SE252:2015:Lecture 3, Jan 13

ILO2:2:*Cloud Virtualization*, Abstractions *and Enabling Technologies*

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ILO 2: Cloud Virtualization, Abstractions & Enabling Technologies

- *You should be able to*
  - *Explain* virtualization and their role in elastic computing.
  - *Describe* service oriented architectures that are foundational to the WWW. ✓
  - *Characterize* the distinctions between Infrastructure, Platform and Software as a Service (IaaS, PaaS, SaaS) abstractions, and Public and Private Clouds, and
  - *analyse* their advantages and disadvantages.

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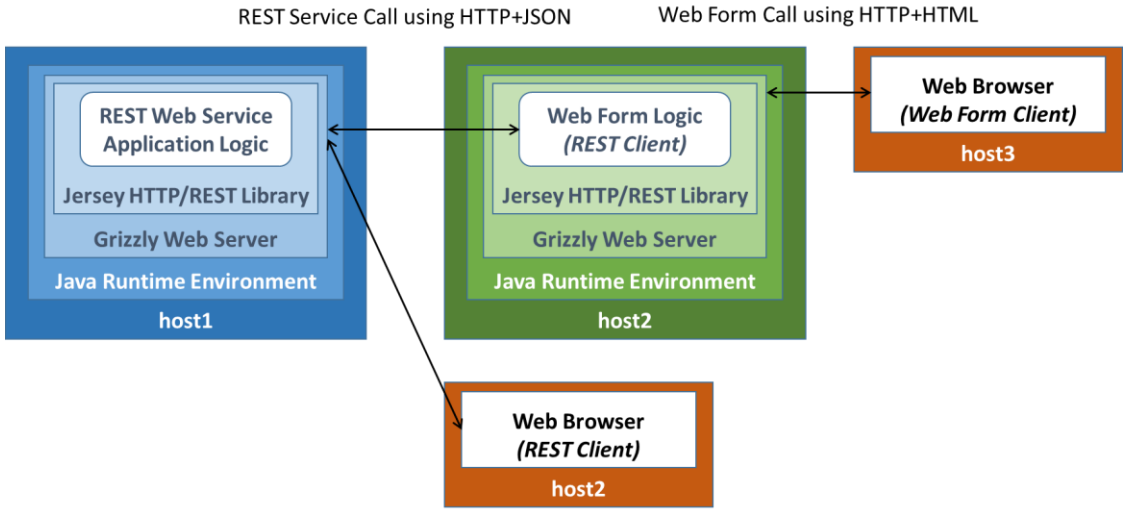
Assignment 0

Project 0

1. *Deploy sample "echo" REST service implemented and browser/commandline client on two machines. Demo these.*
2. *Deploy a web form/REST Client and web browser accessing this form on three machines. Demo these.*
3. *Develop a "TripBuddy" REST service that calls 3 other REST services. Demo these.*



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Lecture 3

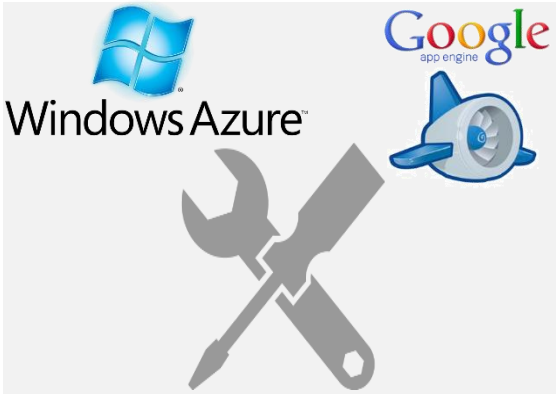
Infrastructure as a Service (IaaS)

* as a Service

- Expose a level of capability as a "service"

IaaS

Infrastructure-as-a-Service



PaaS

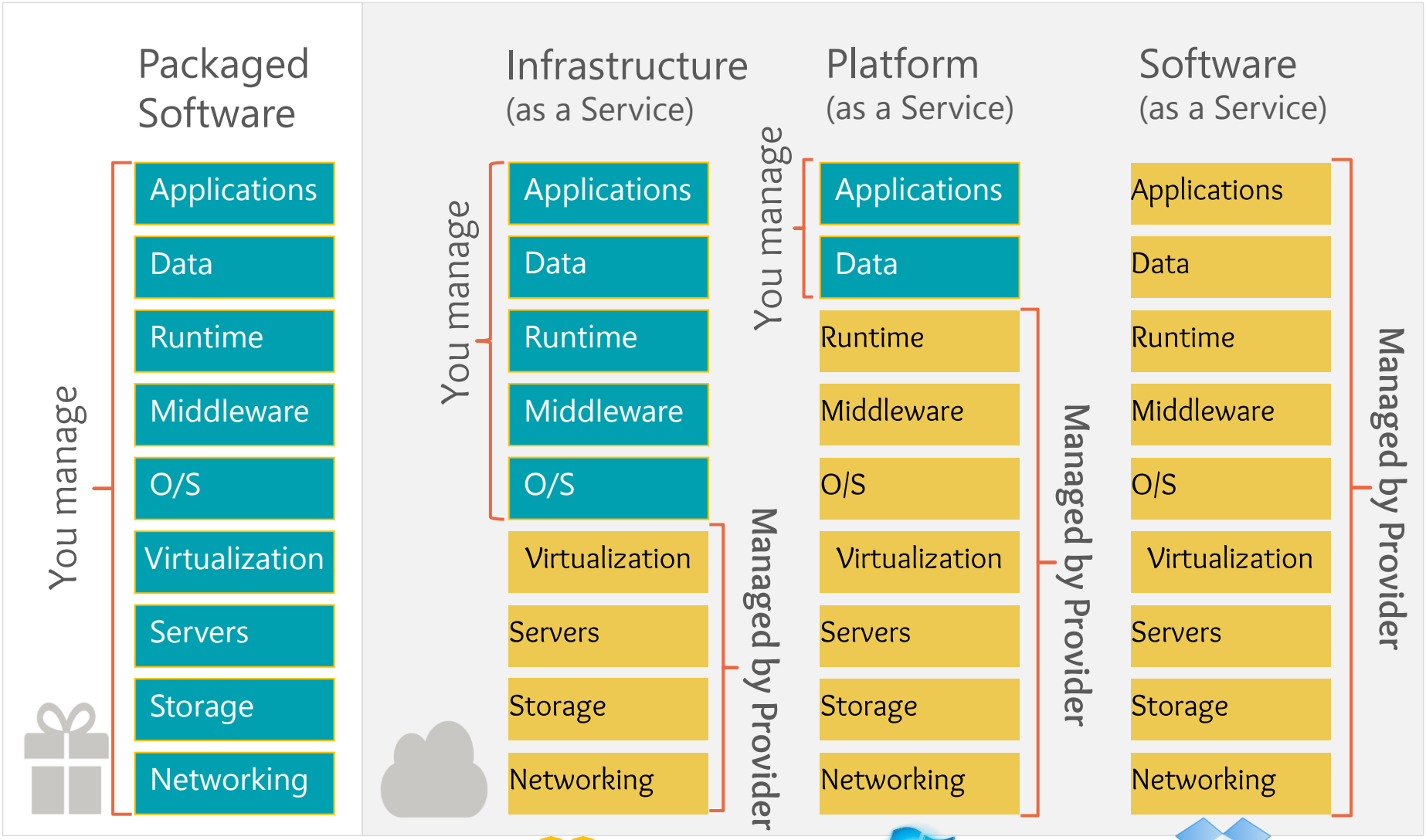
Platform-as-a-Service

SaaS

Software-as-a-Service

host | **build** | **consume**

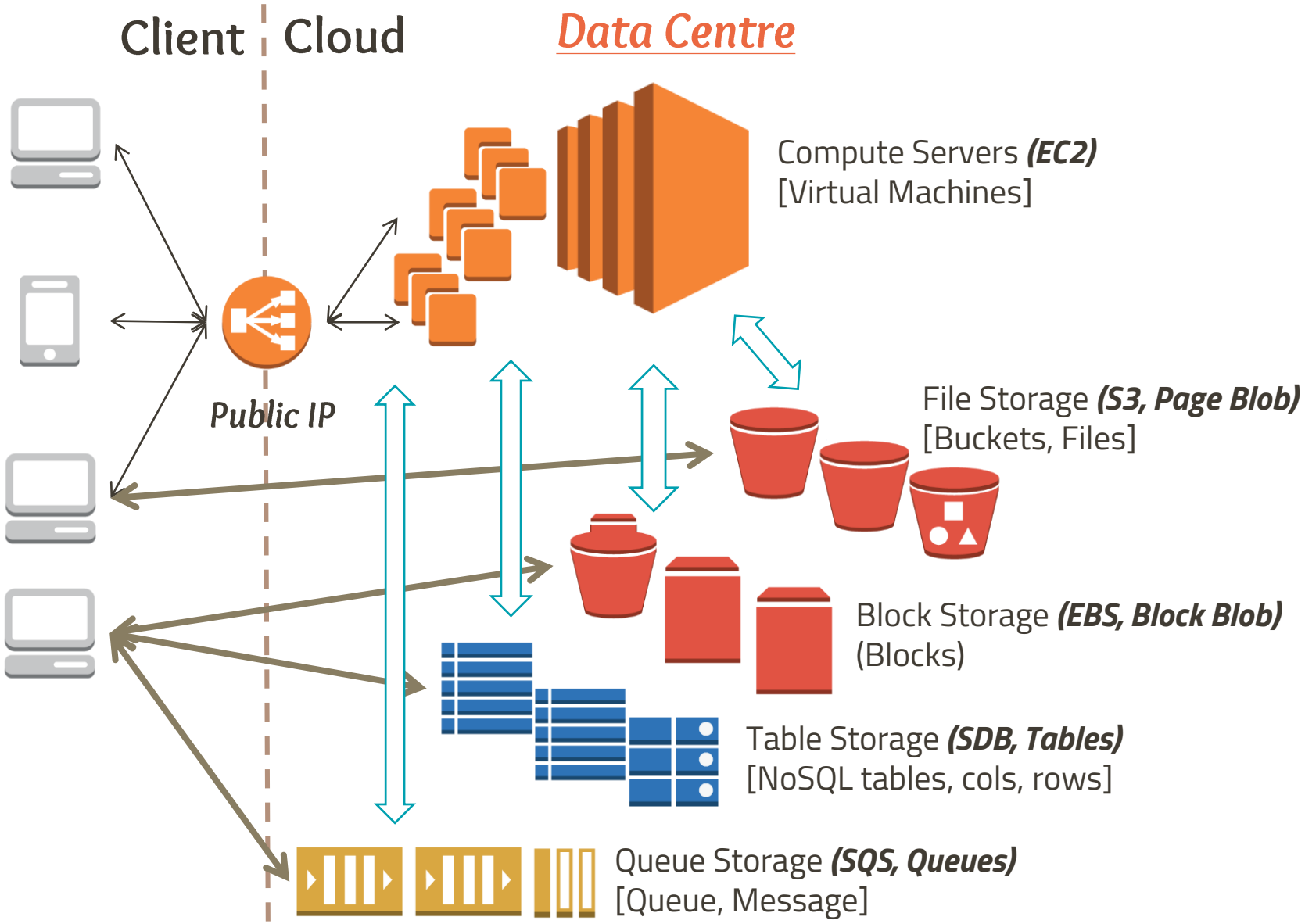
* as a Service


Packaged Software
Infrastructure (as a Service)
Platform (as a Service)
Software (as a Service)
You manage
Managed by Provider
Applications
Data
Runtime
Middleware
O/S
Virtualization
Servers
Storage
Networking
DELIVERED BY MAILMAN
amazon web services
Windows Azure
Dropbox

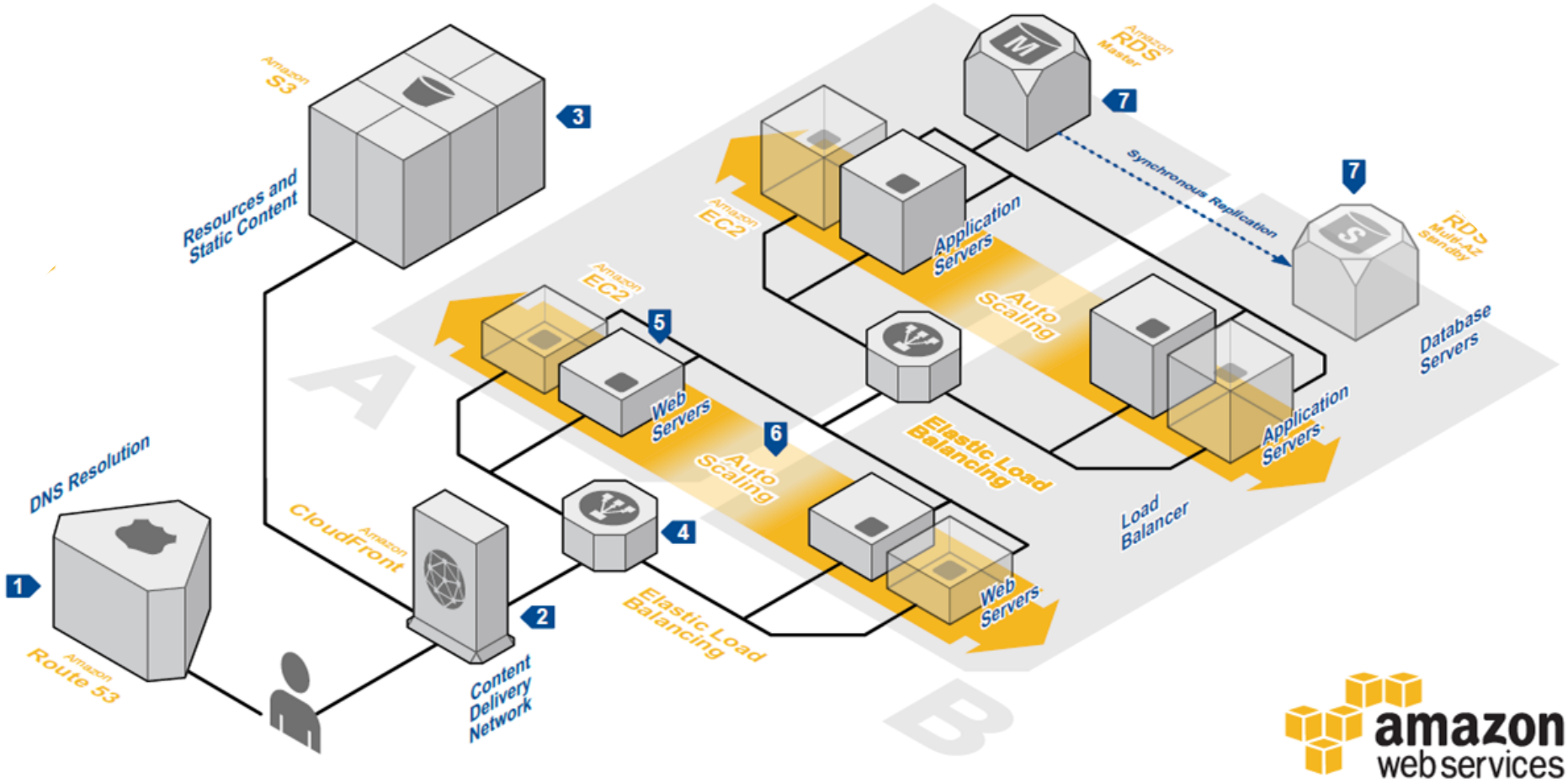
Infrastructure as a Service (IaaS)

- *What services are provided?*
- Offers service-driven access to compute & storage
- Hides (abstracts) the actual hardware
  - Virtualization
  - Web service (rather than POSIX/file sys) API
- Incremental units of compute/storage
  - Pay for atomic units of use

IaaS Typical Architecture



IaaS In Action



amazon web services

AWS Reference Architectures: Web Application Hosting
http://aws.amazon.com/architecture/

IaaS Roots

- Data centres
  - Economies of Scale, Commodity Hardware
  - Consolidate Power, Network, Cooling
- Enabling technologies
  - Internet Everywhere!
  - Virtualization
  - Service oriented architecture
- *Working Business Model!*

Say you have a house to rent…

- What does the tenant want?
  - An independent house ☺
- What can you give?

What does a tenant look for?

- Is it affordable?

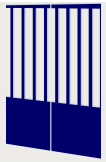
- Is there enough space?

- Is it safe from outsiders?
  - Is it safe from other tenants? Locks, shades, ..

- Will I not be disturbed by tenants?

- Is power billed separately?

- Can I get a separate main entrance?
  - Or at least make sure I don't have to fight crowds?



- Do I have to share the verandah!!?

Say you have a computer to rent…

- What does the “tenant” want?
  - Their own computer ☺
- What can you give?
  - And how?

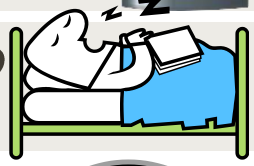
What does a tenant look for?

- Is it affordable to rent?

- Is there enough CPU/memory?

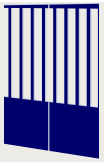
- Is it safe from the N/W?
  - Is it safe from other users? Mem/Code Leaks..

- Will their application use affect me?



- Can I pay for what *I* use?

- Can I get my own N/W connection?
  - Or at least have a reserved bandwidth?



- What do you mean I share the disk!!?

Centrality comes a full circle

- Mainframes -> Personal Computers -> Independent Servers -> Enterprise Servers -> Data Centres
- Data centres
  - Consolidate hardware, infrastructure, energy usage
  - Ease management, automation, physical security
  - Allow transparent HW improvements
- Started as enterprise-scale data centres…

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5min Peer Discussion

To Cloud or not to Cloud?

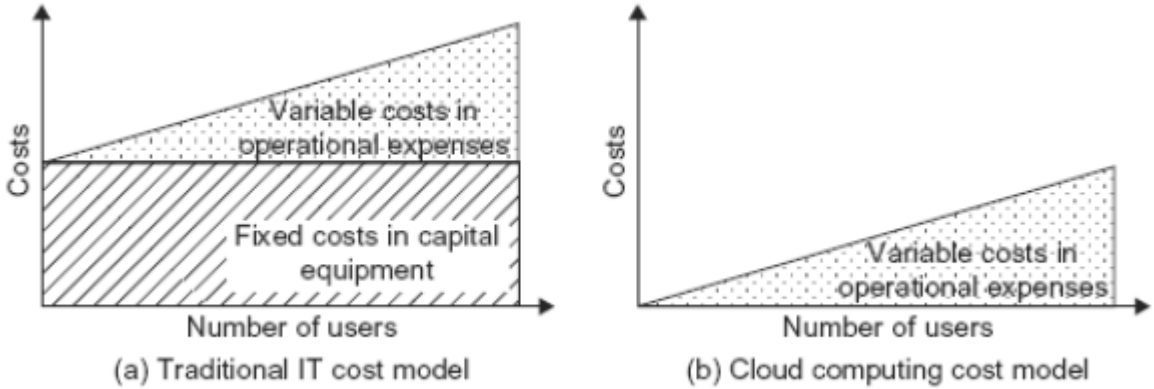
Why IaaS Clouds?

- Elastic, On-demand
- “Infinite” resources
- Pay-as-you-go, Low TCO
- Auto upgrade infrastructure
- Ease of Management, Out sourced!
- Availability, Reliability…
- Geo-distribution, Redundancy…
  - “Location” of the house
- *Cool kid!*

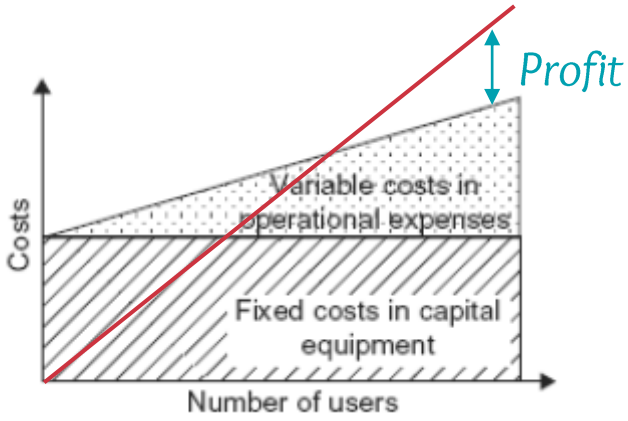
Why IaaS Clouds?

Cloud *User* Perspective

$$UserHours_{Cloud} \times (revenue - Cost_{Cloud}) \geq$$
$$UserHours_{DataDentre} \times \left(revenue - \frac{Cost_{DataCentre}}{Utilization}\right)$$



Cloud Provider Perspective



$$UserHours_{Billed} \times CostPerVM \geq \frac{Cost_{DataCentre}}{Utilization}$$

Textbook, Fig 4.3

Why NOT IaaS? *(That's what the CTO said…)*

- Security, Intellectual Property, Lock in
- Data movement, close to few customers
  - "Location" of the house
- Full control of software stack, licencing, legacy code
- High performance, Custom hardware, Fast networks, QoS…*not part of the 99%*
- Costs: 24x7 high/constant utilization, core competence
- *Luddite!*

How does this all relate to Cloud Computing?

- Rent out spare capacity in Enterprise Data Centres
  - Amazon AWS, etc.
- Build Data Centres where HW can be outsourced
  - Rackspace, etc.
- Grow & Shrink, on-demand

A Colony to rent

Cisco's Data Center in Texas

Google's Data Center in Georgia

Microsoft's Data Center in Ireland

NSA’s Data Center in Utah

Assignment: Project 0

- Due on Thu Jan 22, midnight

Reading

- **Textbook, Sec 4.1 – 4.4**
- Distributed and Cloud Computing: From Parallel Processing to the Internet of Things, *Kai Hwang, Jack Dongarra and Geoffrey Fox*, Morgan Kaufmann, 2011