Computer Network Software Operations

6650/36 weeks

Table of Contents

Acknowledgments ......................................................................................................................................... 1
Course Description........................................................................................................................................ 2
Task Essentials Table.................................................................................................................................... 2
Curriculum Framework................................................................................................................................. 6
Performing Legal and Ethical Functions ...................................................................................................... 6
Introducing Desktop Systems Concepts ....................................................................................................... 8
Introducing Basic Server Systems Concepts .............................................................................................. 12
Introducing Network Design Essentials...................................................................................................... 15
Exploring Networking Media ..................................................................................................................... 19
Understanding Networking Standards and Models..................................................................................... 22
Installing Network OS and Services ........................................................................................................... 25
Performing Network Administration Functions ......................................................................................... 27
Performing Network Management and Security Functions ......................................................................... 30
Providing Basic User Training and Support ............................................................................................... 37
Preparing for Industry Certification ........................................................................................................... 38
Developing Employability Skills ................................................................................................................. 40
SOL Correlation by Task ............................................................................................................................ 46
Teacher Resources ...................................................................................................................................... 49
Appendix: Credentials, Course Sequences, and Career Cluster Information ............................................. 56

Acknowledgments

The components of this instructional framework were developed by the following curriculum development panelists:

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Correlations to the Virginia Standards of Learning were reviewed and updated by the following:
Course Description

Suggested Grade Level: 11 or 12

Computer Network Software covers computer support and network administration topics. Students learn networking concepts, from usage to components, and create peer-to-peer network systems and client server networks. Students install, configure, and connect network cards. Students learn how to install operating systems, set up and manage accounts, load software, and establish and implement security plans.

Recommended prerequisite(s): Keyboarding course(s) or teacher-approved demonstration and documentation of touch keyboarding skills and Information Technology Fundamentals 6670

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.

<table>
<thead>
<tr>
<th>Task Number</th>
<th>Tasks/Competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>39</td>
<td>Identify copyright and licensing laws that apply to computer use and network administration.</td>
</tr>
<tr>
<td>40</td>
<td>Describe procedures to ensure the proper licensing of a client-server operating system (OS) and applications.</td>
</tr>
<tr>
<td>41</td>
<td>Identify ethical behavior that is expected of users and administrators.</td>
</tr>
<tr>
<td>#</td>
<td>Topic</td>
</tr>
<tr>
<td>---</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>42</td>
<td>Describe procedures for documentation found in network policies.</td>
</tr>
<tr>
<td>43</td>
<td>Introducing Desktop Systems Concepts</td>
</tr>
<tr>
<td>44</td>
<td>Compare current digital OS.</td>
</tr>
<tr>
<td>45</td>
<td>Explain the hardware found in a computer.</td>
</tr>
<tr>
<td>46</td>
<td>Navigate the digital OS environment.</td>
</tr>
<tr>
<td>47</td>
<td>Navigate system administration tools.</td>
</tr>
<tr>
<td>48</td>
<td>Demonstrate the procedures followed when installing digital OS.</td>
</tr>
<tr>
<td>49</td>
<td>Demonstrate the procedures for installing and removing software in a desktop environment.</td>
</tr>
<tr>
<td>50</td>
<td>Manage a file system structure.</td>
</tr>
<tr>
<td>51</td>
<td>Explain file system formats.</td>
</tr>
<tr>
<td>52</td>
<td>Introducing Basic Server Systems Concepts</td>
</tr>
<tr>
<td>53</td>
<td>Compare server OS.</td>
</tr>
<tr>
<td>54</td>
<td>Analyze current and emerging specialized server hardware.</td>
</tr>
<tr>
<td>55</td>
<td>Describe client-server architecture, including virtual server architecture.</td>
</tr>
<tr>
<td>56</td>
<td>Introducing Network Design Essentials</td>
</tr>
<tr>
<td>57</td>
<td>Identify the services commonly found on a network server.</td>
</tr>
<tr>
<td>58</td>
<td>Describe file system structures.</td>
</tr>
<tr>
<td>59</td>
<td>Explain file system formats.</td>
</tr>
<tr>
<td>60</td>
<td>Introducing Networking Media</td>
</tr>
<tr>
<td>61</td>
<td>Define aspects of networks.</td>
</tr>
<tr>
<td>62</td>
<td>Define types of network architecture.</td>
</tr>
<tr>
<td>63</td>
<td>Describe the role of the Network Interface Card (NIC) network adapter.</td>
</tr>
<tr>
<td>64</td>
<td>Identify services delivered by a server.</td>
</tr>
<tr>
<td>65</td>
<td>Describe standard network LAN topologies.</td>
</tr>
<tr>
<td>66</td>
<td>Describe variations of standard topologies.</td>
</tr>
<tr>
<td>67</td>
<td>Describe the role of the network adapter.</td>
</tr>
<tr>
<td>68</td>
<td>Describe various types of network adapters.</td>
</tr>
<tr>
<td>69</td>
<td>Describe the functions of networking infrastructure (e.g., adapter, router, switch, bridge, wireless access point).</td>
</tr>
<tr>
<td>70</td>
<td>Describe the primary features of each major access method.</td>
</tr>
<tr>
<td>71</td>
<td>Exploring Networking Media</td>
</tr>
<tr>
<td>72</td>
<td>Define terms related to wired and wireless network media.</td>
</tr>
<tr>
<td>73</td>
<td>Identify the types and uses of wired network media.</td>
</tr>
<tr>
<td>74</td>
<td>Identify the types and uses of wireless network media.</td>
</tr>
<tr>
<td>Page</td>
<td>Task</td>
</tr>
<tr>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td>69</td>
<td>✗</td>
</tr>
<tr>
<td>70</td>
<td>✗</td>
</tr>
</tbody>
</table>

**Understanding Networking Standards and Models**

<table>
<thead>
<tr>
<th>Page</th>
<th>Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>71</td>
<td>✗</td>
</tr>
<tr>
<td>72</td>
<td>✗</td>
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<tr>
<td>75</td>
<td>✗</td>
</tr>
<tr>
<td>76</td>
<td>✗</td>
</tr>
</tbody>
</table>

**Installing Network OS and Services**

<table>
<thead>
<tr>
<th>Page</th>
<th>Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>77</td>
<td>✗</td>
</tr>
<tr>
<td>78</td>
<td>✗</td>
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<td>79</td>
<td>✗</td>
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<td>80</td>
<td>✗</td>
</tr>
<tr>
<td>81</td>
<td>✗</td>
</tr>
</tbody>
</table>

**Performing Network Administration Functions**

<table>
<thead>
<tr>
<th>Page</th>
<th>Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>82</td>
<td>✗</td>
</tr>
<tr>
<td>83</td>
<td>✗</td>
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<tr>
<td>84</td>
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<tr>
<td>88</td>
<td>✗</td>
</tr>
<tr>
<td>89</td>
<td>✗</td>
</tr>
</tbody>
</table>

**Performing Network Management and Security Functions**

<table>
<thead>
<tr>
<th>Page</th>
<th>Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>90</td>
<td>✗</td>
</tr>
<tr>
<td>91</td>
<td>✗</td>
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<td>92</td>
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</tr>
<tr>
<td>96</td>
<td>✽ Develop a plan to avoid data loss.</td>
</tr>
<tr>
<td>97</td>
<td>✽ Back up files and directories.</td>
</tr>
<tr>
<td>98</td>
<td>✽ Restore files and directories.</td>
</tr>
<tr>
<td>99</td>
<td>✽ Develop a network performance monitoring plan.</td>
</tr>
<tr>
<td>100</td>
<td>✽ Monitor server resources to track usage and disk space.</td>
</tr>
<tr>
<td>101</td>
<td>✽ Identify threats and vulnerabilities from users.</td>
</tr>
<tr>
<td>102</td>
<td>✽ Develop a preventive maintenance plan.</td>
</tr>
<tr>
<td>103</td>
<td>✽ Develop an audit policy.</td>
</tr>
<tr>
<td>104</td>
<td>✽ Set up file, directory, and printer auditing.</td>
</tr>
<tr>
<td>105</td>
<td>✽ Describe various forms of malware protection for clients and servers.</td>
</tr>
</tbody>
</table>

**Providing Basic User Training and Support**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>106</td>
<td>✽ Identify training needs.</td>
</tr>
<tr>
<td>107</td>
<td>✽ Provide an orientation to a network system (system onboarding).</td>
</tr>
</tbody>
</table>

**Preparing for Industry Certification**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>108</td>
<td>✽ Describe the process and requirements for obtaining industry certifications.</td>
</tr>
<tr>
<td>109</td>
<td>✽ Identify testing skills/strategies for a certification examination.</td>
</tr>
<tr>
<td>110</td>
<td>✽ Demonstrate ability to successfully complete selected practice examinations (e.g., practice questions similar to those on certification exams).</td>
</tr>
<tr>
<td>111</td>
<td>✽ Complete an industry certification examination representative of skills learned in this course.</td>
</tr>
</tbody>
</table>

**Developing Employability Skills**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>112</td>
<td>✽ Research careers in networking and systems security.</td>
</tr>
<tr>
<td>113</td>
<td>✽ Compose a résumé for electronic processing.</td>
</tr>
<tr>
<td>114</td>
<td>✽ Assemble a professional portfolio that contains samples of student work.</td>
</tr>
<tr>
<td>115</td>
<td>✽ Create a cover letter to accompany a résumé.</td>
</tr>
<tr>
<td>116</td>
<td>✽ Complete manual and electronic application forms.</td>
</tr>
<tr>
<td>117</td>
<td>✽ Participate in an internship program.</td>
</tr>
<tr>
<td>118</td>
<td>✽ Research a company in preparation for a job interview.</td>
</tr>
<tr>
<td>119</td>
<td>✽ Participate in a mock interview.</td>
</tr>
<tr>
<td>120</td>
<td>✽ Compose an interview follow-up letter.</td>
</tr>
<tr>
<td>121</td>
<td>✽ Identify the steps to follow when resigning from a position.</td>
</tr>
<tr>
<td>122</td>
<td>✽ Identify potential employment barriers for nontraditional groups and ways to overcome these barriers.</td>
</tr>
</tbody>
</table>
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 and regulations that govern the use of software, information (i.e., text), and graphics.

FBLA Correlations
- 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 connection and software licenses and searching for unlicensed versions of software.

FBLA Correlations
- 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 that is expected of users and administrators.

Definition
Identification should include listing ethical concerns that an administrator may encounter and be expected to handle responsibly, such as

- privacy issues
- nondisclosure of confidential information
- legal use of copyrighted material
- personally identifiable information (PII) (e.g., phone numbers, social security numbers, birth dates).

FBLA Correlations
- Business Knowledge and Skills
- Business Ethics
- Computer Applications
- Database Design and Application
- Healthcare Administration
- Introduction to Information Technology
- Management Information Systems
- Network Design
- Networking Infrastructures
- Spreadsheet Applications
- Word Processing

Task Number 42
Describe procedures for documentation found in network policies.

Definition
Description should include

- documentation of the network
- policies and procedures to maintain and update the network
  - change of personnel in the event of disaster
  - in event of network penetration
- safety assurance
- risk management
- security policies.

FBLA Correlations
- Business Knowledge and Skills
- Computer Applications
- Cyber Security
- Database Design and Application
- Introduction to Information Technology
- Management Information Systems
- Network Design
Introducing Desktop Systems Concepts

Task Number 43
Compare current digital OS.

Definition
Comparison should include

- defining the term operating system (OS)
- describing the functions and characteristics unique to specific digital OS (e.g., Microsoft Windows, Mac OS, Linux)
- describing the differences between command line interface and graphical user interface (GUI)
- differentiating between traditional computer OS and mobile OS (i.e., Android and IOS).

FBLA Correlations
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 44
Explain the hardware found in a computer.

Definition
Explanation should include

- roles and relationships among the various components
- central processing unit (CPU)
- memory
- network adapters (wired and wireless)
- graphic and sound cards
- mass storage devices (internal) (e.g., Serial Advanced Technology Attachment [SATA], solid state drive [SSD], digital versatile drive read-only memory [DVD ROM], Blu-ray disc, read-only memory [BD ROM])
- ports (e.g., Universal Serial Bus [USB2, USB3, serial, parallel)
- peripherals (e.g., printers, removable media/storage)
- input and output devices
- motherboard
- power supply
• plug n play (PnP) hardware memory
• video graphics processors
• Ethernet and wireless adapters.

FBLA Correlations

Business Knowledge and Skills
Computer Applications
Computer Problem Solving
Database Design and Application
Introduction to Information Technology
Management Information Systems
Network Design
Networking Infrastructures
Spreadsheet Applications
Word Processing

Task Number 45
Navigate the digital OS environment.

Definition

Navigation should include

• using
  • system utilities
  • system administrative tools
  • file structure tools
  • hardware management tools
• applying registry management (e.g., Windows)
• utilizing command-line management skills
• applying task and process management
• demonstrating the use of GUI and command line programs to perform file and administrative tasks.

FBLA Correlations

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 46
Navigate system administration tools.

Definition

Navigation should include
• Internet options
• user account management
• file structure tools (e.g., creating, copying, and moving folders and files; using search features, including wild cards and file extensions)
• hardware management tools (e.g., display, printer, network connections).

FBLA Correlations

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 Correlations

Business Knowledge and Skills
Business Procedures
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 48
Demonstrate the procedures for installing and removing software in a desktop environment.
Definition

Demonstration of the procedures for installing software should include

- exercising administrative access
- reading and agreeing to abide by the software licensing contract
- following the manufacturer's instructions.

Demonstration of the procedures for removing software should include

- exercising administrative access
- following the administrative uninstall process.

FBLA Correlations

Business Knowledge and Skills
Computer Applications
Computer Problem Solving
Database Design and Application
Introduction to Information Technology
Management Information Systems
Network Design
Networking Infrastructures
Spreadsheet Applications
Word Processing

Task Number 49

Manage a file system structure.

Definition

Management should include

- organizing files by various methods (e.g., create, modify, and delete)
- identifying appropriate location of files based on function and use
- differentiating between a file system structure and an end-user file system structure
  - multiple drives (i.e., local, cloud)
  - hidden and protected files
  - directory permissions
  - Universal Naming Convention (UNC).

FBLA Correlations

Business Knowledge and Skills
Computer Applications
Computer Problem Solving
Database Design and Application
Introduction to Information Technology
Management Information Systems
Network Design
Networking Infrastructures
Spreadsheet Applications
Word Processing
Task Number 50

Explain file system formats.

Definition
Explanation should include characteristics, associated OS, and benefits and limitations of different file-system formats. Explanation should also include

- File Allocation Table (FAT and FAT32)
- New Technology File System (NTFS)
- compact disc-read only memory (CD-ROM) file system (CDFS)
- Universal Disk Format (UDF)
- Linux extended variants (Ext2, Ext3, Ext4)
- High-Performance File System (HPFS)
- media access control (MAC).

FBLA Correlations
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

Introducing Basic Server Systems Concepts

Task Number 51

Compare server OS.

Definition
Comparison should include evaluating the benefits and limitations of current server OS, including

- Microsoft server OS
- Linux/UNIX distributions (including a general discussion of the varieties of Linux distributions [i.e., Ubuntu, Debian, CentOS, Kali]).

FBLA Correlations
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 52
Analyze current and emerging specialized server hardware.

Definition
Analysis should include

- uses
- characteristics
- role in the network environment
- cost-benefit analysis
- hardware specifications (e.g., redundant array of independent disks [RAID], hot-swappable devices)
- importance of system requirements (e.g., symmetric multiprocessing [SMP], Small Computer System Interface [SCSI] storage, random-access memory [RAM], or CPU).

FBLA Correlations
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 53
Describe client-server architecture, including virtual server architecture.

Definition
Description should include

- characteristics of a client and a server
- the relationship between the client and the server
- the roles of the client and the server in a network environment.

FBLA Correlations
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 54
Identify the services commonly found on a network server.

**Definition**
Identification should include a list of the most commonly used services found in the client-server environment, including:

- email
- file
- printing
- application
- web
- network
- database
- routing and remote access.

**FBLA Correlations**
- 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

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**Task Number 55**

**Explain the authentication of users in a network environment.**

**Definition**
Explanation should include the

- process for logging a user onto a server and network, based on the client
- services software
- server's security features
- software used (e.g., Active Directory [AD])
- the directory service's software used (e.g., AD, Lightweight Directory Access Protocol [LDAP]).

**FBLA Correlations**
- 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
Introducing Network Design Essentials

Task Number 56
Define aspects of networks.

Definition
Definition should include

- terminology
  - local area network (LAN)
  - virtual local area network (VLAN)
  - wide area network (WAN)
  - wireless local area network (WLAN)
  - personal area network (PAN)
- benefits and limitations of each type
- components required to make a network operational
- typical hardware components
- sample business configurations
- communication medium (i.e., wired, wireless).

FBLA Correlations
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 57
Define types of network architecture.

Definition
Definition should include

- architecture (e.g., peer-to-peer, server-based [domain-controlled])
- sample business configurations
- benefits and limitations of each.

FBLA Correlations
Business Knowledge and Skills
Computer Applications
Database Design and Application
Introduction to Information Technology
Management Information Systems
Network Design
Networking Infrastructures
Spreadsheet Applications
Task Number 58
Differentiate between distributed and centralized computing.

Definition
Differentiation should include characteristics and advantages of
- distributed computing
- centralized computing
- cloud computing.

FBLA Correlations
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 59
Identify services delivered by a server.

Definition
Identification should include
- application
- communication
- domain and/or directory
- fax
- file
- print
- mail
- web
- database

and should also include ways to access various servers.

FBLA Correlations
Business Knowledge and Skills
Computer Applications
Database Design and Application
Introduction to Information Technology
Management Information Systems
Network Design
Networking Infrastructures
Spreadsheet Applications
Task Number 60
Describe standard network LAN topologies.

Definition
Description should include a comparison of the features, functions, characteristics, and financial considerations of network LAN topologies.

FBLA Correlations
- 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 61
Describe variations of standard topologies.

Definition
Description should include a comparison of the features, functions, characteristics, and financial considerations of the variations of standard topologies (e.g., mesh, star, bus, ring).

FBLA Correlations
- 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 62
Describe the role of the network adapter.

Definition
Description should include
- tasks performed
- characteristics that may vary among different manufacturers' cards
- explanations of the MAC address and its uses
- media type (e.g., wired [fiber or copper attached], wireless, Bluetooth)
- speed and/or bandwidth.
Task Number 63
Describe various types of network adapters.

Definition
Description should include characteristics of and similarities and differences among network adapters, including
- media type (e.g., fiber attached, copper attached, wireless)
- connection type
- speed and/or bandwidth.

FBLA Correlations
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 64
Describe the functions of networking infrastructure (e.g., adapter, router, switch, bridge, wireless access point).

Definition
Description should include
- network addressing
- media conversion
- address translation
- security
- protocol conversion and virtual private network (VPN)
- packet routing.

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Business Knowledge and Skills
Computer Applications
Task Number 65
Describe the primary features of each major access method.

Definition
Description should include the relationship among topologies, features, benefits, and drawbacks of access methods, including

- contention (i.e., carrier sense multiple access with collision detection [CSMA/CD] and carrier sense multiple access with collision avoidance [CSMA/CA])
- switching
- token passing
- demand priority
- polling.

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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

Exploring Networking Media

Task Number 66
Define terms related to wired and wireless network media.

Definition
Definition of terms should include

- wired network media
  - Ethernet wired protocol (IEEE 802.3)
  - connection types (e.g. fiber, twisted pair [Cat5/6], coaxial cable)
  - Maximum length
- wireless network media
  - wireless protocol and associated channels (IEEE 802.11)
  - service set identifier (SSID), passkey or password
  - channel/frequencies
  - antenna types (regarding distance/direction of signal)
  - signal interference.
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- Business Knowledge and Skills
- Computer Applications
- Computer Problem Solving
- Database Design and Application
- Introduction to Information Technology
- Management Information Systems
- Network Design
- Networking Infrastructures
- Spreadsheet Applications
- Word Processing

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**Task Number 67**

**Identify the types and uses of wired network media.**

**Definition**

Identification should include

- discussion of and comparison among features, functions, and characteristics
- financial considerations of cable types
  - copper
  - coaxial
  - twisted pair cabling
  - fiber optic (e.g., single mode, multimode).

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**Task Number 68**

**Identify the types and uses of wireless network media.**

**Definition**

Identification should include

- Wi-Fi
- Bluetooth
- cellular.

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**FBLA Correlations**

- Business Knowledge and Skills
- Computer Applications
Task Number 69
Describe the concept of broadband.

Definition
Description should include

- digital subscriber line (DSL), cable, fiber optics, high-speed wireless, transmission system lines 1 and 3 (T1 and T3)
- characteristics and functions of broadband transmissions
- different situations in which incarnations of broadband might be used.

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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 70
Describe a modem.

Definition
Description should include

- characteristics and functions of modem communications
- examples
  - analog
  - coaxial cable
  - asymmetric DSL
  - Integrated Services Digital Network (ISDN), T1, T3 lines.

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Business Knowledge and Skills
Computer Applications
Computer Problem Solving
Database Design and Application
Introduction to Information Technology
Management Information Systems
Understanding Networking Standards and Models

Task Number 71
Describe each layer of the Open System Interconnection (OSI) model.

Definition
Description should include the
- identification of each layer
- primary function of each layer
- method of interaction between layers of computing and networking activities.

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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 72
Describe devices in a network environment and their place in the OSI model.

Definition
Description should include
- elements of a network environment
- explanation of each device’s role and placement in the OSI model
- types of switches
  - switch access
  - switch management
  - virtual LAN
  - trunking
  - Spanning Tree Protocol (STP)
- routers
  - routing basics
  - routing protocols
  - network address translation
FBLA Correlations

Business Knowledge and Skills
Computer Applications
Computer Problem Solving
Database Design and Application
Introduction to Information Technology
Management Information Systems
Network Design
Networking Infrastructures
Spreadsheet Applications
Word Processing

Task Number 73
Define the basic components of a network packet.

Definition
Definition should include the components of a network packet including but not limited to

- headers
- body
- footers
- network addressing
- check sums.

FBLA Correlations

Business Knowledge and Skills
Computer Applications
Computer Problem Solving
Database Design and Application
Introduction to Information Technology
Management Information Systems
Network Design
Networking Infrastructures
Spreadsheet Applications
Word Processing

Task Number 74
Describe networking protocols.

Definition
Description should include the

- Ethernet/Wi-Fi
- Transmission Control Protocol (TCP)
- Internet Protocol (IP) versions 4 and 6
• User Datagram Protocol (UDP)
• application layer protocols (Hypertext Transfer Protocol [HTTP], File Transfer Protocol [FTP])
• roles in data transmission across networks.

**FBLA Correlations**

Business Knowledge and Skills
Business Procedures
Computer Applications
Computer Problem Solving
Database Design and Application
Introduction to Information Technology
Management Information Systems
Network Design
Networking Infrastructures
Spreadsheet Applications
Word Processing

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**Task Number 75**

**Identify components and features of the Institute of Electrical and Electronics Engineers (IEEE) 802 networking specifications.**

**Definition**

Identification should include major components and features as defined in the IEEE 802 networking specifications (i.e., standards 802.1-802.xx).

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Business Knowledge and Skills
Computer Problem Solving
Introduction to Information Technology
Management Information Systems
Network Design
Networking Infrastructures

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**Task Number 76**

**Describe address resolution/assignment and wireless authentication.**

**Definition**

Description should address

• Dynamic Host Control Protocol (DHCP)
  o discover, offer, requests, acknowledge
• Domain Name System (DNS)
• Address Resolution Protocol (ARP).

**FBLA Correlations**

Business Knowledge and Skills
Installing Network OS and Services

Task Number 77
Compare essential network OS components.

Definition
Comparison should include components that
- are common among all network OS
- vary among individual network OS platforms.

FBLA Correlations
Business Knowledge and Skills
Computer Problem Solving
Introduction to Information Technology
Management Information Systems
Network Design
Networking Infrastructures

Task Number 78
Determine whether to use peer-to-peer or directory services.

Definition
Determination should include
- consideration of the needs of the company
- benefits and limitations of peer-to-peer and directory service models.

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Business Knowledge and Skills
Business Procedures
Computer Problem Solving
Database Design and Application
Introduction to Information Technology
Management Information Systems
Network Design
Networking Infrastructures
Spreadsheet Applications
Task Number 79
Identify major decisions associated with the installation of an OS.

Definition
Identification should include decisions that must be made before installing network OS, including licensing and features.

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Business Knowledge and Skills
Computer Problem Solving
Introduction to Information Technology
Management Information Systems
Network Design
Networking Infrastructures

Task Number 80
Select server services.

Definition
Selection should include

- choosing and accessing key server services
  - printers
  - DNS
  - Dynamic Host Configuration Protocol (DHCP)
  - web (HTTP/HTTP Secure [HTTPS]).

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Business Knowledge and Skills
Computer Problem Solving
Introduction to Information Technology
Management Information Systems
Network Design
Networking Infrastructures

Task Number 81
Install a server OS.

Definition
Installation should include following the manufacturer's specifications to install a server OS.

FBLA Correlations
Business Knowledge and Skills
Computer Problem Solving
Introduction to Information Technology
Performing Network Administration Functions

Task Number 82
Define different types of accounts.

Definition
Definition of different types of accounts (e.g., user, group) should include their characteristics and application in a network environment.

FBLA Correlations
- Business Knowledge and Skills
- Computer Problem Solving
- Introduction to Information Technology
- Management Information Systems
- Network Design
- Networking Infrastructures

Task Number 83
Administer user and group accounts.

Definition
Administration should include following the guidelines set forth in the user and group account plans.

FBLA Correlations
- Business Knowledge and Skills
- Computer Problem Solving
- Introduction to Information Technology
- Management Information Systems
- Network Design
- Networking Infrastructures

Task Number 84
Create user profiles.

Definition
Creation should include making decisions based on the users' needs for connectivity and applications.
Task Number 85
Implement global, domain, and local account policies.

Definition
Implementation should include establishing, governing, and observing well-defined policies, naming conventions, and password and access parameters.

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Business Knowledge and Skills
Computer Problem Solving
Introduction to Information Technology
Management Information Systems
Network Design
Networking Infrastructures

Task Number 86
Describe considerations and procedures for sharing applications on the network.

Definition
Description should include
- risks and advantages
- procedures for deploying on various platforms
- security considerations.

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Business Knowledge and Skills
Business Procedures
Computer Problem Solving
Introduction to Information Technology
Management Information Systems
Network Design
Networking Infrastructures

Task Number 87
Manage disk resources.

Definition
Management should include

- understanding users' access needs
- planning the sharing of resources for the most effective use of space
- managing the shared resources with the least effect on performance
- establishing and administering rights, permissions, and quotas.

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Business Knowledge and Skills
Business Procedures
Computer Problem Solving
Introduction to Information Technology
Management Information Systems
Network Design
Networking Infrastructures

Task Number 88
Identify the procedures for installing and managing a shared printer.

Definition
Identification should include

- manufacturer's installation specifications
- printer wizards
- printer drivers
- troubleshooting procedures
- printer permissions.

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Business Knowledge and Skills
Business Procedures
Computer Applications
Computer Problem Solving
Database Design and Application
Introduction to Information Technology
Management Information Systems
Network Design
Networking Infrastructures
Spreadsheet Applications
Word Processing

Task Number 89
Identify the functions, features, and guidelines of email and scheduling.
**Definition**
Identification should include listing
- functions and features common to e-mail and calendar systems
- appropriate guidelines for e-mail use
- ethical and privacy concerns.

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- Business Knowledge and Skills
- Business Procedures
- Computer Applications
- Computer Problem Solving
- Cyber Security
- Database Design and Application
- Introduction to Information Technology
- Management Information Systems
- Network Design
- Networking Infrastructures
- Spreadsheet Applications
- Word Processing

**Performing Network Management and Security Functions**

**Task Number 90**
**Document a network security plan.**

**Definition**
Documentation includes recording, policies and procedures related to a developed security plan that addresses
- risks
- vulnerabilities
- breaches
- other issues.

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- Business Knowledge and Skills
- Business Procedures
- Computer Applications
- Computer Problem Solving
- Cyber Security
- Database Design and Application
- Introduction to Information Technology
- Management Information Systems
- Network Design
- Networking Infrastructures
- Spreadsheet Applications
- Word Processing
Task Number 91

Implement a network security plan.

Definition
Implementation should include explaining and enforcing well-documented use policies that ensure network security, including

- Internet security software
- antivirus or anti-malware software
- protocol control
- network segmentation
- implementation of the principle of least privilege
- acceptable use policies
- access points
- intrusion detection systems (host and network based)
- intrusion protection systems (host and network based).

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

Task Number 92

Explain network hardening.

Definition
Explanation should include

- methods of detection and prevention
- response techniques and options according to intruder detection
- penetration testing
- how network hardening reduces vulnerability.

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

Task Number 93
Manage a network.

Definition
Management should include
- update management
- data protection
- remote management
- mobile device management
- data center management
- monitoring
- log file management
- network management with Simple Network Management Protocol (SNMP).

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Business Knowledge and Skills
Computer Problem Solving
Introduction to Information Technology
Management Information Systems
Network Design
Networking Infrastructures

Task Number 94
Optimize a network.

Definition
Optimization should include
- ensuring optimal usage for system resources
- troubleshooting the network.

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Business Knowledge and Skills
Computer Problem Solving
Introduction to Information Technology
Management Information Systems
Network Design
Networking Infrastructures

Task Number 95
Explain software and hardware firewalls.

Definition
Explanation should include
- characteristics
- functions
- benefits.
Task Number 96

Develop a plan to avoid data loss.

**Definition**

Development should include

- determining what data should be backed up
- choosing the type and frequency of backups
- establishing a policy for restoring data
- selecting a remote storage facility
- documenting the plan
- determining a retention period
- deciding on tape backup vs. disk backup
- selecting file-by-file backups vs. snapshots vs. system images
- determining the appropriate levels of access to data, based on principle of least privilege
- implementing strategies and solutions to prevent data loss, whether accidental or as a result of malicious activity
- creating and documenting a backup policy
- testing the backup plan, to include restoration of data.

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

Task Number 97

Back up files and directories.

**Definition**

Backup should be performed at regular intervals and according to a carefully developed policy and well-tested plan.

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Business Knowledge and Skills
Business Procedures
Task Number 98

Restore files and directories.

Definition
Restoration should be performed according to a carefully developed policy and well-tested plan.

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- Business Knowledge and Skills
- Business Procedures
- Computer Problem Solving
- Cyber Security
- Introduction to Information Technology
- Management Information Systems
- Network Design
- Networking Infrastructures

Task Number 99

Develop a network performance monitoring plan.

Definition
Development should include
- determining what activity should be monitored
- considering the costs of system resources
- determining the expected performance levels
- choosing the monitoring method
- documenting the plan.

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- Business Knowledge and Skills
- Business Procedures
- Computer Problem Solving
- Cyber Security
- Introduction to Information Technology
- Management Information Systems
- Network Design
- Networking Infrastructures

Task Number 100

Monitor server resources to track usage and disk space.
Definition
Monitoring should include
• following guidelines outlined in the audit policy
• mapping storage usage on a scheduled basis
• tracking the method for observing performance objectives
• determining baselines and expected performance levels
• comparing utilization to baselines.

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Business Procedures
Computer Problem Solving
Cyber Security
Introduction to Information Technology
Management Information Systems
Network Design
Networking Infrastructures

Task Number 101
Identify threats and vulnerabilities from users.
Definition
Identification should include differentiating between a threat and a vulnerability, as well as
• email usage
• insider threats
• employee errors
• poor management
  o poor policy creation
  o unused accounts
  o poor password selection.

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Business Procedures
Computer Problem Solving
Cyber Security
Introduction to Information Technology
Management Information Systems
Network Design
Networking Infrastructures

Task Number 102
Develop a preventive maintenance plan.
Definition
Development should include identifying and documenting preventive tasks and procedures that maintain network stability, including
• power issues (i.e., uninterrupted power supply [UPS], spikes, surges)
• defragmentation
• disk clean
• virus scan
• hardware and software maintenance (i.e., security patches)
• performance monitoring.

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

Task Number 103
Develop an audit policy.

Definition
Development should include
• deciding what types of access need to be monitored and why
• justifying auditing methods
• determining resources needed to audit events
• documenting audit policy.

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Business Procedures
Computer Problem Solving
Cyber Security
Introduction to Information Technology
Management Information Systems
Network Design
Networking Infrastructures

Task Number 104
Set up file, directory, and printer auditing.

Definition
Setup should include following guidelines set forth in the audit policy to track the usage of files, directories, and printers.

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Business Knowledge and Skills
Business Procedures
Computer Problem Solving
Task Number 105
Describe various forms of malware protection for clients and servers.

Definition
Description should include

- various forms of malware protection
  - antivirus software
  - spam
  - adware
  - spyware filtering
  - patch management
- characteristics of malware protection
  - function
  - cost
  - upkeep
  - reliability
  - reporting
- types of systems on which the malware protection is deployed
  - email security gateways
  - web security gateways
  - endpoints (workstations or servers).

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

Providing Basic User Training and Support

Task Number 106
Identify training needs.

Definition
Identification should include

- login steps
- FTP
• print operations
• systems and information use
• steps to secure data and access data backups
• security awareness.

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- Business Procedures
- Computer Problem Solving
- Cyber Security
- Introduction to Information Technology
- Management Information Systems
- Network Design
- Networking Infrastructures

**Task Number 107**

**Provide an orientation to a network system (system onboarding).**

**Definition**
Provision should include an orientation involving the use of a well-organized network system guide that articulates

- procedures to log in to the network
- methods used to access resources on the network
- processes used to resolve common problems
- security considerations.

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- Business Knowledge and Skills
- Business Procedures
- Computer Problem Solving
- Cyber Security
- Introduction to Information Technology
- Management Information Systems
- Network Design
- Networking Infrastructures

**Preparing for Industry Certification**

**Task Number 108**

**Describe the process and requirements for obtaining industry certifications.**

**Definition**
Description should include

- list of industry certifications
• process and requirements for obtaining the certifications
• official websites of the testing organization or vendor
• materials from publishers that have developed practice materials and tests based on
  information from the testing organization or vendor
• information from certified instructors or industry-certified professionals
• information in the "Introduction/Course Description" section of this document.

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Business Knowledge and Skills
Business Procedures
Electronic Career Portfolio
Introduction to Information Technology
Job Interview
Management Information Systems
Network Design
Networking Infrastructures

Task Number 109
Identify testing skills/strategies for a certification examination.

Definition
The 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.

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Business Procedures
Electronic Career Portfolio
Introduction to Information Technology
Job Interview
Management Information Systems
Network Design
Networking Infrastructures

Task Number 110
Demonstrate ability to successfully complete selected practice examinations (e.g., practice questions similar to those on certification exams).

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

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- Business Knowledge and Skills
- Business Procedures
- Electronic Career Portfolio
- Introduction to Information Technology
- Job Interview
- Management Information Systems
- Network Design
- Networking Infrastructures

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**Task Number 111**

**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.

Students should be encouraged to attain industry certification as evidence of their computer network software operations skill level and general employability.

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- Business Knowledge and Skills
- Business Procedures
- Electronic Career Portfolio
- Introduction to Information Technology
- Job Interview
- Management Information Systems
- Network Design
- Networking Infrastructures

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**Developing Employability Skills**

**Task Number 112**

**Research careers in networking and systems security.**

**Definition**
Researching should include
- exploring advancement opportunities
- analyzing employment trends
- utilizing job databases to match personal abilities, aptitudes, and job expectations with industry standards.
Task Number 113
Compose a résumé for electronic processing.

Definition
Composition should include
- educational background
- work history
- honors and awards
- extracurricular activities (e.g., membership in clubs, leadership positions held, community service).

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Business Knowledge and Skills
Business Procedures
Electronic Career Portfolio
Introduction to Information Technology
Job Interview
Management Information Systems
Network Design
Networking Infrastructures

Task Number 114
Assemble a professional portfolio that contains samples of student work.

Definition
Assembly should include a
- résumé in a format suitable for online posting
- combination of electronic and non-electronic documents that reflect the student’s knowledge, skills, and abilities
- representation of the student’s work (e.g., program design, source code, technical documentation, output).

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Business Knowledge and Skills
Business Procedures
Task Number 115
Create a cover letter to accompany a résumé.

Definition
Creation of a cover letter should include
- following the business letter format
- writing three or four short paragraphs emphasizing salient résumé points
- indicating familiarity with the company
- indicating whether applying for the position is confidential
- explaining why the position is desired
- addressing the letter to the appropriate individual.

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Business Knowledge and Skills
Business Procedures
Electronic Career Portfolio
Introduction to Information Technology
Job Interview
Management Information Systems
Network Design
Networking Infrastructures

Task Number 116
Complete manual and electronic application forms.

Definition
Completion of manual applications should include
- finishing all sections of employment applications (i.e., name, address, education, work experiences, job title, references, other qualifications)
- utilizing good penmanship
- being prepared (e.g., having copies of résumé and all other relevant information)
- securing references (and obtaining permission before using).

Completion of electronic applications should
- include providing complete, accurate, and effectively organized information
- consideration of criteria specifically related to the electronic transmittal of application information (e.g., attention to security concerns, inclusion of keywords to enhance interest in the application, use of scanner-friendly format).

FBLA Correlations
Task Number 117

Participate in an internship program.

Definition

Participation should include

- finding an internship program within the computer network software operations field
- following an instructor’s or counselor’s guidance
- obtaining consent from parent(s) or legal guardian(s)
- committing to the internship contract.

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Business Knowledge and Skills
Business Procedures
Electronic Career Portfolio
Introduction to Information Technology
Job Interview
Management Information Systems
Network Design
Networking Infrastructures

Task Number 118

Research a company in preparation for a job interview.

Definition

Research should include utilizing electronic and printed resources and

- gathering background information through website, annual reports, human resources’ department
- focusing on the company's mission, history, vision, and additional information.

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Business Knowledge and Skills
Business Procedures
Electronic Career Portfolio
Introduction to Information Technology
Job Interview
Management Information Systems
Task Number 119

Participate in a mock interview.

Definition

Participation should include

- playing a variety of roles in the interview to assess behaviors that are both desirable (e.g., maintaining eye contact, asking informed questions) and undesirable (e.g., speaking too softly, failing to answer questions completely)
- utilizing technical terms and knowledge when answering questions
- displaying knowledge of company.

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Business Knowledge and Skills
Business Procedures
Electronic Career Portfolio
Introduction to Information Technology
Job Interview
Management Information Systems
Network Design
Networking Infrastructures

Task Number 120

Compose an interview follow-up letter.

Definition

Composition should include

- following the business letter format
- expressing appreciation for the opportunity to interview
- reminding the interviewer of the qualifications that were discussed
- confirming interest in the job
- requesting further action (e.g., second interview or meeting).

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Business Knowledge and Skills
Business Procedures
Electronic Career Portfolio
Introduction to Information Technology
Job Interview
Management Information Systems
Network Design
Networking Infrastructures
Task Number 121
Identify the steps to follow when resigning from a position.

Definition
Identification should include

- preparing a sample oral and/or written resignation
- providing ample time to find a replacement (usually two weeks).

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Business Knowledge and Skills
Business Procedures
Electronic Career Portfolio
Introduction to Information Technology
Job Interview
Management Information Systems
Network Design
Networking Infrastructures

Task Number 122
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.

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Business Knowledge and Skills
Business Procedures
Electronic Career Portfolio
Introduction to Information Technology
Job Interview
Management Information Systems
Network Design
Networking Infrastructures
### SOL Correlation by Task

<table>
<thead>
<tr>
<th>Task</th>
<th>English:</th>
<th>Social Studies:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify copyright and licensing laws that apply to computer use and network administration.</td>
<td>11.5, 12.5</td>
<td>Govt 9, 14, 15</td>
</tr>
<tr>
<td>Describe procedures to ensure the proper licensing of a client-server operating system (OS) and applications.</td>
<td>11.5, 12.5</td>
<td></td>
</tr>
<tr>
<td>Identify ethical behavior that is expected of users and administrators.</td>
<td>11.5, 11.6, 12.5, 12.6</td>
<td>Govt 9, 14, 15</td>
</tr>
<tr>
<td>Describe procedures for documentation found in network policies.</td>
<td>11.5, 11.6, 12.5, 12.6</td>
<td></td>
</tr>
<tr>
<td>Explain the hardware found in a computer.</td>
<td>11.5, 12.5</td>
<td></td>
</tr>
<tr>
<td>Navigate the digital OS environment.</td>
<td>11.2, 11.5, 12.2, 12.5</td>
<td></td>
</tr>
<tr>
<td>Navigate system administration tools.</td>
<td>11.5, 12.5</td>
<td></td>
</tr>
<tr>
<td>Demonstrate the procedures followed when installing digital OS.</td>
<td>11.2, 11.5, 12.2, 12.5</td>
<td></td>
</tr>
<tr>
<td>Demonstrate the procedures for installing and removing software in a desktop environment.</td>
<td>11.5, 12.5</td>
<td></td>
</tr>
<tr>
<td>Manage a file system structure.</td>
<td>11.5, 12.5</td>
<td></td>
</tr>
<tr>
<td>Explain file system formats.</td>
<td>11.5, 12.5</td>
<td></td>
</tr>
<tr>
<td>Compare server OS.</td>
<td>11.5, 12.5</td>
<td></td>
</tr>
<tr>
<td>Analyze current and emerging specialized server hardware.</td>
<td>11.5, 12.5</td>
<td></td>
</tr>
<tr>
<td>Describe client-server architecture, including virtual server architecture.</td>
<td>11.5, 12.5</td>
<td></td>
</tr>
<tr>
<td>Identify the services commonly found on a network server.</td>
<td>11.5, 11.6, 12.5, 12.6</td>
<td></td>
</tr>
<tr>
<td>Explain the authentication of users in a network environment.</td>
<td>11.5, 12.5</td>
<td></td>
</tr>
<tr>
<td>Define aspects of networks.</td>
<td>11.3, 11.5, 12.3, 12.5</td>
<td></td>
</tr>
<tr>
<td>Define types of network architecture.</td>
<td>11.3, 11.5, 12.3, 12.5</td>
<td></td>
</tr>
<tr>
<td>Differentiate between distributed and centralized computing.</td>
<td>11.3, 11.5, 12.3, 12.5</td>
<td></td>
</tr>
<tr>
<td>Identify services delivered by a server.</td>
<td>11.3, 11.5, 12.3, 12.5</td>
<td></td>
</tr>
<tr>
<td>Describe standard network LAN topologies.</td>
<td>11.5, 12.5</td>
<td></td>
</tr>
<tr>
<td>Describe variations of standard topologies.</td>
<td>11.5, 12.5</td>
<td></td>
</tr>
<tr>
<td>Describe the role of the network adapter.</td>
<td>11.5, 12.5</td>
<td></td>
</tr>
<tr>
<td>Describe various types of network adapters.</td>
<td>11.5, 12.5</td>
<td></td>
</tr>
<tr>
<td>Describe the functions of networking infrastructure (e.g., adapter, router, switch, bridge, wireless access point).</td>
<td>11.5, 12.5</td>
<td></td>
</tr>
<tr>
<td>Describe the primary features of each major access method.</td>
<td>11.5, 12.5</td>
<td></td>
</tr>
<tr>
<td>Define terms related to wired and wireless network media.</td>
<td>11.3, 11.5, 12.3, 12.5</td>
<td></td>
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<tr>
<td>Identify the types and uses of wired network media.</td>
<td>11.5, 12.5</td>
<td></td>
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<tr>
<td>Identify the types and uses of wireless network media.</td>
<td>11.5, 12.5</td>
<td></td>
</tr>
<tr>
<td>Describe the concept of broadband.</td>
<td>11.5, 12.5</td>
<td></td>
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<tr>
<td>Describe a modem.</td>
<td>11.5, 12.5</td>
<td>VUS 14; Govt 9, 14, 15</td>
</tr>
<tr>
<td>Describe each layer of the Open System Interconnection (OSI) model.</td>
<td>11.5, 12.5</td>
<td></td>
</tr>
<tr>
<td>Describe devices in a network environment and their place in the OSI model.</td>
<td>11.5, 12.5</td>
<td></td>
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<tr>
<td>Task</td>
<td>English:</td>
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<tr>
<td>---------------------------------------------------------------------</td>
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</tr>
<tr>
<td>Define the basic components of a network packet.</td>
<td>11.3, 11.5, 12.3, 12.5</td>
<td></td>
</tr>
<tr>
<td>Describe networking protocols.</td>
<td>11.5, 12.5</td>
<td></td>
</tr>
<tr>
<td>Identify components and features of the Institute of Electrical and</td>
<td>11.5, 12.5</td>
<td></td>
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<tr>
<td>Electronics Engineers (IEEE) 802 networking specifications.</td>
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<tr>
<td>Describe address resolution/assignment and wireless authentication.</td>
<td>11.5, 12.5</td>
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<tr>
<td>Compare essential network OS components.</td>
<td>11.5, 12.5</td>
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<tr>
<td>Determine whether to use peer-to-peer or directory services.</td>
<td>11.5, 12.5</td>
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<tr>
<td>Identify major decisions associated with the installation of a OS.</td>
<td>11.5, 12.5</td>
<td></td>
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<tr>
<td>Select server services.</td>
<td>11.5, 12.5</td>
<td></td>
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<tr>
<td>Install a server OS.</td>
<td>11.5, 12.5</td>
<td></td>
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<tr>
<td>Define different types of accounts.</td>
<td>11.3, 11.5, 12.3, 12.5</td>
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<tr>
<td>Administer user and group accounts.</td>
<td>11.5, 12.5</td>
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<tr>
<td>Create user profiles.</td>
<td>11.5, 12.5</td>
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<tr>
<td>Implement global, domain, and local account policies.</td>
<td>11.5, 12.5</td>
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<tr>
<td>Describe considerations and procedures for sharing applications on</td>
<td>11.5, 12.5</td>
<td></td>
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<tr>
<td>the network.</td>
<td></td>
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<tr>
<td>Manage disk resources.</td>
<td>11.5, 12.5</td>
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<tr>
<td>Identify the procedures for installing and managing a shared printer.</td>
<td>11.5, 12.5</td>
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<tr>
<td>Identify the functions, features, and guidelines of e-mail and</td>
<td>11.5, 12.5</td>
<td></td>
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<tr>
<td>scheduling.</td>
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<tr>
<td>Document a network security plan.</td>
<td>11.5, 11.6, 11.7, 12.5, 12.6, 12.7</td>
<td></td>
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<tr>
<td>Implement a network security plan.</td>
<td>11.5, 11.6, 11.7, 12.5, 12.6, 12.7</td>
<td></td>
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<tr>
<td>Explain network hardening.</td>
<td>11.5, 12.5</td>
<td></td>
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<tr>
<td>Manage a network.</td>
<td>11.5, 12.5</td>
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<tr>
<td>Optimize a network.</td>
<td>11.5, 12.5</td>
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<tr>
<td>Explain software and hardware firewalls.</td>
<td>11.5, 12.5</td>
<td></td>
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<tr>
<td>Develop a plan to avoid data loss.</td>
<td>11.5, 11.6, 11.7, 12.5, 12.6, 12.7</td>
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<tr>
<td>Back up files and directories.</td>
<td>11.5, 12.5</td>
<td></td>
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<tr>
<td>Restore files and directories.</td>
<td>11.5, 12.5</td>
<td></td>
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<tr>
<td>Develop a network performance monitoring plan.</td>
<td>11.5, 12.5</td>
<td></td>
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<tr>
<td>Monitor server resources to track usage and disk space.</td>
<td>11.5, 12.5</td>
<td></td>
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<tr>
<td>Identify threats and vulnerabilities from users.</td>
<td>11.5, 12.5</td>
<td></td>
</tr>
<tr>
<td>Develop a preventive maintenance plan.</td>
<td>11.5, 11.6, 11.7, 12.5, 12.6, 12.7</td>
<td></td>
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<tr>
<td>Develop an audit policy.</td>
<td>11.1, 11.6, 12.1, 12.6</td>
<td></td>
</tr>
<tr>
<td>Set up file, directory, and printer auditing.</td>
<td>11.6, 11.7, 12.6, 12.7</td>
<td></td>
</tr>
<tr>
<td>Describe various forms of malware protection for clients and servers.</td>
<td>11.2, 11.5, 12.2, 12.5</td>
<td></td>
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<tr>
<td>Identify training needs.</td>
<td>11.5, 12.5</td>
<td></td>
</tr>
<tr>
<td>Provide an orientation to a network system (system onboarding).</td>
<td>11.5, 11.6, 12.5, 12.6</td>
<td></td>
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<tr>
<td>Describe the process and requirements for obtaining industry</td>
<td>11.5, 11.6, 11.7, 12.5, 12.6, 12.7</td>
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<tr>
<td>certifications.</td>
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<tr>
<td>Identify testing skills/strategies for a certification examination.</td>
<td>11.5, 11.8, 12.5, 12.8</td>
<td></td>
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<tr>
<td>Demonstrate ability to successfully complete selected practice</td>
<td>11.5, 12.5</td>
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<tr>
<td>examinations (e.g., practice questions similar to those on</td>
<td></td>
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<tr>
<td>certification exams).</td>
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<tr>
<td>Complete an industry certification examination representative of</td>
<td>11.5, 12.5</td>
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<tr>
<td>skills learned in this course.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Research careers in networking and systems security.</td>
<td>11.5, 11.8, 12.5, 12.8</td>
<td></td>
</tr>
<tr>
<td>Compose a résumé for electronic processing.</td>
<td>11.5, 11.6, 11.7, 12.5, 12.6, 12.7</td>
<td></td>
</tr>
<tr>
<td>Assemble a professional portfolio that contains samples of student</td>
<td>11.2, 11.5, 11.6, 11.7, 12.2, 12.5, 12.6, 12.7</td>
<td></td>
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<tr>
<td>work.</td>
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<tr>
<td>Task</td>
<td>English</td>
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<tr>
<td>----------------------------------------------------------------------</td>
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<td></td>
</tr>
<tr>
<td>Create a cover letter to accompany a résumé.</td>
<td>11.2, 11.6, 11.7, 12.2, 12.6, 12.7</td>
<td></td>
</tr>
<tr>
<td>Complete manual and electronic application forms.</td>
<td>11.5, 11.6, 11.7, 12.5, 12.6, 12.7</td>
<td></td>
</tr>
<tr>
<td>Participate in an internship program.</td>
<td>11.5, 12.5</td>
<td></td>
</tr>
<tr>
<td>Research a company in preparation for a job interview.</td>
<td>11.5, 11.8, 12.5, 12.8</td>
<td></td>
</tr>
<tr>
<td>Participate in a mock interview.</td>
<td>11.1, 11.5, 12.1, 12.5</td>
<td></td>
</tr>
<tr>
<td>Compose an interview follow-up letter.</td>
<td>11.5, 11.6, 11.7, 12.5, 12.6, 12.7</td>
<td></td>
</tr>
<tr>
<td>Identify the steps to follow when resigning from a position.</td>
<td>11.1, 11.5, 12.1, 12.5</td>
<td></td>
</tr>
<tr>
<td>Identify potential employment barriers for nontraditional groups and ways to overcome these barriers.</td>
<td>11.5, 12.5</td>
<td></td>
</tr>
</tbody>
</table>
Teacher Resources

Instructional Scenarios

Designing a Secure and Functional Home Network

Duty Area: Introducing 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


Capturing ARP and ICMP Packets

Duty Areas: Understanding Network Standards and Models

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.
   In the Capture Filter text box, type `arp` or `icmp`, and then click Start.

4. At the command prompt, type `tracert books.tomsho.com` and press Enter.

5. When tracert is finished, click the Stop the running live capture toolbar icon in Wireshark to stop the capture.
   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. 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). 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.
   Explore the Network access and Internetwork headers for this frame.
   (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. 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.
   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.
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. 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.
Trade Secrets

Duty/Concept areas addressed:
Installing Network OS and Services
Performing Network Administration Functions
Introducing Basic Server Systems Concepts
Performing Network Management and Security Functions
Providing Basic User Training and Support

Note: This Cybersecurity Software Operations (CSO) scenario could be an ongoing project or culminating project.

A national ad agency has just set up a local office in your town. The agency has a small network that consists of three personal computers with Windows XP operating systems, a file server, two printers, and a main server. The network has been constructed and connected, but no user accounts or permissions have been initiated. The receptionist should be able to view the contact information of current clients, to enter contact information for new clients, and to enter appointments on a shared calendar. The account associate should have higher-level access in order to check the status of jobs and payment histories in the course of handling customer and vendor questions. The account manager should have access to all data available. Everyone in the office shares the two printers. The account manager would also like to have some sort of interoffice "chat" program so that associates can communicate without the distraction of phones or intercoms.

The account manager is concerned about network security, given that client files are kept online and the main server has a secure connection to the parent company. Data is confidential, personal, and sensitive. Therefore, any breach in security could damage the entire company's reputation.

Big Question: How will you set up the network with the various levels of access while protecting important confidential information?

Focused Questions:

1. What are the various levels of access needed?
2. How many user accounts will be needed?
3. How should the printers be shared?
4. What plan will you create to ensure that the ad agency's data is secure?
5. What is the timeline attached to the implementation of the plan?
6. What elements should be involved in the design of the backup plan?

Project-Based Assessment

1. Construct a model or diagram for the office, including network design and access levels.
2. Conduct research to find information about network security.
3. Write a report on a network security breach.

Resource
Microsoft Tech Net

Next Step: Certification

Duty/Concept areas addressed:
Performing Legal and Ethical Functions
Preparing for Industry Certification
Developing Employability Skills

Note: This Cybersecurity Software Operations (CSO) scenario could be an ongoing project or culminating project.

You have just been hired as a network administrator-in-training for a small real estate company. You only work part-time, keeping the small office running, but the real estate agent has plans to double office space within the next 15 months and add three more assistants to help serve his growing client base. Currently you have four PCs, two network printers, and one server. You have already set up network access for each of the four current users and all equipment is working fine. Now, you must implement a new network design for all components.

One condition of your employment is that you obtain industry certification as a systems administrator within six months. In your spare time, you begin to research certifications in your field and try to decide which certification would most complement the role you want to fill.

Because your boss is always interested in new technology, you often have conversations about the latest and greatest technology tools. In a recent chat, you talked about the explosion of file sharing on peer-to-peer networks and the legal and ethical implications. Each month, your boss hosts a dinner meeting of area real estate brokers and he asks you to give an informal presentation on the certification you are pursuing and the security implications for file sharing, namely, unlicensed software on company computers, in the real estate industry.

**Big Question:** What information will your presentation contain?

**Focused Questions:**

1. Which certification is most appropriate to the functions you will be performing as a network systems administrator?
2. What is a peer-to-peer file sharing network?
3. How could the peer-to-peer file sharing network affect businesses?
4. What are the network security risks?
5. Should company computers be protected from workers downloading unauthorized software? Why or why not?
6. How will anyone know your employees are using unlicensed software?
7. What would happen if the authorities discovered your employees are using unlicensed software?
8. What key elements will go into your presentation outline?

**Project-Based Assessment**
Oral presentation and critique

**Resources**

- Featured Cisco Certification Schools in Virginia: http://www.computertrainingschools.com/search/VA/C/
- Advanced Technology Systems (Virginia Beach) http://www.vbatc.com/a-infotech.html
- Industry Certification Programs Offered at Virginia Western Community College http://www.vw.vccs.edu/Pages/BREW/Certification.html
- Free Certification Tutorials, Articles, and Online Courses http://www.learnthat.com/certification/

**The Insurance Agent**
Duty/Concept areas addressed:
Introducing Basic Server Systems Concepts
Introducing Network Design Essentials
Exploring Network Media
Understanding Networking Standards and Models
Installing Network OS and Services
Providing Basic User Training and Support

Note: This Cybersecurity Software Operations (CSO) scenario could be an ongoing project or culminating project.

Your best friend's father is an insurance agent. He just discovered that you are learning about computer networking. One day he calls you and invites you to stop by his new office. He tells you he would like your help setting up a network for his office. He would also like to learn enough about networking in the process to address problems that may arise.

Upon arriving at the office, you learn that the small building was constructed 15 years ago and does not have any network wiring. Your friend's dad has three personal computers with Windows XP operating systems, a network printer, an all-in-one copier/fax/printer, a file server, and a server that connects to each of the three computers and has a remote access connection to the agency's parent company.

Your friend's father employs an assistant and an office receptionist. Each has a separate office. There is also a small utility-type room that currently doubles as a break room and storage closet.

Not only will you be setting up the network, but you will also be setting up the three computers, the printer, and the server.

**Big Question:** How would you design a network for this insurance office and how will you teach the agent about the essentials of computer networking?

**Focused Questions**

1. What is the first thing you would do in this situation?
2. What would a sketch of the network design look like?
3. What hardware and software might be needed?
4. What are the essential networking concepts that you will teach your friend's father?
5. What is your plan for installing and connecting the network?

**Project-Based Assessment**

1. Sketch of the network
2. PowerPoint explaining the terminology and the essentials of computer networking

**Cyber Security and Cyber Forensics Infusion Units**

Cyber Security and Cyber Forensic 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.

**Customer Service Infusion Units**

Customer Service Infusion Units (CSIU) were designed to be infused with designated CTE courses to help students in those programs achieve additional, focused, validated tasks/competencies in customer service. 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.”
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
- Cloud Essentials Certification Examination
- College and Work Readiness Assessment (CWRA+)
- 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
- 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 Network Software Operations, Advanced (6651/36 weeks)
- 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, Advanced (6651/36 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

<table>
<thead>
<tr>
<th>Pathway</th>
<th>Occupations</th>
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<tbody>
<tr>
<td>Information Support and Services</td>
<td>Computer Support Specialist</td>
</tr>
<tr>
<td></td>
<td>Database Administrator</td>
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<td></td>
<td>Internet Entrepreneur</td>
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<tr>
<td></td>
<td>Maintenance Technician</td>
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<tr>
<td>Network Systems</td>
<td>Computer and Information Systems Administrator</td>
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<td>Computer Support Specialist</td>
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<td>Telecommunications Specialist</td>
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<tr>
<td>Programming and Software Development</td>
<td>Computer Software Engineer</td>
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<td></td>
<td>Programmer</td>
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<td>Software Applications Engineer</td>
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<tr>
<td></td>
<td>Software Test Engineer</td>
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<td></td>
<td>Systems Analyst</td>
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### Career Cluster: Science, Technology, Engineering and Mathematics

<table>
<thead>
<tr>
<th>Pathway</th>
<th>Occupations</th>
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<tbody>
<tr>
<td>Engineering and Technology</td>
<td>Computer Hardware Engineer</td>
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<td>Computer Programmer</td>
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<td>Computer Software Engineer</td>
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<td>Network and Computer Systems Administrator</td>
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<td>Network Systems and Data Communication Analyst</td>
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<tr>
<td></td>
<td>Production, Planning, Expediting Clerk</td>
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<td>Project Manager</td>
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<td>Stockroom, Warehouse, or Storage Yard Stock Clerk</td>
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<td>Technical Writer</td>
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<td>Telecommunications Specialist</td>
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<td>Transportation Manager</td>
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