

IP & MPLS NETWORKS AND SERVICES FOR NON-ENGINEERS

A two-day comprehensive overview and update on today's IP telecom networks and services, from demystifying the network "cloud" to MPLS, service levels, transit and everything inbetween.

The biggest telecom company in the United States (AT&T) and the biggest telecom company in Canada (Bell Canada) recently had us develop customized onsite training courses for their employees. It turned out that both carriers wanted the same set of topics!

When a third carrier requested the same outline, we decided it was time to go public with this new course... **If the biggest in the business think their people need to know this set of topics, we have no doubt many others will benefit from this course... including you!**

This totally new and up-to-date course focuses on the new telecom network: IP and MPLS, bringing both those with knowledge of traditional telecom and newcomers to the field up to speed on the IP/MPLS network, circuits, protocols, services and players.

We'll bust the buzzwords, explain the jargon, mainstream technologies and standard industry practices in plain English. Most importantly, you'll understand the underlying ideas and how it all fits together.

Ensuring you and your team have a solid grounding in the new telecom paradigm: IP and MPLS is essential for productivity, efficiency and accuracy.

This training is an investment in your knowledge base and skill set sure to be repaid many times over. Plus, you will receive detailed, high-quality bound course materials with detailed text notes that will be a valuable reference going forward.

Join us today for this career-enhancing course!

What You Will Learn

- All of the pieces necessary to connect across carrier IP networks end-to-end.
- POPs, MANs, collocation, fiber and copper access
- What a service level or class of service is
- What MPLS is, and how it relates to IP
- How and why MPLS is used as a Quality of Service mechanism
- MPLS services vs. Internet service
- What IP transit is, and the difference between transit and peering
- The OSI Layers, the purpose of each layer and protocols at each layer
- Ethernet, frames, MAC addresses, VLANs and Optical Ethernet
- The basics of VoIP - equipment and protocols
- Jargon, buzzwords, mainstream technologies, fundamental ideas and how it all fits together.

Who Should Attend

Non-network-engineers who need to fill in the gaps and build a solid base in IP/MPLS telecom network fundamentals.

Course Content (High-Level Summary)

Carrier Networks

- Demystifying the "cloud": how circuits and services are actually implemented
- Connecting the Last Mile: POPs, MANs, collocations, fiber and copper

IP Network Services

- Internet service vs. business-quality service
- IP interconnect: transit vs. peering, ISPs, service levels, class of service
- MPLS, QoS, diff-serv, traffic profiles and traffic shaping

Datacom, Networking and VoIP Essentials

- The OSI Layers
- Layer 3 packets and IP addresses vs. Layer 2 frames and MAC addresses
- VoIP basics: equipment and protocols

IP Network Technologies from Fiber to MPLS

- Fiber core, fiber access, DSL and cable
- Ethernet, layer 2 switches and broadcast domains, VLANs, Optical Ethernet
- Packet network services: virtual circuits, MPLS and TCP/IP over MPLS

Here's What Seminar Attendees Like You Are Saying

Hundreds of people like you have benefited from Teracom's training. Many tell us their Teracom course was their best course ever; filled gaps in their knowledge and tied everything together... knowledge they've been needing for years. Here's a sampling of comments from attendees of this course:

"Excellent across the board. Very helpful in the context of my work."

- Douglas Meyer, AT&T

"Excellent. Helpful in understanding AT&T's network & moving traffic from end to end."

- Bill Fitzgerald, AT&T

"Excellent. Seminar provided knowledge base and IP terminology that I was not strong in."

- Jim Stringer, AT&T

"Excellent. Helped me gain a better understanding of networking. As an applications developer, I hear the buzzwords and protocols all the time, but I don't directly use them. The course helped me gain an understanding of things. Instructor was extremely knowledgeable on every topic. He was also able to answer our questions."

- Lisa Revel, AT&T

Whether you work for an organization that produces telecom, datacom or networking products or services; or you buy these products and services - or just have to get up to speed on what all the rest of them are talking about when they say "MPLS service", "MAC frame", "transit", "Optical Ethernet", "VPN" or "Layer 3"...

"Excellent. Filled in many gaps in my knowledge of these topics."

- Andrew Muller, AT&T

"Excellent. Everything I learned over the past four years was brought together."

- John Sierant, Bell Canada

"Excellent. Beneficial. Update and upgrade to my knowledge."

- Alexander Evangelinaras, Bell Canada

"I loved the part where he talked about MPLS and VoIP."

- Irene Beauregard, Bell Canada

"I gained a better global view on technology and interconnect."

- Christian Coulon, Bell Canada

Six Reasons to Take a Teracom Course

Teracom's courses have been taught to wide acclaim across North America since 1992 and are designed for the **non-engineering professional** needing to fill in the gaps, build a solid base of knowledge... and see how it all fits together.

1. Cut through the buzzwords, jargon and vendor hype to gain the big picture view of IP and MPLS you can put to use today ... and into the future.
2. Build the career-enhancing knowledge tools you need to succeed in the new world of IP telecommunications networks and services
3. Build a structural understanding of IP/MPLS networking, allowing you to make meaningful comparisons and informed decisions.
4. Understand mainstream technologies and configurations.
5. Obtain detailed workbooks / textbooks that will serve as a valuable reference for years.
6. Understand how it all fits together.

Develop a structure for understanding technologies and solutions, allowing you to make informed choices and meaningful comparisons -- knowledge you can't get on the job, reading trade magazines or talking to vendors.

Course Schedule

We're constantly adding new dates and locations for public presentations of Teracom's very popular courses to our schedule. To see the latest schedule, please visit our web site at www.teracomtraining.com.

How to Register

Space in our seminars is limited, and may sell out, so please register as early as possible to reserve your place. You can register online or by phone:

- Register online at www.teracomtraining.com.
- Register by phone at 1-877-412-2700.

Once you register online or call us, we'll e-mail you back a registration package, including a confirmation letter for you to sign and fax back to complete your registration.

Tuition Fees	US Courses (US\$)	Canadian Courses
IP & MPLS Networks and Services For Non-Engineers	2 days \$995	C\$995

We accept Visa, MasterCard and American Express, as well as checks and purchase orders.

Your Course Materials: An Invaluable Reference

Every course comes complete with a high-quality comprehensive workbook / textbook that's been called the best on-the-job reference tool around. Written in plain English, this easy-to-use reference includes copies of all graphics PLUS extensive detailed accompanying text.

Topics are organized in logical groups to give you easy reference after the seminar to the practical experience, theoretical background, and unbiased information on industry technologies, products and trends you'll need.

With numerous chapters covering all major topics, you'll obtain an invaluable resource impossible to find anywhere else in one book.

Get a sneak preview of our course materials via the tutorials at www.teracomtraining.com.

FREE! Telecom 101 Textbook

Register for this course today, and you will receive a free electronic copy of Teracom's highly-acclaimed 400-page Telecom 101 textbook, 3rd edition, free!

Course Outline

The first three chapters of the course explain the physical IP network, allowing you to understand and trace all of the pieces of an IP circuit from end to end. We'll begin by demystifying the "cloud" and understand how services are implemented. In Chapter 2, you'll understand the story on the ground: POPs, MANs and the different ways that the last mile of a connection to a customer can be implemented, and how carriers interconnect. Chapter 3 provides a concise review of existing technologies that are still used to implement physical connections for IP services.

1. The “Cloud”, Service Provisioning and Network Equipment

1. Anatomy of a Circuit
2. Carriers' Transmission Networks
3. ... How Circuits are Actually Implemented by Carriers
4. Network Equipment: How and Where Each Is Used
5. ... Routers vs. muxes. vs. switches
6. Summary: How Circuits are Provisioned

2. Carrier Networks and Connections; The Last Mile

1. Mature Competitive Carrier Network
2. POPs and MANs
3. Competitive Carrier –The Last Mile
4. Switched Access
5. Subcontract Dedicated Access to ILEC
6. Colocation: Acting as a CLEC
7. Bypass: Fiber to the Customer

3. Channelized TDM, Digital Hierarchy, T1 and SONET

1. The Digital Hierarchy: DS0-DS3
2. Carrier Systems Overview: T1, T3, SONET, ISDN
3. Channelized Time Division Multiplexing
4. TDM Example: T1 Carrier System
5. Fiber Optics and Fiber Cables
6. SONET and DWDM
7. International Digital Hierarchies

The next part is all about IP-based services, both on the buy side and sell side, wholesale and end-user. You'll understand the key difference between Internet service for an end-user vs. business-quality service for an end-user - and the critical concepts of service level agreement, traffic profile and transmission characteristics. We'll sort out transit vs. peering, how carriers buy and sell at the wholesale level, ISPs, plus VPNs.

4. IP Network Services

1. Categories of Service Providers
 - Facilities-Based Carriers
 - Resellers
 - Application Service Providers
2. Network Services
 - "Internet" Service: Broadband IP Dial Tone
 - Service-Level Agreements and Quality of Service
3. IP Interconnect
4. Interconnect for Business Customer Services vs. Internet
5. Transit vs. Peering
6. Internet Service Providers (ISPs)
7. VPNs
 - Customer-Premise-Based IPsec
 - Network-based IPsec with QoS: "Carrier" VPNs

With an understanding of IP services at a "business" level under our belts, we'll turn to understanding IP and MPLS network technologies, filling gaps and eliminating frustration by building a solid knowledge base. First are two essential fundamentals: packets and frames, IP addresses vs. MAC addresses. Then, we'll cover all of the essential functions in a structured way, with a true understanding of the OSI layers, what each layer does and typical protocols at each layer. At the end of this, you'll understand what someone means when they say "Layer 2" vs. Layer 3 and how Ethernet relates to IP.

5. Datacom and Networking Basics

1. Data Circuits
2. Local Area Networks (LANs)
3. Wide Area Networks: Routers
4. Formatting Data for Communication: Essential Functions
5. Frames
6. Packets
7. Packets and IP Addresses vs. Frames and MAC Addresses
8. IP Packets

6. OSI Layers and Protocol Stacks

1. Protocols and Standards
2. Open Systems vs. Proprietary Solutions
3. Protocol Stacks: The ISO OSI 7-Layer Reference Model
4. Understanding the Layers
5. Understanding How a Protocol Stack Works
6. Key Standards Organizations

At this point, we'll know that a network is Layers 1, 2 and 3 of the OSI model. The next part of the course covers the three layers, filling gaps and explaining key technologies for each. Chapter 7 covers fiber and broadband over copper for access. Chapter 8 covers Ethernet and the essential idea of VLANs and how they are used for Optical Ethernet and "bridged" services. Chapter 9 covers packet network services from carriers and the critical idea of virtual circuits - leading up to understanding MPLS as today's implementation of virtual circuits.

7. Layer 1: Physical Connections

1. Fiber Optics
2. Fiber Access Networks (FTTN, FTTP, PON, EPON and GPON)
3. DSL and VDSL
4. Cable TV Systems
5. LAN Cables – Categories of Twisted Pair

8. Layer 2: Ethernet

1. Ethernet Basics
2. Gigabit Ethernet on Copper
3. Layer 2 Switches and Broadcast Domains
4. VLANs
5. Optical Ethernet

9. Layer 3: Packet Network Services

1. Bandwidth on Demand Service Concepts
2. Virtual Circuits
3. X.25 and Jargon
4. Frame Relay
5. TCP/IP over Frame Relay to implement a WAN
6. QoS Requirements for Voice over IP
7. ATM
8. MPLS
9. TCP/IP over MPLS

The last "network" chapter is all about Quality of Service on a packet network - the idea of buying and selling IP packet communication services backed up by a contract called a Service Level Agreement, guaranteeing transmission characteristics like packet delivery ratio and maximum delay. This is sometimes called Differentiated Services (Diff-Serv in Cisco-speak), and is the exact opposite of "net neutrality". It is implementing prioritization of one type of traffic over another... and it turns out that MPLS is a key mechanism for QoS. You'll end up understanding how MPLS is a traffic management overlay on IP to be able to sell service contracts.

10. QoS

1. Diff-Serv and QoS
2. Implementing Differentiated Services with MPLS
3. Service Level Agreements and Traffic Profiles
4. Traffic Policing and Shaping
5. Queues and How Prioritization is Implemented
6. The "MPLS Service" Quiz

In Chapter 4, we covered VPNs for "data" services. The final chapter in the course is a concise overview of VoIP to round out your knowledge. Without bogging down on vendor specifics, you'll understand the main components and functions of a VoIP system and the SIP protocol.

11. VoIP Components, Jargon and Buzzwords

1. The Big Picture
2. VoIP Components, Jargon and Buzzwords
3. Internet Telephony
4. Softswitches and VoIP PBXs
5. IP Centrex vs. Hosted PBX
6. SIP and the SIP Trapezoid
7. Tracing Call Flow Step-by-Step
8. SIP Trunking vs. PRI

If you've read this far, you know by now that it's not by accident that the biggest carriers in the US and Canada both ordered this course for their personnel. This is the essential fundamental knowledge set needed to be effective and efficient in today's IP-based telecom world. Taking this course will eliminate frustration at not really understanding the jargon and buzzwords at project meetings and in discussions with vendors. This is the knowledge base on which to build project and product-specific details. You will be able to confidently and intelligently contribute, be more accurate and more productive. Get this course today!

Our Goal

Our goal is to bust the buzzwords, demystify jargon, understand technologies and mainstream solutions and - most importantly - the ideas underlying all of this, and how it all works together... knowledge you can't get on the job, talking to vendors or reading trade magazines.

How You Will Benefit

You'll gain a long-lasting, solid base of unbiased career-enhancing knowledge you can build on, an investment sure to be repaid many times over, increasing your confidence and productivity and eliminating jargon- and buzzword-related frustration.

Plus, you will receive a high-quality course workbook – a valuable reference packed with detailed notes, diagrams and practical explanations, with experience, tips and templates you can put to immediate use, as well as a certificate attesting to your IP and MPLS network and service knowledge.

Bring This Course To Your Location

Since 1992, we have provided high-quality on-site training at 3Com, Qualcomm, Intel, Cisco, Nortel, AT&T, Alcatel, Kyocera, T-Mobile, Ericsson/Hewlett-Packard, Verizon, MindSpring, APEX Telecom, Equifax, Transamerica Insurance, CNA Insurance, the US Air Force, Bell Canada, Bell Mobility, Cap Gemini, ComSec Establishment, MicroCell, TDS Telecom, Western Wireless... to name a few.

Onsite training has special advantages:

- Your personnel will be up to a common speed with a solid knowledge base.
- We'll fill in the gaps and put in place productivity-enhancing structured understanding.
- The seminar will be a strong team-building exercise.
- Significant reductions in training costs are often achieved.
- Each student receives a detailed workbook / textbook that will be a valuable reference for years to come.

We have built a solid reputation for delivering high-quality onsite private team-training programs that are a resounding success. Please contact us at 1-877-412-2700 or visit our web site for information on bringing this training to you.

Training on DVD/Video

Teracom's self-paced DVD-video courses: ideal for those who need to learn about telecom, datacom, networking, IP, wireless and VoIP outside of structured seminars. Our current library includes:

- V1 **Fundamentals of Telecom 1:** The PSTN • Telephony • Telecom Equipment • The Telecom Industry
- V2 **Fundamentals of Telecom 2:** Digital Voice • DS0-DS3 • TDM • T1 • T3 • ISDN • SONET • Fiber • DWDM
- V3 **Fundamentals of Datacom and Networking:** WANs and LANs • MAC Frames, IP Packets • Network "Cloud"
- V4 **Understanding Networking 1:** OSI Layers • Protocol Stacks • The FedEx Analogy • IP Addressing, DHCP, NAT • Bandwidth on Demand Services • Frame Relay • ATM • MPLS
- V5 **Understanding Networking 2:** Internet • ISPs • Security • Viruses • Firewalls • Encryption • IPsec • VPNs
- V6 **Understanding Wireless 1:** Wireless Fundamentals • Cellular: CDMA, TDMA, GSM, GPRS • 3G: UMTS, CDMA2000, 1X, 1XEV-DO • Wireless Web
- V8 **Understanding Voice over IP 1:** Components • Standards • Architectures
- V9 **Understanding Voice over IP 2:** Voice Packetization • Quality • Codecs, Jitter, Packet Loss • Diff-Serv • Network QoS with MPLS
- V10 **Understanding Voice over IP 3:** SIP and IP Call Flow • Carrier Interconnect • Megaco

Each course comes with an approx. 2-hour full-color multimedia DVD combining an on-camera instructor, extensive graphics and point-by-point bullets, along with a comprehensive workbook/textbook with copies of all graphics and detailed reference notes sure to be a valuable reference for years to come. It's as close as you can get to private lessons from the Director of the Institute without actually being there. PLUS, each course comes with an online test and certification suitable for framing.

We are offering some very special pricing packages including our core training package (V1-V5) at US\$879 for the set of five courses on DVD with detailed workbooks. Other packages including the full library and individual courses are also available. **Please visit www.teracomtraining.com for full details.**

Compare this to \$500 for *one* course on CD or VHS elsewhere and you'll agree that this is a very good deal.

Hundreds of organizations have purchased our video sets!

Order today to make this invaluable addition to your telecommunications training library.

About the Author



Eric Coll is an international expert in telecommunications, data communications and networking and has been actively involved in the industry since 1983. He holds Bachelor's and Master of Engineering (Electrical) degrees, and is licensed as a Professional Engineer in his home jurisdiction.

Mr. Coll has taught telecommunications technology training seminars to wide acclaim across North America since 1992, and has broad experience working as an engineer in the telecommunications industry.

He has worked for Nortel's R&D labs as a design engineer on projects including digital voice and data communications research and digital network equipment design; on satellite radar systems; Wide Area Network design for HMO applications; and many other projects in capacities ranging from detailed design and implementation to systems engineering, project leader and consultant.