

INFRASTRUCTURE AS A SERVICE

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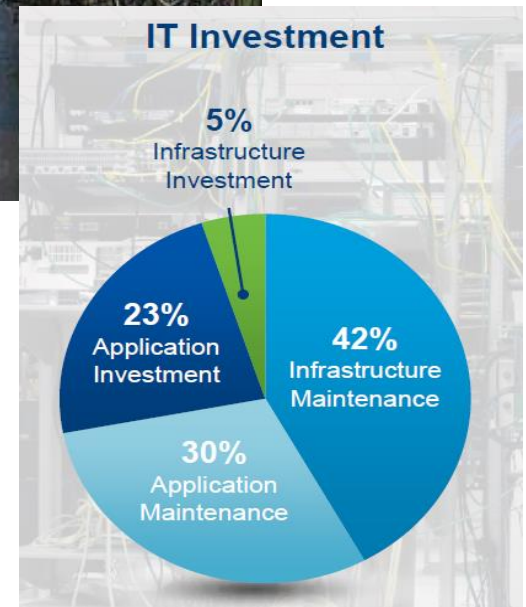
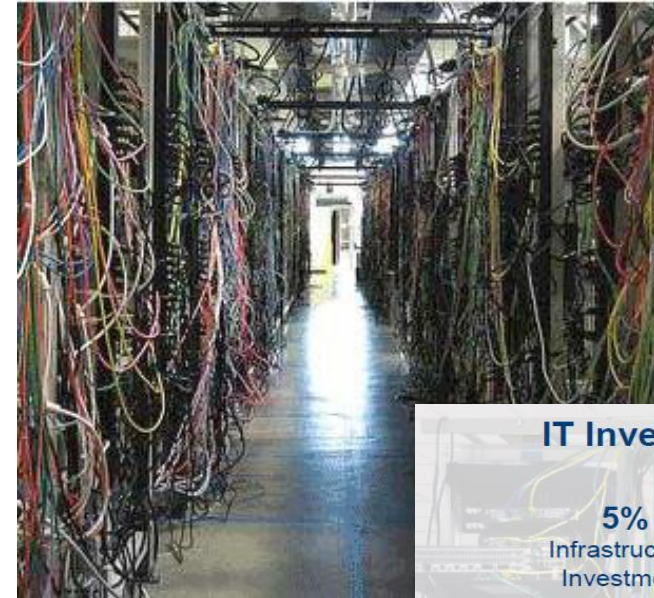
MODULE OBJECTIVE

- Understand the benefits of infrastructure virtualization.
- Understand the maturity model of infrastructure service.
- Understand difference among infrastructure outsourcing, infrastructure utility and IaaS service models.
- Understand required functionalities of IaaS
- Understand IaaS vendors landscape.
- Understand how to host applications on IaaS.



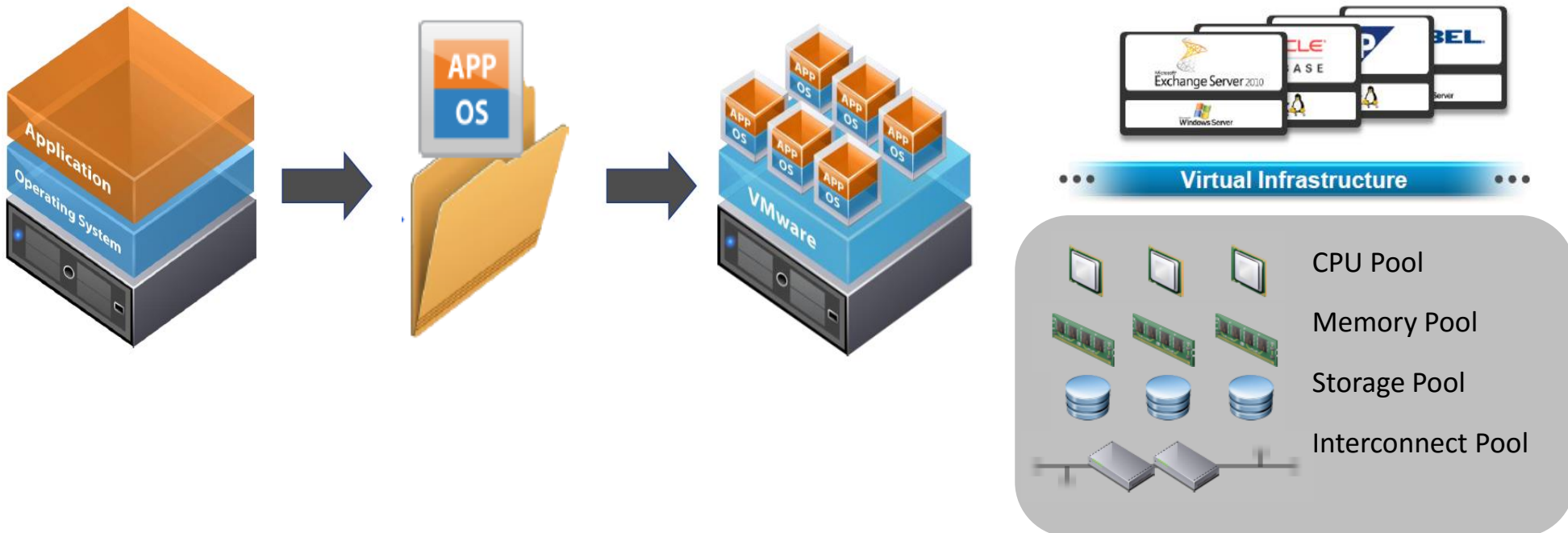
IT INFRASTRUCTURE PAIN POINTS

- Server Sprawl
 - 36M physical x86 servers by 2011: 10-fold increase over 15 years
- Power & Cooling
 - \$1 for every \$1 spent on servers
 - \$29B in power and cooling industry wide
- Space Crunch Costs
 - \$1,000 / sq ft
 - \$2,400 / server
 - \$40,000 / rack
- Operating Costs
 - \$8 in maintenance for every \$1 spent on new infrastructure
 - 20~30 : 1 server-to-admin ratio
- Business agility depends on IT agility.



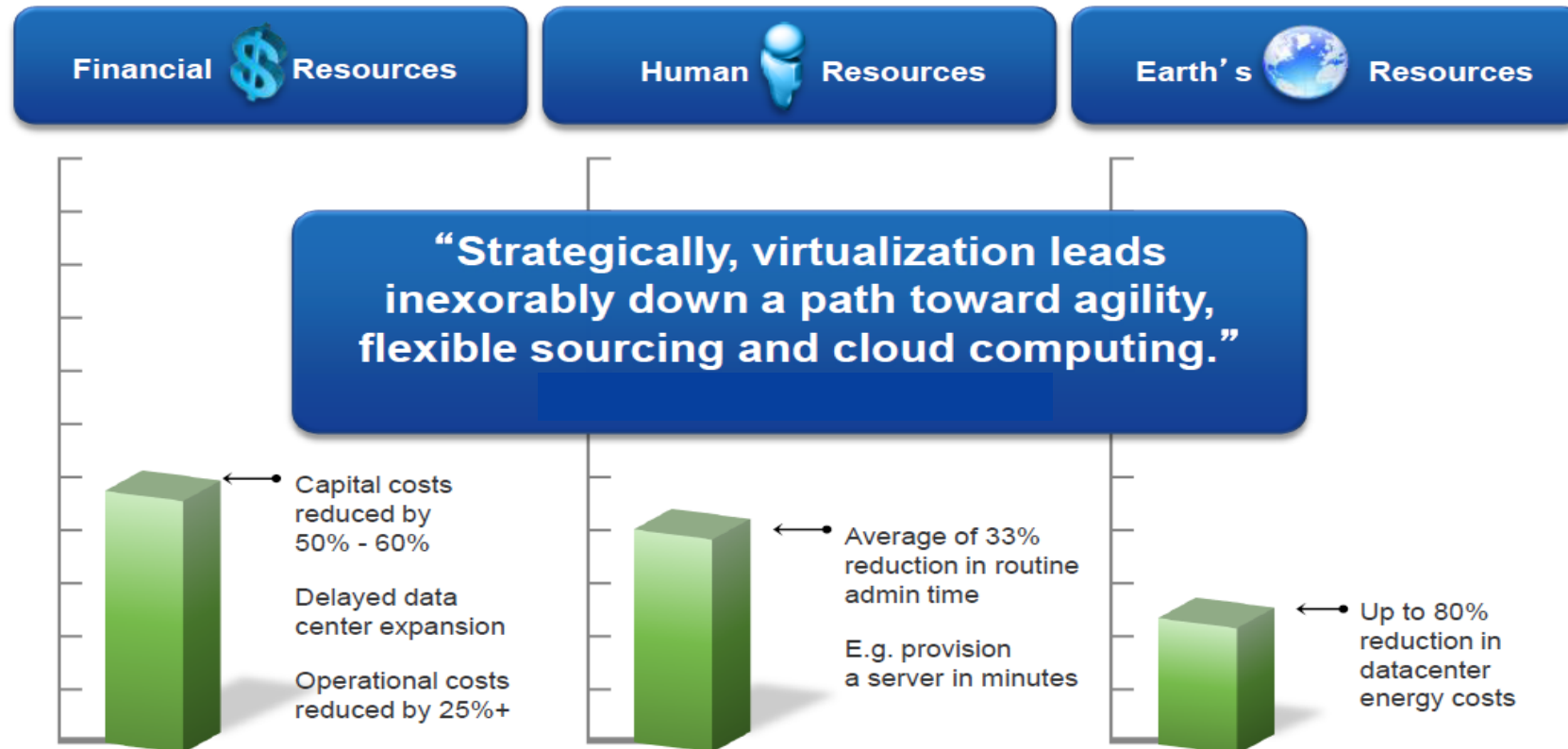
VIRTUALIZATION

- If virtualization is applied effectively, average server utilization can go up from 7~12% to 40~50%, yielding huge savings in floor space and energy.
- Facebook and Google maintain PUE (power usage effectiveness, i.e., the total energy used to operate a datacenter divided by the amount devoted to actual computing) below 1.1, while most data centers runs at around 2.0.

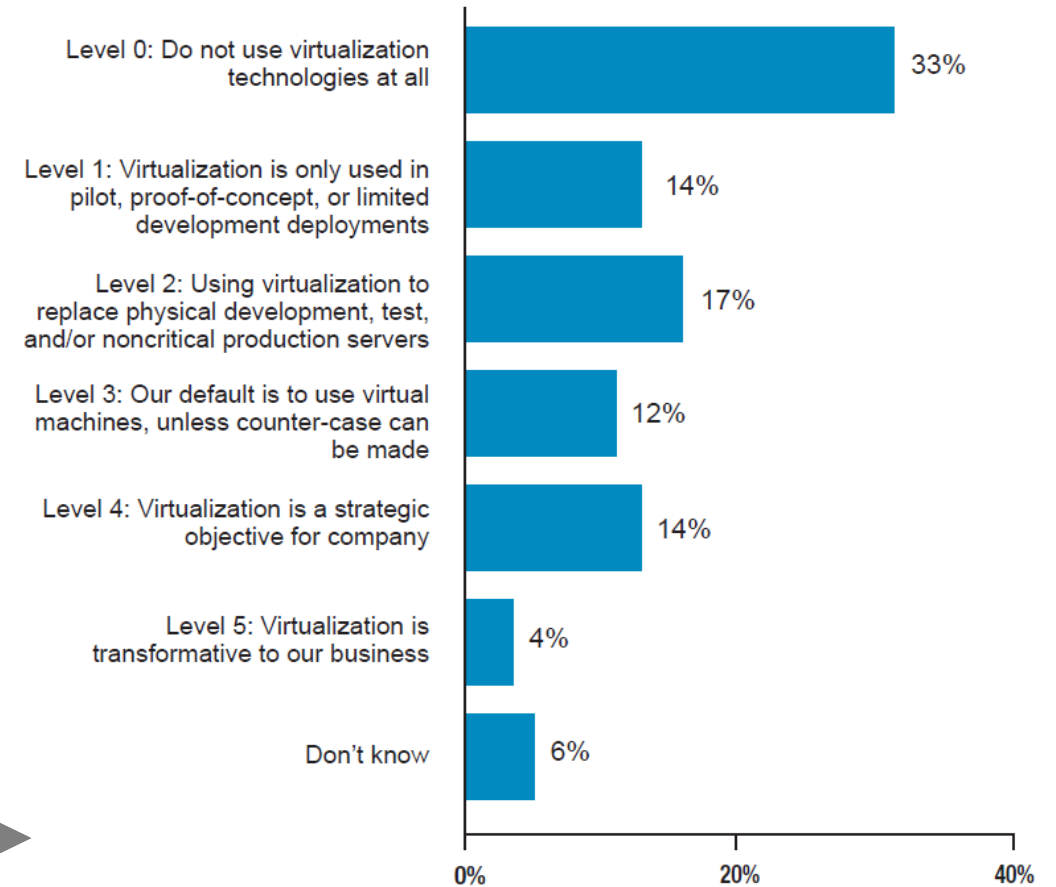
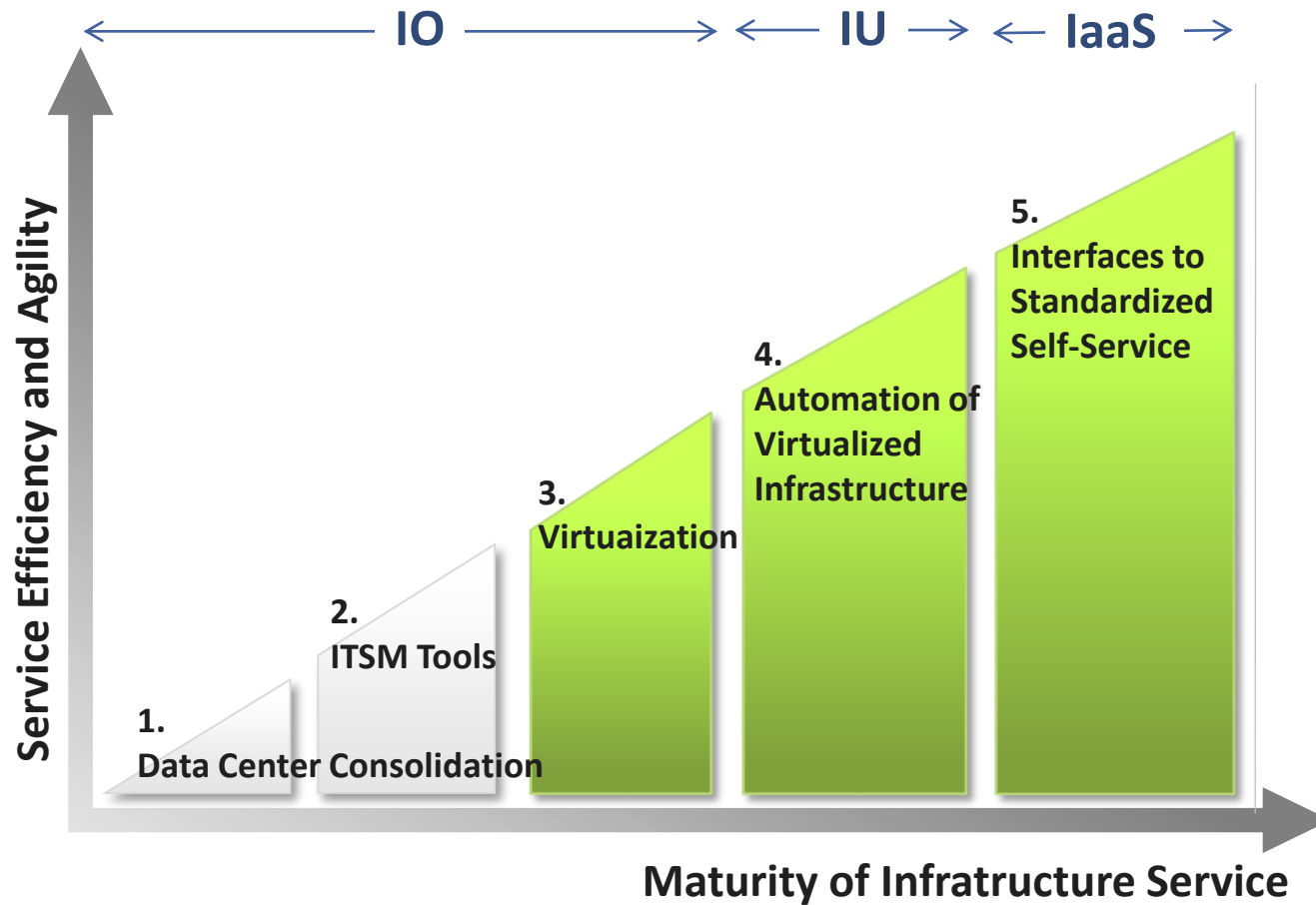


VALUE PROPOSITION OF VIRTUALIZATION

- Reduce the complexity to simplify operations and maintenance
- Dramatically lower costs to redirect investment into value-add opportunities
- Enable flexible, agile IT service delivery to meet and anticipate the needs of the business

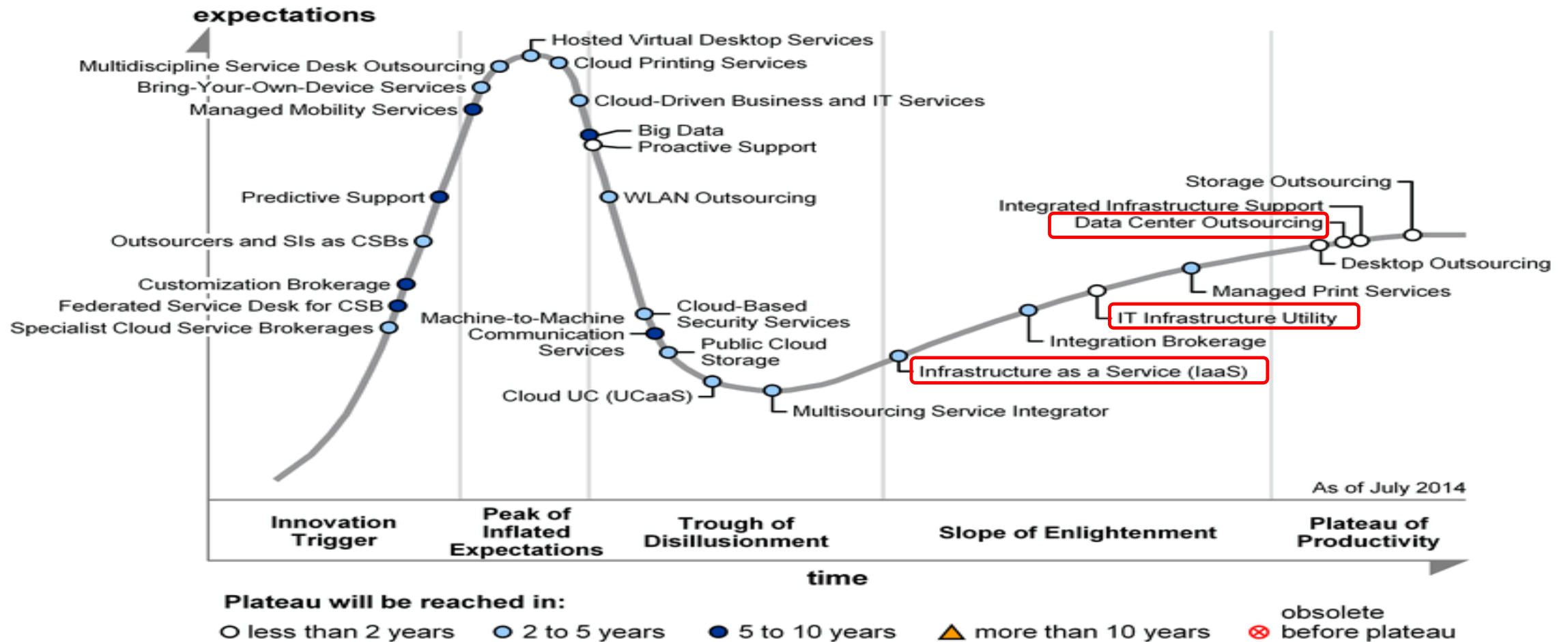


INFRASTRUCTURE SERVICE MATURITY MODEL



Source: IBM Market Insights, *Cloud Computing Research*, July 2009.

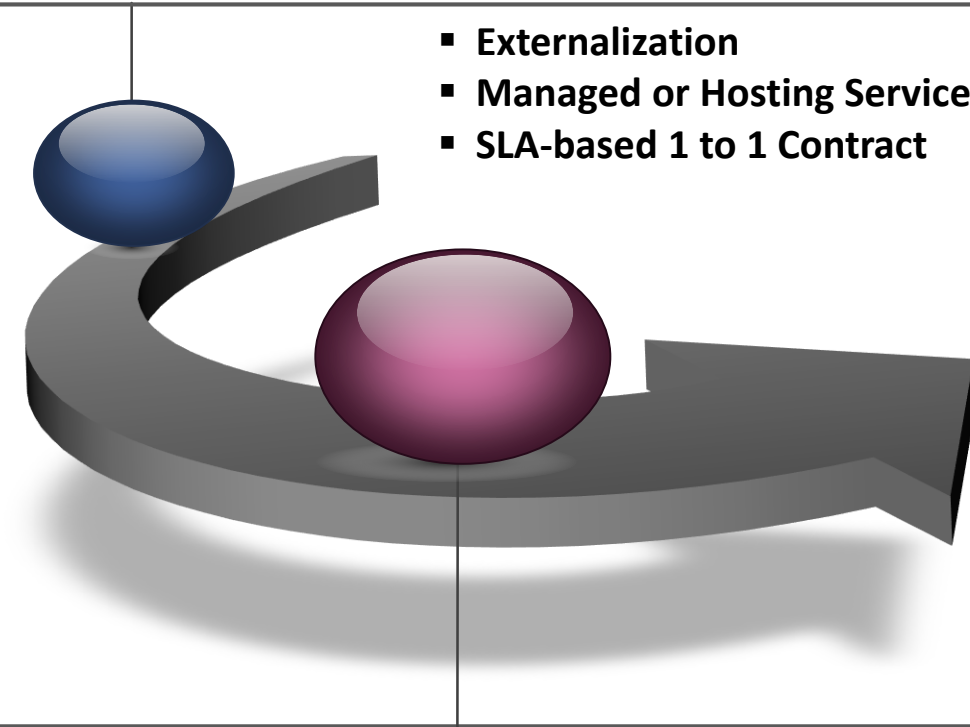
INFRASTRUCTURE SERVICE HYPE CYCLE



EVOLUTION OF INFRASTRUCTURE SERVICE

Infrastructure Outsourcing Service

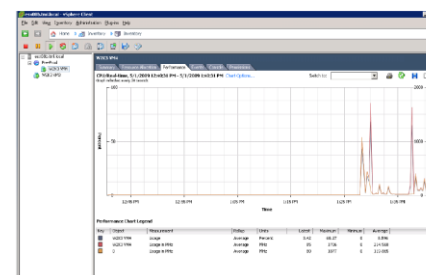
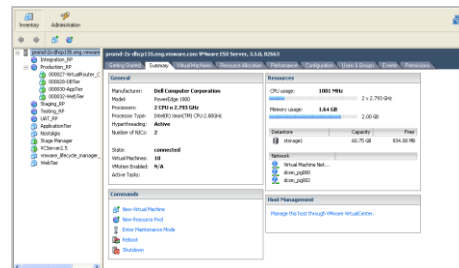
- Externalization
- Managed or Hosting Service
- SLA-based 1 to 1 Contract



Infrastructure Utility Service

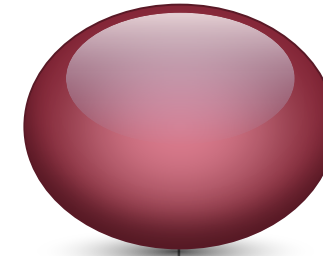
- Sharing Virtualized Infrastructure
- Fully-Implemented ITIL
- SLA-based 1 to 1 Contract

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Infrastructure as a Service

- Web Services
- Automated ITSM over Virtualization
- 1 to Global, "Swipe and Start", "Pay as You Go" Service
- Built-In Monetization Functions



INFRASTRUCTURE SERVICE BUSINESS MODELS

Infrastructure Outsourcing	Infrastructure Utility	IaaS
Colocation, dedicated hosting or managed service	Virtualization and sharing of IT resources	“Swipe-and-go” self-service subscription, automatic provisioning and elasticity
Clients keep direct oversight of the architecture design, technology platforms and operating Processes	Operating platform below application is controlled and managed by the service provider; however, architecture, locations and processes visible to clients	Architecture, locations and processes are masked by service boundary and automation; only elements exposed through service level interfaces are visible
Implementation unique to each client	Implementation flexible to client requirements, contract negotiated, and a transition project executed	No negotiation over service definition; no control over the implemented; everything below the service boundary optimized by the provider
IBM, HP/EDS, CSC, Capgemini, Atos Origin, T-Systems, Logica	IBM, HP/EDS, CSC, Capgemini, Atos Origin, T-Systems, BT Global Services, Savvis, Siemens, AT&T, Terremark, Logica, HCL	Amazon, Google, Microsoft, Joyent, Linode, Rackspace, Nirvanix, Vaultscape,

USE CASES OF IO, IU AND IAAS

IO

- Large scale, relatively static workload
- Customized operations required
- Long term contract (4+ years)

IU

- Flexibility needed due to business uncertainty, incoming M&A or variable workload
- Cost reduction by 15~30%
- Medium term contract (1~3 years)
- Access from the Internet not permissible
- Mission-critical apps
- Multiple OS in use (other than Linux or Windows)

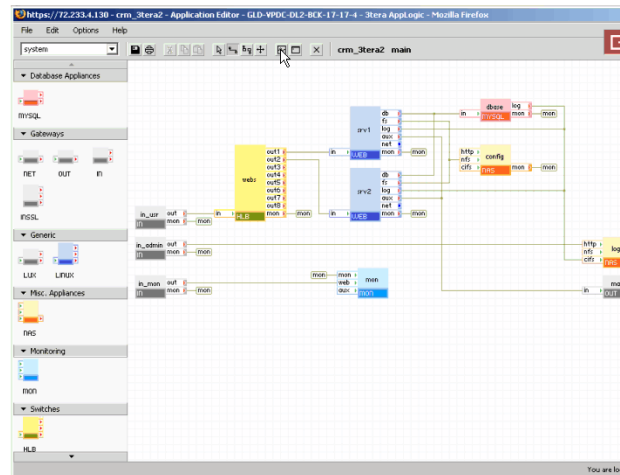
IaaS

- Volatile to bursting capacity requirements
- Little upfront CapEx and flexible pricing
- Cost reduction by 30+%
- Short-term contract (< 1 year)
- Non-mission critical or external-facing Web apps accessible from the Internet
- Significant business opportunities to exploit fast



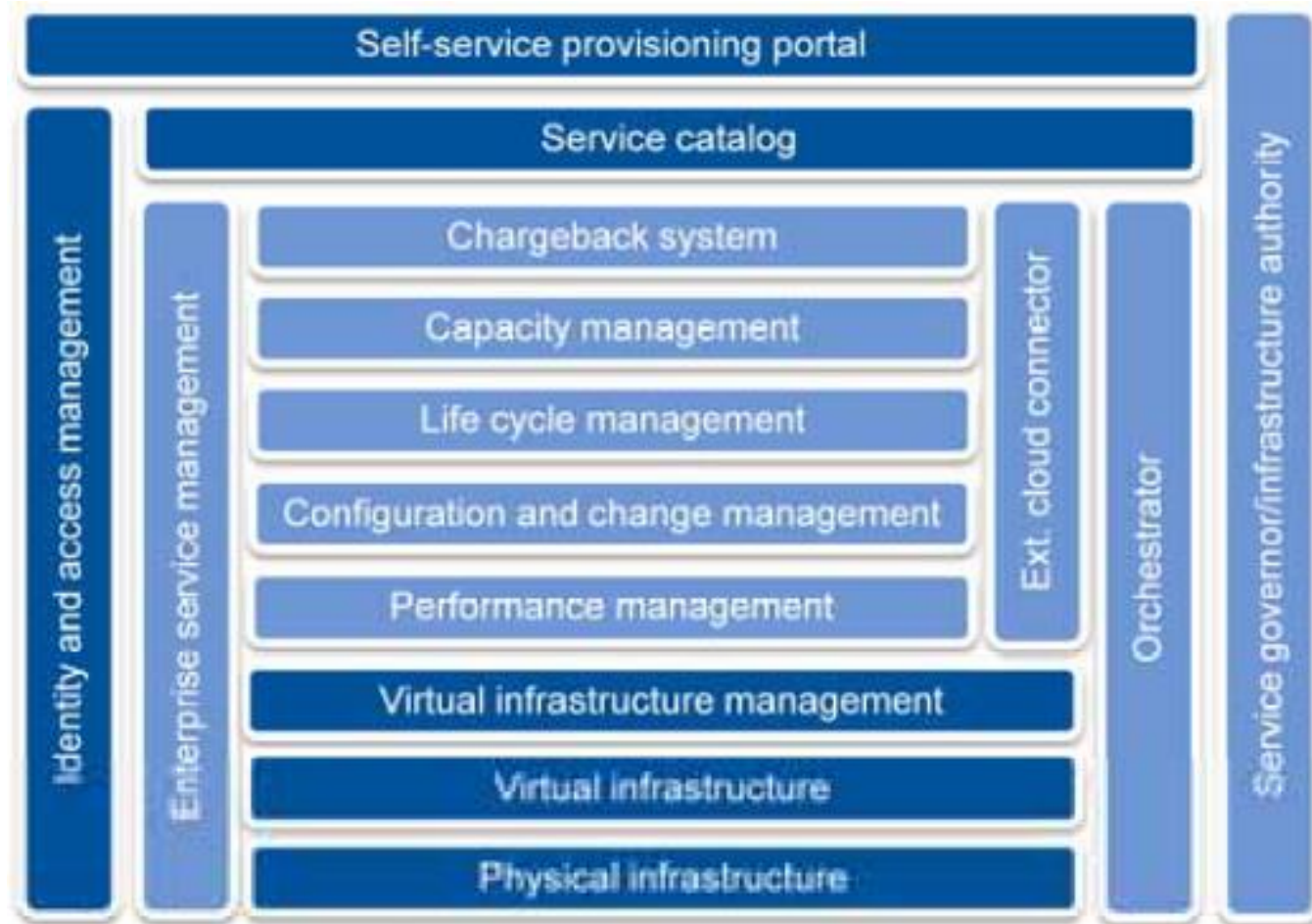
REQUIREMENTS FOR IAAS

- Self-service portal showing service catalog and service-level actuals
- Automation of tenant-aware service delivery, usage mgmt and billing
- Automation of tenant-aware real-time provisioning
- Virtualization of servers, OS, storage, network and client technologies
- Automation of operational processes including performance, availability , incident, problem, change and configuration management



<http://www.3tera.com/AppLogic/Monitoring.php>

PRIVATE IAAS

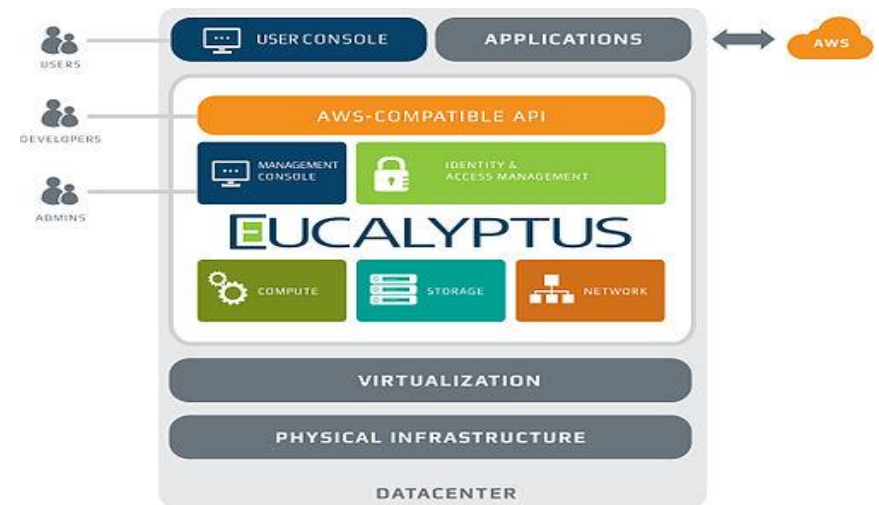
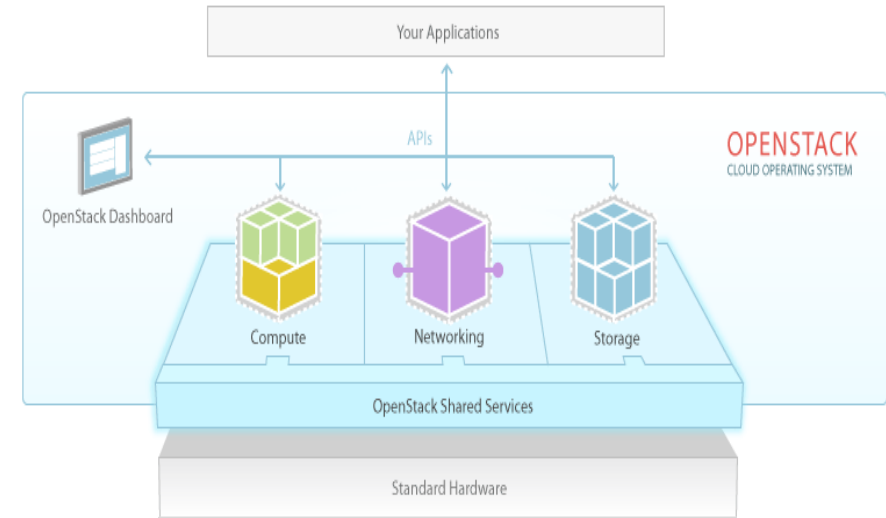


Required

Preferred

OPEN SOURCE IAAS PLATFORMS

- OpenStack
 - Open source platform for building public and private IaaS clouds
 - Supported by 150 companies including Rackspace, VMWare, AMD, Intel, Red Hat, Cisco, HP, IBM, NEC, Yahoo
- CloudStack
 - Open source platform developed by Citrix for building public and private IaaS clouds, supporting VMWare, KVM, Xen Cloud Platform (XCP) and AWS API
- Eucalyptus
 - Open source software for building AWS-compatible public and private IaaS clouds
 - Used by Deutsche Post, Electronic Arts, Fujitsu, Infosys, NASA, Raytheon, Sony, US DoD, Chinese Zhenjiang Government and many more

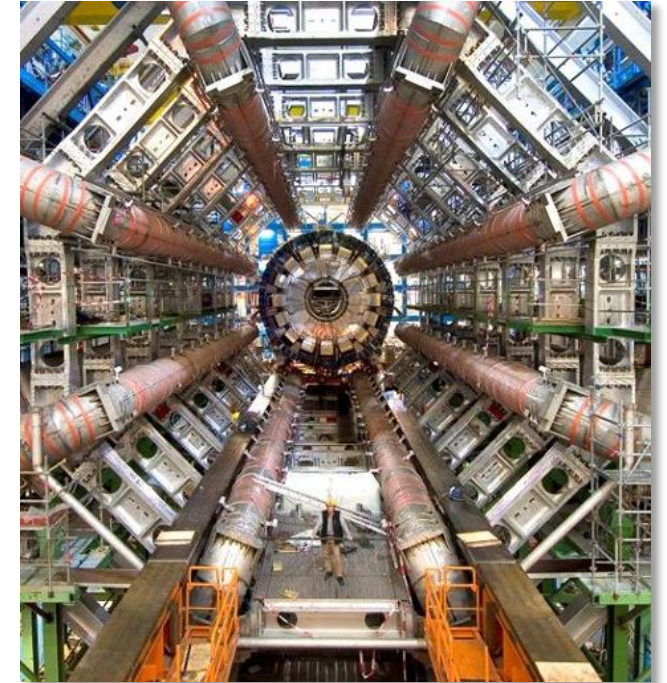


IAAS PROVIDERS



- Amazon AWS
- RackSpace on Xen and OpenStack, with the second-largest market share
- Verizon Terremark on vCloud
- GoGrid Exchange on Xen
- Savvis Symphony on vCloud
- Joyent, the second-biggest independent cloud provider
- OVH, Europe's largest cloud provider
- SoftLayer CloudLayer on Xen and OpenStack, targeting SMEs
- Tier 3 on vCloud
- VMware Bluelock on vCloud
- CSC CloudCompute on vCloud
- NTT Dimension Data on vCloud
- Fujitsu Cloud on Xen
- Dell vCloud

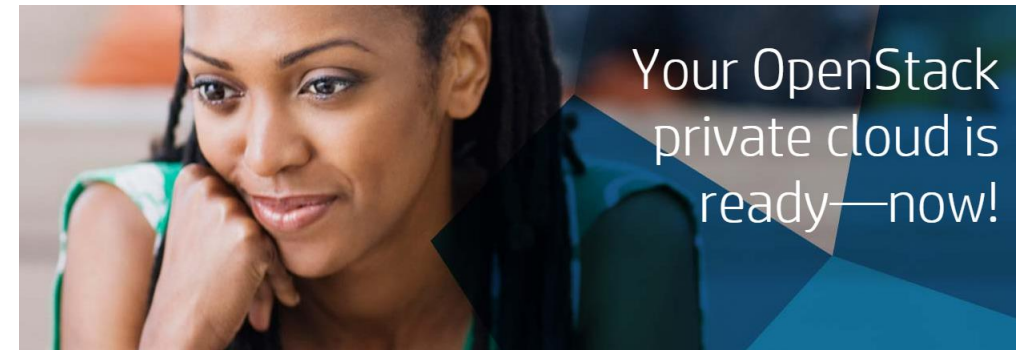
- The IT team of CERN, European Organization for Nuclear Research, has been using the open source OpenStack-based private cloud environment in the testing and development stage since December 2011 and hopes to go live and use private cloud infrastructure in production by February 2013.
- The cloud project is to respond to the physicists' IT needs quickly and efficiently. Self-service user kiosks can create virtual machines in minutes rather than waiting days for a physical server to be installed and allocated.
- CERN compared a number of private cloud and public cloud providers. They were open to the idea of using public cloud and had no issues around storing all their data on the public cloud.
- CERN, however, found that when network costs were added, the public cloud turned out to be between three to five times more expensive. Furthermore, they did not want just IaaS, but also database as a service (DBaaS), and OpenStack addressed their requirements.
- CERN's private cloud infrastructure is to be able to scale up to hosting 15,000 hypervisors on the cloud by 2015, running between 100,000 and 300,000 virtual machines.



CASE STUDY: IAAS PLATFORM

CERN

- Many IT shops have found it difficult to properly fine-tune private clouds and hire qualified OpenStack experts.
- HP has rolled out Helion Rack, a pre-configured, pre-tested private cloud with baked-in OpenStack and Cloud Foundry technologies to accelerate cloud deployments.
- The offering could eliminate the headaches of properly piecing together the collection of components needed for an OpenStack-flavored private IaaS to support developing and deploying cloud-based native applications.
- "The demand on lines of business and dev-test teams for faster delivery is putting IT departments under a lot of pressure," said Owen Rogers, a senior analyst with 451 Research in New York. "They don't have the resources or infrastructure in place to meet that demand. But a product like this can help overcome a lack of cloud and OpenStack software skills which has slowed down a lot of private cloud deployments."



CASE STUDY: IAAS PLATFORM

HP

PREDICTIONS ON IAAS

- IaaS offerings will support increasingly detailed and complex relationships, while I/P offerings will become more scalable and elastic, minimizing the difference between the two approaches.
- Both will approach to the per user/per unit/per month (PUPM) model of pricing.
- IaaS represents the smallest differentiator of cloud computing, and will be soon dominated by a few mega-vendors through market consolidation.
- IaaS will account for less than 10% of the overall cloud services market and the impact of the cloud revolution will be more at the application, information and business process level through the creation of new service business models.
- Both consumers and providers can benefit from moving up the hierarchy of cloud services.