Introduction to Virtualization

The Long Island Chapter of the IEEE Circuits and Systems (CAS) Society

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Presentation Outline
“**Introduction to Virtualization**”

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- **The Traditional Server Concept**
- **The Virtual Server Concept**
- **Virtual Machines**
- **Benefits of Virtualization**
- **Server Consolidation**
- **Virtualization– Key Solutions / Use Cases**
- **Top 3 Economic Reasons For Virtualization**
- **Server, Storage and Network Consolidation**
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- **Experienced App Owners Trust Virtualization for Toughest Workloads**
- **What is Available Today**
- **VMware – Recognized as the Virtualization & Cloud Leader (2010)**
- **What is Available From VMware**
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- **Virtual Distributed Network Switch**
- **The Disadvantages of Virtualization**
- **System Virtualization - Present State**
- **Modernizing the Desktop – Virtual Desktop Infrastructure**
- **Cloud Computing Takes Virtualization to the Next Step**
- **Private, Hybrid and Public Clouds**

What is Virtualization

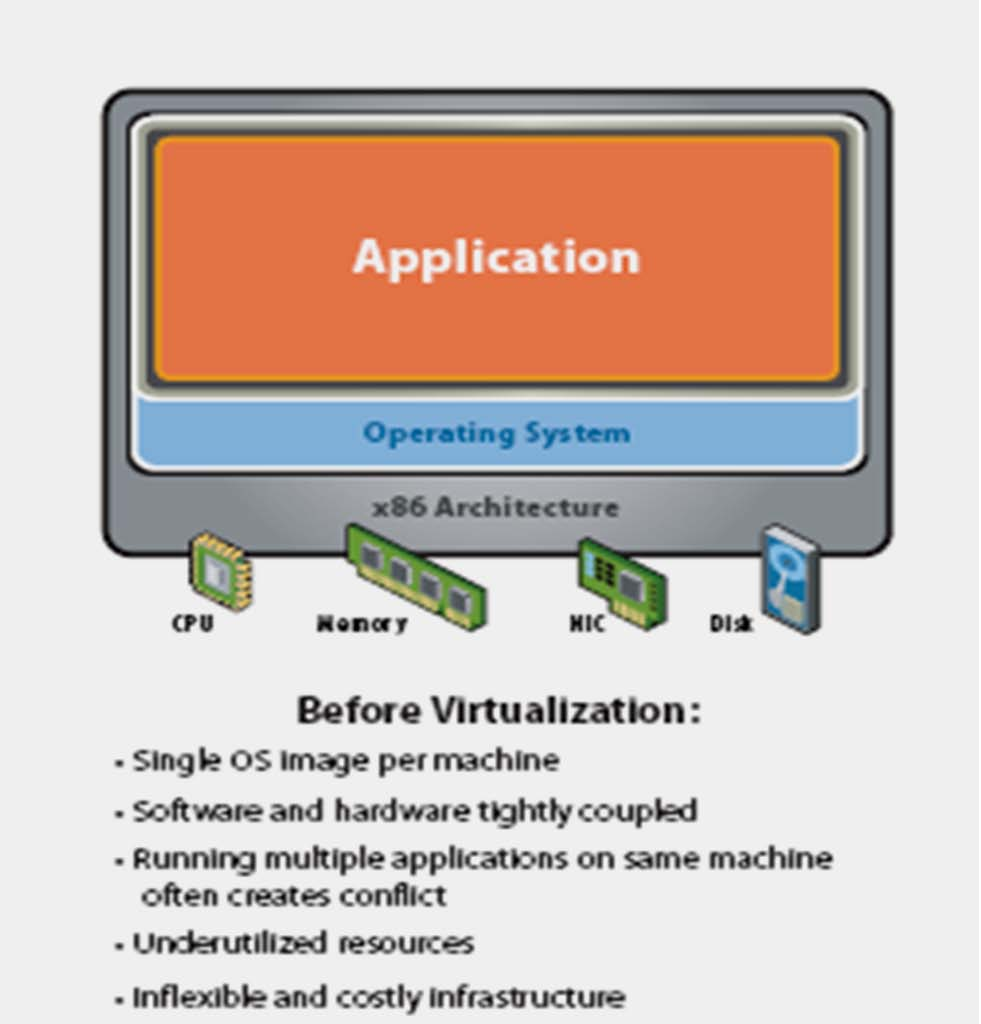
- Virtualization abstracts the underlying physical structure of various technologies. Virtualization, in computing, is the creation of a virtual (rather than actual) version of something, such as a hardware platform, operating system, a storage device or network resources[1]

- Server virtualization[2]
  - Creates multiple isolated environments
  - Allows multiple OS's and workloads to run on the same physical hardware
  - Solves the problem of tight coupling between OS's and hardware

(1) http://en.wikipedia.org/wiki/Virtualization
(2) Anil Desai IEEE Computer Society, Austin Chapter April 18th, 2007

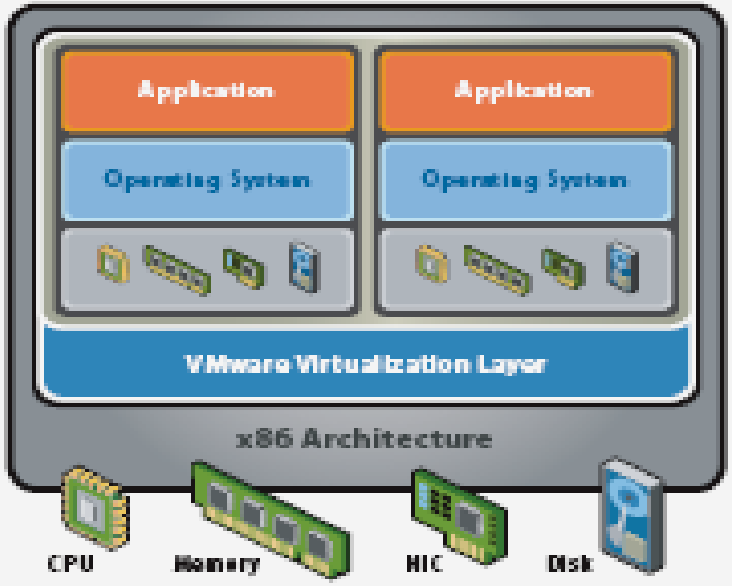
You Know Virtualization Is Real When It Makes It To Dilbert

The Traditional Server Concept



VMware Inc., *Virtualization Overview*, http://www.vmware.com/pdf/virtualization.pdf

The Virtual Server Concept



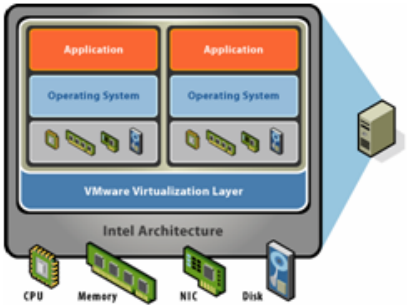
After Virtualization:

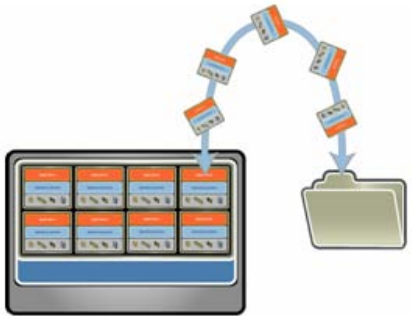
- Hardware-independence of operating system and applications
- Virtual machines can be provisioned to any system
- Can manage OS and application as a single unit by encapsulating them into virtual machines

Virtual Machines

Virtual machines provide:

- Hardware independence – Guest VM sees the same hardware regardless of the host hardware
- Isolation – VM's operating system is isolated from the host operating system
- Encapsulation – Entire VM encapsulated into a single file





Benefits of Virtualization

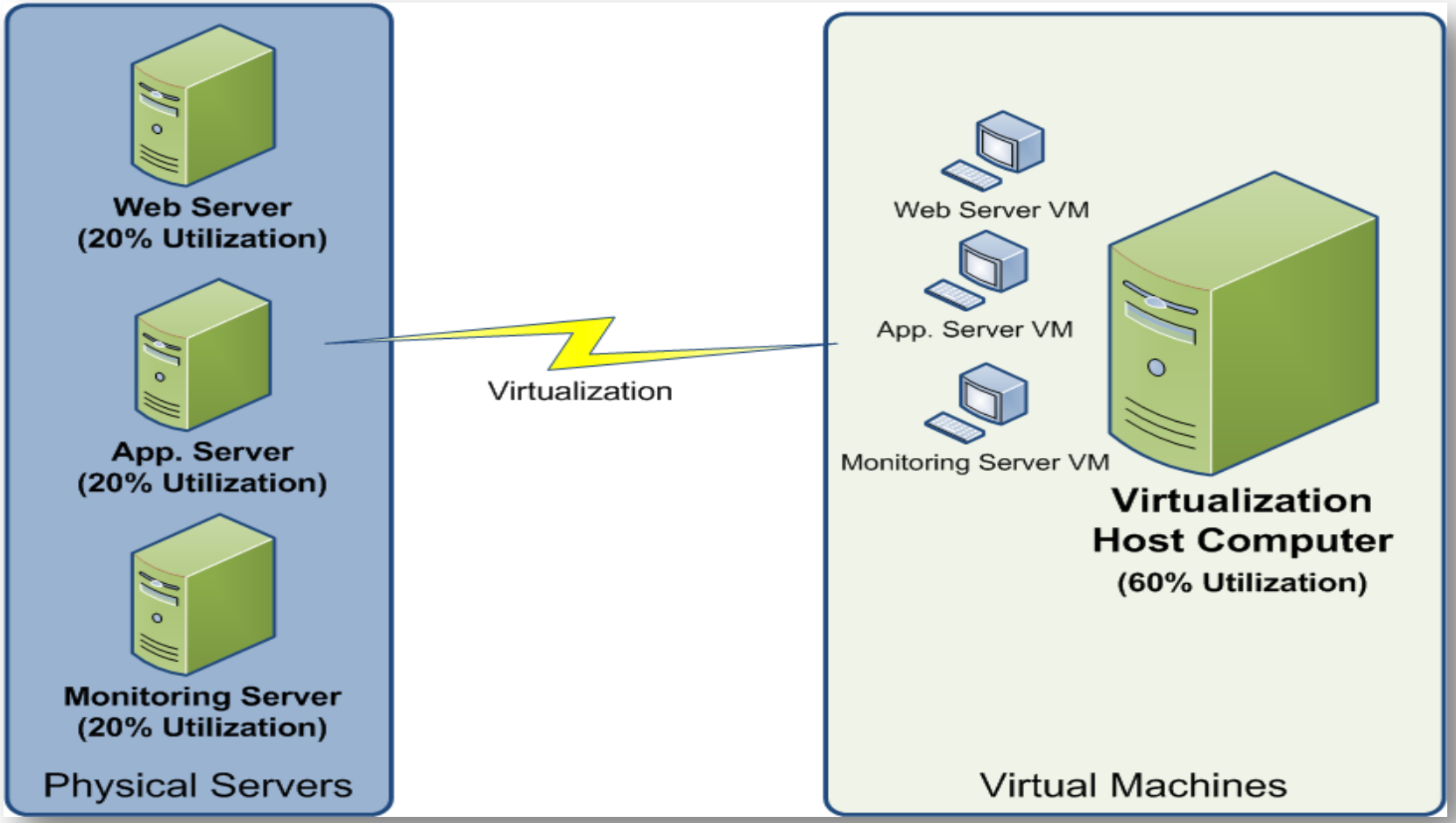
- Simplified administration
- Hardware independence/portability
- Increased hardware utilization
- Server consolidation
- Decreased provisioning times
- Improved security

- Software Development
- Testing / Quality Assurance
- Product evaluations / demonstrations
- Training
- Disaster Recovery

Virtualization Features

Virtualization Scenarios

Server Consolidation



Virtualization – Key Solutions / Use Cases

Server Consolidation and Containment – Eliminate server sprawl by deploying systems into virtual machines

Infrastructure Provisioning – Reduce the time for provisioning new infrastructure to minutes with sophisticated automation capabilities.

Business Continuity – Reduce the cost and complexity of business continuity by encapsulating entire systems files that can be replicated and restored onto any target server

Test and Development – Rapidly provision and re-provision test and development servers; store libraries of pre-configured test machines

Enterprise Desktop – Secure unmanaged PCs. Alternatively, provide standardized enterprise desktop environments hosted on servers.

Legacy Application Re-hosting – Migrate legacy operating systems and software applications to virtual machines running on new hardware for better reliability

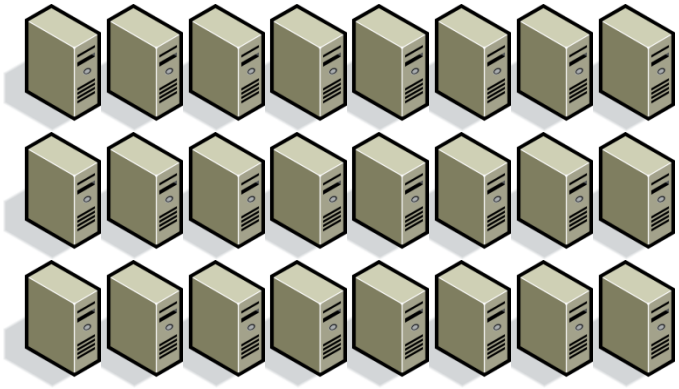
Top 3 Economic Reasons For Virtualization

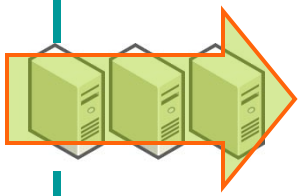
1. Reduce Physical Infrastructure Cost
2. Reduce Datacenter Operating Cost (e.g. Power & Cooling)
3. Minimize Lost Revenue Due to Downtime

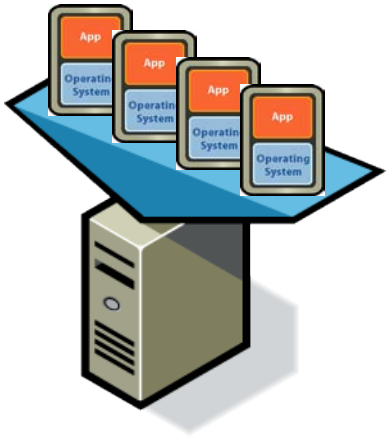
VMware Virtualization: The Right Investment For a Tough Economy Juine 2009

Server, Storage and Network Consolidation

Before	After
1,000 servers with DASD	50 servers with SAN and NAS
200 racks	10 racks
3000 network cables	300 network cables
400 power whips	20 power whips

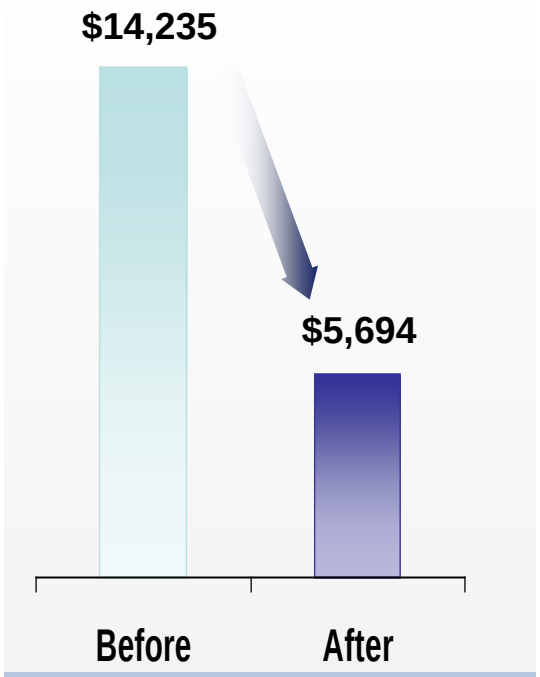






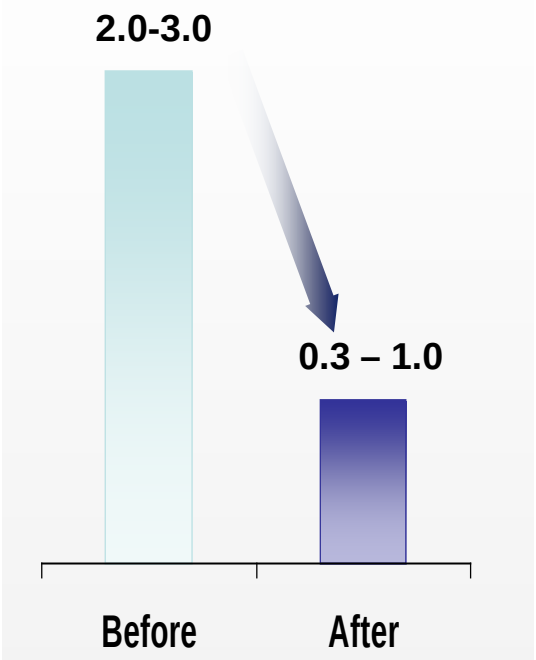
Virtualization Delivers Tangible Business Outcomes

Reduction in Datacenter Capital Expense



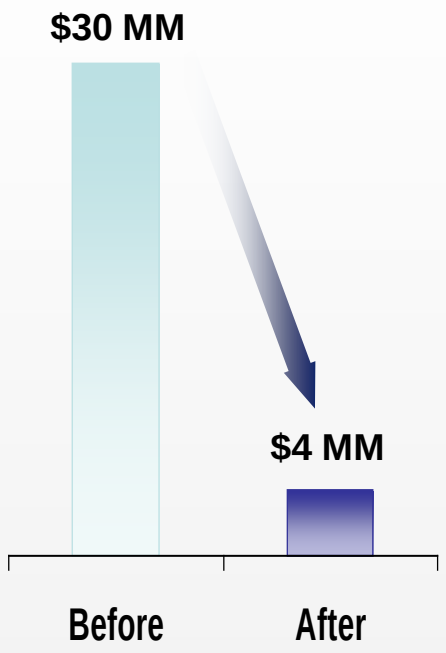
Infrastructure Cost per App

Reduction in Datacenter Operating Expense



Sys Admin per 100 Apps*

Reduction in Risk

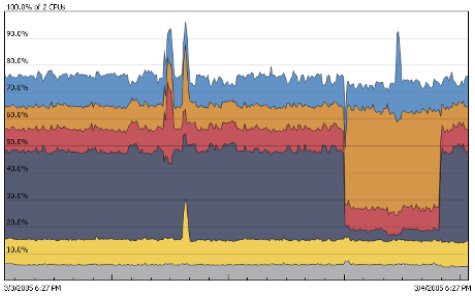


Business Loss Due to Datacenter Outage**

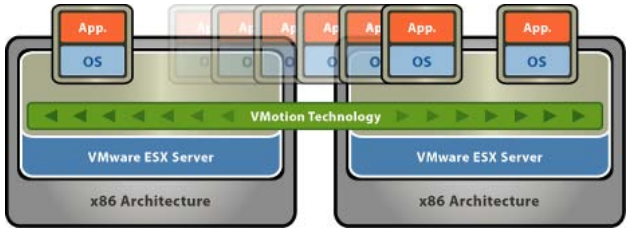
* Source: IDC and VMware TAM program

** Source: VMware customer – a $2bn insurance company. Estimates based on 40 hrs needed to recover before virtualizing and 4.5 hrs needed for the same recovery after virtualization.

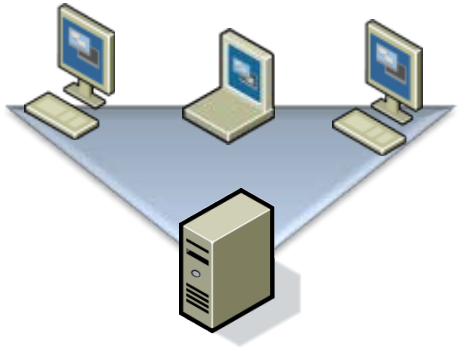
Virtualization Reduce Energy Consumption



- Highest consolidation rates on most secure and reliable virtualization platform
- Safely improve utilization rates
- **80% energy reduction**

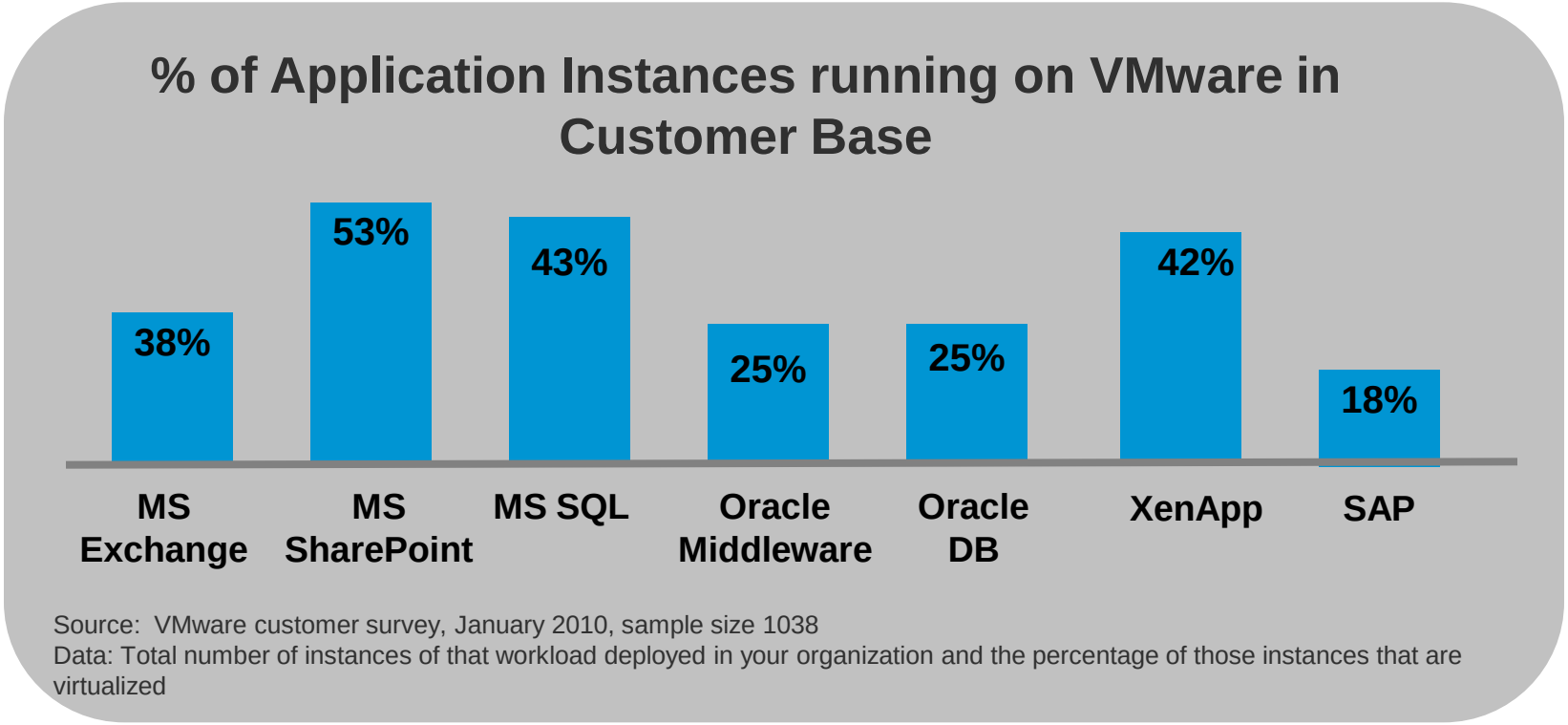


- Dynamic server and storage migration
- Power off unneeded servers in real-time
- Migrate storage dynamically
- **25% energy reduction**



- Host desktop PCs in the datacenter
- Use thin clients, double refresh cycle
- Reduce storage for similar desktop images
- **70% energy reduction**

Experienced App Owners Trust Virtualization for Toughest Workloads



Source: VMware customer survey, January 2010, sample size 1038
Data: Total number of instances of that workload deployed in your organization and the percentage of those instances that are virtualized

In a recent Gartner poll, 73% of customers claimed to use x86 virtualization for mission critical applications in production

Source: Gartner IOM Conference (June 2008)
"Linux and Windows Server Virtualization Is Picking Up Steam" (ID Number: G00161702)

What is Available Today

VMware

- VMware released ESX and GSX 1.0 in 2001. Virtual Center released in 2003.
  - Has the most experience
  - Is the farthest along
  - Very mature product suite
  - Focus is on integrating IT process automation around virtualization

Citrix

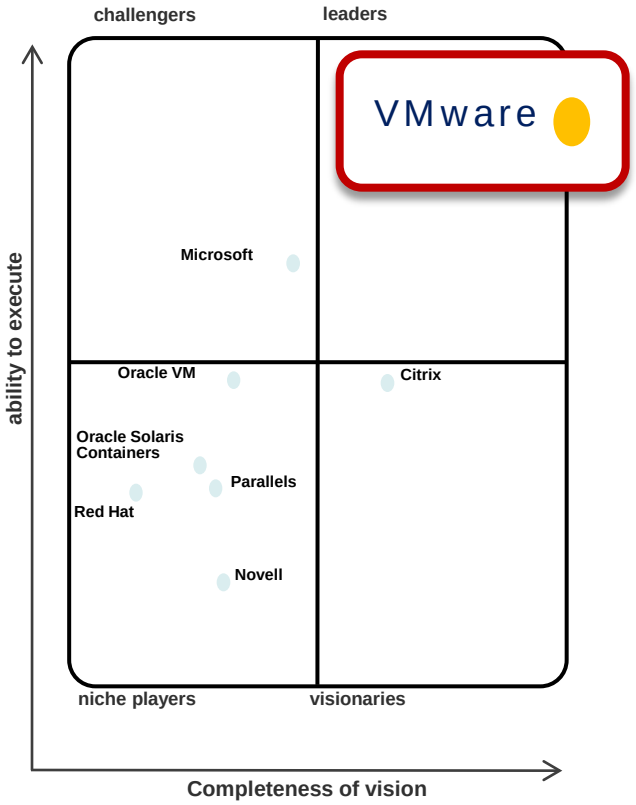
- Citrix Xenserver acquired Xensource on August 15th, 2007
  - Has working low cost server virtualization solution
  - Focus is on client virtualization

Microsoft

- Microsoft Hyper-V (formerly 'Windows Server Virtualization')
  - Standalone version released in October 2008
  - Real solution (one with HA) has been out since August 2009.

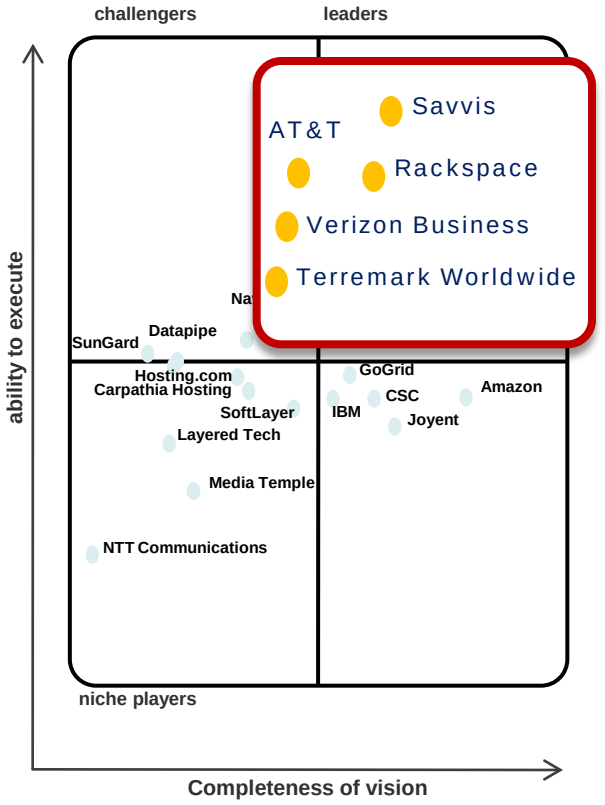
VMware – Recognized as the Virtualization & Cloud Leader (2010)

VMware is only vendor in Leader's Quadrant!



Gartner x86 Virtualization Magic Quadrant

5 of 5 cloud providers in Leader's Quadrant are VMware-based



Gartner IaaS Cloud Magic Quadrant (Infrastructure as a Service)

What is Available From VMware

- **VMw**are's vSphere
  - Key Features
    - Market Leader
    - Virtualizes 54 Guest OSs
    - Server virtualization solution with HA and load balancing
    - Enhanced vMotion
    - Memory Over commit
    - Transparent Page Sharing

•Patch Management

•Fault Tolerance built in

•Certified on over 450 servers

•FC, iSCSI, NFS Supported

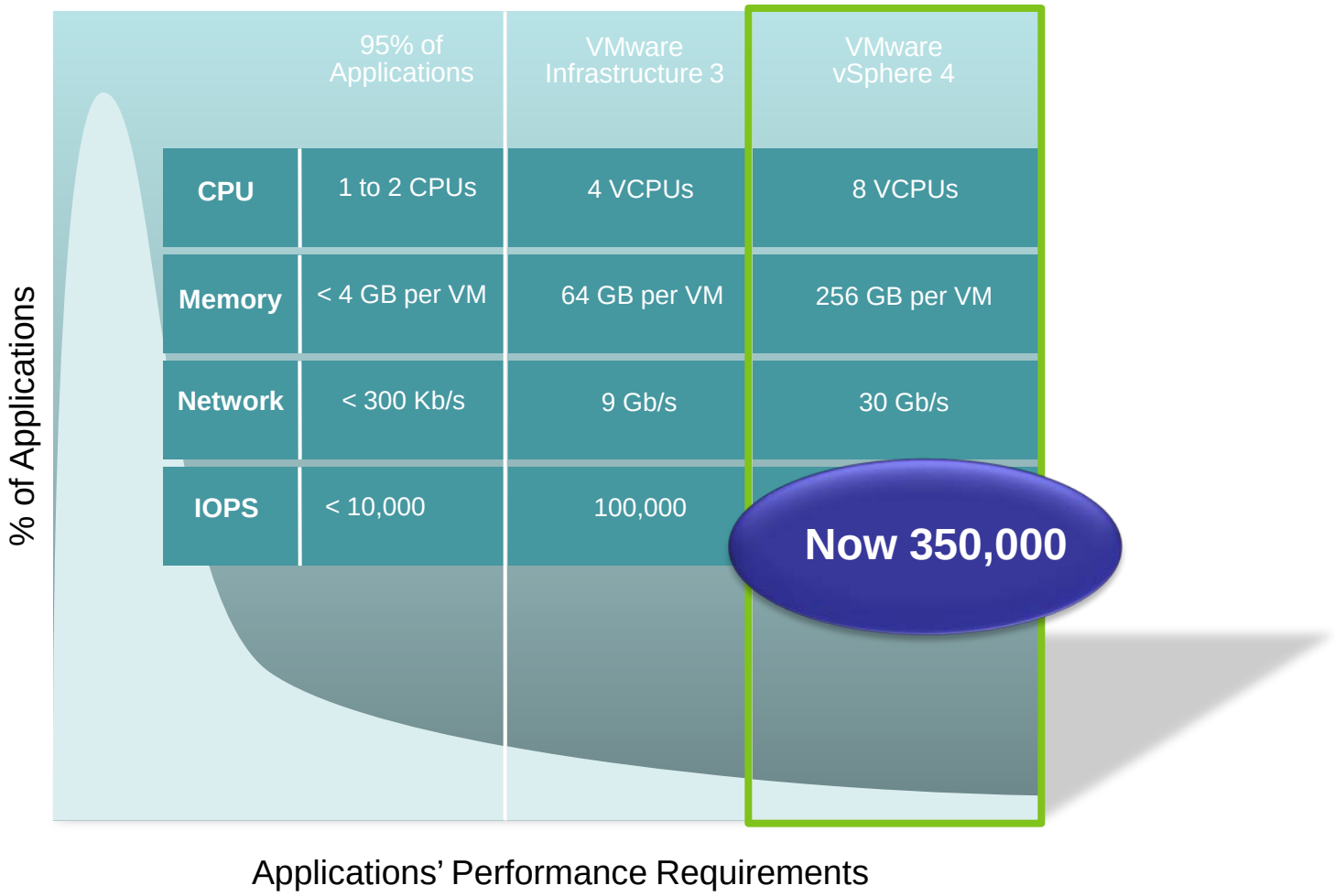
•Power Management

•Distributed switch

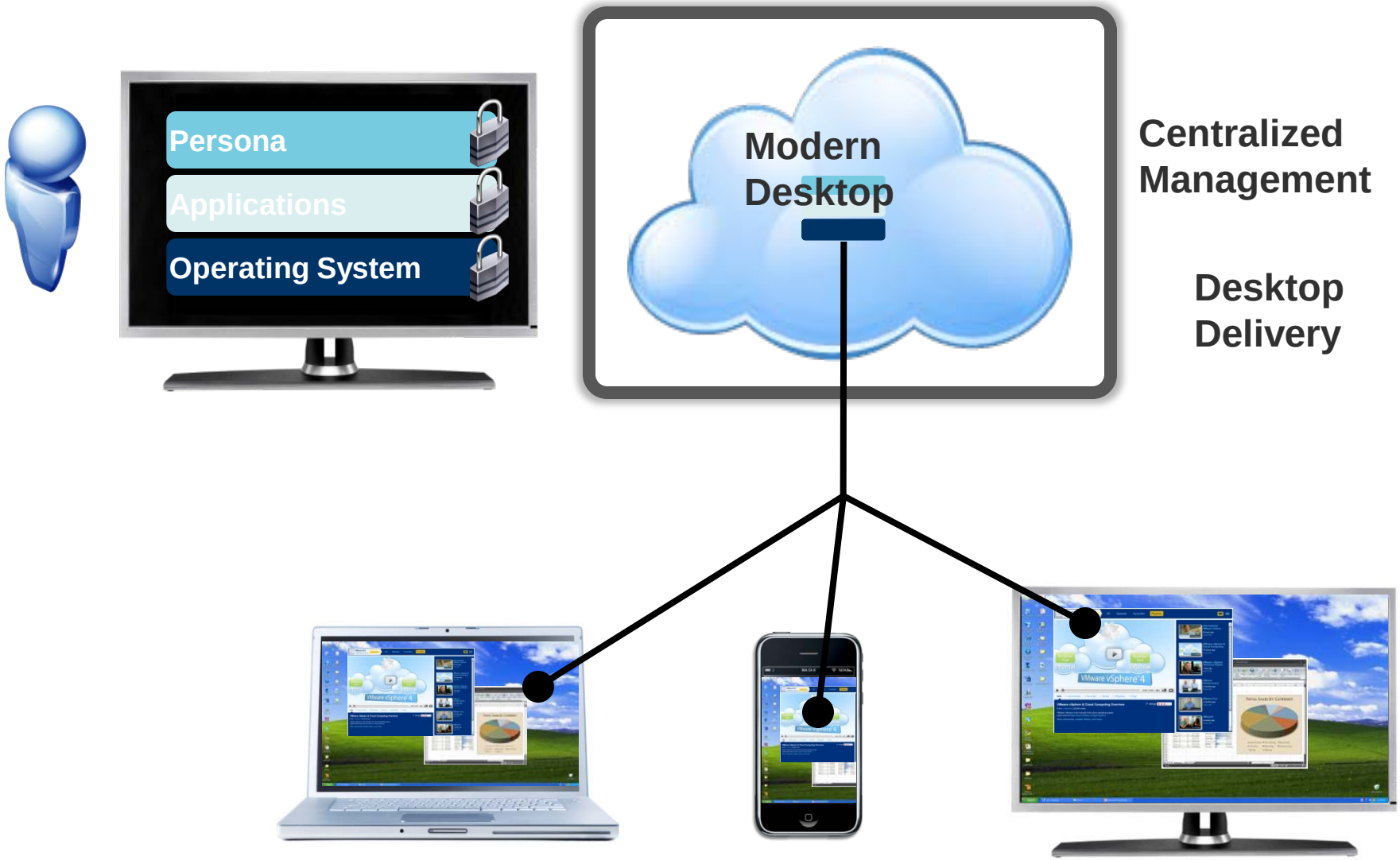
•Supports storage management

•Storage vmotion

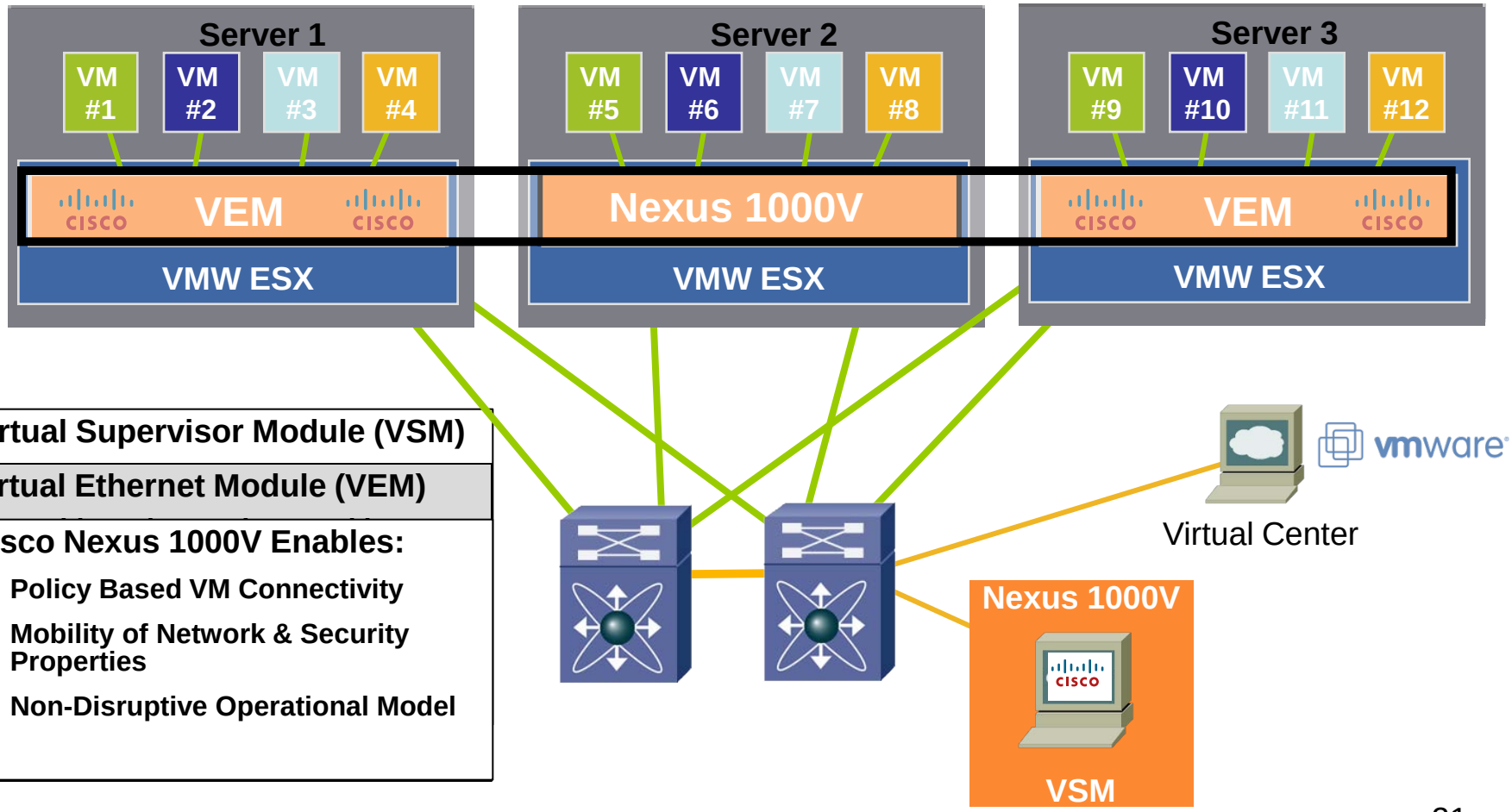
VMware vSphere : Ready to Virtualize All Applications



Modernizing the Desktop – Virtual Desktop Infrastructure



Virtual Distributed Network Switch
Cisco Nexus 1000V Architecture



Virtual Supervisor Module (VSM)

Virtual Ethernet Module (VEM)

Cisco Nexus 1000V Enables:

- **Policy Based VM Connectivity**
- **Mobility of Network & Security Properties**
- **Non-Disruptive Operational Model**

The Disadvantages of Virtualization

- Virtualization may not work well for:
  - Resource-intensive applications
    - VMs may have RAM/CPU/SMP limitations
  - Performance testing
  - Hardware compatibility testing
  - Specific hardware requirements
    - Custom hardware devices
- Some hardware architectures or features are impossible to *virtualize*
  - Certain registers or state not exposed
  - Unusual devices and device control
  - Clocks, time, and real-time behavior

System Virtualization - Present State

- Data center and desktop computing successfully use virtualization to
  - Better utilize computing capacity
  - Balance computing load
  - Manage complexity and parallelism
  - Improve security by isolation

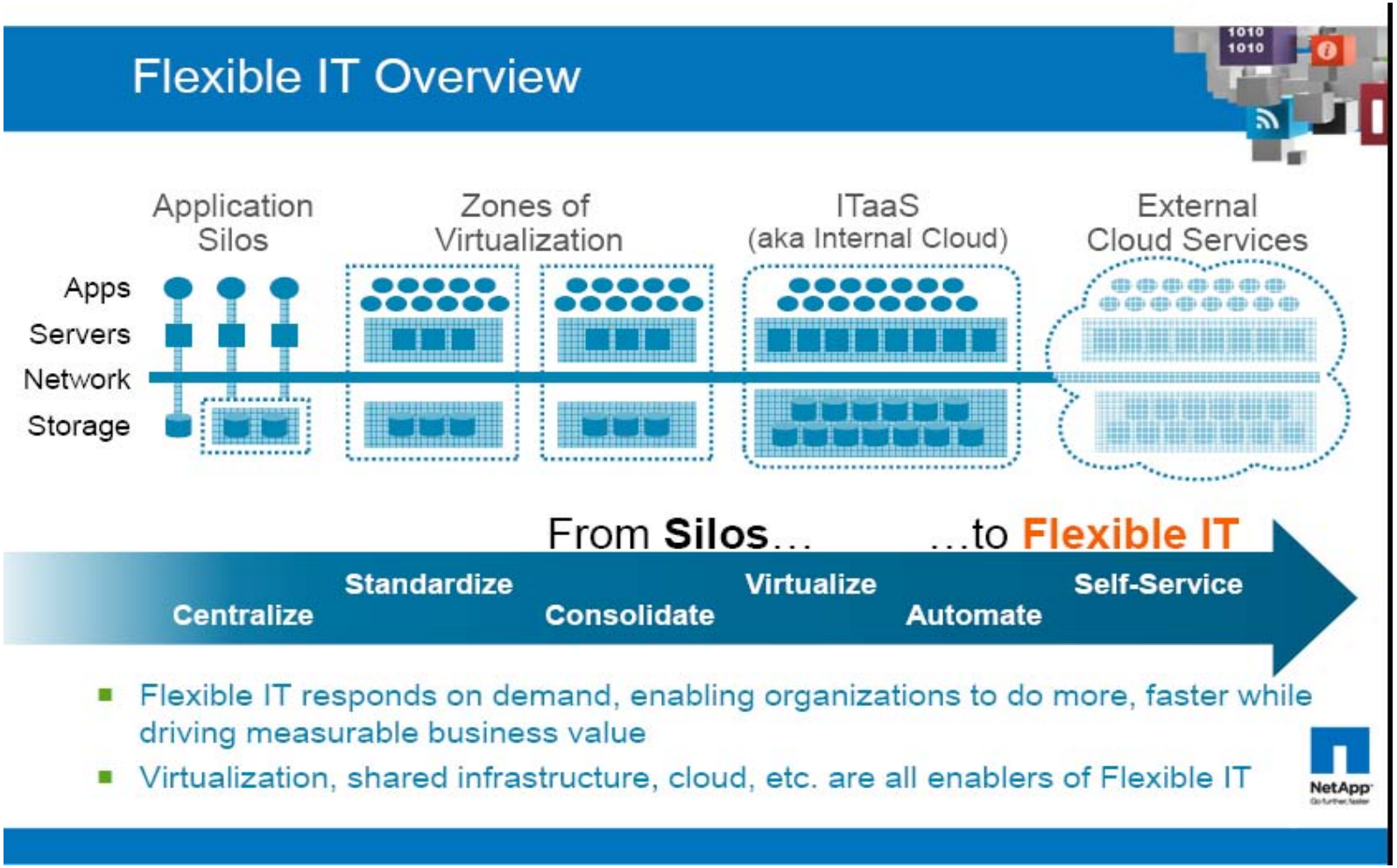
- Mobile and embedded computing currently lag behind since
  - Most hypervisors only support the x86 platform
  - Most hypervisors require large memories
  - Most hypervisors have poor real-time support
  - Most hypervisors are inefficient with microkernel OSs
  - Full-virtualization is not available. Operating system source code needs to be available and must be modified
  - Suitable open source-code hypervisors are not available

Cloud Computing Takes Virtualization to the Next Step

- **You don't have to own the hardware & the staff**
- You "rent" VMs & services as needed from a ITaaS provider (IT as a Service)
- There are multiple public cloud providers
  - e.g. Amazon EC2 and many others

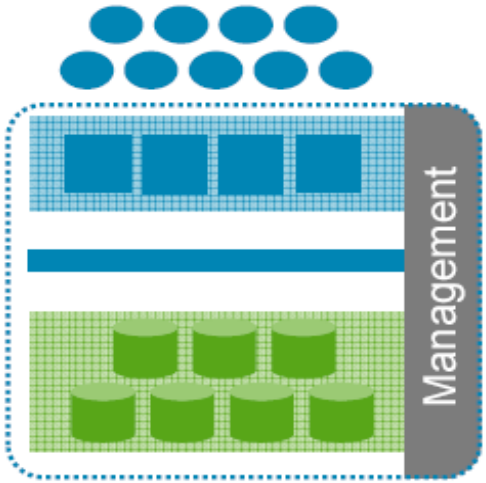
  (Verizon, iland, Rackspace, Savvis , HP, IBM)
- The Cloud will provide IT similar to public utilities providing electricity, gas, and water

Private, Hybrid and Public Clouds



Pre-sized, Validated Data Center Cloud Ready Infrastructure

3 Industry Leaders—1 Architecture

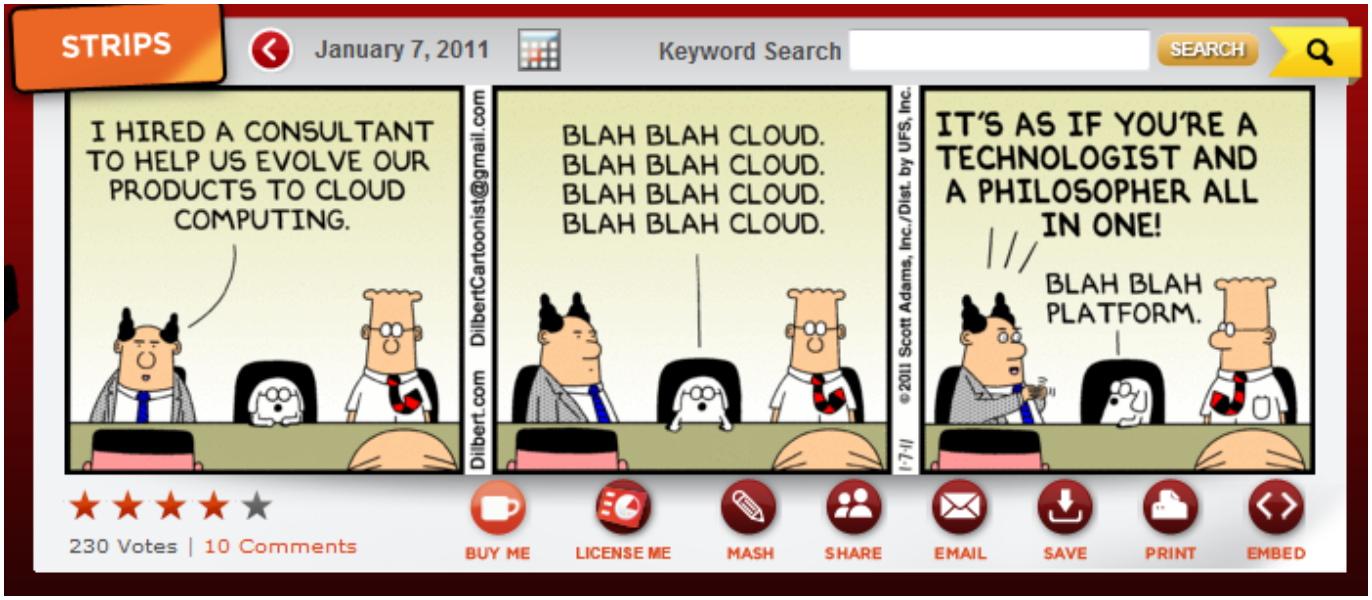


1,000–2,000 Users

- Unified data center architecture
- Best-of-breed technology
  - VMware® vSphere™, vCenter™
  - Cisco® UCS® and Cisco Nexus Family of Switches
  - NetApp FAS storage
- Modular and granular scalability
- Cooperative support
- Simplify your journey from virtualization to cloud infrastructure

Introducing FlexPod For VMware

You Know The Cloud Is Real When It Makes It To Dilbert




Questions?

THANK YOU!