# Revision history

<table>
<thead>
<tr>
<th>Date</th>
<th>Version</th>
<th>Author</th>
<th>Description of changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>December 2010</td>
<td>1.0 - 1.2</td>
<td>Paula Putnam</td>
<td>Initial releases</td>
</tr>
<tr>
<td>November 2011</td>
<td>1.3</td>
<td>Sandy Guardiani</td>
<td>Removed 700MX, removed listing of Cisco UCS blades, added new AMPS, and updated Vblock 0 interconnection illustration</td>
</tr>
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Introduction

This document describes the high-level design of Vblock™ Infrastructure Platforms. It describes the hardware and software components that VCE includes in each 2010 Vblock platforms model.

The target audience for this document includes sales engineers, field consultants, advanced services specialists, and customers who want to deploy a virtualized infrastructure by using Vblock platforms.

Vblock platforms by VCE are enterprise- and service provider-class IT infrastructure built upon industry leading technology by Cisco, EMC, and VMware. Vblock platforms are pre-engineered, tested, and validated units that streamline IT infrastructure acquisition, deployment, and operations. By standardizing IT building blocks, VCE can dramatically simplify IT operations – accelerating IT deployment while reducing costs and improving service levels for all workloads, including the most demanding and mission critical enterprise applications. Customers who previously spent 70% or more of their IT budgets and staff time on maintaining infrastructure can focus on more strategic efforts that add value to the business or mission. Strict design control enables Vblock platforms to meet specific performance and availability levels while maintaining a balanced, optimized, and easily managed converged infrastructure.

For additional information, refer to the VCE Glossary that is located on the VCE Support Portal at www.vce.com/support. A valid user name and password are required. Click on the Documents tab. Select Vblock 0, 1, and 1U in the Folder field. Select this document from the list.

To suggest documentation changes and provide feedback on this book, send an e-mail to docfeedback@vce.com. Include the name of the topic to which your comment applies, and your feedback.
Overview

Vblock™ Infrastructure Platforms

The following table describes the available Vblock platforms described in this guide:

<table>
<thead>
<tr>
<th>Vblock platform</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vblock 0</td>
<td>An ideal platform for enterprise for remote locations, file and print servers, and as a test/development platform utilizing a Network Attached Storage (NAS) file-based layer. UCS local disks are required for boot purposes.</td>
</tr>
<tr>
<td>Vblock 1</td>
<td>Designed for shared services such as email, virtual desktops, collaboration, and file and print servers utilizing a SAN block-based storage layer. UCS local boot disks are optional.</td>
</tr>
<tr>
<td>Vblock 1U</td>
<td>Designed for shared services such as email, virtual desktops, collaboration, and file and print servers utilizing a NAS file-based storage layer or a unified (NAS/SAN) layer. UCS local boot disks are optional.</td>
</tr>
</tbody>
</table>

Components

The following table provides an overview of the different components used in each Vblock platform:

<table>
<thead>
<tr>
<th>Category</th>
<th>Vblock 0</th>
<th>Vblock 1</th>
<th>Vblock 1U</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compute</td>
<td>Two Cisco 6120 Fabric Interconnects&lt;br&gt;Two Cisco UCS 5108 chassis containing B-series blade server modules - local drives for ESXi local boot service and local page memory purposes. Minimum of one and a maximum of four B-series blade packs (four blades minimum, 16 blades maximum).</td>
<td>Two Cisco 6120 or 6140 Fabric Interconnects&lt;br&gt;Four Cisco UCS 5108 chassis containing B-series blade server modules Minimum of four and a maximum of eight B-series blade packs [16 blades minimum, 64 blades maximum with the addition of a compute expansion (CE) rack].</td>
<td>Two Cisco 6120 or 6140 Fabric Interconnects&lt;br&gt;Four Cisco UCS 5108 chassis containing B-series blade server modules - local drives for ESXi local boot service and local page memory purposes. Minimum of two and a maximum of eight B-series blade packs [eight blades minimum, 64 blades maximum with the addition of a compute expansion (CE) rack].</td>
</tr>
<tr>
<td>Network</td>
<td>Cisco Nexus 1000V&lt;br&gt;The Cisco UCS uses 6100 series fabric interconnects that carry the network and storage (IP-based) traffic from the blade servers to the connected LAN&lt;br&gt;Cisco Nexus 5010 data center switches</td>
<td>Cisco Nexus 1000V&lt;br&gt;The Cisco UCS uses 6100 series fabric interconnects that carry the network and storage (IP-based) traffic from the blades to the connected SAN and LAN&lt;br&gt;Cisco Nexus 5020 data center switches or optionally, Cisco Nexus 7010 data center switches</td>
<td>Cisco Nexus 1000V&lt;br&gt;The Cisco UCS uses 6100 series fabric interconnects that carry the network and storage (IP-based) traffic from the blades to the connected SAN and LAN&lt;br&gt;Cisco Nexus 5020 data center switches or optionally, Cisco Nexus 7010 data center switches</td>
</tr>
<tr>
<td>Storage</td>
<td>EMC Celerra NS-120 in a single rack with storage scaling from five DAEs with 75 drive slots of storage to seven DAEs with 105 drive slots of storage</td>
<td>SAN storage - EMC CLARiiON CX4-480 SAN&lt;br&gt;Cisco MDS Aggregation SAN switch</td>
<td>Unified storage - EMC Celerra NS-960 or NS-480&lt;br&gt;Cisco MDS Aggregation SAN switch</td>
</tr>
</tbody>
</table>
The following illustration provides a high-level overview of the components in the 2010 Vblock platforms architecture:
Cisco UCS blades

For a list of supported Cisco UCS blades, refer to the Vblock Infrastructure Platforms Blade Pack Reference that is located on the VCE Support Portal at www.vce.com/support. A valid user name and password are required. Click on the Documents tab. Select Vblock 0, 1, and 1U in the Folder field. Select this document from the list.

Base configurations and scaling

Vblock platforms have been architected with a base and upgrade approach. Base configurations are those configurations that represent an entry point to a Vblock platform. A base Vblock platform begins with racks, in-rack PDU’s, cabling, patch panels, aggregate SAN and Ethernet switches, enough UCS hardware to support a full rack of servers, and storage configuration with a small amount of initial storage in a discrete configuration. Upgrades of blade packs and disk tier groups extend the base to achieve a particular performance or scalability goal. This architecture provides customers with significant scalability and flexibility to meet business requirements.

Vblock platforms are limited in certain capabilities, features, and scale to differentiate each one in the market place. These differences can be aligned to potential numbers and densities of virtual machines and storage capabilities including providing block or NAS disk usage as well as optional features that can be added today and in the future.

Vblock platform design principles

Vblock platforms consist of minimum and maximum configurations that offer balanced I/O, bandwidth, and storage capacity relative to the compute and storage arrays offered. It is a fully-redundant autonomous system with 1+1 or N+1 redundancy.

A Vblock platform zone is a collection of pooled Vblock platforms. Vblock platforms contain the following characteristics:

- A unit of assembly that provides a set of services, at a known level, to target consumers
- Self contained, but it can also use external shared services
- Optimized for the classes of services it is designed to provide
- Can be clustered to provide availability or aggregated for scalability, but Vblock platforms are each still viable on their own
- Fault and service isolation - The failure of one or more Vblock platforms will not impact the operation of other Vblock platforms (service level degradation can occur unless availability or continuity services are present)
Vblock 0

Vblock 0 base and upgrade

This topic shows the Vblock 0 base and upgrade option.

Vblock 0 base

The following illustration shows a Vblock 0 base:
Vblock 0 with upgrade options

The following illustration shows a Vblock 0 with upgrade options:

Vblock 0 with AMP

Advanced Management Pod (AMP) used for remote operations and consists of a remote management router, management switch, and two management servers. This is an optional component and can be removed if not needed by the customer.

Vblock 0 with +2 DAE
Vblock 0 connectivity

The following illustration shows a high-level topological view of connectivity in a Vblock 0:
Vblock 1 compute and storage base

The following illustration shows the compute and storage base for a Vblock 1:

![Diagram of Vblock 1 compute and storage base]

Note: Aggregation Ethernet and SAN equipment is not shown in this illustration due to potential variations in the design. These components are delivered in a separate aggregation rack.
Vblock 1 connectivity

The following illustration shows a high-level topological view of Vblock 1 enabled by SAN storage:
Vblock 1U base

The following illustration shows the Vblock 1U base:

Note: Aggregation Ethernet and SAN equipment is not shown in this illustration due to potential variations in the design. These components are delivered in a separate aggregation rack.
Vblock 1U connectivity

The following illustration shows a high-level topological view of connectivity in a Vblock 1U:
Vblock platforms design

Connectivity overview

The Vblock platform consists of a base and upgrade set of components that offer balanced I/O, bandwidth, and storage capacity relative to the compute and storage arrays offered. Vblock platforms are fully-redundant autonomous systems that have 1+1 or N+1 redundancy by default.

Compute layer

In Vblock platforms, each Cisco UCS chassis contains Cisco B-series blades. The type of blade and quantity are custom ordered to each organization’s requirements.

The amount of RAM per blade within a Vblock platform can be adjusted if you have specific requirements within the definition of a Vblock platform. This however requires careful consideration of the operational environment and introduces some variance.

Each Cisco UCS 61x0 Fabric Interconnect has either four or eight 10 GE/Unified Fabric uplinks to the aggregation layer Cisco switches and either 4 or 8*4G Fibre Channel connections to the SAN aggregation provided by a pair of Cisco MDS Aggregation SAN switches (SAN A and B support).


Network layer overview

Vblock 1 enabled by SAN storage can optionally contain aggregation Ethernet switches and must contain an aggregation SAN switch. Vblock 1U enabled by unified storage has a Cisco Nexus 5020 switch that provides limited local Fibre Channel connectivity and additional 10 Gb Ethernet connectivity to connect the Cisco UCS Fabric Interconnect to the EMC Celerra data mover ports. The Cisco MDS Aggregation SAN switches are necessary components to provide Fibre Channel connectivity between the storage arrays and Cisco UCS 61x0 series Fabric Interconnects and ultimately the Cisco UCS B-200 series blades.

For upstream connectivity, the Cisco UCS 61x0 Fabric Interconnects are connected using either 4*10GE/Unified Fabric or 8*10GE/Unified Fabric connections, which equates to an oversubscription factor of 4:1.

Storage layer overview

Storage capacity is tuned to match the I/O performance of the attached Cisco UCS systems. Additionally, some analysis of the likely underlying applications has also been taken into account to characterize user or VM densities that are likely for a given Vblock platform. Obviously, these numbers are highly variable based upon your use cases and requirements; the numbers are intended to provide guidance on typical densities.
Vblock 0 interconnection

The following illustration shows the interconnection of the EMC Celerra NS-120 in Vblock 0:
Vblock 1 interconnection

The following illustration shows the interconnection of the EMC CLARiiON CX4-480 in Vblock 1 enabled by SAN storage:

The EMC CLARiiON system is configured with an amount of Flash, Fibre Channel, and SATA drives with N+1 spares redundancy.

Vblock 1 enabled by SAN storage can support NAS with the provision that primary boot services are provided across the SAN.

EMC PowerPath/VE (PP/VE) provides several benefits in terms of performance, availability, and operations. The base PP/VE license is mandatory for Vblock 1.
**Vblock 1U interconnection**

The following illustration shows the interconnection of the EMC Celerra NS-960 in Vblock 1U enabled by unified storage:

NAS functionality is integrated into the EMC Celerra NS-960 in Vblock 1U enabled by unified storage.
Vblock platforms management

Management framework

Within the Vblock platforms there are several managed elements, some of which are managed by their respective element managers. These elements offer corresponding interfaces that provide an extensible, open management framework. The following illustration shows the relationships and interfaces in the Vblock platforms management framework. The individual element managers and managed components are:

- VMware vCenter Server
- Cisco UCS Manager
- EMC Symmetrix Management Console
- EMC Navisphere Manager
- VCE Advanced Management POD (AMP)

A Vblock platform element manager, EMC Unified Infrastructure Manager (UIM) manages the configuration, provisioning, and compliance of Vblock platforms. This accrues several benefits as it provides a “single pane of glass” for systems configuration and integration and provides Vblock platform service catalogs and Vblock platform self-service portal capabilities.

EMC UIM does not provide fault, performance monitoring, billing capabilities, or software lifecycle management capabilities. Using the abstractions offered by EMC UIM, and using EMC UIM as a single point of integration, simplifies Vblock platforms integration into IT service catalogs and workflow engines. UIM simplifies Vblock platforms deployment by abstracting the overall provisioning aspects of Vblock platforms, while offering granular access to individual components for troubleshooting and fault management.
Advanced Management Pod (AMP)

The Advanced Management POD (AMP) is an optional component in all Vblock platforms but is recommended as a best practice as it provides a single management point for the Vblock platform. If you have contracted VCE to remotely manage the Vblock platform, the AMP is required. The AMP enables the following benefits:

- Monitors and manages Vblock platform health, performance, and capacity
- Provides fault isolation for management
- Eliminates resource overhead on the Vblock platform
- Provides a clear demarcation point for remote operations

The following table describes the AMPs:

<table>
<thead>
<tr>
<th>AMP</th>
<th>Description</th>
</tr>
</thead>
</table>
| Legacy            | - Two Cisco UCS 200 M1 Servers  
                    | - One Cisco 2921 Integrated Services Router  
                    | - One Cisco Catalyst 4948 Switch |
| Mini              | - One Cisco UCS C200 server, with 48 GB RAM with 4 TB of storage  
                    | - Two Cisco Catalyst 3560X Ethernet switches |
| High-availability (HA) | - Two Cisco UCS C200 servers   
                        | - One EMC VNXe3100  
                        | - Two Cisco Catalyst 3560X Ethernet switches |

Cisco UCS C200 server  
Cisco Catalyst 3560X Ethernet switch  
EMC VNXe3100
Expanding Vblock platforms

Expansion overview

One guiding principle of Vblock platforms is the ability to expand the base capacity. The Vblock platform architecture is very flexible and extensible and is architected to be easily expandable from a few hundred VMs to tens of thousands of VMs. In addition, this capacity can be aggregated (clustered) as a single pool of shared capacity or segmented into smaller isolated pools.

Each Vblock platform can be expanded by adding capacity to:

- **Compute**
- **Storage**

Adding compute capacity

Compute capacity is expanded by adding additional blade packs (1 blade pack = 4 blades). The following illustration shows a base compute rack with four blade packs (16 blades). As additional compute capacity is required, four additional blade packs are ordered to completely populate the base compute rack (8 blade packs = 32 blades). After the rack is fully populated, a fully-populated compute expansion rack (8 blade packs = 32 blades) is added to provide a total of 64 blades between the compute and expansion racks.
Adding storage capacity

You can increase the storage capacity of Vblock platforms by adding tiers or levels of storage. The following disk tier groups simplify the configuration:

<table>
<thead>
<tr>
<th>Vblock platform and storage type</th>
<th>Disk tier groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vblock 0 EMC Celerra NS-120</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vault FC 450GB 15K RAID5 4+1</td>
</tr>
<tr>
<td></td>
<td>Tier 1 (T1): EFD One RAID5 4+1 using either 100GB or 200GB disks</td>
</tr>
<tr>
<td></td>
<td>Tier 2 (T2): FC Two RAID5 4+1 using either 450GB or 600GB 15k disks</td>
</tr>
<tr>
<td></td>
<td>Tier 3 (T3): SATA One RAID5 6+1 using either 1TB or 2TB 7.2k disks</td>
</tr>
<tr>
<td>Vblock 1 EMC CLARiiON CX4-480 SAN</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vault FC 450GB 15K RAID5 4+1, Boot disks FC RAID5 4+1 450GB 15k disks</td>
</tr>
<tr>
<td></td>
<td>Tier 1 (T1): EFD One RAID5 4+1 using either 100GB or 200GB disks</td>
</tr>
<tr>
<td></td>
<td>Tier 2 (T2): FC Six RAID5 4+1 using either 450GB or 600GB 15k disks</td>
</tr>
<tr>
<td></td>
<td>Tier 3 (T3): SATA Three RAID5 6+1 using either 1TB or 2TB 7.2k disks</td>
</tr>
<tr>
<td>Vblock 1U EMC Celerra NS-960 or NS-480</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vault FC 450GB 15K RAID5 4+1, Boot disks FC RAID5 4+1 450GB 15k disks</td>
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<td>Tier 1 (T1): EFD One RAID5 4+1 using either 100GB or 200GB disks</td>
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<td>Tier 2 (T2): FC Six RAID5 4+1 using either 450GB or 600GB 15k disks</td>
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<tr>
<td></td>
<td>Tier 3 (T3): SATA Three RAID5 6+1 using either 1TB or 2TB 7.2k disks</td>
</tr>
</tbody>
</table>
Additional references

The following tables provide links to documentation provided by Cisco, EMC, and VMware for each of the product lines that are discussed in this document.

- Compute
- Network
- Storage
- Virtualization

Compute components

<table>
<thead>
<tr>
<th>Product</th>
<th>Description</th>
<th>Link to documentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco UCS 5100 Series Blade Server Chassis</td>
<td>Chassis that supports up to eight blade servers and up to two fabric extenders in a six rack unit (RU) enclosure</td>
<td><a href="http://www.cisco.com/en/US/products/ps10279/index.html">www.cisco.com/en/US/products/ps10279/index.html</a></td>
</tr>
</tbody>
</table>

Network components

<table>
<thead>
<tr>
<th>Product</th>
<th>Description</th>
<th>Link to documentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco Nexus 1000V</td>
<td>A software switch on a server that delivers Cisco VN-Link services to virtual machines hosted on that server</td>
<td><a href="http://www.cisco.com/en/US/products/ps9902/index.html">www.cisco.com/en/US/products/ps9902/index.html</a></td>
</tr>
</tbody>
</table>
### Vblock™ Infrastructure Platforms 2010 Vblock Platforms

**Architecture Overview**

<table>
<thead>
<tr>
<th>Product</th>
<th>Description</th>
<th>Link to documentation</th>
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</thead>
</table>

### Storage components

<table>
<thead>
<tr>
<th>Product</th>
<th>Description</th>
<th>Link to documentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMC CLARiiON CX4-480</td>
<td>Delivers industry-leading innovation in midrange storage. The unique combination of flexible, scalable hardware design and advanced software capabilities enables EMC CLARiiON CX4 series systems, powered by Intel Xeon processors, to meet the growing and diverse needs of today’s midsize and large enterprises.</td>
<td><a href="http://www.emc.com/products/detail/hardware/clariion-cx4-model-480.htm">www.emc.com/products/detail/hardware/clariion-cx4-model-480.htm</a></td>
</tr>
</tbody>
</table>

EMC Celerra NS-120, NS-480, and NS-960 | Unified storage systems that bring advanced failover and fully automated storage tiering to multi-protocol environments. | [www.emc.com/products/detail/hardware/celerra-ns120.htm](http://www.emc.com/products/detail/hardware/celerra-ns120.htm)  | [www.emc.com/products/detail/hardware/celerra-ns480.htm](http://www.emc.com/products/detail/hardware/celerra-ns480.htm)  | [www.emc.com/products/detail/hardware/celerra-ns960.htm](http://www.emc.com/products/detail/hardware/celerra-ns960.htm) |

### Virtualization components

<table>
<thead>
<tr>
<th>Product</th>
<th>Description</th>
<th>Link to documentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>VMware vCenter Server</td>
<td>Provides a scalable and extensible platform that forms the foundation for virtualization management.</td>
<td><a href="http://www.vmware.com/solutions/virtualization-management/">www.vmware.com/solutions/virtualization-management/</a></td>
</tr>
</tbody>
</table>
ABOUT VCE

VCE, the Virtual Computing Environment Company formed by Cisco and EMC with investments from VMware and Intel, accelerates the adoption of converged infrastructure and cloud-based computing models that dramatically reduce the cost of IT while improving time to market for our customers. VCE, through the Vblock platform, delivers the industry's first completely integrated IT offering with end-to-end vendor accountability. VCE's prepackaged solutions are available through an extensive partner network, and cover horizontal applications, vertical industry offerings, and application development environments, allowing customers to focus on business innovation instead of integrating, validating and managing IT infrastructure.

For more information, go to www.vce.com.