



## Certification Exam

### INTRODUCTION

The CompTIA Security+ Certification is a vendor neutral credential. The CompTIA Security+ 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 that the successful candidate has the knowledge and skills required to identify risk and participate in risk mitigation activities, provide infrastructure, application, operational and information security, apply security controls to maintain confidentiality, integrity and availability, identify appropriate technologies and products, and operate with an awareness of applicable policies, laws and regulations.

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

- A minimum of 2 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 below

CompTIA Security+ is ISO 17024 Accredited (Personnel Certification Accreditation) and, as such, undergoes regular reviews and updates to the exam objectives. The following CompTIA Security+ objectives reflect the subject areas in this edition of this exam, and result from subject matter expert workshops and industry-wide survey results regarding the skills and knowledge required of an information security professional with two years of experience.

This examination blueprint includes domain weighting, test objectives, and example content. Example topics and concepts are included to clarify the test objectives and should not be construed as a comprehensive listing of all the content of this examination.

The table below lists the domain areas measured by this examination and the approximate extent to which they are represented in the examination:

Domain	% of Examination
1.0 Network Security	21%
2.0 Compliance and Operational Security	18%
3.0 Threats and Vulnerabilities	21%
4.0 Application, Data and Host Security	16%
5.0 Access Control and Identity Management	13%
6.0 Cryptography	11%
<b>Total</b>	<b>100%</b>

\*\*Note: The lists of examples provided in bulleted format below each objective 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.

## 1.0 Network Security

### 1.1 Explain the security function and purpose of network devices and technologies

- Firewalls
- Routers
- Switches
- Load Balancers
- Proxies
- Web security gateways
- VPN concentrators
- NIDS and NIPS (Behavior based, signature based, anomaly based, heuristic)
- Protocol analyzers
- Sniffers
- Spam filter, all-in-one security appliances
- Web application firewall vs. network firewall
- URL filtering, content inspection, malware inspection

### 1.2 Apply and implement secure network administration principles

- Rule-based management
- Firewall rules
- VLAN management
- Secure router configuration
- Access control lists
- Port Security
- 802.1x
- Flood guards
- Loop protection
- Implicit deny
- Prevent network bridging by network separation
- Log analysis

### 1.3 Distinguish and differentiate network design elements and compounds

- DMZ
- Subnetting
- VLAN
- NAT
- Remote Access
- Telephony
- NAC
- Virtualization
- Cloud Computing
  - Platform as a Service
  - Software as a Service
  - Infrastructure as a Service

### 1.4 Implement and use common protocols

- IPSec
- SNMP

- SSH
- DNS
- TLS
- SSL
- TCP/IP
- FTPS
- HTTPS
- SFTP
- SCP
- ICMP
- IPv4 vs. IPv6

### **1.5 Identify commonly used default network ports**

- FTP
- SFTP
- FTPS
- TFTP
- TELNET
- HTTP
- HTTPS
- SCP
- SSH
- NetBIOS

### **1.6 Implement wireless network in a secure manner**

- WPA
- WPA2
- WEP
- EAP
- PEAP
- LEAP
- MAC filter
- SSID broadcast
- TKIP
- CCMP
- Antenna Placement
- Power level controls

## **2.0 Compliance and Operational Security**

### **2.1 Explain risk related concepts**

- Control types
  - Technical
  - Management
  - Operational
- False positives
- Importance of policies in reducing risk
  - Privacy policy
  - Acceptable use
  - Security policy
  - Mandatory vacations

- Job rotation
- Separation of duties
- Least privilege
- Risk calculation
  - Likelihood
  - ALE
  - Impact
- Quantitative vs. qualitative
- Risk-avoidance, transference, acceptance, mitigation, deterrence
- Risks associated to Cloud Computing and Virtualization

## **2.2 Carry out appropriate risk mitigation strategies**

- Implement security controls based on risk
- Change management
- Incident management
- User rights and permissions reviews
- Perform routine audits
- Implement policies and procedures to prevent data loss or theft

## **2.3 Execute appropriate incident response procedures**

- Basic forensic procedures
  - Order of volatility
  - Capture system image
  - Network traffic and logs
  - Capture video
  - Record time offset
  - Take hashes
  - Screenshots
  - Witnesses
  - Track man hours and expense
- Damage and loss control
- Chain of custody
- Incident response: first responder

## **2.4 Explain the importance of security related awareness and training**

- Security policy training and procedures
- Personally identifiable information
- Information classification: Sensitivity of data (hard or soft)
- Data labeling, handling and disposal
- Compliance with laws, best practices and standards
- User habits
  - Password behaviors
  - Data handling
  - Clean desk policies
  - Prevent tailgating
  - Personally owned devices
- Threat awareness
  - New viruses
  - Phishing attacks
  - Zero days exploits
- Use of social networking and P2P

## **2.5 Compare and contrast aspects of business continuity**

- Business impact analysis

- Removing single points of failure
- Business continuity planning and testing
- Continuity of operations
- Disaster recovery
- IT contingency planning
- Succession planning

## **2.6 Explain the impact and proper use of environmental controls**

- HVAC
- Fire suppression
- EMI shielding
- Hot and cold aisles
- Environmental monitoring
- Temperature and humidity controls
- Video monitoring

## **2.7 Execute disaster recovery plans and procedures**

- Backup / backout contingency plans or policies
- Backups, execution and frequency
- Redundancy and fault tolerance
  - Hardware
  - RAID
  - Clustering
  - Load balancing
  - Servers
- High availability
- Cold site, hot site, warm site
- Mean time to restore, mean time between failures, recovery time objectives and recovery point objectives

## **2.8 Exemplify the concepts of confidentiality, integrity and availability (CIA)**

# 3.0 Threats and Vulnerabilities

## **3.1 Analyze and differentiate among types of malware**

- Adware
- Virus
- Worms
- Spyware
- Trojan
- Rootkits
- Backdoors
- Logic bomb
- Botnets

## **3.2 Analyze and differentiate among types of attacks**

- Man-in-the-middle
- DDoS
- DoS
- Replay
- Smurf attack

- Spoofing
- Spam
- Phishing
- Spim
- Vishing
- Spear phishing
- Xmas attack
- Pharming
- Privilege escalation
- Malicious insider threat
- DNS poisoning and ARP poisoning
- Transitive access
- Client-side attacks

### **3.3 Analyze and differentiate among types of social engineering attacks**

- Shoulder surfing
- Dumpster diving
- Tailgating
- Impersonation
- Hoaxes
- Whaling
- Vishing

### **3.4 Analyze and differentiate among types of wireless attacks**

- Rogue access points
- Interference
- Evil twin
- War driving
- Bluejacking
- Bluesnarfing
- War chalking
- IV attack
- Packet sniffing

### **3.5 Analyze and differentiate among types of application attacks**

- Cross-site scripting
- SQL injection
- LDAP injection
- XML injection
- Directory traversal/command injection
- Buffer overflow
- Zero day
- Cookies and attachments
- Malicious add-ons
- Session hijacking
- Header manipulation

### **3.6 Analyze and differentiate among types of mitigation and deterrent techniques**

- Manual bypassing of electronic controls
  - Failsafe/secure vs. failopen
- Monitoring system logs
  - Event logs
  - Audit logs

- Security logs
  - Access logs
- Physical security
  - Hardware locks
  - Mantraps
  - Video surveillance
  - Fencing
  - Proximity readers
  - Access list
- Hardening
  - Disabling unnecessary services
  - Protecting management interfaces and applications
  - Password protection
  - Disabling unnecessary accounts
- Port security
  - MAC limiting and filtering
  - 802.1x
  - Disabling unused ports
- Security posture
  - Initial baseline configuration
  - Continuous security monitoring
  - remediation
- Reporting
  - Alarms
  - Alerts
  - Trends
- Detection controls vs. prevention controls
  - IDS vs. IPS
  - Camera vs. guard

### **3.7 Implement assessment tools and techniques to discover security threats and vulnerabilities**

- Vulnerability scanning and interpret results
- Tools
  - Protocol analyzer
  - Sniffer
  - Vulnerability scanner
  - Honeypots
  - Honeynets
  - Port scanner
- Risk calculations
  - Threat vs. likelihood
- Assessment types
  - Risk
  - Threat
  - Vulnerability
- Assessment technique
  - Baseline reporting
  - Code review
  - Determine attack surface
  - Architecture
  - Design reviews

### **3.8 Within the realm of vulnerability assessments, explain the proper use of penetration testing versus vulnerability scanning**

- Penetration testing
  - Verify a threat exists
  - Bypass security controls
  - Actively test security controls
  - Exploiting vulnerabilities
- Vulnerability scanning
  - Passively testing security controls
  - Identify vulnerability
  - Identify lack of security controls
  - Identify common misconfiguration
- Black box
- White box
- Gray box

## 4.0 Application, Data and Host Security

### 4.1 Explain the importance of application security

- Fuzzing
- Secure coding concepts
  - Error and exception handling
  - Input validation
- Cross-site scripting prevention
- Cross-site Request Forgery (XSRF) prevention
- Application configuration baseline (proper settings)
- Application hardening
- Application patch management

### 4.2 Carry out appropriate procedures to establish host security

- Operating system security and settings
- Anti-malware
  - Anti-virus
  - Anti-spam
  - Anti-spyware
  - Pop-up blockers
  - Host-based firewalls
- Patch management
- Hardware security
  - Cable locks
  - Safe
  - Locking cabinets
- Host software baselining
- Mobile devices
  - Screen lock
  - Strong password
  - Device encryption
  - Remote wipe/sanitation
  - Voice encryption
  - GPS tracking
- Virtualization

### 4.3 Explain the importance of data security



- Data Loss Prevention (DLP)
- Data encryption
  - Full disk
  - Database
  - Individual files
  - Removable media
  - Mobile devices
- Hardware based encryption devices
  - TPM
  - HSM
  - USB encryption
  - Hard drive
- Cloud computing

## 5.0 Access Control and Identity Management

### 5.1 Explain the function and purpose of authentication services

- RADIUS
- TACACS
- TACACS+
- Kerberos
- LDAP
- XTACACS

### 5.2 Explain the fundamental concepts and best practices related to authentication, authorization and access control

- Identification vs. authentication
- Authentication (single factor) and authorization
- Multifactor authentication
- Biometrics
- Tokens
- Common access card
- Personal identification verification card
- Smart card
- Least privilege
- Separation of duties
- Single sign on
- ACLs
- Access control
- Mandatory access control
- Discretionary access control
- Role/rule-based access control
- Implicit deny
- Time of day restrictions
- Trusted OS
- Mandatory vacations
- Job rotation

### 5.3 Implement appropriate security controls when performing account management

- Mitigates issues associated with users with multiple account/roles
- Account policy enforcement

- Password complexity
- Expiration
- Recovery
- Length
- Disablement
- Lockout
- Group based privileges
- User assigned privileges

## 6.0 Cryptography

### 6.1 Summarize general cryptography concepts

- Symmetric vs. asymmetric
- Fundamental differences and encryption methods
  - Block vs. stream
- Transport encryption
- Non-repudiation
- Hashing
- Key escrow
- Steganography
- Digital signatures
- Use of proven technologies
- Elliptic curve and quantum cryptography

### 6.2 Use and apply appropriate cryptographic tools and products

- WEP vs. WPA/WPA2 and preshared key
- MD5
- SHA
- RIPEMD
- AES
- DES
- 3DES
- HMAC
- RSA
- RC4
- One-time-pads
- CHAP
- PAP
- NTLM
- NTLMv2
- Blowfish
- PGP/GPG
- Whole disk encryption
- TwoFish
- Comparative strengths of algorithms
- Use of algorithms with transport encryption
  - SSL
  - TLS
  - IPSec
  - SSH
  - HTTPS

### **6.3 Explain the core concepts of public key infrastructure**

- Certificate authorities and digital certificates
  - CA
  - CRLs
- PKI
- Recovery agent
- Public key
- Private key
- Registration
- Key escrow
- Trust models

### **6.4 Implement PKI, certificate management and associated components**

- Certificate authorities and digital certificates
  - CA
  - CRLs
- PKI
- Recovery agent
- Public key
- Private keys
- Registration
- Key escrow
- Trust models

## **SECURITY+ ACRONYMS**

3DES – Triple Digital Encryption Standard  
AAA – Authentication, Authorization, and Accounting  
ACL – Access Control List  
AES - Advanced Encryption Standard  
AES256 – Advanced Encryption Standards 256bit  
AH - Authentication Header  
ALE - Annualized Loss Expectancy  
AP - Access Point  
ARO - Annualized Rate of Occurrence  
ARP - Address Resolution Protocol  
AUP - Acceptable Use Policy  
BCP – Business Continuity Planning  
BIOS – Basic Input / Output System  
BOTS – Network Robots  
CA – Certificate Authority  
CAC - Common Access Card  
CAN - Controller Area Network  
CCMP – Counter-Mode/CBC-Mac Protocol  
CCTV - Closed-circuit television  
CERT – Computer Emergency Response Team  
CHAP – Challenge Handshake Authentication Protocol  
CIRT – Computer Incident Response Team  
CRC – Cyclical Redundancy Check  
CRL – Certification Revocation List  
DAC – Discretionary Access Control  
DDOS – Distributed Denial of Service  
DEP – Data Execution Prevention  
DES – Digital Encryption Standard  
DHCP – Dynamic Host Configuration Protocol  
DLL - Dynamic Link Library  
DLP - Data Loss Prevention  
DMZ – Demilitarized Zone  
DNS – Domain Name Service (Server)  
DOS – Denial of Service  
DRP – Disaster Recovery Plan  
DSA – Digital Signature Algorithm  
EAP - Extensible Authentication Protocol  
ECC - Elliptic Curve Cryptography  
EFS – Encrypted File System  
EMI – Electromagnetic Interference

ESP – Encapsulated Security Payload  
FTP – File Transfer Protocol  
GPU - Graphic Processing Unit  
GRE - Generic Routing Encapsulation  
HDD – Hard Disk Drive  
HIDS – Host Based Intrusion Detection System  
HIPS – Host Based Intrusion Prevention System  
HMAC – Hashed Message Authentication Code  
HSM – Hardware Security Module  
HTTP – Hypertext Transfer Protocol  
HTTPS – Hypertext Transfer Protocol over SSL  
HVAC – Heating, Ventilation Air Conditioning  
IaaS - Infrastructure as a Service  
ICMP - Internet Control Message Protocol  
ID – Identification  
IKE – Internet Key Exchange  
IM - Instant messaging  
IMAP4 - Internet Message Access Protocol v4  
IP - Internet Protocol  
IPSEC – Internet Protocol Security  
IRC - Internet Relay Chat  
ISP – Internet Service Provider  
IV - Initialization Vector  
KDC - Key Distribution Center  
L2TP – Layer 2 Tunneling Protocol  
LANMAN – Local Area Network Manager  
LDAP – Lightweight Directory Access Protocol  
LEAP – Lightweight Extensible Authentication Protocol  
MAC – Mandatory Access Control / Media Access Control  
MAC - Message Authentication Code  
MAN - Metropolitan Area Network  
MBR – Master Boot Record  
MD5 – Message Digest 5  
MSCHAP – Microsoft Challenge Handshake Authentication Protocol  
MTU - Maximum Transmission Unit  
NAC – Network Access Control  
NAT – Network Address Translation  
NIDS – Network Based Intrusion Detection System  
NIPS – Network Based Intrusion Prevention System  
NIST – National Institute of Standards & Technology  
NOS – Network Operating System  
NTFS - New Technology File System

NTLM – New Technology LANMAN  
NTP - Network Time Protocol  
OS – Operating System  
OVAL – Open Vulnerability Assessment Language  
PAP – Password Authentication Protocol  
PAT - Port Address Translation  
PBX – Private Branch Exchange  
PEAP – Protected Extensible Authentication Protocol  
PED - Personal Electronic Device  
PGP – Pretty Good Privacy  
PII – Personally Identifiable Information  
PKI – Public Key Infrastructure  
POTS – Plain Old Telephone Service  
PPP - Point-to-point Protocol  
PPTP – Point to Point Tunneling Protocol  
PSK – Pre-Shared Key  
PTZ – Pan-Tilt-Zoom  
RA – Recovery Agent  
RAD - Rapid application development  
RADIUS – Remote Authentication Dial-in User Server  
RAID – Redundant Array of Inexpensive Disks  
RAS – Remote Access Server  
RBAC – Role Based Access Control  
RBAC – Rule Based Access Control  
RSA – Rivest, Shamir, & Adleman  
RTO – Recovery Time Objective  
RTP – Real-Time Transport Protocol  
S/MIME – Secure / Multipurpose internet Mail Extensions  
SaaS - Software as a Service  
SCAP - Security Content Automation Protocol  
SCSI - Small Computer System Interface  
SDLC - Software Development Life Cycle  
SDLM - Software Development Life Cycle Methodology  
SHA – Secure Hashing Algorithm  
SHTTP – Secure Hypertext Transfer Protocol  
SIM – Subscriber Identity Module  
SLA – Service Level Agreement  
SLE - Single Loss Expectancy  
SMS - Short Message Service  
SMTP – Simple Mail Transfer Protocol  
SNMP - Simple Network Management Protocol  
SONET – Synchronous Optical Network Technologies

SPIM - Spam over Internet Messaging  
SSH – Secure Shell  
SSL – Secure Sockets Layer  
SSO – Single Sign On  
STP – Shielded Twisted Pair  
TACACS – Terminal Access Controller Access Control System  
TCP/IP – Transmission Control Protocol / Internet Protocol  
TKIP - Temporal Key Integrity Protocol  
TLS – Transport Layer Security  
TPM – Trusted Platform Module  
UAT - User Acceptance Testing  
UPS - Uninterruptable Power Supply  
URL - Universal Resource Locator  
USB – Universal Serial Bus  
UTP – Unshielded Twisted Pair  
VLAN – Virtual Local Area Network  
VoIP - Voice over IP  
VPN – Virtual Private Network  
VTC – Video Conferencing  
WAF- Web-Application Firewall  
WAP – Wireless Access Point  
WEP – Wired Equivalent Privacy  
WIDS – Wireless Intrusion Detection System  
WIPS – Wireless Intrusion Prevention System  
WPA – Wireless Protected Access  
XSRF - Cross-Site Request Forgery  
XSRF- Cross-Site Request Forgery  
XSS - Cross-Site Scripting