UNIT-5

Distributed Operating System -

A distributed system is a collection of loosely coupled processes interconnected by a communication network.

Four major reasons for building distributed systems: resource sharing, computation speedup, reliability, and communication.

1. Types of distributed operating system:
   - Data Migration: transfer entire file or transformations of the file
   - Computation Migration: by initiating RPC or by sending a message
   - Process Migration: by the client or by the system

2. Design Issues -
   - Making the multiplicity of processors and storage devices transparent to the user
     - User mobility
     - Fault-tolerance
     - Scalability

3. File System -
   A DFS (distributed file system) is a file system whose clients, servers, and storage devices are distributed among the machines of a distributed system.

   A server is a software entity running on one or more machines and providing a particular type of function to the clients.

   A server is a software running on a single machine.

   A client is a process that can invoke a server using a set of operations that form its client interface.

4. Remote file access -
   Accessing file remotely by the users and the server store that particular file. It can be implemented by RPC (Remote Procedure Call). For reasonable performance, we use a form of caching.
RPC (Remote Procedure Call) -
It is a client-server mechanism that enables an application on one machine to make a procedure call to code on another machine.

RMII (Remote Method Invocation) - distributed object technology developed by Sun, available as part of the core Java API, Java Class Library, object interfaces defined as Java interfaces, uses object serialization.

DSM (Distributed Shared Memory) -
provides a virtual address space that is shared among all nodes in a distributed system.

Basic concept of parallel processing & concurrent programming -
Parallel processing provides simultaneous data processing tasks for the purpose of increasing the computational speed of a computer system.
Concurrent programming allows multiple computations to occur simultaneously in conjunction with each other.

Security & Threats -

Security violation through parameters -

- Denial of service → prevent legitimate use of the system
- Theft of service → unauthorized use of services
- Breach of confidentiality → unauthorized reading of data
- Breach of integrity → unauthorized modification of data
- Breach of availability → unauthorized destruction of data

Computer Worms - It is a full program itself, it spreads to other computers over the network. It potentially bring the entire network to grinding halt. Does not harm other program or data.
Safewarks against worms
- Prevent its creation
- Prevent its spreading

3. Computer virus - It is written with a clear intention of infecting other programs. It is a part of a program. Computer virus does not operate independently. It could harm the system.
Types of viruses - Boot sector infectors, Memory Resident infectors, file specific infectors, command processor infectors, general purpose infectors
Infection method - Affread, Replace, insert, delete, redirect
Virus detection - Checks for the integrity of the binary files
Virus Removal - Part pattern of some virus can be “predicted”
Virus Prevention - Buy official, legal copies of software

4. Security design principle -
- Public design
- least Privilege
- explicit demand
- continuous verification
- simple design
- user acceptance
- multiple conditions

5. Authentication - It is a process of verifying whether a person is a legitimate user or not.
In centralized environment, there ways -
- (personal) A secret, known only to that user.
- (magnetic badge) Something possessed only by that user.
- some human characteristics of the user (fingerprint)
In distributed environment,
Protection Mechanism -
- Protection Framework - Access Rights, Access Hierarchy, Domains and Domain switching, Black structured languages
- Access Control List (ACL) - stores the data by column
- Capability list - stores the data by rows
- Combined scheme - Combine all above schemes