How to Define a Cloud?

1. “… an on-demand service model for IT provision, often based on virtualization and distributed computing technologies… a new way of delivering computing resources, not a new technology”.
   – European Network and Information Security Agency

2. “… 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”.
   – US National Institute of Standards & Technology

3. A computing paradigm where services and data reside in shared resources in scalable data centers, and those services and data are accessible by any authenticated device over the Internet
Cloud Computing: Key Attributes

Key attributes that distinguish cloud computing from conventional computing

• Abstracted and offered as a service
• Built on a massively scalable infrastructure
• Based on dynamic, elastic, flexibly configurable resources that enables rapid provisioning
• Shared and multi-tenanted resources (hardware, memory, database)
• Easily purchased and billed by consumption
• Self-service based usage model
• Accessible over the Internet by any device
Cloud Computing – Why Now?

• **Bandwidth**
  – Increased availability of high-speed broadband (wireless and fixed)

• **Access**
  – Improved mobility & capability of devices
    • Laptops and Netbooks
    • Mobiles, Smartphones, Tablets

• **Storage**
  – Costs of storage capacity have fallen exponentially over the last decade, enabling the new business opportunities/models
Cloud Computing: Benefits

Microeconomic

• Choice and Flexibility
• Cost Savings and Efficiencies
• Greater Computing Power and Latest Technologies
• New Platforms for Innovation

Macroeconomic

• Wealth Creation
• Innovation
• Jobs
• Address societal challenges
## Some Examples

| **Software as a Service (SaaS)** | 1. HR (‘Salesforce’)  
2. Email (‘Hotmail’)  
3. Google (‘Apps’) |
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<td>Software offered by third parties deployed as a hosted service and accessed over the Internet</td>
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| **Platform as a Service (PaaS)** | 1. ‘Azure’  
→ MyTampines  
→ Health Provisioning |
| Platforms that can be used to deploy applications provided by customers or partners of the PaaS provider. | |
| **Infrastructure as a Service (IaaS)** | 1. Amazon (‘EC2’)  
→ Tax Collection |
| Computing infrastructure, such as servers, storage and network, delivered as a cloud service, typically through virtualization. | |
Key Policy & Regulatory Issues

Infrastructure & Access: APEC already focused quite well

Interoperability & Standards: rules for the info ecosystem

Data portability: rules between providers, apps & systems
  – Time/ cost involved? Potential data loss?
  – Can vendors provide sufficient openness to gain trust? Is there common accountability?

Data security: how safe is the data/information
  – Very real possibility that the owner’s data could reside on the same resources as a competitor’s application and data
Key Policy & Regulatory Issues

Privacy: *who can access what & when*

**Identity Management:** *enhancing authentication*

**Data Sovereignty:** *who can access what & when*

- Where is data stored/ processed?
- Who and where are my service/ app providers?
- Legislation: levels of enforcement, company compliance, etc.

**IPR & Piracy**
We need coordinated action about how data will move to the cloud, in the cloud, and between the clouds.

The key question for governments is not, how to build and deploy technology – this is essentially a ‘known’ – but how to build trust and confidence in the system to maximize the benefits.
Policy Interoperability

• Internet has enjoyed ‘light touch’ regulation

• Data is becoming ‘stateless’:
  – Cross platforms
  – Cross providers
  – Cross borders

• Increasing ‘control’ over data means more clarity is needed:
  – Developers need certainty to build globally relevant applications
  – Customers need confidence that their data – and identity – is protected
  – Service providers need clarity to build the platform & infra for the cloud

• How regulatory & legal frameworks ‘interoperate’ is critical
New Regime Suggestions for Cloud

1. Better legal certainty for companies providing cloud services.
   - Today, there is little legal certainty two reasons: (i) laws have become outdated; (ii) it's often unclear whose law applies at any given moment.

2. New generation of regulations focused on outcomes rather than the means by which those outcomes are to be achieved.

3. Enhance the ability for data to cross borders.
   - Place the accountability on cloud service providers within consistent frameworks (“an accountability principle”).