Lecture 1: Introduction

COMP3006J: Cloud Computing

Dr. Ruihai Dong
UCD School of Computer Science
Beijing-Dublin International College
[Email: ruihai.dong@ucd.ie]

Today's Lecture – Introduction

- Limitations of the Traditional Computing Approaches
- What is Cloud Computing?
- Essential Characteristics
- Virtualization
- Cloud Computing Service Models
- Big Data
- Assessment and Assignments

WeChat Group

Limitations of the Traditional Computing Approaches

Huge Initial Investment for Computing Infrastructural Setup

To run an application, business organizations need to invest huge volumes of capital to setup the required IT infrastructure. Servers, client terminals, network infrastructure are required, and they need to put together in a proper manner. Moreover, arranging adequate power supply, cooling system and provisioning space also consume a major part of the IT budget.

Is there any way to avoid this huge initial investment for computing infrastructural setup?

Need to Maintain a Team of Experts

Enterprises (or IT service firms) need to maintain a team of experts (System maintenance team) in order to manage the whole thing. This is a burden for HR management and incurs recurring capital investment.

Can enterprises get relief from these responsibilities and difficulties?

Resource Over-provisioning

Enterprises generally plan and procure to support the maximum business load that they have anticipated. But average resource demand remains far less, most of the time, this causes resource wastage and increases the recurring cost of business.

Shutdown Time

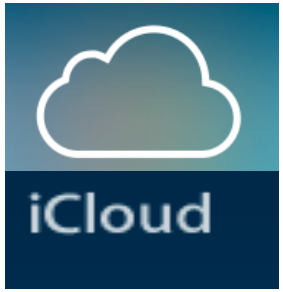
Many enterprise computing systems run forever without stopping. Such system host applications which require round-the-clock availability to fulfill business demand.

When resource capacity expansion of such a system becomes an absolute requirement for the respective business, a system shutdown (hence service disruption) becomes unavoidable which may cause loss in the business.

If a system could be expanded without shutting it down?

What is Cloud Computing?

What is Cloud Computing?




优酷

Cloud Computing: an old idea whose time has come

"Computing may someday be organized as a public utility,
just as the telephone system is organized as a public utility"

(John McCarthy, 1961)

What is Cloud Computing?

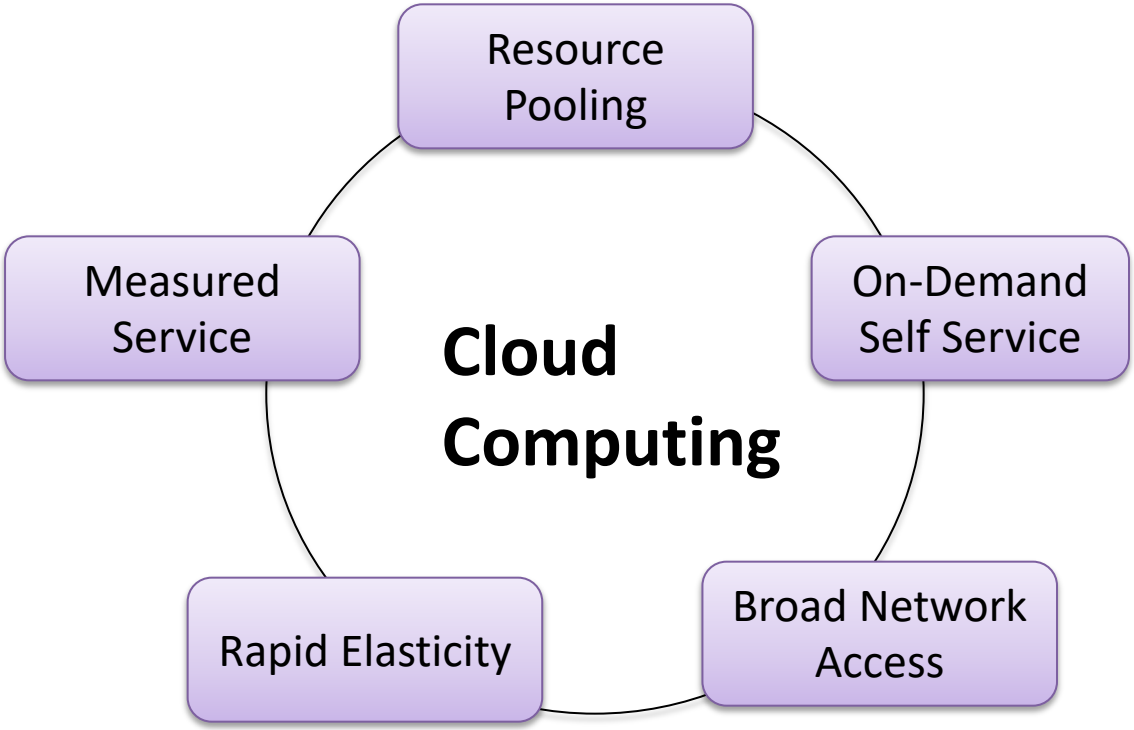
The NIST Definition of Cloud Computing

"Cloud computing is a model for enabling ubiquitous, 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. "

the National Institute of Standards and Technology (**NIST**)

http://nvlpubs.nist.gov/nistpubs/Legacy/SP/nistspecialpublication800-145.pdf

Essential Characteristics (NIST):

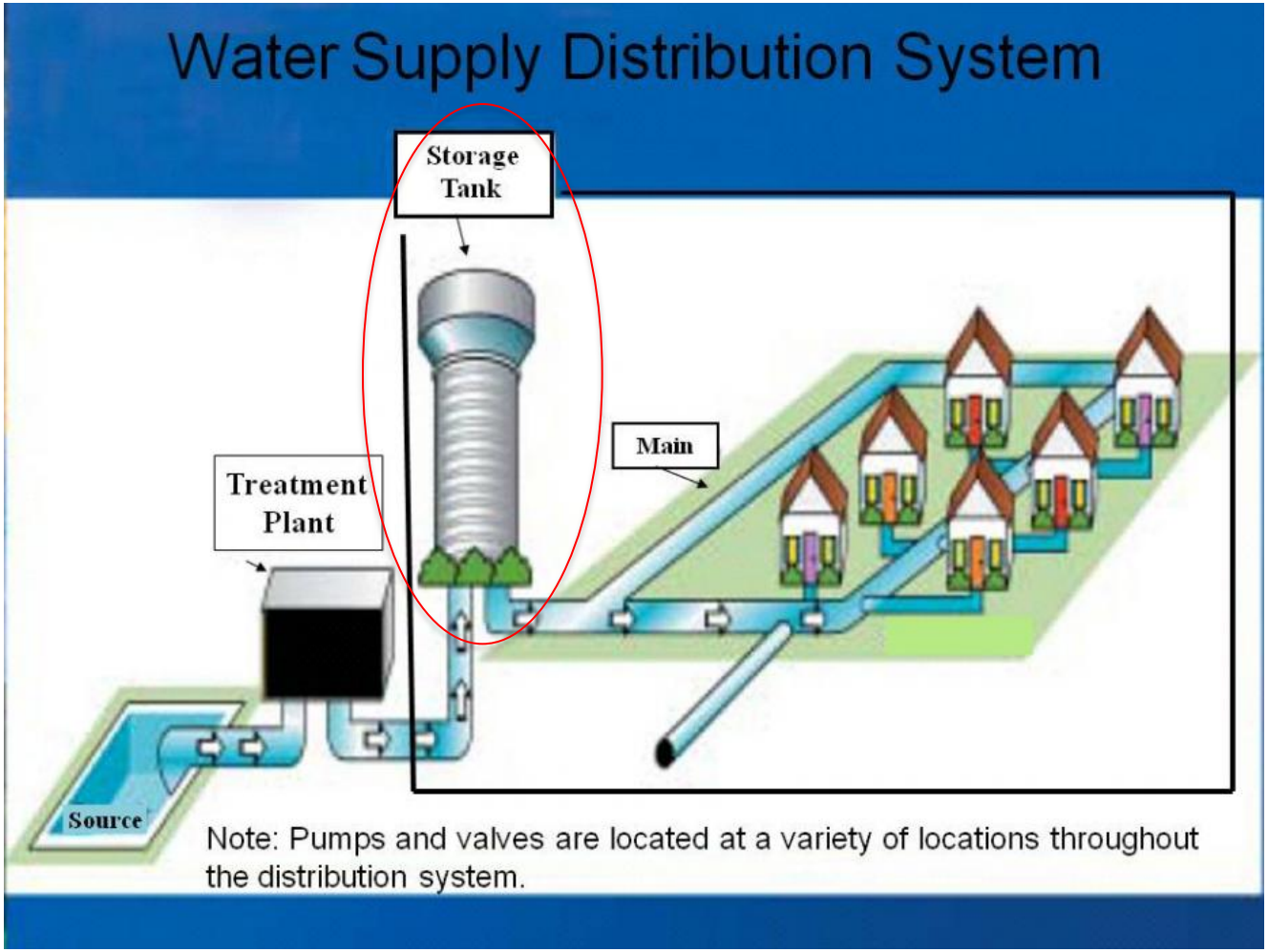


Resource Pooling

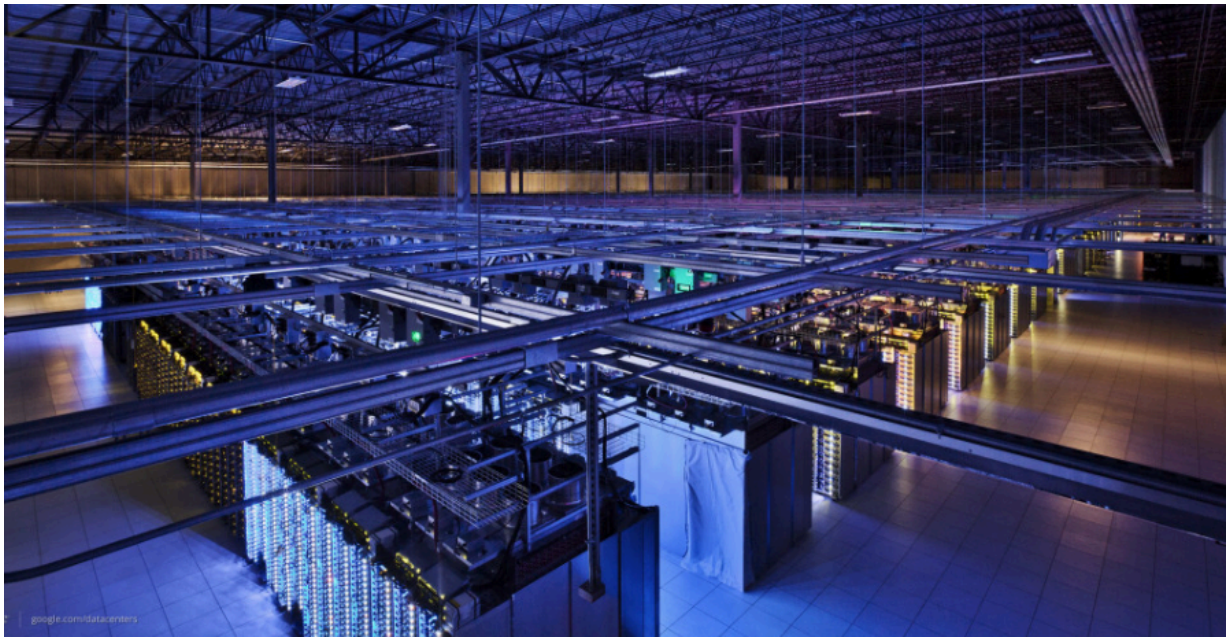
The provider's computing resources are pooled to serve multiple consumers using a multi-tenant model, with different physical and virtual resources dynamically assigned and reassigned according to consumer demand.

There is a sense of location independence in that the customer generally has no control or knowledge over the exact location of the provided resources but may be able to specify location at a higher level of abstraction (e.g., country, state, or datacenter). Examples of resources include storage, processing, memory, and network bandwidth.

Resource Pooling



Resource Pooling



Resource Pooling

AWS now spans 69 Availability Zones within 22 geographic regions around the world, and has announced plans for sixteen more Availability Zones and five more AWS Regions in Indonesia, Italy, Japan, South Africa, and Spain.

https://aws.amazon.com/about-aws/global-infrastructure/

On-demand Self-service

A consumer can unilaterally provision computing capabilities, such as server time and network storage, as needed automatically without requiring human interaction with each service provider.

Broad Network Access

Capabilities are available over the network and accessed through standard mechanisms that promote use by heterogeneous thin or thick client platforms (e.g., mobile phones, tablets, laptops and workstations).

Rapid Elasticity

Capabilities can be elastically provisioned and released, in some cases automatically, to scale rapidly outward and inward commensurate with demand. To the consumer, the capabilities available for provisioning often appear to be unlimited and can be appropriated in any quantity at any time.

Measured Service

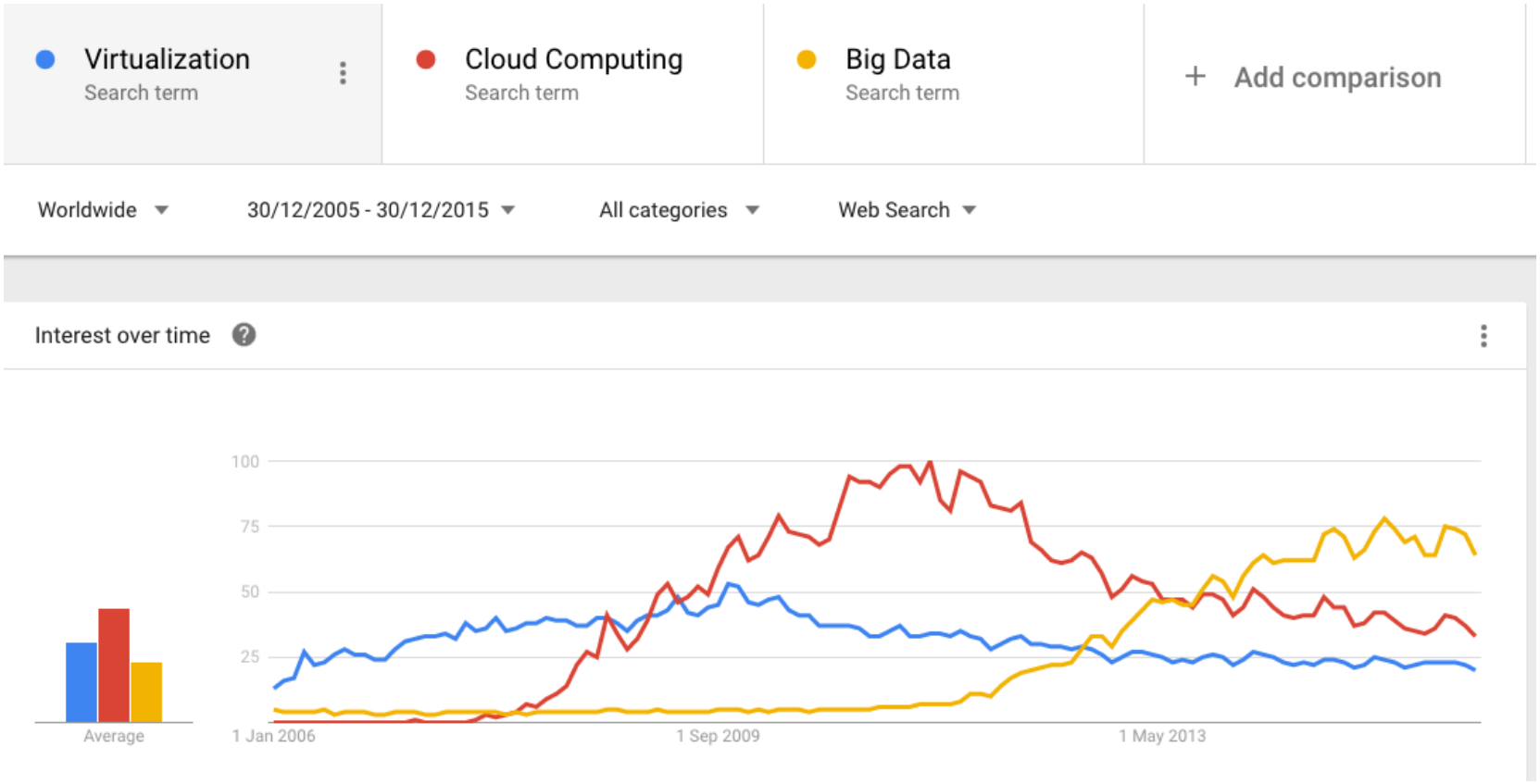
Cloud systems automatically control and optimize resource use by leveraging a metering capability at some level of abstraction appropriate to the type of service (e.g., storage, processing, bandwidth, and active user accounts). Resource usage can be monitored, controlled, and reported, providing transparency for both the provider and consumer of the utilized service.

Storage Pricing (varies by region)

Region: US East (Ohio)

	Standard Storage	Standard - Infrequent Access Storage †	Glacier Storage
First 50 TB / month	$0.023 per GB	$0.0125 per GB	$0.004 per GB
Next 450 TB / month	$0.022 per GB	$0.0125 per GB	$0.004 per GB
Over 500 TB / month	$0.021 per GB	$0.0125 per GB	$0.004 per GB

Virtualization, Cloud Computing and Big Data



Assessment and Assignments

Assignments

- **Assignment 1 – Virtualization (20%)**
  The purpose of this assignment is to give you an understanding of virtualization and to explore to build your own private cloud.

- **Assignment 2 – Cloud Computing Service Models (35%)**
  The purpose of this assignment is to give you the basic understanding of IaaS, PaaS, and Serverless Architecture.

- **Cloud Computing Essay and Presentation (45%)**
  You should pick a topic that you are interested in researching. Any topic involved with cloud computing is acceptable. Once you have selected your topic, you will need to spend some time to do the research and write an essay to describe it. You also need to prepare a short presentation.

Group Work (4 members each team)

Plagiarism & UCD Computer Science

- **Plagiarism is a serious academic offence**
  - UCD Student Code of Conduct / UCD Student Plagiarism Policy / Computer Science Plagiarism Policy and Procedures
- Our staff & demonstrators are **proactive** in looking for possible plagiarism
- Suspected plagiarism is investigated by the CS Plagiarism subcommittee
  - Usually includes an interview with the student(s) involved
  - 1st offence: **typically** 0 or NM in the affected components
  - 2nd offence: more serious consequences e.g. UCD Disciplinary process
- Student who enables plagiarism is equally responsible for it
- All students in a group which plagiarises are held responsible for it
- **Examples** of plagiarism:
  - Copying some/all of the work of another student and submitting it as your own work
  - Copying some/all of an assignment from the Internet/book/etc without referencing it
  - Sharing individual work with another student (by e-mail, FB messenger, WhatsApp, ...)
  - Making your work available (on GitHub, website, social media, ...) before lecturer gives permission
  - A group of students working on a solution, then individually submitting the same work
  - Students collaborating at too detailed a level e.g. consulting each other after implementing a line/block/segment of code and sharing the results
- A new aspect of the School policy

  Students taking a module **cannot post their work publicly in any way** until the module coordinator gives permission to do so. In particular, students cannot make their work accessible to other students in the module until and unless the module coordinator has given them permission to do this.