Accelerating the Journey to The Cloud Via Virtualization

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Agenda

- Introductions
- What is the Cloud? Your Cloud?
- VMware’s Cloud Solution Overview
- Case Studies
- vSphere 5 Update
- Cloud Solution and Security
- Questions / Comments
What is the Cloud?
“Cloud is a style of computing where scalable and elastic IT-related capabilities are provided as a service to customers using Internet technologies. Intense hype surrounds cloud computing, making it difficult to understand vendor options and strategies.”
Gartner 12/4/11

As a metaphor for the Internet, "the cloud" is a familiar cliché, but when combined with "computing," the meaning gets bigger and fuzzier.
InfoWorld 12/6/11

“Cloud Computing is where you can save pictures and stuff on the Internet.”  Courtney, Age 11

“Cloud computing offers a new model that cuts through IT complexity by leveraging the efficient pooling of on-demand, self-managed virtual infrastructure, consumed as a service.”
VMware Website 12/6/11

“
Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. This cloud model is composed of five essential characteristics, three service models, and four deployment models.
Essential Characteristics:

**On-demand self-service.** A consumer can unilaterally provision computing capabilities, such as server time and network storage, as needed automatically without requiring human interaction with each service provider.

**Broad network access.** Capabilities are available over the network and accessed through standard mechanisms that promote use by heterogeneous thin or thick client platforms (e.g., mobile phones, tablets, laptops, and workstations).

**Resource pooling.** The provider’s computing resources are pooled to serve multiple consumers using a multi-tenant model, with different physical and virtual resources dynamically assigned and reassigned according to consumer demand. There is a sense of location independence in that the customer generally has no control or knowledge over the exact location of the provided resources but may be able to specify location at a higher level of abstraction (e.g., country, state, or datacenter). Examples of resources include storage, processing, memory, and network bandwidth.

**Rapid elasticity.** Capabilities can be elastically provisioned and released, in some cases automatically, to scale rapidly outward and inward commensurate with demand. To the consumer, the capabilities available for provisioning often appear to be unlimited and can be appropriated in any quantity at any time.

**Measured service.** Cloud systems automatically control and optimize resource use by leveraging a metering capability at some level of abstraction appropriate to the type of service (e.g., storage, processing, bandwidth, and active user accounts). Resource usage can be monitored, controlled, and reported, providing transparency for both the provider and consumer of the utilized service.
Service Models:

**Software as a Service (SaaS).** The capability provided to the consumer is to use the provider’s applications running on a cloud infrastructure. The applications are accessible from various client devices through either a thin client interface, such as a web browser (e.g., web-based email), or a program interface. The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, storage, or even individual application capabilities, with the possible exception of limited user-specific application configuration settings.

**Platform as a Service (PaaS).** The capability provided to the consumer is to deploy onto the cloud infrastructure consumer-created or acquired applications created using programming languages, libraries, services, and tools supported by the provider. The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, or storage, but has control over the deployed applications and possibly configuration settings for the application-hosting environment.

**Infrastructure as a Service (IaaS).** The capability provided to the consumer is to provision processing, storage, networks, and other fundamental computing resources where the consumer is able to deploy and run arbitrary software, which can include operating systems and applications. The consumer does not manage or control the underlying cloud infrastructure but has control over operating systems, storage, and deployed applications; and possibly limited control of select networking components (e.g., host firewalls).
Deployment Models:

**Private cloud.** The cloud infrastructure is provisioned for exclusive use by a single organization comprising multiple consumers (e.g., business units). It may be owned, managed, and operated by the organization, a third party, or some combination of them, and it may exist on or off premises.

**Community cloud.** The cloud infrastructure is provisioned for exclusive use by a specific community of consumers from organizations that have shared concerns (e.g., mission, security requirements, policy, and compliance considerations). It may be owned, managed, and operated by one or more of the organizations in the community, a third party, or some combination of them, and it may exist on or off premises.

**Public cloud.** The cloud infrastructure is provisioned for open use by the general public. It may be owned, managed, and operated by a business, academic, or government organization, or some combination of them. It exists on the premises of the cloud provider.

**Hybrid cloud.** The cloud infrastructure is a composition of two or more distinct cloud infrastructures (private, community, or public) that remain unique entities, but are bound together by standardized or proprietary technology that enables data and application portability (e.g., cloud bursting for load balancing between clouds).
A Short History

Cloud Computing will transform the delivery and consumption of IT services.
What is this *Cloud* Thing?

Cloud Computing is an *approach to computing* that leverages the efficient pooling of on-demand, self-managed virtual infrastructure, consumed as a service.
VMware Solution

Cloud Computing
The New IT Landscape: Promise & Challenge

Empowered, Secure, Mobile Workforce
- Any app on any device, anytime, anywhere – securely!

New Generation of Enterprise Apps
- Combining the social, mobile experience with enterprise requirements

A More Flexible, Efficient Infrastructure
- Exploiting modern, cost-effective hardware
- Creating & spanning both internal and external resource pools
The New IT Landscape: Promise & Challenge

The Challenge for IT:

Weave all this together into a cohesive, secure, compliant whole
Three Core Focus Areas

- **Re-think End-User Computing**
- **Modernize Application Development**
- **Evolve the Infrastructure**

**The Challenge for IT:**

Weave all this together into a cohesive, secure, compliant whole.
VMware Cloud Stack

Secure, Compliant, Controlled

Secure Private Cloud
- Modular Desktops
- Unified User Management
- Cloud-Ready Applications

End-User Computing

Application Access

VMware Enabled Public Clouds
- SaaS Partners
- Google App Engine

Independent Public Clouds
- Other SaaS Partners

Cloud Application Platform
- Cloud-Scale
- Open
- Self-Managed

Application Portability

Cloud Infrastructure & Management
- Efficiency Through Automation
- Agility with Security & Control
- Freedom of Choice

Application Mobility
- VMware vSphere: Foundation for Cloud Computing

PaaS Partners

Other Cloud Infrastructure Partners
Three Core Focus Areas

- **Re-think End-User Computing**
- **Modernize Application Development**
- **Cloud Infrastructure & Management**
VMware’s Cloud Application Platform

**Frameworks and Tools**
- Rich Web
- Integration
- Batch
- Data Access
- Social Media
- Cloud APIs

**Common Platform Services**
- Application Management
- Data Management
- Messaging
- Dynamic Load Balancing
- App Server

**VMware vFabric**
Portable Across Clouds

VMware vFabric

Common Platform Services
- Application Management
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Frameworks and Tools
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Private Cloud
Three Core Focus Areas

- Re-think End-User Computing
- Cloud Application Platform
- Cloud Infrastructure & Management
Traditional View of Desktop Computing vs.
End-User Perspective

SaaS Apps

Enterprise Apps

Windows Apps
End-User Perspective

SaaS Apps

Enterprise Apps

Windows Apps
End-User Computing = User Centricity

Native from Any Device

Secure Access to All Applications

SaaS Apps

Enterprise Apps

Windows Apps
End-User Computing Emanates from the Cloud

- Image & Persona Mgmt
- Storage Optimization
- Application Virtualization
- Authentication Services

End-user Freedom. IT Control.
Three Core Focus Areas

End-User Computing
Empowered workforce thru flexible, mobile access to apps and data from any device

Cloud Application Platform
Rapid delivery of new, modern business applications

Cloud Infrastructure & Management
On-demand, flexible infrastructure to speed deployments
VMware Cloud Stack

Secure, Compliant, Controlled

Secure Private Cloud

End-User Computing
- Modular Desktops
- Unified User Management
- Cloud-Ready Applications

Application Access

VMware Enabled Public Clouds
- SaaS Partners
- Other SaaS Partners

Independent Public Clouds

Cloud Application Platform
- Cloud-Scale
- Open
- Self-Managed

Application Portability

Cloud Infrastructure & Management
- Efficiency Through Automation
- Agility with Security & Control
- Freedom of Choice

Application Mobility
- VMware vSphere: Foundation for Cloud Computing
Case Studies
State, Local and Education

Lone Star College System

MiCloud – State of Michigan Cloud

City of Pittsburgh
Three Core Focus Areas

1. Re-think End-User Computing
2. Cloud Application Platform
3. Cloud Infrastructure & Management
Introducing…

VMware vSphere™ 5.0

The Best Solution for Cloud Infrastructures
VMware vSphere 5.0: What’s New?

vCenter Server
- New HA Architecture
- vMotion over higher latency links
- ESXi Firewall
- 32 way SMP
- 1 TB VMs
- Virtual Appliance
- Web Client

Application Services
- Scalability
- Availability
- Security

Infrastructure Services
- Compute
- Storage
- Network

- ESXi Convergence
- Auto Deploy
- HW version 8
- Storage DRS
- Profile-Driven Storage
- VMFS 5
- Storage I/O Control (NFS)
- Network I/O Control (per VM controls)
- Distributed Switch (Netflow, SPAN, LLDP)
vCenter Server Appliance (Linux)

Overview

- Run vCenter Server as a Linux-based appliance
- Auto-deploy integrated into the appliance
- Embedded DB2 database for smaller environments and Support for Oracle databases for larger environments

Benefits

- No OS dependency and licenses
- Simplified setup and config (15 minutes)
- Enables deployment choices according to business needs or requirements
- Leverages vSphere availability features for protection of the management layer
Web Client

Overview

- Run and manage vSphere from any web browser anywhere in the world

Benefits

- Platform independence
- Replaces Web Access GUI
- Building block for cloud based administration
Application Services – Availability, Security, and Scalability
New HA Architecture

Overview

- New architecture for High Availability feature of vSphere that run a Fault Domain Manager agent on each host
- Ability to use a storage subsystem for communication
- One Master per cluster that monitors host and VM availability and manages hosts in the cluster and protected VMs

Benefits

- Simplified clustering setup and configuration
- Enhanced reliability through better resource guarantees and monitoring
- Enhanced scalability
Scaling Virtual Machines

Overview

- Create virtual machines with up to:
  - 32 vCPU
  - 1 TB of vRAM

Benefits

- 4x size of previous vSphere versions
- Run even the largest applications in vSphere, including very large databases
- Virtualize even more applications than ever before (Tier 1 and 2)
Infrastructure Services – Compute, Storage, Network
ESXi Convergence

Overview
- vSphere 5.0 will utilize the ESXi hypervisor exclusively
- ESXi is the gold standard for hypervisors

Benefits
- Thin architecture
- Smaller security footprint
- Streamlined deployment and configuration
- Simplified patching and updating model
Auto Deploy

Overview

- Deploy and patch vSphere hosts in minutes using a new “on the fly” model
- Coordination with vSphere Host Profiles
- PXE boot based

Benefits

- Rapid provisioning: initial deployment and patching of hosts
- Centralized host and image management
- Reduce manual deployment and patch processes
- Great for evaluating with VCSA
Storage DRS

Overview

- Group “like” datastores in a datastore cluster in a new storage object
- Initial placement of VMs/VMDKs
- Datastore maintenance mode
- Space and I/O load balancing
- Threshold settings for latency and space

Benefits

- Scalable storage management
- Reduce time for VM provisioning
- Eliminate VM downtime for storage maintenance
- Control out of space and I/O bottleneck avoidance by manual making changes or the process can be automated
Profile-Driven Storage

Overview

- Tier storage based on performance or SLA characteristics (storage visibility)
- View a list of all compliant storage resources
- Linking virtual machines to storage profiles

Benefits

- Utilize the correct storage resources every time (no mistakes)
- Help IT personnel that may not be as familiar with storage characteristics align with business and application goals
- Improve storage utilization and efficiencies
- Helps Storage DRS make decisions
Screenshot showing Profile Driven Storage
### Screenshot showing a non-compliant VM

<table>
<thead>
<tr>
<th>Name</th>
<th>Compliance Status</th>
<th>Last Checked</th>
<th>Compliance Failure</th>
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<tbody>
<tr>
<td>WinXP</td>
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<td></td>
<td>✓ Compliant</td>
<td>8/16/2011 5:00:56 PM</td>
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<td></td>
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<td>8/16/2011 5:00:56 PM</td>
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Performance Guarantees – Network and Storage I/O Control

1. VM requests more resources

2. Other VMs are starved for resources

3. w/ I/O controls, can give VIP VMs preferential access

Overview

- Set up SLAs for use of storage and network resources
  - Added per virtual machine settings for Network I/O Control
  - Added NFS support for Storage I/O Control

Benefits

- Eliminate the “noisy neighbor” problem
- More granular SLA settings for network traffic
- Extend Storage SLAs to more VMs
Screenshot showing Network I/O Control

**dvSwitch**

**Summary**
- Total number of physical adapters: 4
- Total network bandwidth capacity: 40000 Mbps
- Network I/O Control: Enabled

<table>
<thead>
<tr>
<th>Network resource pool</th>
<th>Host limit - Mbps</th>
<th>Physical adapter shares</th>
<th>Shares value</th>
<th>QoS priority tag</th>
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<tr>
<td>System network resource pools</td>
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<tr>
<td>Fault Tolerance (FT) Traffic</td>
<td>Unlimited</td>
<td>Normal</td>
<td>50</td>
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<tr>
<td>Host Based Replication (HBR) Traffic</td>
<td>Unlimited</td>
<td>Normal</td>
<td>50</td>
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<tr>
<td>iSCSI Traffic</td>
<td>Unlimited</td>
<td>Normal</td>
<td>50</td>
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</tr>
<tr>
<td>Management Traffic</td>
<td>Unlimited</td>
<td>Normal</td>
<td>50</td>
<td>--</td>
</tr>
<tr>
<td>NFS Traffic</td>
<td>Unlimited</td>
<td>Normal</td>
<td>50</td>
<td>--</td>
</tr>
<tr>
<td>Virtual Machine Traffic</td>
<td>20</td>
<td>High</td>
<td>1.00</td>
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<tr>
<td>vMotion Traffic</td>
<td>Unlimited</td>
<td>Normal</td>
<td>50</td>
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<tr>
<td>User-defined network resource pools</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Tenant1</td>
<td>10</td>
<td>High</td>
<td>1.00</td>
<td>--</td>
</tr>
<tr>
<td>Tenant2</td>
<td>10</td>
<td>Normal</td>
<td>50</td>
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</tbody>
</table>

**Network Resource Pool Details**

<table>
<thead>
<tr>
<th>Network resource pool</th>
<th>Origin</th>
<th>Host limit</th>
<th>Shares value</th>
<th>QoS priority tag</th>
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</table>

**Recent Tasks**

<table>
<thead>
<tr>
<th>Name</th>
<th>Target</th>
<th>Status</th>
<th>Details</th>
<th>Initiated By</th>
<th>vCenter Server</th>
<th>Reason</th>
</tr>
</thead>
</table>

| Name, Target or Status contains: | Clear |
New Virtual Machine Capabilities

- Richer Desktop Experience
  - 3D graphics

- Broader Device Support
  - Client-connected USB devices
  - USB 3.0
  - Smart Card Readers

- Additional Enhancements
  - Multi-core virtual CPUs (in GUI)
  - Extended VMware tools compatibility
  - Mac OS X server support
vSphere 5: Accelerating the Path to 100% Virtualization

<table>
<thead>
<tr>
<th></th>
<th>ESX 1</th>
<th>ESX 2</th>
<th>VMware Inf. 3</th>
<th>VMware vSphere 4</th>
<th>VMware vSphere 5</th>
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</thead>
<tbody>
<tr>
<td><strong>CPU (VCPUs)</strong></td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>8</td>
<td>32</td>
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<tr>
<td><strong>Memory (GB per VM)</strong></td>
<td>2</td>
<td>3.6</td>
<td>64</td>
<td>256</td>
<td>1,000</td>
</tr>
<tr>
<td><strong>Network (Gb/s)</strong></td>
<td>&lt;.5</td>
<td>.9</td>
<td>9</td>
<td>30</td>
<td>&gt;36</td>
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<tr>
<td><strong>IOPS</strong></td>
<td>&lt;5,000</td>
<td>7,000</td>
<td>100,000</td>
<td>300,000</td>
<td>1,000,000</td>
</tr>
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</table>
Introducing…

VMware vCloud Director 1.5
The Best Solution for Cloud Management
vCloud Director enables delivery of infrastructure as a service

- **Increase business agility** by empowering users to rapidly deploy services on-demand with self-service portals

- **Reduce costs by more efficiently delivering** resources and by consolidating and standardizing your infrastructure

- **Improve security and compliance** within multi-tenant environments with strong access controls and vShield security

- **Enable application portability and interoperability across clouds** while leverage existing investments

Builds on vSphere and scales up to 10,000 VMs and 25 vCenter Servers
Cloud Security
ESXi 5.0 Firewall Features

**Capabilities**
- ESXi 5.0 has a new firewall engine which is **not** based on iptables.
- The firewall is service oriented, and is a stateless firewall.
- Users have the ability to restrict access to specific services based on IP address/Subnet Mask.

**Management**
- The GUI for configuring the firewall on ESXi 5.0 is similar to that used with the classic ESX firewall — customers familiar with the classic ESX firewall should not have any difficulty with using the ESXi 5.0 version.
- There is a new esxcli interface (esxcfg-firewall is deprecated in ESXi 5.0).
- There is Host Profile support for the ESXi 5.0 firewall.
- Customers who upgrade from Classic ESX to ESXi 5.0 will have their firewall settings preserved.
UI: Security Profile

- The ESXi Firewall can be managed via the vSphere client.
- Through the **Configuration > Security Profile**, one can observe the **Enabled Incoming/Outgoing Services**, the **Opened Port List** for each service & the **Allowed IP List** for each service.
VMware vShield – Foundation for Trusted Cloud

Securing the Cloud From Edge to Endpoint

vShield Edge
Secure the edge of the virtual datacenter

vShield App
Protect applications from threats with trust zones

vShield Endpoint
Streamline and accelerate anti-virus solutions

vShield Data Security
Protect against data leaks

Virtual Datacenter 1
DMZ

Virtual Datacenter 2
Web

VMware vShield Manager
Questions / Comments
Accelerating the Journey to The Cloud Via Virtualization

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Bring Cloud Architecture to Existing Datacenters

- Leverage virtualization to transform physical silos into elastic, virtual capacity
- Increase automation thru built-in policy-driven management
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- Leverage virtualization to transform physical silos into elastic, virtual capacity
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- Move from static, physical security to dynamic, embedded security
Bring Cloud Architecture to Existing Datacenters

- Leverage virtualization to transform physical silos into elastic, virtual capacity
- Increase automation thru built-in policy-driven management
- Move from static, physical security to dynamic, embedded security
- Enable secure, self-service to pre-defined IT services, with pay-for-use

![Diagram showing virtualization, automation, security, and IT services integration]

Organizations: Marketing and Finance

- Users & Policies
- Organization VDCs
- Catalogs

![VMware logo]