

CAREER PATHWAY SYSTEM ADMINISTRATOR (451)

November 2020

CLEARED
For Open Publication

Jan 28, 2021

Department of Defense
OFFICE OF PREPUBLICATION AND SECURITY REVIEW

Developed By:

The Interagency
Federal Cyber Career
Pathways Working
Group

Endorsed By:



Table of Contents

CAREER PATHWAY SYSTEM ADMINISTRATOR (451) 1

1 451-SYSTEM ADMINISTRATOR 3

1.1 Work Role Overview 3

1.2 Core Tasks..... 6

1.3 Core Knowledge, Skills, and Abilities 7

1.4 Core Competencies..... 10

1.5 Suggested Qualifications / Capability Indicators 12

2 APPENDIX: 451-SYSTEM ADMINISTRATOR TASK ANALYSIS AND KSA MAPPING..... 13

2.1 Key to Reading the Task Analysis and KSA Mapping..... 13

2.2 451-System Administrator Task Analysis and KSA Mapping..... 14

1 451-SYSTEM ADMINISTRATOR

1.1 WORK ROLE OVERVIEW

The table below provides an overview of various role-specific elements related to 451-System Administrator.

Table 1. 451-System Administrator Work Role Overview

<p>NICE Role Description</p>	<p>Responsible for setting up and maintaining a system or specific components of a system (e.g. for example, installing, configuring, and updating hardware and software; establishing and managing user accounts; overseeing or conducting backup and recovery tasks; implementing operational and technical security controls; and adhering to organizational security policies and procedures).</p>
<p>OPM Occupational Series</p>	<p>Personnel performing the 451-System Administrator work role are most commonly aligned to the following Occupational Series: (Top 5 Shown)</p> <ul style="list-style-type: none"> - 2210-Information Technology – 85% - 1550-Computer Science – 2% - 391-Telecommunications – 2% - 855 – Electronics Engineering – 2% - 854 – Computer Engineering – 1%
<p>Work Role Pairings</p>	<p>Personnel performing the 451-System Administrator work role are most commonly paired with the following complimentary Work Roles (Top 5 shown):</p> <ul style="list-style-type: none"> - 411-Technical Support Specialist – 35% - 421-Database Administrator – 12% - 441-Network Operations Specialist – 11% - 461-Systems Security Analyst – 8% - 422-Data Analyst – 5%
<p>Functional Titles</p>	<p>Personnel performing the 451-System Administrator work role may unofficially or alternatively be called:</p> <ul style="list-style-type: none"> - Application Security Administrator - Identity Access Manager - Local Area Network (LAN)/Wide Area Network (WAN) Administrator - Platform Specialist - Security Administrator - Server Administrator - System Operations Personnel - System Security Administrator - UNIX/Windows System administrator - Web Administrator

<p>Distribution of GS-Levels</p>	<p>Personnel performing the 451-System Administrator work role are most commonly found within the following grades on the General Schedule. *</p> <ul style="list-style-type: none"> - <input type="checkbox"/> GS-4 – redacted** - <input type="checkbox"/> GS-5 – redacted** - <input type="checkbox"/> GS-6 – redacted** - <input type="checkbox"/> GS-7 – redacted** - <input type="checkbox"/> GS-8 – redacted** - <input checked="" type="checkbox"/> GS-9 – 5% - <input type="checkbox"/> GS-10 – redacted** - <input checked="" type="checkbox"/> GS-11 –16% - <input checked="" type="checkbox"/> GS-12 – 33% - <input checked="" type="checkbox"/> GS-13 – 22% - <input checked="" type="checkbox"/> GS-14 – 6% - <input type="checkbox"/> GS-15 – redacted** <p>*15% of all 451s are in non-GS pay plans and excluded from this section **Percentages below 3% are redacted</p>
<p>On Ramps</p>	<p>The following work roles are examples of possible roles an individual may perform prior to transitioning into the 451-System Administrator work role:</p> <ul style="list-style-type: none"> - 411-Technical Support Specialist - 421-Database Administrator
<p>Off Ramps</p>	<p>The following work roles are examples of common transitions an individual may pursue after having performed the 451-System Administrator work role. This is not an exhaustive list, nor does it consider learning and development opportunities an individual may pursue to prepare themselves for performing alternate work roles:</p> <ul style="list-style-type: none"> - 421-Database Administrator - 441-Network Operations Specialist - 461-System Security Analyst - 511-Cyber Defense Analyst - 521-Cyber Defense Infrastructure Support Specialist - 541-Vulnerability Assessment Analyst - 621-Software Developer - 641-Systems Requirements Planner - 671-System Testing and Evaluation Specialist <p>*Note: Leveraging the knowledge, skills, abilities, and tasks of the 451-System Administrator work role, individuals may prepare themselves to transition into one or more of the following cross-functional work roles:</p> <ul style="list-style-type: none"> - 711- Cyber Instructional Curriculum Developer - 712-Cyber Instructor

- | | |
|--|--|
| | <ul style="list-style-type: none">- <i>732-Privacy Officer / Privacy Compliance Manager</i>- <i>751-Cyber Workforce Developer and Manager</i>- <i>752-Cyber Policy and Strategy Planner</i>- <i>802-IT Project Manager</i>- <i>803-Product Support Manager</i> |
|--|--|

1.2 CORE TASKS

The table below provides a list of tasks that represent the Core, or baseline, expectations for performance in the 451-System Administrator work role, as well as additional tasks that those in this role may be expected to perform.

Table 2. 451-System Administrator Core Tasks

Task ID	Task	Core or Additional
T0029	Conduct functional and connectivity testing to ensure continuing operability.	Core
T0063	Develop and document systems administration standard operating procedures.	Core
T0136	Maintain baseline system security according to organizational policies.	Core
T0144	Manage accounts, network rights, and access to systems and equipment.	Core
T0186	Plan, execute, and verify data redundancy and system recovery procedures.	Core
T0418	Install, update, and troubleshoot systems/servers.	Core
T0458	Comply with organization systems administration standard operating procedures.	Core
T0461	Implement and enforce local network usage policies and procedures.	Core
T0498	Manage system/server resources including performance, capacity, availability, serviceability, and recoverability.	Core
T0501	Monitor and maintain system/server configuration.	Core
T0515	Perform repairs on faulty system/server hardware.	Core
T0531	Troubleshoot hardware/software interface and interoperability problems.	Core
T0054	Design group policies and access control lists to ensure compatibility with organizational standards, business rules, and needs.	Additional
T0207	Provide ongoing optimization and problem-solving support.	Additional
T0431	Check system hardware availability, functionality, integrity, and efficiency.	Additional
T0435	Conduct periodic system maintenance including cleaning (both physically and electronically), disk checks, routine reboots, data dumps, and testing.	Additional
T0507	Oversee installation, implementation, configuration, and support of system components.	Additional
T0514	Diagnose faulty system/server hardware.	Additional

1.3 CORE KNOWLEDGE, SKILLS, AND ABILITIES

The table below provides a ranking of KSAs that represent the Core, or baseline, expectations for performance in the 451-System Administrator work role, as well as additional KSAs that those in this role may be expected to demonstrate.

Table 3. 451-System Administrator Core Knowledge, Skills, and Abilities

KSA ID	Description	Competency	Importance to Work Role
K0004	Knowledge of cybersecurity and privacy principles.	Information Systems/Network Security	Foundational to All Work Roles
K0001	Knowledge of computer networking concepts and protocols, and network security methodologies.	Infrastructure Design	Foundational to All Work Roles
K0003	Knowledge of laws, regulations, policies, and ethics as they relate to cybersecurity and privacy.	Legal, Government, and Jurisprudence	Foundational to All Work Roles
K0002	Knowledge of risk management processes (e.g., methods for assessing and mitigating risk).	Risk Management	Foundational to All Work Roles
K0005	Knowledge of cyber threats and vulnerabilities.	Vulnerabilities Assessment	Foundational to All Work Roles
K0006	Knowledge of specific operational impacts of cybersecurity lapses.	Vulnerabilities Assessment	Foundational to All Work Roles
K0158	Knowledge of organizational information technology (IT) user security policies (e.g., account creation, password rules, access control).	Identity Management	Core
K0053	Knowledge of measures or indicators of system performance and availability.	Information Technology Assessment	Core
K0064	Knowledge of performance tuning tools and techniques.	Information Technology Assessment	Core
S0155	Skill in monitoring and optimizing system/server performance.	Information Technology Assessment	Core
S0158	Skill in operating system administration. (e.g., account maintenance, data backups, maintain system performance, install and configure new hardware/software).	Operating Systems	Core
K0088	Knowledge of systems administration concepts.	System Administration	Core
K0130	Knowledge of virtualization technologies and virtual machine development and maintenance.	System Administration	Core
K0167	Knowledge of system administration, network, and operating system hardening techniques.	System Administration	Core
S0144	Skill in correcting physical and technical problems that impact system/server performance.	System Administration	Core
S0157	Skill in recovering failed systems/servers. (e.g., recovery software, failover clusters, replication, etc.).	System Administration	Core

KSA ID	Description	Competency	Importance to Work Role
K0346	Knowledge of principles and methods for integrating system components.	Systems Integration	Core
K0260	Knowledge of Personally Identifiable Information (PII) data security standards.	Data Privacy and Protection	Additional
K0261	Knowledge of Payment Card Industry (PCI) data security standards.	Data Privacy and Protection	Additional
K0262	Knowledge of Personal Health Information (PHI) data security standards.	Data Privacy and Protection	Additional
K0104	Knowledge of Virtual Private Network (VPN) security.	Encryption	Additional
K0100	Knowledge of the enterprise information technology (IT) architecture.	Enterprise Architecture	Additional
A0027	Ability to apply an organization's goals and objectives to develop and maintain architecture.	Enterprise Architecture	Additional
S0043	Skill in maintaining directory services. (e.g., Microsoft Active Directory, LDAP, etc.).	Identity Management	Additional
A0025	Ability to accurately define incidents, problems, and events in the trouble ticketing system.	Incident Management	Additional
A0123	Ability to apply cybersecurity and privacy principles to organizational requirements (relevant to confidentiality, integrity, availability, authentication, non-repudiation).	Information Assurance	Additional
K0049	Knowledge of information technology (IT) security principles and methods (e.g., firewalls, demilitarized zones, encryption).	Information Systems/Network Security	Additional
K0179	Knowledge of network security architecture concepts including topology, protocols, components, and principles (e.g., application of defense-in-depth).	Information Systems/Network Security	Additional
S0076	Skill in configuring and utilizing software-based computer protection tools (e.g., software firewalls, antivirus software, anti-spyware).	Information Systems/Network Security	Additional
S0153	Skill in identifying and anticipating system/server performance, availability, capacity, or configuration problems.	Information Technology Assessment	Additional
A0062	Ability to monitor measures or indicators of system performance and availability.	Information Technology Assessment	Additional
K0050	Knowledge of local area and wide area networking principles and concepts including bandwidth management.	Infrastructure Design	Additional
K0332	Knowledge of network protocols such as TCP/IP, Dynamic Host Configuration, Domain Name System (DNS), and directory services.	Infrastructure Design	Additional
S0111	Skill in interfacing with customers.	Interpersonal Skills	Additional
A0074	Ability to collaborate effectively with others.	Interpersonal Skills	Additional
A0088	Ability to function effectively in a dynamic, fast-paced environment.	Interpersonal Skills	Additional
K0103	Knowledge of the type and frequency of routine hardware maintenance.	Network Management	Additional
S0033	Skill in diagnosing connectivity problems.	Network Management	Additional

KSA ID	Description	Competency	Importance to Work Role
A0055	Ability to operate common network tools (e.g., ping, traceroute, nslookup).	Network Management	Additional
K0077	Knowledge of server and client operating systems.	Operating Systems	Additional
K0117	Knowledge of file system implementations (e.g., New Technology File System [NTFS], File Allocation Table [FAT], File Extension [EXT]).	Operating Systems	Additional
K0318	Knowledge of operating system command-line tools.	Operating Systems	Additional
A0034	Ability to develop, update, and/or maintain standard operating procedures (SOPs).	Policy Management	Additional
A0124	Ability to establish and maintain automated security control assessments	Risk Management	Additional
S0016	Skill in configuring and optimizing software.	Software Development	Additional
S0073	Skill in using virtual machines. (e.g., Microsoft Hyper-V, VMWare vSphere, Citrix XenDesktop/Server, Amazon Elastic Compute Cloud, etc.).	System Administration	Additional
S0143	Skill in conducting system/server planning, management, and maintenance.	System Administration	Additional
S0151	Skill in troubleshooting failed system components (i.e., servers)	System Administration	Additional
S0154	Skill in installing system and component upgrades. (i.e., servers, appliances, network devices).	System Administration	Additional
K0280	Knowledge of systems engineering theories, concepts, and methods.	Systems Integration	Additional
K0289	Knowledge of system/server diagnostic tools and fault identification techniques.	Systems Testing and Evaluation	Additional
K0274	Knowledge of transmission records (e.g., Bluetooth, Radio Frequency Identification (RFID), Infrared Networking (IR), Wireless Fidelity (Wi-Fi), paging, cellular, satellite dishes, Voice over Internet Protocol (VoIP)), and jamming techniques that enable transmission of undesirable information, or prevent installed systems from operating correctly.	Telecommunications	Additional

1.4 CORE COMPETENCIES

The table below is a compilation of competencies aligned to the 451-System Administrator work role, and their associated importance. Listed competencies are collections of three or more similar Knowledge, Skills, or Abilities aligned to the Work Role. *These competencies originate from the [NICE Framework Competency Pivot Tool](#).*

Table 4. 451-System administrator Core Competencies

Technical Competency	Comp ID	Definition	Work Role Related KSAs	Importance
Information Systems / Network Security	C024	KSAs that relate to the methods, tools, and procedures, including development of information security plans to prevent information systems vulnerabilities and to provide or restore security of information systems and network services.	<ul style="list-style-type: none"> - Knowledge of information technology (IT) security principles and methods (e.g., firewalls, demilitarized zones, encryption). - Knowledge of network security architecture concepts including topology, protocols, components, and principles (e.g., application of defense-in-depth). - Skill in configuring and utilizing software-based computer protection tools (e.g., software firewalls, antivirus software, anti-spyware). - Knowledge of cybersecurity and privacy principles. 	Core
Information Technology Assessment	C025	KSAs that relate to the principles, methods, and tools (for example, surveys, system performance measures) to assess the effectiveness and practicality of information technology systems.	<ul style="list-style-type: none"> - Skill in identifying and anticipating system/server performance, availability, capacity, or configuration problems. - Ability to monitor measures or indicators of system performance and availability. - Knowledge of measures or indicators of system performance and availability. - Knowledge of performance tuning tools and techniques. - Skill in monitoring and optimizing system/server performance. 	Core
Infrastructure Design	C026	KSAs that relate to the architecture and typology of software, hardware, and networks, including LANS, WANS, and telecommunications systems, their components and associated protocols and standards, and how they operate and integrate with one another and with associated controlling software.	<ul style="list-style-type: none"> - Knowledge of local area and wide area networking principles and concepts including bandwidth management. - Knowledge of network protocols such as TCP/IP, Dynamic Host Configuration, Domain Name System (DNS), and directory services. - Knowledge of computer networking concepts and protocols, and network security methodologies. 	Core

Technical Competency	Comp ID	Definition	Work Role Related KSAs	Importance
Network Management	C033	KSAs that relate to the operation, management, and maintenance of network and telecommunication systems and linked systems and peripherals.	<ul style="list-style-type: none"> - Knowledge of the type and frequency of routine hardware maintenance. - Skill in diagnosing connectivity problems. - Ability to operate common network tools (e.g., ping, traceroute, nslookup). 	Core
Operating Systems	C034	KSAs that relate to computer network, desktop, and mainframe operating systems and their applications.	<ul style="list-style-type: none"> - Knowledge of server and client operating systems. - Knowledge of file system implementations (e.g., New Technology File System [NTFS], File Allocation Table [FAT], File Extension [EXT]). - Knowledge of operating system command-line tools. - Skill in operating system administration. (e.g., account maintenance, data backups, maintain system performance, install and configure new hardware/software). 	Core
System Administration	C048	KSAs that relate to the upkeep, configuration, and reliable operation of computer systems.	<ul style="list-style-type: none"> - Skill in using virtual machines. (e.g., Microsoft Hyper-V, VMWare vSphere, Citrix XenDesktop/Server, Amazon Elastic Compute Cloud, etc.). - Skill in conducting system/server planning, management, and maintenance. - Skill in troubleshooting failed system components (i.e., servers) - Skill in installing system and component upgrades. (i.e., servers, appliances, network devices). - Knowledge of systems administration concepts. - Knowledge of virtualization technologies and virtual machine development and maintenance. - Knowledge of system administration, network, and operating system hardening techniques. - Skill in correcting physical and technical problems that impact system/server performance. - Skill in recovering failed systems/servers. (e.g., recovery software, failover clusters, replication, etc.). 	Core
Data Privacy and Protection	C014	KSAs that relate to the relationship between the collection and dissemination of data, technology, the public expectation of privacy, legal and political issues surrounding them	<ul style="list-style-type: none"> - Knowledge of Personally Identifiable Information (PII) data security standards. - Knowledge of Payment Card Industry (PCI) data security standards. - Knowledge of Personal Health Information (PHI) data security standards. 	Additional

1.5 SUGGESTED QUALIFICATIONS / CAPABILITY INDICATORS

Table 5. 451-System administrator Suggested Qualifications / Capability Indicators

For indicators of capability for the 451-System Administrator work role, please see [Draft NISTR 8193 - National Initiative for Cybersecurity Education \(NICE\) Framework Work Role Capability Indicators](#).

Section to be populated with updated DoD-8140 Qualification Matrix for 451-System Administrator.

2 APPENDIX: 451-SYSTEM ADMINISTRATOR TASK ANALYSIS AND KSA MAPPING

2.1 KEY TO READING THE TASK ANALYSIS AND KSA MAPPING

Table 6. Key to Reading the Task Analysis and KSA Mapping

Proficiency	Task Statement	Importance
As Written	Task as written within the NICE Cybersecurity Workforce Framework (NICE Framework).	Overall Importance to Work Role
Entry	<i>Example behavioral indicator / task permutation for performing this task at an Entry skills proficiency level.</i>	
Intermediate	<i>Example behavioral indicator / task permutation for performing this task at an Intermediate skills proficiency level.</i>	
Advanced	<i>Example behavioral indicator / task permutation for performing this task at an Advanced skills proficiency level.</i>	

Table 7. Primary Knowledge, Skills, and Abilities Required to Perform the above Task

KSA ID	Description	Competency
ID of K, S, or A	Knowledge, Skill or Ability needed to perform the task as written within the NICE Framework	Competency mapped to the individual K, S, or A.

2.2 451-SYSTEM ADMINISTRATOR TASK ANALYSIS AND KSA MAPPING

Table 8. T0029 Task Analysis

Proficiency	Task Statement	Importance
As Written within Framework	Conduct functional and connectivity testing to ensure continuing operability.	Core
Entry	<i>Support functional and connectivity testing to ensure continuing operability.</i>	
Intermediate	<i>Conduct functional and connectivity testing to ensure continuing operability.</i>	
Advanced	<i>Oversee and provide guidance on correctional actions in functional and connectivity testing to ensure continuing operability.</i>	

Table 9. Primary Knowledge, Skills, and Abilities Required to Perform the above Task

KSA ID	Description	Competency
K0100	Knowledge of the enterprise information technology (IT) architecture.	Enterprise Architecture
A0025	Ability to accurately define incidents, problems, and events in the trouble ticketing system.	Incident Management
K0049	Knowledge of information technology (IT) security principles and methods (e.g., firewalls, demilitarized zones, encryption).	Information Systems/Network Security
K0179	Knowledge of network security architecture concepts including topology, protocols, components, and principles (e.g., application of defense-in-depth).	Information Systems/Network Security
S0076	Skill in configuring and utilizing software-based computer protection tools (e.g., software firewalls, antivirus software, anti-spyware).	Information Systems/Network Security
S0153	Skill in identifying and anticipating system/server performance, availability, capacity, or configuration problems.	Information Technology Assessment
A0062	Ability to monitor measures or indicators of system performance and availability.	Information Technology Assessment
K0053	Knowledge of measures or indicators of system performance and availability.	Information Technology Assessment
K0064	Knowledge of performance tuning tools and techniques.	Information Technology Assessment
S0155	Skill in monitoring and optimizing system/server performance.	Information Technology Assessment
K0332	Knowledge of network protocols such as TCP/IP, Dynamic Host Configuration, Domain Name System (DNS), and directory services.	Infrastructure Design
S0033	Skill in diagnosing connectivity problems.	Network Management

KSA ID	Description	Competency
A0055	Ability to operate common network tools (e.g., ping, traceroute, nslookup).	Network Management
K0077	Knowledge of server and client operating systems.	Operating Systems
K0117	Knowledge of file system implementations (e.g., New Technology File System [NTFS], File Allocation Table [FAT], File Extension [EXT]).	Operating Systems
K0318	Knowledge of operating system command-line tools.	Operating Systems
S0158	Skill in operating system administration. (e.g., account maintenance, data backups, maintain system performance, install and configure new hardware/software).	Operating Systems
S0143	Skill in conducting system/server planning, management, and maintenance.	System Administration
S0151	Skill in troubleshooting failed system components (i.e., servers)	System Administration
K0088	Knowledge of systems administration concepts.	System Administration
K0167	Knowledge of system administration, network, and operating system hardening techniques.	System Administration
S0144	Skill in correcting physical and technical problems that impact system/server performance.	System Administration
S0157	Skill in recovering failed systems/servers. (e.g., recovery software, failover clusters, replication, etc.).	System Administration
K0346	Knowledge of principles and methods for integrating system components.	Systems Integration
K0289	Knowledge of system/server diagnostic tools and fault identification techniques.	Systems Testing and Evaluation

Table 10. T0063 Task Analysis

Proficiency	Task Statement	Importance
As Written within Framework	Develop and document systems administration standard operating procedures.	Core
Entry	Document and draft the preliminary systems administration standard operating procedures.	
Intermediate	Review, enhance, and / or develop systems administration standard operating procedures.	
Advanced	Oversee and approve systems administration standard operating procedures.	

Table 11. Primary Knowledge, Skills, and Abilities Required to Perform the above Task

KSA ID	Description	Competency
K0158	Knowledge of organizational information technology (IT) user security policies (e.g., account creation, password rules, access control).	Identity Management
A0123	Ability to apply cybersecurity and privacy principles to organizational requirements (relevant to confidentiality, integrity, availability, authentication, non-repudiation).	Information Assurance
K0049	Knowledge of information technology (IT) security principles and methods (e.g., firewalls, demilitarized zones, encryption).	Information Systems/Network Security
K0179	Knowledge of network security architecture concepts including topology, protocols, components, and principles (e.g., application of defense-in-depth).	Information Systems/Network Security
K0053	Knowledge of measures or indicators of system performance and availability.	Information Technology Assessment
S0155	Skill in monitoring and optimizing system/server performance.	Information Technology Assessment
K0332	Knowledge of network protocols such as TCP/IP, Dynamic Host Configuration, Domain Name System (DNS), and directory services.	Infrastructure Design
K0103	Knowledge of the type and frequency of routine hardware maintenance.	Network Management
K0077	Knowledge of server and client operating systems.	Operating Systems
S0158	Skill in operating system administration. (e.g., account maintenance, data backups, maintain system performance, install and configure new hardware/software).	Operating Systems
A0034	Ability to develop, update, and/or maintain standard operating procedures (SOPs).	Policy Management
K0088	Knowledge of systems administration concepts.	System Administration
K0130	Knowledge of virtualization technologies and virtual machine development and maintenance.	System Administration
K0167	Knowledge of system administration, network, and operating system hardening techniques.	System Administration

KSA ID	Description	Competency
S0144	Skill in correcting physical and technical problems that impact system/server performance.	System Administration
S0157	Skill in recovering failed systems/servers. (e.g., recovery software, failover clusters, replication, etc.).	System Administration

Table 12. T0136 Task Analysis

Proficiency	Task Statement	Importance
As Written within Framework	Maintain baseline system security according to organizational policies.	Core
Entry	<i>Assist with maintaining baseline system security according to organizational policies.</i>	
Intermediate	<i>Maintain baseline system security according to organizational policies.</i>	
Advanced	<i>Evaluate and recommend changes to the baseline system security.</i>	

Table 13. Primary Knowledge, Skills, and Abilities Required to Perform the above Task

KSA ID	Description	Competency
K0260	Knowledge of Personally Identifiable Information (PII) data security standards.	Data Privacy and Protection
S0043	Skill in maintaining directory services. (e.g., Microsoft Active Directory, LDAP, etc.).	Identity Management
K0158	Knowledge of organizational information technology (IT) user security policies (e.g., account creation, password rules, access control).	Identity Management
A0123	Ability to apply cybersecurity and privacy principles to organizational requirements (relevant to confidentiality, integrity, availability, authentication, non-repudiation).	Information Assurance
K0049	Knowledge of information technology (IT) security principles and methods (e.g., firewalls, demilitarized zones, encryption).	Information Systems/Network Security
K0179	Knowledge of network security architecture concepts including topology, protocols, components, and principles (e.g., application of defense-in-depth).	Information Systems/Network Security
S0076	Skill in configuring and utilizing software-based computer protection tools (e.g., software firewalls, antivirus software, anti-spyware).	Information Systems/Network Security
K0050	Knowledge of local area and wide area networking principles and concepts including bandwidth management.	Infrastructure Design
K0332	Knowledge of network protocols such as TCP/IP, Dynamic Host Configuration, Domain Name System (DNS), and directory services.	Infrastructure Design
A0124	Ability to establish and maintain automated security control assessments	Risk Management

Table 14. T0144 Task Analysis

Proficiency	Task Statement	Importance
As Written within Framework	Manage accounts, network rights, and access to systems and equipment.	Core
Entry	<i>Monitor and develop reports on accounts, network rights, and access to systems and equipment.</i>	
Intermediate	<i>Manage accounts, network rights, and access to systems and equipment.</i>	
Advanced	<i>Approve and review the elevated privileged accounts, network rights, and access to systems and equipment.</i>	

Table 15. Primary Knowledge, Skills, and Abilities Required to Perform the above Task

KSA ID	Description	Competency
K0260	Knowledge of Personally Identifiable Information (PII) data security standards.	Data Privacy and Protection
K0100	Knowledge of the enterprise information technology (IT) architecture.	Enterprise Architecture
S0043	Skill in maintaining directory services. (e.g., Microsoft Active Directory, LDAP, etc.).	Identity Management
K0158	Knowledge of organizational information technology (IT) user security policies (e.g., account creation, password rules, access control).	Identity Management
A0025	Ability to accurately define incidents, problems, and events in the trouble ticketing system.	Incident Management
A0123	Ability to apply cybersecurity and privacy principles to organizational requirements (relevant to confidentiality, integrity, availability, authentication, non-repudiation).	Information Assurance
A0074	Ability to collaborate effectively with others.	Interpersonal Skills
A0088	Ability to function effectively in a dynamic, fast-paced environment.	Interpersonal Skills
K0077	Knowledge of server and client operating systems.	Operating Systems
K0117	Knowledge of file system implementations (e.g., New Technology File System [NTFS], File Allocation Table [FAT], File Extension [EXT]).	Operating Systems
S0158	Skill in operating system administration. (e.g., account maintenance, data backups, maintain system performance, install and configure new hardware/software).	Operating Systems
A0124	Ability to establish and maintain automated security control assessments	Risk Management
K0088	Knowledge of systems administration concepts.	System Administration

Table 16. T0186 Task Analysis

Proficiency	Task Statement	Importance
As Written within Framework	Plan, execute, and verify data redundancy and system recovery procedures.	Core
<i>Entry</i>	<i>Assist with planning and verifying data redundancy and system recovery procedures.</i>	
<i>Intermediate</i>	<i>Plan, execute, and verify data redundancy and system recovery procedures.</i>	
<i>Advanced</i>	<i>Recommend enhancements to data redundancy and system recovery procedures.</i>	

Table 17. Primary Knowledge, Skills, and Abilities Required to Perform the above Task

KSA ID	Description	Competency
K0077	Knowledge of server and client operating systems.	Operating Systems
K0117	Knowledge of file system implementations (e.g., New Technology File System [NTFS], File Allocation Table [FAT], File Extension [EXT]).	Operating Systems
K0318	Knowledge of operating system command-line tools.	Operating Systems
S0073	Skill in using virtual machines. (e.g., Microsoft Hyper-V, VMWare vSphere, Citrix XenDesktop/Server, Amazon Elastic Compute Cloud, etc.).	System Administration
S0143	Skill in conducting system/server planning, management, and maintenance.	System Administration
S0157	Skill in recovering failed systems/servers. (e.g., recovery software, failover clusters, replication, etc.).	System Administration

Table 18. T0418 Task Analysis

Proficiency	Task Statement	Importance
As Written within Framework	Install, update, and troubleshoot systems/servers.	Core
Entry	Assist with the installation, update, and troubleshooting of systems/servers.	
Intermediate	Install, update, configure, and troubleshoot systems/servers.	
Advanced	Lead efforts in installing, updating, configuring, and troubleshooting systems/servers, providing guidance as needed.	

Table 19. Primary Knowledge, Skills, and Abilities Required to Perform the above Task

KSA ID	Description	Competency
S0153	Skill in identifying and anticipating system/server performance, availability, capacity, or configuration problems.	Information Technology Assessment
A0062	Ability to monitor measures or indicators of system performance and availability.	Information Technology Assessment
K0053	Knowledge of measures or indicators of system performance and availability.	Information Technology Assessment
K0064	Knowledge of performance tuning tools and techniques.	Information Technology Assessment
S0155	Skill in monitoring and optimizing system/server performance.	Information Technology Assessment
K0332	Knowledge of network protocols such as TCP/IP, Dynamic Host Configuration, Domain Name System (DNS), and directory services.	Infrastructure Design
S0033	Skill in diagnosing connectivity problems.	Network Management
S0151	Skill in troubleshooting failed system components (i.e., servers)	System Administration
K0088	Knowledge of systems administration concepts.	System Administration
K0167	Knowledge of system administration, network, and operating system hardening techniques.	System Administration
S0144	Skill in correcting physical and technical problems that impact system/server performance.	System Administration

Table 20. T0458 Task Analysis

Proficiency	Task Statement	Importance
As Written within Framework	Comply with organization systems administration standard operating procedures.	Core
Entry	<i>Assist with enforcement and implementation of organization systems administration standard operating procedures.</i>	
Intermediate	<i>Enforce and implement organization systems administration standard operating procedures.</i>	
Advanced	<i>Lead implementation and enforcement efforts to ensure overall compliance with organization systems administration standard operating procedures.</i>	

Table 21. Primary Knowledge, Skills, and Abilities Required to Perform the above Task

KSA ID	Description	Competency
K0158	Knowledge of organizational information technology (IT) user security policies (e.g., account creation, password rules, access control).	Identity Management
A0123	Ability to apply cybersecurity and privacy principles to organizational requirements (relevant to confidentiality, integrity, availability, authentication, non-repudiation).	Information Assurance
K0053	Knowledge of measures or indicators of system performance and availability.	Information Technology Assessment
K0050	Knowledge of local area and wide area networking principles and concepts including bandwidth management.	Infrastructure Design
K0332	Knowledge of network protocols such as TCP/IP, Dynamic Host Configuration, Domain Name System (DNS), and directory services.	Infrastructure Design
A0034	Ability to develop, update, and/or maintain standard operating procedures (SOPs).	Policy Management
K0088	Knowledge of systems administration concepts.	System Administration

Table 22. T0461 Task Analysis

Proficiency	Task Statement	Importance
As Written within Framework	Implement and enforce local network usage policies and procedures.	Core
Entry	<i>Assist with the implementation local network usage policies and procedures.</i>	
Intermediate	<i>Implement and enforce local network usage policies and procedures.</i>	
Advanced	<i>Lead and provide recommendations on implementing and enforcing of local network usage policies and procedures.</i>	

Table 23. Primary Knowledge, Skills, and Abilities Required to Perform the above Task

KSA ID	Description	Competency
K0104	Knowledge of Virtual Private Network (VPN) security.	Encryption
K0158	Knowledge of organizational information technology (IT) user security policies (e.g., account creation, password rules, access control).	Identity Management
K0049	Knowledge of information technology (IT) security principles and methods (e.g., firewalls, demilitarized zones, encryption).	Information Systems/Network Security
K0179	Knowledge of network security architecture concepts including topology, protocols, components, and principles (e.g., application of defense-in-depth).	Information Systems/Network Security
A0062	Ability to monitor measures or indicators of system performance and availability.	Information Technology Assessment
K0053	Knowledge of measures or indicators of system performance and availability.	Information Technology Assessment
K0064	Knowledge of performance tuning tools and techniques.	Information Technology Assessment
S0155	Skill in monitoring and optimizing system/server performance.	Information Technology Assessment
K0050	Knowledge of local area and wide area networking principles and concepts including bandwidth management.	Infrastructure Design
K0332	Knowledge of network protocols such as TCP/IP, Dynamic Host Configuration, Domain Name System (DNS), and directory services.	Infrastructure Design
A0074	Ability to collaborate effectively with others.	Interpersonal Skills
A0088	Ability to function effectively in a dynamic, fast-paced environment.	Interpersonal Skills
S0143	Skill in conducting system/server planning, management, and maintenance.	System Administration

KSA ID	Description	Competency
K0088	Knowledge of systems administration concepts.	System Administration

Table 24. T0498 Task Analysis

Proficiency	Task Statement	Importance
As Written within Framework	Manage system/server resources including performance, capacity, availability, serviceability, and recoverability.	Core
Entry	<i>Monitor and assist with managing system/server resources including performance, capacity, availability, serviceability, and recoverability.</i>	
Intermediate	<i>Manage system/server resources including performance, capacity, availability, serviceability, and recoverability.</i>	
Advanced	<i>Advise and approve the allocation of system/server resources including performance, capacity, availability, serviceability, and recoverability.</i>	

Table 25. Primary Knowledge, Skills, and Abilities Required to Perform the above Task

KSA ID	Description	Competency
S0153	Skill in identifying and anticipating system/server performance, availability, capacity, or configuration problems.	Information Technology Assessment
A0062	Ability to monitor measures or indicators of system performance and availability.	Information Technology Assessment
K0053	Knowledge of measures or indicators of system performance and availability.	Information Technology Assessment
K0064	Knowledge of performance tuning tools and techniques.	Information Technology Assessment
S0155	Skill in monitoring and optimizing system/server performance.	Information Technology Assessment
K0050	Knowledge of local area and wide area networking principles and concepts including bandwidth management.	Infrastructure Design
K0332	Knowledge of network protocols such as TCP/IP, Dynamic Host Configuration, Domain Name System (DNS), and directory services.	Infrastructure Design
A0074	Ability to collaborate effectively with others.	Interpersonal Skills
A0088	Ability to function effectively in a dynamic, fast-paced environment.	Interpersonal Skills
K0103	Knowledge of the type and frequency of routine hardware maintenance.	Network Management
S0033	Skill in diagnosing connectivity problems.	Network Management
A0055	Ability to operate common network tools (e.g., ping, traceroute, nslookup).	Network Management
K0077	Knowledge of server and client operating systems.	Operating Systems

KSA ID	Description	Competency
K0117	Knowledge of file system implementations (e.g., New Technology File System [NTFS], File Allocation Table [FAT], File Extension [EXT]).	Operating Systems
S0143	Skill in conducting system/server planning, management, and maintenance.	System Administration
K0130	Knowledge of virtualization technologies and virtual machine development and maintenance.	System Administration
K0167	Knowledge of system administration, network, and operating system hardening techniques.	System Administration
S0144	Skill in correcting physical and technical problems that impact system/server performance.	System Administration

Table 26. T0501 Task Analysis

Proficiency	Task Statement	Importance
As Written within Framework	Monitor and maintain system/server configuration.	Core
Entry	<i>Document, monitor, and support the maintaining of system/server configuration per standard operating procedures.</i>	
Intermediate	<i>Develop, monitor and maintain system/server configuration.</i>	
Advanced	<i>Lead developing, monitoring, and maintaining of system/server configuration.</i>	

Table 27. Primary Knowledge, Skills, and Abilities Required to Perform the above Task

KSA ID	Description	Competency
S0043	Skill in maintaining directory services. (e.g., Microsoft Active Directory, LDAP, etc.).	Identity Management
K0158	Knowledge of organizational information technology (IT) user security policies (e.g., account creation, password rules, access control).	Identity Management
K0049	Knowledge of information technology (IT) security principles and methods (e.g., firewalls, demilitarized zones, encryption).	Information Systems/Network Security
S0076	Skill in configuring and utilizing software-based computer protection tools (e.g., software firewalls, antivirus software, anti-spyware).	Information Systems/Network Security
K0332	Knowledge of network protocols such as TCP/IP, Dynamic Host Configuration, Domain Name System (DNS), and directory services.	Infrastructure Design
A0088	Ability to function effectively in a dynamic, fast-paced environment.	Interpersonal Skills
A0055	Ability to operate common network tools (e.g., ping, traceroute, nslookup).	Network Management
K0077	Knowledge of server and client operating systems.	Operating Systems
K0117	Knowledge of file system implementations (e.g., New Technology File System [NTFS], File Allocation Table [FAT], File Extension [EXT]).	Operating Systems
K0318	Knowledge of operating system command-line tools.	Operating Systems
S0158	Skill in operating system administration. (e.g., account maintenance, data backups, maintain system performance, install and configure new hardware/software).	Operating Systems
S0143	Skill in conducting system/server planning, management, and maintenance.	System Administration
K0088	Knowledge of systems administration concepts.	System Administration

KSA ID	Description	Competency
K0130	Knowledge of virtualization technologies and virtual machine development and maintenance.	System Administration
K0167	Knowledge of system administration, network, and operating system hardening techniques.	System Administration

Table 28. T0515 Task Analysis

Proficiency	Task Statement	Importance
As Written within Framework	Perform repairs on faulty system/server hardware.	Core
Entry	<i>Assist with performing repairs on faulty system/server hardware.</i>	
Intermediate	<i>Perform repairs on faulty system/server hardware.</i>	
Advanced	<i>Direct and approve repairs of faulty system/server hardware.</i>	

Table 29. Primary Knowledge, Skills, and Abilities Required to Perform the above Task

KSA ID	Description	Competency
A0074	Ability to collaborate effectively with others.	Interpersonal Skills
A0088	Ability to function effectively in a dynamic, fast-paced environment.	Interpersonal Skills
K0103	Knowledge of the type and frequency of routine hardware maintenance.	Network Management
S0033	Skill in diagnosing connectivity problems.	Network Management
S0151	Skill in troubleshooting failed system components (i.e., servers)	System Administration
K0289	Knowledge of system/server diagnostic tools and fault identification techniques.	Systems Testing and Evaluation

Table 30. T0531 Task Analysis

Proficiency	Task Statement	Importance
As Written within Framework	Troubleshoot hardware/software interface and interoperability problems.	Core
Entry	<i>Assist in troubleshooting hardware/software interface and interoperability problems.</i>	
Intermediate	<i>Troubleshoot hardware /software interface and interoperability problems.</i>	
Advanced	<i>Lead efforts to troubleshoot hardware/software interface and interoperability problems.</i>	

Table 31. Primary Knowledge, Skills, and Abilities Required to Perform the above Task

KSA ID	Description	Competency
A0062	Ability to monitor measures or indicators of system performance and availability.	Information Technology Assessment
K0053	Knowledge of measures or indicators of system performance and availability.	Information Technology Assessment
K0064	Knowledge of performance tuning tools and techniques.	Information Technology Assessment
S0155	Skill in monitoring and optimizing system/server performance.	Information Technology Assessment
A0074	Ability to collaborate effectively with others.	Interpersonal Skills
A0088	Ability to function effectively in a dynamic, fast-paced environment.	Interpersonal Skills
S0033	Skill in diagnosing connectivity problems.	Network Management
A0055	Ability to operate common network tools (e.g., ping, traceroute, nslookup).	Network Management
K0077	Knowledge of server and client operating systems.	Operating Systems
K0117	Knowledge of file system implementations (e.g., New Technology File System [NTFS], File Allocation Table [FAT], File Extension [EXT]).	Operating Systems
K0318	Knowledge of operating system command-line tools.	Operating Systems
S0158	Skill in operating system administration. (e.g., account maintenance, data backups, maintain system performance, install and configure new hardware/software).	Operating Systems