Distributed Computing and Big Data

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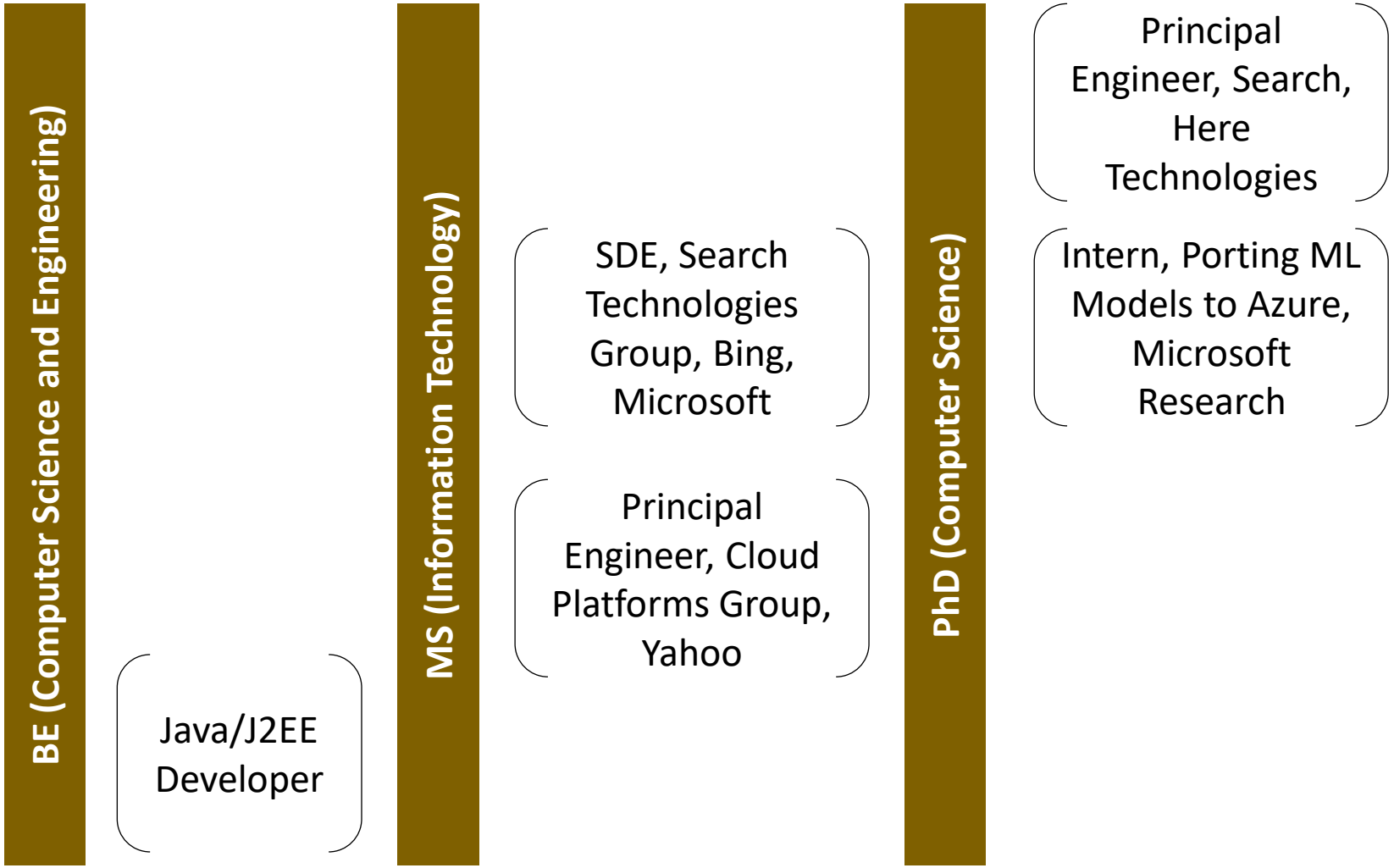
Data is the new oil. - Clive Humby, 2006.

Know Your Instructor



Agenda

- Introduction to Big Data
- Course Dynamics
- Evolution of Systems and Technologies
  - Data Storage
  - Data Processing

What Comes Next?

byte

kilobyte

megabyte

gigabyte

??

???

????

?????

Sizes

Name	Size
Byte	8 bits
Kilobyte	1024 bytes
Megabyte	1024 kilobytes
Gigabyte	1024 megabytes
Terabyte	1024 gigabytes
Petabyte	1024 terabytes
Exabyte	1024 petabytes
Zettabyte	1024 exabytes
Yottabyte	1024 zettabytes

The Impact of Big Data

Your train is on time thanks to **big data**
TNW - 31-Dec-2019
Thanks to thousands of sensors and **big data** analytics, train ... It's this data that keeps the Dutch rail network moving, and helps NS deliver a ...

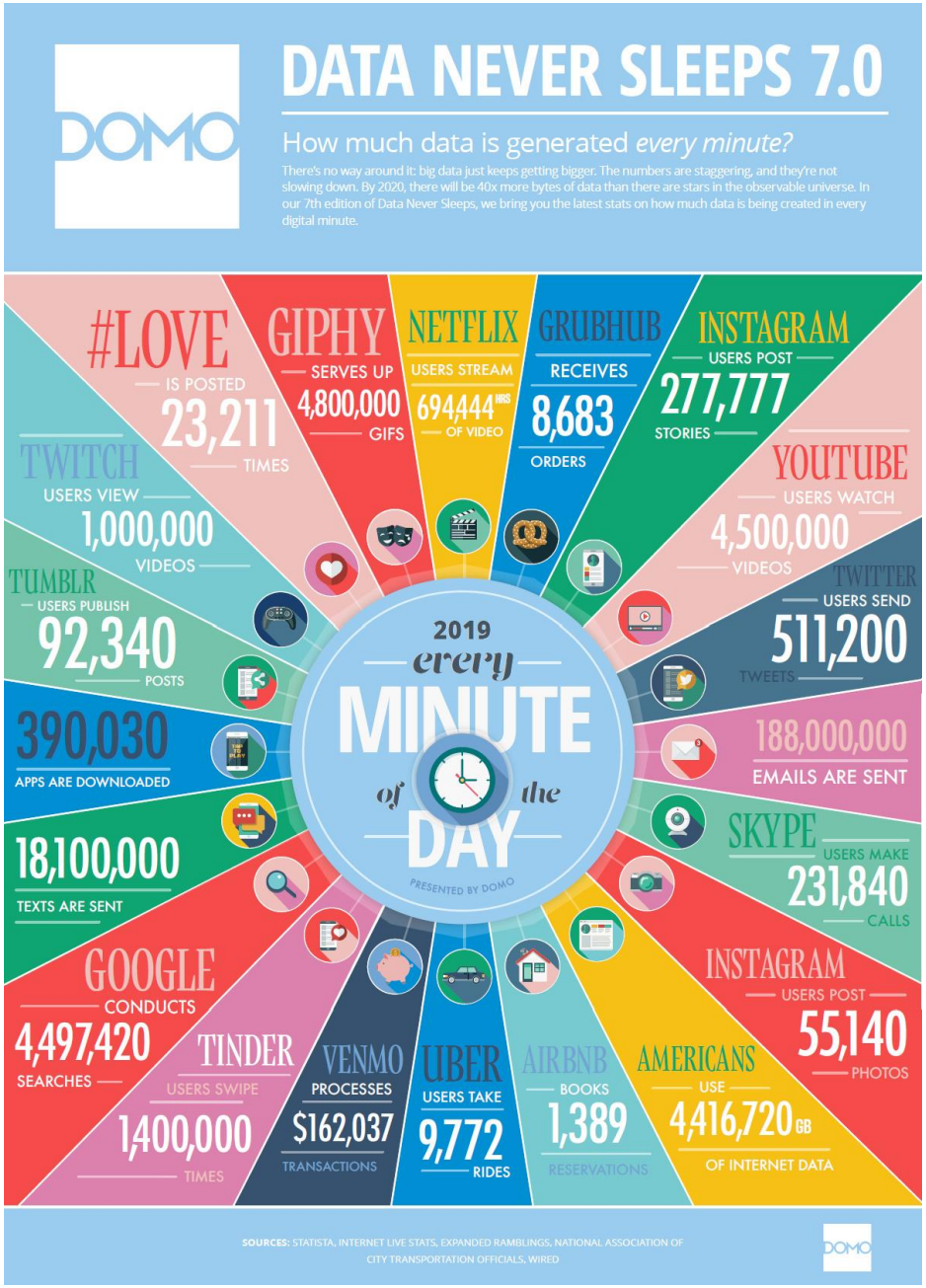
The power of **data** in smart city developments
Independent Australia - 03-Jan-2020
Other fascinating **big data** developments that were presented included ... led to the production of the Australian **Cancer** Atlas — an interactive, ...

At HCA Healthcare, Real-Time **Data Saves Lives**
RTInsights (press release) (blog) - 01-Jun-2019
At HCA Healthcare, Real-Time **Data Saves Lives** ... "Our existing **data** infrastructure was designed for **large**-scale business intelligence and ...

Big Data is Ubiquitous

- Facebook (**per day** statistics)
  - 1.5 billion people are active on Facebook **daily!**
  - More than 300 million photos get uploaded **per day**!
  - Totally, more than 2.5 Trillion posts!
- Facebook (per minute statistics)
  - **Every minute** there are 510,000 comments posted and 293,000 statuses updated!
- Youtube (**per minute** statistics)
  - Users watch 4,146,600 YouTube videos!

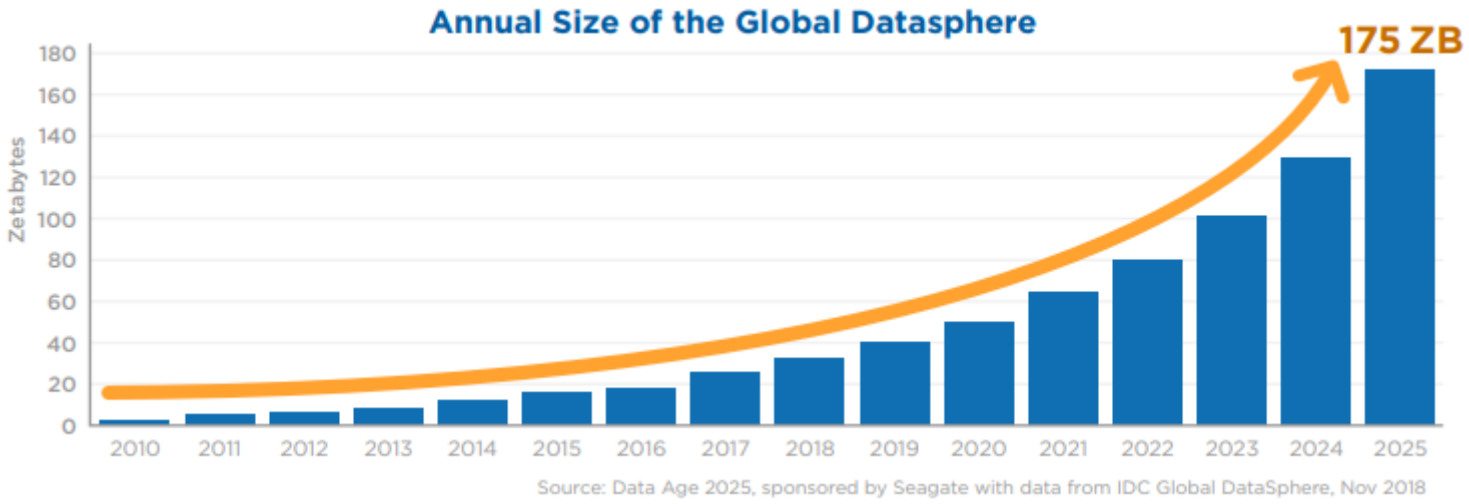
Source: Forbes



Source: https://www.visualcapitalist.com/big-data-keeps-getting-bigger/

And, It is Growing!

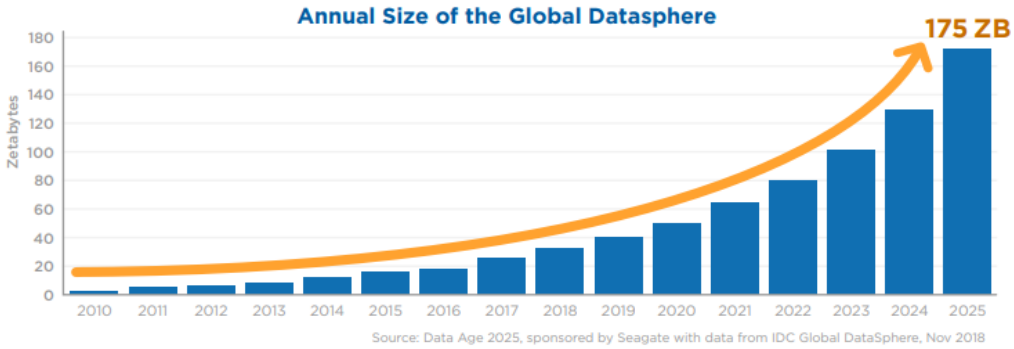
Data Growth



Mankind's quest to digitize the world!
33 ZB (2018) → 175 ZB (2025)
size of global datasphere*

*Source: https://www.seagate.com/files/www-content/our-story/trends/files/idc-seagate-dataage-whitepaper.pdf

Beyond a Single Machine

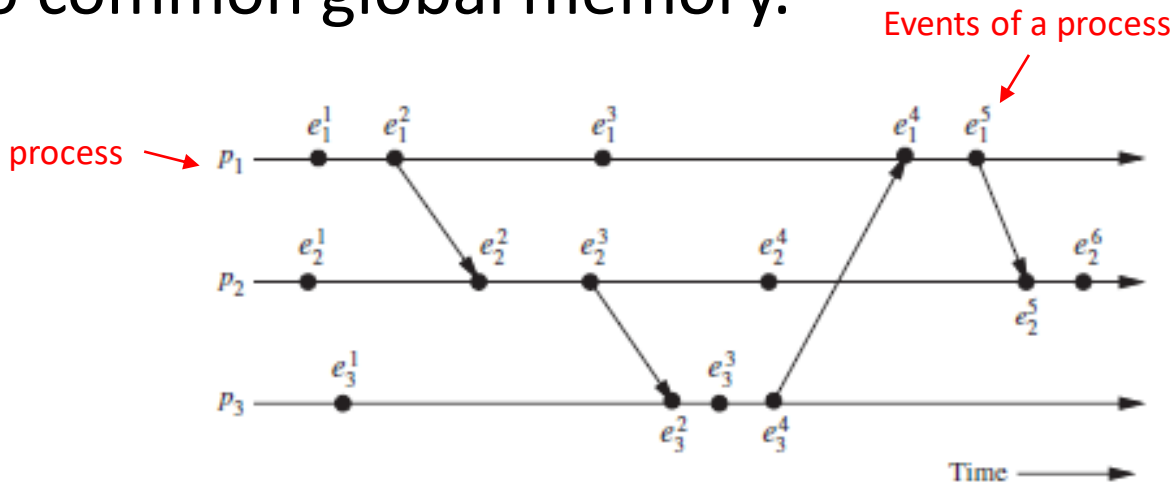


Global datasphere is growing!

How has computing evolved to capture, process and analyze these data?

A Model of a Distributed System

- A set of processes connected by a communication network.
- Communication by information exchange.
- No physical global clock.
- No common global memory.



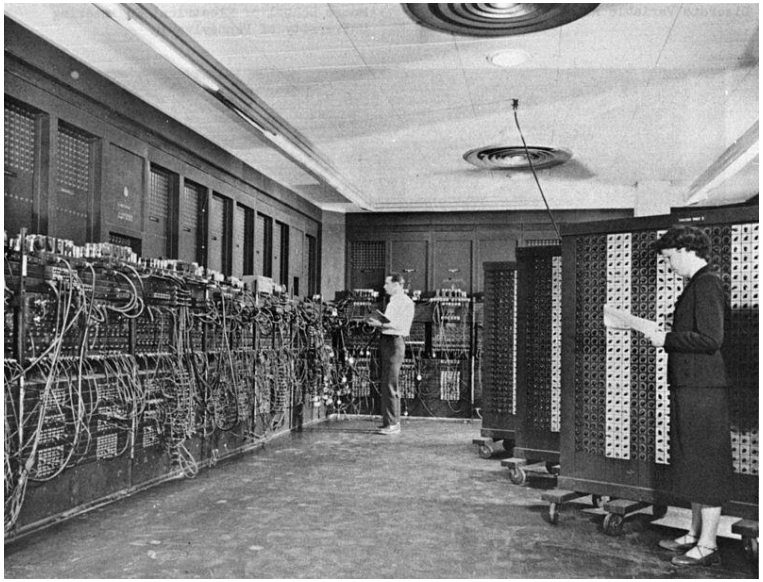
Processors (p_i) may fail!

Messages may be delayed or lost!!

Course Dynamics

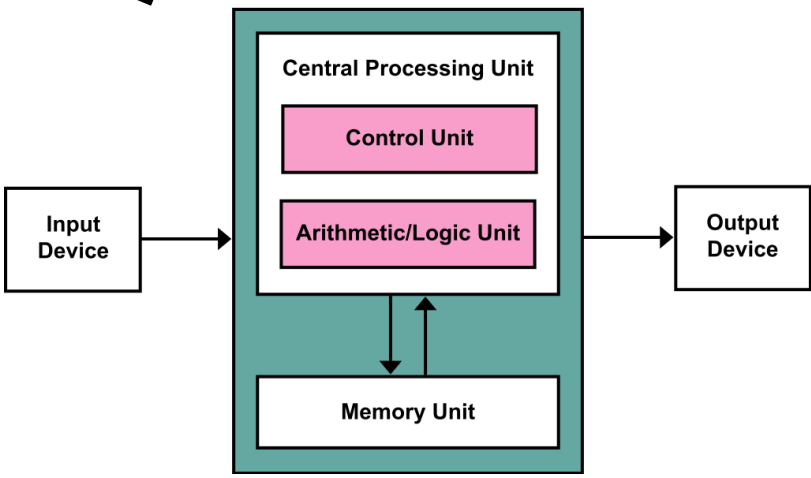
https://vvtesh.github.io/teaching/bdh-2023.html

Evolution of Computers



ENIAC
Early 1900s

Stored-program Von Neumann Architecture 1940



Two Kinds of Problems