CompTIA Network+ Exam N10-008

Lesson 16

Comparing WAN Links and Remote Access Methods

Objectives

- Explain WAN provider links
- Compare and contrast remote access methods

Lesson 16

Topic 16A

Explain WAN Provider Links

Wide Area Network Technologies and the OSI Model

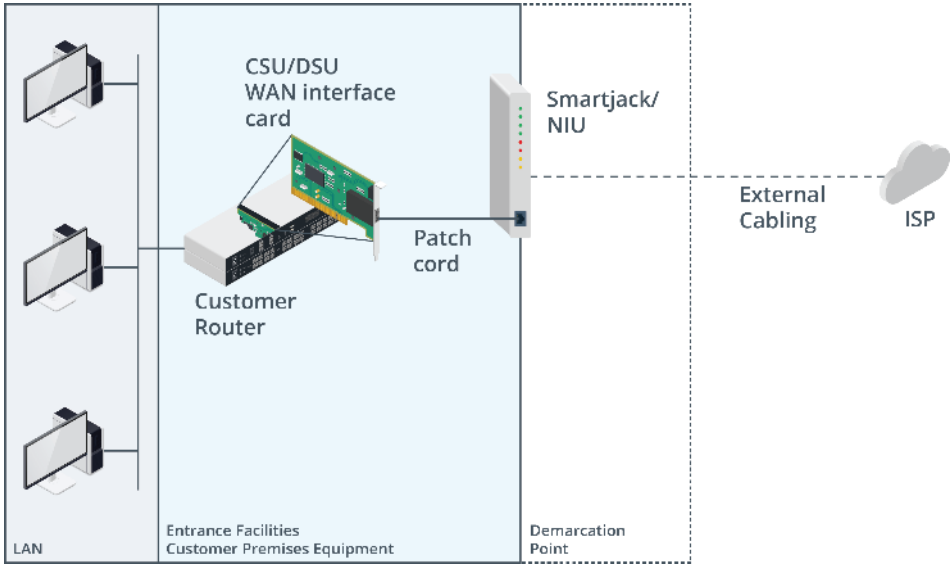
- WAN physical layer
  - Modulation and demodulation
  - Analog modems and digital modems
- WAN data link layer
  - Point-to-point links using serial data protocols
  - Ethernet
- WAN network layer
  - Customer Edge (CE) router link to Provider Edge (PE) router

WAN Provider Links

- Demarcation point (demarc)
  - Termination point for service provider’s cabling
  - Minimum point of entry (MPOE)
- Customer premises equipment (CPE)
- Entrance facilities

T-Carrier and Leased Line Provider Links

- Time Division Multiplexing (TDM) circuits
  - 64 Kbps channels
  - 24 channels multiplexed as a T1 leased line
- Smart jack/Network Interface Unit (NIU)
  - Serial digital signal over 2-pair UTP
  - RJ-48C or RJ-48X to connect to the CSU/DSU
- Channel Service Unit/Data Service Unit (CSU/DSU)
  - DSU digital modem encodes signal from PBX/router
  - CSU performs diagnostics
  - Typically implemented as WAN interface card
- Data link layer
  - High-level Data Link Control (HDLC) or Point-to-Point Protocol (PPP)

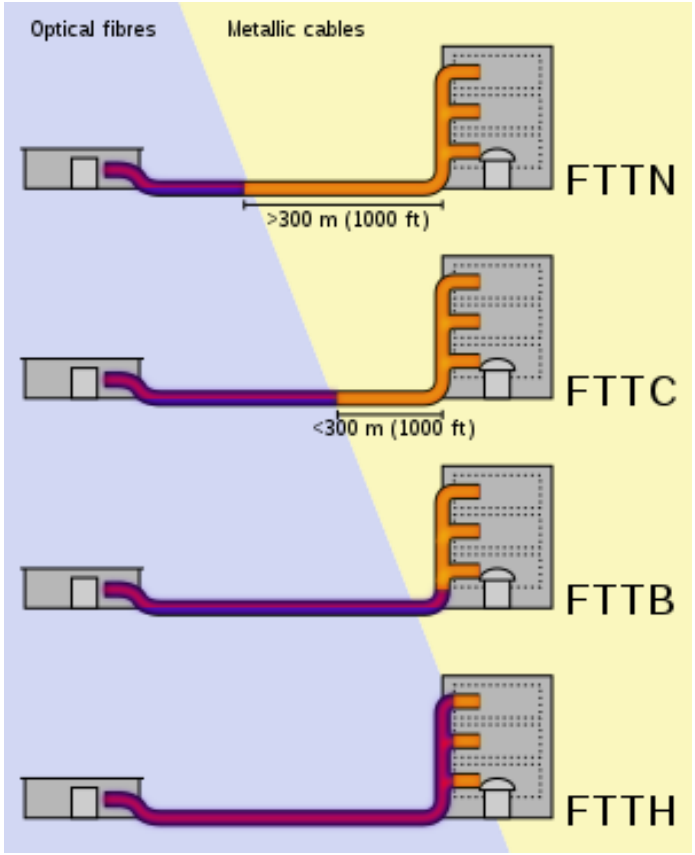


Digital Subscriber Line Provider Links

- Shares same physical telephone line but uses higher frequency range
- DSL modem installed as CPE
- Filters must be installed on telephone points
- DSL types
  - Symmetrical DSL (SDSL)
  - Asymmetrical DSL (ADSL)

Fiber to the Curb

- Fiber to the X (FTTx)
  - Fiber optic cabling in the last mile
  - To the Home (FTTH), To the Premises (FTTP)
  - To the Node (FTTN), To the Curb (FTTC)
- Very High Bitrate DSL (VDSL)
  - Supports FTTC with VDSL over last part of link (up to 300m)
  - Up to 52 Mbps downstream and 6 Mbps upstream
  - VDSL2 up to 100 Mbps over 100m (300 feet)



Cable Provider Links

- Shares same physical cable as cable access TV (CATV)
  - Coax link to customer premises
  - Fiber optic core network
- Cable modem installed as CPE
  - Connects to service provider network using coax F-connector
- Data Over Cable Service Interface Specification (DOCSIS)
  - Downlink speeds of up to 38 Mbps (North America) or 50 Mbps (Europe) and uplinks of up to 27 Mbps
  - DOCSIS version 3 allows use of multiplexed channels to achieve higher bandwidth

Metro-optical Provider Links

- Carrier Ethernet
  - Physical service types
  - Service categories
- Passive Optical Network
  - Residential/SME Fiber to the Home (FTTH) or Premises (FTTP) service
  - Speeds of 100 Mbps+
  - CPE router connects to optical network terminator (ONT) at demarc via fiber optic patch cable

Microwave Satellite

- Align with orbiting satellites
  - Geostationary with the equator
- Subject to higher latency
- ISP installs very small aperture terminal (VSAT) satellite dish at customer site
- Connected via coax to a Digital Video Broadcast Satellite (DVB-S) modem

Review Activity: WAN Provider Links

- Wide Area Network Technologies and the OSI Model
- WAN Provider Links
- T-Carrier and Leased Line Provider Links
- Digital Subscriber Line Provider Links
- Fiber to the Curb
- Cable Provider Links
- Metro-optical Provider Links
- Microwave Satellite

Lesson 16

Topic 16B

Compare and Contrast Remote Access Methods

Remote Network Access Authentication and Authorization

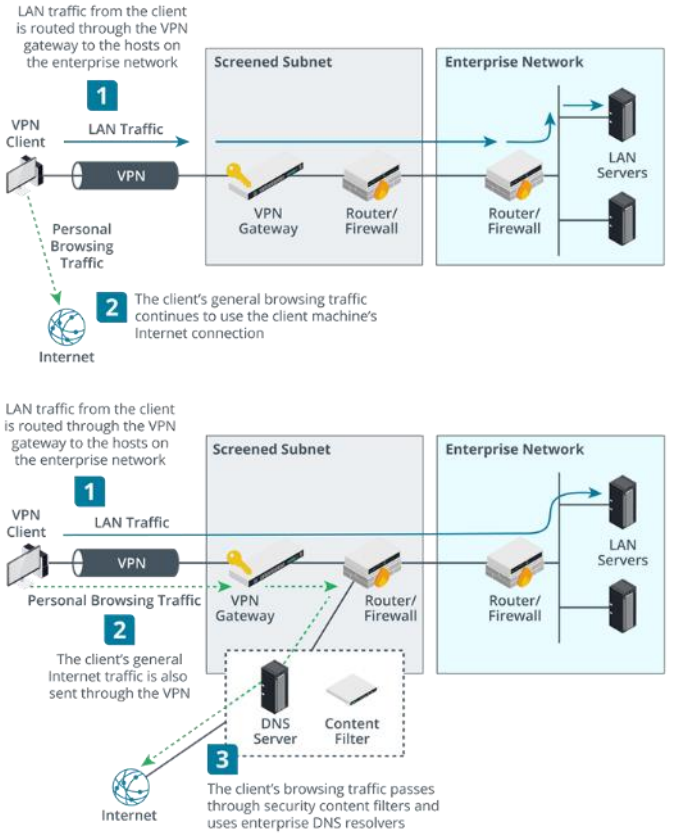
- Authenticate and authorize users
- Document service, risks, and countermeasures
- Define policy restrictions
  - Users/groups, time of day, privileges, auditing, …
- Manage remote devices

Tunneling and Encapsulation Protocols

- Establish a host on the same logical network over a connection through a different network
- Point-to-Point Protocol (PPP)
  - Encapsulation for higher layer packets at layer 2
  - Works over serial point-to-point links
- Generic Routing Encapsulation (GRE)
  - Encapsulates packets at layer 3 (IP protocol #47)
  - Supports point-to-point and point-to-multipoint (mGRE)
  - Independent of PHY/data link network implementation
- IPSecurity (IPSec)
- Transport Layer Security (TLS) and Datagram TLS (DTLS)

Client-to-Site Virtual Private Networks

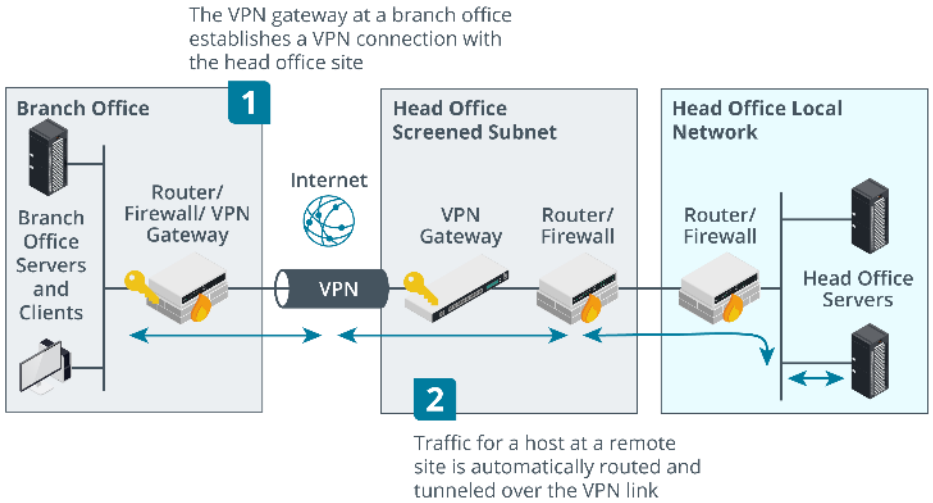
- Remote access or telecommuter model
- Protocols
  - TLS, Secure Socket Tunneling Protocol (SSTP), Layer 2 Tunneling Protocol (L2TP), IPSec, …
  - EAP/RADIUS authentication
- Split tunnel versus full tunnel



Remote Host Access and Remote Desktop Gateways

- Remote host access
  - Remote configuration and administration
  - Remote user access to a desktop
  - Remote desktop gateways for virtual desktops and apps
- Remote Desktop Protocol (RDP) and Virtual Network Computing (VNC)
- Clientless VPN
  - Remote desktop implemented using HTML5 features and basic web browser

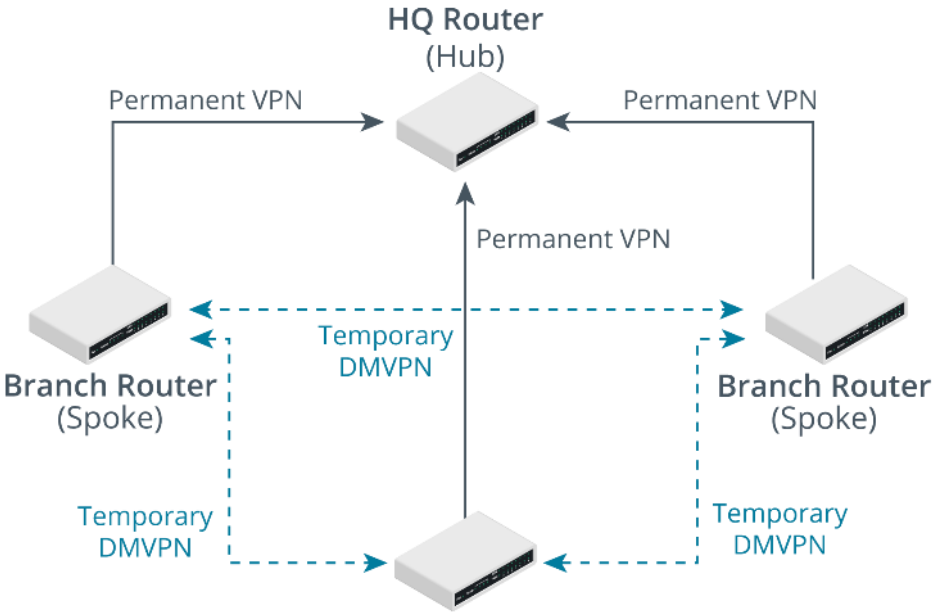
Site-to-Site Virtual Private Networks



- Router/gateways establish VPN links
- Client traffic automatically tunneled between sites

Hub and Spoke VPNs and VPN Headends

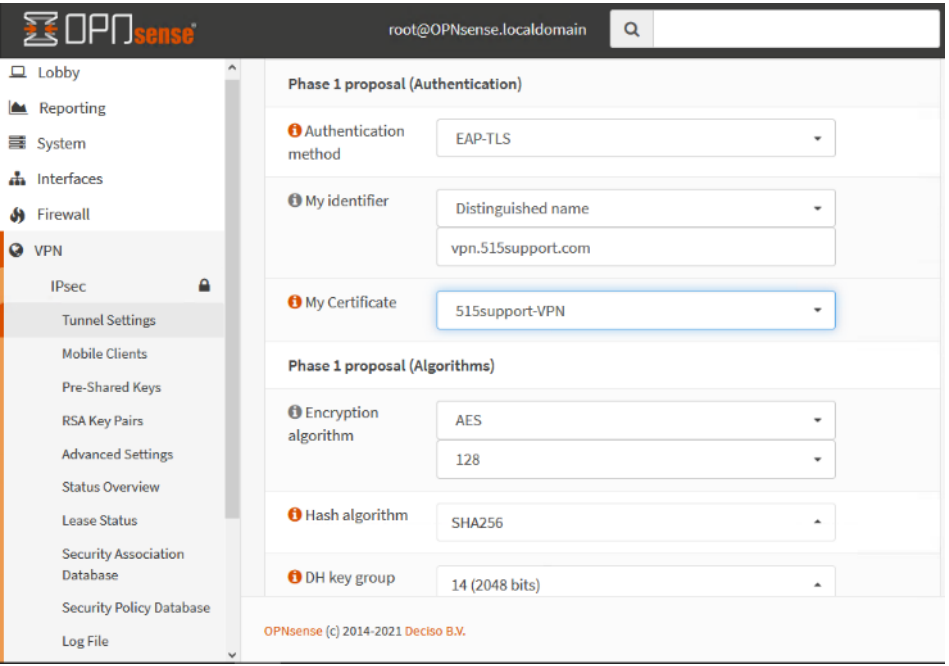
- Hub and spoke topology
  - VPN headend
- Dynamic Multipoint VPN (DMVPN)
  - IPSec for security
  - Next Hop Router Protocol (NHRP)
  - GRE tunneling



Internet Protocol Security

- Layer 3 encryption protocol suite
- Authentication Header (AH)
  - Provides authentication/integrity only
- Encapsulating Security Payload (ESP)
  - Confidentiality and authentication/integrity
- IPv4 and IPv6 implementations

IKE and IPSec Modes



- Internet Key Exchange (IKE)
  - Set up Security Association (SA)
- Transport mode
  - IP header is unencrypted
  - Used for end-to-end communication over the same network
- Tunnel mode
  - Encapsulates encrypted packet within new unencrypted header
  - Used when traffic must pass over an intermediate network (VPN)

Out-of-Band Management Methods

- Managed versus unmanaged appliances
- Management interface
  - Console port/command line interface (CLI)
  - AUX port dial-up link
  - Management port (connect over IP network)
    - Web interface using HTTP/HTTPS
    - Virtual terminal over Telnet/SSH (CLI)
- In-band versus out-of-band management network

Review Activity: Remote Access Methods

- Remote Network Access Authentication and Authorization
- Tunneling and Encapsulation Protocols
- Client-to-Site Virtual Private Networks
- Remote Host Access and Remote Desktop Gateways
- Site-to-Site Virtual Private Networks
- Hub and Spoke VPNs and VPN Headends
- Internet Protocol Security
- IKE and IPSec Modes
- Out-of-Band Management Methods

Lab Activity

Assisted Lab: Configure Remote Access

- Lab types
  - Assisted labs guide you step-by-step through tasks
  - Applied labs set goals with limited guidance
- Complete lab
  - Submit all items for grading and check each progress box
  - Select “Grade Lab” from final page
- Save lab
  - Select the hamburger menu and select “Save”
  - Save up to two labs in progress for up to 7 days
- Cancel lab without grading
  - Select the hamburger menu and select “End”

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Summary