Vblock Architecture

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Vblock Design Governance

It’s an architecture!

Requirements:
- Pretested
- Fully Integrated
- Ready to Go
- Ready to Grow

Balanced configuration
- Compute power
- IO capability
- Network capacity

Virtualization
Simplified deployment & management

Solution cost constrains
Vblock Infrastructure Packages
A New Way of Delivering IT

- Rapid deployment model of virtualized infrastructure
- Pre-integrated and validated solutions reduce total cost of ownership
- Service-level driven through predictable performance and operational characteristics
- Improved compliance/security and reduced risk

Accelerate time to results, Reduce TCO
Virtual Computing Environment Coalition

Partners
SI, Reseller, SP, ISV, etc.

Partner Solution for Customers
solution packages

Customization for vertical applications and industry segments
- e.g., CRM, ERP, Financial, Supply Chain, Exchange, Office, etc.
- e.g., financial services, transportation, retail, health care, etc.

Customer
• VCE Professional Services
• VCE Seamless Support Experience

Acadia
‘Build, Operate, Transfer’ Support – Expedite Partner Opportunity – (If Needed)
Vblock Design Principles

Building Block Simple!

Data Center *unit of assembly*
  - Provides a set of services, at a known level, to target consumers

Optimized for the classes of services it is designed to provide

Self contained
  - But may use external shared services

Optionally
  - Clustered for availability
  - Aggregated for scalability
  - Each Vblock still viable on its own

Fault & service isolation
  - Failure of a Vblock will not impact the operation of other Vblocks
  - Service each component independently
Vblock Architectural Solution
Modular, Scalable, Repeatable, Predictable

Simplifies expansion and scaling
Add storage or compute capacity as required
Can connect to existing LAN switching infrastructure enables graceful migration
Graceful, non-disruptive expansion
Self-contained SAN environment with known standardized platform and processes
Enables introduction of FCIP, Storage Volume Virtualization, Encryption, etc services
Vblock Infrastructure Packages
Scalable Platform for Building Solutions

Vblock 0 (1H 2010)
- An entry-level configuration addresses small datacenters or organizations
- Proof of concept
- Infrastructure management consolidation

Vblock 1
- A mid-sized configuration
  - Broad range of IT capabilities
  - Organizations of all sizes
- Use case: Shared services – Email, File & Print, Virtual Desktops, etc

Vblock 2
- Optimized for performance
  - Support high intensity application environments
  - Extensible to meet the most demanding IT needs
- Enterprise and Service Provider
- Use case: Business critical ERP, CRM systems
Vblock 1: What's in the Architecture?

Compute
- 16-32 Cisco UCS B-series blades
  - 128-256 Cores
  - 960-1920 GB Memory

Network
- Cisco Nexus 1000V
- Cisco MDS 9506 (9221i)

Storage
- EMC CLARiiON CX4 480
  - 53-91 TB capacity
  - EFD, FC and SATA Drives
  - Fibre Channel & iSCSI
- Celerra NAS Gateway

Virtual Data Center OS
- VMware vSphere 4

Management Software
- EMC Ionix Unified Infrastructure Manager (UIM)
- VMware vCenter
- EMC Navisphere
- EMC PowerPath
- Cisco UCS Manager and Fabric Manager
Vblock 2: What's in the Architecture?

Compute
- 32-64 Cisco UCS B-series blades
  - 256 - 512 Cores
  - 3072 - 6144 GB Memory

Network
- Cisco Nexus 1000V
- Cisco MDS 9506

Storage
- EMC Symmetrix V-Max (2 Engines)
  - 140 - 211 TB Capacity
  - EFD, FC and SATA Drives
  - Fibre Channel & iSCSI
- Celerra NAS Gateway

Virtual Data Center OS
- VMware vSphere 4

Management Software
- EMC Ionix Unified Infrastructure Manager (UIM)
- VMware vCenter
- Symmetrix Management Console (SMC)
- EMC PowerPath
- Cisco UCS Manager and Fabric Manager
What’s in the Vblock?

Unified Computing System (UCS)
- Cisco UCS 6100 Series Fabric Interconnects
- Cisco UCS 5100 Series Blade Server Chassis
  - Cisco UCS B-200 M1 Blade Server
    - 48-96 GB Memory
    - Converged Network Adapter (Unified Network)

EMC Storage
- CLARiiON CX4
- Symmetrix V-Max
- NAS Gateway

VMware vSphere
Unified Computing System (UCS)

Single, scalable integrated system
Network + compute virtualization
Today’s Approach

- All fabric types have switches in each chassis
- Repackaged switches
- Complex to manage
- Blade-chassis configuration dependency
- Costly
- Small network domain
Unified Fabric
Cisco UCS

Disaggregate Switch
- Fabric Extender “Distributed line-card”
- Feature coherence
- Single point of mgmt
- Fewer cables
Cisco UCS

Infrastructure Management
- Centralize chassis management
  - Intrinsic system management
- Single management domain
- Scalable architecture

Two Failure Domains
- Separate fabrics
- Central supervisor, forwarding logic
- Distributed Fabric Extenders
  - Traffic isolation
  - Oversubscription

Blade Chassis
- Chassis Management

SAN

LAN

10GE/FCoE
UCS Building Blocks

UCS Manager
Embedded– manages entire system

UCS 6100 Series Fabric Interconnect
20 Port 10Gb FCoE – UCS-6120
40 Port 10Gb FCoE – UCS-6140

UCS Fabric Extender – UCS 2100 Series
Remote line card

UCS 5100 Series Blade Server Chassis
Flexible bay configurations

UCS Blade Server
Industry-standard architecture

UCS Adapters
Choice of multiple Converged Network Adapters and Virtual Adapters
UCS System Interconnect Components

Half Width Blade
- Up to 8 per enclosure
- 1 x Dual 10GE port adapter connected internally to both FEX modules – all links active

Full Width Blade
- Up to 4 per enclosure
- 2 x Dual 10GE port adapter both connected internally to both FEX modules – all links active
Unified Computing System (UCS)

Cisco UCS 6100 Series Fabric Interconnects
- Unified network connectivity to blades and chassis
  - 10 Gigabit Ethernet
  - Fibre Channel over Ethernet (FCoE)
- IP and Fibre Channel to the aggregation layer and SAN
- Management
  - UCS Manager embedded

Vblock Configuration
- Always configured in pairs
  - Availability
  - Performance and load balancing
- Vblock 1 - 6120 Fabric Interconnect
  - (20) 10 Gb fixed ports to blade chassis/aggregation layer
  - (4) 4 Gb Ports to SAN fabric
- Vblock 2 – 6140 Fabric Interconnect
  - (40) 10 Gb fixed ports to blade chassis/aggregation layer
  - (8) 4 Gb Ports to SAN fabric
Unified Computing System (UCS) Vblock Fabric Interconnects Design Considerations

Availability
- Always installed in pairs
- Redundant power and cooling

Predictable performance
- Maximum of 4:1 oversubscription (downstream vs upstream)
- Balanced configuration

Scalability and flexibility
Unified Computing System (UCS) Vblock Chassis Configuration

Cisco UCS 5100 Series Blade Server Chassis
- (8) Blades per chassis
- (2) 2104XP Fabric Extenders
- Redundant Power and Cooling

Vblock Configuration
- Vblock 1
  - 2 to 4 Blade Chassis
- Vblock 2
  - 4 to 8 Blade Chassis
Unified Computing System (UCS) Vblock Blade Configuration

Cisco UCS B-200 M1 Blade Server
- 8 Blades per Chassis
  - 2 Intel® Xeon® 5500 Series processors
  - 48-96 GB Memory
  - Converged Network Adapter (Unified Network)
    - vNIC
    - vHBA
  - Internal connections to both Fabric Extenders

Vblock Configuration
- Vblock 1
  - 16 - 32 blades
  - 128 - 256 cores
  - 960 - 1920 GB memory
    - 6 blades/chassis = 48 GB
    - 2 blades/chassis = 96 GB
- Vblock 2
  - 32 - 64 blades
  - 256 - 512 cores
  - 3072 - 6144 GB memory
    - 96 GB per blade
  - (2) 73 GB internal HDD
Unified Computing System (UCS) Vblock Chassis Configuration Design Considerations

Availability
- Two Fabric Extenders (FEX) per Chassis
- Each blade as two connections (one to each FEX)
- N+1 cooling and power

Predictable Performance
- 2:1 Over-subscription – But still full 10 Gb to each blade
- Balanced configuration
- Distribute vHBA and vNIC between fabrics
  - Slots statically pinned to a link
- QoS
  - BB credits for FC traffic
  - Non-FC traffic can be assigned different weights
Unified Computing System (UCS)
Vblock Chassis / Blade Configuration

Availability
- N+1 blades per chassis
- vNIC routing between fabrics
- OS (Powerpath) vHBA failover

Predictable performance
- Dual quad core Xeon® 5500 Series processors
- Balanced configuration
  - Network
  - Memory
  - Compute

Scalability and flexibility
- Virtualize everything
- VLAN, trunks and port groups
What’s in the Vblock?

Unified Computing System (UCS)
- Cisco UCS 6100 Series Fabric Interconnects
- Cisco UCS 5100 Series Blade Server Chassis
  - Cisco UCS B-200 M1 Blade Server
    - 48-96 GB Memory
    - Converged Network Adapter (Unified Network)
- Unified Network

Storage
- EMC CLARiiON CX4
- EMC Symmetrix V-Max
- EMC Celerra NAS gateway
- Cisco MDS Fibre Channel switch

VMware vSphere
# Storage: CLARiiON and Symmetrix

## Vblock 1
### CLARiiON CX4 480

<table>
<thead>
<tr>
<th>Component</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enterprise Flash Drives (EFD) 400GB</td>
<td>9</td>
<td>17</td>
</tr>
<tr>
<td>15K Fibre Channel 450 GB</td>
<td>79</td>
<td>140</td>
</tr>
<tr>
<td>SATA 1TB</td>
<td>17</td>
<td>23</td>
</tr>
<tr>
<td>Total Drive</td>
<td>105</td>
<td>180</td>
</tr>
<tr>
<td>Total Capacity*</td>
<td>53 TB</td>
<td>91 TB</td>
</tr>
</tbody>
</table>

## Vblock 2
### Symmetrix V-Max (1 or 2 Engine)

<table>
<thead>
<tr>
<th>Component</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enterprise Flash Drives (EFD) 400GB</td>
<td>17</td>
<td>25</td>
</tr>
<tr>
<td>15K Fibre Channel 450 GB</td>
<td>125</td>
<td>230</td>
</tr>
<tr>
<td>SATA 1TB</td>
<td>78</td>
<td>100</td>
</tr>
<tr>
<td>Total Drive</td>
<td>220</td>
<td>355</td>
</tr>
<tr>
<td>Total Capacity*</td>
<td>140 TB</td>
<td>211 TB</td>
</tr>
</tbody>
</table>

* 70% of raw capacity
### Storage: CLARiiON and Symmetrix

#### Vblock 1
**CLARiiON CX4 480**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage Processors</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Fibre Channel front-end ports (4 Gb)</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>iSCSI front-end ports (10 Gb)</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Global Memory (cache)</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>IOPs / MBs</td>
<td>41428 / 4212</td>
<td>50000 / 6000</td>
</tr>
</tbody>
</table>

#### Vblock 2
**Symmetrix V-Max**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Minimum</th>
<th>Maximum*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage Processors (Directors)</td>
<td>2 (1 Engine)</td>
<td>4 (2 Engines)</td>
</tr>
<tr>
<td>Fibre Channel front-end ports (4 Gb)</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>iSCSI front-end ports (1 Gb)</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Global Memory (cache)</td>
<td>64</td>
<td>128</td>
</tr>
<tr>
<td>IOPs / MBs</td>
<td>92193 / 7845</td>
<td>141858 / 12840</td>
</tr>
</tbody>
</table>

* Additional engines possible beyond base Vblock configuration

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Storage: CLARiiON and Symmetrix

Storage configuration are application specific

Logical device considerations*

- LUN size
  - Consistent size based on application requirements
- RAID Protection
  - RAID 1
  - RAID 5
  - RAID 6
- LUN aggregation using meta devices
  - Size
  - Performance
- Virtual Provisioning
  - Thin Pool
  - Thin Devices/Fully allocated

Simplifies storage provisioning

- Storage Tiers based on drive and protection
- Storage Templates
- Storage Policies

Local and remote replication requirements

* Existing Best Practices Apply
Storage: EMC Celerra

File Server for the Vblock

- Gateway configuration sharing CLARiiON or Symmetrix storage
- Vblock 1 NS-G2
  - 2 Datamovers
- Vblock 2 NS-G8
  - 2 – 8 Datamovers
- May be shared across multiple Vblocks
Storage Area Network

Vblock 1
- (2) Cisco MDS 9222i or 9506
  - (8) 4 Gb N-ports to each Fabric Interconnect
  - (4-8) 4 Gb N-ports to each CLARiiON Storage Processor
  - Recommend MDS 9506 if >3 Vblock 1

Vblock 2
- (2) Cisco MDS 9506
  - (8) 4 GB N-ports to each Fabric Interconnect
  - (8-16) 4 GB N-ports to each Symmetrix V-Max engine

Zoning and VSAN
- Based on application requirements and existing best practices
Storage Design Consideration

Balanced configuration
- Capacity, connectivity, workload (IOPs / MBs)

Availability
- Enterprise class storage
- RAID protection
- Extensive remote replication capabilities using MirrorView and SRDF

Predictable Performance
- Large cache
- Tiered storage including FC, SATA and Enterprise Flash Drives (EFD)

Ease of deployment and management
- Template based provisioning
- Wizards
- Fully Automate Storage Tiering (FAST)
- Virtual Provisioning
- Local replication capability using SnapView and TimeFinder
Vblock 1 Min

- Aggregation Layer Switches
- 40 Gbps Uplinks
- 6120 Fabric Interconnect
- 40 Gbps Unified Fabric
- UCS 6108 Blade Chassis
- MDS 9222i SAN Fabric A
- MDS 9222i SAN Fabric B
- External SAN (optional)
- Clarion CX4-400

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Vblock 1 Max
Vblock 2 Min

Aggregation Layer Switches

MDS 9566 SAN Fabric A

MDS 9506 SAN Fabric B

6140 Fabric Interconnect

40 Gbps Uplinks

UCS Blade Chassis

External SAN (optional)

Engine 1

Symmetrix V-Max

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What’s in the Vblock?

Unified Computing System (UCS)
- Cisco UCS 6100 Series Fabric Interconnects
- Cisco UCS 5100 Series Blade Server Chassis
  - Cisco UCS B-200 M1 Blade Server
    - 48-96 GB Memory
    - Converged Network Adapter (Unified Network)
- Unified Network

EMC Storage
- CLARiiON CX4
- Symmetrix V-Max
- NAS Gateway

VMware vSphere
vSphere

VMware vSphere 4 is the Datacenter OS for the Vblock
- Virtualization of all application servers
- ESX & vCenter

Templates enable rapid provisioning

<table>
<thead>
<tr>
<th>Vblock 1</th>
<th># of VMs based on Minimum UCS config.</th>
<th># of VMs based on Maximum UCS config.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:4 Core to VM Ratio (1920 MB memory/VM)</td>
<td>512</td>
<td>1024</td>
</tr>
<tr>
<td>1:16 Core to VM Ratio (480 MB memory/VM)</td>
<td>2048</td>
<td>4096</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vblock 2</th>
<th># of VMs based on Minimum UCS config.</th>
<th># of VMs based on Maximum UCS config.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:4 Core to VM Ratio (3072 MB memory/VM)</td>
<td>1024</td>
<td>2048</td>
</tr>
<tr>
<td>1:16 Core to VM Ratio (768 MB memory/VM)</td>
<td>4096</td>
<td>8192</td>
</tr>
</tbody>
</table>
VBlock Services

Internal or external to the Vblock
- VMware vCenter
- VMware View
- Active Directory
- DNS
- Time Services

Provide consistent services within and across Vblocks
Physical Architecture

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

<table>
<thead>
<tr>
<th>Vblock 1</th>
<th>Minimum Configuration</th>
<th>Maximum Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power</td>
<td>22 KVA</td>
<td>29 KVA</td>
</tr>
<tr>
<td>Cooling</td>
<td>78132 BTU/hr</td>
<td>109662 BTU/hr</td>
</tr>
<tr>
<td>Space</td>
<td>66 Rack Units (RU) 2 Racks</td>
<td>69 Rack Units (RU) 3 Racks</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vblock 2</th>
<th>Minimum Configuration</th>
<th>Maximum Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power</td>
<td>32 KVA</td>
<td>45 KVA</td>
</tr>
<tr>
<td>Cooling</td>
<td>121536 BTU/hr</td>
<td>170096 BTU/hr</td>
</tr>
<tr>
<td>Space</td>
<td>70 Rack Units (RU) 4 Racks</td>
<td>112 Rack Units (RU) 5 Racks</td>
</tr>
</tbody>
</table>
vBlock 1 Min Configuration – Rack Layout - Front View
2 UCS Chassis, 8 Blades each, 6*48 GB RAM + 2* 96 GB RAM (Total 480 GB RAM), 2 73 GB Internal HDD 2
2 UCS 6120 Fabric Interconnect, 20 Fixed ports, 8 Ports 4 GB Fiber Channel
2 MDS 9222i, 18 Ports 4 GB Fiber Channel
Clariion CX4-480, 2 Controllers
vBlock 1 Min Configuration – Rack Layout - Rear View
2 UCS Chassis, 8 Blades each, 6*48 GB RAM + 2* 96 GB RAM (Total 480 GB RAM), 2 73 GB Internal HDD
2 UCS 6120 Fabric Interconnect, 20 Fixed ports, 8 Ports 4 GB Fiber Channel
2 MDS 9222i, 18 Ports 4 GB Fiber Channel
Clarion CX4-480, 2 Controllers
vBlock 1 Max Configuration – Rack Layout Front View

4 UCS Chassis, 8 Blades, 6*48 GB RAM + 2* 96 GB RAM (Total 1920 GB RAM), 2* 73 Internal HDD
2 UCS 6120 Fabric Interconnect, 20 Fixed ports, 8 Ports 4 GB Fiber Channel
2 MDS 9222i, 18 Ports 4 GB Fiber Channel
Clarion CX4-480, 2 Controllers
vBlock 1 Max Configuration – Rack Layout Rear View

4 UCS Chassis, 8 Blades, 6*48 GB RAM + 2*96 GB RAM (Total 1920 GB RAM), 2*73 Internal HDD
2 UCS 6120 Fabric Interconnect, 20 Fixed ports, 8 Ports 4 GB Fiber Channel
2 MDS 9222i, 18 Ports 4 GB Fiber Channel
Clarion CX4-480, 2 Controllers
vBlock 2 Min – Rack Layout Front View

4 UCS Chassis, 8 Blades, 96 GB RAM, 2* 73 GB Disk Drives
2 UCS 6140 Fabric Interconnect, 40 Fixed ports, 8 Ports 4 GB Fiber Channel
2 MDS 9506, 24 Ports 4 GB Fiber Channel
VMAX-ME, 2 Engines

42 U

42 U

42 U

42 U

- 4 UCS 5106 Chassis
- 2 UCS 6140
- 2 - MDS 9506
- 1 - NMS Gateway
- System Bay With 2 Engines
- Storage Bay With 13 DAEs
vBlock 2 Max – Rack Layout Front View

8 UCS Chassis, 8 Blades, 96 GB RAM, 2" 73GB Disk Drives
2 UCS 6140 Fabric Interconnect, 40 Fixed ports, 8 Ports 4 GB Fiber Channel
2 MDS 9506, 24 Ports 4 GB Fiber Channel
VMAX-ME, 2 Engines

2 – UCS 6140
4 – UCS 5108

42 U

42 U

42 U

42 U

1-NAS GW
MDS 9506 * 2

System Bay
With 2 Engines

4 Racks of Storage
Bays
With 52 DAEs

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Templates ensure
- Repeatable, compliant IT processes
- Rapid deployment
- Reduces risk
- Simplifies management

Unified element managers
Vblock Architecture

Reference Architecture based on best of breed components
  – Building block simple!

Yet, flexible enough to build future proof configuration where application specifics are unknown
  – Impressive technical specifications
  – Balanced performance
  – Scalability and flexibility
  – HA/Redundancy
  – Disaster recovery
  – Simplified troubleshooting
  – Ease of management
  – Cost constraints

Pretested! Fully Integrated! Ready to Go! Ready to Grow!
Thank You