

Solution Overview
March 2016



Cisco HyperFlex Systems

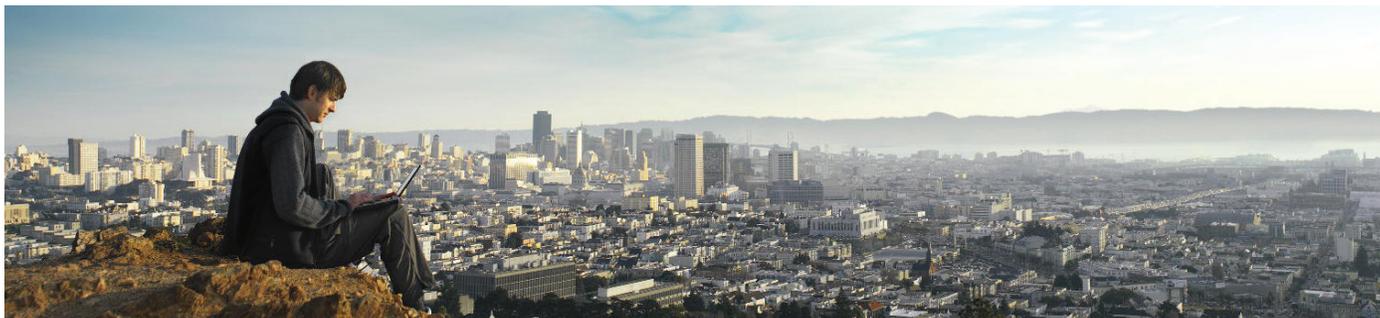


Cisco HyperFlex™ Systems
with Intel® Xeon® Processors



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Highlights

Complete End-to-End Solution

- Cisco HyperFlex™ Systems, powered by Intel® Xeon® processors, deliver a new generation of more flexible, scalable, enterprise-class hyperconverged solutions. They combine software-defined networking and software-defined computing from Cisco UCS® with Cisco HyperFlex HX Data Platform™ Software to provide a single distributed, multitier, object-based data store with enterprise storage features.

Agile

- Our end-to-end solution helps you move faster and achieve your digital transformation.

Efficient

- The solution always keeps your data optimized and your infrastructure aligned with application requirements.

Adaptable

- We help you be ready for an expanding range of applications and operating models.

The Challenge: Limitations of First-Generation Hyperconverged Systems

In IT organizations everywhere, applications dictate architecture—and evolving requirements have been responsible for a continually changing relationship among servers, storage, and network fabric. The lack of a simple and effective way to deploy a virtualization cluster without the complexity of enterprise shared storage systems propelled the creation of hyperconverged systems.

The first generation of hyperconverged systems combined generic x86-architecture servers with software-defined storage to create a simplified, distributed computing platform. But to achieve simplicity and to get to market quickly, vendors made design trade-offs and took many architectural shortcuts. As a result, these first attempts at hyperconvergence fell short of full success:

- **Networking is manual, not automated.** First-generation hyperconverged systems treat networking as an afterthought. They do not include an integrated network fabric with consistent, low latency and high bandwidth between nodes, nor do they attempt to integrate microsegmentation through software-defined networking. Network resources cannot be configured and provisioned automatically using profiles and templates, limiting the simplicity of deployment and system expansion.
- **Scaling is inflexible.** Most hyperconverged products are based on rack server appliances that scale both computing and storage in fixed ratios. These resource ratios may or may not be appropriate for your applications and may cause you to overprovision components you don't need. In the real world, every set of applications has a unique set of requirements, and first-generation products fail to let you independently scale computing, storage, and network resources.
- **Performance requires trade-offs.** The data platforms are implemented using off-the-shelf file systems that weren't built specifically for hyperconvergence. They lack some or all essential features, including integrated data services and important data optimization functions, and their deduplication and compression may require performance trade-offs.

- **Application support is narrow.** Hyperconverged products typically support only virtualized environments and a limited number of hypervisors. The real-world range of applications requires broader support, including support for containerized, microservice application architectures that increasingly are being used.
- **New silos are created.** First-generation infrastructure simplifies deployment and operation of cluster nodes, but they add new GUIs for storage management while still requiring separate tools to manage server hardware. They don't incorporate the network or provide support for software-defined networking (SDN). In addition, they lack a unified control plane and open API to allow integration into higher-level tools. As a result, these environments have spawned new islands of infrastructure and require administrators to learn a new set of management tools.

The Solution: Cisco HyperFlex Systems

Cisco HyperFlex™ Systems, powered by Intel® Xeon® processors, deliver a new generation of more flexible, scalable, enterprise-class hyperconverged solutions. In contrast to first-generation products, our solution includes an integrated network fabric and powerful data optimization capabilities that unlock the full potential of hyperconvergence for a wider range of workloads and use cases. Our solution is faster to deploy, simpler to manage, easier to scale, and ready to provide a unified pool of resources to power applications as your business needs dictate. You harness these resources with simplified, centralized management that is integrated, not isolated. You can deploy our solution wherever you need it, from central data center environments to remote locations and edge-computing environments (Figure 1).

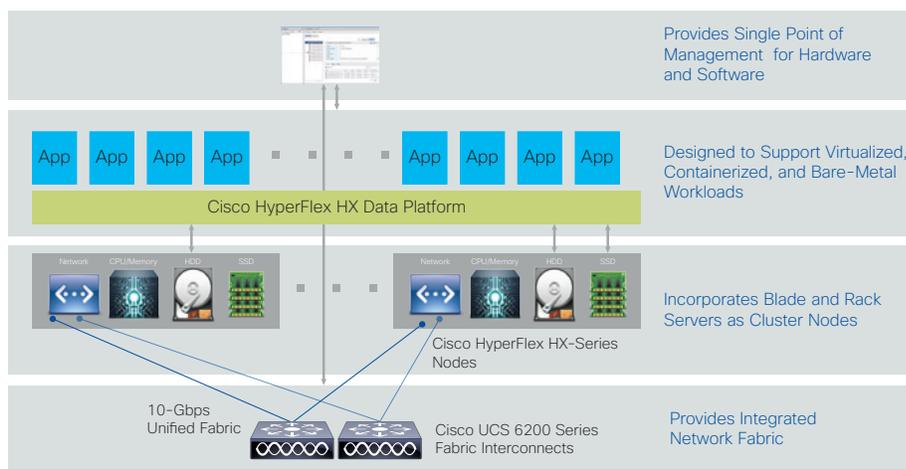


Figure 1. Only Cisco HyperFlex Systems Can Deliver This Combination of Essential Features in a Single Solution

Complete End-to-End Solution

We offer the first hyperconverged platform that is designed as an end-to-end software-defined infrastructure that eliminates the compromises found in first-generation products. We designed Cisco HyperFlex Systems to support a broader range of applications and workloads in the data center, remote locations, and edge-

computing environments. This new generation extends the ease of hyperconverged system deployment, management, and support beyond your central data center.

Cisco HyperFlex Systems combine software-defined computing in the form of Cisco Unified Computing System™ (Cisco UCS®) servers, software-defined storage with the powerful new Cisco HyperFlex HX Data Platform™ Software, and software-defined networking with Cisco UCS fabric that integrates smoothly with Cisco® Application Centric Infrastructure (Cisco ACI™). Together, these elements comprise a composable infrastructure that is the foundation of our solution. The result is a preintegrated cluster that is up and running in an hour or less and that scales resources independently to closely match your application resource needs.

Built on Cisco UCS Technology

Cisco UCS provides a single point of connectivity and hardware management that integrates Cisco HyperFlex HX-Series nodes and Cisco UCS B-Series Blade Servers into a single unified cluster. By choosing the balance of CPU and storage capacity that is right for your applications, you can optimize your Cisco HyperFlex System with more choices than any other vendor offers. Incremental scalability allows you to start small and scale as your needs grow, and adjust the ratio of computing to storage resources as your application needs change. Cisco HyperFlex Systems deliver all the cost savings and performance advantages of Cisco UCS while enabling you to reap the benefits of the broad Cisco UCS management partner ecosystem.

Powered by Next-Generation Data Technology

The Cisco HyperFlex HX Data Platform combines the cluster's solid-state drives and spinning disks into a single distributed, multitier, object-based data store. It includes enterprise-class data management features that you expect from enterprise storage systems to support your entire application lifecycle: for example, snapshots, thin provisioning, and instant and space-efficient cloning. Our networking secures your data through its lifecycle, with security and compliance controls for protection when you distribute, migrate, and replicate data across storage environments. The platform delivers high availability through parallel data distribution and replication, accelerated by the low latency and high bandwidth of the Cisco unified fabric. Data is continuously optimized with real-time, always-on deduplication and compression, helping reduce your storage costs without affecting. Dynamic data placement in server memory, caching, and capacity tiers increase application performance and redundancy. Because of the data platform's extensible architecture, Cisco HyperFlex Systems has future support for a wide range of hypervisors and bare-metal and containerized environments.

Agile, Efficient, and Adaptable Solution

Bringing benefits to your IT organization and to your business, Cisco HyperFlex Systems overcome the limitations of today's products, delivering real solutions that are agile, efficient, and adaptable. Our solution is well suited for hosting environments such as virtual desktops, server virtualization deployments, and test and development environments.

More Agile

From the moment it arrives on your loading dock, your Cisco HyperFlex System is ready to quickly deploy. It ships with software, including the VMware ESXi hypervisor and the data platform, preinstalled. Cisco UCS service profile templates are supplied on site to automatically configure your server identity, configuration, and connectivity to our exact specifications with no risk of configuration drift that can cause downtime. The result: a solution that practically deploys itself in less than an hour.

Our integrated networking interconnects every node—whether based on blade or rack servers—with only a single network hop, helping supply the consistent, low latency between nodes and massive amounts of east-west bandwidth that hyperconverged solutions demand. Cisco virtual network links make every network link as safe and secure as if it were on its own physical cable.

Cisco HyperFlex Systems also enable your IT organization to become more agile and responsive to business demands. When the time comes to increase the size of your cluster, you can do so quickly and easily. The system automatically discovers and configures the new hardware, and adding it to the cluster takes only a few clicks.

And we incorporate both hardware and software management into the familiar VMware vCenter interface, so you can perform all provisioning and storage operations from within vCenter—there are no new tools to learn or consoles to implement.

More Efficient

Our solution was designed from the beginning with a purpose-built, highly efficient data platform that combines the cluster's solid-state disk (SSD) drives and spinning disks (hard-disk drives [HDDs]) into a single, distributed, multitier, object-based data store. Continuous, inline, and real-time data deduplication and compression makes efficient use of storage and reduces your overall IT footprint without affecting performance. Features you expect of enterprise storage systems are built into Cisco HyperFlex Systems. Fast, space-efficient clones help you provision new applications from existing templates or deployments with little use of storage. Thin provisioning lets you deploy more virtual machines with the storage you have, so you purchase actual storage only as you need it. Native snapshots provide efficient point-in-time copies for backup and remote-replication purposes. Unlike with enterprise shared storage, you don't have to install a complex storage network, worry about logical unit numbers (LUNs), or require a storage administrator to configure the data platform.

You also gain operational efficiency because our solution is based on Cisco UCS technology. You gain efficiency through our simplified architecture, which uses fewer components and helps reduce capital expenditures (CapEx). You gain more efficiency and reduced operating expenses (OpEx) from the capability to manage your hyperconverged infrastructure plus all your other Cisco UCS infrastructure from a common management platform.

More Adaptable

Your business needs and your workloads are constantly changing. Why shouldn't your infrastructure adapt to support your workloads and your business with ease? Our solution offers simple and easy physical resource expansion and contraction,

allowing you to scale resources up and out without having to adjust your software or your networking capabilities or interrupt cluster operations. This capability provides an environment in which you can pay as you grow, and you can grow in small increments that don't break your budget. You can independently scale your computing, storage, and caching resources so that they adapt to fit your specific resource needs.

Unlike any other hyperconverged products, ours are designed to support virtualized, containerized, and bare-metal workloads. This freedom of choice allows you to take advantage of our built-in resiliency and fully featured data platform regardless of your workload model. Today, Cisco HyperFlex Systems are supported in VMware vSphere, with planned expansion to support other hypervisors and containerized and bare-metal environments.

Solution Architecture

Cisco HyperFlex Systems combine Cisco UCS networking and computing technology and Cisco HyperFlex HX Data Platform to deliver a complete, end-to-end hyperconverged solution that arrives at your door with hypervisors and data platform software preinstalled. The result is a uniform pool of computing, networking, and storage resources that is designed to power your applications whether they are virtualized, containerized, or run on a bare-metal operating system. This flexibility makes support for a broader range of application types straightforward to achieve. On first customer shipment, applications are supported in a VMware vSphere environment.

Logically, a cluster of three or more Cisco HyperFlex HX-Series nodes provide computing and storage resources to a hyperconvergence layer that supports applications with a full-featured data platform. The data platform is implemented using a Cisco HyperFlex HX Data Platform controller that runs on each node. This approach creates a uniform pool of resources that supports applications across the cluster. When you need to provision computing or storage capacity, that capacity is drawn from the entire pool. No longer do you have to worry about creating LUNs. You simply serve virtual machine storage needs from the pool of resources.

Physically, the system is delivered as a cluster of three or more Cisco HyperFlex HX-Series nodes that are integrated into a single system by a pair of Cisco UCS 6200 Series Fabric Interconnects (Figure 2). No other vendor integrates network and management connectivity into the system like Cisco does. The fabric interconnects provide a single point of connectivity and hardware management for the cluster. With legendary Cisco networking capabilities, the fabric interconnects provide low-latency, high-bandwidth, 10-Gbps connectivity for all system components. The system's unified fabric supports the system's internal communication between agents, production IP traffic, and management connectivity, all with secure isolation between logical networks. This microsegmentation gives you high security and isolation within a single set of cables. After a node is added to the system, it is automatically recognized by the Cisco UCS infrastructure, and you can add it to the cluster with click-of-the-mouse simplicity.

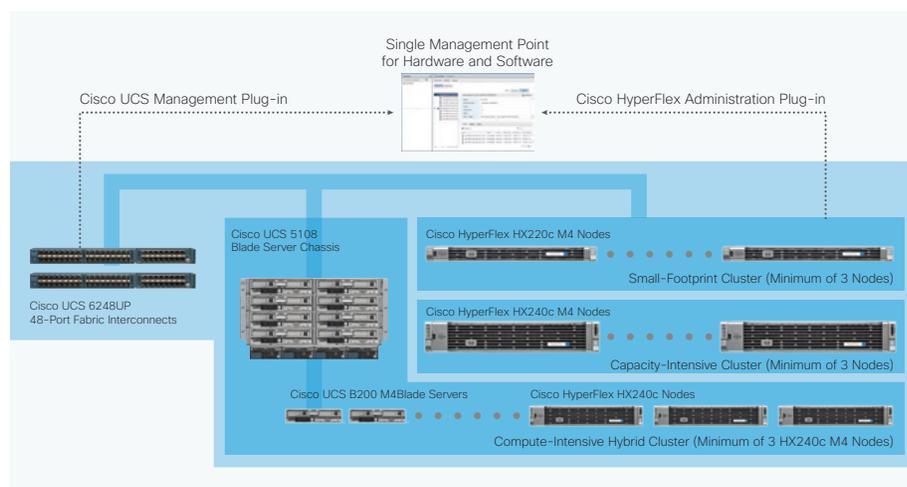


Figure 2. Cisco HyperFlex Systems Product Family

Integrated with Cisco Networking

Networking in most hyperconverged environments is an afterthought. With Cisco HyperFlex Systems, it is an integral and essential part of the system. Using Cisco UCS 6200 Series Fabric Interconnects, you have a single point of connectivity and management that incorporates blade servers and Cisco HyperFlex HX-Series nodes: a feature that no other hyperconverged vendor can offer. After you deploy a cluster, you can scale it to maximum size without needing to redesign the network. The solution is designed for easy, smooth scaling. Hyperconverged systems need massive amounts of east-west traffic bandwidth and low latency, and we deliver both.

Networking is important in hyperconverged systems because the storage platform performance depends on it. With Cisco UCS fabric interconnects, you get high-bandwidth, low-latency 10-Gbps unified fabric connectivity that carries all production IP traffic, hyperconvergence-layer traffic, and management traffic over a single set of cables. Every connection in the cluster is treated as its own microsegment, with the same level of security as if it were supported with a separate physical link, making the integrated network more secure than when commodity approaches are used.

The system is designed so that all traffic, even from blade servers, reaches any other node in the cluster with only a single network hop. No other vendor can achieve this result because every other vendor builds switching into the blade chassis—switching that adds latency. Our latency is deterministic, so you get consistent network performance for the data platform, and you don't have to worry about network constraints on workload placement. This single-hop architecture accelerates east-west traffic, enhancing cluster performance.

When you choose Cisco products, you make an investment that has a continuous upgrade path. Today, Cisco HyperFlex Systems are designed with 20-Gbps connectivity to every node in the cluster and interconnected with Cisco UCS 6200 Series Fabric Interconnects. We have already introduced the Cisco UCS 6300 Series Fabric Interconnects, which bring 40-Gbps connectivity to Cisco UCS. As

demand for data throughput grows in Cisco HyperFlex Systems, we have products ready to meet those needs.

Integration with Cisco Application Centric Infrastructure

The built-in networking of Cisco HyperFlex Systems provides scalable infrastructure and secure, low-latency, high-bandwidth data movement. As your environment grows and begins to span your enterprise, you can use Cisco ACI to implement a software-defined network. Cisco ACI provides automated, policy-based network deployment that secures your applications within secure, isolated environments. The network can attach directly to virtual machines and physical servers and offers these benefits:

- **Increased security:** Cisco ACI isolates your applications and tenants from each other, placing each in a microsegmented environment with application- and tenant-specific policy-based network control.
- **Consistency across scale:** After you capture your best practices in your Cisco HyperFlex environment, Cisco ACI automation can standardize your deployment across all your hyperconverged environments as well as your traditional environments.
- **Monitoring and telemetry:** Cisco ACI provides details about latency, packet drops, and traffic paths that are correlated with applications and logical network segments, giving you more visibility and control over your software-defined networks.
- **Optimized performance:** Cisco ACI automatically allocates traffic across the network's leaf-and-spine architecture for performance and resource utilization, automatically rerouting around hot spots for worry-free network performance.

Supported with the Cisco HyperFlex HX Data Platform

The Cisco HyperFlex HX Data Platform is a purpose-built, high-performance, distributed file system with a wide array of enterprise-class data management services. The data platform's innovations redefine distributed storage technology, exceeding the boundaries of first-generation hyperconverged infrastructure. The platform includes:

- **Enterprise-class data management features** that are required for complete lifecycle management and enhanced data protection in distributed storage environments—including deduplication, compression, thin provisioning, fast space-efficient clones, and snapshots
- **Continuous data optimization** with inline data deduplication and compression that increases resource utilization with more headroom for data scaling
- **Dynamic data placement** in node memory, enterprise-class flash memory (on SSD drives), and capacity storage tiers (on HDDs) to optimize performance and resiliency—and to readjust data placement as you scale your cluster
- **Clusterwide parallel data distribution** that implements replication for high availability and performance, accelerated by the low latency and high bandwidth of the Cisco UCS network fabric

- **API-based data platform architecture** that provides data virtualization flexibility to support existing and new cloud-native data types
- **Simplified approach** that eliminates the need to configure LUNs or to require a storage administrator to configure SANs; storage and data services are managed completely through hypervisor tools such as VMware vCenter

Cisco HyperFlex HX Data Platform Administration Plug-in

The Cisco HyperFlex HX Data Platform is administered through a VMware vSphere web client plug-in. Through this centralized point of control for the cluster, administrators can create volumes, monitor the data platform health, and manage resource use. Administrators can also use this data to predict when the cluster will need to be scaled.

Cisco HyperFlex HX Data Platform Controller

A Cisco HyperFlex HX Data Platform controller resides on each node and implements the distributed file system (Figure 3). The controller runs in user space within a virtual machine and intercepts and handles all I/O from guest virtual machines.

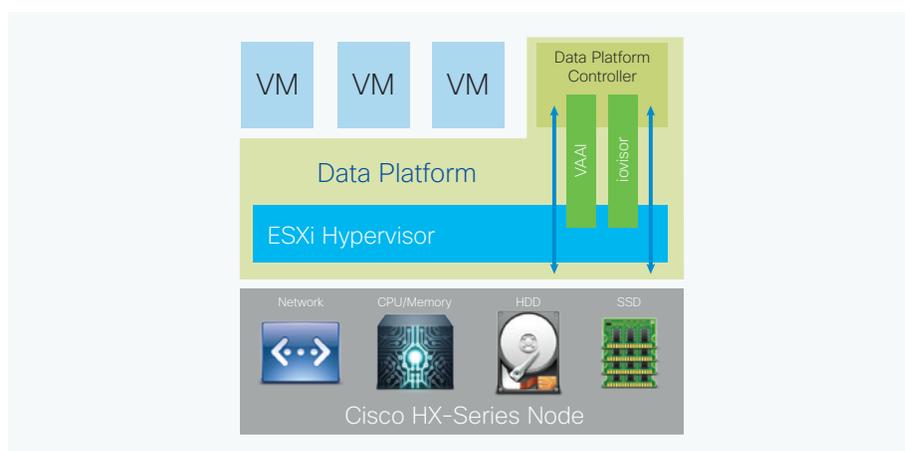


Figure 3. Cisco HyperFlex Data Platform Controller Plugs into the Hypervisor in Each Node

In a VMware environment, the controller occupies a virtual machine with a dedicated number of processor cores and memory, allowing it to deliver consistent performance and not affect the performance of the other virtual machines in the cluster. The controller can access all storage through the VMware VM_DIRECT_PATH feature. It uses the node's memory and SSD drives as part of a distributed caching layer, and it uses the node's HDDs for distributed storage. The controller integrates the data platform into VMware software through the use of two preinstalled VMware ESXi vSphere Installation Bundles (VIBs):

- **IO Visor:** This VIB provides a network file system (NFS) mount point so that the ESXi hypervisor can access the virtual disk drives that are attached to individual virtual machines. From the hypervisor's perspective, it is simply attached to a network file system.

- **VMware API for Array Integration (VAAI):** This storage offload API allows vSphere to request advanced file system operations such as snapshots and cloning. The controller implements these operations through manipulation of metadata rather than actual data copying, providing rapid response, and thus rapid deployment of new application environments.

Data Distribution

The Cisco HyperFlex HX Data Platform controller handles all read and write requests for volumes that the hypervisor accesses and thus intermediates all I/O from the virtual machines. Recognizing the importance of data distribution, the Cisco HyperFlex HX Data Platform is designed to exploit low network latencies and parallelism, in contrast to other approaches that emphasize data affinity.

With data distribution, the data platform stripes data evenly across all nodes, with the number of data replicas determined by the policies you set. This approach avoids both network and storage hot spots and makes I/O performance the same regardless of virtual machine location. This feature gives you more flexibility in workload placement and contrasts with other architectures in which a locality approach does not fully utilize all available networking and I/O resources

- **Data write operations:** For write operations, data is written to the local SSD cache and the replicas are written to the remote SSD drives in parallel before the write is acknowledged.
- **Data read operations:** For read operations, data that happens to be local will usually be read directly off the local SSD drive. If the data is not local, the data is retrieved from an SSD drive on the remote node. This allows the platform to leverage all SSD drives for reads eliminating bottlenecks and delivering superior performance..

In addition, when moving a virtual machine to a new location such as through VMware Dynamic Resource Scheduling (DRS), the data platform does not require data movement and there is no impact or cost to moving virtual machines.

Data Operations

The data platform implements a log-structured file system that uses a caching layer in SSD drives to accelerate read requests and write responses, and it implements a capacity layer with HDDs.

Incoming data is striped across the number of nodes that you define to meet your data availability requirements. The log-structured file system assembles blocks to be written to a configurable cache until the buffer is full or workload conditions dictate that it be destaged to a spinning disk. When existing data is (logically) overwritten, the log-structured approach simply appends a new block and updates the metadata. When data is destaged, the write operation consists of a single seek operation with a large amount of data written. This approach improves performance significantly compared to the traditional read-modify-write model, which is characterized by numerous seek operations and small amounts of data written at a time.

When data is destaged to disk in each node, the data is deduplicated and compressed. This process occurs after the write operation is acknowledged, so

there is no performance penalty for these operations. A small deduplication block size helps increase the deduplication rate. Compression further reduces the data footprint. Data is then moved to HDD storage as cache segments become free (Figure 4).

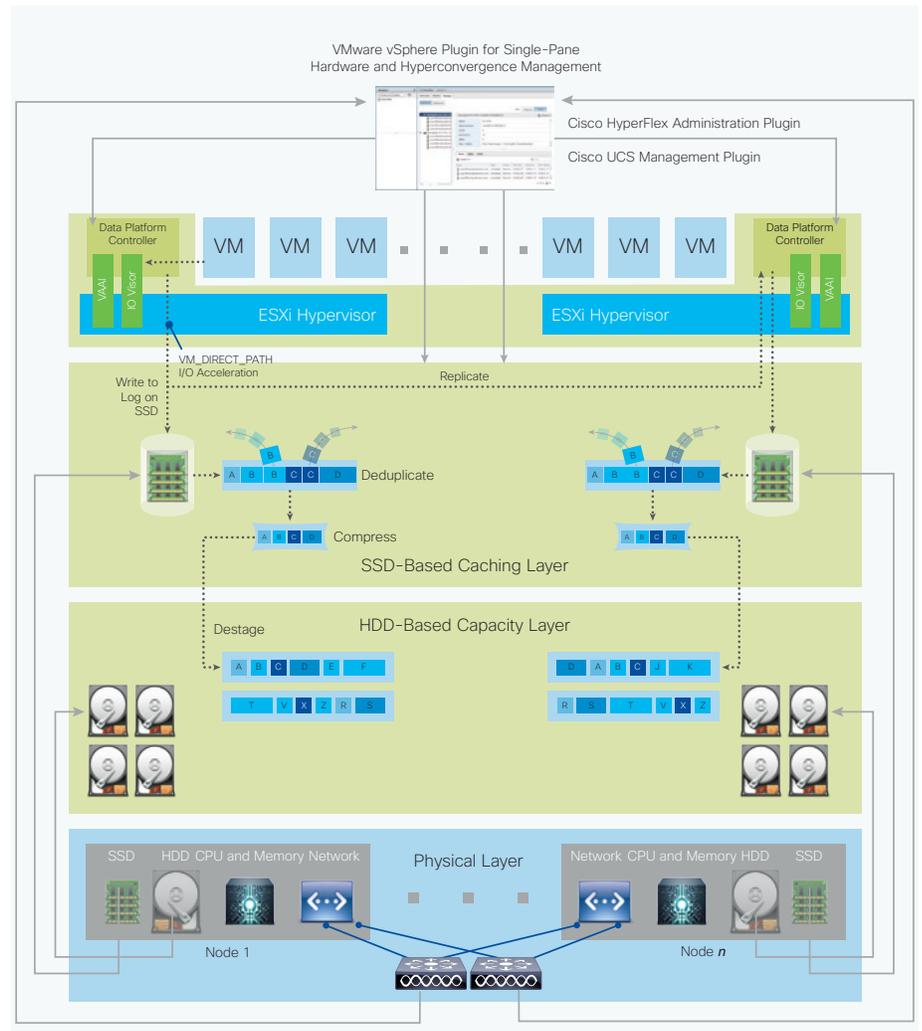


Figure 4. Data Write Flow Through the Cisco HyperFlex HX Data Platform

Read operations cache data in the SSD drives and in main memory for high performance. Having the most frequently used data stored in the caching layer helps make Cisco HyperFlex Systems perform well for virtualized applications. When virtual machines modify data, the original block is likely read from the cache, so there is often no need to read and then expand the data on a spinning disk. The data platform decouples the caching tier from the capacity tier and allows for independent scaling of I/O performance and storage capacity.

Enterprise-Class Storage Features

The data platform has all the features that you would expect of an enterprise shared storage system, eliminating the need to configure and maintain complex Fibre Channel storage networks and devices. The platform simplifies operations and helps ensure data availability. Enterprise-class storage features include the following:

- **Replication** stripes and replicates data across the cluster so that data availability is not affected if single or multiple components fail (depending on the replication factor configured).
- **Deduplication** is always on, helping reduce storage requirements in virtualization clusters in which multiple operating system instances in client virtual machines result in large amounts of replicated data.
- **Compression** further reduces storage requirements, reducing costs, and the log-structured file system is designed to store variable-sized blocks, reducing internal fragmentation.
- **Thin provisioning** allows large volumes to be created without requiring storage to support them until the need arises, simplifying data volume growth and making storage a “pay as you grow” proposition.
- **Fast, space-efficient clones** rapidly replicate storage volumes so that virtual machines can be replicated simply through metadata operations, with actual data copied only for write operations.
- **Snapshots** help facilitate backup and remote-replication operations: needed in enterprises that require always-on data availability.

Built with Cisco UCS Technology

Cisco is the only company to have built a self-aware, self-integrating system with a single point of management and connectivity for the entire system. The system is designed as a single virtual blade server chassis that can span multiple chassis and racks of blade and rack server-based nodes. Cisco thus is in the unique position of being able to deliver a hyperconverged solution that can incorporate blade and rack systems in its architecture, offering greater flexibility than any other solution. You can optimize your system with the amount of computing and storage capacity that you need by changing the ratio of CPU-intensive blade servers to storage-intensive capacity nodes. You no longer have to deploy only appliances.

Cisco HyperFlex HX-Series Nodes

A cluster requires a minimum of three nodes (with disk storage). Data is replicated across at least two of these nodes, and a third node is required for continuous operation in the event of a single-node failure. Each node that has disk storage is equipped with at least one high-performance SSD drive for data caching and rapid acknowledgment of write requests. Each node also is equipped with up to the platform’s physical capacity of spinning disks for maximum data capacity. At first release, we offer three tested cluster configurations:

- **Small-footprint cluster with Cisco HyperFlex HX220c M4 Nodes:** This configuration contains a minimum of three nodes with up to six 1.2-terabyte (TB) SAS drives that contribute to cluster storage capacity, a 120-GB SSD metadata drive, a 480-GB SSD caching drive, and two Cisco Flexible Flash (FlexFlash) Secure Digital (SD) cards that act as boot drives.



Cisco HyperFlex HX220c M4



Cisco HyperFlex HX240c M4



Cisco UCS B200 M4 Blade Server Used in the Compute-Intensive Cluster

- **Capacity-intensive cluster with Cisco HyperFlex HX240c M4 Nodes:** This configuration contains a minimum of three nodes, up to twenty-three 1.2-TB SAS drives for that contribute to cluster storage, a single 120-GB SSD metadata drive, a single 1.6-TB SSD caching drive, and two FlexFlash SD cards that act as the boot drives.
- **Compute-intensive hybrid cluster:** This configuration contains a minimum of three HX240c M4 Nodes with zero or more Cisco UCS B200 M4 Blade Servers for additional computing capacity. The HX240c M4 Nodes are configured as described previously, and the Cisco UCS B200 M4 servers are equipped with boot drives. We require a minimum of three HX220c M4 Nodes with blade servers added according to your workload and storage requirements.

These nodes ship with the VMware ESXi hypervisor preinstalled to shorten deployment time.

Powered by Intel Xeon Processors

Each node offered in these three packages is powered by two Intel Xeon processor E5-2600 v3 series CPUs. This Intel Xeon product series is at the core of an agile, efficient data center. It delivers significantly greater performance and power efficiency than the previous generation of Intel Xeon processors. The series provides more cores with more threads, more processor cache space, faster main memory, and reduced power consumption by intelligently matching core, memory, cache, and I/O power to system demand. Each Cisco HyperFlex HX-Series node includes a range of processor choices, with up to 16 cores, clock rates of up to 2.6 GHz, and 128 to 768 GB of main memory.



Unified, Integrated Infrastructure Management

Cisco UCS management handles all of a cluster's hardware management functions and is accessible through a VMware vSphere plug-in, providing a single point of control for the physical infrastructure, the data platform (see Figure 4 on page 12), and the virtualization layer. Cisco UCS management is also available through an intuitive HTML 5 or Java GUI, command-line interfaces (CLIs), and an open, fully documented XML API.

Cisco HyperFlex Systems integrate easily into existing environments and operation processes. The XML API enables integration into higher-level management tools from Cisco and more than a dozen independent software vendors (ISVs). Tools include monitoring and analysis tools such as VMware vRealize Operations Manager and vCenter, other deployment and configuration tools, and service orchestration tools such as VMware vRealize Orchestrator. Cisco UCS management is also integrated into Cisco UCS Performance Manager for monitoring and analysis. When Cisco HyperFlex Systems are integrated into Cisco UCS Director, your Cisco HyperFlex System can be managed as infrastructure as a service (IaaS) along with other Cisco and third-party hardware.

Cisco UCS management makes our solution more agile, efficient, and adaptable. Integrated management detects any component plugged into the system, making it self-aware and self-integrating, helping the system adapt quickly to changes in hardware configuration. You can move a node from the loading dock and add it to your cluster simply by plugging in network and power cables—no manual node

configuration is required. Cisco UCS service profiles prepare every aspect of a node's identity, configuration, and connectivity, increasing efficiency and security and reducing deployment time. This approach increases compliance and accuracy and eliminates configuration drift that can cause downtime.

Our management approach is particularly important in hyperconverged environments. Central management with role- and policy-based control over resources fundamentally changes the way that you manage your infrastructure. An important benefit of hyperconvergence is the capability to quickly adapt to changing requirements, something that is impossible in first-generation products, which require manual configuration and manual network integration. Cisco HyperFlex Systems are suitable for both enterprise data centers and remote and branch locations. Cisco UCS management helps you centrally manage your hyperconverged environments as unique domains regardless of where they are actually deployed.

If you are a new Cisco customer, you will discover how Cisco UCS management makes you more effective and helps your IT organization become more agile through fewer demands on staff time. If you are an existing Cisco UCS customer, you will be able to use the same management approach for your all your infrastructure: from enterprise applications to big data environments.

Conclusion

With Cisco HyperFlex Systems, we deliver a resilient hyperconverged solution that you can use anywhere: from your enterprise data center to your remote locations. We unlock the full potential of hyperconvergence so that you can use our technology to support more of your applications and use cases—including virtual desktops, server virtualization deployments, and test and development environments. Our solution fills the gap in today's data centers and completes the range of infrastructure solutions available from Cisco (Figure 5). With Cisco UCS management implemented consistently across our entire portfolio, you can

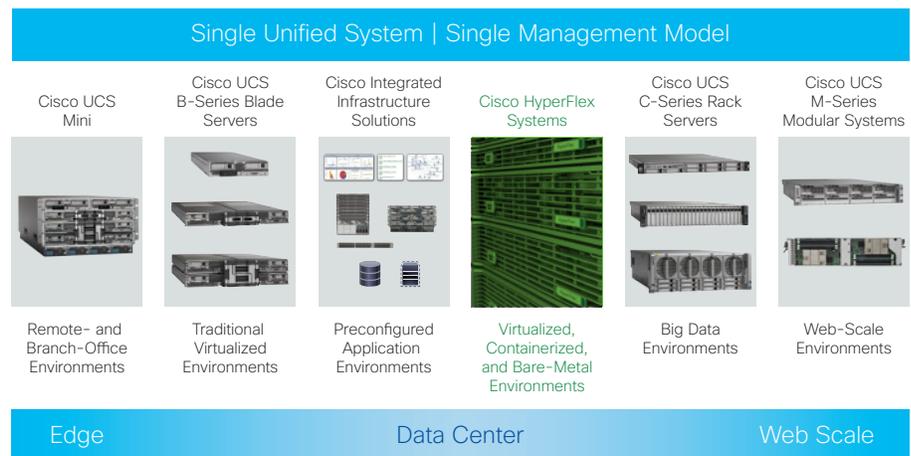


Figure 5. Cisco HyperFlex Systems Extend the Same Management Across the Cisco Product Portfolio

manage and deploy hyperconverged environments exactly like your other Cisco infrastructure, including your remote- and branch-office locations, enterprise computing, big data, and web-scale environments. Applications dictate architecture, and our range of offerings gives you the most advanced capabilities, delivering more agility, efficiency, and adaptability to your data center today.

Part of Our Total Data Center Strategy

As part of our overall data center vision, plans for integration with Cisco ACI and Cisco Enterprise Cloud Suite will put you on the road to a hybrid cloud environment. Cisco UCS Director will enable you to use your Cisco HyperFlex System to deliver IaaS and create a hybrid cloud. Your customers and clients can use the software's integrated service catalog to order application infrastructure customized the way they need it within the constraints that you determine. Our system's integrated network fabric and its secure segmentation of virtual network links plus the microsegmentation provided by Cisco ACI will help you to isolate applications and tenants with security beyond what other solutions provide. And when you need to augment capacity to handle periodic workload peaks you will be able to use a policy-based approach for engaging third-party public cloud services. When you choose Cisco HyperFlex Systems, you take your organization beyond a point-product solution for today's concerns. You put your business on a path to a more agile, adaptable, and efficient future.

For More Information

For more information about Cisco HyperFlex Systems, visit <http://www.cisco.com/go/hyperflex>.

For more information about Cisco UCS, visit <http://www.cisco.com/go/ucs>.



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