**

Career & Technical Education

Curriculum Framework

Statewide Course Equivalency Required Form

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| **Course Information** | | | |
| **Course Title:** *(Must be consistent in all tabs of the Course Application in EDS.)*  Information Networking I | | | **Total Framework Actual Hours:** (*Must equal total number of unit hours identified in Unit Information section of this template.)*  540 |
| **CIP Code:** (*Confirm description matches with intent of course using. See OSPI* [*CIP Code Chart*](https://www.k12.wa.us/student-success/career-technical-education-cte/cte-resources-essentials/cip-codes)*.)*  110901 | **Exploratory  Preparatory**  *(Preparatory courses are best built with a min. of 140 hours. Middle School courses cannot be coded as preparatory.)* | | **Date Last Modified:** (*Use current date in this section for new applications.)*  10/23/2024 |
| **Career Cluster:** (*Must match Career Cluster identified on* [*CIP Code Chart*](https://www.k12.wa.us/student-success/career-technical-education-cte/cte-resources-essentials/cip-codes)*.)*  Information Technology | | | **Cluster Pathway:** (*Must match Cluster Pathway identified on* [*CIP Code Chart*](https://www.k12.wa.us/student-success/career-technical-education-cte/cte-resources-essentials/cip-codes)*.)*  Network Systems |
| **Course Summary:** (*Briefly describe the intention of this course or see CIP code description.)*  **CCNA**  This is a 3-period Skill Center class (3 high school credits). Discover how to design, build, manage and troubleshoot corporate enterprise networks. Learn mitigation of security threats, cybersecurity threat management, and advanced troubleshooting skills with a major emphasis on hands-on learning. Each day half the class time is spent working in a state-of-the-art networking lab. Students take the Cisco Certified Networking Associate (CCNA) exam at the completion of the course. 20 College Credits are available. High School credits earned: CTE (3.0) Program fees may apply. Financial assistance may be available for qualifying students. NOTE: Block schedules affect actual class times daily. | | | |
| **Eligible for Equivalent Credit in:** 1.0 Algebra 1 | | **Total Number of Units:** | |
| **Course Resources:** | | | |

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| **Unit Outline** | | | |
| **Semester 1** | **Semester 2** | **Semester 3** | **Semester 4** |
| Chapter 1: Exploring the Network (12) | Chapter 1: Introduction to Switched Networks (9) | Chapter 1: Introduction to Scaling Networks (9) | Chapter 1: Hierarchical Network Design (6) |
| Chapter 2: Configuring a Network Operating System (9) | Chapter 2: Basic Switching Concepts and Configuration (9) | Chapter 2: LAN Redundancy (12) | Chapter 2: Connecting to the WAN (6) |
| Chapter 3: Network Protocols and Communications (12) | Chapter 3: VLANs (9) | Chapter 3: Link Aggregation (9) | Chapter 3: Point-to-Point Connections (12) |
| Chapter 4: Network Access (12) | Chapter 4: Routing Concepts (9) | Chapter 4: Wireless LANs (12) | Chapter 4: Frame Relay (9) |
| Chapter 5: Ethernet (12) | Chapter 5: Inter-VLAN Routing (9) | Chapter 5: Adjust and Troubleshoot Single-Area OSPF (9) | Chapter 5: Network Address Translation for IPv4 (12) |
| Chapter 6: Network Layer (12) | Chapter 6: Static Routing (9) | Chapter 6: Multi area OSPF (9) | Chapter 6: Broadband Solutions (9) |
| Chapter 7: Transport Layer (9) | Chapter 7: Routing Dynamically (12) | Chapter 7: EIGRP (9) | Chapter 7: Securing Site-to-Site Connectivity (12) |
| Chapter 8: IP Addressing (18) | Chapter 8: Single-Area OSPF (9) | Chapter 8: EIGRP Advanced Configurations and Troubleshooting (9) | Chapter 8: Monitoring the Network (9) |
| Chapter 9: Subnetting IP Networks (12) | Chapter 9: Access Control Lists (15) | [Chapter 9: IOS Images and Licensing](http://ciscoweb/cur/sem3v5/course/module9/index.html) (6) | [Chapter 9: Troubleshooting the Network](http://ciscoweb/cur/sem4v5/course/module9/index.html) (9) |
| Chapter 10: Application Layer (9) | Chapter 10: DHCP (6) |  | Skills Exam and Semester Final (15) |
| Chapter 11: It’s a Network (12) | Chapter 11: Network Address Translation for IPv4 (9) | Skills Exam and Semester Final (15) | CCNA or CCNP Industry Certification Review and CCNA or CCNP Exam (75) |
| Skills Exam and Semester Final (15) | Skills Exam and Semester Final (18) |  |  |

**Semester 1: Introduction to Networks**

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| **Unit Information** | | |
| **Unit: Exploring the Network** | | **Total Learning Hours for Unit:** 12 |
| **Unit Summary:** | | |
| **COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**   * Chapter 1 Test * Lab 1.0.0.1 Initialize and reload a router * PT 1.2.4.4 Representing the Network | | |
| **Leadership Alignment:**  **6.A.3** Apply a fundamental understanding of the ethical/legal issues surrounding the access and use of information technologies  ***Leadership Activities:***  *Students will research the use of current online technologies and participate in a group discussion about the use of these technologies in the current business world.* | | |
| **Industry Standards and/or Competencies** | | |
| 1.1.1.6 Read and compare success stories illustrating innovative ways networks are being used to increase workplace success.  1.2.3.3 Survey current understanding of convergence; then research and compare ISPs offering convergence services. Based on results, evaluate and select the best local ISP converged service. Finally, research local companies or public institutions using convergence technologies in order to determine the advantages and disadvantages of using those technologies.  1.1.1.2: After reading about the changes in Internet services over the past 25 years, describe possible developments in the future of the Internet of Everything (IoE).  1.1.1.5: After reading about a variety of network-based methods of communicating, describe additional sites and tools that you use to share thoughts and projects with others.  1.0.1.2 Draw and label a map of the Internet as you interpret it now.  1.5.1.1 Use the knowledge you have acquired throughout Chapter 1 to draw your concept of the Internet as you see it now.  1.2.4.4 Explore a relatively complex network using Packet Tracer and explore how Packet Tracer serves as a modeling tool for network representations. Challenge activity: add devices to the representation; create a new network.  1.3.1.3 Use ping, tracert, and web-based and software tools to perform network mapping.  1.1.1.2 Examine the development of networking from "fixed" computing to the present-day Internet of Everything and predict future uses for the network as a platform.  1.3.2.5: Define Quality of Service (QoS) and describe how it affects organizational policy-making decisions.  1.1.1.4: After reading about how networks support the way we learn and viewing a video on how technology has expanded the classroom, describe how networking has increased the importance of collaborative teaching and learning.  1.3.2.6: Summarize the responsibilities of a network administrator in providing physical and information security.  1.4.4.3 Conduct targeted job searching on the web to locate information on IT jobs, skills and certifications needed, and salary ranges associated with job titles.  1.2.1.1 Distinguish between devices, media, and services as network components.  1.2.1.6 Distinguish between physical and logical topologies.  Drag the network component function to its device category.  1.3.2.7 Identify the relationships between characteristics and features, such as scalability and security, and a variety of network architecture requirements.  1.4.3.3 Drag various examples of security terminology to the correct definition. | | |
| ***Aligned Washington State Learning Standards*** | | |
| ***In the academic alignment section, only the standards that are being taught and assessed should be included. This should be a selective list, not all inclusive, and cited standards should be specific to the unit of instruction.*** | | |
| **Arts** |  | |
| **Computer Science** | **3A-D-4-18** Convert between binary, decimal, and hexadecimal representations of data (e.g., convert hexadecimal color codes to decimal percentages, ASCII/Unicode representation).  **3B-C-7-22** Explain the role of operating systems (e.g., how programs are stored in memory, how data is organized/retrieved, how processes are managed and multi-tasked).  **3B-C-7-23** Identify the functionality of various categories of hardware components and communication between them (e.g., physical layers, logic gates, chips, input and output devices). | |
| **Educational Technology** | **9-12.3.a.** Students plan and employ effective research strategies to locate information and other resources for their intellectual or creative pursuits.  **9-12.5.c.** Students break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving. | |
| **English Language Arts** | **L.9-10.6** Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.  **RL.9-10.4** Determine the meaning of words and phrases as they are used in the text, including figurative and connotative meanings; analyze the cumulative impact of specific word choices on meaning and tone (e.g., how the language evokes a sense of time and place; how it sets a formal or informal tone). | |
| **Environment & Sustainability** |  | |
| **Financial Education** |  | |
| **Health and Physical Education** |  | |
| **Mathematics** | **MP5.** Use appropriate tools strategically.  **N-Q1.** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. | |
| **Science** |  | |
| **Social Studies** |  | |

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| **Unit Information** | | |
| **Unit:** | | **Total Learning Hours for Unit: 9** |
| **Unit Summary:** | | |
| **COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**   * Chapter 2 Test * Lab 2.1.4.8 Navigation the IOS Instructions * Lab 2.3.3.5 Configuring a Switch Management Address | | |
| **Leadership Alignment:**  **3.B.1** Demonstrate ability to work effectively and respectfully with diverse teams  ***Leadership Activities:***  *Students will work together to setup and Navigate IOS instructions as well as Configure IP address for remote management of switches.* | | |
| **Industry Standards and/or Competencies** | | |
| 2.1.1.5: View a video demonstration, and then explain the benefits of CCO accounts; explore how to set up an account, and how to access IOS information.  2.0.1.2: Design a set of voice commands to control basic functions of an automobile. Explain how the process of creating and implementing commands on a car mirrors the creation and use of IOS software command structure.  2.1.1.1: Distinguish between the functions of shell, kernel, and hardware.  2.3.3.4: As part of a lab building a small network, document the network configuration and reflect on possible reasons for a ping failure.  2.3.3.4: Look for different ways to explain the meaning of individual IOS CLI commands. Develop an optimal grouping of commands to minimize the necessary count of mode changes.  2.4.1.1: Prepare a tutorial to teach a colleague basic CLI commands. Organize commands into subgroups or modes. Suggest how to group different commands together according to their modes so that a minimum number of commands is needed between modes. Focus on explaining the task in layman's terms, using parallels to real life whenever appropriate.  2.1.4.8: Using Packet Tracer, practice navigating the Cisco IOS, including different user access modes, various, configuration modes, and common commands.  2.2.1.4: Using Syntax Checker, configure a hostname on a switch. 2.2.2.4: Using Syntax Checker, configure password encryption on a switch.  2.2.3.1: Using Syntax Checker, save a running configuration from RAM to NVRAM.  2.3.2.5: Implement basic connectivity between a switch and host PCs and use various show commands and the ping command to verify configurations.  2.1.1.1: Describe how the shell, kernel, and hardware interact to perform their functions.  2.2.2.1: Distinguish between the various levels of limiting access to device configurations.  2.3.3.4: Use and reinforce personal knowledge of the Cisco IOS CLI by explaining it to other students.  2.1.2.1: Explain why network administrators should provide physical and password security.  2.1.1.5: Through a video, explore and identify the account benefits and IOS files available through a Cisco Connection Online (CCO) account.  2.1.2.4: Given a series of scenarios, select the most appropriate access method.  2.1.4.9: Establish a console session with Tera Term. Access a Cisco switch through the serial console port, display and configure basic device settings, and (optional) access a Cisco router using a mini-USB console cable.  2.2.3.2: Capture and save a text configuration using Tera Term and HyperTerminal  2.4.1.2: Skills Integration Challenge: configure a small LAN using Cisco IOS CLI commands, and verify connectivity between two PC end devices. | | |
| ***Aligned Washington State Learning Standards*** | | |
| **Arts** |  | |
| **Computer Science** | **3A-N-7-30** Describe key protocols and underlying processes of Internet-based services (e.g., http/https and SMTP/IMAP, routing protocols).  **3B-N-4-35** Simulate and discuss the issues (e.g., bandwidth, load, delay, topology) that impact network functionality (e.g., use free network simulators). | |
| **Educational Technology** | **9-12.5.c.** Students break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving. | |
| **English Language Arts** | **W.9-10.1c** Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.  **RI.11-12.1** Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.  **W.9-10.2a** Introduce a topic; organize complex ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.43 | |
| **Environment & Sustainability** |  | |
| **Financial Education** |  | |
| **Health and Physical Education** |  | |
| **Mathematics** | **N-Q2.** Define appropriate quantities for the purpose of descriptive modeling.  **MP7.** Look for and make use of structure. | |
| **Science** |  | |
| **Social Studies** |  | |

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| **Unit Information** | | |
| **Unit:** | | **Total Learning Hours for Unit:** 12 |
| **Unit Summary:** | | |
| **COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**   * Chapter 3 Test * Lab 3.3.3.4 Using Wireshark to View Network Traffic * Lab 3.3.3.5 Using Wireshark to View Protocol Data Units | | |
| **Leadership Alignment:**  **8.A.1** Set goals with tangible and intangible success criteria  ***Leadership Activities:***  *In groups, students will set goals with tangible and intangible success criteria to earn a signoff stamp for demonstrating compliance to lab goals.* | | |
| **Industry Standards and/or Competencies** | | |
| 3.2.3.6: Gather information about the major networking standards organizations and their important characteristics; reflect on how these organizations enhance our experience of the Internet and computer networking.  3.4.1.1: Compare the proposed resolution of 3.0.1.2's communication problem to the networking models used for communications.  3.0.1.2: Determine ways to communicate when standards are not present or agreed upon. Design a communications model to solve a communication issue.  3.3.3.4: Download and install Wireshark; use it to capture and analyze local and remote ICMP data.  3.2.4.6: Use Packet Tracer simulation mode to investigate the TCP/IP and OSI models and their associated PDUs in action.  3.3.3.3: Use Packet Tracer simulations of typical business and home networks to examine traffic flow across complex internetworks. Conduct traffic capture and analyze how Internet traffic is handled.  3.1.1.1: Define and describe the three components of communication and how they interact; apply the rules of human communication to develop an analogy to computer communication.  3.2.1.2: Describe the role protocols play in formatting messages, sharing information about pathways, identifying errors, and managing data transfer.  3.2.2.2: Trace the development of network protocols and applications through an interactive timeline.  3.2.3.1: Explain the importance of standards organizations in maintaining an open Internet.  3.2.3.7: Access and read web pages for each major standards organization, then match the organization to a statement of its description or function.  3.2.4.7: After researching the RFC process, describe how RFCs use collaboration and community review to support successful implementation of new proposals.  3.3.3.4: After downloading, installing, and using Wireshark, discuss the security implications of using packet-sniffing on a live network.  3.2.4.7: Navigate to the RFC Editor, search for RFCs by keywords and status, and reflect on the importance of RFCs to Internet standards.  3.2.2.4: Given a list of various protocols and functions, categorize them as part of the Application, Transport, Internet, or Network Access layer of the TCP/IP suite.  3.2.4.5: Match OSI layer functional descriptions to the OSI layers.  3.3.1.5: Illustrate the order of the encapsulation process by placing PDUs in appropriate places in the stack. | | |
| ***Aligned Washington State Learning Standards*** | | |
| **Arts** |  | |
| **Computer Science** | **3B-D-4-25** Discuss how data sequences (e.g., binary, hexadecimal, octal) can be interpreted in a variety of forms (e.g., instructions, numbers, text, sound, image).  **3B-D-4-26** Evaluate the ability of models and simulations to formulate, refine, and test hypotheses. | |
| **Educational Technology** | **9-12.3.a.** Students plan and employ effective research strategies to locate information and other resources for their intellectual or creative pursuits. | |
| **English Language Arts** | **SL.9-10.1b.** Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed. | |
| **Environment & Sustainability** |  | |
| **Financial Education** |  | |
| **Health and Physical Education** |  | |
| **Mathematics** | **MP2.** Reason abstractly and quantitatively.  **MP4.** Model with mathematics. | |
| **Science** |  | |
| **Social Studies** |  | |

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| **UNIT 4 COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**   * Chapter 4 Test * Packet Tracer Lab 4.2.4.5 Connecting a Wired and Wireless LAN * Lab 4.2.2.7 Building an Ethernet Crossover Cable | | |
| **Leadership Alignment:**  **6.A.2**Use digital technologies (computers, PDAs, media players, GPS, etc.), communication/networking tools and social networks appropriately to access, manage, integrate, evaluate and create information to successfully function in a knowledge economy  ***Leadership Activities:***  *Students will conduct research and share information/ideas about the impact of digital technologies (and changes to) in a business setting where the purpose is to share information.* | | |
| ***Standards and Competencies*** | | |
| **Unit 4:** NETWORK ACCESS | | |
| **Industry Standards and/or Competencies** | | **Total Learning Hours for Unit:** 12 |
| 4.0.1.2: Given a scenario where multiple participants are attending a conference, discuss efficient ways to share information; consequences or benefits of changes in the format or structure of conference sessions; and processes that should be followed to maximize communication.  4.1.2.4: Given various network devices for identification, complete a table describing the functions and physical characteristics of each device.  Given various networking media, complete a table describing the functions and physical characteristics of each example. Identify sources of further information about networking devices and media.  4.1.3.1: Describe how encoding and signaling interact and change as data rates increase.  4.2.2.6: Correctly align the wire colors to build a UTP 568B, straight- through cable pin out.  4.2.4.5: Use the Physical View of Packet Tracer to examine device configurations, select appropriate cabling media, and connect the devices.  4.3.3.2: Match data link protocols to the standards organizations that define and manage them.  4.2.1.6: Explain proper copper cabling practices to avoid potential fire and electrical hazards.  4.5.1.1: Working in a small team, use the content from this chapter to prepare and present a physical topology design for a small business network.  4.5.1.1: Explain how physical layer implementation is affected by security requirements.  4.5.1.1: Prepare and present a physical topology proposal that meets customer requirements and physical layer standards.  4.1.3.5: After reading about the fundamental principles of Layer 1, match physical layer terms to their descriptions.  4.2.3.7: After reading about fiber optics technology, match descriptions to the fiber optic cable type.  4.4.3.7: After reading about and viewing models of physical and logical topologies, classify a series of media access control methods as characteristics of physical or logical topologies.  4.2.2.7: Build and test an Ethernet crossover cable.  4.3.2.3: "Build" a generic data link layer frame by dragging frame fields to their correct place on a frame diagram; match frame field descriptions to the names of the frame fields.  4.4.4.9: After reading about and viewing models of data link frames, "build" Ethernet, PPP, and wireless frames by dragging frame fields to their correct places on frame diagrams. | | |
| ***Aligned Washington State Learning Standards*** | | |
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| **Arts** |  | |
| **Computer Science** | **3B-A-3-16** Explain the value of heuristic algorithms (discovery methods) to approximating solutions for difficult-to-solve computational problems.  **3A-N-3-34** Use simple encryption and decryption algorithms to transmit/receive an encrypted message. | |
| **Educational Technology** |  | |
| **English Language Arts** | **RL.9-10.4** Determine the meaning of words and phrases as they are used in the text, including figurative and connotative meanings; analyze the cumulative impact of specific word choices on meaning and tone (e.g., how the language evokes a sense of time and place; how it sets a formal or informal tone).  **W.9-10.2d** Use precise language and domain-specific vocabulary to manage the complexity of the topic.  **SL.9-10.1b.** Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed. | |
| **Environment & Sustainability** |  | |
| **Financial Education** |  | |
| **Health and Physical Education** |  | |
| **Mathematics** | **I-IF5.** Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.  **I-IF7.** Graph functions expressed symbolically and show key features of  the graph, by hand in simple cases and using technology for more  complicated cases.  **MP4.** Model with mathematics. | |
| **Science** |  | |
| **Social Studies** |  | |

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| **UNIT 5 COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**   * Chapter 5 Test * Lab 5.1.3.6 Viewing Network Devices MAC Addresses * Packet Tracer 5.2.1.7 Examine the ARP Table Instructions * Lab 5.3.1.10 Using IOS CLI with Switch MAC Address Table | | |
| **Leadership Alignment:**  **2.A.1** Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation  **2.B.1** Analyze how parts of a whole interact with each other to produce overall outcomes in complex systems  ***Leadership Activities:***  *Students will demonstrate their understanding of network communication parts and processes by researching and describing in detail a type of communication network.* | | |
| ***Standards and Competencies*** | | |
| **Unit 5:** ETHERNET | | |
| **Industry Standards and/or Competencies** | | **Total Learning Hours for Unit:** 12 |
| 5.1.3.1: Explore relationships between binary bit patterns that match decimal and hexadecimal values.  5.4.1.1: Working in a group of 2-3 students, prepare a presentation comparing legacy to current Ethernet standards. View a video on The History of Ethernet, then collect visual examples of old, current, and possible future Ethernet physical media and devices. Explain why MAC addresses and framing formats have stayed the same through the evolution of Ethernet.  5.2.1.8: Build and configure a small network. Use the Windows ARP command and the IOS show arp command. Use Wireshark to examine ARP exchanges. Manipulate ARP tables by adding and deleting entries and observe effects on network latency.  5.3.1.7: After reading and viewing models of frame processing on switches, identify how frames will be processed in a series of scenarios.  5.3.1.9: Determine how a switch will forward a frame based on source and destination MAC address and information in the switch MAC table.  5.1.3.6: Set up a network topology, configure basic settings, verify connectivity, and display, describe, and analyze Ethernet MAC addresses. 5.1.4.3: Use Wireshark to capture and analyze Ethernet frames.  5.1.4.4: Examine device information on a pre-configured network in Packet Tracer; gather PDU information and reflect on how media and device configuration affect network communications.  5.2.1.7: Examine PDU information from an ARP request on a pre-configured Packet Tracer topology; examine the ARP table and a switch MAC address table; finally, generate traffic and examine the ARP process in remote communications.  5.0.1.2: Choose one type of network communication and describe the procedure that must be used to register, form an account, initiate contact with others, and ensure that communications are only received by those with whom one wishes to communicate.  5.2.2.1: After reading about ARP issues that may lead to a potential security risk, describe how a network administrator can mitigate these issues.  5.4.1.1: Working in a small group, use information from the video resource provided to compare its contents to the information provided in this chapter.  5.0.1.2: Describe procedures used by network communications to limit conversations to registered individuals.  5.0.1.2: Describe the procedures related to responsible use of a selected type of network communication which involves messaging.  5.1.1.6: Classify a series of descriptions as belonging to either the MAC or LLC sub layer.  5.3.1.7: Classify a series of descriptions as belonging to either store-and-forward or cut-through switching.  5.1.2.4: Organize Ethernet frame fields according to their correct descriptions. "Build" an Ethernet frame by dragging the frame fields to their correct locations on a frame model. | | |
| ***Aligned Washington State Learning Standards*** | | |
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| **Arts** |  | |
| **Computer Science** | **3A-D-4-18** Convert between binary, decimal, and hexadecimal representations of data (e.g., convert hexadecimal color codes to decimal percentages, ASCII/Unicode representation). | |
| **Educational Technology** | **9-12.3.d.** Students build knowledge by actively exploring real-world issues and problems, developing ideas and theories and pursuing answers and solutions.  **9-12.5.c.** Students break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving. | |
| **English Language Arts** | **SL.9-10.1b.** Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed.  **RI.9-10.1** Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text. | |
| **Environment & Sustainability** |  | |
| **Financial Education** |  | |
| **Health and Physical Education** |  | |
| **Mathematics** | **S-MD5.b.** Evaluate and compare strategies on the basis of expected values | |
| **Science** | **HS-ETS1-4.** Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem. | |
| **Social Studies** |  | |

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| **UNIT 6 COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**   * Chapter 6 Test * Lab 6.3.1.9 Explore Routing Physical Characteristics * Lab 6.4.3.4 Troubleshooting Default Gateway Issues * Lab 6.4.3.5 Building Switch and Routing Networks | | |
| **Leadership Alignment:**  **2.A.1** Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation  ***Leadership Activities:***  *Students will create and test systems to solve assigned network assignment(s).* | | |
| ***Standards and Competencies*** | | |
| **Unit 6:** NETWORK LAYER | | |
| **Industry Standards and/or Competencies** | | **Total Learning Hours for Unit:** 12 |
| 6.5.1.1: Given output generated by the show IP route command, use simulation software to build a topology model. Verify and test the model.  6.3.2.6: After viewing a video demonstration of the router boot up process, organize the steps of the process in the correct order based on their descriptions.  6.0.1.2: Visualize how a hop-by-hop routing paradigm results in successful delivery of packets. Describe the factors that influence path selection and delivery.  6.2.2.8: Based on data gathered from viewing host routing tables, draw conclusions about the routing processes used.  6.3.1.10: After exploring different options available on internetworking devices, determine which options provide the necessary connectivity when connecting multiple devices. Add the correct modules and connect the devices.  6.4.3.4: Follow a troubleshooting process to identify and resolve default gateway problems.  6.2.1.7: Identify elements of a host routing table entry 6.2.2.7: Identify elements of a router routing table entry.  6.3.1.9: Examine the outside of the router and identify and describe the capabilities of its internal components by consoling into the router and issuing various commands.  6.4.1.1: Use Syntax Checker to practice initial configuration of a router.  6.4.1.2: Use Packet Tracer to configure initial settings on a router.  6.4.2.1: Describe the importance of the use of interface descriptions in support third party connections.  6.1.4.2: Describe how the design and functionality of IPv6 supports increased network reliability and security.  6.5.1.1: Work collaboratively with a partner to build a topology model, document its functionality, and interpret outputs to evaluate messaging for completeness, accuracy, and timeliness.  6.4.1.1: After reading about initial router configuration settings, describe the importance of the use of passwords and banner commands.  6.5.1.1: Demonstrate the ability to interpret router outputs in building a topology model.  6.1.2.6: After reading about the characteristics of the IP protocol, classify characteristics as typical of a connectionless, best effort, or media independent delivery method.  6.1.3.4: After exploring the fields of an IPv4 header, identify the header field to which a specific function belongs.  6.1.4.6: After exploring the fields of an IPv6 header, identify the header field to which a header description belongs.  6.3.1.8: Match descriptions of the functions of various router components to their names. | | |
| ***Aligned Washington State Learning Standards*** | | |
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| **Arts** |  | |
| **Computer Science** | **3A-N-4-31** Illustrate the basic components of computer networks (e.g., draw logical and topological diagrams of networks including routers, switches, servers, and end user devices; create model with string and paper). | |
| **Educational Technology** | **9-12.5.c.** Students break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving.  **9-12.1.d.** Students understand the fundamental concepts of technology operations, demonstrate the ability to choose, use and troubleshoot current technologies and are able to transfer their knowledge to explore emerging technologies. | |
| **English Language Arts** | |  | | --- | | **W.9-10.1**Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence. | | **W.9-10.1a** Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among claim(s), counterclaims, reasons, and evidence. | | **W.9-10.1b** Develop claim(s) and counterclaims fairly, supplying evidence for each while pointing out the strengths and limitations of both in a manner that anticipates the audience’s knowledge level and concerns. | | |
| **Environment & Sustainability** |  | |
| **Financial Education** |  | |
| **Health and Physical Education** |  | |
| **Mathematics** | **A-REI5.** Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions. | |
| **Science** |  | |
| **Social Studies** |  | |

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| **UNIT 7 COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**   * Chapter 7 Test * Lab 7.1.4.9 Identifying IPv4 Addresses * Lab 7.2.5.4 Configuring IPv6 Addresses * Lab 7.2.5.3 Identifying IPv6 Addresses * Lab 7.2.3.7 Original Testing Network Connectivity with Ping and Traceroute | | |
| **Leadership Alignment:**  **2.B.1** Analyze how parts of a whole interact with each other to produce overall outcomes in complex systems  ***Leadership Activities:***  *Students will participate in class activities analyzing the required components of successful communications and hurdles that compromise or hinder the communication process.* | | |
| ***Standards and Competencies*** | | |
| **Unit 7:** TRANSPORT LAYER | | |
| **Industry Standards and/or Competencies** | | **Total Learning Hours for Unit:** 9 |
| 7.3.1.1: Compare the results of the introductory and summary modeling activities to the information given in this chapter. Draw conclusions about the criteria for choosing high-reliability messaging.  7.0.1.2: After participating in group transmission of a whispered message, discuss the factors that would influence reception of the message. Apply conclusions to the process of network communications.  7.3.1.1: Examine the results of a replay of the activity completed in 7.0.1.2, with different rules governing the communication of the whispered message. Discuss differences in the results.  7.2.1.8: Prepare Wireshark to capture packets. Capture a web session, locate the appropriate packets, and examine information within the packets, including IP addresses, TCP port numbers, and TCP control flags.  7.2.3.5: Record a PC's IP configuration information, then use Wireshark to capture DNS queries and responses. Analyze the captured DNS and UDP packets.  7.2.1.9: Drag descriptors of the TCP connection and termination process to the appropriate places on an image of the 3-way handshake establishment and termination sessions.  7.1.2.9: Examine the many options available, and view information obtained from, the net stat command.  7.2.4.3: Identify TCP and UDP header fields and operation using Wireshark FTP and TFTP session captures. Compare how the two protocols manage communications differently. Discuss how to remediate the fact that all transferred data was sent in clear text.  7.1.2.8: Distinguish between port number ranges for well-known, registered, and dynamic or private ports assigned through IANA, and examine applications associated with them.  7.2.1.6: Summarize the ways in which manipulation of the TCP session can add security to the network.  7.0.1.2, 7.3.1.1: Participate in a modeling activity involving communication of a complex message. Determine how the activity affects the completeness, correctness, and timeliness of message delivery.  7.2.1.2: After reading about TCP server processes, describe how and why a network administrator should restrict server access to certain ports.  7.2.1.8: After conducting and examining a Wireshark capture, determine which three Wireshark filters might be the most useful to a network administrator, and discuss other ways Wireshark could be used in a production network.  7.1.1.8: After reading about the characteristics of both TCP and UDP, match various application layer protocols to the transport layer delivery method.  7.1.2.11: After reading about the characteristics of TCP and UDP, assign a list of characteristics to the appropriate delivery method.  7.3.1.2: Use functions of simulation software to generate network traffic in simulation mode and to examine the functionality of TCP and UDP protocols. | | |
| ***Aligned Washington State Learning Standards*** | | |
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| **Arts** |  | |
| **Computer Science** | **3B-D-4-26** Evaluate the ability of models and simulations to formulate, refine, and test hypotheses.  **3B-N-4-35** Simulate and discuss the issues (e.g., bandwidth, load, delay, topology) that impact network functionality (e.g., use free network simulators). | |
| **Educational Technology** | **9-12.3.d.** Students build knowledge by actively exploring real-world issues and problems, developing ideas and theories and pursuing answers and solutions.  **9-12.5.d.** Students understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions. | |
| **English Language Arts** | **W.9-12.7** Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.  **RI.11-12.2 D**etermine two or more central ideas of a text and analyze their development over the course of the text, including how they interact and build on one another to provide a complex analysis; provide an objective summary of the text. | |
| **Environment & Sustainability** |  | |
| **Financial Education** |  | |
| **Health and Physical Education** |  | |
| **Mathematics** | **8.SP.A.1** Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association. | |
| **Science** | **HS-ETS1-4.** Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem. | |
| **Social Studies** |  | |

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| **UNIT 8 COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**   * Chapter 8 Test * Lab 8.1.4.8 Designing and Implementing a Subnetted IPv4 address scheme * Lab 8.2.1.5 Designing and Implementing an IPv6 Address Scheme * Lab 8.3.1.5 Designing and Implementing a Subnetted IPv6 Address Scheme | | |
| **Leadership Alignment:**  **2.C.4** Interpret information and draw conclusions based on the best analysis  ***Leadership Activities:***  *Students will analyze the information in a “helpdesk” or troubleshooting ticket, describe possible causes, offer solutions, and test the solutions.* | | |
| ***Standards and Competencies*** | | |
| **Unit 8:** IP ADDRESSING | | |
| **Industry Standards and/or Competencies** | | **Total Learning Hours for Unit:** 18 |
| 8.1.1.1: Apply the concept of positional notation in converting between binary and decimal numbering systems.  8.1.2.5: Describe and practice ANDing as a basic binary operation used in digital logic.  8.1.2.9: Use the ANDing process to determine the network address.  8.2.2.1: Recognize the binary bit patterns that match decimal and hexadecimal values.  8.0.1.2: After reading a variety of blogs, viewing videos, and researching the concept of "the Internet of Everything," select a category of interest and create a series of comments and questions related to the topic.  8.2.1.3: Match terms related to IPv4 and IPv6 coexistence to the correct descriptions.  8.1.1.4: Practice binary to decimal conversions with a goal of 100% accuracy.  8.1.1.7: Practice decimal to binary conversions with a goal of 100% accuracy.  8.1.3.7: Practice calculation of network, broadcast, and host range addresses with a goal of 100% accuracy.  8.1.4.2 and 8.1.4.7: Categorize addresses as public or private with a goal of 100% accuracy.  8.1.2.8: Without the use of a calculator, convert IPv4 addresses from dotted decimal to binary; use bitwise ANDing to determine network addresses; and apply network address calculations.  8.2.2.5: Convert IPv6 addresses into short and compressed forms.  8.1.2.7: Use Windows Calculator to convert between numbering systems and to determine the number of hosts in a given network.  8.1.3.8: Use Packet Tracer to generate unicast, broadcast, and multicast traffic. Examine the three types of traffic and make generalizations about the differences.  8.2.3.5, 8.2.3.6, 8.2.3.7: Use ping and trace route to test network connectivity.  8.1.4.5: Describe the organizations that manage the allocation of IPv4 and IPv6 addresses, and the process by which ISPs obtain them.  8.1.4.6: Describe how the ISP tiers interact with each other, and how the placement of an ISP on a tier determines the level of services it can offer.  8.3.1.3: After reading about ICMPv6, describe why a network administrator should use DAD on unicast addresses.  8.4.1.1: Working with a group, choose one application of the IoE (banking, news, etc.) and design an IPv6 addressing scheme for that area. Create a network topology and document how sub netting, unicasts, and multicasts could be incorporated, as well as the impact of the plan on small to medium- sized businesses.  8.3.2.3: Describe why a network administrator might prohibit the entry of ICMP messages into the corporate network.  8.2.1.2: Describe the three categories of migration techniques for moving an organization from IPv4 to IPv6.  8.1.3.6: Based on an interactive graphic of a network topology, categorize a packet based on the address type and determine which host(s) will receive it.  8.1.4.8: Identify network and host portions of IPv4 addresses; identify the types of addresses; and determine if an address assignment is a valid host address. Reflect on the continuing need to study IPv4 addresses in spite of IPv4 address depletion.  8.2.3.5: Match the IPv6 address types to the most appropriate descriptions.  8.2.5.3, 8.2.5.4, 8.2.5.5: Using both simulated and physical equipment, configure IPv6 addresses on a network topology; verify end-to-end connectivity.  8.3.2.8: Follow an effective problem-solving approach in resolving an IP addressing issue: verify the help desk ticket, consider probable causes, propose a solution, implement, verify, and document the plan. | | |
| ***Aligned Washington State Learning Standards*** | | |
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| **Arts** |  | |
| **Computer Science** | **3B-D-4-25** Discuss how data sequences (e.g., binary, hexadecimal, octal) can be interpreted in a variety of forms (e.g., instructions, numbers, text, sound, image).  **3B-D-4-24** Use data analysis to identify significant patterns in complex systems (e.g., take existing data sets and make sense of them).  **3B-A-3-17** Decompose a large-scale computational problem by identifying generalizable patterns and applying them in a solution. | |
| **Educational Technology** | **9-12.3.a.** Students plan and employ effective research strategies to locate information and other resources for their intellectual or creative pursuits.  **9-12.3.d.** Students build knowledge by actively exploring real-world issues and problems, developing ideas and theories and pursuing answers and solutions.  **9-12.5.c.** Students break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving. | |
| **English Language Arts** | **RI.9-10.3** Analyze how the author unfolds an analysis or series of ideas or events, including the order in which the points are made, how they are introduced and developed, and the connections that are drawn between them.  **W.9-10.2a** Introduce a topic; organize complex ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. | |
| **Environment & Sustainability** |  | |
| **Financial Education** |  | |
| **Health and Physical Education** |  | |
| **Mathematics** | **6.EE.2.c.** Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). For example, use the formulas V = s3 and A = 6 s2 to find the volume and surface area of a cube with sides of length s = 1/2.  **S-ID6.a.** Fit a function to the data; use functions fitted to data to solve problems in the context of the data. | |
| **Science** | **HS-ETS1-4.** Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem. | |
| **Social Studies** |  | |

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| **UNIT 9 COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**   * Chapter 9 Test * Lab 9.2.1.6 Using Wireshark to Observe the TCP 3-Way Handshake | | |
| **Leadership Alignment:**  **Classroom:**  **3.A.1** Articulate thoughts and ideas effectively using oral, written and nonverbal communication skills in a variety of forms and contexts  ***Leadership Activities:***  *In groups, students will prepare and present a networking plan to solve a real-world business problem (hospital.)* | | |
| ***Standards and Competencies*** | | |
| **Unit 9:** SUBNETTING IP NETWORKS | | |
| **Industry Standards and/or Competencies** | | **Total Learning Hours for Unit:** 12 |
| 9.1.3.6, 9.1.3.7, 9.1.3.13, 9.1.3.14: Identify and use formulas to calculate the number of subnets and the number of hosts per subnet.  9.0.1.2: Develop an understanding of the need for splitting large groups into smaller, more manageable parts by examining how telephone numbers are divided into identifying groups of numbers.  9.4.1.1: Devise a physical and logical topology for a given situation that incorporates appropriate subnetting to serve the needs of the network. Create the scheme using simulation software and document the scheme to share with others. Validate end-to-end connectivity.  9.1.4.9: Given a specific network topology, determine the number of subnets needed, design an appropriate addressing scheme, and assign addresses. Examine the use of the address space and future growth potential.  9.3.1.4: Implement a sub netted IPv6 addressing scheme on a given network.  9.1.4.10: Research and compare client-based and web-based subnet calculators. Perform network calculations using a subnet calculator. Reflect on the advantages and differences between the two types of calculators.  9.1.2.1: Summarize the steps followed in order to prepare a network requirement study as part of planning network subnets.  9.2.1.1: Describe how proper allocation of addresses can support network security.  9.4.1.1: Working in a small group, plan and present a dedicated computer addressing scheme for patient rooms in a hospital.  9.2.1.1: After reading about structured design, describe the primary considerations to take into account when planning address allocation.  9.4.1.1: Prepare and present a subnetting scheme to meet customer requirements.  9.1.4.5: Subnet to meet network requirements, given the number of hosts that are needed.  9.1.5.6: Use regular subnetting to accommodate a given network, then use VLSM to further subnet the network.  9.2.1.3: Design and implement an IPv4 subnetting scheme on a network; configure the devices; test and troubleshoot the network.  9.2.1.4, 9.2.1.5: Design and implement a VLSM subnetting scheme; configure the devices; test and troubleshoot the network.  9.4.1.2: Take an existing network infrastructure and apply subnetting to finalize the configuration. | | |
| ***Aligned Washington State Learning Standards*** | | |
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| **Arts** |  | |
| **Computer Science** | **3B-A-3-15** Provide examples of computationally solvable problems and difficult-to-solve problems.  **3B-A-5-7** Decompose a problem by creating new data types, functions, or classes.  **3A-N-7-30** Describe key protocols and underlying processes of Internet-based services (e.g., http/https and SMTP/IMAP, routing protocols). | |
| **Educational Technology** | **9-12.4.c.** Students develop, test and refine prototypes as part of a cyclical design process.  **9-12.5.c.** Students break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving.  **9-12.5.d.** Students understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions. | |
| **English Language Arts** | **RI.9-10.1** Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.  **SL.9-10.1b.** Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed. | |
| **Environment & Sustainability** |  | |
| **Financial Education** |  | |
| **Health and Physical Education** |  | |
| **Mathematics** |  | |
| **Science** | **HS-ETS1-4.** Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem. | |
| **Social Studies** |  | |

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| **UNIT 10 COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**   * Chapter 10 Test * Lab 10.4.1.2 Packet Tracer Multiuser Tutorial * Lab 10.4.1.3 Multiuser Implementation of Service | | |
| **Leadership Alignment:**  **4.B.3** Apply a fundamental understanding of the ethical/legal issues surrounding the access and use of information  ***Leadership Activities:***  *Students will research current and relevant copyright issues and legal actions as they pertain to networks and network users.* | | |
| ***Standards and Competencies*** | | |
| **Unit 10:** APPLICATION LAYER | | |
| **Industry Standards and/or Competencies** | | **Total Learning Hours for Unit:** 9 |
| 10.2.3.3: Use FTP from a command prompt and download a GUI version using WS\_FTP LE. Use the application to transfer files.  10.1.2.4: Research available P2P file sharing software and identify issues that can arise from the use of this technology.  10.4.1.1: Using the same scenario as in 10.0.1.2, re-envision the methods of completing business transactions with networked applications available.  Evaluate the cost-effectiveness of network applications in a business context.  10.4.1.3: Use Packet Tracer multiuser to cooperate in implementing and verifying services including DHCP, HTTP, Email, DNS, and FTP.  10.0.1.2: Given a scenario where networked applications are not available, figure out how to complete your corporate workload.  10.2.1.8: Use Packet Tracer simulation software to configure and verify web and email services.  10.2.2.5: Use Syntax Checker to practice entering DNS commands in Windows and UNIX.  10.4.1.2: Explore the capabilities of the multiuser feature of Packet Tracer.  10.0.1.2: Envision that network applications, such as email, are not available to a business. Describe what methods could be used to continue business communications. Estimate what it would cost the business not to have network applications available, and how this would affect security policies.  10.1.2.4: Research P2P data security issues. Identify types of malware that can be transported through P2P file sharing. Define Torrent Poisoning.  Describe how P2P could be used to perpetrate identity theft.  10.4.1.2: Working with a partner, establish and verify a multiuser connection to another instance of Packet Tracer within the same LAN.  10.1.2.4: Research P2P copyright infringement issues and legal actions and describe the implications for network users.  10.3.1.1: After reading about the Internet of Things, explain the trends in technology that are resulting in a huge increase in the development of applications.  10.1.1.5: Match application protocols and standards to the appropriate locations on both the OSI and TCP/IP models.  10.2.2.9: Observe the DNS conversion of a URL to an IP address; use the nslookup command on a web site and on mail servers to observe DNS lookup.  10.2.3.2, 10.2.3.3: Using both simulation software and physical equipment, explore FTP capabilities. | | |
| ***Aligned Washington State Learning Standards*** | | |
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| **Arts** |  | |
| **Computer Science** | **3A-N-7-30** Describe key protocols and underlying processes of Internet-based services (e.g., http/https and SMTP/IMAP, routing protocols).  **3B-A-7-3** Modify an existing program to add additional functionality and discuss intended and unintended implications (e.g., breaking other functionality).  **3B-C-7-22** Explain the role of operating systems (e.g., how programs are stored in memory, how data is organized/retrieved, how processes are managed and multi-tasked). | |
| **Educational Technology** | **9-12.3.d.** Students build knowledge by actively exploring real-world issues and problems, developing ideas and theories and pursuing answers and solutions.  **9-12.5.c.** Students break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving. | |
| **English Language Arts** | **SL.11-12.1d.** Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task. | |
| **Environment & Sustainability** |  | |
| **Financial Education** |  | |
| **Health and Physical Education** |  | |
| **Mathematics** | **S-IC2.** Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. | |
| **Science** | **HS-ETS1-4.** Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem. | |
| **Social Studies** | **1.4.1** Analyzes and evaluates ways of influencing local, state, and national governments to preserve individual rights and promote the common good. (11) | |

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| **UNIT 11 COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**   * Chapter 11 Test * Lab 11.2.4.5 Accessing Network Devices with SSH * Lab 11.2.4.5B Backing Up Configuration Files * Lab 11.4.2.8 Password Recovery * Skill Assessments and Final Exam for CCNA or CCNP | | |
| **Leadership Alignment:**  **4.A.2** Evaluate information critically and competently  **3.A.3** Use communication for a range of purposes (e.g. to inform, instruct, motivate and persuade)  ***Leadership Activities:***  *Students will present their small business network project to the class for assessment and participate in the assessment of other projects by asking/answering questions and thoughtfully completing a rubric of pre-determined criteria/standards.* | | |
| ***Standards and Competencies*** | | |
| **Unit 11:** IT’S A NETWORK | | |
| **Industry Standards and/or Competencies** | | **Total Learning Hours for Unit:** 12 |
| 11.6.1.1: Complete a Capstone Project which involves designing and building a small business network, as well as creating a rubric to use for peer grading. Present the project to the class and prepare to answer questions from peers.  11.42.2, 11.4.2.3, 11.4.2.4: Describe and compare the methods used to back up and restore configuration files using text files, TFTP, and USB ports.  11.0.1.2: Given two network topologies, compare and contrast the two networks. Describe how they differ in the number and deployment of devices. Decide which network you would select if you owned a small to medium-sized business, based on cost, speed, ports, expandability, and manageability.  11.4.2.8: Research the purpose of the configuration register, and how different register values affect router behavior. Research and record the process for password recovery on a specific Cisco router.  11.2.2.6: Explore the SANS website; identify recent network security threats, and research and present a report on a specific network threat.  11.2.4.5: Configure a router for SSH access; use Wireshark to examine both Telnet and SSH sessions; configure a switch for SSH.  11.3.2.3: Document network latency through the use of ping and trace route.  11.1.1.2: Explain the impact of cost, speed and types of ports/interfaces, expandability, and OS features/services in the selection of small network devices.  11.2.3.2: Define AAA (Authentication, Authorization, and Accounting).  11.1.1.5: Describe best practices in network design to support availability.  11.2.1.4: Identify and classify a variety of security threats and vulnerabilities scenarios.  11.5.1.4: Describe basic security measures required on a wireless network.  11.6.1.1: Capstone project: work in a group to design and build a network from scratch. Develop a rubric to assess the assignment.  11.2.1.3: Describe best practices that should be employed in configuring network devices in order to mitigate network vulnerabilities.  11.2.1.3: Describe best practices that should be employed when devising a corporate security policy.  11.2.4.6: Perform basic device hardening on a router and a switch.  11.3.1.1: Describe how to interpret a variety of ping results. 11.3.2.1: Describe how to interpret trace route results.  11.3.3.4: Examine and interpret the output of a variety of show commands.  11.3.4.6: Use IOS CLI commands to gather network information.  11.5.2.4: Configure a Linksys wireless router, allowing remote access to wireless clients as well as connectivity with WPA security. | | |
| ***Aligned Washington State Learning Standards*** | | |
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| **Arts** |  | |
| **Computer Science** | **3B-D-4-27** Identify mathematical and computational patterns through modeling and simulation (e.g., regression, Runge-Kutta, queueing theory, discrete event simulation). | |
| **Educational Technology** | **9-12.3.d.** Students build knowledge by actively exploring real-world issues and problems, developing ideas and theories and pursuing answers and solutions.  **9-12.5.c.** Students break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving.  **9-12.5.d.** Students understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions. | |
| **English Language Arts** | **SL.9-10.4** Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.  **SL.9-10.1b.** Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed. | |
| **Environment & Sustainability** |  | |
| **Financial Education** |  | |
| **Health and Physical Education** |  | |
| **Mathematics** | |  | | --- | | **MP5.** Use appropriate tools strategically. | | **MP6**.Attend to precision. | | |
| **Science** | **HS-ETS1-4.** Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem. | |
| **Social Studies** |  | |

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| **SEMESTER 2 - ROUTING AND SWITCHING ESSENTIALS**  **UNIT 1 – COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**   * Chapter 1 Test * Lab 1.3.1.3 Skills Integration Challenge Instruction | | |
| **Leadership Alignment:**  **2.C.3** Synthesize and make connections between information and arguments  **3.A.1** Articulate thoughts and ideas effectively using oral, written and nonverbal communication skills in a variety of forms and contexts  ***Leadership Activities:***  *Students will create a network design, present their plan for feedback, and justify their design choices.* | | |
| ***Standards and Competencies*** | | |
| **Unit 1:** INTRODUCTION TO SWITCHED NETWORKS | | |
| **Industry Standards and/or Competencies** | | **Total Learning Hours for Unit:** 9 |
| 1.3.1.1: Create network designs to support requirements for a classroom LAN and administrative design. Justify device and layout decisions. Present the designs to the instructor and the class.  1.0.1.2: Develop a matrix (table) listing examples of network data types that can be sent and received.  1.2.1.2: After reading and viewing content illustrating the process of dynamically populating a switch MAC address table, summarize the steps a switch follows in handling incoming data.  1.2.1.7: Determine how a switch forwards a frame based on the source and destination MAC addresses and information in the switch MAC table.  1.3.1.1: Use Packet Tracer to create network designs to meet customer needs.  1.3.1.2: Review and practice basic switch configurations using Syntax Checker.  1.1.1.3: After reading about the demands converged networks put on network architecture and viewing a video about the evolution of converged network services, describe how Cisco Borderless Network architecture meets the needs of changing work patterns.  1.1.2.3: After reading about switch form factors, categorize switch selection criteria that support functions such as reliability, scalability, and port speed.  1.0.1.2: Based on examination of the table developed in this activity, predict how a switch will assist in the processes of sending and receiving data.  1.3.1.3: As part of a skills integration challenge, use commands to specify or limit access to device configurations as part of meeting security requirements.  1.1.1.2: After reading about converged networks, and viewing a video showing collaboration services in action, describe how collaboration services have affected network design.  1.1.1.4: Define the four principles of borderless switched network design: hierarchical, modularity, resiliency, and flexibility.  1.1.1.6: Match hierarchical switch characteristics to the definitions of their terms. Match switched network layer functions to their respective layers.  1.3.1.3: Demonstrate the ability to configure a small LAN by configuring initial settings on two switches, configuring IP address parameters on hosts, and verify end-to-end connectivity. | | |
| ***Aligned Washington State Learning Standards*** | | |
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| **Arts** |  | |
| **Computer Science** | **3B-I-1-34** Evaluate the impact of equity, access, and influence on the distribution of computing resources in a global society. | |
| **Educational Technology** | **9-12.5.c.** Students break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving. | |
| **English Language Arts** | **W.11-12.3a** Engage and orient the reader by setting out a problem, situation, or observation and its significance, establishing one or multiple point(s) of view, and introducing a narrator and/or characters; create a smooth progression of experiences or events.  **L.9-10.6** Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression. | |
| **Environment & Sustainability** |  | |
| **Financial Education** |  | |
| **Health and Physical Education** |  | |
| **Mathematics** | **S-IC6.** Evaluate reports based on data. | |
| **Science** |  | |
| **Social Studies** |  | |

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| **Unit 2 COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**   * Chapter 2 Test * Lab 2.1.1.6 Configuring Basic Switch Settings * Lab 2.2.4.11 Configuring Basic Switch Features | | |
| **Leadership Alignment:**  **2.C.4** Interpret information and draw conclusions based on the best analysis  ***Leadership Activities:***  *After completing a modeling activity, the student will interpret the results to create hypotheses.* | | |
| ***Standards and Competencies*** | | |
| **Unit 2:** BASIC SWITCHING CONCEPTS AND CONFIGURATION | | |
| **Industry Standards and/or Competencies** | | **Total Learning Hours for Unit:** 9 |
| 2.3.1.1: Use a given list of requirements to create, implement, and verify configuration commands on a new switch.  2.2.2.2 and 2.2.4.2: After reading about DHCP-based security attacks and DHCP snooping features, compare and contrast how DHCP can be used to attack and defend a network.  2.2.2.4: Match forms of security attacks to their descriptions.  2.0.1.2: Use the results of a modeling activity to formulate hypotheses about the roles of unicast, multicast, and broadcast traffic on a network.  2.1.2.5, 2.1.2.6: Describe how interpretation of the output of the show interface command on a switch can be used to troubleshoot a variety of network access layer issues.  2.1.2.2: After reading about manual configuration of switch port speed and duplex, practice port configuration using Syntax Checker.  2.1.2.3: After reading about the capabilities of Auto-MDIX, use Syntax checker to practice enabling Auto-MDIX on a switch port.  2.2.1.4: Configure and verify SSH, including secure passwords, IP domain name and secure keys.  2.2.3.1: Describe the roles played by security policies and employee training in developing an effective security management plan.  2.1.1.6: As part of a basic switch configuration, perform basic security operations, such as shutting down ports not assigned to the management VLAN, encrypting switch access, and creating a static MAC address.  2.2.1.1: Compare the outputs of Wireshark captures of both Telnet and SSH; summarize the evidence showing that SSH should be used for management connections.  2.3.1.1: Work with a partner to create a Packet Tracer example to test and verify a new security policy.  2.2.3.3: Describe best practices administrators should follow to minimize adverse effects on the network while maximizing the knowledge gained to support network security.  2.2.4.8: Describe the importance of providing clocking for a network, either by providing a private network master clock or through NTP.  2.1.1.6: Demonstrate the ability to perform basic switch configuration settings, including SVI. Verify both default and configured settings.  2.2.4.9: Configure and verify port security on a switch. Test the configurations by attempting to attach a "rogue laptop" to the network. | | |
| ***Aligned Washington State Learning Standards*** | | |
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| **Arts** |  | |
| **Computer Science** | **3B-D-3-29** Explore security policies by implementing and comparing encryption and authentication strategies (e.g., secure coding, safeguarding keys).  **3B-D-4-25** Discuss how data sequences (e.g., binary, hexadecimal, octal) can be interpreted in a variety of forms (e.g., instructions, numbers, text, sound, image). | |
| **Educational Technology** | **9-12.5.d.** Students understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions.  **9-12.3.d.** Students build knowledge by actively exploring real-world issues and problems, developing ideas and theories and pursuing answers and solutions. | |
| **English Language Arts** | **RI.9-10.1** Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text. | |
| **Environment & Sustainability** |  | |
| **Financial Education** |  | |
| **Health and Physical Education** |  | |
| **Mathematics** | **F-LE1.a.** Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals. | |
| **Science** | **HS-ETS1-4.** Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem. | |
| **Social Studies** |  | |

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| **UNIT 3 COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**   * Chapter 3 Test * Lab 3.2.1.7 Configuring VLAN Instructions * Lab 3.3.2.2 Implementing VLAN Security | | |
| **Leadership Alignment:**  **3.A.1** Articulate thoughts and ideas effectively using oral, written and nonverbal communication skills in a variety of forms and contexts  ***Leadership Activities:***  *Students will create a network plan and share with peers for review.* | | |
| ***Standards and Competencies*** | | |
| **Unit 3:** VLANS | | |
| **Industry Standards and/or Competencies** | | **Total Learning Hours for Unit:** 9 |
| 3.4.1.1: Use a word-processing program to document a proposed VLAN- switched network scheme. Include suggested VLAN names and numbers, port assignment, and how security would be planned for this switched network. Explain criteria used to assign ports. Be able to explain and discuss the proposal with peers.  3.1.1.5: Observe broadcast traffic in a VLAN implementation; describe the effects of the traffic on network devices and determine the collision and broadcast domains existing on the switch.  3.1.2.6: In three different scenarios, indicate which PCs will receive a broadcast frame from PCs representing different VLANs.  3.2.3.3: Based on content describing Dynamic Trunking Protocol, predict the behavior of DTP in determining access and trunk links.  3.1.2.7: Use and modify a Packet Tracer topology to explore the differences between broadcast traffic in a VLAN and non-VLAN implementation.  3.3.1.3: Use Syntax Checker to configure the PVLAN Edge feature.  3.1.1.2: Describe how implementation of VLANs supports business growth and productivity.  3.3.1.4: Match the VLAN attack type, mitigation technique, or security feature to its corresponding description.  3.3.2.2: After configuring basic switch parameters, apply more stringent security measures. Examine the output of various show commands and respond with appropriate configurations.  3.0.1.2: Complete a small-group activity modeling the purpose of VLANs in a switched network. Reflect on how the results of the activity support the idea of dividing networks into logical and physical groups.  3.3.2.1: Develop a list of best practices for administrators to follow in implementing VLANs.  3.4.1.1: Create and share for peer review a VLAN plan for a business.  3.2.1.7: Create, name, and verify VLANs on switches. Assign VLANs to active ports. Conduct tests to verify that the VLANs function as desired.  3.2.2.5: Configure VLANs and trunking on a switched network. | | |
| ***Aligned Washington State Learning Standards*** | | |
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| **Arts** |  | |
| **Computer Science** | **3B-A-7-3** Modify an existing program to add additional functionality and discuss intended and unintended implications (e.g., breaking other functionality).  **3A-N-3-33** Explain the principles of information security (confidentiality, integrity, availability) and authentication techniques. | |
| **Educational Technology** | **9-12.5.d.** Students understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions.  **9-12.5.c.** Students break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving.  **9-12.7.c.** Students contribute constructively to project teams, assuming various roles and responsibilities to work effectively toward a common goal. | |
| **English Language Arts** | **W.9-10.4** Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.  **SL.9-10.1b.** Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed.  **SL.9-10.4** Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. | |
| **Environment & Sustainability** |  | |
| **Financial Education** |  | |
| **Health and Physical Education** |  | |
| **Mathematics** | **MP7.** Look for and make use of structure. | |
| **Science** | **HS-ETS1-4.** Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem. | |
| **Social Studies** |  | |

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| **UNIT 4 COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**   * Chapter 4 Test * Lab 4.1.4.6 Configuring Basic Router Settings with IOS CLI * Lab 4.4.1.1 We really could use a Map | | |
| **Leadership Alignment:**  **1.B.3** Demonstrate originality and inventiveness in work and understand the real-world limits to adopting new ideas  ***Leadership Activities:***  *In groups of 2, students will create their own topology to share and compare with other teams.* | | |
| ***Standards and Competencies*** | | |
| **Unit 4:** ROUTING CONCEPTS | | |
| **Industry Standards and/or Competencies** | | **Total Learning Hours for Unit:** 9 |
| 4.2.2.5: In each of four different packet forwarding scenarios, order the steps the router will follow in forwarding the packet.  4.0.1.2: Using the Internet and Google Maps, request and document two different routes to selected locations. Examine information contained in route instructions. Draw an analogy to networking routes and the information used by routers in determining paths.  4.3.2.5: Investigate both IPv4 and IPv6 directly-connected routes in a network simulation. Determine which show commands would be most helpful in gathering information.  4.1.1.8: Use the tracert command to access an edge router, then use various show commands to gather information about the devices and networks attached. Use this information to complete a topology.  4.1.1.9: Using the tracert command, identify domains obtained using the whois tool.  4.1.1.4: Describe the relationship a router can have to local users, home networks, multiple LANs, and WAN services through ISPs.  4.1.3.1: After using Syntax Checker to configure basic router settings, describe similarities in how access is secured, and passwords and banners employed.  4.4.1.1: Work with a partner to create a visual topology based on the contents of two routers' routing tables. Share and compare your team's design with that of other teams in the class.  4.1.3.2: Employ the use of interface descriptions to aid with troubleshooting and to help identify third-party connections and contact information. Use Syntax Checker to practice these commands.  4.4.1.1: Based on the contents of their routing tables, draw a topology reflecting the networks interconnected by two routers.  4.1.1.7: Demonstrate knowledge of router memory by matching memory functions to memory types. Demonstrate knowledge of router components by identifying ports/slots on a 2901 or 4321 Series router.  4.3.1.4: Interpret the content of a routing table entry. | | |
| ***Aligned Washington State Learning Standards*** | | |
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| **Arts** |  | |
| **Computer Science** | **3B-A-3-15** Provide examples of computationally solvable problems and difficult-to-solve problems.  **3B-A-3-17** Decompose a large-scale computational problem by identifying generalizable patterns and applying them in a solution. | |
| **Educational Technology** | **9-12.5.d.** Students understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions.  **9-12.5.c.** Students break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving.  **9-12.3.d.** Students build knowledge by actively exploring real-world issues and problems, developing ideas and theories and pursuing answers and solutions. | |
| **English Language Arts** | **SL.9-10.4** Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. | |
| **Environment & Sustainability** |  | |
| **Financial Education** |  | |
| **Health and Physical Education** |  | |
| **Mathematics** | **N-Q1.** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. | |
| **Science** |  | |
| **Social Studies** |  | |

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| **UNIT 5 COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**   * Chapter 5 Test * Lab 5.1.2.4 Configuring Per Interface Inter VLAN routing * Lab 5.1.3.7 Configuring 802.1Q Trunk-Based InterVLAN Routing | | |
| **Leadership Alignment:**  **3.A.1** Articulate thoughts and ideas effectively using oral, written and nonverbal communication skills in a variety of forms and contexts  ***Leadership Activities:***  *Students will create and deliver presentations for a variety of purposes solving real-world VLAN problems.* | | |
| ***Standards and Competencies*** | | |
| **Unit 5:** INTER-VLAN ROUTING | | |
| **Industry Standards and/or Competencies** | | **Total Learning Hours for Unit:** 9 |
| 5.0.1.2: Research inter-VLAN routing concepts as preparation for a presentation describing how you would set up an inter-VLAN routing-based network for your business. Takes notes and record the locations of the information. Include quotations for the sources used in the presentation.  5.0.1.2: Include these specific elements in an informational presentation on a proposed inter-VLAN routing setup:  --a synopsis of reasons for changing the current network to the proposed network  --basic, easily understood definitions  --a graphic depicting the proposed network  5.1.1.5: Identify a series of topologies as legacy, router-on-a-stick, or multilayer switch implementations.  5.3.2.3: Examine a given network topology, then troubleshoot Layer 3 switching issues based on command outputs.  5.2.2.3: Based on given troubleshooting outputs, determine which command produced the output.  5.3.1.5: Explore and practice SDM template options in configuring static routes on a Catalyst 2960.  5.4.1.1: Address the needs of a multi-department company by designing an inter-VLAN network scheme to service a few employees on each floor of the building.  5.3.1.2: Explain how Layer 3 switching has improved network performance.  5.4.1.1: Work with a partner to develop a design and presentation, including graphics, to support an inter-VLAN routing scheme. In presenting the scheme, be able to demonstrate how data moves through the network.  5.1.1.4: After reading about the roles of multilayer switches and routers in inter-VLAN routing, be able to explain how their functions support network security.  5.0.1.2: Create a sales-oriented presentation to support a design proposal. Include both text and graphics that explain the proposal.  5.3.2.4: Given an inter-VLAN routing configuration, determine where issues exist and then analyze existing configurations to determine the source of the problems. After applying corrections, verify IP connectivity.  5.3.2.3: Use information interpreted from topology diagrams to troubleshoot a variety of scenarios. | | |
| ***Aligned Washington State Learning Standards*** | | |
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| **Arts** |  | |
| **Computer Science** | **3B-I-1-33** Debate laws and regulations that impact the development and use of software.  **3B-D-4-27** Identify mathematical and computational patterns through modeling and simulation | |
| **Educational Technology** | **9-12.6.c.** Students communicate complex ideas clearly and effectively by creating or using a variety of digital objects such as visualizations, models or simulations. | |
| **English Language Arts** | **SL.9-10.4** Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.  **SL.9-10.1a.** Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas. | |
| **Environment & Sustainability** |  | |
| **Financial Education** |  | |
| **Health and Physical Education** |  | |
| **Mathematics** | **MP4.** Model with mathematics. | |
| **Science** | **HS-ETS1-4.** Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem. | |
| **Social Studies** |  | |

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| **UNIT 6 COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**   * Chapter 6 Test * Lab 6.2.2.5 Configuring IPv4 Static and Default Routes * Lab 6.2.4.5 Configuring IPv6 Static and Default Routes * Chapter 6 Practice Skills Assessment | | |
| **Leadership Alignment:**  **3.B.3** Assume shared responsibility for collaborative work, and value the individual contributions made by each team member  **3.B.2** Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal  ***Leadership Activities:***  *Working in teams, students will build network topologies to a variety of design requirements.* | | |
| ***Standards and Competencies*** | | |
| **Unit 6:** STATIC ROUTING | | |
| **Industry Standards and/or Competencies** | | **Total Learning Hours for Unit:** 9 |
| 6.0.1.2: With a partner, arrive at a solution to a scenario involving routes to a sporting event. Then, derive an analogy to choosing routes for networking traffic. Be able to justify your conclusions.  6.3.3.6: Given a network address and topology, develop and calculate a VLSM addressing scheme.  6.6.1.1: With a partner, write IPv6 route statements to direct IPv6 traffic correctly, based on a given network topology diagram. Compare written answers with those of another group and discuss any differences.  6.2.2.4: Use Packet Tracer to configure a variety of types of IPv4 static routes.  6.5.2.4: Practice troubleshooting skills using an existing pre-configured Packet Tracer network. Locate the issue or issues, determine the best solution, and apply and verify the resolution.  6.1.1.4: Identify the advantages and disadvantages of static routing.  6.1.2.6: Given a list of descriptive phrases, identify the type of static route being described.  6.1.1.2: Describe how administrators use static routes to provide better security in both small and larger networks.  6.6.1.1: Work with a partner to complete an IPv6 static routing design, then work with other groups to discuss and compare solutions.  6.1.1.1: Discuss how the use of static routing requires increased network administrator responsibility.  6.6.1.1: Compose IPv6 static route statements to direct network traffic between routers.  6.2.2.5: Build a network topology to design requirements; configure basic device settings and verify connectivity; configure IPv4 static and default routes to meet traffic requirements.  6.2.4.5: Build a network topology to design requirements; configure basic device settings and verify connectivity; configure IPv6 static and default routes to meet traffic requirements.  6.3.2.2: Explain the three-step process for determining the CIDR summary route and subnet mask for a group of networks. | | |
| ***Aligned Washington State Learning Standards*** | | |
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| **Arts** |  | |
| **Computer Science** | **3A-N-1-32** Compare and contrast multiple viewpoints on cybersecurity (e.g., from the perspective of security experts, privacy advocates, the government).  **3A-N-6-35** Identify digital and physical strategies to secure networks and discuss the tradeoffs between ease of access and need for security.  **3B-D-4-24** Use data analysis to identify significant patterns in complex systems (e.g., take existing data sets and make sense of them). | |
| **Educational Technology** | **9-12.3.d.** Students build knowledge by actively exploring real-world issues and problems, developing ideas and theories and pursuing answers and solutions.  **9-12.5.d.** Students understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions. | |
| **English Language Arts** |  | |
| **Environment & Sustainability** |  | |
| **Financial Education** |  | |
| **Health and Physical Education** |  | |
| **Mathematics** | **N-VM.1.** (+) Recognize vector quantities as having both magnitude and direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes (e.g., v, |v|, ||v||, v). | |
| **Science** | **HS-ETS1-4.** Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem. | |
| **Social Studies** |  | |

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| **UNIT 7 COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**   * Chapter 7 Test * Lab 7.3.2.4 Configuring Basic RIPv2 * Lab 7.6.1.1 IPv6 Details and Instructions * Lab 7.3.1.8 Configuring RIPv2 Instructions | | |
| **Leadership Alignment:**  **3.A.5** Communicate effectively in diverse environments (including multi-lingual)  **2.C.5** Reflect critically on learning experiences and processes  ***Leadership Activities:***  *In teams, students will complete a real-world model of network scenarios, analyze the outcome data collected and suggest alternatives or fix problems.* | | |
| ***Standards and Competencies*** | | |
| **Unit 7:** ROUTING DYNAMICALLY | | |
| **Industry Standards and/or Competencies** | | **Total Learning Hours for Unit:** 12 |
| 7.5.3.3: Use binary information to determine the longest route match in a series of IPv4 and IPv6 destination addresses.  7.1.1.4: Demonstrate understanding of the components of routing protocols by completing a series of statements about EIGRP operations.  7.1.4.10: Distinguish between legacy distance vector, current distance vector, and link-state routing protocol characteristics.  7.3.2.4: Build a network topology, configure and verify RIPv2, configure IPv6 on devices, and configure and verify RIPng.  7.6.1.1: Based on analysis of an IPv6 routing table, identify networks and routes, interpret and values contained in the table, and use this evidence to describe the results of network changes.  7.0.1.2: Use a digital camera or BYOD with camera to record visual data used in determining the parameters for activities as part of a modeling exercise.  7.2.2.4: Using a pre-configured Packet Tracer topology, predict the path based on a comparison of RIP and EIGRP metrics; trace the routes taken by data in RIP and EIGRP configurations; and compare path selection by the two routing protocols.  7.1.3.6: Investigate and examine the concept of convergence by viewing the routing table of a converged network, then adding a new LAN to the topology and watching the network converge.  7.3.1.6: Explain how passive interfaces address routing security risks.  7.0.1.2: Work in teams to complete two scenarios modeling the network concept of routing cost. Use the data collected to examine the parameters for the scenarios, the outcomes, and the relationship to parameters set by routing protocols.  7.1.2.5: After comparing the "scorecards" for dynamic versus static routing, discuss the factors influencing a network administrator's choice of routing protocol.  7.6.1.1: Demonstrate the ability to read an IPv6 routing table, interpret the information found in it, and predict the effect of a change in cost on a route. Be able to compute the next available numerical network assignment.  7.2.1.3: Identify a range of distance vector routing protocol terminology.  7.5.2.6: Identify the Level 1, Level 1 Parent, and Level 2 Child routes in a given routing table.  7.5.4.4: "Construct" IPv6 routing table entries by dragging values to their appropriate fields. | | |
| ***Aligned Washington State Learning Standards*** | | |
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| **Arts** |  | |
| **Computer Science** | **3B-A-5-7** Decompose a problem by creating new data types, functions, or classes.  **3B-D-4-26** Evaluate the ability of models and simulations to formulate, refine, and test hypotheses. | |
| **Educational Technology** | **9-12.3.d.** Students build knowledge by actively exploring real-world issues and problems, developing ideas and theories and pursuing answers and solutions.  **9-12.4.a.** Students know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems.  **9-12.5.d.** Students understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions.  **9-12.3.c.** Students curate information from digital resources using a variety of tools and methods to create collections of artifacts that demonstrate meaningful connections or conclusions. | |
| **English Language Arts** | **SL.9-10.4** Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. | |
| **Environment & Sustainability** |  | |
| **Financial Education** |  | |
| **Health and Physical Education** |  | |
| **Mathematics** | **N-VM.1.** (+) Recognize vector quantities as having both magnitude and direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes (e.g., v, |v|, ||v||, v). | |
| **Science** | **HS-ETS1-4.** Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem. | |
| **Social Studies** |  | |

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| **UNIT 8 COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**   * Chapter 8 Test * Lab 8.2.4.5 Configure Basic Single-Area OSPF * Lab 8.3.3.6 Configure Basic Single-Area OSPFv3 | | |
| **Leadership Alignment:**  **3.A.5** Communicate effectively in diverse environments (including multi-lingual)  **2.C.5** Reflect critically on learning experiences and processes  ***Leadership Activities:***  *In teams, students will complete real-world modeling scenarios of OSPF networks analyzing the outcome data collected.* | | |
| ***Standards and Competencies*** | | |
| **Unit 8:** SINGLE-AREA OSPF | | |
| **Industry Standards and/or Competencies** | | **Total Learning Hours for Unit:** 9 |
| 8.0.1.2: Conduct research on Edsger Wybe Dijkstra, his work, and the algorithm he created for networking routing. View animations of the operation of the algorithm.  8.2.2.6: Use knowledge of decimal and binary conversions to calculate subnets and wildcard masks.  8.0.1.2: After viewing information on Dijkstra's life and work, note observations about the visual resources and record five facts about Dijkstra's life. Compare notes with other classmates.  8.1.1.6: Match OSPF terminology features to functions and descriptions.  8.3.3.5: Given a network topology with IPv6 addressing pre-configured, configure basic single area OSPFv3 and verify connectivity between end devices.  8.2.3.5: Use Syntax Checker to practice adjusting interface bandwidths.  8.4.1.2: Practice skills integration by configuring IP address, OSPFv2 and OSPFv3 routing on a Packet Tracerk network design.  8.2.1.3: Explain the purpose of the OSPF router ID and the preference order used by OSPF routers to determine router ID.  8.1.1.1: Describe the needs of organizations which have influenced changed and additions to OSPF since its invention.  8.2.1.6: Explain how using loopbacks can contribute to security.  8.4.1.1: Work in teams of three to conduct verbal modeling of the SPF routing process; create tables to express the data acquired and relate the processing steps of OSPFv3 to the steps followed in the modeling activity. In this activity, each team member acquires data by speaking to direct neighbors. Tables are built based on sharing of individual members' data.  8.2.2.5: Explain how passive interfaces address routing security risks.  8.4.1.1: Be able to use a formula to compute data for a table listing possible paths to other networks in a given network topology.  8.2.4.5: Build and configure network devices; configure and verify OSPF routing; change router ID assignments and configure OSPF passive interfaces. Change default OSPF metrics.  8.3.3.6: Configure basic single area OSPFv3 on a network topology: configure all devices, assign router IDs, configure passive interfaces, and verify connectivity. | | |
| ***Aligned Washington State Learning Standards*** | | |
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| **Arts** |  | |
| **Computer Science** | **3B-A-4-11** Critically analyze classic algorithms (e.g., sorting, searching) and use in different contexts, adapting as appropriate.  **3B-A-4-12** Evaluate algorithms (e.g., sorting, searching) in terms of their efficiency, correctness, and clarity.  **3B-A-4-13** Compare and contrast fundamental data structures and their uses (e.g., lists, maps, arrays, stacks, queues, trees, graphs). | |
| **Educational Technology** | **9-12.3.d.** Students build knowledge by actively exploring real-world issues and problems, developing ideas and theories and pursuing answers and solutions.  **9-12.5.d.** Students understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions. | |
| **English Language Arts** | **SL.9-10.1a.** Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.  **SL.9-10.1b.** Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed.  **L.9-10.6** Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression. | |
| **Environment & Sustainability** |  | |
| **Financial Education** |  | |
| **Health and Physical Education** |  | |
| **Mathematics** | **N-VM.1.** (+) Recognize vector quantities as having both magnitude and direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes (e.g., v, |v|, ||v||, v). | |
| **Science** | **HS-ETS1-4.** Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem. | |
| **Social Studies** |  | |

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| **UNIT 9 COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**   * Chapter 9 Tests * Lab 9.2.2.6 Configuring and Verifying Standard ACLs * Lab 9.2.1.11 Configuring Named Standard ACLs * Lab 9.2.2.7 Configuring and Verifying Standard ACLs * Lab 9.3.2.13 Configuring and Verifying Extended ACLs | | |
| **Leadership Alignment:**  **3.A.2** Listen effectively to decipher meaning, including knowledge, values, attitudes and intentions  **3.A.3** Use communication for a range of purposes (e.g. to inform, instruct, motivate and persuade)  ***Leadership Activities:***  *Students will create and write questions for a security clearance interview.* | | |
| ***Standards and Competencies*** | | |
| **Unit 9:** ACCESS CONTROL LISTS | | |
| **Industry Standards and/or Competencies** | | **Total Learning Hours for Unit:** 9 |
| 9.1.3.6: Use binary and decimal conversions in order to determine the correct wildcard mask.  9.3.2.13: Write statements for numbered and named ACLs to support given network security policies. Verify that the correct syntax was used by conducting testing.  9.1.3.4: Explain how the use of wildcard mask keywords, such as host and any, simplify the task of creating and reading ACLs.  9.1.3.7: Given a series of ACL statements and comparison IP addresses, determine the appropriate permit or deny result.  9.1.1.6: Observe how an ACL affects network traffic by removing the ACL and verifying the resulting changes.  9.3.2.10, 9.3.2.11, 9.3.2.12: Practice the configuration, application, and verification of extended ACLs for specific situations using Packet Tracer. Use Simulation mode to test the ACLs.  9.1.4.1: State the "three Ps" of best practices for ACL configuration and placement.  9.1.1.1: Describe the ways in which ACLs support router and network security.  9.0.1.2: Participate in mock interviews as either interviewer or interviewee as part of a modeling exercise designed to demonstrate the permit/deny functions of ACLs.  9.0.1.2: Model the permit/deny function of ACLs by determining questions to ask a candidate for a security clearance. Discuss the factors to be considered when issuing clearances and the criteria network professionals should meet.  9.1.5.4: Given statements of network policy, determine the best placement of ACLs to support those policies.  9.1.4.3: Demonstrate understanding of ACL operations by dragging the appropriate word or phrase to complete each of a series of ACL operation statements.  9.3.2.7: Create several extended ACL statements based on given requirements by dragging the statement components to the correct positions.  9.6.1.1: Write a named ACL to address a network issue. Apply it to the most effective router interface and validate that it works. | | |
| ***Aligned Washington State Learning Standards*** | | |
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| **Arts** |  | |
| **Computer Science** | **3B-A-4-13** Compare and contrast fundamental data structures and their uses (e.g., lists, maps, arrays, stacks, queues, trees, graphs).  **3B-A-4-11** Critically analyze classic algorithms (e.g., sorting, searching) and use in different contexts, adapting as appropriate.  **3B-A-4-12** Evaluate algorithms (e.g., sorting, searching) in terms of their efficiency, correctness, and clarity.  **3B-A-3-15** Provide examples of computationally solvable problems and difficult-to-solve problems.  **3B-A-7-4** Explain security issues that might lead to compromised computer programs (e.g., circular references, ambiguous program calls, lack of error checking and field size checking). | |
| **Educational Technology** | **9-12.5.c.** Students break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving. | |
| **English Language Arts** | **SL.9-10.6** Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.  **SL.9-10.4** Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. | |
| **Environment & Sustainability** |  | |
| **Financial Education** |  | |
| **Health and Physical Education** |  | |
| **Mathematics** | **MP1.** Make sense of problems and persevere in solving them.  **MP4.** Model with mathematics.  **N-Q3.** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. | |
| **Science** |  | |
| **Social Studies** |  | |

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| **UNIT 10 COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**   * Chapter 10 Test * Lab 10.1.2.4 Configuring Basic DHCP on a Router | | |
| **Leadership Alignment:**  **2.A.1** Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation  ***Leadership Activities:***  *Students will resolve configuration errors to correct connectivity issues.* | | |
| ***Standards and Competencies*** | | |
| **Unit 10:** DHCP | | |
| **Industry Standards and/or Competencies** | | **Total Learning Hours for Unit:** 9 |
| 10.3.1.1: Incorporate output validating the use of DHCP for the IoE in a presentation.  10.1.1.5: Demonstrate understanding of the steps in the DHCPv4 operation by dragging their terminology to the appropriate field.  10.2.1.8: Demonstrate understanding of the steps in SLAAC operation by dragging their terminology to the appropriate field.  10.1.4.4: Having applied a given configuration that includes several errors, troubleshoot DHCPv4 issues. Use show and debug commands to determine and correct the network connectivity issues.  10.2.4.4: Having applied a given configuration that includes several errors, troubleshoot IPv6 connectivity and stateless DHCPv6 issues. Use show and debug commands to determine and correct the network connectivity issues.  10.0.1.2: Use a web-based simulator to learn to configure DHCP using a Linksys wireless 54GL router.  10.1.3.3: Describe the various roles routers may take in DHCP operations. Using Packet Tracer, configure one router as a DHCP server as well as a DHCP client. Configure two other routers as DHCP relay agents.  10.0.1.2: Before beginning to learn about DHCP, discuss the reasons why you would choose a small generic ISR or a full DHCP server in order to address the needs of a small- to medium-sized network. Discuss why a network administrator would need to save a bank of non-DHCP IP addresses.  10.0.1.2: Prepare and share a word processing document, incorporating screen shots from the use of an Internet-based simulation tool, to illustrate choices in configuring DHCP.  10.1.2.3: Explain how DHCPv4 relay helps to support a network administrator's responsibility to limit network broadcasts.  10.3.1.1: Explore and demonstrate the applications of DHCP to the Internet of Everything by using Packet Tracer to configure a router as a DHCP server, and five end devices to receive DHCP services.  10.1.2.4: Build and configure a network topology; configure a DHCPv4 server and a DHCP relay agent. Verify DHCP services and address leases.  10.3.1.2: Configure VLANs, trunks, DHCP Easy IP, DHCP relay agents, and a router as a DHCP client. | | |
| ***Aligned Washington State Learning Standards*** | | |
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| **Arts** |  | |
| **Computer Science** | **3B-A-6-21** Evaluate key qualities of a program (e.g., correctness, usability, readability, efficiency, portability, scalability) through a process such as a code review.  **3B-A-4-12** Evaluate algorithms (e.g., sorting, searching) in terms of their efficiency, correctness, and clarity. | |
| **Educational Technology** | **9-12.4.d.** Students exhibit a tolerance for ambiguity, perseverance and the capacity to work with open-ended problems.  **9-12.5.d.** Students understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions.  **9-12.5.b.** Students collect data or identify relevant data sets, use digital tools to analyze them, and represent data in various ways to facilitate problem-solving and decision-making. | |
| **English Language Arts** | **SL.9-10.4** Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.  **SL.9-10.6** Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate. | |
| **Environment & Sustainability** |  | |
| **Financial Education** |  | |
| **Health and Physical Education** |  | |
| **Mathematics** | **MP2.** Reason abstractly and quantitatively.  **MP5.** Use appropriate tools strategically. | |
| **Science** | **HS-ETS1-4.** Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem. | |
| **Social Studies** |  | |

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| **UNIT 11 COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**   * Chapter 11 Test * Lab 11.2.2.6 Configuring Dynamic and Static NAT * Lab 11.2.3.7 Configuring NAT Pool Overload and PAT * Skills Exam and Semester Final Assessment and Skills Exam (Project) | | |
| **Leadership Alignment:**  **2.A.1** Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation  ***Leadership Activities:***  *Students will resolve configuration errors to correct connectivity issues.* | | |
| ***Standards and Competencies*** | | |
| **Unit 11:** NETWORK ADDRESS TRANSLATION FOR IPV4 | | |
| **Industry Standards and/or Competencies** | | **Total Learning Hours for Unit:** 9 |
| 11.0.1.2: Conduct research on uses for NAT by taking notes from online resources, viewing NAT graphics, and using them to define the four types of NAT implementations.  11.1.1.6: Identify four critical NAT terms by dragging them to the appropriate position on a diagram of NAT communication on a network topology diagram.  11.3.1.4: Troubleshoot NAT in a scenario where a new subnet was added after an old configuration was restored to a router running NAT. Isolate problem areas, issue appropriate troubleshooting commands, and verify connectivity has been restored.  11.3.1.5: Troubleshoot a "bugged" configuration of static and dynamic NAT.  11.1.2.6: Use the Simulation features of Packet Tracer to generate an HTTP request, capture the resulting traffic on a NAT-enabled device, and examine packet changes as traffic is forwarded.  11.1.3.2: Describe which applications and services may be disrupted or compromised when NAT is employed.  11.4.1.1: Employ the use of a prototype before deploying NAT on a live network, as part of a scenario where you add NAT to an existing network design.  11.0.1.2: Report the results of individual research on NAT to the class. As other students report their results, check off data that you also noted; add new data as it is reported.  11.1.3.1: Discuss how NAT keeps network addressing schemes within legal limits.  11.2.5.3: Explain why NAT for IPv6 is a temporary mechanism to be used to assist in the migration from IPv4 to IPv6.  11.2.1.4: Test network access without NAT; configure static NAT, then test access again.  11.2.2.6: Build a network topology, then configure and verify both static and dynamic NAT to meet network requirements. | | |
| ***Aligned Washington State Learning Standards*** | | |
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| **Arts** |  | |
| **Computer Science** | **3B-D-4-27** Identify mathematical and computational patterns through modeling and simulation (e.g., regression, Runge-Kutta, queueing theory, discrete event simulation).  **3B-I-1-32** Design and implement a study that evaluates or predicts how computation has revolutionized an aspect of our culture and how it might evolve (e.g., education, healthcare, art/entertainment, energy).  **3B-N-4-35** Simulate and discuss the issues (e.g., bandwidth, load, delay, topology) that impact network functionality (e.g., use free network simulators). | |
| **Educational Technology** | **9-12.3.c.** Students curate information from digital resources using a variety of tools and methods to create collections of artifacts that demonstrate meaningful connections or conclusions.  **9-12.5.d.** Students understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions. | |
| **English Language Arts** | **W.11-12.3a** Engage and orient the reader by setting out a problem, situation, or observation and its significance, establishing one or multiple point(s) of view, and introducing a narrator and/or characters; create a smooth progression of experiences or events.  **W.9-10.3c** Use a variety of techniques to sequence events so that they build on one another to create a coherent whole.  **W.9-12.4** Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. | |
| **Environment & Sustainability** |  | |
| **Financial Education** |  | |
| **Health and Physical Education** |  | |
| **Mathematics** | **MP4.** Model with mathematics.  **A-SSE1.b.** Interpret complicated expressions by viewing one or more of their parts as a single entity. | |
| **Science** | **HS-ETS1-4.** Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem. | |
| **Social Studies** |  | |

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| **SEMESTER 3 - NETWORKING SYSTEMS**  **Unit 1 – COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**   * Chapter 1 Test * Lab 1.1.1.2 Troubleshooting OSPF * Lab 1.1.4.2 Configuring Extended VLAN VTP and DTP | | |
| **Leadership Activities:**  **2.A.1** Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation  **2.B.1** Analyze how parts of a whole interact with each other to produce overall outcomes in complex systems  ***Leadership Activities:***  *Students will complete a skills challenge testing their solution for connectivity.* | | |
| ***Standards and Competencies*** | | |
| **Unit 1:** SCALING NETWORKS | | |
| **Industry Standards and/or Competencies** | | **Total Learning Hours for Unit:** 9 |
| 1.0.1.2: Use the Internet to find information and take notes about the Cisco three-layer hierarchical model. Include definitions, facts, device capabilities, and a graphic. Create a simple table to organize your research and share it with another student, group, the class, or the instructor.  1.1.1.6: Identify Cisco Enterprise Architecture modules by dragging the names of module components to their correct locations in a provided graphic.  1.1.2.6: Identify scalability terminology through a matching exercise.  1.3.1.3: Demonstrate the use of documentation when establishing network requirements and when troubleshooting technology implementation.  1.2.1.7: Use the physical environment in Packet Tracer to examine and compare capabilities of Layer 2 and Layer 3 switches, and Layer 3 switches and routers.  1.3.1.2: Use Syntax Checker to review basic switch configurations.  1.2.1.6: Match features of switch hardware to switch selection criteria.  1.2.2.4: Match router descriptions to their functions relative to the three categories of routers.  1.1.2.1: Articulate strategies to enable a network to grow and expand without compromising availability.  1.3.1.1: Assume the role of a network administrator in preparing a simulated network presentation to the branch manager to explain how the network currently operates, and the options for scaling it.  1.2.3.6: After reviewing basic switch interface/port related show commands, be able to explain the port security options a network administrator would choose to implement.  1.2.1.8: After researching campus LAN switches, make specific recommendations to meet a variety of network requirements, and explain the rationale for the recommendations.  1.3.1.3: Complete a skills challenge including VLANs, tranking, port security, and SSH access on a switch; inter-VLAN routing and NAT on a router.  Document the network and test for end-to-end connectivity. | | |
| ***Aligned Washington State Learning Standards*** | | |
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| **Arts** |  | |
| **Computer Science** | **3B-A-7-3** Modify an existing program to add additional functionality and discuss intended and unintended implications (e.g., breaking other functionality).  **3B-A-5-7** Decompose a problem by creating new data types, functions, or classes. | |
| **Educational Technology** | **9-12.5.c.** Students break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving. | |
| **English Language Arts** | |  | | --- | | **W.9-12.3b** Use narrative techniques, such as dialogue, pacing, description, reflection, and multiple plot lines, to develop experiences, events, and/or characters | | **W.9-10.3c** Use a variety of techniques to sequence events so that they build on one another to create a coherent whole. | | |
| **Environment & Sustainability** |  | |
| **Financial Education** |  | |
| **Health and Physical Education** |  | |
| **Mathematics** | |  | | --- | | **MP1.** Make sense of problems and persevere in solving them. | | **MP2.** Reason abstractly and quantitatively. | | |
| **Science** |  | |
| **Social Studies** |  | |

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| **Unit 2 COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**   * Chapter 2 Test * Lab 2.1.2.10 Building Switched Networks with Redundant Links * Lab 2.3.2.3 Configuring Rapid PVST and Portfast * Lab 2.4.3.4 Configuring HSRP and GLBP | | |
| **Leadership Activities:**  **10.B.1.f** Collaborate and cooperate effectively with teams  **2.A.1** Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation  ***Leadership Activities:***  *Students will work with partners and in teams to investigate and solve a variety of network problems.* | | |
| ***Standards and Competencies*** | | |
| **Unit 2:** LAN REDUNDANCY | | |
| **Industry Standards and/or Competencies** | | **Total Learning Hours for Unit:** 12 |
| 2.0.1.2: In order to diagnose a network switch traffic issue, use the Internet to research STP. Take notes in order to describe broadcast storms, switching loops, and information on STP.  2.1.2.8: Identify 802.1D port roles by dragging role names to their appropriate switch ports in a given topology.  2.2.1.3: Identify types of spanning tree protocols by dragging the protocol type to the appropriate description.  2.4.2.2: Identify First Hop Redundancy protocols by dragging the FHRP type to the appropriate definition.  2.1.2.10: Determine the root bridge in a switched network. Then, change port cost and observe spanning tree changes.  2.3.3.6: Based on the given outputs from a switched topology, determine the root bridge, the port placed in blocking mode, and the link that is down.  2.4.3.3: Use Syntax Checker to become familiar with the commands used to enable HSRP.  2.5.1.1: Use Packet Tracer software to create a topology diagram for network documentation purposes.  2.1.2.1: Distinguish between the usage of the Spanning Tree Protocol and the STP acronym; be able to correctly interpret the usage of terms used to identify various implementations of spanning tree.  2.1.1.5: Examine a redundant network design; observe the ARP process, and conduct redundancy tests by deleting and changing links.  2.3.3.4: Be able to describe the symptoms of STP failure.  2.0.1.2: After researching STP, be able to share your conclusions about the nature of a network traffic problem.  2.3.3.1, 2.3.3.2: Explain the importance of determining the differences between expected and actual network topologies as part of the troubleshooting process. | | |
| ***Aligned Washington State Learning Standards*** | | |
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| **Arts** |  | |
| **Computer Science** | **3A-I-1-27** Demonstrate how computing enables new forms of experience, expression, communication, and collaborating.  **3A-N-7-30** Describe key protocols and underlying processes of Internet-based services (e.g., http/https and SMTP/IMAP, routing protocols).  **3A-N-3-33** Explain the principles of information security (availability) and authentication techniques. | |
| **Educational Technology** | **9-12.5.c.** Students break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving.  **9-12.5.d.** Students understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions. | |
| **English Language Arts** | **SL.9-10.4** Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. | |
| **Environment & Sustainability** |  | |
| **Financial Education** |  | |
| **Health and Physical Education** |  | |
| **Mathematics** | **N-Q1.** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. | |
| **Science** |  | |
| **Social Studies** |  | |

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| **UNIT 3 COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**   * Chapter 3 Test * Lab 3.2.1.4 Configuring Etherchannel * Lab 3.2.2.4 Troubleshooting Etherchannel | | |
| **Leadership Activities:**  **2.A.1** Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation  **2.C.5** Reflect critically on learning experiences and processes  ***Leadership Activities:***  *Students will complete computer-based simulations, sharing and comparing learning with peers.* | | |
| ***Standards and Competencies*** | | |
| **Unit 3:** LINK AGGREGATION | | |
| **Industry Standards and/or Competencies** | | **Total Learning Hours for Unit:** 9 |
| 3.0.1.2: Use the Internet to research graphics depicting Ether Channel; prepare a three-slide presentation to communicate the concept to others. The slides should include a concise definition, a graphic of a switch-to-switch Ether Channel topology, and a list of advantages of using Ether Channel.  Share the presentation with the class.  3.1.2.4: Distinguish between PAgP and LACP interface negotiation terms by dragging the terms to the appropriate descriptions; determine if an Ether Channel would be established when given combinations of PAgP and LACP modes.  3.2.2.3: Given a switched network topology that is displaying slow traffic forwarding, identify and correct port channel assignment and protocol issues.  3.2.2.4: Build a network and load device configurations that contain a number of configuration errors. Examine the configurations, make corrections if needed, and verify full functionality.  3.2.2.2: Describe the differences between the purpose and functionality of PAgP or LACP and DTP, and how these protocols work together to automate behavior on trunk links.  3.1.1.2: Discuss reasons why Ether Channel can provide advantages to network administrators.  3.3.1.1: Share and compare Ether Channel solutions prepared using simulation software.  3.3.1.1: Document how Ether Channel can provide an option for network administrators to decrease or eliminate network bottlenecks by creating and populating a matrix supporting its use.  3.3.1.1: Conduct targeted research to verify if existing switches can perform Ether Channel, and if Ether Channel would address existing network issues. Simulate an Ether Channel solution for the network using Packet Tracer simulation software.  3.2.1.4: Build a three-switch topology; configure basic settings, then implement PAgP and verify that the ports have aggregated; configure and verify trunk ports; configure LACP and verify that the ports have aggregated. Verify end-to-end connectivity. | | |
| ***Aligned Washington State Learning Standards*** | | |
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| **Arts** |  | |
| **Computer Science** | **3A-D-4-19** Analyze the representation tradeoffs among various forms of digital information (e.g., lossy versus lossless compression, encrypted vs. unencrypted, various image representations).  **3A-D-3-20** Discuss techniques used to store, process, and retrieve different amounts of information (e.g., files, databases, data warehouses). | |
| **Educational Technology** | **9-12.6.d.** Students publish or present content that customizes the message and medium for their intended audiences.  **9-12.5.d.** Students understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions. | |
| **English Language Arts** | **W.9-12.4** Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.  **SL.9-10.6** Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate. | |
| **Environment & Sustainability** |  | |
| **Financial Education** |  | |
| **Health and Physical Education** |  | |
| **Mathematics** | **N-Q2.** Define appropriate quantities for the purpose of descriptive modeling. | |
| **Science** | **HS-ETS1-4.** Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem. | |
| **Social Studies** |  | |

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| **UNIT 4 COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**   * Chapter 4 Test * Lab 4.4.2.3 Configuring Wireless Routers and Clients | | |
| **Leadership Activities:**  **3.A.1** Articulate thoughts and ideas effectively using oral, written and nonverbal communication skills in a variety of forms and contexts  **3.A.3** Use communication for a range of purposes (e.g. to inform, instruct, motivate and persuade)  ***Leadership Activities:***  *Students will research and analyze business practices then present new learning to peers.* | | |
| ***Standards and Competencies*** | | |
| **Unit 4:** WIRELESS LANS | | |
| **Industry Standards and/or Competencies** | | **Total Learning Hours for Unit:** 12 |
| 4.0.1.2: Use customer case studies and reports to research how businesses and educational and community groups set up WLANs. Take notes on two case studies, focusing on the challenges, solutions, and results.  4.1.1.9: Compare wireless standards by matching speed, frequency, and backwards compatibility options to the appropriate 802.11 IEEE standard; match radio frequencies to the appropriate standards; match applications to the appropriate radio frequencies.  4.1.1.10: Distinguish between the technologies associated with LANs and WLANs.  4.4.3.5: Given a series of WLAN problems, identify the best solutions for troubleshooting the problems.  4.1.2.10: Use online emulators to explore and take notes on the features of a variety of wireless routers and wireless access points.  4.4.3.1: Compare three troubleshooting approaches used to resolve networking problems; explain the sequence of steps an administrator should follow in each approach.  4.3.2.6: Identify security characteristics of open and shared key authentication methods.  4.4.2.3: Configure WPA on a wireless router; apply firewall and port forwarding settings.  4.0.1.2: Select two case studies of WLANs to show to classmates; explain the challenges, solutions, and results shown in each; explain how these results could be applied to your own company's network.  4.3.1.1: Explain why network administrators need to protect business networks from each of the four common wireless threats.  4.5.1.1: Research the features of WLAN devices recommended for purchase and create a chart with your company's most important requirements listed.  Validate your choices for purchase by identifying the features that support the chart values.  4.4.2.3: Configure basic settings on a wireless router; secure the WLAN; connect and verify a wireless client.  4.5.1.2: Configure VLANs, inter-VLAN routing, DHCP, Rapid PVST+, and a wireless router with wireless security. | | |
| ***Aligned Washington State Learning Standards*** | | |
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| **Arts** |  | |
| **Computer Science** | **3A-A-2-2** Demonstrate how diverse collaborating impacts the design and development of software products (e.g., discussing real-world examples of products that have been improved through having a diverse design team or reflecting on their own team's development experience). | |
| **Educational Technology** | **9-12.3.a.** Students plan and employ effective research strategies to locate information and other resources for their intellectual or creative pursuits.  **9-12.3.d.** Students build knowledge by actively exploring real-world issues and problems, developing ideas and theories and pursuing answers and solutions. | |
| **English Language Arts** | **W.9-12.7** Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.  **SL.9-10.4** Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. | |
| **Environment & Sustainability** |  | |
| **Financial Education** |  | |
| **Health and Physical Education** |  | |
| **Mathematics** | **MP4.** Model with mathematics. | |
| **Science** |  | |
| **Social Studies** |  | |

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| **UNIT 5 COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**   * Chapter 5 Test * Lab 5.1.2.13 Configuring OSPFv2 on Multiuser Networks * Lab 5.1.2.12 Determining the DR and BDR * Lab 5.1.5.8 Determining OSPFv2 Advanced Features | | |
| **Leadership Activities:**  **4.B.1** Use information accurately and creatively for the issue or problem at hand  ***Leadership Activities:***  *Teams will work together to create configuration problems for other teams to try and resolve.* | | |
| ***Standards and Competencies*** | | |
| **Unit 5:** ADJUST AND TROUBLESHOOT SINGLE-AREA OSPF | | |
| **Industry Standards and/or Competencies** | | **Total Learning Hours for Unit:** 9 |
| 5.1.2.2: Use a formula for calculating the number of router adjacencies required for a particular network.  5.1.2.3: Define the DR, BDR, and DROTHER roles.  5.1.1.9: After configuring and verifying an OSPFv2 setup, change router IDs, set passive interfaces, change OSPF metrics and route costs, and document resulting changes on the network.  5.3.1.1: Working with a team, create an OSPF setup and introduce an intentional error into the configuration. Trade configuration files with another group and compete to find and correct configurations.  5.1.1.5: Use Syntax Checker to review basic OSPF router configuration commands.  5.1.1.6: Use Syntax Checker to review basic OSPF verification command outputs.  5.1.2.2: Describe topological differences between the five OSPF network types, and how routers in each network type relate to each other.  5.1.5.2: Explain why MD5 authentication is the preferred method of securing OSPF routing information.  5.0.1.2: Participate in a group activity simulating the influence of interface priorities on DR and BDR elections. Discuss and justify the election results.  5.1.5.1: Discuss the importance of securing routing protocols from attacks.  5.2.1.5: Demonstrate knowledge of troubleshooting commands by matching commands to their outputs.  5.1.1.9: Build and configure a network running basic single-area OSPFv2; issue appropriate commands to verify the configuration.  5.2.3.3: Document the commands needed to diagnose and correct problems with connectivity while troubleshooting an OSPF setup. Keep a running "log" of findings and corrections while troubleshooting a complex network. | | |
| ***Aligned Washington State Learning Standards*** | | |
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| **Arts** |  | |
| **Computer Science** | **3A-A-5-6** Integrate grade-level appropriate mathematical techniques, concepts, and processes in the creation of computing artifacts.  **3A-A-3-10** Design algorithms using sequence, selection, and iteration.  **3A-D-5-17** Create computational models that simulate real-world systems (e.g., ecosystems, epidemics, spread of ideas). | |
| **Educational Technology** | **9-12.5.c.** Students break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving.  **9-12.5.d.** Students understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions.  **9-12.3.d.** Students build knowledge by actively exploring real-world issues and problems, developing ideas and theories and pursuing answers and solutions. | |
| **English Language Arts** | **W.11-12.2a** Introduce a topic; organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.  **SL.9-10.1b.** Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed.  **SL.9-10.4** Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. | |
| **Environment & Sustainability** |  | |
| **Financial Education** |  | |
| **Health and Physical Education** |  | |
| **Mathematics** | **I-IF9.** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).  **A-SSE1.b.** Interpret complicated expressions by viewing one or more of their parts as a single entity  **F-LE1.a.** Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals. | |
| **Science** | **HS-ETS1-4.** Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem. | |
| **Social Studies** |  | |

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| **UNIT 6 COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**   * Chapter 6 Test * 6.2.3.8 Lab Configuring Multiarea OSPF V2 * 6.2.3.9 Lab Configuring Multiarea OSPF V3 | | |
| **Leadership Activities:**  **4.B.1** Use information accurately and creatively for the issue or problem at hand  ***Leadership Activities:***  *Working with a partner, students will plan and map OSPF areas for an international airport or Cisco Live conference.* | | |
| ***Standards and Competencies*** | | |
| **Unit 6:** MULTI AREA OSPF | | |
| **Industry Standards and/or Competencies** | | **Total Learning Hours for Unit:** 9 |
| 6.2.2.4, 6.2.2.5: Convert between binary and decimal systems in calculating OSPF route summarization.  6.1.3.1: Create a chart listing the types of routes found in a multi area OSPF routing table, and what each type represents.  6.1.1.5: Identify multi area OSPF terminology by dragging the name of an area or router type to the field provided in a topology diagram.  6.3.1.1: Use Packet Tracer and word processing software to produce routing topologies which demonstrate the differences between single area and multi area OSPF. Include documentation of verification commands. Share your topology with the class.  6.2.1.2: Use Syntax Checker to practice configuration commands.  6.1.1.4: Describe the four types of multi area OSPF routers and describe how their functions contribute to OSPF operations.  6.1.2.7: Demonstrate understanding of the process involved in multi area OSPF routing by identifying the LSA types used for specific operations.  6.1.2.2, 6.1.2.3, 6.1.2.4, 6.1.2.5, 6.1.2.6: Construct a chart of the most common LSA types, indicating their contents, uses, and ways to mitigate LSA flooding on the network.  6.0.1.2: With a partner, model the development of multiple OSPF areas by planning and mapping intra-continental and intercontinental airport service areas.  6.2.3.8: Identify the commands used in configuring multi area OSPFv2 that support secure routing.  6.2.1.1: Create a flowchart showing the planning process for implementing a complex routing protocol such as multi area OSPF.  6.2.3.10: Document the commands needed to diagnose and correct problems with connectivity while troubleshooting an OSPF setup. Keep a running "log" of findings and corrections while troubleshooting a complex network. | | |
| ***Aligned Washington State Learning Standards*** | | |
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| **Arts** |  | |
| **Computer Science** | **3B-A-4-11** Critically analyze classic algorithms and use in different contexts, adapting as appropriate.  **3B-A-4-12** Evaluate algorithms (e.g., sorting, searching) in terms of their efficiency, correctness, and clarity.  **3B-A-3-15** Provide examples of computationally solvable problems and difficult-to-solve problems. | |
| **Educational Technology** | **9-12.5.c.** Students break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving.  **9-12.5.b.** Students collect data or identify relevant data sets, use digital tools to analyze them, and represent data in various ways to facilitate problem-solving and decision-making. | |
| **English Language Arts** | **W.11-12.2a** Introduce a topic; organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.  **L.9-10.6** Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.  **W.9-10.4** Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. | |
| **Environment & Sustainability** |  | |
| **Financial Education** |  | |
| **Health and Physical Education** |  | |
| **Mathematics** | |  | | --- | | **S-IC4.** Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling. | | **S-IC6.** Evaluate reports based on data. | | |
| **Science** |  | |
| **Social Studies** |  | |

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| **UNIT 7 COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**   * Chapter 7 Test * 7.2.2.5 Lab Configuring Basic EIGRP for IPv4 * 7.4.3.4 PT Configuring Basic EIGRP for IPv4 | | |
| **Leadership Activities:**  **7.B.1** Incorporate feedback effectively  **3.A.1** Articulate thoughts and ideas effectively using oral, written and nonverbal communication skills in a variety of forms and contexts  ***Leadership Activities:***  *Students will participate in group discussions based on new readings, research and prior knowledge of routing protocols.* | | |
| ***Standards and Competencies*** | | |
| **Unit 7:** EIGRP | | |
| **Industry Standards and/or Competencies** | | **Total Learning Hours for Unit:** 9 |
| 7.5.1.1: Using Packet Tracer and word processing software, prepare a portfolio file comparing RIP and EIGRP routing protocols. Create a comparison chart, copying outputs and interpreting them to show the differences.  7.3.2.7: Calculate the EIGRP composite metric.  7.1.2.5: Identify the types of EIGRP packets by dragging the packet types to appropriate definitions.  7.4.1.4: After viewing examples of EIGRP for IPv4 and IPv6, distinguish between the characteristics of EIGRPv4 and EIGRPv6 on a comparison chart.  7.3.2.7: Given a series of scenarios, calculate the EIGRP metrics to different destination networks.  7.3.3.8: Given topology information, determine the EIGRP successor and feasible successor.  7.3.4.4: Use Packet Tracer simulation software to modify the EIGRP metric formula to cause a change in the topology, and to observe how DUAL works to re-converge the network.  7.2.1.7: Use Syntax Checker to practice configuration commands.  7.1.1.1: Describe the roles of Cisco and the IETF in the history and current management of EIGRP.  7.2.1.8: Explain how the use of passive interfaces supports increased routing security.  7.0.1.2: Share and compare the results of note taking after viewing a video on the configuration and verification of EIGRP; discuss effective note taking skills.  7.1.1.4: Explain why authentication is a good practice with routing protocols.  7.0.1.2: Use resources related to EIGRP that are located through use of a personal cisco.com account.  7.4.3.5: Configure EIGRP for IPv6; assign router IDs, configure passive interfaces, and verify that the network has converged. | | |
| ***Aligned Washington State Learning Standards*** | | |
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| **Arts** |  | |
| **Computer Science** | **3B-D-4-24** Use data analysis to identify significant patterns in complex systems (e.g., take existing data sets and make sense of them).  **3B-A-4-11** Critically analyze classic algorithms and use in different contexts, adapting as appropriate. | |
| **Educational Technology** | **9-12.5.c.** Students break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving.  **9-12.5.d.** Students understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions.  **SL.9-10.1a.** Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas. | |
| **English Language Arts** | **W.11-12.2d** Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.  **W.9-12.2f** Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).  **L.9-10.6** Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression. | |
| **Environment & Sustainability** |  | |
| **Financial Education** |  | |
| **Health and Physical Education** |  | |
| **Mathematics** | **MP2.** Reason abstractly and quantitatively.  **F-BF3.** Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology | |
| **Science** | **HS-ETS1-4.** Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem. | |
| **Social Studies** |  | |

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| **UNIT 8 COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**   * Chapter 8 Test * 8.1.2.5 Configuring EIGRP Manual Summary Routes for IPv4 and IPv6 * 8.2.3.6 Troubleshooting EIGRP | | |
| **Leadership Activities:**  **3.B.2** Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal  ***Leadership Activities:***  *With a partner, students will design, fine tune, test and report out on a WAN and LAN topology.* | | |
| ***Standards and Competencies*** | | |
| **Unit 8:** EIGRP ADVANCED CONFIGURATIONS AND TROUBLESHOOTING | | |
| **Industry Standards and/or Competencies** | | **Total Learning Hours for Unit:** 6 |
| 8.1.1.9: Calculate classful route summarization for route advertisements.  8.1.2.2: Calculate manual summary routes.  8.0.1.2: Write review questions that test knowledge of five key EIGRP concepts: auto-summarization, load balancing, default routes, hold-down timers, and authentication.  8.3.1.1: Select three EIGRP options to fine-tune on a topology. Use output commands to compare and contrast default and customized configurations.  8.2.2.4: Troubleshoot EIGRP neighbor issues based on topology and output information.  8.1.5.3: Use Syntax Checker to practice configuring EIGRP authentication.  8.3.1.1: Use Packet Tracer to create and configure default and fine-tuned EIGRP routing in order to document the effects on network traffic.  8.3.1.1: Document how fine-tuning options affect an EIGRP setup.  8.1.5.1: Explain the consequences of not securing routing protocol information.  8.0.1.2: With a partner, write 10 EIGRP review questions based on the previous chapter's content. Quiz another group or the class. Document the sources used for supporting content.  8.3.1.1: Work with a partner to design a single WAN and LAN topology to be used to configure default and customized EIGRP settings. After fine- tuning the customized setting, report results and justify the changes.  8.1.5.5: List the commands incorporated in the configuration of EIGRP that support secure routing.  8.2.3.4: Use routing table information to diagnose and identify problems with a variety of EIGRP issues.  8.3.1.2: Complete a skills integration challenge in which you implement EIGRP on two separate networks. After implementing EIGRP options, verify connectivity.  8.2.1.3: Identify the best troubleshooting command to use in specified contexts. | | |
| ***Aligned Washington State Learning Standards*** | | |
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| **Arts** |  | |
| **Computer Science** | **3B-D-4-26** Evaluate the ability of models and simulations to formulate, refine, and test hypotheses.  **3B-D-3-29** Explore security policies by implementing and comparing encryption and authentication strategies (e.g., secure coding, safeguarding keys).  **3B-N-4-35** Simulate and discuss the issues (e.g., bandwidth, load, delay, topology) that impact network functionality (e.g., use free network simulators). | |
| **Educational Technology** | **9-12.5.c.** Students break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving.  **9-12.5.d.** Students understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions. | |
| **English Language Arts** | **W.9-10.1a** Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among claim(s), counterclaims, reasons, and evidence.  **W.911-12.1c** Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.  **L.9-10.6** Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.  **W.9-10.4** Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. | |
| **Environment & Sustainability** |  | |
| **Financial Education** |  | |
| **Health and Physical Education** |  | |
| **Mathematics** | **MP7.** Look for and make use of structure. | |
| **Science** |  | |
| **Social Studies** |  | |

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| **UNIT 9 COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**   * Chapter 9 Test * 9.1.2.5 Packet Tracer - Using a TFTP Server to Upgrade a Cisco IOS Image Instructions Newport * Skills Exam and Semester Final Assessment and Skills Exam (Project) | | |
| **Leadership Activities:**  **2.C.5** Reflect critically on learning experiences and processes  **8.C.2** Demonstrate initiative to advance skill levels towards a professional level  ***Leadership Activities:***  *Students will complete two capstone projects that include design, configuration, testing and verification.* | | |
| ***Standards and Competencies*** | | |
| **Unit 9:** IOS IMAGES AND LICENSING | | |
| **Industry Standards and/or Competencies** | | **Total Learning Hours for Unit:** 15 |
| 9.0.1.2: Create a matrix to record hardware and software information.  9.3.1.1: Create and populate a matrix configuration and verification commands in comparing two routing protocols.  9.1.1.9: Decode the names of a variety of 12.4 and IOS 15 images, recording appropriate information on a chart.  9.3.1.4: Complete a skills integration challenge by completing a VLSM IPv4 addressing scheme, implementing multi-area OSPF, and secure VTY access.  9.0.1.2: Use the CLI in Packet Tracer to obtain operating system and other information about selected hardware.  9.1.1.1: Describe the difference between software release families and software trains, and how Cisco IOS software has evolved to meet the needs of the IT market.  9.1.2.1: Suggestion: Discuss the rationale for using TFTP servers on a production internetwork.  9.3.1.1: Work collaborative with another student to choose configuration and verification commands for a routing protocol comparison; compare your matrix with those of other students in order to optimize the information included.  9.2.1.1: Suggestion: Create a chart comparing the basic features and appropriate uses of IP Base, Data, Unified Communications, and Security technology packages.  9.3.1.2: Complete an EIGRP capstone activity including design, configuration, testing and verification of secure EIGRP, IPv4, IPv6, and VLSM.  9.3.1.3: Complete an OSPF capstone activity including design, configuration, testing and verification of OSPF v2, OSPFv3, and multi area OSPF for IPv4. | | |
| ***Aligned Washington State Learning Standards*** | | |
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| **Arts** |  | |
| **Computer Science** | **3B-A-3-17** Decompose a large-scale computational problem by identifying generalizable patterns and applying them in a solution.  **3B-A-3-20** Develop and use a series of test cases to verify that a program performs according to its design specifications.  **3B-D-4-26** Evaluate the ability of models and simulations to formulate, refine, and test hypotheses. | |
| **Educational Technology** | **9-12.3.d.** Students build knowledge by actively exploring real-world issues and problems, developing ideas and theories and pursuing answers and solutions.  **9-12.4.d.** Students exhibit a tolerance for ambiguity, perseverance and the capacity to work with open-ended problems.  **9-12.5.d.** Students understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions. | |
| **English Language Arts** | **W.9-12.4** Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.  **W.9-10.8** Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.  **SL.9-10.4** Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.  **L.9-10.6** Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression. | |
| **Environment & Sustainability** |  | |
| **Financial Education** |  | |
| **Health and Physical Education** |  | |
| **Mathematics** | **MP6**.Attend to precision. | |
| **Science** | **HS-ETS1-4.** Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem. | |
| **Social Studies** |  | |

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| **SEMESTER 4 - NETWORKING**  **Unit 1 – COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**   * Chapter 1 Exam * 1.4.1.2 Packet Tracer - Skills Integration Challenge OSPF Instructions * 1.4.1.3 Packet Tracer - Skills Integration Challenge EIGRP Instructions | | |
| **Leadership Alignment:**  **8.C.4** Reflect critically on past experiences to inform future progress  **8.C.1** Go beyond basic mastery of skills and/or curriculum to explore and expand one’s own learning and opportunities to gain expertise  ***Leadership Activities:***  *Students will research and report out on current industry practices, occupations and required skills in the networking industry.* | | |
| ***Standards and Competencies*** | | |
| **Unit 1:** HIERARCHICAL NETWORK DESIGN | | |
| **Industry Standards and/or Competencies** | | **Total Learning Hours for Unit:** 6 |
| 1.0.1.2: Research to locate online images representing implementations of the Cisco three-layer design model; incorporate the images and accompanying explanations in a slide presentation. Present the slides to a classmate, another group, or the class for discussion.  1.1.2.6: Match hierarchical design characteristics to the appropriate design layer.  1.4.1.1: Develop definitions of borderless network services through research, including Internet sites, video resources and online presentations.  1.4.1.1: Choose three borderless network services that will provide manageability and good design for an expanding network. For each service, decide how that service will assist you are a designer. Use a variety of sources, including video, to take notes.  1.4.1.2, 1.4.1.3: Use Packet Tracer to review and practice OSPF and EIGRP configurations.  1.2.1.3: Associate network design module names to their relevant locations on topologies.  1.1.1.2: Discuss and define the four principles of structured engineering: hierarchy, modularity, resiliency, and flexibility.  1.4.1.1: Research TrustSec borderless network service, listing at least three area of assistance it offers to network administrators.  1.4.1.1: Prepare an informational matrix defining and describing selected borderless network services. Share the matrix with another students, group, or the entire class.  1.3.1.1: For each of the four "top networking trends" described, list responsibilities network designers face in implementing these trends while protecting the personnel and data being shared.  1.1.1.1: Research the requirements to become, and typical activities of, a CCDA-certified networking professional.  1.4.1.2, 1.4.1.3: As part of two skills integration challenges, perform configurations for a variety of addressing and routing technologies on a dual- stacked IPv4 and IPv6 enterprise network. | | |
| ***Aligned Washington State Learning Standards*** | | |
|  | | |
| **Arts** |  | |
| **Computer Science** | **3B-D-4-26** Evaluate the ability of models and simulations to formulate, refine, and test hypotheses. | |
| **Educational Technology** | **9-12.3.a.** Students plan and employ effective research strategies to locate information and other resources for their intellectual or creative pursuits.  **9-12.6.c.** Students communicate complex ideas clearly and effectively by creating or using a variety of digital objects such as visualizations, models or simulations.  **9-12.5.c.** Students break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving. | |
| **English Language Arts** | **W.11-12.6** Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback including new arguments or information.  **W.11-12.2d** Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.  **SL.9-10.4** Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. | |
| **Environment & Sustainability** |  | |
| **Financial Education** |  | |
| **Health and Physical Education** |  | |
| **Mathematics** | **MP2.** Reason abstractly and quantitatively.  **MP4.** Model with mathematics. | |
| **Science** |  | |
| **Social Studies** |  | |

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| **Unit 2 COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**   * Chapter 2 Exam * 2.1.1.1 Lab - Sem 2 Skills Assessment * 2.1.1.2 Lab - Sem 3 Skills Assessment EIGRP | | |
| **Leadership Alignment:**  **6.A.1** Use technology as a tool to research, organize, evaluate and communicate information  ***Leadership Activities:***  *Students will research and prepare a cost analysis, ROI and total cost of ownership of network solutions for a business plan to setup networks in Antigua.* | | |
| ***Standards and Competencies*** | | |
| **Unit 2:** CONNECTING TO THE WAN | | |
| **Industry Standards and/or Competencies** | | **Total Learning Hours for Unit:** 6 |
| 2.0.1.2: Prepare a cost analysis for purchasing router or ISR options when adding a branch office; create a matrix to record and present the information, and present conclusions to a classmate, group, class, or the instructor.  2.3.1.1: Present the results of an upgrade research project in a matrix, including screenshots or hyperlinks to pictures of each module chosen for the upgrade.  2.1.1.8: Given a series of network descriptions and topology figures, choose the WAN technology type that best matches the needs of each.  2.2.4.3: Using search engines and websites, research WAN technology characteristics; then, use Telarus to explore Internet service providers who supply dedicated WAN services. Finally, localize the research by using GeoQuote to research a local service provider that will provide a T1 dedicated line to one specified geographic area.  2.2.1.3: Classify WAN access options by dragging options to the appropriate position on a chart, distinguishing between private and public services, as well as dedicated, switched, and Internet options.  2.2.4.1, 2.2.4.2: Create a matrix comparing the security needs of private vs. public WANs; for each, rate the relative importance of data integrity, confidentiality, and security.  2.3.1.1: Select WAN access technologies to satisfy business requirements in a small-to-medium sized business network. Share and defend the choices made with a classmate, group, class, or the instructor.  2.0.1.2: Research and record information on return on investment (ROI) and total cost of ownership (TCO) as part of designing a networking solution. | | |
| ***Aligned Washington State Learning Standards*** | | |
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| **Arts** |  | |
| **Computer Science** | **3A-A-4-8** Deconstruct a complex problem into simpler parts using predefined constructs (e.g., functions and parameters and/or classes). | |
| **Educational Technology** | **9-12.3.a.** Students plan and employ effective research strategies to locate information and other resources for their intellectual or creative pursuits.  **9-12.6.c.** Students communicate complex ideas clearly and effectively by creating or using a variety of digital objects such as visualizations, models or simulations. | |
| **English Language Arts** | **W.9-10.3c** Use a variety of techniques to sequence events so that they build on one another to create a coherent whole.  **L.9-10.6** Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.  **SL.9-10.4** Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. | |
| **Environment & Sustainability** |  | |
| **Financial Education** |  | |
| **Health and Physical Education** |  | |
| **Mathematics** | **MP3.** Construct viable arguments and critique the reasoning of others. | |
| **Science** |  | |
| **Social Studies** |  | |

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| **UNIT 3 COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**   * Chapter 3 Test * 3.3.2.7 Lab - Configuring Basic PPP * 3.3.2.8 Lab - Configuring Basic PPP with Authentication * 3.4.1.4 PT - Troubleshooting Basic PPP with Authentication | | |
| **Leadership Alignment:**  **2.C.5** Reflect critically on learning experiences and processes  ***Leadership Activities:***  *Students will demonstrate mastery of skills participating in a timed configuration contest.* | | |
| ***Standards and Competencies*** | | |
| **Unit 3:** POINT-TO-POINT CONNECTIONS | | |
| **Industry Standards and/or Competencies** | | **Total Learning Hours for Unit:** 12 |
| 3.0.1.2: Conduct targeted research to create a matrix listing advantages and disadvantages of using HDLC vs. PPP protocols. Use the matrix to make recommendations.  3.1.1.11: Identify serial communications terminology by dragging the terms to the appropriate descriptions.  3.1.2.7: Use a structured approach to troubleshoot serial communications on the Physical, Data Link, and Network Layers.  3.1.2.6: Use Syntax Checker to practice commands useful in troubleshooting serial interfaces.  3.1.1.4, 3.1.1.5, 3.1.1.6: Discuss how changing and evolving industry requirements led to the development of TDM, STDM, SONET, and SDH.  3.0.1.2: Research the security enhancements offered by PPP over HDLC in comparing the two protocols.  3.0.1.2: Share a matrix comparing PPP and HDLC with another student or the class. Justify whether or not you would suggest sharing the matrix with the network engineering supervisor to justify a change being made from HDLC to PPP for Layer 2 network connectivity.  3.3.2.6: Practice PPP authentication using PAP and CHAP; discuss situations where CHAP would be preferable.  3.0.1.2: Make recommendations for a change in networking protocols, basing the recommendations on research.  3.2.3.6: Demonstrate knowledge of the steps in the LCP Link Negotiation Process by dragging steps to the correct location on a flowchart.  3.5.1.1: Demonstrate knowledge of how PPP options can be configured to match specific network requirements by participating in a timed configuration contest. | | |
| ***Aligned Washington State Learning Standards*** | | |
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| **Arts** |  | |
| **Computer Science** | **3A-N-7-30** Describe key protocols and underlying processes of Internet-based services (e.g., http/https and SMTP/IMAP, routing protocols).  **3A-A-6-12** Use a systematic approach and debugging tools to independently debug a program (e.g., setting breakpoints, inspecting variables with a debugger). | |
| **Educational Technology** | **9-12.3.a.** Students plan and employ effective research strategies to locate information and other resources for their intellectual or creative pursuits.  **9-12.5.c.** Students break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving. | |
| **English Language Arts** | **W.9-12.7** Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.  **L.9-10.6** Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression. | |
| **Environment & Sustainability** |  | |
| **Financial Education** |  | |
| **Health and Physical Education** |  | |
| **Mathematics** | **MP2.** Reason abstractly and quantitatively. | |
| **Science** |  | |
| **Social Studies** |  | |

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| **UNIT 4 COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**   * Chapter 4 Test * 4.2.2.7 Lab - Configuring Frame Relay and Subinterfaces * 4.3.1.6 Lab - Troubleshooting Basic Frame Relay | | |
| **Leadership Alignment:**  **7.A.1** Adapt to varied roles, jobs responsibilities, schedules and contexts  **3.A.1** Articulate thoughts and ideas effectively using oral, written and nonverbal communication skills in a variety of forms and contexts  ***Leadership Activities:***  *Students will assume the role of network administrator researching WAN technologies and create visuals for use in a business presentation.* | | |
| ***Standards and Competencies*** | | |
| **Unit 4:** FRAME RELAY/ETHERNET WAN | | |
| **Industry Standards and/or Competencies** | | **Total Learning Hours for Unit:** 9 |
| 4.4.1.1: Create a Frame Relay or Ethernet WAN cost proposal matrix to illustrate access costs to the ISP, cost of Frame Relay ports, and DLCI costs. Present the cost analysis to solicit comments and approval from company administrators.  4.1.1.5: Identify Ethernet or Frame Relay terminology and concepts by matching terms to the appropriate characteristics.  4.1.2.12: Match LMI terms to the appropriate descriptions.  4.2.2.7: After configuring WAN Ethernet and/or Frame Relay and sub interfaces, break the Ethernet or Frame Relay connection and use troubleshooting procedures and tools to diagnose the problems and to restore connectivity.  4.4.1.2: Utilize Packet Tracer in order to practice a variety of skills, including configuring Frame Relay, PPP with CHAP, EIGRP, static, and default routing.  4.1.3.5: Distinguish between the types of Frame Relay bandwidth and flow control by matching terms to their appropriate descriptions.  4.2.2.7: As part of configuring Frame Relay and sub interfaces, identify specific commands that are necessary in order to provide secure transmission of data.  4.0.1.2: Collect information to populate a matrix providing information to others about emerging WAN technologies.  4.0.1.2: Fulfill the responsibility of a network administrator to keep current with all future network upgrades by researching two emerging and developing WAN technologies.  4.0.1.2: Create a five-slide presentation for use in discussions with a business manager or other network administrators. | | |
| ***Aligned Washington State Learning Standards*** | | |
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| **Arts** |  | |
| **Computer Science** | **3A-N-1-32** Compare and contrast multiple viewpoints on cybersecurity (e.g., from the perspective of security experts, privacy advocates, the government).  **3A-N-7-30** Describe key protocols and underlying processes of Internet-based services (e.g., http/https and SMTP/IMAP, routing protocols). | |
| **Educational Technology** | **9-12.5.c.** Students break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving.  **9-12.5.d.** Students understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions.  **9-12.3.a.** Students plan and employ effective research strategies to locate information and other resources for their intellectual or creative pursuits.  **9-12.6.d.** Students publish or present content that customizes the message and medium for their intended audiences. | |
| **English Language Arts** | **W.9-12.10** Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.  **SL.9-10.6** Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.  **SL.9-10.4** Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task. | |
| **Environment & Sustainability** |  | |
| **Financial Education** |  | |
| **Health and Physical Education** |  | |
| **Mathematics** |  | |
| **Science** |  | |
| **Social Studies** |  | |

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| **UNIT 5 COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**   * Chapter 5 Test * 5.2.2.6 Lab - Configuring Dynamic and Static NAT * 5.2.3.7 Lab - Configuring Port Address Translation (PAT) | | |
| **Leadership Alignment:**  **2.B.1** Analyze how parts of a whole interact with each other to produce overall outcomes in complex systems  ***Leadership Activities:***  *Students will practice their skills and demonstrate knowledge of NAT through prototypes and network simulation problems.* | | |
| ***Standards and Competencies*** | | |
| **Unit 5:** NETWORK ADDRESS TRANSLATION FOR IPV4 | | |
| **Industry Standards and/or Competencies** | | **Total Learning Hours for Unit:** 12 |
| 5.0.1.2: Conduct research on uses for NAT by taking notes from online resources, viewing NAT graphics, and using them to define the four types of NAT implementations.  5.1.1.6: Identify four critical NAT terms by dragging them to the appropriate position on a diagram of NAT communication on a network topology diagram.  5.3.1.5: Troubleshoot a "bugged" configuration of static and dynamic NAT.  5.1.2.6: Use the Simulation features of Packet Tracer to generate an HTTP request, capture the resulting traffic on a NAT-enabled device, and examine packet changes as traffic is forwarded.  5.1.3.2: Suggestion: Describe which applications and services may be disrupted or compromised when NAT is employed.  5.4.1.1: Employ the use of a prototype before deploying NAT on a live network, as part of a scenario where you add NAT to an existing network design.  5.0.1.2: Report the results of individual research on NAT to the class. As other students report their results, check off data that you also noted; add new data as it is reported.  5.1.3.1: Suggestion: Discuss how NAT keeps network addressing schemes within legal limits.  5.2.5.3: Suggestion: Explain why NAT for IPv6 is a temporary mechanism to be used to assist in the migration from IPv4 to IPv6.  5.2.1.4: Test network access without NAT; configure static NAT, then test access again. | | |
| ***Aligned Washington State Learning Standards*** | | |
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| **Arts** |  | |
| **Computer Science** | **3B-A-7-3** Modify an existing program to add additional functionality and discuss intended and unintended implications (e.g., breaking other functionality).  **3A-N-6-35** Identify digital and physical strategies to secure networks and discuss the tradeoffs between ease of access and need for security. | |
| **Educational Technology** | **9-12.3.a.** Students plan and employ effective research strategies to locate information and other resources for their intellectual or creative pursuits.  **9-12.4.c.** Students develop, test and refine prototypes as part of a cyclical design process.  **9-12.5.c.** Students break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving.  **9-12.5.d.** Students understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions. | |
| **English Language Arts** | |  | | --- | | **W.9-12.1d** Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writ | | **W.9-12.1e** Provide a concluding statement or section that follows from and supports the argument presented. |   **L.9-10.6** Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression. | |
| **Environment & Sustainability** |  | |
| **Financial Education** |  | |
| **Health and Physical Education** |  | |
| **Mathematics** | **MP2.** Reason abstractly and quantitatively.  **MP5.** Use appropriate tools strategically. | |
| **Science** |  | |
| **Social Studies** |  | |

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| **UNIT 6 COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**   * Chapter 6 Test * 6.3.2.3 Lab - Configuring a Router as a PPPoE Client for DSL Connectivity * 6.3.1.6 Lab - Troubleshoot PPoE.docx Bridging Course * 6.4.3.5 Lab - Configure and Verify eBGP Bridging Course | | |
| **Leadership Alignment:**  **1.B.1** Develop, implement and communicate new ideas to others effectively  ***Leadership Activities:***  *Students will research and develop a business plan proposal for telework program requirements and present their plan to others.* | | |
| ***Standards and Competencies*** | | |
| **Unit 6:** BROADBAND SOLUTIONS | | |
| **Industry Standards and/or Competencies** | | **Total Learning Hours for Unit:** 9 |
| 6.0.1.2: Based on research, create a matrix comparing cost, speed, security, ease of implementation, and reliability among several types of broadband Internet connections. Identify advantages and disadvantages of each type of connection.  6.2.1.5: Identify cable terminology by dragging each term to the appropriate definition.  6.2.4.2: Given specific customer scenarios, research and detail Internet connections that are available to meet requirements.  6.3.2.2: Use Syntax Checker to practice commands required to configure PPPoE.  6.2.4.2: Investigate broadband distribution in a geographical location. Research broadband access options for specific scenarios and select the best last-mile technology to meet the needs of the consumer.  6.1.1.5: Discuss the psychological, physical and environmental effects of becoming a teleworker. Develop a list of suggestions to lessen the detriments of teleworking.  6.0.1.2: Share the results of broadband technology research with the class or another group, identifying the pros and cons of several forms of broadband technology.  6.1.2.3: Classify the requirements for teleworker connectivity as either the responsibility of the worker, or the corporation.  6.0.1.2: Conduct research on broadband internet connection types that are locally available and would support employment as a teleworker for a major corporation.  6.4.1.1: Create a basic telework program requirements proposal suitable for a small-to-medium-sized business, and present it to another student, the class, or another group.  6.3.2.3: Configure a router as a PPPoE client for DSL connectivity. Build the network, configure the ISP router, and configure the customer router. Reflect on why ISPs who use DSL primarily use PPPoE with their customers. | | |
| ***Aligned Washington State Learning Standards*** | | |
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| **Arts** |  | |
| **Computer Science** | **3B-A-4-12** Evaluate algorithms in terms of their efficiency, correctness, and clarity. | |
| **Educational Technology** | **9-12.3.a.** Students plan and employ effective research strategies to locate information and other resources for their intellectual or creative pursuits. | |
| **English Language Arts** | **L.9-10.6** Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.  **SL.9-10.4** Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.  **SL.9-10.6** Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate. | |
| **Environment & Sustainability** |  | |
| **Financial Education** |  | |
| **Health and Physical Education** |  | |
| **Mathematics** | **N-VM.1.** (+) Recognize vector quantities as having both magnitude and direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes (e.g., v, |v|, ||v||, v). | |
| **Science** |  | |
| **Social Studies** |  | |

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| **UNIT 7 COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**   * Chapter 7 Test * 7.1.2.5 Lab - Configuring VPNs (Optional) Instructions * 7.2.2.5 Lab - Configuring a Point-to-Point GRE VPN Tunnel | | |
| **Leadership Alignment:**  **2.B.1** Analyze how parts of a whole interact with each other to produce overall outcomes in complex systems  ***Leadership Activities:***  *Students will practice skills and apply knowledge in a skills challenge.* | | |
| ***Standards and Competencies*** | | |
| **Unit 7:** SECURING SITE-TO-SITE CONNECTIVITY | | |
| **Industry Standards and/or Competencies** | | **Total Learning Hours for Unit:** 12 |
| 7.0.1.2: Design and deliver a four-slide presentation on the use of VPNs in securing site-to-site connectivity.  7.0.1.2: Use Internet research to derive a concise definition of VPN and IPsec.  7.1.2.3: Distinguish between site-to-site and remote access VPNs by categorizing statements about VPNs to the appropriate types.  7.5.1.2: Complete a skills challenge practicing a variety of skills, including configuring Frame Relay, PPP with CHAP, NAT, and GRE tunnels.  7.5.1.1: Use Packet Tracer to create a prototype topology illustrating where VPNs would be implemented on a network.  7.3.1.2: Design a graphic illustrating the concept of CIA: confidentiality, integrity, and authentication.  7.1.2.4: Enable security features and configure IPsec parameters on two routers to support a site-to-site IPsec VPN. Verify the tunnel before and after sending interesting traffic.  7.0.1.2: After individual students research topics on VPNs, groups of four students form to discuss the research and come to consensus on one concise VPN definition; five facts describing VPNs; one definition of IPsec; and one graphic showing a VPN network using tunneling.  7.5.1.1: Prepare a planning checklist to prepare for implementation of VPNs on the network. Use the VPN Discovery Tool or any other Internet site with VPN implementation or planning checklist examples.  7.5.1.1: As part of a network strategy to support secure access by teleworks, employees, and vendors or clients, make decisions about the types and locations of proposed VPNs on the network.  7.1.2.4: Configure two routers to support a site-to-site VPN for traffic flowing from their respective LANs. | | |
| ***Aligned Washington State Learning Standards*** | | |
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| **Arts** |  | |
| **Computer Science** | **3A-N-1-32** Compare and contrast multiple viewpoints on cybersecurity (e.g., from the perspective of security experts, privacy advocates, the government).  **3A-N-3-33** Explain the principles of information security (confidentiality, integrity, availability) and authentication techniques.  **3A-N-3-34** Use simple encryption and decryption algorithms to transmit/receive an encrypted message.  **3A-N-6-35** Identify digital and physical strategies to secure networks and discuss the tradeoffs between ease of access and need for security.  **3B-D-3-29** Explore security policies by implementing and comparing encryption and authentication strategies (e.g., secure coding, safeguarding keys). | |
| **Educational Technology** | **9-12.3.a.** Students plan and employ effective research strategies to locate information and other resources for their intellectual or creative pursuits.  **9-12.6.d.** Students publish or present content that customizes the message and medium for their intended audiences.  **9-12.5.c.** Students break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving. | |
| **English Language Arts** | **W.11-12.1a** Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences claim(s), counterclaims, reasons, and evidence.  **SL.9-10.1a.** Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas. | |
| **Environment & Sustainability** |  | |
| **Financial Education** |  | |
| **Health and Physical Education** |  | |
| **Mathematics** | **MP2.** Reason abstractly and quantitatively. | |
| **Science** |  | |
| **Social Studies** |  | |

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| **UNIT 8 COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**   * Chapter 8 Test * 8.1.2.6 Lab - Configuring Syslog and NTP Newport * 8.2.2.4 Lab - Configuring SNMP Newport | | |
| **Leadership Alignment:**  **2.B.1** Analyze how parts of a whole interact with each other to produce overall outcomes in complex systems  ***Leadership Activities:***  *Students will practice skills applying new knowledge to network configuration problems.* | | |
| ***Standards and Competencies*** | | |
| **Unit 8:** MONITORING THE NETWORK | | |
| **Industry Standards and/or Competencies** | | **Total Learning Hours for Unit:** 9 |
| 8.2.1.8: Conduct Internet research on available network monitoring software. Gather information on the features of those products. Choose one product and outline its important features.  8.3.1.4: Distinguish between SNMP and Net Flow by classifying network monitoring tool characteristics as either one or the other.  8.1.1.5: Interpret syslog output by dragging sections of the output to the appropriate identifying fields.  8.1.2.4: Use Syntax Checker to practice syslog configuration and verification commands.  8.2.1.8: Use the PRTG network monitoring tool and give examples of some of the features found for it.  8.3.3.1: Discuss possible uses for the data collected by Net Flow analyzers on top talkers, top websites visited, top hosts, and top listeners.  8.0.1.2: Create an outline of a proposed network maintenance plan.  8.4.1.1: Describe situations where syslog, SNMP and Net Flow would be used by a network administrator and ask another student or group to identify which CLI monitoring tool would be appropriate to use to gather information about each of the network issues described.  8.0.1.2: Brainstorm different types of network maintenance records a network administrator would like to keep. Sort the types of records into main categories.  8.4.1.1: Prepare a matrix illustrating a series of situations and explaining to other networking personnel when to use which network monitoring method.  8.1.2.6: Configure syslog and NTP. Configure and observe the effect of logging severity levels. Discuss problems inherent in setting severity levels too high or too low for syslog.  8.3.3.3: Configure Net Flow to capture both incoming and outgoing packets. Use show commands to verify operations and gather statistical information. | | |
| ***Aligned Washington State Learning Standards*** | | |
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| **Arts** |  | |
| **Computer Science** | **3B-A-7-3** Modify an existing program to add additional functionality and discuss intended and unintended implications (e.g., breaking other functionality). | |
| **Educational Technology** | **9-12.3.a.** Students plan and employ effective research strategies to locate information and other resources for their intellectual or creative pursuits.  **9-12.5.c.** Students break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving. | |
| **English Language Arts** | **SL.9-10.6** Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.  **SL.9-10.1a.** Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas. | |
| **Environment & Sustainability** |  | |
| **Financial Education** |  | |
| **Health and Physical Education** |  | |
| **Mathematics** | **MP7.** Look for and make use of structure. | |
| **Science** |  | |
| **Social Studies** |  | |

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| **UNIT 9 COMPONENTS AND ASSESSMENTS** | | |
| **Performance Assessments:**   * Chapter 9 Test * 9.2.3.12 Packet Tracer - Troubleshooting Enterprise Networks 1 Instructions * 9.2.3.13 Packet Tracer - Troubleshooting Enterprise Networks 2 Instructions * 9.2.3.14 Packet Tracer - Troubleshooting Enterprise Networks 3 Instructions * Skills Exam and Semester Final Assessment and Skills Exam (Project) | | |
| **Leadership Alignment:**  **3.A.2** Listen effectively to decipher meaning, including knowledge, values, attitudes and intentions  ***Leadership Activities:***  *Students will take on the role of “helpdesk” and use effective questioning techniques to determine and diagnose end-user issues.* | | |
| ***Standards and Competencies*** | | |
| **Unit 9:** TROUBLESHOOTING THE NETWORK | | |
| **Industry Standards and/or Competencies** | | **Total Learning Hours for Unit:** 9 |
| 9.3.1.1: Use Packet Tracer and word processing software to produce network diagrams, configuration information, and a matrix recording network documentation information.  9.1.2.4: Match a list of commands useful in gathering network information to their definitions.  9.1.2.3: Given a network issue reported by an end-user, role- play effective questioning techniques.  9.0.1.2: Review basic troubleshooting commands by fixing a "broken" network created by another student or group in Packet Tracer.  9.2.2.7: Demonstrate understanding of the layered model by identifying the OSI layer associated with each of a series of network issues.  9.1.1.2: List information that would be recorded under physical and logical topology diagrams when documenting a network. Discuss differences between the two types of topologies.  9.1.1.6: Identify benefits to establishing a network baseline.  9.0.1.2: Create troubleshooting scenarios in Packet Tracer by configuring a network, verifying operations, and then introducing problems. Have other students or groups attempt to diagnose and correct the problems using basic troubleshooting commands.  9.3.1.1: Create a sample network documentation system to use with troubleshooting network problems, including physical and logical diagrams as well as network configuration information.  9.1.1.8: Demonstrate knowledge of networking and discovery commands to document a full network topology when some of the components are "hidden". Draw the topology.  9.1.3.5: Identify key characteristics of the common troubleshooting methods.  9.2.3.15: Retrieve network documentation, then test network connectivity. Gather data and implement solutions. Document results. | | |
| ***Aligned Washington State Learning Standards*** | | |
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| **Arts** |  | |
| **Computer Science** | **3B-A-3-15** Provide examples of computationally solvable problems and difficult-to-solve problems. | |
| **Educational Technology** | **9-12.5.d.** Students understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions. | |
| **English Language Arts** | **W.9-12.1d** Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.   |  | | --- | | *W.11-12.1* ***Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.*** | | **W.11-12.1a** Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences claim(s), counterclaims, reasons, and evidence. | | |
| **Environment & Sustainability** |  | |
| **Financial Education** |  | |
| **Health and Physical Education** |  | |
| **Mathematics** | |  | | --- | | **S-IC3.** Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each. | |  | | **S-IC5.** Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant. | | **S-IC6.** Evaluate reports based on data. | | |
| **Science** |  | |
| **Social Studies** |  | |

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| ***21st CENTURY SKILLS*** | | |
| **Check those that students will demonstrate in this Unit:** | | |
| **LEARNING AND INNOVATION**  **Creativity and Innovation**  Think Creatively  Work Creatively with Others  Implement Innovations  **Critical Thinking and Problem Solving**  Reason Effectively  **U**se Systems Thinking  Make Judgments and Decisions  Solve Problems  **Communication and Collaboration**  Communicate Clearly  Collaborate with Others | **INFORMATION, MEDIA AND TECHNOLOGY SKILLS**  **Information Literacy**  Access and /evaluate Information  Use and Manage Information  **Media Literacy**  Analyze Media  Create Media Products  **Information, Communications and Technology  (ICT Literacy)**  Apply Technology Effectively | **LIFE AND CAREER SKILLS**  **Flexibility and Adaptability**  Adapt to Change  Be Flexible  **Initiative and Self-Direction**  Manage Goals and Time  Work Independently  Be Self-Directed Learners  **Social and Cross-Cultural**  Interact Effectively with Others  Work Effectively in Diverse Teams  **Productivity and Accountability**  Manage Projects  Produce Results  **Leadership and Responsibility**  Guide and Lead Others  Be Responsible to Others |