**Networking Fundamentals**

* OSI Model (concept, layers’ functionality, PDUs, encapsulation/decapsulation).
* IP, Ethernet, TCP, UDP headers and fields’ functionality.
* Networking devices’ functionality and operation (Router/Switch/Proxy server)
* Unicast, multicast and broadcast at Layer 2 and 3.
* Switching: MAC learning, forwarding, filtering, flooding, blocking.
* Broadcast domains, vlans, intervlan routing, tagged/untagged ports, routing-on-a -stick.
* ARP, GARP, Reverse ARP.
* MAC Table vs Routing table vs ARP Table.
* STP (concept, loop avoidance mechanism, port roles and states).
* Subnetting, Subnet Mask, Default Gateway, valid host addresses, broadcast.
* Static routing vs dynamic routing
* Asymmetric routing, routing-instances, policy-based routing, PPP/PPPoe.
* IP concepts: TTL, QoS, MTU, PMTUD, IP fragmentation and reassembly.
* TCP (fundamentals, MSS, flags’ functionality, 3-way-handshake, 4-way-close, sequencing and acknowledging, windowing).
* Troubleshooting tools: ICMP tools, sniffing tools (tcpdump, wireshark, port-mirror), windows/linux network related commands, PMTUD, verifying TCP open ports with telnet, DNS resolution checks, external monitoring tools, techniques for isolating the issue, use of OSI for troubleshooting.
* Basic application protocols:

Telnet vs SSH (functionality, use cases, L4 ports and protocols).

NTP (functionality, use cases, L4 ports and protocols).

FTP (functionality, active vs passive, use cases, L4 ports and protocols).

SNMP, SYSLOG, HTTP(S), SMTP (functionality, use cases, L4 ports and protocols).

DHCP (functionality, DORA, Relay, options, use cases, L4 ports and protocols).

DNS (functionality, use cases, L4 ports and protocols, DNS doctoring).

Radius, TACACS, LDAP (functionality, use cases, L4 ports and protocols).

**Dynamic Routing Protocols**

* **BGP**

Fundamentals.

IBGP vs EBGP (concept, loop avoidance mechanism, etc).

Building an adjacency (packet types and states).

Attributes and manipulation of inbound/outbound traffic.

Route-reflectors vs Confederations

Troubleshooting

* **OSPF**

Fundamentals.

Loop avoidance mechanism.

Building an adjacency (packet types and states).

DR/BDR functionality and election.

Routers, Zones and LSAs types.

Troubleshooting.

**High Availability**

* Link Aggregation and LACP
* VRRP/HSRP
* Clustering

**Security**

* Basic Networking Attacks (IP sweep, port-scanning, MITM, Dos/DDoS, DNS poisoning, etc).
* Firewalls (stateful, stateless, zone-based, application FW, user authentication FW).
* Firewall handling of sessions/flows.
* NAT (concept, source/destination/static/PAT, Port-forwarding, Proxy-ARP, use cases)
* Security concepts (confidentiality, integrity, authentication).
* Encryption, hashing and authentication, types and algorithms examples.
* Key exchange mechanisms like Diffie-Hellman, PKI.
* IPsec

Principles and benefits

Negotiation (IKE messages exchange, Maim mode vs Aggressive mode, traffic-selectors)

NAT-T

* IPS/IDS.
* ALGs (concept and use cases, like FTP).
* UTM.
* SSL Proxy.