# Distributed And Parallel System

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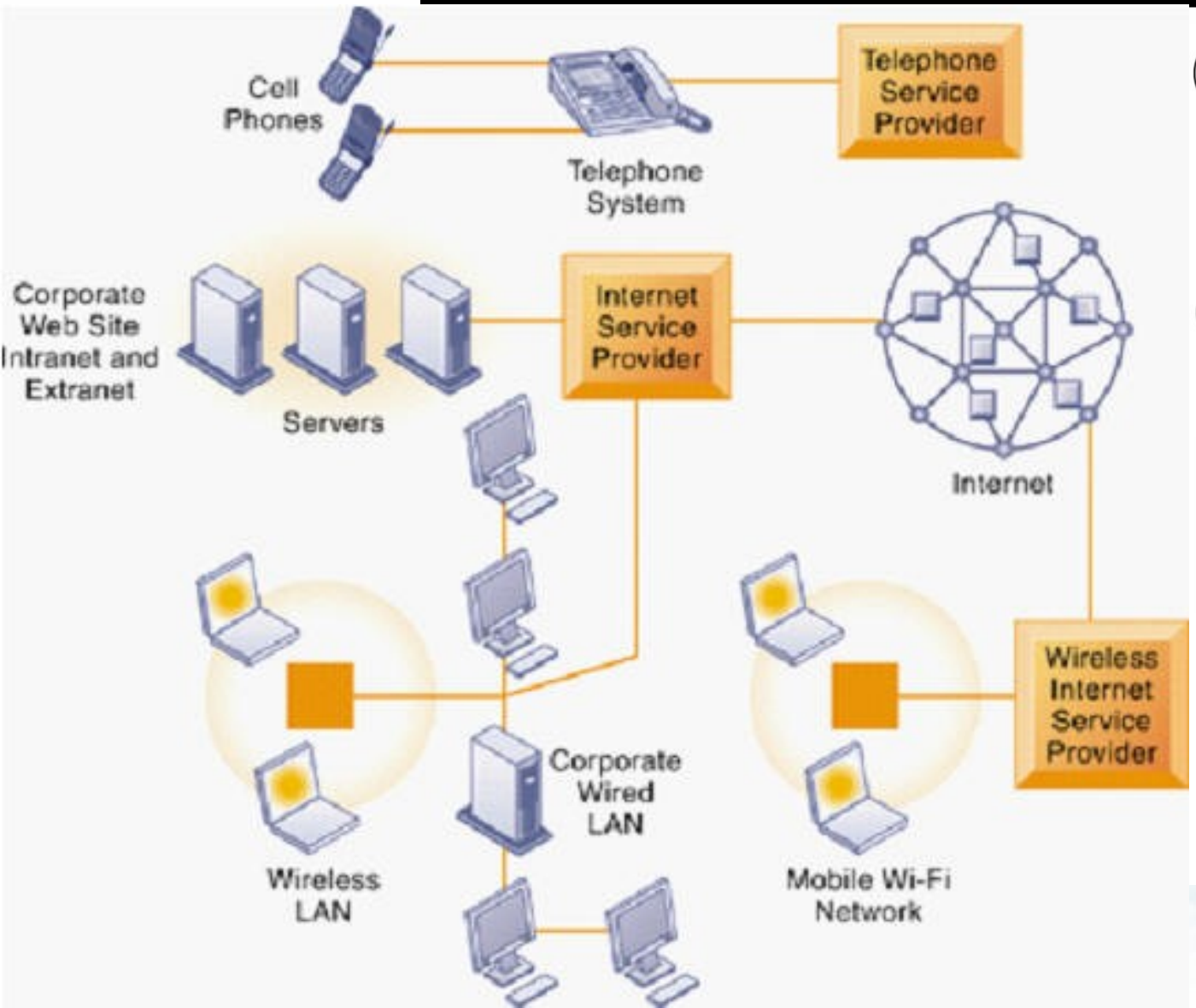
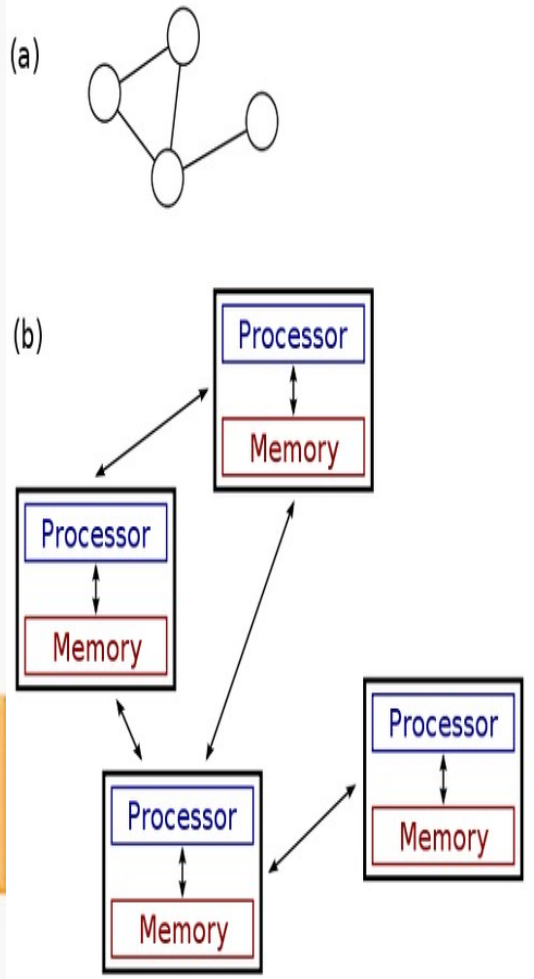
# DEFINITION

- A **distributed system** is a collection of independent computers, interconnected via a network, capable of collaborating on a task.
- A **distributed system** can be characterized as collection of multiple autonomous computers that communicate over a communication network and having following features:
  - ✓ No common Physical clock
  - ✓ Enhanced Reliability
  - ✓ Increased performance/cost ratio
  - ✓ Access to geographically remote data and resources
  - ✓ Scalability

# A Distributed System



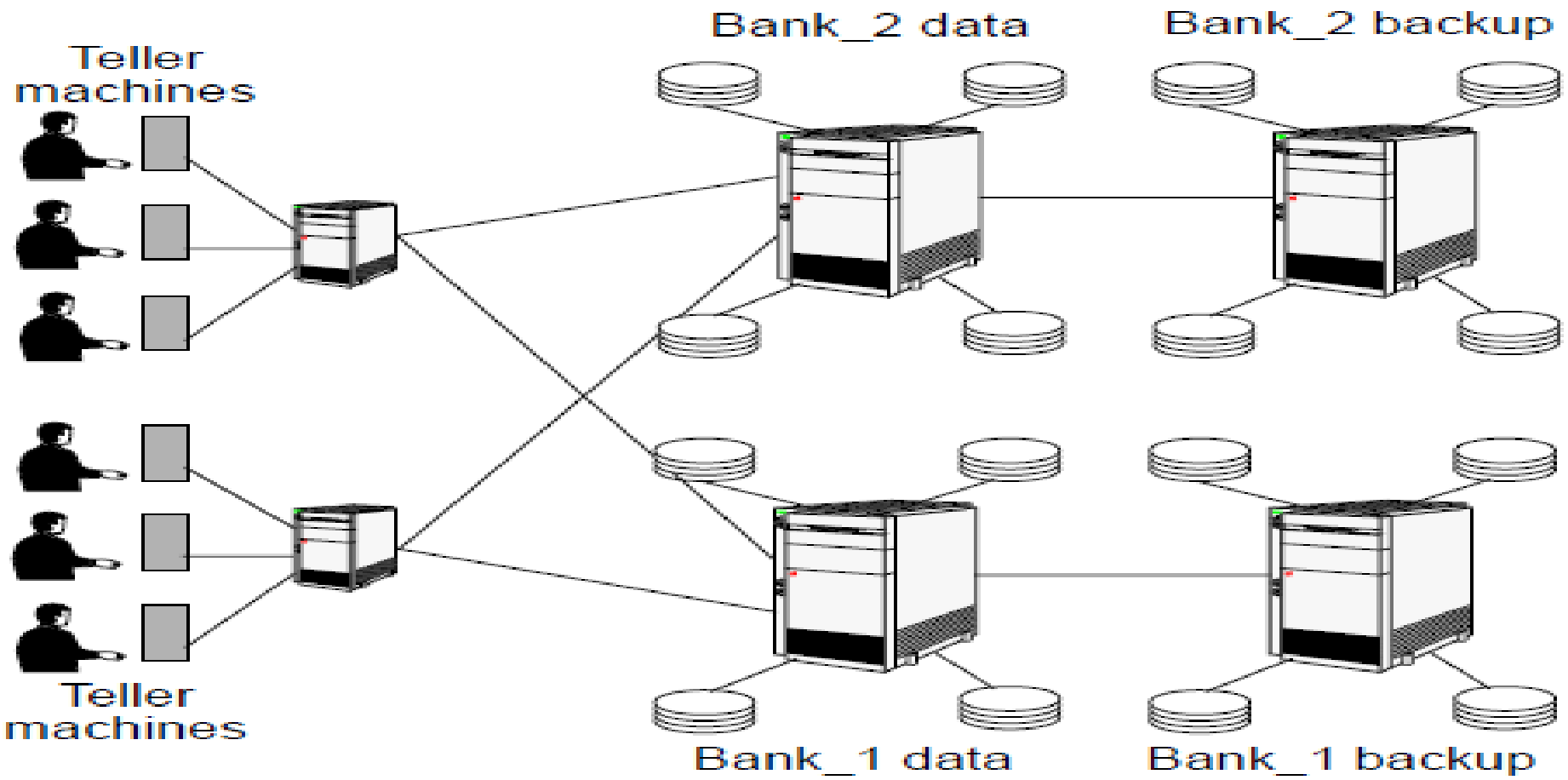



# Examples of Distributed System

- Telephone Networks and Cellular Networks
- Computer Networks Such as internet or intranet
- ATM(bank) Machines
- Distributed database and distributed database management system
- Network of Workstations
- Mobile Computing etc.

# Examples of Distributed Systems (cont'd)

Automatic banking (teller machine) system




- Primary requirements: security and reliability.
- Consistency of replicated data.
- Concurrent transactions (operations which involve accounts in different banks; simultaneous access from several users, etc).
- Fault tolerance

# Advantages Of Distributed System

- Information Sharing among Distributed Users
- Resource Sharing
- Extensibility and Incremental growth
- Shorter Response Time and Higher Output
- Higher Reliability
- Better Flexibility's in meeting User's needs
- Better price/performance ratio
- Scalability
- Transparency

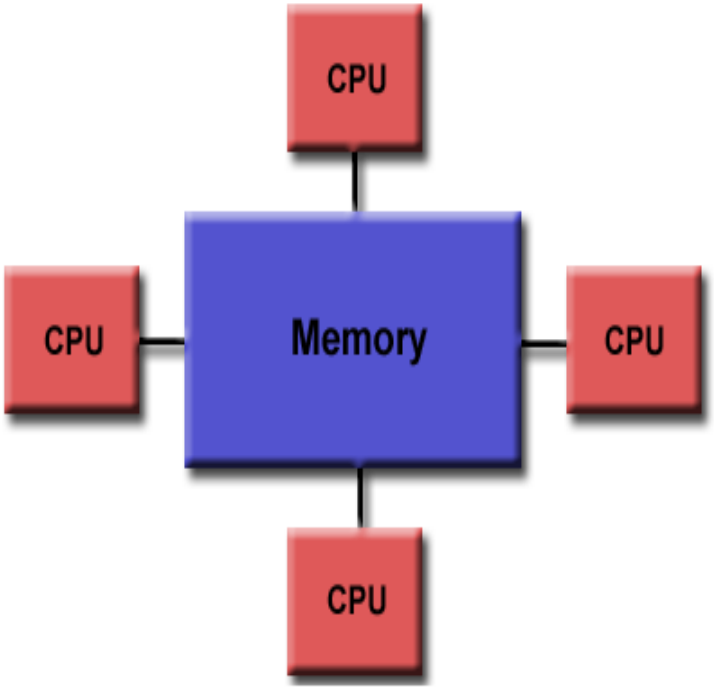
# Disadvantages of Distributed System

- Difficulties of developing distributed software
- Networking Problem
- Security Problems
- Performance
- Openness
- Reliability and Fault Tolerance

# DEFINITION

- A system is said to be a **Parallel System** in which multiple processor have direct access to shared memory which forms a common address space.
- Usually tightly-coupled system are referred to as **Parallel System**. In these systems, there is a single system wide primary memory (address space) that is shared by all the processors. On the other hand **Distributed System** are loosely-coupled system.
- **Parallel computing** is the use of two or more processors (cores, computers) in combination to solve a single problem.

# A Parallel System

# Applications of Parallel System

- An example of Parallel computing would be two servers that share the workload of routing mail, managing connections to an accounting system or database, solving a mathematical problem etc
- Supercomputers are usually placed in parallel system architecture
- Terminals connected to single server

# EXAMPLE: The Earth Simulator Supercomputer from (2002-2004)

# Advantages of Parallel System

- Provide Concurrency(do multiple things at the same time)
- Taking advantage of non-local resources
- Cost Savings
- Overcoming memory constraints
- Save time and money
- Global address space provides a user-friendly programming perspective to memory

# Disadvantages of Parallel System

- Primary disadvantage is the lack of scalability between memory and CPUs.
- Programmer responsibility for synchronization constructs that ensure "correct" access of global memory.
- It becomes increasingly difficult and expensive to design and produce shared memory machines with ever increasing numbers of processors.

# Parallel vs. Distributed System

| | Parallel Systems | Distributed Systems |
|---|---|---|
| **Memory** | Tightly coupled system<br>shared memory | Weakly coupled system<br>Distributed memory |
| **Control** | Global clock control | No global clock control |
| **Processor interconnection** | Order of Tbps | Order of Gbps |
| **Main focus** | Performance<br>Scientific computing | Performance(cost and scalability)<br>Reliability/availability<br>Information/resource sharing |

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