

Broadband Voice over Internet Protocol

B - VoIP TECHNICIAN, Competencies – 2007



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 Ethernet 10/100Base-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

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

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; UK edition

(The following short list of acronyms and the development team's email addresses are not part of the official competencies, but are provided here for internet use.)

Legacy Common Telecom Acronyms

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

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