CHAPTER 2: DISTRIBUTED SYSTEM CONCEPTS AND ARCHITECTURES

Characteristics of distributed systems

- **multiplicity**
  - multiple users/clients
  - concurrent processes/servers
  - replication of resources

- **dispersion**
  - distributed resources
  - decentralized control

- *Non-negligible communication delay*

- *Lack of global information*

- *Failures*
Transparency

- Access
- Location
- Migration
- Concurrency
- Parallelism
- Failure
- Performance
- Size
- Revision
Distributed system architectures

The workstation-server model

![Diagram of the workstation-server model]

The processor-pool model

![Diagram of the processor-pool model]

Similarly, distributed objects, storage, and bandwidth.
Communication network architectures

OSI protocol suite

Connecting hosts
TCP/IP protocol suite

Connecting networks

application processes

message

transport layer

data link and physical layer

frame in bits

communication networks

peer to peer protocols

gateway

internet layer

datagram

internet layer

internet layer

internet layer

application processes

transport layer

application processes

data link and physical layer

message

packet
Major design issues

- Object models and naming schemes: object, client/server, name server
- Distributed coordination: synchronization and distributed algorithms
- Interprocess communication: socket and RPC
- Distributed resources: sharing and replication
- Fault-tolerance and security: redundancy, recovery, protection

DCE example

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<th>security</th>
<th>distributed services</th>
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<td>concurrency control, group management, etc.</td>
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<td>distributed file service</td>
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<td>basic system services</td>
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<td>time, name, process services, etc.</td>
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<td>remote procedure calls and group communication</td>
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<th>applications</th>
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<td>processes and threads</td>
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<td>kernel with transport service</td>
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