



## **B - VoIP TECHNICIAN, Competencies – 2006a** (Broadband Voice over Internet Protocol)

### **1. 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

### **2. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. 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. Softphone Provisioning**

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

## **23. 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. 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 B-VoIP Competencies]

*(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
2. PSTN
3. PCS
4. TDMA/CDMA
5. AMPS
6. TIA/EIA
7. ISDN
8. 2G/3G
9. MTA/BTA
10. ANSI
11. NEC
12. UTP
13. ATM
14. ASCII
15. TI/EI
16. DSL

(A separate level of certification is proposed called B-VoIP **Installer**. Work will begin on the Installer level competencies and examination in the future.

**Thanks to the entire SME (Subject Matter Expert) panel of volunteers for their dedication and combined efforts in developing the B-VoIP Competencies and current examination pool:**

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