

Computer Networking Hardware Operations I

8542 18 weeks / 70 hours

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Course Description

Suggested Grade Level: 10 or 11

This course prepares students for entry-level careers in the Network Systems pathway. Students develop skills needed to become network technicians, PC support specialist, information systems operators, and network security analyst. It provides a hands-on introduction to networking using tools and hardware commonly found in residential and commercial environments. Instructors are encouraged to facilitate field trips and outside-the-classroom learning experiences. Labs include

PC installation, Internet connectivity, wireless connectivity, file and print sharing, and the installation of game consoles, scanners, and cameras.

Task Essentials List

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

Task Number	8542	Tasks/Competencies
Exploring the Network		
39	⊕	Draw your concept of the Internet.
40	⊕	Research network collaboration tools.
41	⊕	Identify network component representations and functions.
42	⊕	Research converged network services.
43	⊕	Identify network architecture requirements.
44	⊕	Identify network security terminology.
45	⊕	Research information technology (IT) and networking career opportunities.
Configuring a Network Operating System		
46	○	Describe Cisco IOS operating system.
47	⊕	Compare access methods.
48	○	Navigate the IOS.
49	⊕	Establish a console session.
50	○	Configure initial switch settings.
51	⊕	Demonstrate basic connectivity.

Task Number	8542	Tasks/Competencies
52	<input type="radio"/>	Design a simple network.
53	<input checked="" type="radio"/>	Configure a switch management address.
Exploring Network Protocols and Communications		
54	<input type="radio"/>	Explain network protocols and standards.
55	<input checked="" type="radio"/>	Identify protocols and layers.
56	<input type="radio"/>	Research networking standards.
57	<input checked="" type="radio"/>	Illustrate the encapsulation process.
Accessing the Network		
58	<input type="radio"/>	Describe the data-link layer.
59	<input checked="" type="radio"/>	Identify network devices and cabling.
60	<input checked="" type="radio"/>	Identify network media.
61	<input checked="" type="radio"/>	Build an Ethernet crossover cable.
62	<input checked="" type="radio"/>	Determine wired and wireless network interface card (NIC) information.
63	<input checked="" type="radio"/>	Identify frame fields.
64	<input type="radio"/>	Design physical facility layout.
Examining the Ethernet		
65	<input checked="" type="radio"/>	Analyze network device MAC addresses.
66	<input checked="" type="radio"/>	Explain the switch MAC address table.
67	<input type="radio"/>	Identify MAC and IP addresses.
68	<input checked="" type="radio"/>	Analyze the Address Resolution Protocol (ARP) table.

Task Number	8542	Tasks/Competencies
Examining the Network Layer		
69	<input checked="" type="checkbox"/>	Identify IP characteristics.
70	<input checked="" type="checkbox"/>	Identify elements of a routing table entry.
71	<input checked="" type="checkbox"/>	Identify router components.
72	<input type="checkbox"/>	Describe Internetworking devices.
73	<input checked="" type="checkbox"/>	Describe physical characteristics of routers.
74	<input checked="" type="checkbox"/>	Configure a Cisco router.
75	<input checked="" type="checkbox"/>	Connect a router to a LAN.
76	<input checked="" type="checkbox"/>	Troubleshoot default gateway issues.
Setting IP Addresses		
77	<input checked="" type="checkbox"/>	Perform network mathematics.
78	<input type="checkbox"/>	Analyze unicast, broadcast, and multicast.
79	<input type="checkbox"/>	Identify IPv4 addresses.
80	<input checked="" type="checkbox"/>	Practice IPv6 address representations.
81	<input checked="" type="checkbox"/>	Identify types of IPv6 addresses.
82	<input checked="" type="checkbox"/>	Configure a global unicast address.
83	<input type="checkbox"/>	Identify IPv6 addresses.
Subnetting IP Networks		
84	<input checked="" type="checkbox"/>	Calculate the subnet mask (basic).
85	<input checked="" type="checkbox"/>	Determine number of bits to borrow.

Task Number	8542	Tasks/Competencies
86	<input type="radio"/>	Calculate IPv4 subnets.
87	<input checked="" type="radio"/>	Demonstrate Variable-length Subnet Masking (VLSM).
88	<input checked="" type="radio"/>	Implement a subnetted IPv6 addressing scheme.
Examining the Transport Layer		
89	<input checked="" type="radio"/>	Identify Transmission Control Protocol (TCP) and User Datagram Protocol (UDP) characteristics.
90	<input checked="" type="radio"/>	Identify TCP and UDP traffic.
Examining the Application Layer		
91	<input checked="" type="radio"/>	Identify the application and presentation (protocols and standards) layers.
92	<input type="radio"/>	Research peer-to-peer file sharing.
93	<input type="radio"/>	Configure Dynamic Host Configuration Protocol (DHCP) and Domain Name System (DNS) servers.
94	<input type="radio"/>	Describe File Transfer Protocol (FTP).
95	<input type="radio"/>	Establish a multiuser Packet Tracer connection.
Building a Small Network		
96	<input type="radio"/>	Identify network security threats.
97	<input type="radio"/>	Examine telnet and SSH in Wireshark.
98	<input checked="" type="radio"/>	Secure network devices.
99	<input checked="" type="radio"/>	Manage device configuration files.
100	<input type="radio"/>	Demonstrate password recovery procedures.
101	<input checked="" type="radio"/>	Perform network latency test with ping and traceroute.

Task Number	8542	Tasks/Competencies
102	<input type="radio"/>	Perform show commands.
103	<input type="radio"/>	Use the CLI to gather network device information.

Legend: Essential Non-essential Omitted

Curriculum Framework

Exploring the Network

Task Number 39

Draw your concept of the Internet.

Definition

Drawing should illustrate

- how networks are made of many different components
- how the Internet connects to a home or school/university location.

Task Number 40

Research network collaboration tools.

Definition

Research should include

- identifying popular network collaboration tools
- conducting work within a collaborative/sharing platform (e.g., Google Drive)
- investigating conferencing and Internet meeting tools

- creating a wiki page.
-

Task Number 41

Identify network component representations and functions.

Definition

Identification should include

- common components of a network
 - functions of the components
 - relationship of network functions to device names/icons.
-

Task Number 42

Research converged network services.

Definition

Research should lead to

- description of network convergence
 - comparison/contrast of Internet service providers (ISPs) offering converged services
 - identification of companies or public institutions that use convergence technologies.
-

Task Number 43

Identify network architecture requirements.

Definition

Identification should include characteristics and features of architecture requirements.

Task Number 44

Identify network security terminology.

Definition

Identification should include network security terms and their associated definitions.

Task Number 45

Research information technology (IT) and networking career opportunities.

Definition

Research should include

- identifying networking careers currently in demand in the job market
- explaining the value of Cisco certifications
- identifying current hiring trends in IT and networking
- identifying future networking career certifications, skills, and career paths.

Configuring a Network Operating System

Task Number 46

Describe Cisco IOS operating system.

Definition

Description should include the command structure of Cisco IOS software.

Task Number 47

Compare access methods.

Definition

Comparison should determine the most appropriate access method for a given scenario.

Task Number 48

Navigate the IOS.

Definition

Navigating should include

- exploring basic physical network connections, accessing the command-line interface (CLI), and exploring IOS Help methods
 - exploring privileged EXEC mode and issuing additional commands
 - exploring clock commands and changing date and time settings.
-

Task Number 49

Establish a console session.

Definition

Establishing a console session should include

- connecting to a Cisco switch using a serial console cable
 - establishing a console session using a terminal emulator, such as Tera Term
 - using show commands to display device settings
 - configuring the clock on the switch.
-

Task Number 50

Configure initial switch settings.

Definition

Configuring should include

- verifying the default switch configuration
- completing a basic switch configuration
- configuring a message of the day (MOTD) banner
- saving configuration files to non-volatile random-access memory (NVRAM)
- showing competency of lab objectives by configuring an additional switch.

Task Number 51

Demonstrate basic connectivity.

Definition

Demonstration should include

- performing a basic configuration of two switches
- configuring PCs with IP addressing
- configuring switch management interfaces
- using various IOS commands to verify configurations and connectivity between devices.

Task Number 52

Design a simple network.

Definition

Designing should include

- identifying cables and ports for use in a network
- cabling a physical lab topology
- entering static IP addresses on PCs
- verifying connectivity between PCs
- configuring switches with hostnames, local passwords, and login banners
- saving the running configurations
- displaying IOS version information
- displaying interface status.

Task Number 53

Configure a switch management address.

Definition

Configuring should include

- building a simple network using Ethernet cabling
- accessing a Cisco switch using console and remote-access methods
- configuring basic switch settings (hostname, management address, and Telnet access)
- configuring an IP address on a PC
- displaying and verifying device configurations
- testing end-to-end network connectivity
- testing remote management functionality using Telnet
- saving switch running configuration to NVRAM.

Exploring Network Protocols and Communications

Task Number 54

Explain network protocols and standards.

Definition

Explanation should include the role of protocols and standards organizations in facilitating interoperability in network communications.

Task Number 55

Identify protocols and layers.

Definition

Identification should include the functions of the TCP/IP and OSI layers by protocol name.

Task Number 56

Research networking standards.

Definition

Research should include

- gathering information about the major networking standards organizations

- identifying important characteristics of some of the major networking standards organizations.
-

Task Number 57

Illustrate the encapsulation process.

Definition

Illustration should include the PDU types in relation to their associated TCP/IP model layer locations.

Accessing the Network

Task Number 58

Describe the data-link layer.

Definition

Description should include the purpose and function of the data-link layer in preparing communication for transmission on specific media.

Task Number 59

Identify network devices and cabling.

Definition

Identification should include functions and physical characteristics of network devices and network media.

Task Number 60

Identify network media.

Definition

Identification should include

- physical layer terms by description
 - copper media types by characteristics
 - fiber-optic cable types by description.
-

Task Number 61

Build an Ethernet crossover cable.

Definition

Building should include

- analyzing Ethernet cabling standards and pinouts
 - building an Ethernet crossover cable, using Category 5 or 5e cable, RJ-45 connectors, RJ-45 crimping tool, wire cutter, and wire stripper
 - testing an Ethernet crossover cable, using Ethernet cable tester (optional) and two PCs (Windows 7 or 8).
-

Task Number 62

Determine wired and wireless network interface card (NIC) information.

Definition

Determining should include

- determining the availability and status of PC NICs
 - changing the status of a PC NIC
 - using the system tray network icons.
-

Task Number 63

Identify frame fields.

Definition

Identification should include frame field terminology used when building a generic frame.

Task Number 64

Design physical facility layout.

Definition

Designing should include

- mapping physical network cabling and technology types to a simple floor plan blueprint
- selecting network devices and the location of the devices to accommodate the floor plan blueprint
- identifying a location for the main distribution facility.

Examining the Ethernet

Task Number 65

Analyze network device MAC addresses.

Definition

Analysis should include

- setting up the topology and initializing devices
- configuring devices and verifying connectivity
- displaying, describing, and analyzing Ethernet MAC addresses.

The following equipment should be used:

- Router (Cisco 1941 with Cisco IOS Release 15.2(4)M3 universal or comparable)
 - Switch (Cisco 2960 with Cisco IOS Release 15.0(2) lanbasek9 image or comparable)
 - PC (Windows 7 or 8 with terminal emulation program, such as Tera Term)
 - Console cables to configure the Cisco IOS devices via the console ports
 - Ethernet cables as shown in the topology
-

Task Number 66

Explain the switch MAC address table.

Definition

Explanation should include

- building and configuring a network
- examining the switch MAC address table.

The following equipment should be used:

- Router (Cisco 1941 with Cisco IOS Release 15.2(4)M3 universal image or comparable)
 - Switches (Cisco 2960 with Cisco IOS Release 15.0(2) lanbasek9 image or comparable)
 - PCs (Windows 7 or 8 with terminal emulation program, such as Tera Term)
 - Console cables to configure the Cisco IOS devices via the console ports
 - Ethernet cables as shown in the topology
-

Task Number 67

Identify MAC and IP addresses.

Definition

Identification should include

- gathering PDU information
 - summarizing information.
-

Task Number 68

Analyze the Address Resolution Protocol (ARP) table.

Definition

Analysis should include

- examining an ARP request

- examining a switch MAC address table
- examining the ARP process in remote communications.

Examining the Network Layer

Task Number 69

Identify IP characteristics.

Definition

Identification should include

- IP delivery methods by their characteristics
 - IPv4 header fields by their functions
 - IPv6 header descriptions and their associated header fields.
-

Task Number 70

Identify elements of a routing table entry.

Definition

Identification should include the correct routing table entry section for each output statement.

Task Number 71

Identify router components.

Definition

Identification should include the functions and descriptions of router components.

Task Number 72

Describe Internetworking devices.

Definition

Description should include

- identifying physical characteristics of Internetworking devices
 - selecting correct modules for connectivity
 - connecting devices using correct cable types and interfaces.
-

Task Number 73

Describe physical characteristics of routers.

Definition

Description should include

- routers' external characteristics
 - routers' internal characteristics, by using show commands.
-

Task Number 74

Configure a Cisco router.

Definition

Configuring should include

- configuring the device name
 - securing the privileged EXEC mode
 - securing remote Telnet and Secure Shell (SSH) access
 - securing all passwords in the config file
 - providing legal notification.
-

Task Number 75

Connect a router to a LAN.

Definition

Connecting should include

- displaying router information
 - configuring router interfaces
 - verifying router configuration.
-

Task Number 76

Troubleshoot default gateway issues.

Definition

Troubleshooting should include

- verifying network documentation
- isolating problems
- implementing, verifying, and documenting solutions.

Setting IP Addresses

Task Number 77

Perform network mathematics.

Definition

Performing network mathematics should include

- converting binary numbers from octets to decimal values
- converting decimal numbers to binary octets
- determining the network addresses in binary and decimal values by using the ANDing process.
- converting between numbering systems
- converting host IPv4 addresses and subnet masks into binary values
- determining the number of hosts in a network using powers of 2
- converting MAC addresses and IPv6 addresses to binary values
- converting IPv4 addresses from dotted decimal format to binary values
- using the bitwise ANDing operation to determine network addresses

- applying network address calculations by identifying the networks to which they belong and by identifying the default gateway addresses.
-

Task Number 78

Analyze unicast, broadcast, and multicast.

Definition

Analysis should include identification of devices that will receive unicast, broadcast, or multicast transmissions using a destination IP address.

Task Number 79

Identify IPv4 addresses.

Definition

Identification should include listing and classifying IPv4 addresses.

Task Number 80

Practice IPv6 address representations.

Definition

Practice should include converting IPv6 addresses into short and compressed forms.

Task Number 81

Identify types of IPv6 addresses.

Definition

Identification should include IPv6 address types based on descriptions.

Task Number 82

Configure a global unicast address.

Definition

Configure global unicast address.

Task Number 83

Identify IPv6 addresses.

Definition

Identification should include

- identifying the different types of IPv6 addresses
- examining a host IPv6 network interface and address
- practicing IPv6 address abbreviation
- identifying the hierarchy of the IPv6 global unicast address network prefix.

Subnetting IP Networks

Task Number 84

Calculate the subnet mask (basic).

Definition

Calculating should include

- determining the binary representation of given subnet masks for octet representation
 - converting subnet masks to prefix notations.
-

Task Number 85

Determine number of bits to borrow.

Definition

Determining should include

- determining the subnet mask to support the number of specified hosts
 - entering answers in binary, decimal, and prefix notation formats.
-

Task Number 86

Calculate IPv4 subnets.

Definition

Calculating should include

- determining IPv4 address subnetting to include the network and broadcast addresses and number of hosts
 - calculating IPv4 address subnetting to include the number of subnets created, hosts per subnet, subnet address, host ranges for the subnet, and broadcast address for the subnet.
-

Task Number 87

Demonstrate Variable-length Subnet Masking (VLSM).

Definition

Demonstration should include

- using regular subnetting procedures to identify IPv4 address information
 - using VLSM to identify IPv4 address information
 - examining the network requirements
 - designing the VLSM addressing scheme
 - assigning IP addresses to devices and verifying connectivity.
-

Task Number 88

Implement a subnetted IPv6 addressing scheme.

Definition

Implementation should include

- determining the IPv6 subnets and addressing scheme
- configuring the IPv6 addressing on routers and PCs and verifying connectivity.

Examining the Transport Layer

Task Number 89

Identify Transmission Control Protocol (TCP) and User Datagram Protocol (UDP) characteristics.

Definition

Identification should include characteristics of transport layer TCP or UDP delivery methods.

Task Number 90

Identify TCP and UDP traffic.

Definition

Identification should include the transport layer delivery method.

Examining the Application Layer

Task Number 91

Identify the application and presentation (protocols and standards) layers.

Definition

Identification should include the protocol names and standards on the OSI and TCP/IP model network locations.

Task Number 92

Research peer-to-peer file sharing.

Definition

Research should include

- peer-to-peer (P2P) networks, file sharing protocols, and applications
 - P2P file sharing issues
 - P2P copyright litigations.
-

Task Number 93

Configure Dynamic Host Configuration Protocol (DHCP) and Domain Name System (DNS) servers.

Definition

Configuring should include

- configuring static IPv4 addressing
 - configuring and verifying DNS records.
-

Task Number 94

Describe File Transfer Protocol (FTP).

Definition

Description should include

- configuring FTP services on servers
 - uploading a file to the FTP server
 - downloading a file from the FTP server.
-

Task Number 95

Establish a multiuser Packet Tracer connection.

Definition

Establishing should include

- making a local multiuser connection to another instance of Packet Tracer
- verifying connectivity across a local multiuser connection.

Building a Small Network

Task Number 96

Identify network security threats.

Definition

Identification should include

- exploring the [SANS Institute website](#)
- identifying recent network security threats
- detailing a specific network security threat.

Task Number 97

Examine telnet and SSH in Wireshark.

Definition

Examining should include

- configuring the devices for SSH access
- examining a Telnet session with Wireshark
- examining an SSH session with Wireshark.

The following equipment should be used:

- 1 Router (Cisco 1941 with Cisco IOS Release 15.2(4)M3 universal image or comparable)

- 1 PC (Windows 7 or 8 with terminal emulation program, such as Tera Term, and Wireshark installed)
 - Console cables to configure the Cisco IOS devices via the console ports
 - Ethernet cables as shown in the topology
-

Task Number 98

Secure network devices.

Definition

Securing network devices should include

- configuring basic device settings
- configuring basic security measures on the router and on the switch.

The following equipment should be used:

- 1 Router (Cisco 1941 with Cisco IOS Release 15.2(4)M3 universal image or comparable)
 - 1 Switch (Cisco 2960 with Cisco IOS Release 15.0(2) lanbasek9 image or comparable)
 - 1 PC (Windows 7 or 8 with terminal emulation program, such as Tera Term)
 - Console cables to configure the Cisco IOS devices via the console ports
 - Ethernet cables as shown in the topology
-

Task Number 99

Manage device configuration files.

Definition

Management should include

- configuring basic device settings
- using terminal emulation software to create a backup configuration file
- using a backup configuration file to restore a router
- building the network
- downloading Trivial File Transfer Protocol (TFTP) Server software (optional)
- using TFTP to back up and restore the switch running configuration
- backing up and restoring running configurations using router flash memory
- using a USB drive to backup and restore the running configuration (optional).

The following equipment should be used:

- 1 Router (Cisco 1941 with Cisco IOS Release 15.2(4)M3 universal image or comparable)
 - 1 Switch (Cisco 2960 with Cisco IOS Release 15.0(2) lanbasek9 image or comparable)
 - 1 PC (Windows 7 or 8 with terminal emulation program, such as Tera Term)
 - Console cables to configure the Cisco IOS devices via the console ports
 - Ethernet cables as shown in the topology
-

Task Number 100

Demonstrate password recovery procedures.

Definition

Demonstration should include

- researching the configuration register
 - documenting the password recovery procedure for a specific Cisco router.
-

Task Number 101

Perform network latency test with ping and traceroute.

Definition

Performance requires a PC (Windows 7 or 8 with Internet access) and should include

- using ping to document network latency
 - using traceroute to document network latency.
-

Task Number 102

Perform show commands.

Definition

Performance should include

- analyzing show command output
- interpreting output for the show command as related to reflection questions.

Task Number 103

Use the CLI to gather network device information.

Definition

Using the CLI should include

- setting up topology and initializing devices
- configuring devices and verifying connectivity
- gathering network device information.

The following equipment should be used:

- 1 Router (Cisco 1941 with Cisco IOS Release 15.2(4)M3 universal image or comparable)
- 1 Switch (Cisco 2960 with Cisco IOS Release 15.0(2) lanbasek9 image or comparable)
- 1 PC (Windows 7 or 8 with terminal emulation program, such as Tera Term)
- Console cables to configure the Cisco IOS devices via the console ports
- Ethernet cables as shown in the topology

SOL Correlation by Task

39	Draw your concept of the Internet.	History and Social Science: GOVT.6, VUS.14, WG.17, WHI.14
40	Research network collaboration tools.	English: 10.8, 11.8, 12.8 History and Social Science: GOVT.6, VUS.14, WG.17, WHI.14
41	Identify network component representations and functions.	English: 10.5, 11.5, 12.5 History and Social Science: VUS.14, WG.17
42	Research converged network services.	English: 10.8, 11.8, 12.8

		History and Social Science: GOVT.6, VUS.14, WG.17
43	Identify network architecture requirements.	English: 10.5, 11.5, 12.5
44	Identify network security terminology.	English: 10.5, 11.5, 12.5 History and Social Science: GOVT.6, VUS.14
45	Research information technology (IT) and networking career opportunities.	English: 10.8, 11.8, 12.8 History and Social Science: GOVT.6, VUS.14, WG.17, WHI.14
46	Describe Cisco IOS operating system.	
47	Compare access methods.	English: 10.5, 11.5, 12.5 History and Social Science: GOVT.6, VUS.14, WG.17, WHI.14
48	Navigate the IOS.	
49	Establish a console session.	
50	Configure initial switch settings.	
51	Demonstrate basic connectivity.	
52	Design a simple network.	
53	Configure a switch management address.	
54	Explain network protocols and standards.	English: 10.5, 11.5, 12.5
55	Identify protocols and layers.	
56	Research networking standards.	English: 10.8, 11.8, 12.8 History and Social Science: GOVT.6, VUS.14, WG.17, WHI.14
57	Illustrate the encapsulation process.	
58	Describe the data-link layer.	English: 10.5, 11.5, 12.5
59	Identify network devices and cabling.	English: 10.5, 11.5, 12.5
60	Identify network media.	
61	Build an Ethernet crossover cable.	English: 10.5, 11.5, 12.5
62	Determine wired and wireless network interface card (NIC) information.	English: 10.5, 11.5, 12.5
63	Identify frame fields.	English: 10.5, 11.5, 12.5
64	Design physical facility layout.	

65	Analyze network device MAC addresses.	English: 10.5, 11.5, 12.5
66	Explain the switch MAC address table.	English: 10.5, 11.5, 12.5
67	Identify MAC and IP addresses.	
68	Analyze the Address Resolution Protocol (ARP) table.	English: 10.5, 11.5, 12.5
69	Identify IP characteristics.	
70	Identify elements of a routing table entry.	
71	Identify router components.	
72	Describe Internetworking devices.	
73	Describe physical characteristics of routers.	
74	Configure a Cisco router.	History and Social Science: VUS.14
75	Connect a router to a LAN.	
76	Troubleshoot default gateway issues.	English: 10.5, 11.5, 12.5
77	Perform network mathematics.	
78	Analyze unicast, broadcast, and multicast.	English: 10.5, 11.5, 12.5
79	Identify IPv4 addresses.	English: 10.5, 11.5, 12.5
80	Practice IPv6 address representations.	
81	Identify types of IPv6 addresses.	
82	Configure a global unicast address.	
83	Identify IPv6 addresses.	English: 10.5, 11.5, 12.5
84	Calculate the subnet mask (basic).	
85	Determine number of bits to borrow.	
86	Calculate IPv4 subnets.	
87	Demonstrate Variable-length Subnet Masking (VLSM).	English: 10.5, 11.5, 12.5
88	Implement a subnetted IPv6 addressing scheme.	
89	Identify Transmission Control Protocol (TCP) and User Datagram Protocol (UDP) characteristics.	
90	Identify TCP and UDP traffic.	
91	Identify the application and presentation (protocols and standards) layers.	English: 10.5, 11.5, 12.5
92	Research peer-to-peer file sharing.	English: 10.8, 11.8, 12.8
93	Configure Dynamic Host Configuration Protocol (DHCP) and Domain Name System (DNS) servers.	
94	Describe File Transfer Protocol (FTP).	
95	Establish a multiuser Packet Tracer connection.	

96	Identify network security threats.	English: 10.5, 11.5, 12.5 History and Social Science: VUS.14
97	Examine telnet and SSH in Wireshark.	English: 10.5, 11.5, 12.5
98	Secure network devices.	History and Social Science: VUS.14
99	Manage device configuration files.	
100	Demonstrate password recovery procedures.	English: 10.8, 11.8, 12.8 History and Social Science: VUS.14
101	Perform network latency test with ping and traceroute.	
102	Perform show commands.	
103	Use the CLI to gather network device information.	History and Social Science: VUS.14, WG.17, WHII.14

Transportation Career Modules

The following transportation career modules were correlated to this course in March 2012 as part of Careers in Transportation Curriculum Project funded by the US Department of Transportation. Modules include field-tested activities and lesson plans that require students to apply knowledge and skills learned in this course and may encourage students to explore related careers in the Transportation, Distribution, and Logistics Career Cluster.

Click on the link to access the [Careers in Transportation Curriculum Project](#) site and scroll down to search for modules by ID number and title.

Related Career Module(s):

- ID#: LPMS701-113 Title: Graphical Linear Programming

Cyber Security and Cyber Forensics Infusion Units

Cyber Security and Cyber Forensics Infusion Units 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. Teachers can find the infusion/unit in the course listing.

SkillsUSA Championship Competitive Events

SkillsUSA is a national membership association serving high school, college and middle school students who are preparing for careers in trade, technical and skilled service occupations, including health occupations, and for further education. SkillsUSA is a partnership of students, teachers and industry working together to ensure America has a skilled workforce. SkillsUSA helps each student excel.

SkillsUSA is an Applied Method of Learning where students practice skills and build self-confidence while helping their schools and communities. SkillsUSA provides experiences in leadership, teamwork, citizenship and character development. The program emphasizes high ethical standards, superior work skills, lifelong education and pride. These are qualities employers value and look for when hiring or promoting workers.

Mission: SkillsUSA empowers its members to become world-class workers, leaders and responsible American citizens. SkillsUSA improves the quality of our nation's future skilled workforce through the development of Framework skills that include personal, workplace and technical skills grounded in academics.

Vision: SkillsUSA produces the most highly skilled workforce in the world, providing every member the opportunity for career success.

Resources: SkillsUSA offers many resources for educators and students please visit <https://www.skillsusa.org/> then go For additional information about the student organization, see SkillsUSA National Website at <https://www.skillsusa.org/> and the SkillsUSA Virginia Website at <https://www.skillsusa.org/>.

SkillsUSA Championships Events: The official regulations for the following events are published in the SkillsUSA Championships Technical Standards. New contests are added each year.

The SkillsUSA Championships brings together industry and labor representatives, educators and the public to watch students compete in leadership and hands-on skill events for a full day. The SkillsUSA Championships begin at the local level with contests in classrooms nationwide. Winners advance through district, regional and state competition, and only the best make it to the national event. Students benefit no matter how they place in their contests. They test their skills, frequently make job contacts, and have a chance for recognition. State and national winners receive gold, silver and bronze medallions, scholarships, tools and other awards as provided by business and industry partners.

(#) Contest not currently offered in Virginia

(*) Contest for students with IEP only

Leadership Development

Action Skills *
American Spirit Chapter
Business Procedure #
Chapter Display
Community Action Project*
Community Service
Employment Application Process *
Extemporaneous Speaking
Job Interview
Job Skill Demonstration A
Job Skill Demonstration Open
Occupational Health and Safety
Opening and Closing Ceremonies
Outstanding Chapter
Pin Design (State Conference)
Prepared Speech
Promotional Bulletin Board
Quiz Bowl
T-shirt Design

Occupationally Related

Career Pathways Showcase
Customer Service
Engineering Technology/Design
Entrepreneurship
First Aid/CPR
Health Knowledge Bowl #
Health Occupations Professional Portfolio
Medical Math
Medical Terminology
Principles of Engineering/Technology
Related Technical Math
Team Engineering Challenge #

Skilled and Technical Sciences

3-D Visualization and Animation
Additive Manufacturing
Advertising Design
Architectural Drafting
Audio/Radio Production
Automated Manufacturing Technology #
Automotive Refinishing Technology
Automotive Service Technology
Automotive: Maintenance and Light Repair (S)
Aviation Maintenance Technology
Barbering
Basic Health Care Skills #
Broadcast News Production

Building Maintenance
Cabinetmaking
Carpentry
CNC Milling Specialist
CNC Technician
CNC Turning Specialist
Collision Damage Appraisal #
Collision Repair Technology
Commercial Baking
Computer Programming
Cosmetology
Crime Scene Investigation
Criminal Justice
Culinary Arts
Dental Assisting
Diesel Equipment Technology
Digital Cinema Technology
Early Childhood Education
Electrical Construction Wiring
Electronics Technology
Esthetics
Firefighting
Graphic Communications
Graphics Imaging – Sublimation
Heating, Ventilation, Air Conditioning and Refrigeration
Humanoid Robotics #
Industrial Motor Control
Information Technology Services
Interactive Application and Video Game Development
Internetworking
Major Appliance and Refrigeration Technology #
Marine Service Technology
Masonry
Mechatronics
Medical Assisting #
Mobile Electronics Installation #
Mobile Robotics Technology
Motorcycle Service Technology
Nail Care
Nurse Assisting
Photography
Plumbing
Power Equipment Technology
Practical Nursing #
Residential Systems Installation and Maintenance #
Restaurant Service

Robotics: Urban Search and Rescue
Robotics and Automation Technology #
Screen Printing Technology
Sheet Metal #
TeamWorks
Technical Computer Applications
Technical Drafting
Telecommunications Cabling
Television (Video) Production
Web Design
Welding
Welding Fabrication
Welding Sculpture

State Only Contest (not national contest)

Auto Maintenance *
Barbering Bricklayer *
Club Scrapbook
Current Events
Emergency Medical Technician
Essay
Extemporaneous Writing
Fantasy Manikin (Live)
Food Preparation Assistant *
Occupational Display
Occupational Scrapbook
Poster
Precision Machining Technology
Promotional Flyer
Radio Communications (Pre-Produced)
Spelling
Student of the Year
Television Production (Pre-Produced Cut-Only)
Television Production (Pre-Produced Special Effects)
Veterinary Assisting

Appendix: Credentials, Course Sequences, and Career Cluster Information

Industry Credentials: Only apply to 36-week courses

- A+ Certification Examination
- Business Information Processing Assessment
- Cisco Certified CyberOps Associate Examination
- Cisco Certified DevNet Associate Examination
- Cisco Certified Networking Associate (CCNA) Examination
- Cisco Certified Networking Professional (CCNP) Automation for Cisco Enterprise Solutions Examination
- Cisco Certified Networking Professional (CCNP) Cisco Enterprise Networks Examination
- Cisco Certified Networking Professional (CCNP) Cisco SD-WAN Solutions Examination
- Cisco Certified Networking Professional (CCNP) Designing Enterprise Wireless Networks Examination
- Cisco Certified Networking Professional (CCNP) Enterprise Advanced Routing and Services Examination
- Cisco Certified Networking Professional (CCNP) Enterprise Network Core Technologies Examination
- Cisco Certified Networking Professional (CCNP) Implementing Enterprise Wireless Networks Examination
- College and Work Readiness Assessment (CWRA+)
- Computer Networking Fundamentals Assessment
- Customer Service Specialist (CSS) Examination
- Internetworking Examination
- IT Fundamentals+ 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
- Network Administration Certification Tests
- Network+ Certification Examination
- Professional Communications 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 Networking Hardware Operations II (8543/18 weeks, 70 hours)
- Computer Networking Hardware Operations III (8544/18 weeks, 70 hours)
- Computer Networking Hardware Operations IV (8545/18 weeks, 70 hours)

Career Cluster: Information Technology	
Pathway	Occupations
Information Support and Services	Applications Integrator Computer Support Specialist Computer Systems Engineer, Architect Database Administrator Database Analyst Information Systems Analyst Information Systems Security Developer Information Systems Security Manager Maintenance Technician Network Systems and Data Communication Analyst Software Test Engineer Systems Analyst Technical Writer
Network Systems	Computer and Information Systems Administrator Computer Operator Computer Security Specialist Computer Software Engineer Computer Support Specialist Computer Systems Engineer, Architect Database Analyst Information Security Analyst Network and Computer Systems Administrator Network Architect Network Systems and Data Communication Analyst Software Test Engineer Systems Analyst Telecommunications Equipment Installer, Repairer Telecommunications Specialist
Programming and Software Development	Computer Software Engineer Information Security Analyst Network Systems and Data Communication Analyst Programmer Project Manager Software Applications Engineer Software Test Engineer Systems Analyst
Web and Digital Communications	Computer Support Specialist Computer Systems Engineer, Architect Project Manager Software Test Engineer Systems Analyst