



Cloud Computing Landscape: *The Importance Of Standards*

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Abstract

- Customers expect the Cloud Services they use to be as open as the rest of their IT environment, consistent with their Enterprise Architecture approach. Cloud Computing also requires us to think of (IT) services at multiple levels - with the highest levels requiring strong Enterprise Architecture skills - ultimately the alignment of technology and organizational objectives.
- There is trend to industrialize the delivery and support of IT services to be more repeatable, reusable, flexible and scalable elements. It is important to understand how the enterprise architect will incorporate and use Cloud Services in conjunction with the traditional IT environment. The enterprise architect will need to deal with Cloud Services which range from elemental to transaction to business services to more elaborate services involving human interaction. Typically, such services are thought to fall into three main categories: infrastructure, platform, and software, “as a service.” Different Cloud deployment models, such as on-premise, off- premise or a federation of these, can also be supported.
- By understanding the main actors and their interaction models in the use and delivery of Cloud Services, and the Cloud deployment models, it is possible to identify the Architectural Model for Cloud Computing supporting both existing and evolving capability. In order to realize the maximum value of the Cloud, the services need to be flexible, separating the concerns between those who use the services and those who provide them, while supporting optimization strategies such as flexible sourcing to achieve economies of scale. Standards will therefore play a critical role in how Clouds operate and interoperate to deliver higher-level business value.
- Referencing examples, this session will present a view of the importance of standards for prioritized support of functionality of Clouds and interaction between Clouds - integration, interoperability and portability.
- Also refer to: <http://groups.google.com/group/cloud-computing-use-cases>

Discussion Outline

- Business Drivers
- Cloud Computing and Benefits
- Architectural Model and Taxonomy
- Use Cases
- Role and Importance of Standards
 - *Existing and New*
- Summary and References

Innovation, Economy, Competition, Secure Collaboration...across Industry...As the world gets smarter, demands on IT will grow



Smart traffic systems



Smart oil field technologies



Smart food systems



Smart healthcare



Smart energy grids



Smart retail



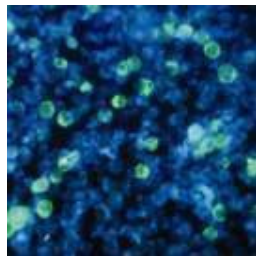
Smart water management



Smart supply chains



Smart countries



Smart weather



Smart regions



Smart cities

A Crisis of Complexity. The Need for Progress is Clear.



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.

85% idle

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

The Emergence of a New Model of Computing

- **Centralized Computing: 1960s -**
 - Optimized for sharing, industrial strength, systems management, . . .
 - Managed by central IT organization
 - Back office applications involving transactions, shared data bases, . . .
 - Mainframes, supercomputers, minicomputers, . . .

- **Client-Server: 1980s -**
 - Optimized for low costs, simplicity, flexibility,
 - Distributed management across multiple departments and organizations
 - Large numbers of PC based applications
 - PC-based clients and servers, Unix, Linux,

- **Cloud: 2000s -**
 - Optimized for massive scalability, distribution of services,
 - Managed by central IT organization, hybrid service acquisition models
 - Supports huge numbers of mobile devices and sensors
 - Internet-based architecture

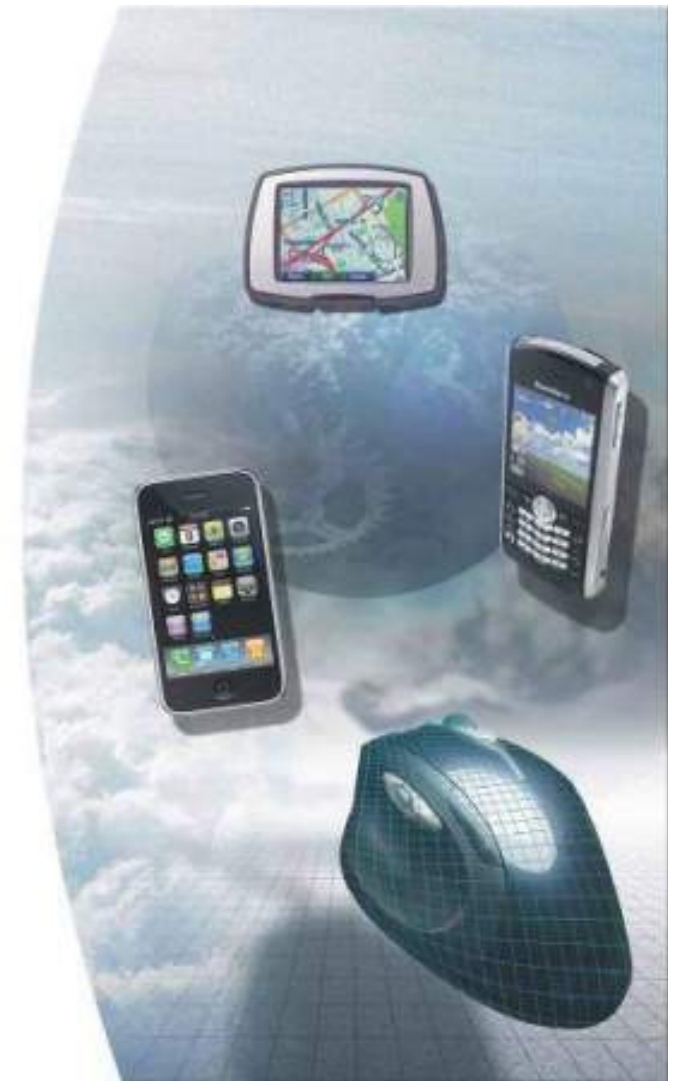
Benefits

▪ **Business benefits:**

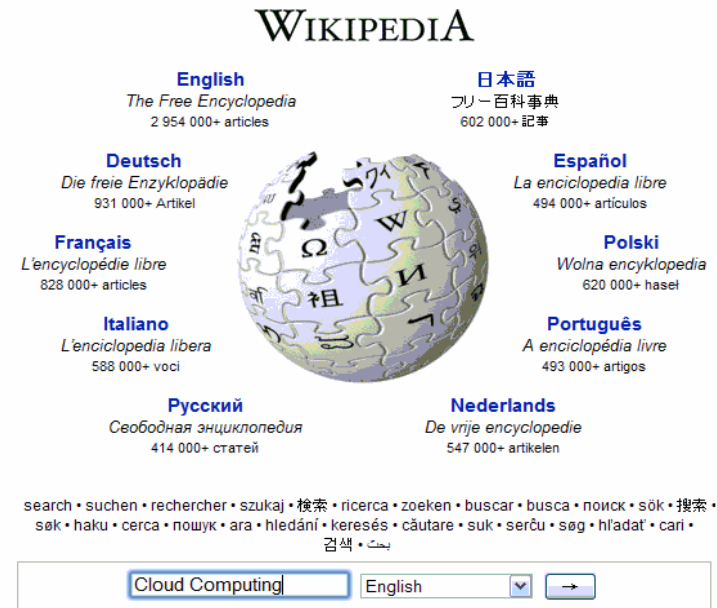
- Cost savings
- More employee and service mobility
- Responsiveness and agility in delivering new solutions

▪ **IT benefits:**

- Allows IT to Shift Focus
- Economies-of-scale
- Hybrid infrastructure: public, private or federation between the two



Wikipedia: Cloud Computing



- Cloud computing is a style of computing in which dynamically scalable and often virtualized resources are provided as a service...
- Users need not have knowledge of, expertise in, or control over the technology infrastructure in the "cloud" that supports them...
- Prof. Ramnath K. Chellappa originally defined it as a computing paradigm where the boundaries of computing will be determined by economic rationale rather than technical limits...

See: http://en.wikipedia.org/wiki/Cloud_Computing

National Institute Of Standards and Technology (NIST) contribution

Definition



- Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.
- This cloud model promotes availability and is composed of five **essential characteristics**, three **delivery models**, and four **deployment models**.

Key Characteristics

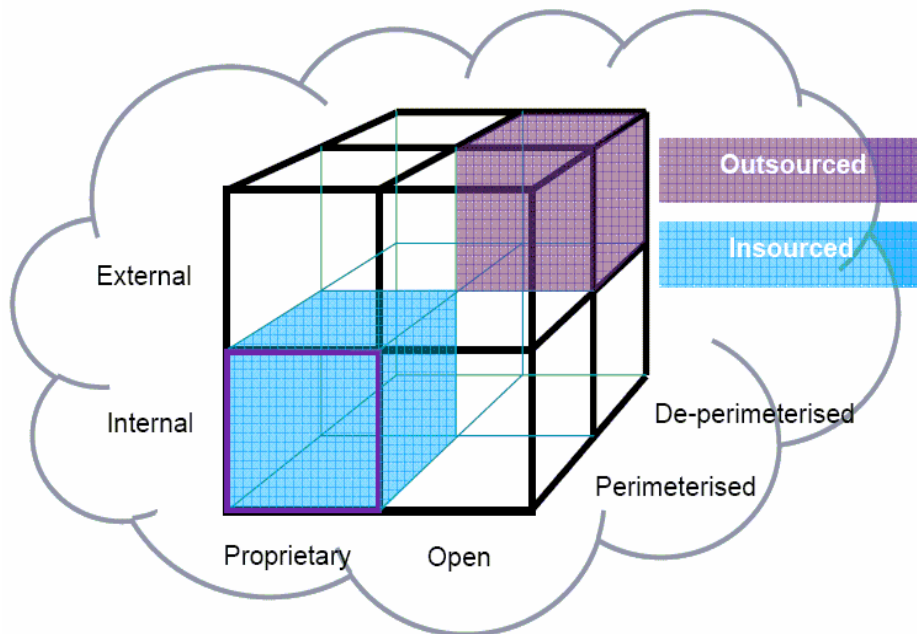
- On-demand self-service
- Ubiquitous network access
- Location independent resource pooling
- Rapid elasticity
- Measured service

Delivery Models

- Private cloud**
 - enterprise owned or leased
- Community cloud**
 - shared infrastructure for specific community
- Public cloud**
 - Sold to the public, mega-scale infrastructure
- Hybrid cloud**
 - composition of two or more clouds
- Two types: internal and external**

See (version 14): <http://csrc.nist.gov/groups/SNS/cloud-computing/index.html>

The Jericho Forum: Cloud Cube Model



Cloud Cube Model

- The Jericho Forum has identified four (4) criteria to differentiate cloud formations from each other and the manner of their provision. These include:
 - **Internal / External**
 - **Proprietary / Open**
 - **Perimeterized / De-perimeterized**
 - **Outsourced / In-sourced**
- The Jericho Forum Cloud Cube Model paper explains these dimensions in more detail

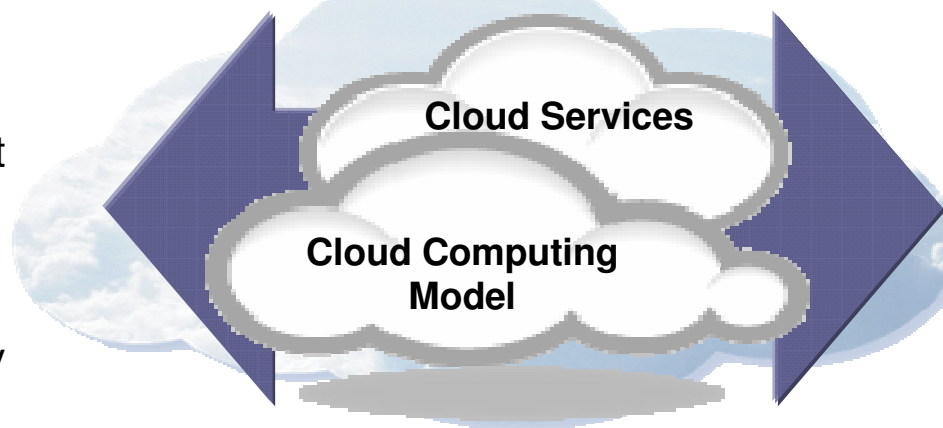
See for more information: <http://www.opengroup.org>

Emerging consumption and delivery models drive new sourcing options and business flexibility.

On-Premise ...

- Client owned – managed by client or services provider.
- Access defined by client.

Federation...



Off-Premise ...

- Standardized services on the provider's cloud.
- Access by subscription.

Considerations ...

- Speed & flexibility.
- Standardization.
- Security, privacy, resiliency.

GOVERNANCE

Services range in their definition ...

**PEOPLE
SERVICES**

Access business services anywhere anytime, anyhow

**BUSINESS
SERVICES**

Enhanced B2B and B2C delivery of services and processes

**APPLICATION
SERVICES**

Model, design and build web delivered application and services

**PLATFORM
SERVICES**

Middleware components optimized to deploy, manage and run business applications

**INFRASTRUCTURE
SERVICES**

Simplify access and control to a vast, virtualized pool of IT resources

ABSTRACTION

AUTOMATION

CONSUMABILITY

SECURITY

STANDARDIZATION

Cost Reduction and Improved Service through Cloud Computing

Cloud technologies may offer operational expense reductions at all layers

People Services

- People cloud, tagging, wisdom of crowds
- Break linear relationship between revenue and labor costs

Business Services

- Businesses (e.g., Telcos) can easily experiment with new services
- Time-to-value of new services greatly decreased

Application Services

- Improved consumability via Web delivery of apps and services
- Web-resident development, deployment, update, app management
- Easy app composition reduces development costs

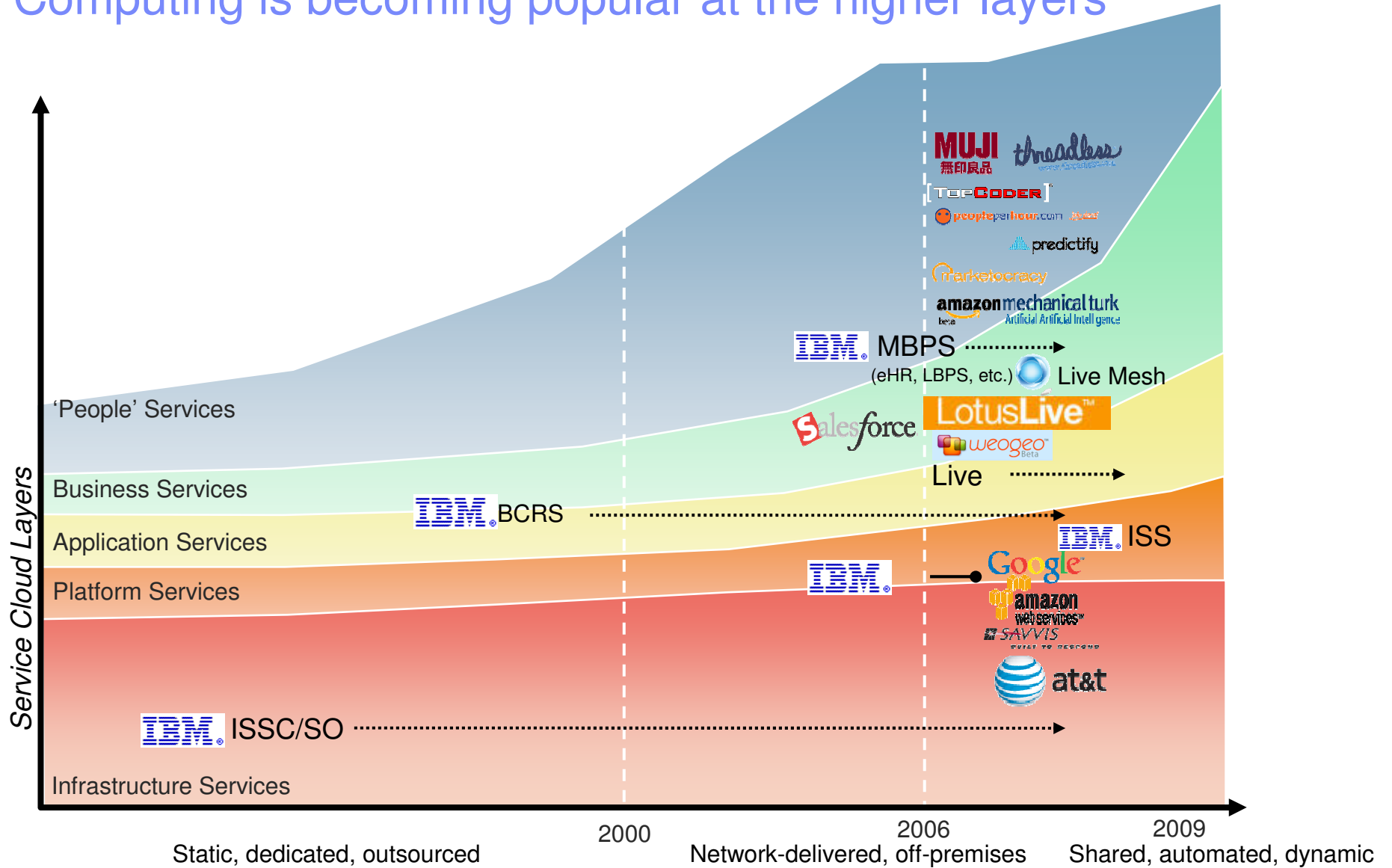
Platform Services

- Deployment technologies uncouple service deployment from hardware.

Infrastructure Services

- Ensembles simplify hardware (server/storage/client/network) management.
- Virtual image management contains scaling costs of update, etc.
- Power and heat management reduce energy costs / emissions

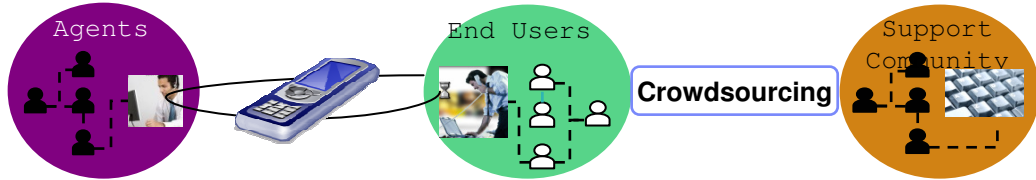
Cloud: because the majority of IT cost is in people, Cloud Computing is becoming popular at the higher layers



Clouds will be used at each layer, and stacked to easily create new solutions

Cloud technologies can offer operational expense reductions and improved service at all layers

People Services



Retail Banking Trade & SC Finance Single Euro Payments Mobile Banking Front Office Optimization

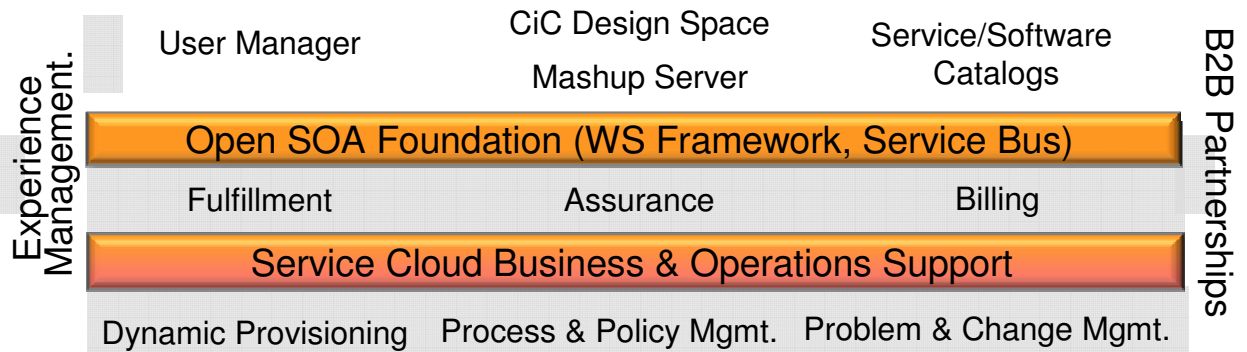
Business Services



Customer Care Payments Int. Risk Mgmt.

Application Services

Industry Frameworks & Information Foundation



Platform Services

Infrastructure Services



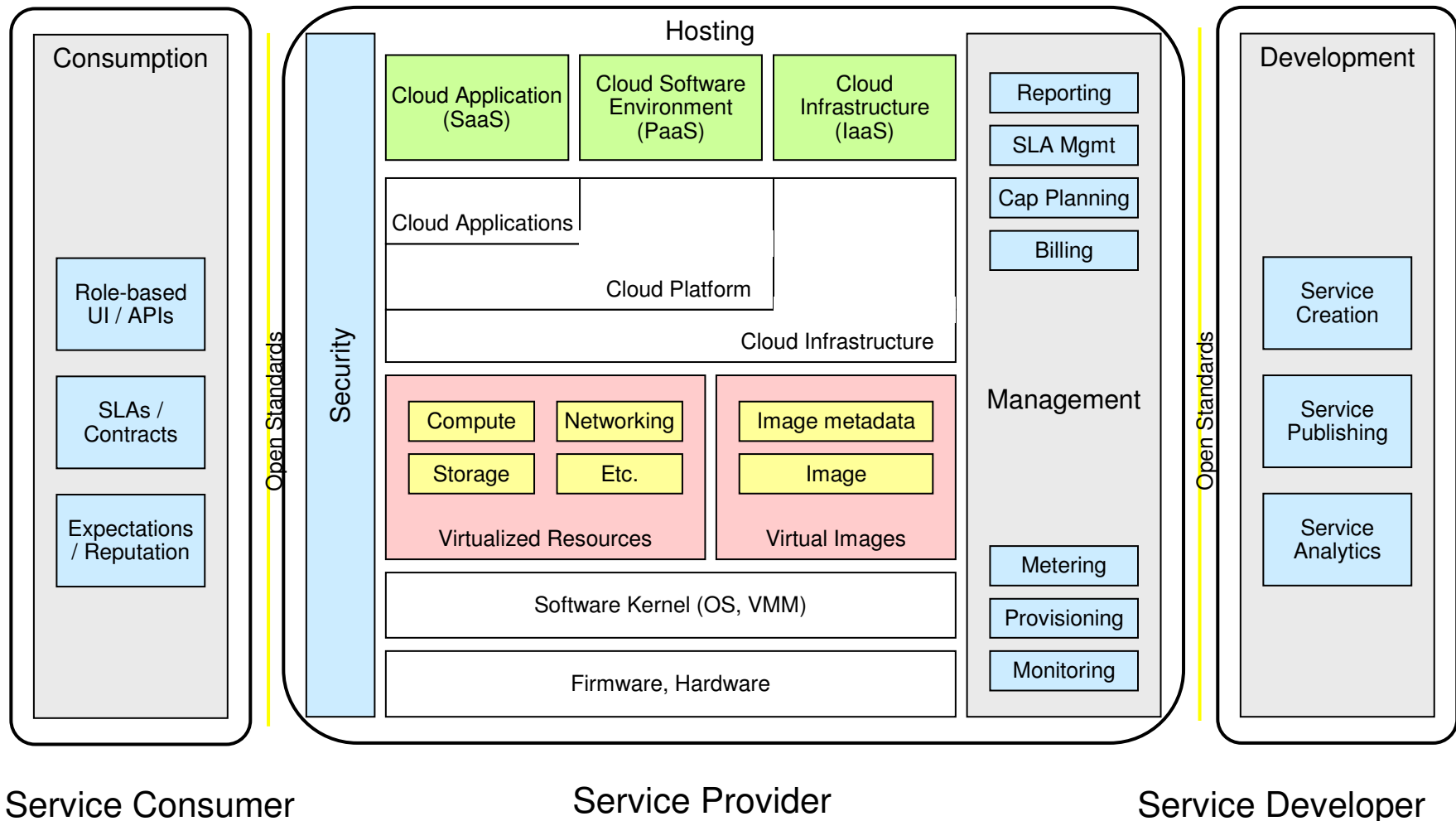
Business and IT (people, process, information, technology)
have imperative to ...

- Deliver Quality, Differentiated Service
- Be Flexible in Sourcing
- Do More with Less
- Be Secure and Compliant

Topics of Interest

- **Services (Platform, Infrastructure, Software, 'Crowds', etc.)**
- **Abstraction**
- **Deployment Models**
 - Consumption and Delivery
 - On-Premise / Off-Premise / Federation / Brokered
 - Jericho Forum refers to these generally as Cloud 'formations'
 - NIST definition and contribution
- **Actors / Roles**
- **Perspectives and Responsibilities**
- **Contracts, Interactions, Community, Reputation, and Expectations**
- **Platform, Application, Data**
- **Importance of Open Standards**

A Taxonomy for Cloud Computing



Adapted from: http://cloud-computing-use-cases.googlegroups.com/web/Whitepaper_Draft_2.pdf

Open Standards Considerations?

- **What are the inhibitors from a Standards Perspective?**
- **What Standards are needed?**
 - Business/Industry
 - Technology
- **Whose perspective is assumed and what value is delivered?**
 - Requestor
 - Provider
 - Creator / Developer
 - Federator / Broker
- **How do we prioritize?**
 - Customer use cases

Open Cloud Use Case Project

- **What is the Open Cloud Use Case Project?**
 - An initiative that originated with Open Cloud Manifesto community but has expanded far beyond its current supporters
 - It is an on-line experiment in group authorship utilizing an open source process

- **What is the goal of the Open Cloud Use Case project?**
 - To produce a whitepaper that describes the high level use cases and requirements for an open cloud environment
 - The use case will be based on real customer scenarios

- **Who is participating?**
 - There are over 750 individuals have joined this effort from across the spectrum of the cloud ecosystem

See: <http://groups.google.com/group/cloud-computing-use-cases>

Cloud Computing Use Cases

Home New since last time: **2 files, 176 messages, 199 members**

Welcome!

This group exists to define use cases for cloud computing. It is a collaboration of cloud consumers and cloud vendors, and is another step towards keeping cloud computing open.

See the [Goal of the Group](#) page for a more in-depth discussion of what we're all about.

Learn more about the Open Cloud at the [Open Cloud Manifesto Web site](#), and follow the discussion on [Twitter](#) and at [LinkedIn](#).

Discussions 7 of 176 messages [view all](#) + new post

[Virtual Processor Core](#)
 By santosh padhy - Jul 18 - 5 authors - 5 replies
[\[Cloud Computing Use Cases 178\] Re: test](#)
 By Carl Jensen - Jul 17 - 3 authors - 3 replies
[Other input to whitepaper](#)
 By Joe Armstrong - Jul 16 - 1 author - 0 replies
[Input for Brokered/Federated section](#)
 By Joe Armstrong - Jul 16 - 1 author - 0 replies
[The second draft ready for your review](#)
 By Ezhil - Jul 15 - 6 authors - 7 replies
[Google Cloud Use Case Posting on Federation](#)
 By koox - Jul 15 - 2 authors - 2 replies
[Real-world customer scenario - Enterprise to Cloud](#)
 By Ezhil - Jul 15 - 3 authors - 3 replies

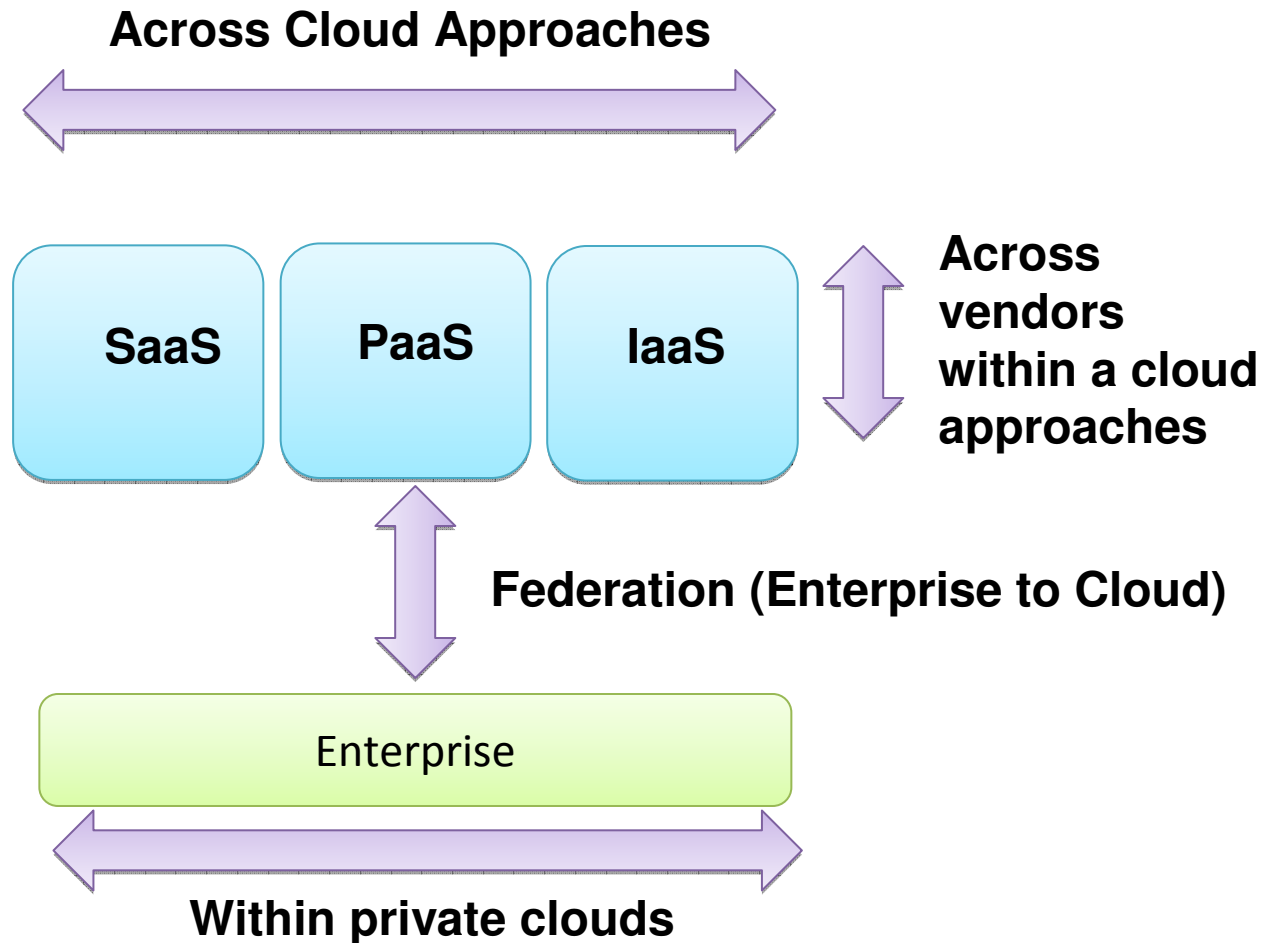
Members 756 members [view all](#)

Cloud Computing Use Case Whitepaper 13 July 2009

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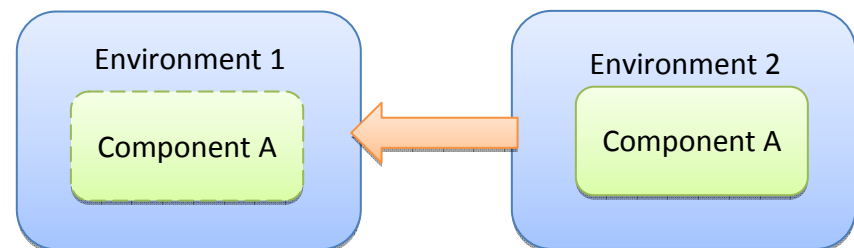
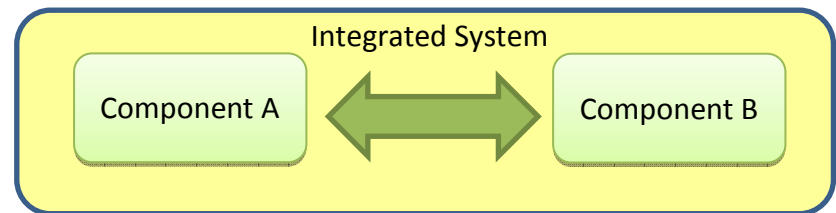
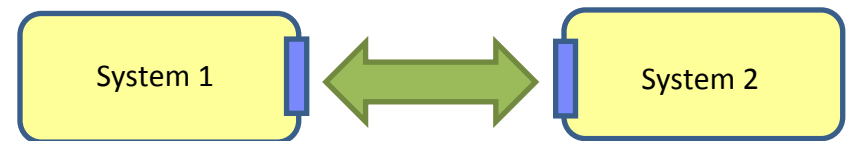
Many inhibitors to cloud adoption can be addressed through security, interoperability, integration and portability standards.



Existing standards may be employed, new standards are lacking due to the emerging nature of the market. Vendors are either focused on innovation or the establishment of platform dominance.

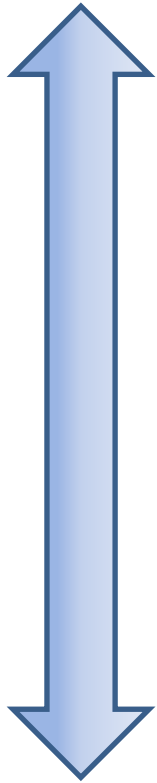
What do we mean by interoperability, integration, and portability?

- **Interoperability is concerned with the ability of systems to communicate – and it requires that the communicated information can be understood by the receiving system - but it is not concerned with whether the communicating systems do anything sensible as a whole.**
- ***Integration* is concerned with the process of combining components or systems into an overall system**
- **Portability is concerned with the ease of moving components or systems between environments (hardware and/or software environments)**



Enterprise Cloud Customer Usage Models

Interoperability most important - May use existing standards



May require new integration & portability technology/standards as a result of the cloud

- Model 1: End User to Cloud - **Application running on the cloud with access for end-users**
- Model 2: Enterprise to Cloud to End-user (Interoperability) - **Applications running in the public cloud – access from employees and customers**
- Model 3: Enterprise to Cloud to Enterprise(Interoperability) - **Cloud application running in the public cloud and interoperates with partner applications (supply chain)**
- Model 4: Enterprise to Cloud (Integration) - **Cloud application integrated with internal IT capabilities**
- Model 5: Enterprise to Cloud (portability) - **Cloud application running in the cloud – flexibility to move to a different cloud provider in the future or in-house**

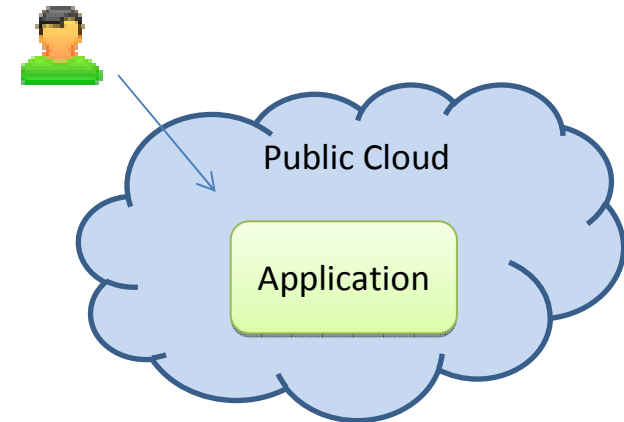
See: <http://groups.google.com/group/cloud-computing-use-cases>

Enterprise Cloud Customer Usage Models

<p>1. End User to Cloud - Application running on the cloud with access for end-users</p>	
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<p>3. Enterprise to Cloud (Integration) - Cloud application integrated with internal IT capabilities</p>	
<p>4. Enterprise to Cloud to Enterprise (Interoperability) - Cloud application running in the public cloud and interoperates with partner applications (supply chain)</p>	
<p>5. Enterprise to Cloud (Portability) - Cloud application running in the cloud – flexibility to move to a different cloud provider in the future or in-house</p>	
<p>6. Private (intra) Clouds - Interoperability / integration within elements of a private cloud and between a private cloud and a traditional SOA environment</p>	

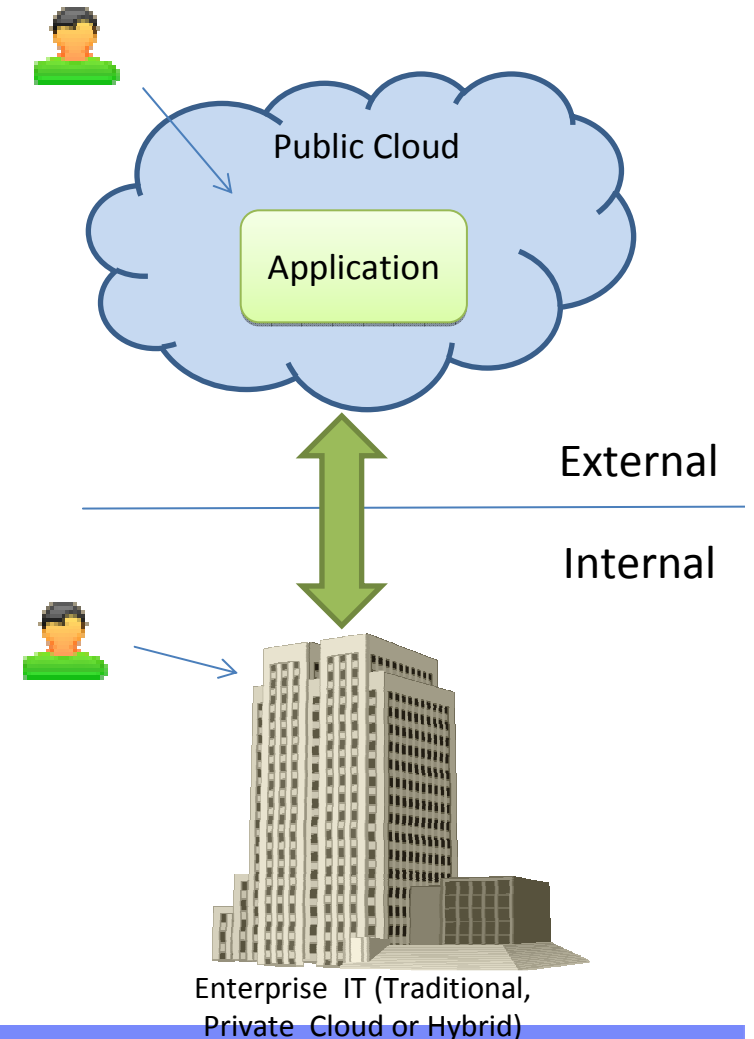
Model 1: End User to Cloud

- What is it ?
 - Application running on the cloud with access for end-users
- Scenarios :
 - Get new Web app provisioned worldwide quickly (e.g., the next facebook, linkedin, ...)
 - Don't need IT infrastructure, flexible acquisition
- What standards are needed?
 - ✓ Basic identity and web access
 - Keep client (Ajax based RIA's) open to prevent lock-in and encourage innovation.



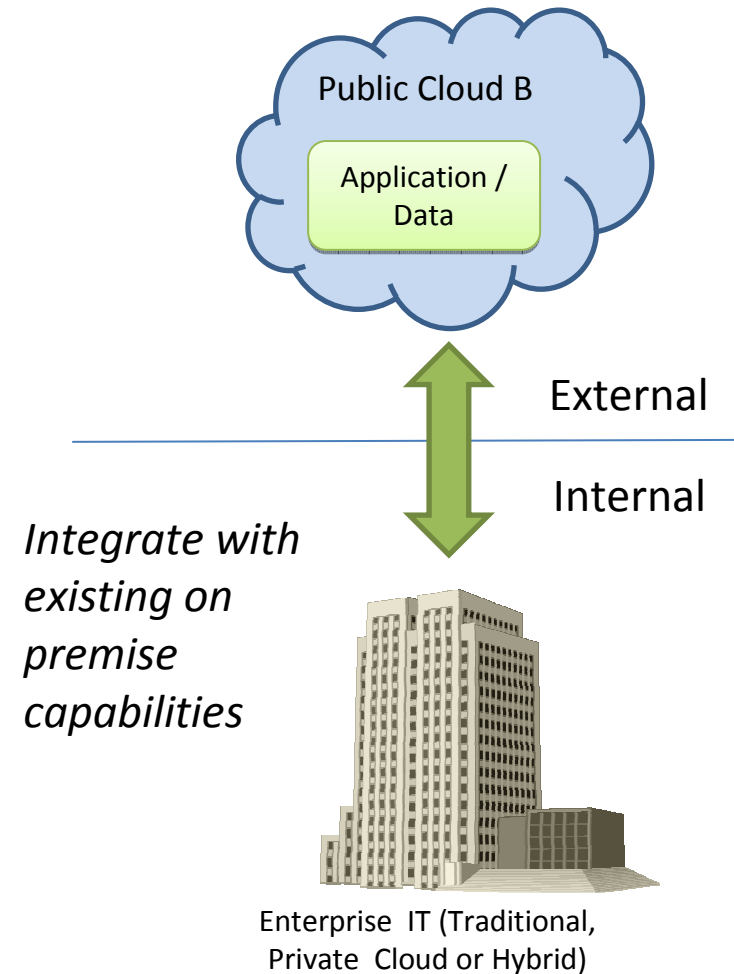
Model 2: Enterprise to Cloud to End-user

- What is it:
 - Deploy (or build) cloud based application specifically for the cloud – access for employees (different) and for customers
- Scenarios:
 - Online sales through catalog, needs to link back into enterprise systems for fulfillment (web app and shopping cart in cloud, fulfillment inside existing enterprise systems)
 - Two sub-models
 - End User is employee in the Enterprise (e.g., Travel Expense Account application)
 - End User is Web customer outside the Enterprise (e.g., online sales)
- What standards are needed?
 - ✓ Existing interoperability/access/identity standards such as HTTP, Web services, REST, OpenID can be used.
 - However, vendors must commit to using these.



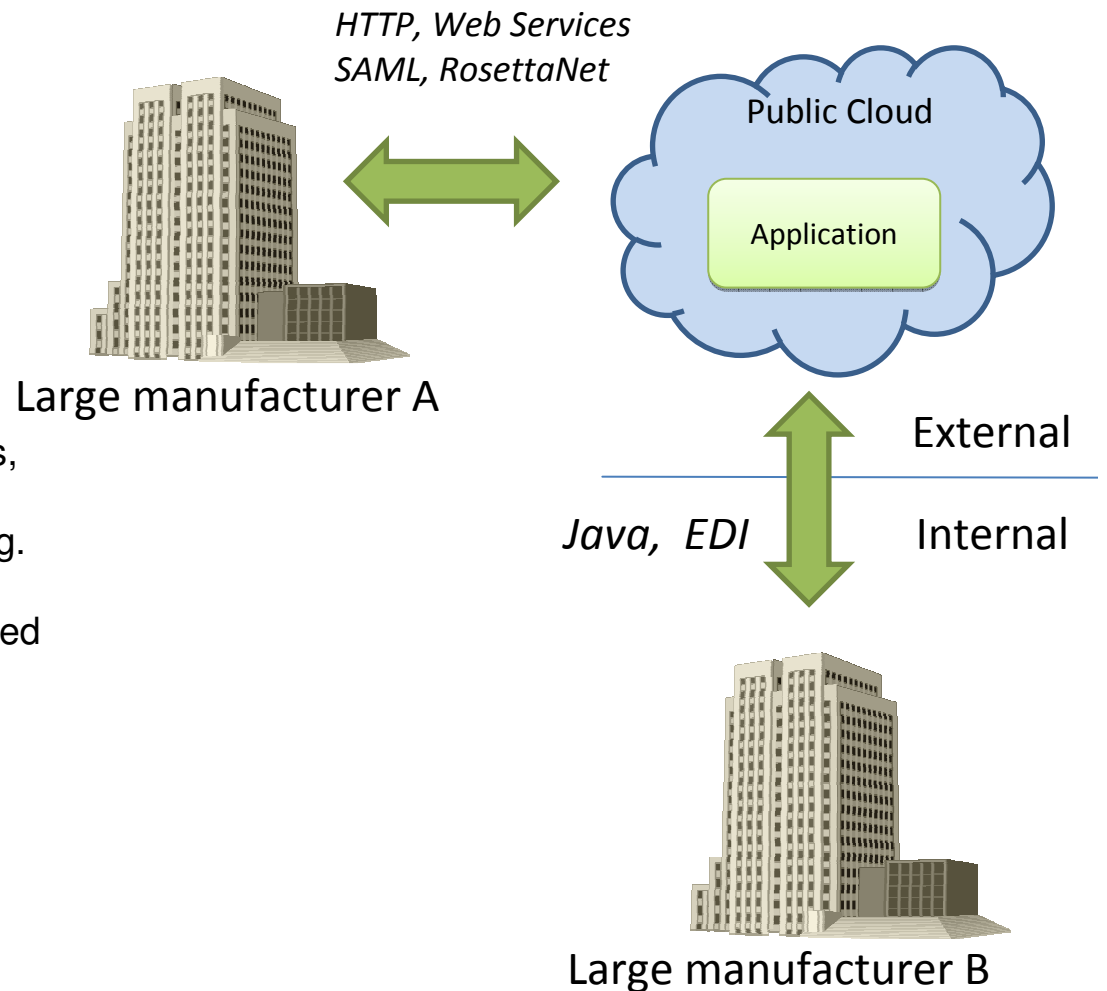
Model 3: Enterprise to Cloud (Integration)

- What is it?
 - Cloud application – integrated with internal IT capabilities
- Scenarios :
 - Typical SOA / IOD approach of integrate with existing on premises and off-premises capabilities or other cloud application (customer list, access control, data)
- What standards are needed?
 - Platform differences will have to be reconciled with standards efforts
 - ✓ Data integration (like a 'JDBC for the cloud')
 - Management and governance systems
 - Metering, monitoring, deployment, service lifecycle
 - Security



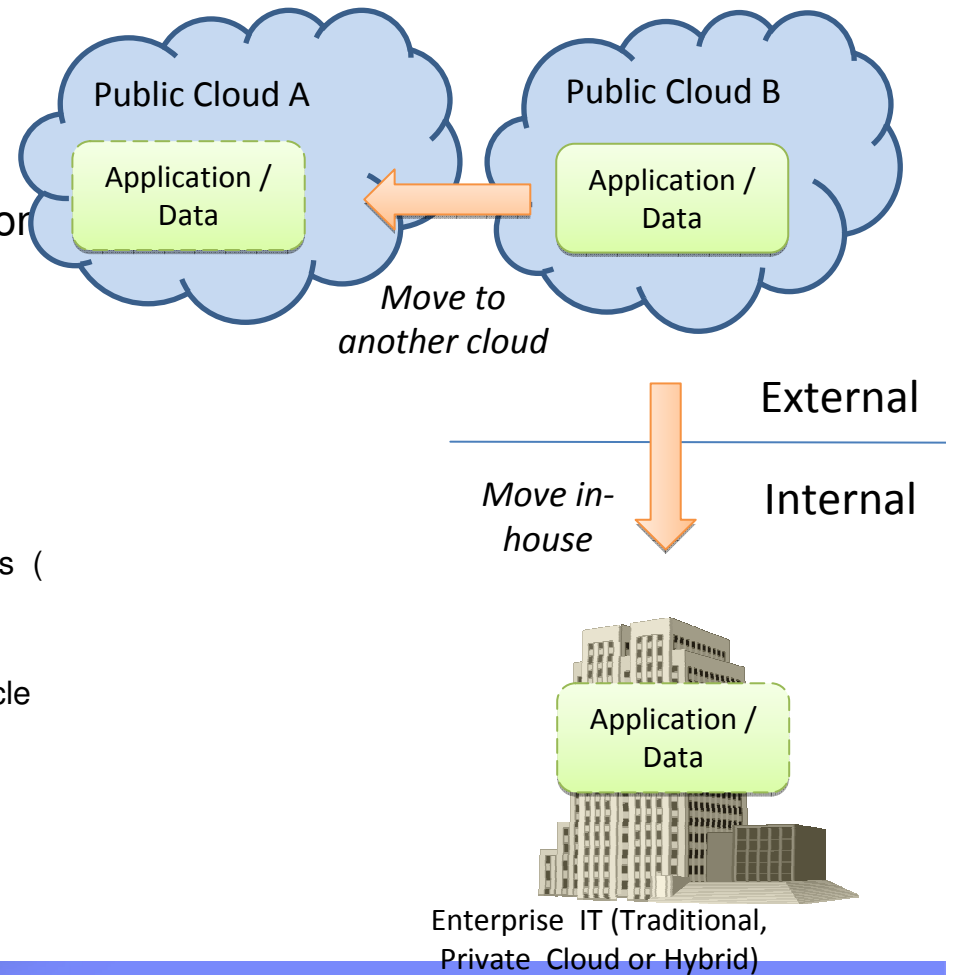
Model 4: Enterprise to Cloud to Enterprise

- What is it?
 - Cloud application running in the public cloud – interoperate with partner applications (supply chain)
- Scenarios :
 - Brokers, common function providers (e.g., supply chain, broadcast recall to multiple customers, broadcast RFP to suppliers, “classic” B2B)
- What standards are needed?
 - ✓ Existing interoperability/access/identity standards such as HTTP, Web services, REST , OpenID can be used.
 - However, vendors must commit to using.
 - Existing industry specific interchange protocols such as RosettaNet would need to be adopted by cloud application vendors



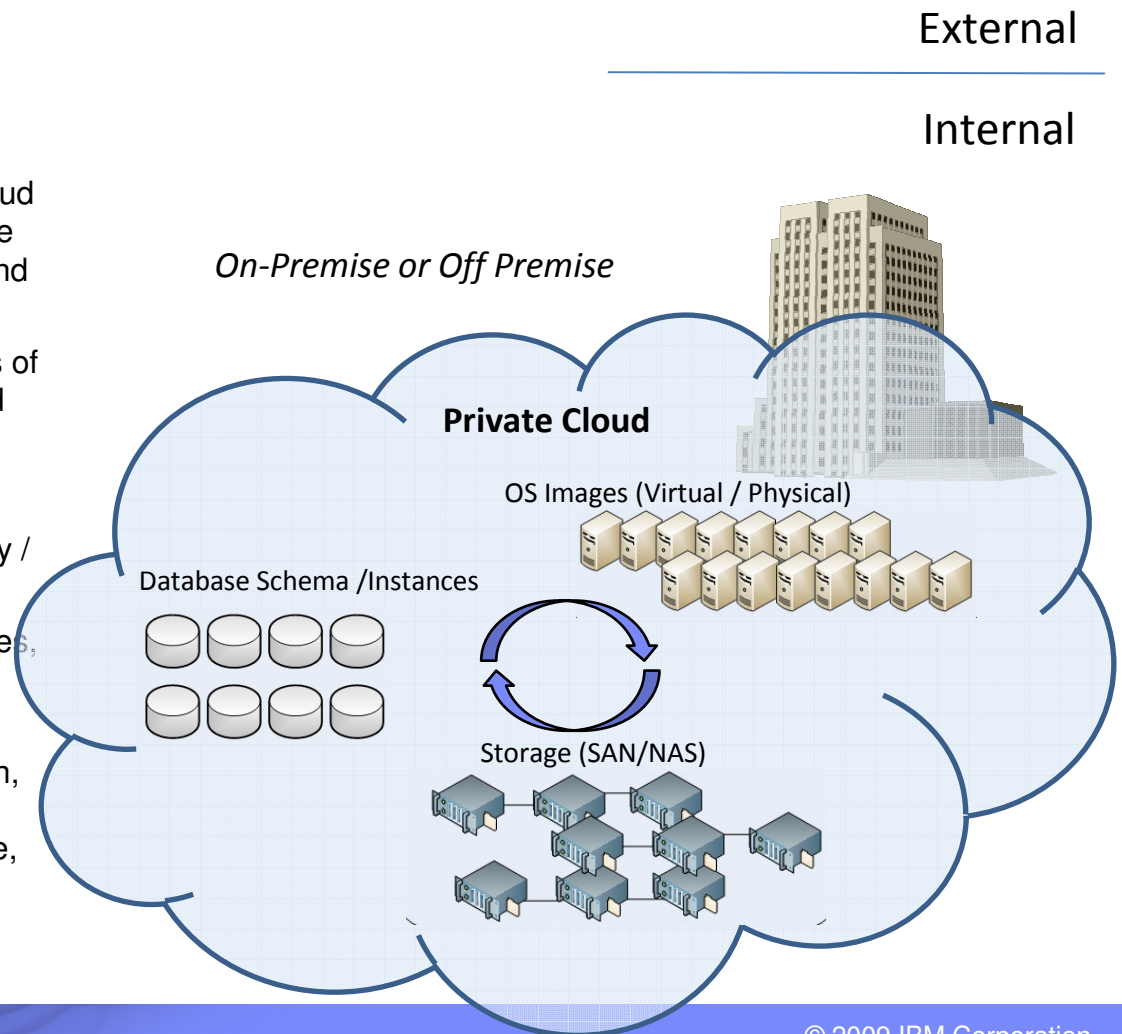
Model 5: Enterprise to Cloud (Portability)

- What is it?
 - Cloud application and/or data running in the cloud – flexibility to move to a different cloud provider in the future or in-house
- Scenarios:
 - Flexibility and choice to change application / platform suppliers
 - “Write once run anywhere”
- What standards are needed?
 - Programming / Platform model (PaaS)
 - Tools and Robust programming language options (J2EE for the cloud, Python, Ruby, etc)
 - Management and governance systems
 - Metering, monitoring, deployment, service lifecycle
 - Security
 - Data
 - Evacuation Procedure
 - VM portability / assembly / composition (IaaS)



Model 6: Private (intra) Cloud

- What is it?
 - A “private” cloud-based service, offers many of the benefits of a public cloud computing environment. The difference is that in a private cloud-based service, data and processes are managed within the organization.
- Scenarios:
 - The enterprise would leverage a private cloud to provide Self-service capabilities, real-time infrastructure, and asset type abstraction and reuse .
 - Interoperability / integration within elements of a private cloud and between a private cloud and a traditional SOA environment
- What standards are needed?
 - ✓ Virtual Appliance- VM portability / assembly / composition is critical.
 - ✓ Existing Standards: Web DAV, Web Services, HTTP, S3, XAM, pNFS, POSIX, SQL-Lite, Meta Data support standards
 - Management, Deployment, Instrumentation, Metering, Synchronization, Orchestration, Policy, Entitlement, Naming/DNS, Presence, Discovery, Storage (Blob Storage, Block Storage, Map/Table , model, Query Model, Content Addressable)



Summary

- **It's important for business managers in their decision-making, to:**
 - Understand how and why using any Cloud Model will return value, based on clear requirements
 - Understand that adoption of Cloud Computing represents a major cultural transformation for many IT decision makers and the lines of business they support. Business and IT executives need to think freshly about "make versus buy" sourcing decisions for their IT service delivery capabilities.
 - Focus on business requirements and value as guideposts for standardization prioritization, cost savings and business agility that can come from Cloud Computing architectures and services
 - Customer feedback indicates that many early Cloud Computing adopters are finding these types of offerings to be sufficiently secure and flexible while helping to reduce costs – Standardization is becoming an important factor and should be
 - With standardization Cloud Computing options will increasingly garner serious consideration from a wide range of businesses and will become a standard sourcing option for many types of applications and infrastructure solutions
 - Standards will be most effectively prioritized and driven by business use cases and regulatory considerations for integration, interoperability and portability

- Participate @: <http://groups.google.com/group/cloud-computing-use-cases>

