



Lecture 12 — Server, Protocols, and Active Directory



1. What is a Server?

◆ Definition:

A **server** is a **computer or system** that provides resources, data, services, or programs to other computers (called **clients**) over a network.

The client sends a **request**, and the server **processes and serves** the requested data or service.

◆ Example:

- When you open Gmail → your browser (client) requests Gmail's **web server**.
 - The server processes your request → sends your emails to display.
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◆ How It Works (Client-Server Model):

Client → Request → Server

Server → Process → Response → Client

◆ Why Servers Are Used:

- Centralized control and management of resources.
- Provide services such as:
 - Email
 - File sharing
 - Database hosting
 - Authentication and authorization
 - Backup and security

2. SMTP (Simple Mail Transfer Protocol)

◆ Definition:

SMTP is a protocol used to **send emails** across the internet.

◆ Function:

- Handles the **sending and forwarding of outgoing emails** from a mail client (like Outlook, Gmail, etc.) to the mail server.
- Works on **Port 25, 465 (SSL), or 587 (TLS)**.

◆ How It Works:

1. The user composes an email.
2. The email client connects to the **SMTP server**.
3. The message is transmitted and queued.
4. The recipient's mail server receives the message and stores it for retrieval via **IMAP/POP3**.

◆ Why It's Used:

- Standard method for reliable email delivery.
- Supports authentication and encryption.
- Ensures fast, scalable communication between email systems.

3. UDP (User Datagram Protocol)

◆ Definition:

UDP is a **connectionless transport protocol** that sends data packets (**datagrams**) without establishing a prior connection.

◆ Key Features:

- **Faster** than TCP (no handshake).
- **No error correction or acknowledgment**.
- Best suited for **real-time applications**.

◆ **Common Uses:**

- Online gaming 🎮
- Video streaming 📺
- Voice over IP (VoIP) calls ☎️
- DNS queries 🌎

◆ **Why It's Used:**

- Low latency and faster data transfer.
- Ideal where **speed matters more than reliability**.

💻 4. Types of Servers

Here's a breakdown of commonly used server types 🤖

Server Type	Purpose / Function	Examples / Notes
Web Server	Hosts websites and serves web pages to users	Apache, Nginx, IIS
Application Server	Runs specific business applications	Tomcat, WebLogic
Database Server	Stores and manages structured data	MySQL, SQL Server, Oracle
File Server	Stores and shares files over a network	Windows File Server
Backup Server	Keeps system and data backups	Veeam, Acronis
DHCP Server	Automatically assigns IP addresses to clients	Windows DHCP, Cisco Router
DNS Server	Converts domain names → IP addresses	Google DNS (8.8.8.8), Cloudflare DNS

Server Type	Purpose / Function	Examples / Notes
Proxy Server	Acts as a middleman between client and internet	Squid, Bluecoat
Mail Server	Sends, receives, and stores emails	Microsoft Exchange, Postfix
Virtual Machine Server	Hosts multiple virtual systems	VMware ESXi, Hyper-V
Cloud Server	Virtualized server in the cloud	AWS EC2, Azure VM, Google Cloud

5. Database Servers

◆ What is a Database?

A **database** is an organized collection of data that can be accessed, managed, and updated easily.

◆ Types:

- **SQL (Structured Query Language)** – Used for relational databases (MySQL, SQL Server, PostgreSQL).
- **MS Access** – A Microsoft tool for small databases; used for local or lightweight applications.

◆ Why Used:

- Centralized data management.
- Data integrity, security, and easy access.
- Essential for websites, applications, and analytics.

6. HR Shortlisting Note

Many companies have a **minimum graduation percentage requirement (usually 50%)**.

If a candidate scores below that, HR systems may **auto-filter** them out of shortlisting, regardless of skills.

7. Active Directory (AD)

◆ **Definition:**

Active Directory (AD) is a **directory service** developed by Microsoft for **Windows Server environments**.

It stores information about:

- Users
- Computers
- Groups
- Permissions
- Policies



and provides **authentication, authorization, and centralized management** in a networked organization.

◆ **How Active Directory Works:**

When a user logs into a company network:

1. The **request first goes to Active Directory**.
2. AD **verifies credentials** (username + password).
3. If verified, AD sends an **authorization token** to the server or resource being accessed.

So every authentication → first passes through AD.

◆ **Why AD is Important:**

- Centralized control over user accounts.
 - Enforces security and password policies.
 - Allows assigning **roles, permissions, and access levels**.
 - Supports **Single Sign-On (SSO)** and federation.
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8. Authentication vs Authorization

Term	Meaning	Example
Authentication	Verifying <i>who you are</i>	Logging in with username/password
Authorization	Determining <i>what you can access</i>	Accessing files based on role



9. AD FS (Active Directory Federation Services)

◆ **Definition:**

ADFS extends Active Directory's capabilities to allow **Single Sign-On (SSO)** between different domains or organizations.

◆ **How It Works:**

- When a user logs in once, AD FS **authenticates** them and issues a **token**.
 - This token can be used to access multiple services (like Outlook, SharePoint, etc.) **without re-entering credentials**.
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◆ **Protocols Used:**

- **SAML (Security Assertion Markup Language)** — standard for SSO communication between systems.
 - **OAuth / OpenID Connect** — for modern web-based SSO.
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10. SSO (Single Sign-On)

◆ Definition:

Single Sign-On allows a user to log in **once** and gain access to multiple systems or applications without logging in again.

◆ Example:

If you log in to your office Microsoft account, you can access:

- Outlook
 - Teams
 - SharePoint
- without entering your credentials again.

◆ Benefits:

- Saves time and improves user experience.
- Reduces password fatigue and login errors.
- Centralized identity and access management.

11. OU (Organizational Unit)

◆ Definition:

An **Organizational Unit (OU)** is a **container** within Active Directory that groups related users, computers, or devices.

It helps in applying **policies and permissions** to specific departments or locations.

◆ **Example:**

Company: **CodingSeekho (Forest)**

- Pune.CodingSeekho (Tree)
- Mumbai.CodingSeekho (Tree)
- Nashik.CodingSeekho (Tree)

Each city branch has **its own OU** — with separate permissions and user groups.

◆ **Why OUs Are Used:**

- To organize users and resources logically.
 - To apply **Group Policies (GPOs)** efficiently.
 - To delegate administrative tasks at department or location level.
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12. Group Policy (GPO)

◆ **Definition:**

A **Group Policy Object (GPO)** is a **set of rules and configurations** applied to users or computers within an OU.

It can control:

- Password policies
- Desktop restrictions
- Software installation
- Network settings

◆ **Note:**

Group Policies are **applied only to OUs** — not directly to users or computers outside an OU.

13. Key Terms Summary

Term	Meaning / Purpose
Server	Provides services/data to clients
SMTP	Protocol to send emails
UDP	Fast, connectionless communication protocol
Active Directory (AD)	Centralized user & resource management
Authentication	Verify user identity
Authorization	Define user access level
ADFS	Enables SSO between domains
SSO	One login for multiple systems
SAML	XML-based authentication standard for SSO
OU	Container grouping users/computers
GPO	Rules applied to OUs for system control
Forest & Tree	Forest = whole organization, Tree = branch/domain

14. Visual Concept Map

Client → Request → Server



Active Directory



Authentication ✓

Authorization ✓



Access to Server or Application

Structure Example:

Forest: codingseekho.com

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|— Tree 1: pune.codingseekho.com
|   |— OU: IT Department
|   |— OU: HR Department
|— Tree 2: mumbai.codingseekho.com
|   |— OU: Sales
└— Tree 3: nashik.codingseekho.com
    |— OU: Accounts
```



LECTURE 12 — COMPLETE SUMMARY

1. What is a Server?

A server is a powerful computer that provides services, data, or resources to other devices called clients.

Examples:

- Gmail server sending your emails
- File server storing shared company files
- Database server storing application data

Why servers are used

- Centralized management
- High performance
- Better security
- Reliable data access
- Supports multiple users at the same time

2. SMTP (Simple Mail Transfer Protocol)

Protocol used for **sending emails**.

Ports

- **25** – Default
- **465** – Secure SSL
- **587** – Secure TLS

How SMTP works

1. User sends an email
2. Email goes to SMTP server
3. SMTP forwards it to receiver mail server
4. Receiver picks email via IMAP/POP3

3. UDP (User Datagram Protocol)

A fast, connectionless protocol that sends data without waiting for confirmation.

Used in:

- Online gaming
- Video streaming
- Voice calls (VoIP)
- DNS

Why UDP?

Speed > Reliability

It avoids handshakes and retransmissions.

4. Types of Servers

Server Type	Purpose
Web Server	Hosts websites
Application Server	Runs business apps
Database Server	Stores structured data
File Server	Shares files
DHCP Server	Gives IP addresses
DNS Server	Converts domain → IP
Proxy Server	Acts as middleman
Mail Server	Sends/receives emails
Backup Server	Stores backups
Cloud Server	Internet-based servers
VM Server	Hosts virtual machines

5. Database Servers

A database is an organized collection of data.

Types

- **SQL databases** → MySQL, SQL Server, Oracle
- **MS Access** → Small, local database

Why used

- Organized storage
- Fast querying
- Multi-user access
- Secure

6. HR Shortlisting Note

Many companies auto-reject profiles with <50% graduation marks due to system filters, not skill issues.



7. Active Directory (AD)

A Microsoft directory service used for **authentication, authorization, and management** of users and systems in an organization.

AD Stores Information About

- Users
- Computers
- Groups
- Policies
- Permissions

Login Process

1. User enters credentials
2. Request goes to AD

3. AD verifies identity
 4. User gets access token
 5. User can access apps/servers
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8. Authentication vs Authorization

Term	Meaning
Authentication	Verifying identity (Who you are?)
Authorization	What you can access (Your permissions)

9. ADFS (Active Directory Federation Services)

Enables SSO across different domains/organizations.

Protocols used

- SAML
 - OAuth
 - OpenID Connect
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10. SSO (Single Sign-On)

Allows a user to log in once and access multiple applications without re-entering credentials.

Example:

Login to Microsoft → Access Outlook, Teams, SharePoint.

Benefits

- Saves time
 - Reduces password fatigue
 - Centralized identity management
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11. OU (Organizational Unit)

A container inside Active Directory used to group users/computers.

Used for:

- Applying Group Policies
 - Delegating admin roles
 - Organizing departments
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12. GPO (Group Policy Object)

A set of configurations applied to users/computers inside an OU.

Controls:

- Password policies
 - Desktop restrictions
 - Software installation
 - Security settings
-



13. Key Concepts

- **Server → provides services**
 - **SMTP → sends emails**
 - **UDP → fast, connectionless protocol**
 - **AD → user & resource management**
 - **GPO → system control policies**
 - **OU → department-wise grouping**
 - **SSO → one login, multiple applications**
 - **SAML/OAuth → authentication standards**
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DETAILED MINDMAP (Text Form)

Lecture 12

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1. Server

| | | Client → Request → Server

| | | Types

| | | | Web, App, DB

| | | | DNS, DHCP

| | | | Proxy, Backup

| | | | Mail, VM, Cloud

|

2. Protocols

| | | | SMTP (send emails)

| | | | UDP (fast, real-time)

|

3. Active Directory

| | | Authentication

| | | Authorization

| | | Objects (Users, Groups)

| | | OU (Logical containers)

| | | GPO (Policies)

| | | Trees & Forests

|

4. ADFS

| | | SSO



```
|   |   └— SAML  
|   |   └— OAuth  
|   └— OpenID Connect  
|  
└— 5. Database  
    |   └— SQL  
    |   └— MS Access  
    └— Central management
```

☒ CONCLUSION

Lecture 12 explains how servers and protocols support modern IT infrastructure and how Active Directory provides centralized authentication, authorization, and management. Understanding SMTP, UDP, servers, OUs, GPOs, and SSO is essential for cybersecurity, system administration, and corporate IT environments. These concepts build the backbone of any enterprise network.

🎯 INTERVIEW QUESTIONS + ANSWERS

1. What is a server?

Answer:

A server is a system that provides services or data to clients over a network. Clients send requests, and the server processes and responds.

2. What is SMTP and what ports does it use?

Answer:

SMTP is a protocol used to send emails.

Ports: **25, 465 (SSL), 587 (TLS)**.

3. What is UDP? How is it different from TCP?

Answer:

UDP is a fast, connectionless protocol.

Difference from TCP:

- No handshake
- No acknowledgements
- Faster but not reliable

Used for gaming, streaming, and DNS.

4. Name some types of servers.

- Web Server
 - File Server
 - DNS Server
 - DHCP Server
 - Database Server
 - Mail Server
 - Proxy Server
 - Cloud Server
 - VM Server
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5. What is a database server?

Answer:

A server that stores and manages structured data. Examples: MySQL, SQL Server.

6. What is Active Directory (AD)?

Answer:

A Microsoft directory service used for centralized user authentication, authorization, and resource management.

7. Explain Authentication vs Authorization.

Authentication: Who you are

Authorization: What you can access

8. What is an OU in Active Directory?

Answer:

An Organizational Unit is a container used to organize users, computers, and groups.

Used for applying GPOs and delegating permissions.

9. What is a GPO?

Answer:

A Group Policy Object defines rules like password policies, software restrictions, etc., applied to OUs.

10. What is SSO?

Answer:

Single Sign-On allows users to log in once and access multiple systems without entering credentials again.

11. What is ADFS?

Answer:

Active Directory Federation Services enables authentication and SSO across different domains using SAML or OAuth.

12. What is a forest and tree in Active Directory?

Forest: Entire organization

Tree: Branch/domain inside the forest

13. What is DNS and why is it used?

Answer:

DNS converts domain names into IP addresses, acting as the internet's phonebook.

14. What is DHCP?

Answer:

Dynamic Host Configuration Protocol automatically assigns IP addresses to devices.

15. What is a proxy server?

Answer:

A middleman server between clients and the internet, used for security, filtering, and caching.

16. Why is SMTP necessary?

Answer:

It manages the sending, routing, and delivery of outgoing emails.

17. Why do companies use OUs and GPOs?

Answer:

To segment departments and apply policies like password rules and security restrictions.

18. What is the role of AD in authentication?

Answer:

AD verifies user credentials and provides an access token for resources.

