CompTIA Security+ Certification Exam Objectives

EXAM NUMBER: SY0-601
About the Exam

Candidates are encouraged to use this document to help prepare for the CompTIA Security+ (SY0-601) certification exam. The CompTIA Security+ certification exam will verify the successful candidate has the knowledge and skills required to:

• Assess the security posture of an enterprise environment and recommend and implement appropriate security solutions
• Monitor and secure hybrid environments, including cloud, mobile, and IoT
• Operate with an awareness of applicable laws and policies, including principles of governance, risk, and compliance
• Identify, analyze, and respond to security events and incidents

This is equivalent to two years of hands-on experience working in a security/systems administrator job role.

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

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 testing exam objectives. Please know that all related exam preparation materials will still be valid.
TEST DETAILS

Required exam SY0-601
Number of questions Maximum of 90
Types of questions Multiple choice and performance-based
Length of test 90 minutes
Recommended experience
• At least 2 years of work experience in IT systems administration with a focus on security
• Hands-on technical information security experience
• Broad knowledge of security concepts
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 Attacks, Threats, and Vulnerabilities</td>
<td>24%</td>
</tr>
<tr>
<td>2.0 Architecture and Design</td>
<td>21%</td>
</tr>
<tr>
<td>3.0 Implementation</td>
<td>25%</td>
</tr>
<tr>
<td>4.0 Operations and Incident Response</td>
<td>16%</td>
</tr>
<tr>
<td>5.0 Governance, Risk, and Compliance</td>
<td>14%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
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</tbody>
</table>
1.0 Threats, Attacks, and Vulnerabilities

1.1 Compare and contrast different types of social engineering techniques.

- Phishing
- Smishing
- Vishing
- Spam
- Spear phishing
- Dumpster diving
- Shoulder surfing
- Pharming
- Tailgating
- Eliciting information
- Whaling
- Prepending
- Identity fraud
- Invoice scams
- Credential harvesting
- Reconnaissance
- Hoax
- Impersonation
- Watering hole attack
- Typo squatting
- Pretexting
- Influence campaigns
  - Hybrid warfare
- Social media
- Principles (reasons for effectiveness)
  - Authority
  - Intimidation
  - Consensus
  - Scarcity
  - Familiarity
  - Trust
  - Urgency

1.2 Given a scenario, analyze potential indicators to determine the type of attack.

- Malware
  - Ransomware
  - Trojans
  - Worms
  - Potentially unwanted programs (PUPs)
  - Fileless virus
  - Command and control
  - Bots
  - Cryptomalware
  - Logic bombs
  - Spyware
  - Keyloggers
  - Remote access Trojan (RAT)
  - Rootkit
  - Backdoor
- Password attacks
  - Spraying
  - Dictionary
  - Brute force
  - Offline
  - Online
  - Rainbow tables
  - Plaintext/unencrypted
- Physical attacks
  - Malicious universal serial bus (USB) cable
  - Malicious flash drive
  - Card cloning
  - Skimming
- Adversarial artificial intelligence (AI)
  - Tainted training data for machine learning (ML)
  - Security of machine learning algorithms
- Supply-chain attacks
- Cloud-based vs. on-premises attacks
- Cryptographic attacks
  - Birthday
  - Collision
  - Downgrade
1.3 Given a scenario, analyze potential indicators associated with application attacks.

- Privilege escalation
- Cross-site scripting
- Injections
  - Structured query language (SQL)
  - Dynamic link library (DLL)
  - Lightweight directory access protocol (LDAP)
  - Extensible markup language (XML)
- Pointer/object dereference
- Directory traversal
- Buffer overflows
- Race conditions
  - Time of check/time of use
- Error handling
- Improper input handling
- Replay attack
  - Session replays
- Integer overflow
- Request forgeries
  - Server-side
  - Client-side
  - Cross-site
- Application programming interface (API) attacks
- Resource exhaustion
- Memory leak
- Secure sockets layer (SSL) stripping
- Driver manipulation
  - Shimming
  - Refactoring
- Pass the hash

1.4 Given a scenario, analyze potential indicators associated with network attacks.

- Wireless
  - Evil twin
  - Rogue access point
  - Bluesnarfing
  - Bluejacking
  - Disassociation
  - Jamming
  - Radio frequency identifier (RFID)
  - Near-field communication (NFC)
  - Initialization vector (IV)
- Man-in-the-middle
- Man-in-the-browser
- Layer 2 attacks
  - Address resolution protocol (ARP) poisoning
  - Media access control (MAC) flooding
  - MAC cloning
- Domain name system (DNS)
  - Domain hijacking
  - DNS poisoning
  - Universal resource locator (URL) redirection
- Domain reputation
- Distributed denial-of-service (DDoS)
  - Network
  - Application
  - Operational technology (OT)
- Malicious code or script execution
  - PowerShell
  - Python
  - Bash
  - Macros
  - Virtual Basic for Applications (VBA)
1.5 Explain different threat actors, vectors, and intelligence sources.

- **Actors and threats**
  - Advanced persistent threat (APT)
  - Insider threats
  - State actors
  - Hacktivists
  - Script kiddies
  - Criminal syndicates
  - Hackers
    - White hat
    - Black hat
    - Gray hat
  - Shadow IT
  - Competitors

- **Attributes of actors**
  - Internal/external
  - Level of sophistication/capability
  - Resources/funding
  - Intent/motivation

- **Vectors**
  - Direct access
  - Wireless
  - Email
  - Supply chain
  - Social media
  - Removable media
  - Cloud

- **Threat intelligence sources**
  - Open source intelligence (OSINT)
  - Closed/proprietary
  - Vulnerability databases
  - Public/private information-sharing centers
  - Dark web
  - Indicators of compromise

- **Research sources**
  - Vendor websites
  - Vulnerability feeds
  - Conferences
  - Academic journals
  - Request for comments (RFC)
  - Local industry groups
  - Social media
  - Threat feeds
  - Adversary tactics, techniques, and procedures (TTP)

1.6 Explain the security concerns associated with various types of vulnerabilities.

- **Cloud-based vs. on-premises vulnerabilities**
- **Zero-day**
- **Weak configurations**
  - Open permissions
  - Unsecure root accounts
  - Errors
  - Weak encryption
  - Unsecure protocols
  - Default settings
  - Open ports and services

- **Third-party risks**
  - Vendor management
    - System integration
    - Lack of vendor support
  - Supply chain
  - Outsourced code development
  - Data storage

- **Improper or weak patch management**
  - Firmware
  - Operating system (OS)
  - Applications

- **Legacy platforms**
- **Impacts**
  - Data loss
  - Data breaches
  - Data exfiltration
  - Identity theft
  - Financial
  - Reputation
  - Availability loss
1.7 Summarize the techniques used in security assessments.

- **Threat hunting**
  - Intelligence fusion
  - Threat feeds
  - Advisories and bulletins
  - Maneuver

- **Vulnerability scans**
  - False positives
  - False negatives
  - Log reviews
  - Credentialed vs. non-credentialed
  - Intrusive vs. non-intrusive
  - Application
  - Web application
  - Network
  - Common Vulnerabilities and Exposures (CVE)/Common Vulnerability Scoring System (CVSS)
  - Configuration review

- **Syslog/Security information and event management (SIEM)**
  - Review reports
  - Packet capture
  - Data inputs
  - User behavior analysis
  - Sentiment analysis
  - Security monitoring
  - Log aggregation
  - Log collectors

- **Security orchestration, automation, and response (SOAR)**

1.8 Explain the techniques used in penetration testing.

- **Penetration testing**
  - White-box
  - Black-box
  - Gray-box
  - Rules of engagement
  - Lateral movement
  - Privilege escalation
  - Persistence
  - Cleanup
  - Bug bounty
  - Pivoting

- **Passive and active reconnaissance**
  - Drones/unmanned aerial vehicle (UAV)
  - War flying
  - War driving
  - Footprinting
  - OSINT

- **Exercise types**
  - Red-team
  - Blue-team
  - White-team
  - Purple-team
2.0 Architecture and Design

2.1 Explain the importance of security concepts in an enterprise environment.

- Configuration management
  - Diagrams
  - Baseline configuration
  - Standard naming conventions
  - Internet protocol (IP) schema
- Data sovereignty
- Data protection
  - Data loss prevention (DLP)
  - Masking
  - Encryption
  - At rest
  - In transit/motion
  - In processing
  - Tokenization
  - Rights management
- Hardware security module (HSM)
- Geographical considerations
- Cloud access security broker (CASB)
- Response and recovery controls
- Secure Sockets Layer (SSL)/Transport Layer Security (TLS) inspection
- Hashing
- API considerations
- Site resiliency
  - Hot site
  - Cold site
  - Warm site
- Deception and disruption
  - Honeypots
  - Honeyfiles
  - Honeynets
  - Fake telemetry
  - DNS sinkhole

2.2 Summarize virtualization and cloud computing concepts.

- Cloud models
  - Infrastructure as a service (IaaS)
  - Platform as a service (PaaS)
  - Software as a service (SaaS)
  - Anything as a service (XaaS)
  - Public
  - Community
  - Private
  - Hybrid
- Managed service provider (MSP)/managed security service provider (MSSP)
- On-premises vs. off-premises
- Fog computing
- Edge computing
- Thin client
- Containers
- Microservices/API
- Infrastructure as code
  - Software-defined networking (SDN)
  - Software-defined visibility (SDV)
- Serverless architecture
- Services integration
- Resource policies
- Transit gateway
- Virtualization
  - Virtual machine (VM)
  - sprawl avoidance
  - VM escape protection
2.3 Summarize secure application development, deployment, and automation concepts.

- Environment
  - Development
  - Test
  - Staging
  - Production
  - Quality assurance (QA)
- Provisioning and deprovisioning
- Integrity measurement
- Secure coding techniques
  - Normalization
  - Stored procedures
  - Obfuscation/camouflage
- Code reuse/dead code
- Server-side vs. client-side execution and validation
- Memory management
- Use of third-party libraries and software development kits (SDKs)
- Data exposure
- Authentication and authorization design concepts.
- Open Web Application Security Project (OWASP)
- Software diversity
  - Compiler
  - Binary
- Automation/scripting
  - Automated courses of action
  - Continuous monitoring
  - Continuous validation
  - Continuous integration
  - Continuous delivery
  - Continuous deployment
- Elasticity
- Scalability
- Version control

2.4 Summarize authentication and authorization design concepts.

- Authentication methods
  - Directory services
  - Federation
  - Attestation
  - Technologies
    - Time-based one-time password (TOTP)
    - HMAC-based one-time password (HOTP)
    - Short message service (SMS)
    - Token key
    - Static codes
    - Authentication applications
    - Push notifications
    - Phone call
    - Smart card authentication
- Biometrics
  - Fingerprint
  - Retina
  - Iris
  - Facial
  - Voice
  - Vein
  - Gait analysis
  - Efficacy rates
  - False acceptance
  - False rejection
  - Crossover error rate
- Multifactor authentication (MFA) factors and attributes
  - Factors
    - Something you know
    - Something you have
    - Something you are
  - Attributes
    - Somewhere you are
    - Something you can do
    - Something you exhibit
    - Someone you know
- Authentication, authorization, and accounting (AAA)
- Cloud vs. on-premises requirements
Given a scenario, implement cybersecurity resilience.

- **Redundancy**
  - Geographic dispersal
  - Disk
    - Redundant array of inexpensive disks (RAID) levels
  - Multipath
  - Network
    - Load balancers
  - Network interface card (NIC) teaming
  - Power
    - Uninterruptible power supply (UPS)
  - Generator
  - Dual supply
  - Managed power distribution units (PDUs)

- **Replication**
  - Storage area network
  - VM

- **On-premises vs. cloud**

- **Backup types**
  - Full
  - Incremental
  - Snapshot
  - Differential
  - Tape
  - Disk
  - Copy
  - Network-attached storage (NAS)
  - Storage area network
  - Cloud
  - Image
  - Online vs. offline

- **Non-persistence**
  - Offsite storage
  - Distance considerations

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- **Embedded systems**
  - Raspberry Pi
  - Field-programmable gate array (FPGA)
  - Arduino

- **Supervisory control and data acquisition (SCADA)/industrial control system (ICS)**
  - Facilities
  - Industrial
  - Manufacturing
  - Energy
  - Logistics

- **Internet of Things (IoT)**
  - Sensors
  - Smart devices
  - Wearables
  - Facility automation
  - Weak defaults

- **Specialized**
  - Medical systems
  - Vehicles
  - Aircraft
  - Smart meters
  - Voice over IP (VoIP)
  - Heating, ventilation, air conditioning (HVAC)
  - Drones/AVs
  - Multifunction printer (MFP)
  - Real-time operating system (RTOS)
  - Surveillance systems
  - System on chip (SoC)
  - Communication considerations
    - 5G
    - Narrow-band
    - Baseband radio

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- **Constraints**
  - Power
  - Compute
  - Network
  - Crypto
  - Inability to patch
  - Authentication
  - Range
  - Cost
  - Implied trust

2.0 Architecture and Design
2.7 Explain the importance of physical security controls.

- Bollards/barricades
- Mantraps
- Badges
- Alarms
- Signage
- Cameras
  - Motion recognition
  - Object detection
- Closed-circuit television (CCTV)
- Industrial camouflage
- Personnel
  - Guards
  - Robot sentries
  - Reception
  - Two-person integrity/control
- Locks
  - Biometrics
  - Electronic
  - Physical
  - Cable locks
- USB data blocker
- Lighting
- Fencing
- Fire suppression
- Sensors
  - Motion detection
  - Noise detection
  - Proximity reader
  - Moisture detection
  - Cards
  - Temperature
- Drones/UAV
- Visitor logs
- Faraday cages
- Air gap
- Demilitarized zone (DMZ)
- Protected cable distribution
- Secure areas
  - Air gap
  - Vault
  - Safe
  - Hot aisle
  - Cold aisle
- Secure data destruction
  - Burning
  - Shredding
  - Pulping
  - Pulverizing
  - Degaussing
  - Third-party solutions

2.8 Summarize the basics of cryptographic concepts.

- Digital signatures
- Key length
- Key stretching
- Salting
- Hashing
- Key exchange
- Elliptic-curve cryptography
- Perfect forward secrecy
- Quantum
  - Communications
  - Computing
- Post-quantum
- Ephemeral
- Modes of operation
  - Authenticated
  - Unauthenticated
  - Counter
- Blockchain
  - Public ledgers
- Cipher suites
  - Stream
  - Block
- Symmetric vs. asymmetric
- Lightweight cryptography
- Steganography
  - Audio
  - Video
  - Image
- Homomorphic encryption
- 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
- Limitations
  - Speed
  - Size
  - Weak keys
  - Time
  - Longevity
  - Predictability
  - Reuse
  - Entropy
  - Computational overheads
  - Resource vs. security constraints
3.0 Implementation

3.1 Given a scenario, implement secure protocols.

- **Protocols**
  - Domain Name System Security Extension (DNSSEC)
  - SSH
  - Secure/Multipurpose Internet Mail Extensions (S/MIME)
  - Secure Real-time Protocol (SRTP)
  - Lightweight Directory Access Protocol Over SSL (LDAPS)
  - File Transfer Protocol, Secure (FTPS)
  - SSH File Transfer Protocol (SFTP)
  - Simple Network Management Protocol, version 3 (SNMPv3)
  - Hypertext transfer protocol over SSL/TLS (HTTPS)
  - IPSec
    - Authentication header (AH)/Encapsulating Security Payloads (ESP)
    - Tunnel/transport
  - Secure Post Office Protocol (POP)/Internet Message Access Protocol (IMAP)
- **Use cases**
  - Voice and video
  - Time synchronization
  - Email and web
  - File transfer
  - Directory services
  - Remote access
  - Domain name resolution
  - Routing and switching
  - Network address allocation
  - Subscription services

3.2 Given a scenario, implement host or application security solutions.

- **Endpoint protection**
  - Antivirus
  - Anti-malware
  - Endpoint detection and response (EDR)
  - DLP
  - Next-generation firewall (NGFW)
  - Host-based intrusion prevention system (HIPS)
  - Host-based intrusion detection system (HIDS)
  - Host-based firewall
- **Boot integrity**
  - Boot security/Unified Extensible Firmware Interface (UEFI)
  - Measured boot
- **Database**
  - Tokenization
  - Salting
  - Hashing
- **Application security**
  - Input validations
  - Secure cookies
  - Hypertext Transfer Protocol (HTTP) headers
  - Code signing
  - Whitelisting
  - Blacklisting
  - Secure coding practices
  - Static code analysis
  - Manual code review
  - Dynamic code analysis
  - Fuzzing
- **Hardening**
  - Open ports and services
  - Registry
  - Disk encryption
  - OS
  - Patch management
    - Third-party updates
    - Auto-update
  - Self-encrypting drive (SED)/full-disk encryption (FDE)
  - Opal
- **Hardware root of trust**
  - Trusted Platform Module (TPM)
- **Sandboxing**
### 3.3 Given a scenario, implement secure network designs.

- **Load balancing**
  - Active/active
  - Active/passive
  - Scheduling
  - Virtual IP
  - Persistence

- **Network segmentation**
  - Virtual local area network (VLAN)
  - DMZ
  - East-west traffic
  - Extranet
  - Intranet
  - Zero Trust

- **Virtual private network (VPN)**
  - Always-on
  - Split tunnel vs. full tunnel
  - Remote access vs. site-to-site
  - IPSec
  - SSL/TLS
  - HTML5
  - Layer 2 tunneling protocol (L2TP)

- **DNS**
  - Network access control (NAC)
    - Agent and agentless

- **Out-of-band management**

- **Port security**
  - Broadcast storm prevention
  - Bridge Protocol Data Unit (BPDU) guard
  - Loop prevention
  - Dynamic Host Configuration Protocol (DHCP) snooping
  - Media access control (MAC) filtering

- **Network appliances**
  - Jump servers
  - Proxy servers
    - Forward
    - Reverse
  - Network-based intrusion detection system (NIDS)/network-based intrusion prevention system (NIPS)
    - Signature-based
    - Heuristic/behavior
    - Anomaly
    - Inline vs. passive
  - HSM
  - Sensors
  - Collectors
  - Aggregators
  - Firewalls
    - Web application firewall (WAF)
    - NGFW
    - Stateful
    - Stateless
    - Unified threat management (UTM)
    - Network address translation (NAT) gateway
    - Content/URL filter
    - Open-source vs. proprietary
    - Hardware vs. software
    - Appliance vs. host-based vs. virtual

- **Access control list (ACL)**
- **Route security**
- **Quality of service (QoS)**
- **Implications of IPv6**
- **Port spanning/port mirroring**
- **Monitoring services**
- **File integrity monitors**
- **Cryptographic protocols**
  - WiFi protected access II (WPA2)
  - WiFi protected access III (WPA3)
  - Counter-mode/CBC-MAC protocol (CCMP)
  - Simultaneous Authentication of Equals (SAE)

- **Authentication protocols**
  - Extensible Authentication Protocol (EAP)
  - Protected Extensible Application Protocol (PEAP)
  - EAP-FAST
  - EAP-TLS
  - EAP-TTLS
  - IEEE 802.1X
  - Remote Authentication Dial-in User Service (RADIUS) Federation

- **Methods**
  - Pre-shared key (PSK) vs. Enterprise vs. Open
  - WiFi Protected Setup (WPS)
  - Captive portals

- **Installation considerations**
  - Site surveys
  - Heat maps
  - WiFi analyzers
  - Channel overlays
  - Wireless access point (WAP) placement
  - Controller and access point security
3.0 Implementation

Given a scenario, implement secure mobile solutions.

• **Connection methods and receivers**
  - Cellular
  - WiFi
  - Bluetooth
  - NFC
  - Infrared
  - USB
  - Point-to-point
  - Point-to-multipoint
  - Global Positioning System (GPS)
  - RFID

• **Mobile device management (MDM)**
  - Application management
  - Content management
  - Remote wipe
  - Geofencing
  - Geolocation
  - Screen locks
  - Push notifications
  - Passwords and pins

• **Mobile devices**
  - Biometrics
  - Context-aware authentication
  - Containerization
  - Storage segmentation
  - Full device encryption

• **Deployment models**
  - Bring your own device (BYOD)
  - Corporate-owned personally enabled (COPE)
  - Choose your own device (CYOD)
  - Corporate-owned
  - Virtual desktop infrastructure (VDI)

**Solutions**

- SMS/Multimedia Messaging Service (MMS)/Rich communication services (RCS)
- External media
- USB On-The-Go (USB OTG)
- Recording microphone
- GPS tagging
- WiFi direct/ad hoc
- Tethering
- Hotspot
- Payment methods

3.6 Given a scenario, apply cybersecurity solutions to the cloud.

• **Cloud security controls**
  - High availability across zones
  - Resource policies
  - Secrets management
  - Integration and auditing
  - Storage
    - Permissions
    - Encryption
    - Replication
    - High availability
  - Network
    - Virtual networks
    - Public and private subnets
    - Segmentation
    - API inspection and integration
  - Compute
    - Security groups
    - Dynamic resource allocation
    - Instance awareness
    - Virtual private cloud (VPC) endpoint
    - Container security

• **Solutions**
  - CASB
  - Application security
  - Next-generation Secure Web Gateway (SWG)
  - Firewall considerations in a cloud environment
    - Cost
    - Need for segmentation
    - Open Systems Interconnection (OSI) layers

**Cloud native controls vs. third-party solutions**
3.0 Implementation

3.7 Given a scenario, implement identity and account management controls.

- **Identity**
  - Identity provider (IdP)
  - Attributes
  - Certificates
  - Tokens
  - SSH keys
  - Smart cards
- **Account policies**
  - Password complexity
  - Password history
  - Password reuse
  - Time of day
  - Network location
  - Geofencing
  - Geotagging
  - Geolocation
- **Account types**
  - User account
  - Shared and generic accounts/credentials
  - Guest accounts
  - Service accounts

3.8 Given a scenario, implement authentication and authorization solutions.

- **Authentication management**
  - Password keys
  - Password vaults
  - TPM
  - HSM
  - Knowledge-based authentication
- **Authentication**
  - EAP
  - Challenge Handshake Authentication Protocol (CHAP)
  - Password Authentication Protocol (PAP)
  - 802.1X
  - RADIUS
  - Single sign-on (SSO)
  - Security Assertions Markup Language (SAML)
  - Terminal Access Controller Access Control System Plus (TACACS+)
  - OAuth
  - OpenID
  - Kerberos
- **Access control schemes**
  - Attribute-based access control (ABAC)

3.9 Given a scenario, implement public key infrastructure.

- **Public key infrastructure (PKI)**
  - Key management
  - Certificate authority (CA)
  - Intermediate CA
  - Registration authority (RA)
  - Certificate revocation list (CRL)
  - Certificate attributes
  - Online Certificate Status Protocol (OCSP)
  - Certificate signing request (CSR)
  - CN
  - Subject alternative name
  - Expiration
- **Types of certificates**
  - Wildcard
  - Subject alternative name
  - Code signing
  - Self-signed
  - Machine/computer
  - Email
  - User
  - Root
  - Domain validation
  - Extended validation
- **Certificate formats**
  - Distinguished encoding rules (DER)
  - Privacy enhanced mail (PEM)
  - Personal information exchange (PFX)
  - .cer
  - .p12
  - .p7b
- **Concepts**
  - Online vs. offline CA
  - Stapling
  - Pinning
  - Trust model
  - Key escrow
  - Certificate chaining
4.0 Operations and Incident Response

4.1 Given a scenario, use the appropriate tool to assess organizational security.

- **Network reconnaissance and discovery**
  - tracert/traceroute
  - nslookup/dig
  - ipconfig/ifconfig
  - nmap
  - ping/pathping
  - hping
  - netstat
  - netcat
  - IP scanners
  - arp
  - route
  - curl
  - the harvester
  - sn1per
- **File manipulation**
  - head
  - tail
  - cat
  - grep
  - chmod
  - logger
- **Shell and script environments**
  - SSH
  - PowerShell
  - Python
- **Scanless**
  - dnsenum
  - Nessus
  - Cuckoo
- **Forensics**
  - dd
  - Memdump
  - WinHex
  - FTK imager
  - Autopsy
- **Exploitation frameworks**
- **Packet capture and replay**
  - Tcpreplay
  - Tcpdump
  - Wireshark
- **Packet capture and replay**
- **Stakeholder management**
  - Communication plan
  - Disaster recovery plan
  - Business continuity plan
  - Continuity of operations planning (COOP)
  - Incident response team
  - Retention policies

4.2 Summarize the importance of policies, processes, and procedures for incident response.

- **Incident response plans**
- **Incident response process**
  - Preparation
  - Identification
  - Containment
  - Eradication
  - Recovery
  - Lessons learned
- **Exercises**
  - Tabletop
  - Walkthroughs
  - Simulations
- **Attack frameworks**
  - MITRE ATT&CK
  - The Diamond Model of Intrusion Analysis
  - Cyber Kill Chain

Given a scenario, use the appropriate tool to assess organizational security.

Summarize the importance of policies, processes, and procedures for incident response.
4.0 Operations and Incident Response

4.3 Given an incident, utilize appropriate data sources to support an investigation.

- Vulnerability scan output
- SIEM dashboards
  - Sensor
  - Sensitivity
  - Trends
  - Alerts
  - Correlation
- Log files
  - Network
  - System
  - Application
- Security
- Web
- DNS
- Authentication
- Dump files
- VoIP and call managers
- Session Initiation Protocol (SIP) traffic
- syslog/rsyslog/syslog-ng
- journalctl
- nxlog
- Retention
- Bandwidth monitors
- Metadata
  - Email
  - Mobile
  - Web
  - File
- Netflow/sflow
  - Echo
  - IPfix
- Protocol analyzer output

4.4 Given an incident, apply mitigation techniques or controls to secure an environment.

- Reconfigure endpoint security solutions
  - Application whitelisting
  - Application blacklisting
  - Quarantine
- Configuration changes
  - Firewall rules
  - MDM
  - DLP
  - Content filter/URL filter
  - Update or revoke certificates
- Isolation
- Containment
- Segmentation
- SOAR
  - Runbooks
  - Playbooks

4.5 Explain the key aspects of digital forensics.

- Documentation/evidence
  - Legal hold
  - Video
  - Admissibility
  - Chain of custody
  - Timelines of sequence of events
    - Time stamps
    - Time offset
  - Tags
  - Reports
  - Event logs
  - Interviews
- Acquisition
  - Order of volatility
  - Disk
  - Random-access memory (RAM)
  - Swap/pagefile
  - OS
  - Device
  - Firmware
  - Snapshot
  - Cache
  - Network
  - Artifacts
- On-premises vs. cloud
  - Right-to-audit clauses
  - Regulatory/jurisdiction
  - Data breach notification laws
- Integrity
  - Hashing
  - Checksums
  - Provenance
- Preservation
- E-discovery
- Data recovery
- Non-repudiation
- Strategic intelligence/counterintelligence
5.0 Governance, Risk, and Compliance

5.1 Compare and contrast various types of controls.

- **Category**
  - Managerial
  - Operational
  - Technical

- **Control type**
  - Preventative
  - Detective
  - Corrective
  - Deterrent
  - Compensating
  - Physical

5.2 Explain the importance of applicable regulations, standards, or frameworks that impact organizational security posture.

- **Regulations, standards, and legislation**
  - General Data Protection Regulation (GDPR)
  - National, territory, or state laws
  - Payment Card Industry Data Security Standard (PCI DSS)

- **Key frameworks**
  - Center for Internet Security (CIS)
  - National Institute of Standards and Technology (NIST) RMF/CSF
  - International Organization for Standardization (ISO) 27001/27002/27701/31000
  - SSAE SOC 2 Type I/II
  - Cloud security alliance
  - Cloud control matrix

- **Reference architecture**

- **Benchmarks/secure configuration guides**
  - Platform/vendor-specific guides
  - Web server
  - OS
  - Application server
  - Network infrastructure devices

5.3 Explain the importance of policies to organizational security.

- **Personnel**
  - Acceptable use policy
  - Job rotation
  - Mandatory vacation
  - Separation of duties
  - Least privilege
  - Clean desk space
  - Background checks
  - Non-disclosure agreement (NDA)
  - Social media analysis
  - Onboarding
  - Offboarding
  - User training
    - Gamification
    - Capture the flag
    - Phishing campaigns
    - Phishing simulations
  - Computer-based training (CBT)
  - Role-based training

- **Diversity of training techniques**

- **Third-party risk management**
  - Vendors
  - Supply chain
  - Business partners
  - Service level agreement (SLA)
  - Memorandum of understanding (MOU)
  - Measurement systems analysis (MSA)
  - Business partnership agreement (BPA)
  - End of life (EOL)
  - End of service (EOS)
  - NDA

- **Data**
  - Classification
  - Governance
  - Retention

- **Credential policies**
  - Personnel
  - Third-party
  - Devices
  - Service accounts
  - Administrator/root accounts

- **Organizational policies**
  - Change management
  - Change control
  - Asset management
5.0 Governance, Risk, and Compliance

5.4 Summarize risk management processes and concepts.

- Risk types
  - External
  - Internal
  - Legacy systems
  - Multiparty
  - IP theft
  - Software compliance/licensing
- Risk management strategies
  - Acceptance
  - Avoidance
  - Transference
    - Cybersecurity insurance
  - Mitigation
- Risk analysis
  - Risk register
  - Risk matrix/heat map
  - Risk control assessment
  - Risk control self-assessment
  - Risk awareness
  - Inherent risk
  - Residual risk
  - Control risk
  - Risk appetite
  - Regulations that affect risk posture
  - Risk assessment types
    - Qualitative
    - Quantitative
  - Likelihood of occurrence
  - Impact
  - Asset value
  - Single loss expectancy (SLE)
  - Annualized loss expectancy (ALE)
  - Annualized rate of occurrence (ARO)

5.5 Explain privacy and sensitive data concepts in relation to security.

- Organizational consequences of privacy breaches
  - Reputation damage
  - Identity theft
  - Fines
  - IP theft
- Notifications of breaches
  - Escalation
  - Public notifications and disclosures
- Data types
  - Classifications
    - Public
    - Private
    - Sensitive
    - Confidential
    - Critical
    - Proprietary
  - Personally identifiable information (PII)
  - Health information
  - Financial information
  - Government data
  - Customer data
  - Information life cycle
  - Impact assessment
  - Terms of agreement
  - Privacy notice
- Privacy enhancing technologies
  - Data minimization
  - Data masking
  - Tokenization
  - Anonymization
  - Pseudo-anonymization
- Roles and responsibilities
  - Data owners
  - Data controller
  - Data processor
  - Data custodian/steward
  - Data protection officer (DPO)
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>
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<tr>
<th>ACRONYM</th>
<th>DEFINITION</th>
<th>ACRONYM</th>
<th>DEFINITION</th>
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<tbody>
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<td>DER</td>
<td>Distinguished Encoding Rules</td>
<td>HOTP</td>
<td>HMAC-based One-time Password</td>
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<td>Electronic Serial Number</td>
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<td>Encapsulating Security Payload</td>
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<td>Extended Service Set Identifier</td>
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<td>False Rejection Rate</td>
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<td>Galois/Counter Mode</td>
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<td>Group Policy Object</td>
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<td>Global Positioning System</td>
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<td>Metropolitan Area Network</td>
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<td>Graphics Processing Unit</td>
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<td>Master Boot Record</td>
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<td>Generic Routing Encapsulation</td>
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<td>MTBF</td>
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<td>Mean Time to Repair</td>
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<td>Open Vulnerability and Assessment Language</td>
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<td>PFS</td>
<td>Perfect Forward Secrecy</td>
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<td>PGP</td>
<td>Pretty Good Privacy</td>
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<td>PHI</td>
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<td>Secure/Multipurpose Internet Mail Extensions</td>
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<td>ACRONYM</td>
<td>DEFINITION</td>
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<td>Structured Exception Handling</td>
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<td>Security Information and Event Management</td>
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<td>SIM</td>
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<td>Simple Object Access Protocol</td>
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<td>Sender Policy Framework</td>
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<td>Spam over Internet Messaging</td>
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<td>Transmission Control Protocol/Internet Protocol</td>
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<td>Ticket Granting Ticket</td>
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<td>Time-based One Time Password</td>
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<td>TPM</td>
<td>Trusted Platform Module</td>
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<td>Transaction Signature</td>
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<td>Unmanned Aerial Vehicle</td>
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<td>UEBA</td>
<td>User and Entity Behavior Analytics</td>
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<td>UEFI</td>
<td>Unified Extensible Firmware Interface</td>
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<td>Unified Endpoint Management</td>
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<td>Uniform Resource Identifier</td>
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<td>URL</td>
<td>Universal Resource Locator</td>
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<td>USB On-The-Go</td>
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<td>Virtual Desktop Infrastructure</td>
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<td>Wireless Intrusion Detection System</td>
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<td>Exclusive Or</td>
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<td>Cross-site Request Forgery</td>
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CompTIA Security+ Certification Exam Objectives Version 1.0 (Exam Number: SY0-601)
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 are not exhaustive.

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<th>SOFTWARE</th>
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<td>• Virtualization software</td>
<td>• Access to a CSP</td>
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<td>• Separate wireless NIC</td>
<td>• Penetration testing OS/distributions</td>
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<tr>
<td>• WAP</td>
<td>(e.g., Kali Linux, ParrotOS)</td>
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<tr>
<td>• Firewall</td>
<td>• SIEM</td>
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<tr>
<td>• UTM</td>
<td>• Wireshark</td>
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<tr>
<td>• Mobile device</td>
<td>• Metasploit</td>
<td></td>
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<tr>
<td>• Server/cloud server</td>
<td>• tcpdump</td>
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<tr>
<td>• IoT devices</td>
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