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Looking into the Cloud

WAVV 2010

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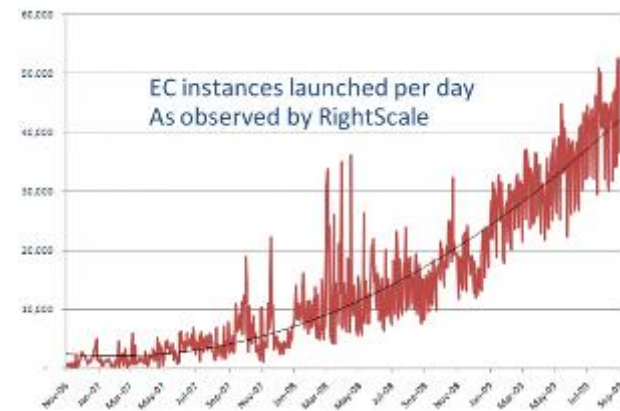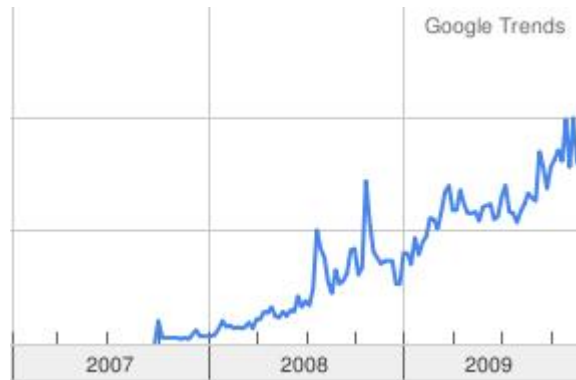
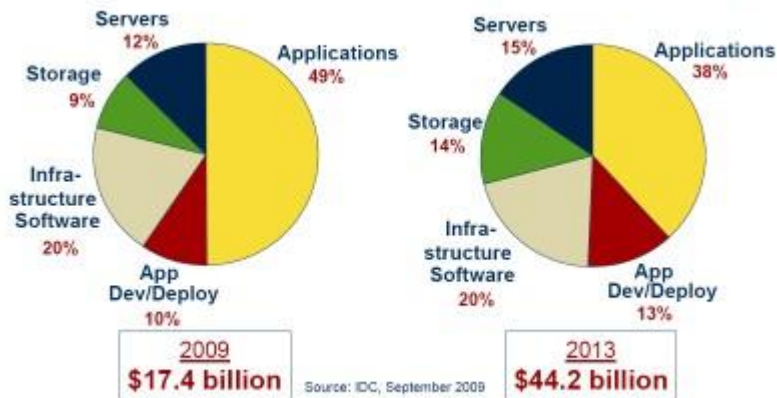# Agenda

An introduction into Cloud computing

§ What's driving the interest in Cloud computing?

§ What is the market saying?

§ Cloud delivery models

§ Definitions – pick your own!

§ Self-service

§ Cloud services

§ Architecture model for Cloud computing

§ Cloud services example

§ Cloud computing economics

§ Pro's and con's – three perspectives (business, user, and service provider)

Cloud Computing: Hottest Topic in the Industry…

Google Trends

2007 2008 2009

EC instances launched per day
As observed by RightScale

Worldwide IT Cloud Services Revenue* by Product/Service Type

Servers 12%
Storage 9%
Infra-structure Software 20%
App Dev/Deploy 10%
Applications 49%

2009 $17.4 billion

Servers 15%
Storage 14%
Infra-structure Software 20%
App Dev/Deploy 13%
Applications 38%

2013 $44.2 billion

Source: IDC, September 2009

Technologies You Can't Afford to Ignore

Top 10 Strategic Technology Areas for 2009	Top 10 Strategic Technology Areas for 2010
1. Virtualization	1. Cloud Computing
2. Business Intelligence	2. Advanced Analytics
3. Cloud Computing	3. Client Computing
4. Green IT	4. IT for Green
5. Unified Communications	5. Reshaping the Data Center
6. Social Software and Social Networking	6. Social Computing
7. Web-Oriented Architecture	7. Security Activity Monitoring
8. Enterprise Mashups	8. Flash Memory
9. Specialized Systems	9. Virtualization for Availability
10. Servers — Beyond Blades	10. Mobile Applications

Modified for 2010   New for 2010   Dropped for 2010

Gartner.

IBM

IT infrastructure is reaching a breaking point

85% idle

In distributed computing environments, up to 85% of computing capacity sits idle.

1.5x

Explosion of information driving 54% growth in storage shipments every year.

70¢ per $1

70% on average is spent on maintaining current IT infrastructures versus adding new capabilities.
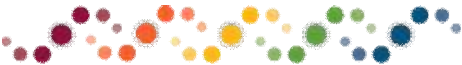
40 billion

Consumer product and retail industries lose about $40 billion annually, or 3.5 percent of their sales, due to supply chain inefficiencies.
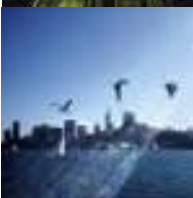
33%

33% of consumers notified of a security breach will terminate their relationship with the company they perceive as responsible.

CEO's see dramatic change ahead

Cloud Computing and SaaS are viewed as the key catalysts for these changes

	2008 CEO Directions	*CIO Implications*
HUNGRY FOR CHANGE	*83% expect substantial change in the next three years*	**Flexible, adaptable, extendible systems to support business model changes**
INNOVATIVE BEYOND CUSTOMER IMAGINATION	*76% see opportunity in more informed and collaborative customers*	**Collaboration & social networking to improve idea/information sharing**
GLOBALLY INTEGRATED	*75% are actively entering new markets*	**Embrace emerging technologies**
DISRUPTIVE BY NATURE	*69% are planning some type of business model innovation over the next three years*	**Manage increasing risk**
GENUINE, NOT JUST GENEROUS	*69% believe rising customer expectations of corporate social responsibility will positively impact their business*	**Deliver on Green IT**

So what is the market saying about cloud computing?

Familiarity with Cloud Computing varies significantly by country – highest in Germany and France, moderate in the US, and much lower in India.

Familiarity With What "Cloud Computing" Is
(Based on 0-10 scale where 0 is weaker and 10 is stronger)

USA
32% | 48% BC | 20% B

Germany
62% AD | 30% | 8%

France
57% AD | 33% | 10%

India
20% | 35% | 45% ABC
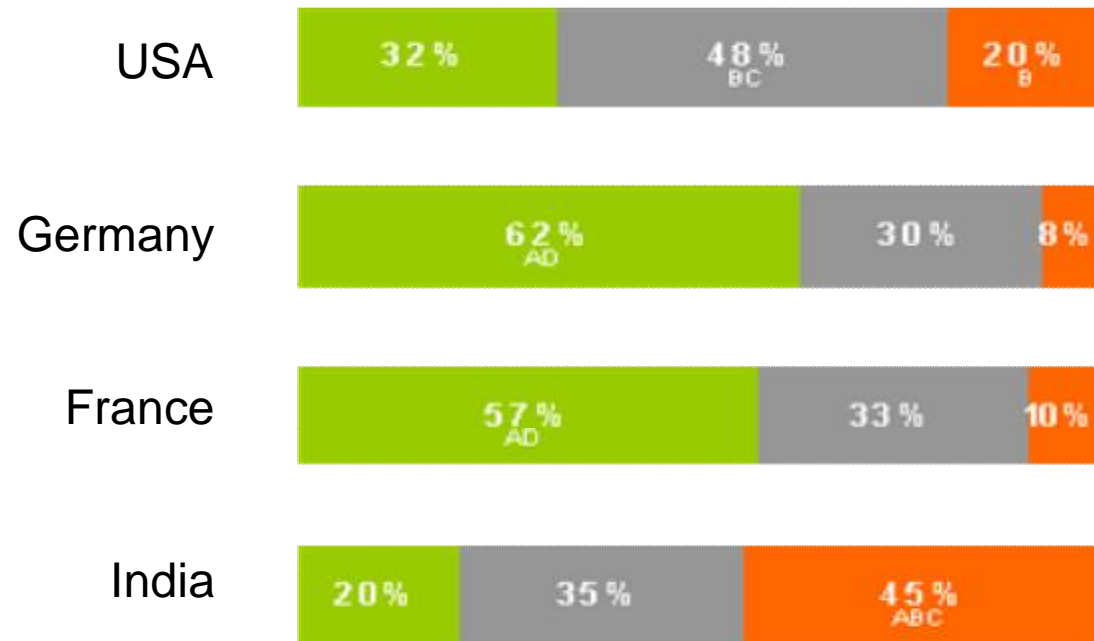
A/B/C/D = Statistically significant at 90% confidence level between countries.
Q.1:   Using a 0-10 scale, how familiar are you with the term "Cloud Computing"?
Q.2:   How familiar are you with what Cloud Computing is, including its key characteristics as described?

IBM

There is nearly universal interest in Cloud computing – 40% use Cloud computing today and nearly all are interested in using it in the future.

§ Consistent with higher familiarity, stated usage is highest in Germany and France; "Not using but likely" is highest in the US, perhaps reflective of an imminent adoption spike.

Current/ Anticipated Usage Of Cloud Computing

	Used in Several Parts of the Company	Used in Certain Parts of the Company	NOT Used, but plan to in next 12 months	NOT Used, but likely to investigate in the future	NOT Used, and NOT likely to in the future	Unsure of plans
Total	13%	27%	21%	27%	5%	6%
US (A)	10%	12%	13%	55%[BCD]	5%	5%
Germany (B)	22%[AD]	42%[AD]	20%	13%	2%	2%
France (C)	13%	40%[AD]	30%[A]	8%	5%	2%
India (D)	7%	17%	20%	32%[BC]	8%	16%[ABC]
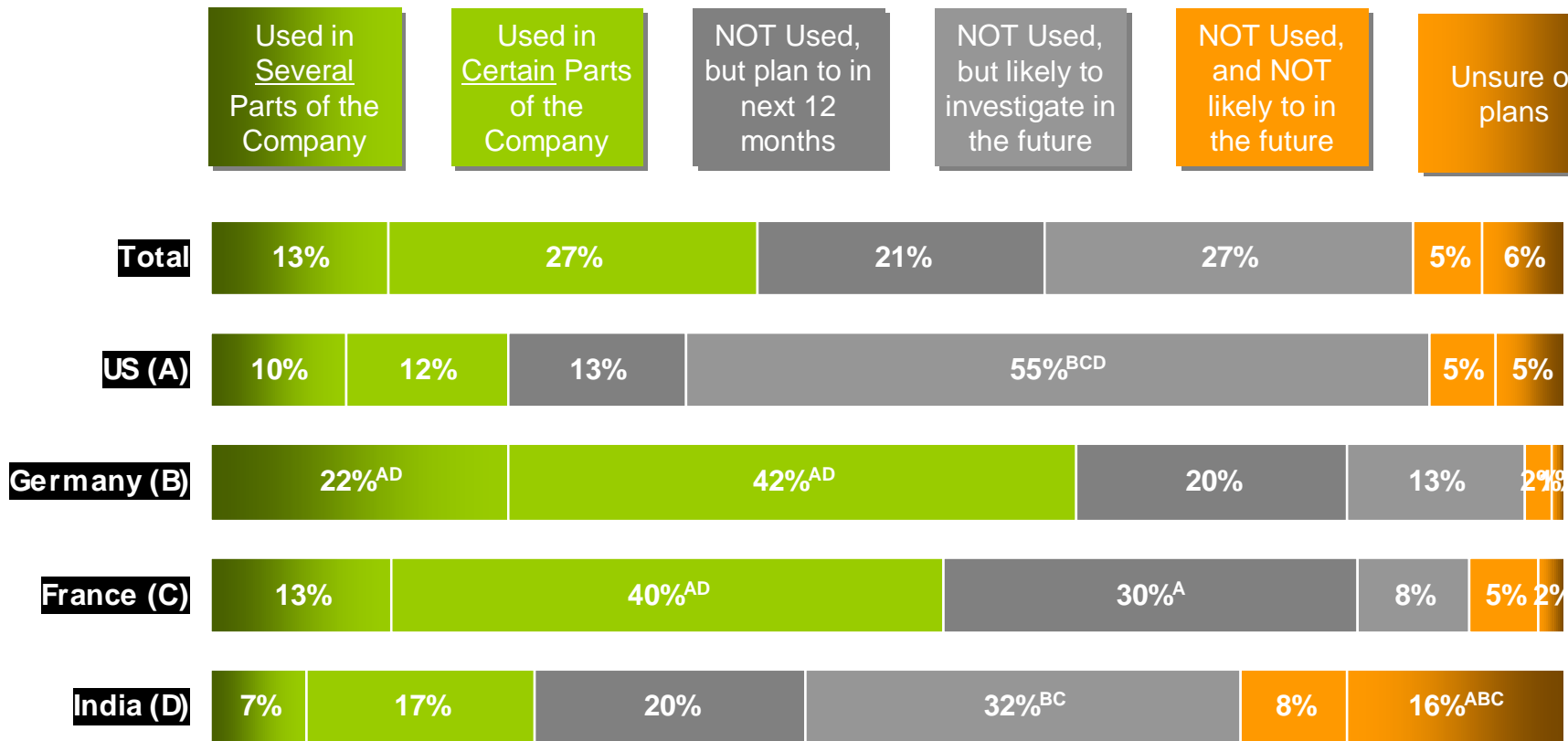
A/B/C/D = Statistically significant at 90% confidence level between countries.
Q.3:   Which of the following best described how you see Cloud Computing being used at your company?

Managing Cloud Adoption

§ **Cloud economics look compelling**

– Small companies will adopt as reliable, easy-to-use services are available

– Scale economics are within reach of many enterprises

§ **Client migration will be work load driven**

– Trade-off is value vs. risk of migration

– Workload characteristics are critical

– New workloads will emerge as cloud makes them affordable (e.g. pervasive analytics, Smart Healthcare)

Enterprise Cloud Opportunity Projections
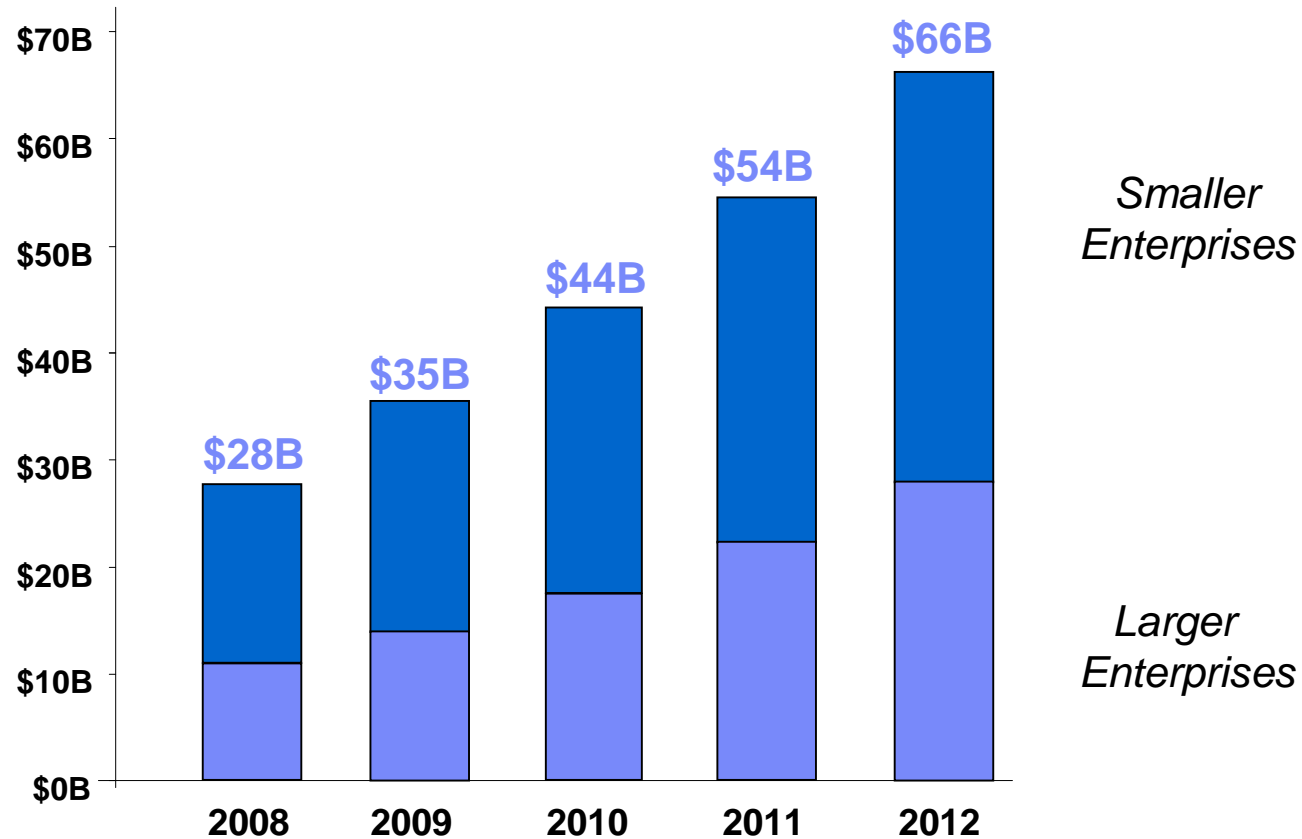
A majority of the $66B cloud opportunity lies within smaller enterprises, but most of the enablement is in larger enterprises

Enterprise Cloud Opportunity
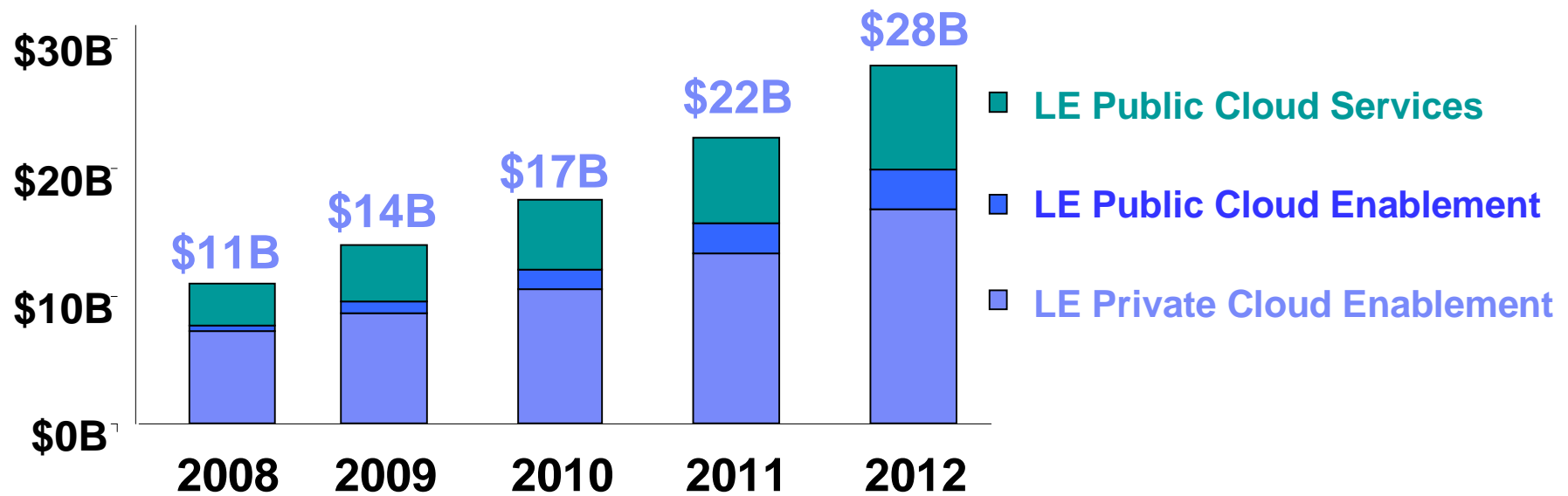
Source: IBM analysis of IT industry analyst reports

More than 40% of the market opportunity for cloud computing is expected to be spent by large enterprises

Business and Technology issues are driving clients to leverage new IT delivery models such as Cloud Computing

Uncontrolled IT Management Spend

Increasing demands on IT to enable new business models

Increasing IT complexity

Drivers of Cloud Computing

Cost Control

Explosion of internet connected devices

Speed of Business Change
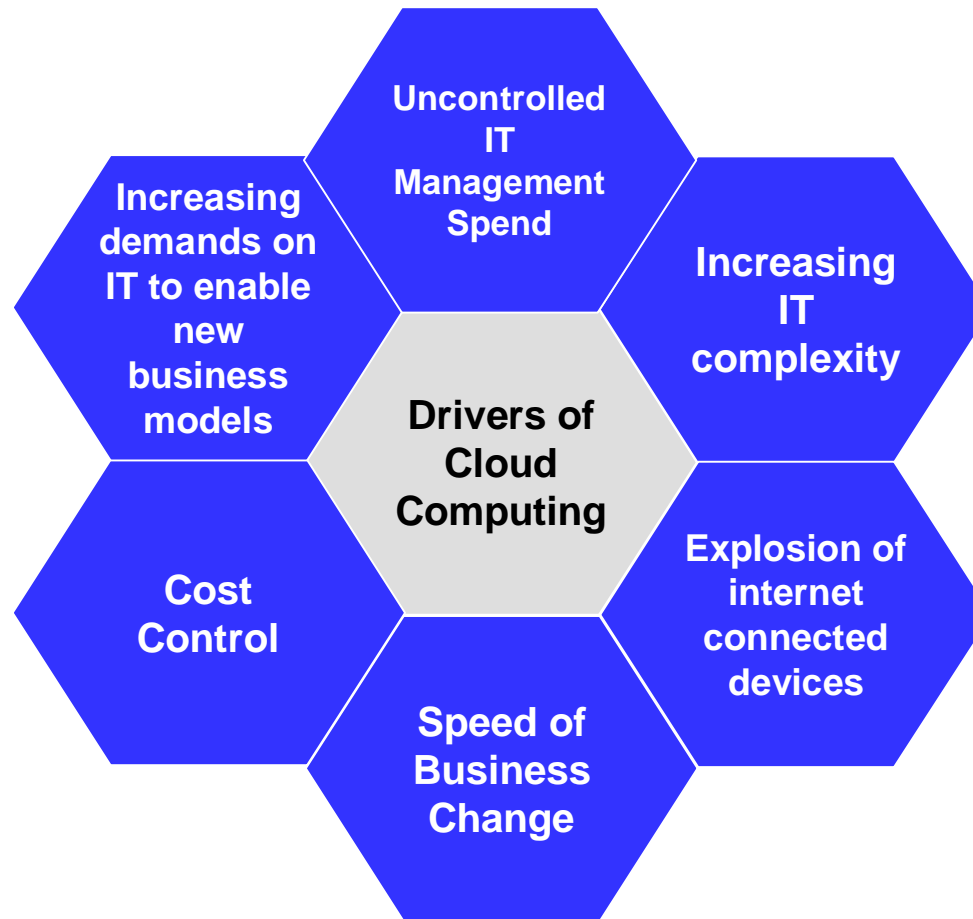
Three Cloud delivery models deliver workload services

Enterprise

Traditional enterprise IT

Private cloud

Public clouds
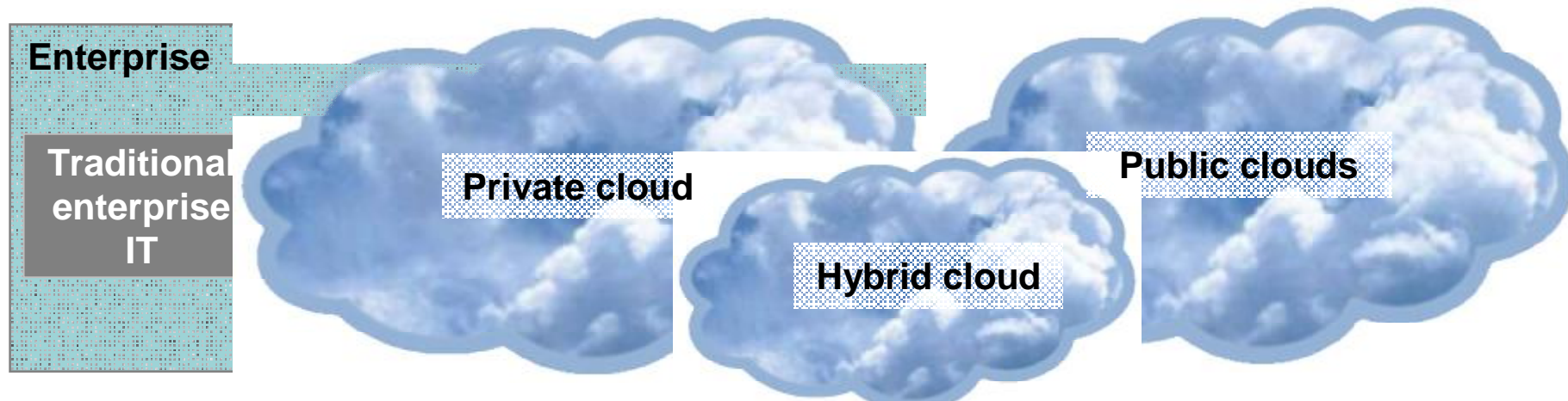
Hybrid cloud

Private cloud

Workloads are provided "as a service," over an intranet, within the enterprise and behind the firewall

Hybrid cloud

Internal and external service delivery methods are integrated activities/functions

Public cloud

Workloads are provided "as a service," over the Internet

§ *Clients prefer private clouds - 64% over public or hybrid clouds, however appeal of public and hybrid cloud is growing.**

§ *Concerns about security and privacy of company data represent the most significant barrier to public cloud services.**

Source: IBM Market Insights, *Cloud Computing Research*, July 2009. n=1,090

Is cloud computing really new?   Yes, and no.

Cloud computing is a **new consumption and delivery model** inspired by consumer Internet services.

Cloud computing exhibits the following 5 key characteristics:

- On-demand self-service
- Ubiquitous network access
- Location independent resource pooling
- Rapid elasticity
- Pay per use

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Quotes to Cloud Computing

Oracle CEO: Larry Ellison, quoted in the Wall Street Journal, September 26, 2008

The interesting thing about Cloud Computing is that we've redefined Cloud Computing to include everything that we already do. . . . I don't understand what we would do differently in the light of Cloud Computing other than change the wording of some of our ads.

Hewlett-Packard VP: Andy Isherwood, quoted in ZDnet News, December 11, 2008

A lot of people are jumping on the [cloud] bandwagon, but I have not heard two people say the same thing about it. There are multiple definitions out there of "the cloud."

A Berkeley View of Cloud Computing

§ Cloud Computing refers to both the **applications delivered as services** over the Internet and the **hardware and systems software in the datacenters** that provide those services.

§ The services themselves have long been referred to as Software as a Service (**SaaS**), so we use that term. The **datacenter** hardware and software is what we will call a Cloud.

§ Google AppEngine, Amazon EC2, Microsoft's Azure: Platform as a Service (**PaaS**)

Cloud Computing - Definition from **IBM BlueCloud** Architecture Board

It is a user experience and a business model

- Cloud computing is an emerging style of computing in which applications, data, and IT resources are provided as services to users over the network.

It is a infrastructure management methodology

- Cloud computing is way of managing large numbers of highly virtualized resources such that from a management perspective, they resemble a single large resource. This can then be used to deliver services.

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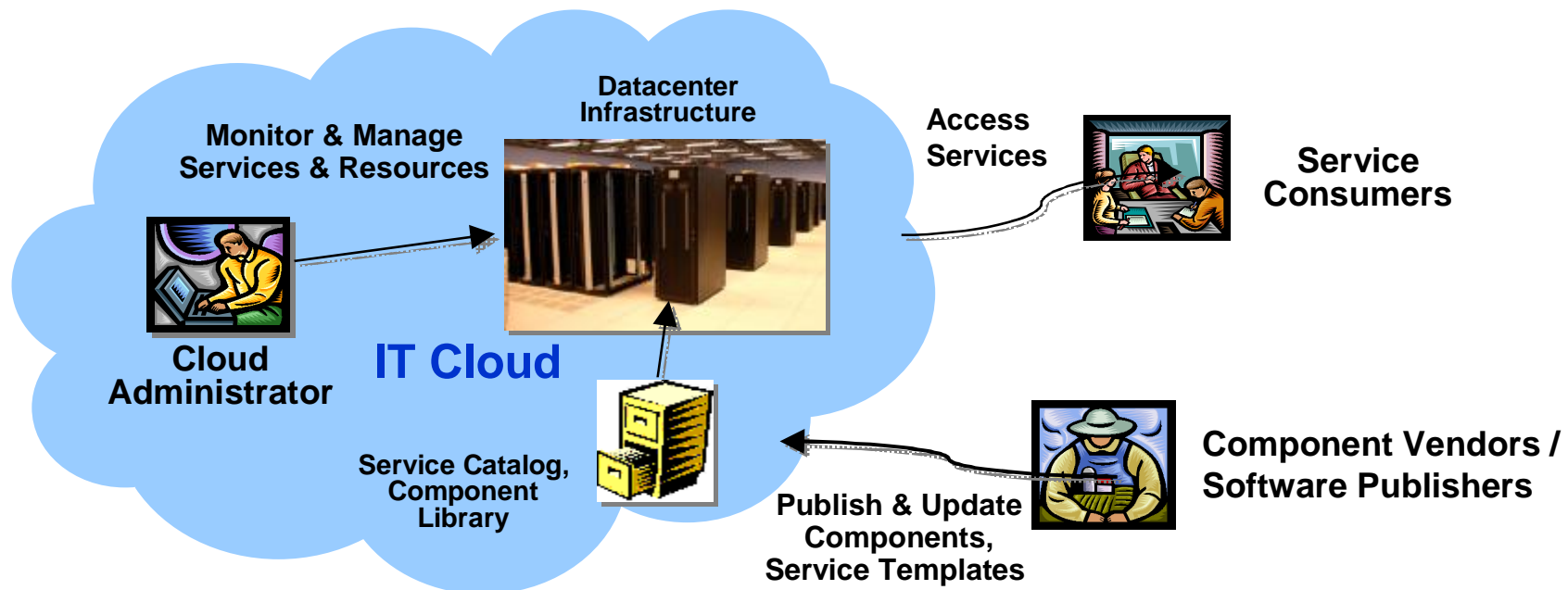
Cloud computing is about enabling the end user to help themselves

A user experience and a business model

§ Standardized offerings

§ Rapidly provisioned

§ Flexibly priced

§ Ease of access

An infrastructure management and services delivery method

§ Virtualized resources

§ Managed as a single large resource

§ Delivering services with elastic scaling

Similar to Banking ATMs and Retail Point of Sale, Cloud is Driven by:

§ Self-Service

§ Economies of Scale

§ Technology Advancement

Banking

IT

Retail

IBM

"Self-service" Drives Process Standardisation

End Users	Service Portal	Service Request Catalog	Provisioning Engine § Workflows § Expert Systems § Scripts

Provisioning Engine
§ Workflows
§ Expert Systems
§ Scripts

Optional Service Modules
§ e.g. Metering/ Usage Billing, Monitoring, etc.

Virtualized Cloud Infrastructure

Benefits:

§ Lower cost

§ Ease-of-use and access

§ Lower compliance overhead

§ Process transformation

IBM

Provision a Test Server

Tester

(1) The Tester creates a new project

List of Services:
§ Create a new Test Server
§ Create a WebSphere Cluster

Selects "Create a new Test Server"

(2)

Images:
§ Internal Web Apps
§ Account Opening Apps

Selects the image based on the type of application to be tested

(3)

Server
§ # CPUs
§ Memory
§ Storage

Changes some of the Server defaults

(4)

Submits Request

(5)

notification

Admin

(6) Approves the request

Automatic Provisioning

notification

Tester

(7) Uses the Server to test the application

Virtual Server

Software Stack

OS

System is de-provisioned when testing is complete (8)

Lifecycle of a Cloud Service

Service Offering Subscription & Instantiation

•Select Service, specify parameters and SLA's
•Automatically instantiate the Service

Service Offering Creation & Registration

•Define Service based on Template and register it in the Catalog

Service Template Definition

•Create Build- and Management Plans for Service

Subscriber (e.g. Line of Business)

Service Catalog Manager

IBM / ISV / IT Dept

Subscription & Instantiation

Service Transition

Production

Offering

Service Operations

Cloud Service

Definition

Service Design

Termination

Service Management Platform
Common Resource Pools

Administrator / SLM

Manual or Autonomic Execution of Management Plans leveraging Automation and Virtualization

Ensure SLA Conformance

Subscriber (e.g. Line of Business)

Service Instance Termination

Destroy Service and free up resources

22

The Architectural View of Cloud Computing

Service Request & Operations

IT Infrastructure & Application Provider

Service Creation & Deployment

End User Requests & Operators

Datacenter Infrastructure

Access Services

Service Catalog, Component Library

Cloud Administrator

Virtual Image Management

Design & Build

Image Library (Store)

Deployment

Operational Lifecycle of Images

. . .

Service Catalog Request UI Operational UI

Service Management

Standards Based Interfaces

Optimized Middleware

Standards Based Interfaces

Virtualized Infrastructure

IBM

Architectural Model for Cloud Computing

Service Request & Operations

IT Infrastructure & Application Provider

Service Creation & Deployment

End User Requests & Operators

. . .

Service Catalog Request UI Operational UI

Service Management

User Request Management/Self Service Portal

Service Lifecycle Management

Image Lifecycle Management	Provisioning	Performance Management	Availability/Backup/ Restore
Security: Identity, Access, Integrity, Isolation, Audit & Compliance		Usage Accounting	License Management

Service Oriented Architecture	*Information Architecture*

Optimized Middleware

Virtualized Infrastructure and Ensembles

IBM Systems Director and Ensemble Manager

Server Virtualization	Storage Virtualization	Network Virtualization

System Resources

SMP Servers	Blades	Storage Servers	Storage	Network Hardware

Virtual Image Management

Design & Build

Image Library (Store)

Deployment

Operational Lifecycle of Images

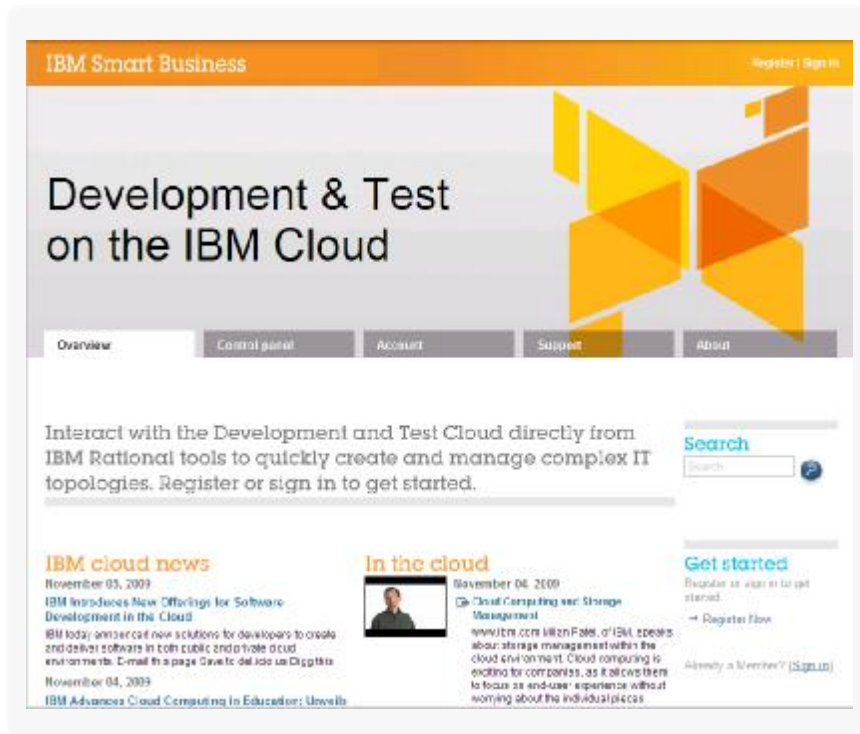# The management services from Tivoli

Converged service delivery platform for cloud computing

An example for a Cloud service offering:
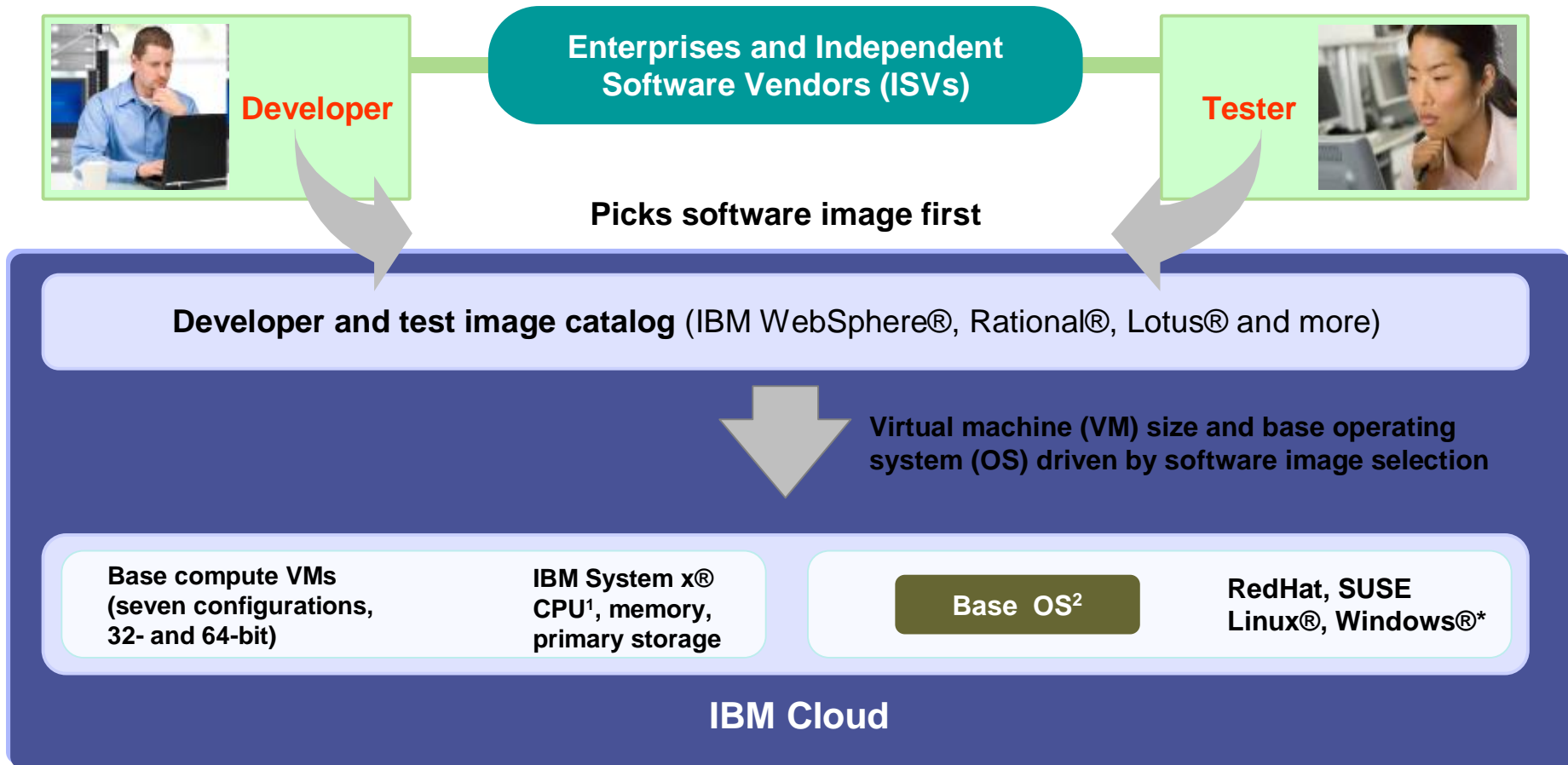
Cloud service example:

IBM Smart Business Development and Test on the IBM Cloud provides you with an enterprise-class cloud environment for development and test.

Our solution:

§ Is a dynamic, virtual development and test infrastructure service designed for the enterprise
  – Self-service access to the IBM Cloud for rapid provisioning of development and test environments, cloud scale and elasticity
  – Pay-as-you-go with options for reserved and dedicated capacity

§ Contains pre-configured software images: tools to help quick-start, support and automate development and testing processes
  – Rational® Application Lifecycle Management software
  – IBM Lotus®, WebSphere®, DB2® and Informix® ready-to-use software stacks

§ Is on the IBM Cloud: managed by IBM for enterprise organizations

Developers and testers access IBM Smart Business Development and Test on the IBM Cloud through easy-to-use self service portal and workflow.

Developer

Enterprises and Independent Software Vendors (ISVs)

Tester

Picks software image first

Developer and test image catalog (IBM WebSphere®, Rational®, Lotus® and more)

Virtual machine (VM) size and base operating system (OS) driven by software image selection

Base compute VMs (seven configurations, 32- and 64-bit)

IBM System x® CPU[1], memory, primary storage

Base OS[2]

RedHat, SUSE Linux®, Windows®*

IBM Cloud

* Windows support is planned for future availability.

Our 32- and 64-bit configuration options allow you to pick the base compute virtual machine (VM) package that best fits your needs.

VM Component	32-bit configuration			64-bit configuration			
	Bronze	Silver	Gold	Bronze	Silver	Gold	Platinum
Virtual CPU at 1.25GHz	1	2	4	2	4	8	16
Virtual Memory (Gigabytes)	2	4	4	4	8	16	16
Instance Storage (Gigabytes)	175	350	350	850	1024	1024	2048

In 32-bit VM:

More compute for same target price and additional packaging selection

In 64-bit VM:

Additional packaging selection (Platinum)

Based on usage patterns, they are most useable combinations of image sizes

With rapid, automated setup through a self-service portal that is designed for ease of use, you can deploy a service within minutes.

**You can have your development and test environment
running in minutes on the IBM Cloud.**

***Click and choose
the service you need***

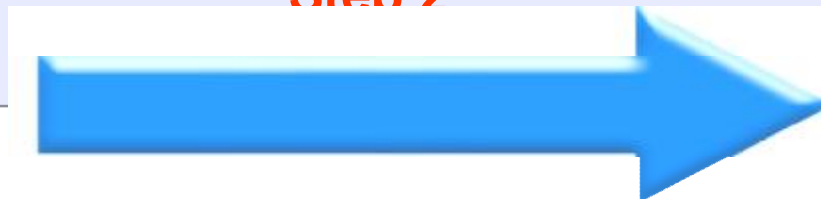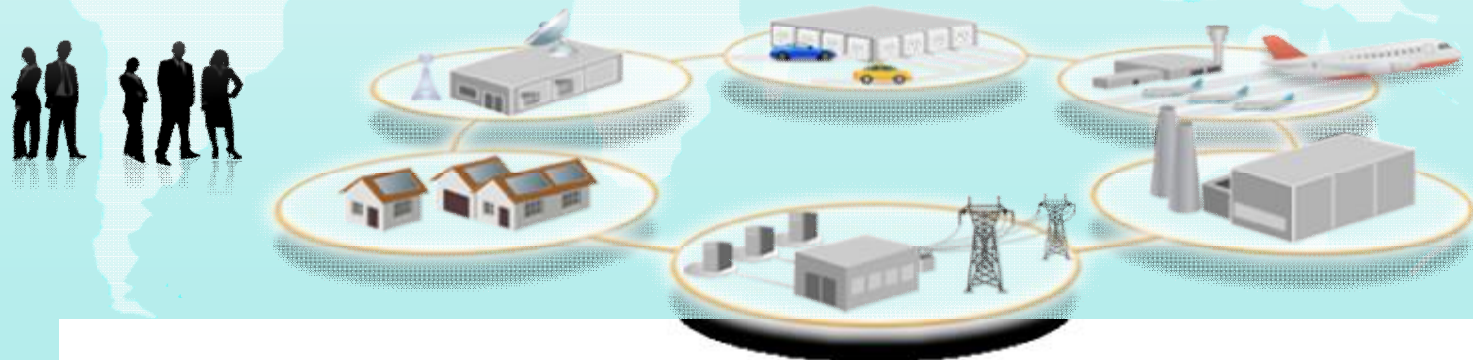***Choose the hardware and
usage configuration***
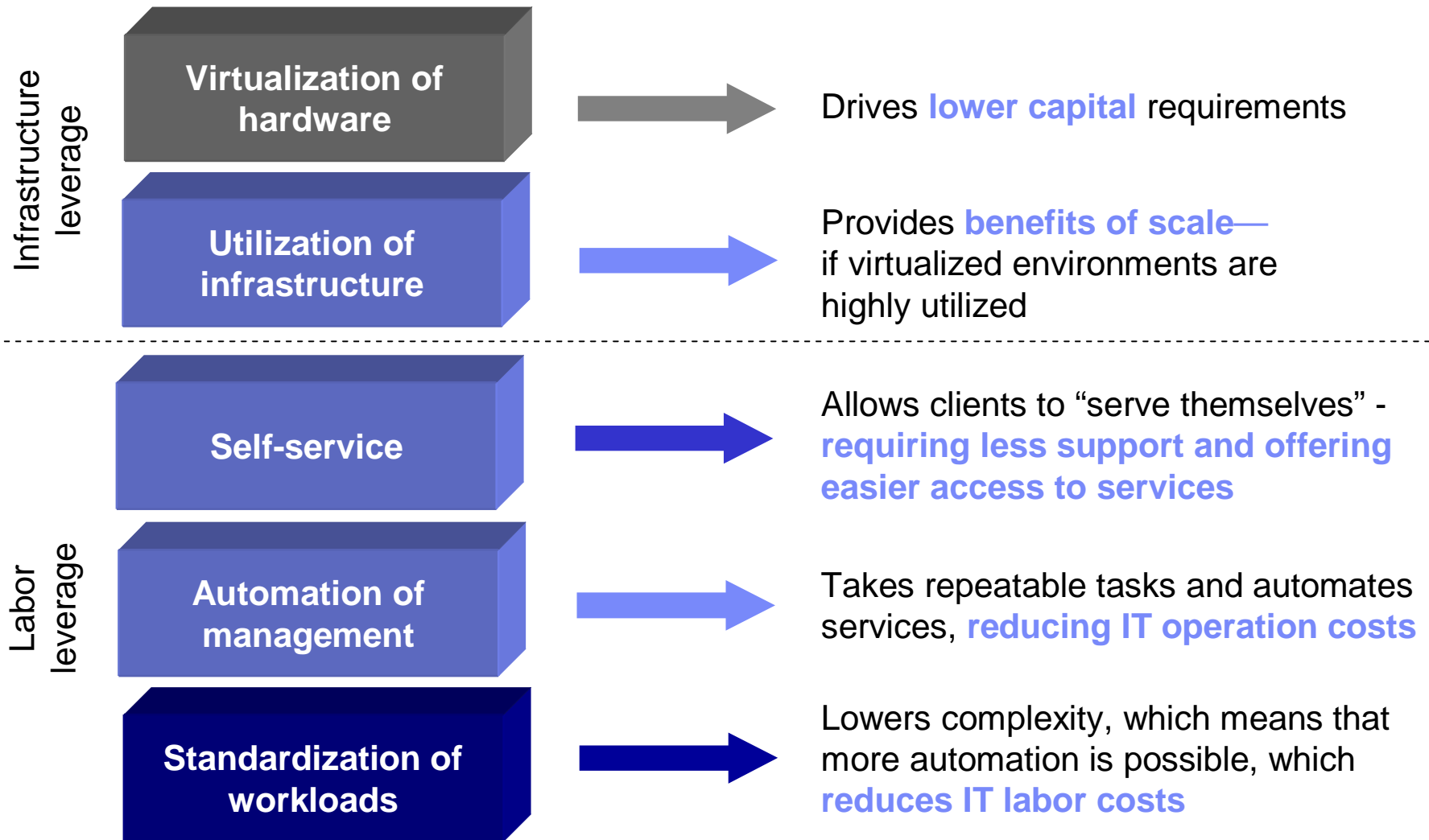
***Application provisioned
and ready to run***

Step 1

Step 2

Step 3

Cloud economics

Seize business opportunities

Execute with reduced risk and cost

Achieve precision in desired business outcomes

Major factors are driving cloud computing economics

Infrastructure leverage

Virtualization of hardware → Drives **lower capital** requirements

Utilization of infrastructure → Provides **benefits of scale**— if virtualized environments are highly utilized

Labor leverage

Self-service → Allows clients to "serve themselves" - **requiring less support and offering easier access to services**

Automation of management → Takes repeatable tasks and automates services, **reducing IT operation costs**

Standardization of workloads → Lowers complexity, which means that more automation is possible, which **reduces IT labor costs**

Cloud Computing provides dramatic, measureable value

Capability	From		To
Server/Storage Utilization	10-20%		70-90%
Self service	None		Unlimited
Provisioning	Weeks		Minutes
Change Management	Months		Days/Hours
Release Management	Weeks		Minutes
Metering/Billing	Fixed cost model		Granular
Payback period for new services	Years		Months

Cloud accelerates business value across a wide variety of domains

Legacy environments

Cloud enabled enterprise
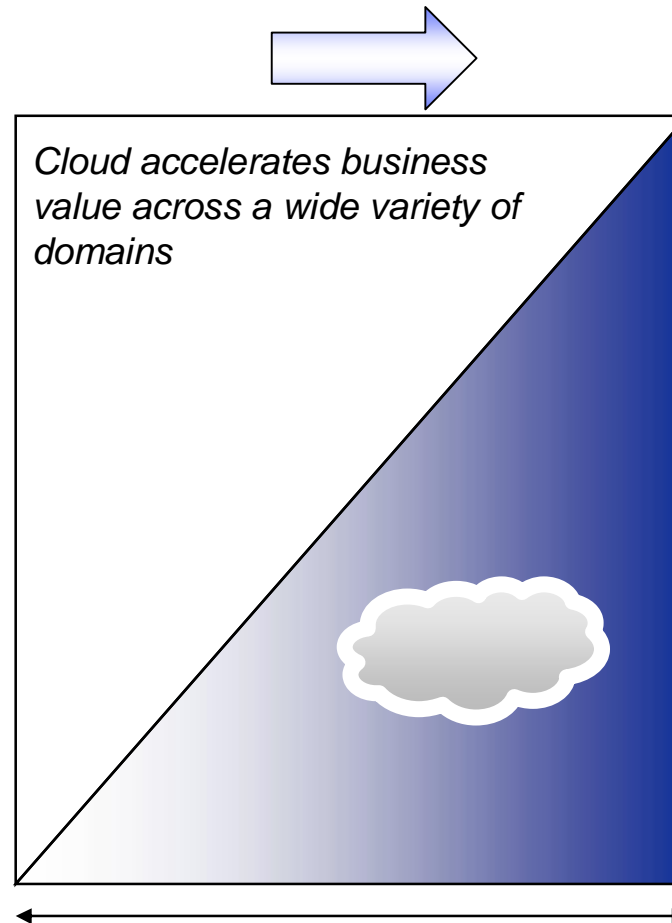
It's important to take a workload-oriented approach to cloud computing

Workload characteristics drive the rate and degree of standardization of services

Test for standardization

§ Web infrastructure applications
§ Collaborative infrastructure
§ Development and test
§ High-performance computing

Examine for risk

§ Database
§ Transaction processing
§ Enterprise resource planning workloads
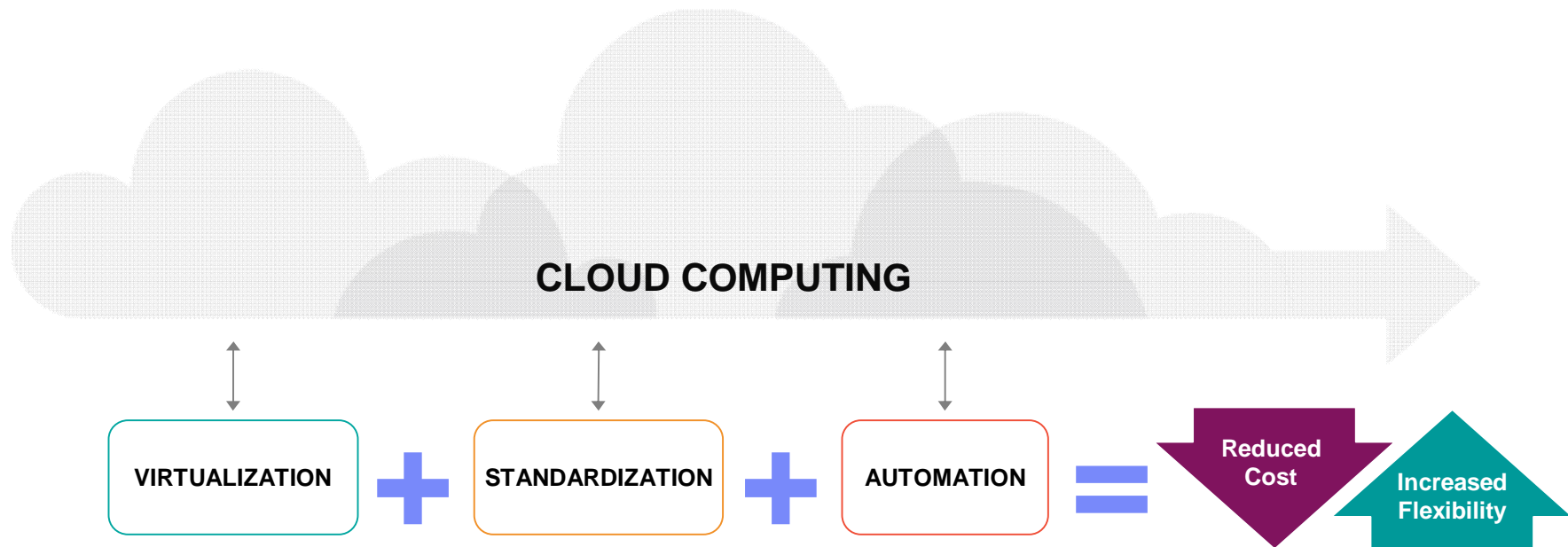§ Highly regulated workloads

Explore new workloads

§ High-volume, low-cost analytics
§ Collaborative business networks
§ Industry-scale "smart" applications

§*Private cloud usage/implementation rates are relatively high across all workloads, with little variation**
§*Infrastructure and collaboration workloads emerge as most appropriate for public cloud**

Source: IBM Market Insights, *Cloud Computing Research*, July 2009. n=1,090

An effective cloud computing deployment is highly optimized to achieve more with less….

CLOUD COMPUTING

VIRTUALIZATION + **STANDARDIZATION** + **AUTOMATION** = Reduced Cost · Increased Flexibility

…leveraging virtualization, standardization and automation to free up operational budget for new investment.

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Pros – three perspectives (business, user and service provider)

Business

§ Outsource non-core functions

§ Choice of service provider

§ Flexible commercials to adapt with demand

§ Shift from CapEx to OpEx for new projects

§ Predictable ongoing operating cost

§ Shift delivery risk & capacity risk to service provider

§ Reduced development & operational headcount

§ Reduces server sprawl

§ Ability for business to offer services too

User

§ Focus on the end service

§ Choice of service providers

§ User empowerment

§ Flexible & adaptable service

§ Anywhere, anytime, anyhow access

§ Rapid speed to provision service

§ Easy to access

§ Easy transition to stages of the 'lifecycle'

§ Standardisation & lower compliance effort

§ Clear service catalogue

§ Elastic scaling of service

Technology/Service Delivery

§ User self-service shifts work to users

§ Enables new business models

§ Flexible Commercials to adapt with demand

§ Focus on economies of scale & automation

§ Focus on driving utilisation of the service to as close to 100% as possible

Cons – three perspectives (business, user and service provider)

Business & User

- § Security concerns
- § Long term viability of the service provider
- § Investigative support from service provider
- § Legacy integration and conversion
- § Service availability, capacity, performance guarantees
- § Commitment requirements (terms, minimum use etc.)
- § Fear of lock in – data, service etc.
- § Service availability, capacity and performance guarantees
- § Data segregation, network isolation, data privacy, access controls
- § Accurate service metrics, reporting and analysis
- § Latency concerns
- § Data ownership, recovery and migration

- § No transparency to provider operation
- § Difficulty to customise
- § Governance of sourcing process
- § Local governing laws (data archiving, storage location, privacy, government access, regulatory requirements)
- § Uncertain remediation of failures
- § Hidden supply chain impact (subcontracting)
- § Immaturity of vendors and standards
- § Setup, training and integration fees
- § Application development skills and models
- § Unproven financial model - Use vs. asset ownership
- § Compliance – Internal policy, SOX etc.
- § Limited cloud ready applications

Technology/Service Delivery

Balancing act – matching demand and service capacity

- § Designing for multi-tenancy
- § Handling software/application/service versions
- § Software licensing models
- § Providing a competitive service, at the right service level without being commoditised
- § Reputational risk concerns

Operations have industrialized to become smarter.

Telcos automate traffic through switches to assure service and lower cost.

Manufacturers use robotics to improve quality and lower cost.

Banks use automated teller machines to improve service and lower cost.

… breakthroughs like these are enabled by service management systems.

Questions