



# Broadband Voice over Internet Protocol

## B - VoIP TECHNICIAN, Competencies:

### 1.0 HISTORY – TELEPHONE COMMUNICATIONS

- 1.1 Generate a chronology of the major steps leading to modern telephone communications
- 1.2 List major events in telephone history and their corresponding dates
- 1.3 Diagram a PSTN system
- 1.4 Name and describe major sections of a simple phone system
- 1.5 Outline the power requirements for PSTN systems
- 1.6 Name the hardware components required for a PSTN and a B-VoIP System

### 2.0 BASIC PSTN (PUBLIC SWITCHED TELEPHONE NETWORKS)

- 2.1 Describe the power requirements for PSTN and compare full power with downtime levels
- 2.2 Identify hardware components used in the Central Office, distribution plant and end user location
- 2.3 List PSTN services currently offered by commercial telephone providers

### 3.0 INTERNET AND WORLD WIDE WEB

- 3.1 Outline major events in the history of the Internet and World Wide Web
- 3.2 Describe how the Internet and WWW operate
- 3.3 Define IPv4 and explain its application
- 3.4 Compare URL/IRL and describe their usage
- 3.5 Explain HTTP (Hypertext Transfer Protocol) and show where it is used

### 4.0 DIGITAL FUNDAMENTALS – SWITCHING TECHNIQUES

- 4.1 Explain the purpose and location of the SSP (Service Switching Point)
- 4.2 Describe Common Channel Signaling System 7
- 4.3 Explain the purpose and location of the STP (Signal Transfer Point)
- 4.4 Explain the purpose and location of the SCP (Service Control Point)
- 4.5 Explain the reasons for Sampling, Quantizing, and Encrypting B-VoIP signals
- 4.6 Define and compare Baud/Bit/Byte
- 4.7 Compare a Datagram with common PSTN signals
- 4.8 Contrast a Virtual Circuit with a discrete wired circuit
- 4.9 Contrast the difference between Segmentation and Reassembly (SAR) of telephone signals

### 5.0 CODECS (CODER/DECODER)

Summarize the purposes of each of the following standards and explain the need for each:

- 5.1 Audio Standards
- 5.2 Video Standards
- 5.3 G.711a, u
- 5.4 G.729
- 5.5 G.726
- 5.6 CLEP
- 5.7 H.261
- 5.8 H.263
- 5.9 H.264
- 5.10 Describe a codec hybrid
- 5.11 CELP (Code Excited Linear Prediction)
- 5.12 Describe how digital and analog converters accomplish their tasks and how analog to digital converters work

### 6.0 LANS – LOCAL AREA NETWORKS

Define the following and locate where in a phone circuit or network they are used:

- 6.1 Bridges
- 6.2 Gateways
- 6.3 Routers
- 6.4 Hubs
- 6.5 Servers
- 6.6 Summarize how Ethernet10/100Base-T are used in networks and compare with other types of cabling
- 6.7 Describe what the TIA/EIA-568.B Commercial Building Standard codes are and their importance to telecom technicians

## **7.0 WANS – WIDE AREA NETWORKS**

- 7.1 Define connection and connectionless network configurations
- 7.2 Define a connection oriented network
- 7.3 Compare topologies currently in use in computer networks
- 7.4 Define telecom switches and demonstrate knowledge of PSTN and digital network switches
- 7.5 Explain the need for network management
- 7.6 Name common Classes of Service and show advantages of each

## **8.0 NETWORK INTERWORKING**

- 8.1 Define 'IP' and explain its need
- 8.2 Define 'Ethernet' and explain how it differs from other interconnection systems
- 8.3 Define 'ATM' (Asynchronous Transfer Mode) and describe how it is used
- 8.4 Explain the purpose of Frame Relay and describe its purpose and benefits
- 8.5 Explain the purpose of MPLS (Multiprotocol Label Switching) and show where it is used
- 8.6 Explain Service Interworking
- 8.7 List the seven (7) OSI layers and define their specific functions and features

## **9.0 BROADBAND A/V/D SCHEMES**

- 9.1 Summarize the purposes of broadband communication and explain advantages over narrowband communication
- 9.2 Dramatize the current needs for wide bandwidth and give examples of modern usage
- 9.3 Define 'bandwidth' and compare for audio/video/data transmission applications and the advantages of various bandwidth sizes

## **10.0 MODULATION**

- 10.1 Distinguish between the major modulation schemes currently in use
- 10.2 Match common acronyms associated with B-VoIP technology and their definitions
- 10.3 Describe PCM (Pulse Code Modulation)
- 10.4 Describe DPCM (Digital Pulse Code Modulation)
- 10.5 Describe DWDM (Dense Wavelength Division Multiplexing)

## **11.0 TRANSMISSION MEDIA**

- 11.1 Classify copper telecommunication cables, comparing bandwidths and common usage
- 11.2 Explain the advantages of coaxial cables, compare types and describe termination fittings
- 11.3 Illustrate a D connector and explain where it is commonly used in telecommunication systems
- 11.4 Describe fiber optic cabling and list advantages over copper cables
- 11.5 Explain why and where wireless telephone communication is preferred

## **12.0 VoIP SERVICES**

- 12.1 Compare common PSTN audio phone conversation technology with VoIP service and list advantages
- 12.2 Compare common PSTN video signaling with VoIP and list advantages of VoIP
- 12.3 Compare common PSTN data signaling with VoIP and list advantages of VoIP

### **13.0 QoS - REAL TIME APPLICATIONS**

- 13.1 Discuss human opinion when judging Quality of Service and compare with other objective measurement methods
- 13.2 Define 'latency' as it applies to telephone signals
- 13.3 Define 'jitter' as it applies to telephone signals

### **14.0 VoIP NETWORK ARCHITECTURES**

- 14.1 Illustrate a LAN (Local Area Network) and describe how it differs from a WAN (Wide Area Network)
- 14.2 List common broadband signal transmissions and compare with narrowband and PSTN (i.e., PSTN @ 3 kHz, TV station @ 6 kHz, multiplexed data packets @ 100 MHz)
- 14.3 Name common types of broadband services currently in use
- 14.4 Describe the Internet system and explain how it functions within the wired and wireless worldwide telephone online system
- 14.5 Define 'domains' as related to telephone networks
- 14.6 Define 'client' in the VoIP system

### **15.0 PROTOCOLS**

- 15.1 Describe the applications of the Transmission Control Protocol (TCP) within the protocol suite and why it is needed
- 15.2 Define User Datagram Protocol (UDP), explain its purpose and advantages as a datagram delivery process
- 15.3 Define IP (Internet Protocol), its origin and purpose

### **16.0 CONTROL PROTOCOLS – IP TRANSPORT**

- 16.1 Describe H.245, its origination, purpose and where commonly used
- 16.2 Describe 'Megaco', its purpose, length of existence and where commonly used
- 16.3 Define 'MGCP' (Media Gateway Control Protocol) and explain its common usage
- 16.4 Explain the purpose of RTP (Real-time Transport Protocol)
- 16.5 Explain the purpose of RSVP (Resource Reservation Protocol)

### **17.0 ADDRESS PROTOCOLS**

- 17.1 Define NAT (Network Address Translation)
- 17.2 Identify the four (4) host classes of an IP address
- 17.3 Describe network & host addresses (I.D.s) and their bit range relation to the host classes
- 17.4 DHCP (Dynamic Host Configuration Protocol)

### **18.0 VoIP SIGNALING PROTOCOLS**

Differentiate between the following signaling protocols and explain the purpose of each in VoIP application:

- 18.1 SIP (Session Initiation Protocol)
- 18.2 SAP (Service Advertising Protocol)
- 18.3 H.323
- 18.4 SDP (Session Description Protocol)
- 18.5 H.931

### **19.0 CABLING STANDARDS**

Explain the purposes and requirements of the following cabling and communications standards in relation to VoIP applications:

- 19.1 TIA/EIA-568
- 19.2 TIA/EIA-569
- 19.3 TIA/EIA 570A (Residential Telecom Cabling Standard)
- 19.4 IEEE 802

## **20.0 NETWORK PROVISIONING**

- 20.1 Describe the mechanics of PSTN Gateways
- 20.2 Explain the purpose of Media Gateways and how they packetize information
- 20.3 Describe a Proxy Server and explain its purpose

## **21.0 USER AGENT PROVISIONING**

- 21.1 Describe the difference between IP and PSTN phones
- 21.2 Explain the purposes of the analog telephone adapter
- 21.3 Define UAC (User Agent Client) and how it is used
- 21.4 Describe the ITU's T-120 standard for multiple user participation

## **22.0 SOFTPHONE PROVISIONING**

- 22.1 Describe the process a computer uses to interface with phone lines

## **23.0 SAFETY**

Describe the following Safety related standards:

- 23.1 ANSI/TIA/EIA 607
- 23.2 CSA T527
- 23.3 NFPA 70
- 23.4 ISO/IEC 1180

## **24.0 TROUBLESHOOTING**

Explain the following troubleshooting processes:

- 24.1 Trouble Analysis
- 24.2 Minimum cable tests for networking protocols:
  - 24.2.1 Wire mapping
  - 24.2.2 Length
  - 24.2.3 Attenuation
  - 24.2.4 NEXT
  - 24.2.5 Propagation delay
  - 24.2.6 Delay skew
  - 24.2.7 PS-NEXT
  - 24.2.8 ELFNEXT
  - 24.2.9 PS-ELFNEXT
  - 24.2.10 Return loss
- 24.3 Testing Nics:
  - 24.3.1 Data packets and link pulses
- 24.4 Network utilities:
  - 24.4.1 Ipcinfg
  - 24.4.2 Ping
- 24.5 Systematically using network utilities to test your network

### **End of B - VoIP Technician Competencies Listings (with 24 major Categories)**

**Find An ETA Approved School Site:**  
[http://www.eta-i.org/eta\\_schools.html](http://www.eta-i.org/eta_schools.html)

**Find An ETA Test Site:**  
<http://www.eta-i.org/testing.html>

## Suggested Study Materials:

**BVoIP Convergence**; ISBN 1-58122-089-8; Max Main; eITPREP-2007; Available through ETA at 800-288-3824 or [eta@eta-i.org](mailto:eta@eta-i.org)

**Understanding Voice Over IP Technology**; ISBN 978-1435427273; Wittenberg; Delmar/Cengage-2009

**VoIP Technologies: A comprehensive guide to VoIP**; ISBN 978-0980107401; Nortel Networks; Nortel Press-2008

**Voice over IP (VoIP) Essentials - Student Guide, V6.0p**; ISBN 074230194X; [www.computerprep.com](http://www.computerprep.com); UK edition

## Legacy Common Telecom Acronyms

- |  |   |
|--|---|
| 1. PBX (Private Branch Exchange)   | 9. MTA/BTA (Mobile/Business Transaction Authority)      |
| 2. PSTN (Public Switched Telephone Network)                                | 10. ANSI (American National Standards Institute)        |
| 3. PCS (Personal Communication Service)                                    | 11. NEC (National Electric Code)                        |
| 4. TDMA/CDMA (Time/Code Division Multiple Access)                          | 12. UTP (Universal Transmission Protocol)               |
| 5. AMPS (Advanced Mobile Phone Service)                                    | 13. ATM (Asynchronous Transfer Mode)                    |
| 6. TIA/EIA (Telecom/Electronic Industry Assoc.)                            | 14. ASCII (American Standard Code for Info Interchange) |
| 7. ISDN (Integrated Service Digital Network)                               | 15. TI/EI (Text/Electronic information)                 |
| 8. 2G/3G/4G (2 <sup>nd</sup> /3 <sup>rd</sup> /4 <sup>th</sup> Generation) | 16. DSL (Digital Subscriber Line)                       |

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