

## Network Implementation and its Security

### Internetworking model

1. Basic concept of networking.
2. What devices do we need in order to build a network? Basic working of all devices (Routers, Switches, Hub). Difference in devices.
3. How a user communicates with others?
4. Different type of Media (Guided and Unguided); Types of Cables, and connectors used in networking.
  - a. STP
  - b. UTP
  - c. Fiber Optics
  - d. RJ 11 and RJ 45
  - e. ST and SC
5. Color coding in different cables
6. Different types of network ( LAN, MAN, CAN, WAN etc)
7. Basic Networking Topologies (Physical and Logical)
8. Internetworking model: Why we need a reference model? Advantages?
9. Detailed information of OSI-TCP/IP Model – Understanding of each layer and protocol associated with each layer in detail.
  - a. **Application Layer:** Work, Protocols,
  - b. **Presentation Layer:** Work and protocols
  - c. **Session Layer:** Work and Protocols
  - d. **Transport Layer** in detail
    - i. Connection Oriented and Connection less communication
    - ii. Flow Control, Windowing and Acknowledgement
  - e. **Network Layer:** Work, Protocol and devices (Router and L3 Switch)
  - f. **Data Link Layer:** LLC and MAC, Working of both sub-layers, Devices: Bridges and Switches.
  - g. **Physical Layer:** Work, Devices, Protocols
10. TCP/IP Model
11. Data flow according to TCP/IP model

12. Concept of ARP: Address Resolution Protocol
13. Difference in TCP/IP and OSI models.
14. Data Encapsulation and De-capsulation

## IP Address and Subnetting

1. IP addressing: IPV4/V6, Uses, Terminology, classes of IP address, Public and private IP address range
2. Unicast, Multicast and Broadcast ip addresses
3. What is a Subnet mask? Why we need a subnet mask in Network?
4. CIDR representation of Subnet mask.
5. Subnetting basics, why we need Subnetting?
6. Use of IP Subnet-Zero command.
7. Subnetting different classes of IP addresses (Class A, B, and C).
8. VLSM : Importance, basic difference in FLSM and VLSM network (using a topology)
9. How to implement VLSM in a network.
10. Advantages of using VLSM in a network: Reduced IP wastages.
11. Route aggregation or Summarization

## Installing Network Simulation Software

1. Cisco Packet Tracer
2. Limitations of Cisco Packet Tracer
3. Installation and configuration of GNS
4. Optimizing GNS
5. Packet Capture using WireShark tool.

## Router IOS

1. Responsibilities of a Router IOS.
2. Router booting process in detail.
3. CLI and Modes of router,
4. Interfaces, sub-interfaces and ports on a router
5. Passwords:
  - a. Enable,

- b. VTY,
  - c. Auxiliary,
  - d. Console
6. Basic Router Configuration and Commands
- a. Hostname, Clock, Banner, passwords: Enable and Secret, Service password encryption,
  - b. Assigning IP Addresses on router;
  - c. Telnet and SSH, DHCP (Configuration on Router), SNMP, CDP (Theory and Configuration), Telnet, Encrypted password
7. Backup and restoration of IOS
8. Password recovery
9. Backup and Restore Configuration

## **IP Routing + Static routing configuration**

- 1. Basics, why we need Routing in a network?
- 2. Detailed study of Routing Process
- 3. IP address configuration on router-Primary and secondary
- 4. AD Values
- 5. Types of IP Routing: IGP, EGP, Routing and Routed protocol
  - A. Static: why?**
    - i. Terminology
    - ii. Connectivity
    - iii. Pros and cons.
  - B. Default:** Where to use, when to use.
  - C. Dynamic:** Why prefer it to Static? When to use? Types and basics.
    - i. Distance Vector
    - ii. Link state
    - iii. Hybrid

## **Static Routing Configuration**

- 1. Configuration commands
- 2. Static IP addressing using exit interface

3. Static IP addressing using Next hop address
4. Difference in next hop address and exit interface
5. Static floating routes
6. Path selection using AD value in static routing
7. Looping problem in Static routes
8. Troubleshooting Static Routing Connectivity

## Routing Information Protocol- Default, V1, V2

- a. Detailed study of RIPv1 and v2
- b. Basic study and configuration
- c. Timers and routing tables in RIP
- d. Versions : Default, V1, V2
- e. Difference in versions
- f. RIP configuration
- g. Configuration Verification
- h. Authentication
- i. Default route advertisement in RIP
- j. Limitations & Problems of RIP and loop avoidance techniques
  1. Split Horizon
  2. Route Poisoning
  3. Routing loops
  4. Passive Interface

## EIGRP

- a. Terminology,
- b. Successor, Feasible Successor, Feasible Distance, timers,
- c. Use of AS Numbers to create different domains
- d. Router ID, Neighbor Discovery, Advantages over Rip
- e. Metric Values
- f. Conditions for Neighborship
- g. Message types in EIGRP, Tables, Feasible Condition for Backup Path selection

- h. Configuration Commands, Same AS and Different AS
- i. Wild Card Mask, Route Summarization, , Authentication, Load Balancing
- j. IPV6 on EIGRP

## Redistribution

- a. When we need to redistribute routes?
- b. How to perform redistribution?
- c. Why we need to redistribute routes in a network?
- d. Practical implementation of Redistribution in a small network.
- e. Interconnecting different AS in EIGRP and connecting two or more Routing Domains like OSPF and RIP.
- f. Troubleshooting basic problems of Redistribution

## Switching

1. What is a switch? Advantages of using a switch instead of bridge in a network.
2. Types of Switches: L2&L3
3. CAM Table, TCAM table, SVI, Management IP Address
4. Methods of switching:
  - a. Store & Forward,
  - b. Cut Through,
  - c. Fragment Free
5. Functions and Limitations of L2 switch
6. Loop Formation in switched network
7. Loop Avoidance Mechanism in Switching: Spanning Tree Protocol
8. Switchport modes: Access, Trunk and Dynamic
9. DTP: Dynamic Trunking Protocol
10. Spanning Tree Terminology:
  - a. BPDU, Root Bridge, Bridge ID, Non-Root Bridge,
  - b. Port Cost, and Root Port, DP, NDP, Forwarding and Blocking ports.
  - c. Root Bridge Election, Port states
  - d. Convergence Mechanism: Port Fast, UpLink Fast, BackBone Fast,
  - e. Variation of spanning tree protocol like CST, PVST+, RPVST+, MST

11. VLANs: Basics, Why use VLANs in a network?
  - a. Native, Voice, Video VLAN
12. VLAN Membership Assignment: Static, VMPS
13. Trunking, VTP, VTP Modes: Client, Server, Transparent
14. VTP pruning
15. Dynamic Trunking Method
16. Inter-VLAN Routing:
  - a. Router on Stick Method
  - b. IVR using L3 switch
17. Troubleshooting basic Switching Connectivity

## Security

1. Switchport Security
2. Access List theory
3. **Access Lists: Practical**
  - a. Standard,
  - b. Extended and
  - c. Named with examples
4. In Bound and Out Bound Access List
5. **Most Common Security Threats**
  - a. Describe common security threats
  - b. Securing network from common attacks
  - c. Email-based and Web-based attacks
  - d. Preventing Worm, Virus, and Trojan Horse attacks
  - e. Phases of a secure network lifecycle
  - f. Security needs of a typical enterprise with a comprehensive security policy
  - g. Mobile/remote security
  - h. Data loss prevention
6. **Common Layer 2 Attacks**
  - a. **Enhancing L2 Security**
    - STP attacks
    - ARP spoofing

- MAC spoofing
- CAM overflows
- CDP/LLDP

b. Implementing VLAN, Trunking and security

## 7. What is a CISCO FIREWALL?

- a. Types of firewalls
- b. Stateful Firewall
- c. NAT in firewall
- d. Zone based Firewall

8. IPS and IDS

9. NAT: How it works?

10. Static and Dynamic Nat, PAT Configuration

11. IPV6 addressing and conversion

12. IPV6 in brief and routing using IPV6 addresses

13. IPV4 to IPV6 conversion