

Revised Network+ Examination Objectives

2005 Version

Introduction

The skills and knowledge measured by this examination are derived from an industry-wide Job Task Analysis (JTA) and validated through an industry wide, global survey for which over 2,000 responses were received from Subject Matter Experts (SMEs) in Q2 2004. The results of this survey were used in weighing the domains and ensuring that the weighting is representative of the relative importance of the content.

The Network+ certification covering the 2005 objectives, certifies that the successful candidates knows the layers of the OSI model, can describe the features and functions of network components and has the skills needed to install, configure, and troubleshoot basic networking hardware peripherals and protocols. A typical candidate should have CompTIA A+ certification or equivalent knowledge, though A+ certification is not required. In addition to A+ certification level knowledge, candidates are encouraged to have at least nine months of work experience in network support or administration.

The 2005 objectives update the Network+ certification exam on new technologies, protocols and cable standards and well as the removal of older and less common versions of the same. The 2005 objectives also include changes to the weightings and presentation of objectives within the domains to reflect changes in the activities of individuals in a networking position. There remains continued emphasis on hands-on experience knowledge needed in the areas of network implementation and network support including troubleshooting scenarios.

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

The table below lists the domains measured by this examination and the extent to which they are represented in the examination.

Network+ Certification Domain Areas	% of Examination
1.0 Media and Topologies	20%
2.0 Protocols and Standards	20%
3.0 Network Implementation	25%
4.0 Network Support	35%
Total	100%

Note: All percentages are approximate and are subject to change.

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Domain 1.0 - Media and Topologies – 20%

1.1 Recognize the following logical or physical network topologies given a diagram, schematic or description:

- Star
- Bus
- Mesh
- Ring

1.2 Specify the main features of 802.2 (Logical Link Control), 802.3 (Ethernet), 802.5 (token ring), 802.11 (wireless), and FDDI (Fiber Distributed Data Interface) networking technologies, including:

- Speed
- Access method (CSMA / CA (Carrier Sense Multiple Access/Collision Avoidance) and CSMA / CD (Carrier Sense Multiple Access / Collision Detection))
- Topology
- Media

1.3 Specify the characteristics (For example: speed, length, topology, and cable type) of the following cable standards:

- 10BASE-T and 10BASE-FL
- 100BASE-TX and 100BASE-FX
- 1000BASE-T, 1000BASE-CX, 1000BASE-SX and 1000BASE-LX
- 10 GBASE-SR, 10 GBASE-LR and 10 GBASE-ER

1.4 Recognize the following media connectors and describe their uses:

- RJ-11 (Registered Jack)
- RJ-45 (Registered Jack)
- F-Type
- ST (Straight Tip)
- SC (Subscriber Connector or Standard Connector)
- IEEE 1394 (FireWire)
- Fiber LC (Local Connector)
- MT-RJ (Mechanical Transfer Registered Jack)
- USB (Universal Serial Bus)

1.5 Recognize the following media types and describe their uses:

- Category 3, 5, 5e, and 6
- UTP (Unshielded Twisted Pair)
- STP (Shielded Twisted Pair)
- Coaxial cable
- SMF (Single Mode Fiber) optic cable
- MMF (Multimode Fiber) optic cable

1.6 Identify the purposes, features and functions of the following network components:

- Hubs
- Switches
- Bridges
- Routers
- Gateways
- CSU / DSU (Channel Service Unit / Data Service Unit)
- NICs (Network Interface Card)
- ISDN (Integrated Services Digital Network) adapters
- WAPs (Wireless Access Point)
- Modems
- Transceivers (media converters)
- Firewalls

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- 1.7 Specify the general characteristics (For example: carrier speed, frequency, transmission type and topology) of the following wireless technologies:
- 802.11 (Frequency hopping spread spectrum)
 - 802.11x (Direct sequence spread spectrum)
 - Infrared
 - Bluetooth
- 1.8 Identify factors which affect the range and speed of wireless service (For example: interference, antenna type and environmental factors).

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Domain 2.0 – Protocols and Standards – 20%

- 2.1 Identify a MAC (Media Access Control) address and its parts.
- 2.2 Identify the seven layers of the OSI (Open Systems Interconnect) model and their functions.
- 2.3 Identify the OSI (Open Systems Interconnect) layers at which the following network components operate:
 - Hubs
 - Switches
 - Bridges
 - Routers
 - NICs (Network Interface Card)
 - WAPs (Wireless Access Point)
- 2.4 Differentiate between the following network protocols in terms of routing, addressing schemes, interoperability and naming conventions:
 - IPX / SPX (Internetwork Packet Exchange / Sequence Packet Exchange)
 - NetBEUI (Network Basic Input / Output System Extended User Interface)
 - AppleTalk / AppleTalk over IP (Internet Protocol)
 - TCP / IP (Transmission Control Protocol / Internet Protocol)
- 2.5 Identify the components and structure of IP (Internet Protocol) addresses (IPv4, IPv6) and the required setting for connections across the Internet.
- 2.6 Identify classful IP (Internet Protocol) ranges and their subnet masks (For example: Class A, B and C).
- 2.7 Identify the purpose of subnetting.
- 2.8 Identify the differences between private and public network addressing schemes.
- 2.9 Identify and differentiate between the following IP (Internet Protocol) addressing methods:
 - Static
 - Dynamic
 - Self-assigned (APIPA (Automatic Private Internet Protocol Addressing))
- 2.10 Define the purpose, function and use of the following protocols used in the TCP / IP (Transmission Control Protocol / Internet Protocol) suite:
 - TCP (Transmission Control Protocol)
 - UDP (User Datagram Protocol)
 - FTP (File Transfer Protocol)
 - SFTP (Secure File Transfer Protocol)
 - TFTP (Trivial File Transfer Protocol)
 - SMTP (Simple Mail Transfer Protocol)
 - HTTP (Hypertext Transfer Protocol)
 - HTTPS (Hypertext Transfer Protocol Secure)
 - POP3 / IMAP4 (Post Office Protocol version 3 / Internet Message Access Protocol version 4)
 - Telnet
 - SSH (Secure Shell)
 - ICMP (Internet Control Message Protocol)
 - ARP / RARP (Address Resolution Protocol / Reverse Address Resolution Protocol)
 - NTP (Network Time Protocol)
 - NNTP (Network News Transport Protocol)
 - SCP (Secure Copy Protocol)
 - LDAP (Lightweight Directory Access Protocol)
 - IGMP (Internet Group Multicast Protocol)
 - LPR (Line Printer Remote)

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2.11 Define the function of TCP / UDP (Transmission Control Protocol / User Datagram Protocol) ports.

2.12 Identify the well-known ports associated with the following commonly used services and protocols:

- 20 FTP (File Transfer Protocol)
- 21 FTP (File Transfer Protocol)
- 22 SSH (Secure Shell)
- 23 Telnet
- 25 SMTP (Simple Mail Transfer Protocol)
- 53 DNS (Domain Name Service)
- 69 TFTP (Trivial File Transfer Protocol)
- 80 HTTP (Hypertext Transfer Protocol)
- 110 POP3 (Post Office Protocol version 3)
- 119 NNTP (Network News Transport Protocol)
- 123 NTP (Network Time Protocol)
- 143 IMAP4 (Internet Message Access Protocol version 4)
- 443 HTTPS (Hypertext Transfer Protocol Secure)

2.13 Identify the purpose of network services and protocols (For example: DNS (Domain Name Service), NAT (Network Address Translation), ICS (Internet Connection Sharing), WINS (Windows Internet Name Service), SNMP (Simple Network Management Protocol), NFS (Network File System), Zeroconf (Zero configuration), SMB (Server Message Block), AFP (Apple File Protocol), LPD (Line Printer Daemon) and Samba).

2.14 Identify the basic characteristics (For example: speed, capacity and media) of the following WAN (Wide Area Networks) technologies:

- Packet switching
- Circuit switching
- ISDN (Integrated Services Digital Network)
- FDDI (Fiber Distributed Data Interface)
- T1 (T Carrier level 1) / E1 / J1
- T3 (T Carrier level 3) / E3 / J3
- OCx (Optical Carrier)
- X.25

2.15 Identify the basic characteristics of the following internet access technologies:

- xDSL (Digital Subscriber Line)
- Broadband Cable (Cable modem)
- POTS / PSTN (Plain Old Telephone Service / Public Switched Telephone Network)
- Satellite
- Wireless

2.16 Define the function of the following remote access protocols and services:

- RAS (Remote Access Service)
- PPP (Point-to-Point Protocol)
- SLIP (Serial Line Internet Protocol)
- PPPoE (Point-to-Point Protocol over Ethernet)
- PPTP (Point-to-Point Tunneling Protocol)
- VPN (Virtual Private Network)
- RDP (Remote Desktop Protocol)

2.17 Identify the following security protocols and describe their purpose and function:

- IPSec (Internet Protocol Security)
- L2TP (Layer 2 Tunneling Protocol)
- SSL (Secure Sockets Layer)
- WEP (Wired Equivalent Privacy)

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- WPA (Wi-Fi Protected Access)
- 802.1x

2.18 Identify authentication protocols (For example: CHAP (Challenge Handshake Authentication Protocol), MS-CHAP (Microsoft Challenge Handshake Authentication Protocol), PAP (Password Authentication Protocol), RADIUS (Remote Authentication Dial-In User Service), Kerberos and EAP (Extensible Authentication Protocol)).

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Domain 3.0 Network Implementation – 25%

- 3.1 Identify the basic capabilities (For example: client support, interoperability, authentication, file and print services, application support and security) of the following server operating systems to access network resources:
- UNIX / Linux / Mac OS X Server
 - Netware
 - Windows
 - Appleshare IP (Internet Protocol)
- 3.2 Identify the basic capabilities needed for client workstations to connect to and use network resources (For example: media, network protocols and peer and server services).
- 3.3 Identify the appropriate tool for a given wiring task (For example: wire crimper, media tester / certifier, punch down tool or tone generator).
- 3.4 Given a remote connectivity scenario comprised of a protocol, an authentication scheme, and physical connectivity, configure the connection. Includes connection to the following servers:
- UNIX / Linux / MAC OS X Server
 - Netware
 - Windows
 - Appleshare IP (Internet Protocol)
- 3.5 Identify the purpose, benefits and characteristics of using a firewall.
- 3.6 Identify the purpose, benefits and characteristics of using a proxy service.
- 3.7 Given a connectivity scenario, determine the impact on network functionality of a particular security implementation (For example: port blocking / filtering, authentication and encryption).
- 3.8 Identify the main characteristics of VLANs (Virtual Local Area Networks).
- 3.9 Identify the main characteristics and purpose of extranets and intranets.
- 3.10 Identify the purpose, benefits and characteristics of using antivirus software.
- 3.11 Identify the purpose and characteristics of fault tolerance:
- Power
 - Link redundancy
 - Storage
 - Services
- 3.12 Identify the purpose and characteristics of disaster recovery:
- Backup / restore
 - Offsite storage
 - Hot and cold spares
 - Hot, warm and cold sites

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Domain 4.0 Network Support – 35%

- 4.1 Given a troubleshooting scenario, select the appropriate network utility from the following:
- Tracert / traceroute
 - ping
 - arp
 - netstat
 - nbtstat
 - ipconfig / ifconfig
 - winipcfg
 - nslookup / dig
- 4.2 Given output from a network diagnostic utility (For example: those utilities listed in objective 4.1), identify the utility and interpret the output.
- 4.3 Given a network scenario, interpret visual indicators (For example: link LEDs (Light Emitting Diode) and collision LEDs (Light Emitting Diode)) to determine the nature of a stated problem.
- 4.4 Given a troubleshooting scenario involving a client accessing remote network services, identify the cause of the problem (For example: file services, print services, authentication failure, protocol configuration, physical connectivity and SOHO (Small Office / Home Office) router).
- 4.5 Given a troubleshooting scenario between a client and the following server environments, identify the cause of a stated problem:
- UNIX / Linux / Mac OS X Server
 - Netware
 - Windows
 - Appleshare IP (Internet Protocol)
- 4.6 Given a scenario, determine the impact of modifying, adding or removing network services (For example: DHCP (Dynamic Host Configuration Protocol), DNS (Domain Name Service) and WINS (Windows Internet Name Service)) for network resources and users.
- 4.7 Given a troubleshooting scenario involving a network with a particular physical topology (For example: bus, star, mesh or ring) and including a network diagram, identify the network area affected and the cause of the stated failure.
- 4.8 Given a network troubleshooting scenario involving an infrastructure (For example: wired or wireless) problem, identify the cause of a stated problem (For example: bad media, interference, network hardware or environment).
- 4.9 Given a network problem scenario, select an appropriate course of action based on a logical troubleshooting strategy. This strategy can include the following steps:
1. Identify the symptoms and potential causes
 2. Identify the affected area
 3. Establish what has changed
 4. Select the most probable cause
 5. Implement an action plan and solution including potential effects
 6. Test the result
 7. Identify the results and effects of the solution
 8. Document the solution and process

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Acronyms Reference:

ACL	Access Control List
AD	Active Directory
ADSL	Asymmetric Digital Subscriber Line
AFP	Apple File Protocol
AH	Authentication Header
AM	Amplitude Modulation
AMI	Alternate Mark Inversion
APIPA	Automatic Private Internet Protocol Addressing
ARP	Address Resolution Protocol
ATM	Asynchronous Transfer Mode
AV	Anti-Virus
BDC	Backup Domain Controller
BERT	Bit-Error Rate Test
BIND	Berkeley Internet Name Domain
BNC	British Naval Connector / Bayonet Niell-Concelman
BootP	Boot Protocol /Bootstrap Protocol
BRI	Basic Rate Interface
BSD	Berkeley Software Distribution
CDFS	CD-ROM File System
CHAP	Challenge Handshake Authentication Protocol
CIFI	Common Internet File System
CNAME	Canonical Name
CRAM-MD5	Challenge-Response Authentication Mechanism – Message Digest 5
CSMA / CA	Carrier Sense Multiple Access / Collision Avoidance
CSMA / CD	Carrier Sense Multiple Access / Collision Detection
CSNW	Client Services for NetWare
CSU	Channel Service Unit
dB	decibels
DC	Domain Controller
DHCP	Dynamic Host Configuration Protocol
DLC	Data Link Control
DNS	Domain Name Service / Domain Name Server / Domain Name System
DSL	Digital Subscriber Line
DSU	Data Service Unit
EAP	Extensible Authentication Protocol
EFS	Encrypting File System
EMI	ElectroMagnetic Interference
FAT	File Allocation Table
FDDI	Fiber Distributed Data Interface
FDDI	Fiber Distributed Data Interface
FDM	Frequency Division Multiplexing

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FHSS	Frequency Hopping Spread Spectrum
FM	Frequency Modulation
FQDN	Fully Qualified Domain Name / Fully Qualified Distunguished Name
FTP	File Transfer Protocol
GBIC	Gigabit Interface Converter
Gbps	Giga bits per second
GPO	Group Policy Object
GSNW	Gateway Services for NetWare
HDLC	High-Level Data Link Control
HTTP	Hypertext Transfer Protocol
HTTPS	Hypertext Transfer Protocol Secure
Hz	Hertz
IANA	Internet Assigned Numbers Authority
ICA	Independent Computer Architecture
ICMP	Internet Control Message Protocol
ICS	Internet Connection Sharing
IEEE	Institute of Electrical and Electronics Engineers
IGMP	Internet Group Multicast Protocol
IIS	Internet Information Server
IKE	Internet Key Exchange
IMAP4	Internet Message Access Protocol version 4
IP	Internet Protocol
IPSec	Internet Protocol Security
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
IPX	Internetwork Packet Exchange
IPX / SPX	Internetwork Packet Exchange / Sequence Packet Exchange
IRC	Internet Relay Chat
ISA	Industry Standard Architecture
ISDN	Integrated Services Digital Network
ISM	Industrial, Scientific, and Medical
ISP	Internet Service Provider
IT	Information Technology
Kbps	Kilobits per second
L2F	Layer 2 Forwarding
L2TP	Layer 2 Tunneling Protocol
LAN	Local Area Network
LC	Local Connector
LDAP	Lightweight Directory Access Protocol
LED	Light Emitting Diode
LLC	Logical Link Control
LPD	Line Printer Daemon

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LPR	Line Printer Remote
MAC	Media Access Control / Medium Access Control
MAU	Multistation Access Unit
Mbps	Megabits per second
MBps	Megabytes per second
MDI	Media Dependent Interface
MDIX	Media Dependent Interface Crossover
MIB	Management Information Base
MMF	MultiMode Fiber
MSAU	MultiStation Access Unit
MS-CHAP	Microsoft Challenge Handshake Authentication Protocol
MT-RJ	Mechanical Transfer-Registered Jack
MX	Mail Exchanger
NAT	Network Address Translation
NCP	NetWare Core Protocol
NDS	NetWare Directory Services
NetBEUI	Network Basic Input / Output Extended User Interface
NetBIOS	Network Basic Input / Output System
NFS	Network File System
NIC	Network Interface Card
NIS	Network Information Service
NLM	NetWare Loadable Module
nm	nanometer
NNTP	Network News Transport Protocol
NT	New Technology
NTFS	New Technology File System
NTP	Network Time Protocol
OCx	Optical Carrier
OS	Operating Systems
OSI	Open Systems Interconnect
OSPF	Open Shortest Path First
OTDR	Optical Time Domain Reflectometer
OU	Organizational Unit
PAP	Password Authentication Protocol
PC	Personal Computer
PCI	Peripheral Component Interconnect
PCMCIA	Personal Computer Memory Card International Association
PDC	Primary Domain Controller
POP3	Post Office Protocol version 3
POTS	Plain Old Telephone System
PPP	Point-to-Point Protocol
PPPoE	Point-to-Point Protocol over Ethernet

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PPTP	Point-to-Point Tunneling Protocol
PRI	Primary Rate Interface
PSTN	Public Switched Telephone Network
PVC	Permanent Virtual Circuit
QoS	Quality of Service
RADIUS	Remote Authentication Dial-In User Service
RAID	Redundant Array of Independent Disks / Redundant Array of Inexpensive Disks
RARP	Reverse Address Resolution Protocol
RAS	Remote Access Service
RDP	Remote Desktop Protocol
RFI	Radio Frequency Interface
RG	Radio Grade
RJ	Registered Jack
RSA	Rivest, Shamir, Adelman
S / MIME	Secure Multipurpose Internet Mail Extensions
SC	Standard Connector / Subscriber Connector
SCP	Secure Copy Protocol
SFF	Small Form Factor
SFTP	Secure File Transfer Protocol
SLIP	Serial Line Internet Protocol
SMB	Server Message Block
SMF	Single Mode Fiber
SMS	Storage Management Services
SMTP	Simple Mail Transfer Protocol
SNMP	Simple Network Management Protocol
SOA	Start of Authority
SOHO	Small Office / Home Office
SONET	Synchronous Optical Network
SPS	Standby Power Supply
SPX	Sequence Packet Exchange
SSH	Secure Shell
SSID	Service Set Identifier
SSL	Secure Sockets Layer
ST	Straight Tip
STP	Shielded Twisted Pair
T1	T-Carrier Level 1
TA	Terminal Adaptor
TCL	Terminal Control Language
TCP	Transmission Control Protocol
TCP / IP	Transmission Control Protocol / Internet Protocol
tcsh	turbo C shell
TDR	Time Domain Reflectometer

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TFTP	Trivial File Transfer Protocol
TTL	Time to Live
UDP	User Datagram Protocol
UNC	Universal Naming Convention
UPS	Uninterruptible Power Supply
URL	Uniform Resource Locator
USB	Universal Serial Bus
UTP	Unshielded Twisted Pair
VLAN	Virtual Local Area Network
VPN	Virtual Private Network
WAN	Wide Area Network
WAP	Wireless Application Protocol / Wired Access Point
WEP	Wired Equivalent Privacy
WINS	Window Internet Name Service
WPA	Wi-Fi Protected Access
www	World Wide Web
XML	Extensible Markup Language
Zeroconf	Zero Configuration