Building a Solid Cloud Foundation with IBM Power Systems

Terri Schlosser, Power Systems Cloud Solutions Offering Manager

Power is performance redefined

Deliver services faster, with higher quality and superior economics

Pressures like workforce mobility and increasing productivity are placing greater demands on IT systems.

Increased expectations

52% CAGR growth in self-service channels

Increased demands

10x growth in digital data from 2007 to 2011.

Increased competition

2/10 of the world's largest companies in 2000 remain on that list today.

54%

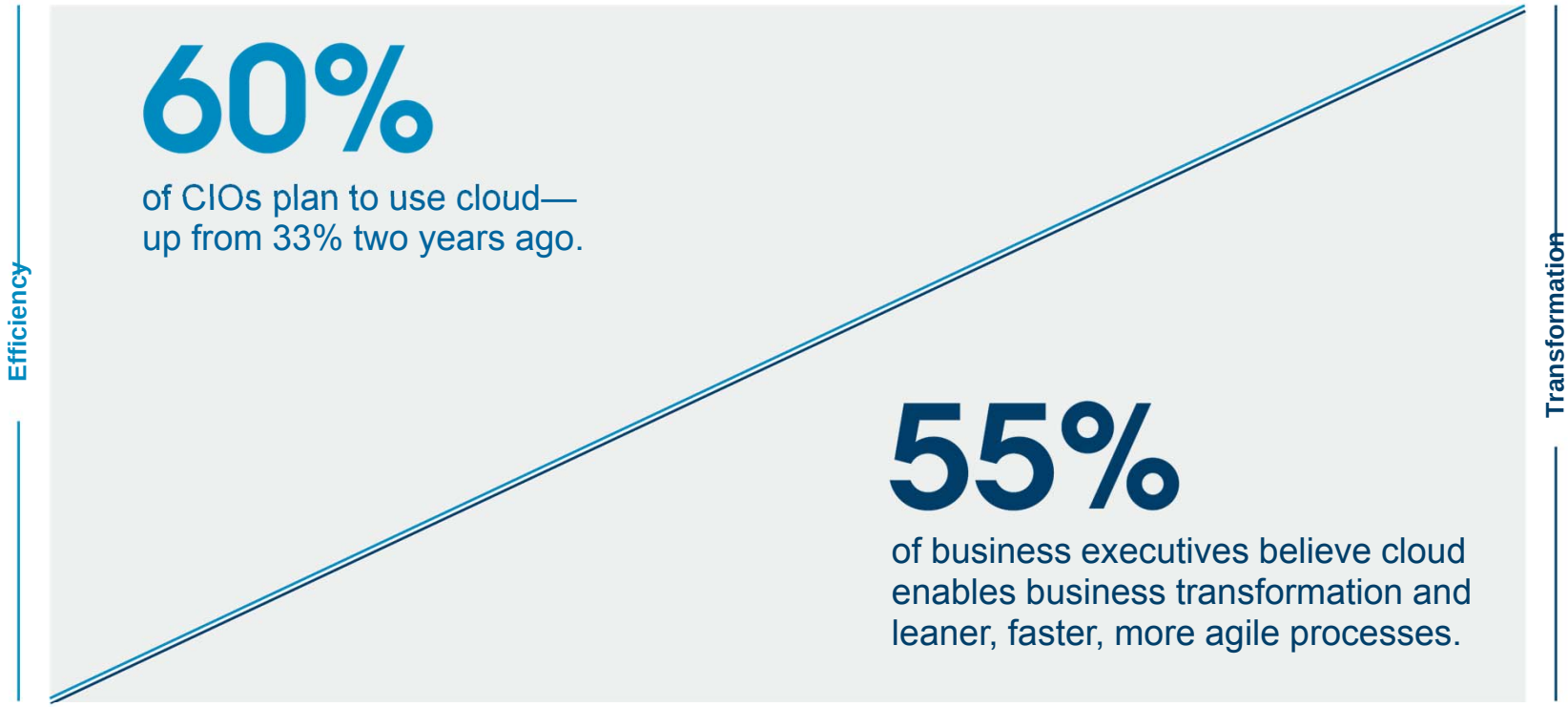
of surveyed enterprise IT budgets in 2010 were spent on ongoing operations and maintenance costs.*

*Source: Forrester Research, Inc. "2011 IT Budget Planning Guide," October 7, 2010 by Craig Symons

As a result, cloud is an increasingly attractive means of creating and delivering IT services.

Value delivered	From traditional	To cloud
Change management	Months	Days or hours
Test provisioning	Weeks	20 minutes
Install database	1 day	12 minutes
Install of operating system	1 day	30–60 minutes
Provisioning environment	■	51% cost savings
Design and deploy business apps	Months	Days/Weeks

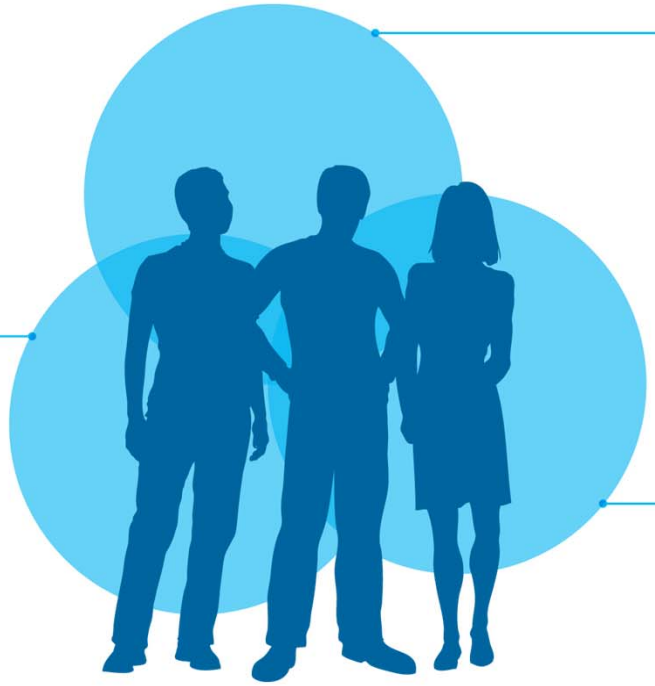
IT is drawn to cloud's cost, efficiency and control…



…while business users are drawn to cloud's simplified, self-service experience and new service capabilities.

2011 IBM CIO Study, London School of Economics, December 2010

Cloud helps business and IT create and deliver value in fundamentally new ways



Improve speed and dexterity

Speed the delivery of new offerings and services by creating new models of self-service and deployment.

Deliver IT without boundaries

Enable new IT and business processes that break down traditional silos and simplify access to information in order to deliver better business outcomes.

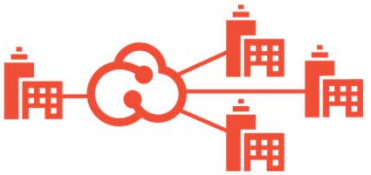
Create new business value

Empower internal and external communities to define and create new offerings and services.

Businesses are choosing a variety of cloud models to meet their unique needs and priorities.

Private cloud

On or off premises cloud infrastructure operated solely for an organization and managed by the organization or a third party



Public cloud

Available to the general public or a large industry group and owned by an organization selling cloud services.

Hybrid IT

Traditional IT and clouds (public and/or private) that remain separate but are bound together by technology that enables data and application portability

Traditional IT

Appliances, pre-integrated systems and standard hardware, software and networking.

What are customers asking IBM?

Infrastructure Teams

How can I improve my resource utilization, simplify administration and reduce cost ?

Line of Business Teams

How can I accelerate my application release cycle in an optimized , quality fashion?

Infrastructure as a Service Technologies


Infrastructure Platform


Management and Administration


Availability and Performance


Security and Compliance

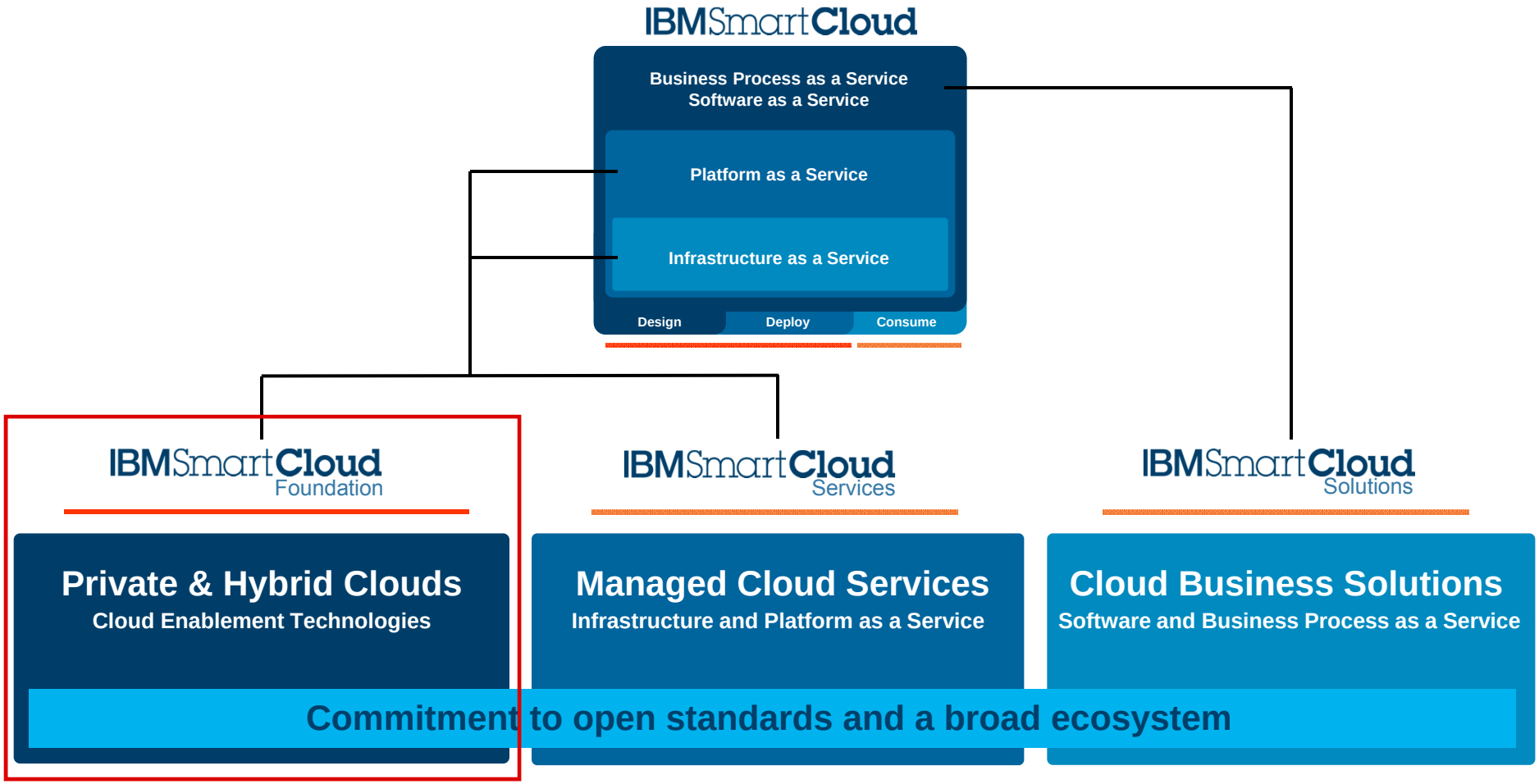
Usage and Accounting

Operations Teams

How can I improve responsiveness and drive productivity and efficiency while maintaining stringent qualities of service?

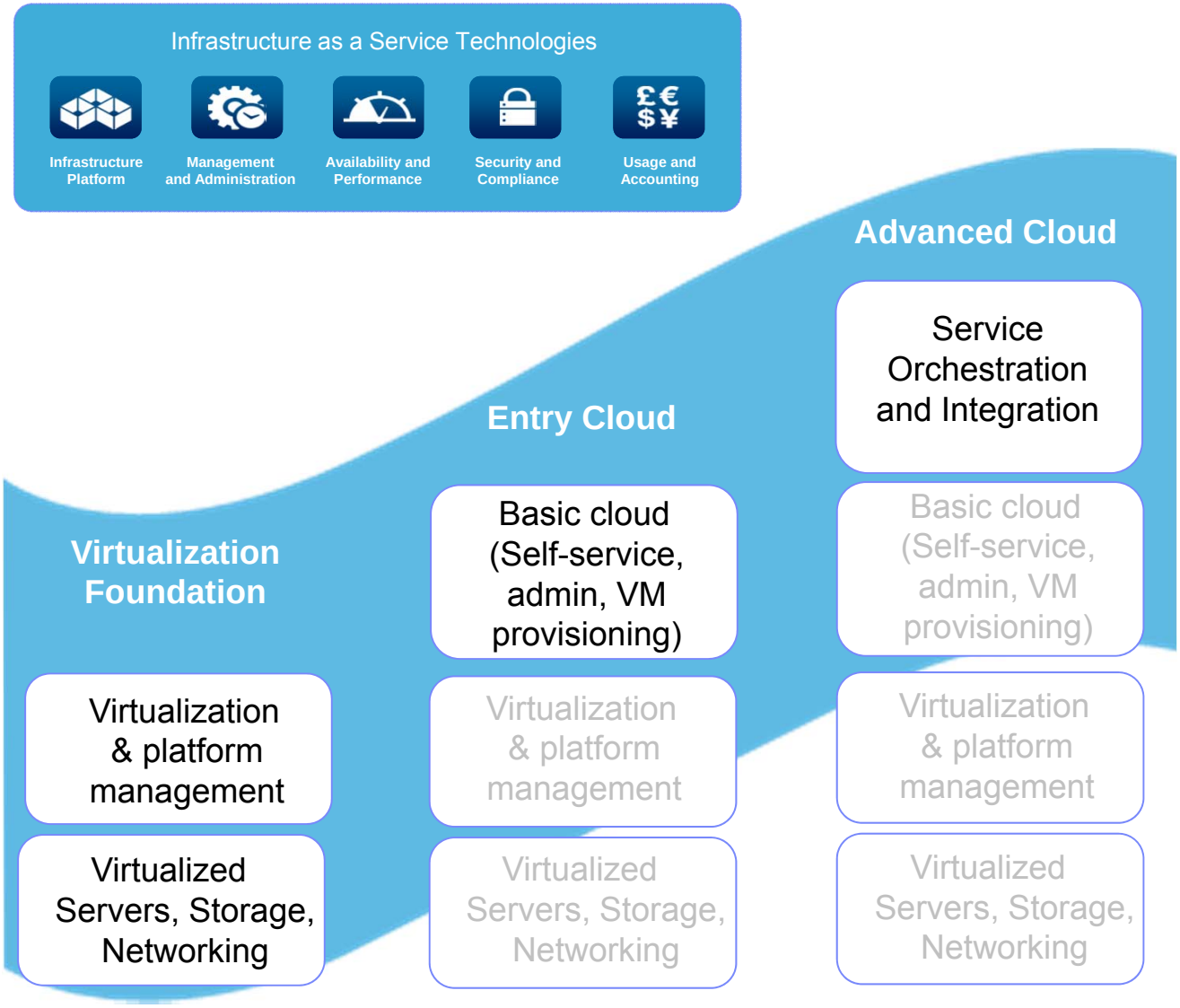
Power is performance redefined

IBM SmartCloud Foundation, Services & Solutions



Power is performance redefined

Clients are not sure where to start on the journey



- This is not always a linear progression. Some clients begin by optimizing their virtualization foundation for a workload, then gradually move to cloud.
- Others require cloud capabilities from the beginning and may start with advanced cloud or entry cloud solutions.
- A client may be in all of these stages w/ different workloads across their data center.

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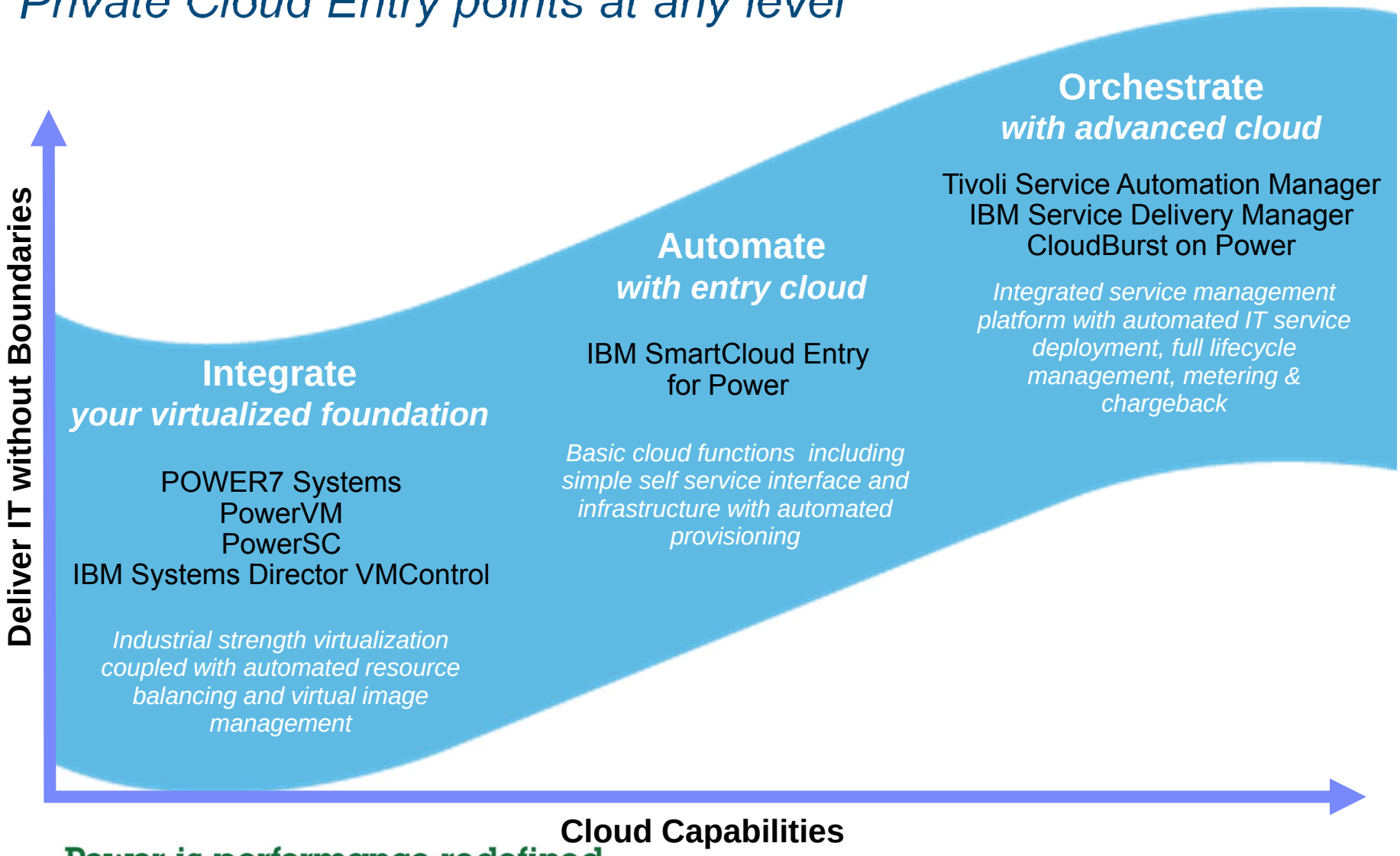
Power Systems Cloud Solutions

Private Cloud Entry points at any level



Power is performance redefined

POWER7 Systems

The Ideal platform for your virtualization foundation

Enterprise RAS features coupled with the automated workload performance and capacity optimization, **ensure the availability and ideal elasticity of your cloud**

- ✓ Innovative RAS capabilities deliver near-continuous system availability
- ✓ Light Path diagnostics can reduce failure identification from hours to minutes
- ✓ Workload optimizing features make POWER7 #1 in transaction and throughput computing
- ✓ The broadest performance range of any platform on the market
- ✓ Reduce costs with more performance per core while using up to 70 percent less energy
- ✓ 4.6 to 7.5 times more performance per core than HP Itanium and Sun Enterprise T5440 cluster respectively

More information: http://www-03.ibm.com/systems/power/hardware/

Best results listed for IBM POWER, HP, and Sun/Oracle systems over 1M tpmC. Source: http://www.tpc.org as of 4/1/08. See Power 780 benchmark details for specific results. See Notices and Substation slides for further details

PowerVM

Advanced virtualization for a superior foundation

Enterprise QOS virtualization capability with **higher performance**, **more scalability**, and **enterprise security** provides the best foundation for your cloud

- ✓ Consolidate multiple workloads onto fewer systems, **increasing server utilization and reducing costs**
- ✓ **Enterprise security** to help manage risk and maximize availability
- ✓ **Superior flexibility** to optimize IT resource utilization and improve responsiveness
- ✓ **Dynamically optimizing IT resources** such as CPUs, memory and I/O across workloads, systems and entire datacenters to improve service levels
- ✓ **Integrated storage virtualization** for simplified provisioning and management of virtual servers

More information: http://www-03.ibm.com/systems/power/software/virtualization/index.html

PowerSC

Security and compliance solution ensures a secure foundation

Security and compliance solution designed to **protect data centers** virtualized with PowerVM **enabling higher quality services** and ensuring a **secure foundation** for your cloud

- ✓ **Simplifies management** and measurement of security and compliance with a single pane to see all systems out of compliance
- ✓ **Reduces cost** of security and compliance with compliance automation and reporting only allowing known trusted software to run
- ✓ **Improves detection and reporting** of security exposures with the Trusted Network Connection protocol ensuring that every Virtual System has appropriate security patches and providing notification of any unpatched systems
- ✓ **Improves the audit capability** to satisfy reporting requirements with trusted logging and security compliance automation

More information: http://www-03.ibm.com/systems/power/software/security/

IBM Systems Director with VMControl

Integrated platform management provides core capabilities for virtualization foundation

Automated management, provisioning and optimization of physical & virtual servers and system pools ensure that your cloud resources are automatically provisioned for optimal utilization

- ✓ Physical and Virtual Management in a single interface to **reduce complexity**
- ✓ Offers unmatched cross-operating system management, which helps **improve service delivery**
- ✓ Provides **faster time-to-value** and **greater business agility** through simplified virtualization management that allows more effective utilization of virtualized resources
- ✓ Establishes repeatable accuracy and consistency through **automation**
- ✓ **Reduces operational and infrastructure costs** through increased efficiency and resource utilization

More information: http://www.ibm.com/systems/software/director/vmcontrol/index.html

IBM i Cloud Solutions

- Virtualization Foundation - Already available
  - **Virtualize resources - VIOS/external storage**
    - Basis for many of the virtualization needs
  - **Network install**
    - Provides dynamic install of additional products
  - **Hibernation – suspend a workload**
    - Helps with elasticity and performance
  - **Provisioning – image management**
    - Create a new partition quickly and error free
- Coming Soon
  - **Partition mobility**
    - Move a running partition to another system
    - Provides elasticity and availability (and non-disruptive maintenance)
  - **SmartCloud Entry**
    - Statement of direction announces intent to add support for IBM i

IBM SmartCloud Entry

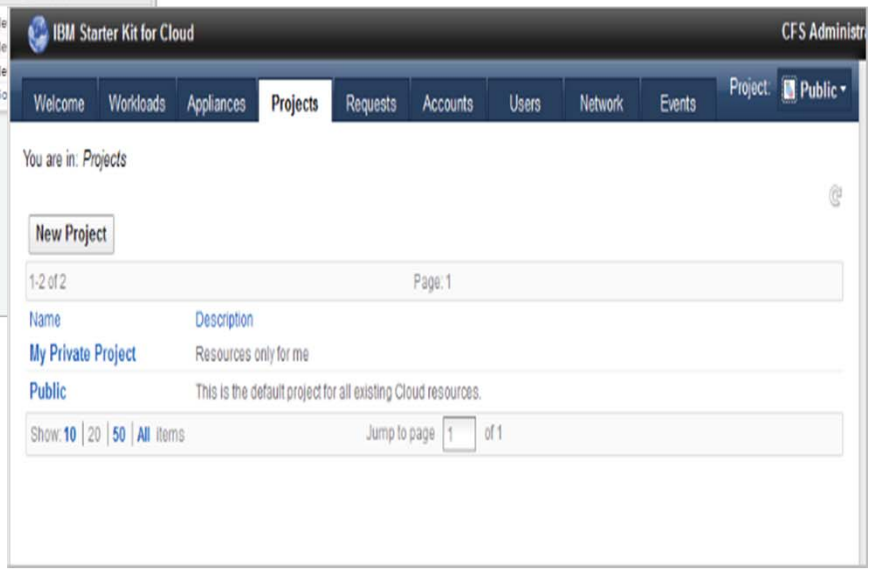
Entry level cloud solution built on top of the virtualization foundation

Entry cloud solution that provides affordable, easy-to-install and easy–to-use capabilities to allow clients to **more rapidly move to a cloud model**

- ✓ **Fast time to value** with a solution that is simple to deploy, easy to use and works with existing infrastructure
- ✓ Accelerate infrastructure delivery and speed service deployment to **quickly respond to changing business needs**
- ✓ **Dramatically increase IT efficiency** with standardization and lower operations cost
- ✓ Scale as needed to **improve quality and meet demand** with continuous availability
- ✓ **Enable self service** with a simple interface that provides oversight
- ✓ **Expandable** to advanced Cloud offerings

More information: http://www.ibm.com/systems/power/solutions/cloud/onpower/starterkit.html

IBM SmartCloud Entry - Projects



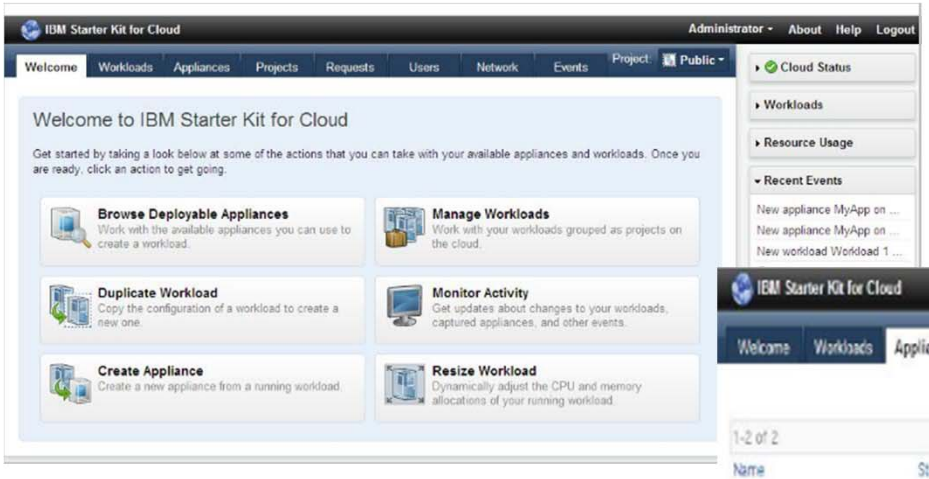
A Project allows for the grouping of Workloads and Appliances for controlling access.

Owner - A project owner has administrator authority to the project and its contents.

User - A project user has the authority to use the project and the objects within the project. For example, a project user can deploy a virtual appliance to the project as well as do some limited management of the project and its contents.

Viewer - A project viewer has authority only to view the project and the virtual appliances and workloads contained in the project.

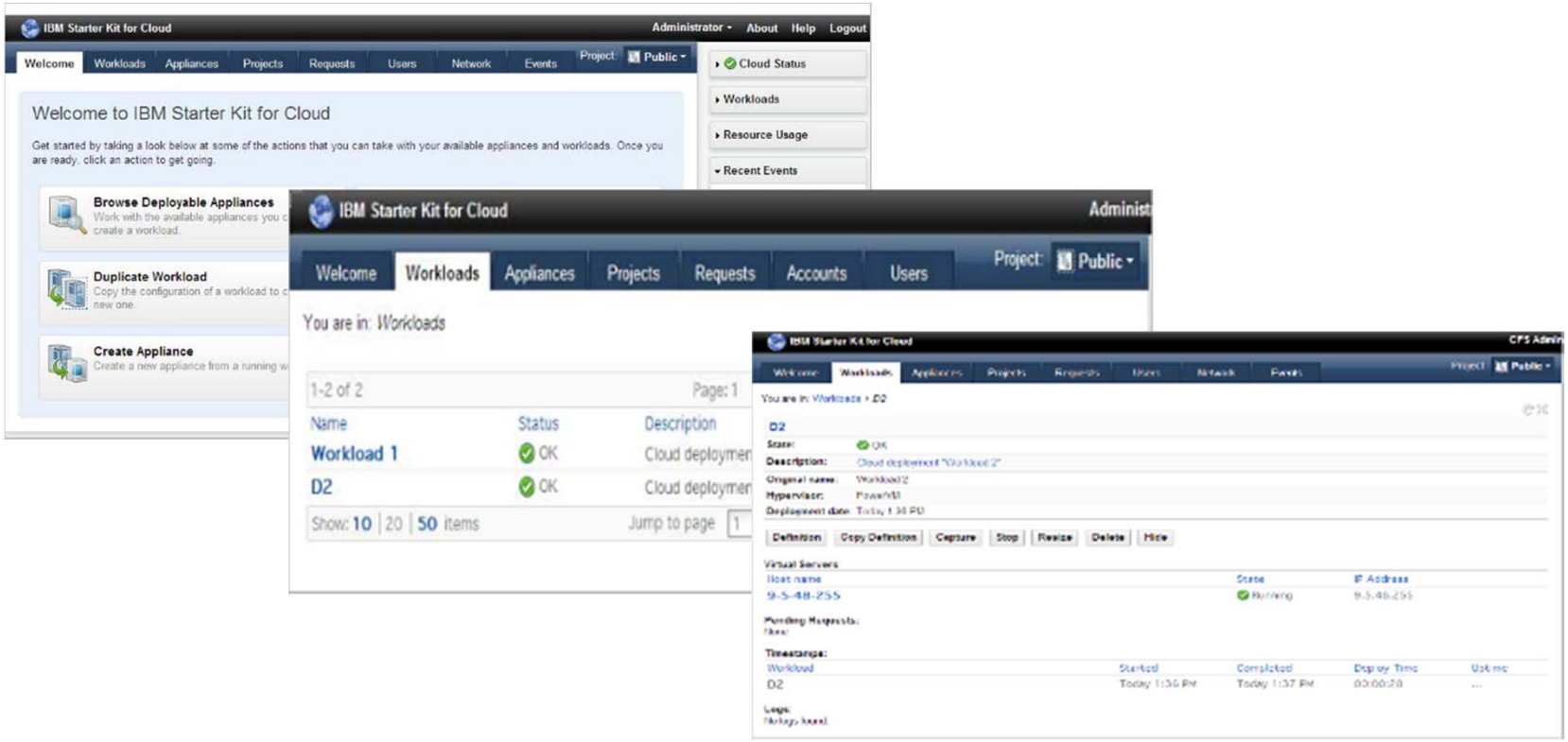
IBM SmartCloud Entry - Appliances



Appliances are used as templates for building Virtual Servers or Workloads

- View Virtual Appliance Properties
- Edit Virtual Appliance Properties
- Deploy Virtual Appliance
  - **Basic**, minimal configuration options, including name, description, project, processor information, and memory are displayed
  - **Advanced**, all of the configuration options available for the virtual appliance are displayed.

IBM SmartCloud Entry - Workloads

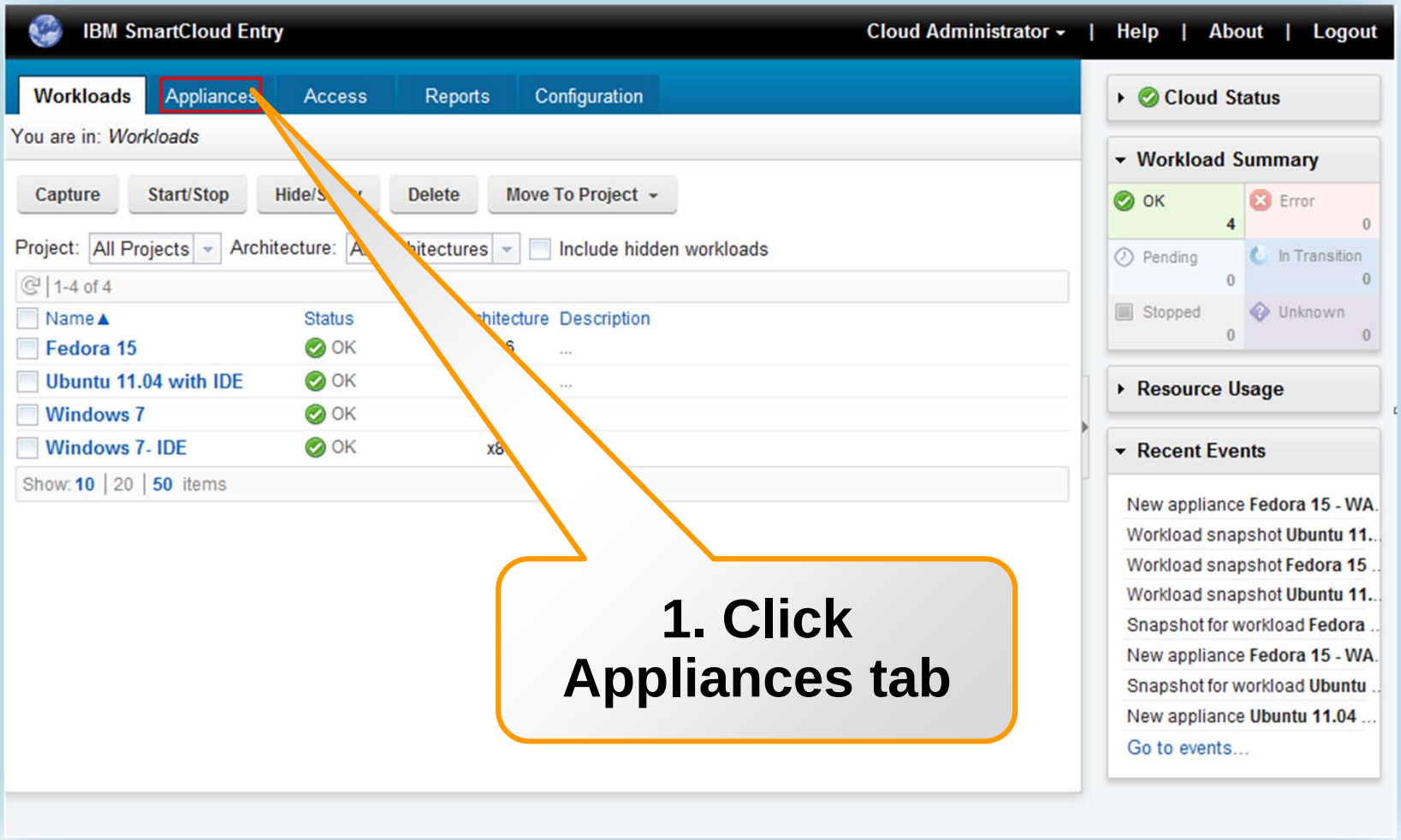


A workload is a Virtual Server or a deployed Appliance

- Start/Stop
- Capture/snapshot
- Delete
- Hide
- View workload definition
- Copy workload definition
- Resize workload

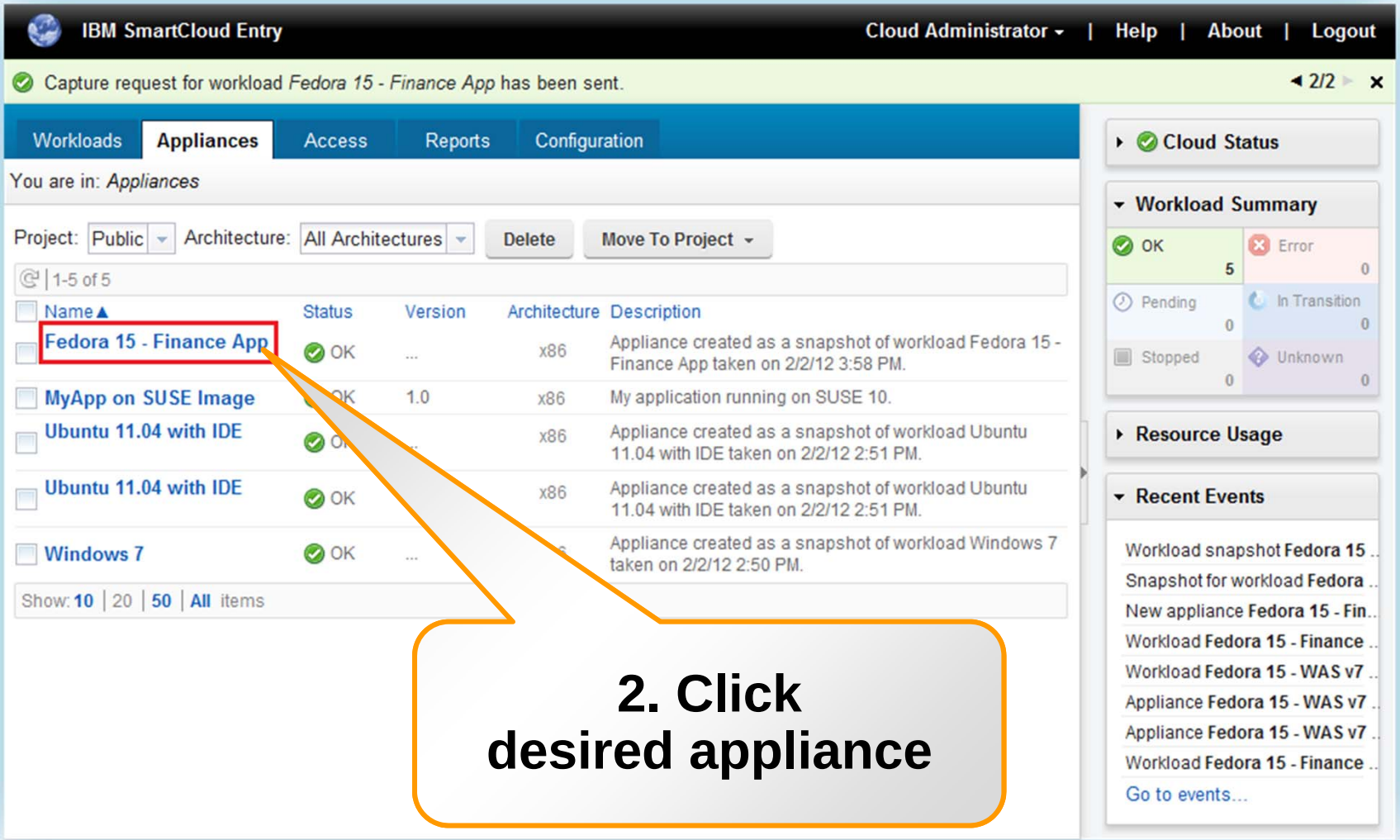
Power is performance redefined

IBM SmartCloud Entry's four-click deploy



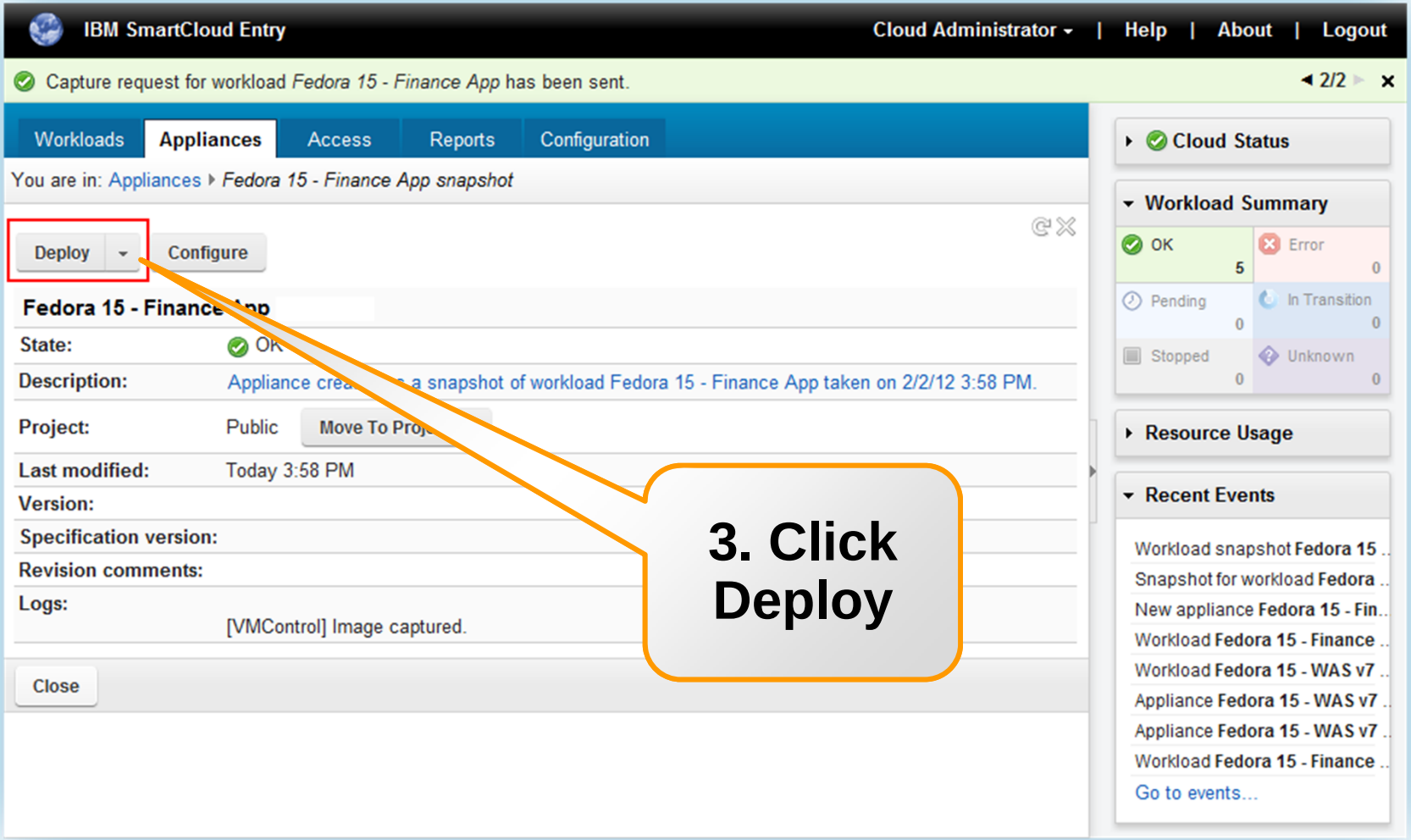
Power is performance redefined

IBM SmartCloud Entry's four-click deploy



Power is performance redefined

IBM SmartCloud Entry's four-click deploy



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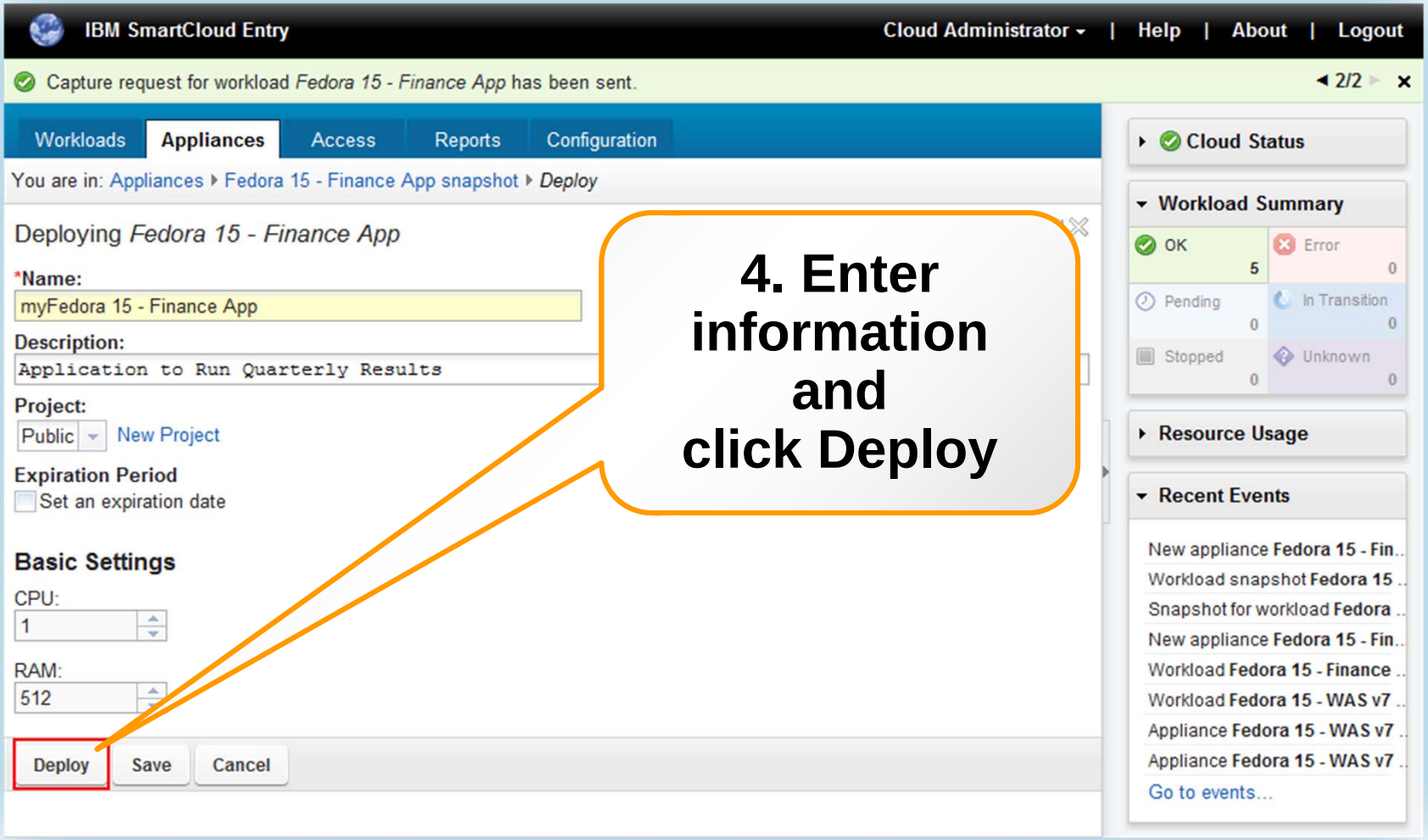

Power is performance redefined

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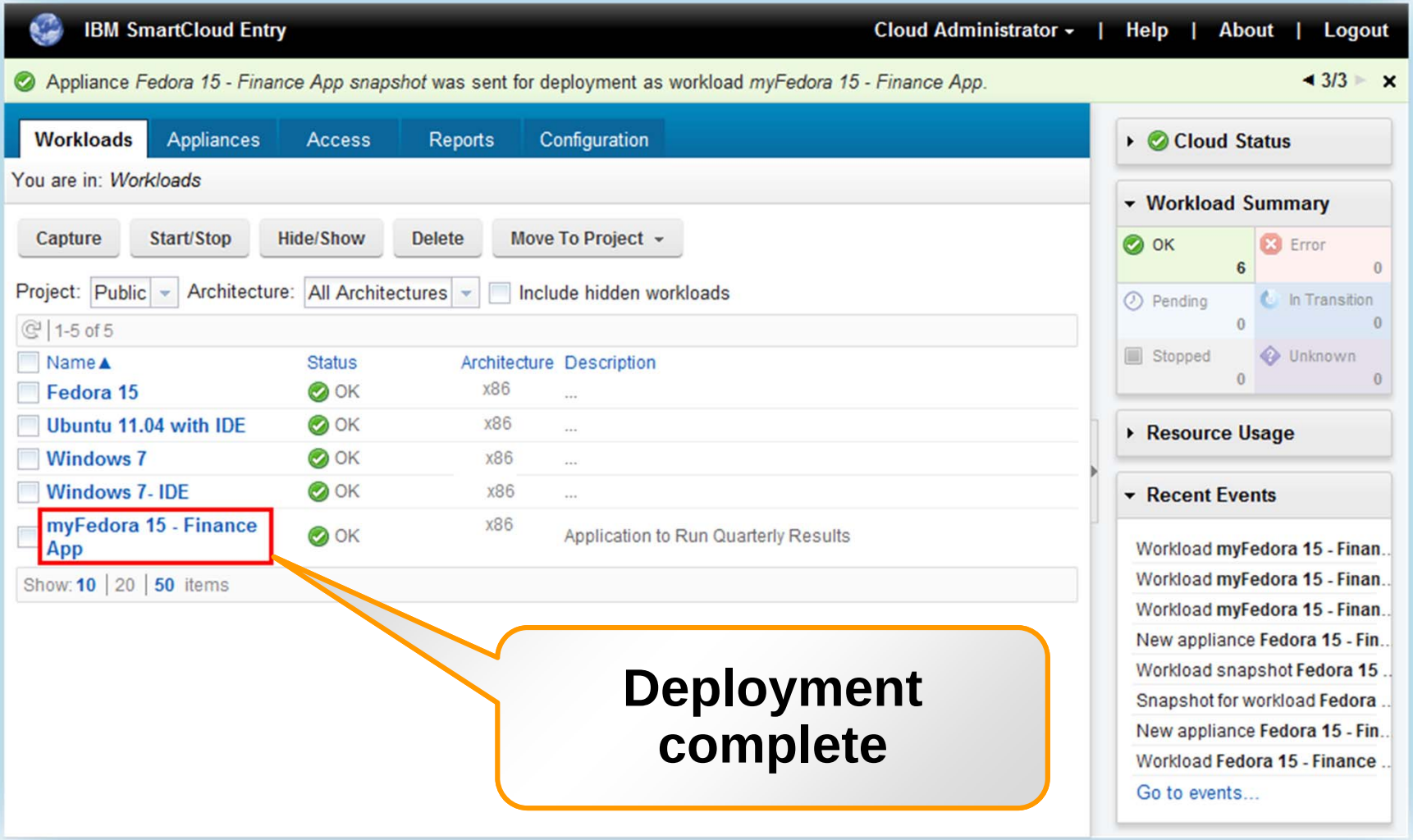


Power is performance redefined

IBM SmartCloud Entry - Budgeting/Accounting, Metering, Approvals

Accounts can be created by admins and users can be associated with an account

- Accounts are charged w/ funds and debited as used
- Charges determined by admin per resource allocated
- Delinquent accounts can be handled via policy (destroy resources, shutdown or do nothing but notify)

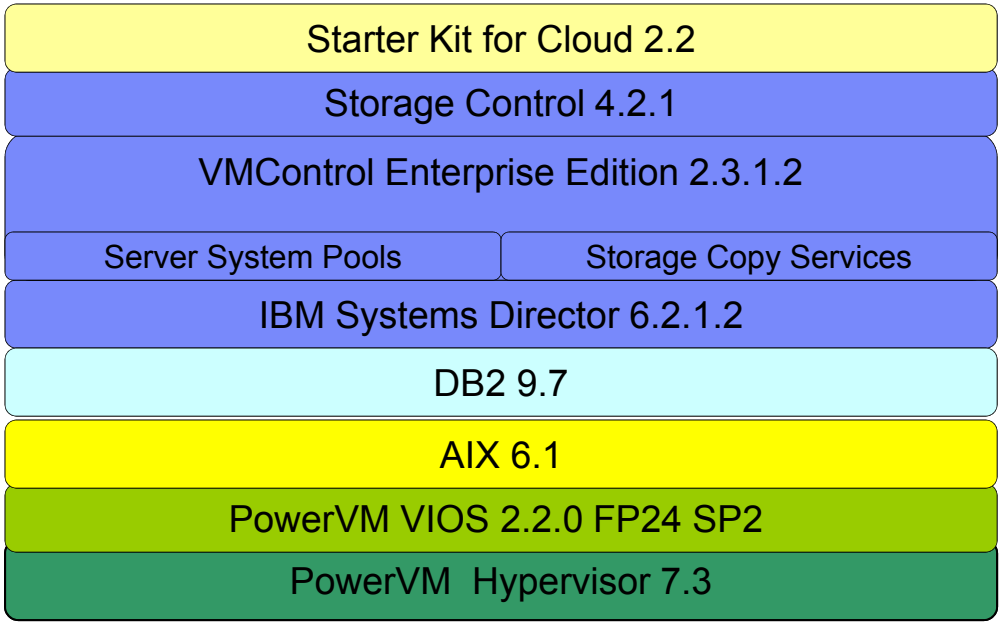
Metering records of allocated resources, state and sizes and who allocated them

- Can be used by external/3rd party reporting tools
- Working to make this directly consumable w/ ITUAM

Approvals can be turned on for new deploys and/or resize operations

- If Enabled, users operation is put in as a request
- Admins get emails and can look at open requests
- Notes can be added to the requests by approver or requestor
- Approver can approve or reject request and can modify parameters during approval
- Requestor can withdraw or resubmit the request

IBM SmartCloud Entry SW architecture and components



Operating systems supported for provisioning on Power

- AIX
- Power Linux (requires Storage Copy Services deployment method)
- IBM i *– coming soon

*All statements regarding IBM's future direction and intent are subject to change or withdrawal without notice, and represent goals and objectives only. Some features require the purchase of additional software components.

IBM SmartCloud Entry for Power Reference Configurations

IBM Starter Kit for Cloud HW Reference Power 740 Rack Based Configuration
p740 Management node, 16 cores, 128GB (8 cores Mgmt, 8 cores Comp)
p740,Compute node 16 cores, 128GB (2 core Mgmt, 14 cores Comp)
Storwize V7000 storage controller with 24 drives - 7TB Min.
Infrastructure System x
HMC
2 - F/C SAN Switch 40 ports
2 - 1 Gb Ethernet Switch
Flat panel with keyboard console and console switch
T42 Rack with 4 PDUs
SKC / SD / VMC / AIX / Power VM

IBM Starter Kit for Cloud HW Reference PS703 BCH Blade Configuration
PS703 Management node, 16 cores, 128GB (7 cores Mgmt 9 cores Comp)
PS703 Compute node, 16 cores, 128GB (1 core Mgmt, and 15 cores Comp)
HS22 x86 infrastructure blade
BCH Chassis 4 - 1 Gb Ethernet Switches 4 - 8 Gb Fibre Channel Switches 2 - MSIMs 2 - AMMs
Storwize V7000 storage controller with 24 drives - 7TB Min
Flat panel with keyboard
B42 Rack with 4 PDUs
SKC / SD / VMC / AIX / Power VM

BladeCenter - http://public.dhe.ibm.com/common/ssi/ecm/en/poo03077usen/POO03077USEN.PDF

Power 740 - http://public.dhe.ibm.com/common/ssi/ecm/en/poo03078usen/POO03078USEN.PDF

Tivoli Service Automation Manager:

Automate requesting, deployment, monitoring and management of cloud computing services

Enable users to **request, deploy, monitor and manage cloud computing services** that leverage all the features of your Power Systems cloud infrastructure **without IT intervention**

- ✓ **Lowers cost of service** delivery through automation and reduced skill requirements
- ✓ **Deploys IT services faster** to meet the increased need for development, test, preproduction and production systems
- ✓ Delivers a **higher degree of standardization and automation** for deployment and management of IT services while reserving skilled IT staff members' time for other high-value tasks
- ✓ Provides **traceable processes and approval routings** to serve as audit trails, and integrates with process governance
- ✓ Offers an **integrated management capability** that addresses the lifecycle changes of a cloud service

More information: http://www.ibm.com/software/tivoli/products/service-auto-mgr/

Tivoli software

IBM Service Delivery Manager for Power Systems

Pre-integrated software solution for advanced cloud solutions

Pre-integrated service management software stack that **automates IT service deployment** and provides **resource monitoring, cost management**, and **availability of services** in a cloud environment

- ✓ Self service portal, standardization and automation help to **reduce complexity and simplify use**
- ✓ **Leverage your existing IT investments** by deploying on your existing Power infrastructure and integrating your existing IT assets as part of your cloud environment
- ✓ Software stack delivered as virtual images and pre-integrated to **improve time to value**
- ✓ **Accelerate deployment** with automated image deployment and activation of components

More information: http://www.ibm.com/software/tivoli/products/service-delivery-manager/

Tivoli software

IBM CloudBurst on Power Systems

Completely integrated advanced cloud solution for the fastest time to value

Completely integrated service management platform with network, servers, storage, software and quickstart services that enable the **fastest time to value**

- ✓ **Deliver services faster via a self service portal** by offering a standardized service catalog and automatically provisioning requested resources
- ✓ **Reduce complexity and risk** through standardization and automation which help to reduce human errors
- ✓ **Lower IT costs** by leveraging automation workflows to provision assets based on business approved policies
- ✓ **Decrease capital expenses** by ensuring optimal utilization of all resources
- ✓ **Scales to the enterprise** with the ability to expand the solution to manage additional platforms and workloads
- ✓ **Enterprise quality of service** by leveraging the Power systems hardware, virtualization and software components

More information: http://www.ibm.com/systems/power/solutions/cloud/cloudburst/

IBM Systems Lab Services & Training Cloud Offerings:

-- Infrastructure, Virtualization, Consolidation & Management

Plan

Identify workloads, build business cases w/
Cloud IT Optimization Assessment
Server, Storage*, Networking*

E2E Solution Architecture, IT Services design w/
Cloud Design Workshop (CDW)
Server, Storage, Networking

Build & Deliver

Implement your Cloud solution based on your requirements from the CDW w/
Implementation Services for SmartCloud Entry
Server, Storage, Networking

Advanced Cloud Implementation Services
Server, Storage, Networking

Training

TT 1SM0: Introduction to Cloud Computing Architecture Overview

TT AN96: IBM Systems Director VMControl 2.3 for Cloud Computing Infrastructure

TT 1SP0: Implementing Power Cloud Components

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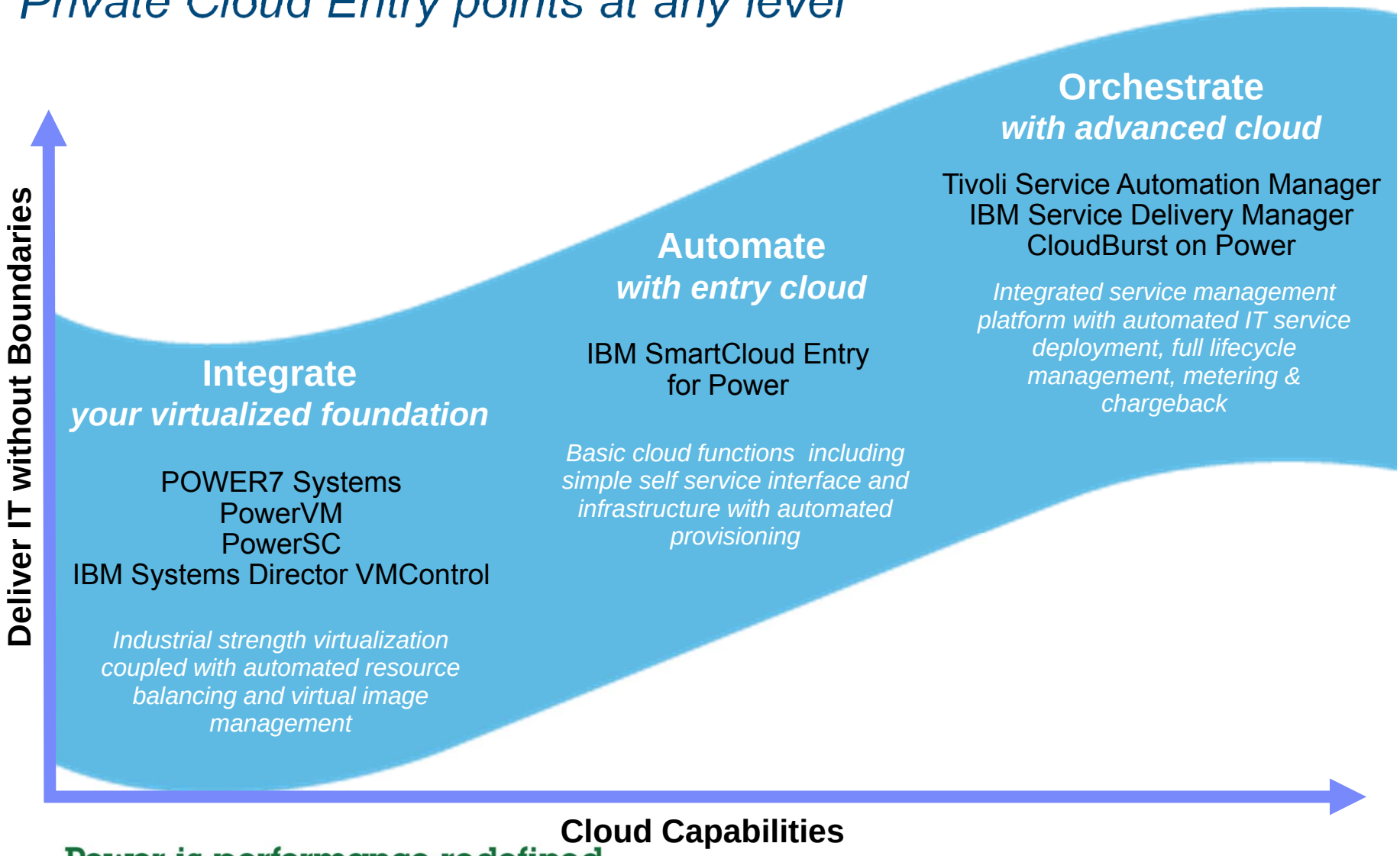
George Henningsen, gehenni@us.ibm.com

Planned releases:
1Q2012 –
1SP1- Configuring ISDM in a Power Systems Cloud
2Q2012 -
1SD0- Designing a Cloud
1SPx- Power SmartCloud Admin
1SX2- Implementing IBM SmartCloud Entry on Power

Power Systems Cloud Solutions

Private Cloud Entry points at any level



Power is performance redefined

Why are Clients moving to Power Systems Cloud Solutions?

Mission critical workloads demand a virtualization solution that can provide Enterprise Quality of Service.

- ✓ **Enhanced Security** – to ensure the highest level of security
- ✓ **Performance** – higher performance per core for optimal application performance & lower SW costs
- ✓ **Availability** – Zero downtime to support those mission critical application workloads
- ✓ **Scalability** – unlimited elastic scaling to meet changing business demands

Power Systems Cloud Solutions offer Enterprise Qualities of Service

Secure

✓ Ensure **enterprise level security** for mission critical workloads with zero Common Vulnerability Exposures reported, unlike VMware

Scalable

✓ **Deliver mission critical virtualized workloads** with ease. PowerVM allows workloads to use 8x the number of CPUs and 7x the memory allowed by VMware

Dynamic

✓ **Maximize resource flexibility** for growing workloads with the ability to dynamically **add & remove VM resources**

Reliable

✓ **Radically reduce downtime** with POWER7 delivering 99.997 percent uptime, >10x more reliable than running Windows or Linux on x86.

* See backup for more information on claims

Performance for China Telecom means implementing a private cloud to deliver services faster at lower cost

- Operating in a highly competitive market, China Telecom needed to reduce time to market for new products and services to seize greater market share. The high cost of floor space and power in data centers was restricting growth.
- Implemented new Power servers, PowerVM & Systems Director VMControl to create a private cloud and to manage virtual system pools
- Improved hardware utilization, cut hardware costs by over 50 percent, cut energy consumption and CO^2 emissions
- Slashed time to market for new business applications from 3-4 months to 2-3 days

*"Our estimate is that the IBM solution has **improved hardware utilization by over 50 percent**, although this may in fact be higher. Sharing resources through the internal cloud has allowed us to consolidate hardware, translating into **50 percent cost savings in terms of servers and storage**."*

Dr. Lifeng Liu, General Manager Assistant in the Network Development Department, China Telecom

China Telecom (Case Study)

Source: IBM POP03111-USEN-00

China Evergrowing Bank

More effective process management with the accounting capability of SmartCloud Entry

Business Challenge

China Evergrowing Bank wanted a solution to automate and simplify their workload deployment efforts, enhance workloads process management. Gaining experience with IBM Power Cloud technology is also a big factor so that they can be prepared to adopt the new Cloud model for their new data center to be established at later 2012.

Solution

IBM PowerVM to consolidate servers and lay out the foundation for Cloud

IBM Systems Director to manage the virtualized environment from a centralized console

IBM SmartCloud Entry solution to automate workload capture and deployment, establish a user self-service portal as well as accounting and billing functions

Benefits

Optimized computing resources and improved server utilization rate

Enhanced workload request/approve/capture/deploy process management and control

Reduced image deploy time from 2-4 weeks to a few hours for the dev/testing workloads

"By using IBM system director, VMControl and SmartCloud Entry, a single portal was introduced to monitor all our power systems, also virtual appliance management such as capture and deploy are totally automatied, which saves us huge efforts. Cloud is a new technology, but also the future trend, we will consider it for our new datacenter"

—Evergrowing Bank

Solution components:

- Power 750 Express; IBM Systems Director Enterprise Editions; PowerVM Enterprise Editions; IBM SmartCloud Entry

恒豐銀行 EVERGROWING BANK

TU München creates a state-of-the-art research environment ... With a smart cloud-enabled infrastructure based on IBM Power Systems

Business challenge:

At the start of each academic session, Technische Universität München (TU München) struggled to complete its systems configuration work cost-effectively, with immense pressure on time and computing resources.

Solution:

The university implemented a fully cloud-enabled infrastructure based on the IBM Power platform that automates many administration tasks and greatly accelerates preparation for the new semester.

Benefits:

- TU München can **provision a new logical partition (LPAR) in 30 minutes – a 90 percent reduction – and provision a new SAP instance in less than half a day.**
- The university replaced 150 Sun servers with two IBM Power servers and two IBM BladeCenter systems, cutting 13 full racks to four half-racks, a saving of 85 percent, and cut energy usage by around 80 percent.
- Migration from MaxDB to DB2 has delivered storage space reductions of approximately 45 percent.

"This innovative and highly efficient SAP and IBM infrastructure offers a great opportunity for TU München to conduct ambitious projects in the important and competitive field of cloud computing research."

— Dr. Holger Wittges, UCC Manager at TU München

Solution components:

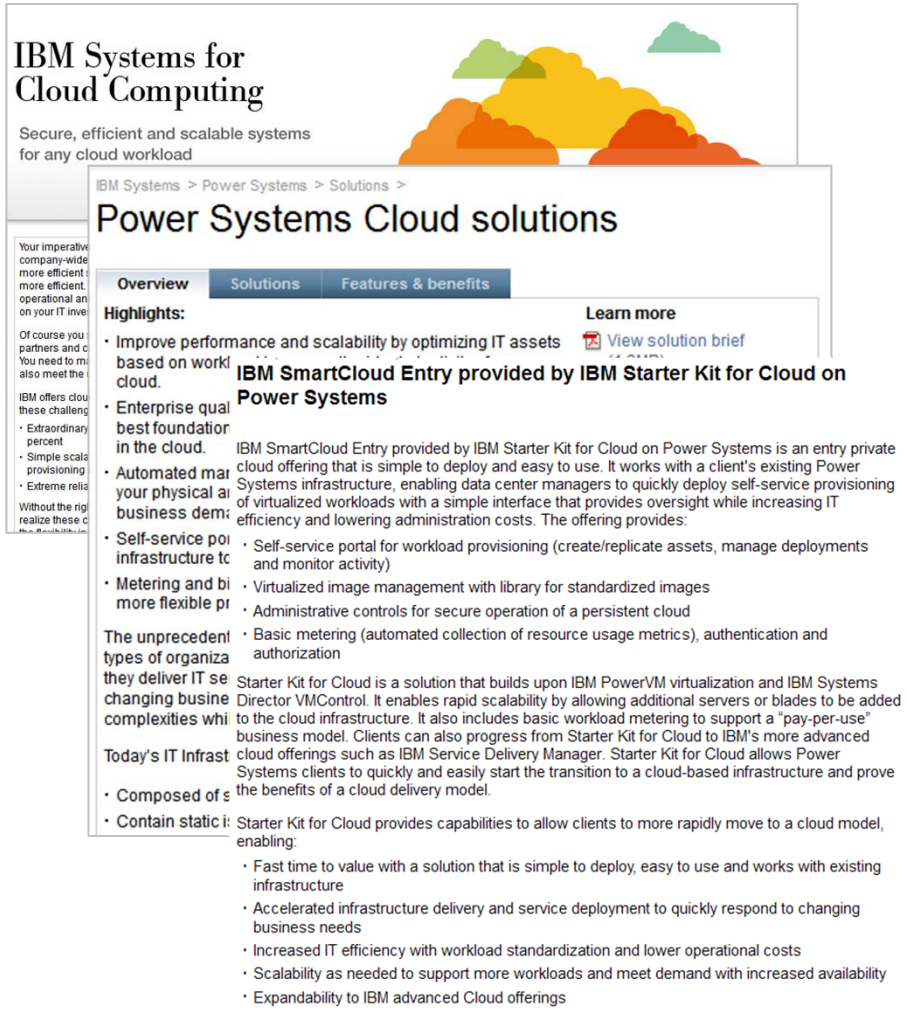
Hardware:
BladeCenter, BladeCenter H Chassis, BladeCenter HX5, BladeCenter PS700 Express, BladeCenter PS701 Express, Power 750, Power Systems, Storage, Storage: XIV

Software:
AIX, Tivoli Service Automation Manager, Tivoli Storage Manager, DB2 for AIX, PowerVM, Tivoli Monitoring

Operating system:
AIX

Technische Universität München,, Case Study, October 2011

Power Cloud on the Web



IBM Systems for Cloud Computing

http://www.ibm.com/systems/cloud/

Power Systems Cloud Solutions

http://www.ibm.com/systems/power/solutions/cloud/

IBM SmartCloud Entry

http://www.ibm.com/systems/power/solutions/cloud/onpower/starterkit.html

Power is performance redefined

Deliver new services faster, with higher quality, and superior economics

Cloud on Power Systems is …

Secure for isolated multi-tenancy of virtual servers

Scalable for your smallest to largest workloads

Dynamic for automated, optimum resource allocation and superior economics

Reliable for enterprise qualities of service across the cloud

PowerVM delivers superior scalability to maximize consolidation and cut IT costs

Scalability Factors	VMware ESX 4.0 *(in VMware vSphere 4.1)*	VMware ESXi 5 *(in VMware vSphere 5)*	PowerVM
Virtual CPUs per VM	8	32	256
Memory per VM	255 GB	1024 GB	8192 GB
Live VMs per server	320	512	1000
CPU threads per server	160	192	1024
Memory per server	1024 GB	2048 GB	8192 GB

Source: http://www.vmware.com/files/pdf/products/vsphere/vmware-what-is-new-vsphere5.pdf

PowerVM delivers superior security to help manage risk and maximize availability

Risk Management Factors	VMware ESX 3.5 *(in VMware Infrastructure 3)*	VMware vSphere 4 & 5	PowerVM
Implementation of virtualization technology	Third-party software add-on	Third-party software add-on	Integrated into server firmware
Isolation of I/O drivers from hypervisor	No	No	Yes (using VIOS)
Built-in cross-platform virtualization support	No	No	Yes (using PowerVM Lx86)
Live migration across processor generations	No	Some (with Intel FlexMigration)	Yes (Power6-Power7)

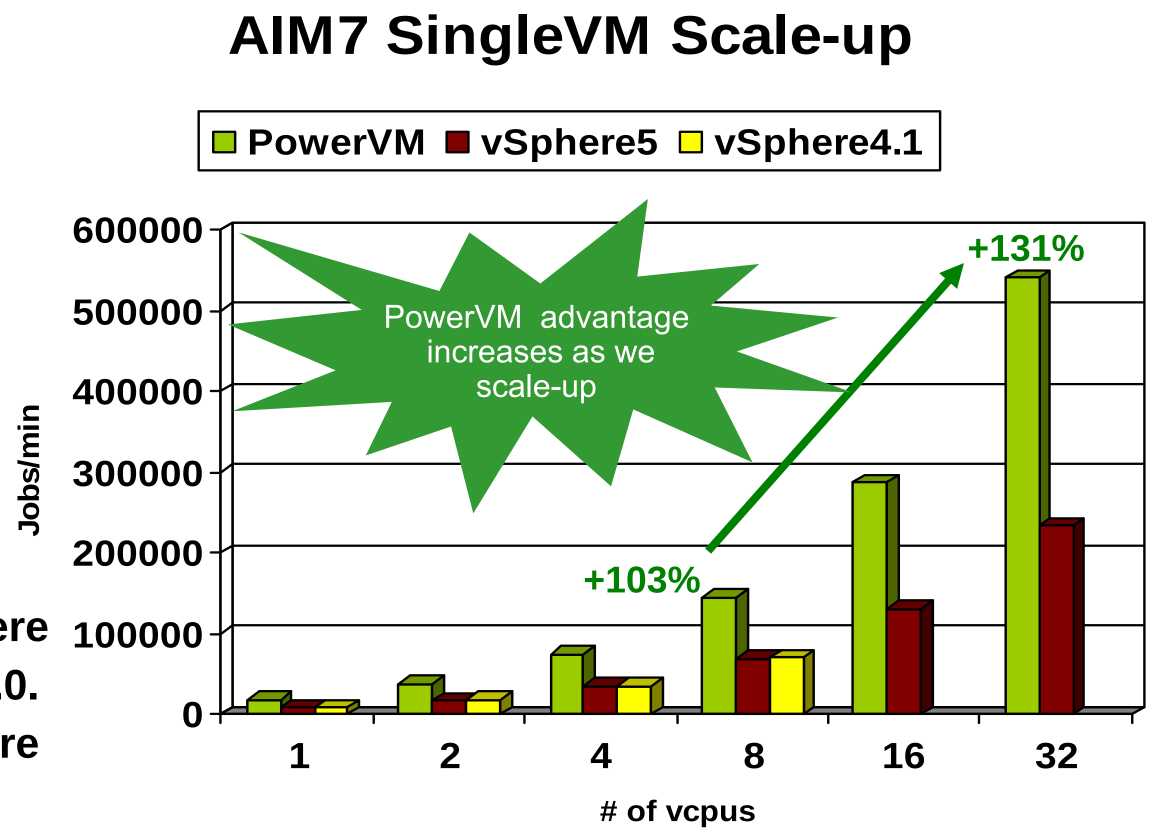
Source: http://www.vmware.com/files/pdf/products/vsphere/vmware-what-is-new-vsphere5.pdf

PowerVM on POWER7 delivers better scale-up and higher throughput performance than VMware vSphere

131%

PowerVM on Power 750 delivers superior scale-up efficiency that outperforms vSphere 5.0 by up to 131%, running the same workloads across virtualized resources.

PowerVM is 103% better than vSphere 4.1 and 131% better than vSphere 5.0. vSphere 5.0 is no better than vSphere 4.1.



PowerVM

Power 750
32 cores (8cores/chip)

HP Proliant DL580 G7 (Westmere EX)
Xeon E7 – 4870 40 cores (10 cores/chip)

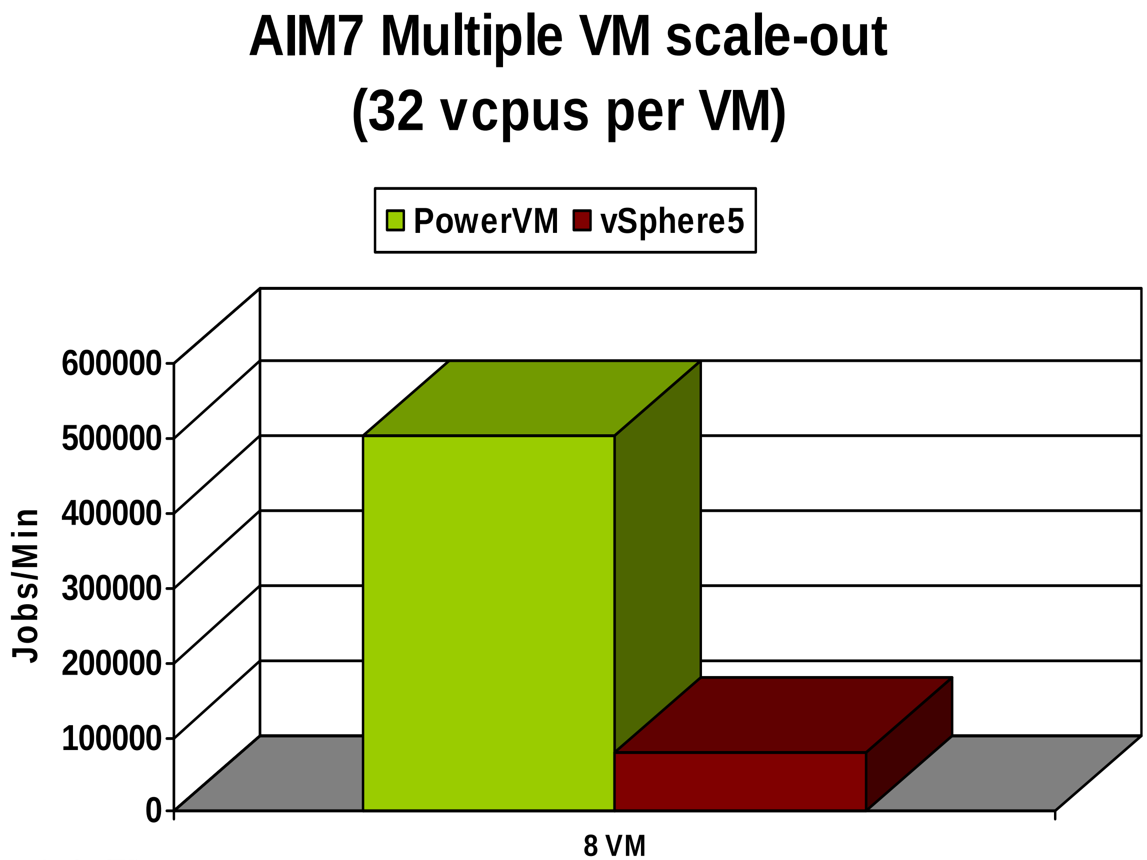
* “A Comparison of PowerVM and VMware vSphere(4.1&5.0) Virtualization Performance”, January 2012
https://www14.software.ibm.com/webapp/iwm/web/signup.do?source=stg-web&S_PKG=us-en-po-ar-edison&S_CMP=web-ibm-po-_-ws-powervm

PowerVM on POWER7 delivers better scale-out and higher throughput performance than VMware vSphere

525%

PowerVM on Power 750 outperforms VMware by up to 525% when running multiple VM's and workloads.

PowerVM maximizes workload performance and all system resources. vSphere 5.0 has more cores but still can't compete with PowerVM.



Power 750
32 cores (8cores/chip)

HP Proliant DL580 G7 (Westmere EX)
Xeon E7 – 4870 40 cores (10 cores/chip)

* "A Comparison of PowerVM and VMware vSphere(4.1&5.0) Virtualization Performance", January 2012
https://www14.software.ibm.com/webapp/iwm/web/signup.do?source=stg-web&S_PKG=us-en-po-ar-edison&S_CMP=web-ibm-po-_-ws-powervm

PowerVM delivers firmware-based security

- Unlike x86-based products such as VMware, the PowerVM hypervisor is secure by design. IBM is the only vendor that has designed the virtualized environment from 'bare metal' through the hypervisor.
- PowerVM hypervisor is part of the digitally-signed firmware with strong cryptography which makes it impossible to remotely install a modified fileset into the EPROMs of Power Systems.
- There are zero vulnerabilities reported against PowerVM by US CERT or by MITRE Corporation
- PowerVM is certified at a CC Evaluated Assurance Level 4+

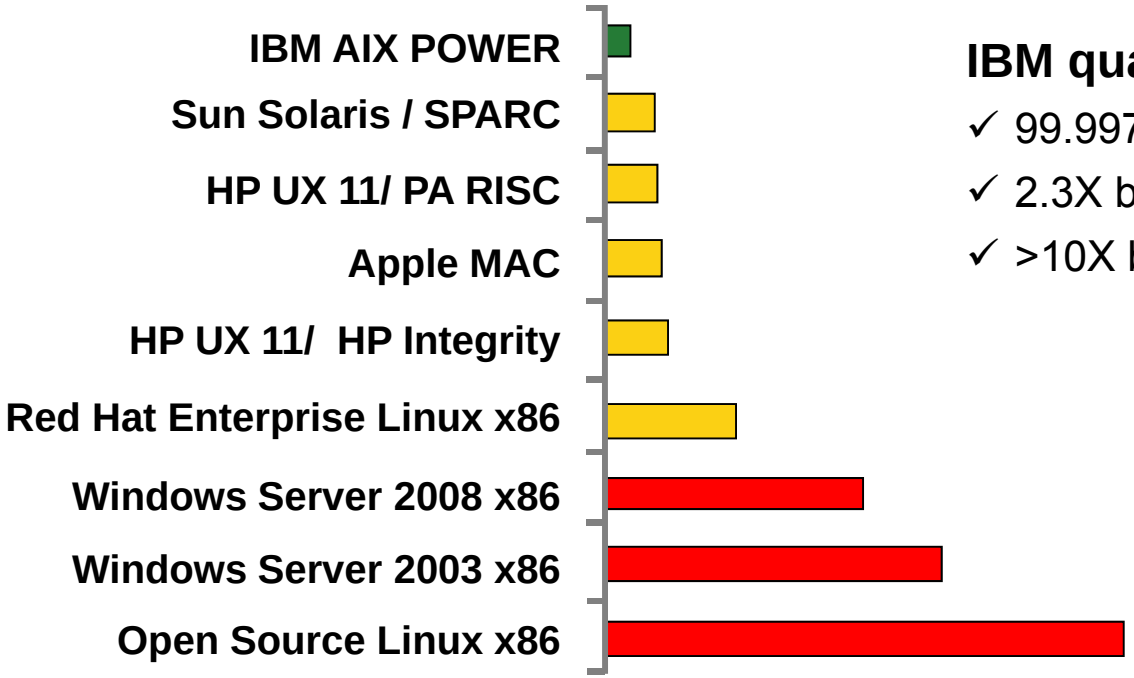
Remember, zero is a number too …
a very good number in the Security domain.

Power is the most reliable enterprise platform

54% of IT executives and managers say that they require 99.99% or better availability for their applications

PowerVM™

Downtime (Hours per Year)



IBM quality of service

- ✓ 99.997% uptime*
- ✓ 2.3X better than next UNIX
- ✓ >10X better than x86-based platforms

POWER7 BUILT ON Power™

*Source: ITIC 2009 Global Server Hardware & Server OS Reliability Survey Results, July 7, 2009. Fully paper is available at ibm.com/aix

Power Systems deliver superior RAS capabilities

RAS Feature	Power Systems	x86
Application/Partition RAS		
Live Partition Mobility (vMotion)	Yes	Yes
Live Application Mobility	Yes	No
Partition Availability priority	Yes	No
System RAS		
OS independent First Failure Data Capture	Yes	No
Memory Keys (including OS exploitation)	Yes	No
Processor RAS		
Processor Instruction Retry	Yes	No
Alternate Processor Recovery	Yes	No
Dynamic Processor Deallocation	Yes	No
Dynamic Processor Sparing	Yes	No
Memory RAS		
Chipkill™	Yes	Yes
Survive Double Memory Failures	Yes	No
Selective Memory Mirroring	Yes	No
Redundant Memory	Yes	Yes
I/O RAS		
Extended Error Handling	Yes	No
I/O Adapter Isolation (PCI-Bus and TCEs)	Yes	No

See the following URLs for addition details:
http://www-03.ibm.com/systems/migratetoibm/systems/power/availability.html
http://www-03.ibm.com/systems/migratetoibm/systems/power/virtualization.html

Starter Kit for Cloud Capabilities

Create Images

- **Easily create** new golden master images and software "appliances" using corporate standard OS
- **Convert images** from physical systems or between various x86 hypervisors to use cheaper tooling
- **Reliably track** images to ensure compliance and minimize security risks
- **Conserve resources**, reducing both the number of images and the storage required for them

Deploy VMs

- **Deployment** of application images across compute and storage resources
- **End user self service** for improved responsiveness
- **Ensure security** through resource and VM isolation, project-level user access controls
- **Easy to use** - no need to know all the details of the infrastructure
- **Protect your investment** through full support of your current virtualization environment
- **Optimize performance** on IBM systems with dynamic scaling, expansive capacity and continuous operation

Operate Your Cloud

- **Delegate provisioning** to authorized 'users' to improve productivity
- **Maintain full oversight** to ensure an optimally running and safe Cloud through automated approval / rejection
- **Standardize deployment** and configuration to improve compliance and reduce errors by setting policies, defaults and templates
- **Simplify administration** with an intuitive interface for managing projects, users, workloads, resources, budgeting, approvals & metering

Simplify storage of thousands of images

35:1 Slash time to market for new apps from four months to just two or three days

Cut costs with efficient operation

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Revised September 26, 2006

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Revised December 2, 2010

Notes on benchmarks and values

The IBM benchmarks results shown herein were derived using particular, well configured, development-level and generally-available computer systems. Buyers should consult other sources of information to evaluate the performance of systems they are considering buying and should consider conducting application oriented testing. For additional information about the benchmarks, values and systems tested, contact your local IBM office or IBM authorized reseller or access the Web site of the benchmark consortium or benchmark vendor.

IBM benchmark results can be found in the IBM Power Systems Performance Report at http://www.ibm.com/systems/p/hardware/system_perf.html .

All performance measurements were made with AIX or AIX 5L operating systems unless otherwise indicated to have used Linux. For new and upgraded systems, the latest versions of AIX were used. All other systems used previous versions of AIX. The SPEC CPU2006, LINPACK, and Technical Computing benchmarks were compiled using IBM's high performance C, C++, and FORTRAN compilers for AIX 5L and Linux. For new and upgraded systems, the latest versions of these compilers were used: XL C for AIX v11.1, XL C/C++ for AIX v11.1, XL FORTRAN for AIX v13.1, XL C/C++ for Linux v11.1, and XL FORTRAN for Linux v13.1.

For a definition/explanation of each benchmark and the full list of detailed results, visit the Web site of the benchmark consortium or benchmark vendor.

TPC	http://www.tpc.org
SPEC	http://www.spec.org
LINPACK	http://www.netlib.org/benchmark/performance.pdf
Pro/E	http://www.proe.com
GPC	http://www.spec.org/gpc
VolanoMark	http://www.volano.com
STREAM	http://www.cs.virginia.edu/stream/
SAP	http://www.sap.com/benchmark/
Oracle, Siebel, PeopleSoft	http://www.oracle.com/apps_benchmark/
Baan	http://www.ssaglobal.com
Fluent	http://www.fluent.com/software/fluent/index.htm
TOP500 Supercomputers	http://www.top500.org/
Ideas International	http://www.ideasinternational.com/benchmark/bench.html
Storage Performance Council	http://www.storageperformance.org/results

Revised December 2, 2010

Notes on performance estimates

rPerf for AIX

rPerf (Relative Performance) is an estimate of commercial processing performance relative to other IBM UNIX systems. It is derived from an IBM analytical model which uses characteristics from IBM internal workloads, TPC and SPEC benchmarks. The rPerf model is not intended to represent any specific public benchmark results and should not be reasonably used in that way. The model simulates some of the system operations such as CPU, cache and memory. However, the model does not simulate disk or network I/O operations.

- rPerf estimates are calculated based on systems with the latest levels of AIX and other pertinent software at the time of system announcement. Actual performance will vary based on application and configuration specifics. The IBM eServer pSeries 640 is the baseline reference system and has a value of 1.0. Although rPerf may be used to approximate relative IBM UNIX commercial processing performance, actual system performance may vary and is dependent upon many factors including system hardware configuration and software design and configuration. Note that the rPerf methodology used for the POWER6 systems is identical to that used for the POWER5 systems. Variations in incremental system performance may be observed in commercial workloads due to changes in the underlying system architecture.

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CPW for IBM i

Commercial Processing Workload (CPW) is a relative measure of performance of processors running the IBM i operating system. Performance in customer environments may vary. The value is based on maximum configurations. More performance information is available in the Performance Capabilities Reference at: www.ibm.com/systems/i/solutions/perfmgmt/resource.html

Revised April 2, 2007