Illinois Digital Government Summit

Cloud Computing

Thirumal Nellutla, Senior IT Architect

John Teoh, Senior Technical Staff Member

September 15, 2008

What is Cloud Computing?

A style of computing where massively scalable IT-enabled capabilities are provided "as a service" over the network

Acquisition Model **Service based**	“I only care about results, not how IT capabilities are implemented”
Business Model **Usage based**	"I want to pay for what I use, like a utility"
Access Model **Internet, Intranet**	"I can access services from anywhere, from any device"
Technical Model **Dynamic, flexible**	“I can scale up or down capacity, as needed"

mark.cleverley@us.ibm.com, thiru@us.ibm.com, jteoh1@us.ibm.com

Cloud Computing Characteristics
Consumer Perspective

Single Point of Access	Self service with rich user experience
Virtualization	Increased system utilizations
Automation	Automated service request and fulfillment
Agility	Rapid service provisioning
Flexibility	Massive scaling of IT services as needed
Usage Accounting	Utility based usage metrics
Service Management	Modular services managed across infra/platform/application/business stacks.
Security	Shared services delivered across trusted domains
Cost Efficiency	Reduced CapEx with minimal to no asset ownership

mark.cleverley@us.ibm.com, thiru@us.ibm.com, jteoh1@us.ibm.com

Cloud Computing is an Evolution in IT

Grid Computing

- Solving large problems with parallel computing
- Made mainstream by Globus Alliance

Utility Computing

- Offering computing resources as a metered service
- Introduced in late 1990s

Software as a Service

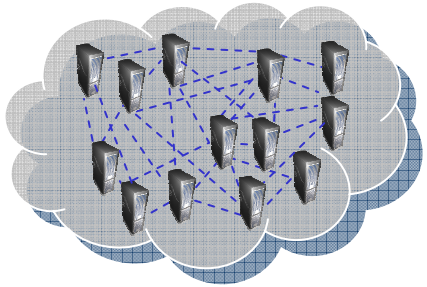
Network-based subscriptions to applications

Gained momentum in 2001

Cloud Computing

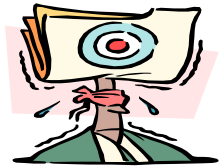
Next-Generation Internet computing

Next-Generation Data Centers



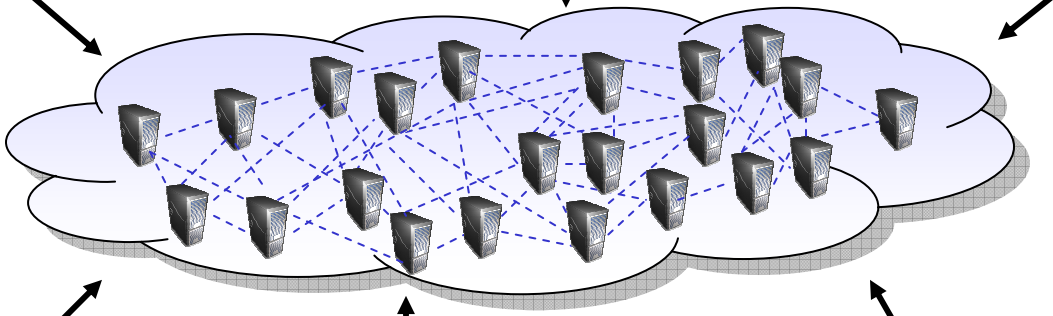
Forces Driving Cloud Computing

Data-Intensive Applications:
- **Explosion of applications and user-generated content:**
- **Exabyte in 2006**
- **Zettabyte in 2010**



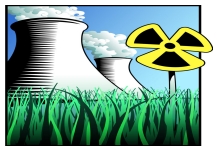
Datacenter Pressures:
Growing operational complexity and cost from infrastructure and application sprawls

Increased network capacity and availability



Innovation and Collaboration

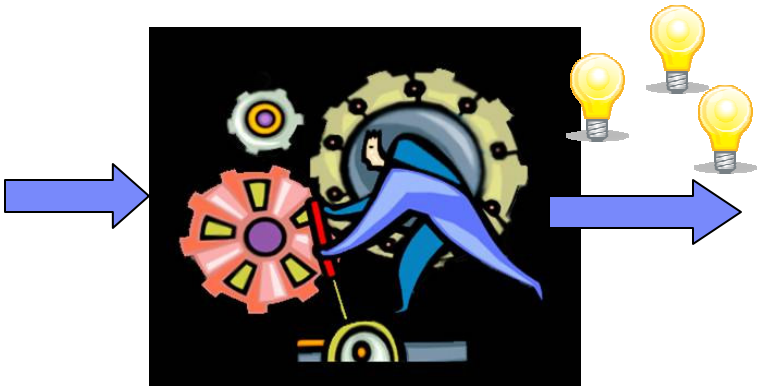
Rising Energy Cost & Green compliance



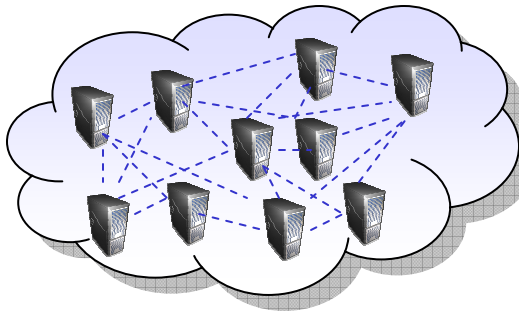
Shared Services Across Lines of Business

Cloud Computing Can Foster Innovation

Leverage Cloud's powerful combination of Web 2.0 collaboration platform and dynamic, secure computing environment to drive business transformations.



Innovation Factory

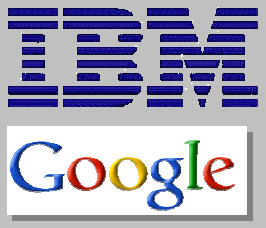


Virtualized Cloud Incubation Environment

Expand sources of innovation with a network of partners, customers, researchers, and academia

Speed time to market for new services by exploiting collaboration technology

Lower barriers to IT by leveraging Cloud to provide incubation environment for new prototypes



Partnership promotes innovation

HOME PAGE | MY TIMES | TODAY'S PAPER | VIDEO | MOST POPULAR | TIMES TOPICS

The New York Times **Technology**

WORLD | U.S. | N.Y. / REGION | BUSINESS | TECHNOLOGY | SCIENCE | HEALTH | SPORTS | OPINION

CIRCUITS | CAMCORDERS | CAMERAS | CELLPHONES | COMPUTERS | HANDHELDS | HOME VIDEO | MUSIC | PERI

Google and I.B.M. Join in 'Cloud Computing' Research

By STEVE LOHR
Published: October 8, 2007

SIGN IN TO E-MAIL OR SAVE THIS
PRINT
REPRINTS
SHARE

ARTICLE TOOLS SPONSORED BY
UNDER THE SAME MOON

Even the nation's elite universities do not provide the technical training needed for the kind of powerful and highly complex computing Google is famous for, say computer scientists. So Google and I.B.M. are announcing today a major research initiative to address that shortcoming.

The two companies are investing to build large data centers that students can tap into over the Internet to program and research remotely, which is called "cloud computing."

Both companies have a deep business interest in this new model in which computing chores increasingly move off individual desktops and out of corporate computer centers to be handled as services over the Internet.

Vietnam Ministry of Science and Technology leverages cloud to run its innovation program

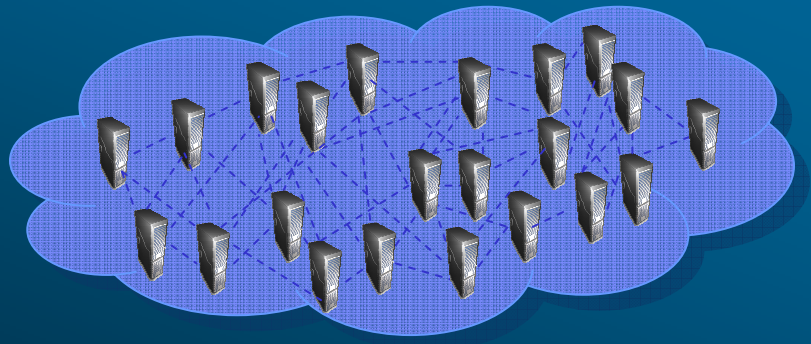
Students

Teachers

Researchers

VISTA Innovation Portal (VIP)

VIP pilot hosted on IBM's Blue Cloud computing infrastructure at Almaden



Blogs | Wikis | Forums

Profiles | Social Tagging

Information Discovery

IBM Innovation Factory

VIP, powered by IBM Innovation Factory, provides a platform to foster collaborative innovation among major universities and research institutes.

WUXI · CHINA

Dynamic Enterprise Data Center Hosting Software Development

Wuxi Cloud Computing Center

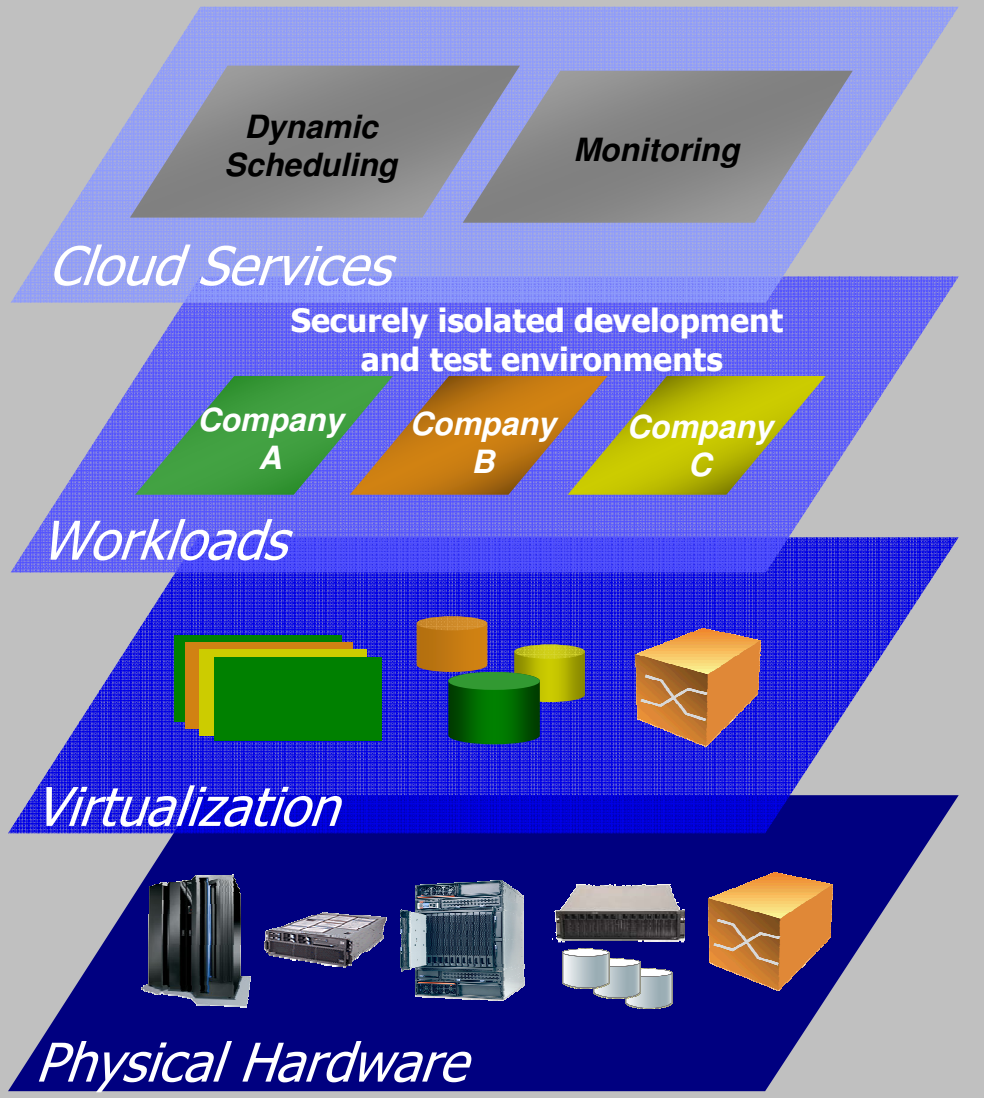
- Dynamic Enterprise Data Center built by IBM for municipal government of Wuxi, China
- Eleven parks to be created across China for software development
- Accelerates transformation to a service-led economy

Benefits

- Fast deployment of Rational software development environments
- Up to 200K software developers, 100 companies
- Cost efficient shared infrastructure

Technology Deployed

- Enabled by IBM technology and service
- Managed with Tivoli systems management products
- Hardware: IBM system p, x and Bladecenter
- Software: Rational dev/test tool suite, Websphere Application Server, DB2



IBM and IDA Announced First Cloud Computing Center in Europe

DUBLIN, IRELAND and ARMONK, N.Y, March 19, 2008 – Today IBM (NYSE: IBM) and the Industrial Development Agency of Ireland (IDA Ireland) announced the establishment of Europe's first Cloud Computing Center.

"IBM's European hub for Cloud Computing highlights Ireland's role as an important contributor to IBM's global research, development and innovation strategy." – Micheál Martin TD, Minister for Enterprise, Trade and Employment

Center Offerings

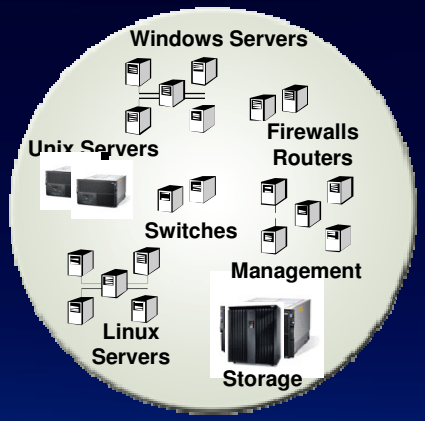
- **On-site cloud computing infrastructure based on a Dynamic Enterprise Data Center**
- **Deep skills and resources**
- **Workshops on next generation workloads**
- **Rapid deployment of proofs of concept and pilots**

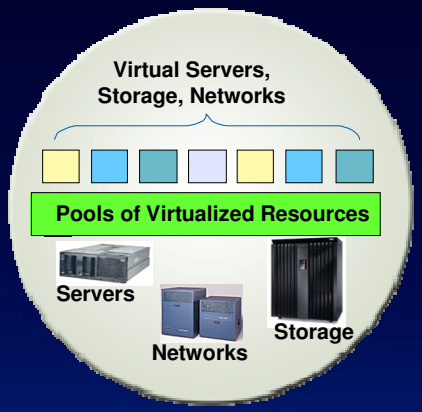
"This new facility and the cloud computing model, the wealth of talent at IBM's software lab in Ireland will be accessible to not only the rest of Europe, but Africa and the Middle East as well." – Steve Mills, Senior Vice President and Group Executive, IBM Software Group

mark.cleverley@us.ibm.com, thiru@us.ibm.com, jteoh1@us.ibm.com

Technology Incubation Cloud for IBM Employees

Technology Roadmap to Cloud





Complex Infrastructure Sprawl

- IT assets & datacenters kept growing
- Desperate system tools
- Inconsistent processes
- Soaring IT & energy costs

Physical Consolidation

- Consolidate IT assets & datacenters
- Standardize and centralize management
- Streamline processes with ITIL best practices
- Energy saving - Phase out inefficient HW

Virtualization

- Virtualize infrastructure - increased system utilization
- Unify virtual & physical mgmt
- Promote resource sharing across organization
- Energy saving – maximize effective use

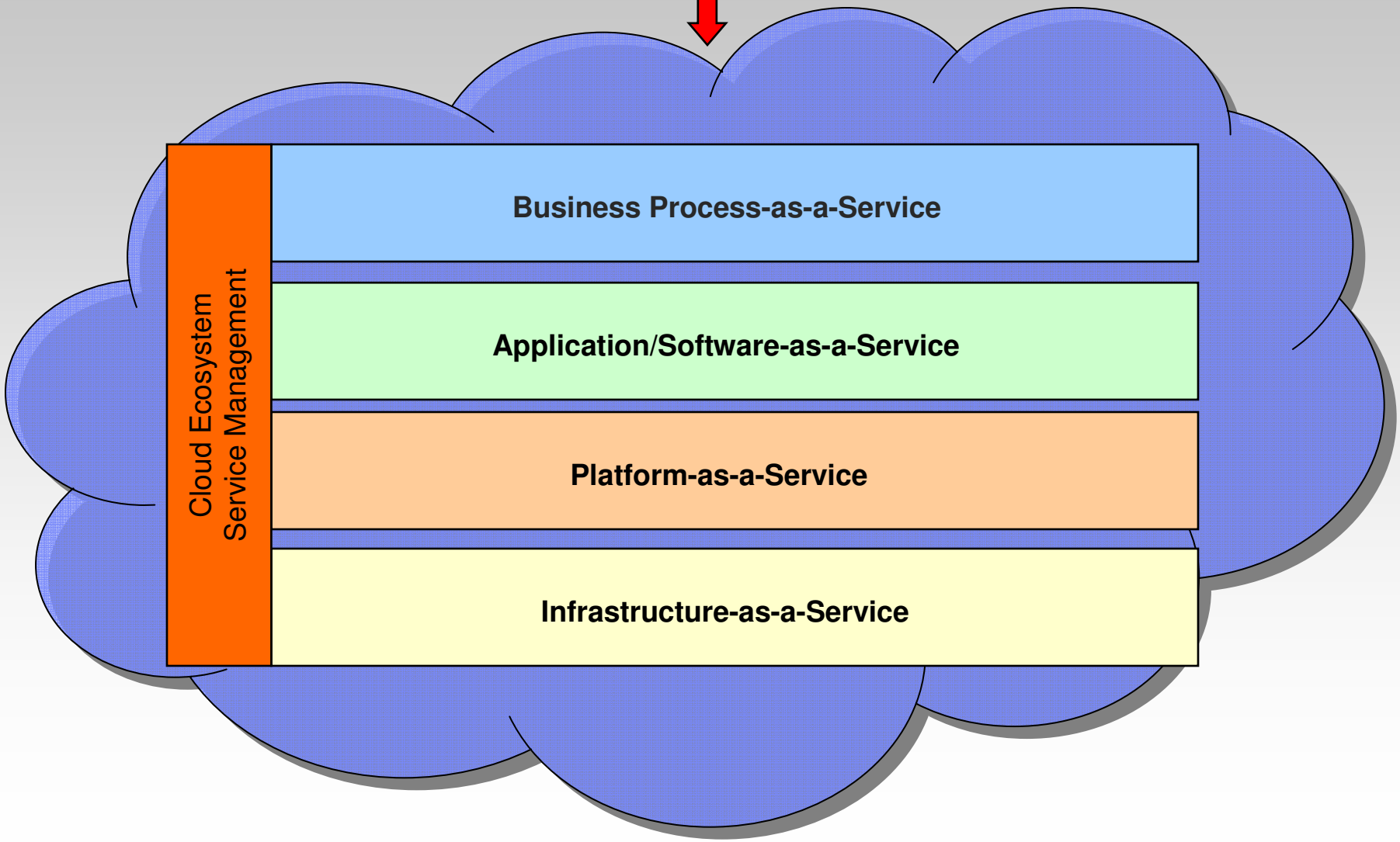
Cloud

- Service oriented architecture infrastructure
- Rapid provisioning of IT resources, massive scaling
- Dynamic service mgmt
- Energy saving via auto workload distribution

mark.cleverley@us.ibm.com, thiru@us.ibm.com, jteoh1@us.ibm.com

A Cloud Framework

Service Consumers



IBM Blue Cloud

Delivers a massively scalable and flexible platform for hosting existing and emerging data-intensive workloads.

Monitoring

Provisioning Bare Metal and Virtual Machines

IBM Tivoli Monitoring v.6

DB2

Tivoli Provisioning Manager v.5.1

WebSphere Application Server

Provisioning Management Stack

eclipse

Apache hadoop

Virtual Machine | Virtual Machine | Virtual Machine | Virtual Machine

Virtualization Manager

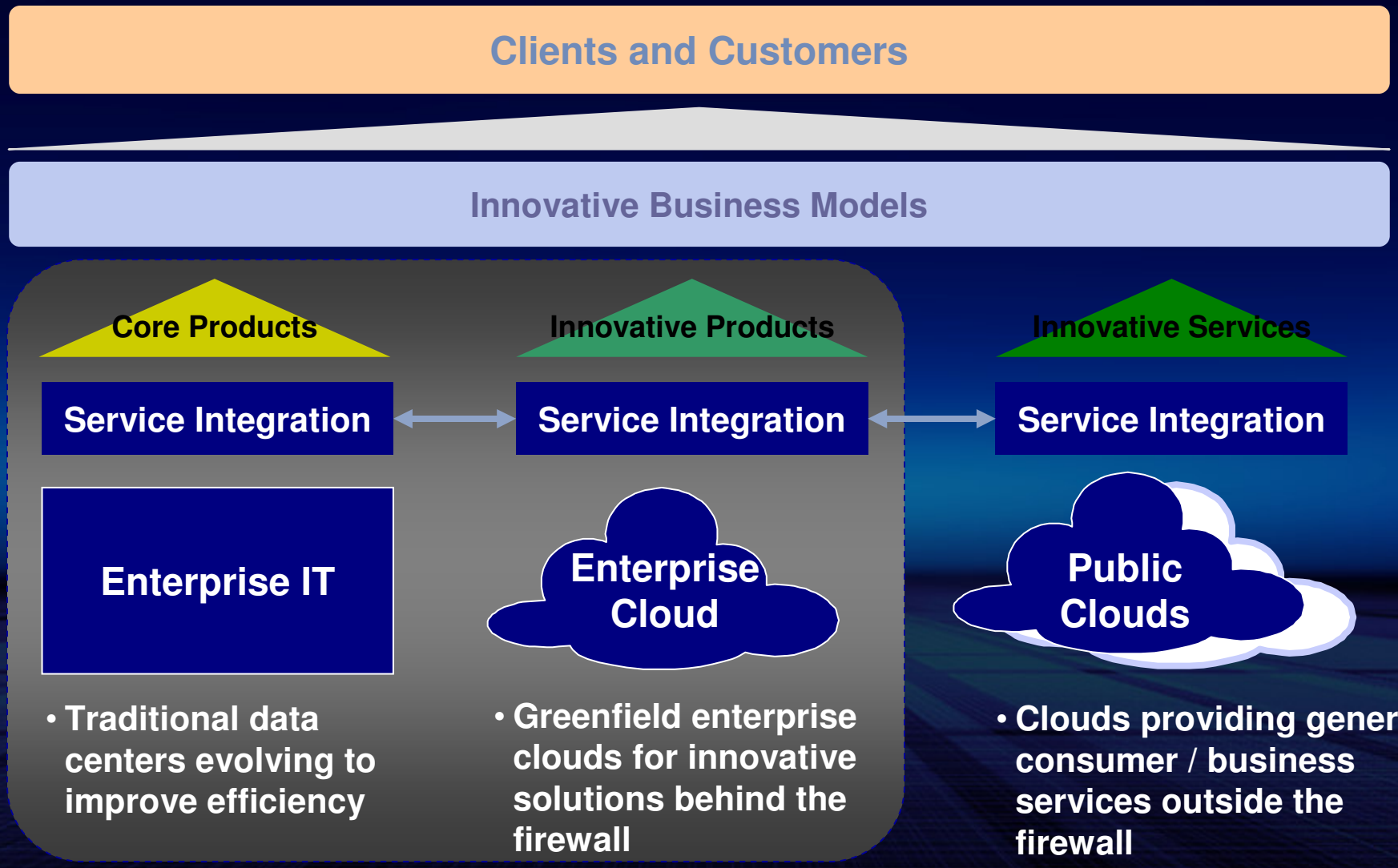
Service Manager

- Virtualization: Manages all workloads run on virtual machines
- Service Manager: Service catalog, provisioning, service availability, security, service lifecycle management
- Provisioning: dispense preloaded virtual machines in minutes
- Monitoring: ensure systems that go down are recycled quickly
- Based on open standards, open source and IBM software, systems technology & services

mark.cleverley@us.ibm.com, thiru@us.ibm.com, jteoh1@us.ibm.com

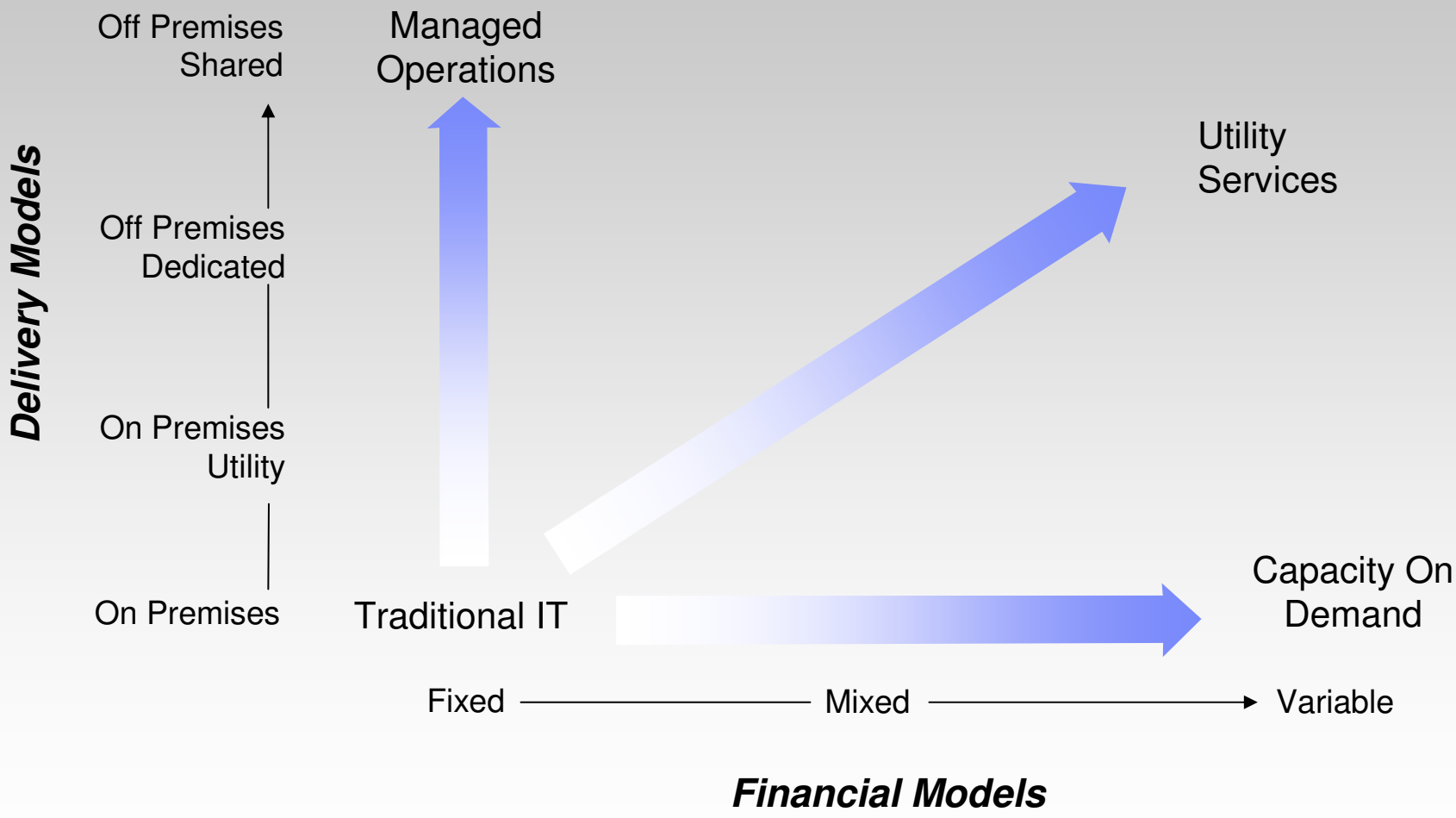
Cloud Delivery Models

Enterprise Internal Cloud – Security sensitive Cloud services delivered behind the firewall.
Public Cloud – General Cloud Services delivered over the Internet
Hybrid Cloud – Combination of internal and external cloud services.



mark.cleverley@us.ibm.com, thiru@us.ibm.com, jteoh1@us.ibm.com

Flexible Financial Models Are Emerging



Cloud Computing Brings Possibilities…

- Increases business responsiveness
- Accelerates creation of new services via rapid prototyping capabilities
- Reduces acquisition complexity via service oriented approach
- Uses IT resources efficiently via sharing and higher system utilization
- Reduces energy consumption
- Handles new and emerging workloads
- Scales to extreme workloads quickly and easily
- Simplifies IT management
- Platform for collaboration and innovation
- Cultivates skills for next generation workforce

Cloud Computing Resources

- A technical white paper on IBM's New Enterprise Data Center: http://ibm.com/datacenter
- IBM High Performance On Demand Solutions: http://www.ibm.com/developerworks/websphere/zones/hipods
- A website to encourage collaboration among universities in the program. This will be built on Web 2.0 technologies from IBM's Innovation Factory. http://www.ibm.com/university/scholars/skills

mark.cleverley@us.ibm.com, thiru@us.ibm.com, jteoh1@us.ibm.com