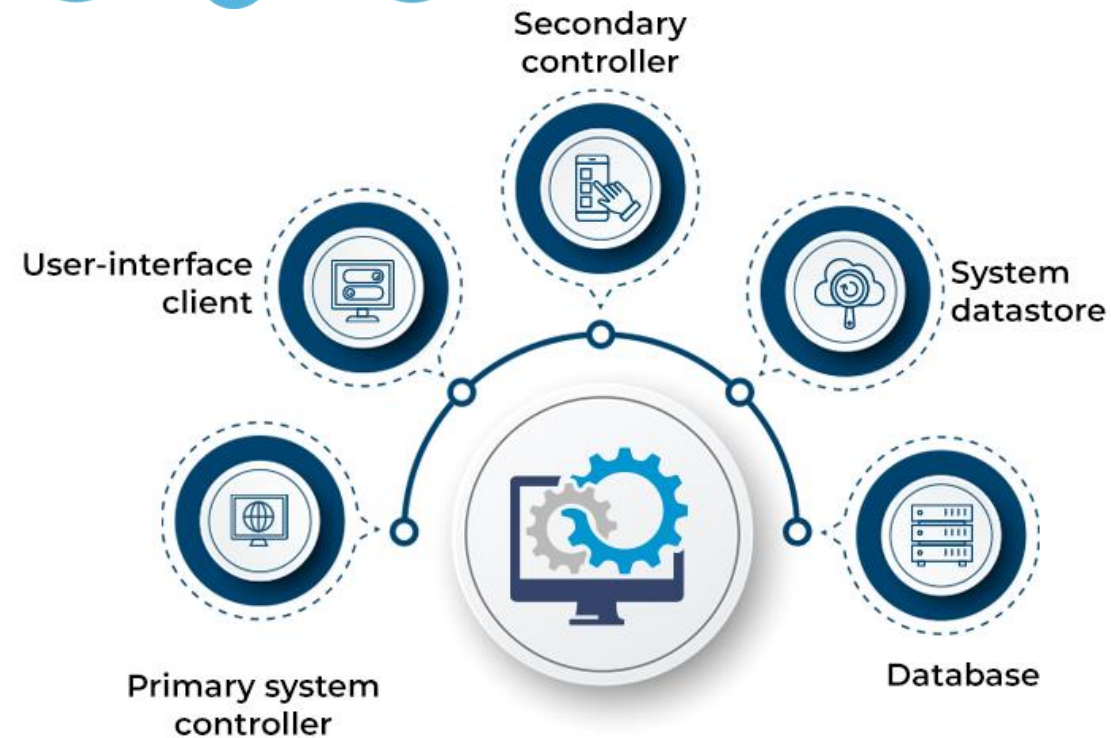




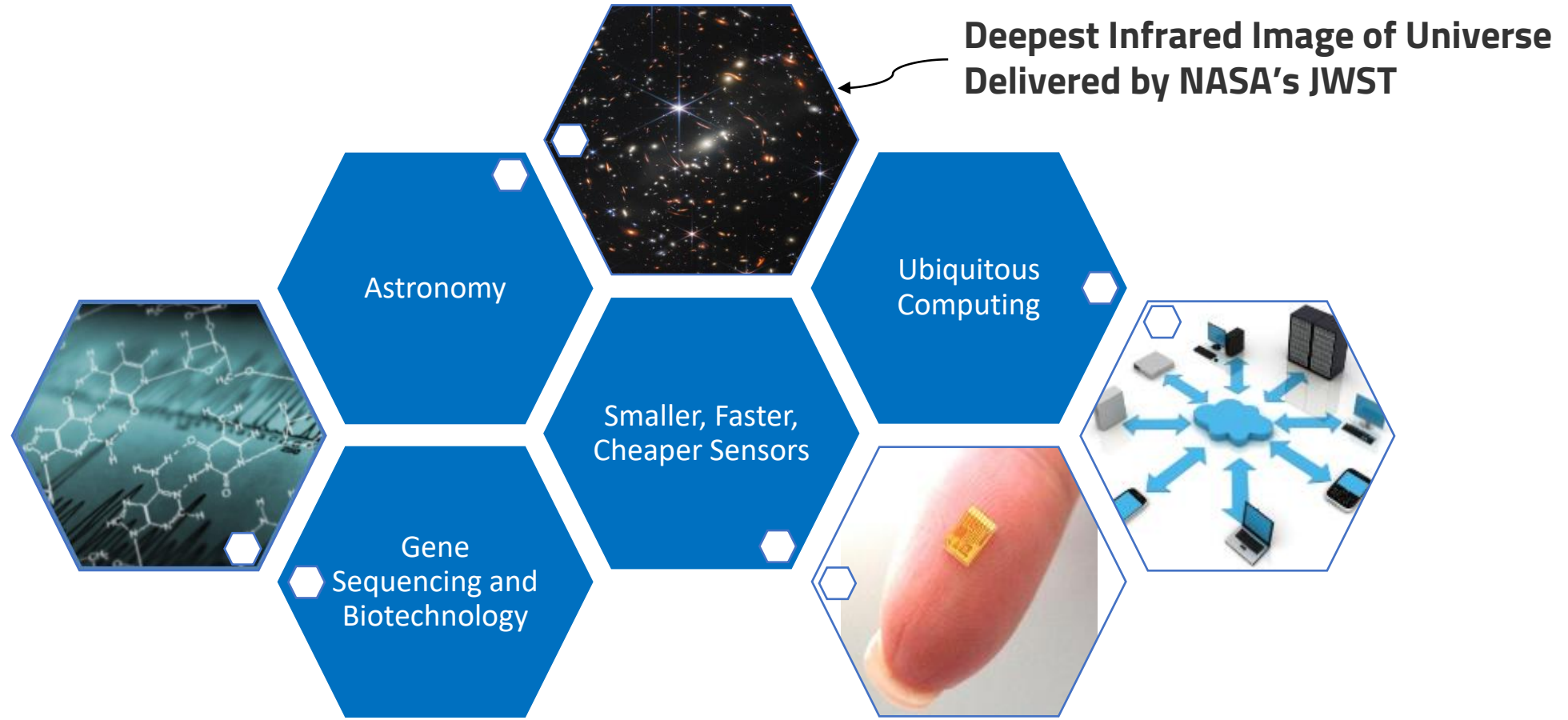
Sistem Terdistribusi

IF2222



01: Pengantar

On the Verge of A Disruptive Century : Breakthroughs



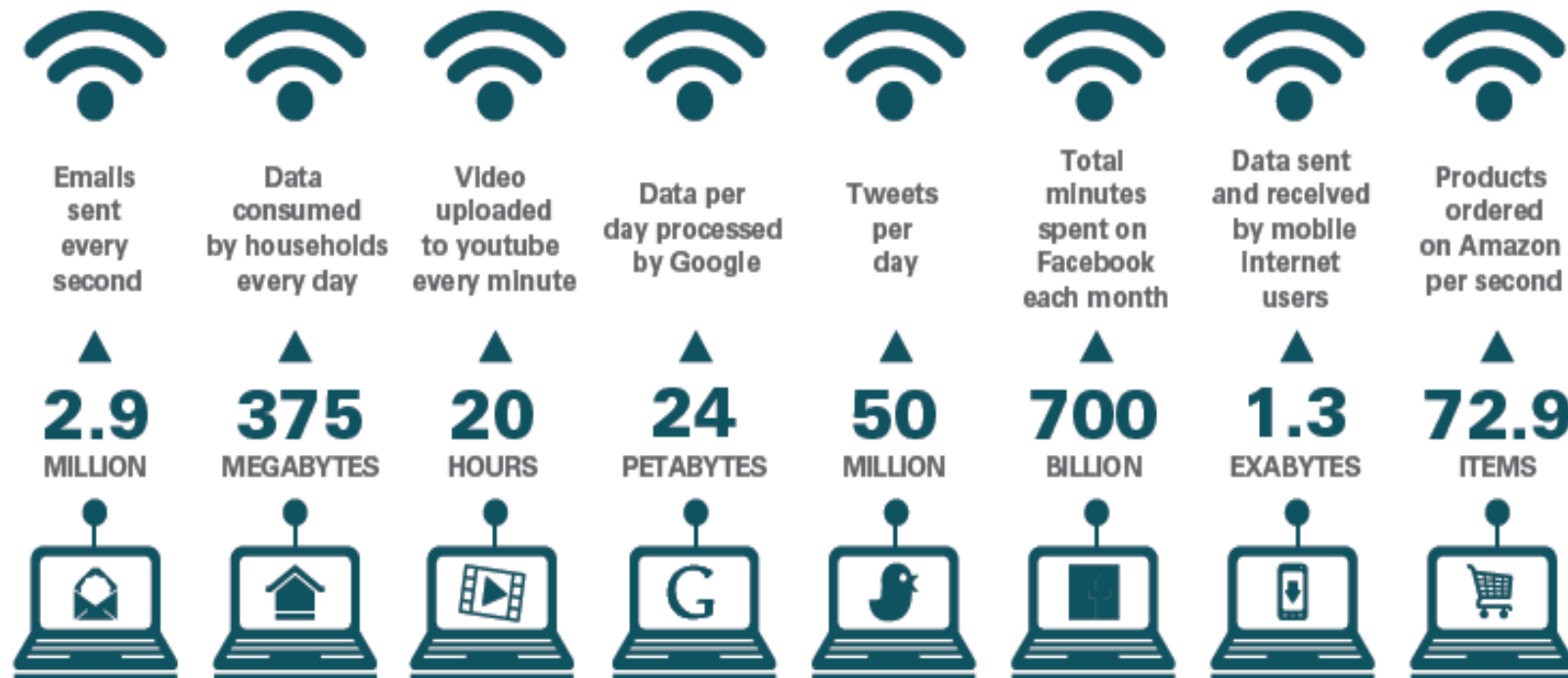
A Common Theme is Data

The amount of data is only growing...
1.2 Zettabytes (10^{21} B or 1 Billion TB)



We Live in a World of Data...

The world of data



What Do We Do With Data?



Store



Share



Access



Process



Encrypt



.... and
more!

We want to do these seamlessly...

Using Diverse Interfaces & Devices



Computers



Mobile Devices



Consumer Electronics



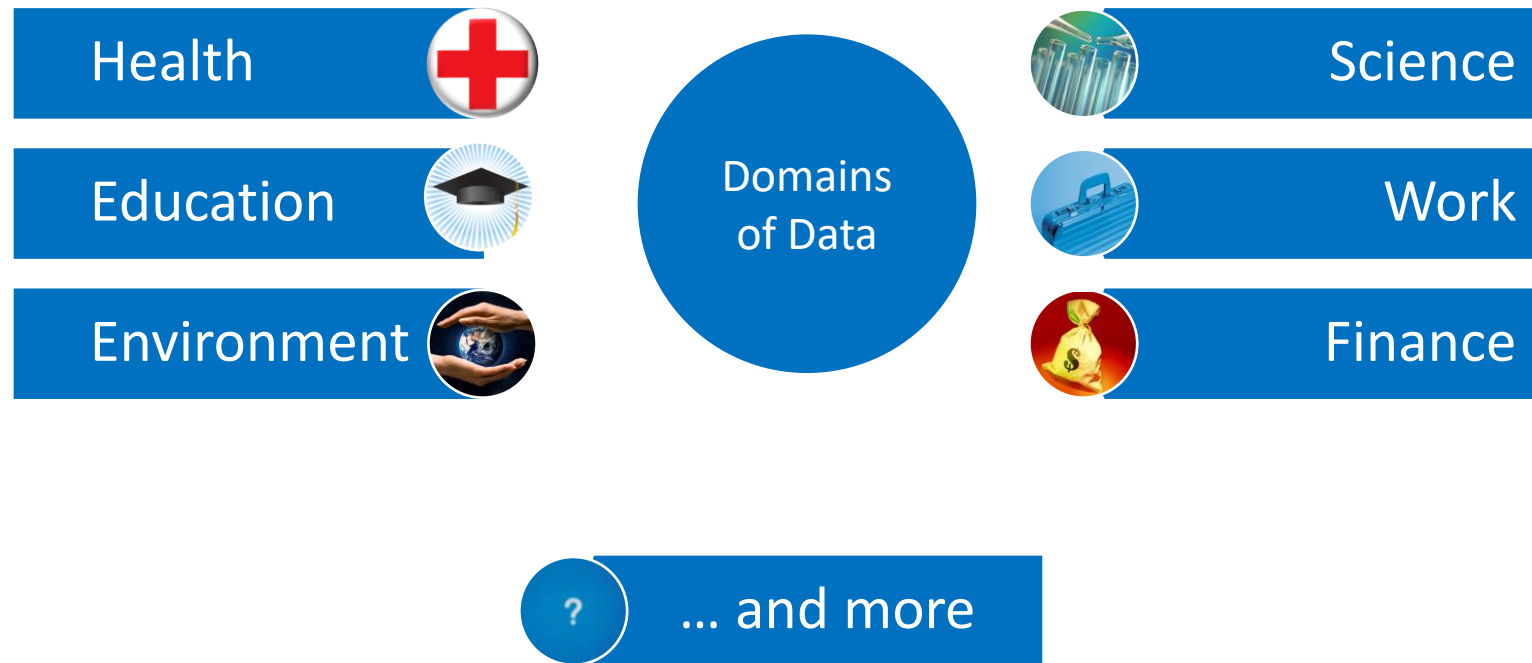
Personal Monitors and
Sensors




...and even appliances

We also want to access, share and process our data from all of our devices, **anytime, anywhere!**

Data Becoming Critical to Our Lives



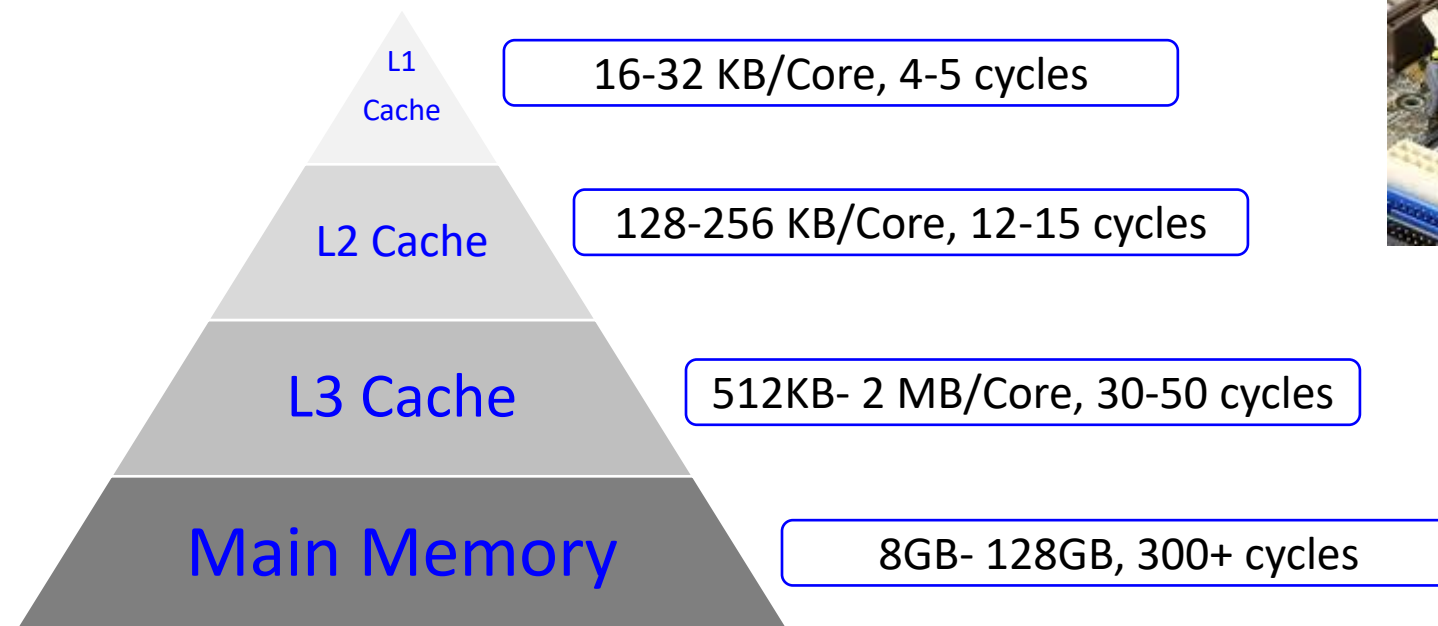
How to Store and Process Data at Scale?

- A system can be scaled:
 - Either *vertically* (or *up*)
 - Can be achieved by hardware upgrades (e.g., faster CPU, more memory, and/or larger disk)
 - And/Or *horizontally* (or *out*)
 - Can be achieved by adding more machines
- 

Vertical Scaling

- **Caveat:** Individual computers can still suffer from *limited resources* with respect to the scale of today's problems

1. Caches and Memory:

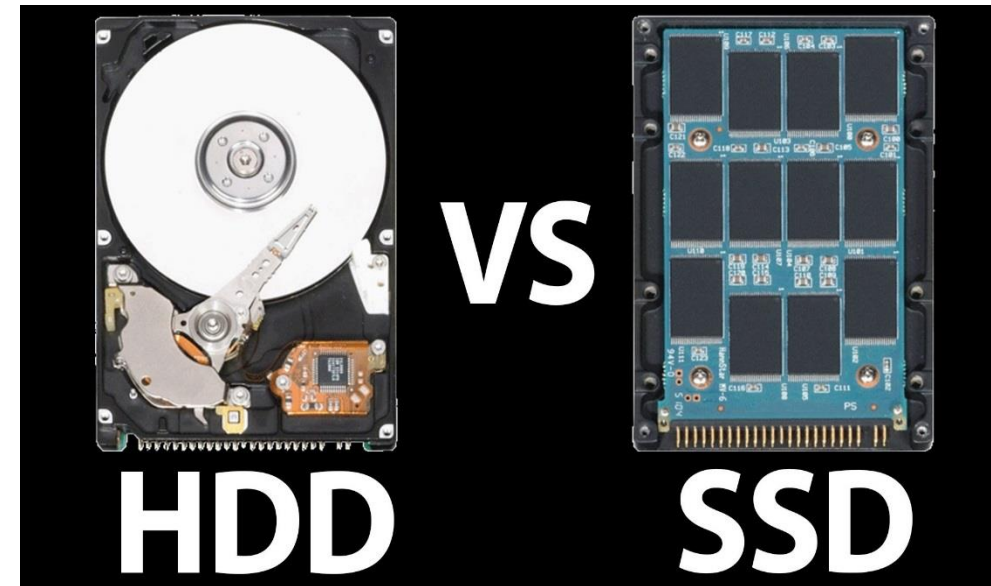


Vertical Scaling

- **Caveat:** Individual computers can still suffer from *limited resources* with respect to the scale of today's problems

2. Disks-- some advancements, but still:

- Limited capacity
- Limited number of channels
- Limited bandwidth

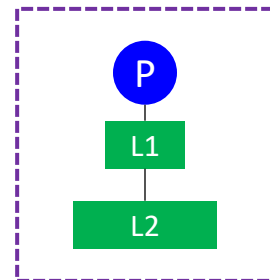


Vertical Scaling

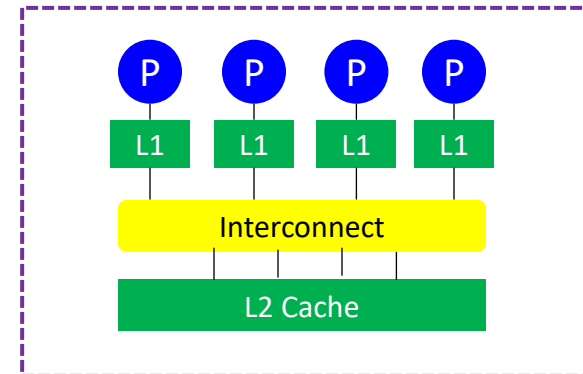
- **Caveat:** Individual computers can still suffer from *limited resources* with respect to the scale of today's problems

2. Processors:

- Moore's law still holds
- Chip Multiprocessors (CMPs) are now available



A single Processor Chip



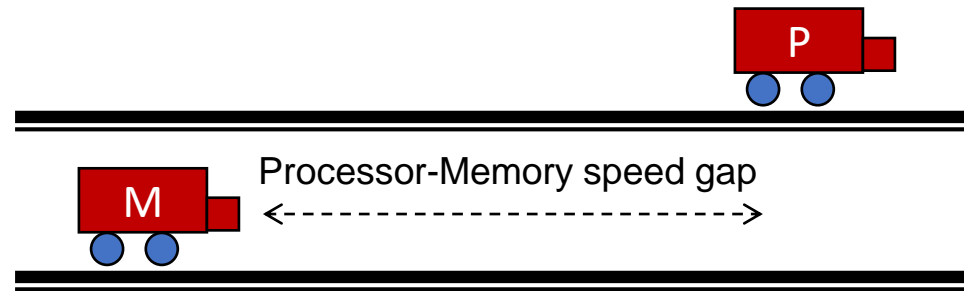
A CMP

Vertical Scaling

- **Caveat:** Individual computers can still suffer from *limited resources* with respect to the scale of today's problems

2. Processors:

- But up until a few years ago, CPU speed grew at the rate of 55% annually, while the memory speed grew at the rate of only 7%



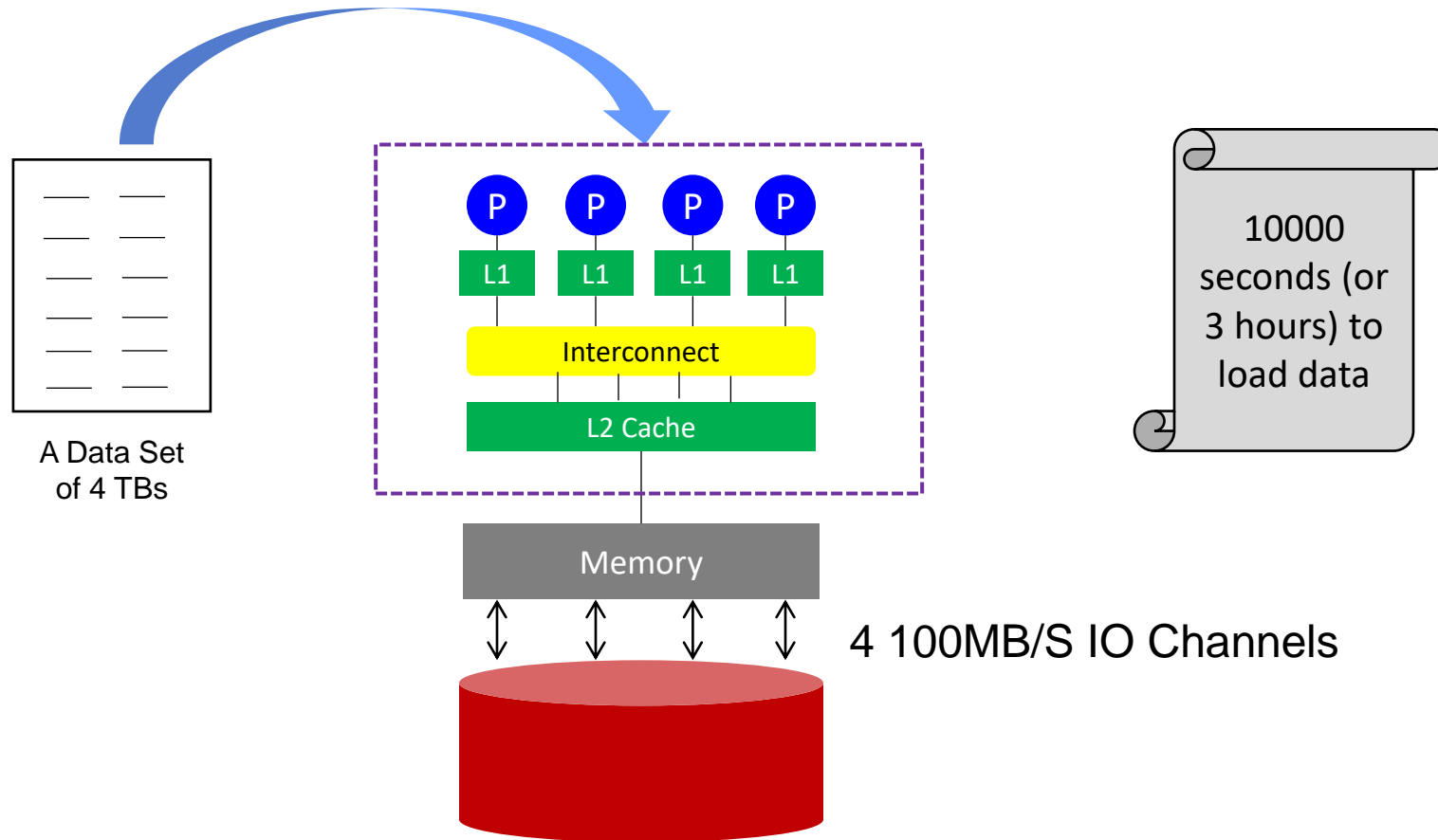
Vertical Scaling

- **Caveat:** Individual computers can still suffer from *limited resources* with respect to the scale of today's problems

2. Processors:

- But up until a few years ago, CPU speed grew at the rate of 55% annually, while the memory speed grew at the rate of only 7%
- Even if 100s or 1000s of cores are placed on a CMP, it is a challenge to deliver input data to these cores fast enough for processing

Vertical Scaling

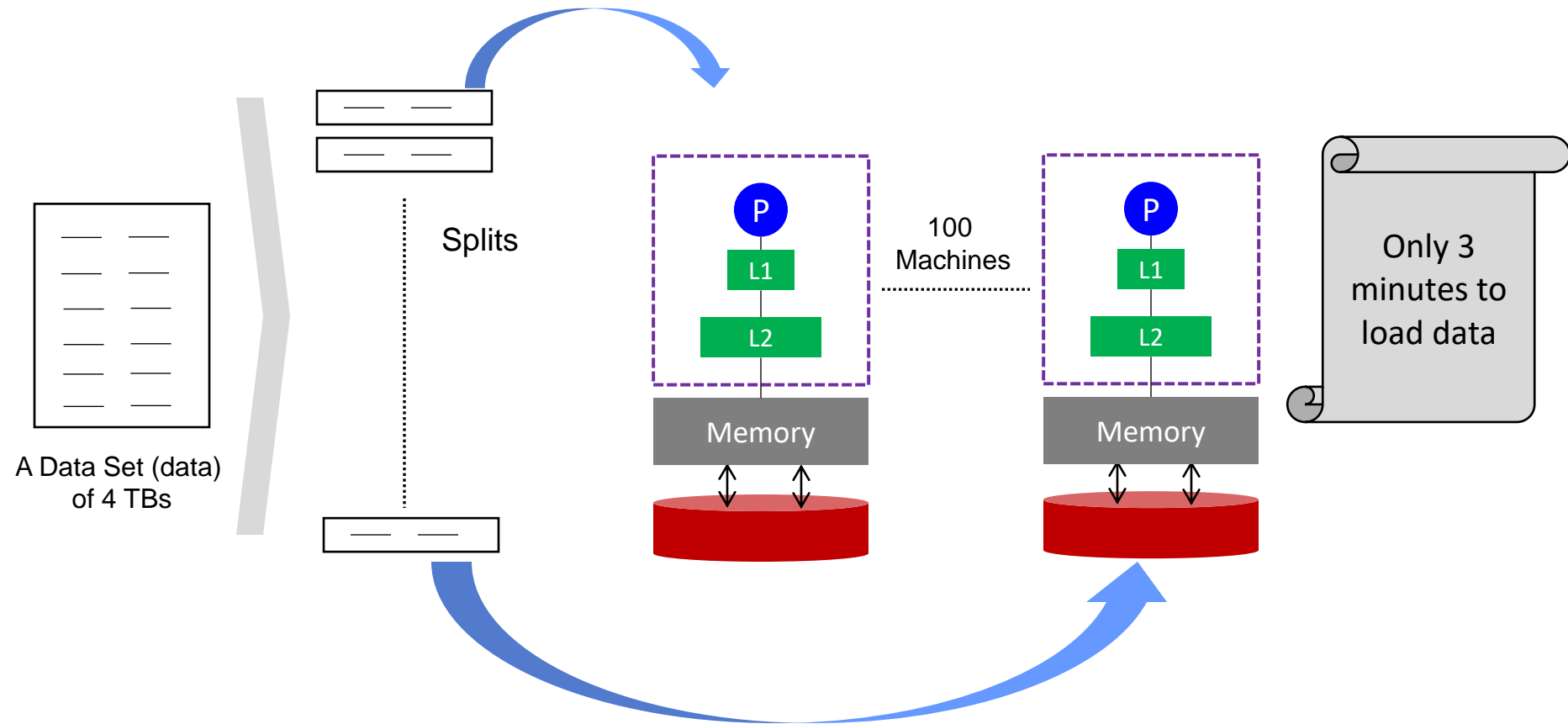


How to Store and Process Data at Scale?

- A system can be scaled:
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 - Can be achieved by hardware upgrades (e.g., faster CPU, more memory, and/or larger disk)
 - And/Or *horizontally* (or *out*)
 - Can be achieved by adding more machines



Horizontal Scaling



Requirements

- Tetapi, ini membutuhkan:
 - A way to express the problem in terms of parallel processes and execute them on different machines (*Programming and Concurrency Models*)
 - A way to organize processes (*Architectures*)
 - A way for distributed processes to exchange information (*Communication Paradigms*)
 - A way to locate and share resources (*Naming Protocols*)

Requirements

- Tetapi, ini membutuhkan :
 - A way for distributed processes to cooperate, synchronize with one another, and agree on shared values (*Synchronization*)
 - A way to reduce latency, enhance reliability, and improve performance (*Caching, Replication, and Consistency*)
 - A way to enhance load scalability, reduce diversity across heterogeneous systems, and provide a high degree of portability and flexibility (*Virtualization*)
 - A way to recover from partial failures (*Fault Tolerance*)

Jadi, Apa itu Sistem Terdistribusi?

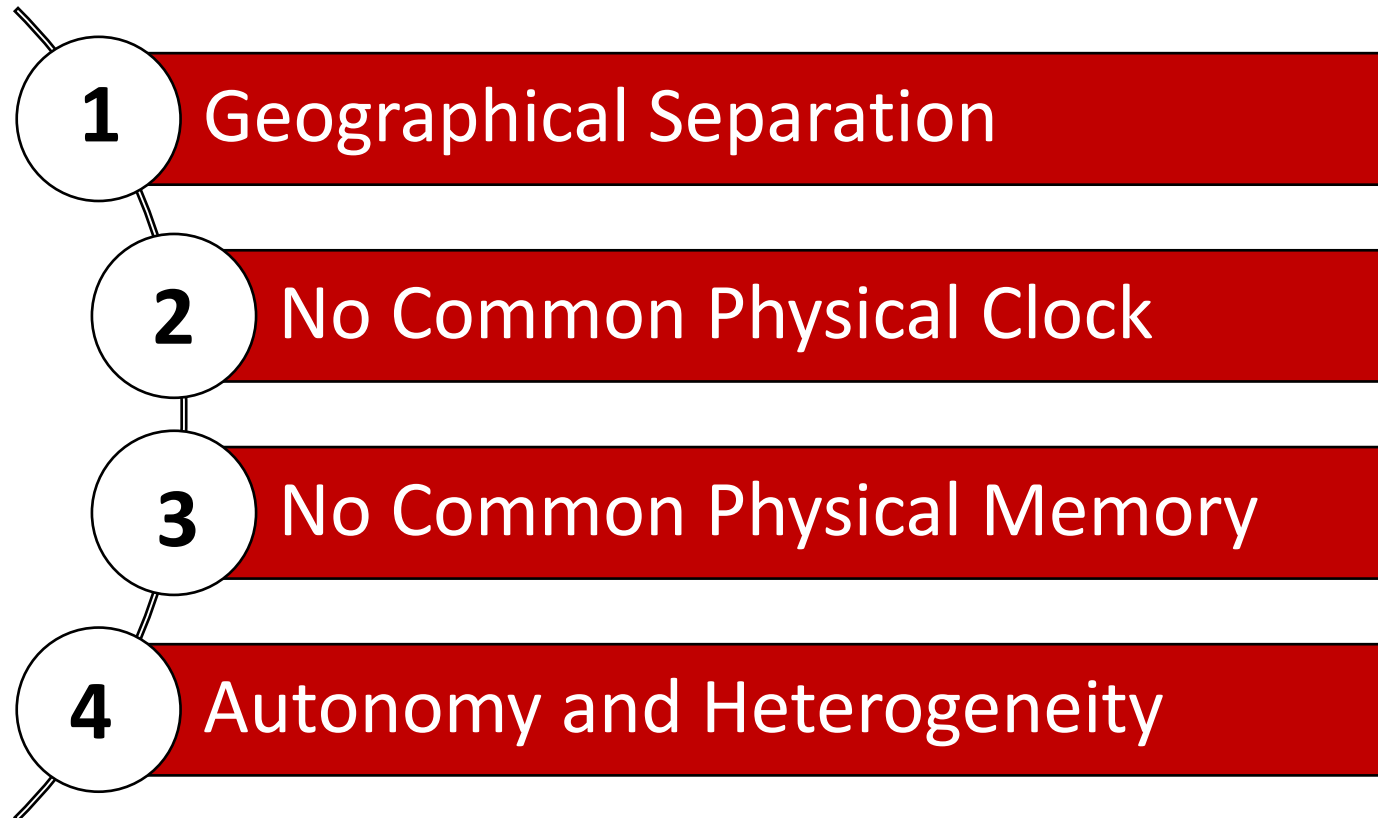
A distributed system is:

A collection of independent computers that appear to its users as a single coherent system

One in which components located at networked computers communicate and coordinate their actions only by passing messages

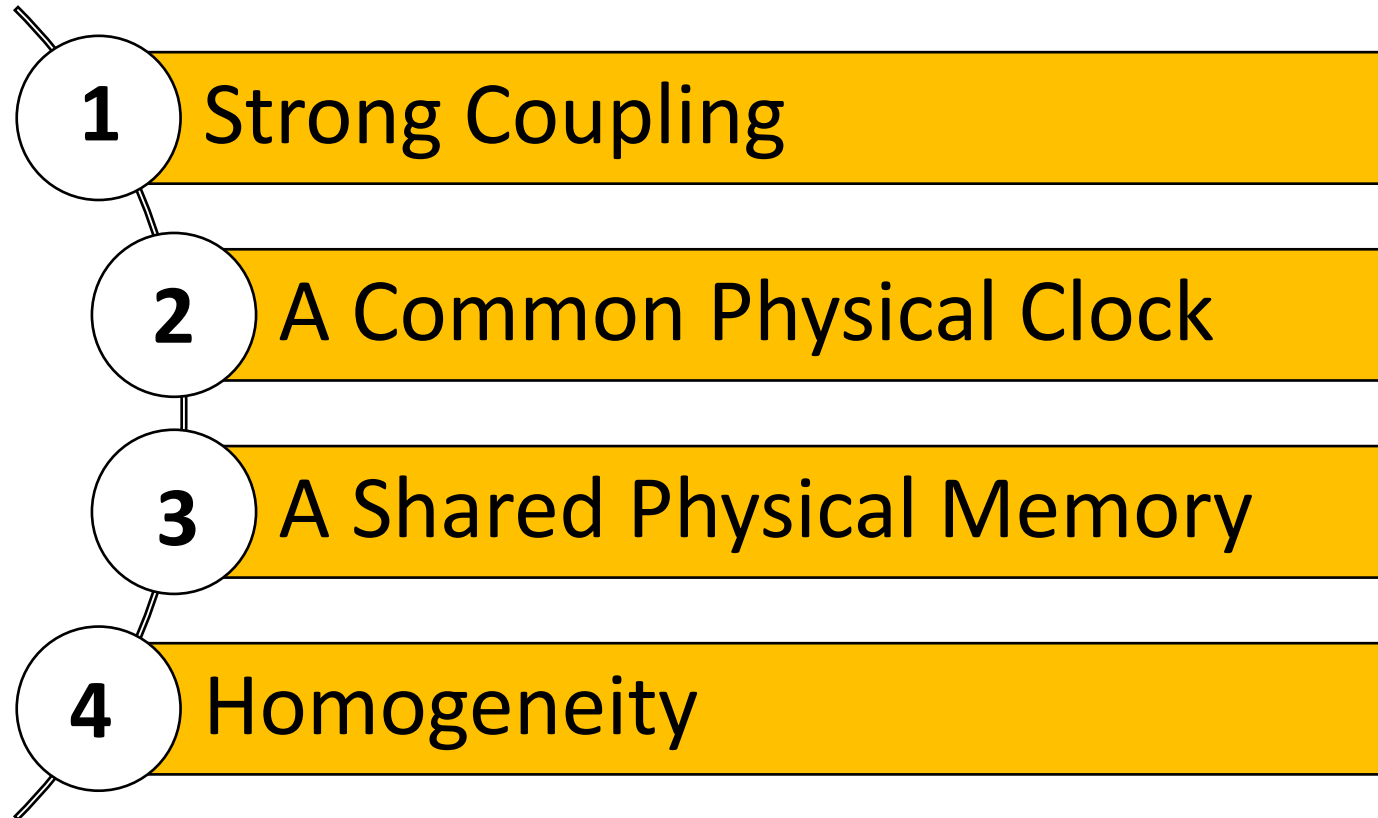
Features

- Distributed Systems imply *four* main features:



Sistem Paralel vs. Terdistribusi

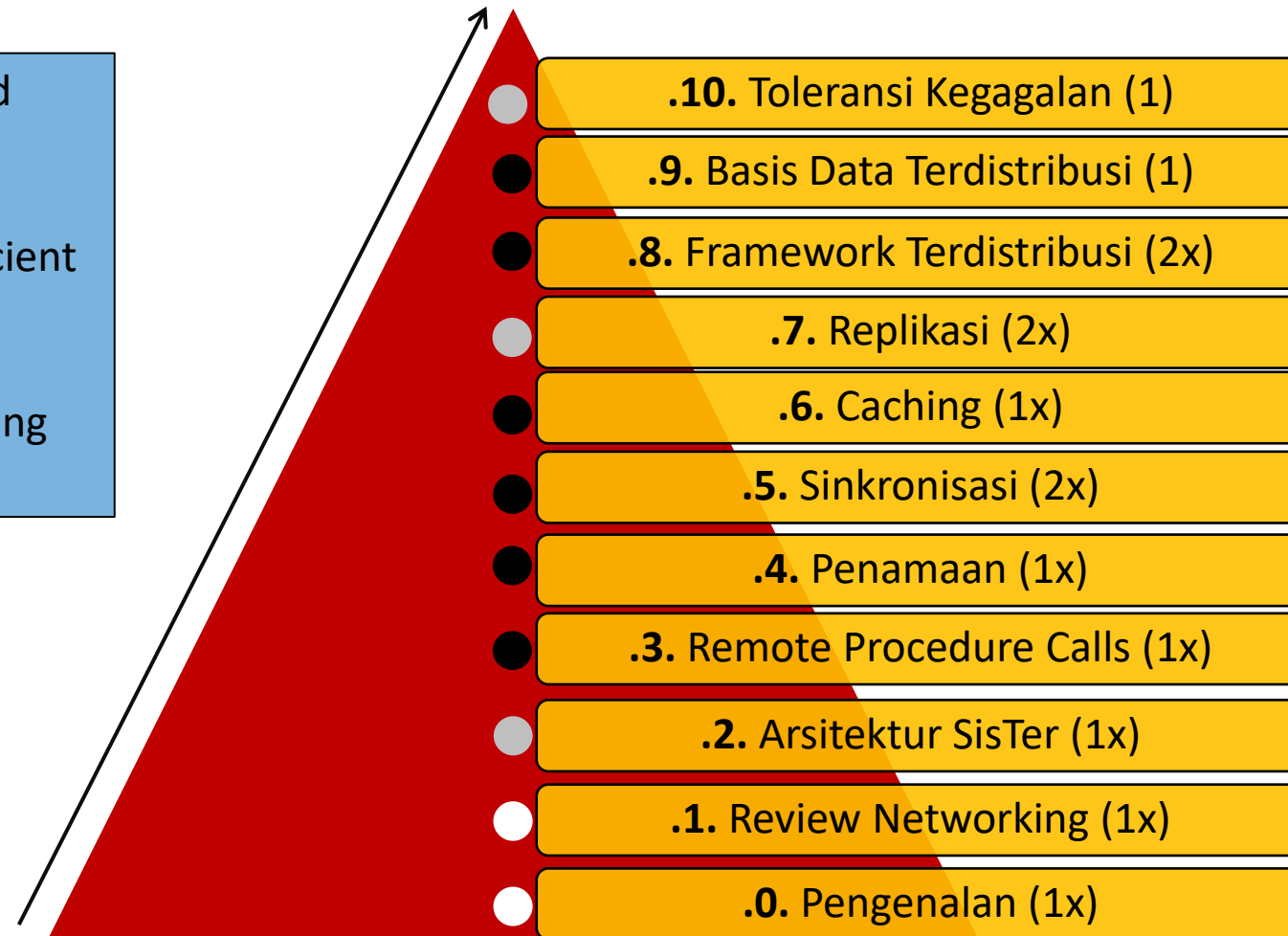
- Distributed systems contrast with parallel systems, which entail:



Administrivia!

Bahasan Sistem Terdistribusi

- **Considered:** a reasonably critical and comprehensive perspective.
- **Thoughtful:** Fluent, flexible and efficient perspective.
- **Masterful:** a powerful and illuminating perspective.

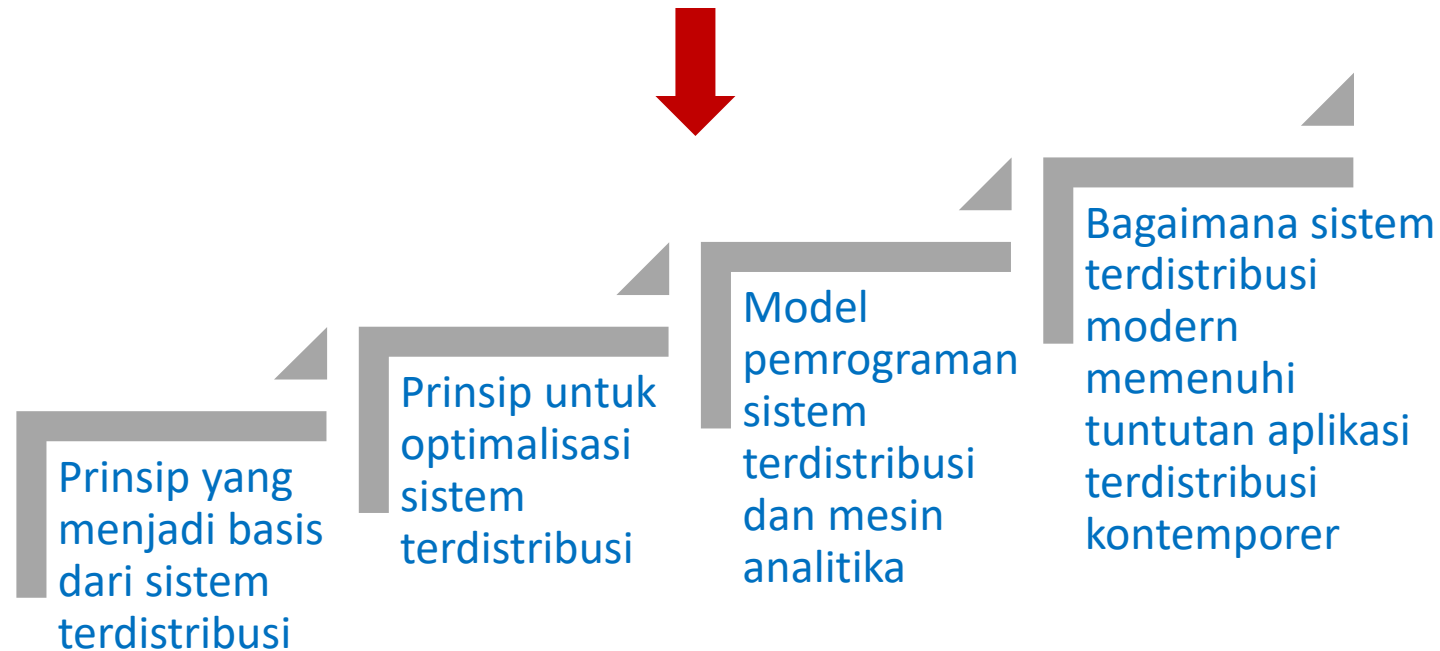


Sistem Terdistribusi 2022

1. **Mengenal Sistem Terdistribusi**
2. Review Jaringan Komputer (layer 2, 3, dan 4)
3. Arsitektur Sistem Terdistribusi
4. *Remote Procedure Calls* (RPC)
5. Layanan Penamaan
6. Sinkronisasi Data (2 pekan)
7. *Message Passing Interface* (MPI)
8. Contoh Arsitektur: Search Engine. PageRank, Hadoop, Pregel, Blockchain
9. Teknik *Caching*
10. Teknik Replikasi Data (2 pekan)
11. Basis Data Terdistribusi
12. Toleransi Kegagalan

Capaian Pembelajaran

Kuliah ini bertujuan memberikan pemahaman mendalam dan pengalaman langsung tentang:



Metode Penilaian

- Bagaimana kita mengukur pembelajaran?

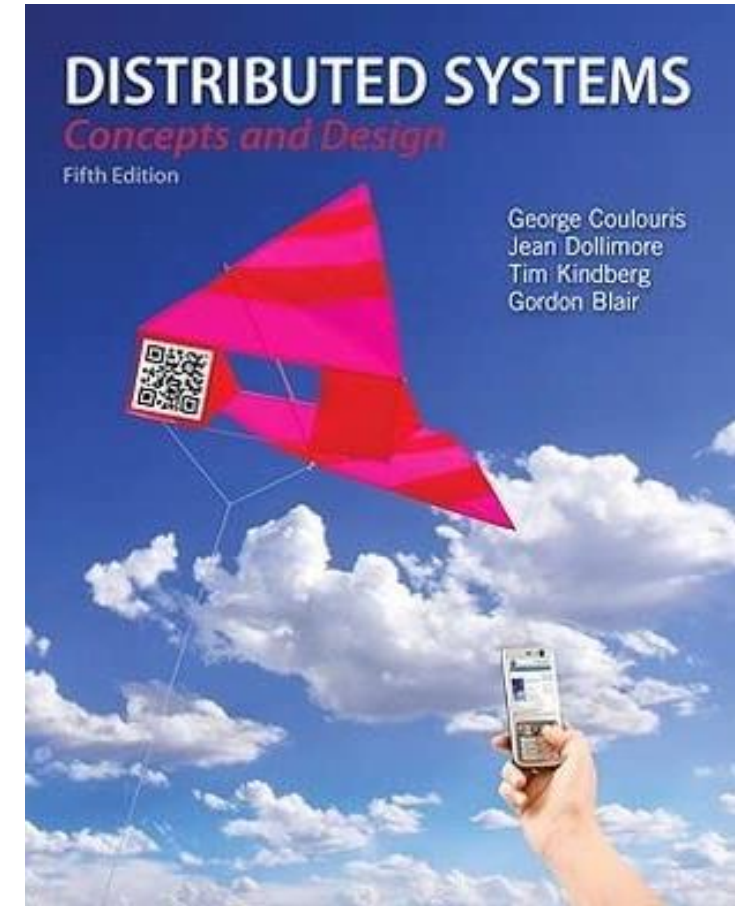
Type	#	Bobot
Proyek	4	40%
Ujian	2	30% (UTS: 10% & UAS: 20%)
Tugas	6	15%
Kuis	4	10%
Partisipasi	14	5%

- ***Untuk lulus kuliah ini, anda harus lulus proyek dan Ujian***

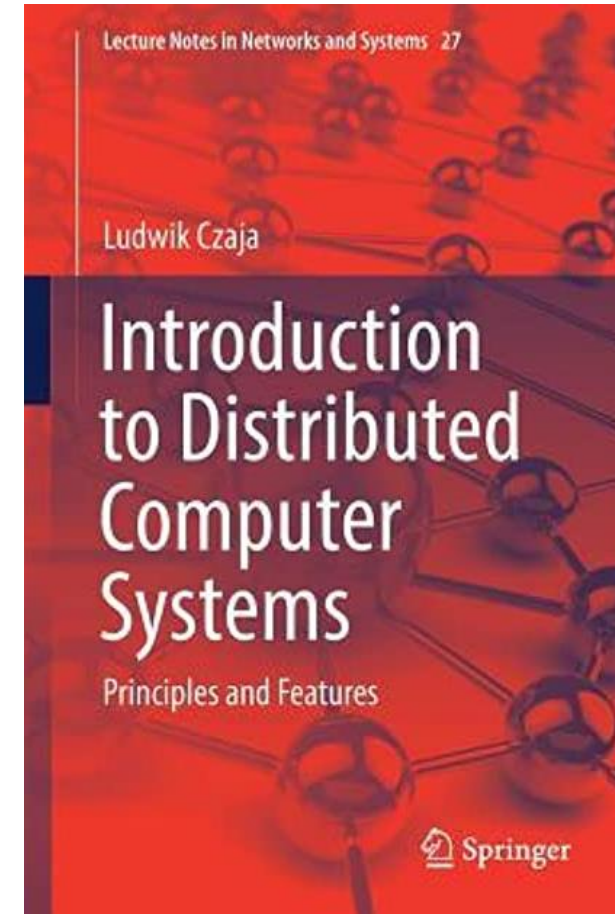
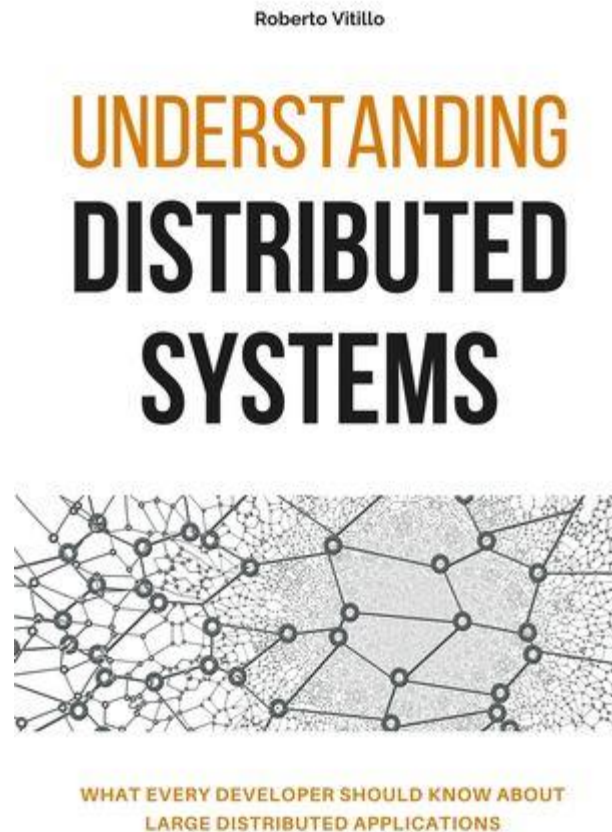
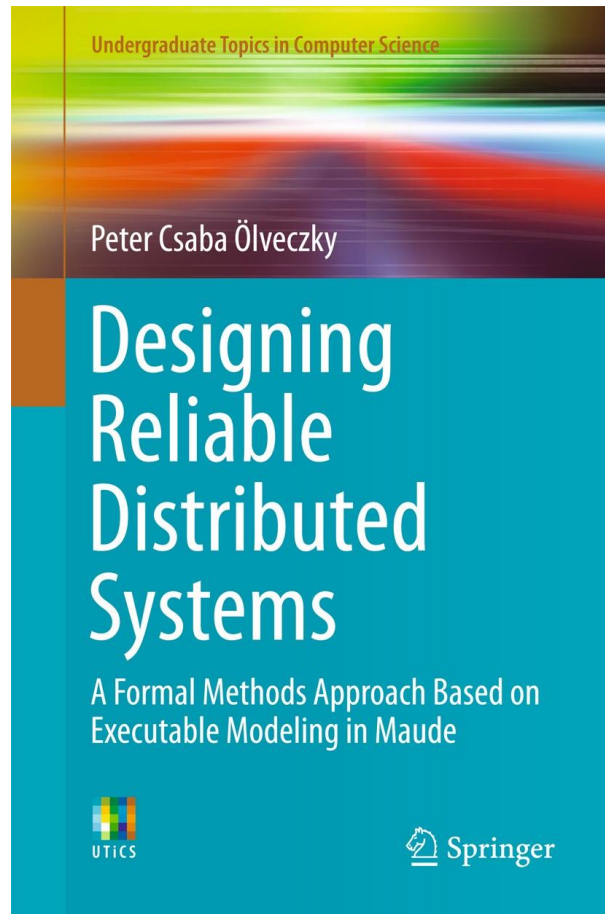
Rules on the Projects

- For all the projects except the final one, the following rules apply:
 - If you submit one day late, 25% will be deducted from your project score
 - If you are two days late, 50% will be deducted
 - The project will not be graded (and you will receive a zero score) if you submit more than two days late
 - You have a ***3-grace-day quota***

Referensi



Referensi



Intrapersonal skill is the internal ability of a person to know and discover himself. It deals with how you handle your emotions, frustrations, excitement, behaves under stress, etc. It is related to a person's internal elements.

Intrapersonal Skills

- self-esteem
- open-mindedness
- being aware of your thinking
- the ability to learn
- being able to understand and manage your own emotions
- self-confidence
- self-discipline
- self-motivation
- being able to overcome boredom
- being patient
- being a self-starter
- being able to take the initiative
- working independently
- being persistent
- having a positive attitude, and
- being a good manager of time etc.

Closing Statements



Interpersonal

1. Refers To Something Involving Relations
2. There Are Two Or More Parties Involved
3. For Varied Reasons People Engage In It
4. There Is Feedback From The Parties Involved
5. It Is Between Two Or More Persons
6. It Is Important In Building And Maintaining Relationships
7. For Better Communication One Has To Develop Self-awareness

Intrapersonal

1. Refers to something occurring within the individual mind or self
2. There are no external parties involved
3. May involve critical analysis or even a response to loneliness
4. There is only individual feedback
5. It is what goes within the mind
6. Has a continuous flow of thought in mind
7. Thoughts, views, opinions & attitudes are part of intrapersonal communication

Kuliah Berikutnya

- Review *Networking*

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