Hewlett Packard Enterprise

Synergy

Infrastructure as Code

Industry's most complete portfolio

Workload optimized, engineered for any demand

ProLiant BL family

Cloud-ready Converged Infrastructure

ProLiant DL family

Versatile, rack-optimized servers

ProLiant ML family

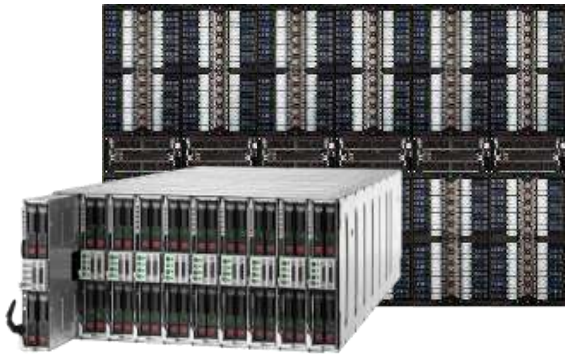
Expandable tower servers

ProLiant SL family

Purpose-built density-optimized servers

HP Moonshot

The world's first software defined server

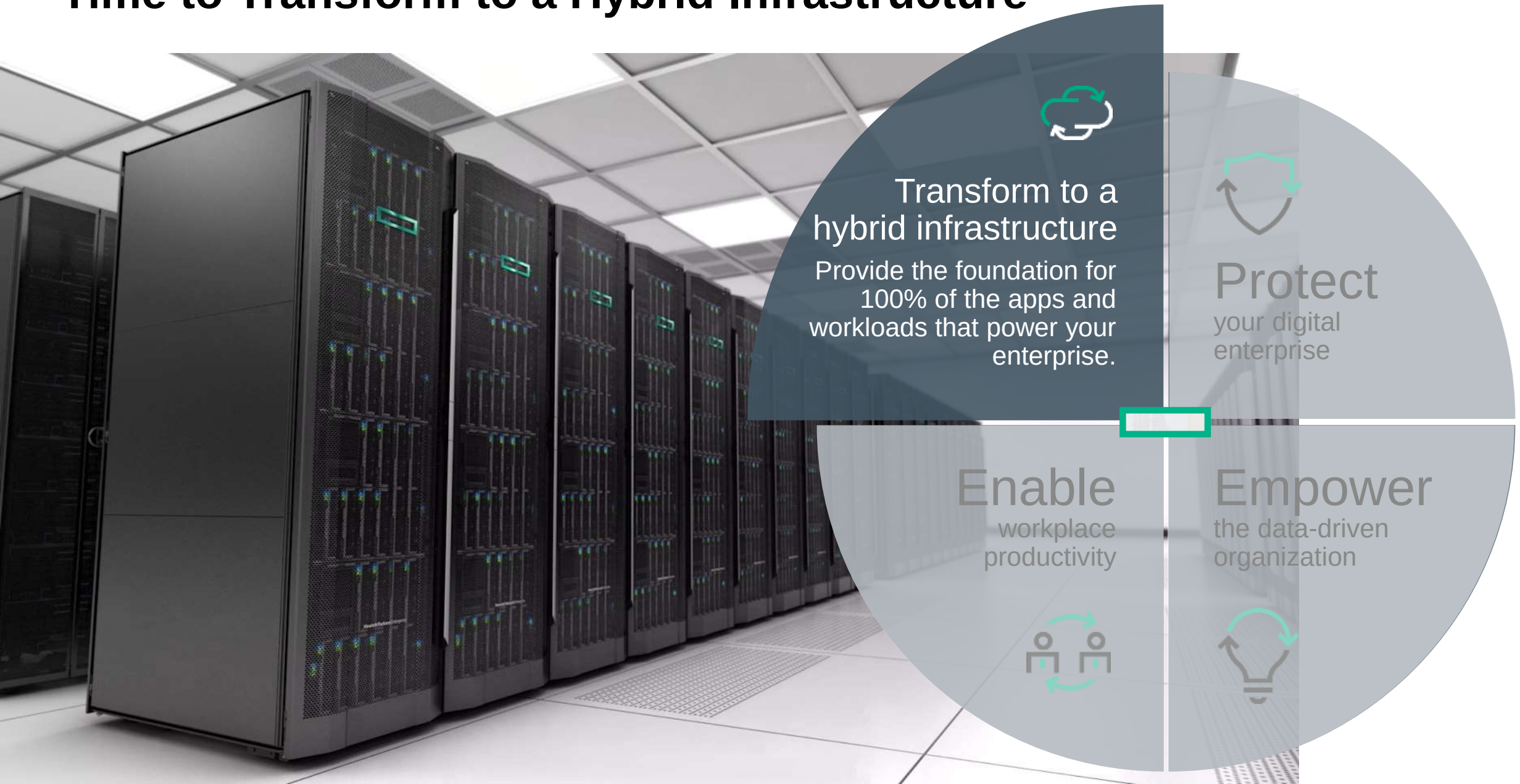


HP Apollo

Optimized rack-scale computing for HPC

Hewlett Packard Enterprise

Time to Transform to a Hybrid Infrastructure



Transform to a hybrid infrastructure

Provide the foundation for 100% of the apps and workloads that power your enterprise.

Protect

your digital enterprise

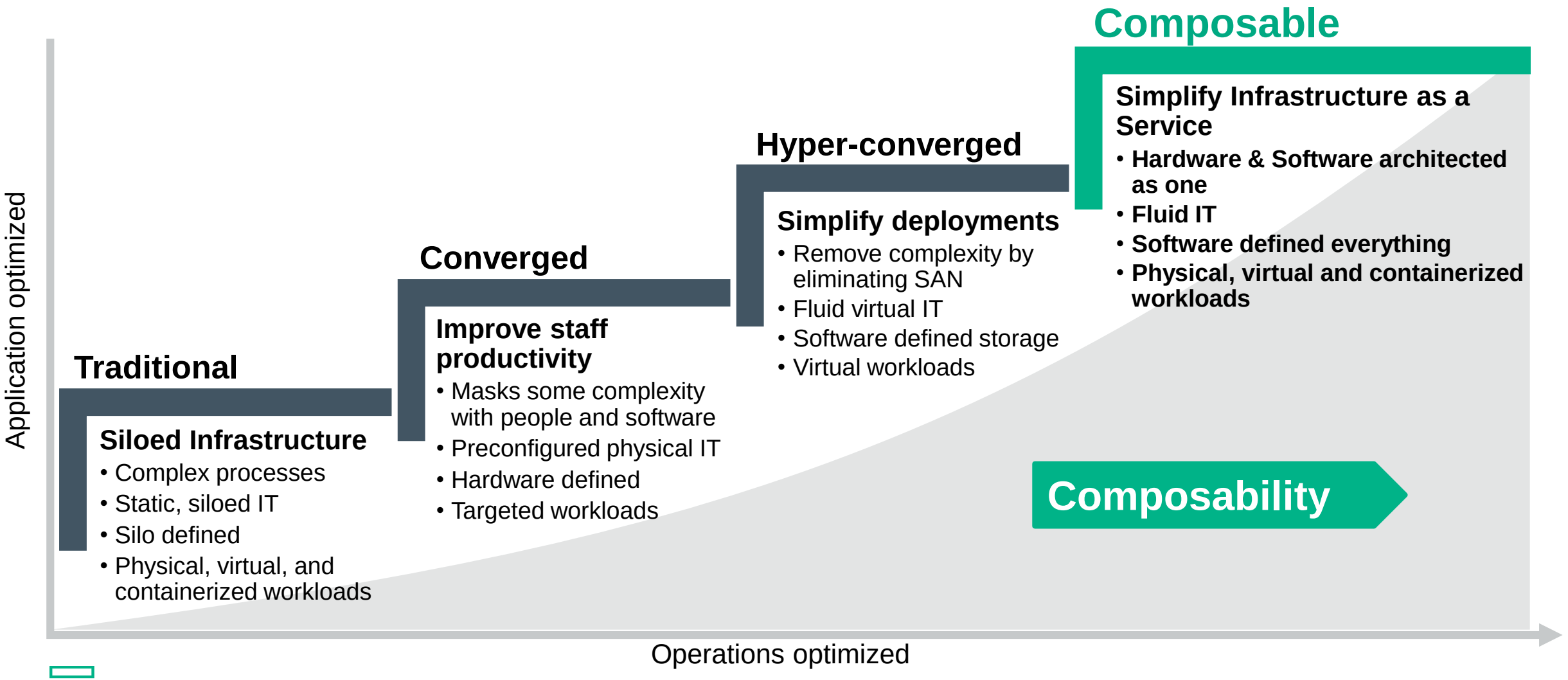
Enable

workplace productivity

Empower

the data-driven organization

A new category of infrastructure is needed to power the Idea Economy



Hewlett Packard Enterprise

HPE Synergy

1. Optimized for the Composable Infrastructure (**Infrastructure as Code**)
2. Infrastructure ready for the next 15+ Years
3. Highly Available solution to protect the customers data availability
4. Easily integrates into existing data centers

"The Converged Infrastructure I always wanted to create."
Gary Thome: Chief Architect, Infrastructure Software and Blades

Hewlett Packard Enterprise

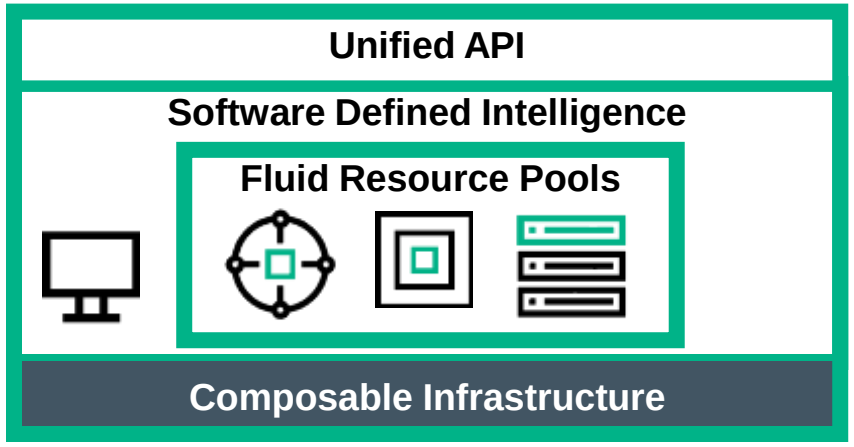
Composable Infrastructure Defined

Fluid Resource Pools

- Single infrastructure of disaggregated pools of compute, storage and fabric that boots-up ready for any workload
- Physical, virtual and containers
- Auto-integrating of resource capacity

Software-Defined Intelligence

- Template-driven workload composition
- Frictionless operations

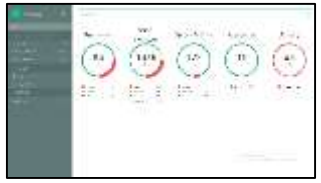


Unified API

- Single line of code to abstract every element of infrastructure for full infrastructure programmability
- Bare metal interface for Infrastructure as a Service

Hewlett Packard Enterprise

HPE Synergy: Engine for the Idea Economy



HPE Composer

Integrated software-defined intelligence to self-discover, auto-integrate and scale from racks to rows

Composable Compute

Provides the performance, scalability, density optimization, storage simplicity, and configuration flexibility

Composable Frame

Everything needed to run applications, so IT can be quickly setup and consumed

Auto-integrating makes scaling simple and automated at rack/row scale

Photonics and memristor ready for investment protection

Code Friendly Infrastructure

Composable Fabric

Rack scale multi-fabric connectivity eliminates standalone TOR switches

Composable Storage

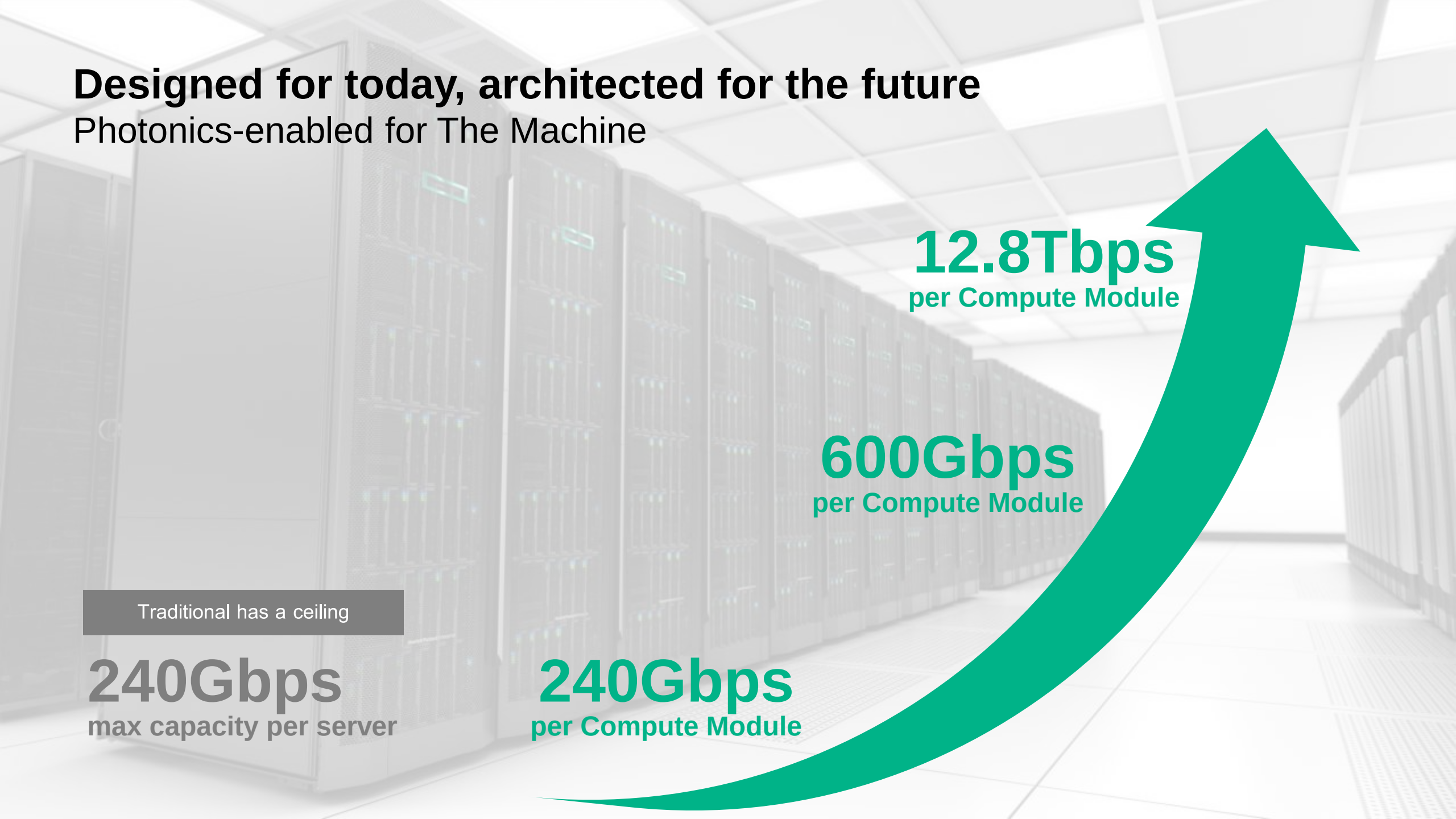
High-density integrated storage

Compose any compute with any storage (SDS, DAS, SAN)

Hewlett Packard Enterprise

Designed for today, architected for the future

Photonics-enabled for The Machine



The Synergy Composer

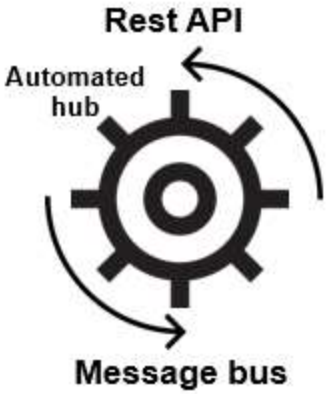
Hewlett Packard Enterprise

HPE Synergy Composer Appliance

HPE Synergy Composer management appliance composes and deploys system resources for your application needs. Software-defined intelligence aggregates Compute, Storage and Fabric resources in a fluid manner that scales to your workloads and is programmatically accessible from a Unified API.

Key Features:

- Protect management environments by leveraging highly available, redundant physical appliances
- Ensure reliability and repeatability by using workload templates
- Increases agility and enable flexible capacity-on-demand through auto-integration of resource capacity to automate scaling.
- Achieve higher operational efficiencies by utilizing resources across physical bare metal, virtualized, and containerized workloads
- Improve developer productivity using a Unified API to access Infrastructure-as-a-Service and Infrastructure-as-code approaches



HPE Synergy Composer
Powered by OneView 3.0

HPE Synergy Management Subsystem

Synergy Composer

Management appliance with embedded HPE OneView

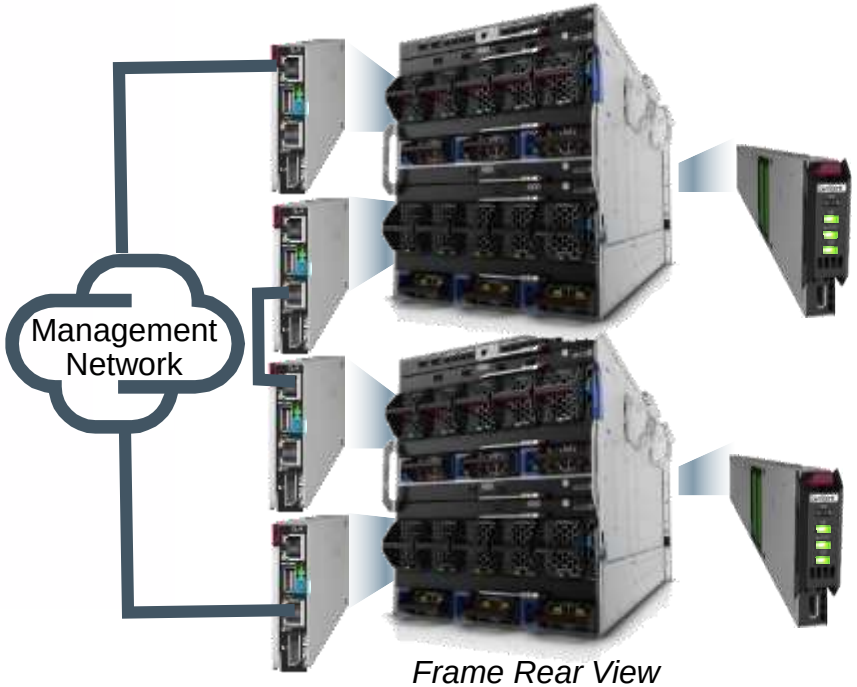
Synergy Frame Link Module

Presents device information to Composer and forms management ring.

Synergy Image Streamer

Image repository and boot location for stateless resources

Multi-Frame Management Ring



Frame Rear View

Connects multiple frames via 10GBASE-T network

Hewlett Packard Enterprise

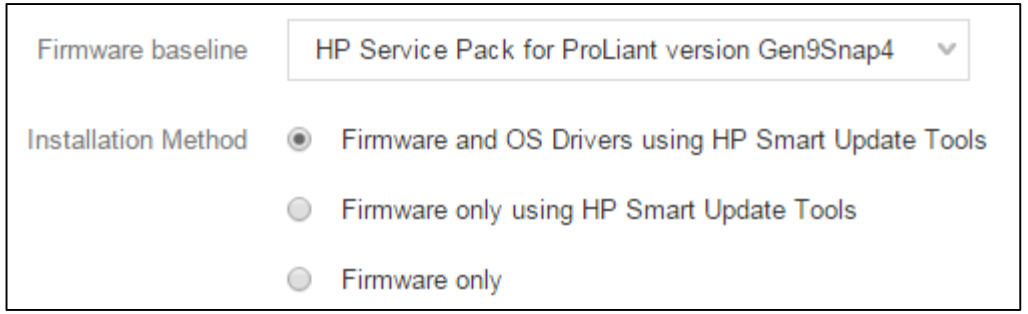
Firmware and OS Driver updates for Compute nodes

HPE Unique

Key Benefits

- Combined driver & firmware updates
- Operational simplicity
  - No OS credentials required
- No production network performance impact
  - Leverages management network
- Separate staging, installation, and update for simpler cross-team coordination

1 Set Firmware/Driver baseline via HPE Synergy Composer



2 Updates are either fully automated or staged pending future reboot.*

** Note: Update method selected at HP SUT installation time*

Hewlett Packard Enterprise

Composable Compute

Hewlett Packard
Enterprise

HPE Synergy 480 Gen9 Compute Module Overview

The HPE Synergy 480 Gen9 Compute Module enables a pool of flexible compute capacity within a composable infrastructure and is designed to deliver superior capacity, efficiency, and flexibility to power more demanding workloads by providing a full range of processor choices, right-sized storage options, a broad memory footprint, and simplified I/O architecture in a 2-socket, half-height form factor.

Key features:

– Up to 1.5 TB of HPE DDR4 SmartMemory and Intel Xeon processors in a 2-socket half-height form factor

– Composable compute flexibility to optimize storage choices and match a broad range of workload requirements including support for NVMe workload acceleration and composable storage.

– Three mezzanine connectors with simplified I/O architecture for expandability, choice of fabric, and long-term design for improved ROI.

– GPU options for VDI

Hewlett Packard Enterprise

HPE Synergy 660 Gen9 Compute Module Overview

The HPE Synergy 660 Gen9 Compute Module delivers higher performance and scalability for your demanding, enterprise data-intensive workloads. The powerful processors and the broader memory footprint in a full-height form factor give your applications like structured databases and business processing the resources they demand.

Key features:

- Up to 3TB of HPE DDR4 SmartMemory and Intel Xeon processors in a 4-socket full-height form factor
- Composable compute flexibility to optimize storage choices and match a broad range of workload requirements including support for NVMe workload acceleration and composable storage.
- Six mezzanine connectors with simplified I/O architecture for expandability, choice of fabric, and long-term design for improved ROI.

Hewlett Packard Enterprise

HPE Synergy 620 and 680 Gen9 EX Compute Modules Overview

The HPE Synergy 620 and 680 Gen9 Compute Modules deliver the highest levels of availability, performance, and memory for data-intensive workloads.

Key features of Synergy 620:

- Composable Compute and Memory:
  - Up to **3TB** of HPE DDR4 SmartMemory and Intel Xeon EX processors in a 2-socket full-height form factor
- Composable Storage:
  - Local: **2 small form factor or 4 micro form factor** SAS/SATA/NVMe/SSD drives for workload acceleration, online spares, to support different RAID levels, or for higher availability and performance
  - Low Cost Boot: 1 external USB, 1 internal USB, 1 internal micro-SD for low cost boot solutions and separation of boot drives from applications
  - Direct Attach to up to 160 SFF drives in a single enclosure: can be configured as a shared storage array with local storage
  - SAN: to protect existing investments
- Composable Fabric:
  - Five mezzanine connectors with simplified I/O architecture for expandability, choice of fabric. and long-term design for improved ROI.

Key features of Synergy 680:

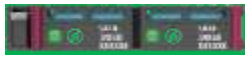
- Composable Compute and Memory:
  - Up to **6TB** of HPE DDR4 SmartMemory and Intel Xeon EX processors in a 4-socket full-height, double-wide form factor
- Composable Storage:
  - Local: **4 small form factor or 8 micro form factor** SAS/SATA/NVMe/SSD drives for workload acceleration, online spares, to support different RAID levels, or for higher availability and performance
  - Low Cost Boot: 1 external USB, 1 internal USB, 1 internal micro-SD for low cost boot solutions and separation of boot drives from applications
  - Direct Attach to up to 160 SFF drives in a single enclosure: can be configured as a shared storage array with local storage
  - SAN: to protect existing investments
- Composable Fabric:
  - Ten mezzanine connectors with simplified I/O architecture for expandability, choice of fabric, and long-term design for improved ROI.

Synergy Compute Storage – Flexible and Fast

Local

SAS SFF Smart Drive

SFF NVMe PCIe Drive



Dual Flash uFF Drives

Diskless / stateless (use USB or microSD)

- SAS SFF, NVMe SFF, Flash uFF, or diskless options
- Unique SFF Flash Adapter packages 2 uFF drives in each drive carrier for double the drive count
- Supports solutions that require an on-line spare

Direct-attached Composable Storage

- 24 drives per rack U of space
- 40 SFF drives per module
- Up to 5 modules in an enclosure
- Redundant I/O adapters for failover
- Composed resource with non-disruptive updates
- “Any to any” composability methodology

NAS or SAN

- Composable with OneView and software-defined infrastructure templates
- Protect existing storage investments:
  - 3PAR F400, 7000, 7450, 8000, 10000, 20000
  - XP P9500 and XP7
  - EVA P6350
  - MSA P2000 G3 and MSA P2040 G4
  - LeftHand OS P4330

Hewlett Packard Enterprise

HPE Synergy Compute Storage and Network Fabric Features

Support for I/O intensive workloads

- High Speed / Performance Storage and Network Fabrics (2.56Tb/s east-west throughput in any configuration per fabric; 2M iOPs optimized for SSD storage)
- Resiliant Fabric Choices (Ethernet, FCoE, FC, iSCSI - M-LAG for resiliency)
- Simple I/O architecture (multiple fabric modules appear as one logical switch to upstream architecture; eliminate TOR switch)
- 10Gb Air-Gapped Management Network for security
- Frame Link and Management intelligence and reporting

40Gb F8 Switch Module

20Gb ICM

VC SE 40Gb F8 Module

VC SE 16Gb FC Module

10Gb/40Gb Pass Thru Module

10Gb ICM

Frame Link Module

Hewlett Packard Enterprise

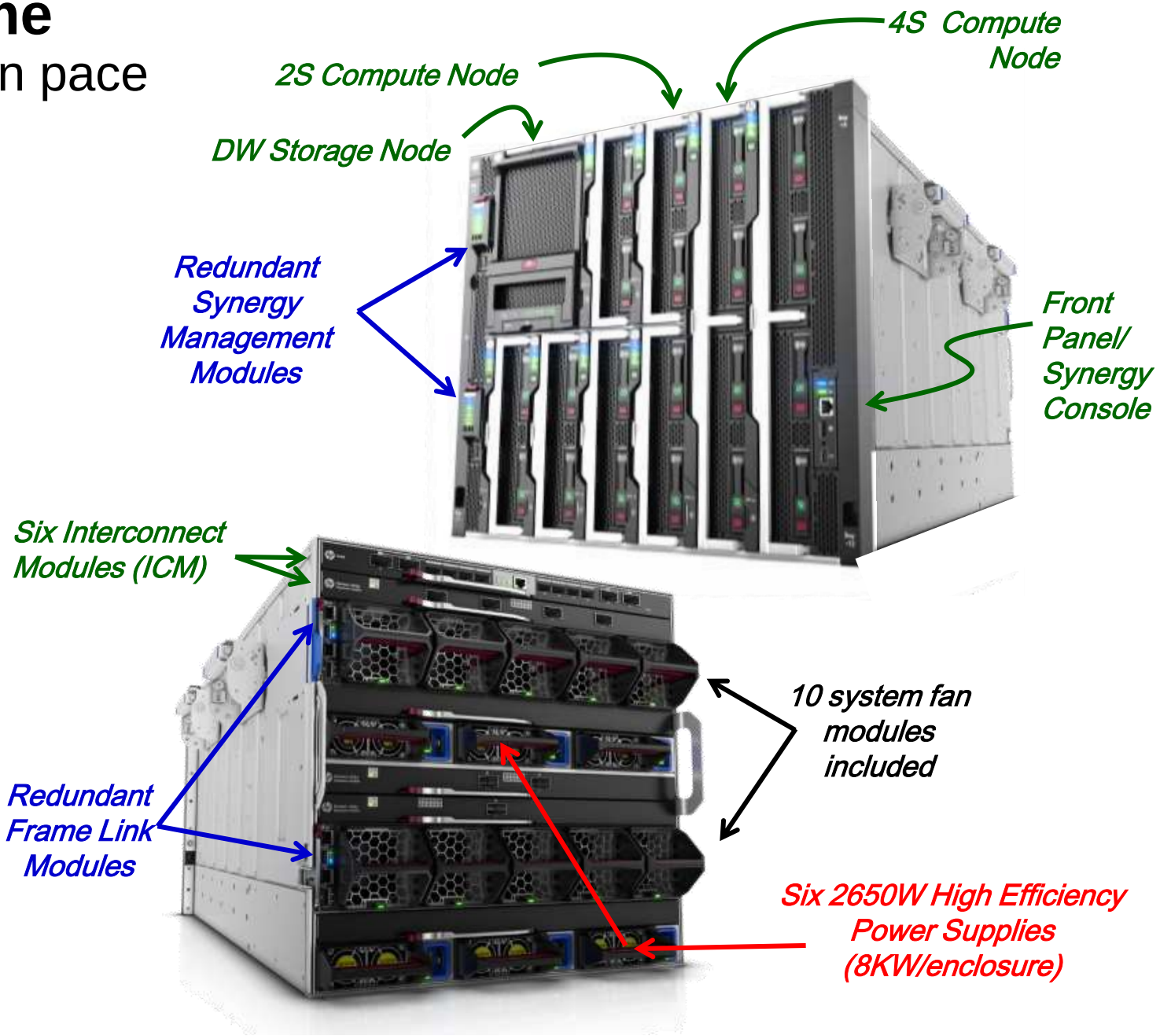
The Synergy Frame

Hewlett Packard
Enterprise

HPE Synergy 12000 Frame

Seamless transition at your own pace

- ✓ Fits a 10U rack space
- ✓ Uses same power loads as today
- ✓ Cool up to 30% more than today with fans included in every Frame
- ✓ Supports all the Compute modules available
- ✓ Redundant Appliance Bays and Frame Link Modules
- ✓ Supports up to 3 redundant Fabrics

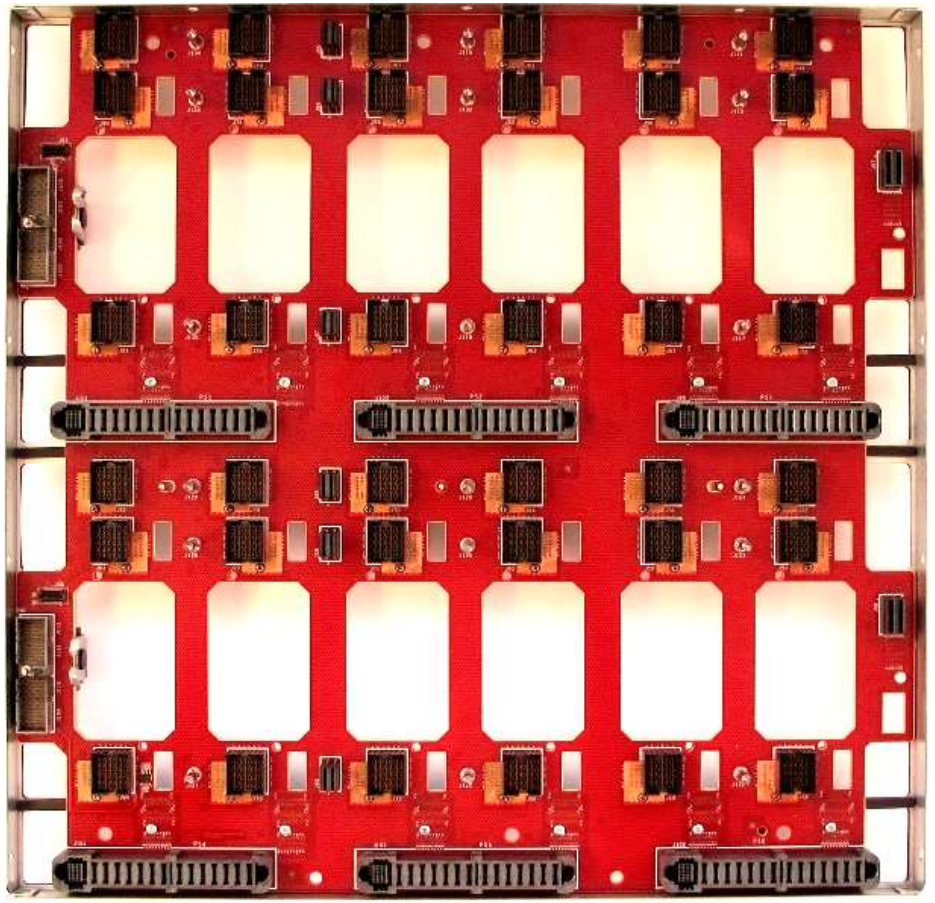


Hewlett Packard Enterprise

The Synergy Frame Midplane Architecture

Next generation Physical Characteristics

- **Module Volume Increased By 55%**
- **Simplified Construction**
  - All passive infrastructure
    - No cables
    - No separate, heavy, expensive power bus plate
    - Full redundancy of power, fabric, management
- **Cooling**
  - Improved Node cooling (~2.5x vs. c-Class)
  - Deterministic airflow for Nodes and ICMs
  - Industry standard fans
- **Power**
  - Full use of 30Amp feed (8.2kW)
  - ~25% more power per Node

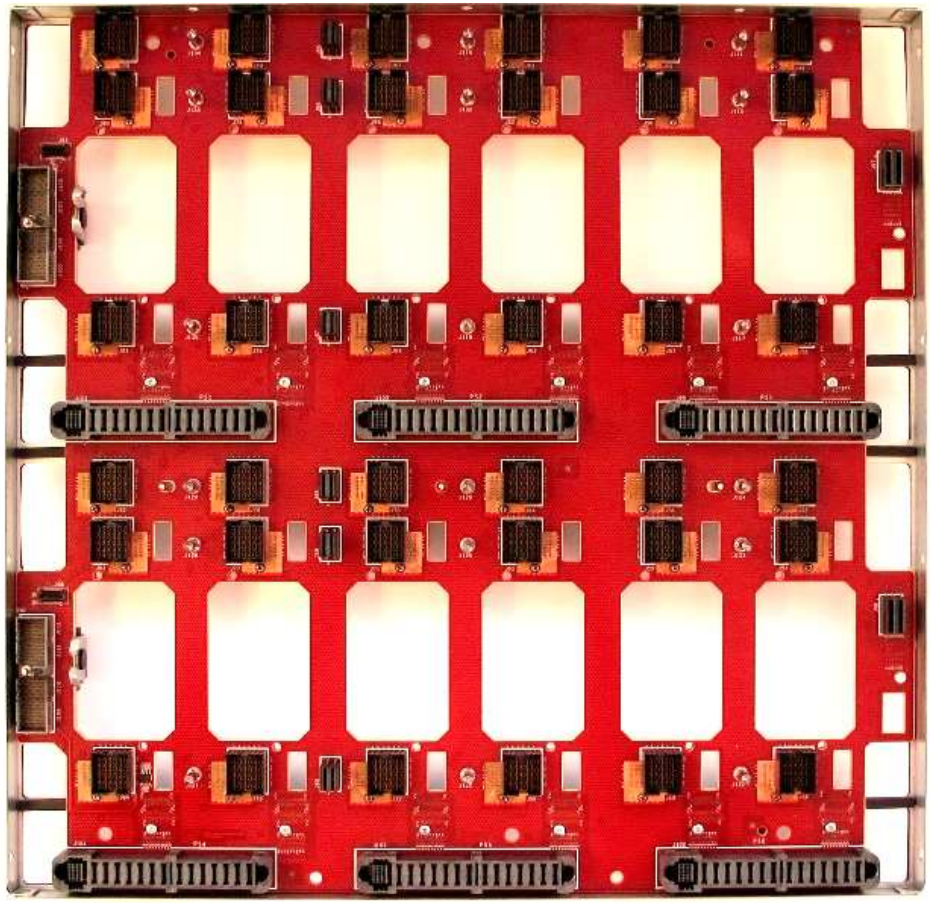


The Synergy Frame Midplane I/O Architecture

Next generation BW and capabilities

- **Improved Signal Integrity**
  - Supports data rates up to 28Gb/s per lane
  - Delivers over 15Tb/s cross sectional BW
  - 3x higher Compute-to-Interconnect module BW
  - Deterministic routing for all Nodes and ICMs
  - Supports 3 @ Redundant Fabrics
  - Direct-connect architecture for lower cost

- **Support for future Photonic strategies**
  - Structures in place for Node to ICM direct connections
  - Increases bandwidth capacity by up to 100x of electrical
  - Bridge to **The Machine** architecture



Composable Storage

Hewlett Packard
Enterprise

Composable Storage

Beth Prof1 | Local Storage

OneView

Local Storage Edit

Integrated controller in RAID mode

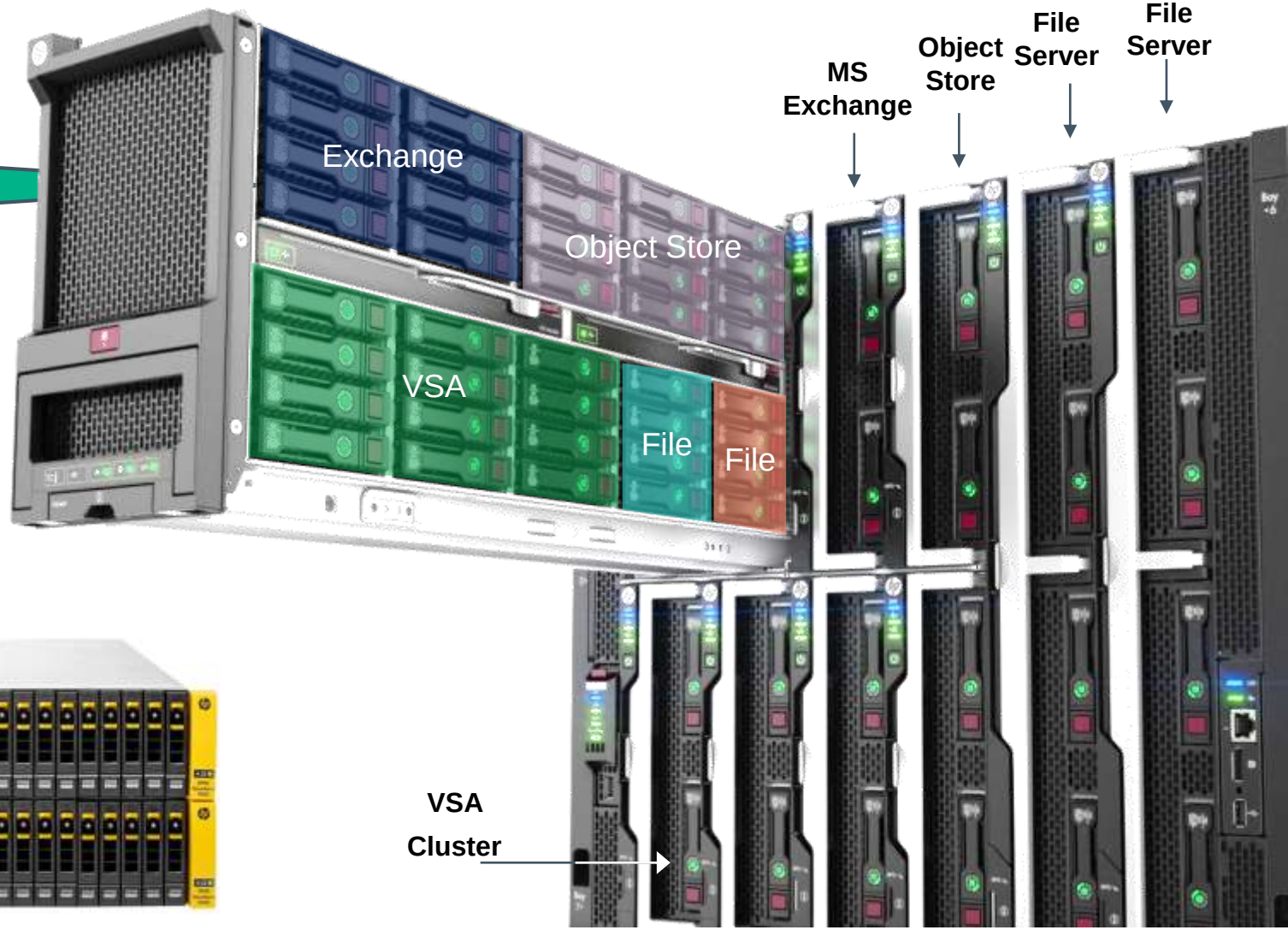
Initialization of internal storage will occur on next assignment to server hardware.

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



Hewlett Packard Enterprise

Hewlett Packard
Enterprise

Thank You