# CHAPTER-1

## Definitions

### 1. Distributed System

A distributed system is one in which hardware or software components located at networked computers communicate and coordinate their actions only by-passing messages.

### 2. Firewall

The role of firewall is to protect an intranet by preventing unauthorized messages leaving or entering. A firewall is implemented by filtering incoming and outgoing messages. Filtering might be done by source or destination, or a firewall might allow only those messages related to email and web access to pass into or out of the intranet that it protects.

### 3. Internet Service Provider (ISP)

Internet Service Providers (ISPs) are companies that provide broadband links and other types of connection to individual users and small organizations, enabling them to access services anywhere in the Internet as well as providing local services such as email and web hosting

### 4. Modern Internet

The modern Internet is a vast interconnected collection of computer networks of many different types, with the range of types increasing all the time. A wide range of wireless communication technologies such as: WiFi, WiMAX, Bluetooth, 3G mobile phone networks.

### 5. Backbone

A backbone is a network link with a high transmission capacity, employing satellite connections, fiber optic cables and high bandwidth circuits.

### 6. Mobile Computing

Mobile computing is the performance of computing tasks while the user is on the move or visiting places other than their usual environment.

### 7. Ubiquitous Computing

Ubiquitous computing is the harnessing of many small, cheap computational devices that are present in users' physical environments, including the home, office and even natural settings.

## 8. Cloud

A cloud is defined as a set of Internet-based application, storage and computing services sufficient to support most users' needs, thus enabling them to largely or totally dispense with local data storage and application software. The term also promotes a view of everything as a service, from physical or virtual infrastructure through to software, often paid for on a per-usage basis rather than purchased

## 9. Cloud Computing

Cloud computing reduces requirements on users' devices, allowing very simple desktop or portable devices to access a potentially wide range of resources and services.

## 10. Cluster Computer

A cluster computer is a set of interconnected computers that cooperate closely to provide a single, integrated high performance computing capability.

## 11. Computer-Supported Cooperative Working

Computer-supported cooperative working (CSCW), a group of users who cooperate directly share resources such as documents in a small, closed group. The pattern of sharing and the geographic distribution of particular users determines what mechanisms the system must supply to coordinate users' actions.

## 12. Service

The term service is used for a distinct part of a computer system that manages a collection of related resources and presents their functionality to users and applications.

## 13. Server

The term server is a running program on a networked computer that accepts requests from programs running on other computers to perform a service and responds appropriately.

## 14. Clients

The requesting processes are referred to as clients. The client invokes an operation upon the server.

**Short Note**

## 1. Characteristics of Distributed Systems

Concurrency

- concurrent program execution
- handle shared resources

No global clock

- coordinate action
- synchronization

Independent failure

- hardware/software failure
- components can fail
  independently of one another

## 2. Examples of Distributed Systems

**Figure 1.1 Selected application domains and associated networked applications**

| | |
|---|---|
| Finance and commerce | eCommerce, online banking and trading: Amazon, eBay, PayPai |
| The information society | Search engines: Google, Yahoo, ebooks, Wikipedia<br>Social networking: Facebook |
| Creative industries and entertainment | Online gaming, music and film in the home, user-generated content,<br>eg You Tube, Flickr |
| Healthcare | Health informatics: on online patient records,<br>Telemedicine: remote diagnosis/sugary |
| Education | e-learning, virtual learning environments: Microsoft Team, Google Classroom |
| Transport and logistics | GPS in route finding systems, map services: Google Maps, Google Earth |
| Science | Grid as an enabling technology for collaboration between scientistic |
| Environmental management | Sensor technology to monitor earthquakes, floods or tsunamis |

## 3. Trends in Distributed Systems

Distributed systems are undergoing a period of significant change and this can be traced back to a number of influential trends:

- the emergence of pervasive networking technology;
- the emergence of ubiquitous computing coupled with the desire to support user mobility in distributed systems;

- the increasing demand for multimedia services;
- the view of distributed systems as a utility.

## 4. Mobile Computing vs Ubiquitous Computing

Ubiquitous and mobile computing overlap, since the mobile user can in principle benefit from computers that are everywhere. But they are distinct, in general. Ubiquitous computing could benefit users while they remain in a single environment such as the home or a hospital. Similarly, mobile computing has advantages even if it involves only conventional, discrete computers and devices such as laptops and printers.

# Chapter - 2

## Definitions

### 1. Physical Model

A physical model considers the types of computers and devices that constitute a system and their interconnectivity, without details of specific technologies.

### 2. Architectural Models

Architectural models describe a system in terms of the computational and communication tasks performed by its computational elements; the computational elements being individual computers or aggregates of them supported by appropriate network interconnections.

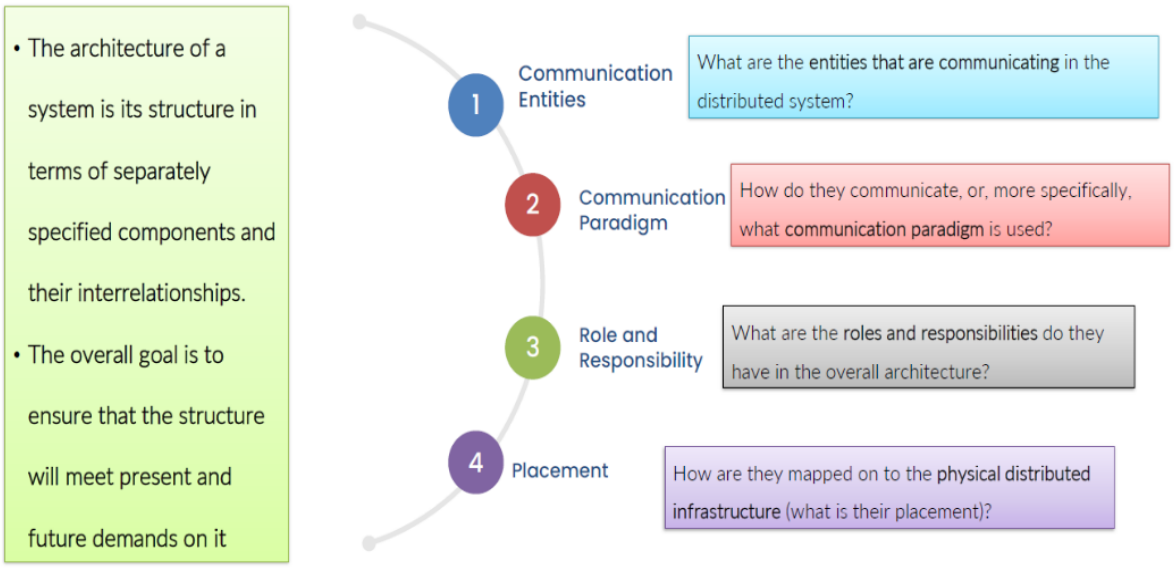
## Short Notes

### 1. Emergence Technologies that are developed by contemporary distributed System

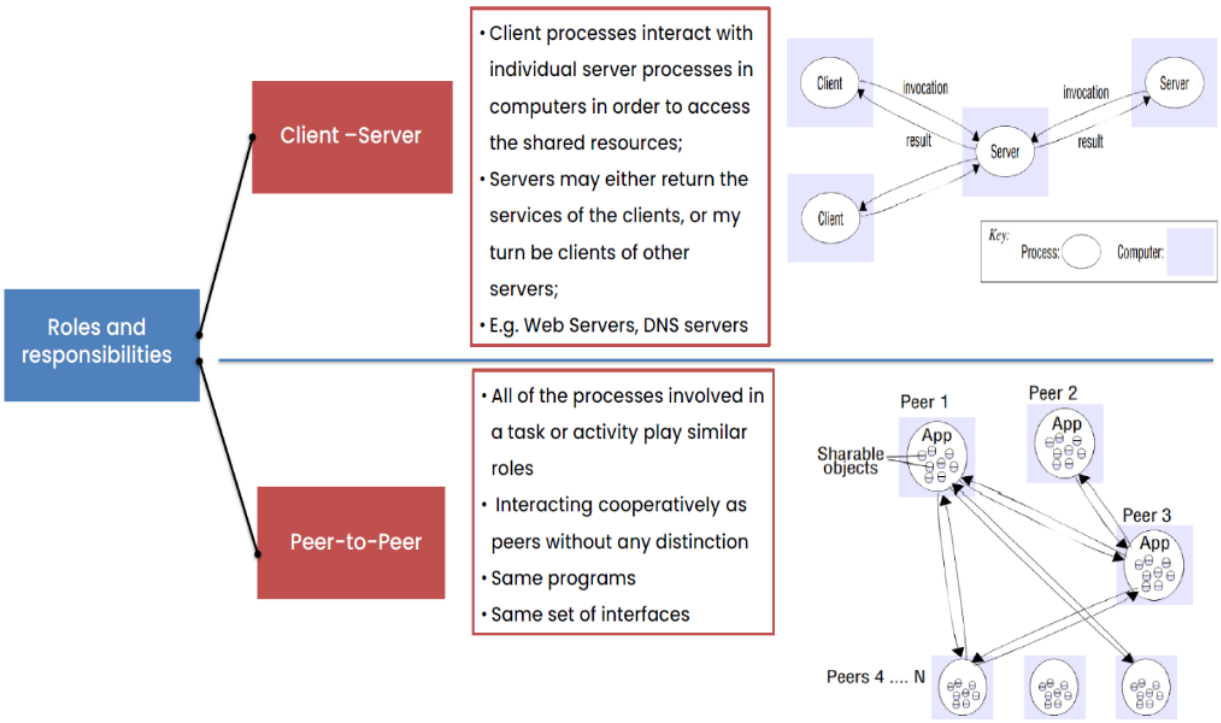
**Emergence technologies that are developed by contemporary distributed system are:** mobile computing, ubiquitous computing and cloud computing and cluster architectures.

- The emergence of mobile computing has led to physical models where nodes such as laptops or smart phone may move from location to location in a distributed system, leading to the need for added capabilities such as service discovery and support for spontaneous interoperation.
- The emergence of ubiquitous computing has led to a move from discrete nodes to architectures where computers are embedded in everyday objects and in the surrounding environment.
- The emergence of cloud computing and cluster architectures has led to a move from autonomous nodes performing a given role to pools of nodes that together provide a given service.

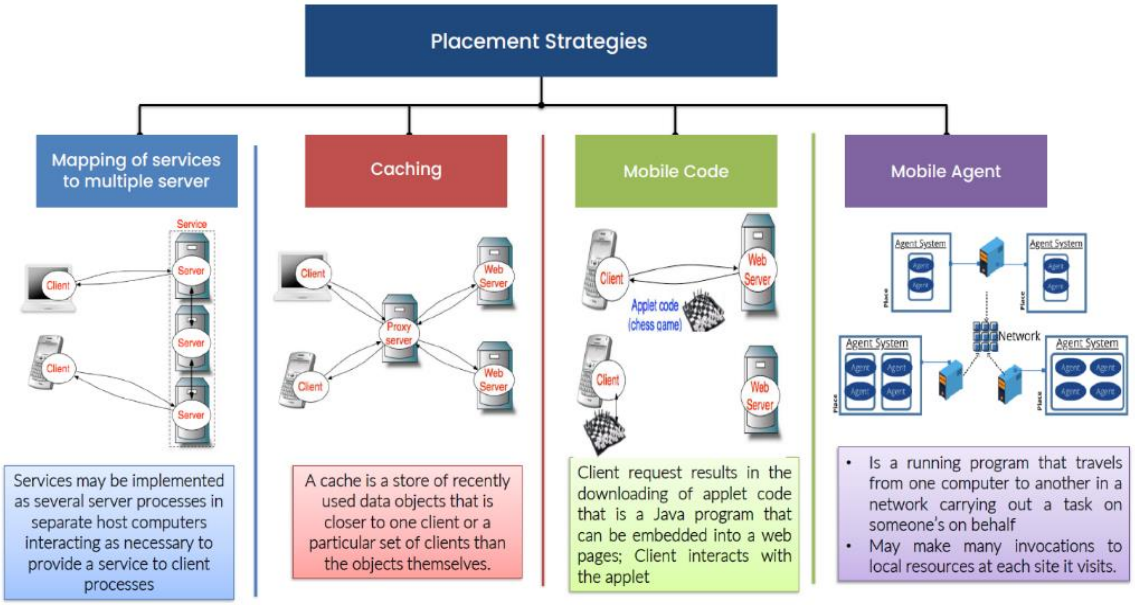
## 2. Architectural Model. What are the entities that are communicating in the distributed system?




## 3. What are the roles and responsibilities do they have in the overall architecture?



## 4. How are they mapped on to the physical distributed infrastructure? What is their placement?




## 5. Group Communication

Group communication: Group communication is concerned with the delivery of messages to a set of recipients and hence is a multiparty communication paradigm supporting one-to-many communication.

Group communication relies on the abstraction of a group which is represented in the system by a group identifier. Recipients elect to receive messages sent to a group by joining the group. Senders then send messages to the group via the group identifier, and hence do not need to know the recipients of the message. Groups typically also maintain group membership and include mechanisms to deal with failure of group members.

## 6. Publish-subscribe Systems

Publish-subscribe systems: Many systems can be classified as information-dissemination systems wherein a large number of producers (or publishers) distribute information items of interest (events) to a similarly large number of consumers (or subscribers). Publish-subscribe systems all share the crucial feature of providing an intermediary service that efficiently ensures information generated by producers is routed to consumers who desire this information.

## 7. Message Queues

Message queues: Whereas publish-subscribe systems offer a one-to-many style of communication, message queues offer a point-to-point service whereby producer processes can send messages to a specified queue and consumer processes can receive messages from the queue or be notified of the arrival of new messages in the queue. Queues therefore offer an indirection between the producer and consumer processes.

## 8. Tuple Spaces

Tuple spaces: Tuple spaces offer a further indirect communication service by supporting a model whereby processes can place arbitrary items of structured data, called tuples, in a persistent tuple space and other processes can either read or remove such tuples from the tuple space by specifying patterns of interest. Since the tuple space is persistent, readers and writers do not need to exist at the same time.

## 9. Distributed Shared Memory

Distributed shared memory: Distributed shared memory (DSM) systems provide an abstraction for sharing data between processes that do not share physical memory. Programmers are nevertheless presented with a familiar abstraction of reading or writing (shared) data structures as if they were in their own local address spaces, thus presenting a high level of distribution transparency. The underlying infrastructure must ensure a copy is provided in a timely manner and also deal with issues relating to synchronization and consistency of data.