

CCNA Routing and Switching Study Guide

Chapters 7 & 21: Wide Area Networks

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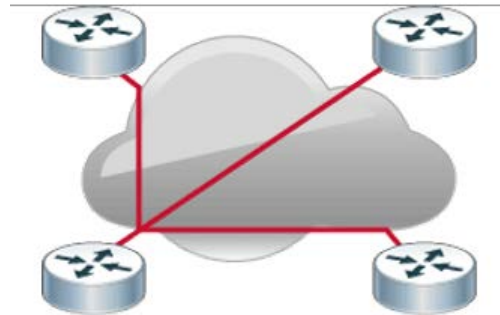
Chapter 21 objectives

The ICND2 topics covered in this chapter include:

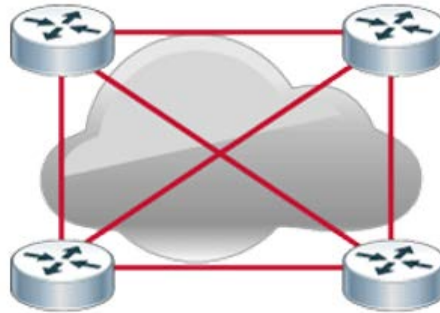
Chapter 21 objectives (con't)

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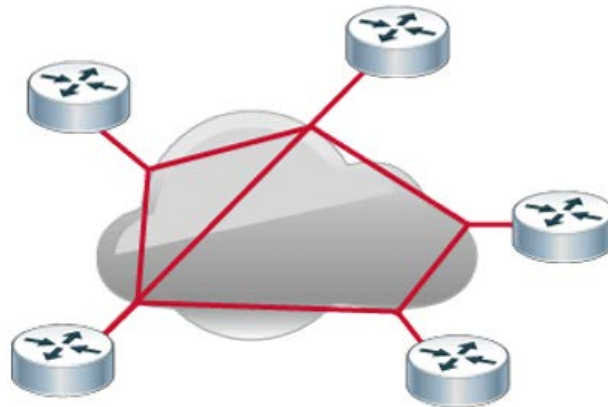
New figure 7.1/21.1



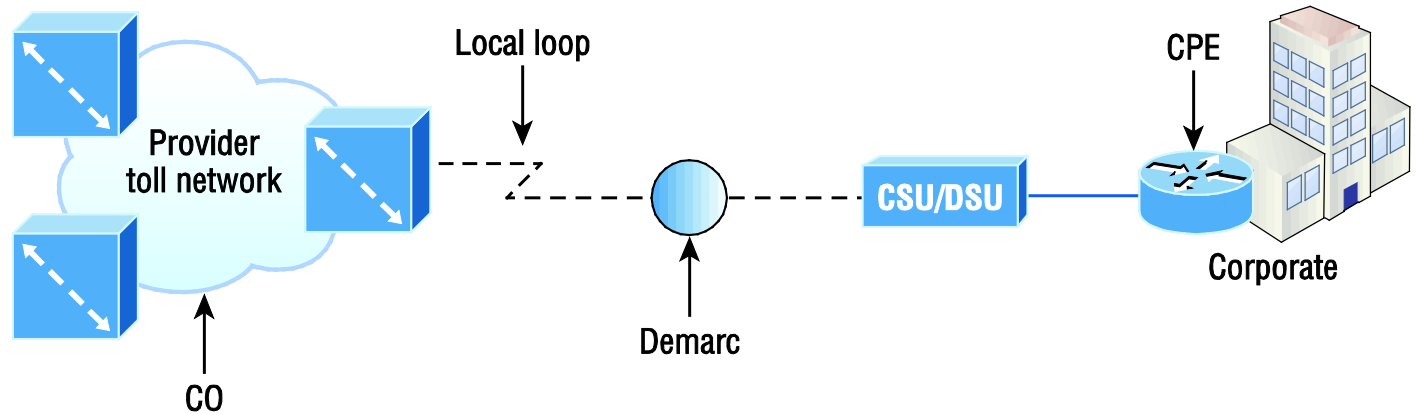
New figure 7.2/21.2



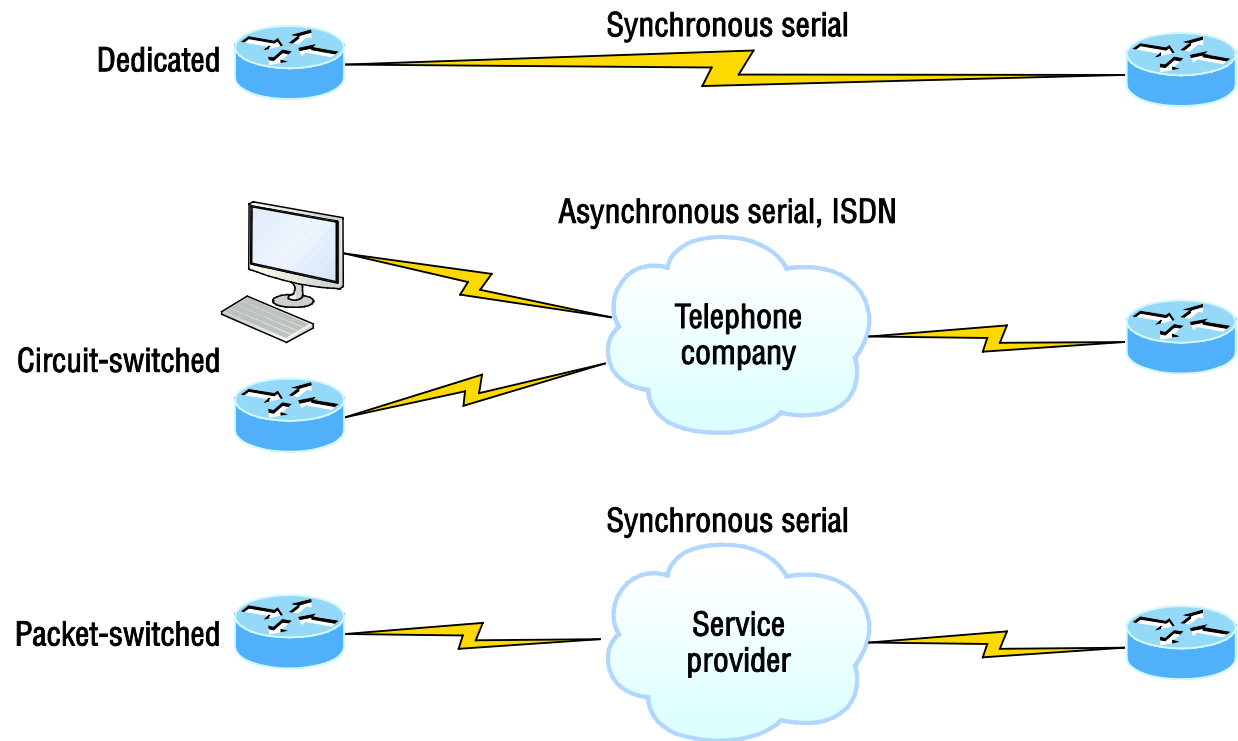
New figure 7.3/21.3



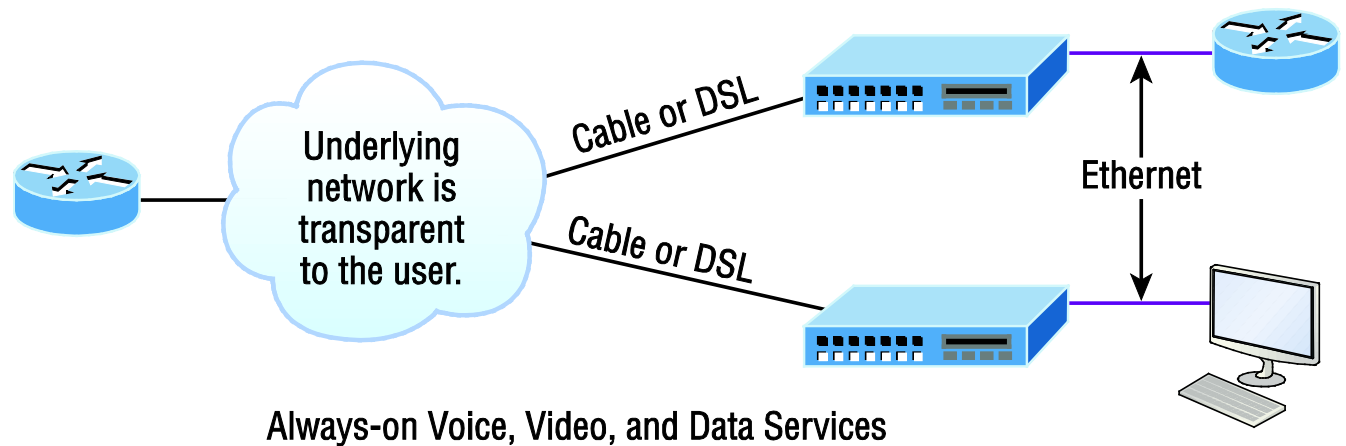
WAN terms



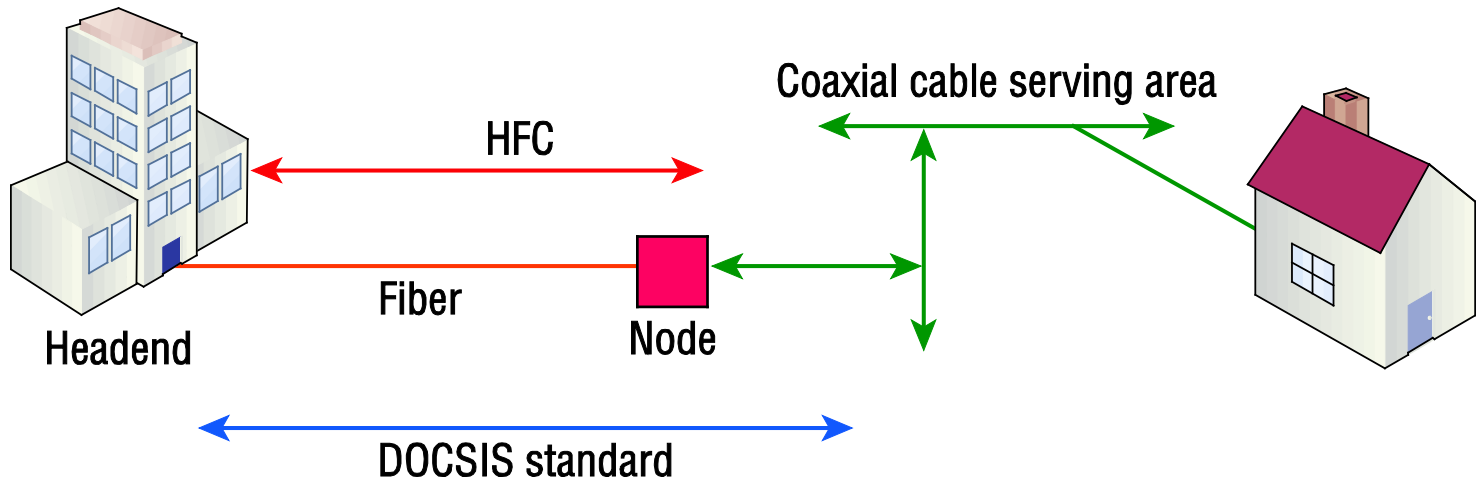
WAN connection types



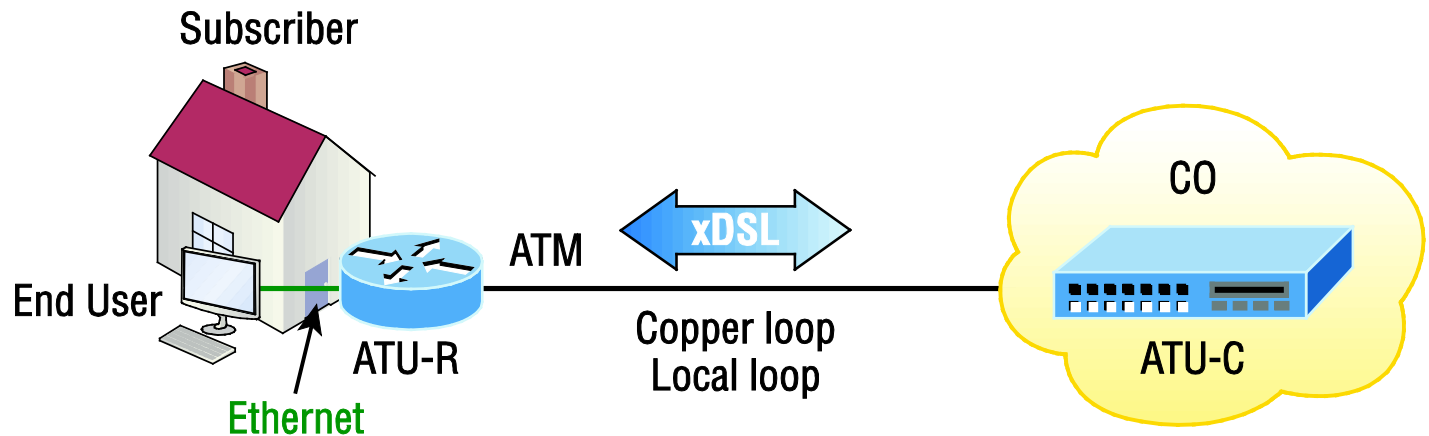
Broadband access using cable or DSL



Cable network and terms

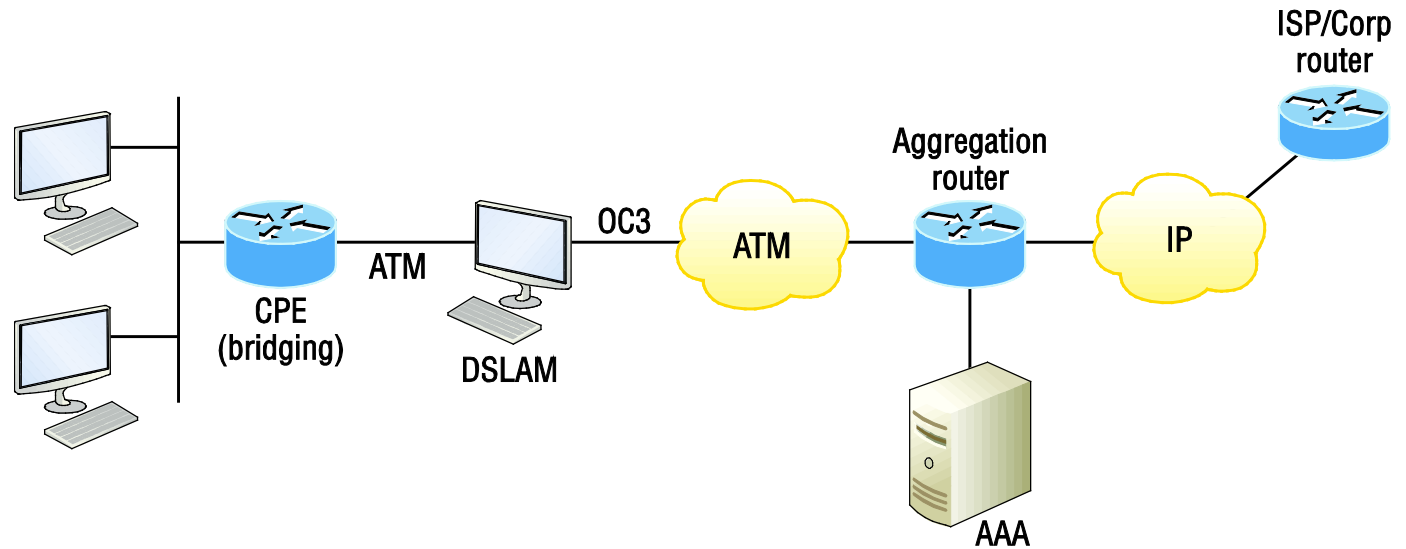


xDSL connection from home user to central office. All types of DSL are layer 1 technologies.



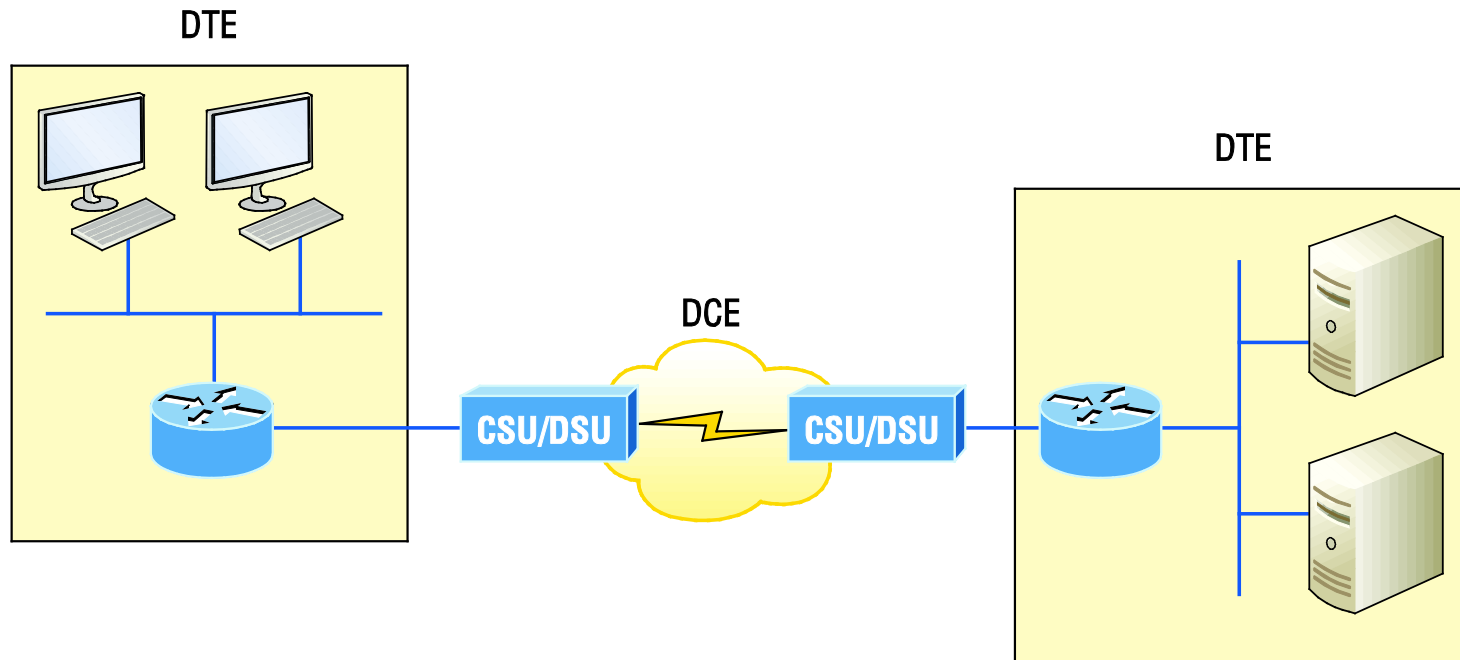
ATU-R = ADSL Transmission Unit – Remote
ATU-C = ADSL Transmission Unit – Central

PPPoE with ADSL



DTE-DCE-DTE WAN

DTE-DCE-DTE WAN connection: Clocking is typically provided by the DCE network to routers. In nonproduction environments, a DCE network is not always present.

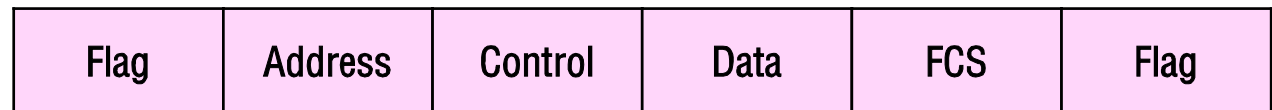


Cisco's HDLC frame format:

Cisco HDLC



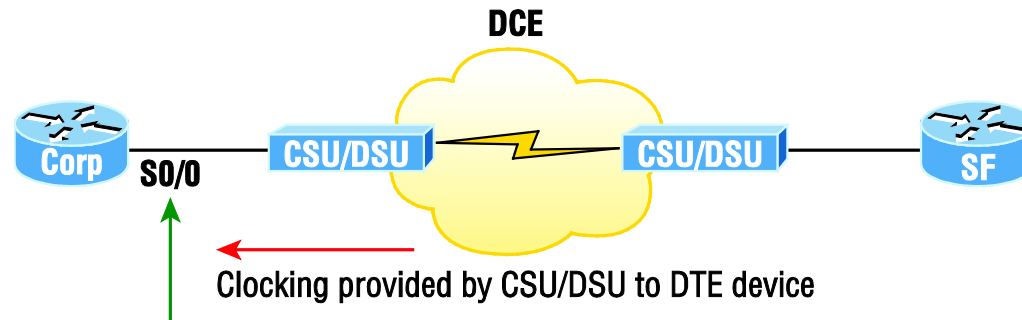
HDLC



Supports only single-protocol environments

Each vendor's HDLC has a proprietary data field to support multiprotocol environments.

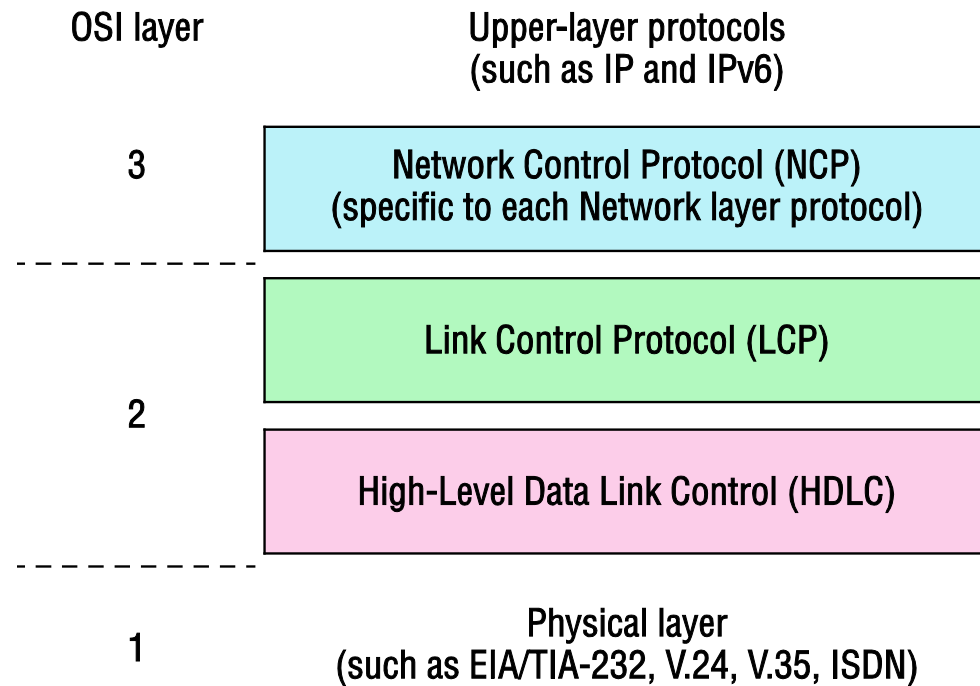
Configuring Cisco's HDLC proprietary WAN encapsulation



```
Corp(config)#int s0/0
Corp(config-if)#ip address 172.16.10.1 255.255.255.252
Corp(config-if)#no shut
```

```
Corp#sh int s0/0
Serial0/0 is up, line protocol is up
  Hardware is PowerQUICC Serial
  Internet address is 172.16.10.1/30
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation HDLC, loopback not set
  Keepalive set (10 sec)
```

PPP protocol stack compared to the OSI reference model.



PPP session establishment



PPP Session Establishment

1. Link establishment phase
2. Authentication phase (optional)
3. Network layer protocol phase

PPP authentication example



Pod1R1

```
hostname Pod1R1
username Pod1R2 password cisco
interface serial 0
ip address 10.0.1.1 255.255.255.0
encapsulation ppp
clock rate 64000
bandwidth 512
ppp authentication chap
```



Pod1R2

```
hostname Pod1R2
username Pod1R1 password cisco
interface serial 0
ip address 10.0.1.2 255.255.255.0
encapsulation ppp
bandwidth 512
ppp authentication chap
```

Failed PPP authentication



Pod1R1

```
hostname Pod1R1
username Pod1R2 password Cisco
interface serial 0
ip address 10.0.1.1 255.255.255.0
clock rate 64000
bandwidth 512
encapsulation ppp
ppp authentication chap
```



Pod1R2

```
hostname Pod1R2
username Pod1R1 password cisco
interface serial 0
ip address 10.0.1.2 255.255.255.0
bandwidth 512
encapsulation ppp
ppp authentication chap
```

Mismatched WAN encapsulations



Pod1R1

```
hostname Pod1R1
username Pod1R2 password cisco
interface serial 0
ip address 10.0.1.1 255.255.255.0
clock rate 64000
bandwidth 512
encapsulation ppp
```



Pod1R2

```
hostname Pod1R2
username Pod1R1 password cisco
interface serial 0
ip address 10.0.1.2 255.255.255.0
bandwidth 512
encapsulation hdlc
```

Mismatched IP addresses



Pod1R1

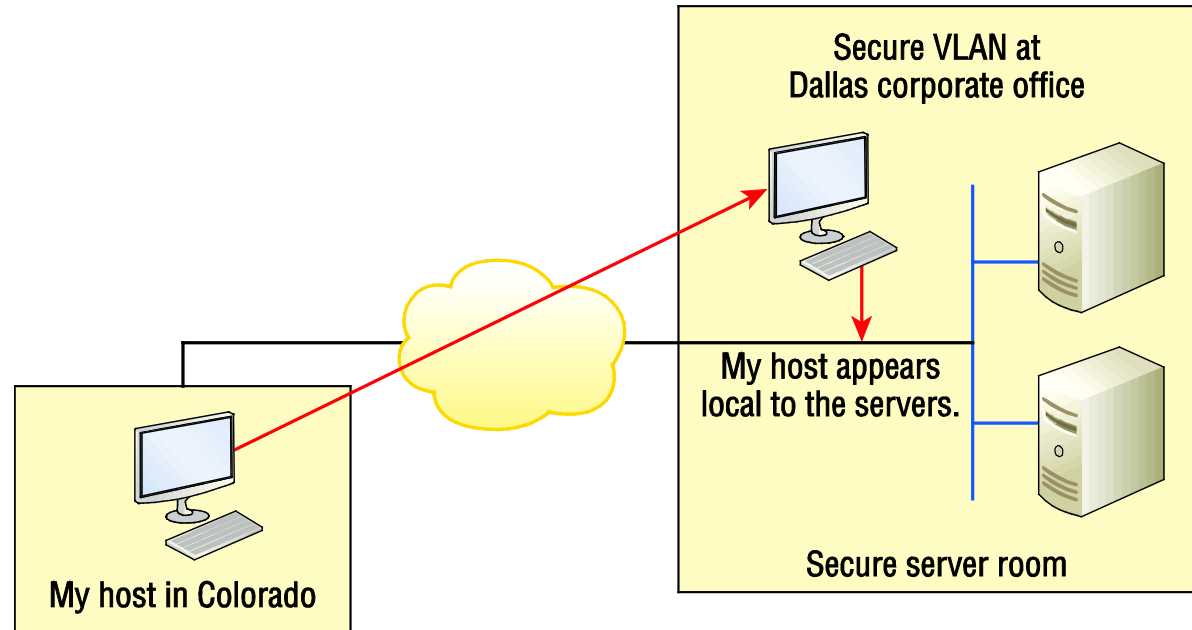
```
hostname Pod1R1
username Pod1R2 password cisco
interface serial 0
ip address 10.0.1.1 255.255.255.0
clock rate 64000
bandwidth 512
encapsulation ppp
ppp authentication chap
```



Pod1R2

```
hostname Pod1R2
username Pod1R1 password cisco
interface serial 0
ip address 10.2.1.2 255.255.255.0
bandwidth 512
encapsulation ppp
ppp authentication chap
```

Example of using a VPN



Benefits of VPNs

Security

VPNs can provide very good security by using advanced encryption and authentication protocols, which will help protect your network from unauthorized access. IPsec and SSL fall into this category. Secure Sockets Layer (SSL) is an encryption technology used with web browsers, which has native SSL encryption, and are known as Web VPN. You can also use the Cisco AnyConnect SSL VPN client installed on your PC to provide a SSL VPN solution, as well as the Clientless Cisco SSL VPN.

Cost Savings

By connecting the corporate remote offices to their closest Internet provider, and then creating a VPN tunnel with encryption and authentication, I gain a huge savings over opting for traditional leased point-to-point lines. This also permits higher bandwidth links and security, all for far less money than traditional connections.

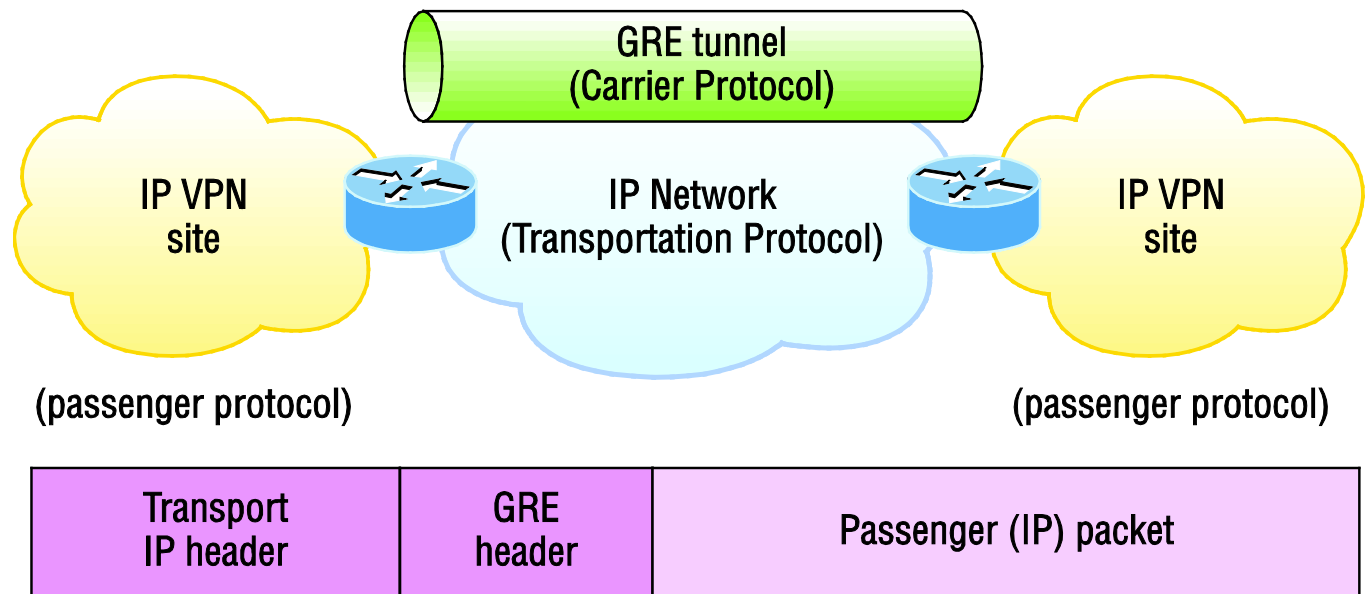
Scalability

VPNs scale very well to quickly bring up new offices or have mobile users connect securely while traveling or when connecting from home.

Compatibility with broadband technology

For remote and traveling users and remote offices, any Internet access can provide a connection to the corporate VPN. This allows users to take advantage of the high-speed Internet access of DSL or cable modems.

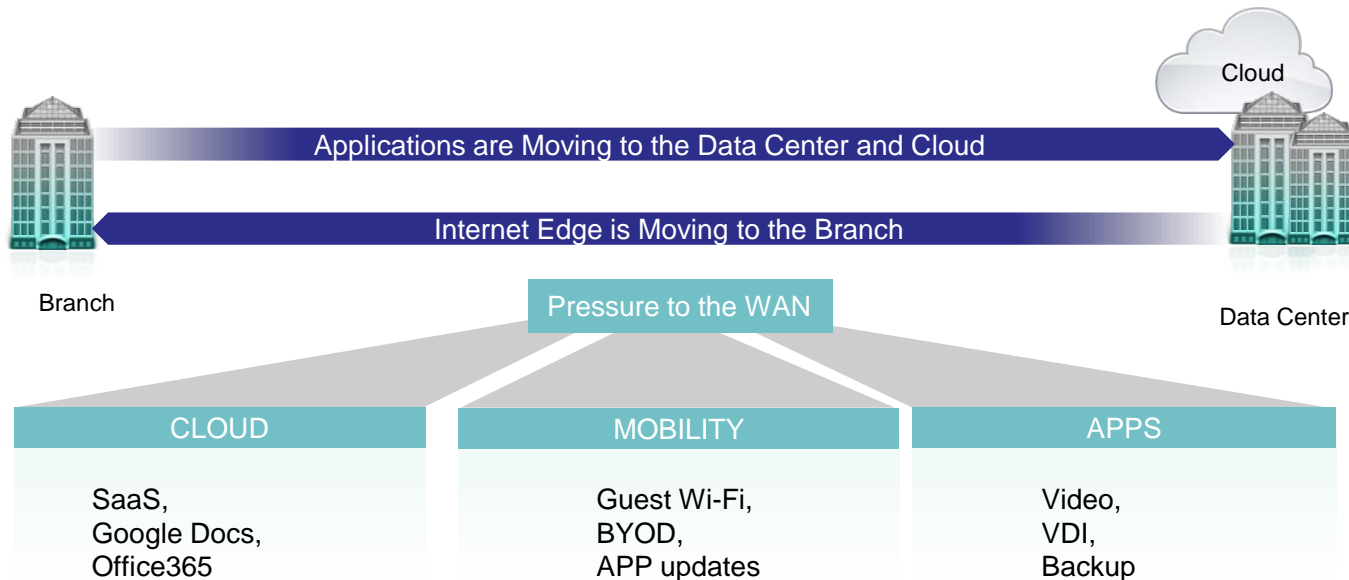
Generic Routing Encapsulation (GRE) tunnel structure



7.6 Branch Wan Challenges

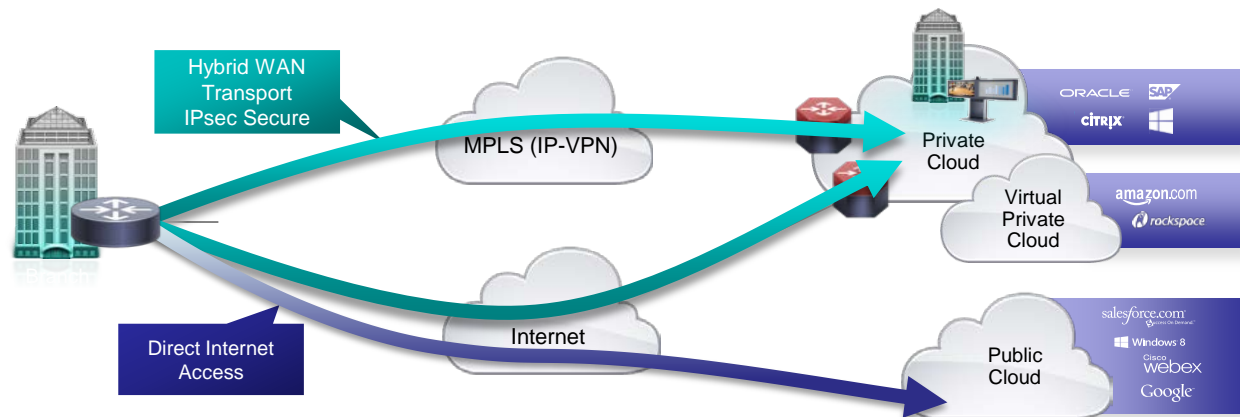
IT Trends – Branch Challenges

Critical to your Business, WAN Bandwidth Expensive, Pressure Increasing



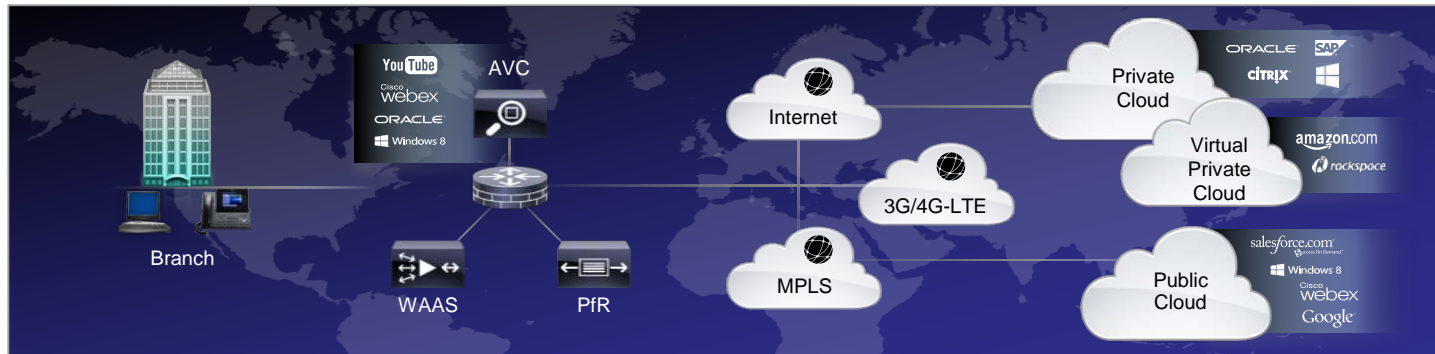
7.7

Intelligent WAN: Leveraging the Internet



- Saves customers money – 6 month ROI
- Improves application response times
- Enables cloud, mobility, and BYOD in the branch

7.8



Transport Independent

- Consistent operational model
- Simple Provider migrations
- Scalable and Modular design
- DMVPN IPsec overlay design

Intelligent Path Control

- Application best path based on delay, loss, jitter, path preference
- Load Balancing for full utilization of all bandwidth
- Improved network availability
- Performance Routing (PfR)

Application Optimization

- Application monitoring with Application Visibility and Control (AVC)
- Application Acceleration and bandwidth savings with WAAS

Secure Connectivity

- Certified strong encryption
- Comprehensive threat defense with ASA and IOS Firewall/IPS
- Cloud Web Security (CWS) for scalable secure direct Internet access

MLP network layout, figure 7.18

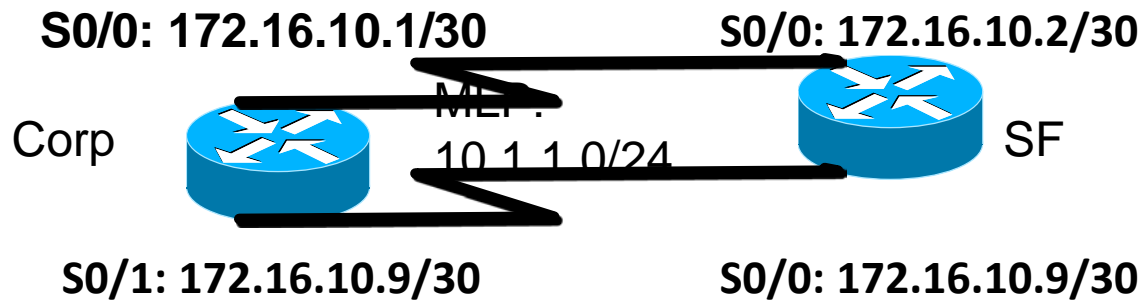


Figure 7.21 Enterprise-managed VPNs

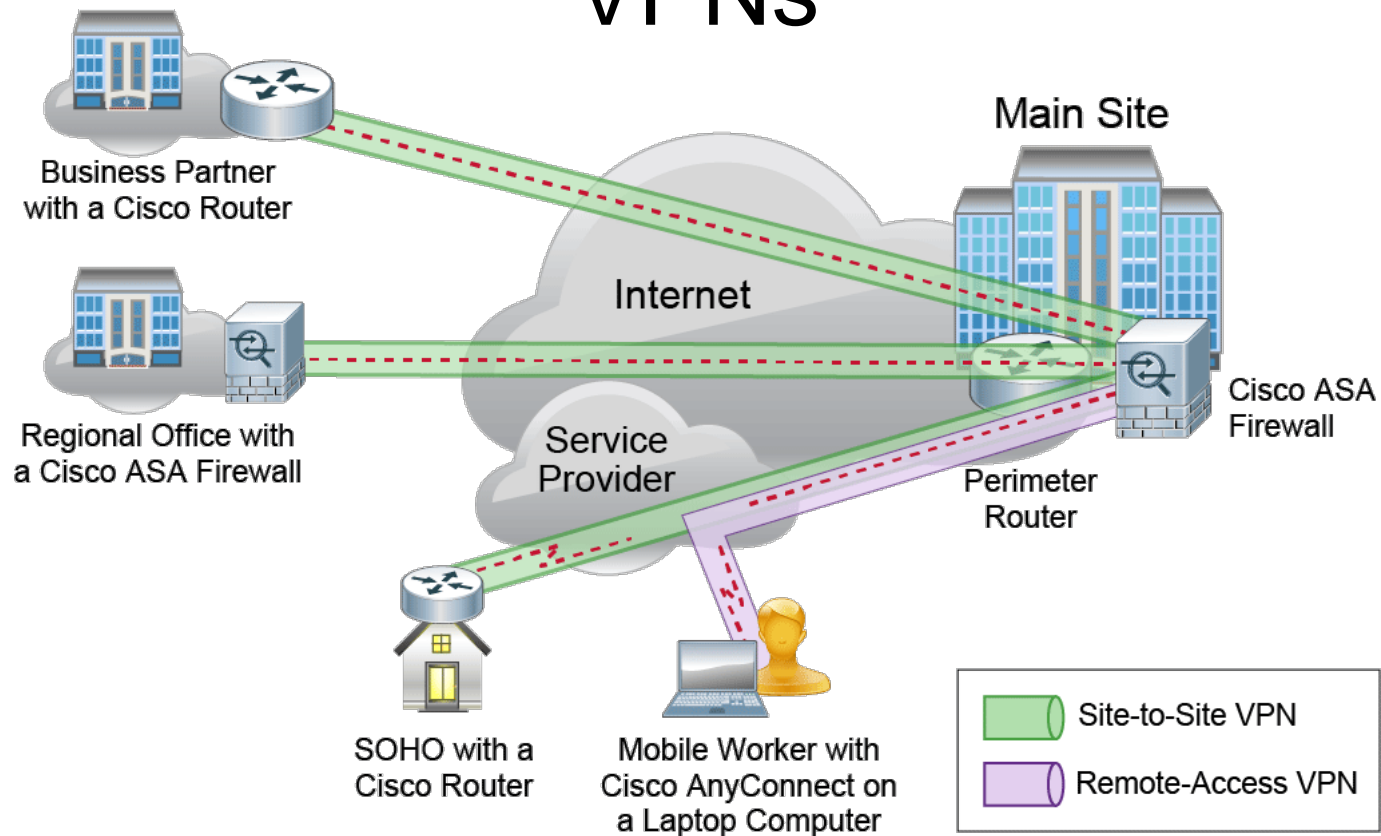
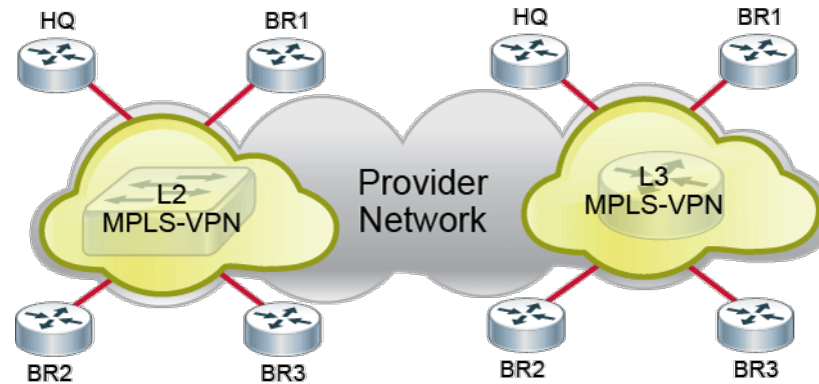


Figure 7.22: Provider-managed VPNs



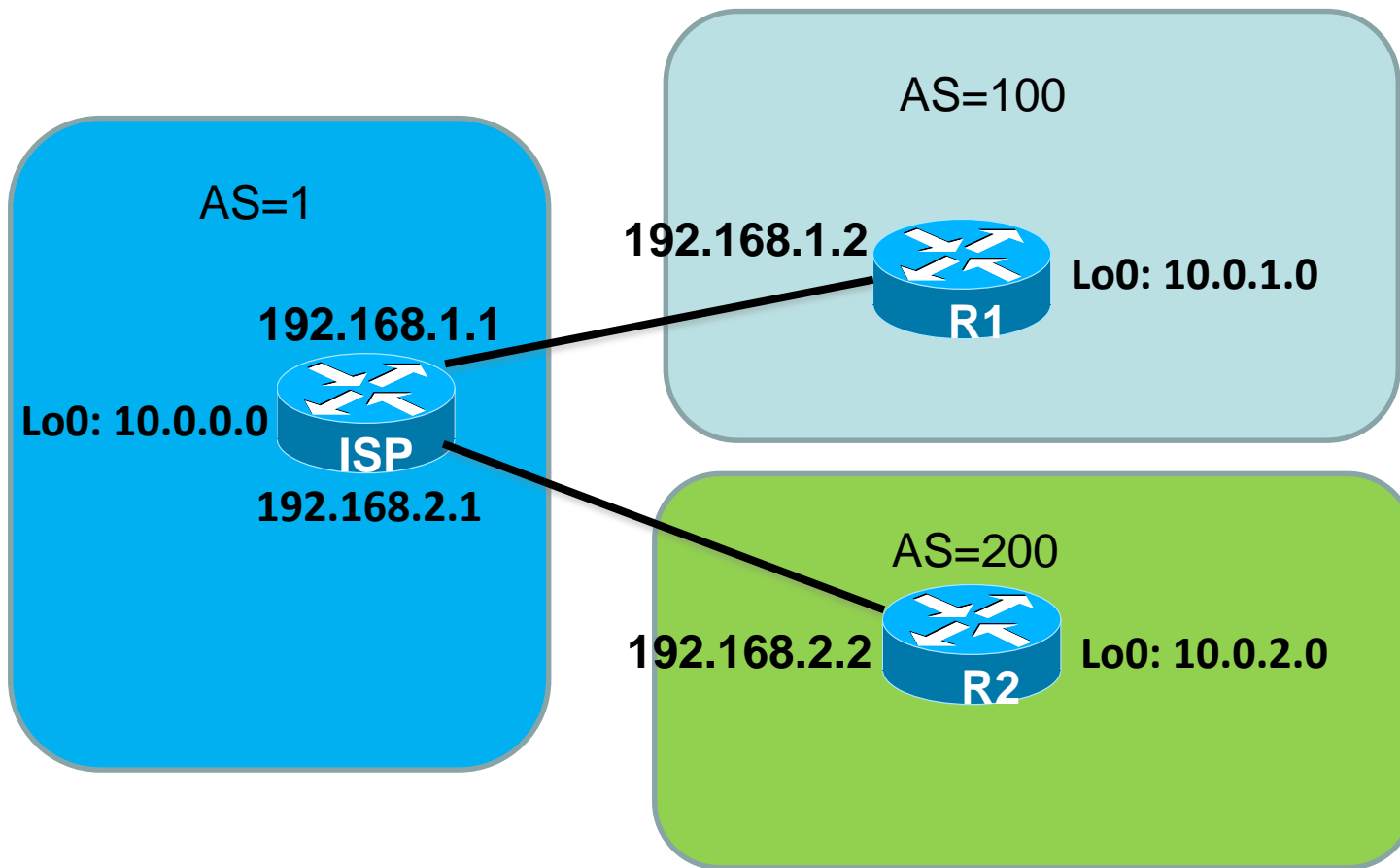
Layer 2 MPLS VPN (VPLS and VPWS):

- Customer routers exchange routes directly.
- Some applications need Layer 2 connectivity to work.

Layer 3 MPLS VPN:

- Customer routers exchange routes with SP routers.
- It provides Layer 3 service across the backbone.

EBGP network layout, figure 7.25



Written Labs and Review Questions

- Read through the Exam Essentials section together in class.
- Open your books and go through all the written labs and the review questions.
- Review the answers in class.