

Chapter 19

Local Area Networking



Episode: **Introduction to TCP/IP**

Objective(s):

Core 1: 2.5 Given a scenario, install and configure basic wired/wireless small office/home office (SOHO) networks.
Core 2: 1.6 Given a scenario, configure Microsoft Windows networking features on a client/desktop.



Episode Description

A+

The Transmission Control Protocol/Internet Protocol (TCP/IP) is the cornerstone of Internet addressing and routing. It's important to understand IP addressing schemes and to see how TCP and IP work together to make the Internet work.

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Key Terms

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- 0:13 - 192.168.5.10
- 2:06 - Advanced Research Projects Agency Network (ARPANET)
- 11:41 - Objective term - Subnet mask
- 13:32 - Objective term - Default gateway

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Quick Review

- TCP/IP was adopted as a protocol for ARPANET and what was to become the Internet
- IP addresses have four octets between 0-255
- Subnet masks are used to differentiate IP addresses on local LANs vs. outside traffic, and are only used for IPv4 addresses



Episode: **Dynamic IP Addressing**

Objective(s):

Core 1: 2.4 Summarize services provided by networked hosts.

Core 1: 2.5 Given a scenario, install and configure basic wired/wireless small office/home office (SOHO) networks.

Core 1: 2.6 Compare and contrast common network configuration concepts.

Core 2: 1.2 Given a scenario, use the appropriate Microsoft command-line tool.

Core 2: 1.6 Given a scenario, configure Microsoft Windows networking features on a client/desktop.



Episode Description

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Manually entering IP addresses into all our devices is an administrative nightmare. To avoid this mess, smart techs use the Dynamic Host Configuration Protocol (DHCP) to automatically provide IP addressing to individual hosts.

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Key Terms

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- 0:24 - Objective term - Dynamic IP addressing via Dynamic Host Configuration Protocol (DHCP)
- 3:50 - Objective term - Automatic Private IP Addressing (APIPA)
- 4:22 - APIPA will always give 169.254.X.X address
- 4:34 - Class B address

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Key Terms

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- 5:48 - Objective term - ipconfig
- 6:34 - Objective term - ipconfig /renew
- 6:50 - Objective term - ipconfig
- 6:55 - Objective term - ipconfig /release
- 7:03 - Objective term - ipconfig /renew

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Quick Review

- Dynamic Host Configuration Protocol (DHCP) automatically and dynamically assigns IP information to hosts
- Gateway routers commonly are DHCP servers for their internal LANs
- If a DHCP client can't find the DHCP server, it will use an APIPA address
- Use the `ipconfig /renew` command to force a new connection to the DHCP server



Episode: **IPv6**

Objective(s): Core 1: 2.5 Given a scenario, install and configure basic wired/wireless small office/home office (SOHO) networks.



Episode Description

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The traditional IP addressing scheme (called IPv4) is quickly being replaced with the much more advanced IPv6 scheme. IPv6 adds several benefits over IPv4 and good techs know how to use it in our systems.

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Key Terms

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- 0:17 - Objective term - IPv4
- 0:22 - Objective term - IPv4: 172.16.254.1
- 0:57 - Objective term - IPv6
- 1:02 - 4 billion addresses
- 1:37 - Objective term - IPv6:
2001:0db8:85a3:0000:0000:8a2e:0370:7334
- 2:30 -
fe80:0000:0000:1234:0000:0000:0000:1234

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Key Terms

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- 2:53 - fe80:0:0:1234:0:0:0:1234
- 3:15 - fe80:0:0:1234::1234
- 3:48 - Link-local address
- 3:52 - Link-local address always starts with fe80
- 4:10 - Global unicast address (Internet address)
- 6:16 - IPv6 prefix (like an IPv4 subnet mask)

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Quick Review

- IPv6 uses a 128-bit addressing scheme with eight sets of zeros separated by colons
- IPv6 addresses use a hexadecimal notation
- Link-local addresses are used for local connections
- Global addresses are used to connect to the Internet
- IPv6 addresses have prefixes instead of subnet masks



Episode: **Port Numbers**

Objective(s):

Core 1: 2.1 Compare and contrast Transmission Control Protocol (TCP) and User Datagram Protocol (UDP) ports, protocols, and their purposes.

Core 1: 2.4 Summarize services provided by networked hosts.



Episode Description

A+

An IP address directs a packet to the right computer, but it's the port number that makes a connection between two applications on separate systems. It's critical to understand how port numbers do their job and to memorize many special port numbers.

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Key Terms

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- 2:33 - Objective term - Domain Name System (DNS)
- 3:52 - Objective term - Port number
- 4:05 - Port numbers go from 0 - 65535
- 9:17 - Well-known ports: 0-1023
- 9:37 - Registered ports: 1024-49151
- 10:10 - Dynamic/ephemeral ports: 49152 - 65535

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Common Port Numbers You Need to Know

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Port	Protocol	Port	Protocol
20/21	File Transfer Protocol (FTP)	137/139	Network Basic Input/Output System (NetBIOS)/ NetBIOS over TCP/IP
22	Secure Shell (SSH)	143	Internet Mail Access Protocol (IMAP)
23	Telnet	161/162	Simple Network Management Protocol (SNMP)
25	Simple Mail Transfer Protocol (SMTP)	389	Lightweight Directory Access Protocol (LDAP)
53	Domain Name System (DNS)	443	Hypertext Transfer Protocol Secure (HTTPS)
67/68	Dynamic Host Configuration Protocol (DHCP)	445	Server Message Block (SMB)/ Common Internet File System (CIFS)
80	Hypertext Transfer Protocol (HTTP)	3389	Remote Desktop Protocol (RDP)
110	Post Office Protocol v3 (POP3)		

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Quick Review

- Port numbers get data to the correct application
- There is always a source and destination port number
- Servers listen for well-known port numbers (0-1023)
- Resource Monitor shows the connections on a system
- Memorize all ports numbers listed on the A+



Episode: **TCP, UDP, and ICMP**

Objective(s): Core 1: 2.1 Compare and contrast Transmission Control Protocol (TCP) and User Datagram Protocol (UDP) ports, protocols, and their purposes.



Episode Description

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TCP is the most popular IP protocol, but it isn't the only one. User Datagram Protocol (UDP) and Internet Control Message Protocol (ICMP) both serve important purposes and features that techs need to understand.

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Key Terms

A+

- 0:22 - Objective term - Protocol
- 0:55 - Transmission Control Protocol/Internet Protocol (TCP/IP)
- 1:22 - Objective term - User Datagram Protocol (UDP)
- 1:22 - Objective term - Internet Control Message Protocol (ICMP)
- 2:10 - Objective term - TCP (connection-based)
- 2:30 - Handshake

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Key Terms

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- 2:41 - UDP (connectionless)
- 3:20 - ICMP (single packet only)
- 4:18 - Protocol data unit (PDU)
- 4:37 - Ethernet frame
- 4:52 - IP packet
- 5:32 - TCP segment/UDP datagram

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Quick Review

- Transmission Control Protocol (TCP) is connection-oriented and sends multiple packets
- User Datagram Protocol (UDP) is connectionless, but also sends multiple packets
- Internet Control Message Protocol (ICMP) is connectionless and always sends a single packet
- We organize packets by protocol data units (PDUs)



Episode: **Understanding DNS**

Objective(s):

Core 1: 2.4 Summarize services provided by networked hosts.

Core 1: 2.6 Compare and contrast common network configuration concepts.



Episode Description

A+

Individual hosts use IP addresses, but humans are terrible at memorizing long strings of numbers. To make our lives easier, most TCP/IP networks (and certainly the Internet) use the Domain Name System (DNS) to apply more human-friendly names to systems. DNS can also make use of various spam management protocols such as DKIM, SPF, and DMARC.

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Key Terms

A+

- 1:05 - www.totalsem.com (175.16.44.3)
- 1:10 - www.totalsem.com
- 1:20 - Objective term - Domain Name System (DNS)
- 1:26 - Fully Qualified Domain Name (FQDN)
Example: www.totalsem.com
- 1:56 - Hosts file
- 8:15 - FQDNs have a 256-character limit

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Key Terms

A+

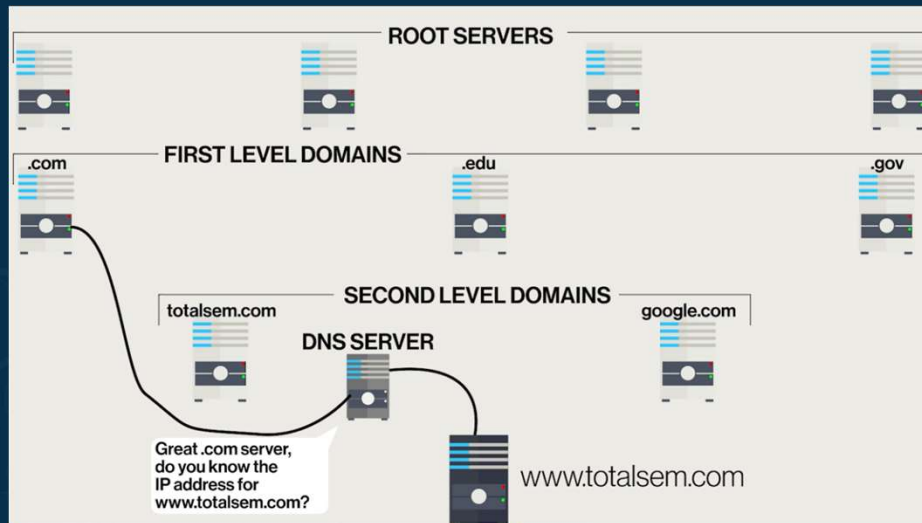
- 8:33 - Objective term - Spam gateway/spam management
- 9:17 - Objective term - Domain-based Message Authentication, Reporting, and Conformance (DMARC)
- 9:55 - Objective term - DomainKeys Identified Mail (DKIM)
- 10:28 - Objective term - Sender Policy Framework (SPF)

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DNS Servers

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Quick Review

- The Domain Name System (DNS) resolves Fully Qualified Domain Names (FQDNs) to IP addresses
- Domain-based Message Authentication, Reporting, and Conformance (DMARC) enters records of domains to avoid spoofing
- DomainKeys Identified Mail (DKIM) enables the sender to sign their message and verify their identity
- Sender Policy Framework (SPF) detects fraudulent e-mail addresses



Episode: **Working with DNS**

Objective(s):

Core 1: 2.6 Compare and contrast common network configuration concepts.

Core 2: 1.2 Given a scenario, use the appropriate Microsoft command-line tool.

Core 2: 1.6 Given a scenario, configure Microsoft Windows networking features on a client/desktop.



Episode Description

A+

When a user complains the Internet is down, what's often happening is that DNS isn't working. There are a few simple tools and procedures to diagnose and repair DNS problems.

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Key Terms

A+

- 0:26 - Objective term - `ipconfig /all`
- 2:16 - Objective term - 1. Manually configure DNS
- 2:27 - Google's DNS servers: 8.8.8.8 or 8.8.4.4
- 3:25 & 3:56 - Objective term - `nslookup`
- 4:20 - Objective term - An A record tracks IPv4 address system names (AAAA records track IPv6)
- 4:29 - Objective term - MX records are used by mail servers
- 4:37 - Canonical Name (CNAME) record

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Quick Review

- Use `ipconfig /all` to see a system's DNS servers
- You can statically configure DNS and still use DHCP for IP addressing
- Have an alternative public DNS server in case your DNS server is down
- Use `nslookup` to verify a DNS server is running



Episode: **Routers**

Objective(s):

Core 1: 1.3 Given a scenario, set up and configure accessories and ports of mobile devices.

Core 1: 2.2 Compare and contrast common networking hardware.

Core 1: 3.1 Explain basic cable types and their connectors, features, and purposes.

Core 1: 2.6 Compare and contrast common network configuration concepts.

Core 2: 2.9 Given a scenario, configure appropriate security settings on small office/home office (SOHO) wireless and wired networks.



Episode Description

A+

The CompTIA A+ exams challenge test takers to perform many configurations of a typical home router. But what does a router do for a SOHO network?

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Key Terms

A+

- 0:19 - Objective term - Routers filter and forward traffic based on IP traffic and connect systems on a LAN
- 4:15 - Router/switch with WAP
- 4:52 - DOCSIS
- 5:32 - Console port
- 5:35 - Objective term - Serial port
- 6:30 - Objective term - DB-9 connector

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Key Terms

A+

- 7:06 - Yost/Rollover cable
- 7:41 - Objective term - Small Office/Home Office (SOHO) router
- 7:59 - Objective term - DHCP range (scope)
- 8:24 - Default username and password
- 8:29 - Objective term - Change the default username and password!

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Quick Review

- Routers filter and forward traffic based on IP addresses
- A routing table determines where to filter or forward IP packets
- Every routing table has a default gateway that sends all data unless otherwise specified
- A SOHO router is usually far more than a router



Episode: **Basic Router Configuration**

Objective(s):

Core 1: 2.5 Given a scenario, install and configure basic wired/wireless small office/home office (SOHO) networks.

Core 1: 2.6 Compare and contrast common network configuration concepts.

Core 2: 2.9 Given a scenario, configure appropriate security settings on small office/home office (SOHO) wireless and wired networks.



Episode Description

A+

All routers share some basic configuration steps every tech must know. From router passwords to LAN IDs, this is the place to learn about these settings.

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Key Terms

A+

- 2:07 - Objective term - Static IP can be set on your WAN if required by your Internet Service Provider (ISP)
- 5:10 - Objective term - DHCP servers must be configured to hand out a pool (or scope) of IP addresses
- 5:38 - Objective term - DHCP lease limits the amount of time a client can use an IP address
- 6:53 - Objective term - DHCP reservations keep IP addresses for statically assigned clients
- 9:12 - Objective term - Firmware upgrade/update

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Quick Review

- Configure both the WAN and LAN connections on your router
- Avoid default settings for basic configurations (IP, SSID, password, etc.)
- Static IP can be set on your WAN if required by your Internet Service Provider (ISP)
- Don't create too large of a DHCP pool
- DHCP reservations set aside IP addresses in the DHCP pool/scope



Episode: **VLANs**

Objective(s):

Core 1: 2.2 Compare and contrast common networking hardware.

Core 1: 2.6 Compare and contrast common network configuration concepts.

Core 2: 2.5 Given a scenario, manage and configure basic security settings in the Microsoft Windows OS.

Core 2: 2.9 Given a scenario, configure appropriate security settings on small office/home office (SOHO) wireless and wired networks.



Episode Description

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Virtual LANs (VLANs) are common features built into almost all switches. VLANs provide superb control of your LAN but have their own quirks that a good tech understands.

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Key Terms

A+

- 0:46 - Objective term- Virtual Local Area Network (VLAN)
- 1:55 - Objective term - Managed vs. unmanaged switch
- 5:59 - Objective term - Port security
- 6:35 - Objective term - Port security can disable ports
- 7:08 - Objective term - Software-defined networking (SDN)

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Quick Review

- Virtual LANs (VLANs) enable network segmentation without adding hardware
- Configure VLAN-capable switches via IP address and web browser
- Use firmware interface for managing VLANs and enabling port security
- Software-defined networking (SDN) can lessen human error



Episode: **Network Troubleshooting**

Objective(s): Core 1: 5.7 Given a scenario, troubleshoot problems with wired and wireless networks.



Episode Description

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Networks sometimes fail. A good network tech knows how read symptoms and diagnose a network quickly to enable users to get back to work.

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Key Terms

A+

- 0:27 - No connectivity
- 1:25 - IP conflict
- 2:17 - Objective term - Limited connectivity
- 2:54 - Rogue DHCP server
- 3:14 - Objective term - Intermittent connectivity
- 3:45 - Unavailable resources
- 4:12 - Objective term - Slow transfer/network speeds

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Quick Review

- Connectivity problems are usually caused by physical or software faults
- External interference can create network problems
- Lack of or slow access to resources point to problems on the network as well

