Vblock Infrastructure Packages: Technical Overview

VCE Solutions
May 23 2011

AGENDA

- Introduction

- Vblock Technical Overview (Architecture & Design)

- Management & Orchestration

- Scaling Up & Out

- Manufacturing / Build Approach

- Vblock 0 Details

- Vblock 1 Details

- Vblock 1U Details

- Vblock 2 Detials

MEGATRENDS:
TO THE NEXT GENERATION DATA CENTER

- Deployment of ubiquitous IP networks

- Expansion of networked consumer electronics

- Explosion of digital content

- Movement to unified communications

- Advancement of highly scalable, low cost compute

- Convergence of networks, compute and storage

- Recovery of the economy yields technology refresh

- Desirability of a IT utility model

- Appetite for new applications

VBLOCK: A NEW WAY TO DELIVER IT

- Roadmap interlocked, rapid deployment model of virtualized infrastructure

- Pre-integrated and validated solutions reduce total cost of ownership

- Floor Tiles become "unit of IT" with predictable performance and operational characteristics

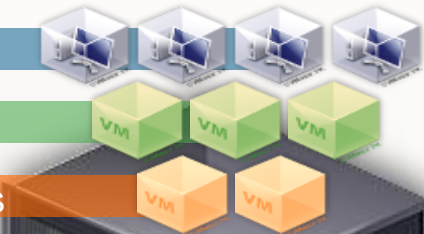- Single point of accountability with improved compliance/security and reduced risk

Solution Packages

Rich APIs

Resource Management

Security

Network
Compute
Virtualization
Storage
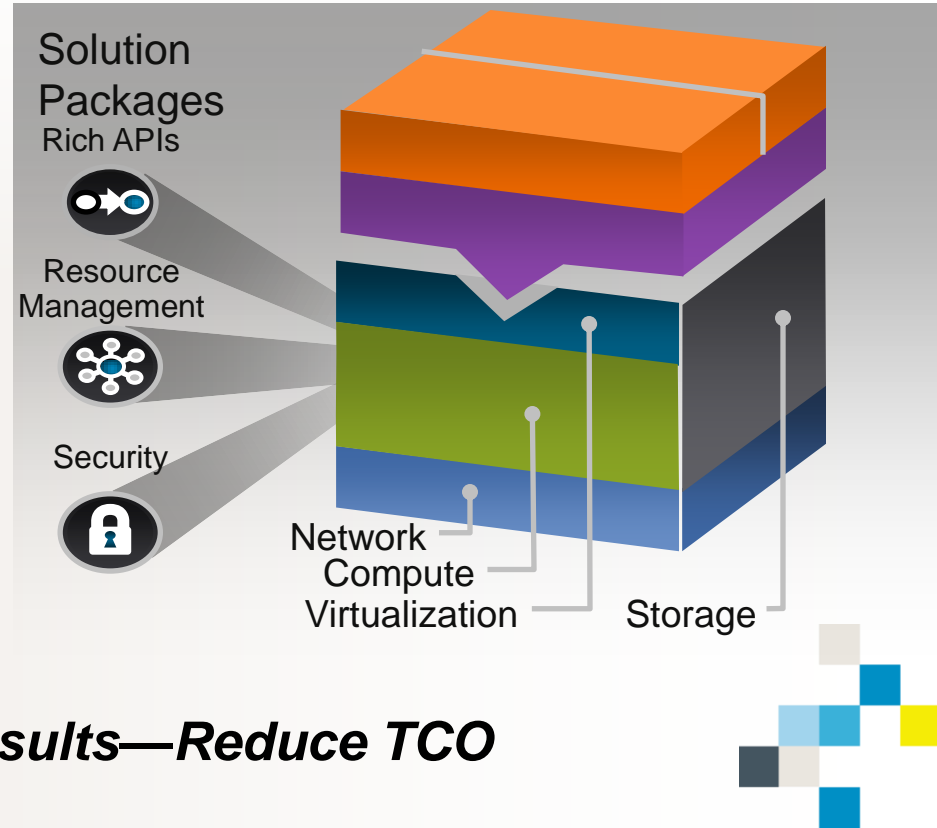
Accelerate Time to Results—Reduce TCO

A CLOSER LOOK: VIRTUALIZATION

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Presentation (user access)

App Middleware servers

Management & DB servers

VMware vSphere

	Availability	Security	Scalablity
Application Services	vMotion Storage vMotion HA Fault Tolerance Data Recovery	vShield Zones VMSafe	DRS Hot Add
	vCompute	vStorage	vNetwork
Infrastructure Services	ESX and ESXi DRS and DPM Memory Overcommit	VMFS Thin Provisioning Storage I/O Control	Distributed Switch Network I/O Control

vmware   Virtualization

Complete Vblock platform for virtualized applications

A CLOSER LOOK: UNIFIED COMPUTING

**Unified Fabric
Fabric Extender**

Virtualized Adapter

**Scale Out
    service profiles
Extended Memory**

Presentation (user access)

App Middleware servers

Management & DB servers

Unified Computing

Virtual switch
(Nexus 1000V)
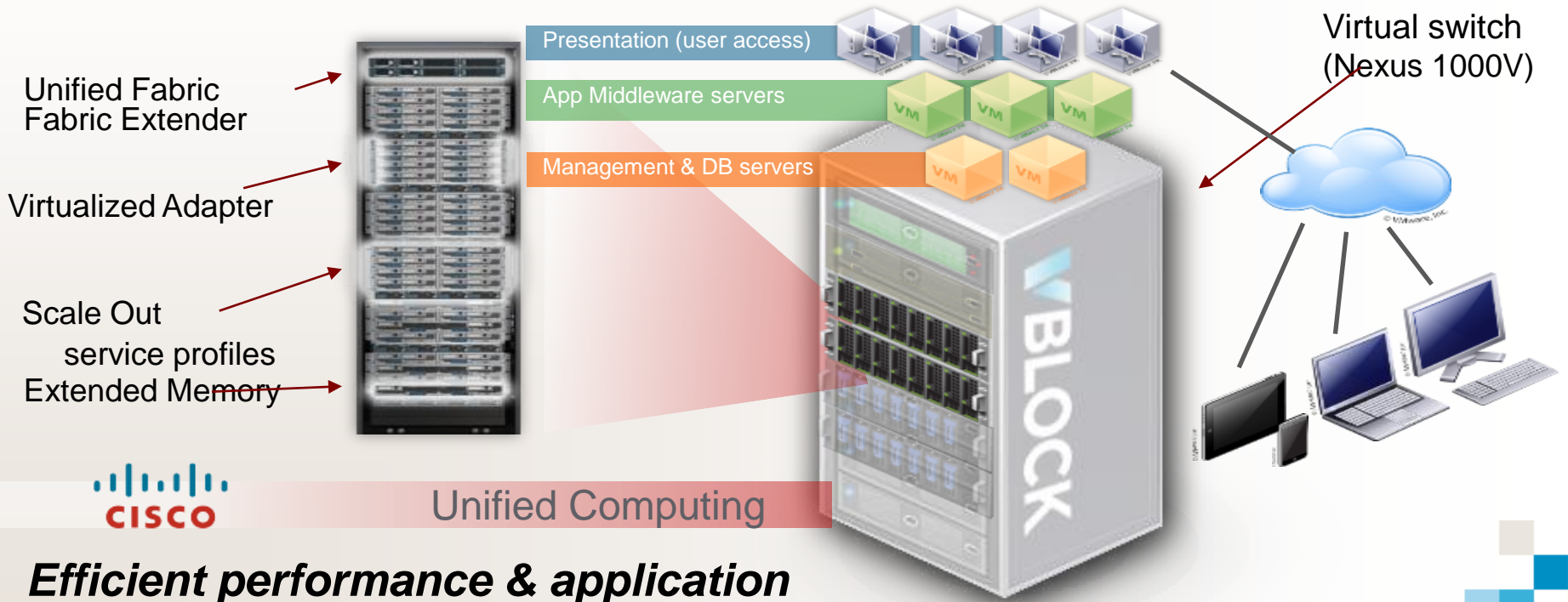
*Efficient performance & application
scalability reduces cost and complexity*

A CLOSER LOOK: STORAGE

High Speed — High Cost

FAST

Lower Speed — Lower Cost

Flash

Fibre Channel

SATA

+ Deduplication/compression

Presentation (user access)

App Middleware servers

Management & DB servers

API

Link clones

Storage

PowerPath VE

Highest density, performance and availability

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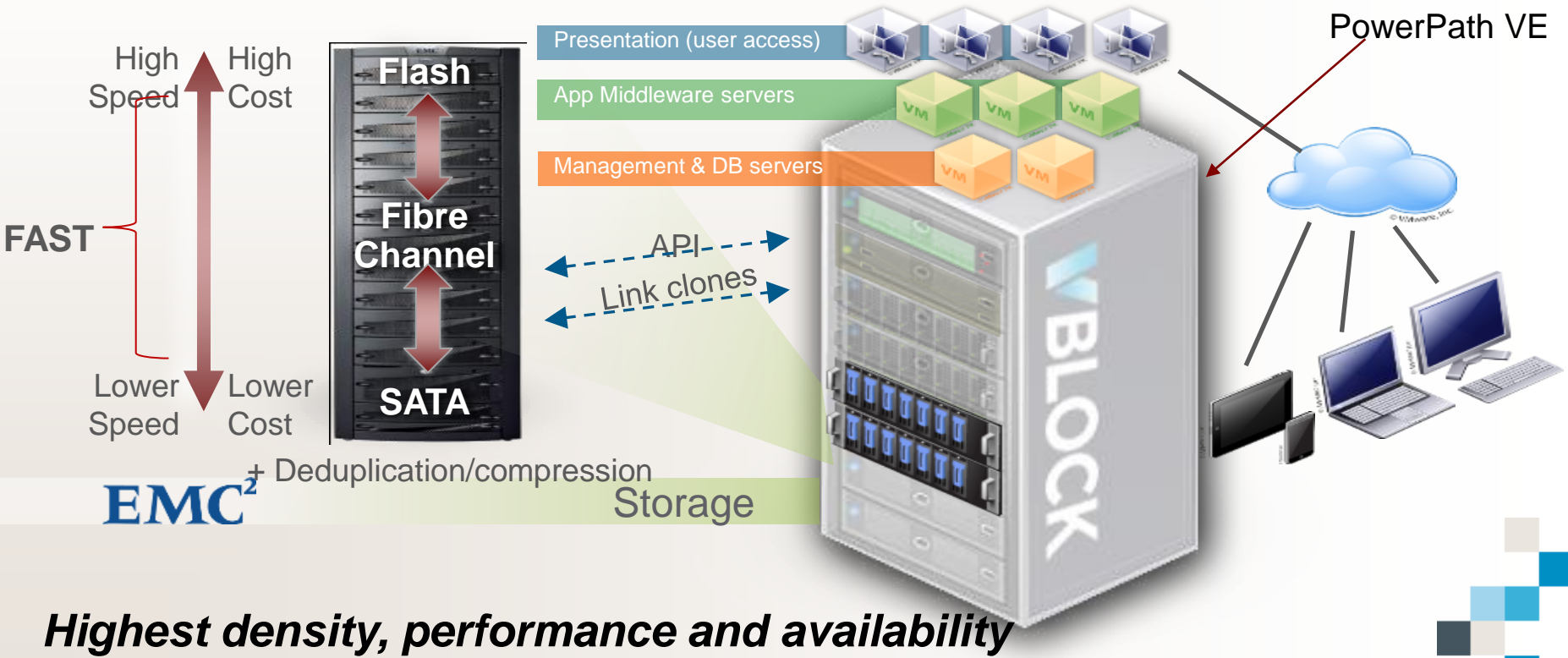
Vblock InfrastructurePackges
Core platform details

Vblock 2

- A high-end configuration that is completely extensible to meet the most demanding IT needs of large enterprises or service providers

Vblock 1

- A mid-sized configuration to deliver a broad range of IT capabilities to organizations of all sizes

Vblock 0

- An entry-level configuration to meet the IT needs of small datacenters
- Test/dev platform for Partners and customers

Imagine the power of three …
Scaling virtualized datacenter infrastructure backed by single support model
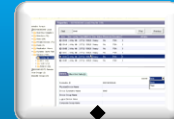
Management and Orchestration

Why a Vblock Without UIM is Not a Vblock

UIM as MoM

Element Managers

vCenter · FMS · Contextual Cross-launch · DCNM · UCSM · SMC · Navi

APIs

vSphere API · SNMP/NX-OS · XML/NETCONF · UCSM XML API · SYMAPI/SMI-S · CLARAPI/SMI-S

VM VM VM VM

VMware ESX

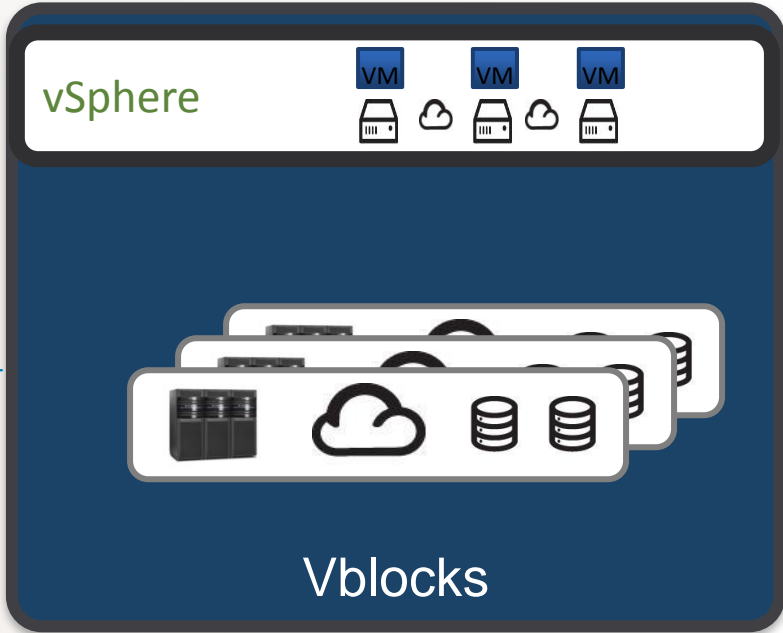vSphere · MDS 9000 · Nexus 1Kv/5K/7K · UCS · VMAX · Clariion
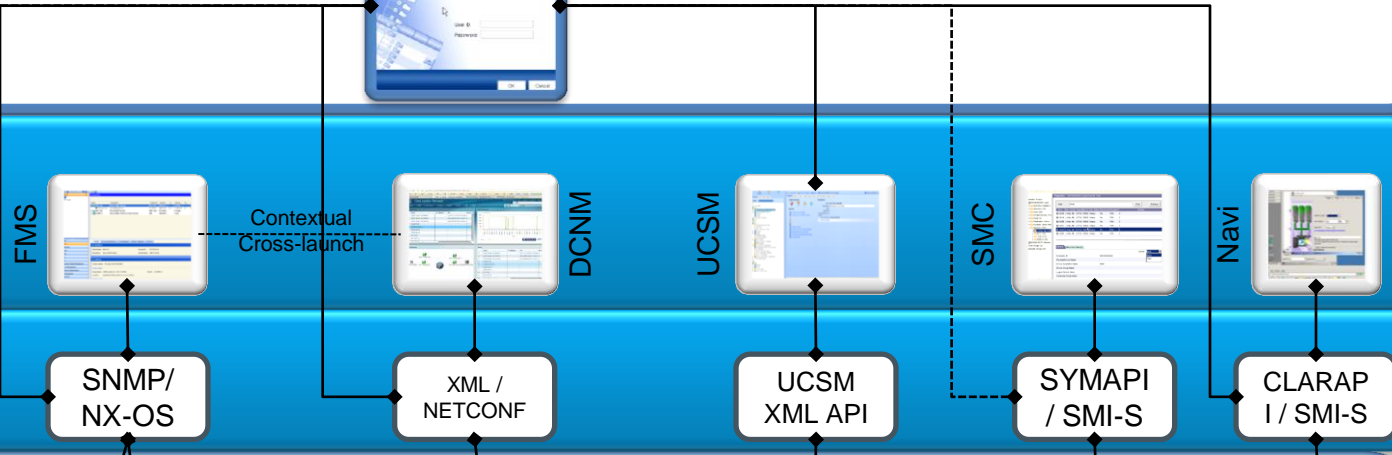
Tools to Cloud Stack Relationship

Application
- VMware Cloud Director
- Chargeback

Cloud OS
- Capacity Planner
- vCenter
- vSphere

Compute
- Unified Infrastructure Manager

Storage
- Unified Infrastructure Manager

Network
- Unified Infrastructure Manager

vSphere

Vblocks

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UNIFIED INFRASTRUCTURE MANAGER

Enterprise
Management Platforms

vCloud (or other)
Portals

Configuration &
Compliance Events

Provisioning Requests

Unified Vblock Element Management

Ionix Unified Infrastructure Manager

IT Infrastructure Provisioning Center

IT Infrastructure Service Catalog

Cross Domain Context & Deep Visibility

Unified
Multi-Vblock
Element
Management

Policy-Based
Management

Unified
Provisioning and
Configuration

Configuration
Compliance
Analysis

Standalone
Component
Management

Cisco
UCS Manager

EMC
Navisphere

EMC Symmetrix
Management
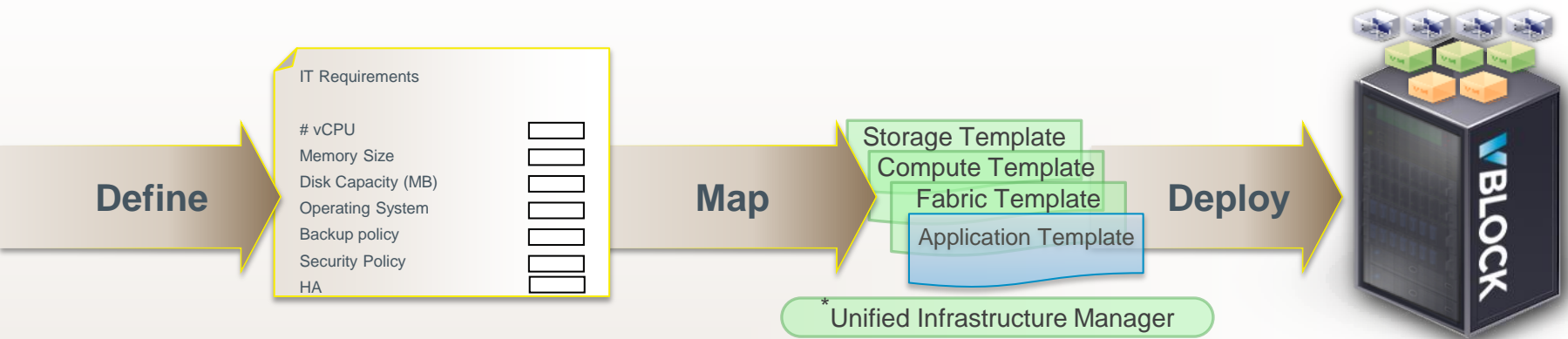Console

Manages one
or more
Vblocks

POLICY DRIVEN APP IT INFRASTRUCTURE WITH TEMPLATES

Define → IT Requirements: # vCPU, Memory Size, Disk Capacity (MB), Operating System, Backup policy, Security Policy, HA → **Map** → Storage Template, Compute Template, Fabric Template, Application Template — *Unified Infrastructure Manager → **Deploy** → VBLOCK

- Templates ensure repeatable, compliant IT processes
  - IT defines storage, server, fabric and application and OS configuration policies to meet the business SLAs

- Resources rapidly assigned according to IT policies and SLA reducing time to application availability

- Reduces configuration error and non-compliance

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UIM SERVICE CATALOG

Standard Catalog Profile Components

Service Offering
- LAN / SAN
- Storage
- OS
- Compute

- Compute Profile
  - Number of compute blades – 1 to N for a cluster
  - Service grades such as Half/Full width or based on type of mezzanine cards
  - Operating system definition (currently only ESX)

- Storage Profile
  - Size of boot partition
  - Size and number of data stores
  - Tier of storage
    - Tier 1 (RAID 10 – high performance)
    - Tier 2 (RAID 5 – medium performance)
    - Tier 3 (RAID 5 – low performance)

- Network Profile
  - Network profiles identify the VLAN ID, QOS, IP Address Pool
  - Optionally PIN groups can provide dedicated or aggregated bandwidth
  - Profiles to be used and on which interfaces)
    - vNIC-a use Sales Network
    - vNIC-b use Engineering Network

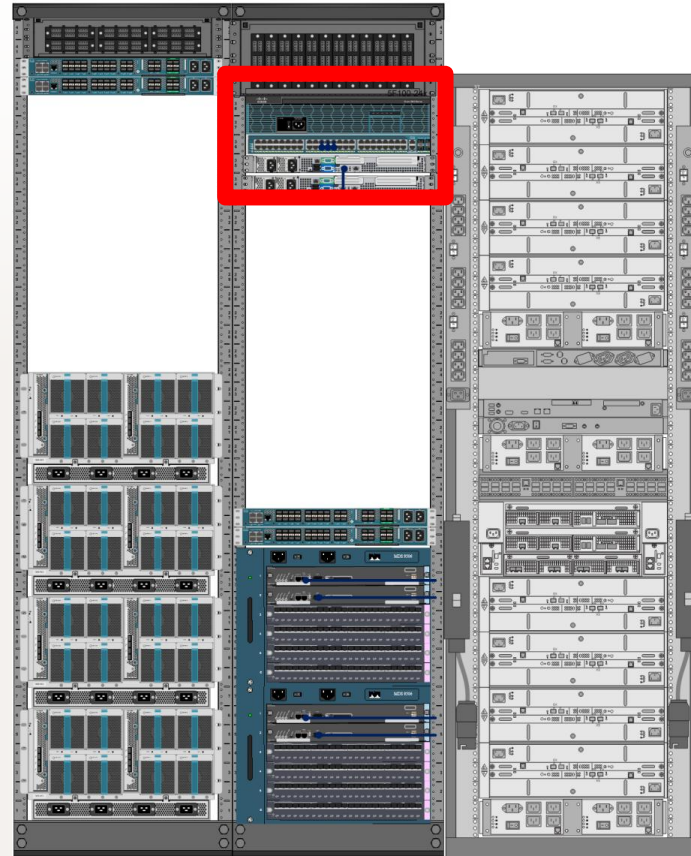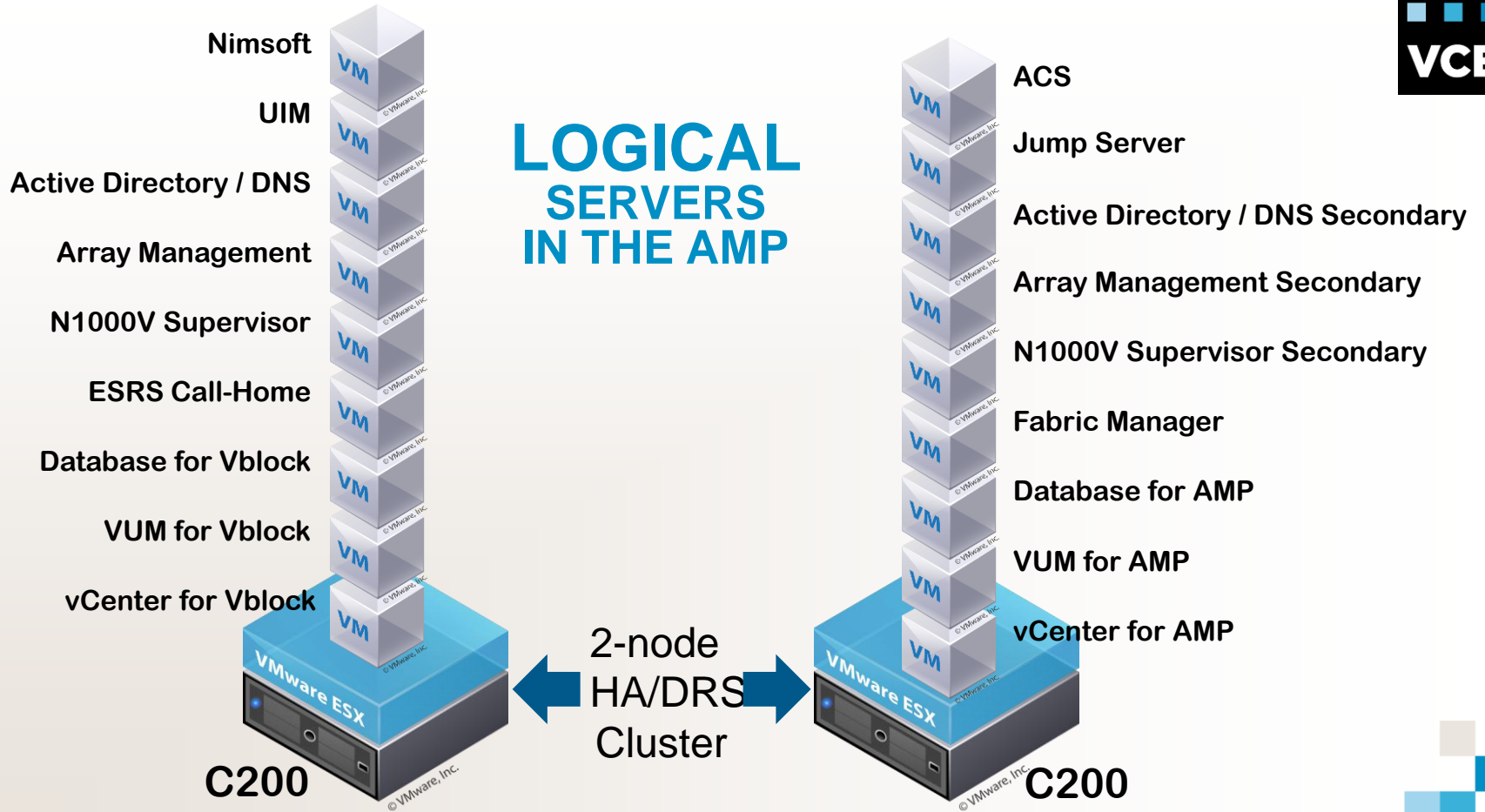**VCE** THE VIRTUAL COMPUTING ENVIRONMENT COMPANY

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ADVANCED MANAGEMENT POD

2900 Series
Router

4900 Series
Switch

C-200 Blade
Servers

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LOGICAL SERVERS IN THE AMP

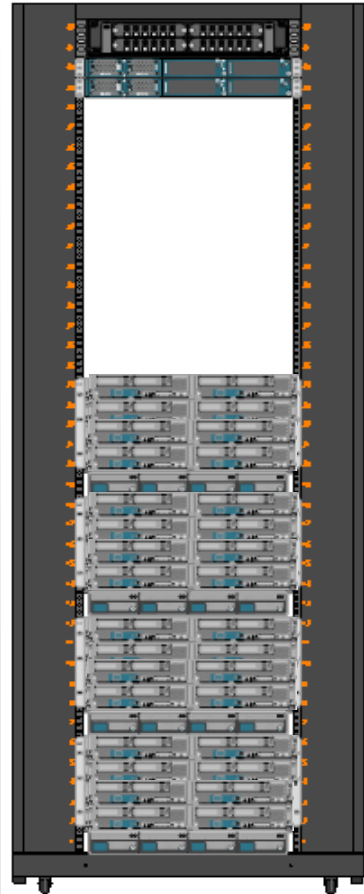Left stack (C200):
- Nimsoft
- UIM
- Active Directory / DNS
- Array Management
- N1000V Supervisor
- ESRS Call-Home
- Database for Vblock
- VUM for Vblock
- vCenter for Vblock

VMware ESX — C200

Right stack (C200):
- ACS
- Jump Server
- Active Directory / DNS Secondary
- Array Management Secondary
- N1000V Supervisor Secondary
- Fabric Manager
- Database for AMP
- VUM for AMP
- vCenter for AMP

VMware ESX — C200

2-node HA/DRS Cluster

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SCALING…

Up and Out

Base and Upgrade example - Compute
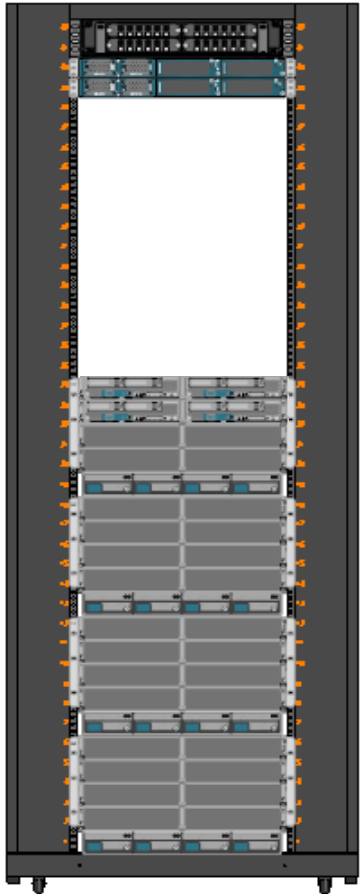
- Starting with the "Base" which consists of rack, in-rack PDUs, cabling, patch panels, UCS chassis, fans, FEX's, Fabric Interconnects – everything except the blades…

- Blade packs are used to populate the chassis based on customer needs and future growth.

- Initial blade packs (2) ordered with base

- Customer orders more blade packs (2) which matches VCE Type 1 minimum

- Customer fills base with more blade packs (4) which matches VCE Type 1 maximum

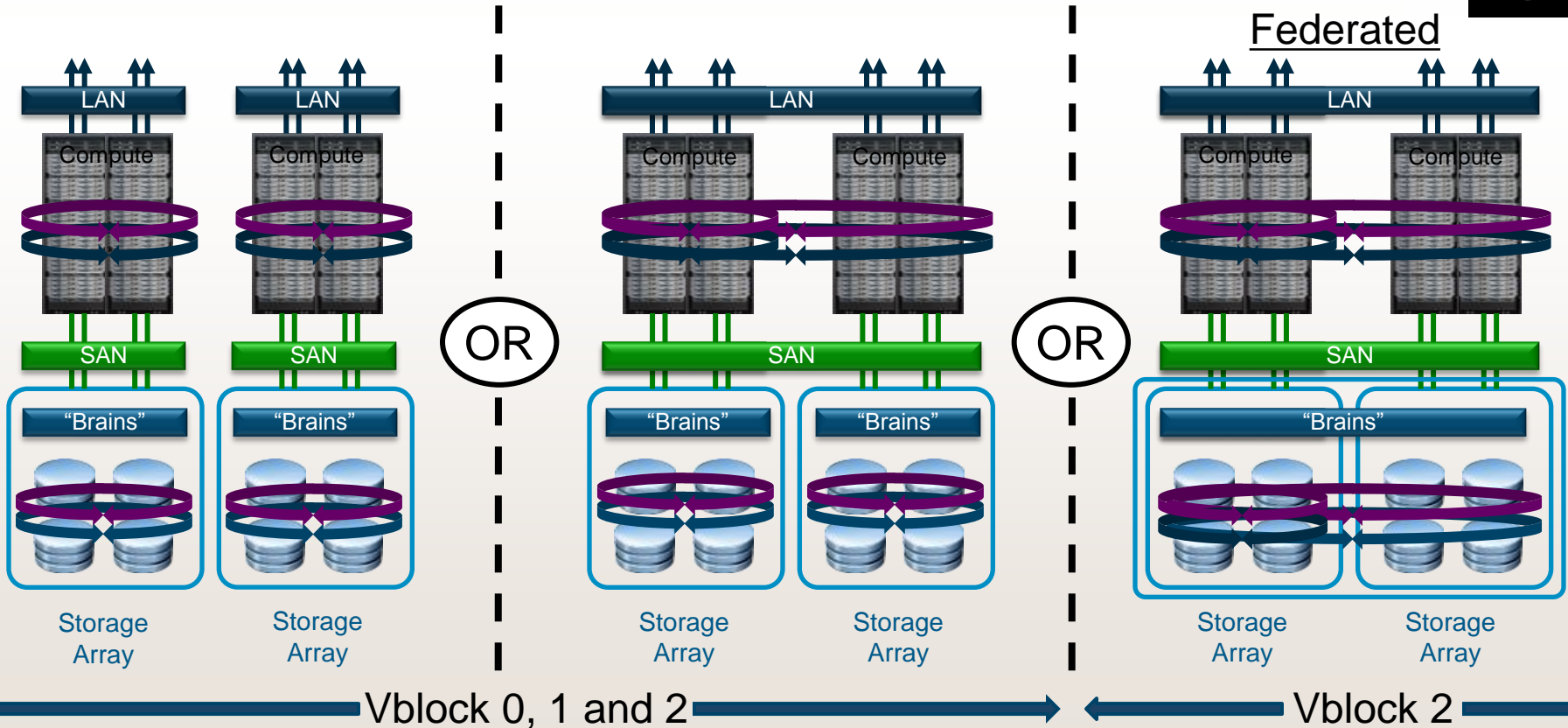- Customer orders another base and blade pack(1)
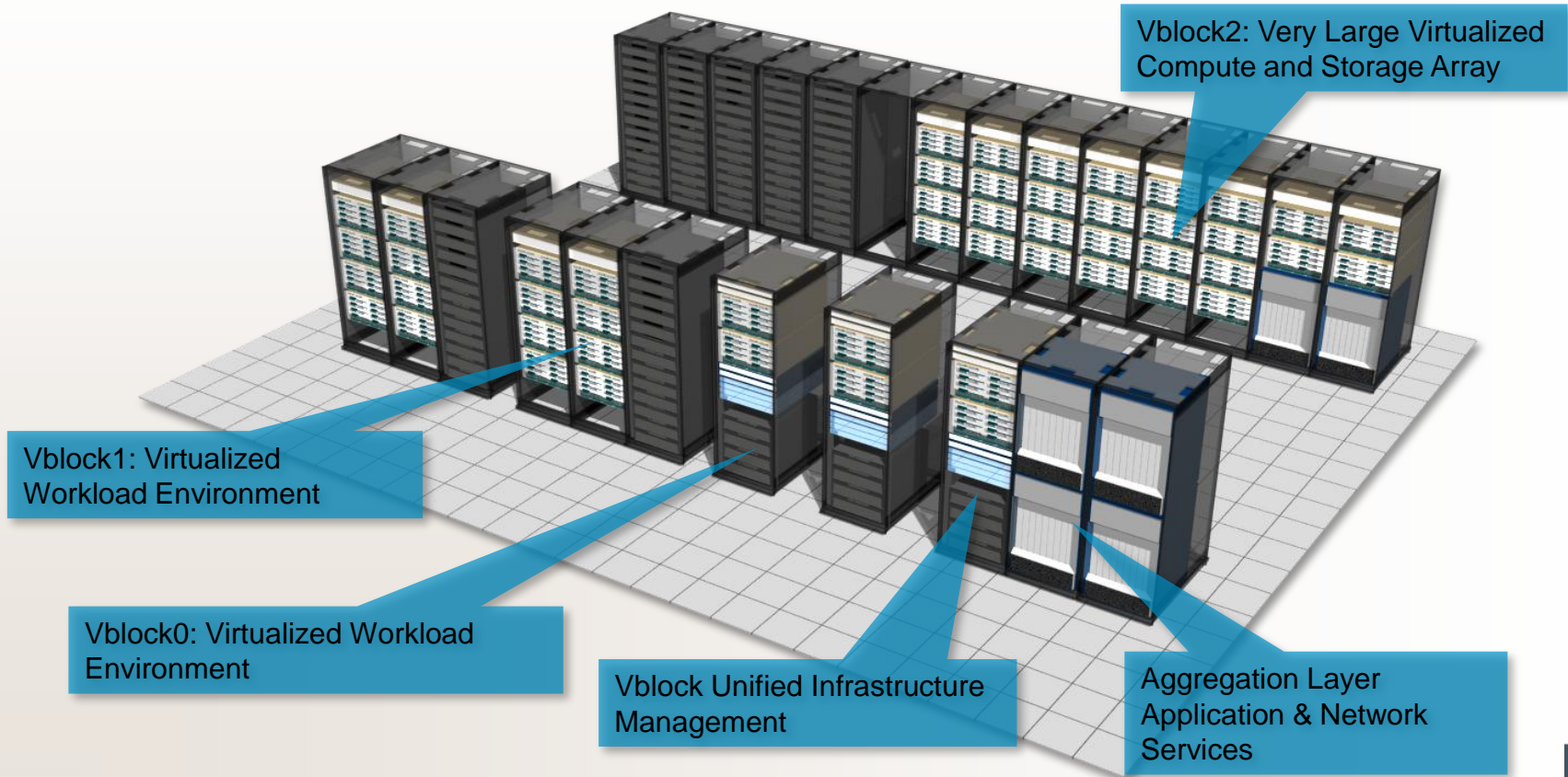
Four B200M2 Blade pack upgrade

Upgrade

Base

Base

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Vblock Scaling

Vblock Infrastructure Packages
Scalable IT Capability & Performance

Vblock2: Very Large Virtualized Compute and Storage Array

Vblock1: Virtualized Workload Environment

Vblock0: Virtualized Workload Environment

Vblock Unified Infrastructure Management

Aggregation Layer Application & Network Services

Architectural Principles

- 'Units' of IT infrastructure with 'matched' performance, operational characteristics and discrete of power, space and cooling

- Repeatable design patterns facilitate rapid deployment, integration and scalability

- Built to contain, manage and mitigate failure scenarios in hardware and software environments

- Designed from the 'Facilities to the Workload' to be scaled for the highest efficiencies in virtualization and workload re-platforming

- Extensible security, management and orchestration frameworks based on industry standard tools, APIs and methods

Design　　　**Selection**　　　**Assembly**　　　**Result**

Vblock Components Pre Mfg. Process

Vblock Components Post Mfg. Process
(Vblock 2 ready to be packaged & shipped to client)

Vblock Components Post Mfg. Process
(Vblock 2 packaged & ready to ship to client)
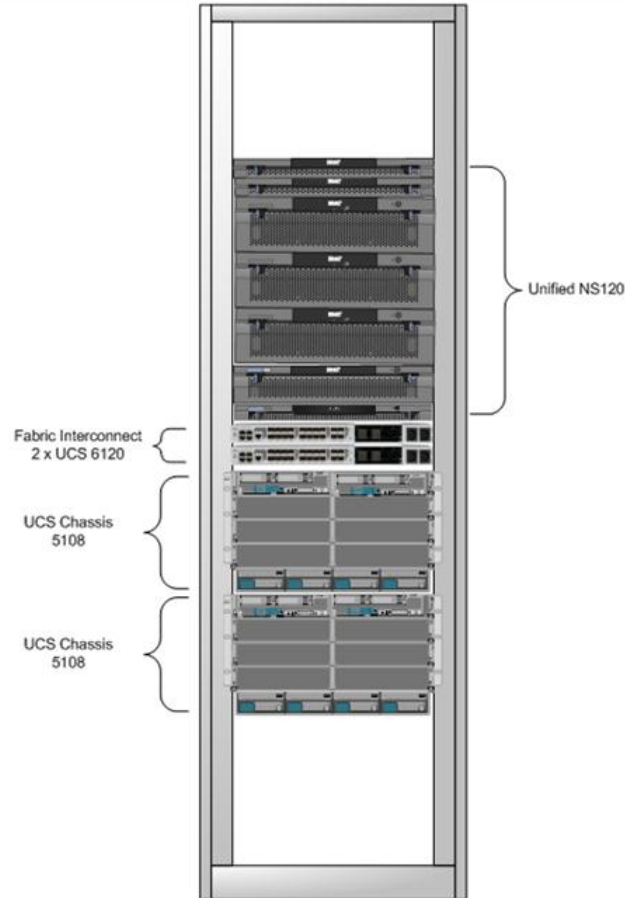
Infrastructure Packages: Reference Architecture

Vblock 0

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Vblock 0 Configuration – Layout – Front View
2 USC Chassis
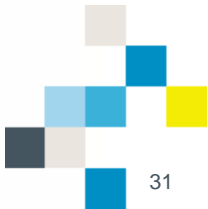2 UCS 6120 Fabric Interconnects
Unified NS 120 Storage Array

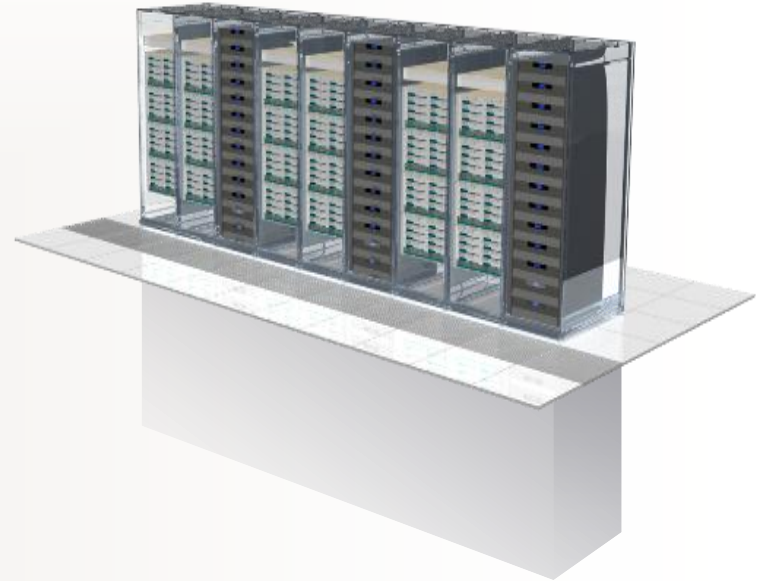VCE THE VIRTUAL COMPUTING ENVIRONMENT COMPANY

Unified NS120

Fabric Interconnect
2 x UCS 6120

UCS Chassis
5108

UCS Chassis
5108

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Vblock0 Components

- Compute
  - Cisco UCS Chassis
  - Cisco UCS B-series Blades
  - Cisco Fabric Interconnects
- Network
  - Cisco Nexus Switches
- Storage
  - EMC NAS Storage Array
- Hypervisor
  - VMware vSphere 4 Enterprise Plus
- Management
  - EMC Ionix Unified Infrastructure Manager
  - VMware vCenter 4.0
  - EMC PowerPath/VE
  - Element Managers (UCSM, Fabric Mgr, Device Mgr, Celerra Mgr)

Vblock0 Configuration Details

Recommended Base Configuration

➢ **Unified Computing System**
- 2 * UCS 5108 Chassis + 4 Fabric Extenders
- 2 * Fabric Interconnect 6120
- 4 Power Supplies
- 1 Blade Pack (4 * B200 M2 2.93GHz 12x4GB)
- Total 36 Cores and 192 GB RAM
- 73GB 15k SAS drive (no RAID)

➢ **SAN**
- 2 * Nexus 5010

➢ **EMC Storage**
- NS-120 Storage Array
- 17.5 TB Raw Storage
- 2 Service Processors / 2 Data Movers
- Mixture of drives types optimized for best price / performance ratio
  - T1 – 0 Flash Drives @ 100 GB
  - T2 – 21 Fibre Channel Drives @ 450 GB
  - T3 – 8 SATA Drives @ 1 TB

➢ **Logical Layer**
- Nexus 1000v Switch
- Ionix Unified Infrastructure manager (UIM)

Optional Configuration

➢ Unified Computing System
- B200, B250, B440 series blades
- 2 Socket 6-Cores
- 4 Socket 8-Cores
- 73/146/300 GB 6Gb SAS 15K RPM SFF Internal HDD

➢ SAN / Network
- 2 * Nexus 5k 8 Port 4GB FC Modules
- Fabric Interconnect Fibre Channel 8 Port Upgrade

➢ EMC Storage
- Additional Disk Array Enclosures
- Fully Automated Storage Tiering (FAST) Suite
- PowerPath/VE
- Mixture of drive types optimized for best price / performance ratio
  - T1 – Flash Drives @ 100 GB
  - T2 – Fibre Channel Drives @ 450 GB
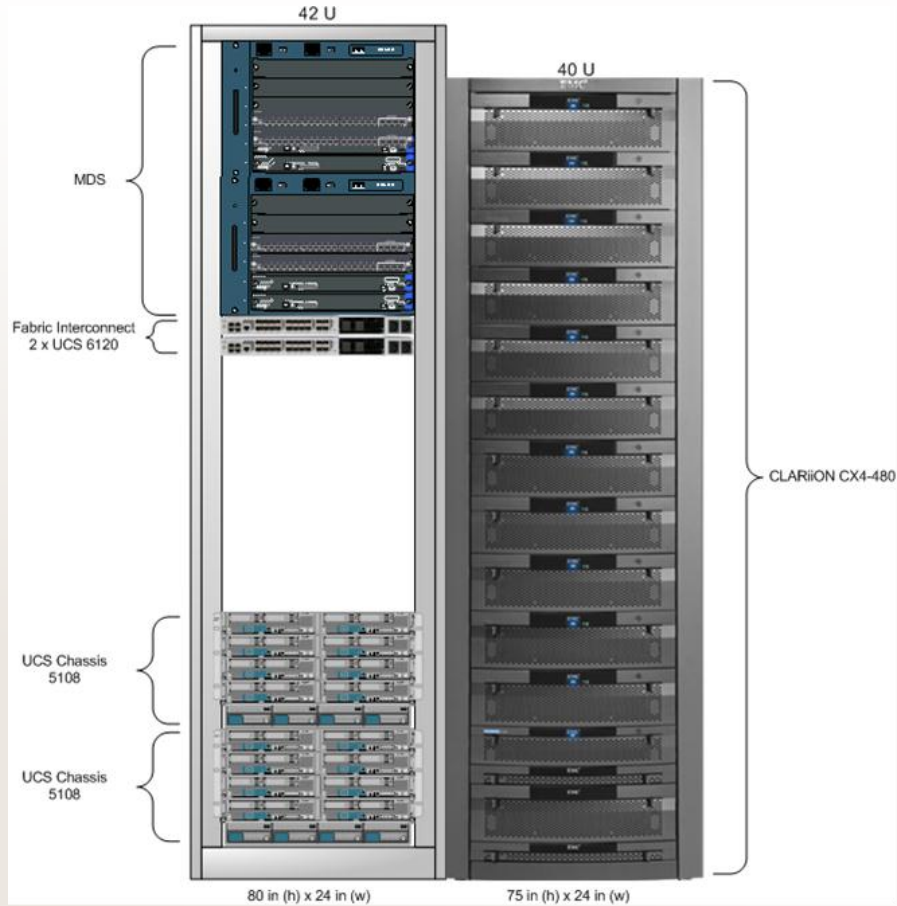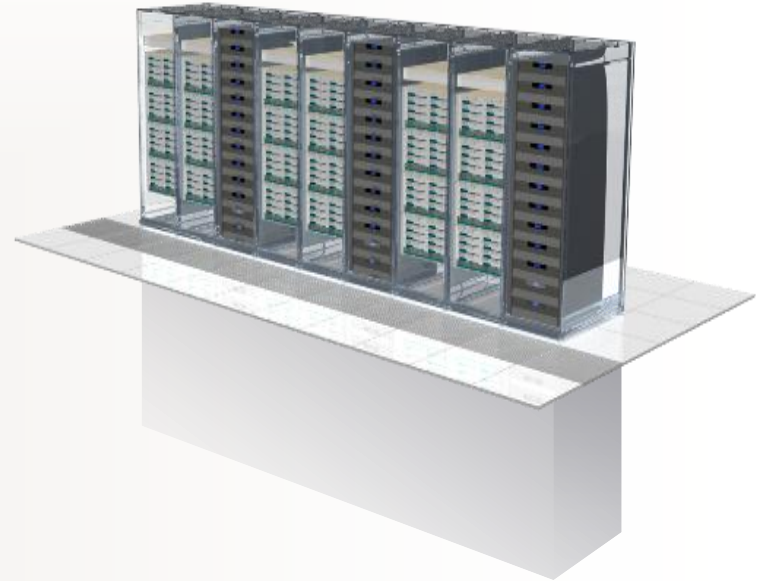 - T3 – SATA Drives @ 1 TB
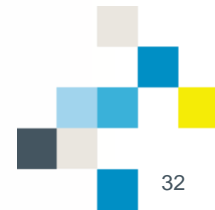
Vblock1 Configuration - Rack Layout – Front View

2 UCS Chassis
2 UCS 6120 Fabric Interconnects
2 Cisco MDS Switches
Clariion CX4-480 Storage Array

Vblock1 Components

- Compute
  - Cisco UCS Chassis
  - Cisco UCS B-series Blades
  - Cisco Fabric Interconnects

- Network
  - Cisco Nexus Switches
  - Cisco MDS Switches

- Storage
  - EMC Clariion Storage Array

- Hypervisor
  - VMware vSphere 4 Enterprise Plus

- Management
  - EMC Ionix Unified Infrastructure Manager
  - VMware vCenter 4.0
  - EMC PowerPath/VE
  - Element Managers (UCSM, Fabric Mgr, Device Mgr, Navisphere)
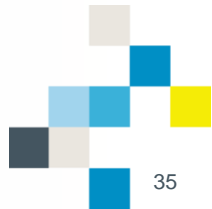
Vblock1 Configuration Details

Recommended Configuration

- **Unified Computing System**
  - 4 * UCS 5108 Chassis + 8 Fabric Extenders
  - 2 * Fabric Interconnect 6120 + 8 Port FC Modules (2)
  - 8 Power Supplies
  - 2 Blade Packs (8 * B200 M2 3.33GHz 12x8GB)
  - Total 96-CPU and 768 GB RAM
  - No local disk drives

- **SAN**
  - 2 * MDS 9148
  - 48 * 8Gb/s Fibre Channel ports
  - 2 * 16 Port Module

- **EMC Storage**
  - CX4-480 Storage Array
  - XX TB Raw Storage
  - 2 Service Processors
  - 9 Disk Array Enclosures (105 disk drives)
  - Fully Automated Storage Tiering (FAST)
  - Mixture of drive types optimized for best price / performance ratio
    - T1 – X Flash Drives @ 100 GB
    - T2 – X Fibre Channel Drives @ 450 GB
    - T3 – X SATA Drives @ 1 TB

- **Logical Layer**
  - Nexus 1000v Switch
  - Ionix Unified Infrastructure Manager (UIM)
  - PowerPath for Virtual Environment
  - vSphere Enterprise Plus
  - vCenter Server Standard

Optional Configuration

- Unified Computing System
  - B200, B250, B440 series blades
  - 2 Socket 6-Cores
  - 4 Socket 8-Cores
  - 2 * Fabric Interconnect 6140

- SAN / Network
  - 2 * MDS 9506
  - 2 * Nexus 5020
  - 2 * Nexus 7010

- EMC Storage
  - Additional Disk Array Enclosures
  - Fully Automated Storage Tiering (FAST) Suite
  - Mixture of drive types optimized for best price / performance ratio
    - T1 – Flash Drives @ 100 GB
    - T2 – Fibre Channel Drives @ 450 GB
    - T3 – SATA Drives @ 1 TB
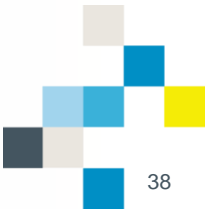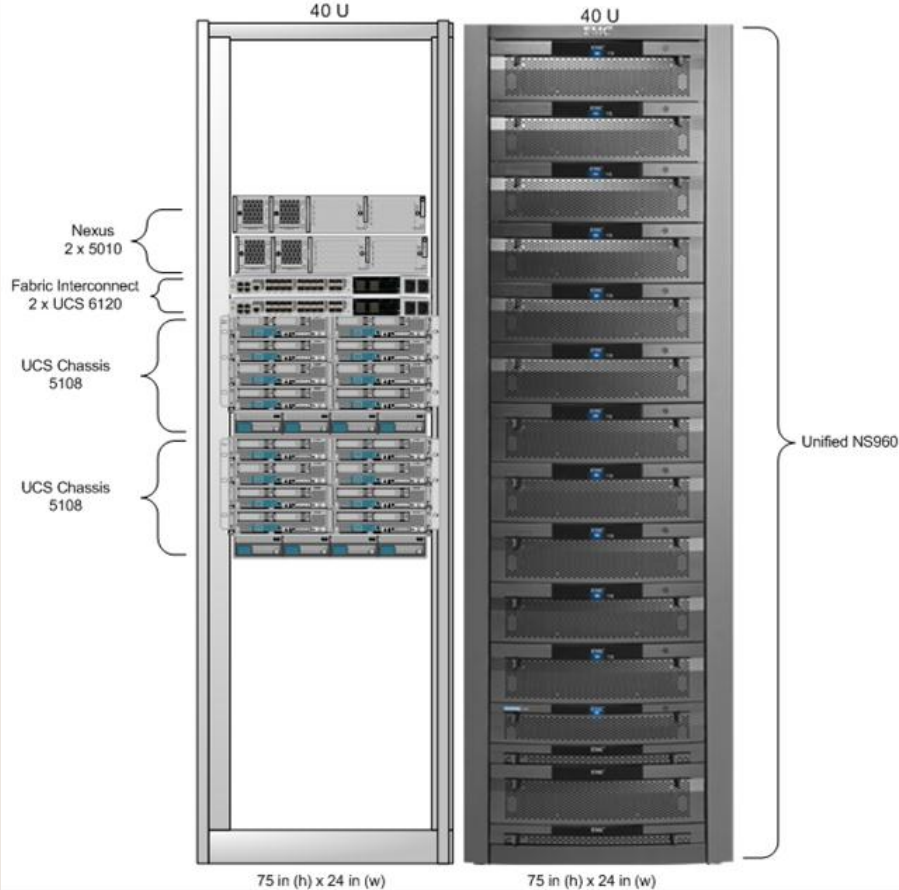
Infrastructure Packages: Reference Architecture

Vblock 1U

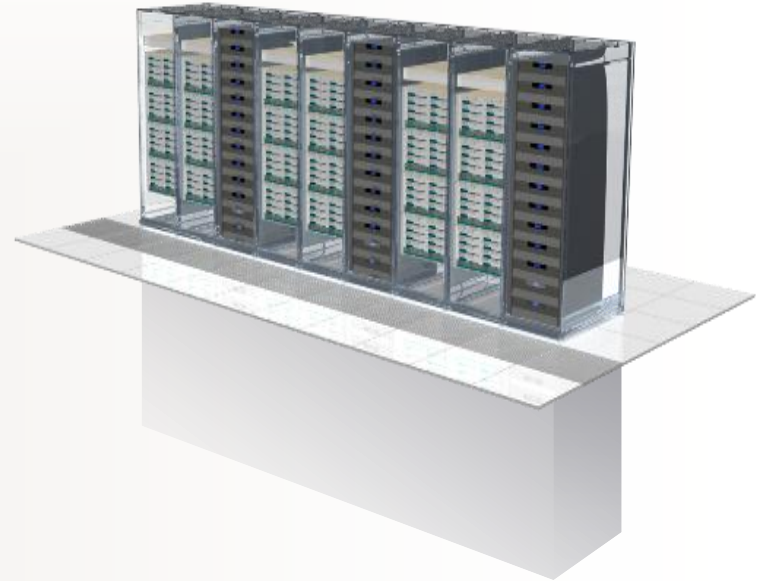# Vblock1U Configuration – Rack Layout – Front View

2 UCS Chassis
2 UCS 6120 Fabric Interconnects
2 Nexus 5010 Switches
Unified NS960 Storage Array

Vblock1U Components

- Compute
  - Cisco UCS Chassis
  - Cisco UCS B-series Blades
  - Cisco Fabric Interconnects

- Network
  - Cisco Nexus Switches

- Storage
  - EMC NAS Storage Array

- Hypervisor
  - VMware vSphere 4 Enterprise Plus

- Management
  - EMC Ionix Unified Infrastructure Manager
  - VMware vCenter 4.0
  - EMC PowerPath/VE
  - Element Managers (UCSM, Fabric Mgr, Device Mgr, UniSphere)
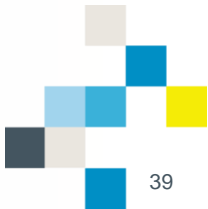
Vblock1U Configuration Details

Recommended Hybrid Configuration

- ➢ **Unified Computing System**
  - – 4 * UCS 5108 Chassis + 8 Fabric Extender Cards
  - – 2 * Fabric Interconnect 6120 + 8 Port FC Modules (2)
  - – 8 Power Supplies
  - – 2 Blade Packs (8 * B200 M2 3.33GHz 12x8GB)
  - – Total 96-CPU and 768 GB RAM
  - – No local disk drives
- ➢ **SAN**
  - – 2 * Nexus 5020
  - – 2 * 8 Port 4GB FC Modules, 4GBPs Optics (16)
- ➢ **EMC Storage**
  - – Unified NS-480 Array
  - – 43.5 TB Raw Storage
  - – 2 Service Processors
  - – 7 Disk Array Enclosures
  - – Fully Automated Storage Tiering (FAST)
  - – Mixt of drive types optimized for best price / performance ratio
    - ▪ T1 – 0 Flash Drives @ 100 GB
    - ▪ T2 – 10+3 Fibre Channel Drives @ 450 GB
    - ▪ T3 – 3+1 SATA Drives @ 1 TB
- ➢ **Logical Layer**
  - – Nexus 1000v Switch
  - – Ionix Unified Infrastructure Manager
  - – PowerPath for Virtual Environment
  - – vSphere Enterprise Plus
  - – vCenter Server Standard

Optional configuration

- ➢ Unified Computing System
  - – B200, B250, B440 series blades
  - – 2 Socket 6-Cores
  - – 4 Socket 8-Cores
  - – 2 * Fabric Interconnect 6140
  - – Local disk drives (73/146/300GB SAS 10K RPM SFF HDD)
- ➢ SAN
  - – Nexus 5k 4GB FC modules
  - – 2 * Nexus 7010
- ➢ EMC Storage
  - – NS-960 Array
  - – Additional Disk Array Enclosures
  - – Advanced Fully Automated Storage Tiering (FAST) Suite
  - – Mixture of drives types optimized for best price / performance ratio
    - ▪ T1 – Flash Drives @ 100 GB
    - ▪ T2 – Fibre Channel Drives @ 450 GB
    - ▪ T3 – SATA Drives @ 1 TB

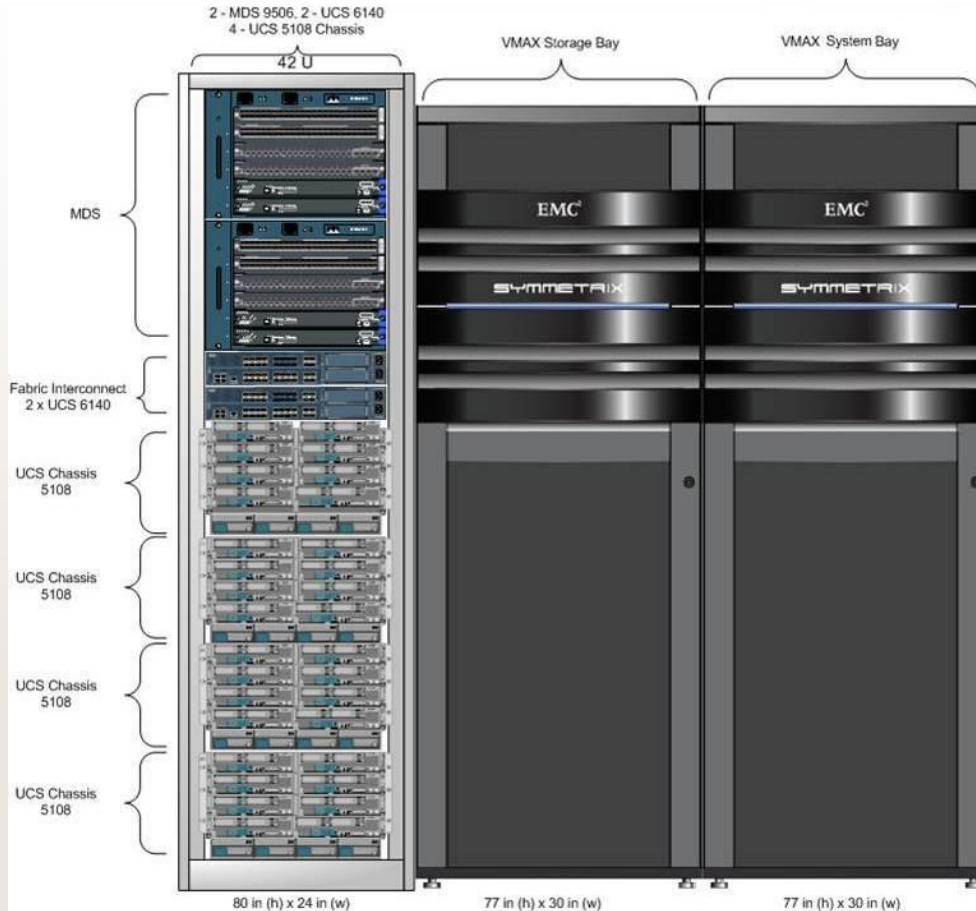# Infrastructure Packages: Reference Architecture

Vblock 2

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Vblock2 Configuration – Rack Layout – Front View

(4) UCS 5108 Chassis - 32 B200 Blades   (2) UCS 6140 Fabric Interconnects - 40 Fixed Ports, 8 FC Ports
(2) MDS 9506 SAN Switches– 24 FC Ports   (1) VMAX – 2 Engines, 80.6 TB Raw Storage

Vblock2 Components

- Compute
  - Cisco UCS Chassis
  - Cisco UCS B-series Blades
  - Cisco Fabric Interconnects

- Network
  - Cisco Nexus Switches
  - Cisco MDS Switches

- Storage
  - EMC Symmetrix V-Max

- Hypervisor
  - VMware vSphere 4 Enterprise Plus

- Management
  - EMC Ionix Unified Infrastructure Manager
  - VMware vCenter 4.0
  - EMC PowerPath/VE
  - Element Managers (UCSM, Fabric Mgr, Device Mgr, SMC)

Vblock2 Configuration Details

Bill of Materials Base configuration

➤ **Unified Computing System**
 – 4 * UCS 5108 Chassis + 8 Fabric Extenders
 – 2 * Fabric Interconnect 6120 + 8 Port FC Modules (2)
 – 8 Power Supplies
 – 2 Blade Packs (8 * B200 M2 3.33GHz 12x8GB)
 – Total 96-CPU and 768 GB RAM

➤ **SAN**
 – 2 * MDS 9148
 – 48 * 8Gb/s Fibre Channel ports
 – 2 * 16 Port Module

➤ **EMC Storage**
 – V-MAX 2-Engine Base
 – 80.6 TB Raw Storage
 – 64GB RAM Cache
 – Fully Automated Storage Tiering (FAST)
 – Mixture of drives types optimized for best price / performance ratio
  ▪ T1 – 0 Flash Drives @ 200 GB
  ▪ T2 – 112 Fibre Channel Drives @ 450 GB
  ▪ T3 – 32 SATA Drives @ 1 TB

➤ **Logical Layer**
 – Nexus 1000v Switch
 – Ionix Unified Infrastructure Manager
 – PowerPath for Virtual Environment
 – vSphere Enterprise Plus
 – vCenter Server Standard

Optional Configuration

➤ Unified Computing System
 – B200, B250, B440 series blades
 – 2 Socket 6-Cores
 – 4 Socket 8-Cores
 – 2 * Fabric Interconnect 6140

➤ SAN / Network
 – 2 * MDS 9506
 – 2 * Nexus 5020
 – 2 * Nexus 7010

➤ EMC Storage
 – 2,4,6 or 8 Engine Base
 – Mixture of drives types optimized for best price / performance ratio
  ▪ T1 – Flash Drives @ 200 GB
  ▪ T2 – Fibre Channel Drives @ 450 GB
  ▪ T3 – SATA Drives @ 1 TB

Vblock Infrastructure Packages
Legacy vs. Vblock Infrastructure Packages

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Optimized Infrastructure	Streamlined Operational Control		Cost and Risk Management
30% increase in server utilization	80% faster dynamic provisioning of storage and server infrastructure		40% cost reduction in cabling (fibre / patch cords etc.) and associated labor
50% increase in server density			
200% increase in VM density	Day to day task automation (vCenter and UCS Manager)		30% less power consumption
Minimum of 72 VMs per KW	Continuous operation and availability (DRS/HA)		4X standard consolidation ratios (footprint)
Deterministic Performance Envelope for Individual or classes of workloads	20X increase in workload mobility	3X increase in local replication speed	'Pre-integrated' Vblock Infrastructure Packages

1MW, 10,000 Sq Ft	Traditional (c-Class blade)	Vblock
DC efficiency	100%	170-200%
Cabling costs	$2.7M	<$1.6M
# physical server	720	1200-1400
# VMs	9300-10800	12000-28000
VM per KW	7.2	12-28

Imagine the power of three …
Combining best of breed technologies from market leaders
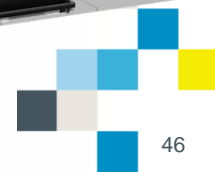
Physical Architecture

➢ Power, cooling, and space including
   – Compute chassis and blades
   – SAN and IP Network Components
   – Storage

Vblock1	**Minimum** Configuration	**Maximum** Configuration
Power	23.5 KVA	34.2 KVA
Cooling	89776 BTU/hr	121306 BTU/hr
Space	64 Rack Units (RU) 2 Racks	91 Rack Units (RU) 3 Racks
Vblock2	**Minimum** Configuration	**Maximum** Configuration
Power	41.76 KVA	58.56 KVA
Cooling	144280 BTU/hr	192340 BTU/hr
Space	155 Rack Units (RU) 4 Racks	179 Rack Units (RU) 5 Racks