



# CompTIA Network+ Certification Exam Objectives

**EXAM NUMBER: N10-007**



# About the Exam

The CompTIA Network+ certification is an internationally recognized validation of the technical knowledge required of foundation-level IT network practitioners.

This exam will certify the successful candidate has the knowledge and skills required to:

- **Troubleshoot, configure and manage common network devices**
- **Establish basic network connectivity**
- **Understand and maintain network documentation**
- **Identify network limitations and weaknesses**
- **Implement network security, standards, and protocols**

The candidate will have a basic understanding of enterprise technologies, including cloud and virtualization technologies.

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

CompTIA Network+ candidates are recommended to have the following:

- **CompTIA A+ certification or equivalent knowledge**
- **At least 9 to 12 months of work experience in IT networking**

## **EXAM ACCREDITATION**

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

## **EXAM DEVELOPMENT**

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

## **CompTIA AUTHORIZED MATERIALS USE POLICY**

CompTIA Certifications, LLC is not affiliated with and does not authorize, endorse or condone utilizing any content provided by unauthorized third-party training sites (aka “brain dumps”). Individuals who utilize such materials in preparation for any CompTIA examination will have their certifications revoked and be suspended from future testing in accordance with the CompTIA Candidate Agreement. In an effort to more clearly communicate CompTIA’s exam policies on use of unauthorized study materials, CompTIA directs all certification candidates to the [CompTIA Certification Exam Policies](#). Please review all CompTIA policies before beginning the study process for any CompTIA exam. Candidates will be required to abide by the [CompTIA Candidate Agreement](#). If a candidate has a question as to whether study materials are considered unauthorized (aka “brain dumps”), he/she should contact CompTIA at [examsecurity@compTIA.org](mailto:examsecurity@compTIA.org) to confirm.

## **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.

## TEST DETAILS

|                        |   |
|------------------------|---|
| Required exam          | N10-007   |
| Number of questions    | Maximum of 90   |
| Types of questions     | Multiple choice and performance-based   |
| Length of test         | 90 minutes  |
| Recommended experience | <ul style="list-style-type: none"><li>• CompTIA A+ certified, or equivalent</li><li>• Minimum of nine months of experience in network support or administration; or academic training</li></ul> |
| Passing score          | 720 (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:

| DOMAIN                                | PERCENTAGE OF EXAMINATION |
|---------------------------------------|---------------------------|
| 1.0 Networking Concepts               | 23%                       |
| 2.0 Infrastructure                    | 18%                       |
| 3.0 Network Operations                | 17%                       |
| 4.0 Network Security                  | 20%                       |
| 5.0 Network Troubleshooting and Tools | 22%                       |
| <b>Total</b>                          | <b>100%</b>               |



# 1.0 Networking Concepts

## 1.1 Explain the purposes and uses of ports and protocols.

- **Protocols and ports**
  - SSH 22
  - DNS 53
  - SMTP 25
  - SFTP 22
  - FTP 20, 21
  - TFTP 69
  - TELNET 23
  - DHCP 67, 68
  - HTTP 80
  - HTTPS 443
- **SNMP 161**
- **RDP 3389**
- **NTP 123**
- **SIP 5060, 5061**
- **SMB 445**
- **POP 110**
- **IMAP 143**
- **LDAP 389**
- **LDAPS 636**
- **H.323 1720**
- **Protocol types**
  - ICMP
  - UDP
  - TCP
  - IP
- **Connection-oriented vs. connectionless**

## 1.2 Explain devices, applications, protocols and services at their appropriate OSI layers.

- **Layer 1 – Physical**
- **Layer 2 – Data link**
- **Layer 3 – Network**
- **Layer 4 – Transport**
- **Layer 5 – Session**
- **Layer 6 – Presentation**
- **Layer 7 – Application**

## 1.3 Explain the concepts and characteristics of routing and switching.

- **Properties of network traffic**
  - Broadcast domains
  - CSMA/CD
  - CSMA/CA
  - Collision domains
  - Protocol data units
  - MTU
  - Broadcast
  - Multicast
  - Unicast
- **Segmentation and interface properties**
  - VLANs
  - Trunking (802.1q)
  - Tagging and untagging ports
  - Port mirroring
  - Switching loops/spanning tree
  - PoE and PoE+ (802.3af, 802.3at)
  - DMZ
- **MAC address table**
- **ARP table**
- **Routing**
  - Routing protocols (IPv4 and IPv6)
    - Distance-vector routing protocols
      - RIP
      - EIGRP
    - Link-state routing protocols
      - OSPF
      - Hybrid
      - BGP
  - Routing types
    - Static
    - Dynamic
      - Default
- **IPv6 concepts**
  - Addressing
  - Tunneling
- **Dual stack**
- **Router advertisement**
- **Neighbor discovery**
- **Performance concepts**
  - Traffic shaping
  - QoS
  - Diffserv
  - CoS
- **NAT/PAT**
- **Port forwarding**
- **Access control list**
- **Distributed switching**
- **Packet-switched vs. circuit-switched network**
- **Software-defined networking**



## 1.4 Given a scenario, configure the appropriate IP addressing components.

- Private vs. public
  - Loopback and reserved
  - Default gateway
  - Virtual IP
  - Subnet mask
- Subnetting
    - Classful
      - Classes A, B, C, D, and E
    - Classless
      - VLSM
      - CIDR notation (IPv4 vs. IPv6)
- Address assignments
    - DHCP
    - DHCPv6
    - Static
    - APIPA
    - EUI64
    - IP reservations
- 

## 1.5 Compare and contrast the characteristics of network topologies, types and technologies.

- Wired topologies
    - Logical vs. physical
    - Star
    - Ring
    - Mesh
    - Bus
  - Wireless topologies
    - Mesh
    - Ad hoc
    - Infrastructure
- Types
    - LAN
    - WLAN
    - MAN
    - WAN
    - CAN
    - SAN
    - PAN
- Technologies that facilitate the Internet of Things (IoT)
    - Z-Wave
    - Ant+
    - Bluetooth
    - NFC
    - IR
    - RFID
    - 802.11
- 

## 1.6 Given a scenario, implement the appropriate wireless technologies and configurations.

- 802.11 standards
    - a
    - b
    - g
    - n
    - ac
  - Cellular
    - GSM
    - TDMA
    - CDMA
- Frequencies
    - 2.4GHz
    - 5.0GHz
  - Speed and distance requirements
  - Channel bandwidth
  - Channel bonding
  - MIMO/MU-MIMO
  - Unidirectional/omnidirectional
  - Site surveys



## 1.7 Summarize cloud concepts and their purposes.

- **Types of services**
    - SaaS
    - PaaS
    - IaaS
  - **Cloud delivery models**
    - Private
    - Public
    - Hybrid
  - **Connectivity methods**
  - **Security implications/considerations**
  - **Relationship between local and cloud resources**
- 

## 1.8 Explain the functions of network services.

- **DNS service**
  - Record types
    - A, AAAA
    - TXT (SPF, DKIM)
    - SRV
    - MX
    - CNAME
    - NS
    - PTR
  - Internal vs. external DNS
  - Third-party/cloud-hosted DNS
  - Hierarchy
  - Forward vs. reverse zone
- **DHCP service**
  - MAC reservations
  - Pools
  - IP exclusions
  - Scope options
  - Lease time
  - TTL
  - DHCP relay/IP helper
- **NTP**
- **IPAM**



## 2.0 Infrastructure

### 2.1 Given a scenario, deploy the appropriate cabling solution.

- **Media types**
  - Copper
    - UTP
    - STP
    - Coaxial
  - Fiber
    - Single-mode
    - Multimode
- **Plenum vs. PVC**
- **Connector types**
  - Copper
    - RJ-45
    - RJ-11
    - BNC
    - DB-9
    - DB-25
    - F-type
  - Fiber
    - LC
    - ST
- SC
  - APC
  - UPC
  - MTRJ
- **Transceivers**
  - SFP
  - GBIC
  - SFP+
  - QSFP
  - Characteristics of fiber transceivers
    - Bidirectional
    - Duplex
- **Termination points**
  - 66 block
  - 110 block
  - Patch panel
  - Fiber distribution panel
- **Copper cable standards**
  - Cat 3
  - Cat 5
  - Cat 5e
  - Cat 6
  - Cat 6a
  - Cat 7
  - RG-6
  - RG-59
- **Copper termination standards**
  - TIA/EIA 568a
  - TIA/EIA 568b
  - Crossover
  - Straight-through
- **Ethernet deployment standards**
  - 100BaseT
  - 1000BaseT
  - 1000BaseLX
  - 1000BaseSX
  - 10GBaseT

### 2.2 Given a scenario, determine the appropriate placement of networking devices on a network and install/configure them.

- Firewall
- Router
- Switch
- Hub
- Bridge
- Modems
- Wireless access point
- Media converter
- Wireless range extender
- VoIP endpoint



### 2.3 Explain the purposes and use cases for advanced networking devices.

- Multilayer switch
  - Wireless controller
  - Load balancer
  - IDS/IPS
  - Proxy server
  - VPN concentrator
  - AAA/RADIUS server
  - UTM appliance
  - NGFW/Layer 7 firewall
  - VoIP PBX
  - VoIP gateway
  - Content filter
- 

### 2.4 Explain the purposes of virtualization and network storage technologies.

- **Virtual networking components**
    - Virtual switch
    - Virtual firewall
    - Virtual NIC
    - Virtual router
    - Hypervisor
  - **Network storage types**
    - NAS
    - SAN
  - **Connection type**
    - FCoE
    - Fibre Channel
    - iSCSI
    - InfiniBand
  - **Jumbo frame**
- 

### 2.5 Compare and contrast WAN technologies.

- **Service type**
  - ISDN
  - T1/T3
  - E1/E3
  - OC-3 – OC-192
  - DSL
  - Metropolitan Ethernet
  - Cable broadband
  - Dial-up
  - PRI
- **Transmission mediums**
  - Satellite
  - Copper
  - Fiber
  - Wireless
- **Characteristics of service**
  - MPLS
  - ATM
  - Frame relay
  - PPPoE
  - PPP
  - DMVPN
  - SIP trunk
- **Termination**
  - Demarcation point
  - CSU/DSU
  - Smart jack





## 3.0 Network Operations

**3.1** Given a scenario, use appropriate documentation and diagrams to manage the network.

- Diagram symbols
- Standard operating procedures/work instructions
- Logical vs. physical diagrams
- Rack diagrams
- Change management documentation
- Wiring and port locations
- IDF/MDF documentation
- Labeling
- Network configuration and performance baselines
- Inventory management

**3.2** Compare and contrast business continuity and disaster recovery concepts.

- **Availability concepts**
  - Fault tolerance
  - High availability
  - Load balancing
  - NIC teaming
  - Port aggregation
  - Clustering
- **Power management**
  - Battery backups/UPS
  - Power generators
  - Dual power supplies
  - Redundant circuits
- **Recovery**
  - Cold sites
  - Warm sites
  - Hot sites
- **Backups**
  - Full
  - Differential
  - Incremental
  - Snapshots
- **MTTR**
- **MTBF**
- **SLA requirements**

**3.3** Explain common scanning, monitoring and patching processes and summarize their expected outputs.

- **Processes**
  - Log reviewing
  - Port scanning
  - Vulnerability scanning
  - Patch management
    - Rollback
  - Reviewing baselines
  - Packet/traffic analysis
- **Event management**
  - Notifications
  - Alerts
  - SIEM
- **SNMP monitors**
  - MIB
- **Metrics**
  - Error rate
  - Utilization
  - Packet drops
  - Bandwidth/throughput

**3.4** Given a scenario, use remote access methods.

- VPN
    - IPSec
    - SSL/TLS/DTLS
    - Site-to-site
    - Client-to-site
  - RDP
  - SSH
  - VNC
  - Telnet
  - HTTPS/management URL
  - Remote file access
    - FTP/FTPS
    - SFTP
    - TFTP
  - Out-of-band management
    - Modem
    - Console router
- 

**3.5** Identify policies and best practices.

- Privileged user agreement
- Password policy
- On-boarding/off-boarding procedures
- Licensing restrictions
- International export controls
- Data loss prevention
- Remote access policies
- Incident response policies
- BYOD
- AUP
- NDA
- System life cycle
  - Asset disposal
- Safety procedures and policies



## 4.0 Network Security

### 4.1 Summarize the purposes of physical security devices.

- **Detection**
  - Motion detection
  - Video surveillance
  - Asset tracking tags
  - Tamper detection
- **Prevention**
  - Badges
  - Biometrics
  - Smart cards
  - Key fob
  - Locks

### 4.2 Explain authentication and access controls.

- **Authorization, authentication and accounting**
  - RADIUS
  - TACACS+
  - Kerberos
  - Single sign-on
  - Local authentication
  - LDAP
  - Certificates
  - Auditing and logging
- **Multifactor authentication**
  - Something you know
  - Something you have
  - Something you are
  - Somewhere you are
  - Something you do
- **Access control**
  - 802.1X
  - NAC
  - Port security
  - MAC filtering
  - Captive portal
  - Access control lists

### 4.3 Given a scenario, secure a basic wireless network.

- **WPA**
- **WPA2**
- **TKIP-RC4**
- **CCMP-AES**
- **Authentication and authorization**
  - EAP
  - PEAP
  - EAP-FAST
  - EAP-TLS
  - Shared or open
  - Preshared key
  - MAC filtering
- **Geofencing**



#### 4.4 Summarize common networking attacks.

- DoS
    - Reflective
    - Amplified
    - Distributed
  - Social engineering
  - Insider threat
  - Logic bomb
  - Rogue access point
  - Evil twin
  - War-driving
  - Phishing
  - Ransomware
  - DNS poisoning
  - ARP poisoning
  - Spoofing
  - Deauthentication
  - Brute force
  - VLAN hopping
  - Man-in-the-middle
  - Exploits vs. vulnerabilities
- 

#### 4.5 Given a scenario, implement network device hardening.

- Changing default credentials
  - Avoiding common passwords
  - Upgrading firmware
  - Patching and updates
  - File hashing
  - Disabling unnecessary services
  - Using secure protocols
  - Generating new keys
  - Disabling unused ports
    - IP ports
    - Device ports (physical and virtual)
- 

#### 4.6 Explain common mitigation techniques and their purposes.

- Signature management
- Device hardening
- Change native VLAN
- Switch port protection
  - Spanning tree
  - Flood guard
  - BPDU guard
  - Root guard
  - DHCP snooping
- Network segmentation
  - DMZ
  - VLAN
- Privileged user account
- File integrity monitoring
- Role separation
- Restricting access via ACLs
- Honeypot/honeynet
- Penetration testing



# 5.0 Network Troubleshooting and Tools

## 5.1 Explain the network troubleshooting methodology.

- **Identify the problem**
  - Gather information
  - Duplicate the problem, if possible
  - Question users
  - Identify symptoms
  - Determine if anything has changed
  - Approach multiple problems individually
- **Establish a theory of probable cause**
  - Question the obvious
  - Consider multiple approaches
    - Top-to-bottom/bottom-to-top OSI model
    - Divide and conquer
- **Test the theory to determine the cause**
  - Once the theory is confirmed, determine the next steps to resolve the problem
  - If the theory is not confirmed, reestablish a new theory or escalate
- **Establish a plan of action to resolve the problem and identify potential effects**
- **Implement the solution or escalate as necessary**
- **Verify full system functionality and, if applicable, implement preventive measures**
- **Document findings, actions, and outcomes**

## 5.2 Given a scenario, use the appropriate tool.

- **Hardware tools**
  - Crimper
  - Cable tester
  - Punchdown tool
  - OTDR
  - Light meter
  - Tone generator
  - Loopback adapter
  - Multimeter
  - Spectrum analyzer
- **Software tools**
  - Packet sniffer
  - Port scanner
  - Protocol analyzer
  - WiFi analyzer
  - Bandwidth speed tester
  - Command line
    - ping
    - tracert, traceroute
    - nslookup
- ipconfig
- ifconfig
- iptables
- netstat
- tcpdump
- pathping
- nmap
- route
- arp
- dig



### 5.3 Given a scenario, troubleshoot common wired connectivity and performance issues.

- Attenuation
  - Latency
  - Jitter
  - Crosstalk
  - EMI
  - Open/short
  - Incorrect pin-out
  - Incorrect cable type
  - Bad port
  - Transceiver mismatch
  - TX/RX reverse
  - Duplex/speed mismatch
  - Damaged cables
  - Bent pins
  - Bottlenecks
  - VLAN mismatch
  - Network connection LED status indicators
- 

### 5.4 Given a scenario, troubleshoot common wireless connectivity and performance issues.

- Reflection
  - Refraction
  - Absorption
  - Latency
  - Jitter
  - Attenuation
  - Incorrect antenna type
  - Interference
  - Incorrect antenna placement
  - Channel overlap
  - Overcapacity
  - Distance limitations
  - Frequency mismatch
  - Wrong SSID
  - Wrong passphrase
  - Security type mismatch
  - Power levels
  - Signal-to-noise ratio
- 

### 5.5 Given a scenario, troubleshoot common network service issues.

- Names not resolving
- Incorrect gateway
- Incorrect netmask
- Duplicate IP addresses
- Duplicate MAC addresses
- Expired IP address
- Rogue DHCP server
- Untrusted SSL certificate
- Incorrect time
- Exhausted DHCP scope
- Blocked TCP/UDP ports
- Incorrect host-based firewall settings
- Incorrect ACL settings
- Unresponsive service
- Hardware failure

# Network+ Acronym List

The following is a list of acronyms that appear on the CompTIA Network+ 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.

| <b>ACRONYM</b> | <b>SPELLED OUT</b>                                     | <b>ACRONYM</b> | <b>SPELLED OUT</b>  |
|----------------|--|----------------|---|
| AAA            | Authentication Authorization and Accounting            | CARP           | Common Address Redundancy Protocol                                      |
| AAAA           | Authentication, Authorization, Accounting and Auditing | CASB           | Cloud Access Security Broker  |
| ACL            | Access Control List                                    | CAT            | Category  |
| ADSL           | Asymmetric Digital Subscriber Line                     | CCMP           | Counter-mode Cipher Block Chaining Message Authentication Code Protocol |
| AES            | Advanced Encryption Standard                           | CCTV           | Closed Circuit TV   |
| AH             | Authentication Header                                  | CDMA           | Code Division Multiple Access   |
| AP             | Access Point   | CSMA/CD        | Carrier Sense Multiple Access/Collision Detection                       |
| APC            | Angle Polished Connector                               | CHAP           | Challenge Handshake Authentication Protocol                             |
| APIPA          | Automatic Private Internet Protocol Addressing         | CIDR           | Classless Inter-Domain Routing  |
| APT            | Advanced Persistent Tool                               | CIFS           | Common Internet File System   |
| ARIN           | American Registry for Internet Numbers                 | CNAME          | Canonical Name  |
| ARP            | Address Resolution Protocol                            | CoS            | Class of Service  |
| AS             | Autonomous System                                      | CPU            | Central Processing Unit   |
| ASCII          | American Standard Code for Information Exchange        | CRAM-MD5       | Challenge-Response Authentication Mechanism–Message Digest 5            |
| ASIC           | Application Specific Integrated Circuit                | CRC            | Cyclic Redundancy Checking  |
| ASP            | Application Service Provider                           | CSMA/CA        | Carrier Sense Multiple Access/Collision Avoidance                       |
| ATM            | Asynchronous Transfer Mode                             | CSU            | Channel Service Unit  |
| AUP            | Acceptable Use Policy                                  | CVE            | Common Vulnerabilities and Exposures                                    |
| Auto-MDX       | Automatic Medium-Dependent Interface Crossover         | CVW            | Collaborative Virtual Workspace   |
| BCP            | Business Continuity Plan                               | CWDM           | Coarse Wave Division Multiplexing                                       |
| BERT           | Bit-Error Rate Test                                    | Daas           | Desktop as a Service  |
| BGP            | Border Gateway Protocol                                | dB             | Decibel   |
| BLE            | Bluetooth Low Energy                                   | DCS            | Distributed Computer System   |
| BNC            | British Naval Connector/Bayonet Niell-Concelman        | DDoS           | Distributed Denial of Service   |
| BootP          | Boot Protocol/Bootstrap Protocol                       | DHCP           | Dynamic Host Configuration Protocol                                     |
| BPDU           | Bridge Protocol Data Unit                              | DLC            | Data Link Control   |
| BRI            | Basic Rate Interface                                   | DLP            | Data Loss Prevention  |
| BSSID          | Basic Service Set Identifier                           | DLR            | Device Level Ring   |
| BYOD           | Bring Your Own Device                                  | DMVPN          | Dynamic Multipoint Virtual Private Network                              |
| CaaS           | Communication as a Service                             | DMZ            | Demilitarized Zone  |
| CAM            | Content Addressable Memory                             | DNAT           | Destination Network Address Translation                                 |
| CAN            | Campus Area Network                                    | DNS            | Domain Name Service/Domain Name Server/Domain Name System               |

| <b>ACRONYM</b> | <b>SPELLED OUT</b>                              | <b>ACRONYM</b> | <b>SPELLED OUT</b>  |
|----------------|---|----------------|---|
| DOCSIS         | Data-Over-Cable Service Interface Specification | ICA            | Independent Computer Architecture                         |
| DoS            | Denial of Service                               | ICANN          | Internet Corporation for Assigned Names and Numbers       |
| DPI            | Deep Packet Inspection                          | ICMP           | Internet Control Message Protocol                         |
| DR             | Designated Router                               | ICS            | Internet Connection Sharing/Industrial Control System     |
| DSCP           | Differentiated Services Code Point              | IDF            | Intermediate Distribution Frame                           |
| DSL            | Digital Subscriber Line                         | IDS            | Intrusion Detection System                                |
| DSSS           | Direct Sequence Spread Spectrum                 | IEEE           | Institute of Electrical and Electronics Engineers         |
| DSU            | Data Service Unit                               | IGMP           | Internet Group Message Protocol                           |
| DTLS           | Datagram Transport Layer Security               | IGP            | Interior Gateway Protocol                                 |
| DWDM           | Dense Wavelength Division Multiplexing          | IGRP           | Interior Gateway Routing Protocol                         |
| E1             | E-Carrier Level 1                               | IKE            | Internet Key Exchange                                     |
| EAP            | Extensible Authentication Protocol              | IMAP4          | Internet Message Access Protocol version 4                |
| EBCDIC         | Extended Binary Coded Decimal Interchange Code  | InterNIC       | Internet Network Information Center                       |
| EDNS           | Extension Mechanisms for DNS                    | IoT            | Internet of Things  |
| EGP            | Exterior Gateway Protocol                       | IP             | Internet Protocol   |
| EMI            | Electromagnetic Interference                    | IPAM           | IP Address Management                                     |
| ESD            | Electrostatic Discharge                         | IPS            | Intrusion Prevention System                               |
| ESP            | Encapsulated Security Payload                   | IPSec          | Internet Protocol Security                                |
| ESSID          | Extended Service Set Identifier                 | IPv4           | Internet Protocol version 4                               |
| EUI            | Extended Unique Identifier                      | IPv6           | Internet Protocol version 6                               |
| FC             | Fibre Channel                                   | ISAKMP         | Internet Security Association and Key Management Protocol |
| FCoE           | Fibre Channel over Ethernet                     | ISDN           | Integrated Services Digital Network                       |
| FCS            | Frame Check Sequence                            | IS-IS          | Intermediate System to Intermediate System                |
| FDM            | Frequency Division Multiplexing                 | ISP            | Internet Service Provider                                 |
| FHSS           | Frequency Hopping Spread Spectrum               | IT             | Information Technology                                    |
| FM             | Frequency Modulation                            | ITS            | Intelligent Transportation System                         |
| FQDN           | Fully Qualified Domain Name                     | IV             | Initialization Vector                                     |
| FTP            | File Transfer Protocol                          | Kbps           | Kilobits per second                                       |
| FTPS           | File Transfer Protocol Security                 | KVM            | Keyboard Video Mouse                                      |
| GBIC           | Gigabit Interface Converter                     | L2TP           | Layer 2 Tunneling Protocol                                |
| Gbps           | Gigabits per second                             | LACP           | Link Aggregation Control Protocol                         |
| GLBP           | Gateway Load Balancing Protocol                 | LAN            | Local Area Network  |
| GPG            | GNU Privacy Guard                               | LC             | Local Connector   |
| GRE            | Generic Routing Encapsulation                   | LDAP           | Lightweight Directory Access Protocol                     |
| GSM            | Global System for Mobile Communications         | LEC            | Local Exchange Carrier                                    |
| HA             | High Availability                               | LED            | Light Emitting Diode                                      |
| HDLC           | High-Level Data Link Control                    | LLC            | Logical Link Control                                      |
| HDMI           | High-Definition Multimedia Interface            | LLDP           | Link Layer Discovery Protocol                             |
| HIDS           | Host Intrusion Detection System                 | LSA            | Link State Advertisements                                 |
| HIPS           | Host Intrusion Prevention System                | LTE            | Long Term Evolution                                       |
| HSPA           | High-Speed Packet Access                        | LWAPP          | Light Weight Access Point Protocol                        |
| HSRP           | Hot Standby Router Protocol                     | MaaS           | Mobility as a Service                                     |
| HT             | High Throughput                                 | MAC            | Media Access Control/Medium Access Control                |
| HTTP           | Hypertext Transfer Protocol                     | MAN            | Metropolitan Area Network                                 |
| HTTPS          | Hypertext Transfer Protocol Secure              | Mbps           | Megabits per second                                       |
| HVAC           | Heating, Ventilation and Air Conditioning       | MBps           | Megabytes per second                                      |
| Hz             | Hertz   |                |   |
| IaaS           | Infrastructure as a Service                     |                |   |
| IANA           | Internet Assigned Numbers Authority             |                |   |



| ACRONYM | SPELLED OUT  |
|---------|--|
| MDF     | Main Distribution Frame                                  |
| MDI     | Media Dependent Interface                                |
| MDIX    | Media Dependent Interface Crossover                      |
| MFA     | Multifactor Authentication                               |
| MGCP    | Media Gateway Control Protocol                           |
| MIB     | Management Information Base                              |
| MIMO    | Multiple Input, Multiple Output                          |
| MLA     | Master License Agreement/<br>Multilateral Agreement      |
| MMF     | Multimode Fiber  |
| MOA     | Memorandum of Agreement                                  |
| MOU     | Memorandum of Understanding                              |
| MPLS    | Multiprotocol Label Switching                            |
| MS-CHAP | Microsoft Challenge Handshake<br>Authentication Protocol |
| MSA     | Master Service Agreement                                 |
| MSDS    | Material Safety Data Sheet                               |
| MT-RJ   | Mechanical Transfer-Registered Jack                      |
| MTU     | Maximum Transmission Unit                                |
| MTRR    | Mean Time To Recovery                                    |
| MTBF    | Mean Time Between Failures                               |
| MU-MIMO | Multiuser Multiple Input, Multiple Output                |
| MX      | Mail Exchanger   |
| NAC     | Network Access Control                                   |
| NAS     | Network Attached Storage                                 |
| NAT     | Network Address Translation                              |
| NCP     | Network Control Protocol                                 |
| NDR     | Non-Delivery Receipt                                     |
| NetBEUI | Network Basic Input/Output<br>Extended User Interface    |
| NetBIOS | Network Basic Input/Output System                        |
| NFC     | Near Field Communication                                 |
| NFS     | Network File Service                                     |
| NGFW    | Next-Generation Firewall                                 |
| NIC     | Network Interface Card                                   |
| NIDS    | Network Intrusion Detection System                       |
| NIPS    | Network Intrusion Prevention System                      |
| NIU     | Network Interface Unit                                   |
| nm      | Nanometer  |
| NNTTP   | Network News Transport Protocol                          |
| NTP     | Network Time Protocol                                    |
| OCSP    | Online Certificate Status Protocol                       |
| OCx     | Optical Carrier  |
| OID     | Object Identifier  |
| OOB     | Out of Band  |
| OS      | Operating System   |
| OSI     | Open Systems Interconnect                                |
| OSPF    | Open Shortest Path First                                 |
| OTDR    | Optical Time Domain Reflectometer                        |

| ACRONYM | SPELLED OUT                                |
|---------|--|
| OUI     | Organizationally Unique Identifier         |
| PaaS    | Platform as a Service                      |
| PAN     | Personal Area Network                      |
| PAP     | Password Authentication Protocol           |
| PAT     | Port Address Translation                   |
| PC      | Personal Computer                          |
| PCM     | Phase-Change Memory                        |
| PDoS    | Permanent Denial of Service                |
| PDU     | Protocol Data Unit                         |
| PGP     | Pretty Good Privacy                        |
| PKI     | Public Key Infrastructure                  |
| PoE     | Power over Ethernet                        |
| POP     | Post Office Protocol                       |
| POP3    | Post Office Protocol version 3             |
| POTS    | Plain Old Telephone Service                |
| PPP     | Point-to-Point Protocol                    |
| PPPoE   | Point-to-Point Protocol over Ethernet      |
| PPTP    | Point-to-Point Tunneling Protocol          |
| PRI     | Primary Rate Interface                     |
| PSK     | Pre-Shared Key                             |
| PSTN    | Public Switched Telephone Network          |
| PTP     | Point-to-Point                             |
| PTR     | Pointer                                    |
| PUA     | Privileged User Agreement                  |
| PVC     | Permanent Virtual Circuit                  |
| QoS     | Quality of Service                         |
| QSFP    | Quad Small Form-Factor Pluggable           |
| RADIUS  | Remote Authentication Dial-In User Service |
| RARP    | Reverse Address Resolution Protocol        |
| RAS     | Remote Access Service                      |
| RDP     | Remote Desktop Protocol                    |
| RF      | Radio Frequency                            |
| RFI     | Radio Frequency Interference               |
| RFP     | Request for Proposal                       |
| RG      | Radio Guide                                |
| RIP     | Routing Internet Protocol                  |
| RJ      | Registered Jack                            |
| RPO     | Recovery Point Objective                   |
| RSA     | Rivest, Shamir, Adelman                    |
| RSH     | Remote Shell                               |
| RSTP    | Rapid Spanning Tree Protocol               |
| RTO     | Recovery Time Objective                    |
| RTP     | Real-Time Protocol                         |
| RTSP    | Real-Time Streaming Protocol               |
| RTT     | Round Trip Time or Real Transfer Time      |
| SA      | Security Association                       |
| SaaS    | Software as a Service                      |
| SAN     | Storage Area Network                       |
| SC      | Standard Connector/Subscriber Connector    |

| ACRONYM | SPELLED OUT   |
|---------|---|
| SCADA   | Supervisory Control and Data Acquisition                              |
| SCP     | Secure Copy Protocol  |
| SCSI    | Small Computer System Interface                                       |
| SDLC    | Software Development Life Cycle                                       |
| SDN     | Software Defined Network  |
| SDP     | Session Description Protocol  |
| SDSL    | Symmetrical Digital Subscriber Line                                   |
| SECaaS  | Security as a Service   |
| SFP     | Small Form-factor Pluggable   |
| SFTP    | Secure File Transfer Protocol   |
| SGCP    | Simple Gateway Control Protocol                                       |
| SHA     | Secure Hash Algorithm   |
| SIEM    | Security Information and Event Management                             |
| SIP     | Session Initiation Protocol   |
| SLA     | Service Level Agreement   |
| SLAAC   | Stateless Address Auto Configuration                                  |
| SLIP    | Serial Line Internet Protocol   |
| SMB     | Server Message Block  |
| SMF     | Single-Mode Fiber   |
| SMS     | Short Message Service   |
| SMTP    | Simple Mail Transfer Protocol   |
| SNAT    | Static Network Address Translation/Source Network Address Translation |
| SNMP    | Simple Network Management Protocol                                    |
| SNR     | Signal-to-Noise Ratio   |
| SNTP    | Simple Network Time Protocol  |
| SOA     | Start of Authority  |
| SOHO    | Small Office Home Office  |
| SONET   | Synchronous Optical Network   |
| SOP     | Standard Operating Procedure  |
| SOW     | Statement of Work   |
| SPB     | Shortest Path Bridging  |
| SPI     | Stateful Packet Inspection  |
| SPS     | Standby Power Supply  |
| SSH     | Secure Shell  |
| SSID    | Service Set Identifier  |
| SSL     | Secure Sockets Layer  |
| SSO     | Single Sign-on  |
| ST      | Straight Tip or Snap Twist  |
| STP     | Spanning Tree Protocol/Shielded Twisted Pair                          |
| SVC     | Switched Virtual Circuit  |
| SYSLOG  | System Log  |
| T1      | Terrestrial Carrier Level 1   |
| TA      | Terminal Adaptor  |
| TACACS  | Terminal Access Control Access Control System                         |
| TACACS+ | Terminal Access Control Access Control System+                        |
| TCP     | Transmission Control Protocol   |
| TCP/IP  | Transmission Control Protocol/Internet Protocol                       |
| TDM     | Time Division Multiplexing  |
| TDR     | Time Domain Reflectometer   |

| ACRONYM  | SPELLED OUT   |
|----------|---|
| Telco    | Telecommunications Company  |
| TFTP     | Trivial File Transfer Protocol  |
| TIA/EIA  | Telecommunication Industries Association/<br>Electronic Industries Alliance |
| TKIP     | Temporal Key Integrity Protocol   |
| TLS      | Transport Layer Security  |
| TMS      | Transportation Management System  |
| TOS      | Type of Service   |
| TPM      | Trusted Platform Module   |
| TTL      | Time to Live  |
| TTLS     | Tunneled Transport Layer Security   |
| UC       | Unified Communications  |
| UDP      | User Datagram Protocol  |
| UNC      | Universal Naming Convention   |
| UPC      | Ultra Polished Connector  |
| UPS      | Uninterruptible Power Supply  |
| URL      | Uniform Resource Locator  |
| USB      | Universal Serial Bus  |
| UTM      | Unified Threat Management   |
| UTP      | Unshielded Twisted Pair   |
| VDSL     | Variable Digital Subscriber Line  |
| VLAN     | Virtual Local Area Network  |
| VLSM     | Variable Length Subnet Mask   |
| VNC      | Virtual Network Connection  |
| VoIP     | Voice over IP   |
| VPN      | Virtual Private Network   |
| VRF      | Virtual Routing Forwarding  |
| VRPP     | Virtual Router Redundancy Protocol  |
| VTC      | Video Teleconference  |
| VTP      | VLAN Trunk Protocol   |
| WAF      | Web Application Firewall  |
| WAN      | Wide Area Network   |
| WAP      | Wireless Application Protocol/<br>Wireless Access Point                     |
| WEP      | Wired Equivalent Privacy  |
| WLAN     | Wireless Local Area Network   |
| WMS      | Warehouse Management System   |
| WPA      | WiFi Protected Access   |
| WPS      | WiFi Protected Setup  |
| WWN      | World Wide Name   |
| XDSL     | Extended Digital Subscriber Line  |
| XML      | eXtensible Markup Language  |
| Zeroconf | Zero Configuration  |

# Network+ Proposed Hardware and Software List

CompTIA has included this sample list of hardware and software to assist candidates as they prepare for the Network+ 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

- Optical and copper patch panels
- Punchdown blocks (110)
- Layer 2/3 switch
- PoE switch
- Router
- Firewall
- VPN concentrator
- Wireless access point
- Basic laptops that support virtualization
- Tablet/cell phone
- Media converters
- Configuration terminal (with Telnet and SSH)
- VoIP system (including a phone)

## SPARE HARDWARE

- NICs
- Power supplies
- GBICs
- SFPs
- Managed switch
- Hub
- Wireless access point
- UPS

## SPARE PARTS

- Patch cables
- RJ-45 connectors, modular jacks
- RJ-11 connectors
- Unshielded twisted pair cable spool
- Coaxial cable spool
- F-connectors
- Fiber connectors
- Antennas
- Bluetooth/wireless adapters
- Console cables (RS-232 to USB serial adapter)

## TOOLS

- Telco/network crimper
- Cable tester
- Punchdown tool
- Cable stripper
- Coaxial crimper
- Wire cutter
- Tone generator
- Fiber termination kit
- Optical power meter

## SOFTWARE

- Packet sniffer
- Protocol analyzer
- Terminal emulation software
- Linux/Windows OSs
- Software firewall
- Software IDS/IPS
- Network mapper
- Hypervisor software
- Virtual network environment
- WiFi analyzer
- Spectrum analyzer
- Network monitoring tools
- DHCP service
- DNS service

## OTHER

- Sample network documentation
- Sample logs
- Defective cables