Course Description

Concentrates on an introduction to Wide Area Networking (WANs). Includes WAN design, LAPB, Frame Relay, ISDN, HDLC, and PPP. Lecture 3 hours. Laboratory 2 hours. Total 5 hours per week.

General Course Purpose

This course will focuses on Layer 2 and Layer 3 of the OSI Model, Network Address Translation, Dynamic Host Configuration Protocol and Network Management Systems. Extensive lab activities will reinforce router and switch configuration learned from previous modules, using Variable Length Subnet Masking (VLSM) and Classless Inter-Domain Routing (CIDR).

Course Prerequisites/Corequisites

College level reading and writing ability. Prerequisite is ITN 156 – Basic Switching and Routing: Cisco

Course Objectives

Upon completing the course, the student will be able to:

- Describe WAN technologies and services
- Understand key Frame Relay terms and concepts
- List commands to configure Frame Relay, LMIIs, maps and sub interfaces
- List commands to monitor Frame Relay operation in a router
- Understand the different Frame Relay encapsulation
- Identify PPP operations to encapsulate WAN data on Cisco routers
- State relevant use and context for ISDN
- Identify ISDN protocols, functions, groups, reference points and channels
- Construct access control lists to secure a network
- Practice secure router management

Major Topics to be Included

- Wide Area Network Design
- Point-to-Point Protocol (PPP)
- Frame Relay
- Introduction to Network Security
- Access Control Lists
- Broadband Services and VPN
- IP Addressing Services

Student Learning Outcomes

Wide Area Network Design

- Identify and describe WAN switching categories
  - Packet switching: Frame Relay, ATM
  - Circuit switching: Analog, ISDN
- Define Virtual circuits
- Name the different WAN connections
  - Leased line
  - Circuit switching
  - Packet switching
- Cell relay
- Internet

Point-to-Point (PPP)
- Define the proprietary [Cisco] High-level Data Link Control (HDLC) encapsulation
- Configure HDLC on an interface
- Compare HDLC with Point-to-Point encapsulation (PPP, non-proprietary)
- Understand a PPP session
- Enable PPP on an interface
- Use authentication protocol with PPP
  - Password Authentication protocol (PAP)
  - Challenge Handshake Authentication Protocol (CHAP)

Frame Relay
- Identify and describe basic WAN components:
  - Data Communications Equipment (DCE)
  - Data Terminal Unit (DTE)
  - Frame Relay backbone
- Describe a virtual circuit
  - Switched virtual circuit (SVC)
  - Permanent virtual circuit (PVC)
- Match virtual circuits with Data Link Connection Identifier (DLCIs)
- Configure Frame Relay, virtual circuits and Local Management Interface (LMI)
  - Address mapping
  - Subinterfaces: point-to-point, multipoint

Introduction to Network Security
- List and describe the types of network attacks
- Understand the importance of a security policy in protecting network assets
- Identify major categories of security threats
- Enumerate and describe the different techniques to mitigate network attacks
- Configure router security

Access Control Lists
- Understand the role of access control lists (ACLs) in securing a network
- Identify the types of Cisco ACLs
  - Standard ACLs
  - Extended ACLs
    - Numbered ACLs
    - Named ACLs
  - Dynamic ACLs
  - Complex ACLs
- Configure ACLs and apply them to router interfaces

Broadband Services and VPN
- Understand how broadband services support teleworking
- Describe how teleworkers connect to the WAN
  - Dial-up access
  - DSL
  - Cable modem
  - Wireless
  - Satellite
- Understand and describe how VPN supports secure private networks over the Internet

IP Addressing Services
- Identify some solutions to shortage of IP addresses
  - Dynamic Host Configuration Protocol (DHCP)
  - Network Address Translation (NAT)
  - IPv6
- Configure dynamic and static NAT
• Configure IPv6 addresses

**Required Time Allocation per Topic**

In order to standardize the core topics of ITN 157, the following student contact hours per topic are required. Each syllabus should be created to adhere as closely as possible to these allocations. Of course, the topics cannot be followed sequentially. Many topics are taught best if it reflects the current android version. There are normally 60 student contact-hours per semester for a four credit course. (This includes 15 weeks of instruction and does not include the final exam week so 15* 4 = 60 hours. Sections of the course that are given in alternative formats from the standard 16 week section still meet for the same number of contact hours.) The final exam time is not included in the time table. The changes in Android Development are happening so fast that some of the content easily could be less significant soon. So it is really important to include the changes in syllabus. Also, additional topic/ Optional Content, leaves ample time for an instructor to tailor the course to special needs or resources.

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<td>IP Addressing Services</td>
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<td>Testing to include quizzes, tests, and exams (not including final exam)</td>
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