# Yesterday Today and Tomorrow of CC
# 云计算的前世今生与未来

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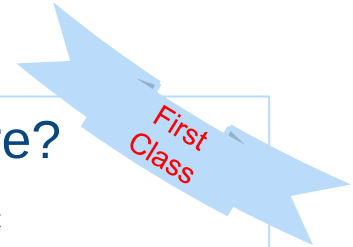
# Background

## Who am I?

- Forest Zhang 张荣典
- IT veteran(15 yrs), worked at SI, ISV, IT Outsourcer for Public Sector, Telco, MNC and etc.
- Belief: Cloud Computing is the future of IT

## Why are we here?




- BUAA, on-the-job postgraduate of CC
- You are ‘Cloud Force Cadets’
- You are to be Elite Architects of CC
- Today is the First Day and ‘First Class’ (导论)

## Disclaimer ☺

- The views and opinions expressed in this slide deck are those of Forest Zhang, not the views and opinions of his employer.
- There are pictures, diagrams and knowledge in this slide deck from the ‘Cloud’. To whom may concern, please raise your concern to forest.zrd@gmail.com.

# Agenda

- Yesterday:
  - Cloud Computing Background & Origin
  - Cloud Computing Business Value
- Today:
  - Cloud Computing Current Status
  - Cloud Computing Market Analysis
- Tomorrow:
  - Cloud Computing Trends
  - Cloud Computing Future Analysis

Special Bonus

- Chapter 1:
  - Cloud Computing Definition
  - Cloud Computing Ref. Architecture
- Chapter 2:
  - Cloud Computing Standards
  - Cloud Computing Security Framework
- Chapter 3:
  - Cloud Computing Designing Philosophy

# First Class Principles

**Open Mind**

Think and re-think, image and re-image

**Open Discussion**

Agree to disagree, disagree to agree


Origins from earth…

# CHAPTER 1: YESTERDAY OF CLOUD COMPUTING

# Cloud Chaos


Cloud computing is Super Hype，is it a fad or craze?

# Cloud Chaos (cont.)

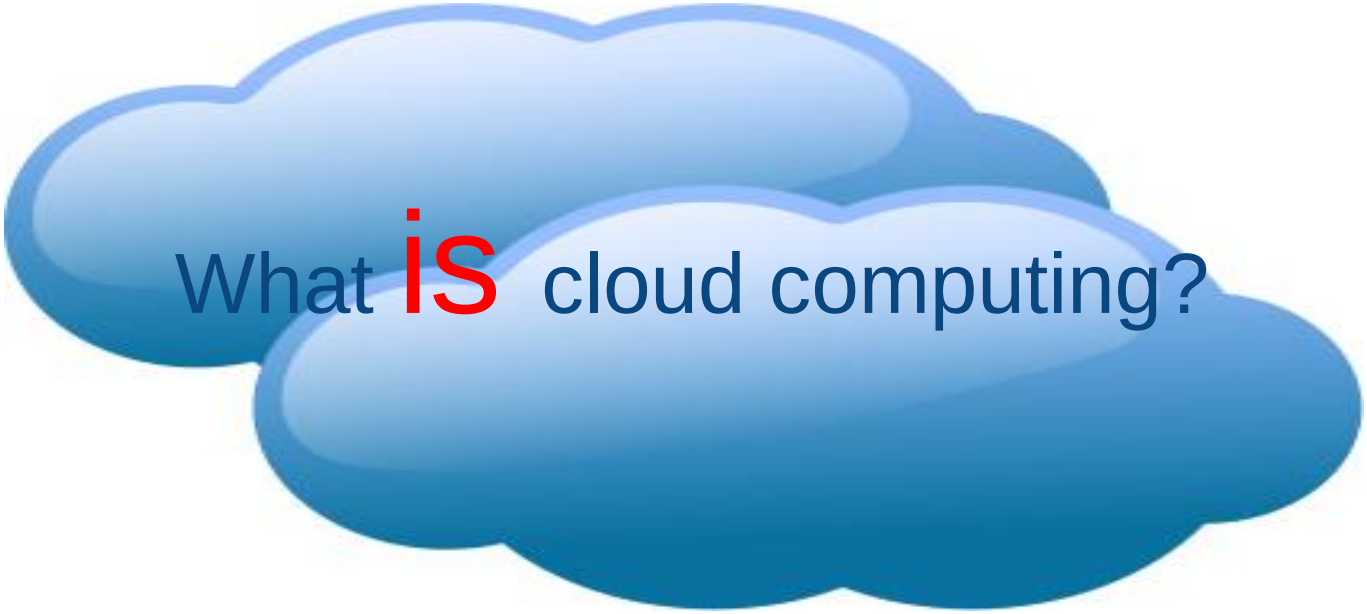

China is Cloudy and Clouded…

# Cloud Chaos (cont.)

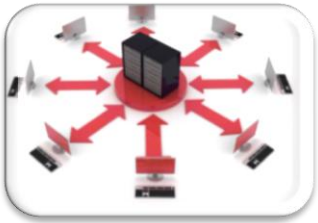
Cloud computing is the **Big Thing**, it was is and will continue be…

CC is interpreted by different people in different ways for different purposes.

# Cloud Question & Quest



# CC Origins: Computing History



Mainframe Era
Big Iron

1970

Rise of PC

1980

Client/Server Era

1990

Internet Era

2000

Cloud Era

Beyond 2010

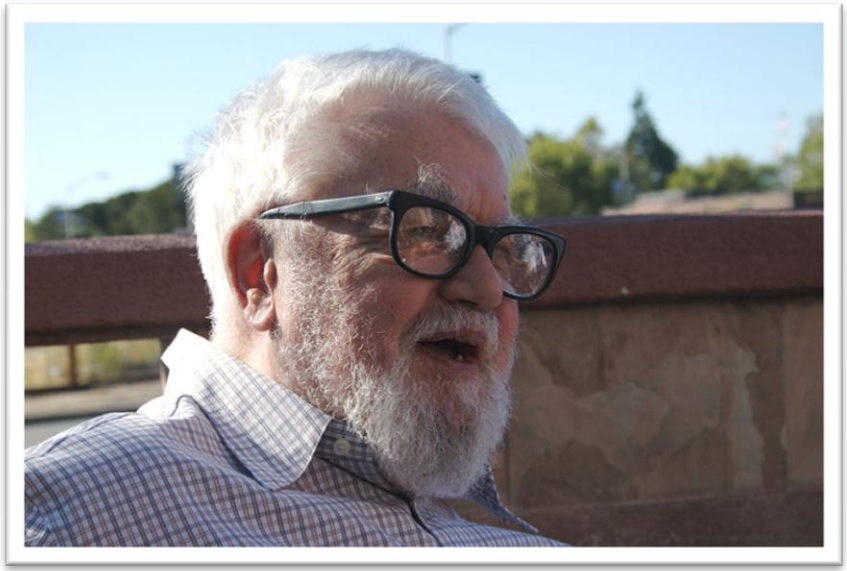
The history of computing is the history of science computing, business computing and personal computing.

# CC Origins: Utility Computing (cont.)

*"…computing may someday be organized as a public utility just as the telephone system is a public utility... The computer utility could become the basis of a new and important industry…"*

***- John McCarthy***

***1961***



Is cloud computing utility computing?

Hmmm…
UC was a **vision** practiced, faded and resurfaced
UC laid the thinking foundation and enlightened
grid computing & cloud computing…

# CC Origins: Grid Computing(cont.)

Distributed Computing

*The term grid computing originated as metaphor for making computer power as easy to access as an electric power grid.*

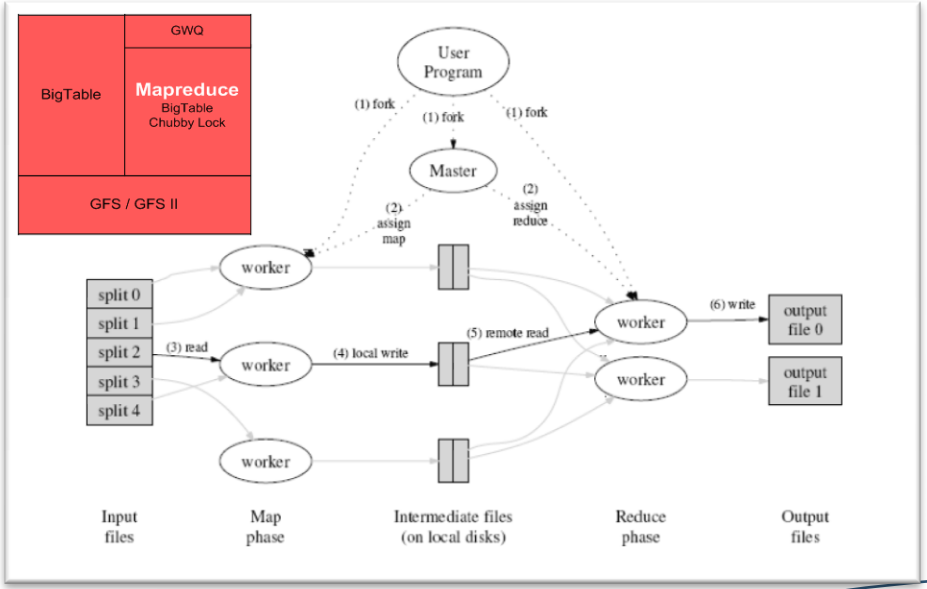
***Ian Foster's & Carl Kesselman***
***Early 1990s***

Is cloud computing grid computing?

Not exactly, GC may or may not be delivered as Utility Computing or Cloud Computing.
GC is more Science 2.0 versus Business 2.0…

# CC Origins: “Web Computing”(cont.)

Distributed Computing

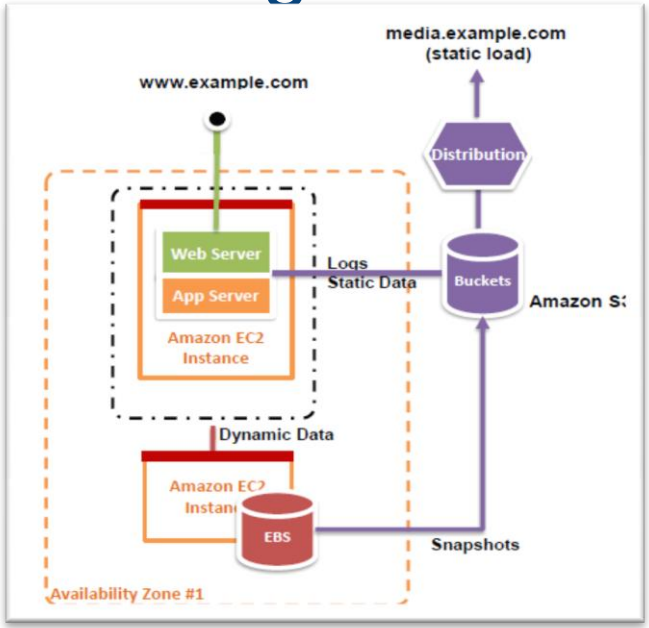



*Google introduced MapReduce in 2004 to support distributed computing on large data sets on clusters of computers.*

Is cloud computing “web computing”?

Not exactly, “WC” may or may not be used to construct or delivered as cloud computing…
“WC” is more Big Web & Big Data…

# CC Origins: Elastic Compute Cloud (cont.)




Cloud Computing
Debut

*Amazon launched S3(Simple Storage Service) in March, EC2(Elastic Compute Cloud) in August 2006.*

amazon web services™

Is AWS
cloud computing?

Yes, but cloud computing is much much more
than Amazon Web Services…

# Cloud Origins: All Roads Lead to CC

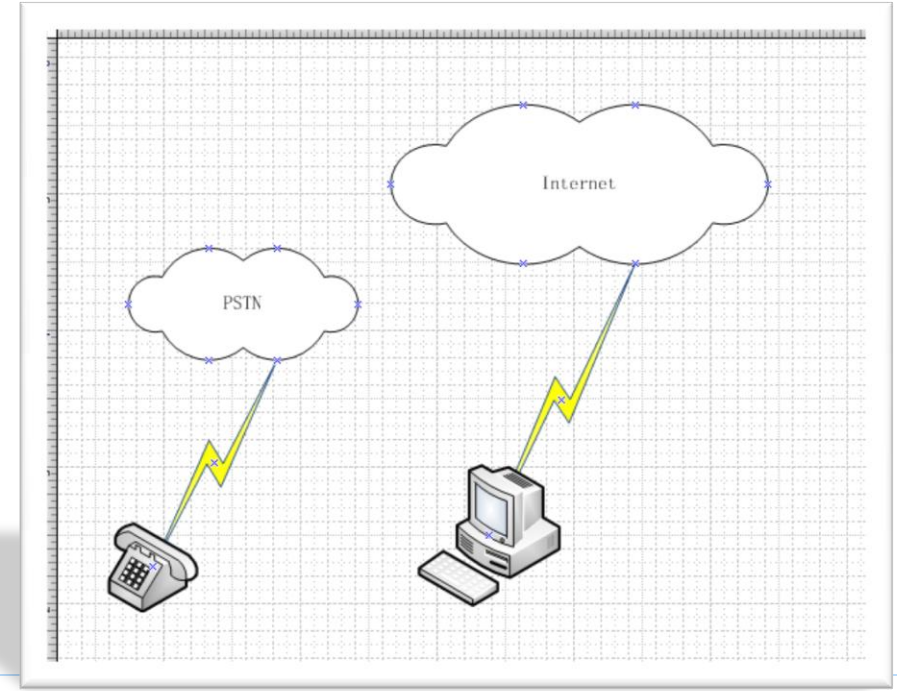
- There were many origins, converging into cloud computing.
  (Distributed Computing, Autonomous Computing, Middleware, SOA, Web Technologies, Web 2.0, IT Outsourcing…)
- CC is Big Impact, Big Challenge, Big Opportunity.

# Open Discussion

What is cloud computing?

Please share your interpretation…

# Cloud Definition: It's The Simple “Cloud”!




The “**cloud**” represents the telephone network in drawing, later metaphor for Internet to depict and abstract the underlying infrastructure…

# Cloud Definitions

FORRESTER®

*A standardized IT capability (services, software, or infrastructure) delivered via Internet technologies in a pay-per-use, self-service way.*

Gartner®

*A style of computing where scalable and elastic IT-related capabilities are provided as a service using Internet technologies.*

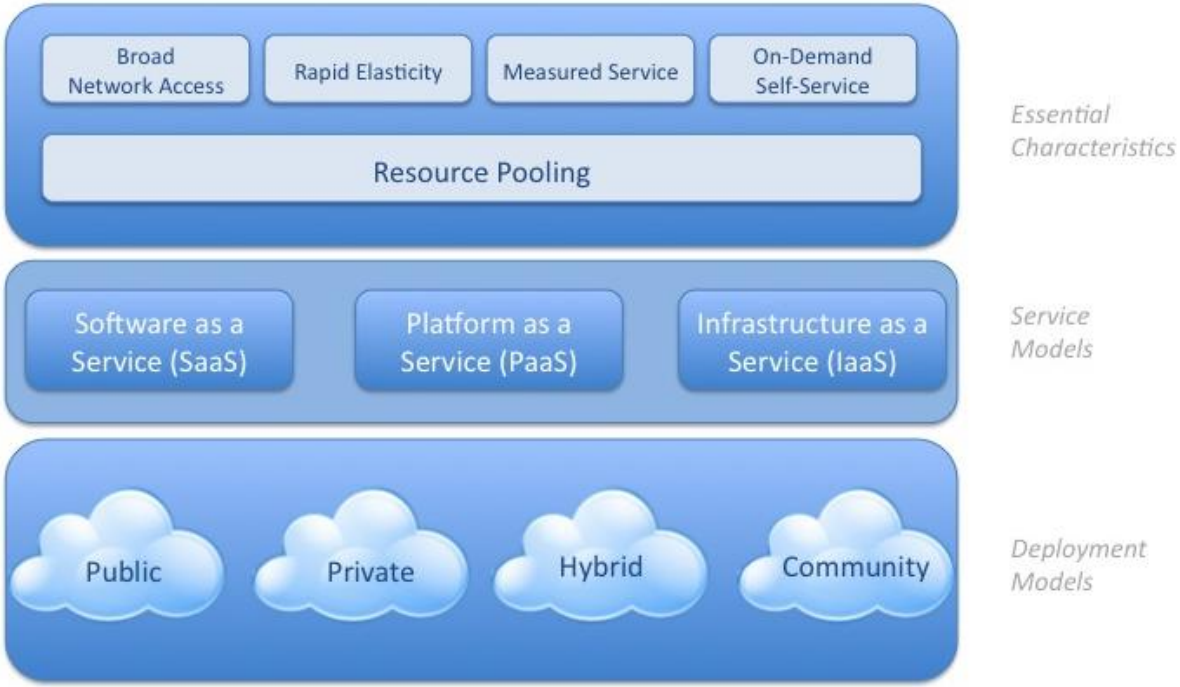
# Cloud Definition: NIST Version


NIST CC 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.*

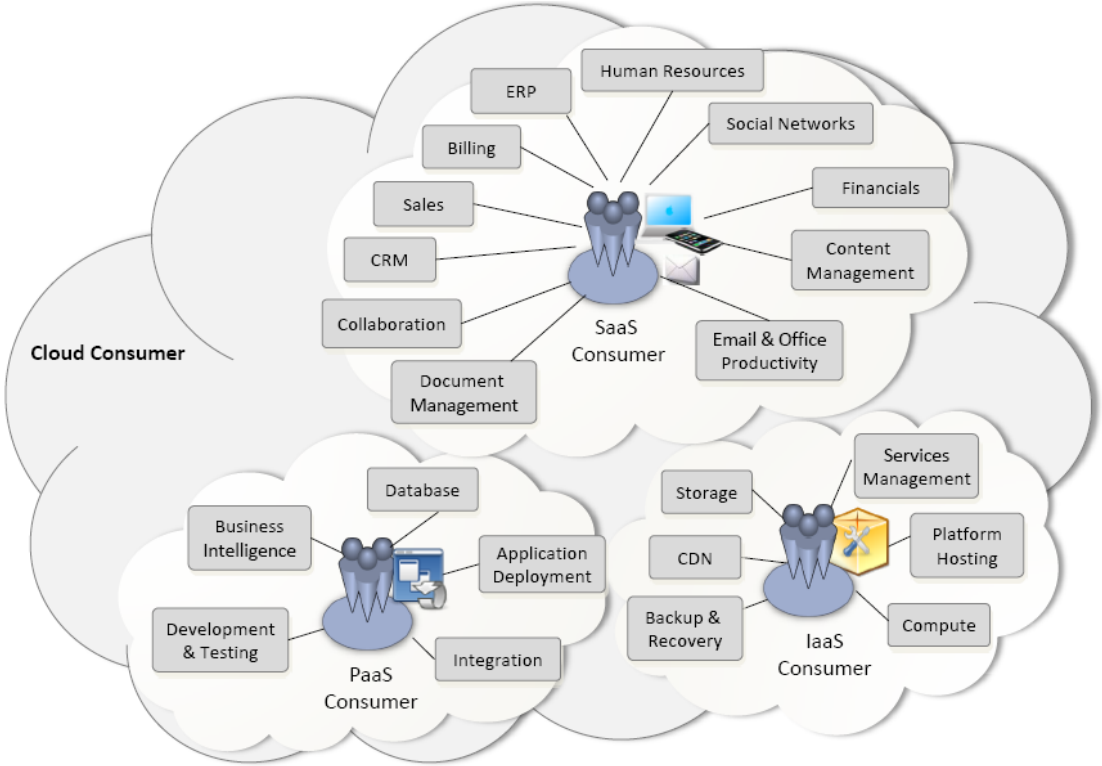
National Institute of Standards and Technology

# Cloud Definition: NIST Version (cont.)




National Institute of Standards and Technology

# Cloud Definition: CC Examples




National Institute of Standards and Technology

# Open Discussion

Dare you CHALLENGE

NIST's CC Definition?

*It's all about service…*

# Cloudonomics

Why do we need CC? What's the business value?

# Cloudonomics Analogy: Rent or Build?

Say you just moved to a city,

and you're looking for

a place to live



Note: this analogy copied from Andy Harjanto's "I am cloud confused" series. Thank you, Andy.

# Cloudonomics Analogy: Rent or Build?(cont.)

You can either

Build a house or

Rent an apartment

# Cloudonomics Analogy: Rent or Build?(cont.)

How big is the house?

Are you planning to grow a family?

How much money will you spend?

If you build a house, there are a few important decisions you have to make…

# Cloudonomics Analogy: Rent or Build?(cont.)

lighting

Roof

windows

tile

furniture

door

flooring

landscaping

You do get a chance to customize it

# Cloudonomics Analogy: Rent or Build?(cont.)

Hire Landscaper

Electrician

Plumber

House Keeping

Gutter Cleaning

Pay property tax

Water

Electricity

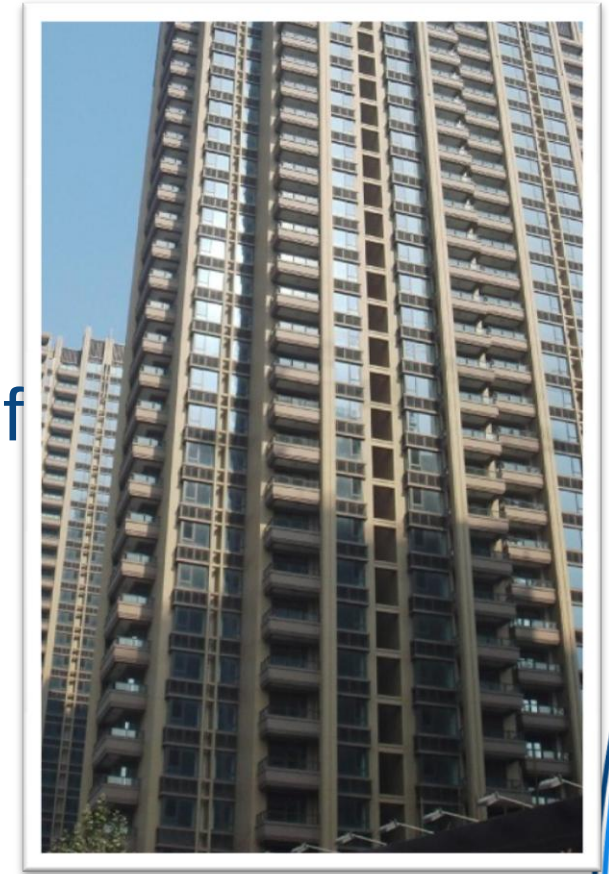
Heating and Cooling

Once the house is built,

you're responsible for maintenance

# Cloudonomics Analogy: Rent or Build?(cont.)

What about rent a unit from a builder with massive number of apartments?

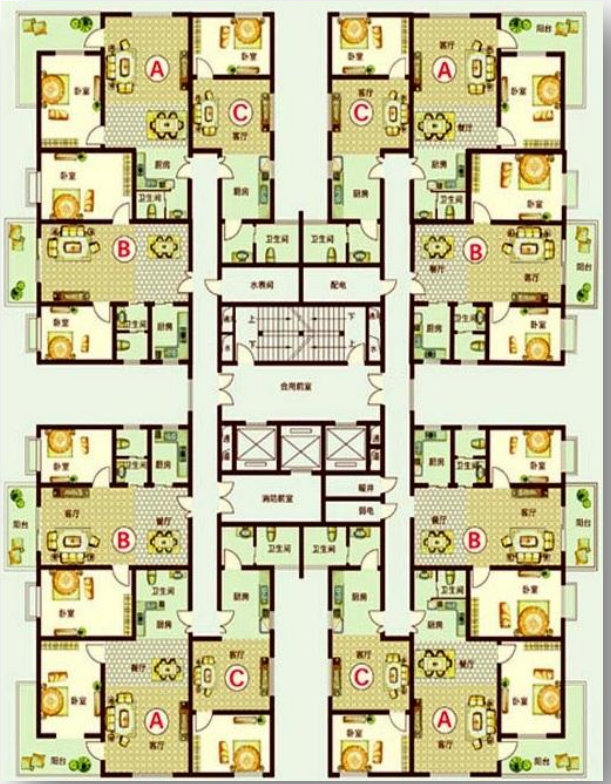


# Cloudonomics Analogy: Rent or Build?(cont.)

A unit can easily be converted into a 2,3,4 or more units

You can start with one unit and grow later, or downsize

You decision is much simpler



# Cloudonomics Analogy: Rent or Build?(cont.)

triple pane windows

high speed Internet

green materials

high capacity electricity

No need to worry about maintenance cost

No need to Hire landscapers, electricians, plumbers

Builders provide you high quality infrastructure

# Cloudonomics Analogy: Rent or Build?(cont.)

But you do not have much options to customize

# Cloudonomics Analogy: Rent or Build?(cont.)

Pay as You Go

You just pay your rent and utilities…

# Cloudonomics: Laws

Economies of Cloud Scale

- The peak of the sum is never greater than the sum of the peaks
- Aggregate demand is smoother than individual
- On-demand trumps forecasting
- Average unit costs are reduced by distributing fixed costs over more units of output.
- Utility services cost less even though they cost more
- Space-time is a continuum (Einstein/Minkowski)

# Cloudonomics: Pros & Cons (Yin & Yang)

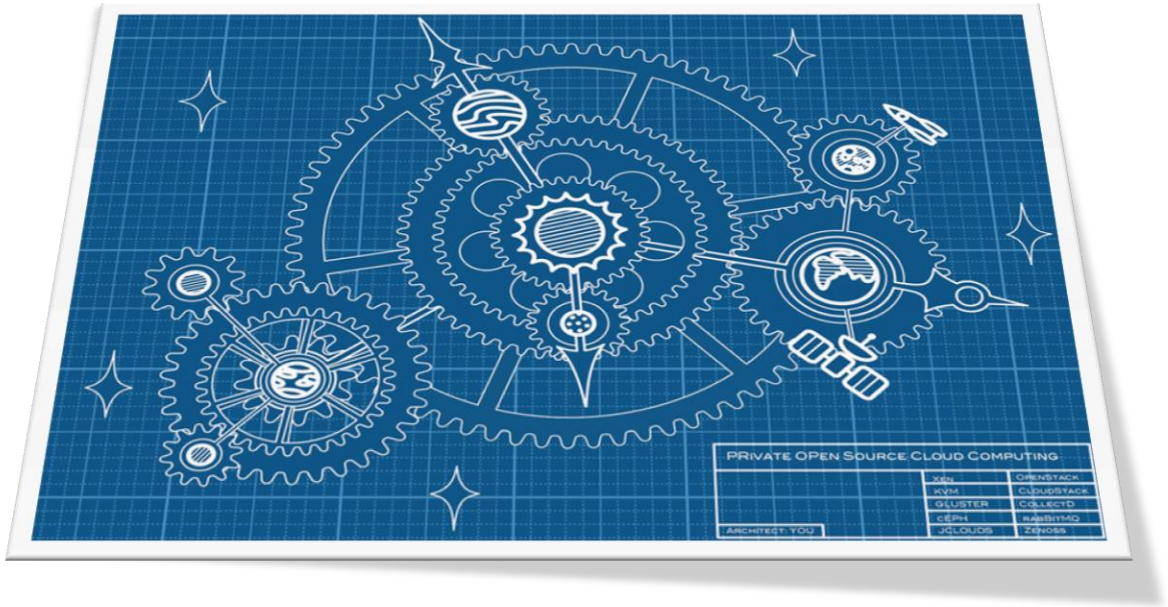
**Pros (Yang)**

- Shift CAPEX to OPEX
- Cost flexibility and reduction
- Scalability
- Market adaptability
- …

**Cons (Yin)**

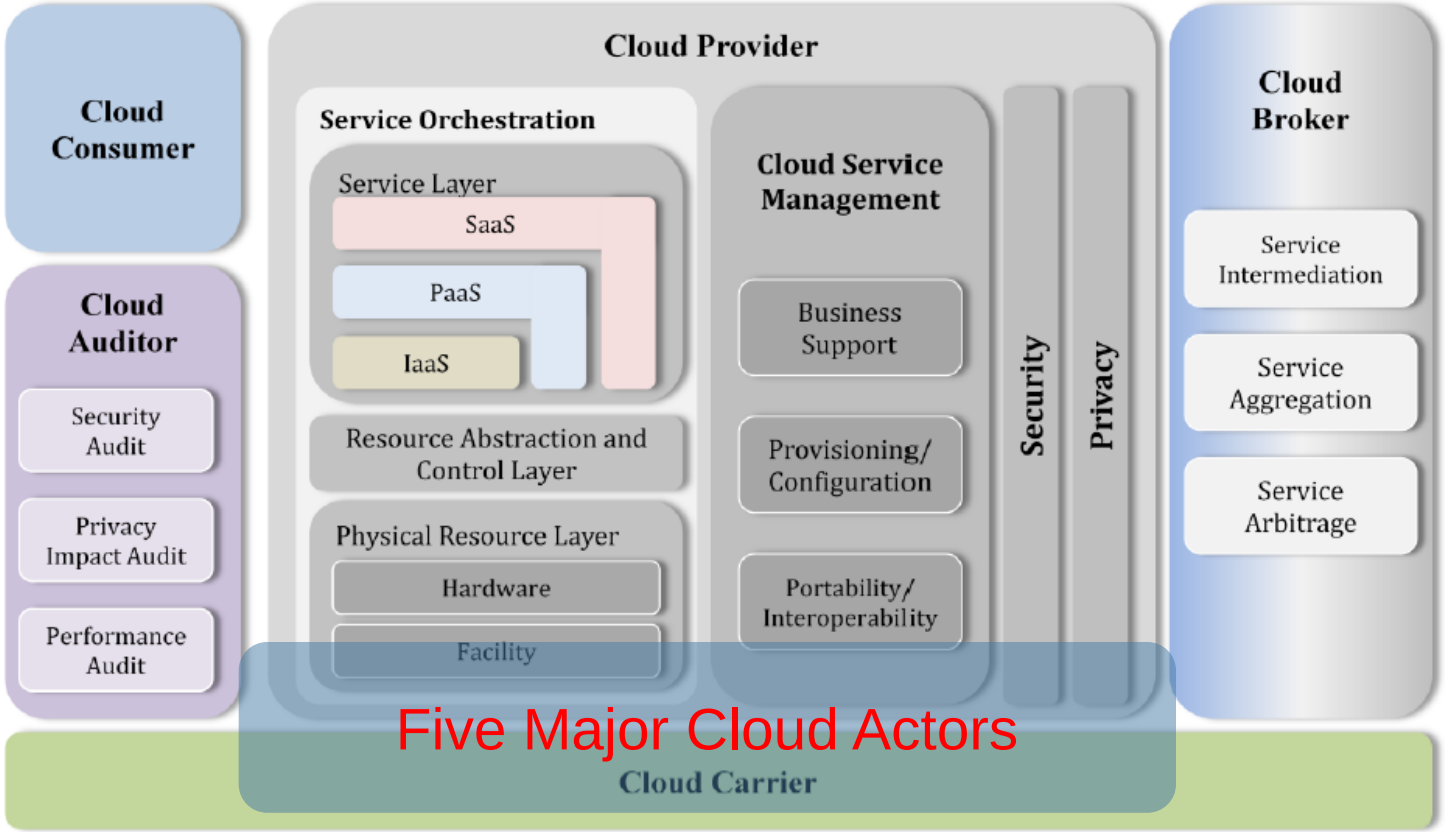
- Give up assets and control
- New governance skill sets needed
- Security concerns or perception
- …

# Cloud Reference Architecture

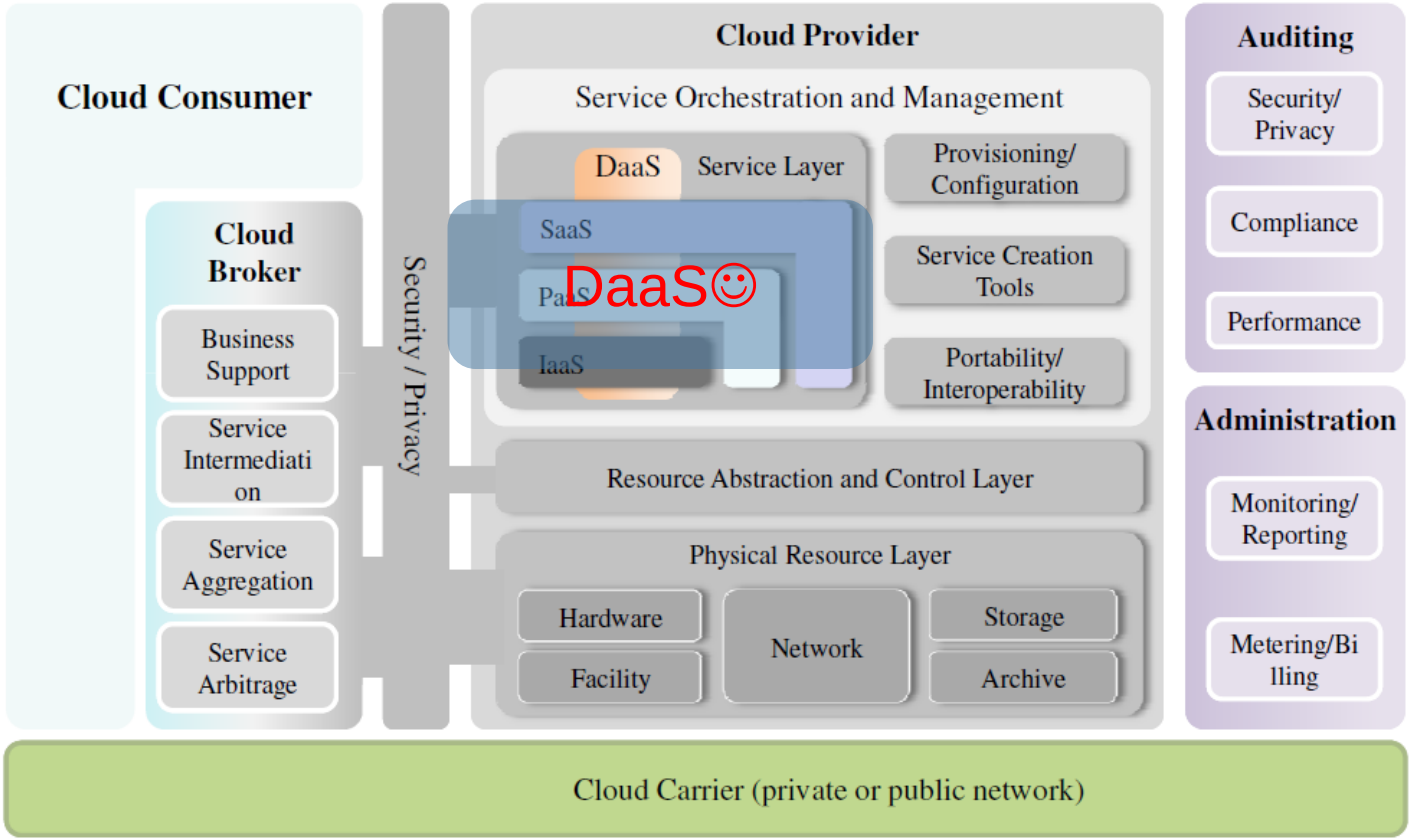



High Level, Conceptual RA & Framework

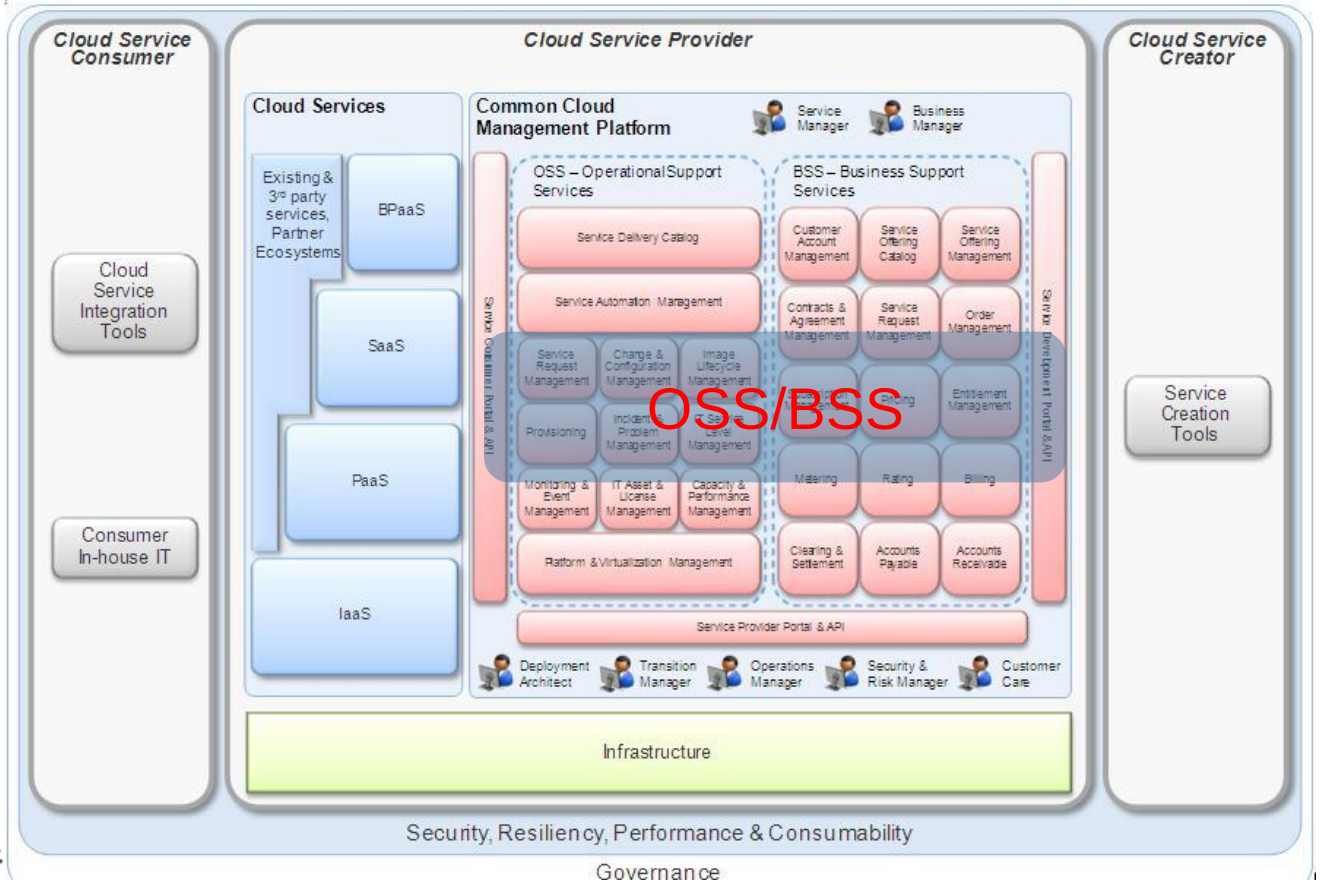
# Cloud RA: NIST CC RA



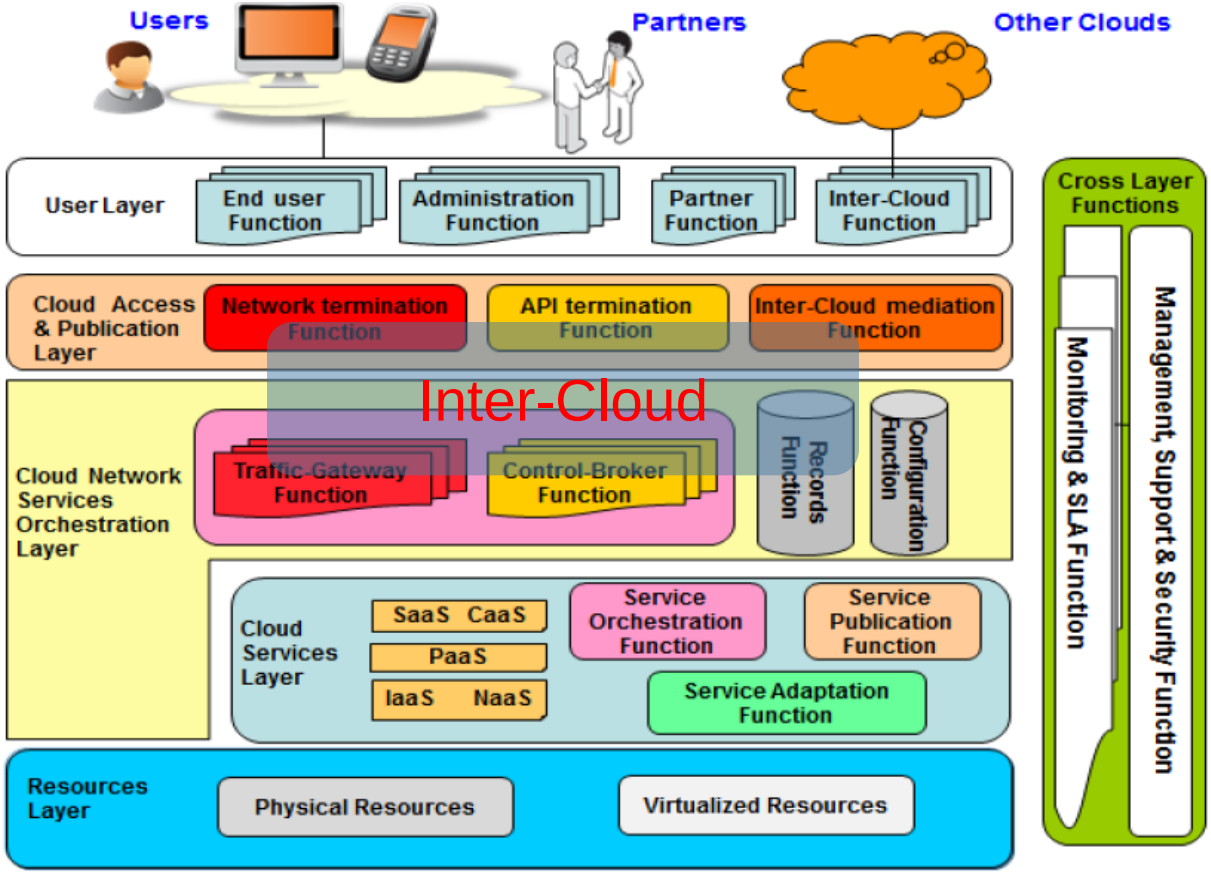
# Cloud RA: SNIA's Amendment



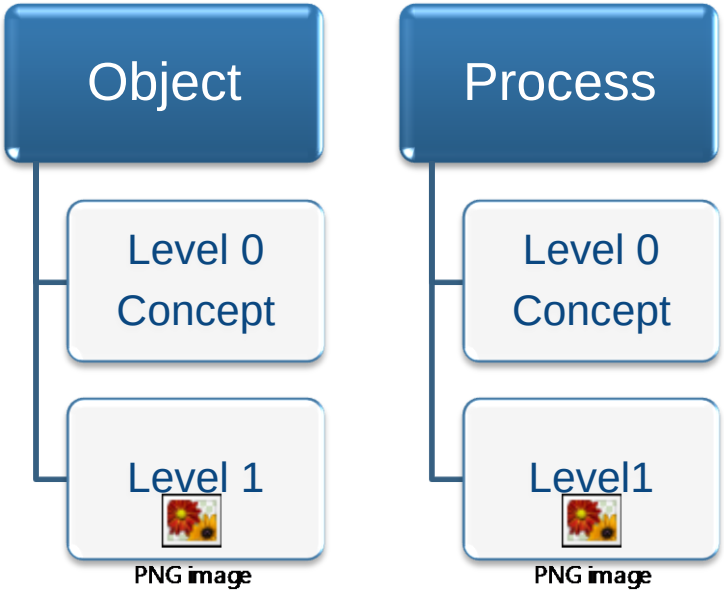
# Cloud RA: Open Group CCRA



# Cloud RA: ITU Functional Cloud RA



# Cloud RA: China Cloud Computing(C3) RA☺

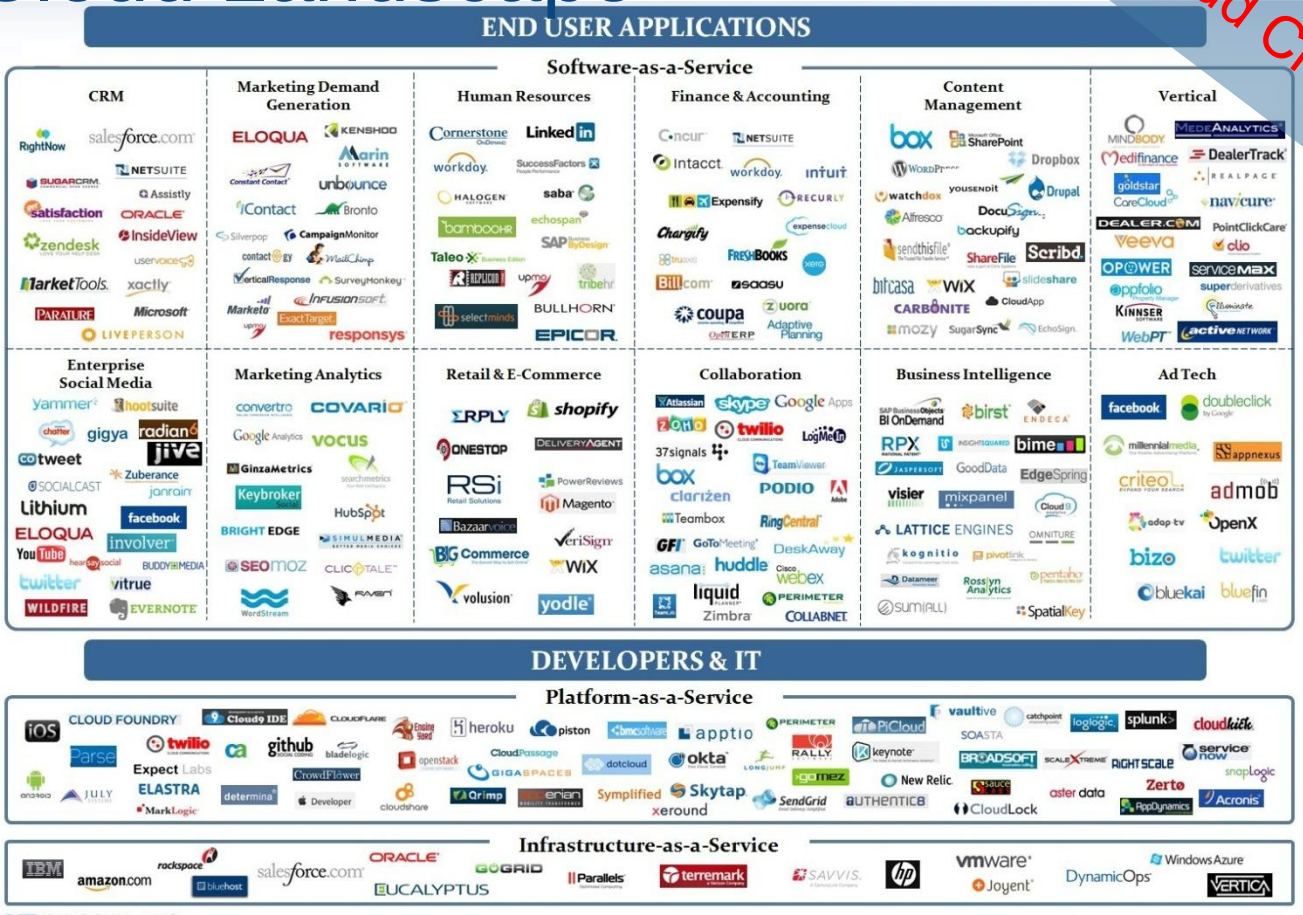


Rising on horizon…

# CHAPTER 2: TODAY OF CLOUD COMPUTING

# Cloud Landscape

Cloud Crowded




*By*

*Bessemer Venture Partner*

*2011*

# Cloud Landscape (cont.)

China is catching up…

*By*

*Forest Zhang*

*2011*

China will be another gold mine, but with many entry threshold

# Cloud Current Status: Public IaaS


***Gartner 2011:***

***Magic Quadrant for Public Cloud Infrastructure as a Service***

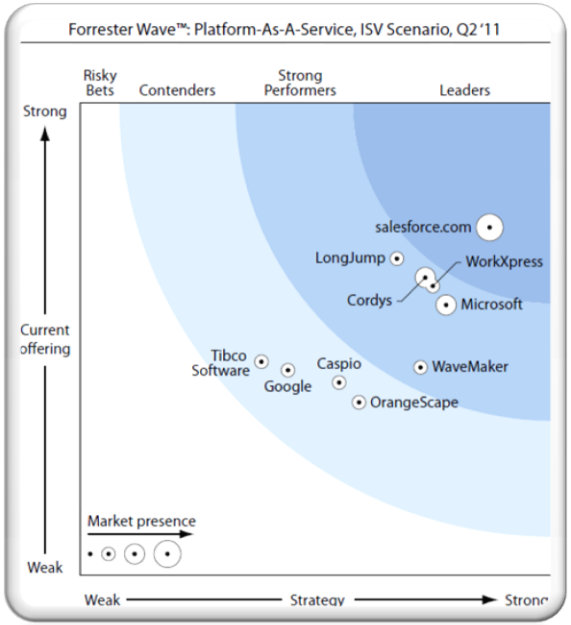
# Cloud Current Status: PaaS for ISV

**IDE with cloud deployment**
- Appian
- Google
- LongJump
- Magic Software
- Microsoft
- NetSuite
- OutSystems
- salesforce.com
- Servoy
- Tibco Software
- Vaakya
- VMware
- WaveMaker
- WSO2

**IDE-neutral cloud runtime**
- Amazon
- Appistry
- Apprenda
- CloudBees
- Cloudsoft
- Engine Yard
- GigaSpaces
- Heroku
- Joyent
- Microsoft
- Red Hat
- techcello.com
- VMware

**Cloud IDE**
- Appian
- Cordys
- Intuit
- salesforce.com
- TrackVia
- WOLF Frameworks

**PaaS for business experts**
- Caspio
- Cordys
- IS Tools
- OrangeScape
- WorkXpress
- Zoho




*Forrester 2011:*

*The Forrester Wave™: Platform-As-A-Service For Vendor Strategy Professionals*

# Cloud Current Status: Private & Hybrid

***The Cloud Market: Ranking the Solutions (4 = Highest Score)***

| Roll-Up Scores | VMW | MSFT | AMZN | IBM | HP | CA | RAX | BMC | RHT | ORCL |
|---|---|---|---|---|---|---|---|---|---|---|
| IaaS + Mgmt. | 3.6 | 2.6 | 2.4 | 2.4 | 2.4 | 2.4 | 2.3 | 2.2 | 1.8 | 1.0 |
| PaaS | 3.7 | 3.1 | 2.4 | | | | | | 2.2 | 1.7 |

**Leader**

- Top virtualization vendor (*VMware*)
- "All in" on the hybrid cloud
- Leveraging on-premise footprint to position itself in the sweet spot for moving enterprise buyers to hybrid cloud

**Disruptors**

- Public cloud and open source providers (*Amazon, Rackspace, Red Hat*)
- Have shaken up buying patterns for traditional datacenter infrastructure and application development
- Lack the enterprise experience and solutions to be hybrid cloud leaders

**Followers**

- Large enterprise systems management vendors (*CA, BMC*)
- Take time to integrate disruptive technologies into mgmt frameworks
- Their enterprise footprint will make them strong players down the road

**Defenders**

- Enterprise systems, OS, and application vendors (*HP, IBM, Microsoft, Oracle*)
- Hybrid cloud threatens existing installed base of hardware/software customers
- Working to contain the impact until they can monetize the hybrid cloud

***Taneja Group Aug. 2011:***

***An Overview***

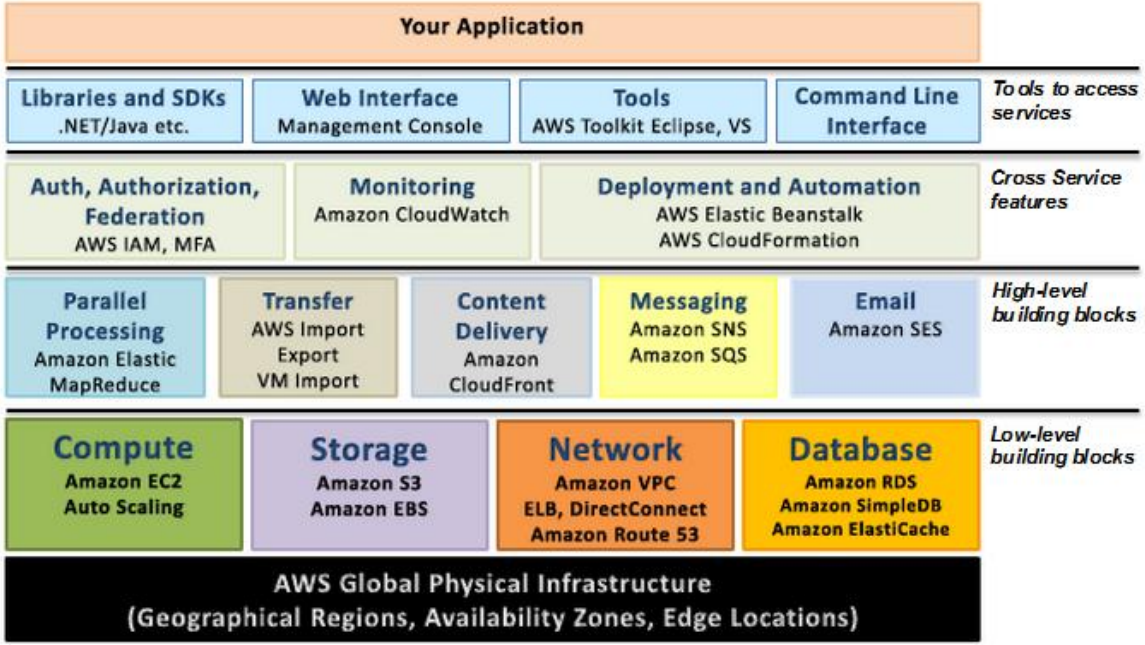
***of The Cloud Market***

***Vendor Landscape***

# Cloud Current Status: Money

Big Cloud, Big Money?

# Cloud Current Status: Amazon AWS

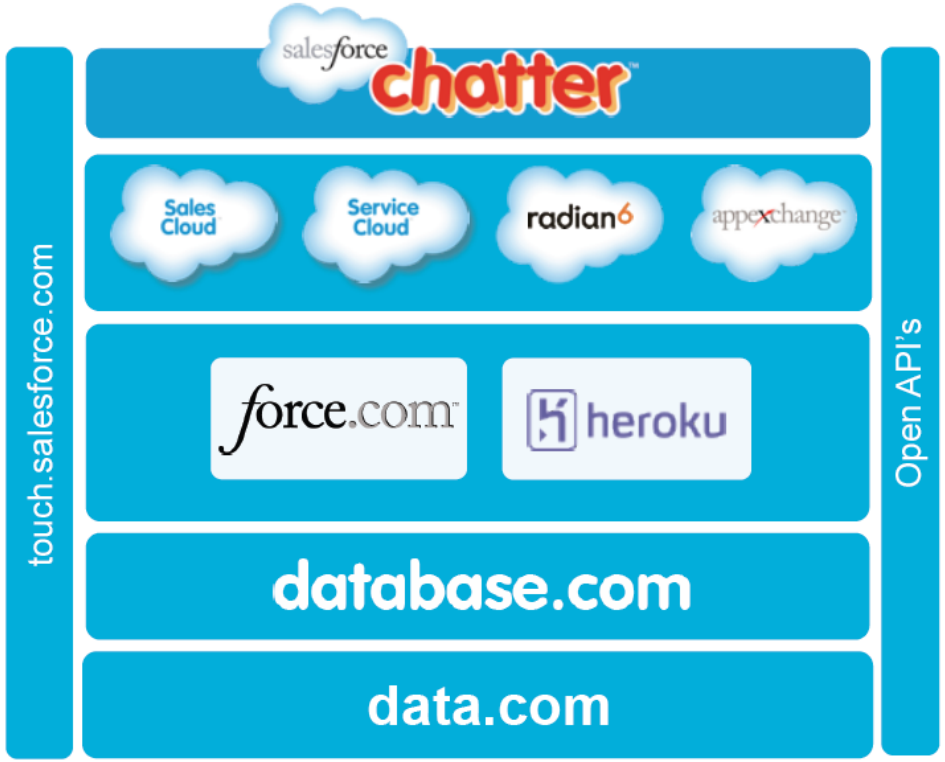



*"…AWS represents more than 60 percent of Amazon's other category...AWS has generated roughly $678 million so far this year..."*

*Note: Q3 of 2011*

*2012 Estimation: > 1 Billion $*

# Cloud Current Status: Salesforce




*First Cloud Company to Exceed $2.1 Billion!*

*10,000+ Customers*
*FTE ~7,000*

# Cloud Current Status: NetSuite

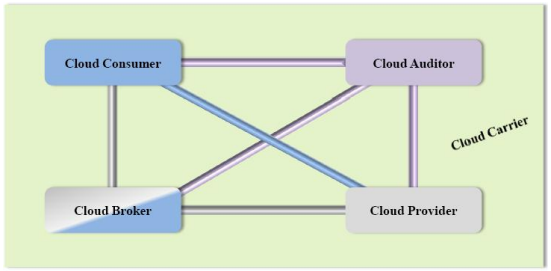

*"The #1 Cloud ERP / Financials Software Suite"*

*236.2 million USD /2011*

# Cloud Market Analysis: Who's Customer?

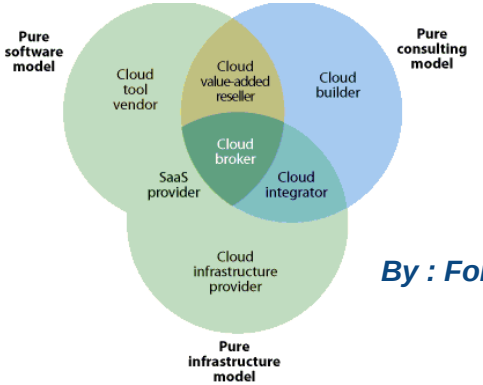

- Different Clouds
- Different Segments
- Different Traits
- Different Requirements

# Cloud Market Analysis: Which Role?




***NIST CC RA***

***Cloud Actor***




***By : Forrester Research***

- Cloud Consumer
- Cloud Auditor
- Cloud Carrier
- Cloud Enabler
  - Cloud Builder(Consulting & SI)
  - Cloud Vendor(Tech & Prod Vendor)
- Cloud Provider
  - S/P/IaaS
- Cloud Broker
  - Cloud Based XaaS
  - Cloud Enabled BPaaS
  - Cloud Centered PS/MS

# Cloud Market Analysis: What Value Props?

## Commodity Cloud

- Low cost, optimized for new apps

## Enterprise Cloud

- High cost, run old apps unchanged

# Cloud Market Analysis: What Positioning?

Cloud Builder

Cloud Broker

SaaS

Private Cloud

Commodity Cloud

PaaS

Public Cloud


IaaS

Cloud Product Vendor

Cloud Service Provider

# Cloud Wars

The War Has Begun…

# Cloud Wars: Gang of Four


Big Telco

Big ICT




Big Web

Big Electronics

# Cloud Wars: Big Telco

NaaS, CaaS?

| Pros | Cons |
| --- | --- |
| • Financial strength | • Core competence |
| • Customer relationship | • Ability to partner |
| • Ability to operate at scale | • Competing on cost |
| • Customer information | • Customer's perception |
| • … | • Skills |
| | • Speed |
| | • … |

# Cloud Wars: Big Web

Commodity Cloud
Consumer Cloud

| Pros | Cons |
| --- | --- |
| • Speed<br>• Innovation<br>• Technical skills<br>• Competing on cost<br>• Ability to operate at scale<br>• Financial strength<br>• … | • Enterprise market presence<br>• IT service portfolio<br>• ITSM & SLA<br>• Customer's perception<br>• … |

# Cloud Wars: Big ICT

Cloud Builder
Enterprise Cloud

| Pros | Cons |
| --- | --- |
| • Enterprise presence<br>• Complete HW/SW/Srv solutions<br>• Technical skills<br>• ITSM & SLA<br>• Customer's perception<br>• … | • Operation at scale<br>• Speed<br>• Competing on cost<br>• … |

# Cloud Wars: Big Electronics

Consumer Cloud
Mobile Cloud, Personal Cloud

| Pros | Cons |
| --- | --- |
| • Speed<br>• Consumer market presence<br>• Abundant gadgets<br>• Intuitive features<br>• Selling channel<br>• … | • Enterprise market presence<br>• IT solution know-how<br>• IT service operation experience<br>• … |

# Open Discussion

Tell us something about

Your Cloud…

# Cloud Standards


Nothing can be accomplished without norms or standards

# Cloud Standards: Why Do We Need?

# Cloud Standards: Who's Setting…







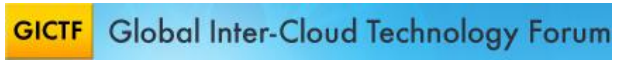


Open Cloud Initiative








There are SDOs (Standard Development Organization)…

# Cloud Standards: What's Set…

## Basic Standards

TCP/IP
HTTP/HTML
XML DSig
SOAP
SSL/TLS
JSON
WS-*
XML Encrypt
DNS
SNMP
UDDI
FTP
CIM
SMTP
WSDL
X.509 PKI
SMI-S
SAML
OAuth
WBEM
OpenID

## High Level Standards

SPML
SCIM
TOSCA
XACML
Usage Record
WS Agreement
APS
CDMI
CIMI
OVF
OCCI
AWS API
OpenStack API

There are many de facto or de jure, cloud or cloud relevant standards…

# Cloud Standards: What's Set… (cont.)

## Framework & RA

ISO/IEC 20000, ITIL v3

ITU: Functional Cloud RA

TM Forum: Frameworx

NIST: Cloud Computing RA

Open Group: Cloud Computing RA

DMTF: RA for Managing Clouds

## Governance & Security

ISO/IEC 27001, BS7799

CSA: Cloud Audit, CCM, CAI…

ISACA: COBIT

NIST: SP800-53 R3

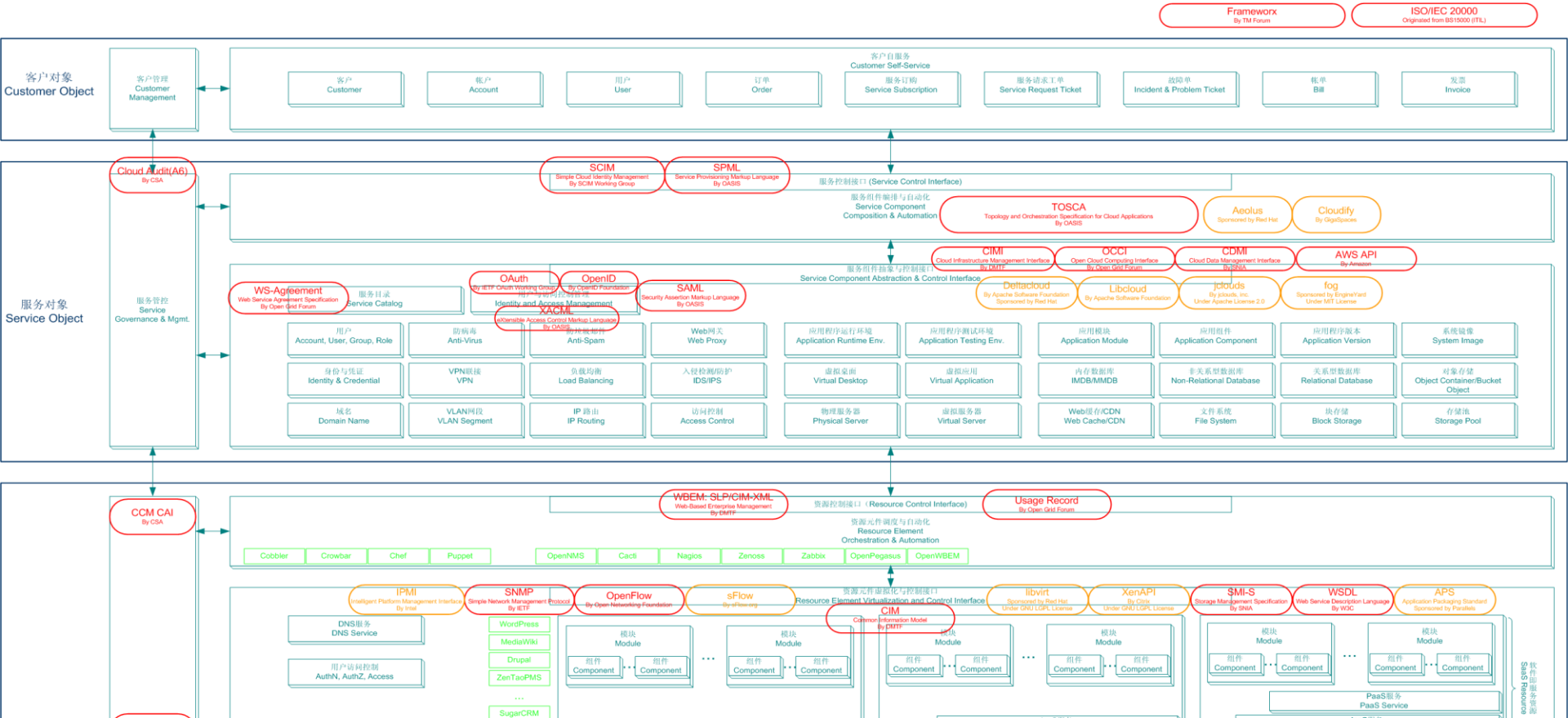
PCI SSC: PCI DSS

HHS: HIPAA

AICPA: SAS 70 I/II

There are Frameworks & Reference Architectures,
Governance & Security Frameworks & Practices…

# Cloud Standards: RA & Standards Mapping



# Cloud Security


Does absolute secure exist?

# Cloud Security Analogy

Let’s pick a simple story…

You worked hard this year,

you bought a pile of **gold bars!**

Note: this analogy copied from Andy Harjanto’s “I am cloud confused” series. Thank you, Andy.

# Cloud Security Analogy (cont.)

Where should you store them?

# Cloud Security Analogy (cont.)

Plenty of valuable assets, but it may have elaborate security protection in place

# Cloud Security Analogy (cont.)

House

Some valuable assets,

security protection may not as elaborate

# Cloud Security Analogy (cont.)

If you have the guts to give up control,
to whom will you trust?

# Open Discussion

Is Cloud secure?

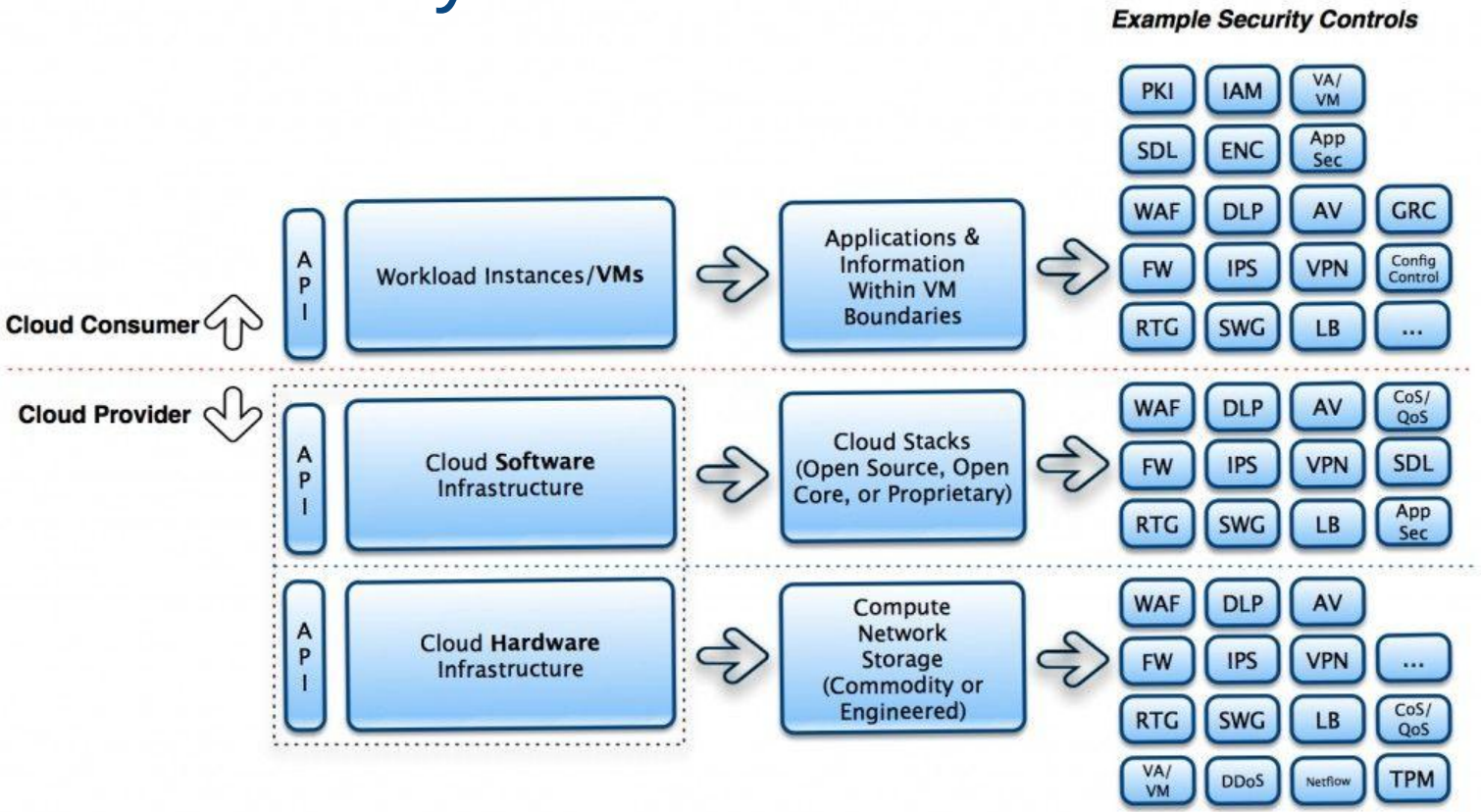
If not…, then

What's insecure?

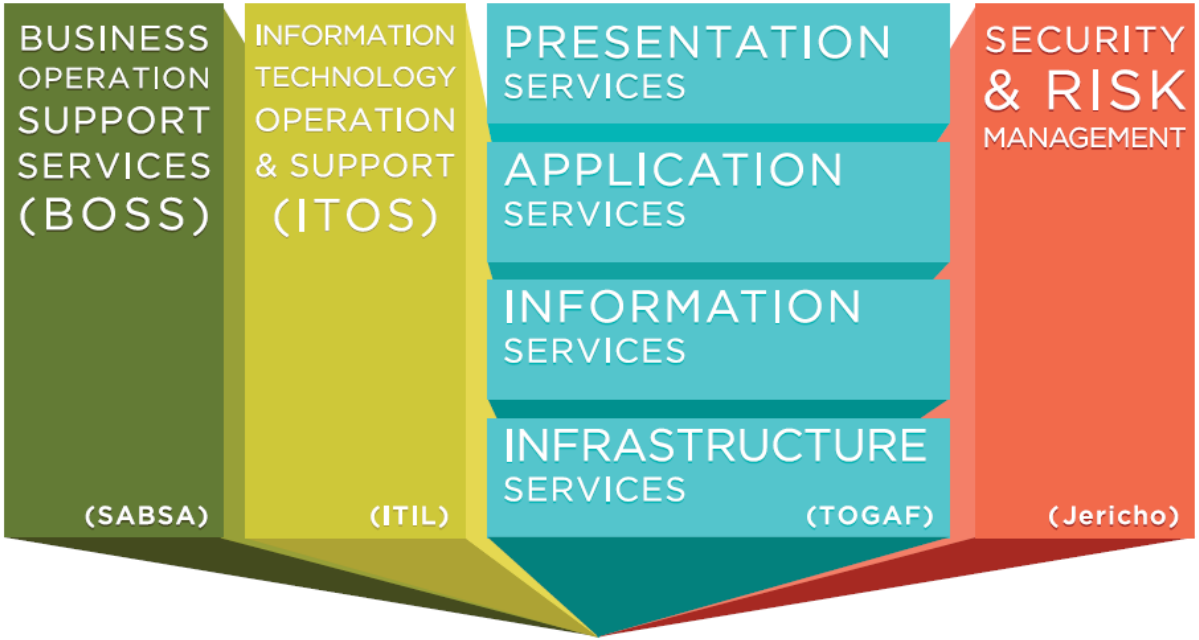
# Cloud Security

Any holistic way for Cloud Security?

# Cloud Security: ABC Test☺



# Cloud Security: ABC Test☺ (cont.)




TCI Reference Architecture

cloud security alliance℠

北京航空航天大學 软件学院

# Cloud Security: CSA Security Guidance

cloud security alliance SM

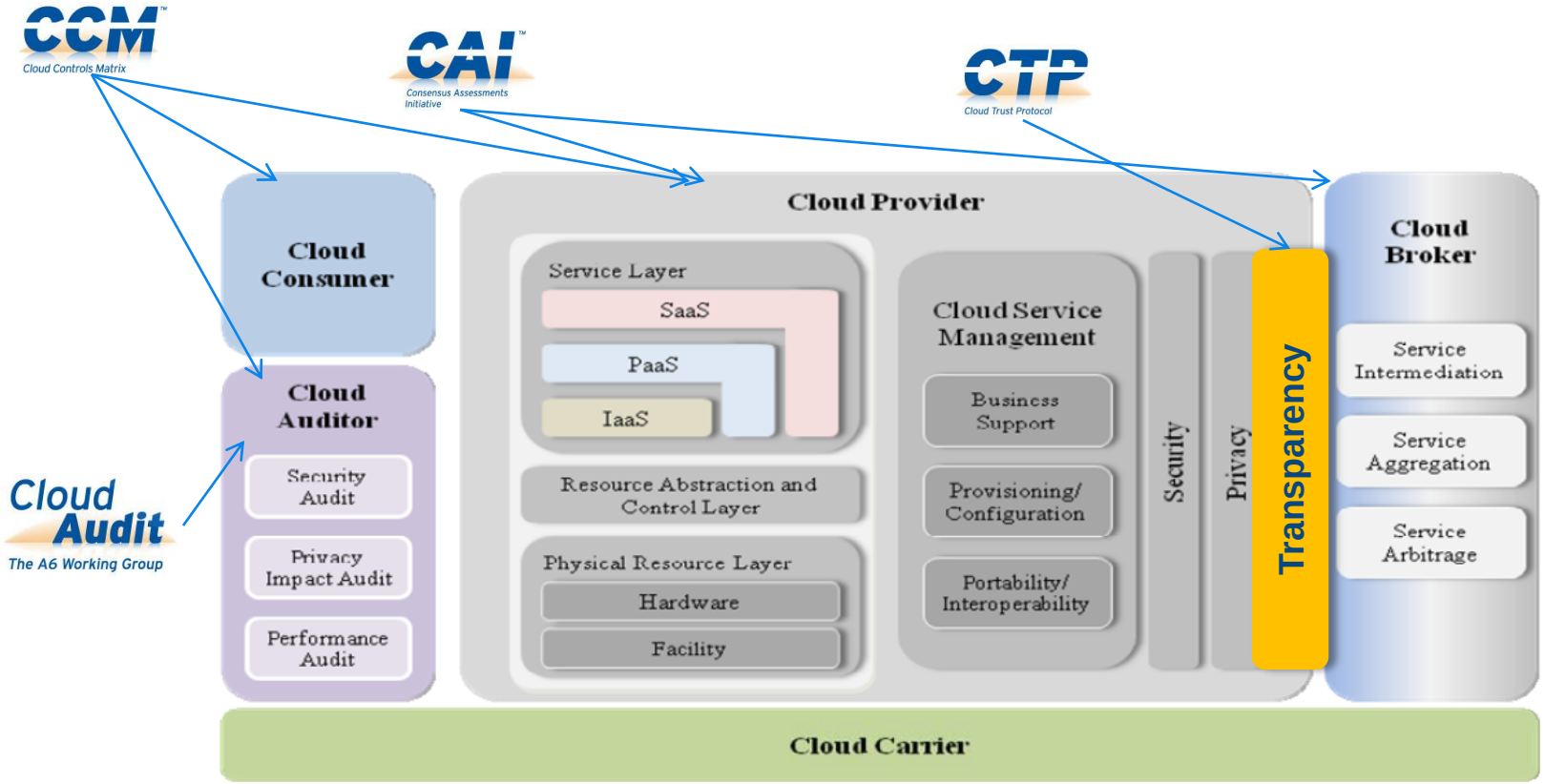
CSA Security Guidance

# Cloud Security: CSA GRC Stack

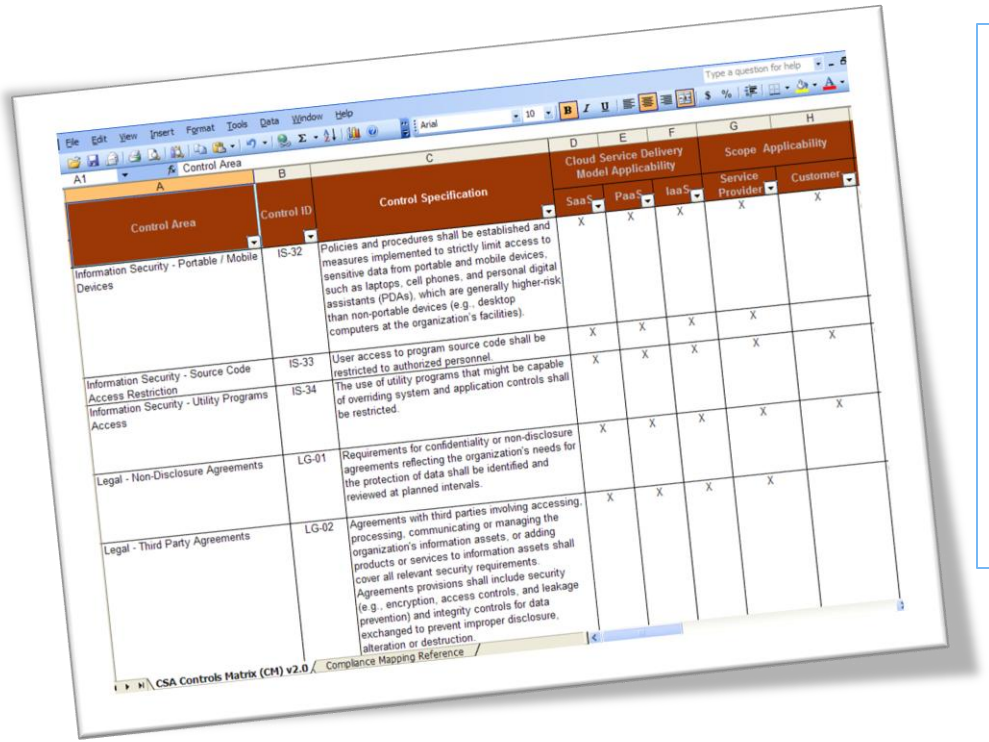
- A suite of 4 integrated and reinforcing CSA initiatives (Governance, Risk Management and Compliance)
  - The Stack Packs:
    - Cloud Controls Matrix
    - Consensus Assessments Initiative
    - Cloud Audit
    - CloudTrust Protocol


- Designed to support cloud consumers and cloud providers
- Prepared to capture value from the cloud as well as support compliance and control within the cloud

# Cloud Security: CSA GRC Stack (cont.)



# Cloud Security: CSA CCM



| Control Area | Control ID | Control Specification | Cloud Service Delivery Model Applicability | | | Scope Applicability | |
|---|---|---|---|---|---|---|---|
| | | | SaaS | PaaS | IaaS | Service Provider | Customer |
| Information Security - Portable / Mobile Devices | IS-32 | Policies and procedures shall be established and measures implemented to strictly limit access to sensitive data from portable and mobile devices, such as laptops, cell phones, and personal digital assistants (PDAs), which are generally higher-risk than non-portable devices (e.g., desktop computers at the organization's facilities). | X | X | X | X | X |
| Information Security - Source Code Access Restriction | IS-33 | User access to program source code shall be restricted to authorized personnel. | X | X | X | X | X |
| Information Security - Utility Programs Access | IS-34 | The use of utility programs that might be capable of overriding system and application controls shall be restricted. | X | X | X | X | X |
| Legal - Non-Disclosure Agreements | LG-01 | Requirements for confidentiality or non-disclosure agreements reflecting the organization's needs for the protection of data shall be identified and reviewed at planned intervals. | X | X | X | X | |
| Legal - Third Party Agreements | LG-02 | Agreements with third parties involving accessing, processing, communicating or managing the organization's information assets, or adding products or services to information assets shall cover all relevant security requirements. Agreements provisions shall include security (e.g., encryption, access controls, and leakage prevention) and integrity controls for data exchanged to prevent improper disclosure, alteration or destruction. | X | X | X | X | |

CSA Controls Matrix (CM) v2.0 | Compliance Mapping Reference

- First ever baseline control framework specifically designed for managing risk in the Cloud Supply Chain
- Serves as the basis for new industry standards and certifications.

CCM™
Cloud Controls Matrix

北京航空航天大學 软件学院

# Cloud Security: CSA CCM (cont.)

1. Compliance (CO)
2. Data Governance (DG)
3. Facility Security (FS)
4. Human Resources (HR)
5. Information Security (IS)
6. Legal (LG)
7. Operations Management (OM)
8. Risk Management (RI)
9. Release Management (RM)
10. Resiliency (RS)
11. Security Architecture (SA)

*11 domains*


*98 controls*

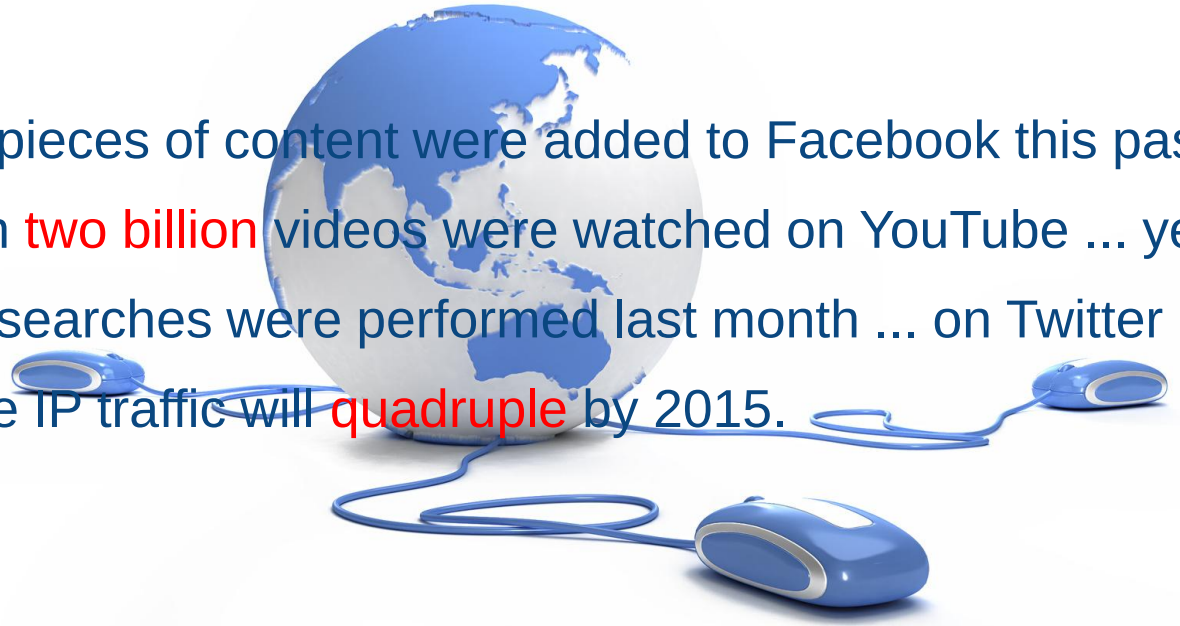
Controls baselined and mapped to:

- COBIT
- BITS Shared Assessments
- HIPAA/HITECH Act
- Jericho Forum
- ISO/IEC 27001-2005
- NERC CIP
- NISTSP800-53
- FedRAMP
- PCI DSSv2.0

Final frontier to space…

# CHAPTER 3: TOMORROW OF CLOUD COMPUTING

# What's happening to this world?



- 30 billion pieces of content were added to Facebook this past month.
- More than two billion videos were watched on YouTube ... yesterday.
- 32 billion searches were performed last month ... on Twitter
- Worldwide IP traffic will quadruple by 2015.
- …

Note: the data might be from Gartner Oct. 2011

# What's happening to this world? (cont.)

- Internet
  - Internet of Things
    - Internet of People
      - …

*Everything is Connecting*

# What's happening to this world? (cont.)

*Digital Planet, Digital World*

*digital life, digital business…*

# What's happening to this world? (cont.)

*Is Cloud Computing catalyst of digitalization*

*or the result of digitalization…*

# Cloud Computing Trends: Mobile Cloud

- Desktop
  - Laptop
    - Palmtop
      - *Biggest Smartest IoT*
    - Mobile Internet
  - Internet


*Mobile + Cloud Computing*

# Cloud Computing Trends: Social Cloud

- 6 degrees separation
  - Weak ties
    - Dunbar's number
      - Connex Comm. Collab. Commerce
    - Internet of People
  - Internet


*SNS+ Cloud Computing*

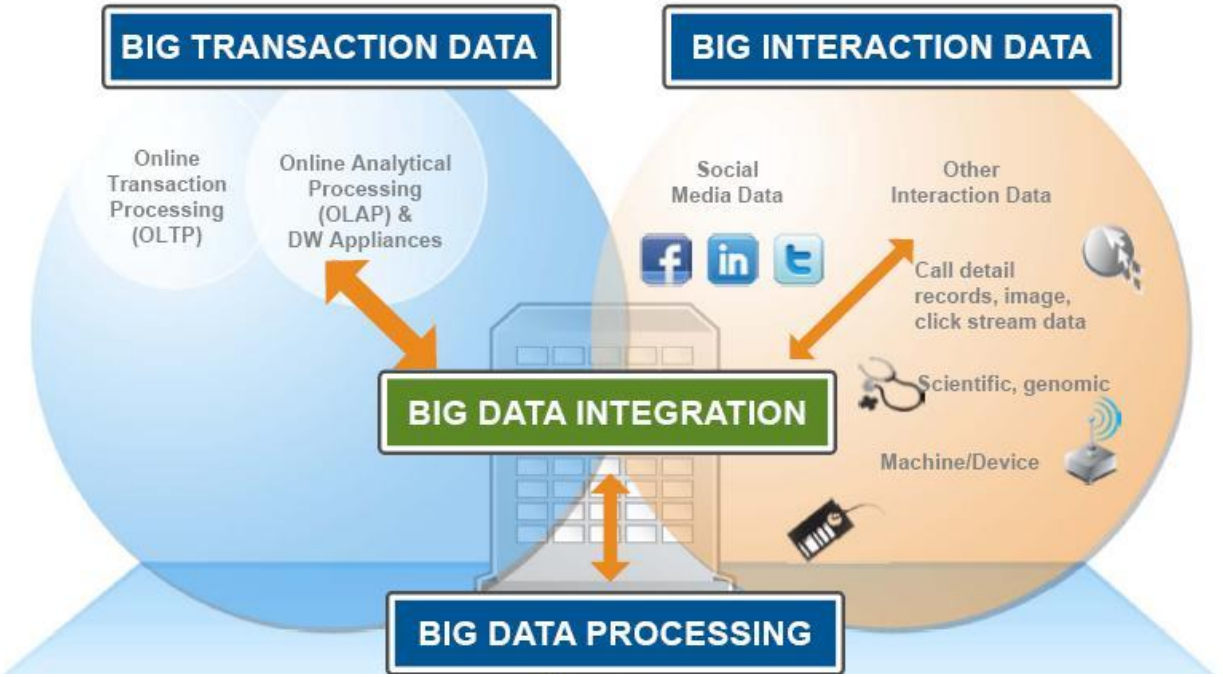
# Cloud Computing Trends: Personal Cloud

- Personal Computer
  - Post PC
    - Personal Cloud

✓ Anywhere ✓ Anytime
✓ Anyone
✓ Any device
✓ Any channel ✓ Any content


*You + Cloud Computing*

# Cloud Computing Trends: Cloud Data




*Cloud Computing + Big Data*

Note: the diagram is from slide deck of Informatica

# Open Discussion

What is cloud computing?

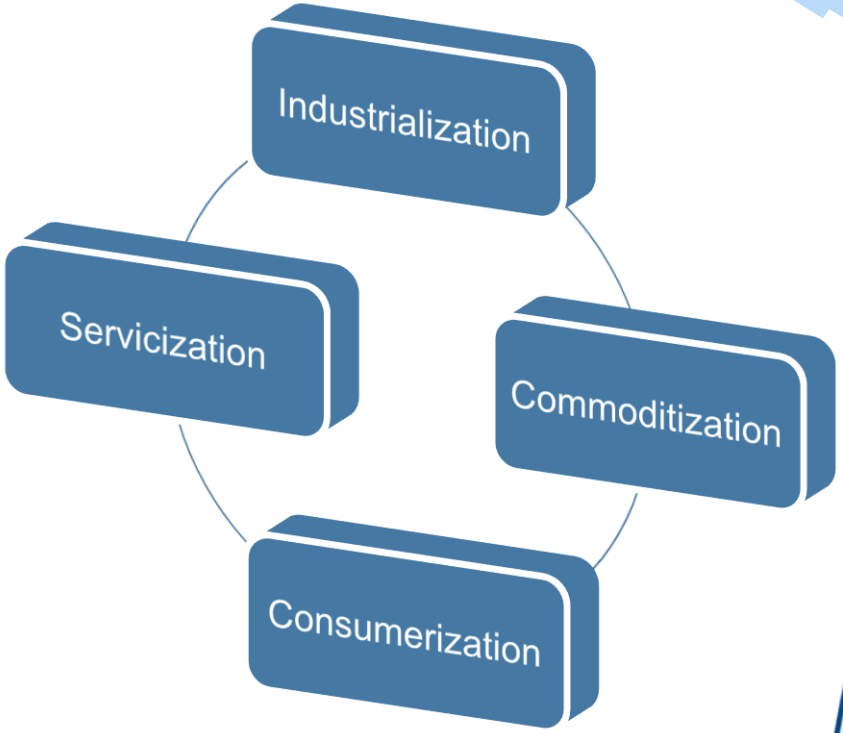
Can we re-define cloud computing?

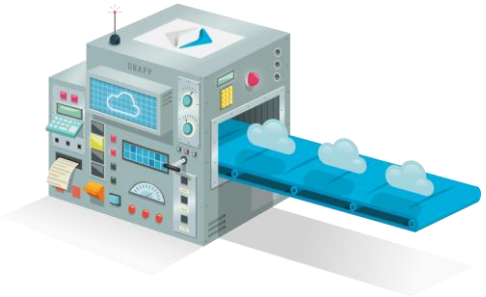
- *Cloud in General*
  - *Cloud Service*
    - *Cloud Computing*

# CC Future Analysis: Industry View


Cloud Computing is:

- *Technology Evolution*
- *Delivery Model Revolution*
- *Business Model Innovation*



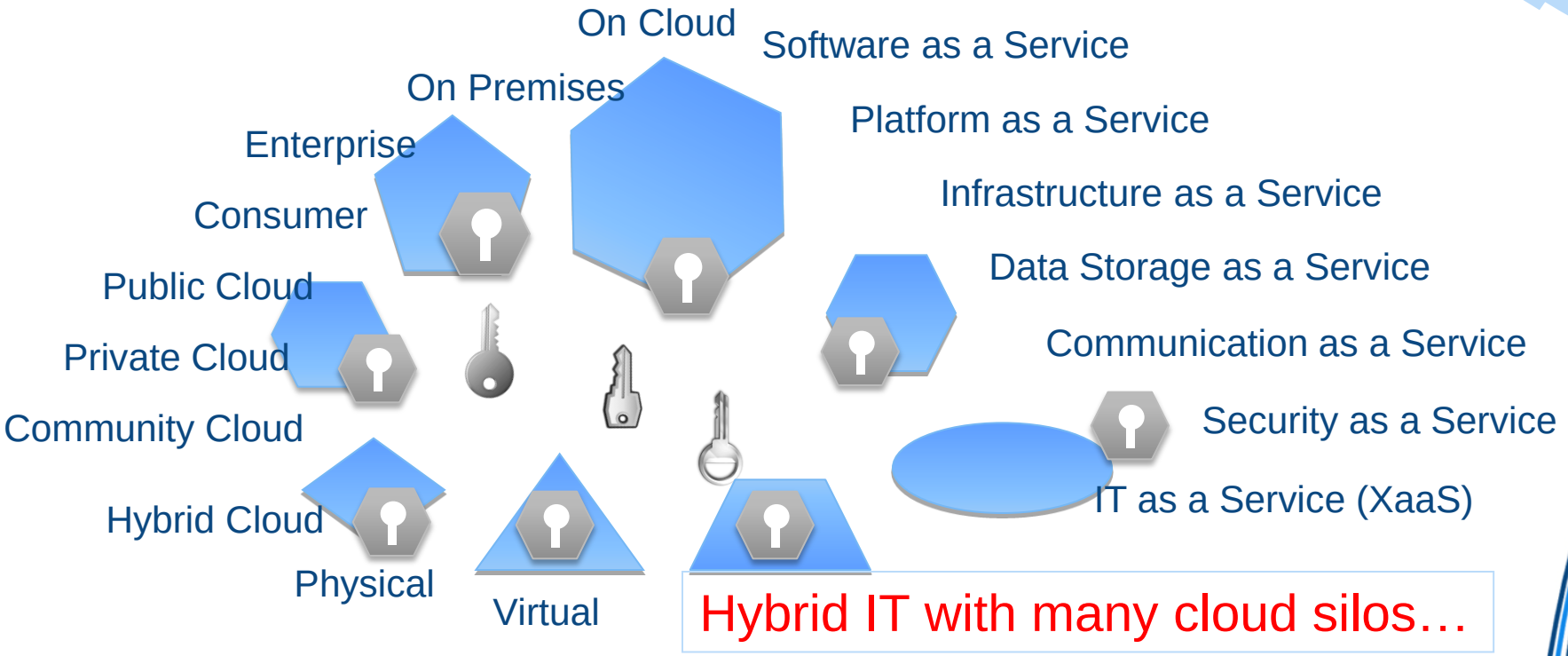



# CC Future Analysis: Dream or Reality?




- *Bring your own devices…*
- *Cloud First! Pay per we go…*
- *Serverless, no Software, no Ops…*

# CC Future Analysis:Hybrid IT,Hyper Hybrid



# CC Future Analysis: Intercloud


*There was Inter-net, there will be Inter-cloud…*

**Intercloud**

Interconnected ‘Cloud of Clouds’

# Cloud Computing Designing Philosophy

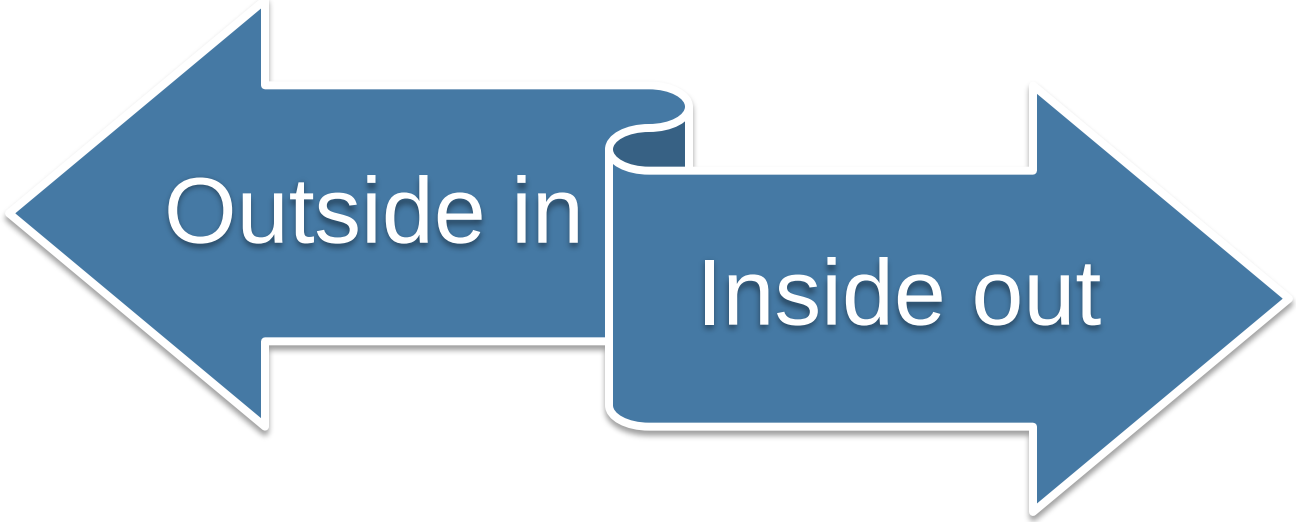

Design for failure, nothing fails.

# Cloud Computing Architect Path

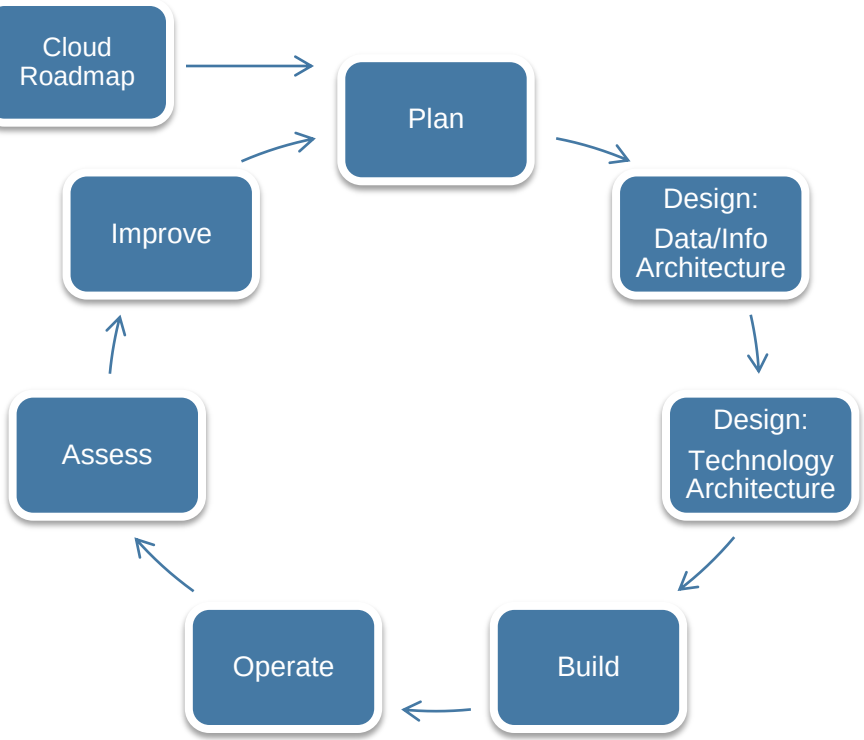
Cloud Subscriber

Cloud Provider

# CC Architect – Subscriber: Philosophy



# CC Architect – Subscriber: Methodology



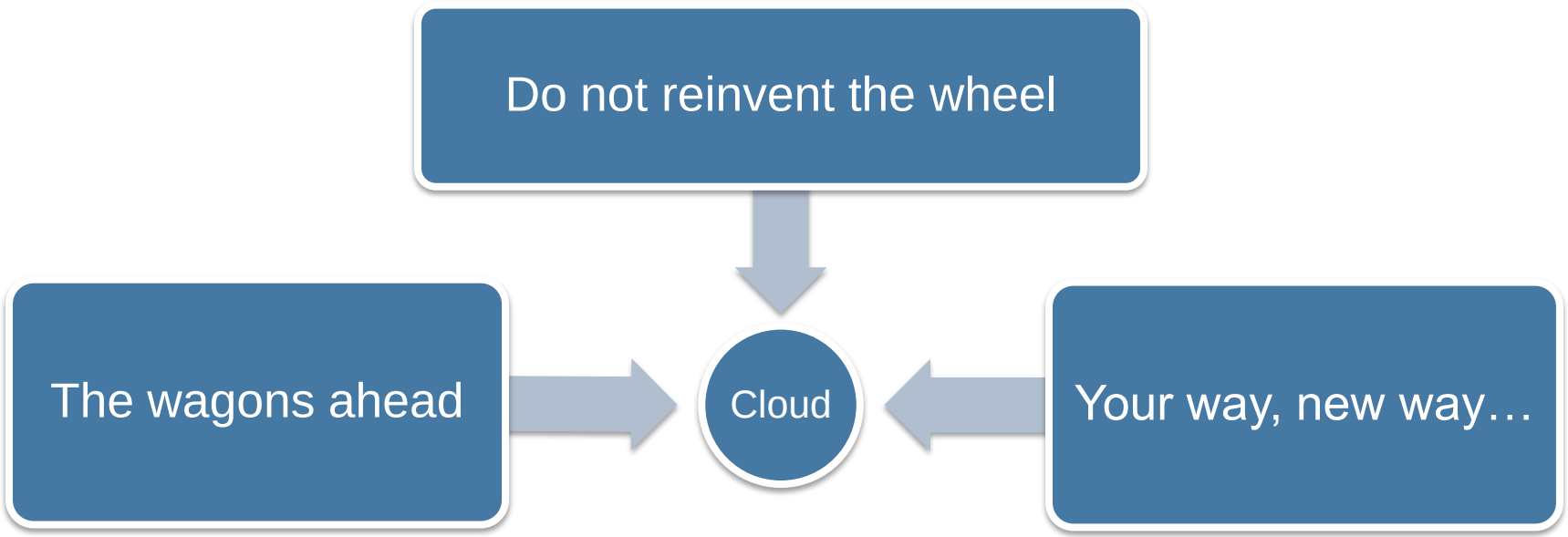
# CC Architect – Subscriber: Approach

| Level | 1: Performed | 2: Defined | 3: Managed | 4: Adapted | 5: Optimized |
|---|---|---|---|---|---|
| *Focus* | *Functionality* | *Competency* | *Effectiveness* | *Responsiveness* | *Automation* |
| *Benefits* | *New features* | *IT cost savings, avoidance, and control* | *Time-to-market and agility* | *Real-time, event-driven and measurable outcomes* | *Utility as a result of commoditization and industrialization* |
| *Success Factors* | *On-ramp learning, Retooling* | *Consolidation, Standardization* | *Alignment, R&D* | *Best practices, Governance* | *Thought leadership, Innovation* |
| **SaaS** | Isolated use of tactical Web-based applications, and ad-hoc SOA | Selected enterprise collaboration applications such as email, productivity tools, and solution development/testing | ERP: Enterprise resource planning (CRM, Financials, HR) | Customize cloud applications and seamless B2B | Enterprise-wide 0-software execution with coordinated integration with partners |
| **PaaS** | Internal shift to basic programming platforms, such as Java EE, .Net, Ruby on Rails | Utilize full-blown stack platform internally, like SCA, SEAM, Jboss, CMS | Spin-off home grown apps into cloud service platforms like Hadoop, Nebula | Revamp existing applications towards industry mainstream platforms like Facebook, force.com | Develop bespoke apps on off-premise cloud platforms, such as Google App Engine, MS Azure |
| **IaaS** | Apply virtualization in internal data centers, such as Xen, VMWare, and Hypervisor | Move selected hosting components to Managed Service Providers (MSP) | Build private clouds and simplify infrastructure by cloudification | Employ on-demand public cloud services (EC2, S3) and explore hybrid cloud | Corporate-wise 0-infrastructure implementation leveraging interoperable clouds for reliable multi-provider SLA |

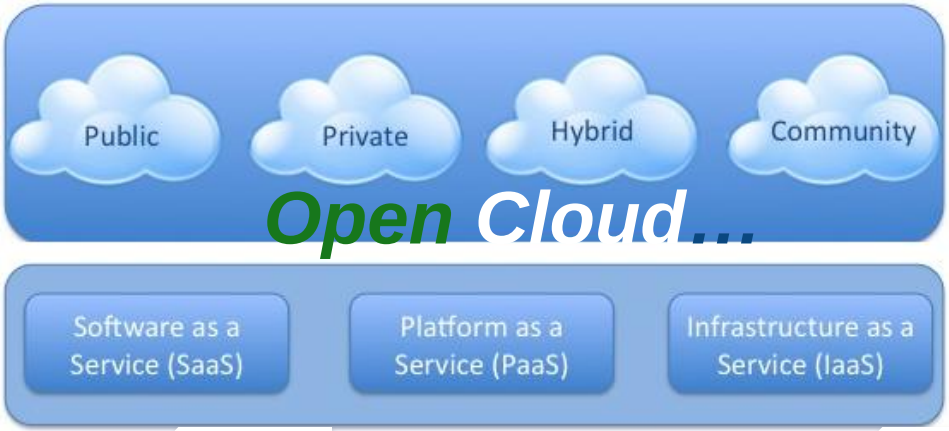
# CC Architect – Subscriber: tips

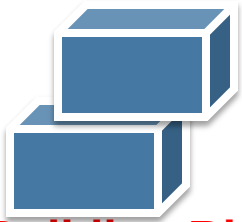
- *What's the business strategy of your organization?*
- *How aligned are your Cloud strategy and roadmap?*
- *Is your financial system accustomed to Cloud model?*
- *How are you going to address Cloud Silos, Cloud SSO?*
- *How will you govern and secure your Cloud Apps and Cloud Data?*
- *…*

# CC Architect – Cloud Provider: Philosophy

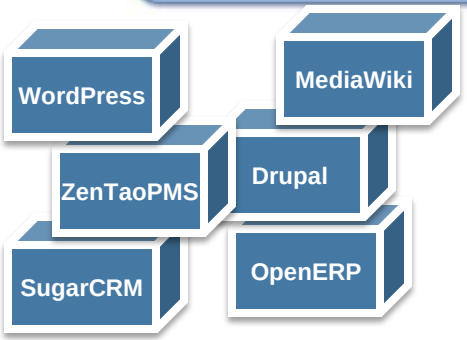


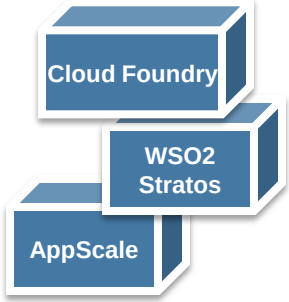
# CC Architect(Cloud Provider): The Wheels…

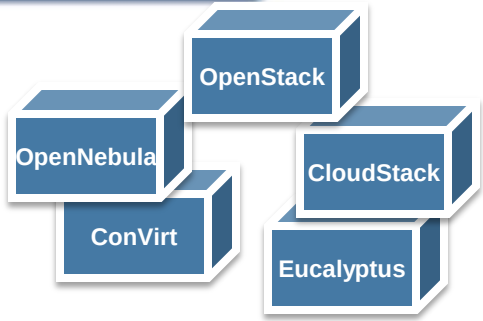



Building Blocks



# CC Architect(Cloud Provider): The Wheels…


Framework: Struts, Django, Grails, SQLAlChemy, jQuery, Spring, Ruby on Rails, Hibernate

Runtime: Java, V8, Ruby, Node.js, Python, Groovy

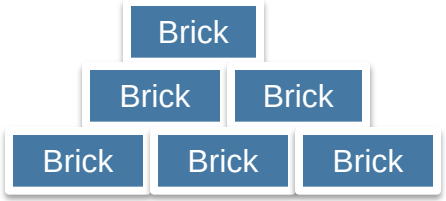
Middleware: Zend, Tomcat, Django, Twisted, Redis, CouchDB, MongoDB, VoltDB, RabbitMQ, Apache, Nginx, Jetty, JBoss, Mongrel, NATS, MySQL, HBase, OceanBase, QPid, OpenESB, PostgreSQL, Cassandra, Mule ESB, ServiceMix

OS: FreeBSD, Ubuntu, CentOS, Redflag Asianux, Debian, openSUSE, OpenSolaris

Server Virtualization: Xen/XCP, KVM, OpenVZ, OpenNode, VirtualBox, QEMU, LXC

Storage: GlusterFS, Swift, Sheepdog, HDFS, Ceph, Open-iSCSI

Networking: LVS, HAProxy, OpenVPN, Open vSwitch, Netfilter




**Building Blocks**

# CC Architect(CP):The Wagons Ahead…

- Parallelize Everything
- Distribute Everything (to atomic level if possible)
- Compress Everything (CPU cheaper than bandwidth)
- Secure Everything (you can never be too paranoid)
- Cache (almost) Everything
- Redundantize Everything (in triplicate usually)
- Latency is VERY evil
- Jedis build their own lightsabres (Eat your own Dog Food)

# CC Architect(CP):The Wagons Ahead…(ctd.)

- Design for failure and nothing fails
- Loose coupling sets you free
- Implement “Elasticity”
- Build Security in every layer
- Think Parallel
- Leverage different storage options

# CC Architect(CP):The Wagons Ahead…(ctd.)

**Gmail and Google Apps**
**Date Started:**2/27/2011
**Company:** Google
**Length of Outage:** 2 days
**Users Impacted:** 120,000

**Salesforce**
**Date Started:**01/2010
**Company:** Salesforce.com
**Length of Outage:** 1hour
**Users Impacted:** 6,800 customers

**Amazon Web Services**
**Date Outage Began:** 4/21/2011
**Company:** Amazon.com
**Length of Outage:** 4 Days
**Users Impacted:** Millions and Millions

**Playstation Network**
**Date Outage Began:** 4/21/2011
**Company:** Sony
**Length of Outage:** 25 days
**Users Impacted:** 75,000,000

**Azure**
**Date Started:**28/02/2012
**Company:** Microsoft
**Length of Outage:** >12 hours
**Users Impacted:** many regions

Lesson learned

learn from lessons…

# Open Discussion

Your way,

New way…

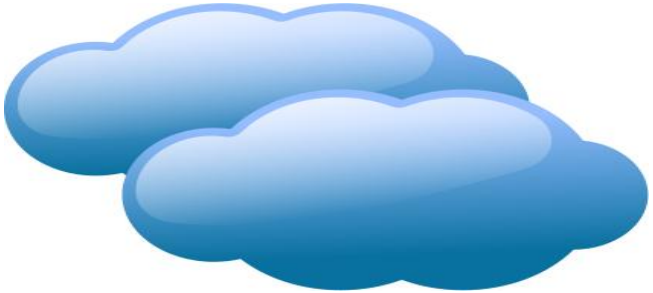
# Open Discussion: tips…

- *Do we really need hyper-visor like Xen/KVM?*
- *Is it possible to distribute the "Cloud Controller"?*
- *Can we converge IaaS and PaaS implementations?*
- *Any way to converge the different types of distributed "Data Storage"?*
- *…*


Beginning of classes…

# THE END OF “FIRST CLASS”

# Homework



- ***1 micro blog* on Weibo.com**
  - *All about and just about Cloud Computing*
  - *@forestzrd and @北航云计算高端硕士班*
- *It has to be thorough thought opinion or idea, be creative…*