Virginia Western Community College
TEL 251
Internetworking IV

Prerequisites
TEL 250

Course Description
Focuses on the differences between the following WAN services: LAPB, Frame Relay, ISDN/LAP HDLC, PPP, and DDR

Semester Credits: 4   Lecture Hours: 3   Lab/Clinical/Internship Hours: 3

Required Materials

Textbook:
All reading material is located on netacad.com

Other Required Materials:
Packet Tracer Software (available from the class website)

Course Outcomes

At the completion of this course, the student should be able to:

- Describe different WAN technologies and their benefits
- Describe the operations and benefits of virtual private networks (VPNs) and tunneling
- Configure and troubleshoot serial connections
- Configure and troubleshoot broadband connections
- Configure and troubleshoot IPsec tunneling operations
- Monitor and troubleshoot network operations using syslog, SNMP, and NetFlow
- Describe network architectures

Topical Description

- Lesson 01: Hierarchical Network Design
  - Describe the structured engineering principles for networking design.
  - Describe the three layers of a hierarchical network and how they are used in network design.
  - Describe the various modules in network design.
  - Describe the Cisco Enterprise Architecture Model.

- o Describe the need for business network architectures that are designed to address emerging trends in IT.
  - o Describe three business network architectures: borderless network architecture, collaboration network architecture, and the data center/virtualization network architecture.
- Lesson 02: Connecting to the WAN
  - o Describe the purpose of a WAN.
  - o Describe WAN operations.
  - o Describe WAN services available.
  - o Compare various private WAN technologies.
  - o Compare various public WAN technologies.
  - o Select the appropriate WAN protocol and service for a specific network requirement.
- Lesson 03: Point-to-Point Connections
  - o Explain the fundamentals of point-to-point serial communication across a WAN.
  - o Configure HDLC encapsulation on a point-to-point serial link.
  - o Describe the benefits of using PPP over HDLC in a WAN.
  - o Describe the PPP layers architecture and the functions of LCP and NCP.
  - o Explain how a PPP session is established.
  - o Configure PPP encapsulation on a point-to-point serial link.
  - o Configure PPP authentication protocols.
  - o Use show and debug commands to troubleshoot PPP.
- Lesson 04: Frame Relay
  - o Describe the benefits of Frame Relay.
  - o Explain Frame Relay operation.
  - o Explain bandwidth control mechanisms in Frame Relay.
  - o Configure basic Frame Relay PVC on a router serial interface.
  - o Configure point-to-point subinterfaces.
  - o Use show and debug to verify and troubleshoot Frame Relay.
- Lesson 05: Network Address Translation for IPv4
  - o Describe NAT characteristics.
  - o Describe the benefits and drawbacks of NAT.
  - o Configure static NAT using the CLI.
  - o Configure dynamic NAT using the CLI.
  - o Configure PAT using the CLI.
  - o Configure port forwarding using the CLI.
  - o Describe NAT64.
  - o Use show commands to verify NAT operation.
- Lesson 06: Broadband Solutions
  - o Describe the benefits of teleworking solutions.
  - o Describe the requirements for supporting teleworking solution using broadband.
  - o Describe a cable system and cable broadband access.
  - o Describe a DSL system and DSL broadband access.
  - o Describe broadband wireless option.
  - o Select an appropriate broadband solution for a given network requirement.
  - o Describe the operation of Point-to-Point Protocol over Ethernet (PPPoE).
  - o Configure a basic PPP over Ethernet connection on a client router.
- Lesson 07: Securing Site-to-Site Connectivity

- o   Describe benefits of VPN technology.
- o   Describe site-to-site and remote access VPNs.
- o   Describe the purpose and benefits of GRE tunnels.
- o   Configure a site-to-site GRE tunnel.
- o   Describe how IPsec is implemented using the IPsec protocol framework.
- o   Explain how the AnyConnect client and clientless SSL remote access VPN implementations support business requirements.
- o   Compare IPsec and SSL remote access VPNs.
- Lesson 08: Monitoring the Network
  - o   Explain syslog operation.
  - o   Configure syslog to compile messages on a small - to medium-size business network management device.
  - o   Explain SNMP operation.
  - o   Configure SNMP to compile messages on a small - to medium-size business network.
  - o   Describe NetFlow operation.
  - o   Configure NetFlow to monitor traffic in a small - to medium-size business network.
  - o   Explain how NetFlow data is used to examine traffic patterns.
- Lesson 09: Troubleshooting the Network
  - o   Explain how network documentation is developed and used to troubleshoot network issues.
  - o   Describe the general troubleshooting process.
  - o   Compare troubleshooting methods that use a systematic, layered approach.
  - o   Describe troubleshooting tools used to gather and analyze symptoms of network problems.
  - o   Determine the symptoms and causes of network problems using a layered model.
  - o   Troubleshoot a network using the layered model.

Notes to Instructors

- All instructors are to use a combination of Packet Tracer and hands on labs (via classroom equipment or the Netlab+ online lab server)
- Assignments consist of labs, quizzes, chapter tests, skills based exam, and a final exam