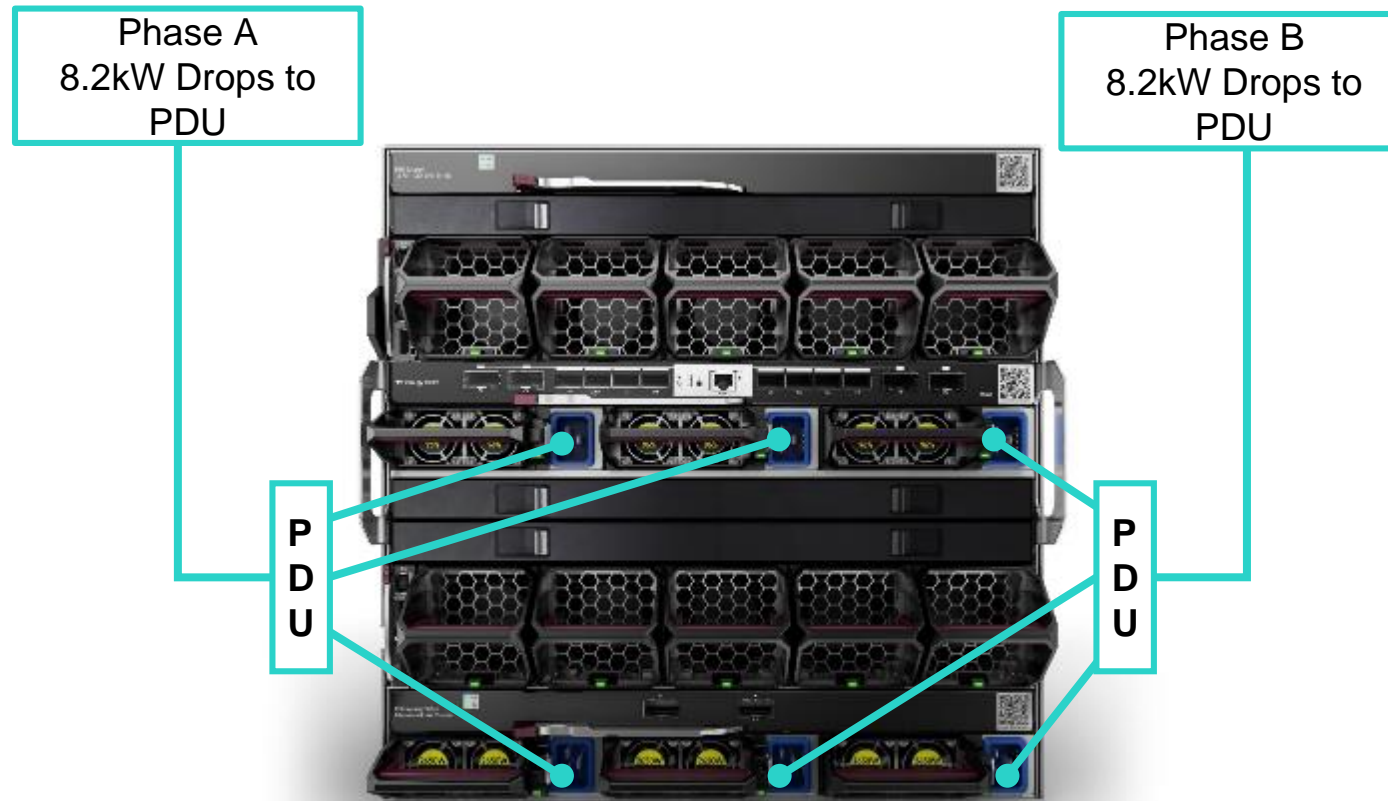
HPE Synergy Frame Architecture

Rear view

- ① Three primary Interconnect Modules (ICM)
- ② Redundant Interconnect Modules
- ③ Redundant Frame Link Modules
- ④ Ten System Fan Modules included
- ⑤ Six Titanium 2650W Power Supplies (8.2kW Frame)

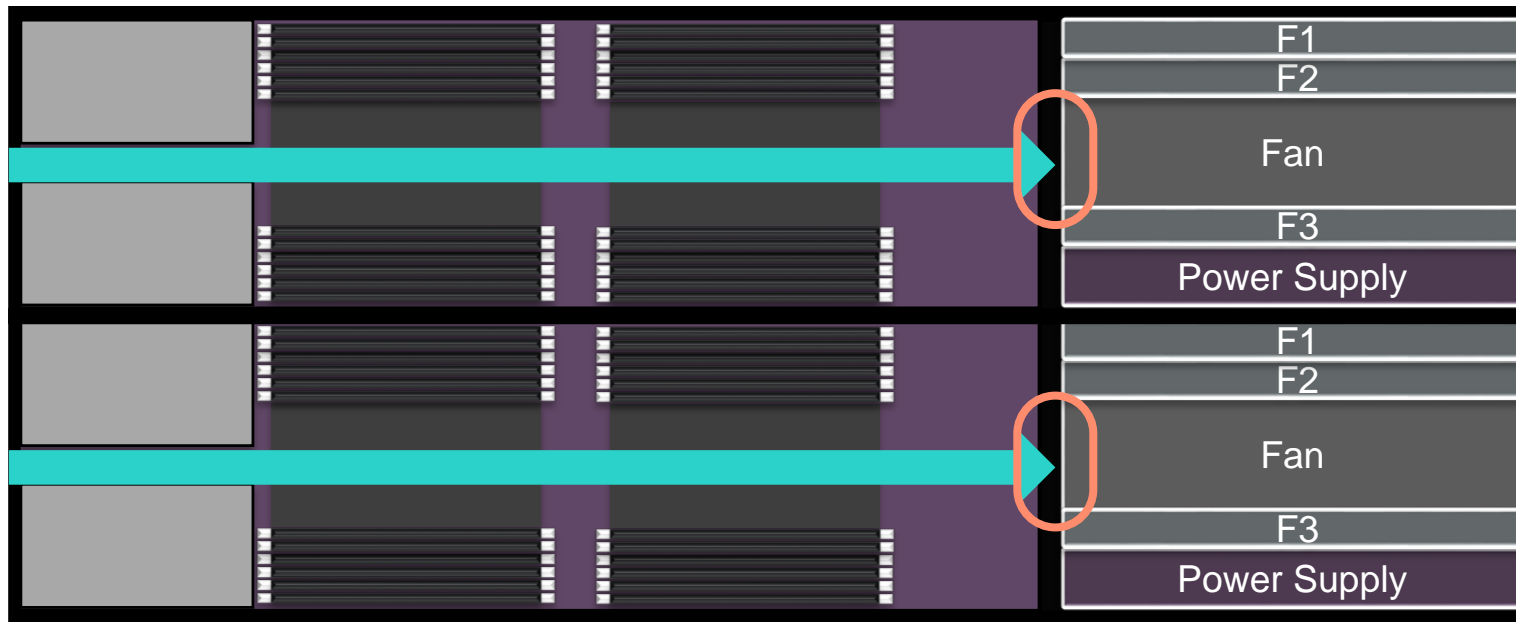


Optimized for existing power hardware requirements



Synergy 12000 Frame: Cooling

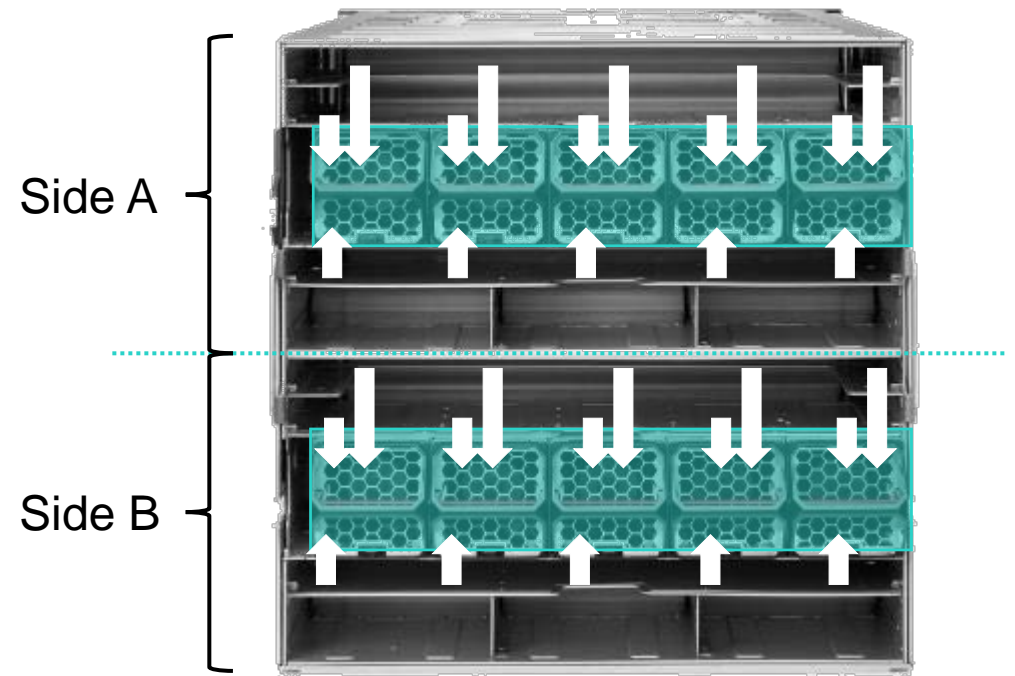
- Straight front to back air flow
- Consistent air flow path regardless of ICM bay
- 3x larger midplane air opening
- No common plenum
- Louvers on every fan bay prevent backflow when fans or modules are removed



Synergy 12000 Frame: Cooling

Fan placement & redundancy

- Frame always includes 10 fans, installed in 2 rows of 5
 - Each row cools 6 bays, 3 ICMs, 1 FLM, 1 appliance bay
 - 4+1 redundancy per row in all cases
-
- FLM reports fan failures to Composer: “degraded frame”
 - If 2 or more fans per frame fail, no additional modules will be allowed to power up.



Synergy 12000 Frame: Bandwidth

Significantly more bandwidth than c7000 enclosure

Today interconnects use copper traces on Synergy backplane

- Backplane lane speed is 28Gb/s
- Backplane has 12 bays
- Each bay has access to 24 lanes
 - 8 lanes per mezzanine
- Each lane is Duplex:

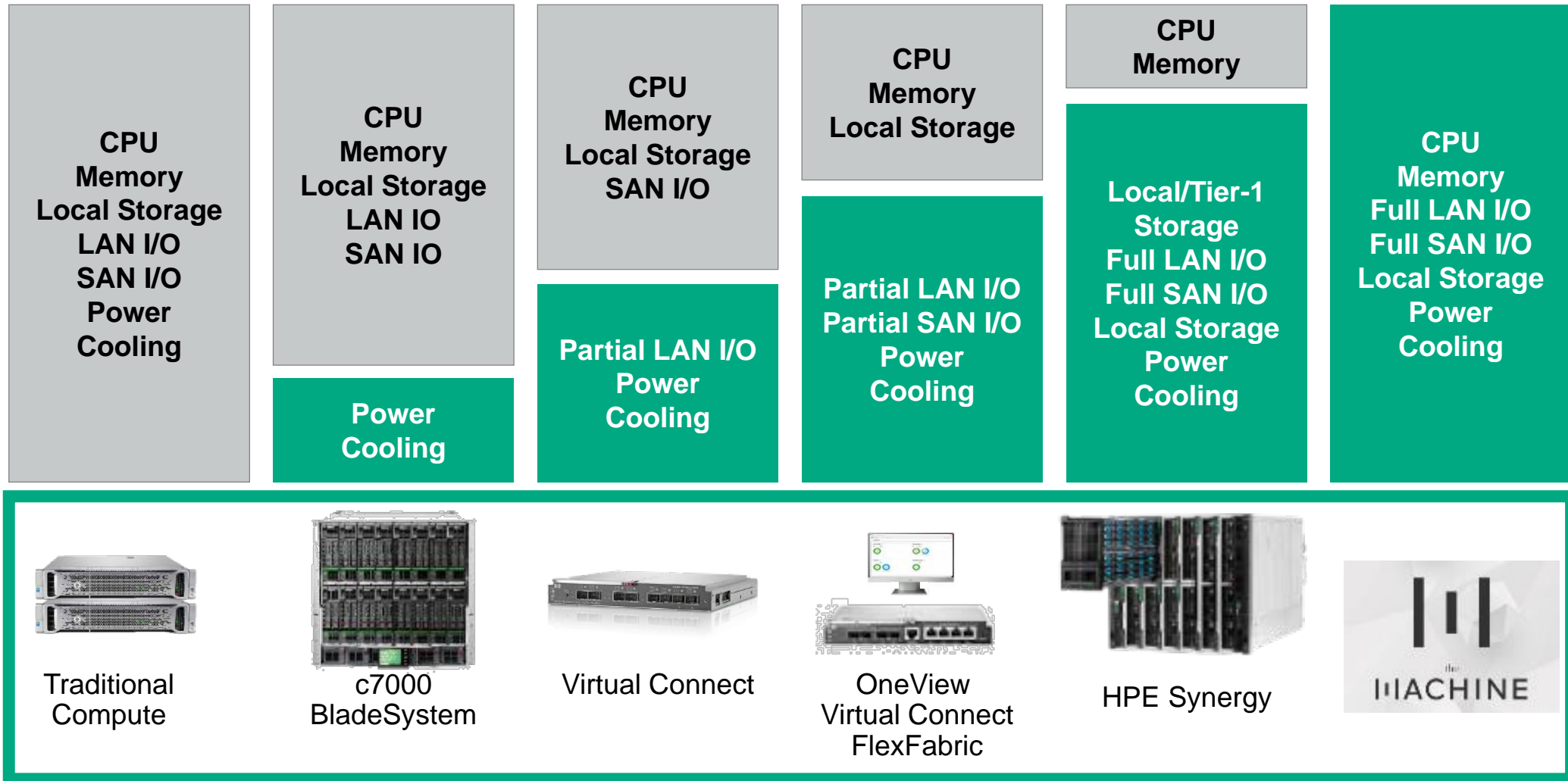
28 x 12 x 24 x 2 =

16 128 Gb/s

–And then we have Photonics...



HPE Journey to fluid compute resources and The Machine



HPE Synergy Management Subsystem



**HPE Synergy
Composer**

Management
appliance powered
by HPE OneView



**HPE Synergy Image
Streamer (option)**

Image repository
and boot location
for stateless
resources



**HPE Synergy
Frame Link Module**

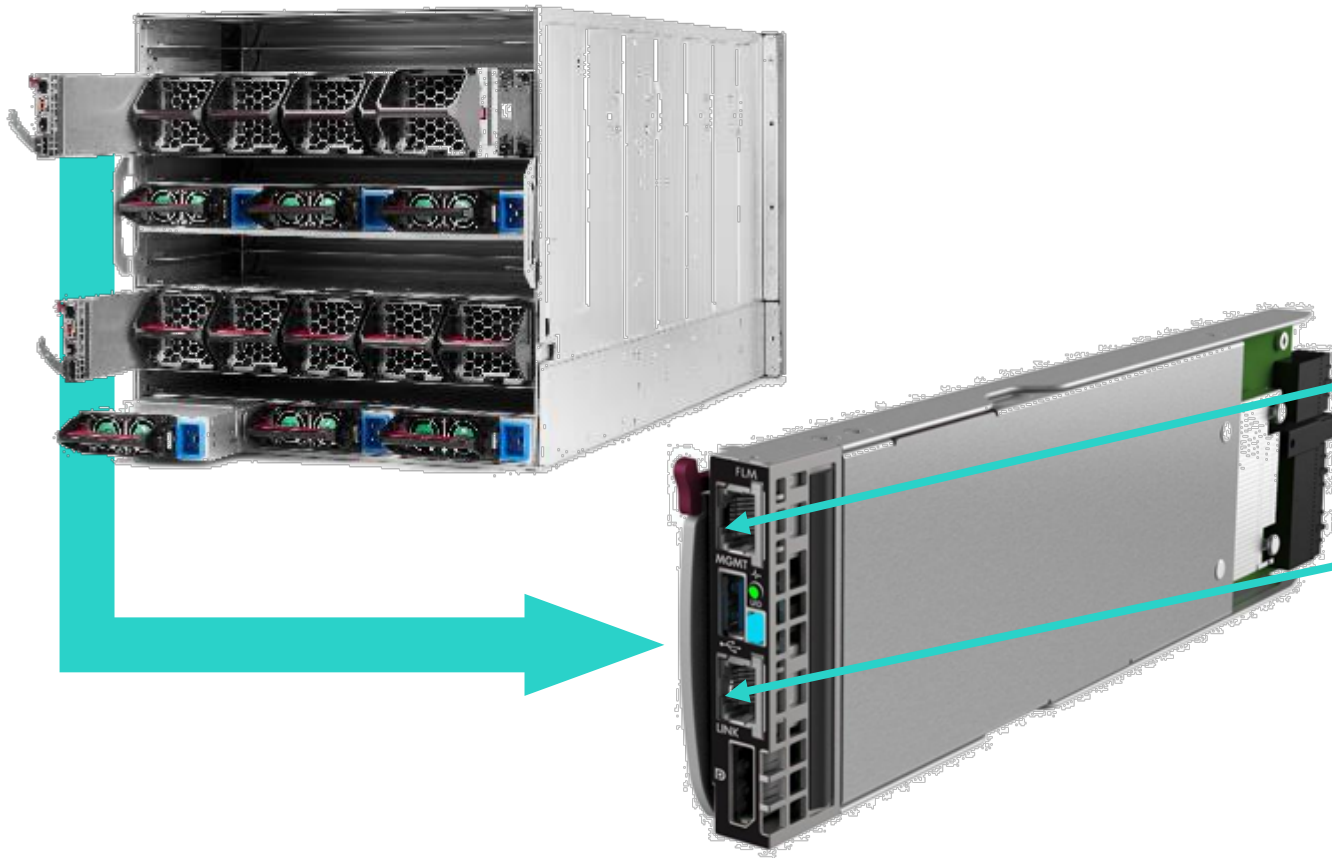
Presents device
information to
Composer and
forms management
ring

Multi-Frame Management Ring



Connects multiple frames via
10GBASE-T network

Synergy Frame Link Module



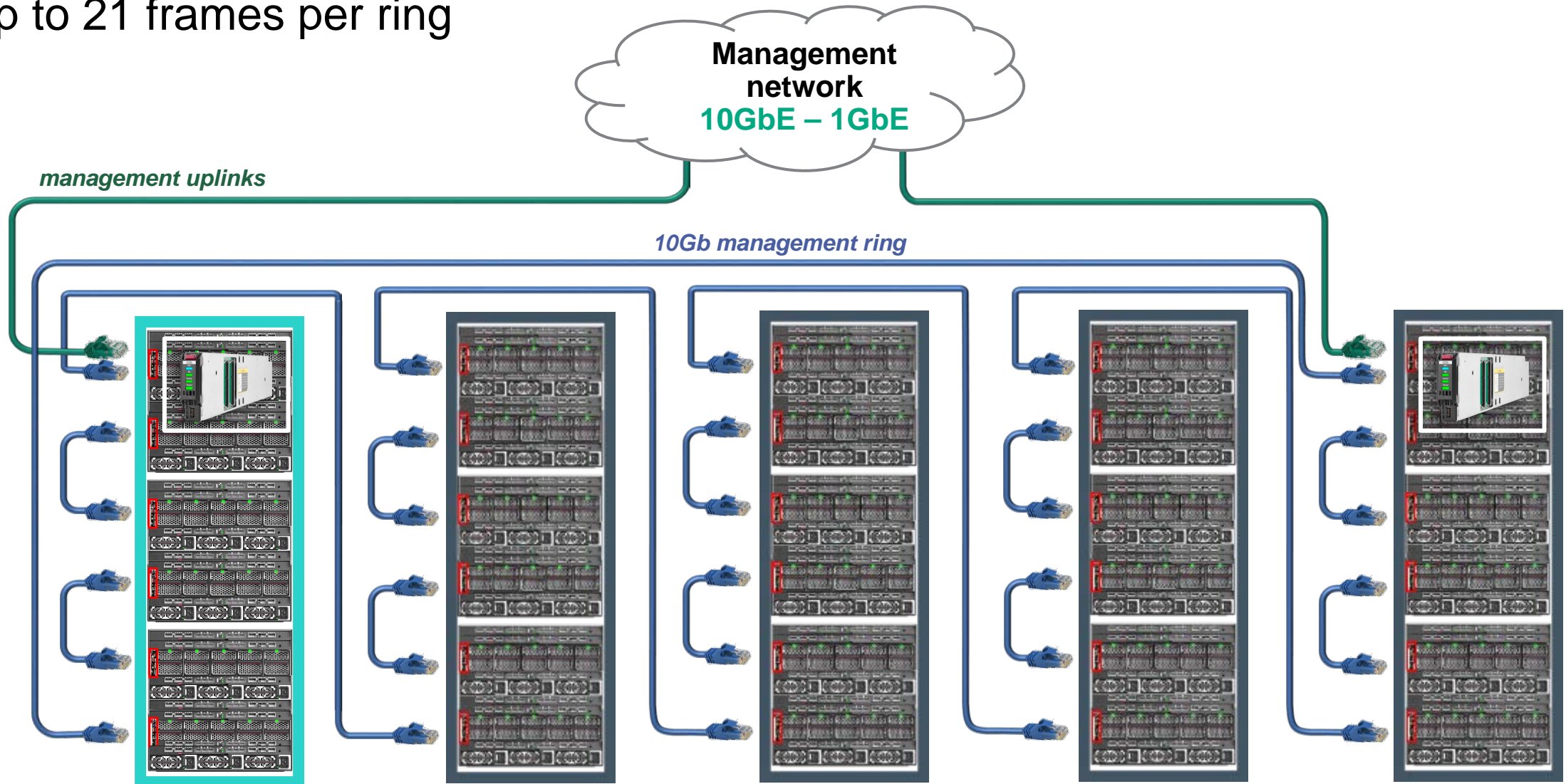
Frame ships with 1 FLM, 2 required in all cases for redundancy

FLM main functions:

- Auto-discovery in frame
- Thermal and power reporting to Composer
- Dedicated 10Gb connection to customer management LAN (MGMT port)
- Dedicated 10Gb management ring (LINK ports)

Management Architecture – Single management ring

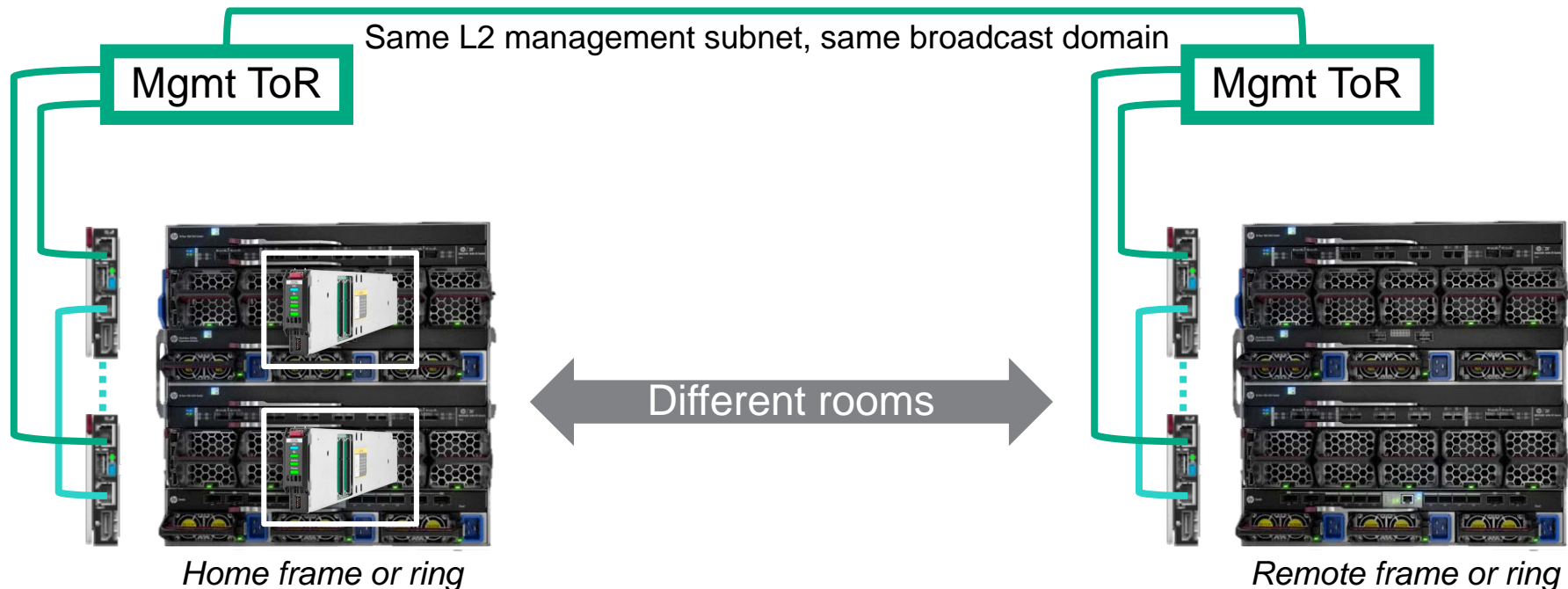
Up to 21 frames per ring



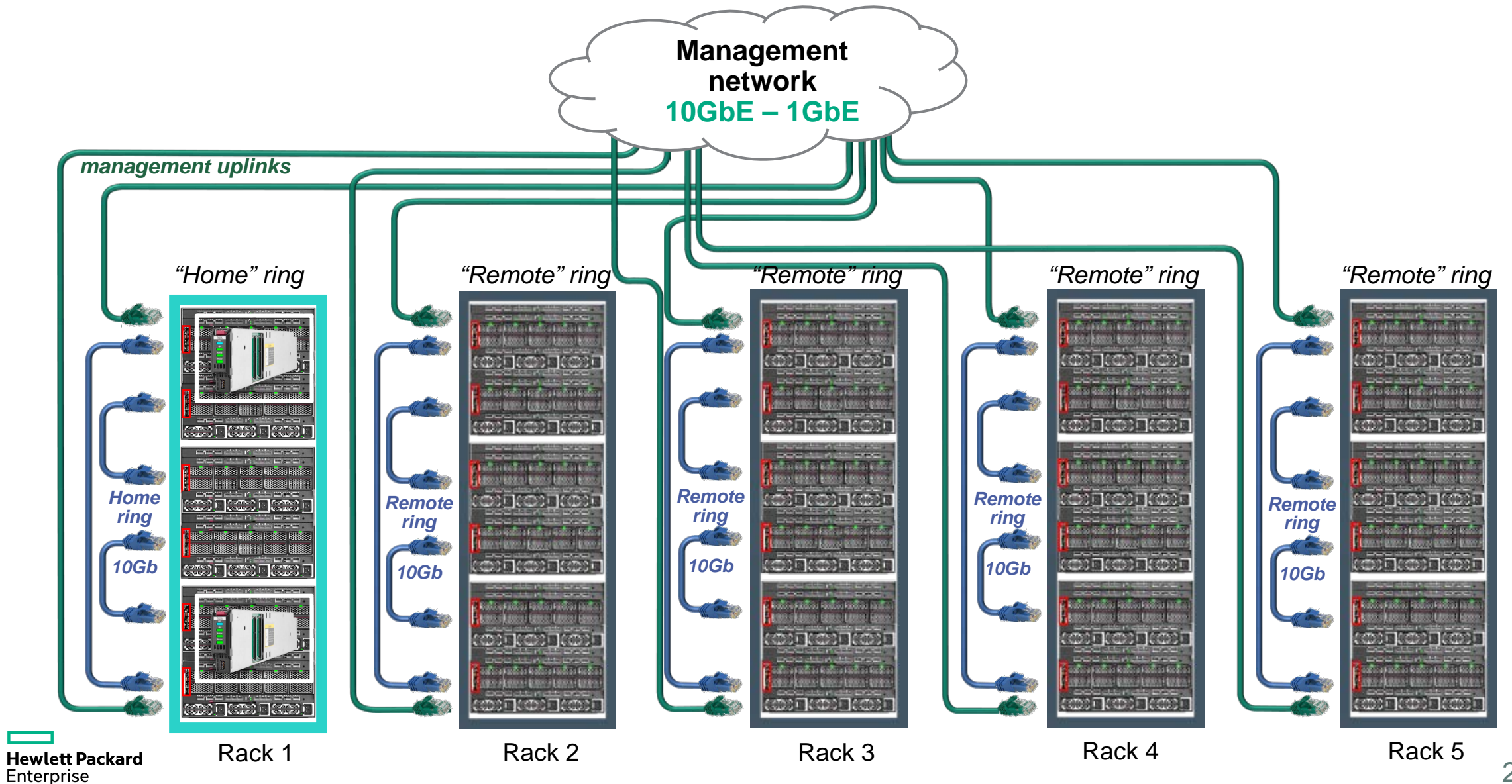
Management Architecture – Remote Frames

Remote frame = in another room (more than 30m cable from Composer)

- Composers must be in the home management ring, remote frames / rings do not require Composers
- **FLM MGMT ports** are cabled to ToR switches, **FLM LINK ports** cannot be connected to switches
- First remote frame is not auto-discovered: must enter remote FLM IPv6 address in h/w setup screen
 - Other frames connected to remote ring will be auto-discovered



Management Architecture – Remote rings



HA management environment

HPE Synergy Composer

- High Availability management
- Redundant physical appliances
- Embedded HPE OneView
- Backup & Recovery
- Supportability tools
- Unified use for virtual & physical
- Embedded 'invisible' licensing

HPE Synergy Composer



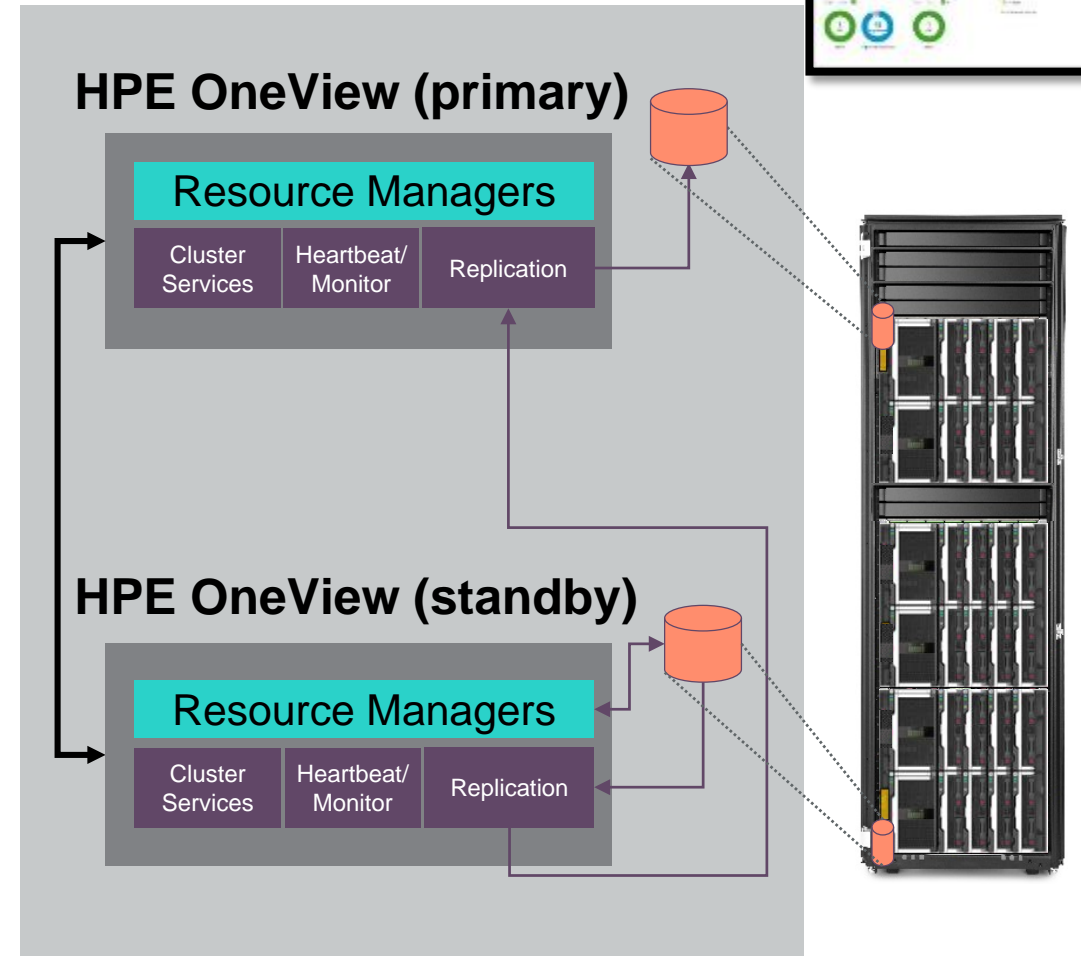
HPE Synergy Composer



HPE OneView

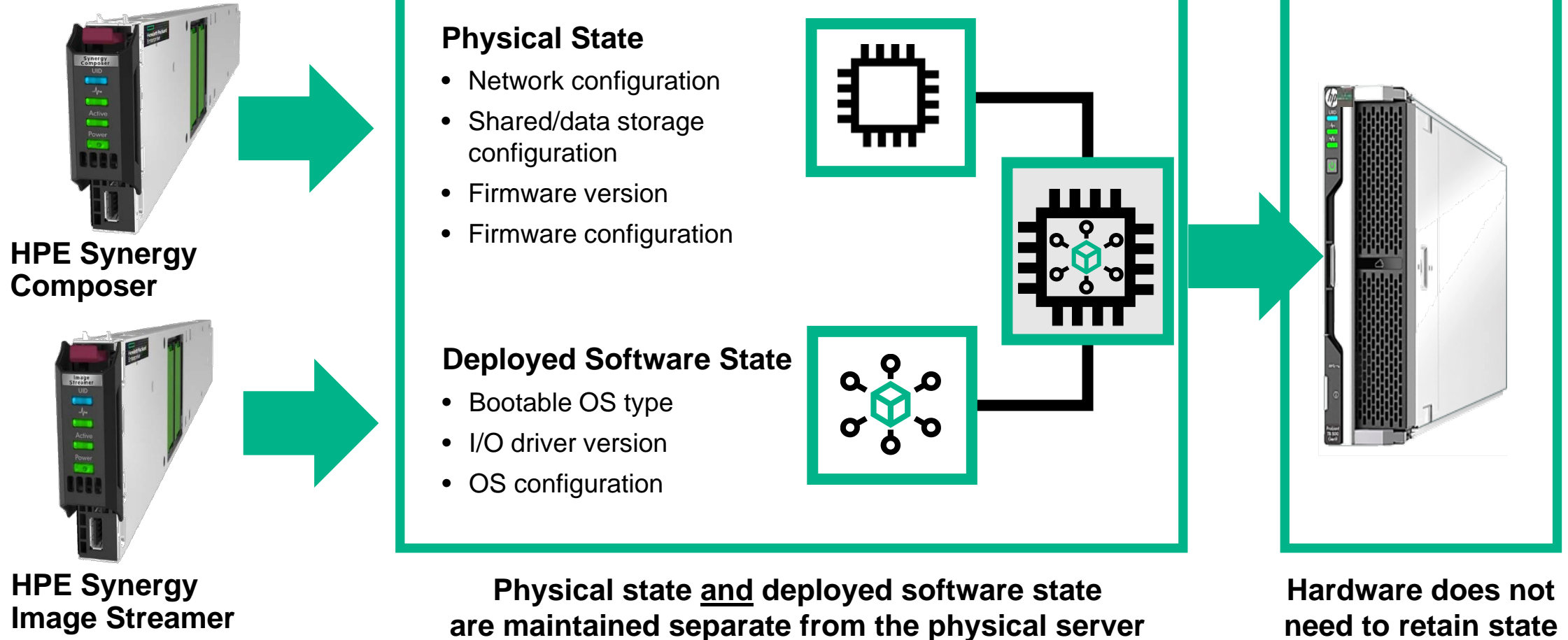


Virtual Cluster IP ←



HPE Synergy Image Streamer

Managing stateless Compute Modules with a server profile



HPE Synergy Composer and Image Streamer

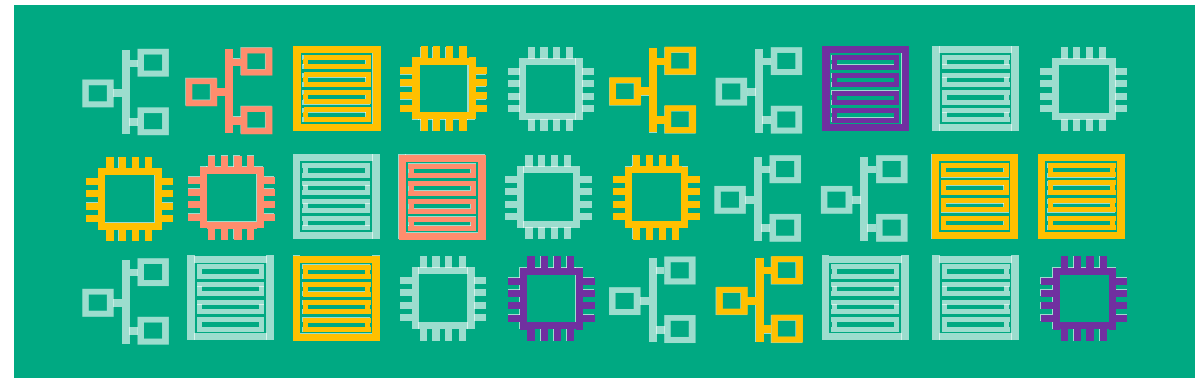
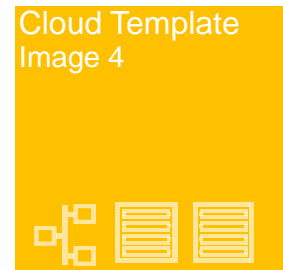
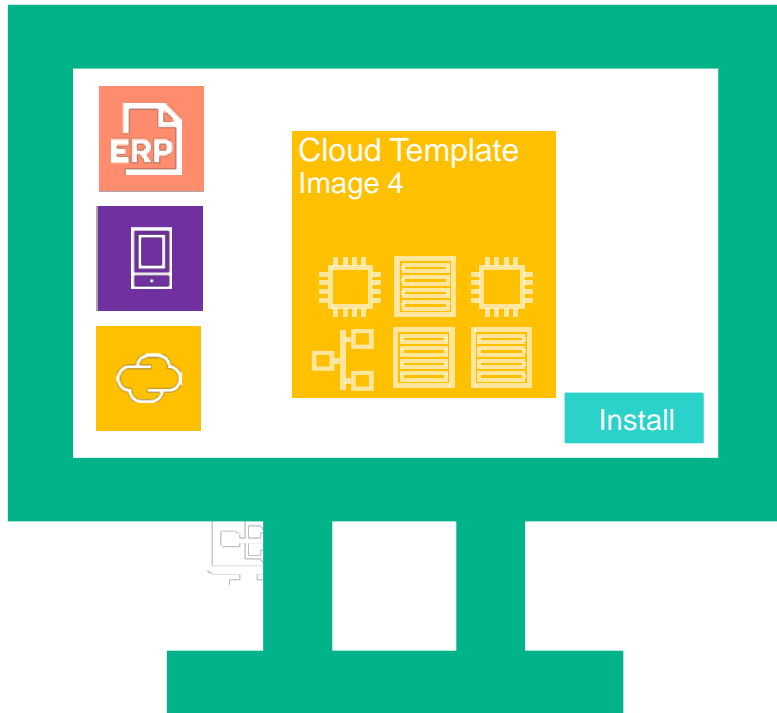
Compose and recompose resources for your real-time application needs

Fluid resource pools

Software-defined intelligence

Unified API

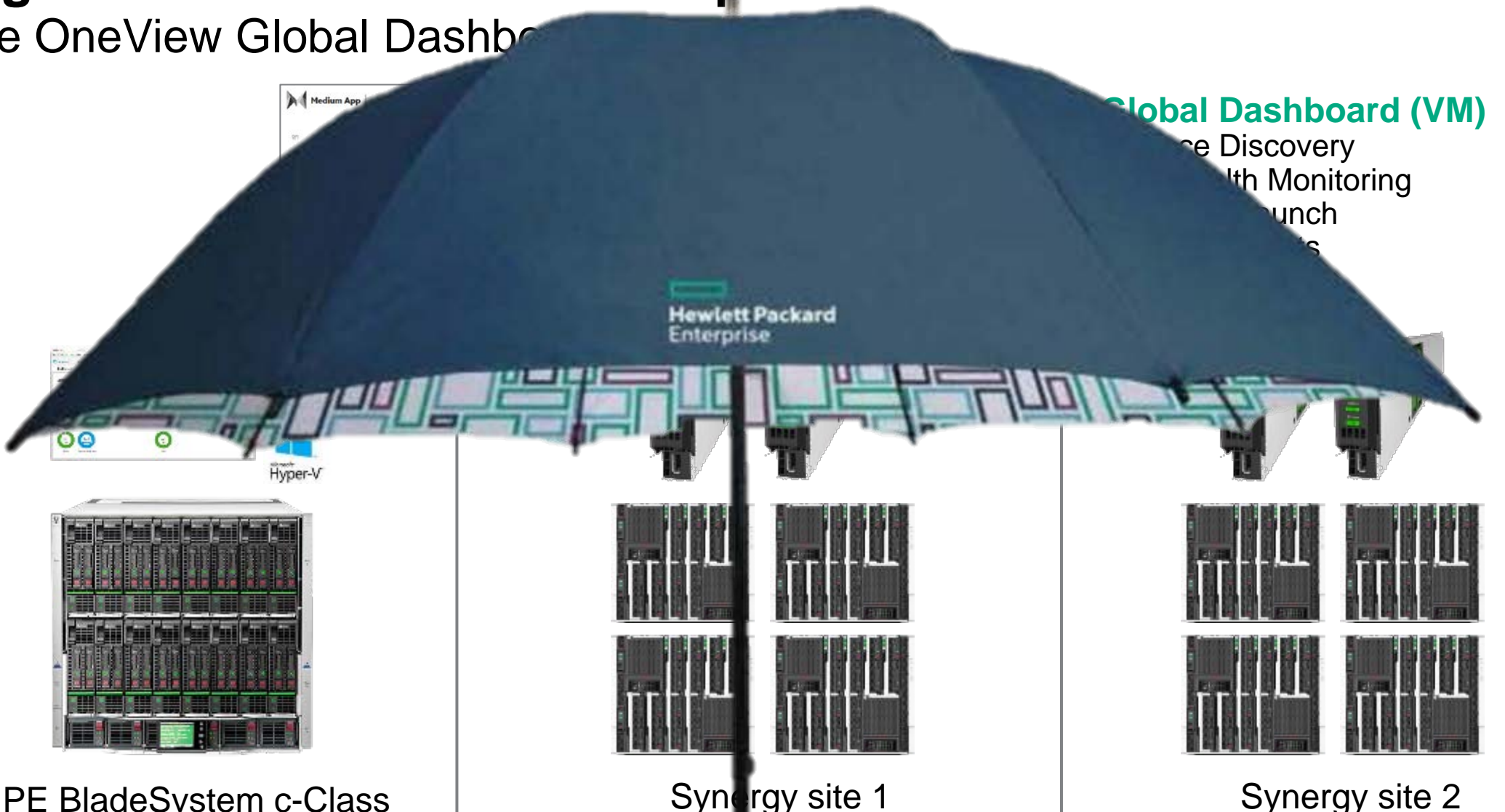
Image library



Deploy at cloud-like speed

Management Architecture – Multiple Sites

Use the OneView Global Dashboard

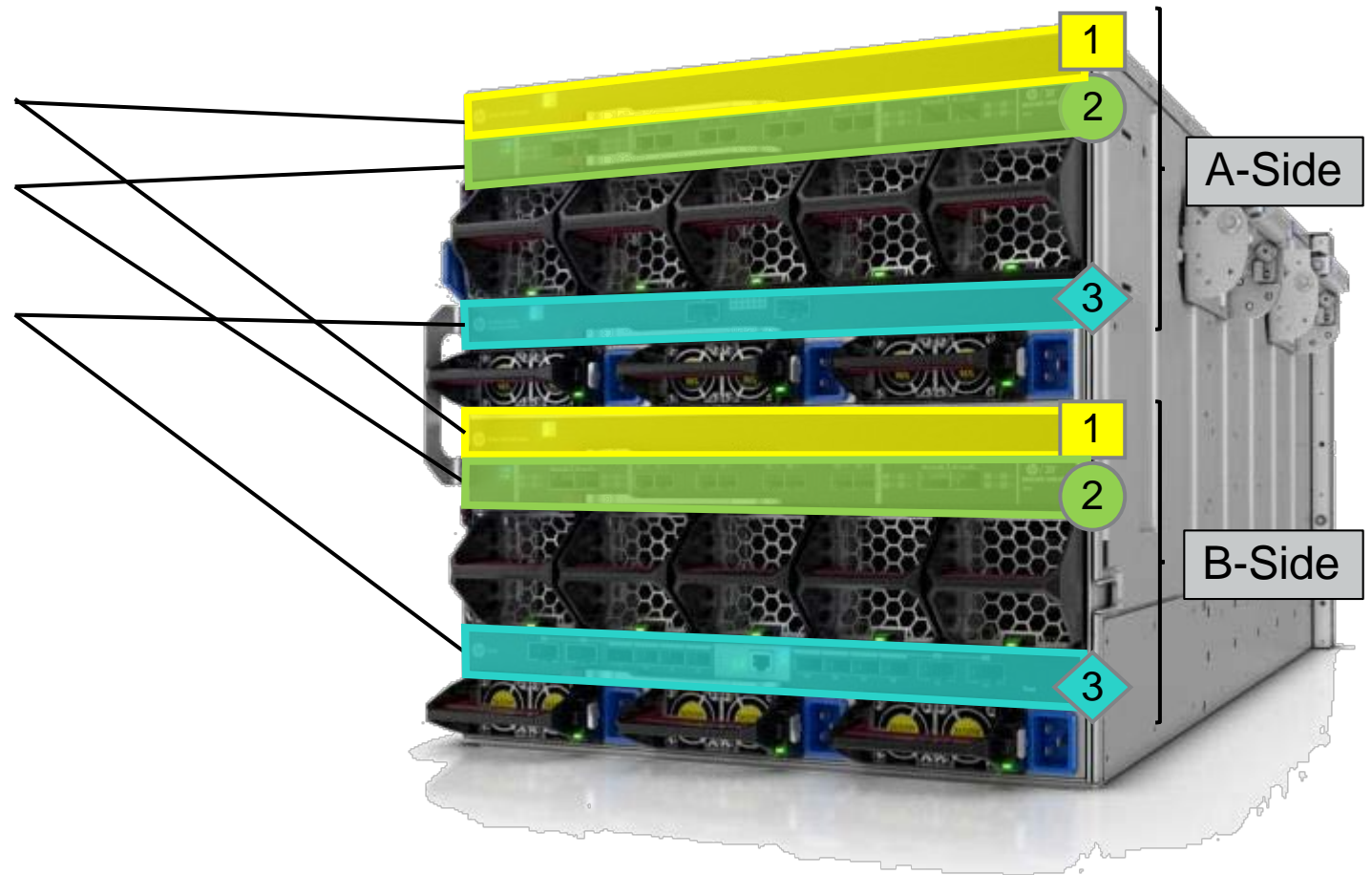


Interconnect Fabrics: best practices

HPE Synergy supports three redundant fabrics

Rules of Thumb:

- ICM Slots 1 & 4 for SAS
- ICM slots 2 & 5 for Fibre Channel, or secondary Ethernet
- ICM slots 3 & 6 for primarily Ethernet



Synergy Compute Module Mezzanine Connections to Fabrics



		SY480 (1 or 2 CPUs)		SY620 (1 or 2 CPUs)		SY660 (2 or 4 CPUs)				SY680 (4 CPUs)			
Processors →		P1	P2	P1	P2	P1	P2	P3	P4	P1	P2	P3	P4
ICM 1 ICM 4	1	1		4	1	1	4			4	10	1	7
ICM 2 ICM 5	2		2		2			2	5	2		8	
ICM 3 ICM 5	3	3		6	3	3	6			6	12	3	9

Required CPU

Optional CPU

PCIe 3.0 x16

PCIe 3.0 x8

Flexible and customizable

Instantly provision your compute resources for any workload



HPE Synergy 480 Gen9



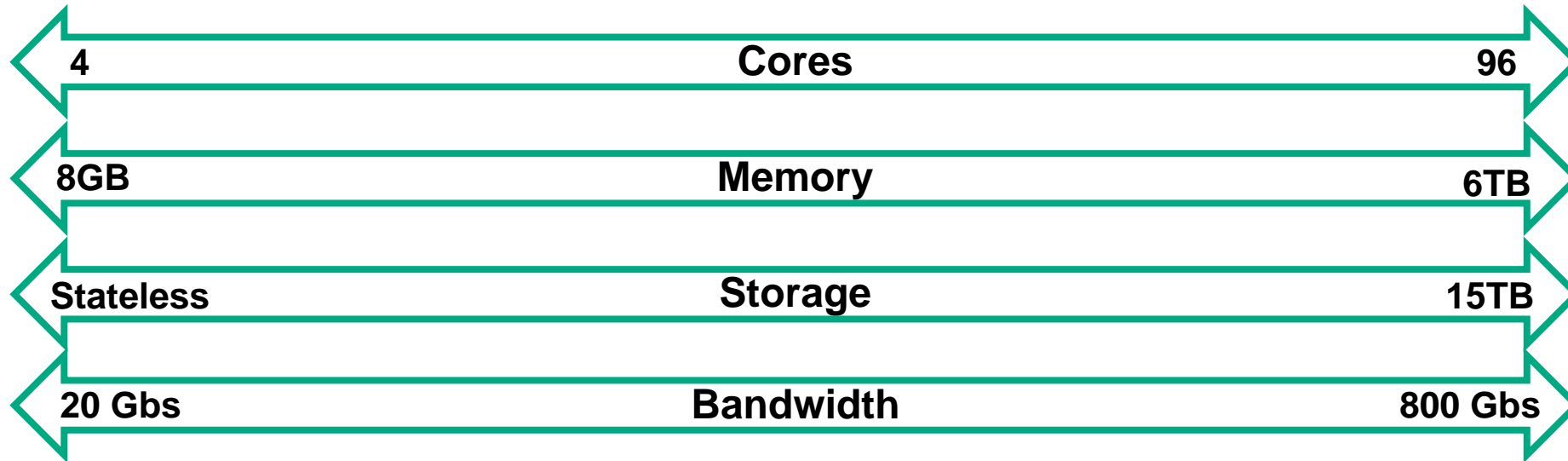
HPE Synergy 660 Gen9



HPE Synergy 620 Gen9



HPE Synergy 680 Gen9



HPE Synergy Compute Module Portfolio

Composable computing to handle any workload



	Synergy 480 Gen9	Synergy 660 Gen9	Synergy 620 Gen9	Synergy 680 Gen9
Form Factor	EP 2-socket half-height	EP 4-socket full-height	EX 2-socket full-height	EX 4-socket full-height, double-wide
Density per enclosure / rack	12 / 48	6 / 24	6 / 24	3 / 12
DIMM Slots	24	48	48	96
Max Memory Size	1.5TB	3 TB	3TB	6TB
Local Storage	Diskless, 2 SFF or 4 uFF; USB and Micro-SD	Diskless, 4 SFF or 8 uFF; USB and Micro-SD	Diskless, 2 SFF or 4 uFF; USB and Micro-SD	Diskless, 4 SFF or 8 uFF; USB and Micro-SD
Storage Options	Direct-attached storage to HPE Synergy D3940, NAS or SAN storage			
Graphics Adapter	NVIDIA Tesla with 1536 cores	N/A	N/A	N/A
Mezzanine Connectors	3 x16 PCIe 3.0	6 x16 PCIe 3.0	2 x16 and 3 x8 PCIe 3.0	4 x16 and 6 x8 PCIe 3.0
IOPs	2M IOPs for drives, controllers and networking in a non-blocking SAS fabric that allows full utilization of flash storage			
Controllers and Networking	<ul style="list-style-type: none"> HP Dynamic Smart Array B140i (standard) HPE H240nr Smart HBA HPE Smart Array P240nr, P542D HPE Synergy 10Gb CNA, 10/20Gb CNA HPE Synergy 16Gb FC HBA 		<ul style="list-style-type: none"> HPE H240nr Smart HBA HPE Smart Array P240nr, P542D HPE Synergy 10Gb CAN, 10/20Gb CNA HPE Synergy 16Gb FC HBA 	

HPE Synergy: Fabric portfolio

Composable Fabric



HPE Virtual Connect SE 40Gb F8
Module and Interconnect Link Modules



HPE VC SE 16Gb Module

- Delivers high performance and composability
- Creates a pool of flexible fabric capacity that can be configured to rapidly provision infrastructure
- Wire-once, change-ready templates that allows workloads to be moved without modifying the network
- Supports native Fibre Channel, FCoE, and Flat SAN storage connectivity
- Easily integrates with existing SAN/LAN infrastructure

Traditional Fabric



HPE Synergy 40Gb Switch Module
and Interconnect Link Modules



Brocade 16Gb FC Switch
for HPE Synergy



HPE Synergy 10/40Gb
Pass Through Module

- Traditional switch functionality at the edge
- Full manual control for network administrators from a Command Line Interface (CLI) and monitoring through HPE Intelligent Management Center (IMC)
- Pass through module allows for a 1 to 1 connection between a compute model and a top of rack switch

Master/Satellite Interconnect Modules (ICM)

Disaggregated fabric eliminates ToR infrastructure

Master Module

- Enabled by OneView
 - Discovery, analysis, port mapping info, and troubleshooting
- Frictionless firmware updates orchestrated by OneView
- Ethernet, FCoE, FC, and iSCSI
- 12 x 10/20Gb downlinks to compute modules
- 4 x 120Gb satellite ports
- 8 x 40Gb uplink ports
 - 6 x 40Gb or 6 x 4x10Gb splitters, or 6 x 4x8Gb FC
 - 2 x 40Gb cluster ports
- **2.56Tb/s total throughput**

20Gb Satellite module

- Link extender: flat network, no hop
 - Line-rate link extension, no oversubscription
 - **Zero intelligence, zero touch configuration, no signal processing**
- Ethernet, FCoE, FC, and iSCSI
- 12 x 10/20Gb downlinks to compute modules
- 2 x 120Gb uplinks to master module
- Up to 2 satellite frames can be stacked with master modules
- Ultra low latency (<8ns)
- Out-of-band management

Module views

- Master module VC SE 40Gb F8



- Satellite module **20Gb**



Master/Satellite Interconnect Modules (ICM)

Disaggregated fabric eliminates ToR infrastructure

Master Module

- Enabled by OneView
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 - 6 x 40Gb or 6 x 4x10Gb splitters, or 6 x 4x8Gb FC
 - 2 x 40Gb cluster ports

– **2.56Tb/s total throughput**

10Gb Satellite module

- Link extender: flat network, no hop
 - Line-rate link extension, no oversubscription
 - **Zero intelligence, zero touch configuration, no signal processing**
- Ethernet, FCoE, FC, and iSCSI
- 12 x 10Gb downlinks to compute modules
- 120Gb uplink to master module
- Up to 4 satellite frames can be stacked with master modules
- Ultra low latency (<8ns)
- Out-of-band management

Module views

- Master module VC SE 40Gb F8

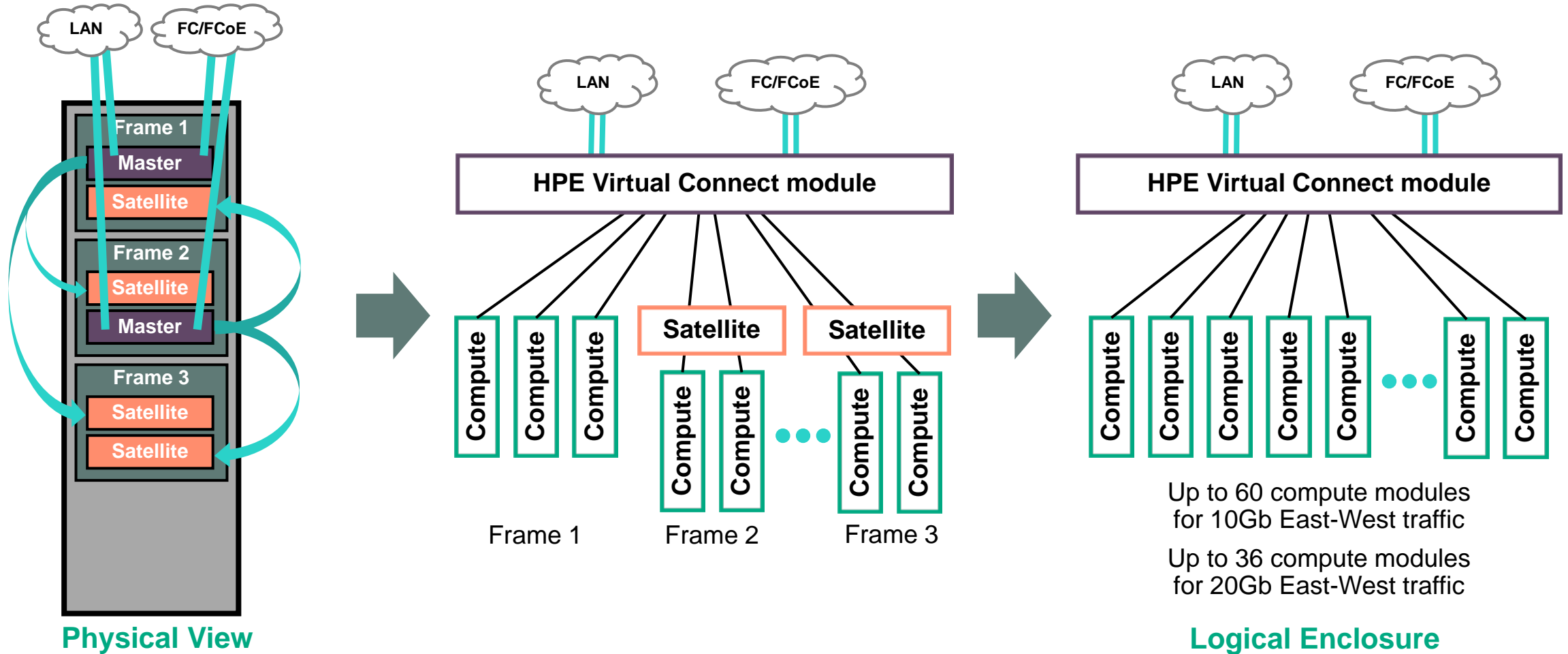


- Satellite module **10Gb**



High performance, rack-scale fabric architecture

Extend fabric without adding an extra hop or sacrificing performance

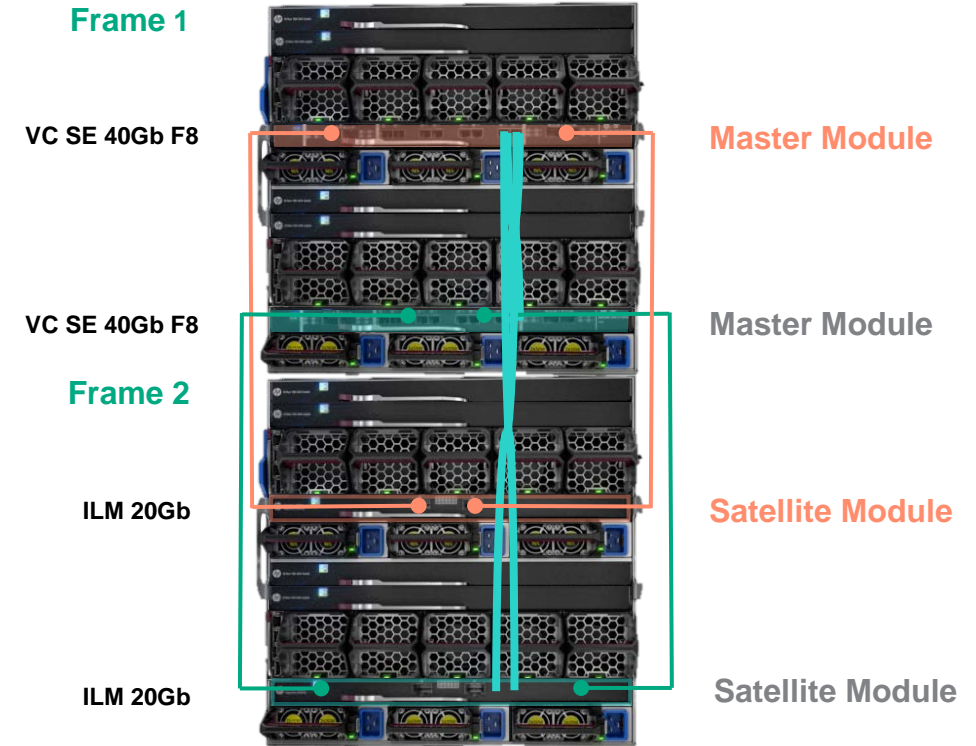


Production Network for HA multi-frame deployment

Frictionless Scaling with 20Gb Interconnect Link Module

Compose on-demand to meet business needs

- Extends networking to Satellite enclosures without adding hops
- Graceful addition of 2nd frame when expanding from 1xframe Redundant to 2xframe HA configuration with 20Gb Satellite modules.
- Easy and intuitive process

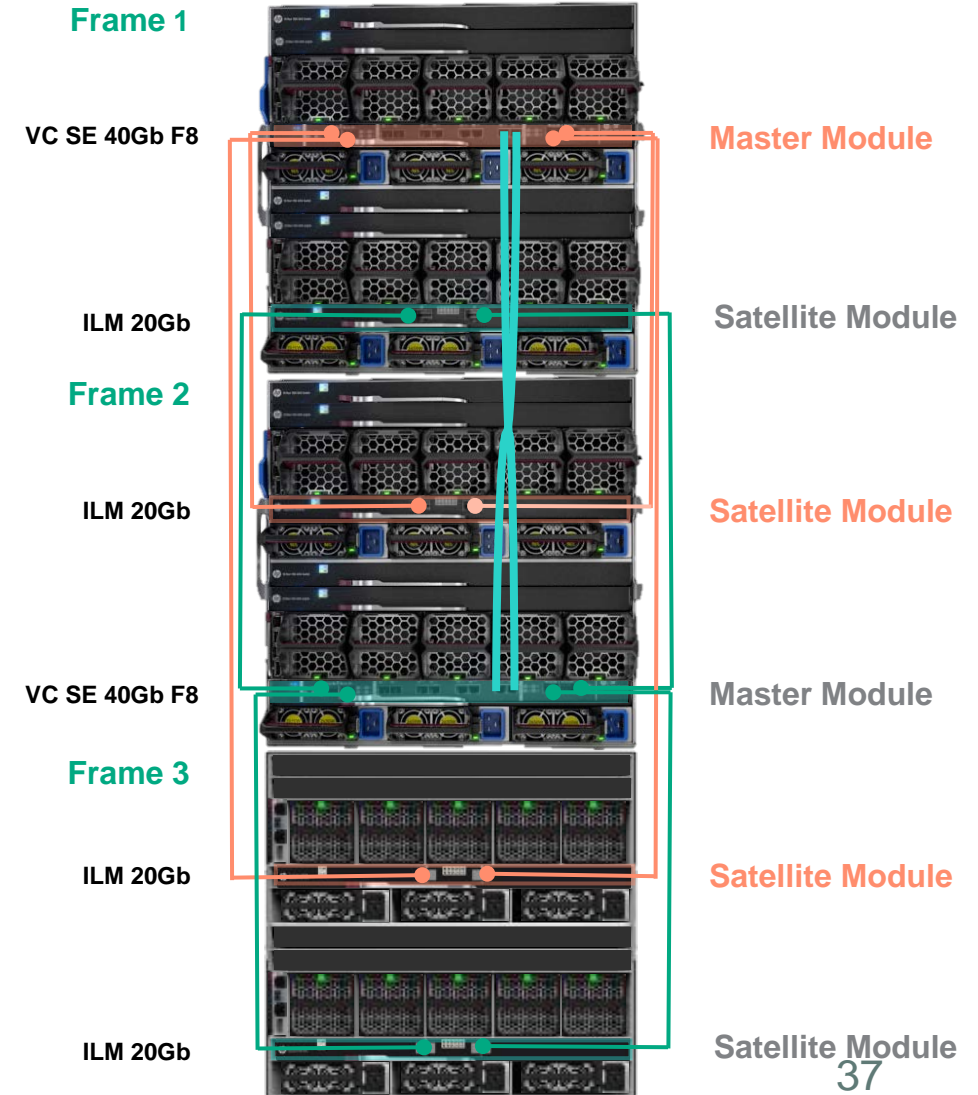


Production Network for HA multi-frame deployment

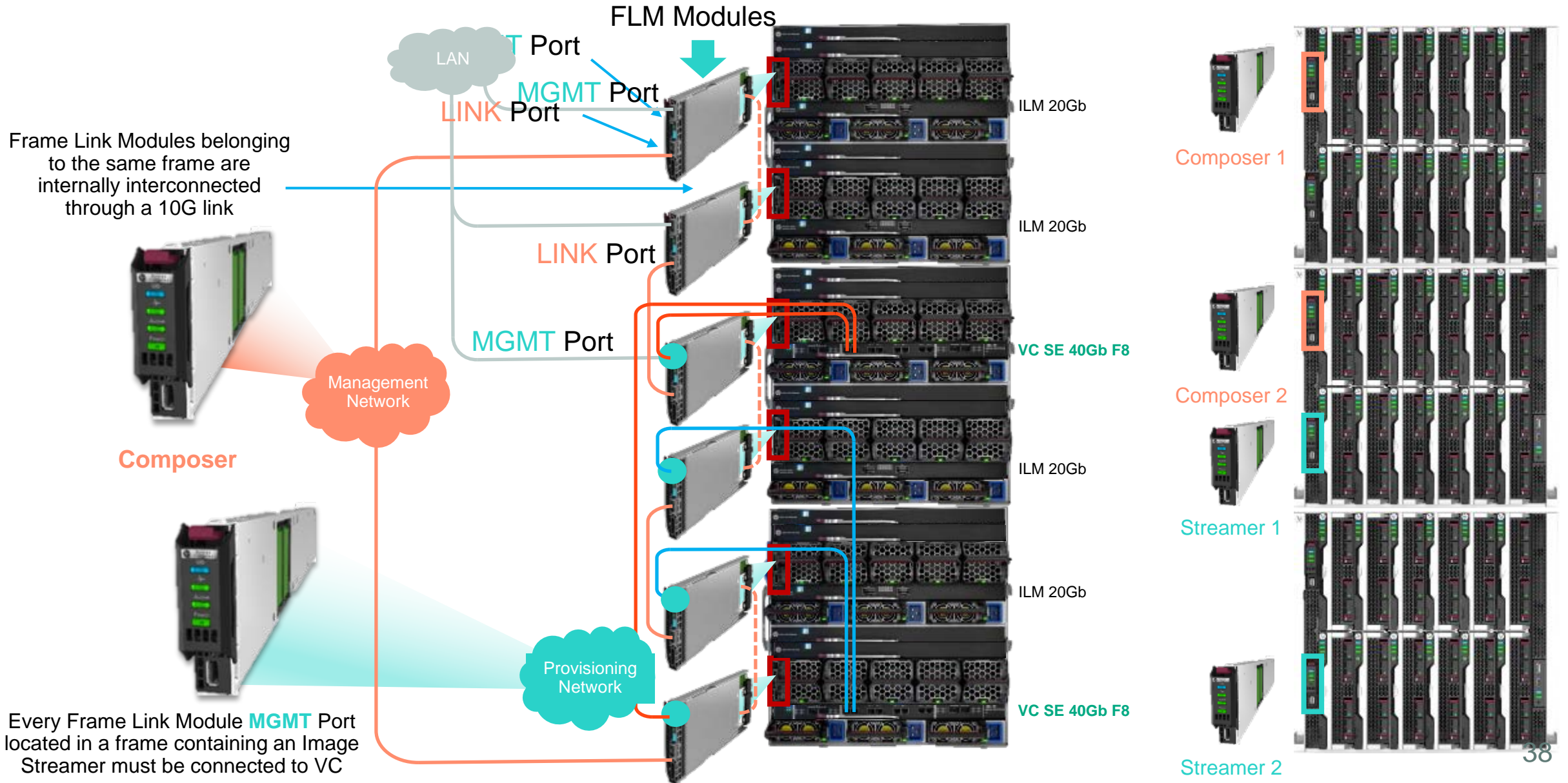
Frictionless Scaling with 20Gb Interconnect Link Module

Compose on-demand to meet business needs

- Extends networking to Satellite enclosures without adding hops
- Graceful addition of 3rd frame from 2xframe HA to 3xframe HA configuration with 20Gb Satellite modules.
- Easy and intuitive process



Adding the management ring: Composer and Image Streamer



HPE Synergy Management: summary

Composable Infrastructure



Scalable On-Demand Topology

- Gapped management network provides management security
- Management ring provides automatic discovery and change detection

Management ('control') domain

- Redundant Composer appliances for HA

Fabric ('data') domain

- Multiple fabric domains per HPE Synergy
- Image Streamer Domain = Fabric Domain
- Redundant Image Streamer appliances per domain

Converged Networking with VC SE 40Gb F8 module

Ethernet, FCoE, Fibre Channel and iSCSI over the same interconnect module

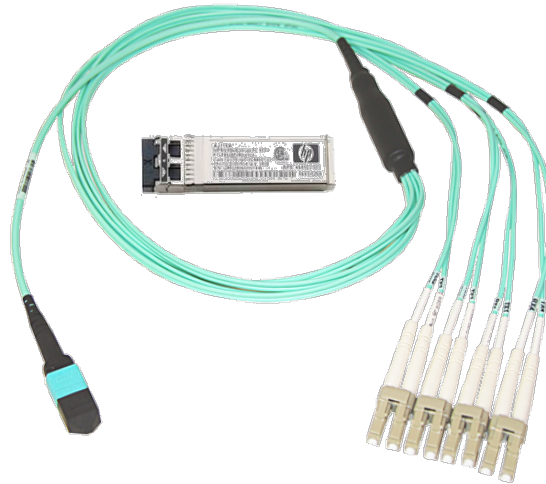
QSFP/SFP+ AOC/DAC splitter cable:

- 4x10 Gb



QSFP+ AOC/DAC cables:

- 40 Gb

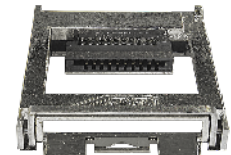


QSFP+ Transceivers

- MPO/MPO: 40 Gb
- MPO/LC breakout cables: 4x10 Gb / 4x8 Gb FC
- Fibre Channel Enabled via FC license
- License is per master module
- All ports and satellite modules are covered with a single license.

QSFP/SFP+ Adapter

- 1x10 Gb



40Gb Crosslinks only,
no splitting!

Synergy Composable Storage: Flexible and Fast

Local



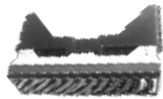
SAS SFF
Smart Drive



SFF NVMe
PCIe Drive



Dual Flash
uFF Drives



Diskless /
stateless (USB or
microSD)

SAS SFF, NVMe SFF, Flash uFF, or
diskless options

Direct-attached Composable Storage



24 drives per rack U
40 SFF drives per module
Up to 5 modules per frame
Redundant I/O adapters for failover
Non-disruptive updates
“Any to any” compossability methodology

NAS or SAN



Composable with OneView
and software-defined infrastructure
templates

Reduce overprovisioning with no fixed ratios

Fluid pool of up to four D3940 storage modules / 160 drives per frame

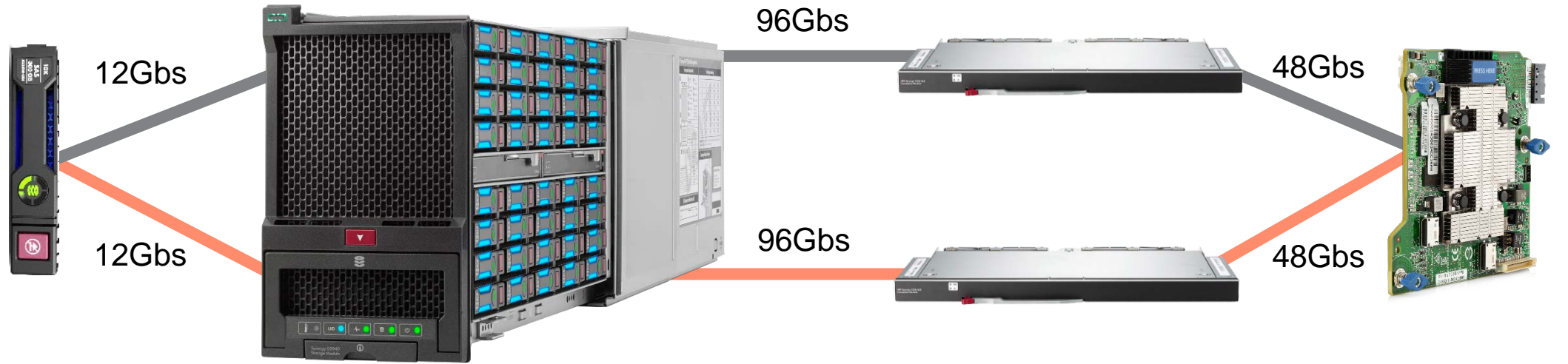


- Up to 71 drives zoned to each P542D controller in-frame
- No predetermined ratio between storage and compute modules
- Choice of any combination of 12Gb and 6Gb SAS or SATA HDDs and SDDs
 - 3.2TB drives require hotfix until Gen10 launch
- Flexible File, Block or Object data support



High Performance Optimized for SSD Storage

Non-blocking SAS fabric allows full utilization of flash storage



Synergy D3940 Storage Module

HPE Synergy 12Gb SAS Connection Module

Smart Array P542D

40 SSDs / storage module
(50,000 IOPs each)

Dual Domain 12Gb SAS
fabric
(24 ports, 4 lanes per port)

10 P542D controllers
(200,00 IOPS+ per
controller)

Example: Synergy Composable Storage

Beth Prof1 | Local Storage ▾ OneView

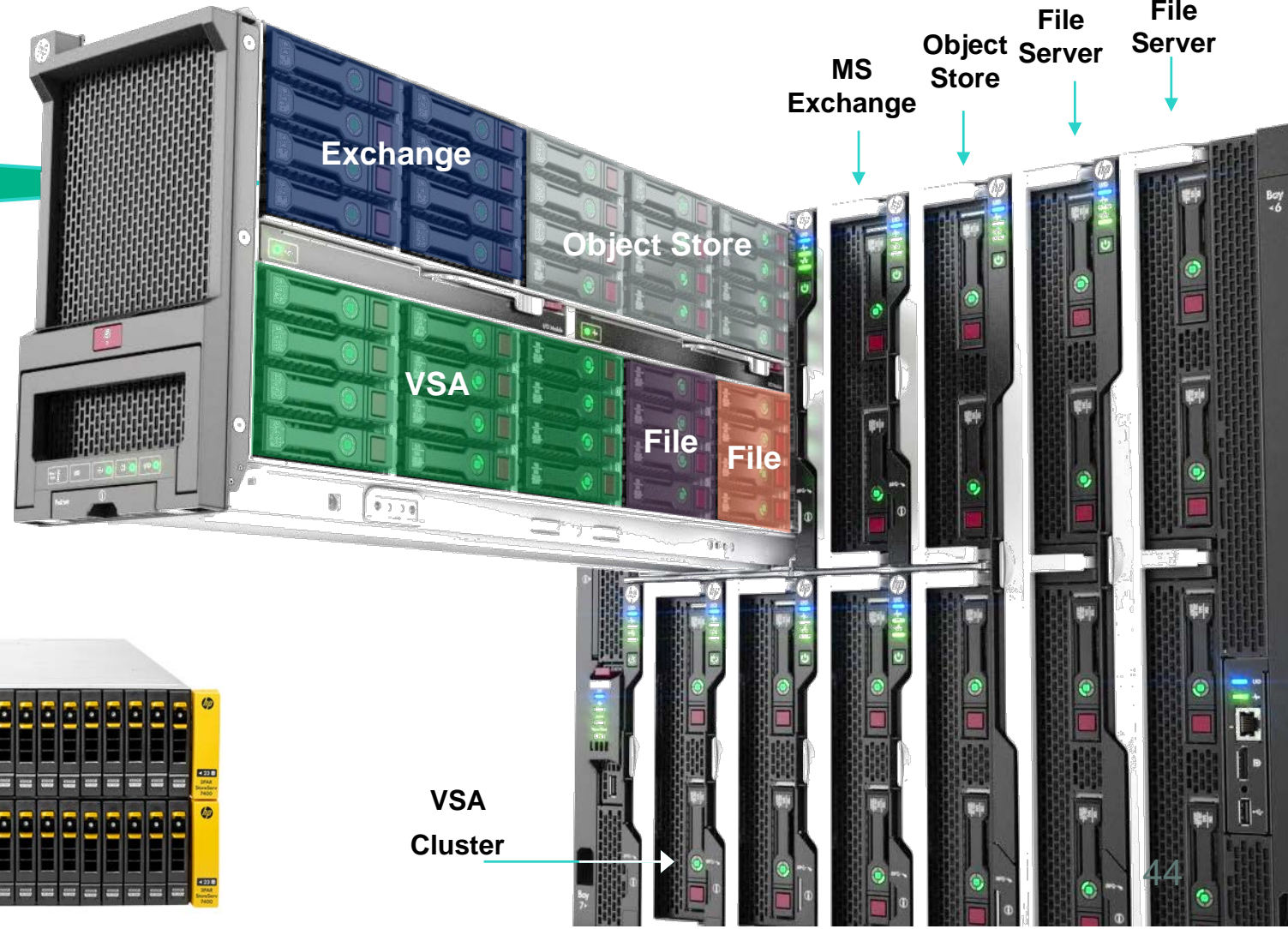
Local Storage ⚙️ Edit

Integrated controller in RAID mode
Initialization of internal storage will occur on next assignment to server hardware.

Logical Drive	Name	RAID Level	Number of Drives	Drive Technology
1	Recovery volume	RAID6	6	SATA SSD
pending	Local Spare drive	RAID1	2	SATA SSD

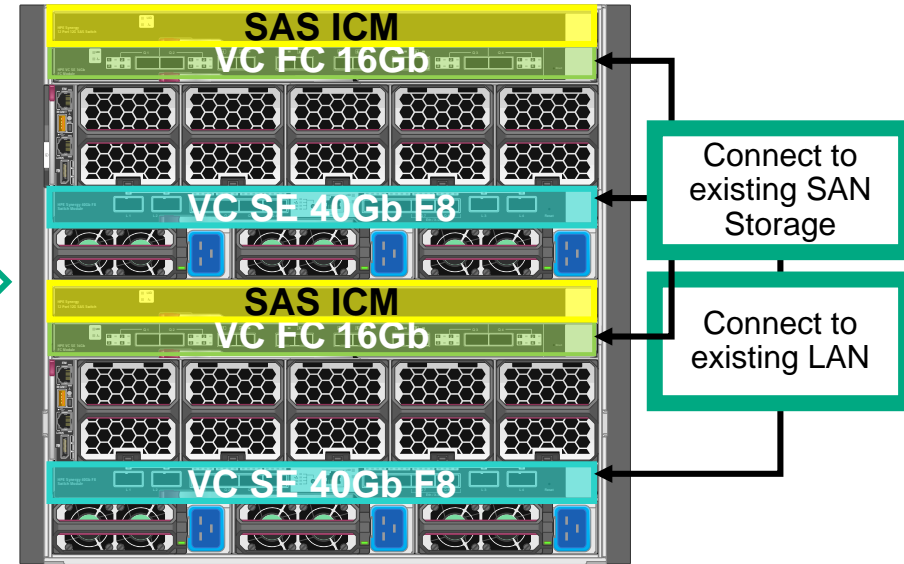
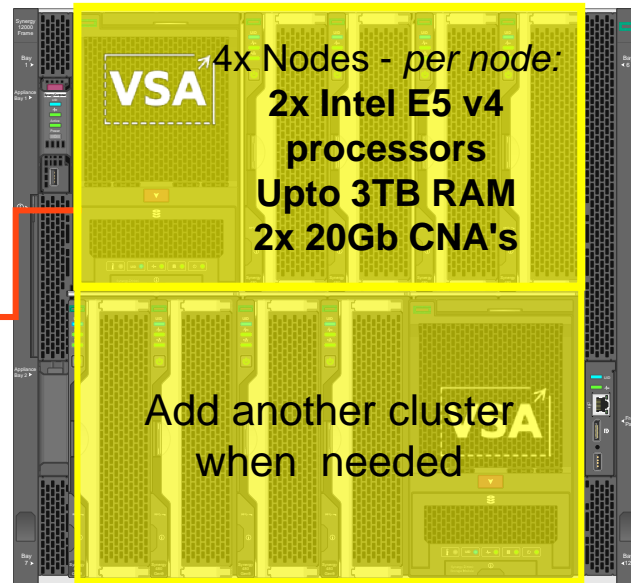
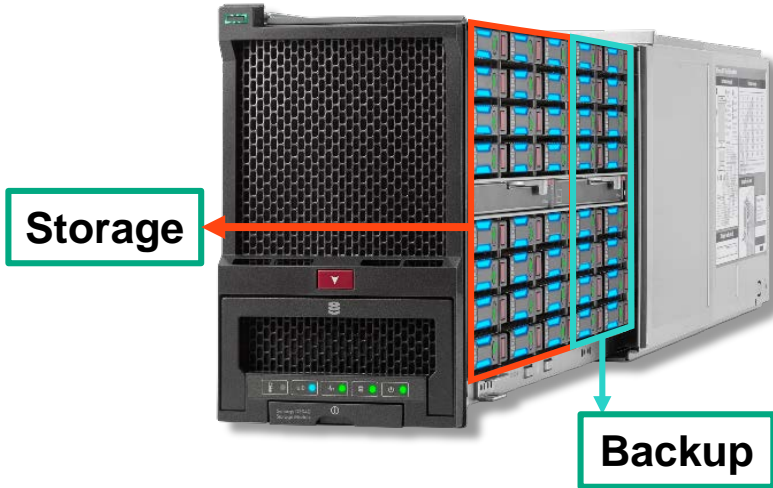
PCI slot 1 controller in RAID mode
Initialization of internal storage will occur on next assignment to server hardware.

Logical Drive	Name	RAID Level	Number of Drives	Drive Capacity
1	Secret database	RAID 1	3	1 TB
2	Data volume 1	RAID 5	8	3 TB
pending	Data volume 2	RAID 5	5	500 GB



Hyper Convergence with HPE Synergy

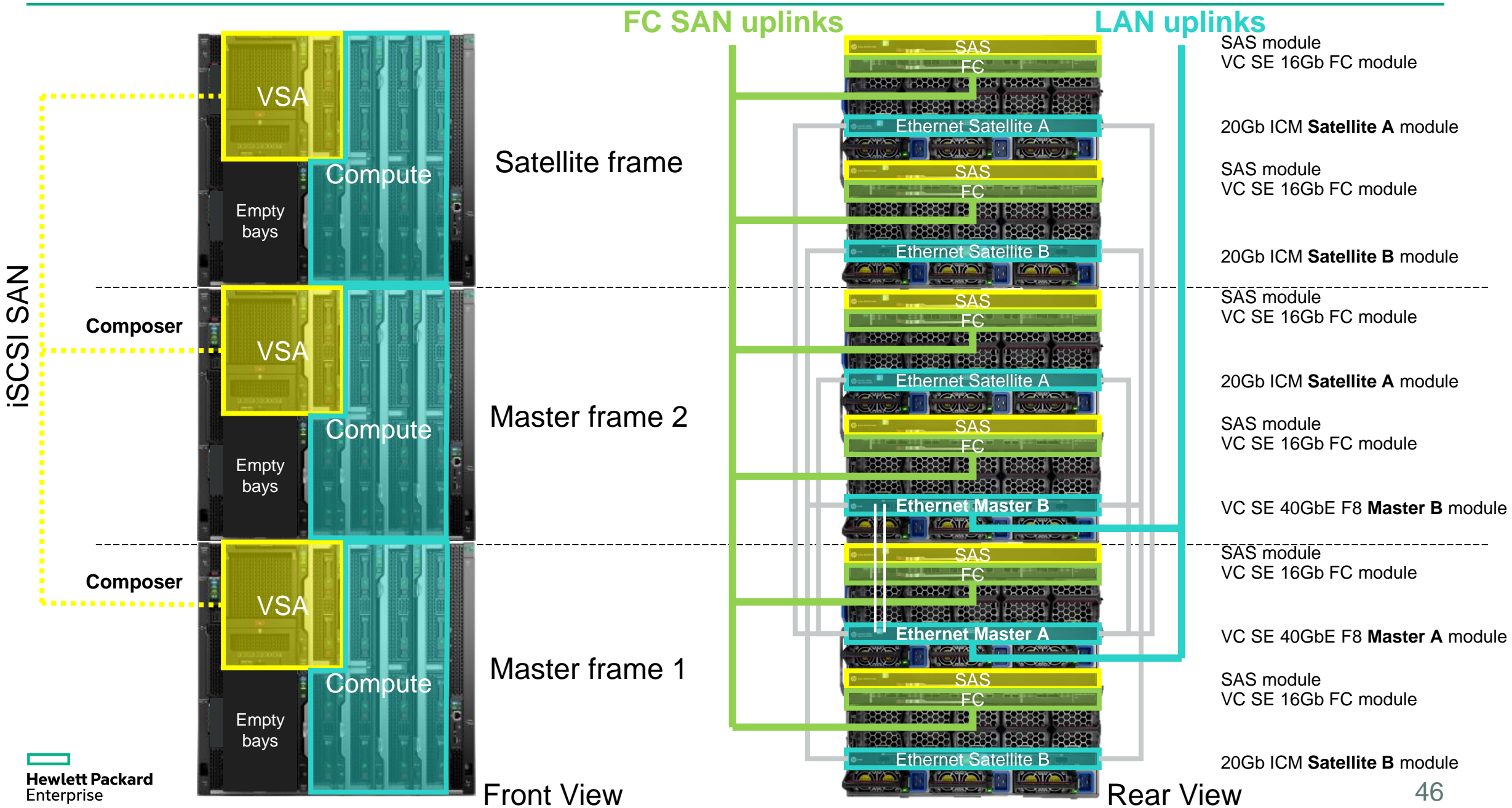
Up to 70TB Usable Capacity per cluster



- Vendor agnostic design. Choose HPE StoreVirtual, VMware vSAN, etc.
- Available with VMware, Microsoft Hyper-V or KVM
- Scalable design that can scale compute & storage independently of each other.

- Leverage built-in replication features to enable disaster recovery across sites.
- Ability to support virtualization of Intel Xeon E7 processors
- Separate storage pools for data and backup, managed as a single appliance

- Support for deduplication, compression and much more
- Low latency 40Gb network fabric for node-to-node replication
- Share storage externally via built-in iSCSI, FCoE/FC or optional FC Modules.





Summary

Composable Infrastructure: HPE Synergy

Summary: Transformational Power of HPE Synergy

I need

```
HPEOVServerProfile -name mysite01 -template ObjectS
```

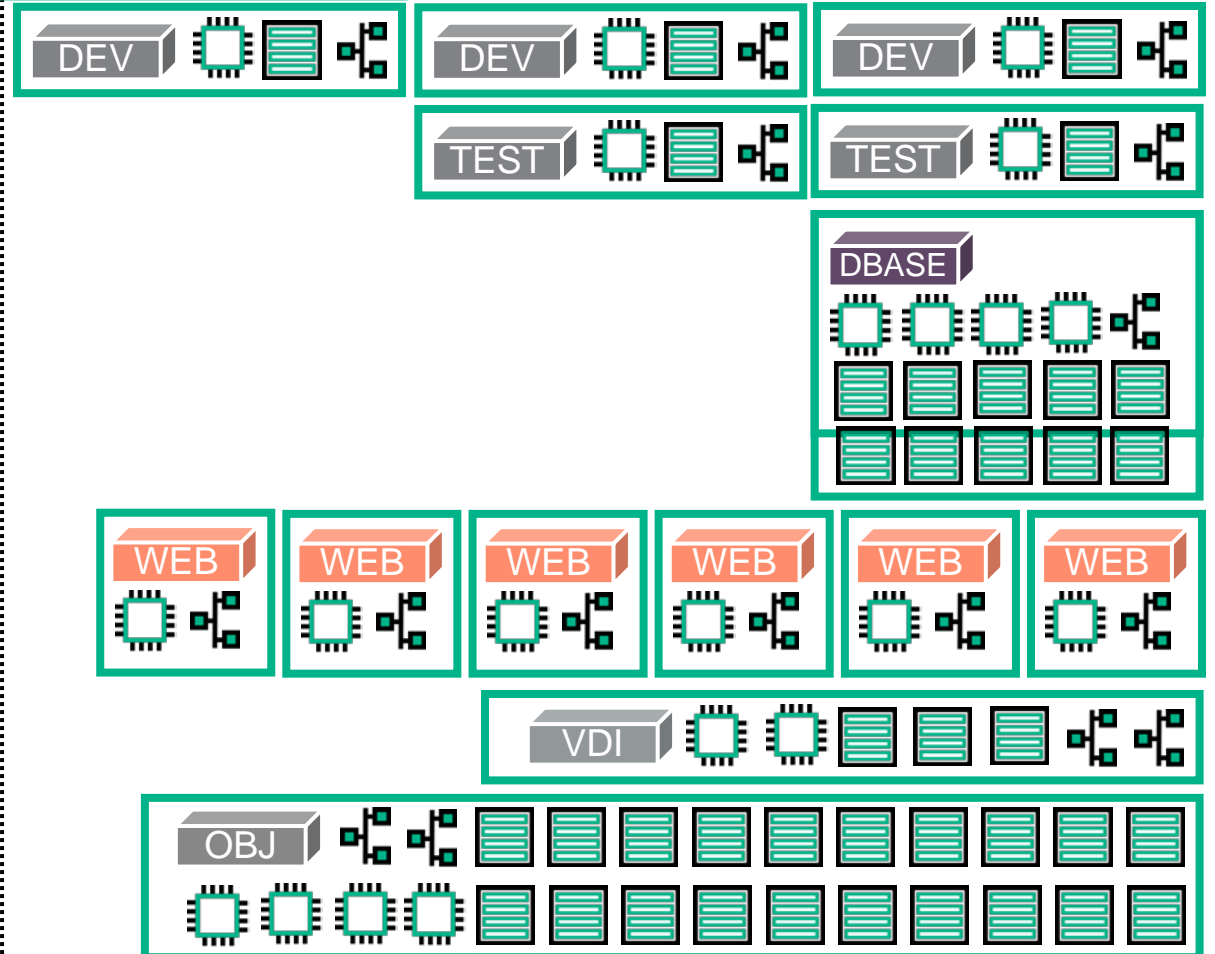
“App Dev/Test environment”

“Make that a bigger Database”

“Web for the holiday season”

“VDI now and holiday is over”

“and Object Storage”!



The Synergy story is SIMPLE!



Platform

HPE Synergy



Environments

Traditional apps
Idea Economy apps



Elements

Fluid Resource Pools
Software Defined Intelligence
Unified API



Benefits

Reduce cost
Deploy at cloud speed
Simplify operations
Develop more apps



Hewlett Packard Enterprise

Thank You!

<https://www.hpe.com/info/synergy>

Run Anything

With HPE Synergy, compute, storage and fabric are now always available as single pools of resources that can be instantly configured according to the specific needs of each application.



HPE Synergy videos

HPE Synergy Introduction (1:52)	https://www.youtube.com/watch?v=iE-spGCMIes
HPE Synergy Image Streamer Video Demo (1:20)	https://www.youtube.com/watch?v=q08A1dZ4I94
HPE Synergy Composer (1:55)	https://www.youtube.com/watch?v=VXc-rP2qAjE
HPE Synergy Frictionless Update Demo (1:41)	https://www.youtube.com/watch?v=uxsy7vEyEA4
HPE Composable Infrastructure Innovation (1:37)	https://www.youtube.com/watch?v=sr_jBJjxPs
HPE Synergy in Two Minutes (2:02)	https://www.youtube.com/watch?v=8tbNdGa2iS0
HPE Synergy with HPE 3PAR 8000 product video (1/44)	https://www.youtube.com/watch?v=q3bOPZkzo38
HPE Synergy: Single infrastructure. Untapped cost savings. Single interface. Improved workflow. (3:33)	https://www.youtube.com/watch?v=5kH6qriLX74
Simplify Lifecycle operations with HPE OneView Global Dashboard (2:33)	https://www.youtube.com/watch?v=M2Fz1hK6u84
Your Infrastructure Automation Engine: HPE OneView 3.0 (2:17)	https://www.youtube.com/watch?v=Tz1jAAo2H_4