



EUCIP - IT Administrator

Module 4 - Expert Network Use

Version 2.0

Module 4 Goals

Module 4 The Module **Expert Network Use** requires the candidate to know the various ways of communication, interconnectivity between LANs and advanced data communications, in order to choose the best solution for his/her company. Furthermore, he/she should be able to diagnose and repair network communication problems that may occur. The candidate should be capable of recognising the different solutions that can be used for data communication, so that he/she can choose the best way to cover his company needs.

Category	Knowledge Area	Ref.	Knowledge Item
4.1. Networking: a historical introduction	4.1.1 Architectures	4.1.1.1	From hierarchical to distributed systems; the client-server approach
	4.1.2 Communication protocols	4.1.2.1	De facto and de jure standards: the TCP/IP suite and the OSI model; standard organizations (CCITT, ITU-TS, IEEE, ISO, IAB)
4.2. The OSI reference model	4.2.1 Description of the reference model layers	4.2.1.1	Illustrate the purpose of the layered reference model (principle of encapsulation and service access points in layer models). Know the main standard organisations, such as CCITT, ITU-TS, IEEE, ISO and IAB. Also know the domain they are focusing.
		4.2.1.2	Describe the aim of the different layers (physical, data link, network, transport, session, presentation, and application)
		4.2.1.3	Describe the main aspects of protocols (error control, session management, flow control, ...)
		4.2.1.4	Be aware of the differences between ISO/OSI model and real word protocols as TCP/IP
4.3. Physical Layer	4.3.1 Data types and signalling	4.3.1.1	Describe the properties of analog and digital signals
		4.3.1.2	Distinguish bits and bytes in digital binary signals
	4.3.2 Data transmission	4.3.2.1	Illustrate the main bounded (copper cables and fiber-optic cables) and unbounded (microwave, radio, infrared, laser, satellite) media
		4.3.2.2	Describe structured cabling systems (behaviour, use and benefits), components (plug, sockets, patch-cords, racks, etc.), and non-certificated add-ons
		4.3.2.3	Illustrate the main network topologies (bus, star, ring, tree)
		4.3.2.4	Distinguish communication modes (simplex, half-duplex, full duplex) and transmission types (asynchronous, synchronous, serial, parallel).

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		4.3.2.5	Be aware of the terms start bit, stop bit, parity and data bit. Also know where they are being used. Be aware of the terms SYNC, STX, ETX, ACK and NACK. Also know where they are used
		4.3.2.6	Define channels and bandwidths
	4.3.3 Ethernet	4.3.3.1	Describe Ethernet systems: data transmission rates, transmission media, and maximum lengths and nodes
	4.3.4 Token ring	4.3.4.1	Illustrate the token ring architecture (topology, physical layer media and data transmission rates)
	4.3.5 Fiber Distributed Data Interface (FDDI)	4.3.5.1	Describe a FDDI network system (structure, data rate and distance limits)
	4.3.6 Asynchronous Transfer Mode (ATM) and Frame Relay.	4.3.6.1	Indicate the range of data transmission rates in ATM systems and Frame Relay systems
	4.3.7 Wireless LAN	4.3.7.1	Indicate the transmission media and techniques for wireless communications (infrared, spread spectrum, narrowband microwave) and their range of operation. Also know problem of radiowave spreading.
		4.3.7.2	Know interoperability tips in wireless broadband systems(WiFi and WiMAX standards, bluetooth, 802.11, 802.16 and 802.20).
	4.3.8 Networking: repeaters and hubs	4.3.8.1	Describe the function of a hub and a repeater
4.4. Datalink layer	4.4.1 General	4.4.1.1	Describe circuit and packet switching concepts
		4.4.1.2	Explain the CSMA/CD operations
		4.4.1.3	Describe the access to a token ring: medium access control protocol, pros and cons of a token passing system
		4.4.1.4	Illustrate the medium access control in a FDDI system
		4.4.1.5	Distinguish packets from cells and frames
	4.4.2 Asynchronous Transfer Mode (ATM) and Frame Relay.	4.4.2.1	Define ATM logical connections (transmission path, virtual path, virtual channel)
		4.4.2.2	Define Frame Relay logical connections (virtual circuit, permanent virtual circuit, datalink connection identifier, multilink frame relay, aggregated virtual circuit)
		4.4.2.3	Illustrate the ATM layer functions (switching, multiplexing, routing, congestion management)

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		4.4.2.4	Illustrate the FR layer functions (switching, multiplexing, routing, congestion management)
	4.4.3 PPP	4.4.3.1	Describe the purposes and the operations of PPP, and the differences between PPP and SLIP
	4.4.4 VLAN	4.4.4.1	Define what a VLAN can do at logical level.
	4.4.5 Bridges and switches	4.4.5.1	Describe the function of a switch and a bridge
4.5. Network layer	4.5.1 Network protocols	4.5.1.1	Explain the purpose of an addressing system
		4.5.1.2	Illustrate the aims of IP protocol
	4.5.2 Support protocols	4.5.2.1	List the functions of ICMP, DHCP, and ARP protocols
	4.5.3 IP addressing	4.5.3.1	Describe the IP addressing scheme, the relationship between IP addresses and network classes, subnetting and CIDR concepts
	4.5.4 Internetworking	4.5.4.1	Describe routing needs and functions
	4.5.5 Networking devices: routers and layer-3 switches	4.5.5.1	Distinguish logical from physical addresses
		4.5.5.2	Describe the aims of a router, and the function of a layer-3 switch
4.6. Transport layer	4.6.1 Transport layer basics	4.6.1.1	Give a definition of port, well-known-port, and connection
	4.6.2 Transport layer protocols	4.6.2.1	Describe the purposes of TCP protocol, its main mechanisms (PAR, flow control, multiplexing, urgent data signalling, etc.), and the features of UDP protocol underlining its differences from TCP
		4.6.2.2	Describe main principles of Apple sharing services (AFP,...)
		4.6.2.3	Comparison between different protocols and their interoperability
	4.6.3 VLAN	4.6.3.1	Define what a VLAN is and list its pros and cons
	4.6.4 Transport security	4.6.4.1	Illustrate the purposes of Network Address Translation (NAT) and Port Address Translation (PAT). Also know different naming (SNAT, DNAT, ...)
		4.6.4.2	Illustrate the purposes of (address) proxy
		4.6.4.3	Explain the aim of a firewall and its functions
4.7 Session layer	4.7.1 Session establishment: parameter negotiation	4.7.1.1	RAS & PPP/SLIP negotiation phase hints
		4.7.1.2	DHCP negotiation hints

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4.8 Presentation layer	4.8.1 Data coding standards	4.8.1.1	Know ASCII, ANSI and UNICODE standards, the ASCII limits on national languages (concept of character set), computers internal data encoding (binary files vs. text files, text files EOL encoding in DOS/Windows, Apple and Unix/Linux system), and computers internal number encoding (big endian vs. low endian, canonical representation)
	4.8.2 MIME protocol	4.8.2.1	MIME protocol as a way to manage different objects.
	4.8.3 Other non binary formats	4.8.3.1	List compressed formats (HQX, BIN), the purposes of file compression and the main standards for known platforms (ZIP, GZ, ARC for DOS/Windows; SIT, CPT for Macintosh; GZ, Z, TAR, ZIP for Unix)
4.9. Applications	4.9.1 Network applications: TELNET and FTP	4.9.1.1	Illustrate the purposes of TELNET
		4.9.1.2	Describe the purposes of FTP protocol
		4.9.1.3	Describe the purposes of DHCP and TFTP protocols
	4.9.2 Remote resources on the Web	4.9.2.1	Give the definition of URL
		4.9.2.2	Illustrate the aim and the operations of Domain Name System (DNS)
		4.9.2.3	Describe the purposes of HTTP and HTTPS protocols
		4.9.2.4	Know CGI and applets main aspects.
		4.9.2.5	Explain cookies, their benefits and dangers
		4.9.2.6	Describe http content-type headers vs MIME standard
		4.9.2.7	Describe the aim of main markup languages (HTML, SGML, XML, CSS, XSL) and style sheet
		4.9.2.8	Illustrate the purposes of a gateway
	4.9.3 Electronic mail	4.9.3.1	Describe SMTP and its components (sender, protocol, receiver)
		4.9.3.2	Describe e-mail addresses structure
		4.9.3.3	Illustrate the purpose of POP3 & IMAP protocol
		4.9.3.4	Know data transmission limitation with SMTP (large sized e-mail, ...)
4.9.3.5		Illustrate the purposes of MIME and its extensions with respect to SMTP	
4.9.4 Groupware applications	4.9.4.1	Describe chat and messaging systems	
	4.9.4.2	Describe the purposes and uses of mailing lists	

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		4.9.4.3	Describe the purposes and uses of Usenet and newsgroups
		4.9.4.4	Describe the purposes and uses of forums
		4.9.4.5	Describe the purpose of Netiquette: what to do and not to do with e-mail and newsgroups
	4.9.5 Access control and sharing	4.9.5.1	Describe the DAC, MAC, RBAC policies, the purposes of file sharing, the different permission levels, and the concepts of login and logon-script
		4.9.5.2	Illustrate different types of shareable objects: files, folders, printers, modems,...
		4.9.5.3	Describe the purposes of NetBIOS, NETBEUI, SMB and CIFS protocols (principle of operations, main features and differences), the server browsing operation, the master browser elections and operations, and sharing services (main differences between them, encapsulation level in Ethernet vs. IP)
	4.9.6 Innovative applications	4.9.6.1	Give a definition of interoperability and illustrate different approaches to it (standard interfaces, brokers)
		4.9.6.2	Illustrate the main features of a thin client
		4.9.6.3	Illustrate the main features of a mobile client/device.
			Know multimedia aspects.
	4.9.7 Network control	4.9.7.1	Define the aim of SNMP protocol, the purpose of a network manager and a SNMP agent
		4.9.7.2	Be able to explain what can be managed with SNMP and the main tools to do this.
4.10. Low level configuration	4.10.1 Describe how to connect a computer to a network	4.10.1.1	Connect a computer to a Ethernet segment (10BaseT, 100BaseT, 100BaseF); connect in cascade hubs or switches using crossed ports, crossed cables or coax cables
		4.10.1.2	Connect a computer to a WiFi network (know how to use Access Point, why and how to set the channel, WAP and device authentication, DHCP)
	4.10.2 Describe how to install a network card into a computer	4.10.2.1	Know installation constraints: health, security, warranty, technical approval
		4.10.2.2	Know main card bus types, their differences and distinguish the PC bus type.
		4.10.2.3	Know automatic card recognition systems: principle of operation of PCMCIA, USB, FireWire.
		4.10.2.4	Insert cards in a computer

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	4.10.3 Device drivers	4.10.3.1	Install network card driver on different platforms (Windows, Apple, Linux)
	4.10.4 IP configuration	4.10.4.1	Obtain IP base parameters: IP number, IP Mask, Default gateway, DNS server(s)
		4.10.4.2	Configure IP base parameters on different platforms (Windows, Apple, Linux)
	4.10.5 Netbios, NETBEUI, SMB, CIFS configuration	4.10.5.1	Install Ethernet- and IP-encapsulated sharing services on Windows and Linux/Unix platforms
		4.10.5.2	Setup validation level (user vs share)
4.11. Network services usage and configuration	4.11.1 Web Browser setup	4.11.1.1	Be able to make main browser setup (proxy, plugin, etc.)
	4.11.2 E-mail setup	4.11.2.1	Configure e-mail accounts and related items (POP or imap server, SMTP server, etc.)
	4.11.3 Advanced e-mail use	4.11.3.1	Configure e-mail automatic handling rules
		4.11.3.2	Setup coding rules (HTML vs text)
		4.11.3.3	Access and use webmail applications
	4.11.4 FTP usage	4.11.4.1	Use a FTP program for simple file transfers (connect as normal user or guest, change and list directories on local and remote computer, set passive mode; send / receive one or multiple files using binary and/or ASCII transfer)
	4.11.5 Object sharing	4.11.5.1	Access shared objects (disks, directories, modem, printers) using Windows, Apple Macintosh, Linux/Unix; stop network printing
		4.11.5.2	Activate/deactivate automounting of shared objects using Windows or Apple Macintosh
		4.11.5.3	Share disks, directories, and printers using Windows, Apple Macintosh, Linux/Unix, Novell
		4.11.5.4	Use sharing services through VLAN over Internet
4.12. Troubleshooting & testing	4.12.1 Physical connections	4.12.1.1	Use heartbeat and related loop led indicators
		4.12.1.2	Test how a PC is connected to wireless LAN
	4.12.2 IP testing	4.12.2.1	Use ICMP to test network (method and its limitations): the "ping" command to test server reachability and the network behaviour under stress
		4.12.2.2	Verify correct DHCP operation both listing IP values (Host address, gateway, DNS) and monitoring requests/responses
	4.12.3 Service testing	4.12.3.1	Use the "ping" command to test name lookup

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		4.12.3.2	Use "nslookup" related commands & programs to test DNS operations
		4.12.3.3	Use the "route" command to verify packet outcoming
		4.12.3.4	Use the "tcpdump" to monitor packets
		4.12.3.5	Use the "tracert" command to check how packets reach a given server
	4.12.4 Protocols verifying	4.12.4.1	Use the "nslookup" MX query to discover mail servers
		4.12.4.2	Use the Telnet program to manually simulate SMTP simple session, verify existence of an account, and send an email
		4.12.4.3	Use the Telnet program to simulate a POP3 / IMAP session and get a list of pending messages
		4.12.4.4	Use the Telnet program to simulate a HTTP session and download a page to test server operations
4.13. Legal	4.13.1 Cabling	4.13.1.1	Illustrate structured cabling regulations and warranties
	4.13.2 Wireless	4.13.2.1	Describe European and national wireless regulations (such as ETSI2)
	4.13.3 Job safety	4.13.3.1	Know safety on job as in relevant local regulations (example, Italian 626 regulation)
4.14. Basic security Issues	4.14.1 Network security	4.14.1.1	Illustrate the main security requirements (confidentiality, integrity, availability...)
	4.14.2 Cryptography	4.14.2.1	Explain the principles of private and public key encryption
	4.14.3 Browser security	4.14.3.1	Distinguish a secure connection from an insecure one and when it is necessary to use a secure transaction
		4.14.3.2	Enable and disable cookies, ActiveX, Java, and JavaScript