Information Technology Institute

Introduction to Operating Systems

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Cloud Computing

• Cloud Computing History

- Concept evaluated in 1950(IBM) called RJE (Remote Job Entry Process).
- In 2006 Amazon provided first public cloud AWS (Amazon Web Service).

What is Cloud?

- The term cloud **refers to** Network or Internet. Something that is present in at remote location.

- Cloud can provide
  - **Services** over network (on Public networks or on Private networks).
  - **Applications** such as email, web conferencing, customer relationship management (CRM)

What is Cloud Computing?

- **Cloud computing** can be defined as a new style of computing in which dynamically scalable and often virtualized resources are provided as a services over the Internet.

- Cloud computing refers to **manipulating**, **configuring**, and **accessing** the application online. It offers online data storage, infrastructure and application.
- Cloud computing is both combination **of software and hardware** based computing resources delivered as a network service.

What is Cloud Computing?

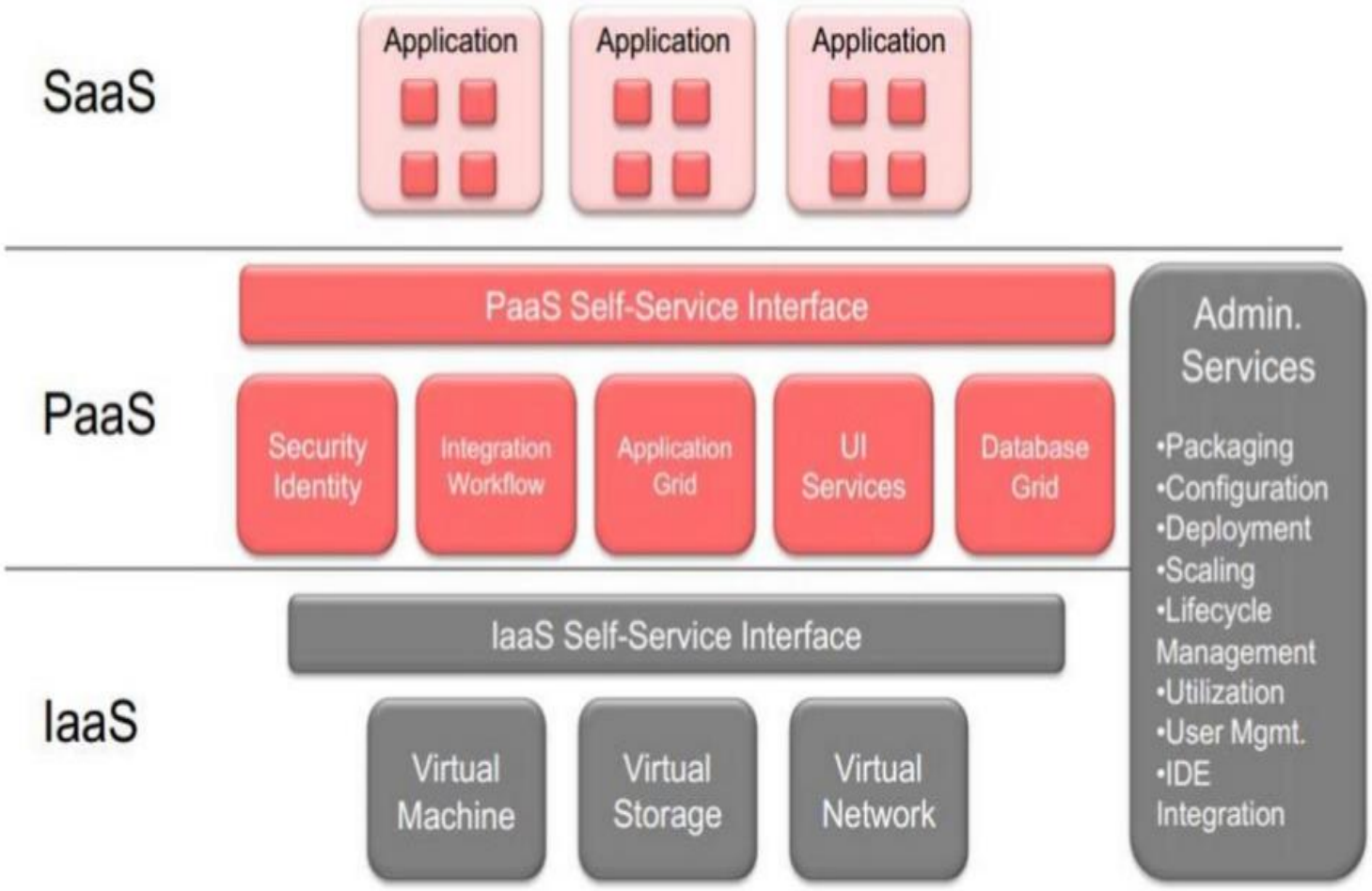
- Cloud computing is the on-demand delivery of IT resources over the Internet with pay-as-you-go pricing.

- Instead of buying, owning, and maintaining physical data centers and servers, you can access technology services, such as computing power, storage, and databases, on an as needed basis from a cloud provider like Amazon Web Services (**AWS**).

What is Cloud Computing?

- Cloud Computing is a general term used to describe a new class of network based computing that takes place over the Internet .
  - A collection of integrated and networked hardware, software and Internet infrastructure (called a platform).
  - These platforms hide the **complexity** and details of the underlying infrastructure from users and applications by providing very simple graphical interface or API
- A technical point of view
  - Internet-based computing (i.e., computers attached to network)

• Cloud Computing Services



Cloud Computing Services

- **Infrastructure as a service (IaaS)**
  - Offering hardware related services using the principles of cloud computing. These could include storage services (database or disk storage) or virtual servers.
    - Amazon EC2, Amazon S3

Cloud Computing Services

- **Platform as a Service (PaaS)**
  - Offering:
    - Development platform and Grid Database on the cloud.
    - security and identity .
    - Workflow and UI service .
  - Google's Application Engine, Microsofts Azure

Cloud Computing Services

- **Software as a service (SaaS)**
  - Including a complete software offering on the cloud.

  Users can access a software application hosted by the cloud vendor on pay-per-use basis.
  - This is a well-established sector.

  - Googles gmail and Microsofts hotmail, Google docs

• Cloud Computing & OS

- **OS is the core engine for cloud**

  (storages , memory , network …)
- Virtualization ➔hypervisor

Cloud Computing Challenges

- **Performance** (High networking load).
- **Security and Privacy** (Data not in your own PC)
- **Control** (No fully control) .
- **Bandwidth Costs** (transferring data).
- **Reliability** (Service interrupts) .

• Big Data

• Big Data

- What is the Dataset?

  a collection of numbers or values that relate to a **particular subject**.

  For example, the test scores of each student in a particular class is a data set

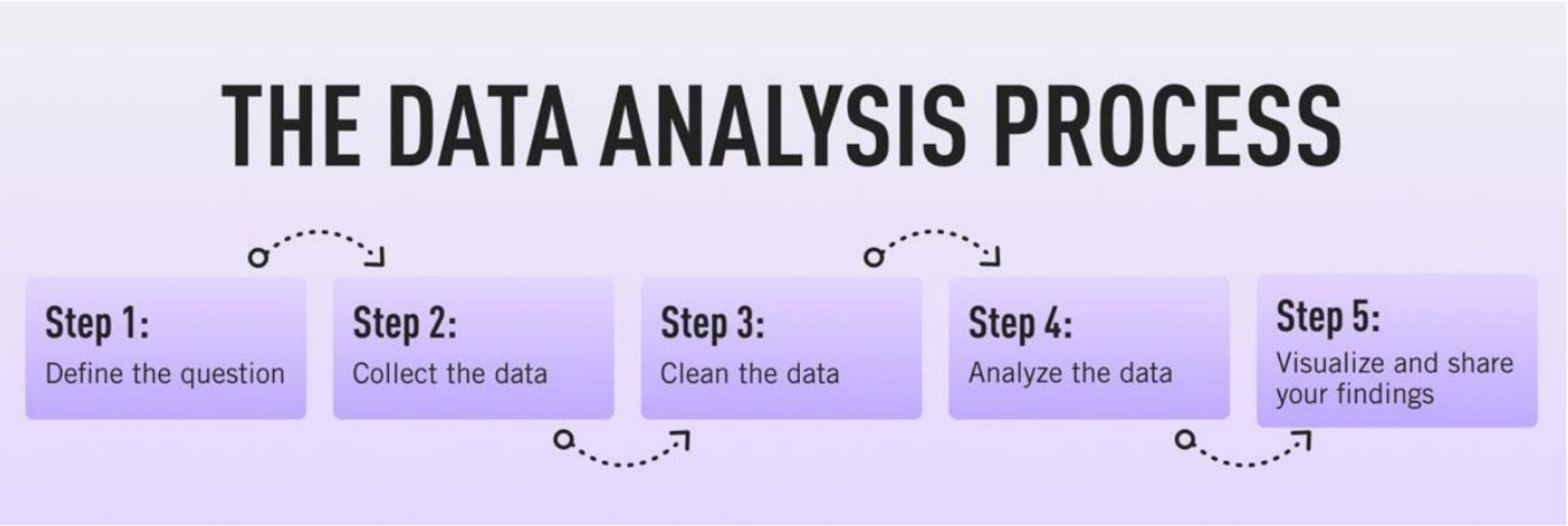
- What is the Big Data Analysis?

  a process of inspecting, cleansing, transforming, and modeling data

• Big Data

- What is the Data?
  - measurements (unprocessed or processed) represented as text, numbers, or multimedia.

• What is Data Analysis Process?



What is Big Data?

No standard definition:

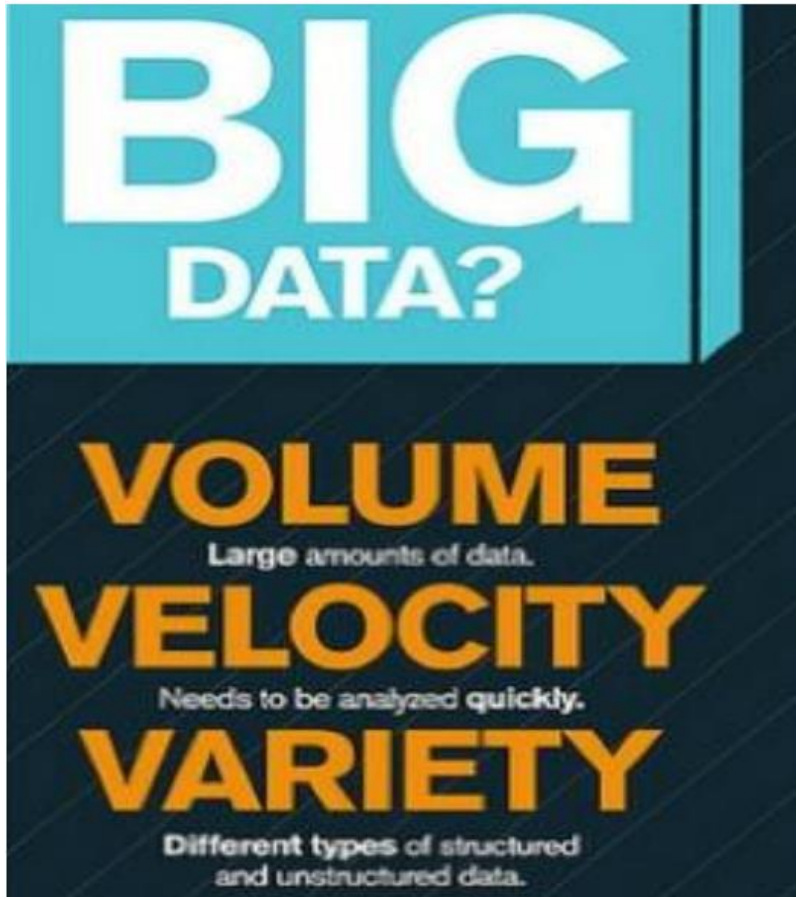
Big data is a term for data sets that are so large or complex that traditional data processing applications are inadequate.

Challenges:

- Data capture and storage
- Data cleaning and curation
- Analysis and visualization
- Searching
- Data sharing and transfer
- Querying , updating and information privacy.

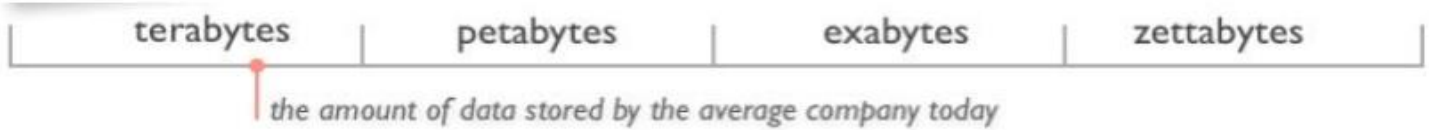
• Who is generating Big Data?

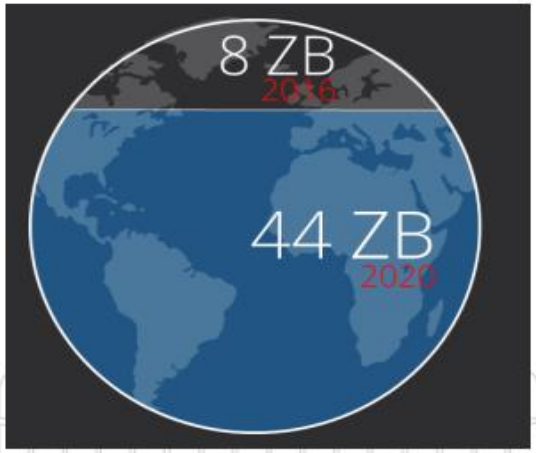
• Data Characteristics:



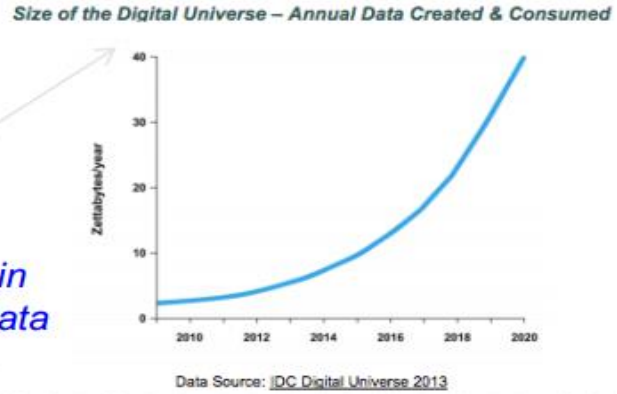
• Data Characteristics:

- Data Volume
  - Growth 40% per year
  - From 8 zettabytes (2016) to 44zb (2020)
- Data volume is increasing exponentially





Exponential increase in collected/generated data



• Variety

- Different Types:
  - Relational Data (Tables/Transaction/Legacy Data)
  - Text Data (Web)
  - Semi-structured Data (XML)
  - Graph Data
    - Social Network, Semantic Web (RDF), …
  - Streaming Data
    - You can only scan the data once
  - A single application can be generating/collecting many types of data
- Different Sources:
  - Movie reviews from IMDB and Rotten Tomatoes
  - Product reviews from different provider websites

• Velocity

- Data is begin generated **fast** and need to be processed fast
  - Online Data Analytics
  - Late decisions ➔ missing opportunities
  - Examples
    - **E-Promotions:** Based on your current location, your purchase history, what you like ➔ send promotions right now for store next to you
    - **Healthcare monitoring:** sensors monitoring your activities and body ➔ any abnormal measurements require immediate reaction
    - **Disaster management and response**

References

- "Essential Computer Science: A Programmer's Guide to Foundational Concepts": Paul D. Crutcher, Neeraj Kumar Singh, Peter Tiegs: Apress, 2021

Course Outlines

Thank You

With My Best Wishes

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