

Operating Network Centric Systems on a “Cloud”

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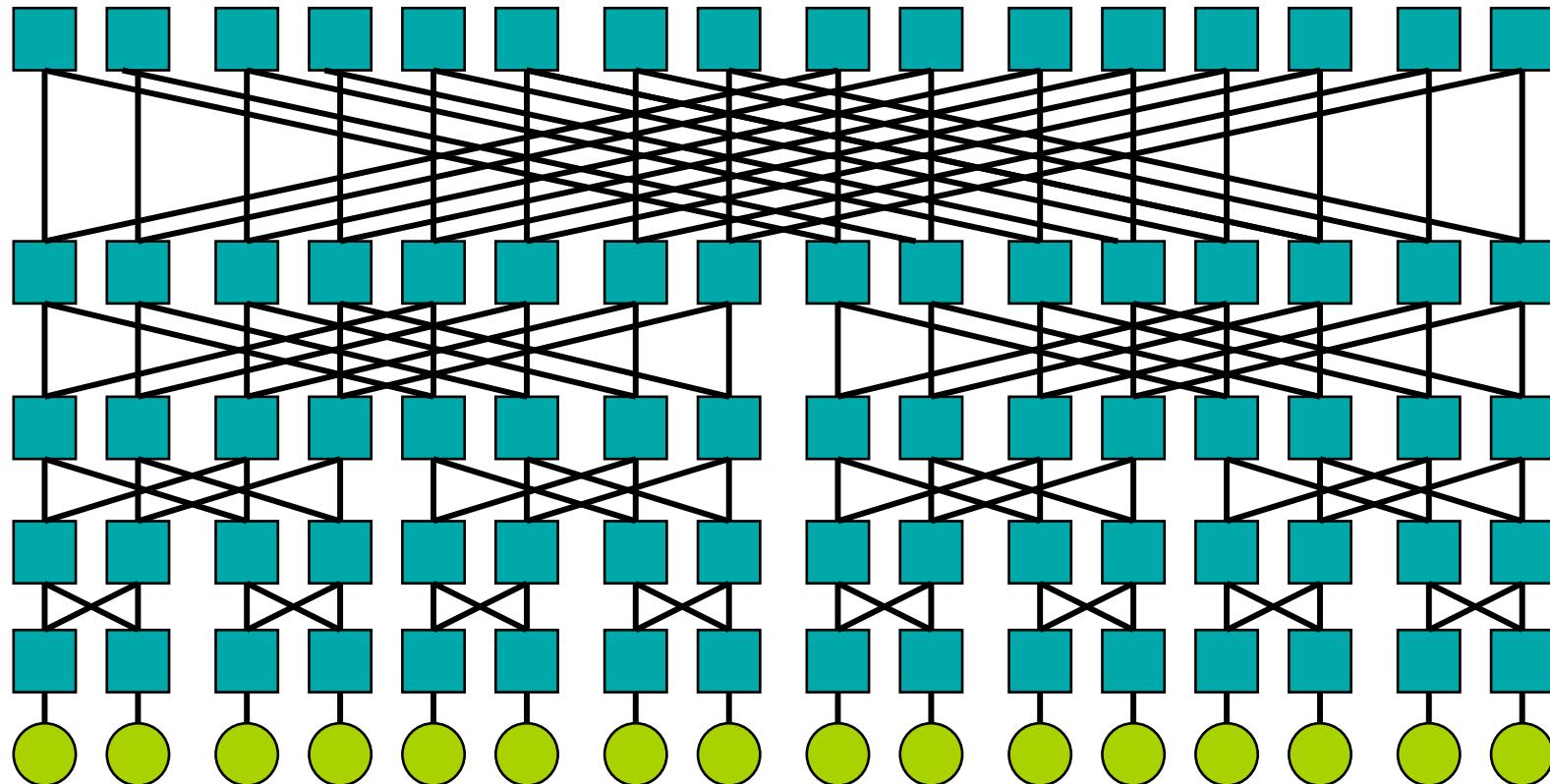
Part I

Cloud Computing

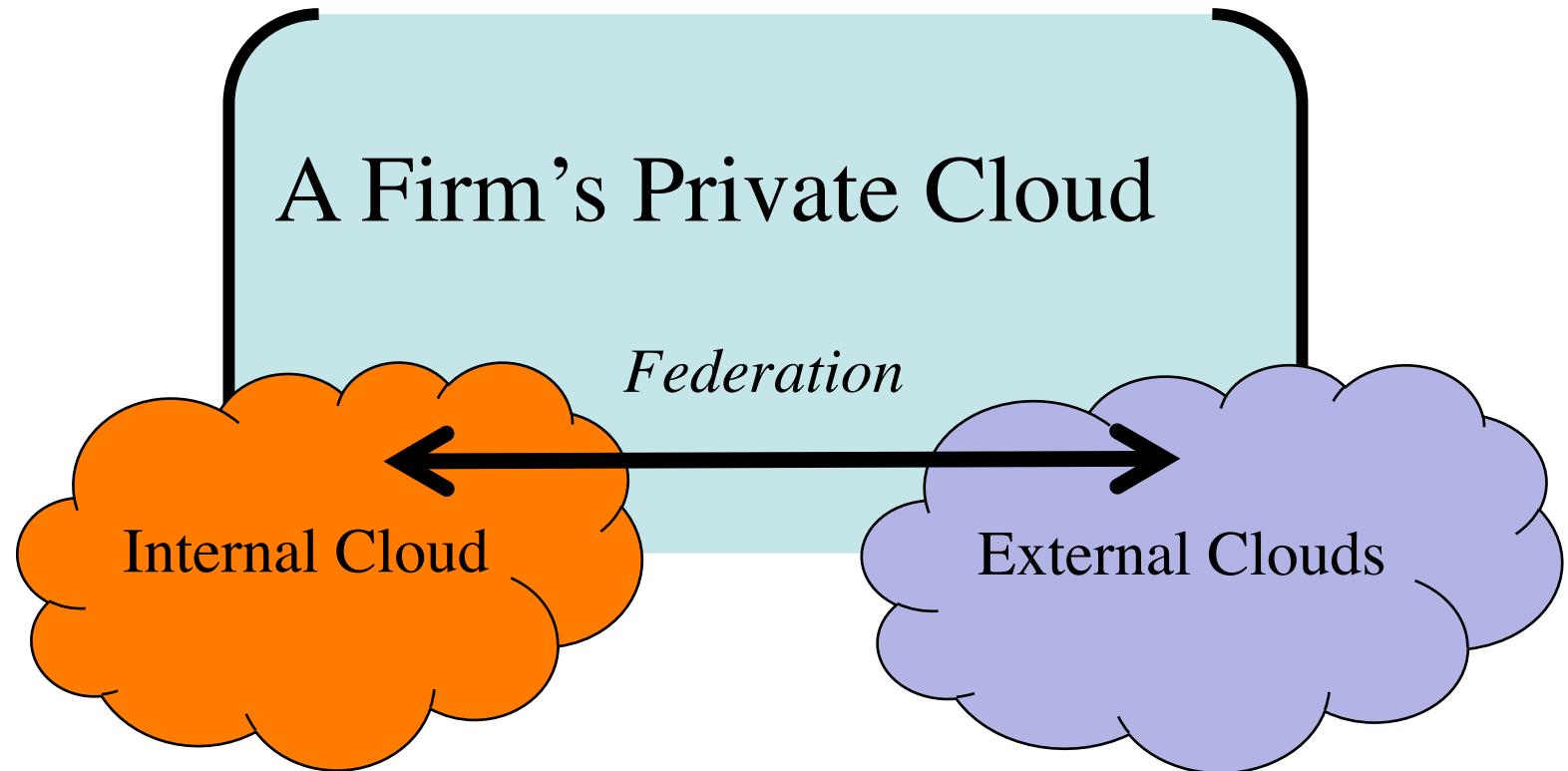
Multiple Data Centers Sharing a Workload – The Google “Cloud”



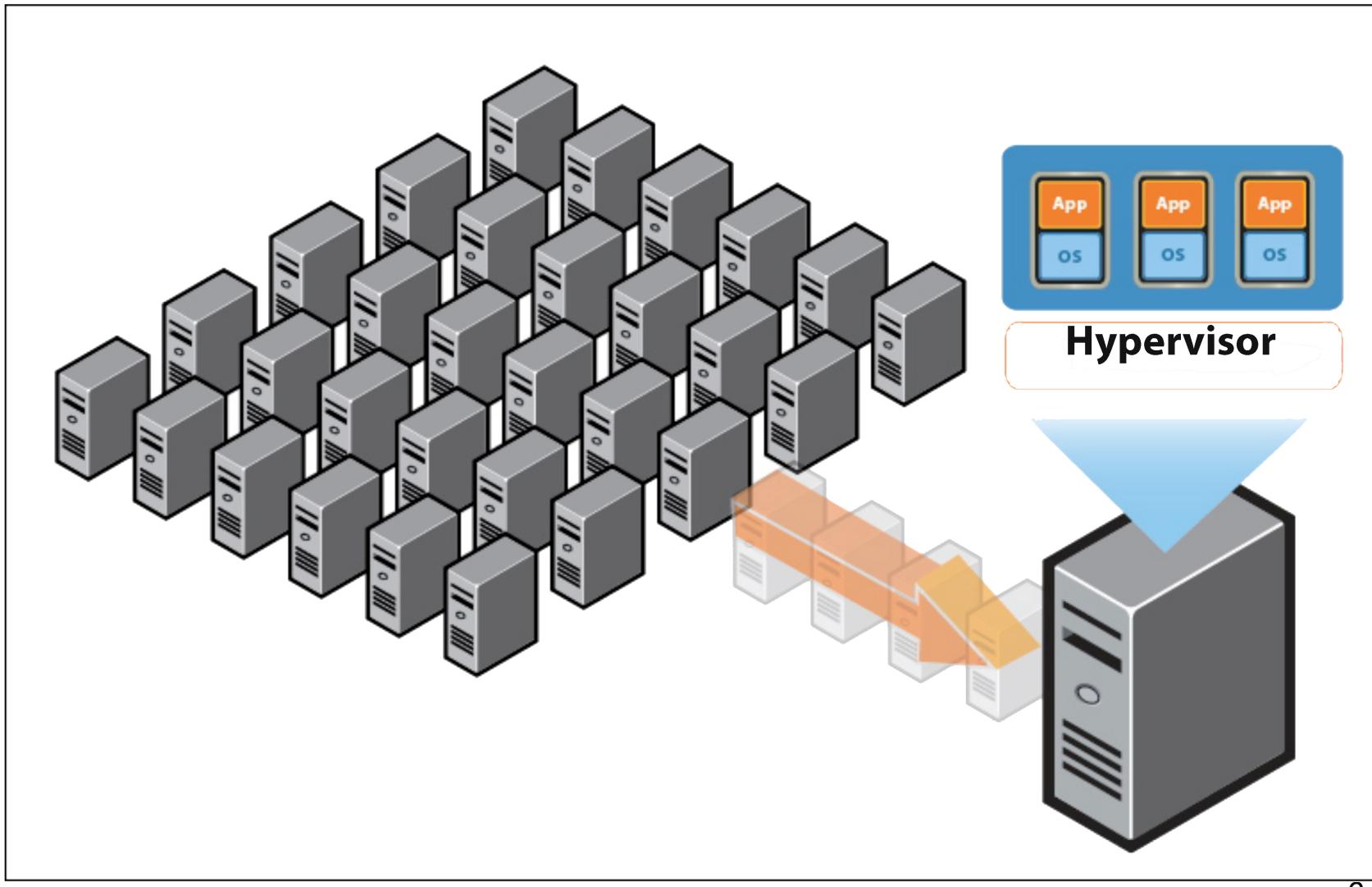
Cloud Goals: Managing a Massive Parallel Network



Directions for Enterprise Clouds

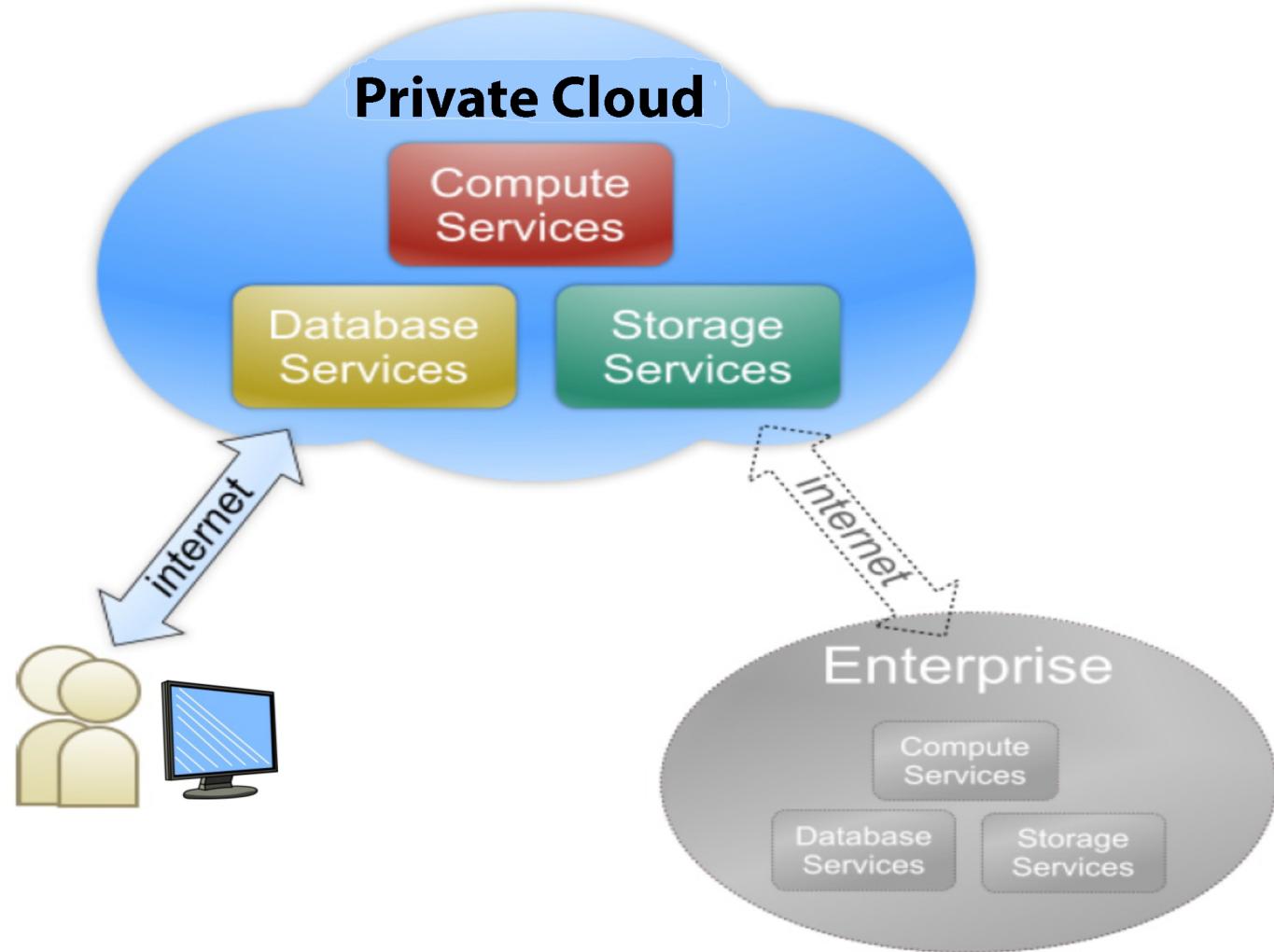


Virtualization for Consolidation Into a Controlled Environment

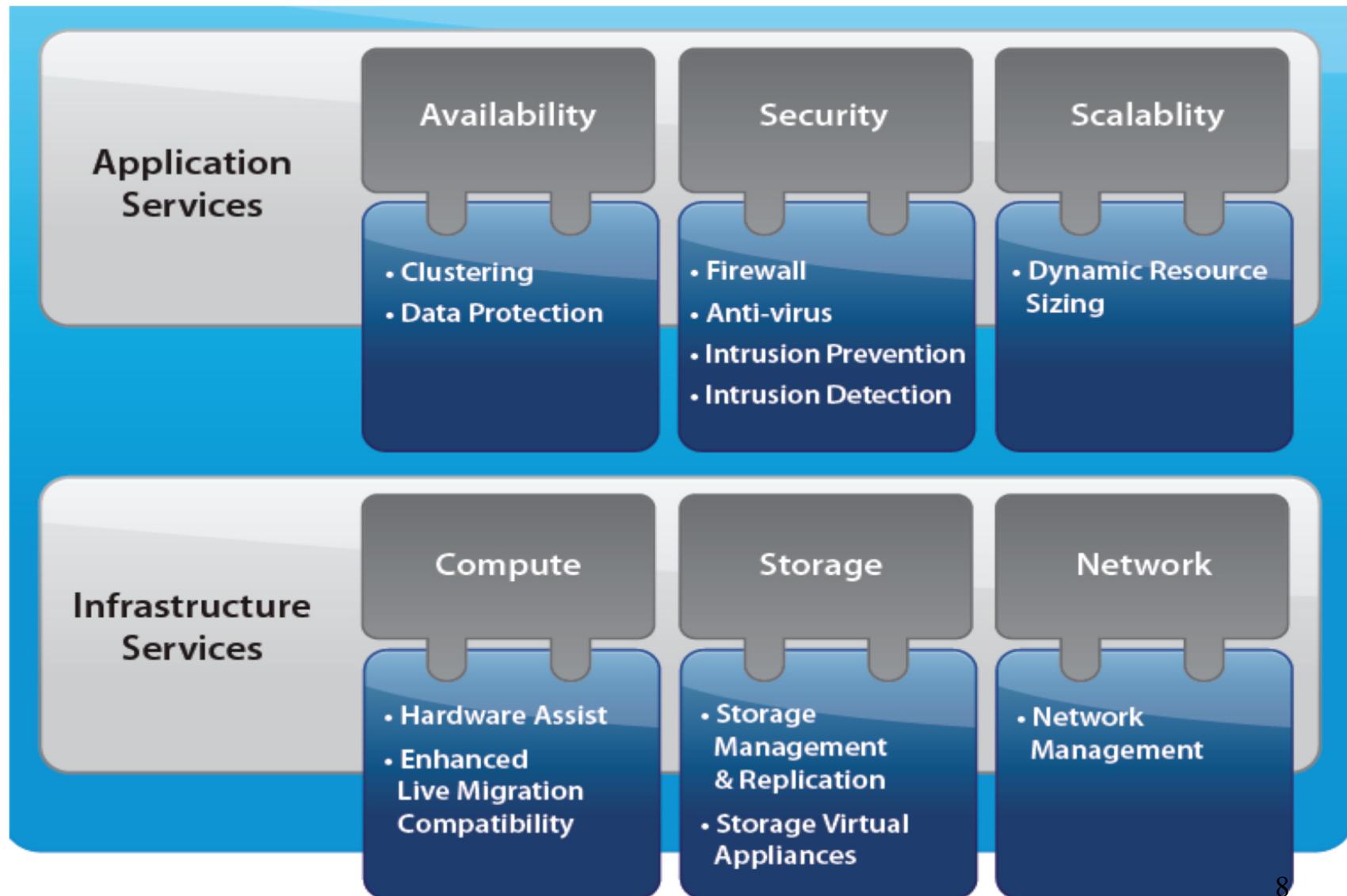


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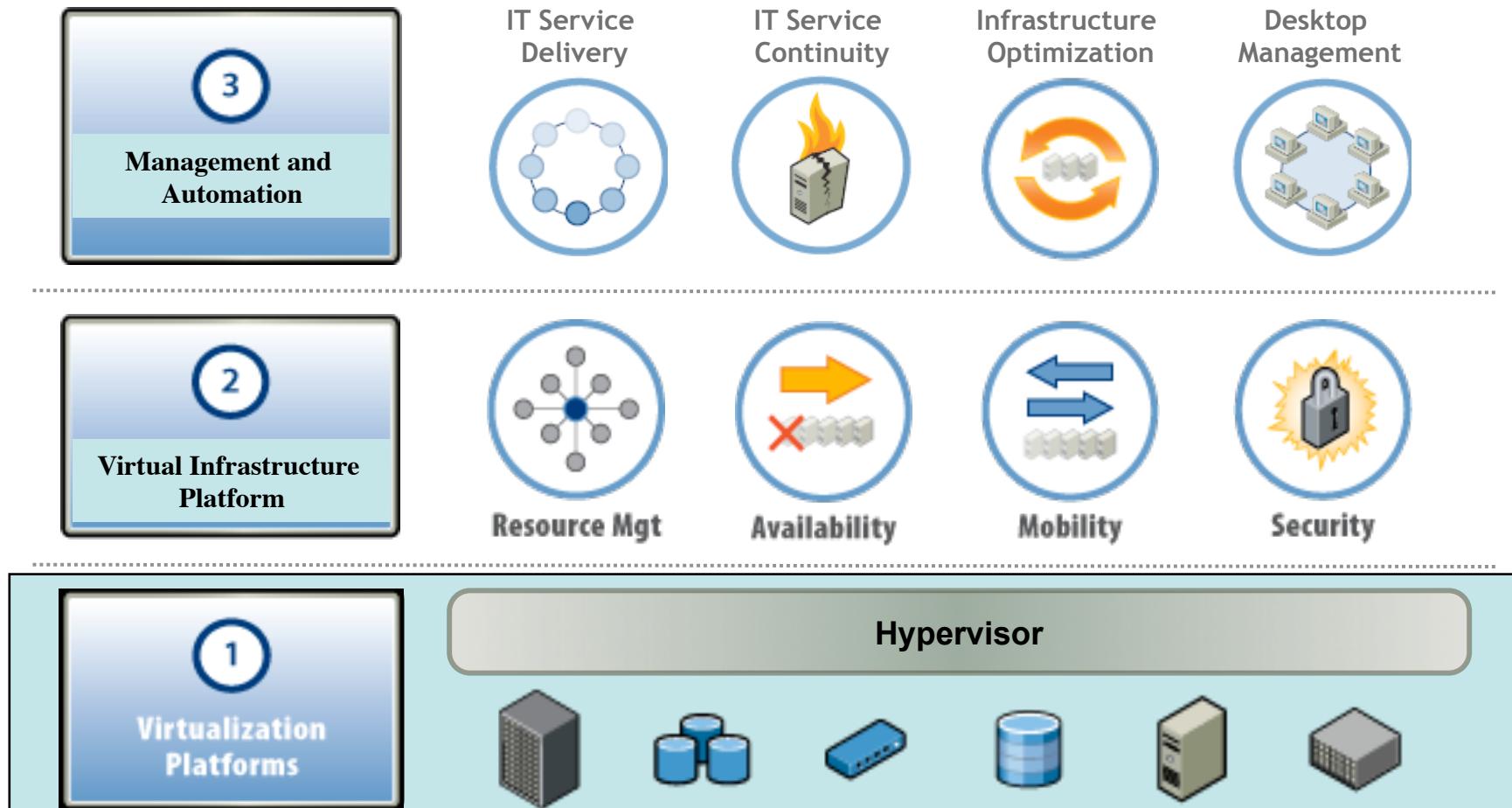
Browser Access to a Private Cloud



Cloud Operating System Services



Evolution of NOC Controls for a Virtual Datacenter



Cloud Delivery Models

- Software as a Service (SaaS)
- Platform as a Service (PaaS)
- Infrastructure as a Service (IaaS)

Software Available on EC2

Category: Amazon Elastic Compute Cloud

Documents in Category

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|--|---|
|  C# Library for Amazon EC2 |  |
| C# Library for Amazon EC2 | |
| Last Modified: Oct 23, 2008 5:14 AM | |
|  typica - A java client library for a variety of Amazon Web Services |  |
| A Java client library for Amazon SQS, Amazon EC2, Amazon SimpleDB and Amazon DevPay | |
| Last Modified: Sep 21, 2008 2:48 PM | |
|  Simple Command-Line Access to Amazon EC2 and Amazon S3 |  |
| AWS developer Timothy Kay put together this command-line tool that provides easy command-line access to Amazon EC2 and Amazon S3. The tool is designed to be simple to install and simple to use. | |
| Last Modified: Sep 21, 2008 2:48 PM | |
|  RightScale Ruby library to access Amazon EC2, S3, SQS, and SDB |  |
| RightScale's AWS gems provide Ruby interfaces to four key Amazon Web Services: EC2, S3, SQS and SDB. An optional robust HTTP layer retries and clears transient errors. | |
| Last Modified: Sep 21, 2008 2:02 PM | |
|  Code for Mobile Monitoring and Administration of Amazon Web Services |  |
| The Apple iPhone has been one of the most anticipated mobile computing platforms in years. It provides a web browser experience previously found only on traditional computing platforms. This project demonstrates the development of an Amazon EC2/Amazon S3 monitoring and administration application, optimized for the iPhone, using familiar web development tools—PHP and JavaScript. | |
| Last Modified: Sep 21, 2008 1:39 PM | |

Cloud Deployment Models

- Public Cloud
- Private Cloud
- Community Cloud
- Hybrid Cloud

Usage Pricing

High CPU Instances	Linux/UNIX	Windows
Medium	\$0.20 per hour	\$0.30 per hour
Extra Large	\$0.80 per hour	\$1.20 per hour
Data Transfer In		
All Data Transfer		\$0.10 per GB
Data Transfer Out		
First 10 TB per Month		\$0.17 per GB
Next 40 TB per Month		\$0.13 per GB
Next 100TB per Month		\$0.11 per GB
Over 150 TB per Month		\$0.10 per GB

Costs Known in Advance

Amazon S3 (US)	Storage:	100	GB-months
	Data Transfer-in:	20	GB
	Data Transfer-out:	500	GB
	PUT/LIST Requests:	10000	Requests
	Other Requests:	100000	Requests

Estimate of Your Monthly Bill

Amazon S3 (US)	Storage	\$ 15.00	
	Data Transfer	\$ 87.00	
	Requests	\$ 0.20	
	Amazon S3 (US) Bill:		\$ 102.20

Cloud Characteristics

- Elasticity
- Metered Service
- Self Service
- Ubiquitous Access
- Resource Pooling

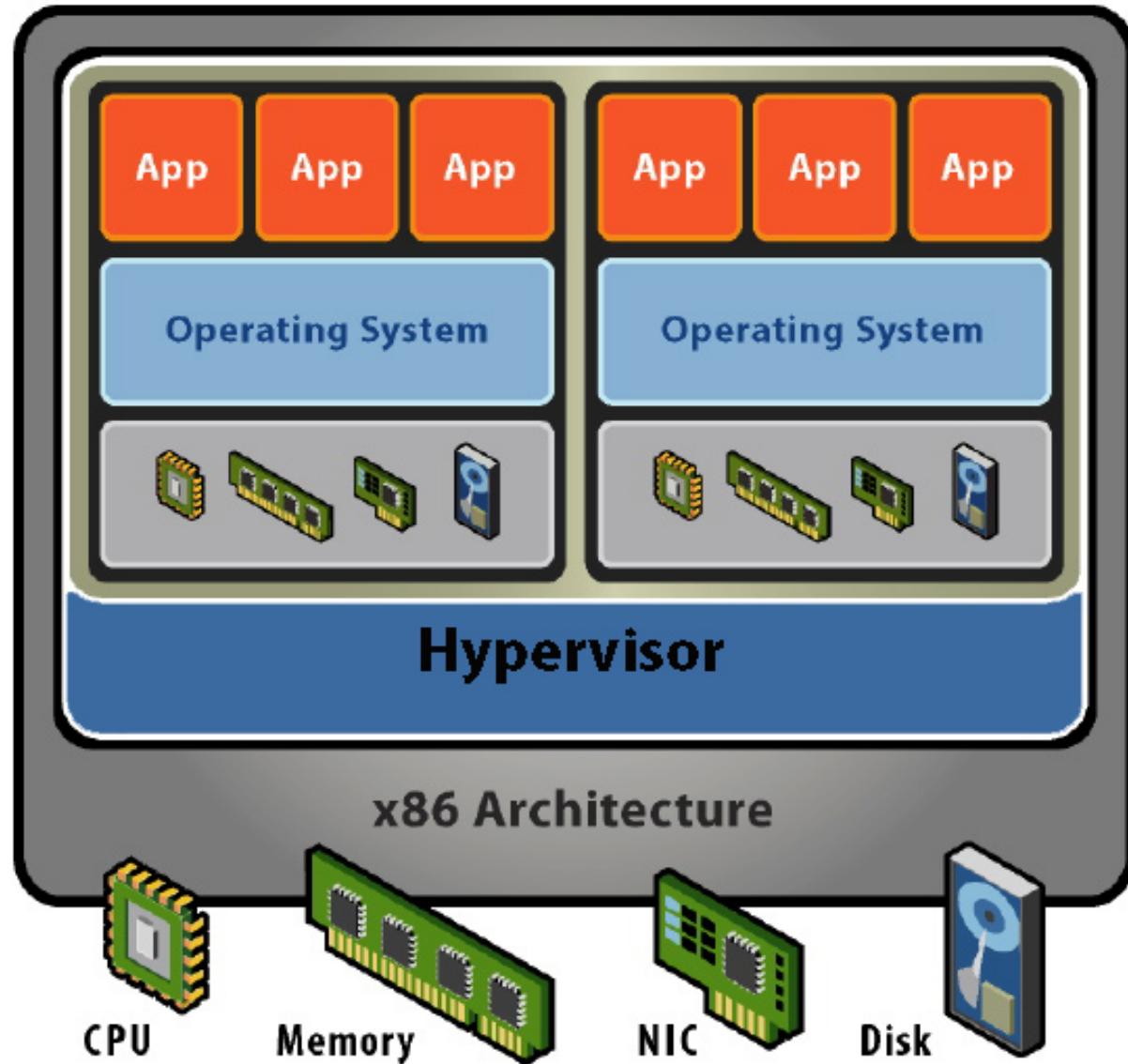
Cloud Parameters

- Interoperability
- Integration
- Portability
- Energy Management
- Service Level Agreements
- Brokering
- Multi-Tenancy
- Cloud Bursting

Part II

Applications Virtualization

The Relationship of the Hypervisor to the Operating System



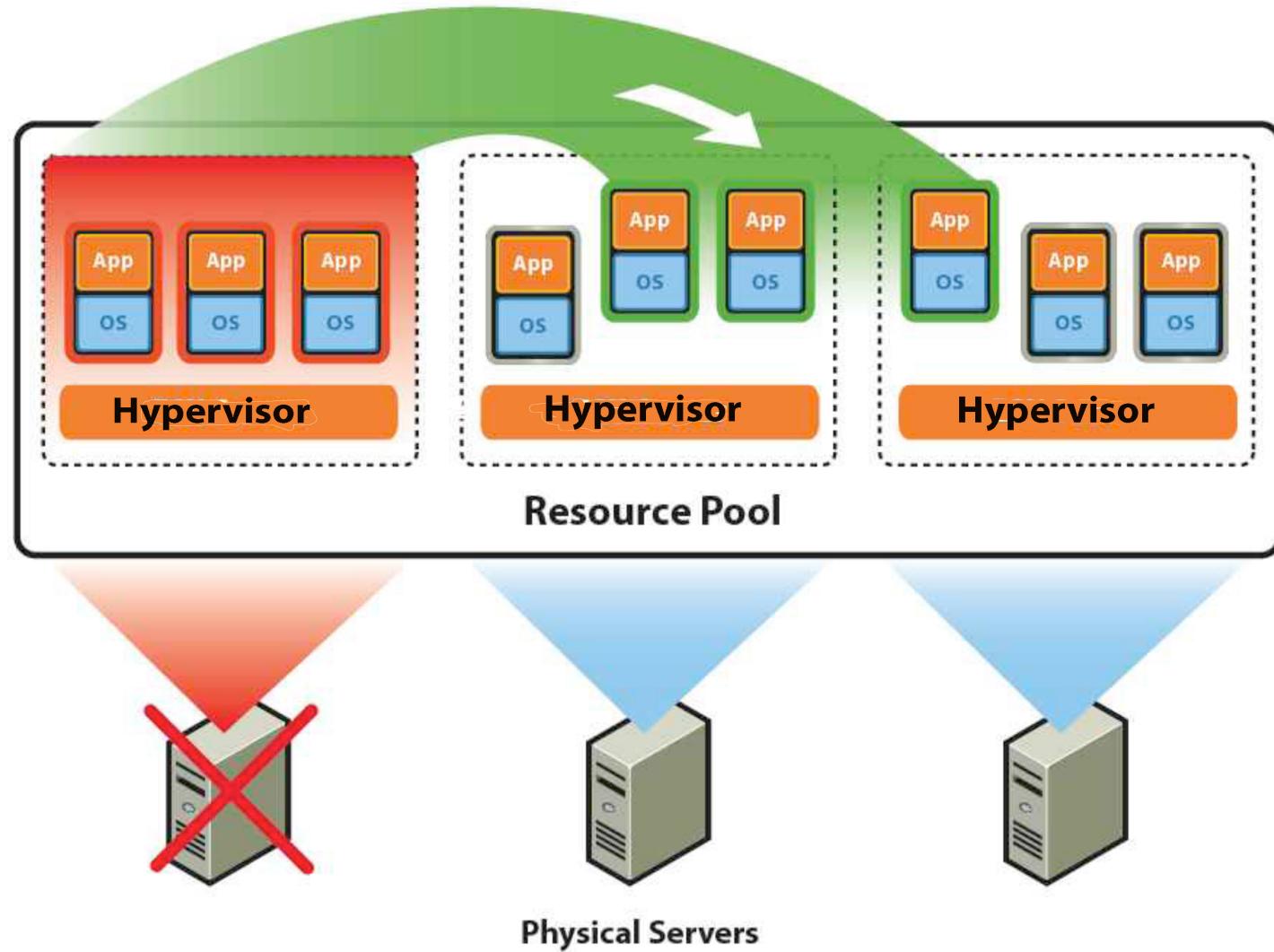
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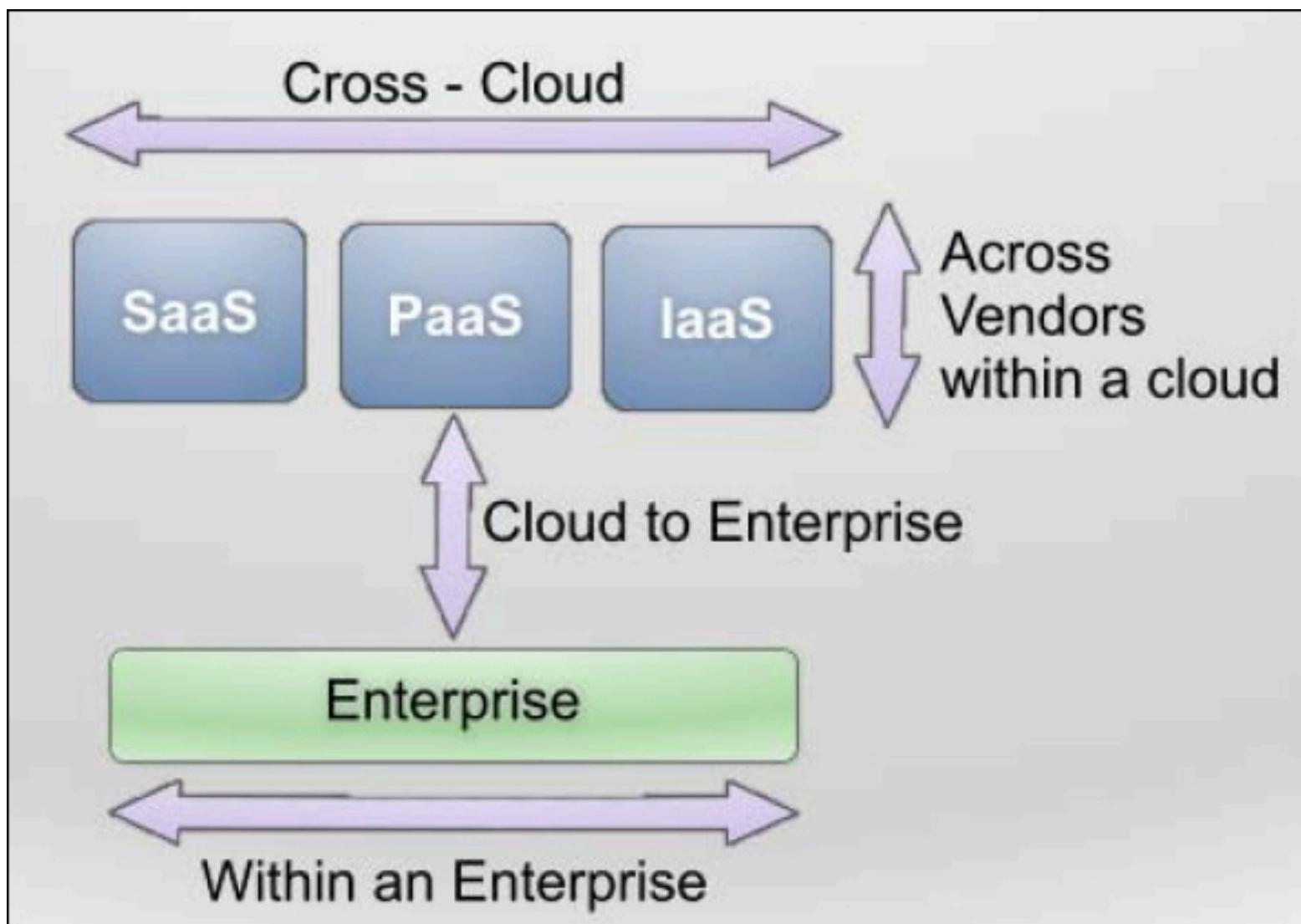
Example of 78% Energy Savings

Current (As Is)			
Power and Cooling Consumption before VMware	Number of Servers	Actual Operating Power (Watts)	Actual Cooling Power (Watts)
1 CPU	0	239	299
2 CPU	500	369	461
4 CPU	0	478	598
8 CPU	0	804	1,005
16 CPU	0	2,211	2,764
32 CPU	0	4,623	5,779
Total	500	184,500 Watts	230,500 Watts

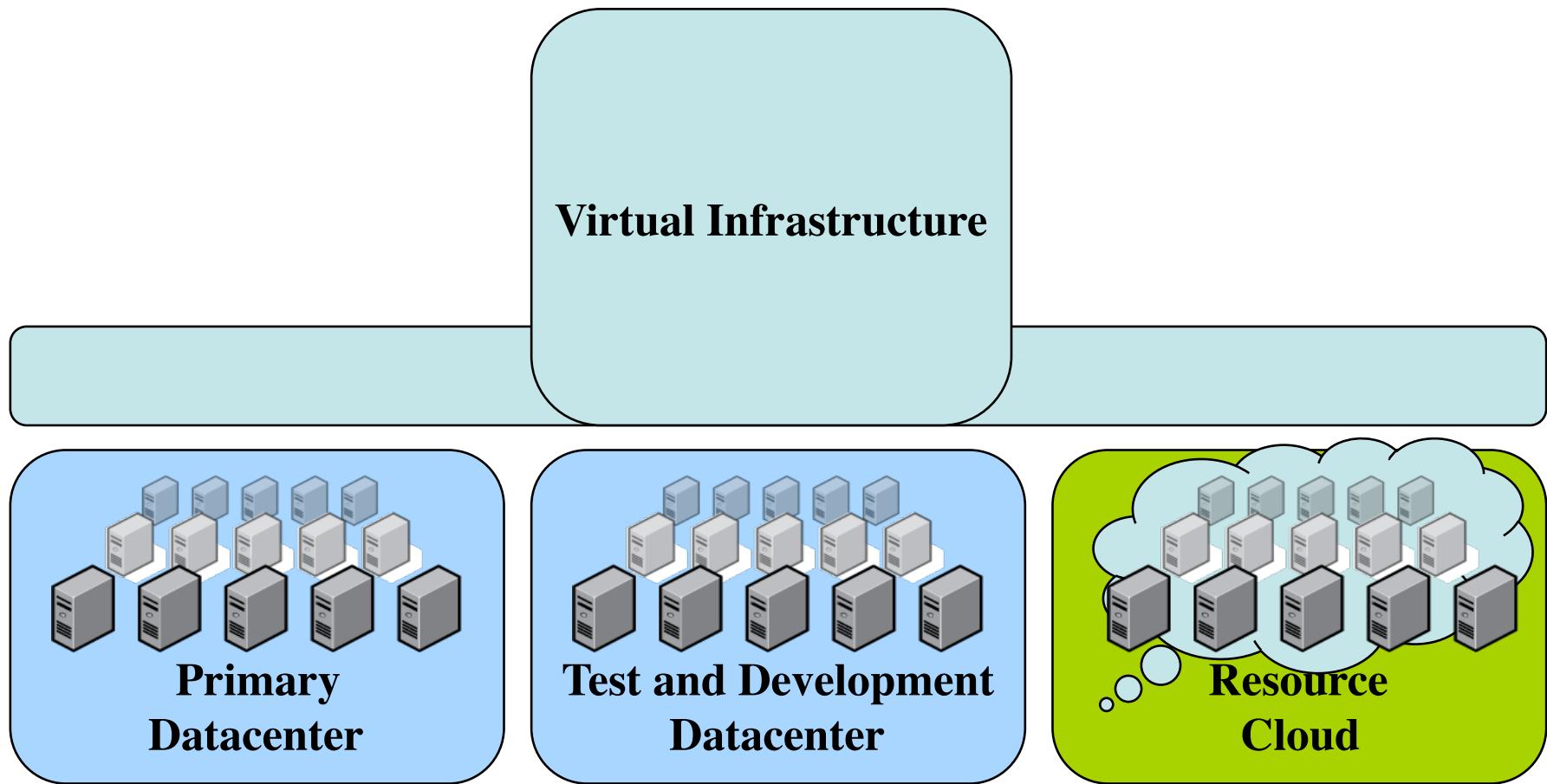
With VMware (Projected)			
Power and Cooling Consumption with VMware	Number of Servers	Actual Operating Power (Watts)	Actual Cooling Power (Watts)
1 CPU	0	409	511
2 CPU	63	633	791
4 CPU	0	1,093	1,366
8 CPU	0	1,840	2,300
16 CPU	0	7,084	8,855
32 CPU	0	14,812	18,515
Total	63	39,879 Watts	49,833 Watts

Virtual Computers Can Relocate Within the “Cloud”

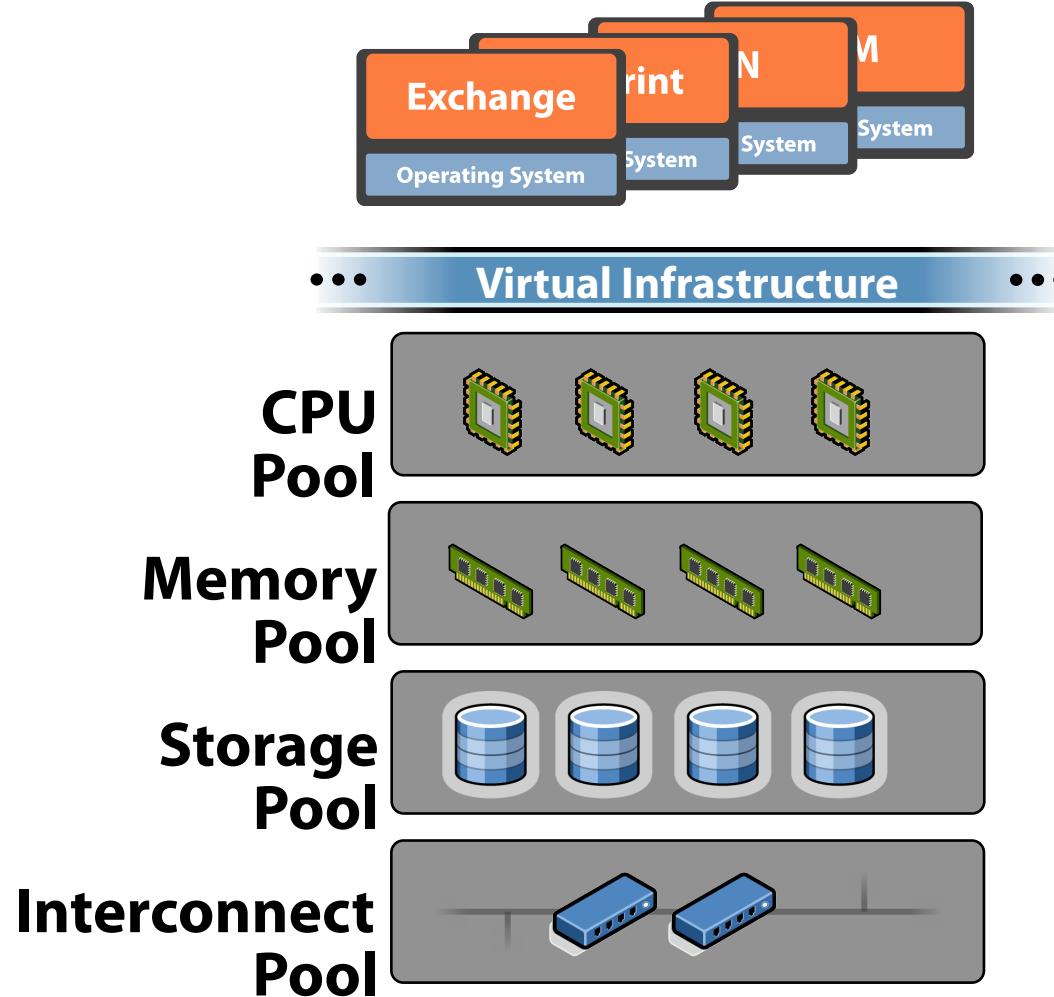




Virtual Infrastructure Manages Cloud Connections



Organization of a Virtual Datacenter



A Virtual Data Center Environment Delivers

- Infrastructure services to aggregate on-premise servers, storage and network.
- Cloud services for on-premise and third party infrastructures.
- Application services for availability, security and scalability independent of hardware and location.
- Management services that manage the virtual environment and the applications that run on it.

How the Cloud is Different

- Unlike a traditional Operating Systems the virtual datacenter OS - serves as the OS for the entire datacenter.
- Datacenters can operate the virtual data center using cheap commodity hardware because reliability is achieved through virtual redundancy.

Cloud Fault Tolerance

- Delivers zero downtime, zero data loss and +Six Sigma availability.
- Assures execution of applications independent of chosen microprocessors or Operating Systems.
- Manages fault tolerance without the costs and complexity of hardware duplication.

A Capital Intensive Network Operations Center



The NOC Becomes the Key to Net-Centricity

- Manages the migration from a device centric world to a customer centric world.
- Enables connecting from anywhere, by any means.
- Offers access privileges only to authorized persons.
- Allows purchasing of computer processing power independent of circuit technology.
- Makes it possible to associate computing services according to a person's roles or location.

Self Service Management

Self Service Portal

Service Catalogue

Billing/Chargeback

VMware
vCenter
Suite

SLA Driven
Management
Model

Availability



99.99%

Security



High

Performance



.2 Milliseconds

Provisioning

Configuration

Capacity

Operations

Performance

Availability

Infrastructure Management

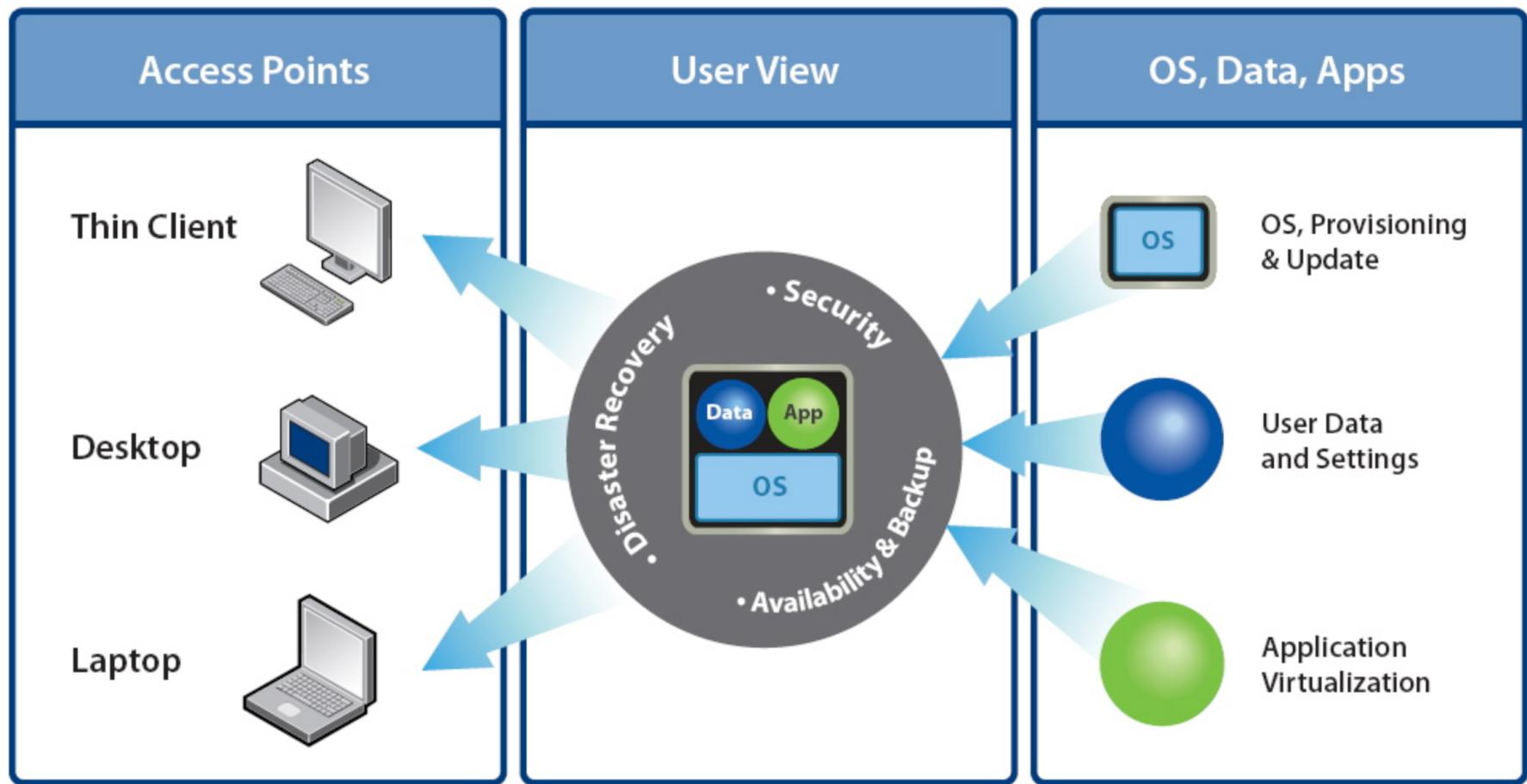
vSphere

Hardware

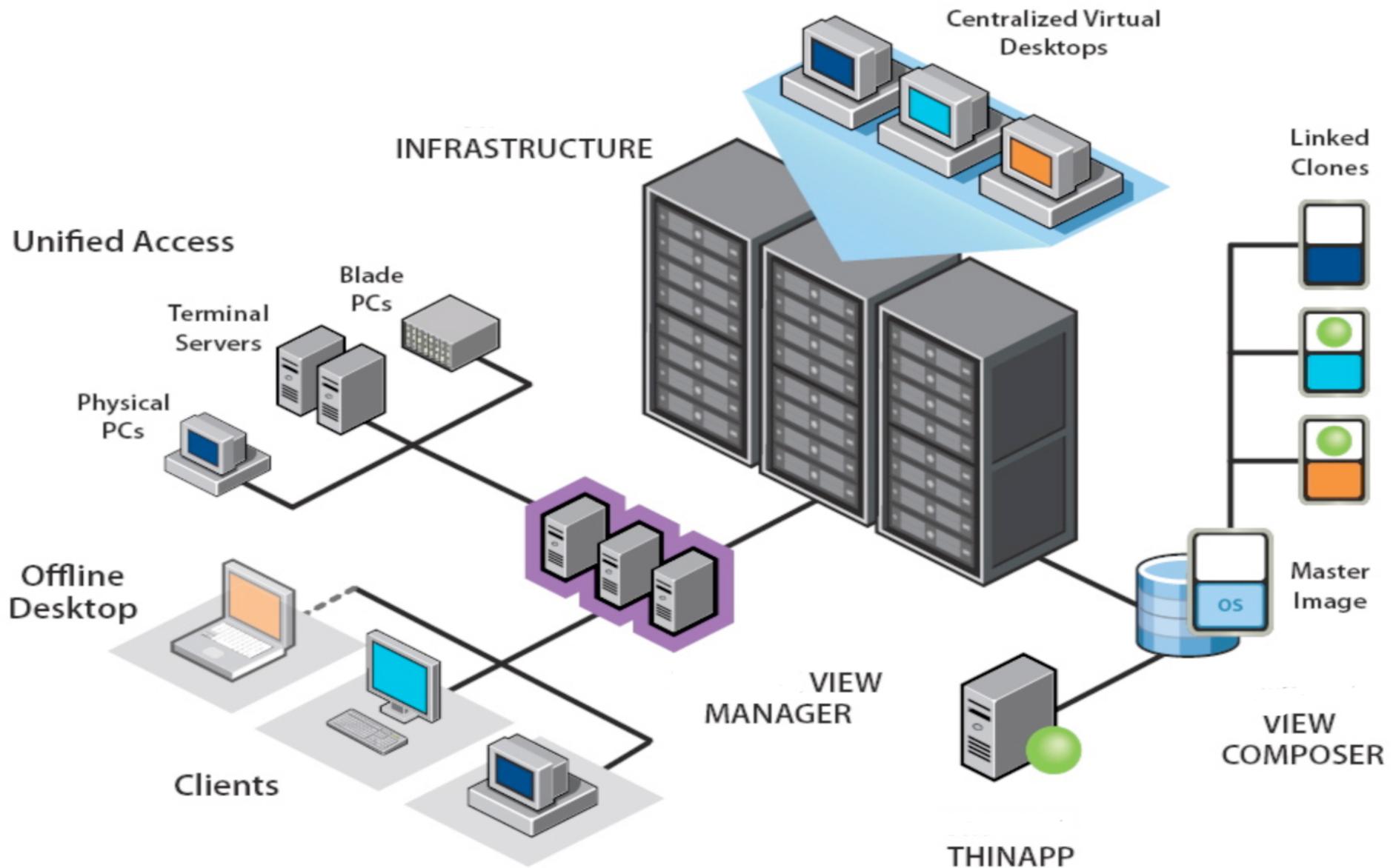
Part III

Virtual Desktops

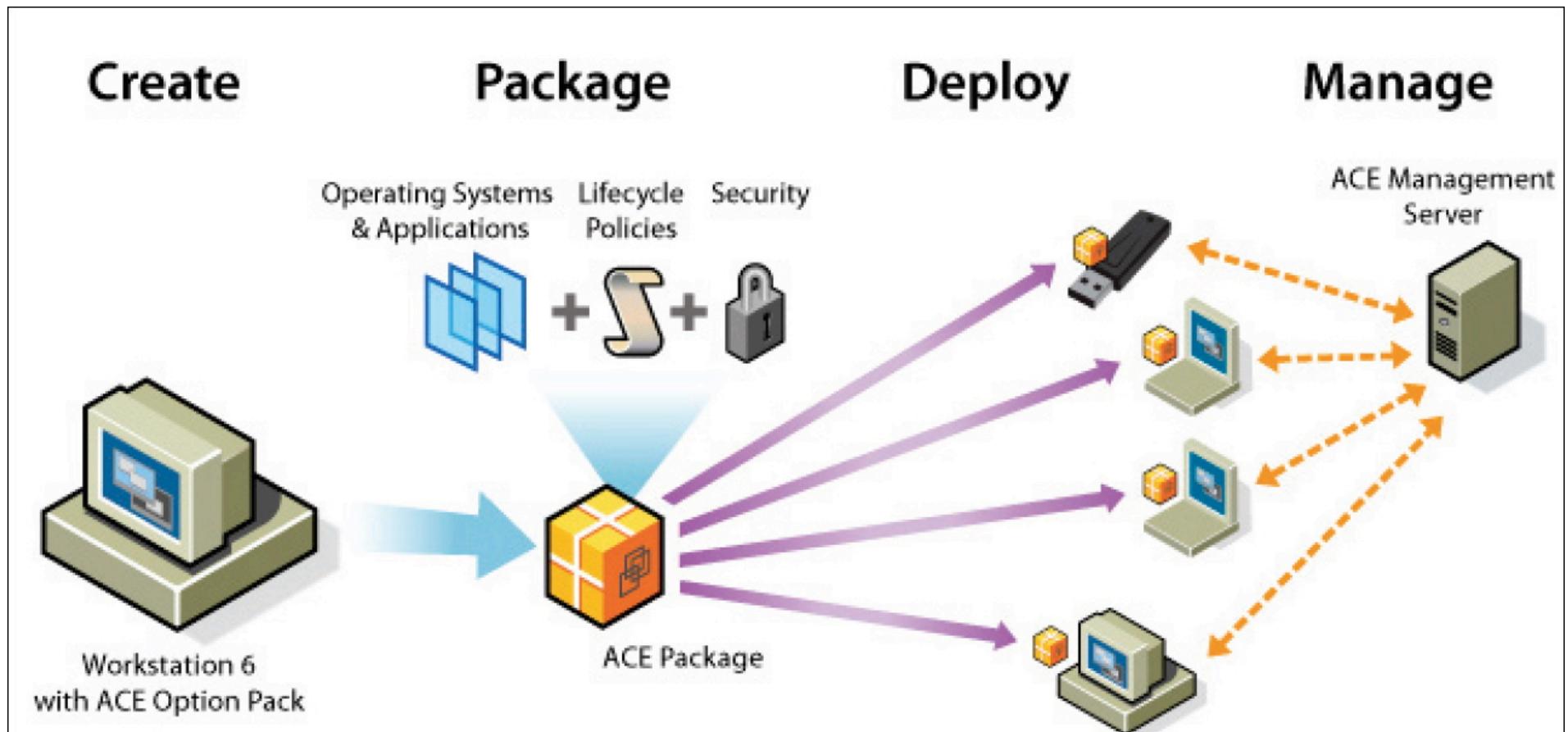
Encapsulation of Virtual Applications



Unified Desktop Access to a Cloud



Setting Up an Advanced Computing Environment



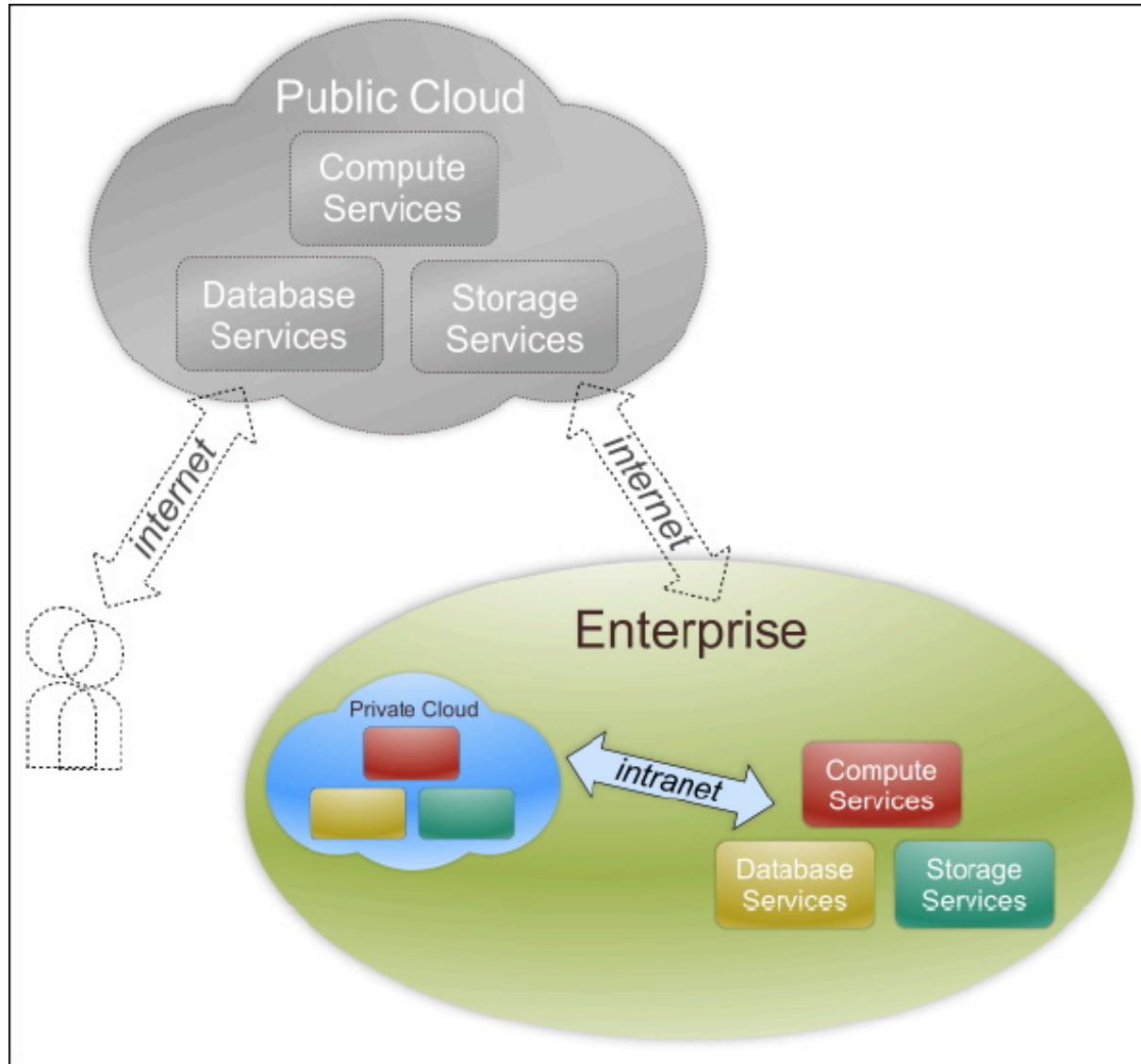
Features of Virtual Desktops

1. Centralized security and management policies
2. Secured access with authentication and encryption.
3. Device control
4. Expiration control
5. Rules-based network access
6. Endpoint lockdown
7. Snapshots
8. Instant recovery
9. Design once, deploy anywhere

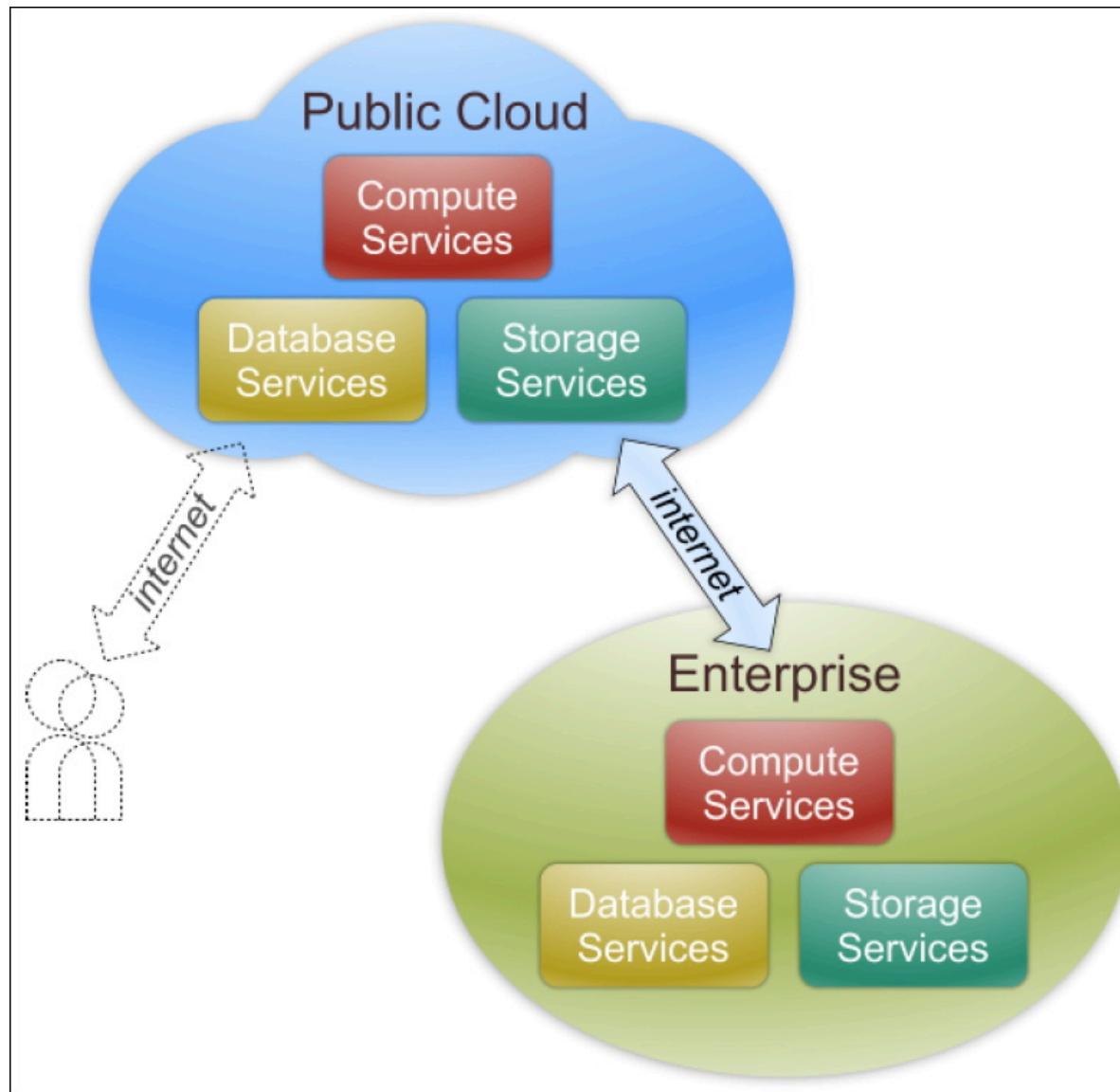
Part IV

Cloud Services Cases

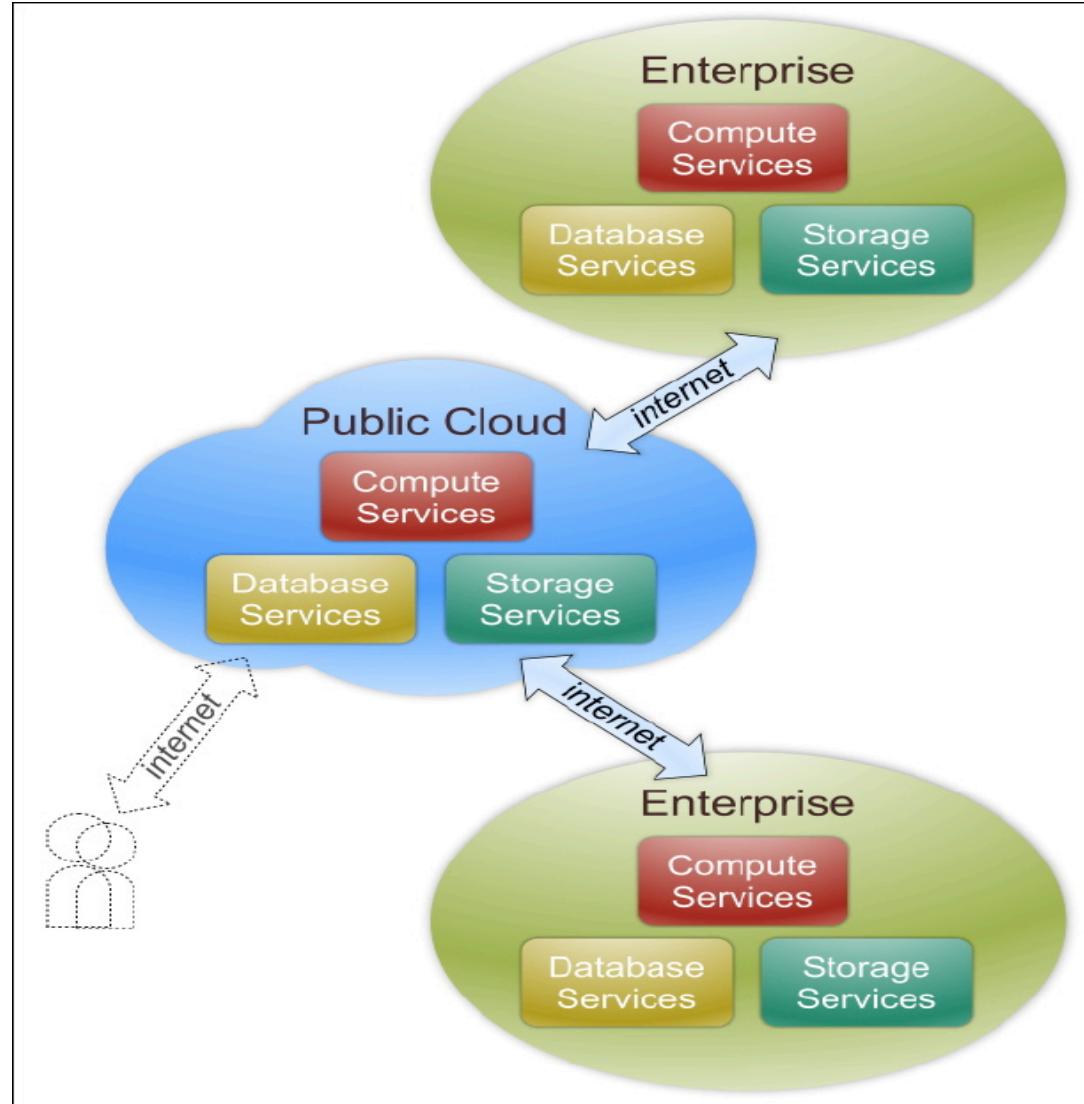
Private Cloud Managed Within an Enterprise



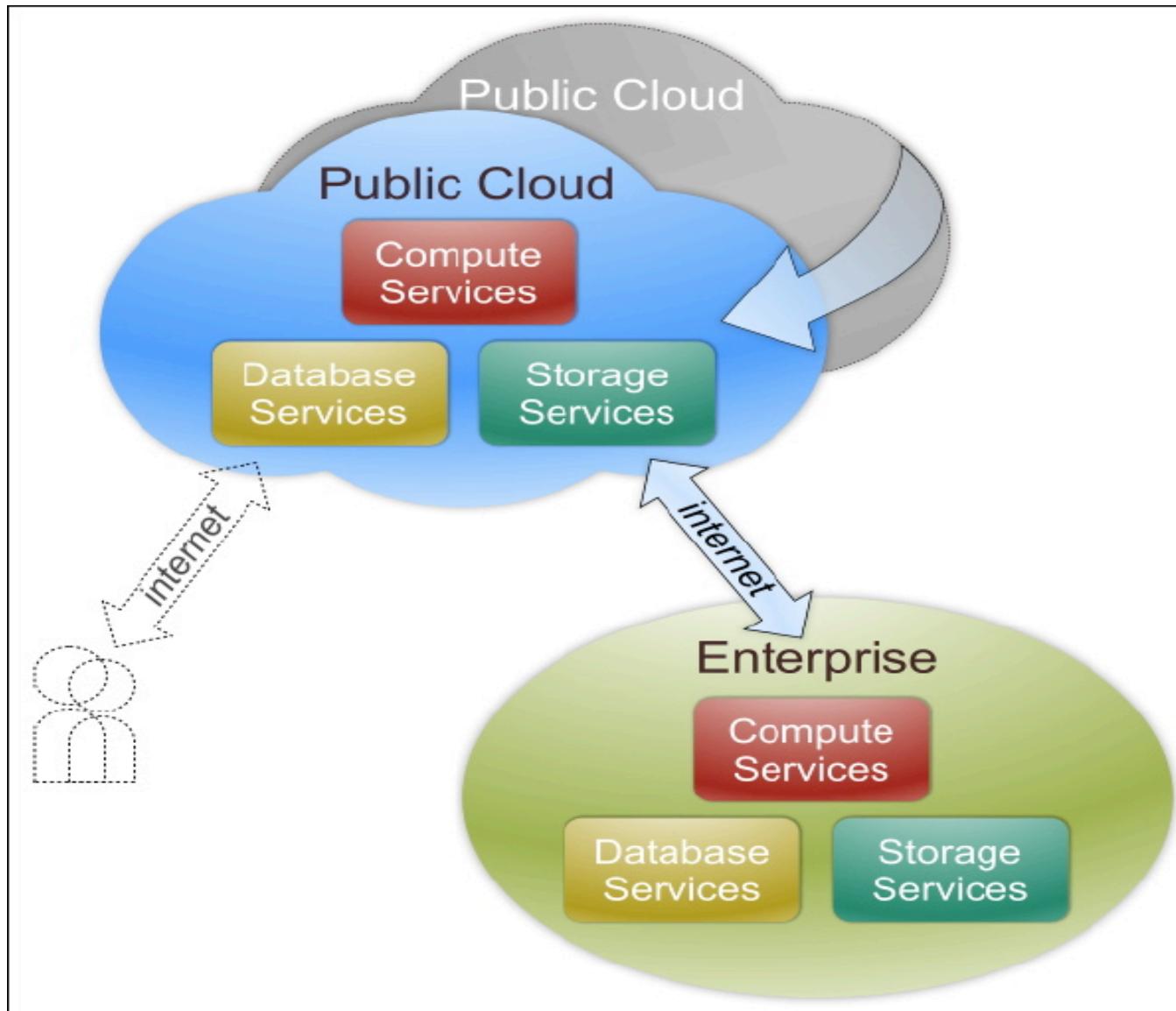
Enterprise Interoperability with Public Cloud



Enterprise to Enterprise Interoperability

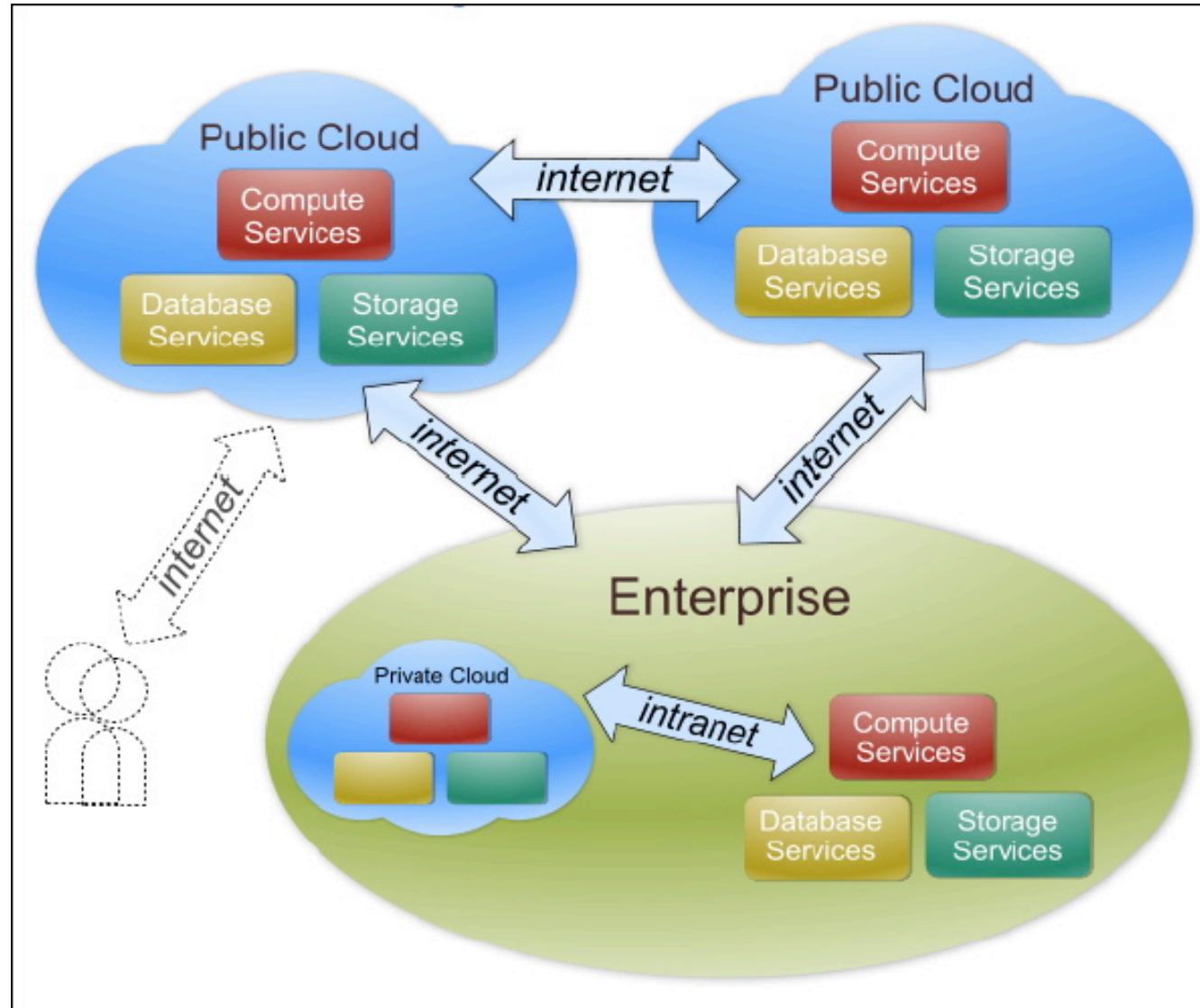


Enterprises Changing Public Cloud Vendors



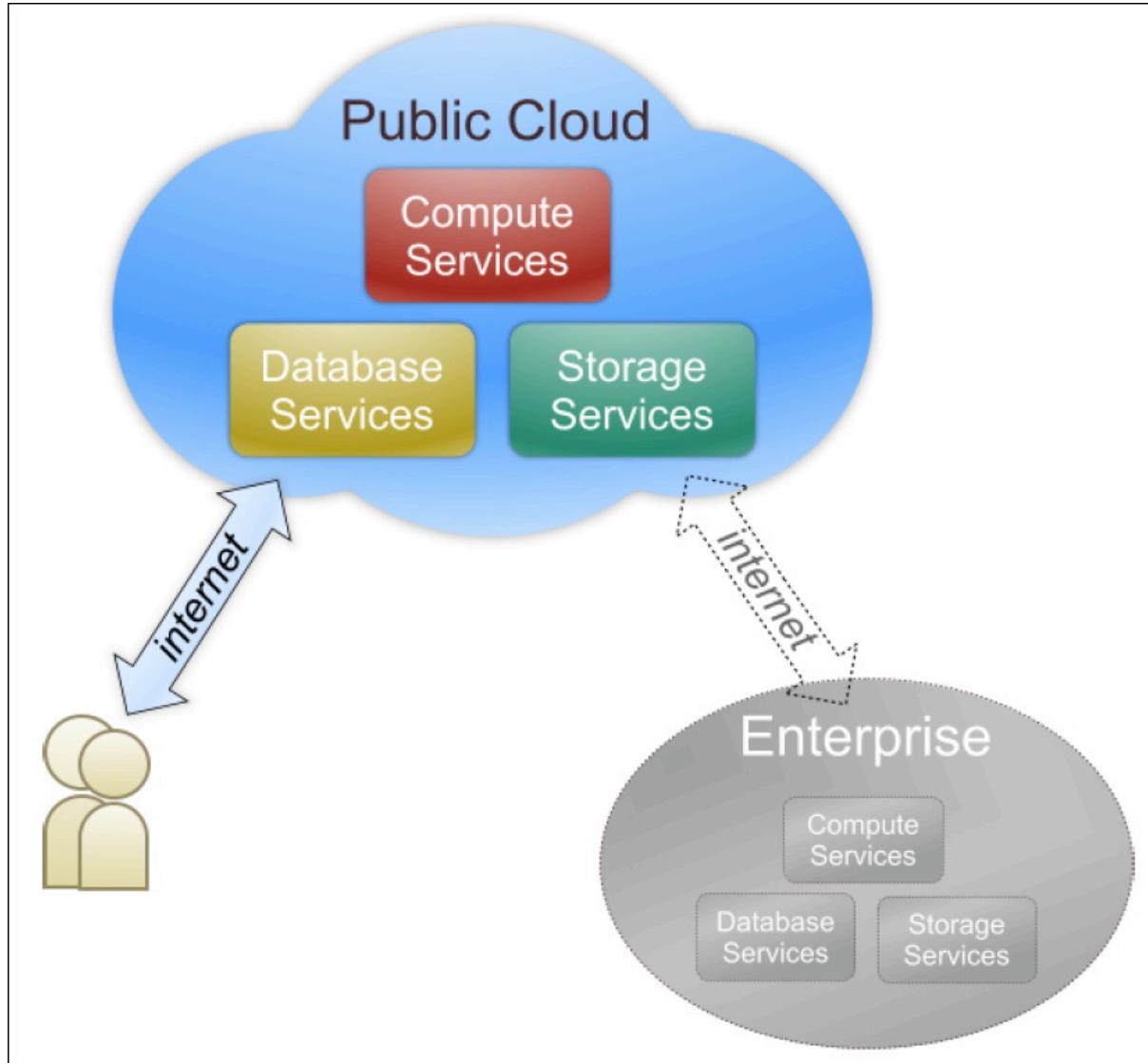
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Enterprises Using Hybrid Clouds

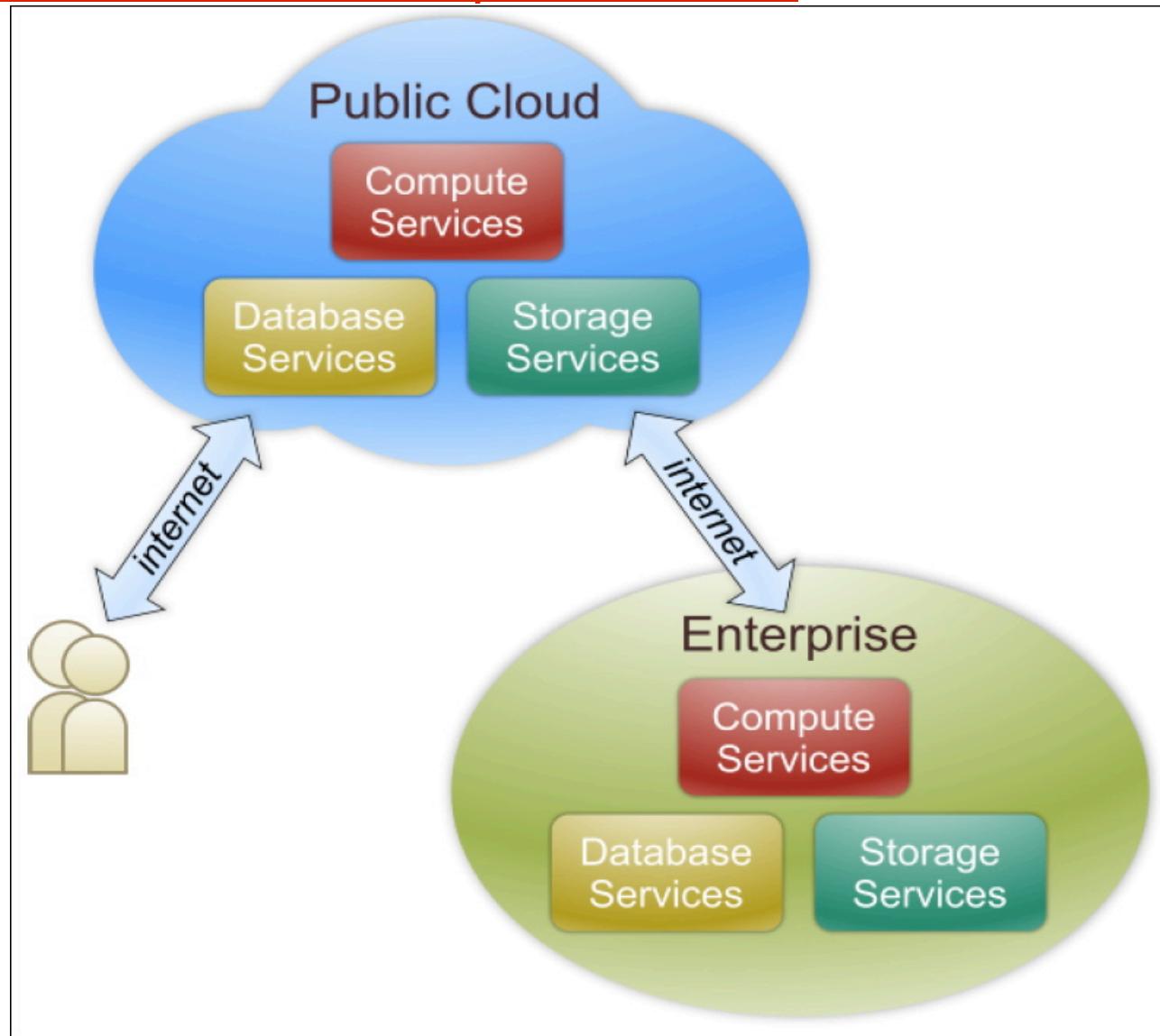


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A Public Cloud Supports Users



The Public Cloud for Enterprise Access



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Part V

Summary

Evolution Towards a “Cloud”

- Virtualization has evolved to include not just a hypervisor but a comprehensive set of capabilities that minimize planned and unplanned downtime, ensure application service levels and automate routine processes in the datacenter.
- Virtualization is an enabling technology that frees up applications from physical servers and enables hardware independence.
- Virtualization is evolving to a dynamic datacenter with infrastructure services for aggregating compute capacity and for automated restart of redundant datacenters affected by software failure.

Consolidate, Virtualize and then Automate

