Virtualization
The Future of Data Center Architecture

Executive Roundtable
June 2008

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Virtualization: Transformational Change in IT

- Decouples software from underlying hardware
- Encapsulates Operating Systems and applications into “Virtual Machines”

A Virtual Machine
Virtual Infrastructure: 10 years in the making

Automated Resource Assurance
- Dynamic Balancing
- Continuous Optimization

Increased Availability
- Automated
- Across Applications

On Demand Capacity
- Non-disruptive Scaling
- Flexible, Reconfigurable

The “Data Center Operating System”
Virtual Infrastructure: 10 years in the making
**Initial Virtualization Benefits: Consolidation**

Before VMware:
- Servers: 1,000 Direct attach
- Storage: 3000 cables/ports
- Network: 200 racks
- Facilities: 400 power whips

After VMware:
- Servers: 80 Tiered SAN and NAS
- Storage: 400 cables/ports
- Network: 10 racks
- Facilities: 20 power whips
Strategic Computing Architecture

One Platform to Solve a Range of Pressing Challenges Across a Range of Environments and Users

- Server Consolidation
- Business Continuity
- Security
- Enterprise Desktops

VMware Infrastructure

- Server
- Storage
- Network
Example: Whirlpool/Maytag Acquisition

Maytag Datacenter

- Acquired physical data center with legacy hardware
- Virtualize...
- Move just the physical storage appliance
- Entire datacenter worth of applications operational on new physical infrastructure in 6 hours!

Whirlpool Datacenter
Evolution of The Virtual Datacenter

Separate
- Test and Development

Consolidate
- Server Consolidation

Aggregate
- Capacity On Demand

Automate
- Self-Managing Datacenter

Liberate
- Computing Clouds On and Off Premise
Evolution of The Virtual Datacenter

Separate

Consolidate

Aggregate

Automate

Liberate

Test and Development

Server Consolidation

Capacity On Demand

Self-Managing Datacenter

Computing Clouds On and Off Premise
Hypervisor Evolution

The hypervisor is very far from being a commodity
  - Reliability, security, and performance will vary dramatically

In a phase of tremendous innovation driven by:
  - Proliferation of cores and potential inefficiencies
    - Intel and AMD launches make 16+ core systems mainstream
  - Component Software Architectures
  - Technology makes even more workloads virtualization candidates
    - 2nd generation CPU and memory HW assist, Paravirtualization
  - Rapidly growing move to pervasive, mission-critical use
    - Requires huge focus on reliability, security, and manageability
ESXi: Thin, Hardware-Integrated Hypervisor

Part of the Hardware:
Better than being an OS feature

32MB Footprint:
Increased security, manageability and reliability

Simplicity:
Server boot to first VMs in minutes
A Really Good Basket
Evolution of The Virtual Datacenter

Separate

Consolidate

Aggregate

Automate

Liberate

Test and Development

Server Consolidation

Capacity On Demand

Self-Managing Datacenter

Computing Clouds On and Off Premise
Server Consolidation is Officially Mainstream

Our servers are using too much electricity. We need to virtualize.

I did my part by reading about virtualization in a trade journal. Now you do the software part.

Why is your part taking so long?

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VMware: Secure Virtualization

- **Secure Architecture and Design**
  - Purpose-built, Lightweight
  - Customization of 3rd party drivers

- **Isolation and Containment**
  - Low-level separation enforcement
  - Fine-grained resource controls

- **Continuing Security Validation**
  - Audits
  - Certifications
  - Security Response

- **Time-tested Technology**
  - VMM: 6th generation, millions of customers
  - ESX Server: 3rd generation, 100,000+ customers
Green Energy Efficiencies

**GREEN CALCULATOR**
Reduce Energy Cost & Environmental Impact with Virtualization

<table>
<thead>
<tr>
<th>How many servers do you plan to virtualize?</th>
<th>100 servers</th>
</tr>
</thead>
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*Calculations are based on the power consumption of a standard 2 CPU server.

**Energy Savings:**
- Annual Server & Cooling Energy Usage (kWh): 400,000
- Virtualized: 75
- Savings: 10%

**Cost Reduction:**
- Physical Hardware:
  - $650,000.00
- Annual Energy Cost:
  - $48,048.00
- $75,075.00
- $48,540.50

**Environmental Impact:**
- Planting Trees: 2,000
- Cars off the highway:
  - 122
- Annual CO2 Emission (lbs):
  - 543,648

**Equal to:**
- 55 Trees
- 1.5 Cars
- 4t CO2
- 700 Dollars
- 7,000 kWh

**Trees** | **Cars** | **CO2 (lbs)**
---|---|---
Interior Health Authority | 3,200 | 240 | 1,420,171
First American | 14,000 | 1,050 | 6,213,246

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1. Assumes 56.5M per 2 CPU server
2. Assumes 50.16 kWh and 338 Watts per 2 CPU server
3. Assumes 12,000 miles per year and 18 mpg.
4. Assumes 1.341 lbs CO2 emission per kWh.

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*Interior Health Authority*

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*First American*
Consolidation is also for Desktops

Virtual Desktop Infrastructure (VDI)

- **Full** desktops run as VMs in the data center
- Connect securely to desktop from anywhere
- Centralized management
- More efficient resource usage
- Higher availability
- Online and offline mode
Evolution of The Virtual Datacenter

Separate
- Test and Development

Consolidate
- Server Consolidation

Aggregate
- Capacity On Demand

Automate
- Self-Managing Datacenter

Liberate
- Computing Clouds On and Off Premise
Virtual Infrastructure - Distributed Virtualization

Single-machine partitioning is great, but “VMware virtual infrastructure” arrives with a collection of machines

- Aggregate volume hardware into virtual computing, storage, and networking resource pools
- Dynamic Flexible Environment
- Key enablers are VMotion, Storage VMotion, VMFS and Virtual Center
Pools of Shared Resources

Exchange

File/Print

VPN

CRM

VMware Infrastructure

CPU Pool

Memory Pool

Storage Pool

Interconnect Pool
Pools of Shared Resources

VMware Infrastructure

- CPU Pool
- Memory Pool
- Storage Pool
- Interconnect Pool
VMware: From Consolidation to Strategic Computing Platform

- Resource Management
- Business Continuity
- Application Availability
- Service Level Management
- Security

VMware Infrastructure
Vision: Next-Generation Datacenter

> **Plug-and-Play:** Power on a new server with ESXi. The new server joins a cluster.

> **Self-optimizing:** All VMs in the cluster are automatically rebalanced taking in consideration the newly available resources.
Deploy Resources to Applications in Real Time

VMware Infrastructure

CPU Pool
Memory Pool
Storage Pool
Interconnect Pool

VMware Products
- DRS—Distributed Resource Scheduler
- DPM—Distributed Power Management

Interconnect Pool
CPU Pool
Memory Pool
Storage Pool
Fast Recovery from HW and SW Failures

VMware Infrastructure

Products
- VMotion, Storage VMotion
- Update Manager
- HA—High Availability
- Site Recovery Manager
Transforming Business Continuity

Traditional solutions are costly and complex
- Point solutions tied to HW, OS, or applications

VMware reduces cost and complexity at each business continuity level
- Integrated to the VI3 platform
- HW, OS, app independent

Entry-Level Server
  - Encapsulation
  - Isolation

High-End Server
  - VMotion
  - Shared Redundancy

Fault-Tolerant Configurations

Failover Cluster

Mirrored Sites

VMware HA

Continuous Availability

Storage Resiliency

Site Recovery Manager

Replication

Isolation
Traditional Security—Host or Network Based

Diagram showing layers of security such as Application and Operating System.
VMware VMSafe: Opportunity for Better Security

Protection Engine
Isolation
Introspection
Interposition

VMware Infrastructure
Result: Applications Run Best on VMware

Best place to run your applications

➤ Guarantee application performance
➤ Fast recovery from hardware or software failure
➤ Security threats detected and eliminated
Record Capacity for Exchange 2007

VMware Sets Capacity Record Running Microsoft Exchange on IBM System x3850 M2 Servers

San Jose, February 26, 2008 — VMware, Inc. (NYSE: VMW), the global leader in virtualization solutions...
Evolution of The Virtual Datacenter

- Separate
- Consolidate
- Aggregate
- Automate

Test and Development
Server Consolidation
Capacity On Demand
Self-Managing Datacenter
Computing Clouds On and Off Premise
Virtual Machines Enable Datacenter Automation

Virtual Machines are Standardized Software Containers

Consolidated

Automated

Virtual Machines

IT Services

OVF
2008: VMware’s Year of Automation

VMware Infrastructure

- Dev
- Test
- Integration
- Staging
- Production

VMware Products

- Lifecycle Manager
- Lab Manager
- Stage Manager
VMware Site Recovery Manager

Simplifies and automates disaster recovery workflows

Turns manual recovery runbooks into automated recovery plans

Provides central management of recovery plans from VirtualCenter

Builds upon existing storage replication offerings

Makes disaster recovery rapid, reliable, manageable, affordable
Evolution of The Virtual Datacenter

- **Separate**: Test and Development
- **Consolidate**: Server Consolidation
- **Aggregate**: Capacity On Demand
- **Automate**: Self-Managing Datacenter
- **Liberate**: Computing Clouds On and Off Premise
Shared Resources for Server and Desktop

Virtual Desktop Manager

Virtual Infrastructure

VMware
Strategic Computing Architecture

One Platform to Solve a Range of Pressing Challenges Across a Range of Environments and Users

Server Consolidation  Business Continuity  Security  Enterprise Desktops

VMware Infrastructure

Server  Storage  Network
At this point, which best describes the role of server virtualization in your IT infrastructure?

- **46%**: Standardizing on VMware Infrastructure
- **24%**: Default Server Policy
- **29%**: Some New Production Servers
- **15%**: Low-Risk, Non-critical Apps
- **10%**: Limited to Testing & Dev

*Source: Comprehensive survey of VMware customers conducted in July, 2007*
Summary

VMware is enabling the fully virtualized datacenter that is self-optimizing, self-healing, and highly automated.

VMware is the best place to run applications, providing higher availability and performance than physical deployments.

VMware is enabling the future datacenter that:

- Focuses on VMs as a fundamental unit of management.
- Enables more effective infrastructure services.
- Enables sharing of computing resources across IT services and physical location.

VMware Infrastructure is the new computing platform.
Questions?
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