

Computer Network Software Operations, Advanced

6651/36 weeks

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Course Description

Suggested Grade Level: 11 or 12

Computer Network Software Operations, Advanced covers advanced aspects of network administration, focusing on the management and support of network users and systems. Topics include understanding the responsibilities of computer professionals, training end users, evaluating new technology, developing system policies, troubleshooting workstations, managing network services and protocols, and effectively using e-mail and business communications. Students learn communication protocols, troubleshooting techniques for systems and client-server networks, website management, and other advanced networking topics. Students also practice techniques used to install operating systems, set up and manage accounts, load software, and create and implement security plans.

Task Essentials Table

- Tasks/competencies designated by plus icons (⊕) in the left-hand column(s) are essential
- Tasks/competencies designated by empty-circle icons (○) are optional
- Tasks/competencies designated by minus icons (⊖) are omitted
- Tasks marked with an asterisk (*) are sensitive.

| Task Number | 6651 | Tasks/Competencies |
|---|------|---|
| Performing Legal and Ethical Functions | | |
| 39 | ⊕ | Identify copyright and licensing laws that apply to computer use and network administration. |
| 40 | ⊕ | Describe procedures to ensure the proper licensing of a client-server operating system (OS) and applications. |

| | | |
|---------------------------------------|---|--|
| 41 | + | Identify ethical behavior. |
| 42 | + | Identify testing skills and strategies for a certification examination. |
| 43 | + | Demonstrate the ability to complete selected practice examinations (i.e., practice questions similar to those on certification exams). |
| 44 | + | Complete an industry-certification examination representative of skills learned in this course. |
| Using Desktop Systems Concepts | | |
| 45 | + | Compare essential network OS components. |
| 46 | + | Navigate the digital OS environment. |
| 47 | + | Demonstrate the procedures followed when installing digital OS. |
| Using Server Systems Concepts | | |
| 48 | + | Explain server OS. |
| 49 | + | Explain the uses of current and emerging server and storage hardware. |
| 50 | + | Identify partitions and volumes. |
| Configuring Network Servers | | |
| 51 | + | Install applications. |
| 52 | + | Implement directory services on a network. |
| 53 | + | Manage directory and file replication. |
| 54 | + | Describe the structure and architecture of the Domain Name System (DNS). |
| 55 | + | Install the DNS. |
| 56 | + | Explain how a Dynamic Host Configuration Protocol (DHCP) client obtains an IP address from a DHCP server. |
| 57 | + | Install a DHCP service. |
| 58 | + | Manage fault-tolerant volumes, using RAID. |
| 59 | + | Explain the difference between roaming and local profiles. |
| 60 | + | Implement directory replication. |
| 61 | + | Troubleshoot directory services replication. |
| 62 | + | Implement Internet Printing Protocol (IPP) services. |
| Configuring Network Security | | |
| 63 | + | Explain types of server malware protection. |
| 64 | + | Implement web-based and server security features. |
| 65 | + | Describe the Secure Sockets Layer (SSL) and Transport Layer Security (TLS). |
| 66 | + | Explore a security certificate. |

| | | |
|---|---|---|
| 67 | + | Describe firewalls. |
| 68 | + | Install a firewall. |
| 69 | + | Implement user security policies. |
| Performing Network Administrative Functions | | |
| 70 | + | Define different types of accounts. |
| 71 | + | Configure user and group accounts. |
| 72 | + | Create user profiles. |
| 73 | + | Implement global, domain, and local account policies. |
| 74 | + | Describe considerations and procedures for deploying sharing applications on the network. |
| 75 | + | Manage shared disk resources. |
| 76 | + | Identify the procedures for the administration of a shared printer. |
| 77 | + | Explain email and collaborative scheduling systems. |
| 78 | + | Implement global, domain, and local system policies. |
| 79 | + | Describe the process of logging on to a domain account and changing a password. |
| 80 | + | Implement disk quotas. |
| 81 | + | Explain concepts related to logon authentication. |
| 82 | + | Identify levels of encryption. |
| Maintaining Servers | | |
| 83 | + | Describe remote administration. |
| 84 | + | Identify the resources available to solve common support issues. |
| 85 | + | Describe service packs and patches. |
| 86 | + | Review event logs. |
| 87 | + | Review security and all system logs. |
| 88 | + | Describe the utilities that monitor a server's performance. |
| 89 | + | Describe the backup and restore process for directory services. |
| Conducting Transmission Control Protocol/Internet Protocol (TCP/IP) Activities | | |
| 90 | + | Describe Transmission Control Protocol/Internet Protocol (TCP/IP). |
| 91 | + | Compare static and dynamic IP routing. |
| 92 | + | Configure TCP/IP. |
| 93 | + | Test a TCP/IP configuration, using OS-specific commands. |
| 94 | + | Identify the network and host IDs' TCP/IP addresses. |

| | | |
|--|---|--|
| 95 | + | Compare IPv4 and IPv6. |
| 96 | + | Explain the function of a subnet mask and Classless Inter-Domain Routing (CIDR) format. |
| 97 | + | Describe a loopback address. |
| 98 | + | Describe the services provided by Network Basic Input/Output System (NetBIOS) over TCP/IP. |
| 99 | + | Explain the process of host name resolution (i.e., mapping a host name to an IP address on local and remote networks). |
| 100 | + | Modify the host file to resolve host names. |
| 101 | + | Configure File Transfer Protocol (FTP). |
| 102 | + | Explain the purpose of the Simple Network Management Protocol (SNMP). |
| 103 | + | Describe the implementation of virtual Local Area Network (VLAN). |
| Implementing and Managing Web Servers | | |
| 104 | + | Describe the key protocols of web servers. |
| 105 | + | Install web-based services (e.g., Apache, Windows IIS). |
| 106 | + | Configure web-based services. |
| 107 | + | Explain the major architectural components and security vulnerabilities of web-based services. |
| 108 | + | Establish web-based services. |
| 109 | + | Add virtual servers and directories. |
| 110 | + | Install a server-side programming language that supports dynamic content. |
| 111 | + | Access a web page with dynamic content. |
| Ensuring Network Security | | |
| 112 | + | Monitor network traffic. |
| 113 | + | Analyze network systems for cybersecurity vulnerabilities. |
| 114 | + | Explain the core security principles used in network management. |
| 115 | + | Analyze threats and risks to networks. |
| 116 | + | Analyze internal and external cybersecurity threats to computer networks. |
| 117 | + | Identify sustainable computer networking practices. |
| 118 | + | Install a virtualized OS. |
| Providing User Training and Support | | |
| 119 | + | Identify user and network administrator training needs. |
| 120 | + | Provide network onboarding for new employees. |
| 121 | + | Develop a training plan. |

| | | |
|--|---|---|
| 122 | ⊕ | Provide training to users. |
| 123 | ⊕ | Create a user manual. |
| 124 | ⊕ | Provide ongoing user support. |
| 125 | ⊕ | Track hardware and software usage problems. |
| Developing Employability Skills | | |
| 126 | ⊕ | Update résumé. |
| 127 | ⊕ | Describe the process and requirements for obtaining industry certifications related to the Computer Network Software Operations, Advanced course. |
| 128 | ⊕ | Update a professional portfolio that contains representative samples of student-work. |
| 129 | ⊕ | Identify potential employment barriers for nontraditional groups and ways to overcome these barriers. |

Legend: ⊕ Essential ○ Non-essential ⊖ Omitted

Curriculum Framework

Performing Legal and Ethical Functions

Task Number 39

Identify copyright and licensing laws that apply to computer use and network administration.

Definition

Identification should include laws that govern the use of software, information, and graphics.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Computer Applications

Database Design and Application

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Spreadsheet Applications

Word Processing

Task Number 40

Describe procedures to ensure the proper licensing of a client-server operating system (OS) and applications.

Definition

Description should include steps for developing a method for

- tracking server connections
- monitoring software licenses
- searching for unlicensed software.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Computer Applications

Database Design and Application

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Spreadsheet Applications

Word Processing

Task Number 41

Identify ethical behavior.

Definition

Identification should include

- ethical concerns that an administrator may encounter
- email privacy issues
- nondisclosure of confidential information
- application of copyrighted material.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Business Ethics

Business Law

Cyber Security

Task Number 42

Identify testing skills and strategies for a certification examination.

Definition

Identification of testing skills and strategies should be undertaken by

- conducting an Internet research project
- reviewing materials from exam and practice-exam publishers
- interviewing certified instructors and/or industry-certified professionals.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Business Procedures

Electronic Career Portfolio

Introduction to Information Technology

Job Interview

Management Information Systems

Network Design

Networking Infrastructures

Task Number 43

Demonstrate the ability to complete selected practice examinations (i.e., practice questions similar to those on certification exams).

Definition

Demonstration should include completing practice examinations for selected certifications obtained from vendor sites and/or materials from publishers. The level of performance on a practice examination may serve as a gauge of the applicant's readiness for formal industry testing.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Business Procedures

Electronic Career Portfolio

Introduction to Information Technology

Job Interview

Management Information Systems

Network Design

Networking Infrastructures

Task Number 44

Complete an industry-certification examination representative of skills learned in this course.

Definition

Completion of an industry certification examination is achieved when the student applicant earns an examination score deemed "passing" by the testing organization. Qualifying examinations are those currently approved at the state level as representative of Cybersecurity Software Operations, Advanced skills.

Students should be encouraged to attain industry certification as evidence of their Computer Network Software Operations skill level and general employability.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Business Procedures

Electronic Career Portfolio

Introduction to Information Technology

Job Interview

Management Information Systems

Network Design

Networking Infrastructures

Using Desktop Systems Concepts

Task Number 45

Compare essential network OS components.

Definition

Comparison should include components that

- are common among all network OS
- vary among individual network OS platforms.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 46

Navigate the digital OS environment.

Definition

Navigation should include using system utilities, system administrative tools, file structure tools, hardware management tools and

- registry management (e.g., Windows)
- command-line management skills
- task and process management
- demonstrating the use of graphical user interface (GUI) and command line programs to perform file and administrative tasks.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Computer Applications

Database Design and Application

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Spreadsheet Applications

Word Processing

Task Number 47

Demonstrate the procedures followed when installing digital OS.

Definition

Demonstration should include

- stopping unnecessary services
- removing unnecessary administrative rights from users
- removing unnecessary software
- locking down or hardening a desktop OS.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Computer Applications

Database Design and Application

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Spreadsheet Applications

Word Processing

Using Server Systems Concepts

Task Number 48

Explain server OS.

Definition

Explanation should include

- identifying the benefits and limitations
- defining the term *operating systems* (OS)
- discussing the functions and unique characteristics of specific OS (e.g., Microsoft Windows, macOS, Linux distributions, Chrome OS), mobile OS, and embedded systems.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Computer Applications

Database Design and Application

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Spreadsheet Applications

Word Processing

Task Number 49

Explain the uses of current and emerging server and storage hardware.

Definition

Explanation of server and storage hardware includes

- server types
 - blade
 - symmetric multiprocessing (SMP)
- storage types
 - redundant array of independent disks (RAID)
 - Serial Advanced Technology Attachment (SATA)
 - Small Computer System Interface (SCSI)
 - Fibre Channel (FC).

Explanation of storage hardware should also include

- characteristics
 - distributed antennae system (DAS)
 - partitioning and formatting
 - interfaces
 - file systems
 - various RAID configurations
 - mechanical disk specifications

- network attached storage (NAS), storage area network (SAN), just a bunch of disks (JBOD), tape, optical, flash
- hot swappable
- role
- cost/benefit analysis
- software design description (SDD) vs. mechanical
- performance considerations.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Computer Applications

Cyber Security

Database Design and Application

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Spreadsheet Applications

Word Processing

Task Number 50

Identify partitions and volumes.

Definition

Identification should include

- devising a strategy that addresses the needs of the network and the number of partitions and volumes necessary to divide connections
- following established guidelines for creating partitions and volumes
- making partitions and volumes operational.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Configuring Network Servers

Task Number 51

Install applications.

Definition

Installation should include performing the steps required to successfully install additional client-services software in a heterogeneous environment, following the manufacturer's installation instructions (e.g., email, office productivity apps) and services (e.g., file sharing, printing) commonly found in a client-server environment.

Note: Systems being modified require a virtual machine such as available in the [Virginia Cyber Range \(https://www.virginiacyberrange.org/\)](https://www.virginiacyberrange.org/).

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Computer Applications

Cyber Security

Database Design and Application

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Spreadsheet Applications

Word Processing

Task Number 52

Implement directory services on a network.

Definition

Implementation should include

- Lightweight Directory Access Protocol (LDAP), such as naming conventions and hierarchical structures
- other related standards.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Computer Applications

Cyber Security

Database Design and Application

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Spreadsheet Applications

Word Processing

Task Number 53

Manage directory and file replication.

Definition

Management should include

- describing the uses
- determining the requirements
- establishing the processes.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Computer Applications

Cyber Security

Database Design and Application

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Spreadsheet Applications

Word Processing

Task Number 54

Describe the structure and architecture of the Domain Name System (DNS).

Definition

Description should include

- name servers—resolve computer or domain names to Internet Protocol (IP) addresses
- domain name space—a hierarchical grouping of names in various structures (e.g., root-level domains, top-level domains, second-level domains, and host names)
- domain resource records (e.g., A, AAAA, mail exchanger [MX], pointer [PTR])
- time to live (TTL)
- security vulnerabilities associated with DNS
- types of DNS queries and their usage.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 55

Install the DNS.

Definition

Installation should include

- configuring zones, replications, TTL values, and forwarders, as needed
- following the manufacturer's instructions for the running OS.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 56

Explain how a Dynamic Host Configuration Protocol (DHCP) client obtains an IP address from a DHCP server.

Definition

Explanation should include

- requesting an IP address
- configuring the length of the IP address' lease
- setting common parameters with a lease (default gateway, DNS servers, etc.)
- identifying the function of an automatic private IP address (APIPA)
- identifying the function of a static IP address
- identifying the alternate configuration of an IP address.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 57

Install a DHCP service.

Definition

Installation should include

- adhering to the operating system's specifications
- managing the security of DHCP and network threats to DHCP
- explaining the role of the DHCP relay agent (i.e., configured on a router with the IP address of the computer running DHCP, enabling the agent to forward requests from clients to DHCP servers on remote subnets)
- determining when or why a DHCP relay agent (or helper address) is necessary.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 58

Manage fault-tolerant volumes, using RAID.

Definition

Management should include

- explaining the characteristics of software RAID and hardware RAID
- describing RAID 0, RAID 1, RAID 5, and RAID 1+0
- determining the level of fault tolerance vs. the amount of system overhead needed
- deciding whether to mirror the drives.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 59

Explain the difference between roaming and local profiles.

Definition

Explanation should include the profile location that differentiates between

- local user profile that is stored locally on the hard disk of the computer or virtual machine and is created during the first time a user logs on to a computer and
- roaming user profile which is a copy of the local profile that is copied to another, usually central location and is downloaded to any computer that a user logs onto on a network.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 60

Implement directory replication.

Definition

Implementation should include automating a scheduled replication process between servers for the sake of redundancy.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 61

Troubleshoot directory services replication.

Definition

Troubleshooting should include identifying reasons and remedies to replicate services.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 62

Implement Internet Printing Protocol (IPP) services.

Definition

Implementation should include

- describing IPP services
- managing printers from a web browser
- sending print jobs to printers using the Hypertext Transfer Protocol (HTTP) protocol

diagnosing problems using utilities.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Configuring Network Security

Task Number 63

Explain types of server malware protection.

Definition

Explanation should include

- antivirus software, spam, adware, spyware filtering, and patch management
- characteristics of each form
- strengths and weaknesses of each form
- determinations about which form is necessary in various environments
- location where protections are deployed (e.g., email security gateways, web security gateways, endpoints)
- effects of each form on a server
- performance influence.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Task Number 64

Implement web-based and server security features.

Definition

Implementation should include utilizing web-based and server security features to control access to an Internet server by

- employing password authentication schemes
- restricting or permitting access at the IP address level
- managing server access keys
- disabling folder browsing
- patching software and OS
- testing systems for vulnerabilities.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Cyber Security

E-business

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Website Design

Task Number 65

Describe the Secure Sockets Layer (SSL) and Transport Layer Security (TLS).

Definition

Description should include

- defining the purpose of SSL and TLS
- explaining the benefits of SSL and TLS
- describing the difference between SSL and TLS
- explaining the deprecation of SSL protocol versions in favor of TLS protocols
- summarizing the process of obtaining an SSL digital certificate
- explaining common issues with digital certificates.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 66

Explore a security certificate.

Definition

Exploration should include

- understanding the purpose and benefits of certificates and public key infrastructure (PKI)
- describing how a certificate affects user security
- identifying how a certificate is used to encrypt data and how a certificate/key combination is used to decrypt a certificate file
- viewing certificates in Internet browsers.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 67

Describe firewalls.

Definition

Description of firewalls should include

- characteristics, uses, and benefits of each to include performance comparison
- comparison of software and hardware firewalls
- pros and cons of host-based vs. network.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 68

Install a firewall.

Definition

Installation should include following the

- manufacturer's instructions
- business and security requirements to securely enable applications across a network.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 69

Implement user security policies.

Definition

Implementation should include following an established security plan to ensure measures are in place to protect the network.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Business Procedures

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Performing Network Administrative Functions

Task Number 70

Define different types of accounts.

Definition

Definition should include

- types of accounts
 - user
 - group
 - system
 - administration
 - service
- characteristics
- application in a network environment.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 71

Configure user and group accounts.

Definition

Configuration should include making decisions based on user needs for connectivity, applications, permissions, and/or privileges.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 72

Create user profiles.

Creation should include making decisions based on users' needs (i.e., roaming vs. mandatory profile).

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 73

Implement global, domain, and local account policies.

Definition

Implementation should include

- establishing, governing, and observing well-defined policies
- naming conventions
- creating password and access parameters
- setting up user rights and privileges.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 74

Describe considerations and procedures for deploying sharing applications on the network.

Definition

Description should include

- risks and advantages
- procedures for deploying on various platforms
- security considerations.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 75

Manage shared disk resources.

Definition

Management should include

- identifying users' access needs
- planning the sharing of resources for the most effective use of disk space
- creating and administering rights (e.g., permissions, quotas)
- supervising shared resources to minimize negative effects on performance and appropriate permissions assigned
- identifying and correcting hardware failures
- checking system health indicators.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 76

Identify the procedures for the administration of a shared printer.

Definition

Identification should include

- following manufacturer's installation specifications
- utilizing printer wizards
- installing printer drivers
- troubleshooting procedures
- employing user permissions.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 77

Explain email and collaborative scheduling systems.

Definition

Explanation of email and scheduling systems should include

- functions and characteristics
- usage policies and procedures
- ethical and privacy concerns.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Business Procedures

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 78

Implement global, domain, and local system policies.

Definition

Implementation should include

- differentiating between global groups and local groups
- accounting for trust relationships
- determining which system-level tasks should be restricted to administrators
- documenting, publishing, and reviewing policies.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Business Procedures

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 79

Describe the process of logging on to a domain account and changing a password.

Definition

Description should include the

- type of access granted to a user with a proper domain logon
- permissions needed for a user to change a password
- frequency of a mandatory password change
- constraints that should be implemented in password selection.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Business Procedures

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 80

Implement disk quotas.

Definition

Implementation should include

- identifying the reasons for and benefits of establishing and following disk quotas
- following the manufacturer's instructions.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Business Procedures

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 81

Explain concepts related to logon authentication.

Definition

Explanation should include single and multi-factors authentication and

- process by which a user name is located and authenticated

- various types of authentication (e.g., anonymous, basic, form-based, secure, integrated, multi-factor [security tokens, smart cards, biometrics]).

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Business Procedures

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 82

Identify levels of encryption.

Definition

Identification should include

- asymmetric encryption
- symmetric encryption
- one-way hash
- salting.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Business Procedures

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Maintaining Servers

Task Number 83

Describe remote administration.

Definition

Description should include the methods of implementing remote administration by utilizing remote access security.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Business Procedures

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 84

Identify the resources available to solve common support issues.

Definition

Identification of support should include resources such as

- built-in (e.g., help menus, tutorials)
- telephone
- web-based
- printed publications.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Business Procedures

Computer Problem Solving

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Word Processing

Task Number 85

Describe service packs and patches.

Definition

Description should include

- identifying characteristics, uses, and benefits of each
- explaining how to locate and obtain service packs and patches
- explaining why service packs and patches are required
- explaining how to install packs and patches
- explaining firmware updates
- defining patch management and change management
- explaining hardware compatibility lists
- identifying the need for testing and validation.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Business Procedures

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 86

Review event logs.

Definition

Reviewing should include accessing and examining event logs.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Business Procedures

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 87

Review security and all system logs.

Definition

Review should include accessing and examining security and all system logs.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Business Procedures

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 88

Describe the utilities that monitor a server's performance.

Definition

Description should include the characteristics of and procedures for using utilities (e.g., Microsoft Task Manager, system monitors).

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Business Procedures

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 89

Describe the backup and restore process for directory services.

Definition

Description should include

- system-state backups
- registry backups
- backup utilities.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Business Procedures

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Conducting Transmission Control Protocol/Internet Protocol (TCP/IP) Activities

Task Number 90

Describe Transmission Control Protocol/Internet Protocol (TCP/IP).

Definition

Description should include

- the role TCP/IP plays as an industry-standard suite of protocols designed for wide area networks (WANs) and the Internet
- the advantages of using TCP/IP.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 91

Compare static and dynamic IP routing.

Definition

Comparison should include characteristics, functions, benefits, and shortcomings.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 92

Configure TCP/IP.

Definition

Configuration should include a static address including an IP address, subnet mask, and gateway.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Cyber Security

Introduction to Information Technology
Management Information Systems
Network Design
Networking Infrastructures

Task Number 93

Test a TCP/IP configuration, using OS-specific commands.

Definition

Testing could include using OS-specific commands (e.g., ping, network statistics, ipconfig/ifconfig, trace route [TRACERT], nslookup).

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills
Cyber Security
Introduction to Information Technology
Management Information Systems
Network Design
Networking Infrastructures

Task Number 94

Identify the network and host IDs' TCP/IP addresses.

Definition

Identification should include the requirements for addresses, based on class addresses.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills
Cyber Security
Introduction to Information Technology
Management Information Systems
Network Design
Networking Infrastructures

Task Number 95

Compare IPv4 and IPv6.

Definition

Comparison should include identification of features and anticipated developments in IPv4 and IPv6.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 96

Explain the function of a subnet mask and Classless Inter-Domain Routing (CIDR) format.

Definition

Explanation of a subnet mask should include the concept that it divides a network into segments and reduces network traffic by blocking a portion of the IP address, so the TCP/IP can distinguish the network ID from the host ID.

Explanation of a CIDR format should include the concept that it identifies the subnet mask.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 97

Describe a loopback address.

Definition

Description should include how the loopback range tests a TCP/IP protocol implementation on a host.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 98

Describe the services provided by Network Basic Input/Output System (NetBIOS) over TCP/IP.

Definition

Description should include

- network registration and verification
- session establishment and termination
- reliable connection-oriented session data transfer
- unreliable connectionless datagram data transfer
- protocol support (driver)
- adapter monitoring and management.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 99

Explain the process of host name resolution (i.e., mapping a host name to an IP address on local and remote networks).

Definition

Explanation should include

- typing a command, using the name assigned to the destination host
- resolving the host name to an IP address
- resolving the IP address to a hardware address.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 100

Modify the host file to resolve host names.

Definition

Modification should include changing the host file, according to network OS requirements.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 101

Configure File Transfer Protocol (FTP).

Definition

Configuration should include using administrative tools and adhering to the network OS requirements and procedures.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 102

Explain the purpose of the Simple Network Management Protocol (SNMP).

Definition

Explanation should include

- managing requests for status information from multiple hosts
- reporting significant events (traps) to multiple hosts
- using hosts' names and IP addresses to identify the hosts from which SNMP receives requests and to which SNMP reports information
- enabling monitoring of TCP/IP performance using Windows Performance Monitor.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Cyber Security
Introduction to Information Technology
Management Information Systems
Network Design
Networking Infrastructures

Task Number 103

Describe the implementation of virtual Local Area Network (VLAN).

Definition

Description should include

- uses of VLAN (e.g., securely segmenting LANs for effective TCP/IP management)
- considerations and requirements for the implementation of VLAN.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills
Cyber Security
Introduction to Information Technology
Management Information Systems
Network Design
Networking Infrastructures

Implementing and Managing Web Servers

Task Number 104

Describe the key protocols of web servers.

Definition

Description should include

- HTTP
- HTTP Secure (HTTPS), SSL, and TLS
- FTP
- Simple Mail Transfer Protocol (SMTP) Network News Transfer Protocol (NNTP).

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills
Cyber Security
Introduction to Information Technology
Management Information Systems

Network Design

Networking Infrastructures

Task Number 105

Install web-based services (e.g., Apache, Windows IIS).

Definition

Installation should include observing documentation and licensing restrictions.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 106

Configure web-based services.

Definition

Configuration should include using a utility (e.g., Internet Service Manager Snap-in) to configure and monitor all Microsoft IIS.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 107

Explain the major architectural components and security vulnerabilities of web-based services.

Definition

Explanation should include

- FTP publishing service
- web-based administrative service
- database service (e.g., SQL, MySQL)

- mail service
- world wide web (WWW) publishing service.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 108

Establish web-based services.

Definition

Establishment should include

- FTP publishing service
- web-based administrative service
- database service (e.g., SQL, MySQL)
- mail service
- WWW publishing service
- SMTP
- NNTP.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 109

Add virtual servers and directories.

Definition

Addition should include using OS-specific administration tools.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Cyber Security

Introduction to Information Technology
Management Information Systems
Network Design
Networking Infrastructures

Task Number 110

Install a server-side programming language that supports dynamic content.

Definition

Installation should include

- explaining the advantages and disadvantages of server-side programming languages (e.g., active server pages [ASP.NET], server-side Java [SSJ], hypertext preprocessor [PHP], Perl, Python)
- demonstrating the ability to install languages on a server.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills
Coding and Programming
Cyber Security
Introduction to Information Technology
Management Information Systems
Network Design
Networking Infrastructures

Task Number 111

Access a web page with dynamic content.

Definition

Accessing should include citing the characteristics and benefits of a web page with dynamic content.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills
Cyber Security
Introduction to Information Technology
Management Information Systems
Network Design
Networking Infrastructures

Ensuring Network Security

Task Number 112

Monitor network traffic.

Definition

Monitoring should include interpreting network traffic using a protocol analyzer (e.g., network monitor [Windows], open source [Wireshark], or tcpdump).

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 113

Analyze network systems for cybersecurity vulnerabilities.

Definition

Analysis of systems should include detecting vulnerabilities by using

- port scanning (i.e., Network Mapper [Nmap])
- software update services
- baseline creation
- industry standard vulnerability scanning
- other tools, such as Microsoft Baseline Security Analyzer (MBSA)
- normal network traffic
- malicious network traffic (i.e., Address Resolution Protocol [ARP] poisoning, teardrop attack, SMURF attack).

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 114

Explain the core security principles used in network management.

Definition

Explanation should include

- authentication, authorization, and accounting (AAA)
- confidentiality, integrity, and availability (CIA Triad)
- secure password storage (password hashing)
- file integrity (checksum).

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 115

Analyze threats and risks to networks.

Definition

Analysis of threats and risks should include

- differentiating between a threat and a risk
- identifying internal and external
- rating them
- reporting them to risk management.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 116

Analyze internal and external cybersecurity threats to computer networks.

Definition

Analysis should include threats from

- employees

- natural disasters
- malware
- common vulnerability and exposures (CVE)
- common vulnerability scoring system (CVSS)
- unknown hackers.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 117

Identify sustainable computer networking practices.

Definition

Identification should include

- virtualized operating systems
- paperless solutions
- power usage
- wake on LAN
- thin clients.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 118

Install a virtualized OS.

Definition

Installation should include using one of the following

- Hyper-V (Microsoft)
- VMware
- Virtual PC
- VirtualBox (open source)
- Another tool, as appropriate.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Providing User Training and Support

Task Number 119

Identify user and network administrator training needs.

Definition

Identification of user training needs should include

- logon steps
- FTP, access, and security
- print operations
- data backups
- data storage policies.

Identification of network administrator training needs should include

- web network services
- system and security logs
- system backups
- maintenance of logon scripts.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 120

Provide network onboarding for new employees.

Definition

Provision should include using a network guide that articulates

- procedures for logging on to the network

- methods for accessing resources on the network
- procedures for resolving common problems
- policies about system usage
- descriptions of available network resources.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Business Procedures

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 121

Develop a training plan.

Definition

Development should include

- assessing the users' prior knowledge of, and experience with, the subject matter
determining the subject matter
- identifying the expected results of the training
- selecting the trainees
- determining the method and mode of training (e.g., one-to-one, hands-on, seminar).

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Business Procedures

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 122

Provide training to users.

Definition

Provision should include following a training plan and giving users the opportunity to demonstrate what they learn.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Business Procedures

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 123

Create a user manual.

Definition

Creation should include

- selecting topics
- outlining the topics
- writing descriptions and instructions for the selected topics
- incorporating illustrations, where appropriate, in the manual
- verifying the accuracy of the manual.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Business Procedures

Computer Applications

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Word Processing

Task Number 124

Provide ongoing user support.

Definition

Provision should include assisting users with computer problems by requiring that a support person be available during core business hours and demonstrating

- established troubleshooting procedures
- communication skills
- sensitivity to user needs and frustrations
- patience with users with various levels of computer experience.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Business Procedures

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Task Number 125

Track hardware and software usage problems.

Definition

Tracking should include

- operating a database or similar software tool
- documenting problems commonly experienced by network users
- identifying factors that may contribute to the problems
- detailing steps taken to resolve the problems.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Business Procedures

Cyber Security

Introduction to Information Technology

Management Information Systems

Network Design

Networking Infrastructures

Developing Employability Skills

Task Number 126

Update résumé.

Definition

Updating the résumé should include

- educational background
- work history
- honors and awards
- membership in clubs and organizations and/or community activities
 - leadership positions held

- community service.

Students should know how to convert a résumé created in a word processing application into ASCII or plain text format with line breaks, so it can be posted on the Internet, placed into an employer’s résumé bank on a company website, or scanned/ converted into digital text by optical character recognition (OCR) software.

Students should be encouraged to keep a résumé updated to reflect their education and experience.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Computer Applications

Cyber Security

Electronic Career Portfolio

Introduction to Information Technology

Job Interview

Management Information Systems

Network Design

Networking Infrastructures

Word Processing

Task Number 127

Describe the process and requirements for obtaining industry certifications related to the Computer Network Software Operations, Advanced course.

Definition

Description should include a list of Virginia Board of Education approved industry certifications related to the Cybersecurity Software Operations, Advanced, course and the process/requirements for obtaining the certifications from

- official websites of the testing organizations or vendors
- materials from publishers that have developed practice materials and tests based on information from the testing organizations or vendors
- information from certified instructors or industry-certified professionals.

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Business Procedures

Electronic Career Portfolio

Introduction to Information Technology

Job Interview

Management Information Systems

Network Design

Task Number 128

Update a professional portfolio that contains representative samples of student-work.

Definition

Update should include

- résumé (electronic and non-electronic documents)
- representations of the student's qualifications and work (e.g., program design, source code, technical documentation, output).

FBLA Competitive Events and Activities Areas

Business Knowledge and Skills

Computer Applications

Cyber Security

Electronic Career Portfolio

Introduction to Information Technology

Job Interview

Management Information Systems

Network Design

Networking Infrastructures

Word Processing

Task Number 129

Identify potential employment barriers for nontraditional groups and ways to overcome these barriers.

Definition

Identification of potential employment barriers should include

- gender
- ethnicity
- age
- discrimination in hiring or promoting practices.

Identification of ways to overcome the barriers should include

- scholarships
- job training programs
- mentorships
- minority assistance programs.

Business Knowledge and Skills

Computer Applications
 Cyber Security
 Electronic Career Portfolio
 Introduction to Information Technology
 Job Interview
 Management Information Systems
 Network Design
 Networking Infrastructures
 Word Processing

SOL Correlations by Task

| | |
|--|---|
| Identify copyright and licensing laws that apply to computer use and network administration. | English: 11.5, 12.5 Social Studies: VUS 14; Govt 9, 14, 15 |
| Describe procedures to ensure the proper licensing of a client-server operating system (OS) and applications. | English: 11.5, 12.5 |
| Identify ethical behavior. | English: 11.5, 12.5 Social Studies: VUS 14; Govt 9, 14, 15 |
| Identify testing skills and strategies for a certification examination. | English: 11.5, 12.5 |
| Demonstrate the ability to complete selected practice examinations (i.e., practice questions similar to those on certification exams). | English: 11.5, 12.5 |
| Complete an industry-certification examination representative of skills learned in this course. | English: 11.5, 12.5 |
| Compare essential network OS components. | English: 11.5, 12.5 |
| Navigate the digital OS environment. | English: 11.5, 12.5 |
| Demonstrate the procedures followed when installing digital OS. | English: 11.5, 12.5 |
| Explain server OS. | English: 11.3, 11.5, 12.3, 12.5 |
| Explain the uses of current and emerging server and storage hardware. | English: 11.5, 12.5 |
| Identify partitions and volumes. | English: 11.1, 11.5, 12.1, 12.5 |
| Install applications. | English: 11.2, 11.5, 12.2, 12.5 |
| Implement directory services on a network. | English: 11.5, 12.5 |
| Manage directory and file replication. | English: 11.5, 12.5 |
| Describe the structure and architecture of the Domain Name System (DNS). | English: 11.5, 12.5 |
| Install the DNS. | English: 11.5, 12.5 |
| Explain how a Dynamic Host Configuration Protocol (DHCP) client obtains an IP address from a DHCP server. | English: 11.5, 12.5 |
| Install a DHCP service. | English: 11.5, 12.5 |
| Manage fault-tolerant volumes, using RAID. | English: 11.5, 12.5 |
| Explain the difference between roaming and local profiles. | English: 11.5, 12.5 |
| Implement directory replication. | English: 11.5, 12.5 |
| Troubleshoot directory services replication. | English: 11.5, 12.5 |
| Implement Internet Printing Protocol (IPP) services. | English: 11.5, 12.5 |

| | |
|--|---|
| Explain types of server malware protection. | English: 11.5, 12.5 |
| Implement web-based and server security features. | English: 11.5, 12.5 |
| Describe the Secure Sockets Layer (SSL) and Transport Layer Security (TLS). | English: 11.3, 11.5, 12.3, 12.5 |
| Explore a security certificate. | English: 11.5, 12.5 |
| Describe firewalls. | English: 11.5, 12.5 |
| Install a firewall. | English: 11.5, 12.5 |
| Implement user security policies. | English: 11.5, 12.5 |
| Define different types of accounts. | English: 11.3, 11.5, 12.3, 12.5 |
| Configure user and group accounts. | English: 11.5, 12.5 |
| Create user profiles. | English: 11.1, 11.5, 12.1, 12.5 |
| Implement global, domain, and local account policies. | English: 11.5, 12.5 |
| Describe considerations and procedures for deploying sharing applications on the network. | English: 11.5, 12.5 |
| Manage shared disk resources. | English: 11.5, 12.5 |
| Identify the procedures for the administration of a shared printer. | English: 11.5, 12.5 |
| Explain email and collaborative scheduling systems. | English: 11.5, 12.5 |
| Implement global, domain, and local system policies. | English: 11.5, 11.6, 11.7, 12.5, 12.6, 12.7 |
| Describe the process of logging on to a domain account and changing a password. | English: 11.5, 12.5 |
| Implement disk quotas. | English: 11.5, 12.5 |
| Explain concepts related to logon authentication. | English: 11.5, 12.5 |
| Identify levels of encryption. | English: 11.5, 12.5 |
| Describe remote administration. | English: 11.5, 12.5 |
| Identify the resources available to solve common support issues. | English: 11.5, 12.5 |
| Describe service packs and patches. | English: 11.5, 12.5 |
| Review event logs. | English: 11.5, 12.5 |
| Review security and all system logs. | English: 11.5, 12.5 |
| Describe the utilities that monitor a server's performance. | English: 11.5, 12.5 |
| Describe the backup and restore process for directory services. | English: 11.5, 12.5 |
| Describe Transmission Control Protocol/Internet Protocol (TCP/IP). | English: 11.5, 12.5 |
| Compare static and dynamic IP routing. | English: 11.5, 12.5 |
| Configure TCP/IP. | |
| Test a TCP/IP configuration, using OS-specific commands. | English: 11.5, 12.5 |
| Identify the network and host IDs' TCP/IP addresses. | English: 11.5, 12.5 |
| Compare IPv4 and IPv6. | English: 11.5, 12.5 |
| Explain the function of a subnet mask and Classless Inter-Domain Routing (CIDR) format. | English: 11.5, 12.5 |
| Describe a loopback address. | English: 11.5, 12.5 |
| Describe the services provided by Network Basic Input/Output System (NetBIOS) over TCP/IP. | English: 11.5, 12.5 |
| Explain the process of host name resolution (i.e., mapping a host name to an IP address on local and remote networks). | English: 11.5, 11.6, 12.5, 12.6 |
| Modify the host file to resolve host names. | English: 11.5, 12.5 |
| Configure File Transfer Protocol (FTP). | English: 11.5, 12.5 |
| Explain the purpose of the Simple Network Management Protocol (SNMP). | English: 11.5, 11.6, 12.5, 12.6 |
| Describe the implementation of virtual Local Area Network (VLAN). | English: 11.5, 12.5 |
| Describe the key protocols of web servers. | English: 11.5, 12.5 |

| | |
|---|---|
| Install web-based services (e.g., Apache, Windows IIS). | English: 11.5, 12.5 |
| Configure web-based services | English: 11.5, 12.5 |
| Explain the major architectural components and security vulnerabilities of web-based services. | English: 11.5, 12.5 |
| Establish web-based services. | English: 11.5, 12.5 |
| Add virtual servers and directories. | |
| Install a server-side programming language that supports dynamic content. | English: 11.5, 12.5 |
| Access a web page with dynamic content. | English: 11.2, 11.5, 12.2, 12.5 |
| Monitor network traffic. | English: 11.2, 11.5, 12.2, 12.5 |
| Analyze network systems for cybersecurity vulnerabilities. | English: 11.5, 12.5 |
| Explain the core security principles used in network management. | English: 11.5, 12.5 |
| Analyze threats and risks to networks. | English: 11.5, 12.5 |
| Analyze internal and external cybersecurity threats to computer networks. | English: 11.5, 12.5 |
| Identify sustainable computer networking practices. | English: 11.5, 12.5 |
| Install a virtualized OS. | English: 11.5, 12.5 |
| Identify user and network administrator training needs. | English: 11.5, 12.5 |
| Provide network onboarding for new employees. | English: 11.5, 12.5 |
| Develop a training plan. | English: 11.1, 11.5, 12.1, 12.5 |
| Provide training to users. | English: 11.5, 12.5 |
| Create a user manual. | English: 11.5, 11.6, 11.7, 12.5, 12.6, 12.7 |
| Provide ongoing user support. | English: 11.5, 12.5 |
| Track hardware and software usage problems. | English: 11.5, 11.6, 11.7, 12.5, 12.6, 12.7 |
| Update résumé. | English: 11.5, 11.6, 11.7, 12.5, 12.6, 12.7 |
| Describe the process and requirements for obtaining industry certifications related to the Computer Network Software Operations, Advanced course. | English: 11.5, 11.8, 12.5, 12.8 |
| Update a professional portfolio that contains representative samples of student-work. | English: 11.5, 11.6, 11.7, 12.5, 12.6, 12.7 |
| Identify potential employment barriers for nontraditional groups and ways to overcome these barriers. | English: 11.5, 12.5 |

Teacher Resources

Instructional Scenarios

Designing a Secure and Functional Home Network

Duty Area: Using Desktop Systems Concepts

Scenario:

You have been retained to design a home network. (See the resource link below, Cyber.Org, for the complete lesson plan). You must map out a home network using the following:

- cable (ISP)
- modem
- router
- firewall
- repeater
- desktop computer

- all-in-one printer
- PlayStation (PS5)
- 3 cell phones
- a smart appliance
- one other device of your choice.

Big Question:

How can a home network function securely and seamlessly using wired and wireless devices?

Focused Questions:

- What is the difference between a wired and wireless device?
- What are the advantages and disadvantages of using wireless?
- What are the advantages and disadvantages of using wired?
- What is a repeater? Why is it important in a home network?
- What is a wireless access point (WAP)?

Project-Based Assessment:

Complete the design of your home network according to the resource guidelines provided and follow the scenario above.

Resources:

- <https://cyber.org/>
- <https://cyber.instructure.com/courses/61>

Instructional scenario submitted Jennifer Marden, Loudoun County High School, Loudoun County Public Schools, 2021; Kristi Rice, Spotsylvania High School, Spotsylvania County Public Schools, 2021, and Katrina Riggleman, Riverbend High School, Spotsylvania County Public Schools, 2021.

Capturing ARP and ICMP Packets

Duty Areas: Ensuring Network Security

Scenario:

This is a lab that allows students to work with Wireshark to capture address resolution protocol (ARP) and Internet control message protocol (ICMP) packets.

Time Required: 30 minutes

Instructions

1. If required, log on to your computer as **NetAdmin** and open a command prompt window.
2. Type **arp -d** and press **Enter** to clear your ARP cache.
3. Start Wireshark and click **Capture Options**.
4. In the Capture Filter text box, type **arp or icmp**, and then click **Start**.
5. At the command prompt, type **tracert books.tomsho.com** and press **Enter**.
6. When tracert is finished, click the **Stop the running live capture** toolbar icon in Wireshark to stop the capture.
7. Scroll to the first packet summary line, if necessary.

Find the ARP packets your computer has generated by looking in the Info column for “Who has *A.B.C.D*, Tell 192.168.100.*XX*” (replacing *A.B.C.D* with the address of your default gateway and *XX* with your student number). Click this packet summary line.

Notice that the Dst (for destination) address is ff:ff:ff:ff:ff:ff, indicating a broadcast. Next:

- 1 In the middle pane, click to expand the **Ethernet II** line. Notice that the Type field is ARP (0x806), which tells the Network access layer which Internetwork-layer protocol should receive the packet.
 - a. Click again to collapse this line.
- 2 Click to expand the **Address Resolution Protocol (request)** line. Examine the information in the ARP header. The ARP message has fields to indicate what technology is used in the Network access layer (Ethernet) and the protocol type that needs the MAC address (IP, in this case).
 - a. Click again to collapse this line.
- 3 In the top pane, click the ARP reply message immediately following the ARP request. The Info column should be similar to “*A.B.C.D* is at 0A:1B:2C:3D:4E:5F.” The MAC address in the ARP reply is the MAC address of your default gateway.
 - a. Explore the Network access and Internetwork headers for this frame.
 - b. (*Note: You might also find an ARP request and ARP reply for your DNS server if it’s in the same network as your computer.*)
- 4 In the top pane, click the first **ICMP Echo (ping) request** message from your computer to the destination computer at *books.tomsho.com*. The IP address should be 67.210.126.125, but IP addresses can change, so it might be different.
- 5 In the middle pane, click to expand the **Internet Protocol** line.
 - a. Notice that the value in the “Time to live” line is 1.
- 6 In the top pane, click the **ICMP Time-to-live exceeded** message that follows the ping request. This message was generated by the first router en route to *books.tomsho.com*.
 - a. Notice that the source address is the address of your default gateway.
- 7 Find the next ICMP Echo (ping) request message and view the TTL value. Tracert sends three Echo (ping) request messages for each TTL value, so the first three messages have a TTL value of 1.
 - a. Find the fourth ICMP Echo (ping) request message and view the TTL value, which should be 2. The “Time-to-live exceeded” message following it is from the next router down the line. Tracert follows this pattern until reaching the destination device (*books.tomsho.com*).
- 8 Exit Wireshark but leave the command prompt window open if you’re continuing to the next project.

Instructional scenario submitted by Jennifer Marden, Loudoun County High School, Loudoun County Public Schools, 2021.

Design Your Companies Authentication Backend

Duty/Concept Area(s): Using Desktop Systems Concepts

Scenario:

You are currently employed at WebWidgets Incorporated as a security consultant working on the redesign and development of their authentication systems. Your job is to design the backend authentication systems for a variety of outward-facing services that your company uses. You need to provide compelling arguments as to what type of authentication and authorization solutions can satisfy the security and usability needs.

WebWidgets Incorporated has the following services that their employees need to access when outside the company network:

- Webmail service
- Gitlab repositories
- Team management system
- Web admin panels

The team has already had an initial briefing where they discussed the possibility of hosting all services on their internal network or using software-as-a-service (SaaS) solutions. The CEO has expressed concerns over security, but also knows they cannot sacrifice major accessibility.

You need to explore popular methods for managing multiple services through a single-sign on (SSO) either provided by a service or housed locally. You will also have to consider the possible vulnerabilities that an SSO introduces and how those can be mitigated.

After weighing the possibilities and choosing a design, you will need to prepare a presentation for the CEO consisting of two options for your team.

Big Question:

How do modern-day systems manage network accounts for authentication and authorization through a variety of services?

Focused Questions:

- What is SSO?
- What is SaaS?
- What are common industry solutions for SSO (internal or provided) and SaaS?
- What types of threats should be considered when implementing SSO or SaaS?
- How can these threats be mitigated?

SOL Correlation:

C/T 9-12.2, C/T 9-12.3, C/T 9-12.4, C/T 9-12.5

Project-Based Assessment:

Student(s) will work to create a presentation to compare to possible designs for the company's new infrastructure.

Instructional scenario submitted by Karl Meister, Norview High School, Norfolk Public Schools, 2021.

Lockdown at International Hotel

Duty Area(s): Ensuring Network Security

Scenario:

Please refer to the resource link below for more information.

<https://cyber.instructure.com/courses/6/pages/aics>

Module 1: International Hotel Lockdown

Big Question:

How do agencies like the Department of Homeland Security investigate an incident using digital forensics and various media?

Focused Questions:

- Based on the evidence, how might you go about constructing a list of key names or groups that can be responsible for the incident?
- Based on the evidence gathered, what is the timeline of events?
- What type of information did you glean from the .txt file?
- Based on the evidence, were you able to identify connections between any of the key figures involved?

Project-Based Assessment:

Groups can be graded on the following:

- Opening Statements (clear, well organized, and relevant)
- Addressed Issues (coverage of topic)
- Supporting Facts (provided facts that support the topic)
- Persuasiveness (arguments are clear and convincing)
- Teamwork (all members contributed to briefing)
- Organization (addressed likely culprit and gave clear recommended response)
- Overall preparedness, effectiveness, and professionalism

Resources: Cyber.org/Cyber Society/AICS

<https://cyber.instructure.com/courses/6/pages/aics>

Instructional scenario submitted Jennifer Marden, Loudoun County High School, Loudoun County Public Schools, 2021; Kristi Rice, Spotsylvania High School, Spotsylvania County Public Schools, 2021, and Katrina Riggelman, Riverbend High School, Spotsylvania County Public Schools, 2012.

Cyber Security and Cyber Forensics Infusion Units

Cyber Security and Cyber Forensics Infusion Units (CYBR) were designed to be infused with designated CTE courses to help students in those programs achieve additional, focused, validated tasks/competencies in personal and professional cyber security skills. These units are not mandatory, and, as such, the tasks/competencies are marked as "optional," to be taught at the instructor's discretion.

Entrepreneurship Infusion Units

Entrepreneurship Infusion Units may be used to help students achieve additional, focused competencies and enhance the validated tasks/competencies related to identifying and starting a new business venture. Because the unit is a complement to certain designated courses and is not mandatory, all tasks/competencies are marked "optional."

Microsoft Imagine Academy Resources

Microsoft Imagine Academy (MSIA) offers classroom resources and materials and instructional techniques that will help enhance instruction and learning for this course. Using the school's membership ID and product key for the Microsoft Imagine Academy, all resources are available through the [MSIA Member Dashboard on the Microsoft site](#).

- To access the curriculum resources, select the Classroom Tile from the member site.
- To access downloadable curriculum resources including the MOAC e-Book, Lesson Plans, and Study Guides select Curriculum Overview - Curriculum Downloads.
- To access Online Learning videos and tutorials select Online Learning Directory tile.
- For more information visit: [How to Get Started with Microsoft Imagine Academy Program](#).

Appendix: Credentials, Course Sequences, and Career Cluster Information

Industry Credentials: Only apply to 36-week courses

- A+ Certification Examination
- Business Information Processing Assessment
- Certified Internet Web (CIW) Advanced HTML 5 and CSS 3 Specialist Examination
- Certified Internet Web (CIW) Data Analyst Examination
- Certified Internet Web (CIW) Database Design Specialist Examination
- Certified Internet Web (CIW) E-Commerce Services Specialist Examination
- Certified Internet Web (CIW) Internet Business Associate Examination
- Certified Internet Web (CIW) JavaScript Specialist Examination
- Certified Internet Web (CIW) Network Technology Associate Examination
- Certified Internet Web (CIW) Site Development Associate Examination
- Certified Internet Web (CIW) Social Media Strategist Examination
- Certified Internet Web (CIW) User Interface Designer Examination
- Certified Internet Web (CIW) Web Design Specialist Examination
- Certified Internet Web (CIW) Web Security Specialist Examination
- Cloud Essentials Certification Examination
- College and Work Readiness Assessment (CWRA+)
- Computer Maintenance Technology Examination
- Computer Networking Fundamentals Assessment
- Computer Repair Technology Assessment
- Computer Technology Assessment
- IC3 Digital Literacy Certification Examination
- Internetworking Examination
- IT Fundamentals+ Certification Examination
- Linux+ Certification Examination
- Microsoft 365 Fundamentals Examination
- Microsoft Certified Azure Fundamentals Examination
- Microsoft Dynamics 365 Fundamentals Examination
- Microsoft Office Specialist (MOS) Examinations
- Microsoft Technology Associate (MTA) Examinations
- National Career Readiness Certificate Assessment
- Network Administration Certification Tests
- Network Pro Certification Examination
- Network+ Certification Examination
- Oracle Certified Associate Examinations
- Oracle Certified Junior Associate Examinations
- PC Pro Certification Examination
- Security Pro Certification Examination
- Security+ Certification Examination
- Technical Support Certification Tests
- Workplace Readiness Skills for the Commonwealth Examination

Concentration sequences: *A combination of this course and those below, equivalent to two 36-week courses, is a concentration sequence. Students wishing to complete a specialization may take additional courses based on their career pathways. A program completer is a student who has met the requirements for a CTE concentration sequence and all other requirements for high school graduation or an approved alternative education program.*

- Computer Information Systems (6612/36 weeks)
- Computer Information Systems (6614/18 weeks)
- Computer Information Systems, Advanced (6613/36 weeks)
- Computer Information Systems, Advanced (6615/18 weeks)
- Computer Network Software Operations (6650/36 weeks)
- Cybersecurity Software Operations (6304/36 weeks)
- Database Design and Management (Oracle) (6660/36 weeks)
- Design, Multimedia, and Web Technologies (6630/36 weeks)
- Design, Multimedia, and Web Technologies (6632/18 weeks)
- Digital Applications (6611/36 weeks)
- Digital Applications (6617/18 weeks)
- Information Technology Fundamentals (6670/36 weeks)
- International Baccalaureate Information Technology in a Global Society (IB6613/36 weeks)

- Java Programming (Oracle) (6661/36 weeks)
- Office Administration (6621/36 weeks)
- Office Administration (6622/18 weeks)
- Programming (6640/36 weeks)
- Programming, Advanced (6641/36 weeks)

| Career Cluster: Information Technology | |
|---|--|
| Pathway | Occupations |
| Information Support and Services | Computer Support Specialist Computer Systems Engineer, Architect Multimedia Artist, Animator Network Systems and Data Communication Analyst |
| Network Systems | Computer and Information Systems Administrator Computer Security Specialist Computer Support Specialist Network and Computer Systems Administrator Network Systems and Data Communication Analyst Telecommunications Specialist |
| Programming and Software Development | Game Designer, Programmer Multimedia Artist, Animator Network Systems and Data Communication Analyst Software Applications Engineer Web Developer |

| Career Cluster: Science, Technology, Engineering and Mathematics | |
|---|---|
| Pathway | Occupations |
| Engineering and Technology | Computer Hardware Engineer Computer Programmer Computer Software Engineer Network and Computer Systems Administrator Network Systems and Data Communication Analyst Production, Planning, Expediting Clerk Project Manager Stockroom, Warehouse, or Storage Yard Stock Clerk Technical Writer Telecommunications Specialist Transportation Manager |