

# Telecommunications for Non-Engineers

Our “core training” in a two-day format: an intensive course covering all major topics in telecom, datacom and networking.

Specifically designed for the non-engineering professional, this course starts at the beginning with fundamentals, progresses in a logical order through popular technologies and finishes at the end with a clear understanding of mainstream solutions... and how everything fits together.

- We bust the buzzwords, explain the jargon, and more importantly, the ideas and concepts behind the jargon: key concept-level knowledge that you can't get on the job, from magazines or vendors.
- Covering the topics in a systematic way, we build *structured knowledge* that lasts a lifetime.

The content, its order and our analogies and explanations have been refined over *twelve years*. This training - and our superb instructors - consistently receives rave reviews on evaluations. Many attendees tell us that this is training they wish they'd had years ago!

<p><b>Course Objectives</b></p> <ul style="list-style-type: none"> <li>• Establish a solid base in the fundamentals of telecom, datacom and networking.</li> <li>• Fill in the gaps. Understand jargon and buzzwords.</li> <li>• Understand mainstream technologies and solutions.</li> <li>• Put a structure in place that project-specific knowledge can be built on in the future.</li> <li>• Understand how it all fits together.</li> <li>• Develop career-enhancing knowledge skills.</li> </ul>	<p><b>Course Content (High-Level Summary)</b></p> <ol style="list-style-type: none"> <li><b>1. Fundamentals of Telephony</b> <ul style="list-style-type: none"> <li>• Loops, trunks, switching; PSTN, POTS, the voiceband</li> </ul> </li> <li><b>2. Telecom Equipment</b> <ul style="list-style-type: none"> <li>• PBX vs. Centrex; IVRs and ACDs for call centers</li> <li>• DSL and Cable</li> </ul> </li> <li><b>3. The Telecommunications Industry</b> <ul style="list-style-type: none"> <li>• LECs and IXC; players, alliances, competition</li> <li>• CLECs and VoIP over DSL</li> </ul> </li> <li><b>4. Digital Communications Concepts</b> <ul style="list-style-type: none"> <li>• PCM and 64 kb/s; DS0-DS3; T1, T3, SONET, ISDN</li> </ul> </li> <li><b>5. How Circuits are Actually Provided</b> <ul style="list-style-type: none"> <li>• TDM, Fiber and SONET backbones; DWDM</li> <li>• Inside the Cloud; muxes vs. switches vs. routers</li> </ul> </li> <li><b>6. Wireless</b> <ul style="list-style-type: none"> <li>• Cellular and Mobility; CDMA vs. TDMA/GSM; 3G</li> <li>• Wi-Fi and Satellite</li> </ul> </li> <li><b>7. Datacom and Networking Basics</b> <ul style="list-style-type: none"> <li>• LANs, frames and MAC Addresses</li> <li>• Packets and networks; IP packets</li> </ul> </li> <li><b>8. Understanding Protocol Stacks</b> <ul style="list-style-type: none"> <li>• Understand the ISO Layers; how a stack works</li> </ul> </li> <li><b>9. IP</b> <ul style="list-style-type: none"> <li>• IP networks, routers and packets</li> <li>• IP addresses: dynamic and DHCP, private and NAT</li> </ul> </li> <li><b>10. IP Networks and Services</b> <ul style="list-style-type: none"> <li>• Bandwidth on Demand concepts</li> <li>• Virtual circuits; MPLS for QoS, VPNs for security</li> <li>• Voice over IP (VoIP) components, jargon, buzzwords</li> </ul> </li> <li><b>11. The Internet</b> <ul style="list-style-type: none"> <li>• Past and present; gap-filling: ISPs, DNS, HTTP; IPv6</li> </ul> </li> <li><b>12. Wrapping Up</b> <ul style="list-style-type: none"> <li>• Technology deployment steps; the Future: IP-PSTN</li> </ul> </li> </ol>
<p><b>Prerequisites</b></p> <p>None</p>	
<p><b>Who should attend</b></p> <ul style="list-style-type: none"> <li>• This course is for those needing to fill in knowledge gaps, understand buzzwords and jargon, popular technologies like T1 and IP, and more importantly, understand the ideas behind these technologies and understand how it all fits together.</li> <li>• Ideal for non-engineers who are in need of a solid knowledge base to be more effective in dealing with technology projects and technical personnel.</li> </ul>	
<p><b>Teracom's reputation</b></p> <ul style="list-style-type: none"> <li>• Since 1992, we have provided high-quality on-site training for non-engineers at 3Com, Cisco, AT&amp;T, Alcatel, Nortel, Teleglobe, Qualcomm... to name a few. We have built a solid reputation for delivering high-quality training programs that are a resounding success.</li> </ul>	

**For more information, call us toll-free: 1-877-412-2700**

## 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 Teracom alumni:

*"Feedback from my team was TERRIFIC. It gave our entire technical Call Center a common foundation, and you seem to have crafted that perfect balance between technical depth, real-world applications, and lively delivery. I couldn't be happier with the results. The things my team learned from this training were applied in real-world situations almost immediately."*

- Rusty Walther, Vice President, Client Services, AboveNet Communications

*"The selection of material - the order of its presentation - the way it was presented... incredibly effective at presenting concepts and ideas - uses great analogies and stays on topic."*

- Susan Lennon, Nortel

*"The seminar delivered exactly what was advertised, at a very high quality.*

*Truth in advertising!" - Gary Lundberg, Copper Mountain Networks*

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 "DS1", "Ethernet frame", "TCP/IP over Frame Relay", "IP VPN" or "firewall"...

*"Best course we have ever had onsite at 3Com"*

*"Perfect content; well organized, well paced, building block approach, resulted in a very nice cathedral" - Jim George, Qualcomm*

*"Course was excellent! One of the best I have taken. Extremely well organized and presented. Seminar workbook is outstanding - a very valuable reference" - Kieran Delaney, Maritime Life*

*"I liked most the use of analogies to explain complex concepts. It delivered exactly what the brochure promoted. Gave me a thorough understanding so I feel more confident."*

- Judith Myers, Ameritech

*"Excellent! Tied the individual pieces of knowledge together into a picture... was interactive and built up the knowledge layers properly." - Jim Geiss, Qwest*

*"Filled in a lot of gaps in my knowledge of networking... able to deliver the knowledge effectively and entertainingly. Excellent seminar"- Kirk Kroeker, IEEE Computer Society*

*"Great information that I will be able to use at work. Very easy to understand all the information especially the IP networking part. I wouldn't change a thing"*

- Orlando Jasso, AboveNet Communications.

*"Layman's terms with humor was very relaxing - helped me concentrate... understanding is now CLEAR ... the manual will be very helpful" - Linda Côté, Bell Canada*

*"Best instructor I have had on a course - excellent explainer in layman terms, not techie terms"*

- Susan Coleman, Bell Sygma

*"Best course materials ever; the full text descriptions are invaluable. Course filled in so many gaps for me. Bravo!" - Ross Brooks, Vertek*

*"Outstanding! The best I've encountered, and I've attended many seminars."*

- Bob Gibbons, WMX Technologies

## Detailed Course Description

The goal of this course is to bust the buzzwords, cut through the jargon and doubletalk to fill in gaps, put in place a structured understanding of telecom, datacom, IP and networking... and how it all fits together. In plain English. We'll start at the beginning of the story, progress through key concepts in a logical order, and finish at the end.

### 1. Fundamentals of Telephony

Whether you're interested in telecom, datacom, wireless, Wide Area Networking or Voice over IP, everything begins with the Public Switched Telephone Network and Plain Ordinary Telephone Service. We'll begin with a model for the PSTN, explaining analog circuits and circuit switching, as well as common telephony buzzwords and jargon, and an overview of SS7.

- A. History of Telecommunications
- B. The Public Switched Telephone Network (PSTN)
- C. Analog Circuits
- D. What is Sound?
- E. The Voiceband
- F. Plain Ordinary Telephone Service (POTS)
- G. DTMF Address Signaling
- H. Signaling System 7 (SS7)

### 2. Telecom Equipment

We'll round out the fundamentals of Chapter 1 with a practical overview of different types of equipment that can be connected to the telephone network. Without bogging down on details, we'll sort out switches, PBXs, ACDs, IVRs, Call Centers and include a discussion of DSL and how it is provided... so you can understand how CLECs could provide VoIP over DSL telephone service in the next chapter. We'll compare and contrast DSL vs. Cable for broadband.

- A. Telephone Switches
- B. PBXs vs. Centrex
- C. Voice VPNs
- D. Call Centers: IVRs and ACDs
- E. Modems
- F. DSL Technologies: Beyond the Voiceband
- G. DSL Equipment
- H. Cable TV Distribution
- I. Cable Modems

### 3. The Telecommunications Industry

With a basic technology framework in place, we'll review the telecommunications business, including players, alliances and competition and understand how each organization fits into the picture. We'll understand why the LECs are buying the IXC's and understand CLECs and what they can do.

- A. Local Exchange Carriers (LECs)
- B. PSTN Switching Centers Before Competition
- C. Accessing the Inter-Exchange Carriers (IXCs)
- D. Competitive Local Exchange Carriers (CLECs)

### 4. Digital Communications Concepts

Drilling into technology a bit, we'll understand what "digital" is and the traditional method of implementing it. We'll understand how voice is digitized, the standard way of doing that (DS0s and the 64 kb/s rate) and the DS0-DS3 digital hierarchy, plus a practical overview of technologies that implement this: T1, T3, SONET and ISDN.

- A. Why Digital?
- B. Analog and Digital: What Do We Really Mean?
- C. Voice Digitization (Analog-Digital Conversion)
- D. The Digital Hierarchy: DS0-DS3
- E. Carrier Systems Overview: T1, T3, SONET, ISDN
- F. Digital Circuit Applications
- G. Integration: Voice, Video, Data

## 5. How Circuits are Actually Provided

In this chapter, you will understand the equipment and configurations carriers actually use to provide services. You will understand how Time-Division Multiplexing (TDM) implements channels, how SONET does this on fiber optics, what a SONET ring is and Wave-Division Multiplexing. Then, you will understand how edge equipment – multiplexers, switches and routers connect users to the SONET fiber backbone, and how each type of equipment allocates capacity to users in a different way.

- A. Establishing the Hierarchy: Time Division Multiplexing
- B. TDM Example: The T1 Carrier System
- C. Fiber Optics
- D. SONET and DWDM: “Backbone” Transmission Networks
- E. Anatomy of a Digital Circuit
- F. Common Carriers' Transmission Networks
- G. ... How Circuits are Actually Implemented by Carriers
- H. Network Equipment: How and Where Each Is Used
- I. ... Routers vs. muxes. vs. switches
- J. Summary: How Circuits are Actually Provided

## 6. Wireless Communications

We'll round out your knowledge of telecom with wireless. We'll concentrate on mobile communications, explaining jargon and buzzwords, the idea of cellular, different cellular technologies, including analog, PCS and 3G, and understand CDMA vs. TDMA/GSM. We'll conclude with an overview of Wi-Fi and satellite communications.

- A. Wireless
- B. Mobile Networks and Cellular Concepts
- C. First Generation: AMPS
- D. Digital Cellular
- E. CDMA vs. TDMA/GSM
- F. 3G
- G. 4G: LTE
- H. Wireless LANs and Wi-Fi
- I. Satellite Communications

## 7. Datacom and Networking Basics

The second part of the course is devoted to packets and bandwidth-on-demand. As this has traditionally been associated with data, we'll begin with datacom and networking basics, exploring practical examples of circuit and network configurations. With this framework in place, you'll be able to categorize and compare different types of equipment and circuit configurations, and be ready to understand Voice over IP.

- A. Data Communications Basics: Bits and Bytes
- B. Data Circuit Model: DTEs and DCEs
- C. Ethernet LANs
- D. Frames and MAC Addresses
- E. Packets and Networks
- F. IP Packets
- G. Packets vs. Frames

## 8. Understanding Protocol Stacks

Understanding how the OSI Layers allow us to discuss separate issues separately, what a protocol stack is and how it works is necessary to be able to understand Voice (and everything else) over IP. Here, you will really understand what a layer is, the purpose of each, examples of a stack of protocols implementing all of the layers, and how the stack works.

- A. Protocols and Standards
- B. Protocol Stacks: The ISO OSI Reference Model
- C. Understanding the Layers
- D. Understanding How a Protocol Stack Works
- E. Key Standards Organizations

## 9. IP

The remainder of the course is all about IP. The first topic is IP addresses and routers. We'll explain this in plain English starting with the simplest implementation: an IP network built with dedicated lines. You'll understand IP address classes, dynamic addresses and DHCP, private addresses and Network Address Translators – and how routers route packets from one computer to another over a WAN.

- A. Review: Integrating Applications on High-Speed Circuits
- B. Statistical Multiplexing
- C. IP Routers and IP Packets
- D. IP Address Classes
- E. Dotted-Decimal Notation
- F. Dynamic Addresses and DHCP
- G. Private Addresses and NAT

## 10. IP Networks and Services: MPLS, QoS, VPNs and Voice over IP (VoIP)

With IP basics in place, we'll understand WANs using bandwidth-on-demand services from carriers. We'll cover the critical concept of virtual circuits, and survey technologies including Frame Relay, ATM and IP/MPLS. You'll understand how MPLS can be used for QoS and how VPNs assure secure communications. Then, we'll understand the "killer app": Voice over IP, with an overview of VoIP operation, equipment, jargon and buzzwords.

- A. Bandwidth on Demand Service Concepts
- B. Virtual Circuit Technologies
- C. Technology Roundup
- D. MPLS
- E. IP VPNs
- F. Voice over Bandwidth on Demand Services
- G. Voice over IP

## 11. The Internet

Let's not forget the Internet! In this chapter, we'll understand where this came from and what it is today. We'll fill in gaps in details like ISPs, TCP, the Domain Name System, HTML, HTTP and secure web pages, browsers and servers, and complete the picture with a discussion of current issues including IPv6.

- A. Internet History: A network to survive nuclear war
- B. Internet Fundamentals: connectionless, unreliable service; routing tables
- C. Internet Service Providers (ISPs)
- D. Commonly Used Internet Protocols
- E. TCP
- F. Domain Name System
- G. The World Wide Web, HTML and HTTP
- H. Browsers and Servers
- I. Current Internet Issues

## 12. Wrapping Up

The final chapter brings all of the concepts together with a top-down review. You'll learn valuable insight into how technology *should* be deployed, and review mainstream services and solutions. We'll conclude with a view toward the future: the IP Packet-Switched Telecommunications Network where telephone service, cable TV, web surfing and email are all IP-based services delivered over a single broadband connection.

- A. Top-Down Review
- B. Technology Deployment Steps
- C. Review: Circuits and Services
- D. Access Circuit / Network Service Cross-Reference Matrix
- E. The IP-PSTN

## Training on DVD/Video

Teracom's self-paced DVD and 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: Telephony and the PSTN; Telecom Industry; Telecom Equipment
- V2 Fundamentals of Telecom 2: Analog and Digital; DS0-DS3; TDM; T1, T3, ISDN, SONET, Fiber
- V3 Fundamentals of Data Communications: Frames and Packets; Protocol Stacks; OSI Model
- V4 Understanding Networking 1: Routers, Private Networks; X.25, Frame Relay, ATM, IP VPNs
- V5 Understanding Networking 2: The Internet, WWW, Firewalls and Security
- DVD6 Understanding Wireless 1: Analog vs. Digital; Cellular; CDMA, TDMA, GSM/GPRS; 3G, wireless web
- DVD8 Voice over IP 1: The Many Flavors of VoIP - Advantages, Challenges, Potential Issues
- DVD9 Voice over IP 2: Protocols, Standards, Buzzwords - Voice Quality - Codecs - Compression
- DVD10 Voice over IP 3: VoIP on WANs - QoS - Centrex VoIP and PBX - VoIP in the Call Center

Each course comes with an approx. 2-hour full-color VHS video or DVD and a comprehensive workbook/textbook with copies of all graphics and detailed reference notes sure to be a valuable reference for years to come. PLUS, a knowledge evaluation exercise and personalized course completion certificate signed by Eric C. Coll, M.Eng., P.Eng., Director of the Institute and suitable for framing.

We are offering some very special pricing packages:

- Our core training package (V1-V5) is US\$879 for the set of five courses on VHS with detailed workbooks.
- A second core training package (V1-V5 and DVD6) is US\$995 for six courses with detailed workbooks.
- The VoIP courses (DVD8-DVD10) are US\$695 for the set of three VoIP courses on DVD with workbooks.
- Other packages including the full library and individual courses are also available.

Compare this to \$500 for *one* course on VHS elsewhere, and you'll agree that this is a very good deal. PLUS, our courses are up-to-date, authoritative, and packed with information. Add to this the high-quality workbook/textbook for each course, the exercises and certificate suitable for framing...

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## 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.

## 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.