Distributed Applications
Characteristics of Distributed Systems

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Definition

[Coulouris et al., 2001]

"one in which hardware or software
components located at networked computers
communicate and coordinate their actions only
by passing messages."

[Tanenbaum, 1996]

"a collection of independent computers that appear to the users of the system as a single computer."

[Sloman and Kramer, 1986]

"one in which several autonomous processors and data stores supporting processes and/or databases interact in order to cooperate to achieve an over- all goal. The processes coordinate their activities and exchange information by means of information transferred over a communication network."

Characteristics

[Coulouris et al., 2001].

- Resource Sharing

- Openness

- Concurrency

- Scalability

- Fault Tolerance

- Transparency

Transparency

[ISO, 1992]

- Access transparency

- Location transparency

- Concurrency transparency

- Replication transparency

- Failure transparency

- Migration transparency

- Performance transparency -

- Scaling transparency

Design and Specification Issues

[Coulouris et al., 2001]:

- Communication

- Consistency maintenance

- Naming

- Software structure

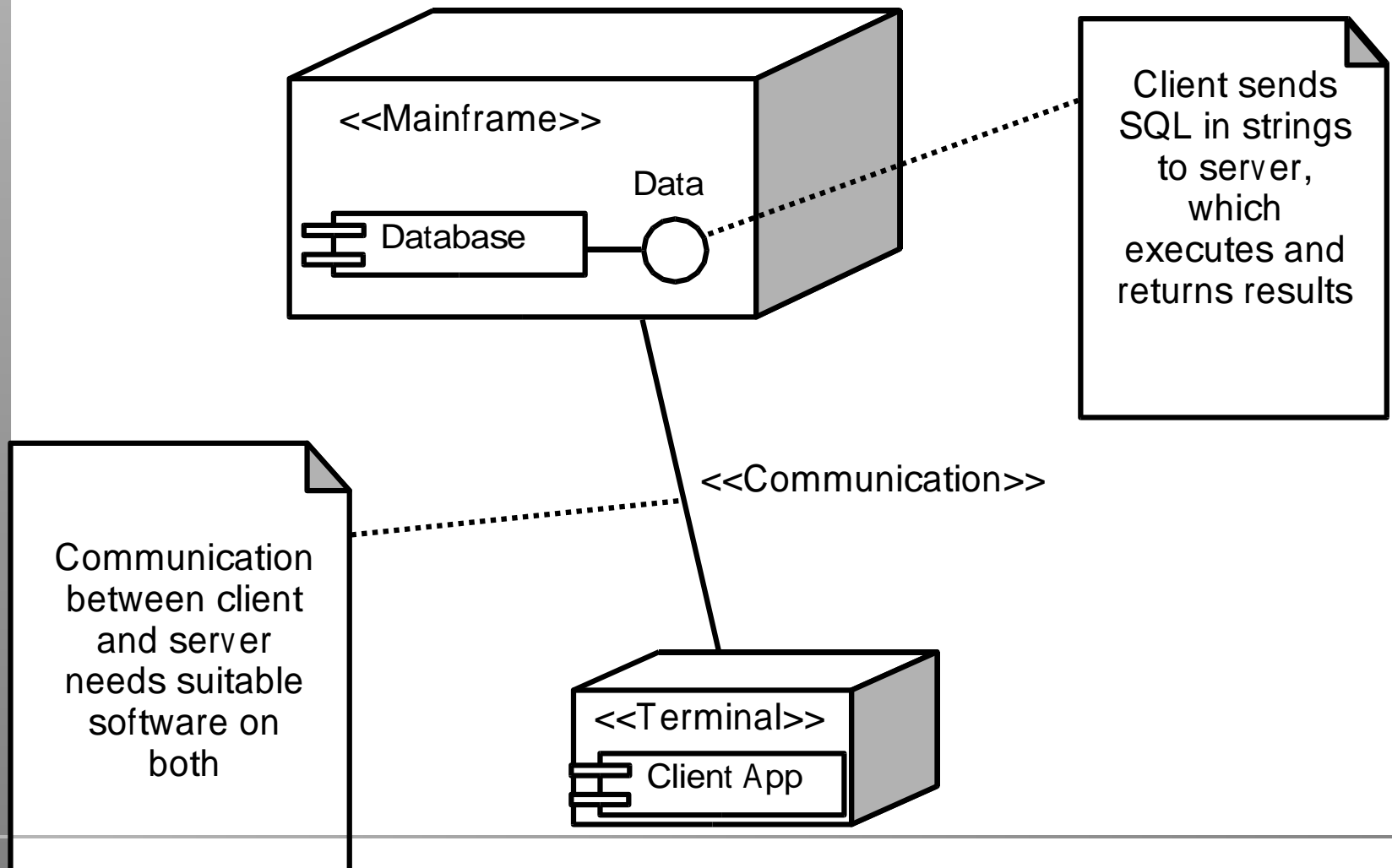- Workload allocation

Architecture

- client/server model

- peer-to-peer model

- server-network model

Client-Server

[Coulouris et al., 2001]:

- Transmission of a request from a client (user) process to a server (provider) process.

- Execution of the request by the server

- Transmission of a reply to the client

UML model of client server application

Other models

- Peer-to-peer Model

- Server-Network Model

- Group multicast

Workload allocation

[Coulouris et al., 2001]:

- Processor pool model

- Shared-memory multiprocessor model

Consistency maintenance

- Update consistency

- Replication consistency

- Cache consistency

- Failure consistency

- Clock consistency

- User interface consistency

User requirements

[Coulouris et al., 2001]

- Functionality - what is does: e.g. CSCW, e-business

- Quality of Service: performance, reliability, security

- Reconfigurability: accommodate changes without causing disruption to existing services.

References

[ISO, 1992] (1992). *Basic Reference Model of Open Distributed Processing, Part I: Overview and Guide To Use*. International Standards Organisation, ISO/ITEC JTC1/SC212/WG7 CD 10746-1, International Standards Organisation.

[Coulouris et al., 2001] Coulouris, G., Dollimore, J., and Kindberg, T. (2001). *Distributed Systems Concepts and Design*. Addison-Wesley, third edition.

[Sloman and Kramer, 1986] Sloman, M. and Kramer, J. (1986). *Distributed Systems and Computer Networks*.