Chapter 13

WAN Connectivity

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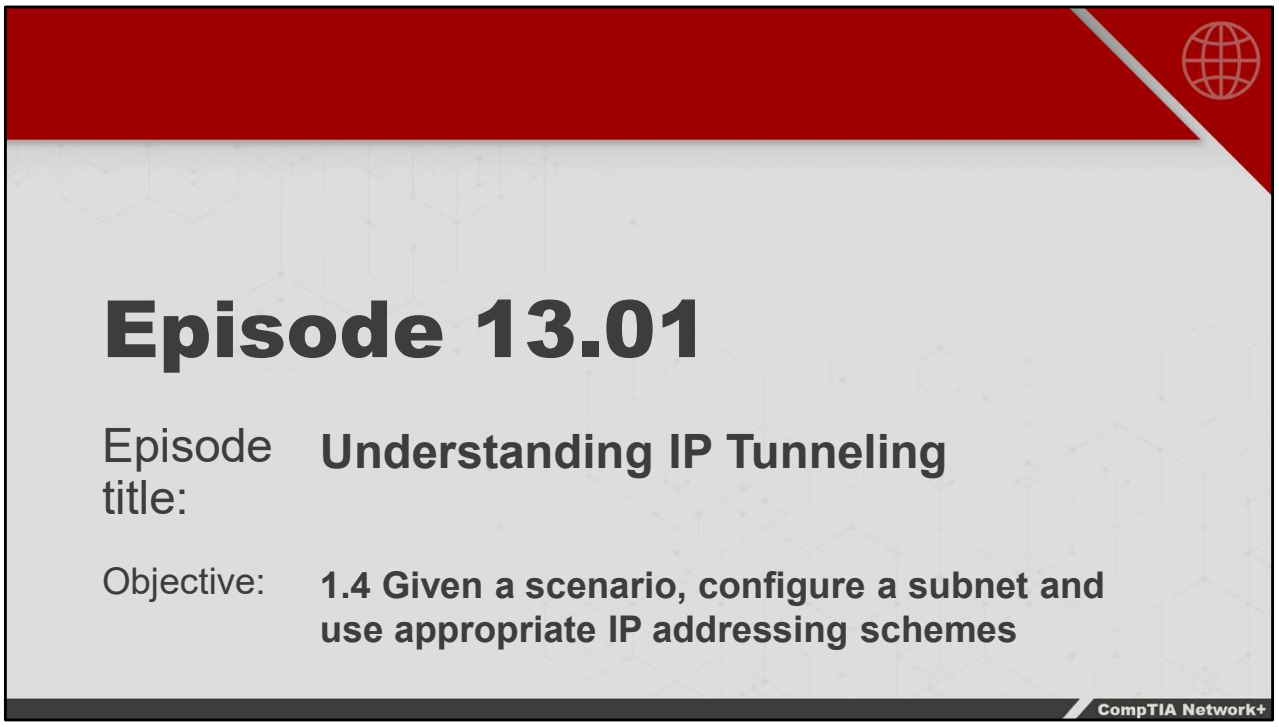
Episode 13.01
Episode title:
Understanding IP Tunneling
Objective:
1.4 Given a scenario, configure a subnet and use appropriate IP addressing schemes
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Key Terms

- Redesign the program to include encryption
- Piggyback on a protocol that's already encrypted
- Tunnel
- A tunnel starts by making an encrypted connection between two computers
- Tunnels are used to encrypt unencrypted protocols

Quick Review

- Very few Internet protocols are encrypted
- Tunnels can encapsulate unencrypted protocols to create encrypted communication channels
- Tunnels are often used with remote access connections

Episode 13.02

Episode title: **WAN Technologies**

Objective: **1.2 Explain the characteristics of network topologies and network types**

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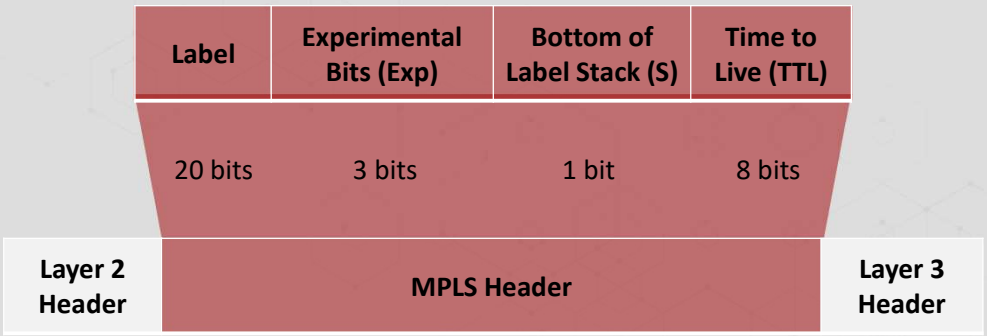
Key Terms

- Bidirectional wavelength division multiplexing (WDM or BWDM)
- Dense wavelength division multiplexing (DWDM)
- DWDM fiber example: 51.8-Mbps OC-1 line × 150 signals = 7.6 Gbps!
- Coarse wavelength division multiplexing (CWDM) Private WANs

Key Terms

- Private WANs
- Multiprotocol Label Switching (MPLS)
- Software-defined wide area networking (SD-WAN)
- Metro Ethernet/optical
- Metropolitan area network (MAN)

Multiprotocol Label Switching (MPLS) Packet



Quick Review

- Multiprotocol label switching (MPLS) provides a labeling system to greatly improve performance
- Software-defined wide area network (SD-WAN) uses MPLS technologies, but with better security
- The metropolitan area network (MAN) does not use the Internet to connect and thus doesn't require security, so it is more affordable

Episode 13.03

Episode title: **Digital Subscriber Line (DSL)**

Objective:

1.2 Explain the characteristics of network topologies and network types

2.1 Compare and contrast various devices, their features, and their appropriate placement on the network

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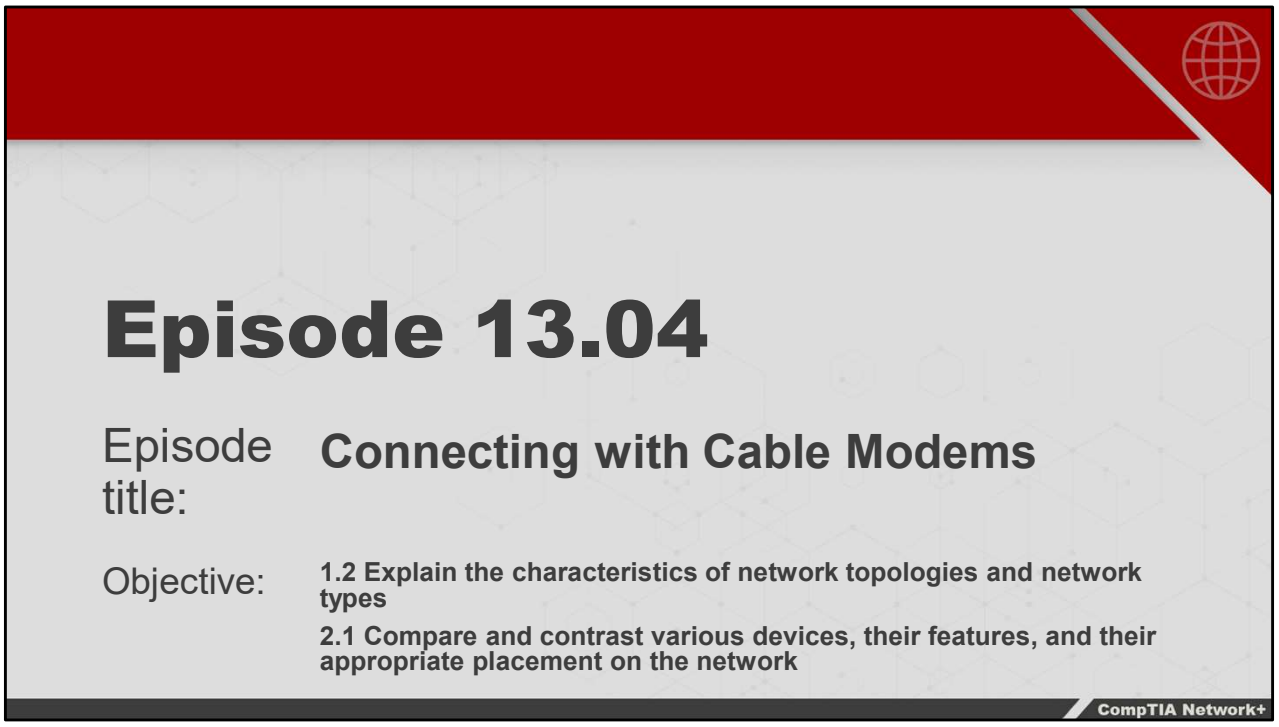
Key Terms

- DSL line
- DSL modem
- RJ-11
- RJ-45
- Symmetric DSL
- Asymmetric DSL
- DSL filter
- VDSL (very-high-bit-rate DSL)

Quick Review

- DSL is either in symmetric or asymmetric mode, asymmetric is the common application
- DSL filtering is used to clear the phone line of the DSL noise


Episode 13.04
Episode title:
Connecting with Cable Modems
Objective:
1.2 Explain the characteristics of network topologies and network types
2.1 Compare and contrast various devices, their features, and their appropriate placement on the network
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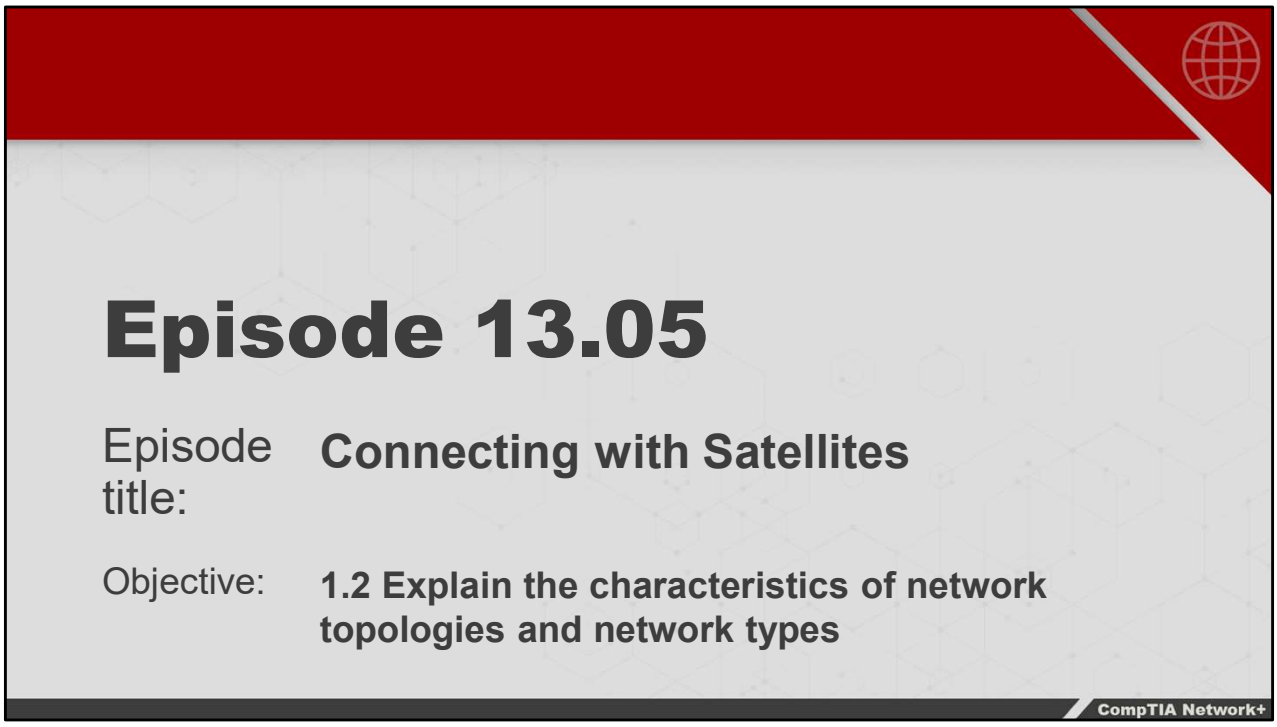
Key Terms

- MAC Address Clone

Quick Review

- Cable modems come from cable company
- Cable rarely requires PPPoE
- Cable modems use F-type connectors


Episode 13.05
Episode title:
Connecting with Satellites
Objective:
1.2 Explain the characteristics of network topologies and network types
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Key Terms

- RG-6 cable
- Satellite modem
- Satellite latency

Quick Review

- Satellite modems enable connecting to the Internet through a satellite
- Satellite connections have terrible latency
- Run a RG-6 cable from the dish to the modem

Episode 13.06

Episode title: **Cellular Technologies**

Objective: **2.4 Given a scenario, install and configure the appropriate wireless standards and technologies**

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Key Terms

- Global System for Mobile Communications (GSM)
- Time-division multiple access (TDMA)
- Enhanced Data rates for GSM Evolution (EDGE)
- Code-division multiple access (CDMA)
- Long Term Evolution (LTE)

Key Terms

- LTE is 4G and has up to 300 Mbps download/75 Mbps upload speeds
- 5G
- 5G runs on three bands (low, medium, high)

Quick Review

- The G stands for generation, and currently 5G is the fastest cellular technology
- Global System for Mobile Communications (GSM) is the oldest cellular technology and uses time-division multiple access (TDMA)
- Code-division multiple access (CDMA) is not compatible with GSM

Episode 13.07

Episode title: **Remote Desktop Connectivity**

Objective:

1.5 Explain common ports and protocols, their application, and encrypted alternatives

4.4 Compare and contrast remote access methods and security implications

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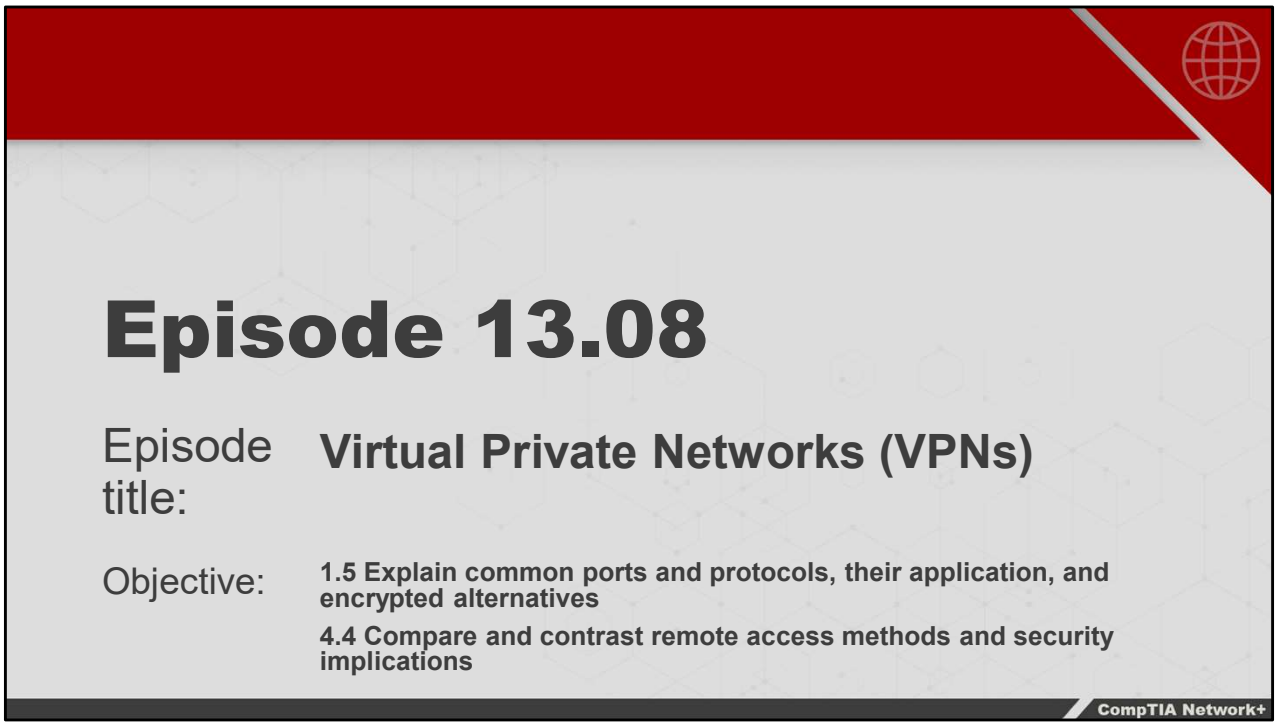
Key Terms

- Citrix used Independent Computing Architecture (ICA) for the first remote desktops
- Tight Virtual Network Computing (TightVNC)
- Microsoft Remote Desktop Protocol (RDP)
- RDP uses port 3389
- TightVNC uses port 5900

Quick Review

- Remote desktop connections can be used to access computers from an offsite location, or be used to help control the desktop of a user you are assisting
- Microsoft Remote Desktop Protocol (RDP) runs on port 3389
- Tight Virtual Network Computing (TightVNC) runs on port 5900


Episode 13.08
Episode title:
Virtual Private Networks (VPNs)
Objective:
1.5 Explain common ports and protocols, their application, and encrypted alternatives
4.4 Compare and contrast remote access methods and security implications
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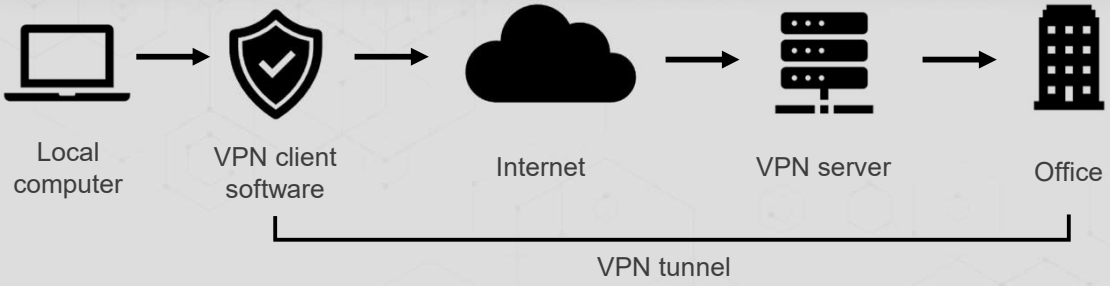
Key Terms

- Virtual private network (VPN)
- A VPN creates a tunnel between a client computer and an endpoint

Virtual Private Networks (VPNs)



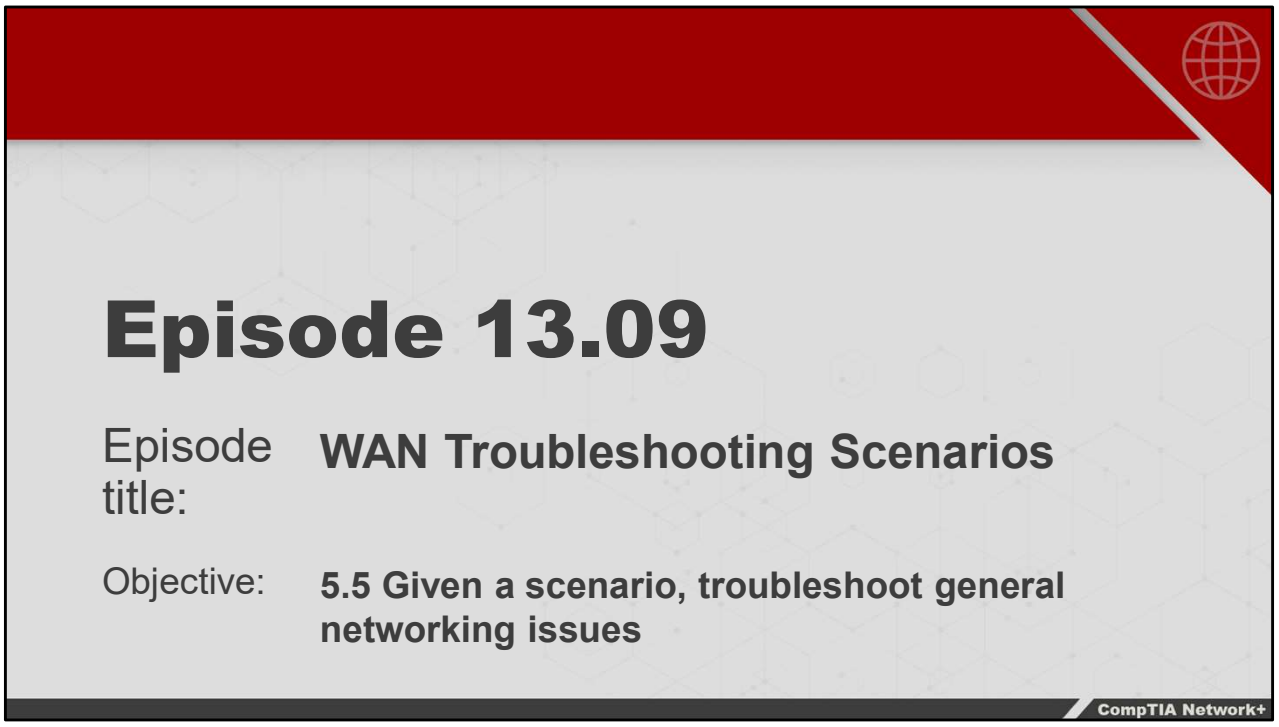
1. Computer connects to the Internet using local DHCP
2. VPN client software creates a virtual NIC (vNIC) on your local computer (endpoint 1)
3. Then it makes a connection with the VPN server at the office (endpoint 2)
4. Then it makes a virtual direct cable from the vNIC to the office

Key Terms

- Point-to-Point Tunneling Protocol (PPTP)
- Layer 2 Tunneling Protocol over IPsec (L2TP/IPsec)
- SSL Tunneling Protocol (SSTP)
- Encapsulating Security Payload (EAP)
- Client-to-site VPN
- VPN concentrator/headend
- Site-to-site VPN
- OpenVPN and SSH (Secure Shell)
- IKEv2
- Generic Routing Encapsulation (GRE)

Quick Review

- A virtual private network (VPN) creates a secure tunnel so a remote machine or network can be part of a local network
- A client-to-site VPN connects a remote computer to a local network
- A site-to-site VPN connects distant networks into a single network


Episode 13.09
Episode title:
WAN Troubleshooting Scenarios
Objective:
5.5 Given a scenario, troubleshoot general networking issues
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Key Terms

- Use ping, ipconfig, and netstat to test connectivity
- Check the LAN interface
- Check the modem interface
- Check DNS server connection
- Check for interference

Quick Review

- Use common tools like ping and ipconfig, and check to ensure cables are properly connected
- Most problems that occur within WAN technologies are rarely the ISP's fault
- Interference is usually on the consumer end unless natural disasters occur which would cause a failure