Western Technical College

10150130 Cisco 3: Advanced Routing & Switching

Course Outcome Summary

Course Information

Description	This course covers advanced router configuration, LAN switching, Fast Ethernet, virtual LANs and advanced network design. Students will work in teams to design a large campus network. PLEASE NOTE: A Windows operating system is recommended for this course. Required software used in this course is not compatible with Mac operating system.
Career Cluster	Information Technology
Instructional Level	Associate Degree Courses
Total Credits	3
Total Hours	90

Textbooks

No textbook required.

Learner Supplies

None. Required.

Program Outcomes

1. Implement computer networks.
2. Implement client systems.
3. Implement network security components.
4. Develop technical documentation.
5. Troubleshoot network systems.
6. Maintain the network infrastructure

Course Competencies

1. **Explain the goals of an enterprise network referencing LANs, WANs, intranets and extranets.**

Assessment Strategies

1.1. Written Objective Test

Criteria

Your performance will be successful when:

1.1. Learner develops network documentation.
1.2. Learner develops a Business Continuity Plan.
1.3. Learner explains the functions of a Network Operations Center (NOC).
1.4. Learner diagrams the relationship between the enterprise campus, enterprise edge, service provider edge.
1.5. Learner explains the need for quality of service between data, voice and video packets.
1.6. Learner understands the needs of a teleworker.
1.7. Learner plans and documents network user policies.
1.8. Learner creates a labeling scheme and diagrams physical wiring.

Learning Objectives

1.a. List environmental factors that affect a network.
1.b. Describe network performance monitoring.
1.c. Describe the components of an enterprise network.
1.d. Recognize the convergence of data, voice and video on a network.

2. Explore switching in an enterprise network.

Assessment Strategies

2.1. Skills Test

Criteria

Your performance will be successful when:

2.1. Learner successfully installs a switch in a network.
2.2. Learner consoles into a switch and views menu options.
2.3. Learner demonstrates the process used by a switch to build a MAC table.
2.4. Learner lists and describes the different switching modes.
2.5. Learner configures a root bridge.
2.6. Learner explains the purpose of the Rapid Spanning Tree.
2.7. Learner illustrates how a switch uses microsegmentation to increase network performance.
2.8. Learner demonstrates half-duplexing and full-duplexing.
2.9. Learner sets up basic security in switch.
2.10. Learner lists three factors that influence latency in a switch.

Learning Objectives

2.a. Describe the Spanning Tree Protocol.
2.b. Describe basic operation of a switch.
2.c. Compare half-duplex and full-duplex transmission.

3. Develop VLANs and their characteristics.

Assessment Strategies

3.1. Lab Assignment
3.2. Skills Test

Criteria

Your performance will be successful when:

3.1. Learner explains the effect of VLANs on LAN broadcasts.
3.2. Learner describes the various types of VLAN implementations.
3.3. Learner correctly defines frame filtering, tagging, and frame identification.
3.4. Learner explains the purpose of VLAN frame tagging.
3.5. Learner lists four benefits provided by VLANS.
3.6. Learner differentiates between static and dynamic VLANs.
3.7. Learner explains the functions of routers in VLANs.
3.8. Learner access the switch and creates a VLAN.
3.9. Learner tests VLAN to ensure it meets specified requirements.

Learning Objectives

3.a. Describe VLANs.
3.b. List benefits of VLANs.
3.c. Describe role of switches and routers in VLANs.
3.d. Describe VLAN frame filtering, frame identification and frame tagging.

4. Explore hierarchical IP addressing schemes

Assessment Strategies

4.1. Lab Assignment
4.2. Skills Test
4.3. Written Objective Test

Criteria

Your performance will be successful when:

4.1. Learner creates VLSM addressing scheme.
4.2. Learner implements VLSM addressing scheme.
4.3. Learner describe the function of route summarization.
4.4. Learner describes the need for private and public IP addresses.
4.5. Learner creates NAT and PAT tables.
4.6. Learner explains Inside and Outside Global addresses.
4.7. Learner diagrams the three layers in a hierarchical design.
4.8. Learner differentiates between classfull and classless routing.

Learning Objectives

4.a. Demonstrate usage of Variable Length Subnet masks (VLSM).
4.b. Describes the usage of public and private IP addresses.
4.c. Implement a hierarchical network design.

5. Identify the features of Distance Vector Routing Protocols

Assessment Strategies

5.1. Written Objective Test

Criteria

Your performance will be successful when:

5.1. Learner explains what happens to a packet's IP and MAC address as it moves through the network
5.2. Learner explains the usage of various network topologies
5.3. Learner demonstrates how static and dynamic routes are added to a routing table
5.4. Learner compares RIP and RIPV2
5.5. Learner lists metrics used by Distance Vector protocols.
5.6. Learner applies the value of the Administrative Distance (AD) to route decisions.
5.7. Learner compares of the usage of Neighbor Table, Topology Table and Routing Table.
5.8. Learner demonstrates the value of route summarization for router efficiency.
5.9. Learner describes how to use holddowns, split horizons, and poison reverse updates prevent routing loops.
5.10. Learner applies the Feasibility Distance (FD) Administrative Distance (AD) and Reported Distance (RD)
5.11. Learner explains the usage of EIGRP and it's metrics

Learning Objectives

5.a. Compare distance vector routing protocols.
5.b. Apply distance vector routing protocols in an Enterprise.
5.c. Design a hierarchical Enterprise network.

6. Identify the features of Link State Routing Protocols

Assessment Strategies

6.1. Written Objective Test

Criteria

Your performance will be successful when:

6.1. Learner lists metrics used by Link State protocols

6.2. Learner demonstrates how Link State protocols are added and appear in routing tables.
6.3. Learner applies the value of the Administrative Distance (AD) to route decisions
6.4. Learner demonstrates how Designated Router is determined.
6.5. Learner defines an autonomous system (AS) and explains its use
6.6. Learner demonstrates usage of wildcard masks in routing statements
6.7. Learner compares Link State routing protocols with Distance Vector routing protocols.
6.8. Learner applies authentication to Link State protocols.

Learning Objectives

6.a. Compare link state routing protocols.
6.b. Apply link state routing protocols in an Enterprise.
6.c. Describe the usage of interior and exterior border protocols.

7. Implement enterprise WAN connections

Assessment Strategies

7.1. Lab Assignment
7.2. Skills Test

Criteria

Your performance will be successful when:

7.1. Learner explains the appropriate use of Circuit Switching, Packet Switching and Cell Switching
7.2. Learner configures a router using layer 2 protocols HDLC and PPP
7.3. Learner configures security authentication using PAP and CHAP
7.4. Learner completes a Frame Relay implementation
7.5. Learner explains the functions of DLCI and LMI in a Frame Relay implementation
7.6. Learner explains the functions of Network Control Protocols (NCP) and Link Control Protocol (LCP)
7.7. Learner understands the purpose of FECN and BECN in a Frame Relay Circuit
7.8. Learner explains the concept of Time Division Multiplexing (TDM)
7.9. Learner describes of the use of Virtual Circuits.
7.10. Learner uses Packet Tracer to simulate lab configurations.

Learning Objectives

7.a. Describe the features of Packet Switching, Circuit Switching, and Cell Switching
7.b. Implement Layer 2 protocols HDLC and PPP.
7.c. Implement security using PAP and CHAP
7.d. Examine Frame Relay features in an enterprise WAN

8. Plan and configure standard and extended access control lists (ACLs)

Assessment Strategies

8.1. Lab Assignment
8.2. Skills Test
8.3. Written Objective Test

Criteria

Your performance will be successful when:

8.1. Learner provides a short definition of an access control list (ACL).
8.2. Learner lists four reasons ACLs are used.
8.3. Learner creates a flowchart illustrating how an ACL evaluates a packet.
8.4. Learner learner lists characteristic and capabilities of standard IP ACLs.
8.5. Learner creates a standard ACL to permit or deny specified traffic.
8.6. Learner applies standard ACL to a router interface and tests to determine whether the desired results were achieved.
8.7. Learner lists characteristic and capabilities of extended IP ACLs.
8.8. Learner creates an extended IP ACL to permit or deny specified traffic.
8.9. Learner applies the extended ACL to a router interface and tests to determine whether the desired results were achieved.
8.10. Learner successfully removes an ACL from a router interface and deletes it from the router.
8.11. Learner successfully creates, applies and tests ACL for specific scenarios.

Learning Objectives

8.a. Explain purpose of access control lists.
8.b. Describe testing of packets with ACLs.
8.c. Explain purpose and function of wildcard mask bits.
8.d. Compare standard and extended access lists.
8.e. Configure standard and extended access lists.

9. Develop tools to monitor network traffic and trouble shooting processes.

Assessment Strategies

9.1. Lab Assignment

Criteria

Your performance will be successful when:

9.1. Learner has completed trouble shooting a PPP problem.
9.2. Learner has completed trouble shooting a CHAP authentication problem.
9.3. Learner has resolved an ACL problem.
9.4. Learner has corrected a RIP version problem.
9.5. Learner has resolved an OSPF problem.
9.6. Learner successfully demonstrated usage of PING and Tracert as trouble shooting utilities.
9.7. Learner successfully used a network monitoring tool, establishing a baseline performance.
9.8. Learner has completed trouble shooting a VLAN problem.
9.9. Learner demonstrated a trouble shooting strategy in problem solving.

Learning Objectives

9.a. Use three layer hierarchical design structure when trouble shooting network problems.
9.b. Use proven trouble shooting techniques such as top-down, bottom-up and divide and conquer.
9.c. Use network monitoring tools to monitor and trouble shoot a network.
9.d. Determine the appropriate uses of a network monitoring tool.