EUCIP
European Certification of Informatics Professionals

EUCIP IT Administrator - Module 3 Networks

Syllabus Version 3.0

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EUCIP IT Administrator – Networks

This document details the syllabus for *EUCIP IT Administrator - Networks*. The syllabus describes, through learning outcomes, the knowledge and skills that a candidate for *EUCIP IT Administrator - Networks* should possess. The syllabus also provides the basis for the theory and practice-based test in this module.

Module Goals

EUCIP IT Administrator - Networks requires the candidate to have a broad appreciation of networking concepts and be able to carry out configuration and network support tasks.

The candidate shall be able to:

- Describe the main network architectures and communications protocols.
- Understand the OSI reference model and the various layers: physical, datalink, network, transport, session, presentation, applications.
- Carry out low level configuration such as connecting to a network, network card installation, IP configuration.
- Set up web browsers and email services and use FTP.
- Conduct basic network troubleshooting and testing.
- Understand key legal principles relating to network use and safety.
- Know about basic network and browser security issues.

CATEGORY	SKILL SET	REF.	TASK ITEM
3.1 Introduction to Networking	*3.1.1 Architectures and Communications Protocols*	3.1.1.1	Describe the development of the client-server approach from hierarchical to distributed systems.
		3.1.1.2	Describe de facto and de jure standards: the TCP/IP suite and the OSI model and standard organizations like: CCITT, ITU-TS, IEEE, ISO, and IAB.
3.2 The OSI Reference Model	*3.2.1 Overview of the Reference Model Layers*	3.2.1.1	Outline the purpose of the layered reference model (principle of encapsulation and service access points in layer models).
		3.2.1.2	Describe the role of the different OSI model layers: physical, data link, network, transport, session, presentation, and application.
		3.2.1.3	Describe the main goals of protocols like: error control, session management, flow control.
		3.2.1.4	Distinguish between the ISO/OSI model and TCP/IP protocol.

CATEGORY	SKILL SET	REF.	TASK ITEM
3.3 Physical Layer	*3.3.1 Data Types and Signalling*	3.3.1.1	Outline the properties of analog and digital signals.
		3.3.1.2	Distinguish between bits, bytes and packets in digital binary signals.
	3.3.2 Data Transmission	3.3.2.1	Identify the main bounded (copper cables and fiber-optic cables) and unbounded (microwave, radio, infrared, laser, satellite) transmission media.
		3.3.2.2	Describe structured cabling systems (behaviour, use and benefits), components (plug, sockets, patch-cords, racks, etc.), and non-certificated add-ons.
		3.3.2.3	Recognise the main network topologies: bus, star, ring, tree.
		3.3.2.4	Distinguish between communication modes (simplex, half-duplex, full duplex) and transmission types (asynchronous, synchronous, serial, parallel).
		3.3.2.5	Recognise the terms start bit, stop bit, parity and data bit and where they are being used. Recognise the terms SYNC, STX, ETX, ACK and NACK and where they are used.
		3.3.2.6	Define channels and bandwidths.
	3.3.3 Protocols	3.3.3.1	Describe Ethernet systems: data transmission rates, transmission media, and maximum lengths and nodes.
		3.3.3.2	Describe a FDDI network system in terms of structure, data rate and distance limits.
		3.3.3.3	List the range of data transmission rates in ATM systems and Frame Relay systems.
	3.3.4 Devices	3.3.4.1	List the transmission media and techniques for wireless communications (infrared, spread spectrum, narrowband microwave) and their range of operation. Recognise the problem of radiowave spreading.

CATEGORY	SKILL SET	REF.	TASK ITEM
		3.3.4.2	Outline the function of a hub and a repeater.
3.4 Datalink Layer	*3.4.1 Introduction*	3.4.1.1	Outline circuit and packet switching concepts. Define frames.
		3.4.1.2	Outline the CSMA/CD operations. Define MAC address.
		3.4.1.3	Outline the main principles of medium access control in a FDDI system.
	3.4.2 Asynchronous Transfer Mode (ATM) and Frame Relay.	3.4.2.1	Define ATM logical connections: transmission path, virtual path, virtual channel.
		3.4.2.2	Define Frame Relay logical connections like: virtual circuit, permanent virtual circuit, datalink connection identifier.
	3.4.3 Point-to-Point Protocol (PPP)	3.4.3.1	Describe the purpose and operations of PPP, and the differences between PPP and SLIP.
	3.4.4 Virtual LAN (VLAN)	3.4.4.1	Outline what a VLAN can do at datalink layer.
	3.4.5 Bridges and Switches	3.4.5.1	Outline the function of a switch and a bridge.
3.5 Network Layer	*3.5.1 Network Protocols*	3.5.1.1	Describe the purpose of an addressing system.
		3.5.1.2	Outline the aims of IP protocol. Define the term datagram.
	3.5.2 Support Protocols	3.5.2.1	Recognise the functions of ICMP, DHCP, and ARP protocols.
	3.5.3 IP Addressing	3.5.3.1	Describe the IP addressing scheme, the relationship between IP addresses and network classes, subnetting and CIDR concepts. Distinguish between IPv4 and IPv6.
	3.5.4 Internetworking	3.5.4.1	Describe routing needs and functions.
	3.5.5 Networking Devices: Routers and Layer-3 Switches	3.5.5.1	Distinguish between logical and physical addresses.
		3.5.5.2	Describe the aims of a router, and the function of a layer-3 switch.

CATEGORY	SKILL SET	REF.	TASK ITEM
3.6 Transport Layer	*3.6.1 Transport Layer Basics*	3.6.1.1	Define the terms segment, port, well-known-port, and connection in the context of the transport layer.
	3.6.2 Transport layer Protocols	3.6.2.1	Understand the purpose of the TCP protocol and its main mechanisms: PAR, flow control, multiplexing, urgent data signalling. Recognise the features of the UDP protocol and its differences from TCP.
	3.6.3 VLAN	3.6.3.1	Define the term VLAN. Recognise the advantages and disadvantages of a VLAN.
	3.6.4 Transport Security	3.6.4.1	Outline the purpose of Network Address Translation (NAT) and Port Address Translation (PAT). Recognise different types of NAT like: SNAT, DNAT.
		3.6.4.2	Understand the purpose of address proxy.
		3.6.4.3	Understand the purpose of a firewall and its main functions.
3.7 Session Layer	*3.7.1 Session Establishment: Parameter Negotiation*	3.7.1.1	Describe RAS & PPP/SLIP negotiation phase hints.
		3.7.1.2	Describe DHCP negotiation hints.
3.8 Presentation Layer	*3.8.1 Data Coding Standards*	3.8.1.1	Outline the ASCII, ANSI and UNICODE standards, the ASCII limits on national languages (concept of character set), computers internal data encoding (binary files vs. text files, test files EOL encoding in DOS/Windows, Apple and Unix/Linux system), and computers internal number encoding (big endian vs. low endian, canonical representation).
	3.8.2 MIME Protocol	3.8.2.1	Understand how MIME protocol can be used as a way to manage different objects.
	3.8.3 Other Non Binary Formats	3.8.3.1	Outline the purpose of file compression and the main standards for known platforms like: ZIP, GZ, ARC for DOS/Windows; SIT, CPT for Macintosh; GZ, Z, TAR, ZIP for Unix).
3.9 Applications	*3.9.1 Network Applications*	3.9.1.1	Outline the purpose of application level.

CATEGORY	SKILL SET	REF.	TASK ITEM
		3.9.1.2	Describe the purpose of TELNET.
		3.9.1.3	Describe the purpose of the FTP protocol.
		3.9.1.4	Describe the purpose of the DHCP and TFTP protocols.
	3.9.2 Remote Resources on the Web	3.9.2.1	Define the term uniform resource locator (URL).
		3.9.2.2	Describe the aim and the main operations of the Domain Name System (DNS).
		3.9.2.3	Describe the purpose of the HTTP and HTTPS protocols.
		3.9.2.4	Understand working principles of CGI and applets.
		3.9.2.5	Define the term cookie. Recognise the benefits and dangers of cookies.
		3.9.2.6	Describe http content-type headers, MIME standard.
		3.9.2.7	Understand the purpose of the main markup languages and style sheets like: HTML, SGML, XML, CSS, XSL.
		3.9.2.8	Outline the purpose of a gateway.
	3.9.3 e-Mail	3.9.3.1	Describe the purpose and components of simple mail transfer protocol (SMTP).
		3.9.3.2	Outline the structure of an e-mail address.
		3.9.3.3	Understand the purpose of the POP3 and IMAP protocols.
		3.9.3.4	Identify data transmission limitations of SMTP like: large sized e-mail, unknown attachments.
		3.9.3.5	Understand the purpose of MIME and its relationship with SMTP.
	3.9.4 Groupware Applications	3.9.4.1	Outline the purpose and features of chat and instant messaging systems.
		3.9.4.2	Outline the purpose and uses of forums.

CATEGORY	SKILL SET	REF.	TASK ITEM
		3.9.4.3	Define the term netiquette.
	3.9.5 Access Control and Sharing	3.9.5.1	Describe the DAC, MAC, RBAC policies, the purpose of file sharing, the different permission levels, and the concepts of login and logon-script.
		3.9.5.2	Describe the purpose of NetBIOS, NETBEUI, SMB and CIFS protocols like: principle of operations, main features and differences.
		3.9.5.3	Describe the server browsing operation, the master browser elections and operations, and sharing services (main differences between them, encapsulation level in Ethernet vs. IP).
	3.9.6 Network Control	3.9.6.1	Outline the aim of SNMP protocol, the purpose of a network manager and a SNMP agent.
		3.9.6.2	Describe what SNMP can manage and outline the main SNMP tools.
3.10 Low Level Configuration	*3.10.1 Connecting to a Network*	3.10.1.1	Connect a computer to an Ethernet segment (10BaseT, 100BaseT, 100BaseF).
		3.10.1.2	Connect in cascade hubs or switches using crossed ports, crossed cables or coax cables.
		3.10.1.3	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).
	3.10.2 Install a Network Card	3.10.2.1	Recognise network card installation constraints: health, security, warranty, technical approval.
		3.10.2.2	Install a network card. Recognise the bus type of a PC, the main card bus types and their differences.
		3.10.2.3	Recognise automatic hardware recognition systems like: PCMCIA, USB, FireWire.
		3.10.2.4	Insert network cards in a computer.
	3.10.3 Device Drivers	3.10.3.1	Install network card drivers on different operating systems.

CATEGORY	SKILL SET	REF.	TASK ITEM
	3.10.4 IP Configuration	3.10.4.1	Define IP base parameters: IP number, IP Mask, Default gateway, DNS server(s).
		3.10.4.2	Configure IP base parameters on different operating systems.
	3.10.5 Netbios, NETBEUI, SMB, CIFS Configuration	3.10.5.1	Install Ethernet- and IP-encapsulated sharing services on Windows and Linux/Unix platforms.
		3.10.5.2	Set up the validation level like: per user, per share.
3.11 Network Services Usage and Configuration	*3.11.1 Web Browser Setup*	3.11.1.1	Set up a web browser including proxy, plugins.
	3.11.2 e-Mail Setup and Use	3.11.2.1	Configure e-mail accounts and related items like: POP or imap server, SMTP server.
		3.11.2.2	Configure automatic handling rules for e-mail.
		3.11.2.3	Setup email coding rules like: HTML, text.
		3.11.2.4	Access and use webmail applications.
	3.11.3 FTP Use	3.11.3.1	Use a FTP program for simple file transfers.
	3.11.4 Object Sharing	3.11.4.1	Access shared objects like: disks, directories, modem, printers using Windows, Apple Macintosh, Linux/Unix; stop network printing.
		3.11.4.2	Activate/deactivate automounting of shared objects using Windows or Apple Macintosh.
		3.11.4.3	Share disks, directories, and printers using various operating systems.
3.12 Troubleshooting and Testing	*3.12.1 Physical Connections*	3.12.1.1	Use heartbeat and related led indicators.
		3.12.1.2	Test a PC WLAN connection.
	3.12.2 IP Testing	3.12.2.1	Use network testing like: ICMP, ping command to test network and network behaviour under stress.

CATEGORY	SKILL SET	REF.	TASK ITEM
		3.12.2.2	Verify correct DHCP operation listing IP values (Host address, gateway, DNS) and monitoring requests/responses.
	3.12.3 Service Testing	3.12.3.1	Use the ping command to test name lookup.
		3.12.3.2	Use nslookup and dig programs to test DNS operations.
		3.12.3.3	Use the route command to verify packet outcoming.
		3.12.3.4	Use the tcpdump to monitor packets.
		3.12.3.5	Use the traceroute/tracert commands to check how packets reach a given server.
	3.12.4 Verifying Protocols	3.12.4.1	Use the nslookup/dig MX query to discover mail servers.
		3.12.4.2	Use the Telnet program to manually simulate SMTP simple session, verify existence of an account, and send an email.
		3.12.4.3	Use the Telnet program to simulate a POP3 / IMAP session and get a list of pending messages.
		3.12.4.4	Use the Telnet program to simulate a HTTP session and download a page to test server operations.
3.13 Legal	*3.13.1 Cabling*	3.13.1.1	Recognise structured cabling regulations like: industrial cabling standards and warranties that an installer must give to the customers.
	3.13.2 Wireless	3.13.2.1	Recognise European and national wireless regulations like: ETSI2.
	3.13.3 Job Safety	3.13.3.1	Recognise relevant health and safety regulations in your country.
3.14 Basic Security Issues	*3.14.1 Network Security*	3.14.1.1	Outline the main security requirements: confidentiality, integrity, availability.
	3.14.2 Cryptography	3.14.2.1	Describe the principles of private and public key encryption.

CATEGORY	SKILL SET	REF.	TASK ITEM
	3.14.3 Browser Security	3.14.3.1	Distinguish between a secure connection, insecure connection. Recognise when it is necessary to use a secure transaction.
		3.14.3.2	Enable, disable cookies, ActiveX, Java, and JavaScript.