



Correlation of

Network+ Guide to Networks, 8/E, by Tamara Dean/ Jean Andrews, © 2019, ISBN: 9781337569330

to

South Carolina's Career and Technology Education Information Technology Activity/Course Codes: Networking Fundamentals - 5310

COMPETENCY/OBJECTIVE	PAGE REFERENCES
Networking Fundamentals provides students with classroom, laboratory, and hands-on experience in current and emerging networking technologies. Upon successful completion of the course sequence in the networking major, students will be able to seek employment or further their education and training in the information technology field. The networking student will benefit most from the curriculum if he or she possesses a strong background in reading, math, and problem-solving skills. Instruction is based on industry domains including network architecture; network operations; network security; network troubleshooting; industry standards, practices, and network theory; and workplace readiness and leadership skills. In addition, instruction and training are provided for the proper care, maintenance, and use of networking software, tools, and equipment. Particular emphasis is given to the use of critical thinking skills and problem-solving techniques. Networking Fundamentals is a prerequisite for Advanced Networking.	
A. SAFETY 1. Review school safety policies and procedures.	29-33
2. Review classroom safety rules and procedures.	29-33
3. Review safety procedures for using equipment in the classroom.	29-33
	29-33
4. Identify major causes of work-related accidents in office environments.	
5. Demonstrate safety skills in an office/work environment.	29-33
B. STUDENT ORGANIZATIONS	
1. Identify the purpose and goals of a Career and Technology Student Organization (CTSO).	This objective is not directly addressed in this edition of Network+ Guide to Networks. This is an instructor led activity at the local level.
2. Explain how CTSOs are integral parts of specific clusters, majors, and/or courses.	This objective is not directly addressed in this edition of Network+ Guide to Networks. This is an instructor led activity at the local level.
3. Explain the benefits and responsibilities of being a member of a CTSO.	This objective is not directly addressed in this edition of Network+ Guide to Networks. This is an instructor led activity at the local level.
4. List leadership opportunities that are available to students through participation in CTSO conferences, competitions, community service, philanthropy, and other activities.	This objective is not directly addressed in this edition of Network+ Guide to Networks. This is an instructor led activity at the local level.
5. Explain how participation in CTSOs can promote lifelong benefits in other professional and civic organizations.	This objective is not directly addressed in this edition of Network+ Guide to Networks. This is an instructor led activity at the local level.

COMPETENCY/OBJECTIVE	PAGE REFERENCES
C. TECHNOLOGY KNOWLEDGE	
1. Demonstrate proficiency and skills associated with the use of technologies that are common to a specific occupation.	3, 38, 75, 83-84, 87-89, 116-117, 120-122, 124-125, 179-180, 188, 210
2. Identify proper netiquette when using e-mail, social media, and other technologies for communication purposes.	This objective is not directly addressed in this edition of Network+ Guide to Networks.
3. Identify potential abuse and unethical uses of laptops, tablets, computers, and/or networks.	499-500, 532
4. Explain the consequences of social, illegal, and unethical uses of technology (e.g., piracy; illegal downloading; licensing infringement; inappropriate uses of software, hardware, and mobile devices in the work environment).	499-500
5. Discuss legal issues and the terms of use related to copyright laws, fair use laws, and ethics pertaining to downloading of images, photographs, documents, video, sounds, music, trademarks, and other elements for personal use.	533
6. Describe ethical and legal practices of safeguarding the confidentiality of business-related information.	395, 397-398, 512, 533
7. Describe possible threats to a laptop, tablet, computer, and/or network and methods of avoiding attacks.	499-511
D. PERSONAL QUALITIES AND EMPLOYABILITY SKILLS	
1. Demonstrate punctuality.	This objective is not directly addressed in this edition of Network+ Guide to Networks. This is an instructor led activity at the local level.
2. Demonstrate self-representation.	This objective is not directly addressed in this edition of Network+ Guide to Networks. This is an instructor led activity at the local level.
3. Demonstrate work ethic.	This objective is not directly addressed in this edition of Network+ Guide to Networks. This is an instructor led activity at the local level.
4. Demonstrate respect.	This objective is not directly addressed in this edition of Network+ Guide to Networks. This is an instructor led activity at the local level.
5. Demonstrate time management.	This objective is not directly addressed in this edition of Network+ Guide to Networks. This is an instructor led activity at the local level.
6. Demonstrate integrity.	This objective is not directly addressed in this edition of Network+ Guide to Networks. This is an instructor led activity at the local level.
7. Demonstrate leadership.	This objective is not directly addressed in this edition of Network+ Guide to Networks. This is an instructor led activity at the local level.

COMPETENCY/OBJECTIVE	PAGE REFERENCES
8. Demonstrate teamwork and collaboration.	This objective is not directly addressed in this edition of Network+ Guide to Networks. This is an instructor led activity at the local level.
9. Demonstrate conflict resolution.	This objective is not directly addressed in this edition of Network+ Guide to Networks. This is an instructor led activity at the local level.
10. Demonstrate perseverance.	This objective is not directly addressed in this edition of Network+ Guide to Networks. This is an instructor led activity at the local level.
11. Demonstrate commitment.	This objective is not directly addressed in this edition of Network+ Guide to Networks. This is an instructor led activity at the local level.
12. Demonstrate a healthy view of competition.	This objective is not directly addressed in this edition of Network+ Guide to Networks. This is an instructor led activity at the local level.
13. Demonstrate a global perspective.	This objective is not directly addressed in this edition of Network+ Guide to Networks. This is an instructor led activity at the local level.
14. Demonstrate health and fitness.	This objective is not directly addressed in this edition of Network+ Guide to Networks. This is an instructor led activity at the local level.
15. Demonstrate self-direction.	This objective is not directly addressed in this edition of Network+ Guide to Networks. This is an instructor led activity at the local level.
16. Demonstrate lifelong learning.	This objective is not directly addressed in this edition of Network+ Guide to Networks. This is an instructor led activity at the local level.
E. PROFESSIONAL KNOWLEDGE	
1. Demonstrate effective speaking and listening skills.	This objective is not directly addressed in this edition of Network+ Guide to Networks, the student should have sufficient language and communication skills to fulfill this objective.
2. Demonstrate effective reading and writing skills.	This objective is not directly addressed in this edition of Network+ Guide to Networks, the student should have sufficient language and communication skills to fulfill this objective.
3. Demonstrate mathematical reasoning.	This objective is not directly addressed in this edition of Network+ Guide to Networks, the student should have sufficient basic mathematics skills at this level.
4. Demonstrate job-specific mathematics skills.	440-455
5. Demonstrate critical-thinking and problem-solving skills.	33-38
6. Demonstrate creativity and resourcefulness.	43-52

COMPETENCY/OBJECTIVE	PAGE REFERENCES
7. Demonstrate an understanding of business ethics.	This objective is not directly addressed in this edition of Network+ Guide to Networks.
8. Demonstrate confidentiality.	This objective is not directly addressed in this edition of Network+ Guide to Networks.
 Demonstrate an understanding of workplace structures, organizations, systems, and climates. 	This objective is not directly addressed in this edition of Network+ Guide to Networks.
10. Demonstrate diversity awareness.	This objective is not directly addressed in this edition of Network+ Guide to Networks.
11. Demonstrate job acquisition and advancement skills.	This objective is not directly addressed in this edition of Network+ Guide to Networks.
12. Demonstrate task management skills.	This objective is not directly addressed in this edition of Network+ Guide to Networks.
13. Demonstrate customer-service skills.	This objective is not directly addressed in this edition of Network+ Guide to Networks.
F. NETWORKING INDUSTRY-SPECIFIC CONTENT	
1. NETWORK ARCHITECTURE	
a. Explain the functions and applications of various network devices:	
1. Router	195-205
2. Switch	198
3. Multilayer switch	198
4. Firewall	140-141, 559-565
5. HIDS	567-568
6. IDS/IPS	566-569
7. Access point (wireless/wired)	17, 72, 307, 327-330, 332-344,
8. Content filter	562
9. Load balancer hub	This objective is not directly addressed in this edition of Network+ Guide to Networks.
10. Analog modem	236, 238, 348, 411, 681, 691
11. Packet shaper	This objective is not directly addressed in this edition of Network+ Guide to Networks.
12. VPN concentrator.	415

COMPETENCY/OBJECTIVE	PAGE REFERENCES
b. Compare and contrast the use of networking services and applications:	
1. VPN	404, 412-417
2. Site to site/host to site/host to host	412-417
3. Protocols	
i. IPsec	399, 415
ii. GRE	417
iii. SSL VPN	415
iv. PTP/PPTP	417
4. TACACS/RADIUS	575
5. RAS	404
6. Web services	This objective is not directly addressed in this edition of Network+ Guide to Networks.
7. Unified voice services	634
8. Network controllers	15, 314, 387
c. Install and configure the following networking services/applications to include:	
1. DHCP	
i. Static vs. dynamic IP addressing	201
ii. Reservations	120
iii. Scopes	120
iv. Leases	120
v. Options (DNS servers, suffices)	116
vi. IP helpers/DHCP relay	456-457, 470
vii. DNS	116, 127-129
viii. DNS servers	116
ix. DNS records (A, MX, AAAA, CNAME, PTR)	138-139
x. Dynamic DNS	414
2. Proxy/reverse proxy	This objective is not directly addressed in this edition of Network+ Guide to Networks.
3. NAT	
i.PAT	123
ii. SNAT	123

COMPETENCY/OBJECTIVE	PAGE REFERENCES
iii. DNAT	123
4. Port forwarding	407, 409-410
d. Explain the characteristics and benefits of various WAN technologies:	
1. Fiber	
i. SONET	706-709
ii. DWDM	240
iii. CWDM	240
2. Frame Relay	710-711
3. Satellite	717-720
4. Broadband cable	698
5. DSL/ADSL	694-698
6. ISDN	704
7. ATM	711-712
8. PPP/Multilink PPP	405-406
9. MPLS	712-714
10. GSM/CDMA	
i. LTE/4G	717
ii. HSPA+	717
iii. 3G	715
iv. Edge	715
11. Dialup	689-691
12. WiMAX	This objective is not directly addressed in this edition of Network+ Guide to Networks.
13. Metro-Ethernet	701
14. Leased lines	
i. T-1	702-703
іі. Т-3	703
iii. E-1	702-703
iv. E-3	703
v. OC3	709
vi. OC12	709

COMPETENCY/OBJECTIVE	PAGE REFERENCES
15. Circuit switch vs packet switch	683
e. Install and properly terminate various cable types and connectors using appropriate tools:	
1.Ccopper connectors	
i. RJ-11	778
ii. RJ-45	778
iii. RJ-48C	
iv. DB-9/RS-232	254
v. DB-25	254
vi. UTP coupler	
vii. BNC coupler	
viii. BNC	244
ix. F-connector	244
x. 110 block	60
xi. 66 block	60
2. Copper cables	
i. Shielded vs unshielded	66, 247-248
ii. CAT3, CAT5, CAT5e, CAT6, CAT6a	246
iii. PVC vs plenum	68
iv. RG-59	243
v. RG-6	243
vi. Straight-through vs crossover vs rollover	251-253
3. Fiber connectors	
i. ST	268-269
ii. SC	268-269
iii. LC	268-269
iv. MTRJ	268-269
v. FC	651
vi. Fiber coupler	
4. Fiber cables	
i. Single mode	265-266

COMPETENCY/OBJECTIVE	PAGE REFERENCES
ii. Multimode	266
iii. APC vs UPC	268
5. Media converters	
i. Single mode fiber to Ethernet	269-270
ii. Multimode fiber to Ethernet	269-270
iii. Fiber to coaxial	269-270
iv. Single mode to multimode fiber	269-270
6. Tools	
i. Cable crimpers	255
ii. Punch down tool	60
iii. Wire strippers	
iv. Snips	367
v. OTDR	282
vi. Cable certifier	281-282
f. Differentiate between common network topologies:	
1. Mesh	
i. Partial	
ii. Full	13
2. Bus	16
3. Ring	16-17
4. Star	16
5. Hybrid	16
6. Point-to-point	404-406
7. Point-to-multipoint	680
8. Client-server	6-8
9. Peer-to-peer.	3-6
g. Differentiate between network infrastructure implementations:	
1. WAN	19-20
2. MAN	19-20
3. LAN	12-19

COMPETENCY/OBJECTIVE	PAGE REFERENCES
4. WLAN	This objective is not directly addressed in this edition of Network+ Guide to Networks.
i. Hotspot	
5. PAN	
i. Bluetooth	315-316
ii. IR	321-322
iii. NFC	320-321
6. SCADA/ICS	
i. ICS Server	
ii. DCS/closed network	
iii. Remote terminal unit	
iv. Programmable logic controller	
v. Medianets:	
a. VTC: ISDN, IP/SIP	132-133, 140, 704
h. Implement and configure the appropriate addressing schema given a scenario:	
1. IPv6	
i. Auto-configuration	
a. EUI64	129, 460
ii. DHCP6	122
iii. Link local	126-130
iv. Address Structure	126-128
v. Address compression	126
vi. Tunneling 6 to 4, 4 to 6	
a. Teredo/Miredo	
2. IPv4	
i.Address structure	118-120
ii. subnetting	438-461
iii. APIPA	119-120
iv. Classful A, B, C, D	442-444, 449-452
v. Classless	444

COMPETENCY/OBJECTIVE	PAGE REFERENCES
vi. Private vs Public	118
vii. NAT/PAT	123, 380-381
viii. MAC addressing	26, 113-114, 159
ix. Multicast	126-127
x. Unicast	126-127
xi. Broadcast	126-127
xii. Broadcast domains vs collision domains.	120, 194
i. Explain the basics of routing concepts and protocols:	
1. Loopback interface	119, 163-166
2. Routing loops	204-205
3. Routing tables	198-201
4. Static vs dynamic routes	This objective is not directly addressed in this edition of Network+ Guide to Networks.
5. Default route	This objective is not directly addressed in this edition of Network+ Guide to Networks.
6. Distance vector routing	203-206
7. Protocols (RIP v2)	202
8. Hybrid routing protocols	
i. BGP	202, 206
9. Link state routing protocols	
i.OSPF	202, 205
ii. IS-IS	202, 205
10. Interior vs exterior gateway routing protocols	
11. Autonomous system numbers	197-206
12. Route redistribution	This objective is not directly addressed in this edition of Network+ Guide to Networks.
13. High availability	
i.VRRP	644
ii. Virtual IP	642-644
iii. HSRP	644-645

COMPETENCY/OBJECTIVE	PAGE REFERENCES
14. Route aggregation	This objective is not directly addressed in this edition of Network+ Guide to Networks.
15. Routing metrics	
i. Hop counts	201-202
ii. MTU, bandwidth	193-193
iii. Costs	202
iv. Latency	201, 203, 237-238
v. Administrative distance	202
vi. SPB	573-574
j. Identify the basic elements of unified communication technologies:	
1. VoIP	59-60
2. Video	60, 471
3. Real time services	
i. Presence	518
ii. Multicast vs unicast	126-128
4. QoS	
i.DSCP	634
ii. COS	635
5. Devices	This objective is not directly addressed in this edition of Network+ Guide to Networks.
i.UC servers	
ii. UC devices	
iii. UC gateways	
k. Compare and contrast technologies that support cloud and virtualization:	
1. Virtualization	
i. Virtual switches	48-50
ii. Virtual routers	377-379
iii. Virtual firewall	385-386
iv. Virtual vs physical NICs	376-378
v. Software defined networking	386-389

COMPETENCY/OBJECTIVE	PAGE REFERENCES
2. Storage area network	
i. iSCSI	653
ii. Jumbo frame	193
iii. Fibre Channel	651
iv. Network attached storage	648-650
3. Cloud concepts	
i. Public IaaS, SaaS, PaaS	389-394
ii. Private IaaS, SaaS, PaaS	389-394
iii. Hybrid IaaS, SaaS, PaaS	389-394
iv. Community IaaS, SaaS, PaaS	389-394
I. Implement a basic network given a set of requirements:	
1. List of requirements	75-77
2. Device types/requirements	75-77
3. Environment limitations	75-77
4. Equipment limitations	75-77
5. Compatibility requirements	75-77
6. Wired/wireless considerations	369-370
7. Security considerations.	409-410
2. NETWORK OPERATIONS	
a. Use appropriate monitoring tools given a scenario:	
1. Packet/network analyzer	212
2. Interface monitoring tools	This objective is not directly addressed in this edition of Network+ Guide to Networks.
3. Port scanner	513
4. Top talkers/listeners	620
5. SNMP management software	
i. Trap	627-629
ii. Get	627-629
iii. Walk	
iv. MIBS	626-627

COMPETENCY/OBJECTIVE	PAGE REFERENCES
6. Alerts	
i. Email	69-70
ii. SMS	621
7. Packet flow monitoring	625
8. SYSLOG	624-626
9. SIEM	569-570
10. Environmental monitoring tools	
i. Temperature	53, 58, 69-70
ii. Humidity	58, 69-70
11. Power monitoring tools	This objective is not directly addressed in this edition of Network+ Guide to Networks.
12. Wireless survey tools	341-343
13. Wireless analyzers	351-353
b. Analyze metrics and reports from monitoring and tracking performance tools given a scenario:	
1. Baseline, Bottleneck	437, 620, 629-631, 640
2. Log management	622-627
3. Graphing	72-79
4. Utilization	
i. Bandwidth	60, 471
ii. Storage	645-653
iii. Network device CPU	205, 657
iv. Network device memory	
v. Wireless channel utilization	305-307
5. Link status	627
6. Interface monitoring	
i. Errors	68, 153-154
ii. Utilization	79, 91, 619-621
iii. Discards	189, 557, 621
iv. Packet drops	631
v. Interface resets	621

COMPETENCY/OBJECTIVE	PAGE REFERENCES
vi. Speed and duplex	238-239
c. Use appropriate resources to support configuration management given a scenario:	
1. Archives/backups	645-648
2. Baselines	629-631
3. On-boarding and off-boarding of mobile devices	344
4. NAC	583-584
5. Documentation	
i. Network diagrams (logical/physical)	71-79
ii. Asset management	513-514
iii. IP address utilization	118-122
iv. Vendor documentation	79-81
v. Internal operating procedures/policies/standards)	529-538
d. Explain the importance of implementing network segmentation:	
1. SCADA systems/Industrial control systems	464, 691
2. Legacy systems	14, 60, 193-195, 204-205
3. Separate private/public networks	This objective is not directly addressed in this edition of Network+ Guide to Networks.
4. Honeypot/honeynet, Testing lab	88-89, 514-515
5. Load balancing	642
6. Performance optimization	This objective is not directly addressed in this edition of Network+ Guide to Networks.
7. Security	This objective is not directly addressed in this edition of Network+ Guide to Networks.
8. Compliance	532, 575
e. Install and apply patches and updates given a scenario:	
1. OS updates	521-523
2. Firmware updates	25
3. Driver updates	This objective is not directly addressed in this edition of Network+ Guide to Networks.
4. Feature changes/updates	521-523
letwork+ Guide to Networks. 8/F –	

COMPETENCY/OBJECTIVE	PAGE REFERENCES
5. Major vs minor updates	521-523
6. Vulnerability patches	521-523
7. Upgrading vs downgrading (Configuration backup)	521-523
f. Configure a switch using proper features given a scenario:	
1. VLAN	
i. Native VLAN/Default VLAN	462-474
ii. VTP	468
2. Spanning tree (802.1d)/rapid spanning tree (802.1w)	
i. Flooding	571
ii. Forwarding/blocking	571
iii. Filtering	571
3. Interface configuration	
i. Trunking/802.1q	466
ii. Tag vs untag VLANs	468
iii. Port bonding (LACP)	641-642
iv. Port mirroring (local vs remote)	568
v. Speed and duplexing	238-239
vi. IP address assignment	118-122
vii. VLAN assignment	471
4. Default gateway	116
5. PoE and PoE+ (802.3af, 802.3at)	259-261
6. Switch management	
i. User/passwords	362-364
ii. AAA configuration	575-583
iii. Console	64
iv. Virtual terminals	
v. In-band/Out-of-band management	411
7. Managed vs unmanaged.	464-467

COMPETENCY/OBJECTIVE	PAGE REFERENCES
g. Install and configure wireless LAN infrastructure and implement the appropriate technologies in support of wireless capable devices:	
1. Small office/home office wireless router	17, 120-122
2. Wireless access points	
i. Device density	324
ii. Roaming	
iii. Wireless controllers	
a. VLAN pooling	
b. LWAPP	338
iv. Wireless bridge	341-342
v. Site surveys (Heat maps)	341-342
vi. Frequencies (2.4 Ghz, 5.0 Ghz)	305-307, 323-324, 333
vii. Channels	305-307, 333
viii. Goodput	307, 312, 315, 321
ix. Connection types	
a. 802.11a-ht	
b. 802.11g-ht	
x. Antenna placement	307-312
xi. Antenna types	
a. Omnidirectional	307-312
b. Unidirectional	307-312
xii. MIMO/MUMIMO	332-334
xiii. Signal strength	
a. Coverage	326
b. Differences between device antennas	307-312
xiv. SSID broadcast	
xv. Topologies	
a. Adhoc	335-337
b. Mesh	335-337
c. Infrastructure	335-337

COMPETENCY/OBJECTIVE	PAGE REFERENCES
xvi. Mobile devices	
a. Cell phones	715-717
b. Laptops	14, 344-346
c. Tablets	3, 344
d. Gaming devices	182, 315, 344, 409-410
e Media devices	344
3. NETWORK SECURITY	
a. Compare and contrast risk related concepts:	
1. Disaster recovery	661-662
2. Business continuity	659-665
3. Battery backups/UPS	655-658
4. First responders	663-664
5. Data breach	499-501
6. End user awareness and training	501-503
7. Single point of failure	
i. Critical nodes	639
ii. Critical assets	
iii. Redundancy	638-645
8. Adherence to standards and policies	530-531
9. Vulnerability scanning	512-514
10. Penetration testing	512-514
b. Compare and contrast common network vulnerabilities and threats such as:	
1. Attacks/threats	
i. Denial of service	
a. Distributed DoS	
1. Botnet	505
2. Traffic spike	505
3. Coordinated attack	505
b. Reflective/amplified	
1. DNS	503
2.NTP	505

COMPETENCY/OBJECTIVE	PAGE REFERENCES
3. Smurfing	568
c. Friendly/unintentional DoS	504
d. Physical attack	
1. Permanent DoS	505-506
ii. ARP cache poisoning	506-507
iii. Packet/protocol abuse	
iv. Spoofing	214-215
v. Wireless	
a. Evil twin	349
b. Rogue AP	
c. War driving	349-350
d. War chalking	349-350
e. Bluejacking	316
f. Bluesnarfing	316
g. WPA/WEP/WPS attacks	347-350
vi. Brute force	349
vii. Session hijacking	
viii. Social engineering	501-503
ix. Man-in-the-middle	507
x. VLAN hopping	473-474
xi. Compromised system	499-501
xii. Effect of malware on the network	499-511
xiii. Insider threat/malicious employee	503
xiv. Zero day attacks	500-501
2. Vulnerabilities	
i. Unnecessary running services	570-575
ii. Open ports	104, 513
iii. Unpatched/legacy systems	500-501
iv. Unencrypted channels	401, 508, 513
v. Clear text credentials	585

COMPETENCY/OBJECTIVE	PAGE REFERENCES
vi. Unsecure protocols	
a. TELNET	10
b. HTTP	23
c. SLIP	405
d. FTP	10
e. TFTP	132
f. SNMPv1 and SNMPv2	132, 505
vii. TEMPEST/RF emanation	
c. Implement network hardening techniques given a scenario:	
1. Anti-malware software	
i. Host-based	418
ii. Cloud/server-based	418
iii. Network-based	418
2. Switch port security	
i. DHCP snooping	507
ii. ARP inspection	
iii. MAC address filtering	214
iv VLAN assignments	
a. Network segmentation	436-462
3. Security policies	530-531
4. Disable unneeded network services	570-575
5. Use secure protocols such as:	
i SSH	10
ii. SNMPv3	508
iii. TLS/SSL	400
iv. SFTP	10
v. HTTPS	9
vi. IPsec	399
6. Access lists such as:	
i. Web/content filtering	
ii. Port filtering	

COMPETENCY/OBJECTIVE	PAGE REFERENCES
iii. IP filtering	
iv. Implicit deny	557
7. Wireless security such as:	
i. WEP	347-350
ii. WPA/WPA2	
a. Enterprise	348
b. Personal	
iii. TKIP/AES	593
iv. 802.1x	596
v. TLS/TTLS	400-401
vi. MAC filtering	214
8. User authentication such as:	
i. CHAP/MSCHAP	405, 586
ii. PAP	585-586
iii. EAP	585-586
iv. Kerberos	586-589
v. Multifactor authentication	590-591
vi. Two-factor authentication	590-591
vii. Single sign-on	590-591
9. Hashes such as MD5 and SHA.	527-528
d. Compare and contrast physical security controls such as:	
1. Mantraps	This objective is not directly addressed in this edition of Network+ Guide to Networks.
2. Network closets	55-58, 61
3. Video monitoring	
i. IP cameras/CCTVs	518
4. Door access controls	515-517
5. Proximity readers/key fob	515-517
6. Biometrics	88, 418, 516
7. Keypad/cipher locks	515-517

COMPETENCY/OBJECTIVE	PAGE REFERENCES
8. Security guard.	This objective is not directly addressed in this edition of Network+ Guide to Networks.
e. Install and configure a basic firewall given a scenario.	
1. Types of firewalls	
i. Host-based	559-565
ii. Network-based	559-565
iii. Software vs hardware	559-565
iv. Application aware/context aware	559-565
v. Small office/home office firewall	559-565
vi. Stateful vs stateless inspection	559-565
vii. UTM	565
2. Settings/techniques	
i. ACL	557-559
ii. Virtual wire vs routed	
iii. DMZ	141
iv. Implicit deny	557
v. Block/allow	
a. Outbound traffic	557-559
b. Inbound traffic	557-559
vi. Firewall placement	
a. Internal/external	557-559
f. Explain the purpose of various network access control models such as:	
1. 802.1x	596
2. Posture assessment	512
3. Guest network	348
4. Persistent vs non-persistent agents	543-544
5. Quarantine network	584
6. Edge vs access control	197
g. Summarize basic forensic concepts such as:	
1. First responder	663-665

COMPETENCY/OBJECTIVE	PAGE REFERENCES
2. Secure the area.	
i. Escalate when necessary	663-665
3. Document the scene.	663-665
4. eDiscovery	663-665
5. Evidence/data collection	663-665
6. Chain of custody	663-665
7. Data transport	663-665
8. Forensics report	663-665
9. Legal hold	663-665
4. TROUBLESHOOTING	
a. Implement the following network troubleshooting methodology given a scenario.	
1. Identify the problem.	
i. Gather information	33-38
ii. Duplicate the problem, if possible.	33-38
iii. Question users.	33-38
iv. Identify symptoms.	33-38
v. Determine if anything has changed.	33-38
vi. Approach multiple problems individually.	33-38
2. Establish a theory of probable cause.	
i. Question the obvious.	33-38
 ii. Consider multiple approaches (Top-to-bottom/bottom-to-top OSI model, or divide and conquer). 	33-38
3. Test the theory to determine cause.	
 Once theory is confirmed, determine next steps to resolve problem; if theory is not confirmed, re-establish new theory or escalate. 	33-38
 Establish a plan of action to resolve the problem and identify potential effects. 	33-38
5. Implement the solution or escalate as necessary.	33-38
 Verify full system functionality and if applicable implement preventative measures. 	33-38
7. Document findings, actions, and outcomes.	33-38
Network+ Guide to Networks, 8/E –	

COMPETENCY/OBJECTIVE	PAGE REFERENCES
b. Analyze and interpret the output of troubleshooting tools given a scenario using the following:	
1. Command line tools such as:	
i. ipconfig0	103, 116-117
ii. Netstat	207-208
iii.ifconfig	147-149
iv. Ping/ping6/ping -6	143-145
v. Tracert/tracert -6/traceroute6/traceroute -6	208-211
vi. nbtstat, nslookup	
vii. arp	25, 190-191
viii. mac address lookup	26, 113-114
ix. table	
x. Pathping	212
2. Line testers	This objective is not directly addressed in this edition of Network+ Guide to Networks.
3. Certifiers	281-282
4. Multimeter	279-280
5. Cable tester	280
6. Light meter	282
7. Toner probe	277
8. Speed test sites	This objective is not directly addressed in this edition of Network+ Guide to Networks.
9. Looking glass sites	This objective is not directly addressed in this edition of Network+ Guide to Networks.
10. WiFi analyzer	351
11. Protocol analyzer	181
c. Troubleshoot and resolve common wireless issues given a scenario such as:	
1. Signal loss	309-312
2. Interference	310
3. Overlapping channels	355
4. Mismatched channels	307-309

COMPETENCY/OBJECTIVE	PAGE REFERENCES
5. Signal-to-noise ratio	This objective is not directly addressed in this edition of Network+ Guide to Networks.
6. Device saturation	356-357
7. Bandwidth saturation	This objective is not directly addressed in this edition of Network+ Guide to Networks.
8. Untested updates	354-357
9. Wrong SSID	354
10. Power levels	355-356
11. Open networks	This objective is not directly addressed in this edition of Network+ Guide to Networks.
12. Rogue access point	338
13. Wrong antenna type	356
14. Incompatibilities	354-357
15. Wrong encryption	354
16. Bounce	310
17. MIMO	332
18. AP placement	355
19. AP configurations	
i. LWAPP	338
ii. Thin vs thick	
20. Environmental factors	
i. Concrete walls	311
ii. Window film	
iii. Metal studs	
21. Wireless standard related issues	
i. Throughput	307
ii. Frequency	323
iii. Distance	323
iv Channels	305

COMPETENCY/OBJECTIVE	PAGE REFERENCES
d. Troubleshoot and resolve common copper cable issues given a scenario	
such as:	
1. Shorts	33
2. Opens	31
3. Incorrect termination (mismatched standards)	
i. Straight-through	251
ii. Crossover	251-253
4. Cross-talk	
i. Near end	281-282
ii. Far end	237
5. EMI/RFI	236-237
6. Distance limitations	237-238
7. Attenuation/Db loss	237
8. Bad connector	38
9. Bad wiring	38
10. Split pairs	38
11. Tx/Rx reverse	253
12. Cable placement	38
13. Bad SFP/GBIC - cable or transceiver.	271
e. Troubleshoot and resolve common fiber cable issues given a scenario such as:	
1. Attenuation/Db loss	237
2. SFP/GBIC - cable mismatch	271
3. Bad SFP/GBIC - cable or transceiver	271
4. Wavelength mismatch	276
5. Fiber type mismatch	276
6. Dirty connectors	276
7. Connector mismatch	This objective is not directly addressed in this edition of Network+ Guide to Networks.
8. Bend radius limitations	This objective is not directly addressed in this edition of Network+ Guide to Networks.

COMPETENCY/OBJECTIVE	PAGE REFERENCES
9. Distance limitations	This objective is not directly addressed in this edition of Network+ Guide to Networks.
f. Troubleshoot and resolve common network issues given a scenario such as:	
1. Incorrect IP configuration/default gateway	136
2. Broadcast storms/switching loop	571
3. Duplicate IP	686
4. Speed and duplex mismatch	239
5. End-to-end connectivity	701-702
6. Incorrect VLAN assignment	473
7. Hardware failure	386
8. Misconfigured DHCP	147
9. Misconfigured DNS	147
10. Incorrect interface/interface	This objective is not directly addressed in this edition of Network+ Guide to Networks.
11. Misconfiguration	153
12. Cable placement	This objective is not directly addressed in this edition of Network+ Guide to Networks.
13. Interface errors	684-685
14. Simultaneous wired/wireless connections	354-357
15. Discovering neighboring devices/nodes	354-357
16. Power failure/power anomalies	658
17. MTU/MTU black hole	224
18. Missing IP routes	This objective is not directly addressed in this edition of Network+ Guide to Networks.
19. NIC teaming misconfiguration	
i. Active-active vs active-passive	
ii. Multicast vs broadcast	126-127
g. Troubleshoot and resolve common security issues given a scenario such:	
1. Misconfigured firewall	563-565
2. Misconfigured ACLs/applications	557-559
3. Malware	508-511

COMPETENCY/OBJECTIVE	PAGE REFERENCES
4. Denial of service	503-508
5. Open/closed ports	104, 513
6. ICMP related issues	This objective is not directly addressed in this edition of Network+ Guide to Networks.
i. Ping of death	
ii. Unreachable default gateway	
7. Unpatched firmware/Oss	87, 521
8. Malicious users	
i. Trusted	503
ii. Untrusted users	501
iii. Packet sniffing	101-105
9. Authentication issues	
i. TACACS/RADIUS misconfigurations	575
ii. Default passwords/settings	97
10. Improper access/backdoor access	521
11. ARP issues	25, 190-191,506-507
12. Banner grabbing/OUI	This objective is not directly addressed in this edition of Network+ Guide to Networks.
13. Domain/local group configurations	This objective is not directly addressed in this edition of Network+ Guide to Networks.
14. Jamming	This objective is not directly addressed in this edition of Network+ Guide to Networks.
h. Troubleshoot and resolve common WAN issues given a scenario for the following:	
1. Loss of internet connectivity	681-683
2. Interface errors	684-685
3. Split horizon	This objective is not directly addressed in this edition of Network+ Guide to Networks.
4. DNS issues	684-686
5. Interference	685
6. Router configurations	681
7. Customer premise equipment	684

COMPETENCY/OBJECTIVE	PAGE REFERENCES
8. Smart jack/NIU	684
9. Demark	This objective is not directly addressed in this edition of Network+ Guide to Networks.
10. Loopback	119-120
11. CSU/DSU	
i. copper line drivers/repeaters	684
12. Company security policy	
i. Throttling	633
ii. Blocking	
iii. Fair access policy/utilization limits	
13. Satellite issues	
i. Latency	720
5. INDUSTRY STANDARDS, PRACTICES, AND NETWORK THEORY	
a. Analyze a scenario and determine the corresponding OSI layer for the following layers:	
1. Layer 1 – Physical	26
2. Layer 2 – Data link	25-26
3. Layer 3 – Network	25
4. Layer 4 – Transport	24
5. Layer 5 – Session	24
6. Layer 6 – Presentation	23
7. Layer 7 – Application	23
b. Explain the basics of network theory and concepts:	
1. Encapsulation/de-encapsulation	24
2. Modulation techniques	
i. Multiplexing	239-241
ii. De-multiplexing	239-241
iii. Analog and digital techniques	238
iv. TDM	249
3. Numbering systems	
i. Binary	111

COMPETENCY/OBJECTIVE	PAGE REFERENCES
ii. Hexadecimal	111
iii. Octal	
4. Broadband/base band	This objective is not directly addressed in this edition of Network+ Guide to Networks.
5. Bit rates vs baud rate	235-236
6. Sampling size	620
7. CDMA/CD and CSMA/CA	325-327
8. Carrier detect/sense	193-195
9. Wavelength	240, 265, 273
10. TCP/IP suite	
i. ICMP	25, 188-189
ii. UDP	24
iii. TCP	24, 174-181
11. Collision	120, 194
c. Deploy the appropriate wireless standard given a scenario:	
1. 802.11a	305, 323, 324
2. 802.11b	324
3. 802.11g	324
4. 802.11n	324
5. 802.11ac	324-325
d. Deploy the appropriate wired connectivity standard given a scenario for the following:	
1. Ethernet standards	
i. 10BaseT	
ii. 100BaseT	262
iii. 1000BaseT	262
iv. 1000BaseTX	
v. 10GBaseT	262
vi. 100BaseFX	
vii. 10Base2	
viii. 10GBaseSR	

COMPETENCY/OBJECTIVE	PAGE REFERENCES
ix. 10GBaseER	
x. 10GBaseSW	
xi. IEEE 1905.1-2013	
a. Ethernet over HDMI	
b. Ethernet over power line	
2. Wiring standards	
i. EIA/TIA 568A/568B	250
3. Broadband standards	
i. DOCSIS	698
e. Implement the appropriate policies or procedures given a scenario for the following:	
1. Security policies	
i. Consent to monitoring	530
2. Network policies	583-584
3. Acceptable use policy	532-533
4. Standard business documents	
i. SLA	636
ii. MOU	85-86
iii. MSA	86
iv. SOW	86
f. Summarize safety practices.	
1. Electrical safety	
i. Grounding	33
2. ESD	
i. Static	33
3. Installation safety	
i. Lifting equipment	32-33
ii. Rack installation	79
iii. Placement	
iv. Tool safety	32
4. MSDS	31-32

COMPETENCY/OBJECTIVE	PAGE REFERENCES
5. Emergency procedures	
i. Building layout	29
ii. Fire escape plan	29
iii. Safety/emergency exits	29
iv. Fail open/fail close	30-31
v. Emergency alert system	29
6. Fire suppression systems	29
7. HVAC	69-70
g. Install and configure equipment in the appropriate location using best practices given a scenario for the following:	
1. Intermediate distribution frame	This objective is not directly addressed in this edition of Network+ Guide to Networks.
2. Main distribution frame	56-58
3. Cable management	
i. Patch panels	58-60
3. Power management	
i. Power converters	
ii. Circuits	
iii. UPS	656
iv. Inverters	
v. Power redundancy	653-658
4. Device placement	557-559
5. Air flow	64
6. Cable trays	68
7. Rack systems	
i. Server rail racks	
ii. Two-post racks	62-64
iii. Four-post racks	62-64
iv. Free-standing racks	63-64
8. Labeling	
i. Port labeling	

COMPETENCY/OBJECTIVE	PAGE REFERENCES
ii. System labeling	
iii. Circuit labeling	
iv. Naming conventions	82-85
v. Patch panel labeling	82-85
9. Rack monitoring	This objective is not directly addressed in this edition of Network+ Guide to Networks.
10. Rack security	This objective is not directly addressed in this edition of Network+ Guide to Networks.
h. Explain the basics of change management procedures for the following:	
1. Documenting reason for a change	91
2. Change request	
i. Configuration procedures	90-92
ii. Rollback process	90-92
iii. Potential impact	90-92
iv. Notification	90-92
3. Approval process	90-92
4. Maintenance window	
i. Authorized downtime	90-92
5. Notification of change	90-92
6. Documentation	
i. Network configurations	82-85
ii. Additions to network	82-85
iii. Physical location changes	82-85
i. Compare and contrast the following ports and protocols.	
1. 80 HTTP	9
2. 443 HTTPS	9, 400
3. 137-139 NetBIOS	562
4. 110 POP	9
5. 143 IMAP	9
6. 25 SMTP	9-10
7. 5060/5061 SIP	133

COMPETENCY/OBJECTIVE	PAGE REFERENCES
8. 2427/2727 MGCP	This objective is not directly addressed in this edition of Network+ Guide to Networks.
9. 5004/5005 RTP	This objective is not directly addressed in this edition of Network+ Guide to Networks.
10. 1720 H.323	133
11. TCP	
i. Connection-oriented	24
12. UDP	
i. Connectionless	24
j. Configure and apply the appropriate ports and protocols given a scenario.	
1. 20,21 FTP	10, 112, 412
2. 161 SNMP	9-10
3. 22 SSH	406-408, 523-524
4. 23 Telnet	10, 406, 513
5. 53 DNS	116, 127-129
6. 67,68 DHCP	114
7. 69 TFTP	133, 412
8. 445 SMB	This objective is not directly addressed in this edition of Network+ Guide to Networks.
9. 3389 RDP	11-12

"National Geographic," "National Geographic Society" and the "Yellow Border Design" are registered trademarks of the National Geographic Society® Marcas Registradas.