

VMware

vCenter Server (\$) (license manager)	Server hardware	ESX (\$) (vMotion, DRS, HA, Storage vMotion)		
		ESXi (freeware) (ESXi freeware is managed by the Virtual Infrastructure (or vSphere) Client)		Guest OS
		ESXi (\$) (vMotion, DRS, HA, Storage vMotion)		Guest OS... Guest OS...
Workstation hardware	Windows or Linux OS	User session	VMware Server (freeware)	Guest OS
			VMware Workstation (\$)	Guest OS
			VMware Player (freeware)	Guest OS...
			vSphere Client for managing ESX(i) hosts (freeware)	

VMware-Server software and datacenter products

- VMware vSphere 5
- VMware vSphere 4 (rebranded version VMware Infrastructure)
- VMware Infrastructure 3
- VMware ESXi (formerly VMware ESX Server ESXi edition)
- VMware ESX (formerly VMware ESX Server)
- VMware Server (formerly VMware GSX Server)
- VMware vCenter Application Discovery Manager (formerly EMC Ionix Application Discovery Manager)
- VMware vCenter AppSpeed
- VMware vCenter Converter (formerly VMware P2V)
- VMware vCenter Lab Manager (formerly VMware Lab Manager)
- VMware vCenter Lifecycle Manager
- VMware vCenter Operations Standard / Advanced / Enterprise (formerly Integrien Alive)
- VMware vCenter Orchestrator
- VMware vCenter Server (formerly VMware VirtualCenter)
- VMware vCenter Server Heartbeat
- VMware vCenter Site Recovery Manager
- VMware vCenter Stage Manager (formerly VMware Stage Manager)
- VMware vCenter Update Manager (ESX/ESXi Host, Guest OS (Windows & Linux) and Virtual Appliance Patch Management)
- VMware Capacity Planner
- VMware Data Recovery
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VMware

- **VMware Infrastructure** is a collection of VMware products **used to manage** a VMware ESX/ESXi server environment.
- **VMware vSphere** is a "cloud OS".
- **VMware vSphere 4**
 - ✦ was originally named VMware Virtual Infrastructure (VI) 4
 - ✦ and is **capable of managing large pools of infrastructure**,
 - ✦ including software and hardware both from internal and external networks.

VMware Infrastructure



VMware Infrastructure

<u>Developer(s)</u>	<u>VMware, Inc.</u>
<u>Stable release</u>	3.5 Update 4 / March 30, 2009
<u>Platform</u>	<u>x86</u> -compatible
<u>Type</u>	<u>Virtual machine</u> suite
<u>License</u>	<u>Proprietary</u>
Website	<u>VMware Infrastructure</u>

VMware Infrastructure

- **VMware Infrastructure 3 (VI)** is a suite of computer hardware virtualization products from VMware, Inc. (a division of EMC Corporation).
- The suite includes:
 - ❖ **VMware ESX Server version 3**
 - ❖ **VMware ESXi version 3.x**
 - ❖ **VMware vCenter version 2 (formally VMware VirtualCenter)**
 - ❖ **Virtual SMP (which allows a guest operating system to "see" up to four CPUs in the virtual machine)**
- Users can supplement this software bundle **by purchasing optional products**, such as VMotion, as well as **distributed services** such as:
 - ❖ VMware High Availability (HA)
 - ❖ VMware Distributed Resource Scheduler (DRS)
 - ❖ VMware Consolidated Backup
 - ❖ VMware Inc. released VMware Infrastructure 3 in June 2006. The suite comes in three "editions": Starter, Standard and Enterprise.

VMware Infrastructure

■ Known limitations

- Known limitations in VMware Infrastructure 3 may constrain the design of data centers:
- As of June 2008 limitations in VMware Infrastructure 3 version 3.5 include the following:
 - ◆ Guest system maximum RAM: 64 GB
 - ◆ Number of guest CPUs: 4
 - ◆ Number of hosts in an HA cluster: 32
 - ◆ Number of hosts in a DRS cluster: 32
 - ◆ Size of RAM per server: 256 GB
 - ◆ Number of hosts managed by Virtual Center Server: 200
 - ◆ Number of virtual machines managed by Virtual Center Server: 2000
- Other limitations exist, for example, volume size is limited to 64 TB with no more than 6 SCSI controllers per virtual machine; maximum number of remote consoles to a virtual machine is 10. It is also not possible to connect fibre-channel driven tape-drives, which hinders the ability to do backups using these drives.
- **Future**
- VMware is now moving towards a cloud computing model with their VMware vSphere 4 release.

VMware vSphere



VMware vSphere

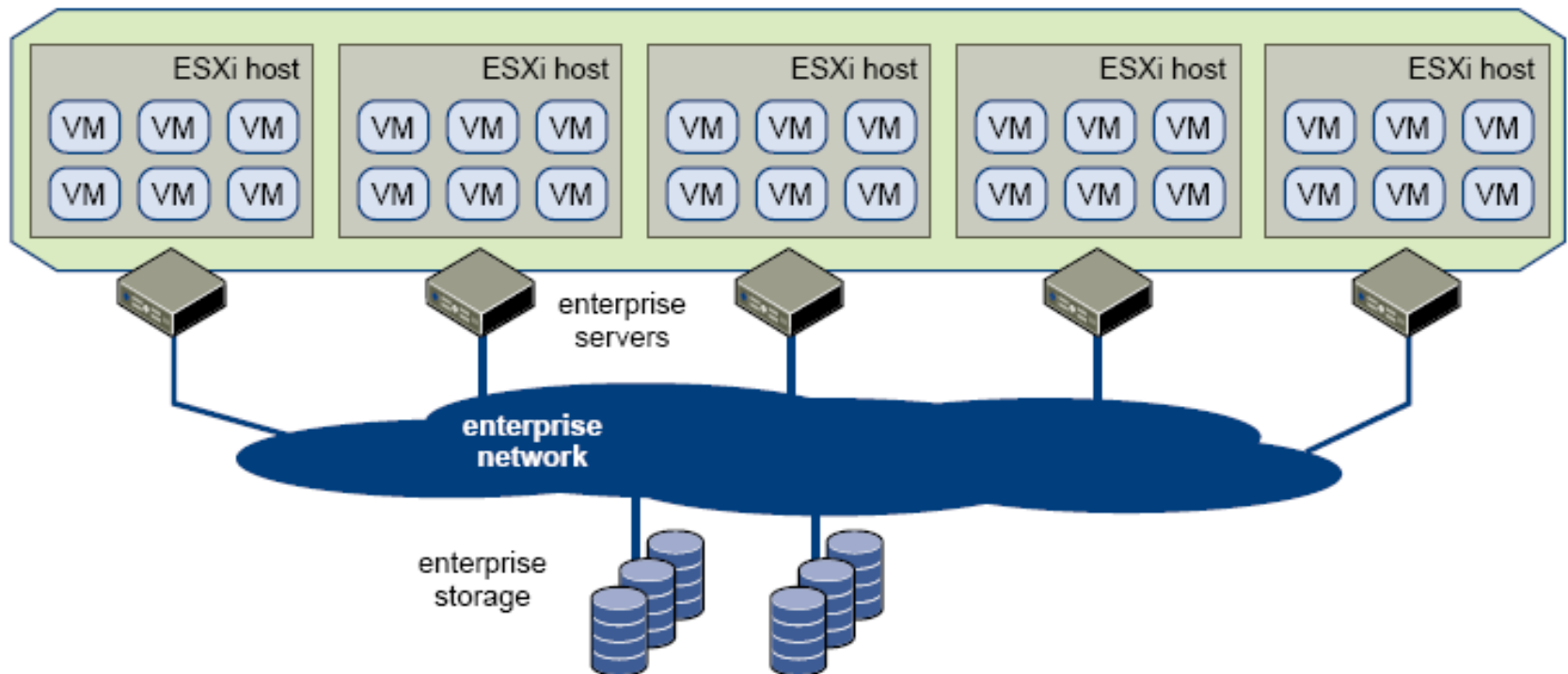
<u>Developer(s)</u>	<u>VMware</u>
<u>Stable release</u>	5
Development status	current
<u>Operating system</u>	64 bit
<u>Type</u>	Cloud Operating System
<u>License</u>	<u>Proprietary</u>
Website	<u>www.vmware.com/products/vsphere</u>

VMware

- **VMware vSphere** (formerly VMware Infrastructure 4) is VMware's cloud computing virtualization operating system.
- **History**
- While VMware Infrastructure 3.5 was in development, vSphere was conceived as an enhanced suite of tools with cloud computing utilizing VMware ESX/ESXi 4
- The cloud computing-enabled tool suite was spun off as VMware Infrastructure 4 (for short, VI 4) parallel to but distinct from VMware Infrastructure 3.5 (VI 3.5) that was then ready for release (March 30, 2009)
- VMware eventually announced vSphere 4 instead of VI 4 on April 21, 2009 and released it on May 21, 2009
- VMware released Update 1 for vSphere 4 on November 19, 2009 to add support for Windows 7 and Windows Server 2008 R2
- **VMware's vSphere 4.1** began shipping in August 2010. This update included an updated vCenter Configuration Manager as well as vCenter Application Discovery Manager, and the ability of vMotion to move more than one virtual machine at a time from one server host to another.
- VMware released Update 1 for vSphere 4.1 on 10 February, 2011 to add support for RHEL 6, RHEL 5.6, SLES 11 SP1 for VMware, Ubuntu 10.10, and Solaris 10 Update 9
- On 12 July 2011, VMware released its latest version of the suite: **VMware vSphere 5**

VMware - vSphere

Figure 1-2. The Infrastructure Can Span Many Physical Devices

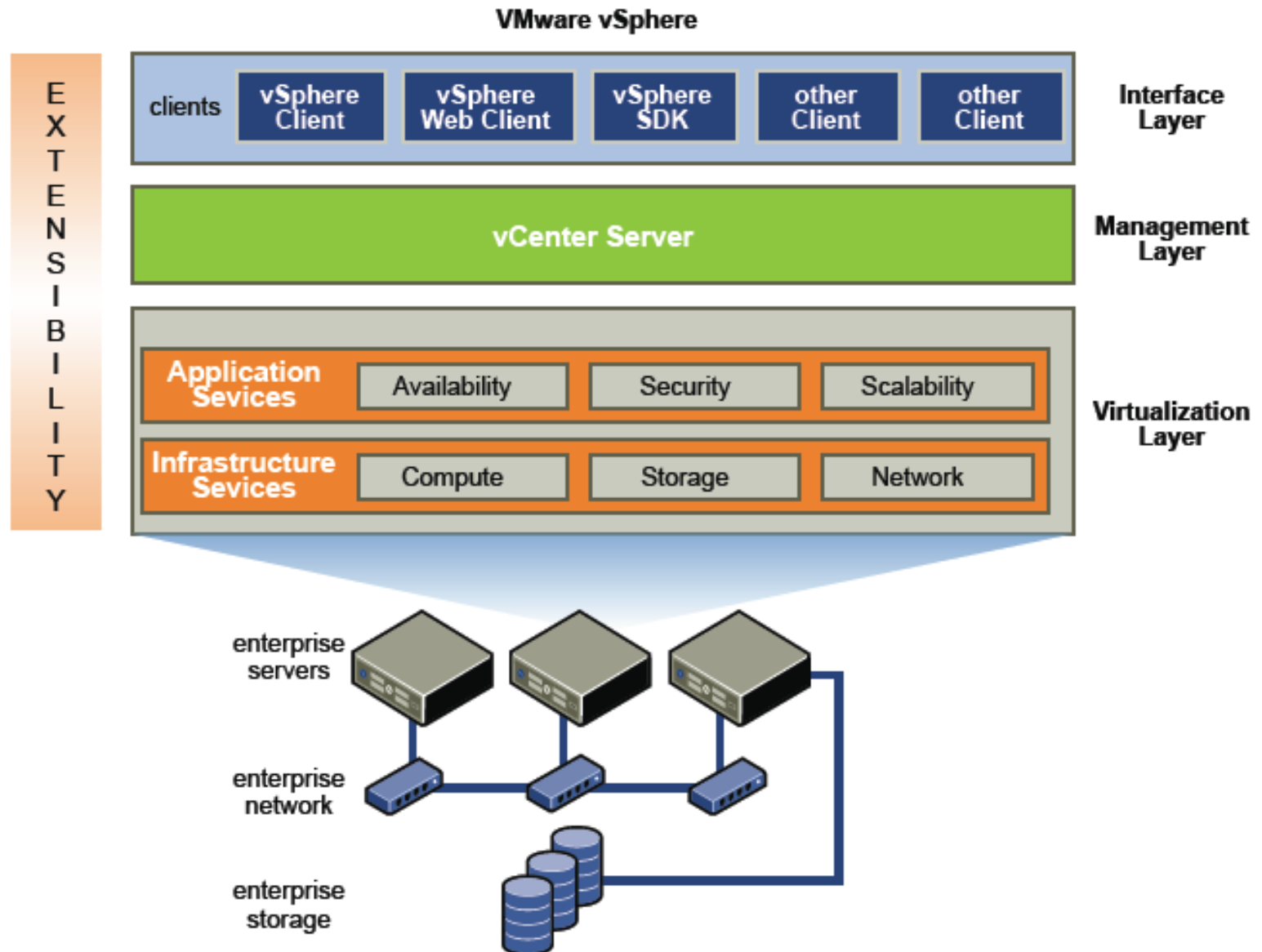


VMware - vSphere

- **VMware vSphere , a Platform for Virtualization and Cloud Infrastructure**
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 -
- **VMware vSphere manages large collections of infrastructure**, such as
 - ❖ CPUs
 - ❖ storage
 - ❖ and networking
 - ❖ as a seamless and dynamic operating environment
 - ❖ and also manages the complexity of a datacenter
- The **VMware vSphere software stack** is composed of
 - ❖ the virtualization,
 - ❖ management,
 - ❖ and interface layers.

VMware - vSphere

Figure 1-4. Relationships Between the Component Layers of VMware vSphere



VMware - vSphere

■ VMware vSphere Components and Features

- An introduction to the components and features of VMware vSphere helps you to understand the parts and how they interact.
- VMware vSphere includes the following components and features.
 - ✦ **VMware ESXi** A virtualization layer run on physical servers that abstracts processor, memory, storage, and resources into multiple virtual machines.
 - ✦ **VMware vCenter Server** The central point for configuring, provisioning, and managing virtualized IT environments. It provides essential datacenter services such as access control, performance monitoring, and alarm management.
 - ✦ **VMware vSphere Client** An interface that enables users to connect remotely to vCenter Server or ESXi from any Windows PC.
 - ✦ **VMware vSphere Web Client**
 - ✦ A Web interface that enables users to connect remotely to vCenter Server from a variety of Web browsers and operating systems.
 - ✦ **VMware vSphere SDKs** Feature that provides standard interfaces for VMware and third-party solutions to access VMware vSphere.

VMware - vSphere

- **File System (VMFS)**

- A high performance cluster file system for ESXi virtual machines.

- **vSphere Virtual SMP** Enables a single virtual machine to use multiple physical processors simultaneously.

- **vSphere vMotion** Enables the migration of powered-on virtual machines from one physical server to another with zero down time, continuous service availability, and complete transaction integrity. Migration with vMotion cannot be used to move virtual machines from one datacenter to another.

- **vSphere Storage vMotion**

- Enables the migration of virtual machine files from one datastore to another without service interruption. You can place the virtual machine and all its disks in a single location, or select separate locations for the virtual machine configuration file and each virtual disk. The virtual machine remains on the same host during Storage vMotion. Migration with Storage vMotion lets you move the virtual disks or configuration file of a virtual machine to a new datastore while the virtual machine is running. Migration with Storage vMotion enables you to move a virtual machine's storage without any interruption in the availability of the virtual machine.

VMware - vSphere

- **vSphere High Availability (HA)**

- A feature that provides high availability for virtual machines. If a server fails, affected virtual machines are restarted on other available servers that have spare capacity.

- **vSphere Distributed Resource Scheduler (DRS)**

- Allocates and balances computing capacity dynamically across collections of hardware resources for virtual machines. This feature includes distributed power management (DPM) capabilities that enable a datacenter to significantly reduce its power consumption.

- **vSphere Storage DRS** Allocates and balances storage capacity and I/O dynamically across collections of datastores. This feature includes management capabilities that minimize the risk of running out of space and the risk of I/O bottlenecks slowing the performance of virtual machines.

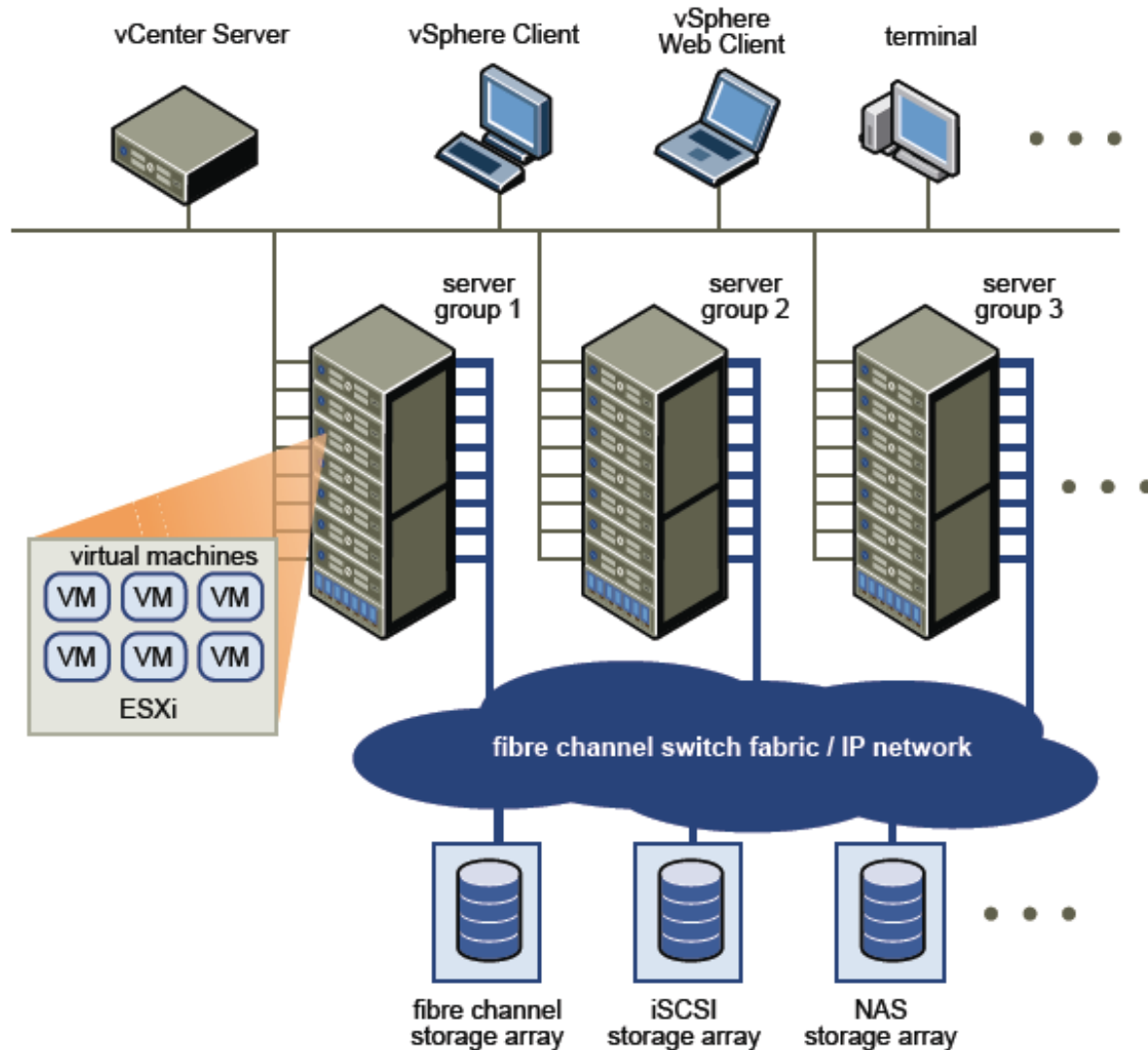
- **vSphere Fault Tolerance** Provides continuous availability by protecting a virtual machine with a copy. When this feature is enabled for a virtual machine, a secondary copy of the original, or primary, virtual machine is created. All actions completed on the primary virtual machine are also applied to the secondary virtual machine. If the primary virtual machine becomes unavailable, the secondary machine becomes immediately active.

VMware - vSphere

- **vSphere High Availability (HA)**
- **vSphere Distributed Switch (VDS)**
- A virtual switch that can span multiple ESXi hosts, enabling significant reduction of on-going network maintenance activities and increasing network capacity. This increased efficiency enables virtual machines to maintain consistent network configuration as they migrate across multiple hosts.
- **Host Profiles** A feature that simplifies host configuration management through user-defined configuration policies. The host profile policies capture the blueprint of a known, validated host configuration and use this configuration to configure networking, storage, security, and other settings across multiple hosts. The host profile policies also monitor compliance to standard host configuration settings across the datacenter. Host profiles reduce the manual steps that are involved in configuring a host and can help maintain consistency and correctness across the datacenter.
- Host profiles are also a component of vSphere Auto Deploy. The concept of an autodeployed host means that vCenter Server owns the entire host configuration and it is captured within a host profile. Certain policies require user input to provide host-specific values. To support Auto Deploy for host profiles, an answer file is created that contains the definitions for those policies.

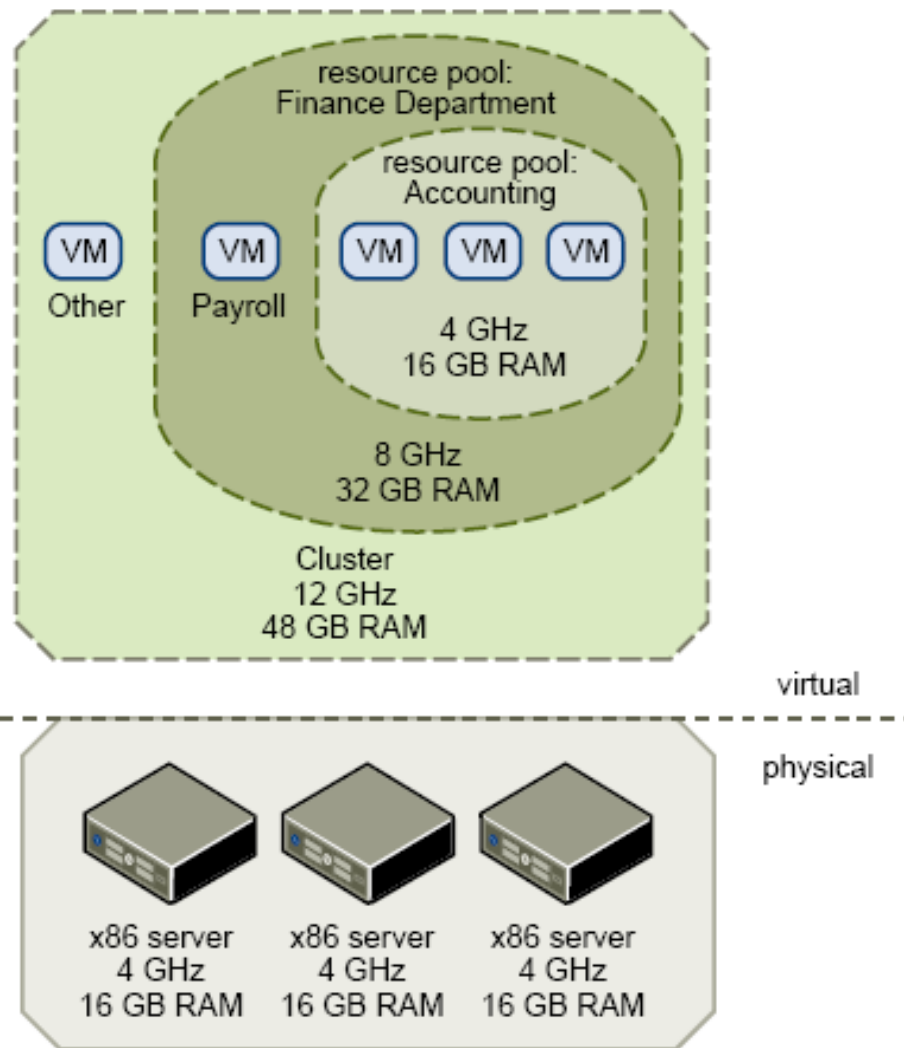
VMware - vSphere

Figure 1-5. VMware vSphere Datacenter Physical Topology



VMware - vSphere

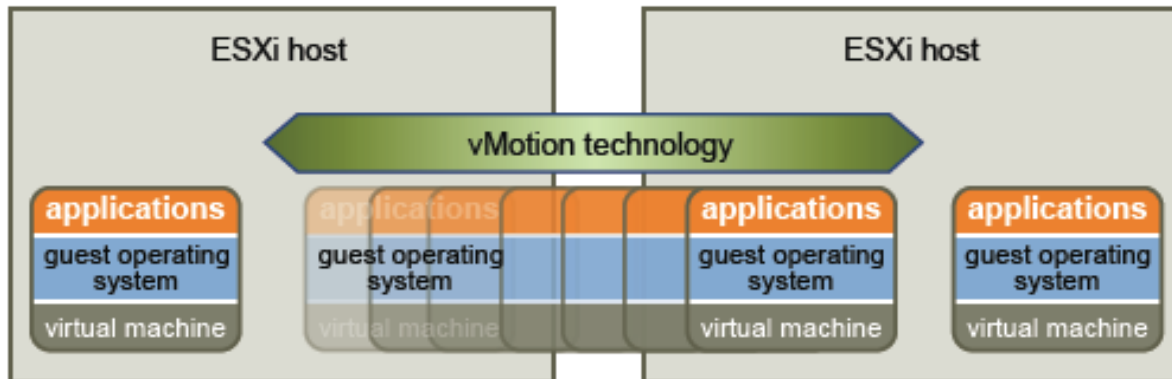
Figure 2-2. Hosts, Clusters, and Resource Pools



VMware - vSphere

- **vSphere vMotion**
- Virtual machines run on and consume resources from ESXi. With vMotion, you can migrate running virtual machines from one physical server to another without service interruption. The effect is a more efficient assignment of resources. With vMotion, resources can be dynamically reallocated to virtual machines across physical servers.

Figure 2-3. Migration with vMotion



VMware - vSphere

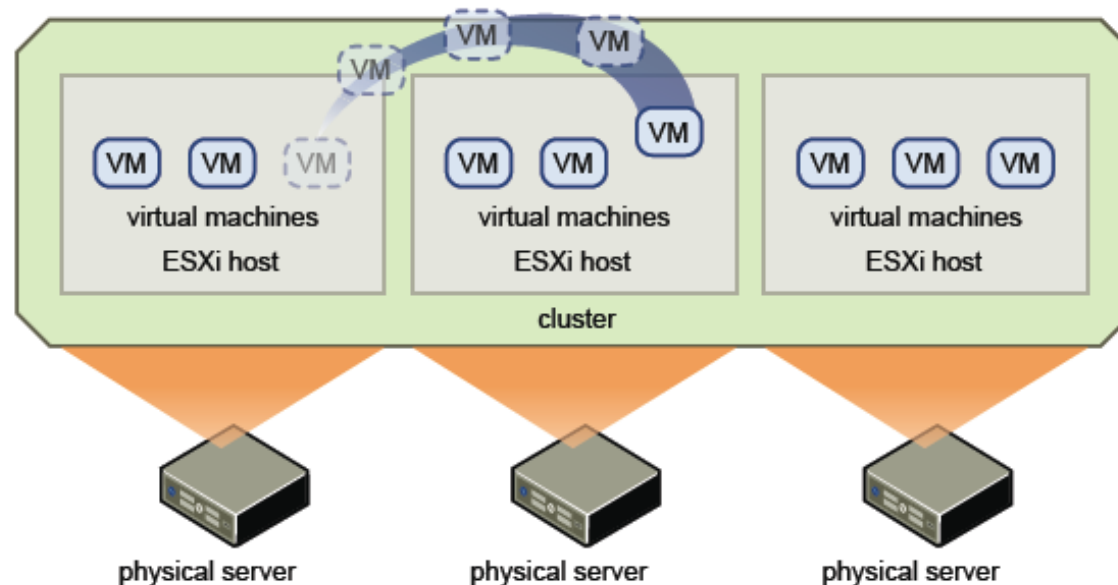
■ vSphere Storage vMotion

- With Storage vMotion, you can migrate virtual machines from one datastore to another datastore without service interruption.
- This ability allows administrators, for example, to off-load virtual machines from one storage array to another to perform maintenance, reconfigure LUNs, resolve space issues, and upgrade VMFS volumes.
- Administrators can also use Storage vMotion to optimize the storage environment for improved performance by seamlessly migrating virtual machine disks.

VMware – vSphere- Distributed Resource Scheduler

- **vSphere Distributed Resource Scheduler (DRS) helps you manage a cluster of physical hosts as a single compute resource.** You can assign a virtual machine to a cluster and DRS finds an appropriate host on which to run the virtual machine. DRS places virtual machines so that the load across the cluster is balanced, and cluster-wide resource allocation policies (for example, reservations, priorities, and limits) are enforced. When a virtual machine is powered on, DRS performs an initial placement of the virtual machine on a host. As cluster conditions change (for example, load and available resources), DRS uses vMotion to migrate virtual machines to other hosts as necessary.

Figure 2-4. vSphere DRS

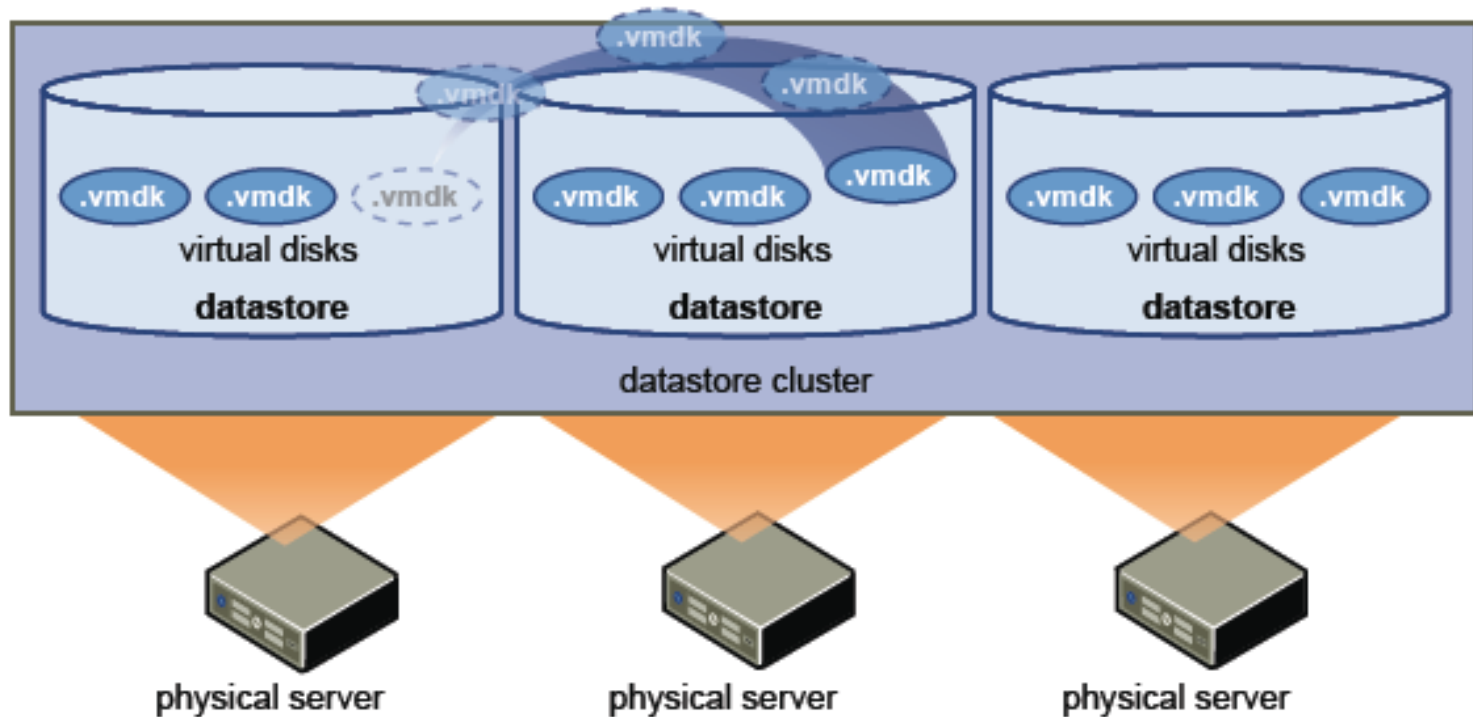


VMware – vSphere Storage DRS

- Storage DRS helps you manage multiple datastores as a single compute resource, called a datastore cluster.
- A datastore cluster is an aggregation of multiple datastores into a single logical, load-balanced pool. You can treat the datastore cluster as a single flexible storage resource for resource management purposes. In effect, a datastore cluster is the storage equivalent of an ESXi compute cluster.
- You can dynamically populate datastore clusters with datastores of similar characteristics. You can assign a virtual disk to a datastore cluster and Storage DRS finds an appropriate datastore for it. The load balancer manages initial placement and future migrations based on workload measurements. Storage space balancing and I/O balancing minimize the risk of running out of space and the risk of I/O bottlenecks slowing the performance of virtual machines.

VMware – vSphere Storage DRS

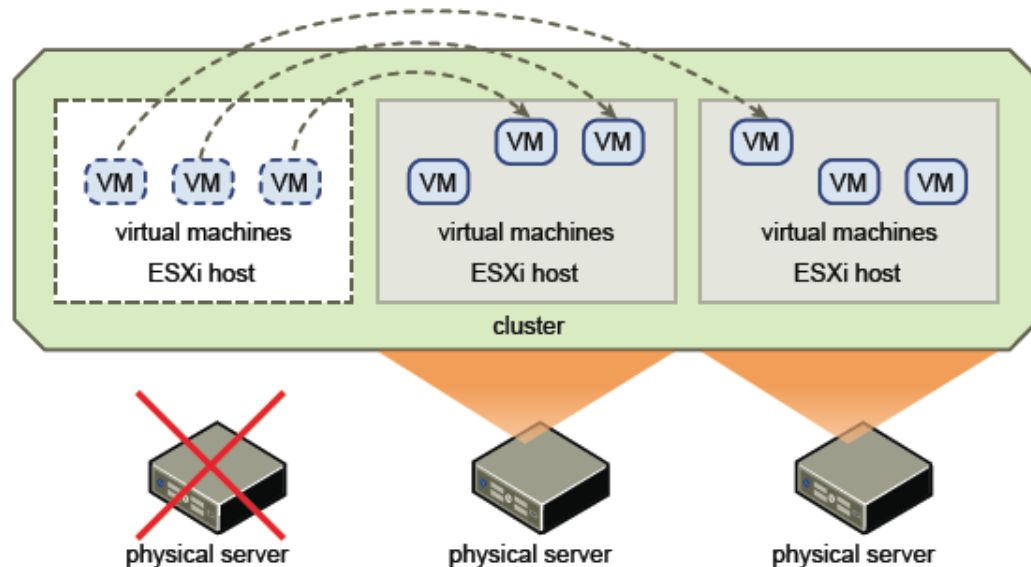
Figure 2-5. Storage DRS



VMware – vSphere High Availability

- With vSphere HA, virtual machines automatically restart on a different physical server in a cluster if a host fails. vSphere HA monitors all physical hosts in a cluster and detects host failures. Each physical host maintains a heartbeat with the other hosts in the cluster. Loss of a heartbeat initiates the process of restarting all affected virtual machines on other hosts. vSphere HA admission control ensures that if a host fails, sufficient resources are available in the cluster at all times to restart virtual machines on different physical hosts.

Figure 2-6. vSphere HA



VMware - vSphere

Figure 2-7. Relationship Between the Networks with vSphere Distributed Switches Inside and Outside the Virtual Environment

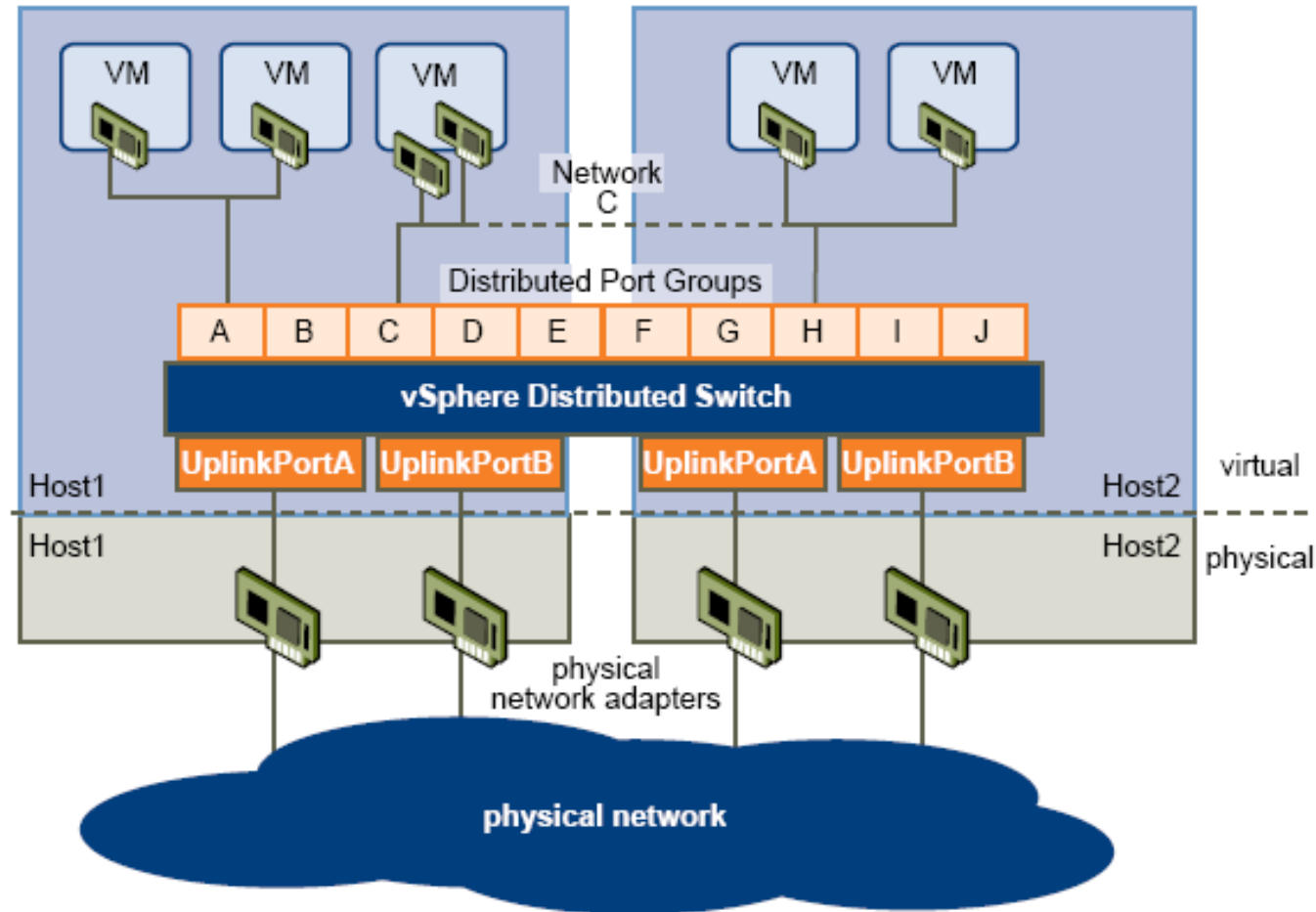
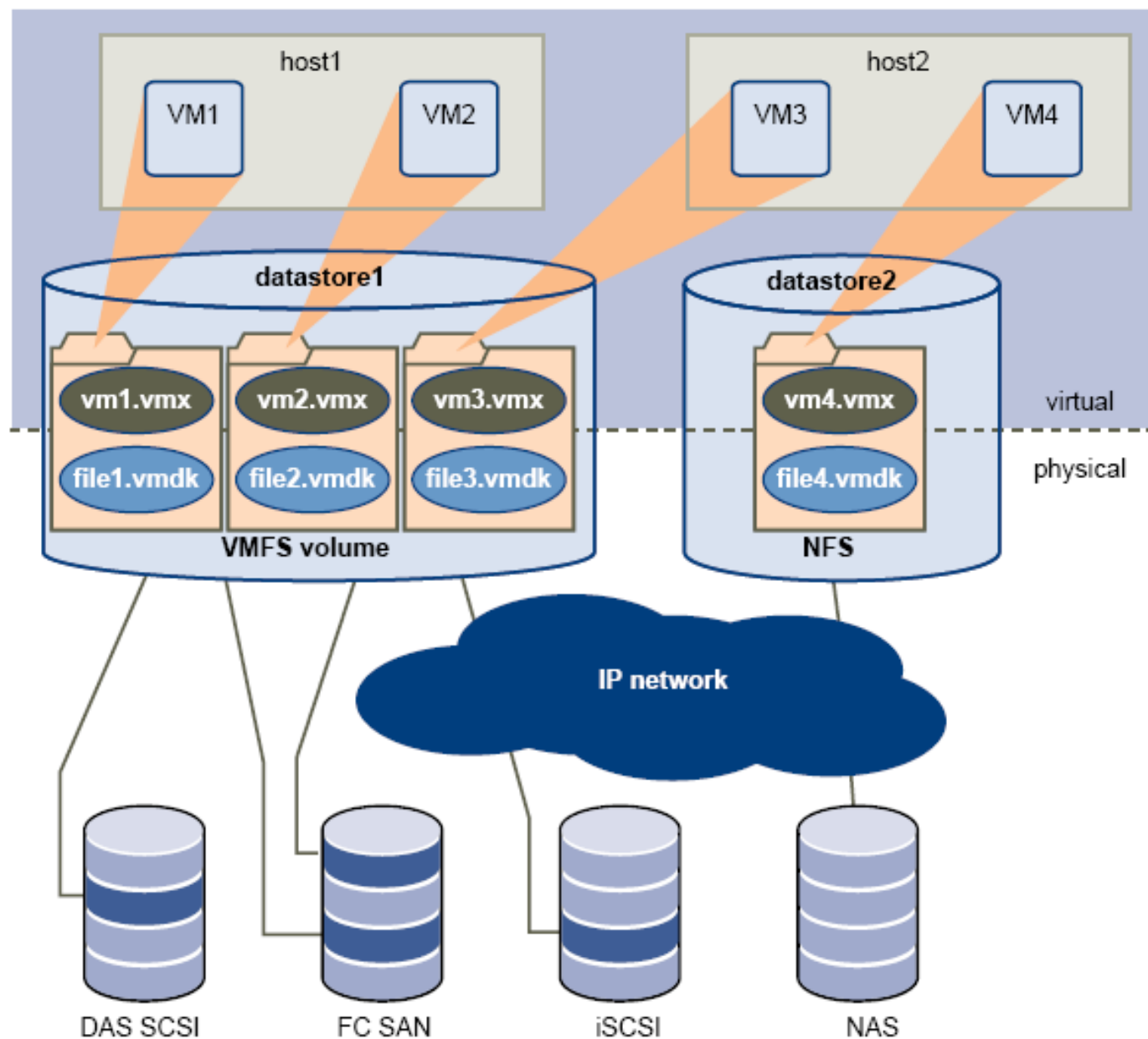
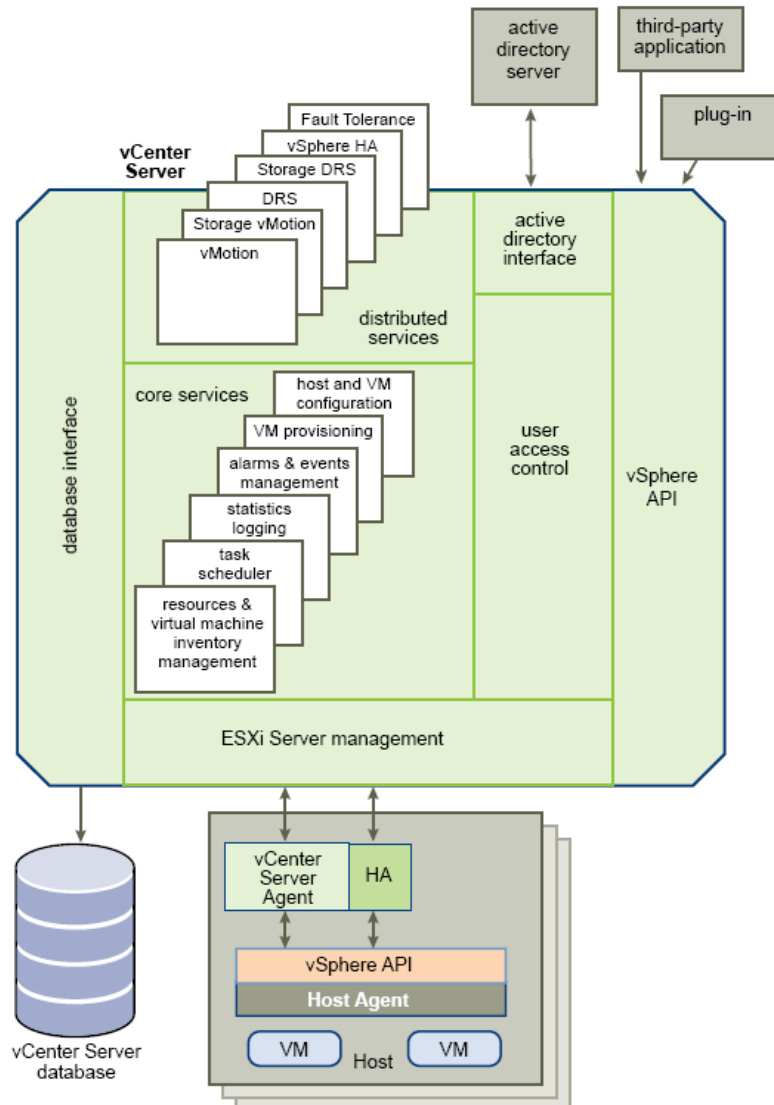


Figure 2-9. Storage Architecture



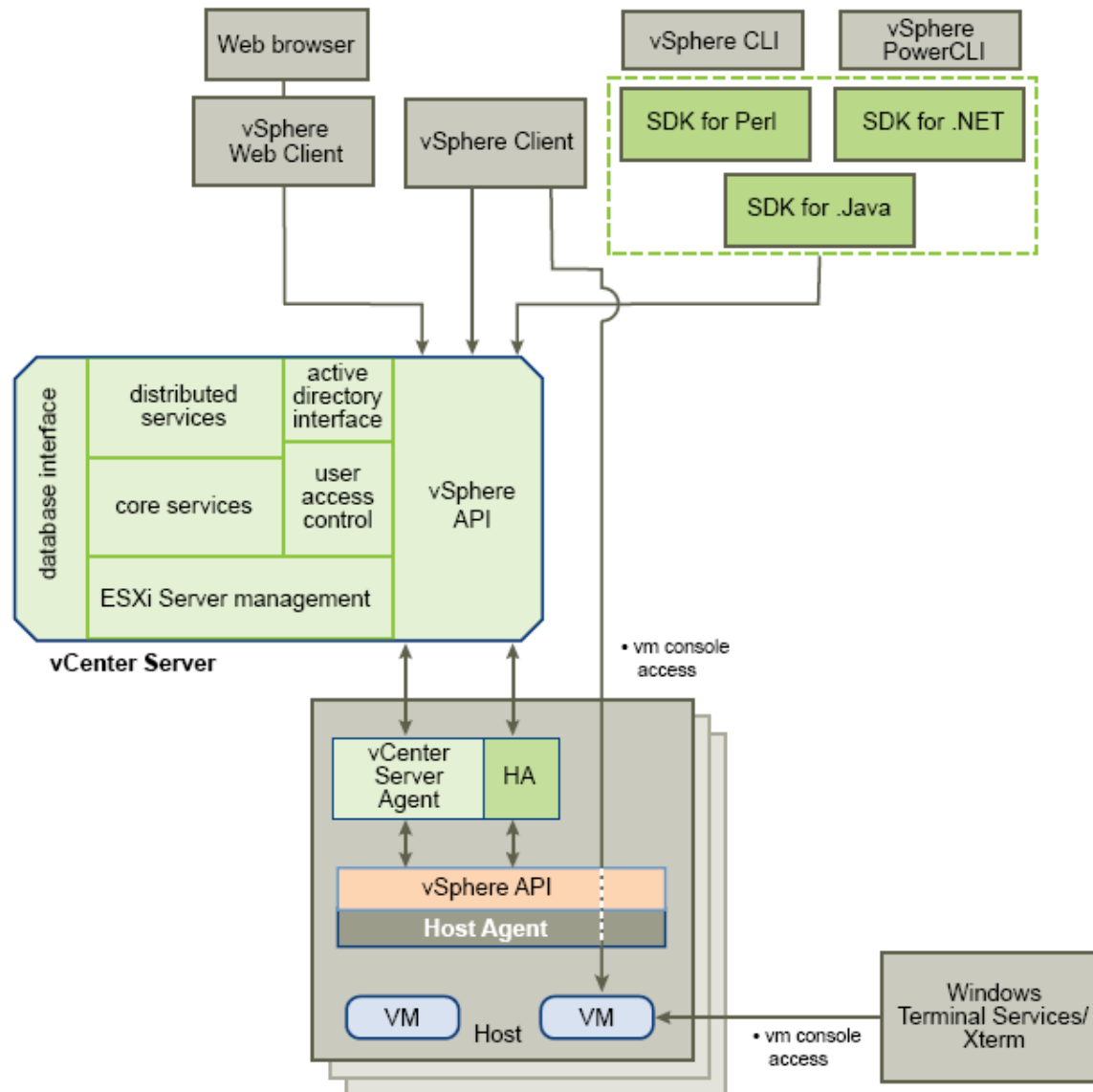
VMware - vSphere

Figure 3-1. vCenter Server Components



VMware - vSphere

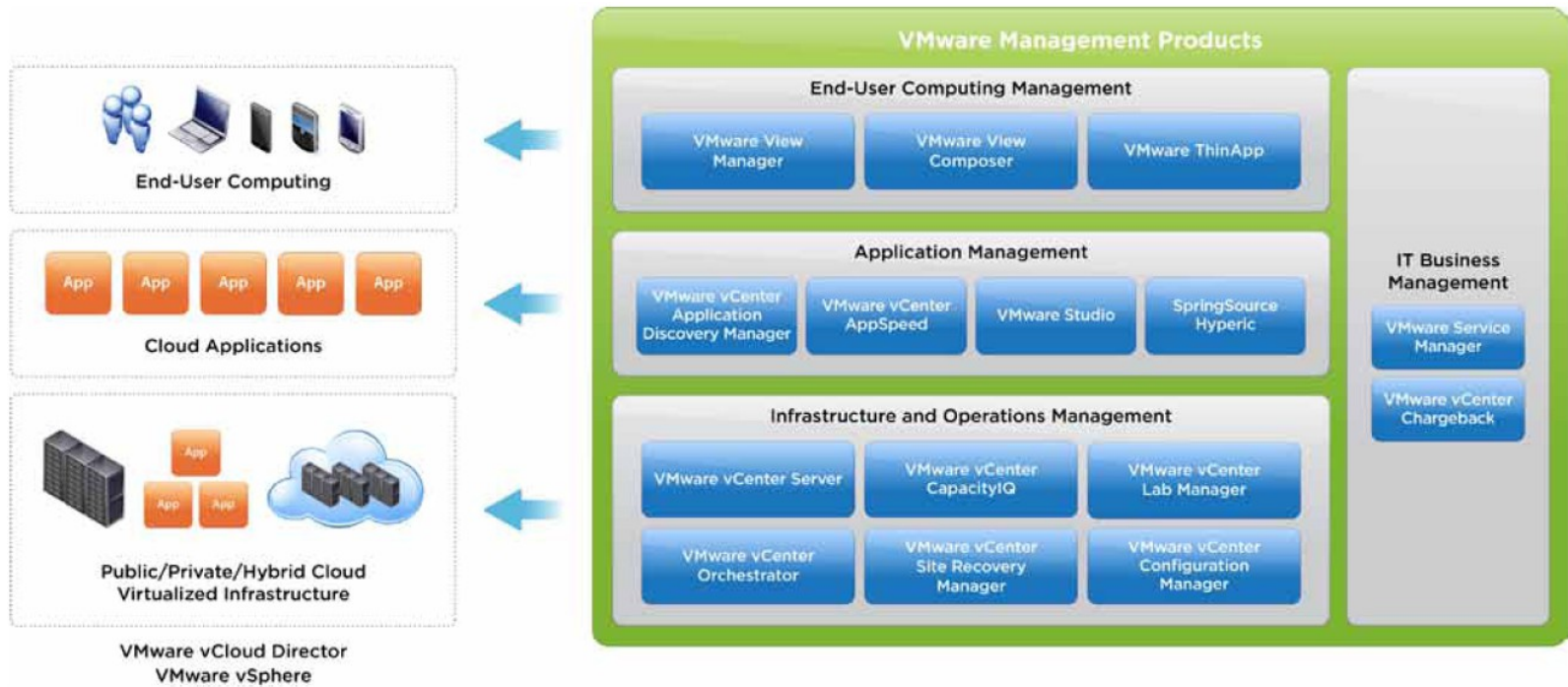
Figure 4-1. VMware vSphere Access and Control



VMware - vCloud

- **vCloud** is a cloud computing initiative from VMware which will allow customers to **migrate work on demand from their "internal cloud" of cooperating VMware hypervisors to a remote cloud of VMware hypervisors**. The goal of the initiative is to provide the power of cloud computing with the flexibility allowed by virtualization.
- The initiative was announced at the 2008 VMworld conference in Las Vegas and garnered significant press attention
- At the 2009 VMworld conference in San Francisco **vCloud** was featured in the vCloud Pavilion. vCloud was also a subject at the 2010 conference. The vCloud initiative has grown with many public service providers and multiple supporting applications.
- vCloud architecture relies on vshield edge for its operation, routed networks in vCloud need a VM running vshield-edge software, acting as the default gateway of that network. This virtual gateway is implemented on a free host on the system and provides its services to VMs on that host and on other hosts.

VMware - VCloud



VMware management products fundamentally simplify how IT is managed with built-in automation and policy-based control.

VMware-Cloud Management Software

■ **VMware vCloud**

- ❖ VMware vCloud Director enables self-service access to logical pools of compute, network and storage resources with policy driven controls and service level agreements
- ❖ VMware vCloud Request Manager
- ❖ VMware vCloud Datacenter Services
- ❖ VMware vCloud Express
- ❖ VMware vCloud Consulting Services
- ❖ VMware vCloud API

- **VMware Go** is a web-based service to guide users of any expertise level through the installation and configuration of VMware vSphere Hypervisor