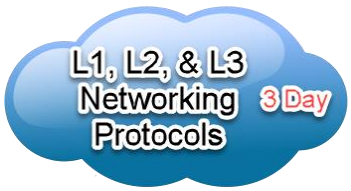

Course Title: L1, L2, and L3 Networking Protocols – 3 Day Hands On Lab Course

Course Description

Knowing the fundamentals of L1, L2, and L3 Networking Protocols is vital to anyone who is in the networking field today, whether it be Application Service Provider, Network Service Provider levels or Enterprise level. This 3-day insightful and revealing course has been designed to focus on the systems approach, the engineering thinking, behind the world of Layer 1, Layer 2, and Layer 3 Networking.

Anyone working in networking today has to be a master the essentials of these protocol layers, and this course will help you to accomplish that knowledge level.

This is an instructor led training (ILT) course that is usually held at a customer location or online with a live instructor.

Course Objectives:

The objectives of the course are to:

1. Develop a "hands-on" skill set targeted at Layer 1, Layer 2 and Layer 3 methods and protocols
2. Learn how to use critical networking tools and methods
3. Improve student job performance by having a more complete and robust understanding of the subject matter
4. Improve customer/cowerker satisfaction by sharing the knowledge and skills to work and troubleshoot the network
5. Deepen networking knowledge and understanding

These objectives are met by covering the necessary technical bases in a straight forward manner, by keep the content in context of the objectives - connecting the dots. Utilizing a short, subject specific architecture with exercises to drive home key points and Hands-On experience that reveal these points builds skills and knowledge based on Bloom's Taxonomy. Presentation is industry current and up-to-date using a technology specialists.

Audience:

The target audience for this course is anyone in the telecommunications field that requires a solid and complete understanding of the fundamental operations of L1, L2 and L3 networking, especially new hires, and desires hands-on skills that can be applied to their job function. Ideal candidates are:

- Central Office Technicians, Engineers, and Supervisors
- Line Technicians, and Customer Service Technicians

- Operations individuals that will provide IP configuration and support services
- Development Engineers that must know TCP/IP networking in order to provide hardware and software solutions
- Network Design Engineers that need to understand TCP/IP services and applications
- Network Management individuals that are providing element and network management tools
- Network Administrators and IT professionals
- Technical sales individuals that must be able to correlate features with functionality
- Technical marketing individuals that want more than just a basic understanding of IP
- Certification Track individuals that need to expand their knowledge and studies

Course Prerequisites:

All students must attend with a lap-top computer in order to interface to the Online School (web browser) and the Lab Systems (Remote Desktop Connection). If the course is held at a classroom where computers are available, the Lap-top computer will not be required.

Course Materials:

Students will be provided with a Course Student Guide and a Lab Guide. Also, a lab system for configuration and labs will be provided.

Course Outline:

Section 1: Establishing The Groundwork

- Overview and Introductions
- Introduction to the Internet
- Access and Applications of IP
- The Layered Model of Networking
- LAB – Layered Model Exercise
- LAB - Getting Set up for the Hands-On Lab Experiments

Section 2: L1 Interface Fundamentals

- Physical Layer Introduction and Overview
- Duplex: Half vs. Full
- Serial vs. Parallel
- Synchronous vs Asynchronous
- Twisted Pair/Fiber Optic Cable
- T1 – V.35
- CSU/DSU
- Ethernet Physical Media
- SFP’s: Copper vs. Fiber

Section 3: L2 Protocol Basics

- Basics of Ethernet Part 1 - Definition of Ethernet Technology, History, Ethernet Versions
- LAB - The Basics of Ethernet - Part 1

- Basics of Ethernet Part 2 - Defining a LAN, Topology Options, Cabling Options
- LAB – Ethernet Topology and Cabling Exercise
- Basics of Ethernet Part 3 - Ethernet MAC Addresses, Learning
- LAB – Ethernet MAC Address Exercise
- Address Resolution Protocol (ARP)
- LAB – ARP Experiment
- Basics of Ethernet Part 4 – Understanding VLANS, 802.1Q Encapsulation, VTP
- Protocol
- LAB – VLAN Experiment
- Basics of Ethernet Part 5 – Spanning Tree Protocol, Gigabit Ethernet
- LAB: Spanning Tree Experiment
- Cisco Discovery Protocol (CDP)
- LAB - CDP Lab

Section 4: L3 IPv4 Addressing and VPN's, and IPv6 Overview

- Layer 3 IPv4 and Addressing
- LAB – IPv4 Addressing Exercise
- IPv4 Subnet Addressing
- LAB – IPv4 Subnetting exercise
- IPv4 Multicast and NAT Operations
- LAB - Demonstration of IPv4 Multicast
- IPv6 Overview
- LAB - Demonstration and Examination of IPv6 with Wireshark

Section 5: L3 Network Control Plane Operations

- IP DHCP and DNS
- Basics of IP Routing
- Interior routing with EIGRP
- LAB – EIGRP Routing
- Exterior routing with BGP
- LAB – BGP Routing

Section 6: Tunneling with L2TP

- Tunneling Definition, Purpose, and Types
- L3 Virtual Private Networking (VPN)
- Secure Delivery of IP Traffic with IPsec
- L2TP Definition, Use Case and Encapsulation
- LAB - L2TP