CompTIA Security+ Certification Exam Objectives

EXAM NUMBER: SY0-501
About the Exam

The CompTIA Security+ certification is a vendor-neutral credential. The CompTIA Security+ SY0-501 exam is an internationally recognized validation of foundation-level security skills and knowledge, and is used by organizations and security professionals around the globe.

The CompTIA Security+ exam will certify the successful candidate has the knowledge and skills required to:

- Install and configure systems to secure applications, networks and devices
- Perform threat analysis and respond with appropriate mitigation techniques
- Participate in risk mitigation activities
- Operate with an awareness of applicable policies, laws and regulations

The successful candidate will perform these tasks to support the principles of confidentiality, integrity, and availability.

The CompTIA Security+ certification is aimed at an IT security professional who has:

- A minimum of two years’ experience in IT administration with a focus on security
- Day-to-day technical information security experience
- Broad knowledge of security concerns and implementation, including the topics in the domain list

These content examples are meant to clarify the test objectives and should not be construed as a comprehensive listing of all content in this examination.

EXAM ACCREDITATION

CompTIA Security+ is accredited by ANSI to show compliance with the ISO 17024 standard and, as such, the exam objectives undergo regular reviews and updates.

EXAM DEVELOPMENT

CompTIA exams result from subject-matter expert workshops and industry-wide survey results regarding the skills and knowledge required of an IT professional.

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PLEASE NOTE

The lists of examples provided in bulleted format are not exhaustive lists. Other examples of technologies, processes or tasks pertaining to each objective may also be included on the exam although not listed or covered in this objectives document. CompTIA is constantly reviewing the content of our exams and updating test questions to be sure our exams are current and the security of the questions is protected. When necessary, we will publish updated exams based on existing exam objectives. Please know that all related exam preparation materials will still be valid.

CompTIA Security+ Certification Exam Objectives Version 7.0 (Exam Number: SY0-501)
TEST DETAILS
Required exam SY0-501
Number of questions Maximum of 90
Types of questions Multiple choice and performance-based
Length of test 90 minutes
Recommended experience At least two years of experience
in IT administration with a focus on security
Passing score 750 (on a scale of 100–900)

EXAM OBJECTIVES (DOMAINS)
The table below lists the domains measured by this examination
and the extent to which they are represented:

<table>
<thead>
<tr>
<th>DOMAIN</th>
<th>PERCENTAGE OF EXAMINATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0 Threats, Attacks and Vulnerabilities</td>
<td>21%</td>
</tr>
<tr>
<td>2.0 Technologies and Tools</td>
<td>22%</td>
</tr>
<tr>
<td>3.0 Architecture and Design</td>
<td>15%</td>
</tr>
<tr>
<td>4.0 Identity and Access Management</td>
<td>16%</td>
</tr>
<tr>
<td>5.0 Risk Management</td>
<td>14%</td>
</tr>
<tr>
<td>6.0 Cryptography and PKI</td>
<td>12%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>
1.0 Threats, Attacks and Vulnerabilities

1.1 Given a scenario, analyze indicators of compromise and determine the type of malware.

- Viruses
- Crypto-malware
- Ransomware
- Worm
- Trojan
- Rootkit
- Keylogger
- Adware
- Spyware
- Bots
- RAT
- Logic bomb
- Backdoor

1.2 Compare and contrast types of attacks.

- Social engineering
  - Phishing
  - Spear phishing
  - Whaling
  - Vishing
  - Tailgating
  - Impersonation
  - Dumpster diving
  - Shoulder surfing
  - Hoax
  - Watering hole attack
  - Principles (reasons for effectiveness)
    - Authority
    - Intimidation
    - Consensus
    - Scarcity
    - Familiarity
    - Trust
    - Urgency
- Application/service attacks
  - DoS
  - DDoS
  - On-path attack (previously known as man-in-the-middle)
  - Buffer overflow
  - Injection
  - Cross-site scripting
  - Cross-site request forgery
  - Privilege escalation
  - ARP poisoning
  - Amplification
  - DNS poisoning
  - Domain hijacking
  - Zero day
  - Replay
  - Pass the hash
  - Hijacking and related attacks
    - Clickjacking
    - Session hijacking
    - URL hijacking
    - Typo squatting
  - Driver manipulation
    - Shimming
    - Refactoring
  - MAC spoofing
  - IP spoofing
- Wireless attacks
  - Replay
  - IV
  - Evil twin
  - Rogue AP
  - Jamming
  - WPS
  - Bluejacking
  - Bluesnarfing
  - RFID
  - NFC
  - Disassociation
- Cryptographic attacks
  - Birthday
  - Known plain text/cipher text
  - Rainbow tables
  - Dictionary
  - Brute force
    - Online vs. offline
  - Collision
  - Downgrade
  - Replay
  - Weak implementations
1.3 Explain threat actor types and attributes.

- **Types of actors**
  - Script kiddies
  - Hacktivist
  - Organized crime
  - Nation states/APT
  - Insiders
  - Competitors

- **Attributes of actors**
  - Internal/external
  - Level of sophistication
  - Resources/funding
  - Intent/motivation
  - Use of open-source intelligence

1.4 Explain penetration testing concepts.

- **Active reconnaissance**
- **Passive reconnaissance**
- **Pivot**
- **Initial exploitation**
- **Persistence**
- **Escalation of privilege**

- **Unknown environment**
- **Known environment**
- **Partially known environment**
- **Penetration testing vs. vulnerability scanning**

1.5 Explain vulnerability scanning concepts.

- **Passively test security controls**
  - Identify vulnerability
  - Identify lack of security controls
  - Identify common misconfigurations

- **Intrusive vs. non-intrusive**
  - Credentialled vs. non-credentialled
  - False positive

1.6 Explain the impact associated with types of vulnerabilities.

- **Race conditions**
- **Vulnerabilities due to:**
  - End-of-life systems
  - Embedded systems
  - Lack of vendor support
- **Improper input handling**
- **Improper error handling**
- **Misconfiguration/weak configuration**
- **Default configuration**
- **Resource exhaustion**
- **Untrained users**
- **Improperly configured accounts**
- **Vulnerable business processes**
- **Weak cipher suites and implementations**

- **Memory/buffer vulnerability**
  - Memory leak
  - Integer overflow
  - Buffer overflow
  - Pointer dereference
  - DLL injection

- **System sprawl/undocumented assets**
- **Architecture/design weaknesses**
- **New threats/zero day**
- **Improper certificate and key management**
2.0 Technologies and Tools

2.1 Install and configure network components, both hardware- and software-based, to support organizational security.

- **Firewall**
  - ACL
  - Application-based vs. network-based
  - Stateful vs. stateless
  - Implicit deny
- **VPN concentrator**
  - Remote access vs. site-to-site
  - IPSec
    - Tunnel mode
    - Transport mode
    - AH
    - ESP
  - Split tunnel vs. full tunnel
  - TLS
  - Always-on VPN
- **NIPS/NIDS**
  - Signature-based
  - Heuristic/behavioral
  - Anomaly
  - Inline vs. passive
  - In-band vs. out-of-band
  - Rules
  - Analytics
    - False positive
    - False negative
- **Proxy**
  - Forward and reverse proxy
  - Transparent
  - Application/multipurpose
- **Load balancer**
  - Scheduling
  - Affinity
  - Round-robin
  - Active-passive
  - Active-active
  - Virtual IPs
- **Switch**
  - Port security
  - Layer 2 vs. Layer 3
  - Loop prevention
  - Flood guard
- **NAC**
  - Dissolvable vs. permanent
  - Host health checks
  - Agent vs. agentless
- **Mail gateway**
  - Spam filter
  - DLP
  - Encryption
- **Router**
  - ACLs
  - Antispoofing
- **Access point**
  - SSID
  - MAC filtering
  - Signal strength
  - Band selection/width
  - Antenna types and placement
  - Fat vs. thin
  - Controller-based vs. standalone
- **SIEM**
  - Aggregation
  - Correlation
  - Automated alerting and triggers
  - Time synchronization
  - Event deduplication
  - Logs/WORM
- **DLP**
  - USB blocking
  - Cloud-based
  - Email
- **NAC**
  - Cloud-based
  - Email
- **Bridge**
  - SSL/TLS accelerators
  - SSL decryptors
  - Media gateway
  - Hardware security module
- **Load balancer**
  - Scheduling
  - Affinity
  - Round-robin
  - Active-passive
  - Active-active
  - Virtual IPs
- **Data sanitization tools**
  - Steganography tools
  - Honeypot
  - Backup utilities
  - Banner grabbing
  - Passive vs. active
  - Command line tools
    - ping
    - netstat
  - 2.2 Given a scenario, use appropriate software tools to assess the security posture of an organization.

- **Protocol analyzer**
- **Network scanners**
  - Rogue system detection
  - Network mapping
- **Wireless scanners/cracker**
- **Password cracker**
- **Vulnerability scanner**
- **Configuration compliance scanner**
- **Exploitation frameworks**
- **Data sanitization tools**
  - Steganography tools
  - Honeypot
  - Backup utilities
  - Banner grabbing
  - Passive vs. active
  - Command line tools
    - ping
    - netstat

**Comptia Security+ Certification Exam Objectives Version 7.0 (Exam Number: SY0-501)**
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<thead>
<tr>
<th>2.3</th>
<th>Given a scenario, troubleshoot common security issues.</th>
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</thead>
<tbody>
<tr>
<td>• Unencrypted credentials/clear text</td>
<td>• Content filter</td>
</tr>
<tr>
<td>• Logs and events anomalies</td>
<td>• Access points</td>
</tr>
<tr>
<td>• Permission issues</td>
<td>• Weak security configurations</td>
</tr>
<tr>
<td>• Access violations</td>
<td>• Personnel issues</td>
</tr>
<tr>
<td>• Certificate issues</td>
<td>• Policy violation</td>
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<tr>
<td>• Data exfiltration</td>
<td>• Insider threat</td>
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<tr>
<td>• Misconfigured devices</td>
<td>• Social engineering</td>
</tr>
<tr>
<td>- Firewall</td>
<td>• Social media</td>
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<tr>
<td>• Personal email</td>
<td>• Unauthorized software</td>
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<tr>
<td>• Logs and events anomalies</td>
<td>• Baseline deviation</td>
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<tr>
<td>• Permission issues</td>
<td>• License compliance violation</td>
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<tr>
<td>• Access violations</td>
<td>(availability/integrity)</td>
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<tr>
<td>• Certificate issues</td>
<td>• Asset management</td>
</tr>
<tr>
<td>• Data exfiltration</td>
<td>• Authentication issues</td>
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<tr>
<th>2.4</th>
<th>Given a scenario, analyze and interpret output from security technologies.</th>
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<tbody>
<tr>
<td>• HIDS/HIPS</td>
<td>• Application allow list</td>
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<tr>
<td>• Antivirus</td>
<td>• Removable media control</td>
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<td>• File integrity check</td>
<td>• Advanced malware tools</td>
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<tr>
<td>• Host-based firewall</td>
<td>• Patch management tools</td>
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<td>• Firewall</td>
<td>• UTM</td>
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<td>• DLP</td>
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<td>• Data execution prevention</td>
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<td>• Data exfiltration</td>
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<td></td>
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<td>• Insider threat</td>
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<td>• Social engineering</td>
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<td>• Social media</td>
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<table>
<thead>
<tr>
<th>2.5</th>
<th>Given a scenario, deploy mobile devices securely.</th>
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<tbody>
<tr>
<td>• Connection methods</td>
<td>• Screen locks</td>
</tr>
<tr>
<td>- Cellular</td>
<td>- Push notification services</td>
</tr>
<tr>
<td>- WiFi</td>
<td>- Passwords and pins</td>
</tr>
<tr>
<td>- SATCOM</td>
<td>- Biometrics</td>
</tr>
<tr>
<td>- Bluetooth</td>
<td>- Context-aware authentication</td>
</tr>
<tr>
<td>- NFC</td>
<td>- Containerization</td>
</tr>
<tr>
<td>- ANT</td>
<td>- Storage segmentation</td>
</tr>
<tr>
<td>- Infrared</td>
<td>- Full device encryption</td>
</tr>
<tr>
<td>- USB</td>
<td>• Enforcement and monitoring for:</td>
</tr>
<tr>
<td></td>
<td>- Third-party app stores</td>
</tr>
<tr>
<td></td>
<td>- Rooting/jailbreaking</td>
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<td>- Sideloaden</td>
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<td>- Custom firmware</td>
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<td></td>
<td>- Carrier unlocking</td>
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<td></td>
<td>- Firmware OTA updates</td>
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<tr>
<td></td>
<td>• Mobile device management concepts</td>
</tr>
<tr>
<td></td>
<td>- Application management</td>
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<td></td>
<td>- Content management</td>
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<td></td>
<td>- Remote wipe</td>
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<tr>
<td></td>
<td>- Geofencing</td>
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<td></td>
<td>- Geolocation</td>
</tr>
<tr>
<td>• Camera use</td>
<td>- Camera use</td>
</tr>
<tr>
<td>• SMS/MMS</td>
<td>- SMS/MMS</td>
</tr>
<tr>
<td>• External media</td>
<td>- External media</td>
</tr>
<tr>
<td>• USB OTG</td>
<td>- USB OTG</td>
</tr>
<tr>
<td>• Recording microphone</td>
<td>- Recording microphone</td>
</tr>
<tr>
<td>• GPS tagging</td>
<td>- GPS tagging</td>
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<tr>
<td>• WiFi direct/ad hoc</td>
<td>- WiFi direct/ad hoc</td>
</tr>
<tr>
<td>• Tethering</td>
<td>- Tethering</td>
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<tr>
<td>• Payment methods</td>
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<tr>
<td>• Deployment models</td>
<td>- BYOD</td>
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<td>- BYOD</td>
<td>- COPE</td>
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<tr>
<td>- CYOD</td>
<td>- Corporate-owned</td>
</tr>
<tr>
<td>- Corporate-owned</td>
<td>- VDI</td>
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<table>
<thead>
<tr>
<th>2.6</th>
<th>Given a scenario, implement secure protocols.</th>
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<tbody>
<tr>
<td>• Protocols</td>
<td>• SNIPv3</td>
</tr>
<tr>
<td>- DNSSEC</td>
<td>• SSL/TLS</td>
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<td>- SSH</td>
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<tr>
<td>- S/MIME</td>
<td>• Secure POP/IMAP</td>
</tr>
<tr>
<td>- SRTP</td>
<td>• Use cases</td>
</tr>
<tr>
<td>- LDAPS</td>
<td>- Voice and video</td>
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<tr>
<td>- FTPS</td>
<td>- Time synchronization</td>
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<td>- SFTP</td>
<td>- Email and web</td>
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<td>• File transfer</td>
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<td>• Directory services</td>
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<td>• Remote access</td>
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<td>• Domain name resolution</td>
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<td>• Routing and switching</td>
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<td>• Network address allocation</td>
</tr>
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<td>• Subscription services</td>
</tr>
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</table>
3.0 Architecture and Design

3.1 Explain use cases and purpose for frameworks, best practices and secure configuration guides.

- Industry-standard frameworks and reference architectures
  - Regulatory
  - Non-regulatory
  - National vs. international
  - Industry-specific frameworks
- Benchmarks/secure configuration guides
  - Platform/vendor-specific guides
    - Web server
    - Operating system
    - Application server
    - Network infrastructure devices
    - General purpose guides
- Defense-in-depth/layered security
  - Vendor diversity
  - Control diversity
    - Administrative
    - Technical
    - User training

3.2 Given a scenario, implement secure network architecture concepts.

- Zones/topologies
  - Screened subnet (previously known as demilitarized zone)
  - Extranet
  - Intranet
  - Wireless
  - Guest
  - Honeynets
  - NAT
  - Ad hoc
- Segregation/segmentation/isolation
  - Physical
  - Logical (VLAN)
  - Virtualization
  - Air gaps
- Tunneling/VPN
  - Site-to-site
  - Remote access
- Security device/technology placement
  - Sensors
  - Collectors
  - Correlation engines
  - Filters
  - Proxies
  - Firewalls
  - VPN concentrators
  - SSL accelerators
  - Load balancers
  - DDoS mitigator
  - Aggregation switches
  - Taps and port mirror
  - SDN

3.3 Given a scenario, implement secure systems design.

- Hardware/firmware security
  - FDE/SED
  - TPM
  - HSM
  - UEFI/BIOS
  - Secure boot and attestation
  - Supply chain
  - Hardware root of trust
  - EMI/EMP
- Operating systems
  - Types
    - Network
    - Server
  - Workstation
  - Appliance
  - Kiosk
  - Mobile OS
  - Patch management
  - Disabling unnecessary ports and services
  - Least functionality
  - Secure configurations
  - Trusted operating system
  - Application allow list/deny list
  - Disable default accounts/passwords
- Peripherals
  - Wireless keyboards
  - Wireless mice
  - Displays
  - WiFi-enabled MicroSD cards
  - Printers/MFDs
  - External storage devices
  - Digital cameras
3.4 Explain the importance of secure staging deployment concepts.

- Sandboxing
- Environment
  - Development
  - Test
- Staging
- Production
- Secure baseline
- Integrity measurement

3.5 Explain the security implications of embedded systems.

- SCADA/ICS
- Smart devices/IoT
  - Wearable technology
  - Home automation
- HVAC
- SoC
- RTOS
- Printers/MFDs
- Camera systems
- Special purpose
  - Medical devices
  - Vehicles
  - Aircraft/UAV

3.6 Summarize secure application development and deployment concepts.

- Development life-cycle models
  - Waterfall vs. Agile
- Secure DevOps
  - Security automation
  - Continuous integration
  - Baselining
  - Immutable systems
  - Infrastructure as code
- Version control and change management
- Provisioning and deprovisioning
- Secure coding techniques
  - Proper error handling
  - Proper input validation
  - Normalization
  - Stored procedures
  - Code signing
  - Encryption
  - Obfuscation/camouflage
  - Code reuse/dead code
  - Server-side vs. client-side execution and validation
- Memory management
- Use of third-party libraries and SDKs
- Data exposure
- Code quality and testing
  - Static code analyzers
  - Dynamic analysis (e.g., fuzzing)
  - Stress testing
  - Sandboxing
  - Model verification
- Compiled vs. runtime code

3.7 Summarize cloud and virtualization concepts.

- Hypervisor
  - Type I
  - Type II
  - Application cells/containers
- VM sprawl avoidance
- VM escape protection
- Cloud storage
- Cloud deployment models
  - SaaS
  - PaaS
  - IaaS
  - Private
  - Public
  - Hybrid
  - Community
- On-premise vs. hosted vs. cloud
- VDI/VDE
- Cloud access security broker
- Security as a service
3.8 Explain how resiliency and automation strategies reduce risk.

- **Automation/scripting**
  - Automated courses of action
  - Continuous monitoring
  - Configuration validation

- **Templates**
- **Master image**

- **Non-persistence**
  - Snapshots
  - Revert to known state
  - Rollback to known configuration
  - Live boot media

- **Elasticity**

- **Scalability**
- **Distributive allocation**
- **Redundancy**
- **Fault tolerance**
- **High availability**
- **RAID**

3.9 Explain the importance of physical security controls.

- **Lighting**
- **Signs**
- **Fencing/gate/cage**
- **Security guards**
- **Alarms**
- **Safe**
- **Secure cabinets/enclosures**
- **Protected distribution/Protected cabling**
- **Airgap**
- **Access control vestibule**
- **Faraday cage**
- **Lock types**
- **Biometrics**
- **Barricades/bollards**
- **Tokens/cards**

- **Environmental controls**
  - HVAC
  - Hot and cold aisles
  - Fire suppression

- **Cable locks**
- **Screen filters**
- **Cameras**
- **Motion detection**
- **Logs**
- **Infrared detection**
- **Key management**
4.0 Identity and Access Management

4.1 Compare and contrast identity and access management concepts

- Identification, authentication, authorization and accounting (AAA)
- Multifactor authentication
  - Something you are
  - Something you have
  - Something you know
  - Somewhere you are
  - Something you do
- Federation
  - Single sign-on
  - Transitive trust

4.2 Given a scenario, install and configure identity and access services.

- LDAP
- Kerberos
- TACACS+
- CHAP
- PAP
- MSCHAP
- RADIUS
- SAML
- OpenID Connect
- OAuth
- Shibboleth
- Secure token
- NTLM

4.3 Given a scenario, implement identity and access management controls.

- Access control models
  - MAC
  - DAC
  - ABAC
  - Role-based access control
  - Rule-based access control
- Physical access control
  - Proximity cards
  - Smart cards
- Biometric factors
  - Fingerprint scanner
  - Retinal scanner
  - Iris scanner
  - Voice recognition
  - Facial recognition
  - False acceptance rate
  - False rejection rate
  - Crossover error rate
- Tokens
  - Hardware
  - Software
  - HOTP/TOTP
- Certificate-based authentication
  - PIV/CAC/smart card
  - IEEE 802.1x
- File system security
- Database security

4.4 Given a scenario, differentiate common account management practices.

- Account types
  - User account
  - Shared and generic accounts/credentials
  - Guest accounts
  - Service accounts
  - Privileged accounts
- General Concepts
  - Least privilege
  - Onboarding/offboarding
- Account policy enforcement
  - Credential management
  - Permission auditing and review
  - Usage auditing and review
  - Time-of-day restrictions
  - Recertification
  - Standard naming convention
  - Account maintenance
  - Group-based access control
  - Location-based policies
- Group policy
- Password complexity
- Expiration
- Recovery
- Disablement
- Lockout
- Password history
- Password reuse
- Password length
5.0 Risk Management

5.1 Explain the importance of policies, plans and procedures related to organizational security.

- Standard operating procedure
- Agreement types
  - BPA
  - SLA
  - ISA
  - MOU/MOA
- Personnel management
  - Mandatory vacations
  - Job rotation
  - Separation of duties
- Clean desk
- Background checks
- Exit interviews
- Role-based awareness training
  - Data owner
  - Systems administrator
  - System owner
  - User
  - Privileged user
  - Executive user
- NDA
- Onboarding
- Continuing education
- Acceptable use policy/rules of behavior
- Adverse actions
- General security policies
  - Social media networks/applications
  - Personal email

5.2 Summarize business impact analysis concepts.

- RTO/RPO
- MTBF
- MTTR
- Mission-essential functions
- Identification of critical systems
- Single point of failure
- Impact
  - Life
  - Property
  - Safety
- Finance
- Reputation
- Privacy impact assessment
- Privacy threshold assessment

5.3 Explain risk management processes and concepts.

- Threat assessment
  - Environmental
  - Artificial/manufactured
  - Internal vs. external
- Risk assessment
  - SLE
  - ALE
  - ARO
  - Asset value
  - Risk register
- Likelihood of occurrence
- Supply chain assessment
- Impact
- Quantitative
- Qualitative
- Testing
  - Penetration testing authorization
  - Vulnerability testing authorization
- Risk response techniques
  - Accept
  - Transfer
  - Avoid
  - Mitigate
- Change management
5.0 Risk Management

5.4 Given a scenario, follow incident response procedures.

- Incident response plan
  - Documented incident types/category definitions
  - Roles and responsibilities
  - Reporting requirements/escalation

- Cyber-incident response teams
- Exercise
- Incident response process
  - Preparation
  - Identification

- Containment
- Eradication
- Recovery
- Lessons learned

5.5 Summarize basic concepts of forensics.

- Order of volatility
- Chain of custody
- Legal hold
- Data acquisition
  - Capture system image
  - Network traffic and logs

- Capture video
- Record time offset
- Take hashes
- Screenshots
- Witness interviews
  - Preservation

- Recovery
- Strategic intelligence/counterintelligence gathering
  - Active logging
  - Track person hours

5.6 Explain disaster recovery and continuity of operations concepts.

- Recovery sites
  - Hot site
  - Warm site
  - Cold site

- Order of restoration
- Backup concepts
  - Differential
  - Incremental

- Snapshots
- Full
- Geographic considerations
  - Off-site backups
  - Distance
  - Location selection
  - Legal implications
  - Data sovereignty

- Continuity of operations planning
  - Exercises/tabletop
  - After-action reports
  - Failover
  - Alternate processing sites
  - Alternate business practices

5.7 Compare and contrast various types of controls.

- Deterrent
- Preventive
- Detective

- Corrective
- Compensating
- Technical

- Administrative
- Physical

5.8 Given a scenario, carry out data security and privacy practices.

- Data destruction and media sanitization
  - Burning
  - Shredding
  - Pulping
  - Pulverizing
  - Degaussing
  - Purging
  - Wiping

- Data sensitivity labeling and handling
  - Confidential
  - Private
  - Public
  - Proprietary
  - PII
  - PHI

- Data roles
  - Owner
  - Steward/custodian
  - Privacy officer

- Data retention
- Legal and compliance
6.0 Cryptography and PKI

6.1 Compare and contrast basic concepts of cryptography.

- Symmetric algorithms
- Modes of operation
- Asymmetric algorithms
- Hashing
- Salt, IV, nonce
- Elliptic curve
- Weak/deprecated algorithms
- Key exchange
- Digital signatures
- Diffusion
- Confusion
- Collision
- Steganography
- Obfuscation
- Stream vs. block
- Key strength
- Session keys
- Ephemeral key
- Secret algorithm
- Data-in-transit
- Data-at-rest
- Data-in-use
- Random/pseudo-random number generation
- Key stretching
- Implementation vs. algorithm selection
  - Crypto service provider
  - Crypto modules
- Perfect forward secrecy
- Security through obscurity
- Common use cases
  - Low power devices
  - Low latency
  - High resiliency
  - Supporting confidentiality
  - Supporting integrity
  - Supporting obfuscation
  - Supporting authentication
  - Supporting non-repudiation
  - Resource vs. security constraints

6.2 Explain cryptography algorithms and their basic characteristics.

- Symmetric algorithms
  - AES
  - DES
  - 3DES
  - RC4
  - Blowfish/Twofish
- Cipher modes
  - CBC
  - GCM
  - ECB
  - CTR
  - Stream vs. block
- Asymmetric algorithms
  - RSA
  - DSA
  - Diffie-Hellman
  - Groups
  - DHE
  - ECDHE
- Key stretching algorithms
  - BCRYPT
  - PBKDF2
- Hashing algorithms
  - MD5
  - SHA
  - HMAC
  - RIPEMD
- Obfuscation
  - XOR
  - ROT13
  - Substitution ciphers
6.3 Given a scenario, install and configure wireless security settings.

- **Cryptographic protocols**
  - WPA
  - WPA2
  - CCMP
  - TKIP

- **Authentication protocols**
  - EAP
  - PEAP
  - EAP-FAST
  - EAP-TLS
  - EAP-TTLS

- **Methods**
  - IEEE 802.1x
  - RADIUS Federation

- **Components**
  - CA
  - Intermediate CA
  - CRL
  - OCSP
  - CSR
  - Certificate
  - Public key
  - Private key
  - Object identifiers (OID)

- **Concepts**
  - Online vs. offline CA

- **Types of certificates**
  - Wildcard
  - SAN
  - Code signing
  - Self-signed
  - Machine/computer
  - Email

- **Certificate formats**
  - DER
  - PEM
  - PFX
  - CER
  - P12
  - P7B

6.4 Given a scenario, implement public key infrastructure.

- **Components**
  - CA
  - Intermediate CA
  - CRL
  - OCSP
  - CSR
  - Certificate
  - Public key
  - Private key
  - Object identifiers (OID)

- **Concepts**
  - Online vs. offline CA

- **Methods**
  - PSK vs. Enterprise vs. Open
  - WPS
  - Captive portals

- **Types of certificates**
  - Wildcard
  - SAN
  - Code signing
  - Self-signed
  - Machine/computer
  - Email

- **Certificate formats**
  - DER
  - PEM
  - PFX
  - CER
  - P12
  - P7B
# CompTIA Security+ Acronyms

The following is a list of acronyms that appear on the CompTIA Security+ exam. Candidates are encouraged to review the complete list and attain a working knowledge of all listed acronyms as part of a comprehensive exam preparation program.

<table>
<thead>
<tr>
<th>ACRONYM</th>
<th>SPELLED OUT</th>
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<tbody>
<tr>
<td>3DES</td>
<td>Triple Digital Encryption Standard</td>
</tr>
<tr>
<td>AAA</td>
<td>Authentication, Authorization, and Accounting</td>
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<td>ABAC</td>
<td>Attribute-based Access Control</td>
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<td>ACL</td>
<td>Access Control List</td>
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<td>AES</td>
<td>Advanced Encryption Standard</td>
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<td>AES256</td>
<td>Advanced Encryption Standards 256bit</td>
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<td>AH</td>
<td>Authentication Header</td>
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<td>ALE</td>
<td>Annualized Loss Expectancy</td>
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<tr>
<td>AP</td>
<td>Access Point</td>
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<td>API</td>
<td>Application Programming Interface</td>
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<td>APT</td>
<td>Advanced Persistent Threat</td>
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<td>ARO</td>
<td>Annualized Rate of Occurrence</td>
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<td>ARP</td>
<td>Address Resolution Protocol</td>
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<td>ASLR</td>
<td>Address Space Layout Randomization</td>
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<td>Application Service Provider</td>
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<td>Acceptable Use Policy</td>
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<td>Antivirus</td>
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<td>Asset Value</td>
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<td>Business Impact Analysis</td>
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<td>Basic Input/Output System</td>
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<td>Business Partners Agreement</td>
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<td>BPDU</td>
<td>Bridge Protocol Data Unit</td>
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<td>BYOD</td>
<td>Bring Your Own Device</td>
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<td>CA</td>
<td>Certificate Authority</td>
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<tr>
<td>CAC</td>
<td>Common Access Card</td>
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<tr>
<td>CAN</td>
<td>Controller Area Network</td>
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<tr>
<td>CAPTCHA</td>
<td>Completely Automated Public Turing Test to Tell Computers and Humans Apart</td>
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<td>CAR</td>
<td>Corrective Action Report</td>
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<td>CASB</td>
<td>Cloud Access Security Broker</td>
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<td>CBC</td>
<td>Cipher Block Chaining</td>
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<td>CCMP</td>
<td>Counter-Mode/CBC-Mac Protocol</td>
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<td>CCTV</td>
<td>Closed-circuit Television</td>
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<td>CER</td>
<td>Certificate</td>
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<td>CER</td>
<td>Cross-over Error Rate</td>
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<td>CERT</td>
<td>Computer Emergency Response Team</td>
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<td>CFB</td>
<td>Cipher Feedback</td>
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<td>CHAP</td>
<td>Challenge Handshake Authentication Protocol</td>
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<td>CIO</td>
<td>Chief Information Officer</td>
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<td>CIRT</td>
<td>Computer Incident Response Team</td>
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<td>CMS</td>
<td>Content Management System</td>
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<td>COOP</td>
<td>Continuity of Operations Plan</td>
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<td>COPE</td>
<td>Corporate Owned, Personally Enabled</td>
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<td>CP</td>
<td>Contingency Planning</td>
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<td>Cyclic Redundancy Check</td>
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<td>Computer Incident Response Team</td>
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<td>Chief Security Officer</td>
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<td>CSP</td>
<td>Cloud Service Provider</td>
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<td>CSR</td>
<td>Certificate Signing Request</td>
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<td>CSRF</td>
<td>Cross-site Request Forgery</td>
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<td>CSU</td>
<td>Channel Service Unit</td>
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<td>CTM</td>
<td>Counter-Mode</td>
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<td>CTO</td>
<td>Chief Technology Officer</td>
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<tr>
<td>CTR</td>
<td>Counter</td>
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<tr>
<td>CYOD</td>
<td>Choose Your Own Device</td>
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<tr>
<td>DAC</td>
<td>Discretionary Access Control</td>
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<td>DBA</td>
<td>Database Administrator</td>
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<td>DDoS</td>
<td>Distributed Denial of Service</td>
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<td>DEP</td>
<td>Data Execution Prevention</td>
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<td>DER</td>
<td>Distinguished Encoding Rules</td>
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<tr>
<td>DES</td>
<td>Digital Encryption Standard</td>
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<td>DFIR</td>
<td>Digital Forensics and Investigation Response</td>
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<td>DHCP</td>
<td>Dynamic Host Configuration Protocol</td>
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<td>DHE</td>
<td>Data-Handling Electronics</td>
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<td>DHE</td>
<td>Diffie-Hellman Ephemeral</td>
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<td>DLL</td>
<td>Dynamic Link Library</td>
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<tr>
<td>DLP</td>
<td>Data Loss Prevention</td>
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CompTIA Security+ Certification Exam Objectives Version 7.0 (Exam Number: SY0-501)
<table>
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<th>SPELLED OUT</th>
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<tr>
<td>DMZ</td>
<td>Demilitarized Zone</td>
<td>IaaS</td>
<td>Infrastructure as a Service</td>
</tr>
<tr>
<td>DNAT</td>
<td>Destination Network Address Translation</td>
<td>ICMP</td>
<td>Internet Control Message Protocol</td>
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<td>DNS</td>
<td>Domain Name Service (Server)</td>
<td>ICS</td>
<td>Industrial Control Systems</td>
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<td>DoS</td>
<td>Denial of Service</td>
<td>ID</td>
<td>Identification</td>
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<td>DRP</td>
<td>Disaster Recovery Plan</td>
<td>IDEA</td>
<td>International Data Encryption Algorithm</td>
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<td>DSA</td>
<td>Digital Signature Algorithm</td>
<td>IDF</td>
<td>Intermediate Distribution Frame</td>
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<td>DSL</td>
<td>Digital Subscriber Line</td>
<td>IdP</td>
<td>Identity Provider</td>
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<td>Data Service Unit</td>
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<td>Intrusion Detection System</td>
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<td>EAP</td>
<td>Extensible Authentication Protocol</td>
<td>IEEE</td>
<td>Institute of Electrical and Electronic Engineers</td>
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<td>ECB</td>
<td>Electronic Code Book</td>
<td>IIS</td>
<td>Internet Information System</td>
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<td>Elliptic Curve Cryptography</td>
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<td>Exposure Factor</td>
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<td>Internet of Things</td>
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<td>Internet Protocol</td>
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<td>Electromagnetic Interference</td>
<td>IPSec</td>
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<td>Electro Magnetic Pulse</td>
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<td>Incident Response Plan</td>
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<td>Electronic Serial Number</td>
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<td>Interconnection Security Agreement</td>
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<td>Encapsulated Security Payload</td>
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<td>False Acceptance Rate</td>
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<td>Initialization Vector</td>
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<td>False Rejection Rate</td>
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<td>File Transfer Protocol</td>
<td>L2TP</td>
<td>Layer 2 Tunneling Protocol</td>
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<td>FTP over SSL</td>
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<td>Galois Counter Mode</td>
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<td>Lightweight Directory Access Protocol</td>
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<td>Gnu Privacy Guard</td>
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<td>Lightweight Extensible Authentication Protocol</td>
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<td>Group Policy Object</td>
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<td>Monitoring as a Service</td>
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<td>Global Positioning System</td>
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<td>Mandatory Access Control</td>
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<td>Graphic Processing Unit</td>
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<td>Media Access Control</td>
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<td>Generic Routing Encapsulation</td>
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<td>Message Authentication Code</td>
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<td>Hard Disk Drive</td>
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<td>Master Boot Record</td>
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<td>Host-based Intrusion Detection System</td>
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<td>Host-based Intrusion Prevention System</td>
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<td>Main Distribution Frame</td>
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<td>Hashed Message Authentication Code</td>
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<td>Mobile Device Management</td>
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<td>HMAC-based One-Time Password</td>
<td>MFA</td>
<td>Multifactor Authentication</td>
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<td>Hardware Security Module</td>
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<td>Multi-function Device</td>
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<td>Hypertext Markup Language</td>
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<td>Multipurpose Internet Mail Exchange</td>
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<td>Hypertext Transfer Protocol</td>
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<td>Multimedia Message Service</td>
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<td>Hypertext Transfer Protocol over SSL/TLS</td>
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<td>Memorandum of Agreement</td>
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<td>Heating, Ventilation and Air Conditioning</td>
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<td>MOTD</td>
<td>Message of the Day</td>
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<td>MOU</td>
<td>Memorandum of Understanding</td>
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<td>MPLS</td>
<td>Multi-Protocol Label Switching</td>
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<td>MSCHAP</td>
<td>Microsoft Challenge Handshake Authentication Protocol</td>
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<td>MSP</td>
<td>Managed Service Provider</td>
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<td>MTBF</td>
<td>Mean Time Between Failures</td>
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<td>MTTF</td>
<td>Mean Time to Failure</td>
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<td>MTTR</td>
<td>Mean Time to Recover or Mean Time to Repair</td>
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<td>Maximum Transmission Unit</td>
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<td>Non-disclosure Agreement</td>
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<td>NFC</td>
<td>Near Field Communication</td>
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<td>Next Generation Access Control</td>
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<td>National Institute of Standards &amp; Technology</td>
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<td>New Technology LAN Manager</td>
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<td>Network Time Protocol</td>
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<td>Secure Hashing Algorithm</td>
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<td>Virtual Desktop Infrastructure</td>
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<td>Variable Length Subnet Masking</td>
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<td>Virtual Machine</td>
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<td>Service Level Agreement</td>
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<td>Voice over IP</td>
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<td>Single Loss Expectancy</td>
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<td>Server Message Block</td>
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<td>Video Teleconferencing</td>
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<td>Short Message Service</td>
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<td>Simple Mail Transfer Protocol</td>
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<td>Wireless Access Point</td>
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<td>Simple Mail Transfer Protocol Secure</td>
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<td>Wired Equivalent Privacy</td>
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<td>Solid State Drive</td>
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<td>Exclusive Or</td>
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<td>TCO</td>
<td>Total Cost of Ownership</td>
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<td>TCP/IP</td>
<td>Transmission Control Protocol/Internet Protocol</td>
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<td>TGT</td>
<td>Ticket Granting Ticket</td>
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<td>Temporal Key Integrity Protocol</td>
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<td>Transport Layer Security</td>
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<td>Time-based One-time Password</td>
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<td>Trusted Platform Module</td>
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<td>Transaction Signature</td>
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<td>User Acceptance Testing</td>
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<td>User Datagram Protocol</td>
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<td>UEFI</td>
<td>Unified Extensible Firmware Interface</td>
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<td>UPS</td>
<td>Uninterruptable Power Supply</td>
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<td>URI</td>
<td>Uniform Resource Identifier</td>
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<td>URL</td>
<td>Universal Resource Locator</td>
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<tr>
<td>USB</td>
<td>Universal Serial Bus</td>
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Security+ Proposed Hardware and Software List

CompTIA has included this sample list of hardware and software to assist candidates as they prepare for the Security+ exam. This list may also be helpful for training companies that wish to create a lab component to their training offering. The bulleted lists below each topic are sample lists and not exhaustive.

**EQUIPMENT**
- Router
- Firewall
- Access point
- Switch
- IDS/IPS
- Server
- Content filter
- Client
- Mobile device
- VPN concentrator
- UTM
- Enterprise security managers/SIEM suite
- Load balancer
- Proxies
- DLP appliance
- ICS or similar systems
- Network access control servers
- DDoS mitigation hardware

**HARDWARE TOOLS**
- WiFi analyzers
- Hardware debuggers

**SOFTWARE TOOLS AND SOFTWARE TOOLS**
- Exploitation distributions (e.g., Kali)
- Proxy server
- Virtualization software
- Virtualized appliances
- Wireshark
- tcpdump
- NMAP
- OpenVAS
- Metasploit/Metaspoitable2
- Back Orifice
- Cain & Abel
- John the Ripper
- pfSense
- Security Onion
- Roo
- Any UTM

**SPARE PARTS/HARDWARE**
- Keyboards
- Mice
- Network cables
- Monitors
- Wireless and Bluetooth dongles

**OTHER**
- SourceForge