Intro to Virtualization: Get started with ESXi
Agenda

- Why customers are turning to VMware
  - Same datacenter, new economics
  - Reducing risk with higher application availability
- VMware ESXi Overview
  - ESXi Key Features
  - Comparing ESXi to VMware vSphere and VMware Server
- ESXi Walkthrough
- Next Steps: vSphere features and editions
Proven Solution, Unrivaled Customer Success

- 120,000+ VMware customers
  - 100% of Fortune 100
  - 92% of Fortune 1000
- 94% use VMware in production
- 65% standardizing on virtual infrastructure
State of Infrastructure Today

**Server Sprawl**
- 36M physical x86 servers by 2011— a ten-fold increase in 15 years
- $140 bn in excess server capacity - a 3-year supply

**Power & Cooling**
- 50c for every $1 spent on servers
- $29 bn in power and cooling industry wide

**Space Crunch**
- $1,000 / sqft
- $2,400 / server
- $40,000 / rack

**Operating Cost**
- $8 in maintenance for every $1 spent on new infrastructure
- 20-30 : 1 server-to-admin ratio

3. Source: VMware
VMware Virtualization Technology

New Model: Virtualization Technology

- Separation of OS and hardware
- Isolation
- Encapsulation of OS and application into VMs
- Hardware independence
- Flexibility
Key Properties of Virtual Machines

Partitioning

- Run multiple operating systems on one physical machine
- Divide system resources between virtual machines
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Isolation
- Fault and security isolation at the hardware level
- Advanced resource controls preserve performance
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- Move and copy virtual machines as easily as moving and copying files
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Hardware Independence
- Provision or migrate any virtual machine to any similar or different physical server
## State of Infrastructure with Virtualization

<table>
<thead>
<tr>
<th></th>
<th>BEFORE VMware</th>
<th>AFTER VMware</th>
<th>SAVINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Servers</td>
<td>1000</td>
<td>80</td>
<td>$5,816</td>
</tr>
<tr>
<td>Network Switches</td>
<td>84</td>
<td>10</td>
<td>$296</td>
</tr>
<tr>
<td>Power (kWh)</td>
<td>407</td>
<td>52</td>
<td>$759</td>
</tr>
<tr>
<td>Cooling (kWh)</td>
<td>509</td>
<td>64</td>
<td>$949</td>
</tr>
<tr>
<td>Real Estate (Sq ft)</td>
<td>2053</td>
<td>257</td>
<td>$431</td>
</tr>
<tr>
<td><strong>Total Savings</strong></td>
<td></td>
<td></td>
<td><strong>$8,251</strong></td>
</tr>
</tbody>
</table>

* Note: Savings include estimated cost of VMware licenses, Support and Subscription
Instant Provisioning

<table>
<thead>
<tr>
<th>Week 1</th>
<th>Week 2</th>
<th>Week 3</th>
<th>Week 4</th>
<th>Week 5</th>
<th>Week 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>BEFORE VMware</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Procure hardware</td>
<td>Configure hardware</td>
<td>Install OS</td>
<td>Configure OS &amp; Tools</td>
<td>Assign IP Addr</td>
<td>Configure Network</td>
</tr>
<tr>
<td>&lt;1 hour of work</td>
<td>1-2 days lead time</td>
<td>20-40 hrs of work</td>
<td>4-6 week lead time</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

WITH VMware

<table>
<thead>
<tr>
<th>Deploy from Template</th>
<th>Power on VM</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1 hour of work</td>
<td>1-2 days lead time</td>
</tr>
<tr>
<td>20-40 hrs of work</td>
<td>4-6 week lead time</td>
</tr>
</tbody>
</table>
The Always On, On Demand Datacenter

- Shared pools of resources
- Self-optimizing
- Fault tolerant
- Self-protecting
- Automated
- Desktop or Server Workloads

VMware vSphere
Free Up $$$ from Maintenance to Innovation

**BEFORE**
- Infrastructure maintenance: 42%
- Application maintenance: 30%
- Application innovation: 23%
- Infrastructure innovation: 5%

**AFTER**
- Infrastructure maintenance: 30%
- Application maintenance: 15%
- Application innovation: 45%
- Infrastructure innovation: 10%

Source: Fortune 100 Company
Automated Disaster Recovery

Site Recovery Manager leverages VMware vSphere to deliver advanced disaster recovery management and automation

- **Simplifies and automates disaster recovery workflows:** Setup, testing, failover
- **Turns manual recovery runbooks into automated recovery plans**
- **Provides central management of recovery plans from vCenter**
Virtual Desktops

Benefits

- Central Management, Security, Compliance
- Business Continuity
- Standard PC management model and isolation

- Eliminated need to buy PCs
- Reduced time to add a new PC image to <10 min
- Administer all desktops worldwide centrally with vCenter
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VMware ESXi Overview

Next generation of VMware’s market-leading ESX hypervisor

- Partitions a server into virtual machines
  - Reduces hardware, power, and cooling with the performance and features of ESX

- Plug-and-Play
  - Minimal configuration. Run VMs in minutes

- OS-Independent, thin architecture
  - Unparalleled security and reliability

- Full-featured
  - Superior consolidation and scalability
  - Easy to manage with remote tools
  - Simple license upgrade to VI3 Enterprise
vSphere 4 Delivers Performance for Demanding Applications

<table>
<thead>
<tr>
<th>95% of applications</th>
<th>ESX 3.5</th>
<th>ESX 4.0</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CPU</strong></td>
<td>1 to 2 CPUs</td>
<td>4 VCPUs</td>
</tr>
<tr>
<td><strong>Memory</strong></td>
<td>&lt; 4 GB at peak</td>
<td>64 GB per VM</td>
</tr>
<tr>
<td><strong>Network</strong></td>
<td>&lt; 2.4Mbits/s</td>
<td>9 Gb/s</td>
</tr>
<tr>
<td><strong>IOPS</strong></td>
<td>&lt; 100 at peak</td>
<td>100,000</td>
</tr>
</tbody>
</table>

Application Performance Requirements

1. Source: VMware Capacity Planner assessments
VMware ESX and ESXi – The most reliable hardware abstraction

Proven by customers
- Over 120,000 customers
- Over seven years of maturation
- Over 85% of customers using for production workloads
- Years of continuous uptime at customer sites

Reliable by design
- ESXi: 32MB on disk
- Less code = fewer bugs, fewer patches, etc.
- No dependence on OS or arbitrary drivers

2008 Editor’s Choice Awards
Most Reliable Category
1. VMware ESX
2. IBM mainframe
VMware ESXi vs VMware vSphere

**VMware ESXi**
- Single server partitioning
- Production-class hypervisor
- Advanced server resource management
- FREE

**VMware vSphere**
- Pools of computing resources
- Centralized management
- Built-in automation, availability and manageability
- All Editions include ESXi, starting at $166 per CPU socket

*The hypervisor is to Virtual Infrastructure what the engine is to a car, or the BIOS to a PC – an enabling component but not the whole solution.*
**VMware ESXi vs. VMware Server**

**VMware ESXi**
- Installs “bare metal”
- OS Independent
- Complete hardware resource management

**VMware Server**
- Installs as an application
- Runs on a host OS
- Depends on OS for resource management
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Hardware Needed

Server

- **CPU**
  - Minimum: Single socket, dual core
  - Ideal: Dual-socket, 4 or more cores per CPU
- **Memory**
  - Minimum: 2GB
  - Ideal: 8+GB

Network

- Minimum: one NIC, plus one for Management interface
- Ideal: One for Management Interface plus multiple NICs for VMs

Storage

- **Local Storage (SATA/SAS):**
  - Minimum: one 80GB drive
  - Ideal: 2 mirrored drives (only for ESXi Installable) plus 4 RAID5 drives for VMs
- **Shared Storage**
  - NFS, iSCSI, Fibre Channel: for VM storage
  - ESXi Installable requires local disk or 1 GB+ USB 2.0 flash storage for the hypervisor
Installing ESXi

VMware ESXi Embedded
- Installed via SD flash or USB key internal to the server
- Distributed with a new server
- No Installation -- *Just Turn It On!*

VMware ESXi Installable
- Load Installer via CD or ISO image
- Simple 2-step procedure:
  1. Accept EULA
  2. Select local drive for installation
Get up and running in Minutes

1. Power on server, which boots into hypervisor
2. Configure Admin Password
3. (optional) Modify network configuration
4. Connect via vSphere Client
   - Point your browser to the configured IP Address
   - Download & Install Windows-based vSphere Client
   - Start vSphere Client and log into host
Creating Virtual Machines

Use VMware Converter
- Transfer existing physical servers into virtual machines
- Import existing VMware and 3rd party virtual images

Create from Scratch
- Specify CPUs (1-4), Memory (1-256 GB), Disks, Network interfaces
- Load OS from ISO image (over 80 supported OSes)

Import a Virtual Appliance
- Hundreds to choose from on the Virtual Appliance Marketplace
- Download directly via vSphere Client and deploy on host
Importing a virtual appliance
Interacting with Virtual Machines

Virtual Machine Console

> Just like the console screen or BIOS of a physical server

Or just use standard remote access, e.g. RDP, ssh, etc.
Manage Your ESXi Host: vSphere Client
Monitor Your ESXi Host: CIM
Manage Individual VMs

Control capabilities

➤ Power on/off
➤ Suspend
  ■ Captures state of VM to disk
  ■ Can resume back to same state
➤ Snapshot
  ■ Makes point-in-time copy of virtual disk(s)
  ■ Can have multiple snapshots in a tree
Monitor Individual VMs
Backing up Virtual Machines

Option 1: traditional backup tools

- Back up a VM like you would a physical server

Option 2: back up VM as a set of files

- Can view and download VM files via vSphere Client through Datastore Browser (can also do via RCLI), OR

- Can download VM files directly from shared storage device

1. Take snapshot of VM
2. Download copies of VM files
3. Remove snapshot
More Sophisticated Features

Resource Pools

- Allows you to divide resources of host in fine-grained way
- Create multiple-nested resource pools according to policies, e.g.
  - By Application
  - By Department
More Sophisticated Features

Virtual Networking

- Create multiple vSwitches and assign one or more NICs to each
- Create vSwitches without NICs for internal-only traffic
- Make use of VLAN tagging (if your physical network supports it)
## Typical ESXi Deployment Scenarios

<table>
<thead>
<tr>
<th>Small Office / Department</th>
<th>Design Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>➤ Small number of physical servers to consolidate</td>
</tr>
<tr>
<td></td>
<td>➤ Simple management requirements</td>
</tr>
<tr>
<td></td>
<td>➤ Can tolerate limited hardware failures and maintenance downtime</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Remote Sites</th>
<th>Typical Setup</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>➤ 2 servers</td>
</tr>
<tr>
<td></td>
<td>➤ NAS</td>
</tr>
<tr>
<td></td>
<td>➤ Entry-level switch</td>
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Next Step after ESXi: VMware vSphere

VMware vSphere is the most widely deployed virtualization platform and can offer you:

- Centralized management of virtual machines and ESXi hosts
- Integrated back up and restore of virtual machines
- Protection against physical server failures for high availability
- Live migration of virtual machines and their disk files between physical servers with no downtime
- Dynamic load balancing of virtual machines to guarantee service levels
vSphere for Small Businesses

- **vSphere Essentials Plus, an All inclusive package:**
  - Licenses for 3 physical servers (up to 2 processors each)
  - License for central management server

- **Package cannot be decoupled or combined**

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**ESSENTIALS PLUS ($2,995)**

- **Data Recovery**
  - x 6 CPUS

- **High Availability**
  - x 6 CPUS

- **Update Manager**
  - x 6 CPUS

- **VC Agent**
  - x 6 CPUS

- **4-way vSMP**
  - x 6 CPUS

- **VMware ESXi OR VMware ESX**
  - x 6 CPUS

- **vCenter Server for Essentials (up to 3 servers)**
  - x 1
Essentials Plus: VMware HA

Cost effective high availability for all servers

In the event of hardware failure:

- Impacted virtual machines are restarted on remaining hosts
- Placement optimized by global scheduler
- vCenter handles all setup and configuration automatically

None of the cost and complexity of clustering
Essentials Plus: VMware Data Recovery

- Agent-less, disk-based backup and recovery of your VMs
- VM or file level restore
- Incremental backups and data de-dupe to save disk space
- Quick, simple and complete data protection for your VMs
- Centralized management through vCenter Server plug-in
- Cost-effective storage management for backup data
Essentials Plus: Patch Management

- Update Manager
  - Secure offline VM and template patching
  - Enable rollback in case of patching failures with automated snapshots
Essentials Plus: Additional Management Features

- Virtual Machine Templates
  - Create “golden image” for rapid, standardized deployment

- Virtual Machine Cloning
  - Create exact copy of virtual machine for testing, debugging, etc.

- Alarms and Alerts
  - Get notified of resource shortage and other issues

- Cold Migration of virtual machines between ESX hosts
  - Enables flexibility for hardware maintenance, etc.

- Fine-grained roles and permissions
  - Allows for delegated administration

- Active Directory based authentication
  - Unified with existing user directory
Other vSphere Editions

**without host limitation**

- **STANDARD**
  - Hypervisor
  - Management Agent
  - High Availability
  - Thin Provisioning

- **ADVANCED**
  - Hypervisor Management Agent
  - High Availability
  - Thin Provisioning

- **ENTERPRISE PLUS**
  - Hypervisor Management Agent
  - High Availability
  - Thin Provisioning

- **CONSOLIDATION**
  - Live Migration
  - Continuous Availability
  - Network Security
  - Zoning
  - Data Protection

- **AVAILABILITY**
  - Live Migration
  - Continuous Availability
  - Network Security
  - Zoning
  - Data Protection

- **SIMPLIFIED OPERATIONS**
  - 3rd Party Multipathing
  - Dynamic Resource Allocation
  - Power Management
  - Storage Live Migration
  - Distributed Switch
  - Host Configuration Controls

License (1 Processor) SnS (Gold/Plat) $795 $273 / 323 $2,245 $472 / 561 $3,495 $734 / 874
VMware vSphere: Live Migration

VMware VMotion
VMware vSphere: Load Balancing

VMware Distributed Resource Scheduler

VMware ESX

VMware ESXi

Resource Pool

VMotion

Physical Servers
VMware vSphere: Power Management

VMware Distributed Power Management

VMotion

VM
VM
VM
VM
VM
VM
VM
VM
VM

Resource Pool

VMware ESX
VMware ESXi
VMware ESX

Standby Host Server

Power Optimized Servers
VMware vSphere: Continuous Availability

VMware Fault Tolerance

No Reboot
Transparent Failover

VMware ESX

Fault Tolerance

VMware ESXi

Operating Server

Failed Server

Operating Server
Summary

1. Virtualization reduces cost, improves high availability, and simplifies operations

2. ESXi is a high performance, production-class hypervisor

3. ESXi can be up and running with VMs in minutes

4. ESXi can be upgraded to VMware vSphere with a simple license change

Download ESXi today at  http://www.vmware.com/products/esxi/