

I. COURSE DESCRIPTION:

- A. Department Information:
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| Division: | Business and Information Technology |
| Department: | Computer Information Technology |
| Course ID: | CIT 094 |
| Course Title: | Fundamentals of WANs, Wide Area Networks , Semester Four
(Cisco Networking Academy) |
| Units: | 3 |
| Lecture: | 2 Hours |
| Laboratory: | 3 Hours |
| Prerequisite: | CIT 093 |
- B. Catalog Description:
This course provides the fundamentals in Wide Area Network topologies, interfaces, protocols, linking technology, frame encapsulation, design, internetworking structure and theory, ISDN and ISDN components, configuration, frame relay, and subinterfaces. Learn through theory and hands-on application in the process of designing, configuring, installing and implementing a Wide Area Network.
- C. Schedule Description:
The fourth semester of the Cisco Academy provides students with classroom and laboratory experience in designing, configuring, installing and implementing a Wide Area Network. It includes but is not limited to WAN topologies, interfaces, protocols, and frame encapsulation.

II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: One

III. EXPECTED OUTCOMES FOR STUDENTS

Upon successful completion of the course, the student will be able to:

- A. demonstrate substantial conceptual understanding of LAN switching, VLANs, LAN Design, Routing Protocols and ACLs.
- B. perform switch and router configurations relevant to switching modes, VLANs, ACLs, DHCP, OSPF, EIGRP, and NAT/PAT.
- C. attain a working knowledge of WAN vocabulary.
- D. explain the relevance of T1 leased lines, Frame Relay, ISDN, and PPP to Wan networks.
- E. perform simple one, two, and three-level (core, distribution, access) WAN designs.
- F. apply the WAN design process a case study.
- G. utilize variable length subnetting and address translation to conserve IP address space for connections to the Internet.
- H. make changes to router configurations to support ULSM & ULAN tracking.
- I. explain the 4-phase PPP session process.
- J. add PPP, PAP, and CHAP to router configurations.
- K. attain a working vocabulary of ISDN technology.
- L. include ISDN in router configuration.
- M. include ISDN in a case study.
- N. achieve a working vocabulary of Frame Relay technology.
- O. attach a router to a Frame Delay Network.
- P. Include Frame Relay in a case study.
- Q. describe WAN-related network management tasks.
- R. answer any OSI-related questions and perform any IP address-related calculations that might appear on any CCNA Exam.
- S. execute complex router configurations using any command covered in the CNAP.

IV. CONTENT

- A. Address Space Conservation
 - 1. Variable Length Subnet Masks
 - 2. DHCP
 - 3. NAT
 - 4. PAT
 - 5. Route Aggregation
 - 6. Route Optimization
- B. WANs
 - 1. Technology
 - 2. WAN Devices
 - 3. How WANs Relate to the OSI Model
 - 4. WAN Encapsulation Formulas
 - 5. WAN Link Options
- C. WAN Design
 - 1. WAN Communication
 - 2. The First Steps in WAN Design
 - 3. How to Identify and Select Networking Capabilities
- D. Point-to-Point Protocol
 - 1. PPP
 - 2. PPP Session Establishment
 - 3. PPP Authentication
- E. Integrated Services Digital Network (ISDN)
 - 1. ISDN
 - 2. How ISDN Relates to the OSI Reference Model
 - 3. ISDN Uses
 - 4. ISDN Services: BRI and PRI
 - 5. ISDN Configuration Tasks
 - 6. Dial-on-Demand Routing
- F. Frame Relay
 - 1. Frame Relay Technology
 - 2. LMI: Cisco's Implementation of Frame Relay
 - 3. LMI Features
 - 4. Frame Relay Subinterfaces
 - 5. The Configuration of Basic Frame Relay
- G. Network Management
 - 1. The Administrative Side of Network Management
 - 2. Monitoring the Network
 - 3. Troubleshooting Networks
- H. Network + Certification
 - 1. OSPF
 - 2. Link-State Protocol fundamentals
 - 3. DR/BDR election
 - 4. Backbone Area
 - 5. Importing routes
- I. CCNA Exam Preparation
 - 1. OSI Model
 - 2. Creating Subnets
 - 3. Router Commands
 - 4. LAN Switching
 - 5. Microsegmentation of a Network
 - 6. Switching Methods

7. The Benefits of Virtual LANs (VLANs)
8. Spanning Tree Protocol
9. Skills Based Sample

V. METHODS OF INSTRUCTION:

- A. Lecture
- B. Web-based Interactive Labs
- C. Demonstration
- D. Web-based Training
- E. Discussion
- F. Group Activity

VI. TYPICAL ASSIGNMENTS:

- A. Web-based Interactive Labs
 1. Using the curriculum's interactive flash capability, create an extended access control list on the simulated router.
 2. Take the interactive quiz related to ISDN and review the appropriate material from the curriculum for any incorrect responses.
- B. Written Assignments
 1. In your engineering journal, record a summary of Frame Relay operation.
 2. Construct a reference table of all acronyms related to PPP, ISDN, and Frame Relay that include their meanings and importance to their particular technologies.

VII. EVALUATION:

- A. Methods of evaluation:
 1. Problem Solving Exercises and Skills Demonstration
 - a. Use the Ping, Tracert, and Telnet troubleshooting tools to solve a connectivity problem between routers in a network.
 - b. Correctly configure the first serial port of a Router for PPP encapsulation with CHAP authentication.
 2. Objective Tests and Written Assignments
 - a. What is the router command to set the ISDN switch type?
 - b. Typical Written Assignment
Describe the ISDN components and the reference points that would be used in a connection from TE2 device to the phone company central office.
 3. Lab Activities
 - a. Examine the configuration of the router lab setup and make changes to switch the appropriate serial ports on Routers from HDLC to PPP encapsulation.
 - b. Typical Lab Activity
Design a 3 level WAN layout for a school district.
- B. Frequency of evaluation:
 1. On-line module examinations as each module is completed; the software provides immediate feedback and review
 2. Group work evaluated weekly
 3. Skill-based final exam
 4. On-line final exam

VIII. TYPICAL TEXT(S)

Cisco Systems, Inc. Cisco Networking Academy Program, CCNA 1 & 2 Companion Guide, Third Edition Indianapolis, IN: Cisco Press, 2003.

San Bernardino Valley College
Curriculum Approved: February 2, 2004
Last Updated: January 2004

Cisco Systems, Inc. Cisco Networking Academy Program, CCNA 1 & 2 Engineering Journal & Workbook, Third Edition Indianapolis, IN: Cisco Press, 2003.

IX. OTHER SUPPLIES REQUIRED OF STUDENTS: Zip disk