Certified IP Network Professional

Course Duration: 60 Hours / 10 Days

Main Modules:

Sr. Number	Topic	Duration
1.	IP Networking Fundamentals	3 Days
2.	IPv6	2 Days
3.	MPLS (Multi Protocol Label Switching)	2 Days
4.	IP QoS (Internet Protocol Quality of Service)	1 Day
5.	Mobile IP	1 Day
6.	IMS and IP Multimedia Subsystem	0.5 Day
7.	VoIP	0.5 Day

Course Overview

IP networking fundamentals module covers the basic network functions, technologies, applications, standards, and protocols to tackle advanced networking skills including TCP/IP, Routing Protocols, IP addressing, IPv6, Ethernet, MPLS, Security, VPN, Wireless Broadband, WiFi, LTE, IMS, Unified Communications, Voice over IP (VoIP), Video over IP, SIP, and Diameter.

IPv6 module covers IPv6 management and troubleshooting and a look into network connectivity, tools such as trace route, Ping, Netstat and communications trace functions to test connections and routes for both types of networks.

MPLS module an in-depth overview of MPLS technology, including MPLS theory, architecture, configuration, design issues, operations, troubleshooting, VPN, Traffic Engineering (TE) and GMPLS

IP QoS module describes policy-based QoS architecture which supports infrastructure for delivering QoS based applications. Finally, the course introduces some emerging trends in IP QoS.It explains the techniques, principles and technology associated with implementing IP Quality of Service (QoS). The IETF's Integrated Services standard and accompanying protocols such as RSVP, RTP and RTCP are described, and how RSVP, DiffServ is used as a QoS signaling protocol to request a certain QoS is covered.

Mobile IP module introduces the technical fundamentals of Mobile IP (MIP). Mobile IP is a standard developed by IETF for the purpose of providing macro mobility across a set of different radio access technologies.

IMS module provides an advanced technical overview of IP Multimedia Subsystem (IMS). In this course we will discuss various advanced concepts that are integral to the development of IMS and all IP networks.

VoIP module is a comprehensive VoIP training course for engineering professionals who need an overview and update on VoIP fundamentals, PBX replacement, convergence, carrier services and interconnect, implementation issues and solutions

Who Should Attend?

- IT infrastructure planning, Project implementation and operation engineers and technicians.
- RAN , Core, BSS and Transmission engineers working in engineering or Operations department.
- NOC / NMC engineers working to manage incident at 1st level or 2nd level.
- DSL and Mobile internet engineers and Technicians working in engineering or operations department.
- Managers, Supervisors and Team leads managing teams in IT , RAN, Transmission, BSS and Core department.
- Sales, Marketing and Commercial managers involve in Sales and marketing and budgeting of IMS, VoIP and Internet Solutions.

Detail Course Outline:

1. IP Networking Fundamentals

- Basics of TCP/IP protocol suites
- Switches and routers
- IPv4 Addressing and Subnetting
- IPv6 addressing
- Transport protocols and error control of IP (ICMP, TCP, UDP, SCTP)
- Basic security, NAT and firewall
- Ethernet VLANs and VLAN Trunking (802.1Q)
- Spanning Tree Protocol
- The ARP Protocol
- Gigabit Ethernet: GigE, 10Gbit/s, 40 Gbit/s and 100 Gbit/s
- Frame Relay, PPP, PPPoE Protocols overview
- IP routing protocols such as RIP, EIGRP, BGP and OSPF
- HTTP, HTTPS, FTP, SSH, SNMP, and Telnet application protocols
- Basics of VoIP
- RTP, RTCP and RTSP
- SIP and SDP
- IP QoS
- Multiprotocol Label Switching (MPLS) Services overview
- Layer 3 Virtual Private Networks (VPNs) Services
- Layer 2 VPN – VPLS Services
- Traffic Engineering (TE)

2. IPv6   (Internet Protocol Version 6)

2.1 Introduction to IPv6

- IPv6 Addressing
- Unicast Addresses
- Anycast Addresses
- Multicast Addresses
- 64-bit MAC Address Assignment
- Loopback and Unspecified Addresses
- IPv6 Header Information
- New Header Format
- IPv6 Extension Headers
- ICMPv6 Network Operation
- Neighbor Advertisement
- Router Solicitation
- Router Advertisement
- Routing Services and Protocols
- Routing Protocols Supported by IPv6
- RIPng Protocol
- RIPng Enhancements
- Enabling IPv6 on Windows, Linux, Apple, UNIX and Cisco
- OSPFv3 Protocol
- BGP Protocol
- IBGP and EBGP Neighbors
- Address Family IPv6 Configuration

- IPv6 Access List
- DNS Overview
- DNS infrastructure
- IPv6 Tunneling
- IPSec Tunneling
- Setting up the IPSec6 Tunnel

2.2 IPv6 Configuration

- Configuring IPv6 Addresses
- Configuring IPv6 Default Router
- IPv6 DNS Settings
- Configuring IPv6 RouteTable
- Active Routes
- Address assignment
- Routing support
- DNS support on resource record and transport
- Application support on server
- IPv4 / IPv6 dual routing configuration
- ICMPv6 filtering
- Path MTU Discovery
- Fall back to IPv4 from IPv6
- DNS support on resource record
- Application support on server
- Windows, Mac OS X, Solaris
- FreeBSD, NetBSD, GNU/Linux
- Applications support IPv6

2.3 IPv6 Operation and Maintenance

- IPv6 Addressing
- Static IPv6 Assignment
- DHCPv6 Configuration
- IPv6 Multicast Services
- Connecting to the IPv6 Internet
- IPv6 Multicast Routing
- IPv6 PIM-DM
- Routing Services and Protocols
- Routing Protocols Supported by IPv6
- Key configuration
- IPv6-Enabled Routing Protocols
- Routing with RIPng
- OSPFv3
- Integrated IS-IS
- Multitopology IS-IS for IPv6
- EIGRP for IPv6
- MP-BGP
- Configuring Route Redistribution
- Route Redistribution
- PE-CE Redistribution for Service Providers
- GRE Tunneling

- IPv6 Internal Routing
- Peer Group Configuration
- Route Redistribution
- Route Maps
- BGP Configuration
- IPv6 Access List
- IPSec Tunneling
- IPSec Authentication
- Configuring IPSec authentication
- Advanced Reflexive ACLs
- IPv6 Mobility
- Advanced IS-IS
- ICMPv6 Network Operation
- Neighbor Solicitation
- Neighbor Advertisement
- Router Solicitation
- Router Advertisement
- Testing DNS
- OS IPv6 Configuration
- Windows
- Linux
- BSD
- Mac OS X
- IPv6 device configuration

3. MPLS (Multi Protocol Label Switching)

3.1 What is MPLS?

- Challenges for new IP centric networks
- Limitations of traditional IP networking
- Achieving QoS
- Understanding the fundamentals
- Proprietary approaches to MPLS
- IP Switching (Nokia), IP Navigator (Lucent), Tag Switching (Cisco)
- Basic MPLS operation
- MPLS Terminology
- Forwarding Equivalence Class
- Label encoding, distribution and binding
- MPLS VPNTraffic Engineering (TE)
- MPLS TE

3.2 Label Distribution and signaling

- Routing of LSPs
- Label distribution methods
- RSVP as a label distribution protocol
- MPLS extensions to RSVP

- Label distribution and binding with RSVP
- The Label Distribution Protocol (LDP) and CR-LDP
- LDP operation
- Label Retention modes
- Comparison of RSVP and LDP

3.3 MPLS Architecture

- MPLS Operation
- MPLS Node Architecture
- MPLS Elements
- Loop Survival, Detection, and Prevention in MPLS

3.4 A comparison of Frame Relay, ATM and MPLS

- Integration of IP and ATM
- Challenges Faced by Service Providers
- Frame Relay and MPLS
- Label Ranges and processing
- Label Distribution
- Hybrid Switches
- Multipoint and VC merging
- ATM and MPLS
- Mapping to ATM QoS

3.5 MPLS Traffic Engineering (MPLS-TE)

- Overview of Traffic Engineering
- MPLS Traffic Engineering Elements
- MPLS Traffic Engineering Configuration
- LSP Path determination
- Explicit routes and constraint based routing
- Fast Re-routing: Taking account of Network Failures
- MPLS deployment Edge or Core
- ATM and Traffic Engineering
- Unequal-Cost Load Balancing via Metric Manipulation
- Advantages of MPLS Traffic Engineering

3.6 MPLS Virtual Private Networks (VPN)

- Introducing Virtual Private Networks (VPNs)
- MPLS VPN Architecture
- MPLS VPN Routing Model
- VPN Routing and Forwarding (VRF)
- OSPF as the Routing Protocol Between PE and CE Routers
- BGP as the Routing Protocol Between PE and CE Routers
- EIGRP Between PE and CE Routers

3.7 Advanced MPLs topics

- MPLS Design and Implementation
- Implement MPLS TE
- Real-world MPLS VPNs, TE, and QoS
- Case studies and configuration examples
- Network management issues
- Multiprotocol Lambda Switching
- MPLS VPN Architecture
- Legacy L2 and L3 VPN Overview
- Layer 3 IP VPNs
- MPLS L3 VPN
- L3 VPN Services & Types
- VRF's, Route Distinguishers & Route Targets
- BGP for MPLS L3 VPN
- PE to CE Control Plane & Routing
- RSVP Extention for MPLS TE
- OSPF and IS-IS Enhancement for MPLS TE
- Troubleshooting MPLS L3 VPNs

3.8 Generalized Multiprotocol Label Switching (GMPLS)

- What is GMPLS?
- Generalized MPLS (Formerly MPL(ambda)S)
- Extension of the MPLS Control Plane
- components of GMPLS

4. IP QoS (Internet Protocol Quality of Service)

- Why need any QoS?
- Basic of Quality of Service in Data Networks
- Qos in Data Networks: Protocols and Standards
- QoS in Packet Switched Networks
- Efforts to define QoS
- QoS parameters
- Grade of Service
- Class of Service
- Why QOS?
- Building Blocks of IP QoS
- Congestion
- Provisioning and Supporting QOS
- The QOS Models
- Scope of QOS Service and QOS Domains
- Service Level Agreements (SLAs)
- SLA Monitoring Points
- Applying QoS
- At the Core

- At the Edge
- QoS in Internet today
- How does the Internet provide QoS today?
- What are the limitations with the current QoS strategy
- QoS Requirements
- What are the QoS requirements?
- Challenges for deploying IP QoS
- Policy based QoS architecture
- QoS Models
- Application approach vs. aggregated approach
- Introduction to IP QoS models
- Integrated Services Approach (IntServ)
- Integrated Service approach
- Limitations of the Integrated Services approach
- ReSerVation Protocol (RSVP)
- Differentiated Services Approach (DiffServ)
- Differentiated Services approach
- DiffServ protocol
- DiffServ implementation
- Multiprotocol Label Switching (MPLS) Protocol
- Traffic management functions
- Common Open Policy Standard (COPS)
- Emerging Trends in QoS
- Classification and Marking
- MQC and NBAR for Classification
- Queuing
- FIFO, WFQ, CBWFQ and LLQ
- Class-Based Weighted RED
- QoS Best Practices
- Traffic Classification Best Practices
- Deploying End-to-End QoS

5. Mobile IP

5.1 Introduction to Mobile IP

- What is Mobile IP?
- IP Mobility Support for IPv4
- IP Mobility Support for IPv6
- Mobility Solutions Addressed
- Mobile IP and Cellular Technologies
- Operation of the Mobile IP Protocol

5.2 Mobile IP Principals and Architecture

- Mobile IP Messages and Options
- Mobility Header and Messages Agent Discovery
- Care-of Address (CoA)
- Correspondent Node
- Foreign Agent (FA)

- Home Address
- Home Agent (HA)
- Home Network
- Mobile Node
- Mobility Agent
- Mobility Binding
- Mobility Security Association
- Registration
- Security Parameter Index (SPI)
- Tunnel
- Virtual Network
- Visited Network
- Visitor List
- Message Format and Protocol Extensibility
- IP Mobility Support for IPv4
- Reverse Tunneling for Mobile IP
- Mobile IP Network Access Identifier for IPv4
- Mobile IPv4 Challenge/Response Extensions
- PoP virtual network (PVN)

5.3 Mobile IP AAA Requirements

- What is AAA?
- Authentication, Authorization, and Accounting
- AAA Servers in Home and Local Domains
- Security Associations
- AAA Servers with Mobile IP agents
- IPSec and Internet Key Exchange (IKE)
- Mobile IP with Dynamic IP Addresses
- Firewalls and AAA

5.4 Networking with Mobile IP

- Diameter and Mobile IP interworking
- A Brief Note on Mobile IP Security
- NAT/Firewall traversal of Mobile IP tunnels
- NAPT between Mobile Node and Home Agent
- Firewall Traversal with Mobile IP and AAA
- Redundancy among Home Agents
- Networking solutions with Mobile IP
- Hotspot Areas
- Extranet partners
- Wide Area Solution

6. IMS and IP Multimedia Subsystems

6.1 IMS Business Aspects

- What is IMS?
- The IP Multimedia Subsystem (IMS) is the 3GPP and 3GPP2
- IMS market trends
- IMS in EV-DO, HSPA/HSPA+ and LTE

- Business case and challenges for IMS
- Delivering value added services enabled by IMS
- Mobile content & delivery
- Push To Services
- Converged Voice Services
- Multimedia Messaging
- Conferencing Messaging
- Response Services
- Service roaming
- Open IMS

6.2 Architecture of IP Multimedia Subsystem (IMS)

- Reference architecture
- Application layer
- Service control layer
- Media layer
- Interfaces and Protocols
- CSCF, HSS, MGCF, and MGW
- P-CSCF, I-CSCF and S-CSCF
- BGCF/MGCF
- IMS-MGW
- MRFC/MRFP
- SCIM, OSA-SCS, IM-SSF
- CAMEL Application Part (CAP) specification for IP Multimedia Subsystems (IMS)
- Scenarios in UMTS/HSPA/HSPA+ and EV-DO
- Scenarios in VoLTE
- MME, S-GW, P-GW, PCRF and P-SCSF
- Registration
- Call origination and termination
- Roaming and Handovers
- Supplementary Services
- Session renegotiation

7. VoIP (Voice over Internet Protocol)

- Telephony Terminology
- Public Switched Telephone Network (PSTN)
- Circuit Switched and Packet Switched
- Voice and Video Communications
- VoIP and Next- Generation Services
- Voice Compression
- Performance and voice quality considerations
- Voice & Data Convergence
- The Numbering Plan for Telephony - E.164
- Signaling
- Q.931 Messages
- Signaling System Number 7 (SS7)
- Examples of the SS7 Functions
- SS7 Signaling Architecture
- Challenges In Transitioning to an all VoIP

About Organizer:

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