

# FUNDAMENTALS OF TELECOM

*A high-level two-day course covering all major topics in broadband, telecom, datacom and networking... in plain English.*

Course 122 *Fundamentals of Telecom* is our famous BOOT CAMP condensed into a two-day telecom course, designed for non-engineering professionals who need to understand telecom jargon and buzzwords, and get up to speed on broadband, telecom, datacom and networking at a high level.

Totally up to date with broadband Internet and the converged IP telecom network in the front seat, ending with upcoming 5G IoT applications like supply chain tracking and smart cities, the topics in this course represent the current knowledge set necessary in telecom today.

Thousands of people from organizations including CIA, NSA, IRS, FAA and FBI, Cisco, Intel and Microsoft, all branches of US Armed Forces, DND, AT&T, Verizon, Bell Canada, Wells Fargo, TD Bank, the World Bank, Oneida Tableware, the San Francisco Giants and hundreds of others who needed to be more effective in understanding and dealing with telecom and networking technology have benefited from this training.

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.

This core training - and our superb instructors - consistently receive rave reviews on evaluations. Covering the topics in a systematic way, we build structured knowledge that lasts a lifetime. 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 today's broadband telecom, datacom and networking.</li> <li>• 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 Overview</b></p> <p><b>The Core Knowledge Set</b></p> <ul style="list-style-type: none"> <li>• Today's broadband converged IP telecom network: network core, last-mile access, and interconnect</li> <li>• Telecom fundamentals: pulses, modems, multiplexing</li> <li>• Network fundamentals: IP packets and MAC frames</li> <li>• The Internet and ISPs; browsers and apps</li> <li>• Web Services, Cloud Computing and Data Centers</li> <li>• Residential, Business and Wholesale Services</li> <li>• Internet Exchanges, POPs and Toll Centers</li> </ul> <p><b>Telecom Technologies, Equipment and Connections</b></p> <ul style="list-style-type: none"> <li>• Wireless: Cellular, 4G, 5G, Mobile Internet, Wi-Fi, Satellite</li> <li>• Fiber fundamentals, WDM, Optical Ethernet, PONs</li> <li>• Copper: POTS, DSL, Cable Modems</li> <li>• Network equipment: routers and switches</li> <li>• Internet Exchanges, Toll Centers and CLECs</li> <li>• VoIP Phone System components and operation</li> </ul> <p><b>5G and IoT</b></p> <ul style="list-style-type: none"> <li>• Low bit-rate, low-power wireless everywhere</li> <li>• Supply chain trackers, smart cities</li> <li>• High bit-rate, ultra-reliable for VR, highway platoons</li> </ul>
<p><b>Prerequisites</b></p> <p>None</p>	
<p><b>Who should attend</b></p> <ul style="list-style-type: none"> <li>• Those needing to get up to speed on telecom technologies, networks, services and players... and how it all fits together.</li> <li>• Anyone needing to understand and get on top of all the telecom jargon and buzzwords.</li> <li>• Managers and decision-makers needing to understand what the "techies" are telling them.</li> <li>• Those wanting a 2-day version of our training, skipping the more technical discussions.</li> <li>• Ideal for non-engineering professionals in need of a high-level understanding of telecom and networks to be more effective in dealing with technology projects, budgets and technical personnel.</li> </ul>	

Register online at [www.teracomtraining.com](http://www.teracomtraining.com) or call us toll-free: 1-877-412-2700

## **Demystify Buzzwords and Jargon**

One of the biggest challenges in telecommunications is dealing with all of the acronyms, abbreviations, jargon and buzzwords.

The list goes on and on: Broadband, Ethernet, TCP/IP, SIP trunking, OSI, Layer 2, VoIP, Hosted PBX, DSL, OE, PRI, ILEC, POP, MAN, Wi-Fi, LAN, WAN ...

It can be very frustrating sitting in meetings with these terms flying around and not understanding most of them... particularly when someone asks your opinion.

Plus, there is a second-order problem: even if you were to figure out all of the current jargon and buzzwords, there will surely be more next month!

The solution? Understand the fundamentals. Take the cover off the box and see what it does and how it works. Doing this, you'll find out there are only four or five fundamental ideas in telecom, with ongoing incremental improvement in each area.

## **Understand the Fundamentals**

Once you understand the fundamentals, not only will the buzzwords and jargon be demystified, you'll have a solid knowledge base. In the future, if you're not familiar with the exact product someone is discussing, you'll still know what they are talking about.

We'll begin with a big-picture view, identifying the different parts of the network, understanding how circuits are implemented by carriers, how carriers interconnect, and the residential, business and wholesale services.

We'll make sure everyone is starting at the same level, with telecom essentials like how bits are represented using pulses on fiber and LAN cables, how bits are represented using modems on wireless and coax systems, and the different kinds of multiplexing.

Without bogging down on details, you'll learn the mechanics of the broadband converged telecom network: IP packets carried in MAC frames, and how phone calls, television, images and text are digitized and carried in the IP packets.

## **Understand the Technologies: Wireless, Fiber and Copper**

With the fundamentals in place, we'll understand the technologies for communicating over radio, fiber and copper wires, and the mainstream technologies in each area.

In the wireless chapter, we'll start with spectrum, then you'll learn the components and operation of a mobile cellular network, 4G LTE and 5G, mobile internet, fixed wireless broadband internet, Wi-Fi and satellites.

We'll understand Optical Ethernet, Fiber to the Premise and PONs. You'll also learn how DSL and Cable modems on copper.

You'll learn the kinds of equipment used, what each does, and how it all interconnects for phone calls and Internet traffic.

Taking this course to understand the fundamental ideas and mainstream technologies puts you back in control, with the confidence to contribute effectively.

## **Understand the Network**

In the not-too-distant future, the Internet and the Public Telephone Network will become the same thing, and all communications including phone calls, television and internet traffic will be in IP packets. Taking this course, you'll fill the gaps in your knowledge of IP and packet networks.

You'll also learn how networks are actually constructed, and how all of the players: the phone company (the ILEC), mobile operators, cable operators, long-distance and bulk carriers all connect.

## **Understand Cloud Computing and Data Centers**

Cloud computing and data centers are a mammoth business and one of the biggest growth areas in the telecom area today. We'll what a web server is, how it serves web pages to clients, and how back-end processing is needed to do transactions and database operations like finding your bank balance and creating a web page to display it.

Then you'll learn how the computing power necessary to support thousands or millions of users doing this is implemented in Data Centers with Cloud Computing infrastructure to allow scalability and fault-tolerance... and how this service is sold as "Web Services" by the likes of Amazon's AWS and Microsoft Azure.

## **Learn VoIP**

Without bogging down on details, we'll identify all the components of a VoIP phone system, what each does, and the differences between VoIP over the Internet, VoIP in carrier networks and VoIP in business telephone systems.

## **5G and IoT**

We'll finish off with 5G applications. First, low bite-rate, low power services for IoT, and examples of applications like temperature sensors in shipping containers, garbage containers that notify when they are full and flush detection to protect seniors. At the other end of the scale, we'll see how high bit-rate, ultra-reliable communications will be used for "VR anywhere" and highway platooning.

## **Gain Vendor-Independent Knowledge You Can Build On**

The knowledge you gain taking this renowned training course is vendor-independent foundational knowledge in telecommunications, networks, IP, packets, fiber, wireless: fundamentals, technologies, standard practices, and how it all fits together.

Not only will it eliminate buzzword frustration, the cost of this training will be repaid in improved accuracy and productivity gain many times over.

Teracom's proven instructor-led training courses have been developed and refined over many years providing training for organizations including AT&T, Verizon, Bell Canada, Intel, Microsoft, Cisco, Qualcomm, the CIA, NSA, IRS, FAA, US Army, Navy, Marines and Air Force and hundreds of others... and are totally updated for the 2020s.

Register today to get this career-enhancing addition to your knowledge skills!

## Here's What Seminar Attendees Like You Are Saying

Hundreds of people like you have benefited from Teracom's core training. Many tell us this was their best course ever; filled gaps in their knowledge and tied everything together... knowledge they've been needing for years. Others on course their first week on the job remarked "what a wonderful way to get started in the business."

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

*"Excellent! I learned a lot - everyday terms, definitions, and acronyms. Seminar notebook very helpful. The instructor was the best I ever had - lots of knowledge and experience and stories were GREAT."*

- Serena Laursen, Microsoft

*"Thank you for conducting a very successful course last week. It was both informative and interesting and you were able to find the perfect balance of sharing deep knowledge, provide relatable examples and lighten it up with great humor. The feedback that we have received has been extremely positive."*

- Charlotte Kaheru, International Finance Corporation, World Bank

*"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 "SIP trunking", "Ethernet", "MAC frame", "5G, MPLS, VPN, Data Center, Cloud Computing..."

*"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, AT&T

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

*"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

*"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

## Six Reasons to Take This 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. Totally up to date for the 2020s!

1. Cut through the buzzwords, jargon and vendor hype to gain a structured understanding of telecommunications and networking, allowing you to make meaningful comparisons and informed decisions... knowledge skills you can put to use today and in the future.
2. Get up to speed on the latest developments and trends. This course is totally up to date with SIP trunking, VoIP, 4G, 5G, Optical Ethernet, MPLS, Data Centers, Cloud Computing and IoT, providing far more benefit than outdated courses.
3. Eliminate buzzword frustration, be more confident, more accurate and more productive.
4. Learn more with instructor-led training – the best kind of training you can get – where you can interact and ask questions, with instructors consistently rated “excellent” on student evaluations.
5. Obtain course books with detailed text notes that will serve as a valuable reference for years.
6. Understand how it all fits together.

Develop a foundation and structured knowledge 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... an investment that will be repaid many times over.

## Course Schedule

We're constantly adding new dates. To see the latest schedule, please visit [teracomtraining.com](http://teracomtraining.com). Or have us come to you for a private on-site seminar!

## How to Register

Space in our seminars is limited, and may sell out, so please register as early as possible to reserve your place. Register online at [teracomtraining.com](http://teracomtraining.com), or call us at 1-877-412-2700. You will receive a registration package with full details plus a confirmation letter to sign and return.

## Free Bonuses! Eight Online Courses and TCO CTNS Certification

The TCO Certified Telecommunications Network Specialist (CTNS) Certification Package, with its eight online courses and exams is included as a free bonus with Course 122. The online courses are an excellent way to take a second pass the topics, and include additional pictures of equipment and discussion. If you choose to write the optional exams, you can also earn the TCO CTNS certification, complete with certificate suitable for framing and letter of reference.

## Your Course Materials: An Invaluable Reference

*No-one expects anyone to learn all of this in one shot!* For self-study and day-to-day reference, every course comes with a high-quality printed color course book 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 text notes.

Topics are organized in logical groups to give you easy reference to the practical experience, theoretical background, and unbiased information on industry technologies, products and trends you will 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 the course materials via the tutorials at [www.teracomtraining.com](http://www.teracomtraining.com).

## Detailed Course Outline

*Fundamentals of Telecom* is Teracom's famous 5-day *BOOT CAMP* condensed into two days by keeping the most necessary and interesting topics and skipping the more technical discussions to fit into a two-day format.

This course is designed for non-engineering professionals who need to understand telecom jargon and get up to speed on broadband, telecom, datacom and networking at a high level.

Our philosophy is: start at the beginning. Understand the fundamental ideas. Understand mainstream technologies that implement these ideas. Learn the acronyms, abbreviations and jargon. Get an unbiased big-picture view that will give you the knowledge you need to ask the right questions, make meaningful comparisons and informed decisions.

Our goal is to eliminate frustration, increase confidence, accuracy and productivity by building a solid vendor-independent knowledge base that has both immediate and long-term value.

### Part 1: Fundamentals

The first part of Course 122 is five chapters that cover the fundamentals of telecom, filling gaps, explaining concepts and establishing a solid knowledge base. First is a high-level pass with a big-picture view and introducing all of the course topics. Then we progress in a logical order: how telecom circuits are provisioned by carriers, telecom fundamentals, followed by IP packet network fundamentals. Then you'll learn about the Internet as a business: ISPs, web service providers like AWS and Azure, cloud computing and data centers. We'll finish with a roundup of where the money is: telecom services with recurring billing in the residential, business and wholesale categories.

#### 1. Introduction to Broadband Converged IP Telecommunications

We begin with a comprehensive big-picture introduction to today's telecom: the concepts of convergence and broadband, the modern telecom network, the parts of the network, the three key technologies: Ethernet, IP and MPLS, what they are and what each does. You'll learn how a circuit is implemented end-to-end, and identify today's standard residential, business and wholesale services.

- A. History of Telecommunications
- B. Convergence
- C. Broadband
- D. Today's Telecom Network
- E. Network Core
- F. Ethernet, IP and MPLS
- G. Network Access: The Last Mile
- H. Network Edge: Connecting the Access to the Core
- I. Carrier Interconnect for PSTN and Internet
- J. Residential, Business and Wholesale Services

## 2. Telecom Fundamentals

Next, we'll ensure you have a solid foundation in the fundamental ideas of telecom: the elements of a circuit; terminals, clients, servers and peers; how bits are represented on fiber, copper and radio. Then we'll understand how capacity is shared to carry many users' traffic on common facilities: Frequency Division Multiplexing, Time Division Multiplexing, and overbooking and Bandwidth on Demand.

- A. Circuits
- B. Terminals: Clients, Servers and Peers
- C. Representing Bits on Digital Circuits: Pulses
- D. Representing Bits in Frequency Channels: Modems
- E. Serial and Parallel
- F. Sharing: FDM on Radio, CATV and Fiber
- G. Sharing: Channelized TDM
- H. Bandwidth on Demand: Efficient Sharing

## 3. Network Fundamentals

In this chapter, we'll ensure you also have a solid foundation in the fundamentals and jargon of today's converged telecom network – much of which was formerly called data communications. Without bogging down on details, we'll review circuit configurations and understand how routers implement a network by relaying packets from one circuit to another. You'll speed on IP packets, Ethernet and MAC frames, and what TCP does and what MPLS labels are for.

- A. Unbalanced Configuration: CATV, PON, WiFi, CAN-BUS
- B. Balanced Configuration: LANs and Ethernet
- C. Frames and MAC Addresses
- D. Networks, Packets and IP Addresses
- E. IP Packets in MAC Frames
- F. IP Packets
- G. TCP, UDP and Port Numbers
- H. MPLS Labels

## 4. The Internet, Cloud Computing and Data Centers

The Internet, which started out as a way to send text email messages, is now worldwide converged broadband communications. In this chapter, we'll understand what exactly an Internet Service Provider does, and how they get packets delivered world-wide. We'll review web clients, browsers and apps, web servers, then understand the huge business of web services, cloud computing and data centers.

- A. A Network to Survive Nuclear War
- B. Internet Service Providers (ISPs)
- C. Web Clients: Browsers and Apps
- D. Web Servers: HTTP, HTTPS, HTML
- E. Web Services
- F. Cloud Computing and AWS
- G. Data Centers
- H. Net Neutrality

## 5. Telecom Services

No foundation in telecom would be complete without understanding where the money is: services with recurring billing. We'll organize services into Residential, Business and Wholesale, and identify today's standard choices and offerings in each area.

- A. Residential
  1. Broadband Internet
  2. POTS & PSTN Phone Calls
  3. VoIP Internet Telephone Service
  4. "Basic Cable" and Video on Demand
- B. Business
  1. Internet with Security, DNS
  2. "MPLS Services" and MPLS VPNs
  3. Internet VPNs
  4. SD-WAN
  5. Centrex
  6. SIP Trunking
  7. PRI & PBX Trunking
- C. Wholesale
  1. Bulk: Dark Fiber, Wavelengths, Carrier Ethernet
  2. Internet Transit
  3. Content Delivery Networks (CDN)

## Part 2: Telecom Technologies, Equipment and Connections

The second part of the course is three chapters on technologies for transmitting information from one place to another: wireless, fiber and copper, followed by a chapter on telecom equipment and carrier connections, then finishing with a comprehensive overview of VoIP: Voice over IP and SIP.

You'll learn about wireless spectrum, mobile network components and operation, LTE, 5G, Wi-Fi and satellites. We'll cover optical basics, DWDM and how networks are built with point-to-point fibers. We'll review copper-wire technologies: DSL and POTS on twisted pair, Hybrid Fiber-Coax cable TV systems. You'll see the types of telecom equipment, and learn how the Internet is actually physically implemented, along with POPs in toll centers, and CLECs. You'll understand how VoIP phone calls are set up with SIP, and what SIP Trunking does.

## 6. Wireless

In this chapter, you will learn all about wireless transmission. We'll identify the components and basic principles of operation of a mobile network. You'll learn how mobile to PSTN phone calls "voice minutes" are connected, how mobile Internet "data plan" works, as well as roaming and virtual operators. You'll learn about 4G LTE and 5G, plus fixed wireless broadband internet. We'll cover WiFi and the latest 802.11ax standard, and finish with satellite communications.

- A. Radio Fundamentals
- B. Mobile Network Components and Operation
- C. Cellular and Handoffs
- D. PSTN Phone Calls using the Phone App ("Voice Minutes")
- E. Mobile Internet ("Data Plan")
- F. Mobile Operators, MVNOs and Roaming
- G. 4G LTE
- H. 5G New Radio (NR)
- I. WiFi: Wireless LANs & 802.11 Standards
- J. LEO and GEO Satellite



## 7. Fiber

The core of the converged network is routers connected point-to-point to other routers with fiber. Telephone companies that used to pull copper access wires to every home in a suburb are investing to pull an access fiber to every home. In this chapter, we'll cover the basics of fiber, the makeup of fiber cables, wavelengths and WDM. You'll understand how Optical Ethernet is used to actually implement the fiber connections, and how OE is used in the core, in metro areas, and fiber to the premise via Passive Optical Networks (PONs).

- A. Optical Basics
- B. Fiber and Cable Construction
- C. Wave-Division Multiplexing: CWDM and DWDM
- D. Optical Ethernet
- E. Metropolitan Area Network
- F. Fiber to the Premise
  - 1. Passive Optical Network (PON)
  - 2. Active Optical Network

## 8. Copper

In this chapter, we'll understand how DSL broadband service runs on twisted pairs put in place for analog POTS telephone service; how cable modems move broadband on coaxial cable; and how both are delivered as fiber to the neighborhood then copper to the premise.

- A. Twisted Pair Loops
  - 1. The Public Switched Telephone Network (PSTN)
  - 2. Plain Ordinary Telephone Service (POTS)
  - 3. DSL and VDSL2
  - 4. Fiber to the Node + DSL to the Premise
- B. Hybrid Fiber-Coax
  - 1. CATV: Fiber to the Node + Coax to the Premise
  - 2. Cable Modems

## 9. Equipment, Carriers and Interconnect

To allow communications between customers of different carriers, the carriers must implement physical connections between their networks. In this chapter, we'll understand the equipment used, and you'll learn how the Internet is actually implemented, with peering and transit agreements at Internet Exchanges. You will also learn about POPs in toll centers: how and where the phone company, mobile providers and CATV connect together and to other carriers for phone calls with a PSTN phone number. You'll also learn where a CLEC fits into the picture with equipment collocated in wire centers.

- A. Broadband Network Equipment: Routers and Ethernet Switches
- B. Broadband Customer Premise Equipment
- C. CO Switches, PBXs and Remotes
- D. IX: Interconnect for Internet Traffic
- E. Toll Center: Interconnect for PSTN Telephone Calls
- F. Switched Access and POPs
- G. COs and Wire Centers
- H. CLEC: Local Competition – Collocation plus ILEC Dark Fiber

## 10. VoIP Components, Systems, Standards, Jargon and Buzzwords

In this chapter, we'll demystify VoIP jargon and buzzwords, what the components of a VoIP phone systems are, and what each does: soft switches, media servers, gateways and terminals, plus the main standards and protocols used in VoIP systems. You'll learn how Internet VoIP connects to the PSTN, and we'll bring everything together tracing a VoIP phone call starting on a laptop, over the classroom WiFi to the Internet, and then to the cellular carrier to a cellphone in the class. To finish the course, the last lesson is "where this is headed": what will people have as basic "telephone" service 20 years from now.

- A. The Big Picture
- B. VoIP System Components
  - 1. Terminals
  - 2. Voice in IP Packets
  - 3. Softswitches / SIP Servers / Call Managers
  - 4. Media Servers and Unified Messaging
  - 5. Gateways
  - 6. LANs and WANs
- C. Key VoIP Standards
- D. Internet Telephony: Computer-Computer VoIP over Internet
- E. Internet to PSTN e.g. Skype Minutes
- F. Class Exercise: Trace a Phone Call from Laptop to Cellphone
- G. Where This is All Headed: Broadband IP Dial Tone

## Part 3: 5G and IoT Applications

To wrap up the course, we'll explore the upcoming explosion of devices and systems using low bit-rate, low-power 5G wireless services, with examples of applications ranging from temperature sensors in shipping containers and garbage containers that notify when they are full, to flush detection to protect seniors. At the other end of the scale, we'll see how high bit-rate, ultra-reliable communications will be used for "VR anywhere" and highway platooning.

### 11. 5G and IoT: Smart Cities and Supply Chain Tracking to VR Anywhere and Platoons

- A. 5G Design Goals and Use Cases
- B. New Radio: New Spectrum Allocations
- C. The Internet of Things (not)
- D. Communications for Things
- E. A Computer in Everything
- F. Smart Cities: Intelligent Traffic Management Systems
- G. Smart Cities: Parking, Trash
- H. Asset Tracking and Monitoring
- I. Metering and Monitoring
- J. Millimeter-Wave Bands: Ultra-Broadband
- K. VR Anywhere
- L. Highway Traffic Management and Platooning

## Bring This Course to Your Location

Since 1992, we have provided high-quality on-site training in telecommunications for non-engineering professionals at AT&T, Verizon, Bell Canada, TELUS, Qualcomm, 3Com, Cisco, Intel, Alcatel, Nortel, Teleglobe, the NSA, Defense Information Systems Agency, US Coast Guard, US Air Force, Office of Naval Intelligence, MindSpring, APEX Telecom, Equifax, Transamerica Insurance, The Hartford, American Broadband, Cap Gemini, ComSec Establishment, MicroCell Telecom, TDS Telecom, Kyocera, Winstar, Western Wireless, US Cellular, Ericsson/Hewlett-Packard, Entergy, Intelsat, RangeTel, Alltel, Vertek, DSCI, Cox Cable, Florida Power and Light, Frontier Communications, Western Iowa Telephone, Genuity, LG Electronics, Panasonic, SouthEast Telephone, State of Nebraska, State of Montana, Tektronix, Bermuda Telecom, UTS and the Universal Service Administrative Company... to name a few. Plus, we have a GSA contract with pre-approved government pricing.

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 of telecom and networking fundamentals, wireless, TCP/IP, MPLS, VoIP... to meet your requirements.
- 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.
- Pre- and post-training testing is available, including team results on a spreadsheet

We have built a solid reputation for delivering high-quality private team-training programs that are a resounding success. We'd like to do the same for you! Please contact us at 1-877-412-2700 for more information.

## 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 of Engineering and Master of Engineering (Electrical) degrees.

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 telecom network equipment design, and on satellite radar systems, consulting on Wide Area Network design, and many other projects in capacities ranging from detailed design and implementation to systems engineering, project leader and consultant.

In addition to being founder and Director of Teracom Training Institute, Mr.

Coll provides consulting to the telecommunications industry, specializing in telecommunications technology R&D and as a Subject Matter Expert in tax matters.

## Online Courses

Get up to speed and build a solid base of knowledge in telecom, datacom, networking, IP, MPLS and wireless... with certification to prove it. Based on Teracom's proven instructor-led training courses developed and refined over twenty years providing training for organizations including AT&T, Verizon, Bell Canada, Intel, Microsoft, Cisco, Qualcomm, the CIA, NSA, IRS, FAA, US Army, Navy, Marines and Air Force and hundreds of others, Teracom online courses are top-notch, top-quality and right up to date with the topics and knowledge you need.

Many of Teracom self-paced online telecom training courses are a full multimedia experience. The text spoken by the instructor is displayed on the right side of the screen while animated diagrams, pictures, bullets and video are displayed on the left. Each lesson in a course has several parts, followed by informal quiz questions to ensure key points are understood. Every course includes a full-color course completion certificate suitable for framing.

Take advantage of these courses for individual learning, or for an entire organization. The scalable myTeracom Learning Management System can register and manage all of your people, and generate management reports showing progress and scores with the click of a button.

You can also select individual courses, or select from other packages of discounted courses as best meets your learning needs.

We've partnered with the Telecommunications Certification Organization for certifications. Register for a Certification Package, complete the courses and exams, and earn TCO Certification, with diploma, personalized Letter of Introduction / Letter of Reference explaining your knowledge skills, and more.

## TCO Telecommunications Certifications

Upgrade your knowledge – and your résumé – with high-quality telecom training courses by Teracom Training Institute plus TCO Certification from the Telecommunications Certification Organization.

### [Certified Telecommunications Network Specialist \(CTNS\)](#)

The internationally-recognized CTNS Certification is the core network knowledge required by anyone serious in the telecom world today.

### [Certified Telecommunications Analyst \(CTA\)](#)

The prestigious TCO Certified Telecommunications Analyst CTA Certification is the most comprehensive telecommunications certification available, demonstrating to employers that the holder has broad and deep telecom, datacom and network knowledge.

### [Certified VoIP Analyst \(CVA\)](#)

CVA covers all aspects of Voice over IP, including all the different ways VoIP is implemented, how calls are set up with softswitches and SIP, how voice is packetized and the factors affecting sound quality, connecting to carriers and SIP trunking, and network quality with MPLS, Service Level Agreements and Class of Service.

### [Certified Wireless Analyst \(CWA\)](#)

TCO Certified Wireless Analyst Certification covers the core technical knowledge needed by anyone serious in the wireless business today, full range of wireless technologies including radio and spectrum fundamentals, mobile communications concepts and network technologies, as well as WiFi and other fixed wireless.

### [Certified Telecommunications Subject Matter Expert \(CTSME\)](#)

The TCO Certified Telecommunications Subject Matter Expert (CTSME) is the most comprehensive telecom, datacom, networking, wireless, VoIP and SIP training and certification available anywhere. CTSME encompasses four TCO Certifications: CTA, CVA, CWA and CTNS. You get all four certifications, with their courses, bundled with a discount in the CTSME Certification Package.

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