CSCI 5409 Cloud Computing – Fall, 2023
Week 2 – Lecture 1 (Sep 11, 2023)

The Background of Cloud Computing

Dr. Lu Yang
Faculty of Computer Science
Dalhousie University
luyang@dal.ca

Housekeeping and Feedback

- First lab will be happening tomorrow
- Teams channels
- Certification vouchers

Objectives

- Understand the concept of cloud computing
- Understand the term and Kubernetes assignment
- Understand the history and future of cloud computing

Contents

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What is Cloud Computing

What is Cloud Computing

"Simply put, cloud computing is the delivery of computing services – including servers, storage, databases, networking, software, analytics and intelligence – over the Internet ("the cloud") to offer faster innovation, flexible resources and economies of scale. Typically, you only pay for cloud services you use, helping you lower your operating costs, run your infrastructure more efficiently and scale as your business needs change."

https://azure.microsoft.com/en-ca/overview/what-is-cloud-computing/#benefits

What is Cloud Computing – The way to learn

Experiential Learning

- Cloud computing is not a programming language, API, formula or mathematical theory. It is a paradigm for arranging IT resources.
  - After instruction in the fundamentals, learning happens by **doing**.
- **The most important skill you must develop is courage;** the courage to dive in and arrange gizmos and fiddle knobs until your stuff works.
- Be tenacious!
  - Google error messages, don't stop at the first couple of links
  - Use binary searches to find problems
  - Try try try try try try try **THEN** ask **Teams-> TA -> Lu**

What is Cloud Computing – Business Drivers

Capacity Planning

- Determining and fulfilling future demands of an organization's IT resources
- Capacity = Maximum amount of work delivered in a period of time
- If not matched to demand, systems go down or become unavailable

Cost Reduction

- Cost Reduction:
  - Constant need to balance requirements with over-expenditure on infrastructure
  - Reduced costs:
    - IT personnel
    - Utility and capital expenses
    - Security / access control measures and audits
    - Software licenses

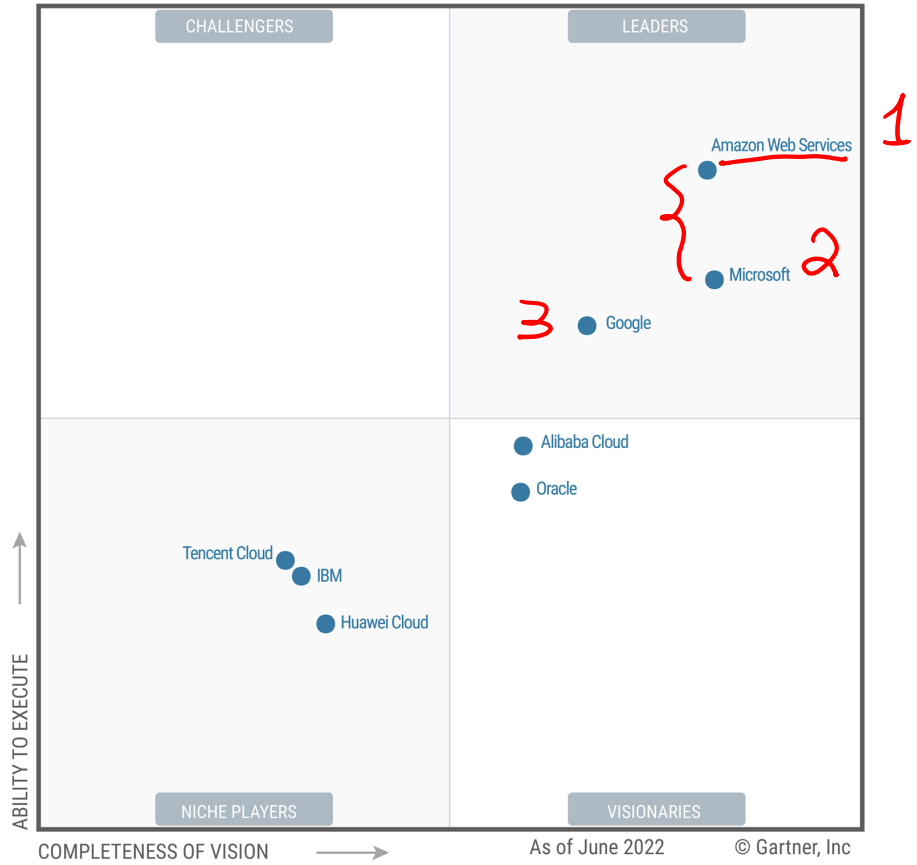
Organizational Agility

- Organizational Agility:
  - Covid-19 is the perfect demonstration of this, as everyone went home suddenly demand for online resources skyrocketed, without cloud computing we would not be talking right now
  - Organizations can freely and safely attempt to scale their business without worrying about IT resources keeping up

T. Erl, Z. Mahmood, R. Puttini, *Cloud Computing* (2013)

What is Cloud Computing – Major Players

Figure 1: Magic Quadrant for Cloud Infrastructure and Platform Services



https://aws.amazon.com/blogs/aws/aws-named-as-a-leader-in-the-2022-gartner-cloud-infrastructure-platform-services-cips-magic-quadrant-for-the-12th-consecutive-year/

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Term Assignment
& Kubernetes Assignment

AWS Academy & AWS Credits

- 3 types of accounts:
  - **AWS Academy lab account** – Free, no credit card, $100 credit for our class
    - Everything we create here is in a special sandbox that is not the real AWS
    - Everything is deleted when the course ends
    - If you run out of credits, **then that's it!**
  - **AWS starter account** – Free, no credit card, promotional credit?
  - **Regular AWS developer account** – ***Not free***, credit card required BE CAREFUL
- If you run out of credits, you're on your own!
  - Learning to be careful and manage your credits and the cost of the services you deploy is part of this course
  - OpenStack, or paying for credits on your own is your only recourse.

Kubernetes Assignment – Using GCP

Google Cloud Platform (GCP)

- You can use any GCP services. Google is always generous!
- We focus on cloud-native CI/CD tools and Google Kubernetes Engine (GKE)
- $50/student

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History of Cloud Computing

History of Cloud Computing – Wild Thinking

Terms or technologies you can think of about the history of cloud computing

Internet
Servers
Virtulization
Storage
Network(VPC)
data center
OS
Regions & AZs
CDN
Containerization
Security
Scalability

History of Cloud Computing – The journey

Time sharing:
"The computers would handle a number of problems concurrently.
Organizations would have input-output equipment installed on their own premises and would buy time on the computer much the same way that the average household buys power and water from utility companies"

John Backus, Dec 1958

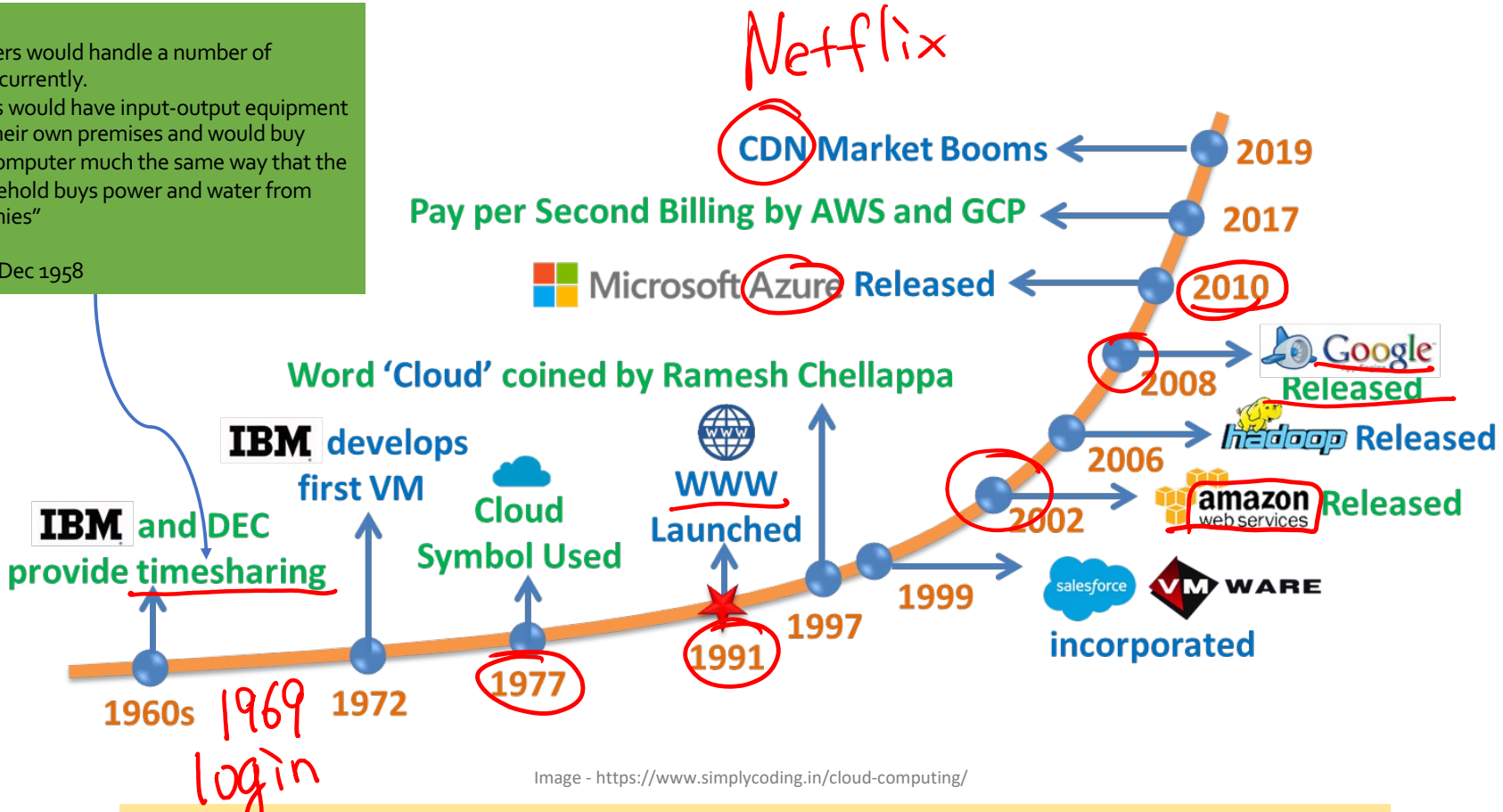


Image - https://www.simplycoding.in/cloud-computing/

The global cloud computing market size was valued at USD 483.98 billion in 2022 and is expected to grow at a compound annual growth rate (CAGR) of 14.1% from 2023 to 2030
https://www.grandviewresearch.com/industry-analysis/cloud-computing-industry

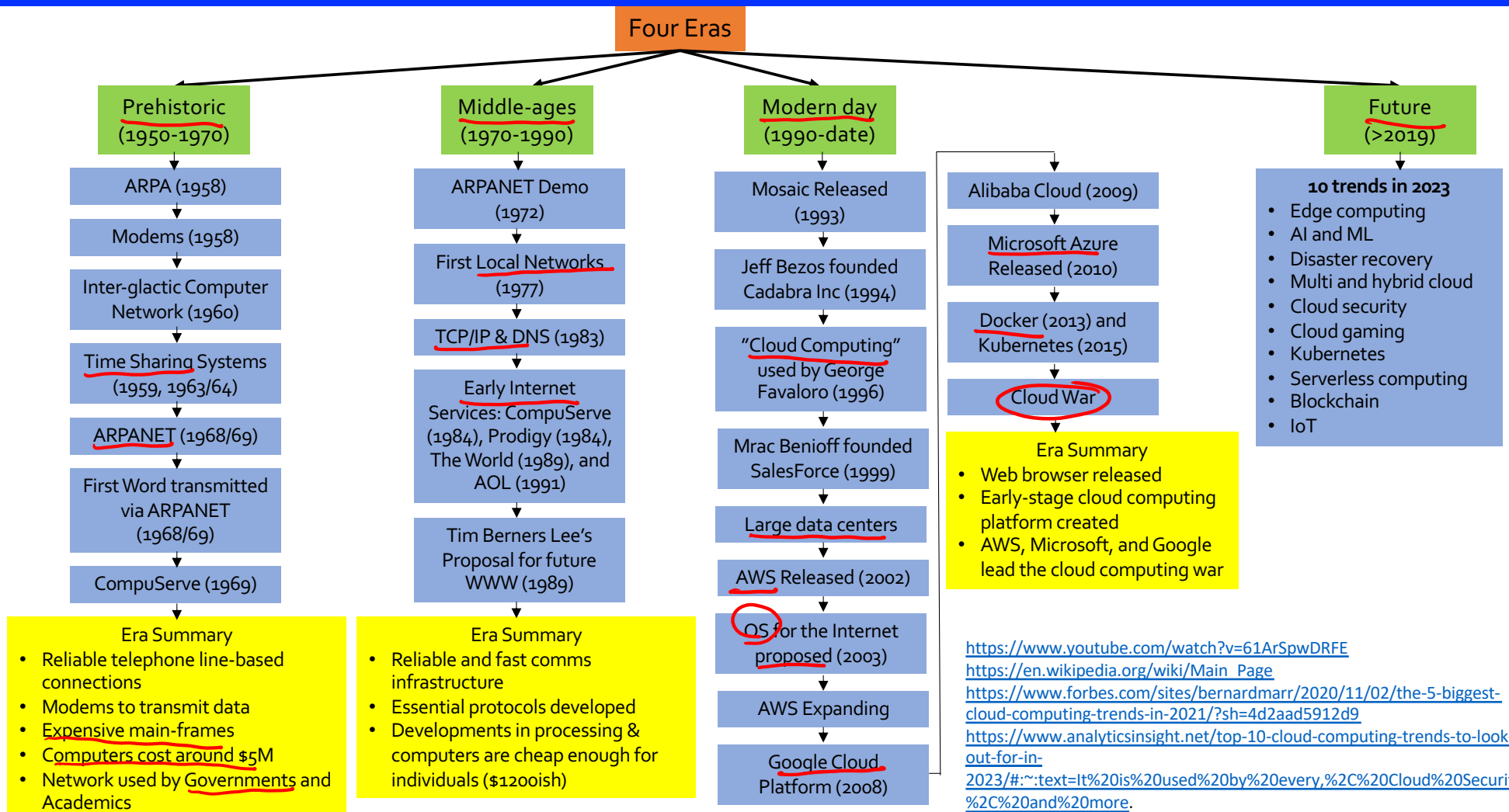
History of Cloud Computing – The journey

It's not even finished growing…

- 2002 – Amazon Web Services (AWS) launched as a free service.
- 2006 – AWS started offering web-based computing infrastructure services, now known as cloud computing.
- 2007 – IBM partnered with Google to promote cloud computing in universities.
- 2008 – Google announced App Engine, a developer tool that allowed users to run web applications on Google infrastructure.
- 2010 – Microsoft released Azure, its cloud computing service.
- 2011 – IBM introduced the SmartCloud framework.
- 2011 – Facebook launched the Open Compute Project (OCP) to share specifications for energy efficient data centres.
- **2013 – Docker introduced open source container software.**
- 2015 – Google and Microsoft lead massive build outs of data centres.
- 2017 – Huawei and Tencent joined Alibaba in major data centre build-outs in China.
- **2018 – Leading data centre operators started the migration to 400G data speeds.**
- **2018 – Silicon photonics technology started to positively impact data centre networking architectures.**
- **2020 – Edge computing will revise the role of the cloud in key sectors of the economy.**
- **2021 – Data centre speeds are expected to exceed 1,000G.**
- **2024 – GlobalData forecasts that spending on cloud services (SaaS, PaaS, and IaaS) will be more than $429bn.**

https://www.verdict.co.uk/cloud-computing-timeline/

History of Cloud Computing – Four eras



https://www.youtube.com/watch?v=61ArSpwDRFE
https://en.wikipedia.org/wiki/Main_Page
https://www.forbes.com/sites/bernardmarr/2020/11/02/the-5-biggest-cloud-computing-trends-in-2021/?sh=4d2aad5912d9
https://www.analyticsinsight.net/top-10-cloud-computing-trends-to-look-out-for-in-2023/#:~:text=It%20is%20used%20by%20every,%2C%20Cloud%20Security%2C%20and%20more.

Takeaway

- Learnt the concept of cloud computing
- Learnt the term and Kubernetes assignment
- Learnt the history and future of cloud computing