

Assignment: Distributed Operating System Principles (COP5615)

Name: Vikas Chaubey, **UFID:** 3511 5826, **Email:** vikas.chaubey@ufl.edu

Lecture: 3 & 4 (summary notes)

Distributed operating systems:

It's a collection of autonomous computing components(nodes) which work together in sync to form a single coherent system. The nodes in the distributed systems could be hardware devices or software processes and they collaborate with each other to perform tasks.

Middleware Architecture for distributed systems:

In this type of architecture, Middleware system layer enables the various components of a distributed system to communicate and manage data. this layer acts as a middle layer and provides interoperability among the applications and different operating systems running on the machines. This layer generally contains commonly used component and functions which are not implemented by applications separately.

The goal of distributed architecture design:

The design goal is to achieve sharing of resources, Distribution transparency, openness and scalability. Among these most important are Distribution transparency, which is abstraction of hiding parameters like Access, location, Relocation, Migration, replication, Concurrency and Failure. However, aiming the full distribution transparency is difficult. Scalability of Distributed systems have three components size scalability (number of users), Geographical scalability (Max distance between nodes), Administrative scalability (Max number of administrative domains).

The distributed systems could be scaled up using following techniques:

- 1) By hiding communication latencies among components for ex. by using asynchronous communication
- 2) in client server model moving computations to client for ex. by doing form check at client side.
- 3) partitioning data and computations across multiple machines for ex. Dividing DNS (domain name server) space into zones.

Pitfalls In developing distributed operating systems:

Most of the time many distributed systems become needlessly complex because of mistakes caused by false assumptions, some of the most important false assumptions are as follow:

- 1) The network is fully reliable and secure
- 2) the network is homogeneous i.e. it uses similar configuration and protocols across all connected nodes
- 3) The network topology does not change
- 5) communication latency is zero in network
- 6) bandwidth is infinite
- 7) transport cost is zero

Types of Distributed systems: there are basically three types of distributed systems:

1) High performance distributed computing systems (Systems which are originated from parallel computing)

Examples:

a) Cluster Computing: It is a group of homogeneous (Same OS and hardware) end nodes connected through LAN. All these connected compute nodes are managed by a single Master node.

b) Grid Computing: It is the group of networked heterogeneous nodes dispersed across wide area acting as a single virtual supercomputer to perform large tasks. The architecture of grid computing contains various layers such as Application layer, collective layer, connectivity, resource layers and fabric layers.

c) Cloud Computing: Cloud computing is the on-demand availability of computer system resources such as data storage and computing power, without direct active management by the user. This is done by making large Data centers available to users through internet. Main Cloud computing services are software as service (web services), Platform as a service (framework and databases) and Infrastructure as service (Storage and CPU etc.).

2) Distributed Information systems

Examples:

a) Transaction processing Systems: this system processes information related to business transactions, it involves collection, modification and retrieval of all transaction data. The characteristics of a transaction are that it is atomic (happens indivisibly), consistent, isolated (no mutual interference) and durable (changes are permanent).

b) Enterprise Application integration: It deals with linking of different applications within a single organization together in order to simplify and automate business processes.

3) Distributed systems for pervasive computing (The new representational name is Internet of things which means network of physical objects which incorporate sensors, software and other technologies)

Examples:

a) Electronic healthcare systems (involves storing of monitored data, prevention of loss of crucial data, physician feedback, robustness and security policies for the system)

b) Sensor Network: Involves setup of sensor tree, aggregation of results, handling of network failure.

ex. sensor network in roads to check deformity etc.

Lecture: 4 (Summary Notes)

Different Styles of Architecture for Distributed systems:

1) layered Architecture: It consists of multiple stacked layers on top of each other, the information flow between these layers is sequentially bottom and top or top to bottom. It is simple architecture to implement distributed systems. But it is limited and poses many restrictions Example: TCP/IP network architecture

Application Layering: The traditional three layers are:

- 1) the user interface level (Ex. user interface)
- 2) the processing level (Ex. web server)
- 3) The data Level (Ex. Database)

2) Object based architecture Style: Unlike layered architecture, in this design there are no sequential steps. Components of this type of architecture are objects, each object can interact with other objects through a given connector (method call).

3) Event based Architecture style: software and hardware components run on multiple different inter networked nodes and the components communication happens with the help of events.

4) The shared Data space Architecture: In this type of architecture different components in the architecture share a Data space (Ex. database) in order to save information. This makes a system more robust against data losses by incorporating data persistence.

5) Centralized architecture: This architecture mainly consists of stateless client and a stateful server. A client sends request to the server and server sends response. Clients and server can be on different machines and clients follow request/reply model.

Different types of centralized Architecture (Multitiered Architectures):

a) single tiered: all the components of the application are set up on one Single server.

b) two tiered: The simplest implementation of a multitiered architecture is a client machine implementing user interface and a server machine implementing the remaining functionality but multitiered architecture provides different alternative client server organization where many server roles can also be transferred to client machine, this makes system fast and more interactive.

c) three tiered: in this architecture each layer is setup on separate machine. layers such as client, Application/web server and Database server layers.

6) Peer to peer architecture: In this type of architecture each node is equal and have same roles. each node is responsible to save certain information dn participate in communication in the network. This type of architecture is more symmetric and makes use of distributed hash tables to locate data in the network. Ex. Bit Torrent