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Cloud Computing #1

Akitaka Matsuo
Essex IADS

Schedule

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1. Overview of cloud computing
2. What is cloud computing?
3. Advantages and disadvantages
4. Trends
5. Week 5 Class

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OVERVIEW: WHY CLOUD?

Definition #1

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“An approach to computing in which the end user connects to a remote network of computers (the cloud) in order to run programs, store data, etc. This enables users to access large amounts of data storage and computing power from anywhere in the world without having to own and maintain these resources themselves.”

(From Oxford Dictionary of Computer Science)

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Scenario

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- Suppose that you want to run a deep learning project
  - Need a lot of computer resource

So...

Let’s buy a monster machine!

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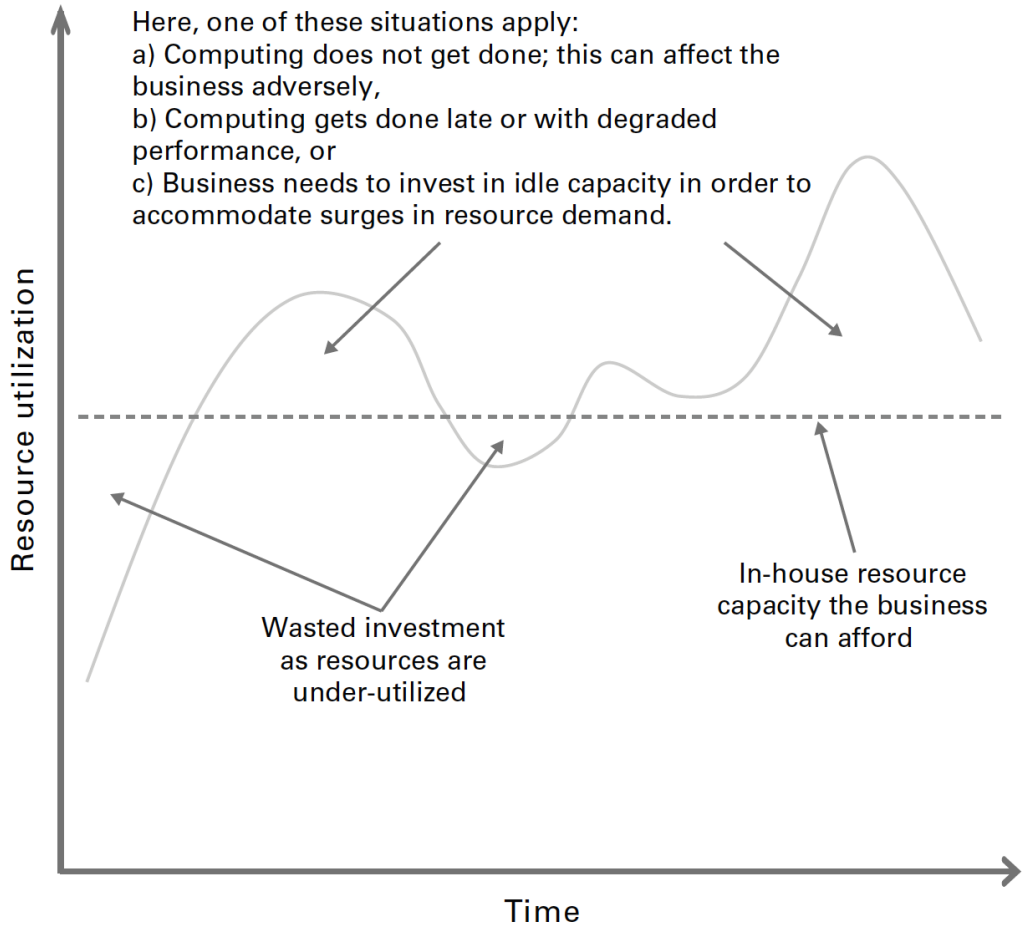
However…

- This is so-called “on premise” solution in industry
- However, there are pitfalls for this solution
  - Your computation environment is fixed
  - Your demand fluctuates
- Furthermore
  - Hardware breaks down
  - Software needs patch
  - Internet connection is gone



So what if...

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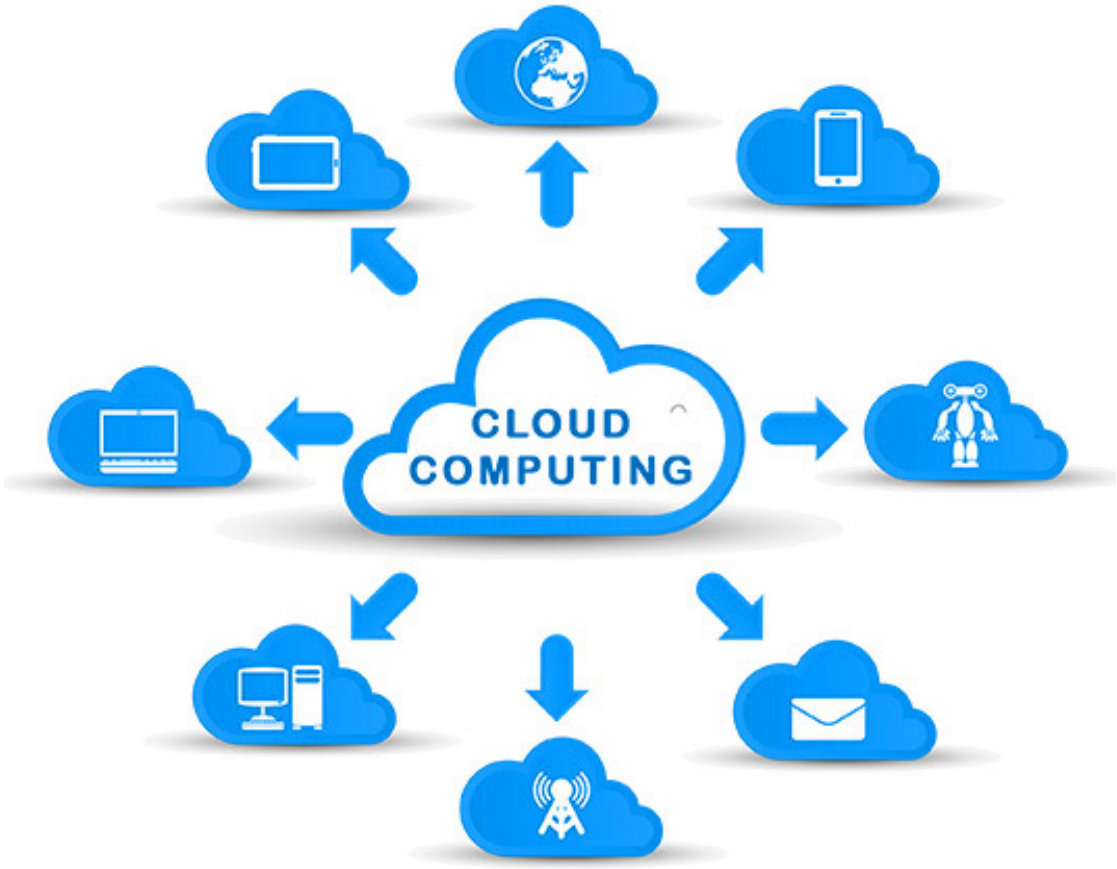
- What if you can avoid all these issues with a reasonable cost?
- That's what cloud computing is for!
  - You just have to pay what you use
  - You can deploy things in the matter of hours/minutes/seconds



Google Colab

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- In this module we have already been using Google Colab, a cloud-based service.
  - Use an internet browser as a client for accessing service
  - Colab is connected to Google Drive, the other cloud-based service for data storage
- We will learn:
  - How Colab is categorized in the cloud service?
  - What's the other options?

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WHAT IS CLOUD COMPUTING?

Definition #2

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"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. This cloud model promotes availability and is composed of five essential characteristics, three service models, and four deployment models." (From *NIST Definition of Cloud Computing* (https://csrc.nist.gov/publications/detail/sp/800-145/final))

What do they do?

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- Essentially, the **virtualization** of computational environment
  - Computers are virtualized (similar idea to virtual machine on your computer)
- Computational resources are hosted in data centers
  - A large number of hardware
  - Connected to the network
- The advantage:
  - Elasticity
  - Scalability
  - Measured service provision

Who are the service providers?

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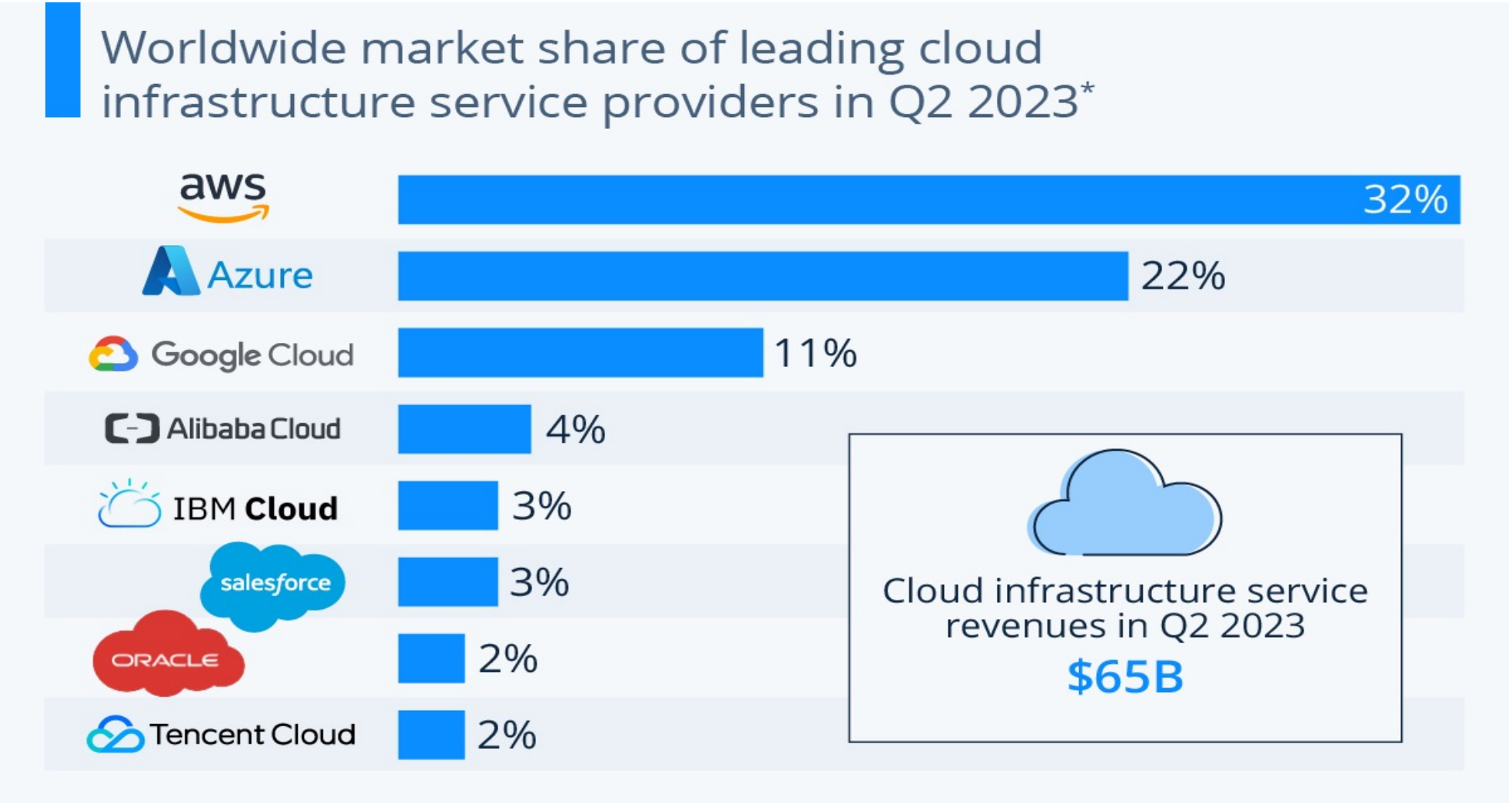

From: https://www.statista.com/chart/18819/worldwide-market-share-of-leading-cloud-infrastructure-service-providers/

Data centers (AWS example)

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Data centers

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- Physical locations of data centers are usually undisclosed for security reasons

Level of Abstraction

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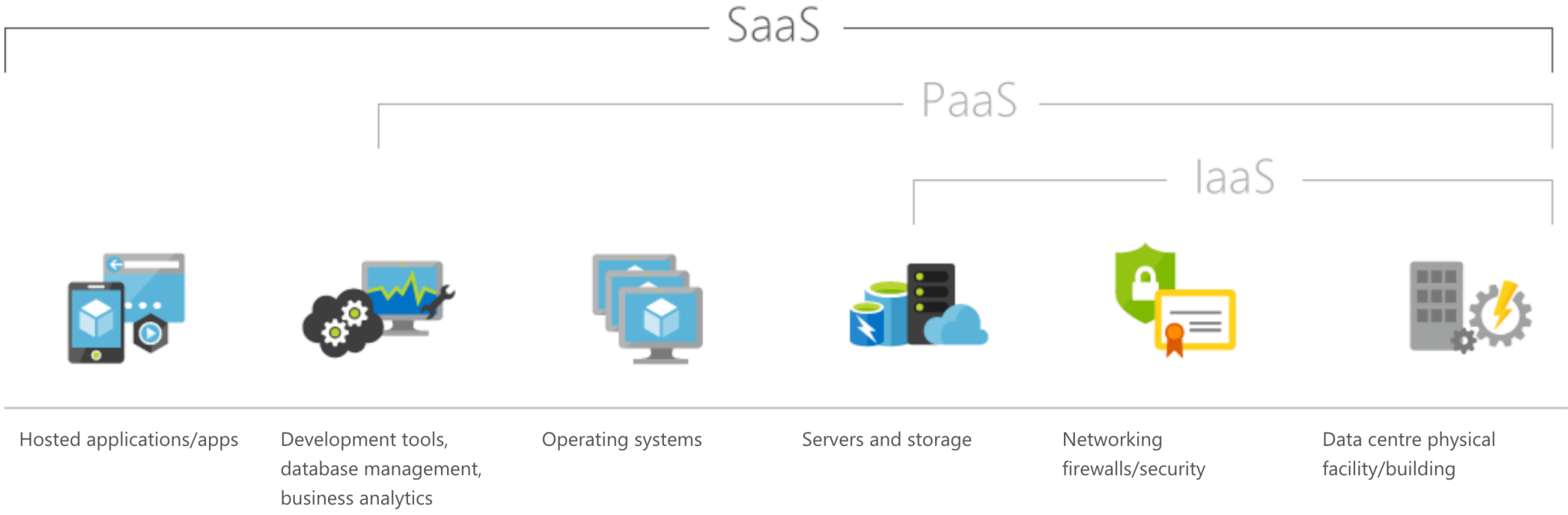
To what extent, you want a service provider to be responsible? (aaS = as a Service)

- Infrastructure? (IaaS)
- Platform (= OS)? (PaaS)
- Software (SaaS)



Some use cases

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- Data storage
  - Store important data reliably and securely
- Computation
  - Set up a virtual machine and run a computationally intensive tasks
    - Jupyter notebook server
    - RStudio server
- Data acquisition
  - Stream tweets (although it's sort of discontinued)
  - Create a crawler to regularly check news websites
- Database hosting
  - Set up databases online