CCNA – Lecture 1

Important Points Summary

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1) Computer Network Basics

1. A computer network is a group of connected devices.
2. Connection can be wired or wireless.
3. The main purpose is sharing resources.
4. Networks allow exchanging information between devices.
5. Networking reduces overall cost.
6. Example: A network printer is better than a USB printer per device.
7. Networks support file sharing.
8. They support IPTV and online streaming services.
9. They provide access to company services (ERP, Mail).
10. They support online gaming.
11. They support E-learning systems.

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2) Network Elements

12. A Client is also called Endpoint or Node.
13. The client requests services.
14. A Server provides services.
15. Examples of server services: Printer, Mail server, Internet, File server.
16. Media is the transmission medium (cable or WiFi).
17. Network devices connect multiple devices together.
18. Examples: Switch, Router, Access Point.
19. Media connects through a NIC (Network Interface Card).
20. Every device needs a NIC to access the network.

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3) Network Types

LAN (Local Area Network)

21. Covers a small physical area.
22. Example: Home, office, school building.
23. Very high speed.
24. Range: Hundreds of meters.

CAN (Campus Area Network)

25. Connects multiple LANs within a campus.
26. Used in universities or corporate campuses.
27. Range: 5–50 km.
28. Usually no ISP between buildings.
29. High speed.

WAN (Wide Area Network)

30. Connects multiple LANs over large distances.
31. The Internet is the largest WAN.
32. Requires ISP between distant locations.
33. Uses leased line or VPN.
34. Speed is limited compared to LAN.
35. Same company → Intranet.
36. Different companies or public → Internet.

PAN (Personal Area Network)

37. Small network within a few meters.
38. Range: About 10 meters.
39. Examples: Bluetooth headset, mouse, keyboard.
40. Limited speed.

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4) Network Topology

41. Network topology is the physical or logical arrangement of devices and links.

Bus Topology

42. One main cable connects all devices.
43. Only one device can transmit at a time.
44. Very low cost.
45. Very low security.
46. If the main cable fails, the entire network fails.
47. Collision may occur when two devices transmit together.
48. CSMA/CD is used for collision detection.
49. Devices wait using a random backoff timer before retransmitting.

Ring Topology

50. Devices are connected in a circular loop.
51. Each device connects to exactly two devices.
52. Only one device transmits at a time.
53. If one device fails, it may affect the whole network.
54. Low cost.

Star Topology

55. All devices connect to a central device (switch).
56. Multiple devices can send and receive simultaneously.
57. High reliability.
58. Failure of one device does not affect others.
59. Higher cost than Bus and Ring.
60. Security depends on the central device.
61. Tree topology is a group of connected star networks.

Mesh Topology

62. Devices are interconnected with each other.
63. Types: Full Mesh and Partial Mesh.
64. Very high reliability.
65. Very high security.
66. Very expensive.
67. Complex troubleshooting and management.
68. Wireless networks can be an example of mesh.

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5) Topology Comparison

69. Bus: Very high delay, very low reliability, very low cost.
70. Ring: High delay, low reliability, low cost.
71. Star: Low delay, high reliability, high cost.
72. Mesh: Very low delay, very high reliability, very high cost.

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6) OSI Model (7 Layers)

73. Layer 1 – Physical: Transmits electrical or optical signals.
74. Layer 2 – Data Link: Defines frame format over the physical medium.
75. Layer 3 – Network: Determines the best path for data.
76. Layer 4 – Transport: Segments data and ensures reliable delivery.
77. Layer 5 – Session: Manages and maintains sessions.
78. Layer 6 – Presentation: Encrypts, decrypts, and converts data format.
79. Layer 7 – Application: Presents data in a human-understandable form.