Information Support Services and Networking Standards and Skills

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## Table of Contents­­

[Health & Safety Standards 3](#_Toc148351296)

[**Standard 1: Safety and Health in the Information Support Services and Networking Field** 3](#_Toc148351297)

[Technical & Integrated Academic Standards 3](#_Toc148351298)

[**Standard 2: Information Technology Development in Society** 3](#_Toc148351299)

[**Standard 3: Help Desk Support** 4](#_Toc148351300)

[**Standard 4: Computer Hardware** 5](#_Toc148351301)

[**Standard 5: Operating Systems** 6](#_Toc148351302)

[**Standard 6: Laptops and Mobile Technology** 8](#_Toc148351303)

[**Standard 7: Fundamentals of Networking** 8](#_Toc148351304)

[**Standard 8: Fundamentals of Cybersecurity** 11](#_Toc148351305)

[**Standard 9: Concepts of Cloud Computing** 13](#_Toc148351306)

[**Standard 10: Basics of Programming and Development** 14](#_Toc148351307)

[**Standard 11: Servers** 15](#_Toc148351308)

[Employability Standards 16](#_Toc148351309)

[**Standard 12: Employability Skills** 17](#_Toc148351310)

[Entrepreneurship Standards 17](#_Toc148351311)

[**Standard 13: Entrepreneurship** 17](#_Toc148351312)

[Digital Literacy & Computer Science Standards 18](#_Toc148351313)

[**Standard 14: Digital Literacy and Computer Science** 18](#_Toc148351314)

[Sample Performance Tasks 18](#_Toc148351316)

[**Standard 1: Safety and Health in the Information Support Services and Networking Field** 18](#_Toc148351317)

[**Standard 2: Information Technology Development in Society** 18](#_Toc148351318)

[**Standard 3: Help Desk Support** 19](#_Toc148351319)

[**Standard 4: Computer Hardware** 19](#_Toc148351320)

[**Standard 5: Operating Systems** 21](#_Toc148351321)

[**Standard 6: Laptops and Mobile Technology** 21](#_Toc148351322)

[**Standard 7: Fundamentals of Networking** 22](#_Toc148351323)

[**Standard 8: Fundamentals of Cybersecurity** 23](#_Toc148351324)

[**Standard 9: Concepts of Cloud Computing** 24](#_Toc148351325)

[**Standard 10: Basics of Programming and Development** 24](#_Toc148351326)

[**Standard 11: Servers** 25](#_Toc148351327)

[Credential References 25](#_Toc148351328)

## Health & Safety Standards

### Standard 1: Safety and Health in the Information Support Services and Networking Field

Students will be able to demonstrate safety and health in a computer environment, including the management of power sources, use of personal protective equipment, and workspace ergonomics.

* Aligned Industry Recognized Credentials: OSHA10 – General

#### Skills:

1. Safely connect to, disconnect from, and mitigate risk associated with multiple types of direct and switched power sources.
2. Select and use personal protective equipment, including electrostatic wrist straps.
3. Use ergonomically correct designs and practices to minimize long-term health risks.
4. Demonstrate appropriate use of safety procedures and tools.
5. Explain the dangers of Electrostatic Discharge (ESD).
6. List the tools to protect against ESD.
7. Demonstrate appropriate use of ESD safety tools.
8. Implement personal safety and Occupational Safety and Health Administration (OSHA) guidelines.
9. Describe environmental impacts and the purpose of environmental controls.
10. Use Material Safety Data Sheet (SDS) and manufacturer’s recommendations for handling, protection, and disposal of components and materials.
11. Monitor temperature, humidity level awareness, and proper ventilation.
12. Identify devices and procedures to protect against power surges, brownouts, blackouts.
13. Demonstrate protection from airborne particles, dust, and debris.

## Technical & Integrated Academic Standards

### Standard 2: Information Technology Development in Society

Students will be able to explain the role of software applications in the workplace and the community, including the impacts of software development on commerce and culture and its potential to advance equity.

* Aligned Industry Recognized Credentials: CompTIA Project+

#### Skills:

1. Understand the concept of “access to information” and the potential impact of emerging technologies.
2. Describe and classify industry-recognized credentials and their roles in Information Technology career pathways.
3. Identify and describe the attributes of a digital footprint and its impact on one’s reputation.
4. Describe the evolution of technology.
5. Illustrate the information technology (IT) timeline (evolution).
6. Describe the impact of technologies on society.
7. Identify technologies and describe their uses in the workplace and society.
8. Describe the varied career paths in information technology.
9. Identify and list professional certifications.
10. Identify and describe the various IT career paths.
11. Describe fundamentals of dealing with prohibited content/activity.
12. Outline steps of first response identification, reporting, and data preservation.
13. Explain use of documentation/documentation changes.
14. Describe the chain of custody process with regards to managing evidence.
15. Compare and contrast documentation methods.
16. Implement basic change management best practices.
17. Implement basic disaster prevention and recovery methods.
18. Explain the process of different licensing processes.
19. Deal appropriately with customers’ confidential and private materials.

### Standard 3: Help Desk Support

Students will be able to provide help desk support, handle digital evidence appropriately, and demonstrate professionalism and confidentiality when handling customer information.

#### Skills:

1. Create a flowchart for handling with digital evidence.
2. Implement basic change management, disaster prevention and recovery methods.
3. Demonstrate ethical practices with customer information.
4. Adhere to regulated policies and procedures.
5. Use proper language and avoid jargon, acronyms, and slang, when applicable.
6. Demonstrate how to deal with customers in different situations.
7. Set and meet expectations/timeline and communicate status with the customer.
8. Practice proper communication and professionalism.
9. Use proper language – avoid jargon, acronyms, and slang when applicable.
10. Set and meet expectations/timeline and communicate status with the customer.
11. Deal appropriately with customers concerning attitude, cultural sensitivity, punctuality, difficult situations, and confidential materials.

### Standard 4: Computer Hardware

Students will be able to install and configure fundamental computer hardware, including various cables, Random Access Memory (RAM), removable media devices, Motherboard and expansion cards, printers, Central Processing Units (CPU), power supplies, peripheral devices, and more.

* Aligned Industry Recognized Credentials: CompTIA A+

#### Skills:

1. Identify and program physical computing devices.
2. Identify and explain the functions of network hardware components.
3. Install and configure multiple displays on a given workstation.
4. Install different connectors on a power supply.
5. Apply thermal paste and coolers to CPUs.
6. Configure primary and secondary Serial Advanced Technology Attachment (SATA) hard disk drive in a computer.
7. Describe hardware/software Redundant Array of Independent Disk (RAID) types.
8. Explain basic cable types, features, and their purposes.
9. Identify network cable and connector types.
10. Identify video cable and connector types.
11. Identify peripheral cable and connector types.
12. Identify storage cable and connector types.
13. Identify multipurpose cable and connector types.
14. Identify and install Random Access Memory (RAM) types.
15. Identify and select appropriate RAM types.
16. Describe and distinguish different RAM configuration properties.
17. Install and test various RAM types.
18. Identify and select and install appropriate Storage Devices.
19. Describe and distinguish different storage device properties (speed, size, type).
20. Identify and select and install appropriate removable media devices.
21. Describe hardware/software Redundant Array of Independent Disk (RAID) types.
22. Differentiate between different motherboard form factors.
23. Explore and examine Basic Input/Output Systems (BIOS), and/or Unified Extensible Firmware Interface (UEFI) settings and features.
24. Identify motherboard connector types.
25. Identify and configure motherboard firmware settings.
26. Identify types of expansion cards and explain their purpose.
27. Configure and install appropriate expansion cards.
28. Differentiate among various Central Processing Unit (CPU) types and corresponding cooling devices.
29. List types and features of CPUs and their socket types.
30. Choose appropriate CPU for various motherboards.
31. Identify different system and CPU cooling types.
32. Identify different system and CPU cooling types.
33. Determine power supply characteristics and specifications for types of voltage and power.
34. Select and install the proper power supply.
35. Explain the purpose, use, and properties of various input and output peripheral devices.
36. Install and configure peripheral device.
37. Summarize the associated imaging process for each type of printer.
38. Install and configure various printers with appropriate cables and printer drivers.
39. Summarize printer types, installation, and maintenance.
40. Perform printer maintenance.
41. Select appropriate components and software for a customer configuration (i.e., CAD workstation, audio/video editing pc, home server, gaming pc, thin client).
42. Evaluate characteristics of display devices.
43. Identify different types of display devices, their connection types, and cables.
44. Define refresh rates, resolution, native resolution, and brightness/lumens.
45. Explain the use of analog vs. digital, privacy/antiglare filters, and multiple displays.
46. Troubleshoot problems related to motherboards, RAM, CPUs, and power.
47. Troubleshoot hard drives and RAID arrays.
48. Troubleshoot video, projector, and display issues.
49. Troubleshoot common mobile device issues while adhering to the appropriate procedures.
50. Troubleshoot printers.

### Standard 5: Operating Systems

Students will be able to describe the fundamental characteristics of an operating system, differentiate between types of operating systems, and navigate the Command Line interface.

* Aligned Industry Recognized Credentials: CompTIA A+

#### Skills:

1. Describe the purpose of an operating system.
2. Implement file, system, and network management command line tools.
3. Explore different utilities within administrative tools, system utilities, disk management, panel applets, and settings.
4. Compare and contrast Graphical User Interface and Command Line Interface.
5. Explain the purpose of an operating system.
6. Identify compatibility concerns between operating systems (Windows/ Mac/Linux).
7. Compare and contrast specifications and limitations for 32-bit vs. 64-bit operating systems.
8. Compare and contrast operating systems versions and features.
9. Explain and identify licensing, end of life, and update limitations.
10. Explain and implement various boot methods (imaging, multi, recovery).
11. Explain types of installation (clean install, upgrade, restore, unattended, repair, imaging and remote, and GUID Partition Table (GPT)/Master Boot Record (MBR).
12. Explain and implement file system formatting.
13. Explain and perform different types of partitioning methods (volumes, system recovery).
14. Implement post installation procedures (time/date, driver installation, updates, domain configuration, security, etc.).
15. Explain how command line tools are used for diagnostics.
16. Describe and implement file management command line tools.
17. Explain and implement system management command line tools.
18. Describe and implement network management command line tools.
19. Demonstrate the use of built-in Operating System (OS) features and tools (admin, disk management, run line commands) and how to access them through appropriate paths.
20. Explore different utilities within the administrative tools.
21. Explore different utilities within the system utilities.
22. Explore different utilities within disk management.
23. Explore different control panel applets and settings.
24. Summarize application installation and configuration concepts.
25. Research and understand hardware and operating system requirements.
26. Demonstrate methods of installation and deployment.
27. Understand open-source vs. license-based software.
28. Install, configure, and utilize local and network applications.
29. Uninstall applications.
30. Troubleshoot Operating System problems such as failure to boot, updates and patches, and OS Repair.
31. Troubleshoot and resolve PC security issues.
32. Use best practice procedures for malware removal.
33. Troubleshoot mobile OS, application, and application security issues.

### Standard 6: Laptops and Mobile Technology

Students will be able to install and configure laptop and mobile hardware, components, applications, settings, and features.

#### Skills:

1. Understand open-source vs license-based software.
2. Install and uninstall remote or portable applications.
3. Replace a laptop OEM keyboard and a Wifi-antenna connector.
4. Install and configure laptop hardware and components.
5. Install components within the display of a laptop.
6. Configure appropriate laptop setting and features.
7. Compare and contrast characteristics of various types of other mobile devices.
8. Connect and configure accessories and ports of other mobile devices.
9. Configure basic mobile device network connectivity and application support.
10. Use various methods to perform mobile device synchronization.

### Standard 7: Fundamentals of Networking

Students will be able to explain foundational concepts of networking and networking topologies, including networking hardware and software, Transmission Control Protocol (TCP), wireless, and wired networks.

* Aligned Industry Recognized Credentials: CompTIA Net+

#### Skills:

1. Identify security risks associated with storing information on network devices.
2. Compare and contrast wireless networking standards and encryption types.
3. Install secure Small Office/Home Office (SOHO) wireless/wired network using best practices.
4. Implement and verify Wide Area Network (WAN) links.
5. Compare the layers of the Open Systems Interconnection (OSI) and Transmission Control Protocol/Internet Protocol (TCP/IP) models.
6. Define the purpose of networking models.
7. Identify, describe, and apply the layers of the OSI and TCP/IP model.
8. Classify the differences between Layer applications, devices, and protocols as they relate to the OSI and TCP/IP models.
9. Compare and contrast Transmission Control Protocol (TCP) and User Datagram Protocol (UDP) ports, protocols, and their purposes.
10. Identify common Transmission Control Protocol (TCP) and User Datagram Protocol (UDP) default ports.
11. Define common network protocols and their use of TCP or UDP.
12. Compare and contrast common networking hardware device's function and features.
13. Differentiate the functionality of routers, switches, access points, cloud-based network controller, firewall, network interface card, repeater, hub, Cable/Digital Subscriber Line (DSL) modem, bridge, patch panel, Power over Ethernet (PoE), and powerline-Ethernet.
14. Compare and contrast wireless networking standards and encryption types.
15. Categorize the various wireless standards, in terms of speeds, distances, and frequencies.
16. Describe various wireless encryption types.
17. Install, configure, and deploy a secure Small Office/Home Office (SOHO) wireless/wired network using best practices.
18. Determine the hardware, software, and infrastructure requirements for implementation.
19. Access and configure wireless/wired Integrated Services Router (ISR) for a basic SOHO network.
20. Explain common network configuration concepts.
21. Explain the purpose and properties of Internet Protocol (IP) addressing.
22. Differentiate the difference between multicast, unicast, and broadcast.
23. Configure IP address, subnet mask, and default gateway on a network device.
24. Describe and prepare an IP addressing scheme using both Classful and a Classless Inter-domain Routing (CIDR).
25. Describe the differences between Internet Protocol version 4 (IPv4) and Internet Protocol version 6 (IPv6).
26. Distinguish differences between IP Address types: static, dynamic using both Dynamic Host Configuration Protocol (DCHP) and Automatic Private IP Addressing (APIPA), public, private with use of Network Address Translation (NAT), and link-local addressing.
27. Summarize the properties and purposes of services provided by networked hosts. (Server)
28. Identify Application Services.
29. Understand File and Print Services.
30. Understand Web Services.
31. Understand Remote Access Services.
32. Understand Server Virtualization.
33. Understand various Internet Server Appliances (UTM, IDS, IPS).
34. Compare and contrast Internet connection types, network types, topologies, and their features.
35. Differentiate among network types such as Local Area Network (LAN), Wide Area Network (WAN), Personal Area Network (PAN), Metropolitan Area Network (MAN), Wireless Local Area Network (WLAN), and Wireless Mesh Wireless Network (WMN).
36. Identify the Internet connection types such as cable, fiber, satellite, and cellular.
37. Describe Carrier-sense Multiple Access with Collision Detection (CSMA/CD) and Carrier-sense Multiple Access with Collision Avoidance (CSMA/CA).
38. Compare and contrast physical vs. logical topologies.
39. Describe ring, bus, star, extended star, and mesh topologies.
40. Describe Peer-to-peer, Client-server, Hybrid, Point-to-point, Point-to-multipoint topologies.
41. Use appropriate networking tools.
42. Understand and utilize the use of networking tools such as: crimper, cable stripper, multimeter, tone generator and probe, cable tester, punch down tool, and WiFi analyzer.
43. Install and terminate network cabling.
44. Implement a Switched network.
45. Select the appropriate media, cables, ports, and connectors to connect switches to other network devices and hosts.
46. Explain the process of layer 2 encapsulation and Ethernet framing.
47. Explain how a switch builds its Media Access Control (MAC) address table and forwards frames.
48. Describe switch forward methods and port settings available on layer 2.
49. Access and utilize the switch command line interface (CLI) to set parameters and perform, save, and verify initial switch configuration tasks such as SVI, passwords, and remote access management.
50. Verify network status and switch operation using CLI utilities.
51. Implement and verify security for a switch (port security, deactivate ports)
52. Implement a routed network.
53. Describe routing concepts (including: packet forwarding, router lookup process).
54. Describe the operation of routers (including: router bootup process, POST, router components).
55. Configure, verify, and troubleshoot Routing protocols.
56. Access and utilize the router command line interface (CLI) to set item such as advanced global parameters and ACLs.
57. Connect, configure, and verify operation status of router/layer 3 interfaces using both IPv4 and IPv6 addressing.
58. Enable NAT for a small network with a single ISP and verify operation using CLI and ping.
59. Configure, verify, and troubleshoot Dynamic Host Configuration Protocol (DHCP) and Domain Name System (DNS) operation on a router.
60. Perform and verify routing configuration tasks for static routes.
61. Verify network status and router operation using CLI utilities.
62. Manage router operating system configuration files (including save, edit, upgrade, restore).
63. Implement password and physical security for a network router.
64. Implement and verify Wide Area Network (WAN) links.
65. Configure and verify a basic WAN serial connection.
66. Troubleshoot common wired and wireless network problems.
67. Identify and Correct Layer 2 and Layer 3 Addressing Issues.
68. Demonstrate common troubleshooting command line tools (Ping, Tracert/traceroute, Dig, Ipconfig/Nslookup, Address Resolution Protocol (ARP), Nbtstat, and Netstat).
69. Install software and hardware tools, protocol analyzer, throughput testers, and connectivity software.

### Standard 8: Fundamentals of Cybersecurity

Students will be able to identify common threats and install physical and logical security and test measures on various technologies to detect and protect against common threats.

* Aligned Industry Recognized Credentials: CompTIA Sec+

#### Skills:

1. Define fundamental cybersecurity principles, including common threats, attacks, and vulnerabilities in software and network infrastructure.
2. Explain what secure systems are from the Confidentiality, Integrity, Availability (CIA triad) perspective.
3. Research and identify components of access control such as Identification, authentication, and authorization.
4. Research and describe penetration testing methods in the context of ethical hacking.
5. Research and describe topics in cryptology, cryptography, and cryptanalysis.
6. Analyze wireless security protocols, encryption, and authentication methods.
7. Configure a firewall and update firmware.
8. Define and describe pass code locks, remote wipes, locator applications, remote backup applications, and failed login attempts restrictions.
9. Identify the sectors of society that are at risk of cybersecurity breaches.
10. Use digital forensic investigative techniques to solve a cybercrime.
11. Respond appropriately to a suspected cybersecurity event.
12. Summarize the importance of physical and logical security measures.
13. Explain user education and the principle of least privilege.
14. Analyze physical security techniques.
15. Analyze logical security techniques.
16. Compare and contrast wireless security protocols and authentication methods.
17. Analyze wireless security protocols, encryption, and authentication methods.
18. Compare and contrast social engineering, threats, and vulnerabilities.
19. Differentiate between malware, rootkits, phishing, shoulder surfing, spyware, and viruses.
20. Analyze common threats, vulnerabilities, and social engineering techniques.
21. Examine mitigation techniques.
22. Implement security best practices to secure a workstation.
23. Compare and contrast the differences of basic Microsoft Windows OS security settings, such as Users and groups, file, and folder permissions.
24. Compare and contrast the differences of basic Linux OS / Mac OS security settings such as Users and groups, file, and folder permissions.
25. Examine Password Best Practices, Account management, Basic Active Directory functions, Patch/update management, and Data encryption.
26. Implement methods for securing Mobile devices.
27. Define and describe pass code locks, remote wipes, locator applications, remote backup applications, and failed login attempts restrictions.
28. Distinguish among appropriate antivirus applications, available OS updates and patches, authentication, and encryption.
29. Configure security on SOHO wireless and wired networks.
30. Configure options for MAC filtering, port forwarding/triggering, Service Set Identifier (SSID) broadcast, and wireless encryption.
31. Enable/disable services such as firewall, DHCP, Perimeter Network/Demilitarized Zone (DMZ), NAT, and WiFi Protected Setup (WPS).
32. Disable unused ports and update firmware.
33. Describe appropriate data destruction/disposal methods.
34. Explain hard drive sanitation methods and physical destruction.
35. Evaluate whether a particular cyber behavior is acceptable in a social context.
36. Consider the impact of personal cyber behavior on others.
37. Design the correct level of protection by implementing the appropriate safeguards.
38. Recognize that a digital presence affects future success, both personally and professionally.
39. Identify personal data sharing that places people at risk and evaluate risky personal data-sharing practices.
40. Identify various Threat Actors and their roles.
41. System Security.
42. Weigh the outcomes of various types of computer “hacking”, including black, white, and gray.
43. Analyze the evidence of an attack.
44. Applied Cyber Security.
45. Use digital forensics investigative techniques to solve a cybercrime.
46. Describe the potential legal ramifications of cybercrimes.
47. Define what constitutes a cybercrime
48. Respond to a detected cybersecurity event.
49. Identify the sectors of society that are at risk to cybersecurity breaches.
50. Utilize virtualization for threat investigation.
51. Research Incident Response Frameworks: Cyber Kill Chain, Diamond Model, Chain of Custody, and National Institute of Standards and Technology (NIST).
52. Research and apply standards – Policies, NIST, Regulations for data management.
53. Utilize Alert & Monitoring tools – Event Viewer, Protocol/Port Analyzers (Wireshark, Simple Network Management Protocol (SNMP)), and NetFlow.
54. Investigate, evaluate, and respond to alerts such as logs and PCAPs.
55. Differentiate symmetric/asymmetric cryptography algorithms for Integrity, Authenticity, Confidentiality (Public Key Infrastructure (PKI))/digital certificates/hashes/Authentication, Authorization, Accounting (AAA).

### Standard 9: Concepts of Cloud Computing

Students will be able to explore and evaluate cloud computing concepts and configure client-side virtualization.

* Aligned Industry Recognized Credentials: CompTIA Net+

#### Skills:

* + - 1. Add Resource, Emulator, Security, and Network requirements to client-side visualization.
			2. Compare and contrast Cloud Computing concepts.
			3. Compare and contrast Shared resources (Internal vs. External), Rapid elasticity, On-demand, Resource pooling, Measured Service, and Metered Services.
			4. Evaluate and use Off-site email applications, Cloud-Based file storage services, and Virtual application streaming/cloud-based applications.
			5. Set up and configure client-side virtualization.
			6. Identify and describe the purpose and different types of virtual machines.
			7. Configure client-side virtualization to include Resource, Emulator, Security, and Network requirements.
			8. Explain the use of Hypervisor.
			9. Install a Virtual Solution such as desktop, server, or switches.

### Standard 10: Basics of Programming and Development

Students will be able to describe, demonstrate, and evaluate fundamental elements and concepts of programming, website design, and front and back-end development.

#### Skills:

1. Describe what a computer program is and why it runs.
2. Differentiate between programming languages.
3. Explain database concepts and the purpose of a database.
4. Create a website with hyperlinks, design features and more.
5. Compare and contrast programming language categories.
6. Describe what a computer program is and how it runs.
7. Differentiate Interpreted (Scripting languages, Scripted languages, Markup languages); Compiled programming languages; Query languages; Assembly language.
8. Identify Script file types (.bat, .ps1, .vbs, .sh, .py, .js); Environment variables; Comment syntax; Basic script constructs (Basic loops, Variables); Basic data types (Integers, Strings).
9. Use programming organizational techniques and interpret logic.
10. Develop Organizational techniques (Pseudocode concepts, Flow-chart concepts, Sequence); Logic components (Branching, Looping).
11. Explain the purpose and use of programming concepts.
12. Demonstrate Identifiers (Variables, Constants); Containers (Arrays, Vectors); Functions; Objects (Properties, Attributes, Methods).
13. Explain database concepts and the purpose of a database.
14. Describe the usage of database (Create, Import/input, Query, Report); Flat file vs. database (Multiple concurrent users, Scalability, Speed, Variety of data); Records; Storage (Data persistence).
15. Compare and contrast various database structures.
16. Distinguish between structured vs. semi-structured vs. non-structured; Relational databases (Schema, Tables, Rows/records, Fields/columns, Primary key, Foreign key, Constraints); Non-relational databases (Key/value databases, Document databases).
17. Summarize methods used to interface with databases.
18. Use Relational methods (Data manipulation - Select, Insert, Delete, Update, Data definition - Create, Alter, Drop, Permissions); Database access methods (Direct/manual access, Programmatic access, User interface/utility access, Query/report builders); Export/import (Database dump, Backup).
19. Describe the methods of creating web sites.
20. Apply structural requirements (information architecture) for development of a web site.
21. Create a web site, using web site design software or programming language.
22. Apply web site design features.
23. Create hyperlinks.
24. Proofread, edit, and test a web site.
25. Explain and demonstrate publishing, updating, and maintaining a web site.
26. Describe methods for achieving web site recognition.
27. Critique a web site according to accepted web site design principles.

### Standard 11: Servers

Students will be able to install and manage servers, server performance, server maintenance, and active directory.

* Aligned Industry Recognized Credentials: CompTIA Net+

#### Skills:

1. Implement server roles by managing device drivers, services, and server installations.
2. Identify the steps to the server start-up process.
3. Identify disk types.
4. Create server virtualization modes.
5. Install and manage servers.
6. Manage device drivers, including but not limited to, installation; removal; disabling; update/upgrade; rollback; troubleshooting; Plug & Play; interrupts; driver signing.
7. Manage services, including but not limited to, what services are; which state a service can be in; startup types; recovery options; delayed startup; Run As settings for a service; stopping or pausing a service; service accounts, dependencies.
8. Perform various server installations including, but not limited to, choosing correct OS version; partitioning; F8 options; server core vs. full; interactive install; unattended install; automated install using WDS; upgrade vs. clean install; firmware updates including BIOS.
9. Implement server roles.
10. Prepare various types of application servers including, but not limited to, mail servers; database servers; collaboration servers; monitoring servers; threat management.
11. Configure web services including, but not limited to, Internet Information Services (IIS), World Wide Web (WWW), FTP, separate worker processes, adding components, sites, ports, SSL, and certificates.
12. Utilize remote access including, but not limited to, remote assistance, remote administration tools, remote desktop services, licensing, remote desktop gateway, Virtual Private Network (VPN), application virtualization, and multiple ports.
13. Configure file and print services including, but not limited to, printer pools; web printing; web management; driver deployment; file, folder, and share permissions vs. rights; auditing; and print job management.
14. Create server virtualization modes; Virtual Hard Disk (VHDs); virtual memory; virtual networks; snapshots and saved states; physical to virtual; and virtual to physical.
15. Manage active directory.
16. Create accounts and groups.
17. Structure organizational units and containers.
18. Describe active directory infrastructure, including, but not limited to, domain controllers, forests, operation master roles, domain vs. workgroup, child domains, trusts, functional levels, namespace, sites, and replication.
19. Identify storage technologies.
20. Manage active directory.
21. Classify RAID (RAID 0, RAID 1, RAID 5, RAID 10 and combinations; hardware and software RAID).
22. Structure organizational units and containers.
23. Identify disk types (Advanced Technology Attachment (ATA); basic disk; dynamic disk; mount points; file systems; mounting a virtual hard disk; distributed file systems; optical disks).
24. Manage server performance.
25. Distinguish among major server hardware components.
26. Explain performance monitoring (methodology; procedures; effect of network, CPU memory and disk; creating a baseline; using performance and resource monitor in task manager).
27. Explain logs and alerts.
28. Perform server maintenance.
29. Identify the steps in the server startup process.
30. Explain the value of business continuity (i.e., backup and restore, disaster recovery and data redundancy).
31. Manage server patch management.

## Employability Standards

### Standard 12: Employability Skills

Students will understand and demonstrate the roles of professional communication, critical thinking, problem solving, professionalism, teamwork, and collaboration within the context of Information Technology careers.

#### Skills:

1. Demonstrate the impact of communication skills on the success of an IT professional.
2. Describe appropriate methods of communication for internal and external stakeholders.
3. Evaluate the impact of poor communication by computer systems support professional on the performance of a corporate computer network.
4. Troubleshoot a project plan to find mistargeted or extraneous work that does not contribute to the ultimate objectives of the project.

## Entrepreneurship Standards

### Standard 13: Entrepreneurship

Students will be able to describe opportunities for entrepreneurship and be able to evaluate the value proposition of business ownership in the Information Technology field.

#### Skills

1. Understand and be able to explain the needs of a startup IT services company (including initial equipment and staffing needs, a marketing/business development plan, and a basic revenue management strategy).
2. Describe the concept of professional networking and demonstrate personal introductions and an “elevator speech” appropriate for other IT professionals, business owners, and other potential business partners.
3. Evaluate the licensing, regulatory, and tax implications of self-employment and business ownership as an IT professional compared to W-2 employment.
4. Identify and organize the foundational technology-related competencies necessary to succeed as an IT professional.
5. Describe the use of online resources in licensing and professional development as an IT professional.
6. Demonstrate the use of common ticketing, scheduling, project management and/or customer relationship management systems for IT professionals.
7. Understand where to find online resources to support given IT-related challenges and how to be a safe and ethical consumer and creator of digital content.

## Digital Literacy & Computer Science Standards

### Standard 14: Digital Literacy and Computer Science

Students will be able to demonstrate the use of common software and information technology in a modern IT environment.

#### Skills:

1. Apply strategies for using digital tools and technology to drive business and commerce.

## Sample Performance Tasks

### Standard 1: Safety and Health in the Information Support Services and Networking Field

Students will be able to demonstrate safety and health in a computer environment, including the management of power sources, use of personal protective equipment and workspace ergonomics

* Aligned Industry Recognized Credentials: OSHA10 – Computer Occupations

#### Sample Performance Tasks:

* Students will demonstrate the appropriate use of ESD safety tools (ex: wrist strap, anti-static bags, and proper workspace) following safe handling and storage methods for computer components according to current industry and OSHA standards.
* Given a hazardous chemical such as isopropyl alcohol, students will research and print out SDS documentation and identify proper safety controls for handling and storing the chemical.

### Standard 2: Information Technology Development in Society

Students will be able to explain the role of software applications in the workplace and the community, including the impacts of software development on commerce and culture and its potential to advance equity.

* Aligned Industry Recognized Credentials: CompTIA Project+

#### Sample Performance Tasks:

* Students will create an electronic presentation/timeline that shows the evolution of technology advancements in the IT field and how it has impacted society today.
* Students will create a tri-fold presentation of industry related certifications and highlight three different career pathways in the IT field.
* Students will research IT credentialing options. Students will choose a certification that interests them; then create a pathway for achieving this goal to place in their portfolio.
* Students will write an essay on, “What would the world be like today if computers didn’t exist?” How would they spend their time? What would the work look like in the areas of communication, economy, education, family life, community?
* After choosing any occupation other than the IT field, students will research the types of technologies that are used in that field (not just computers per se). Students will present their findings in creative ways e.g. a recruitment program for a college or business, a website, a “day in the life,” a story or a play.
* Students will research a company’s usage of RSS feeds, Facebook, Twitter, and other types of social media. Create an electronic presentation or podcast highlighting the importance of interactive media on the chosen company/business.
* Given a network helpdesk support scenario, students will demonstrate appropriate communication and professionalism in email communication with the customer.
* Students will create an electronic flowchart for handling digital evidence.
* Given a scenario, students will be able to evaluate different networking mapping and topology software to diagram a small business network.
* Using a local or cloud-based software, students will be able to implement and manage an inventory management and ticketing system for a small business and support a ticket from creation to completion.
* Given a scenario of a security incident, students will be able to develop a plan including incident response, path of escalation, and chain of custody.

### Standard 3: Help Desk Support

Students will be able to provide help desk support, handle digital evidence appropriately, and demonstrate professionalism and confidentiality when handling customer information.

#### Sample Performance Tasks:

* Given a remote support scenario, students will be able to effectively communicate with a disgruntled customer on a computer issue.

### Standard 4: Computer Hardware

Students will be able to install and configure fundamental computer hardware, including various cables, Random Access Memory (RAM), removable media devices, Motherboard and expansion cards, printers, Central Processing Units (CPU), power supplies, peripheral devices, and more.

* Aligned Industry Recognized Credentials: CompTIA A+

#### Sample Performance Tasks:

* Given a scenario, students will differentiate between different video cables and their intended purpose.
* Given a scenario, students will identify a multipurpose cable, manufacturer, properties, and purpose.
* Given a motherboard, students will create a drawing that accurately illustrates the motherboard and label and briefly describe all of the components.
* Given a scenario, students will troubleshoot and test system RAM configuration.
* Given a scenario, install, and configure appropriate storage devices, such as Optical, Solid State, Magnetic and Flash Drives.
* Given a scenario, students will install, configure, and test a digital video disc-rewritable (DVD-RW) optical drive.
* Given a scenario, students will install and configure a primary and secondary Serial Advanced Technology Attachment (SATA) hard disk drive in a computer.
* Given a scenario, students will install an external hard disk drive and generate a data backup.
* Given a scenario, students will install and configure motherboards, Central Processing Units (CPU), and add-on cards.
* Given a scenario, students will install and configure an expansion card such as a video card, sound card, or Network Interface Card (NIC).
* Given a scenario, students will create a chart that shows the differences between Intel processors and their Advanced Micro Devices (AMD) equivalent.
* Given a scenario, students will install a CPU on a motherboard; apply thermal paste, and appropriate coolers.
* Given a scenario, students will identify the different connectors on a power supply and list examples of their usage.
* Given scenario, students will install and verify functionality of a power supply in a computer chassis; connect power cables to corresponding motherboard and internal components.
* Given a scenario, students will select, install, and configure a given peripheral device.
* Given a scenario, students will install and test an all-in-one printer/scanner/copier with specified data cable and install accurate device drivers and software needed for full functionality.
* Given a variety of user types (gamer, video production, musician, etc.), students will specify a computer configuration that would fulfill the user’s requirements.
* Given a scenario, students will install and configure multiple displays on a given workstation.
* Given a scenario, students will use the Microsoft DirectX Diagnostic Tool to analyze graphic display attributes of a system.
* Given a scenario, students will determine a variety of hardware problems, repair or replace the components, and test the solutions.

### Standard 5: Operating Systems

Students will be able to describe the fundamental characteristics of an operating system, differentiate between types of operating systems, and navigate the Command Line interface.

* Aligned Industry Recognized Credentials: CompTIA A+

#### Sample Performance Tasks:

* Given a scenario, students will compare the pros and cons to using a Graphical User Interface (GUI) vs a Command Line Interface (CLI) operating system.
* Given the scenario, students will select an operating system that would be suitable for the hardware given.
* Given a scenario, students will be able to partition, install, and carry out post installation procedures in setting up a system for a user.
* Given a scenario, use the appropriate command line tools for network, system, and file management.
* Given a scenario, use the ping tool to test network connectivity to a computer.
* Given a scenario, use diskpart to identify partitions on a physical disk.
* Given a scenario, use robocopy to copy files to a disk.
* Given a scenario, students will be able to create a user manual/outline for the settings menu in windows.
* Given a scenario, students will use task manager to monitor disk utilization.
* Given a scenario, students will configure appropriate RAID features such as mirroring or spanning.
* Given a scenario, students will install/uninstall, configure, and utilize local, remote, or portable applications.

### Standard 6: Laptops and Mobile Technology

Students will be able to install and configure laptop and mobile hardware, components, applications, settings, and features.

#### Sample Performance Tasks:

* Given a scenario, students will be able to research and replace a laptop OEM keyboard.
* Given a scenario, students will be able to replace a WiFi antenna connector.
* Given a scenario, configure the laptop power settings.

Given a scenario, students will be able to compare an Apple device to an Android device and its features in relation to a customer's needs.

* Given a scenario, configure a wireless accessory to a computer system.
* Given a scenario, students will be able to configure a POP3 email account on a user's mobile device.
* Given a scenario, students will be able to back up a user device to a cloud platform.

### Standard 7: Fundamentals of Networking

Students will be able to explain foundational concepts of networking and networking topologies, including networking hardware and software, Transmission Control Protocol (TCP), wireless, and wired networks.

* Aligned Industry Recognized Credentials: CompTIA Net+

#### Sample Performance Tasks:

* Students will create an electronic presentation/chart comparing the layers of the OSI to the TCP/IP models.
* In a chart, students will determine if the given device sample, protocol, PDU, or application belongs to the associated layer of the OSI model.
* Students will research the most common TCP and UDP ports and their associated applications and prepare a report summarizing their findings.
* Given a scenario, students will create an interactive presentation, podcast, or Vlog that demonstrates the functionality and differences among hubs, switches, bridges, routers, firewalls, access points, and modems.
* Given a scenario, students will create a presentation comparing the various wireless standards for speed, distance limitations, and frequencies.
* Given a network scenario, students will decide the appropriate wireless encryption type to satisfy customer specifications.
* Given a scenario, students will design an IP scheme for a network and identify the network, broadcast, and host address range for a network.
* Students will apply Classless Inter-Domain Routing (CIDR) and Variable-Length Subnet Masking (VLSM) rules to a large network.
* Students will subnet an IPv6 network.
* Given a scenario, students will configure a local computer for Dynamic Host Configuration Protocol (DHCP) for both wired and wireless adapter cards.
* Using a WHOIS website, students will locate 10 different domains/websites and identify the DNS service. Students will record data related to the corresponding DNS service, records, and configuration.
* Students will record data related to the corresponding DNS service, records, and configuration.
* Given a scenario, students will research current SOHO Internet service provider (ISP) options and compare student’s home network contracts to current offerings.
* Using diagram software, students will diagram a network’s physical and logical topology.
* While reading/reviewing a network diagram, students will determine how the network device handles a packet in a given scenario.
* Identify, prescribe, and resolve common switched network media issues, configuration issues, auto-negotiation, and switch hardware failures.
* Given a scenario, students will terminate and test Unshielded Twisted Pair (UTP) cables for straight -through and cross over configurations.
* Students will run UTP cable for a basic network data drop, terminate cable at the wall (RJ45 female), and patch panel termination points.
* Given a scenario, students will use problem solving strategies and diagnostic tools to identify network problems.
* Given a scenario, students will download a free packet sniffer software package; install sniffer on a basic LAN; generate traffic to capture packets; and open and view captured packets.

### Standard 8: Fundamentals of Cybersecurity

Students will be able to identify common threats and install physical and logical security and test measures on various technologies to detect and protect against common threats.

* Aligned Industry Recognized Credentials: CompTIA Sec+

#### Sample Performance Tasks:

* Given a scenario, students will install and test physical security measures on devices, including but not limited to biometric and hardware locks, badge card readers, USB, and server locks.
* Students will install, configure, and test logical security measures on devices, including but not limited to user authentication, ports, and anti-malware.
* Given a scenario, students will research and configure the most current protocol, encryption and authentication methods including WPA-2, Multifactor Authentication, and RADIUS.
* Given a scenario, students will detect, remove, and prevent malware using appropriate tools and methods.
* Students will research an exploited network.
* Students will research the most common security threats.
* Students will create an electronic presentation summarizing the security threats and highlighting the preventative measures that could be taken on the given device.
* Given a scenario, on a small peer-to-peer network, students will create and test shared folders allowing for some and all users to view, edit, and save.
* Students will secure a workstation by disabling guest and unknown accounts.
* Students will run a password analyzer program against a list of student created passwords to determine strength in accordance with best practices.
* Students will configure users and groups in Windows OS.
* Given a scenario, students will secure and use a mobile device according to organizational policies. Students will then select appropriate authentication methods to harden the mobile device.
* Students will evaluate local policies such as acceptable use or BYOD.
* Given a scenario, students will implement appropriate data destruction and disposal methods, including physical destruction and recycling or repurposing best practices.
* Given a scenario, students will configure an ISR per a given client scenario using industry best practices such as enabling MAC filtering, port forwarding, and wireless encryption.
* Students will configure a firewall setting on a wired/wireless system according to client specifications.

### Standard 9: Concepts of Cloud Computing

Students will be able to explore and evaluate cloud computing concepts and configure client-side virtualization.

* Aligned Industry Recognized Credentials: CompTIA Net+

#### Sample Performance Tasks:

* Given a scenario, students will configure client-side virtualization to include Resource, Emulator, Security, and Network requirements.

### Standard 10: Basics of Programming and Development

Students will be able to describe, demonstrate, and evaluate fundamental elements and concepts of programming, website design, and front and back-end development.

#### Sample Performance Tasks:

* Given a scenario, students will design a simple program for a specific application.
* Given a scenario, students will create, test functionality, debug, and document a simple computer program.
* Given a scenario, students will create a custom database from a given set of guidelines.
* Given a scenario, students will create a webpage, upload the webpage to a File Transfer Protocol (FTP) server, and administer changes to the webpage via an FTP client.
* Given a scenario, students will solve a variety of software problems using appropriate diagnostic utilities, apply appropriate repair techniques, and test the solutions.

### Standard 11: Servers

Students will be able to install and manage servers, server performance, server maintenance, and active directory.

* Aligned Industry Recognized Credentials: CompTIA Net+

#### Sample Performance Tasks:

* Students will configure an Integrated Services Router (ISR) to be a DHCP server for 25 dynamic nodes (laptops, desktops) and create a reservation for 5 static nodes (printers/servers).
* Students will install a Domain Name System (DNS) service on a local server or virtual server.

## Credential References

CompTIA Certifications

<https://www.comptia.org/certifications>

CompTIA has four IT certification series that test different knowledge standards – from entry-level to expert.