



DISTRIBUTED COMPUTING

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OVERVIEW

DISTRIBUTED COMPUTING

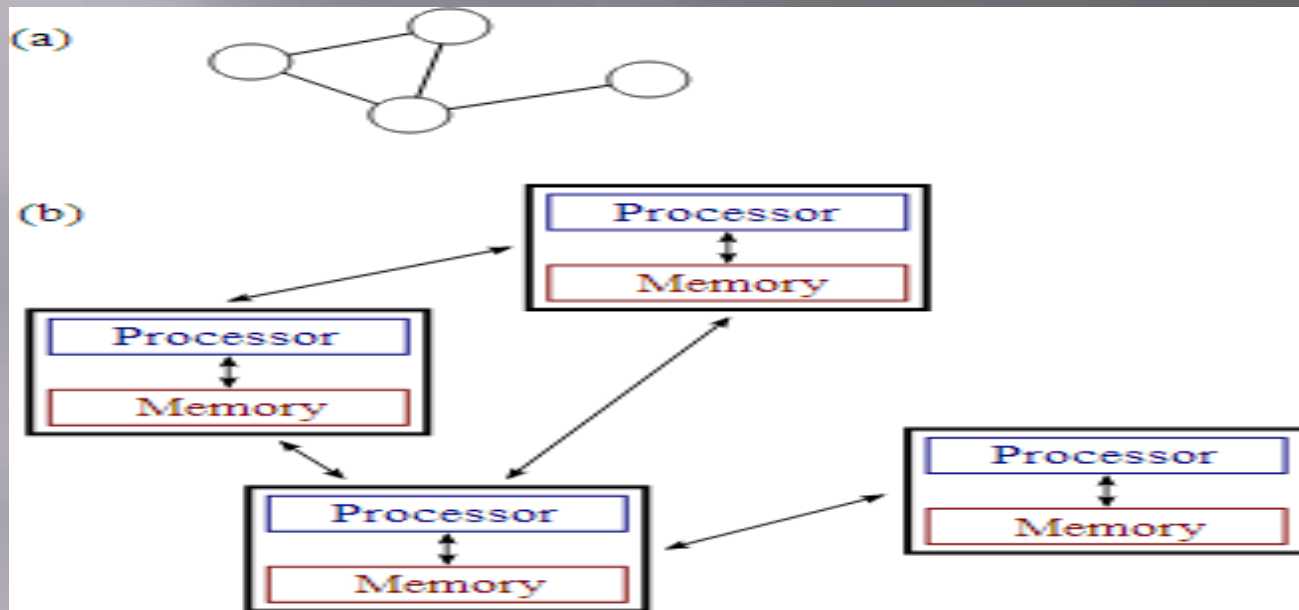


- A distributed system is one in which hardware or software components located at networked computers communicate and coordinate their actions only by message passing.
- In the term distributed computing, the word distributed means spread out across space. Thus, distributed computing is an activity performed on a distributed system.
- These networked computers may be in the same room, same campus, same country, or in different country.

HISTORY

- The use of concurrent processes that communicate by message-passing has its roots in operating system architectures studied in the 1960s.
- The study of distributed computing became its own branch of computer science in the late 1970s and early 1980s.
- The first conference in the field, Symposium on Principles of Distributed Computing (PODC), dates back to 1982, and its European counterpart International Symposium on Distributed Computing (DISC) was first held in 1985.

INTRODUCTION



In distributed system each processor have its own memory. The computational entities are called computers or nodes.

In distributed computing a program is split up into parts that run simultaneously on multiple computers communicating over a network.

Distributed computing is a form of parallel computing.

WORKING OF DISTRIBUTED SYSTEM:

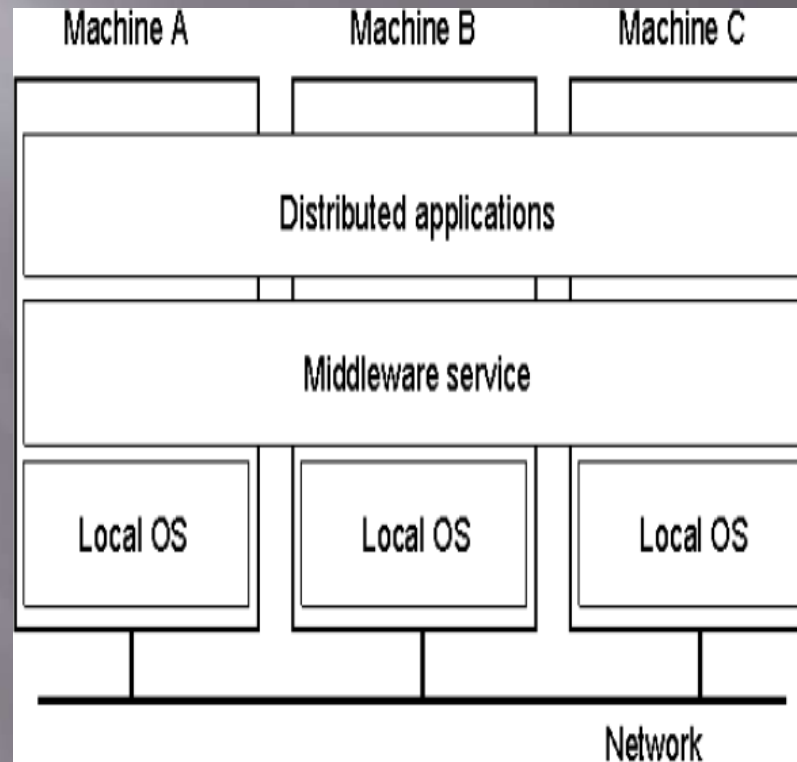


Fig. A Distributed System

TYPES OF DISTRIBUTED COMPUTING:

- **Grid computing**

Multiple independent computing clusters which act like a “grid” because they are composed of resource nodes not located within a single administrative domain. (formal)

The creation of a “virtual supercomputer” by using spare computing resources within an organization.

- **Cloud computing**

Cloud computing is a computing paradigm shift where computing is moved away from personal computers or an individual application server to a “cloud” of computers. Users of the cloud only need to be concerned with the computing service being asked for, as the underlying details of how it is achieved are hidden. This method of distributed computing is done through pooling all computer resources together and being managed by software rather than a human.

MOTIVATION

The main motivations in moving to a distributed system are the following:

- Inherently distributed applications.
- Performance/cost.
- Resource sharing.
- Flexibility and extensibility.
- Availability and fault tolerance.
- Scalability.

GOALS

- **Making Resources Accessible**

The main goal of a distributed system is to make it easy for the users (and applications) to access remote resources, and to share them in a controlled and efficient way.

- **Distribution Transparency**

An important goal of a distributed system is to hide the fact that its processes and resources are physically distributed across multiple computers.

- **Openness**

An open distributed system is a system that offers services according to standard rules that describe the syntax and semantics of those services.

- **scalability**

Scalability of a system can be measured along at least three different dimensions.

CHARACTERISTICS

- **Resource Sharing:-** Resource sharing is the ability to use any hardware, software or data anywhere in the system.
- **Openness:-** Openness is concerned with extensions and improvements of distributed systems.
- **Concurrency:-** Concurrency arises naturally in distributed systems from the separate activities of users, the independence of resources and the location of server processes in separate computers.
- **Scalability:-** Scalability concerns the ease of the increasing the scale of the system (e.g. the number of processor) so as to accommodate more users and/or to improve the corresponding responsiveness of the system.
- **Fault tolerance:-** Fault tolerance cares the reliability of the system so that in case of failure of hardware, software or network, the system continues to operate properly, without significantly degrading the performance of the system.
- **Transparency:-** Transparency hides the complexity of the distributed systems to the users and application programmers.

ARCHITECTURE

Client Server
Architecture

3-Tier
Architecture

N- Tier
Architecture

Tightly
Coupled

Peer To Peer

EXAMPLES OF DISTRIBUTED SYSTEMS

Examples of distributed systems and applications of distributed computing include the following:

- Telecommunication networks:
 - Telephone networks and cellular networks
 - Computer networks such as the Internet
- Network applications:
 - World wide web and peer-to-peer networks
 - Massively multiplayer online games and virtual reality communities
- Real-time process control:
 - Aircraft control systems
 - Industrial control systems
- Parallel computation:
 - Scientific computing, including cluster computing and grid computing and various volunteer computing projects
 - Distributed rendering in computer graphics

ADVANTAGES

- Economics
- Speed
- Inherent distribution of applications
- Reliability
- Extensibility and Incremental Growth
- Distributed custodianship
- Data integration
- Missed opportunities

DISADVANTAGES

- Complexity
- Network problem
- Security