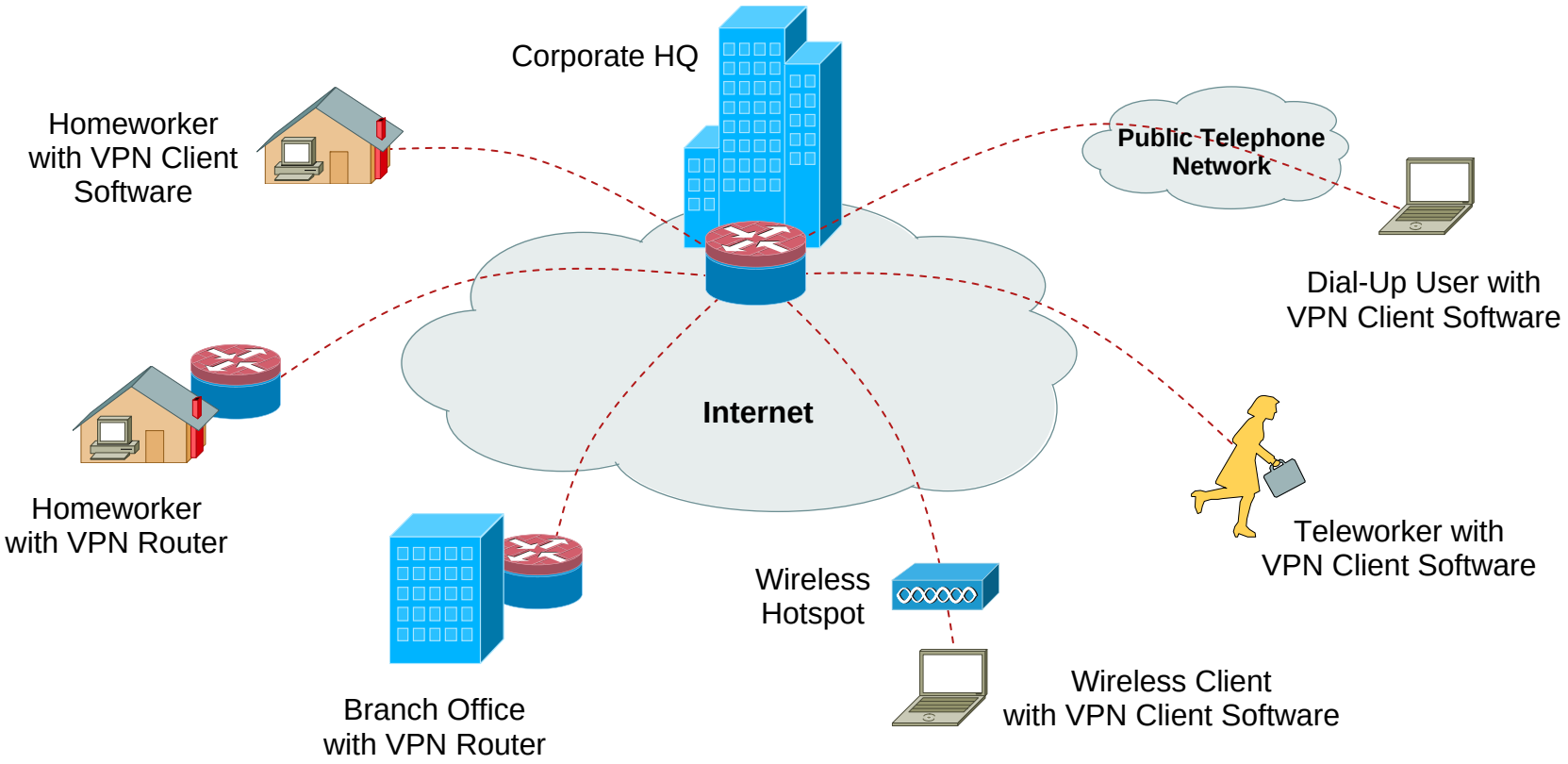
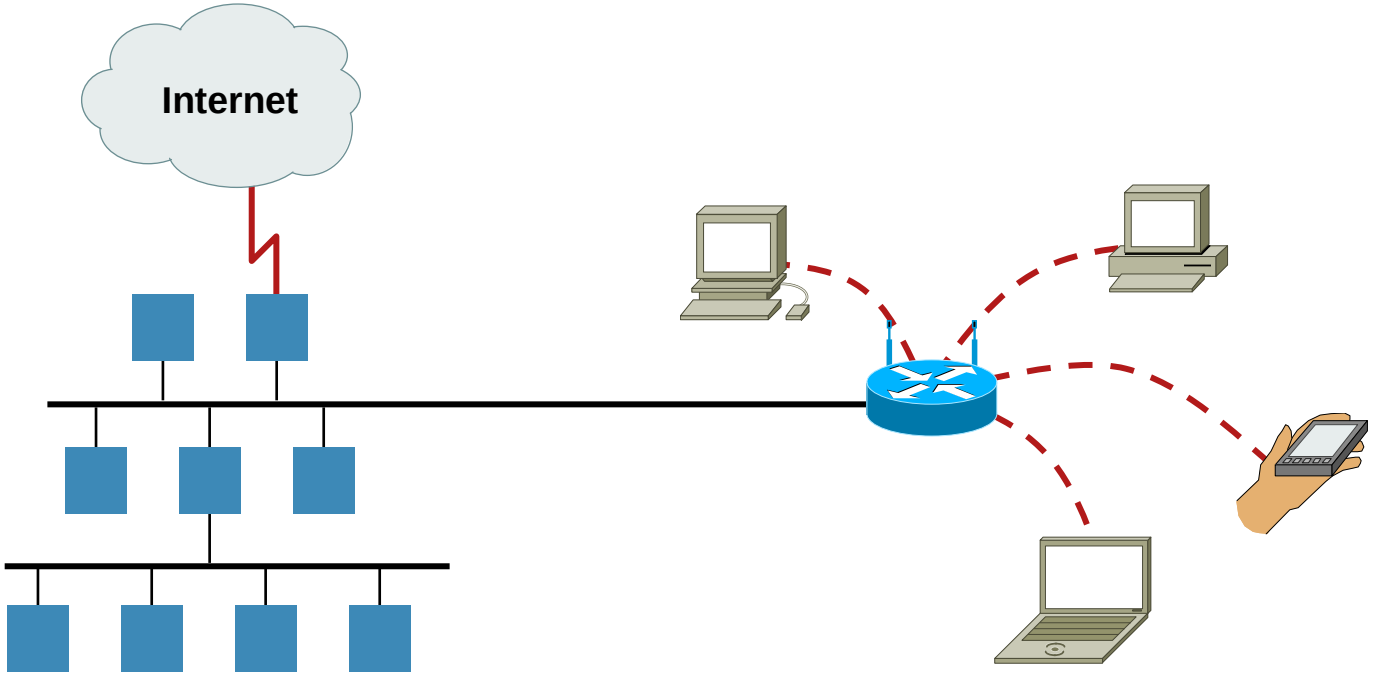
Introduction to VPNs

What Is a Virtual Private Network (VPN)?



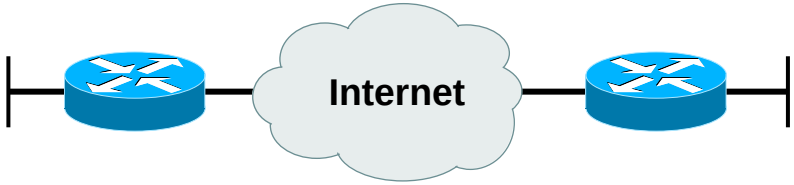
A Remote Access VPN secures connections for remote users, such as mobile users or telecommuters, to corporate LANs over shared service provider networks

Wireless: A New Big Driver for VPNs

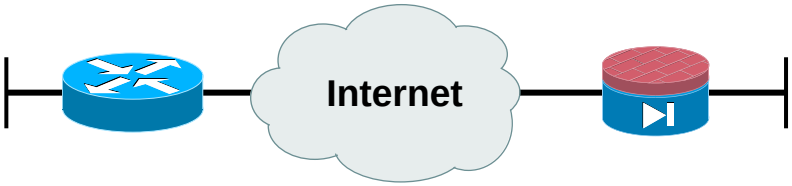


- An access point (AP) is a shared device
- Remember the performance issues of shared hubs
- Bridges, and other devices allow for interconnection
- Protocols and applications work seamlessly

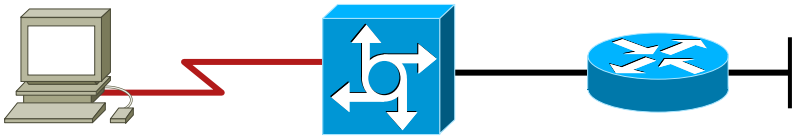
Basic VPN Terms



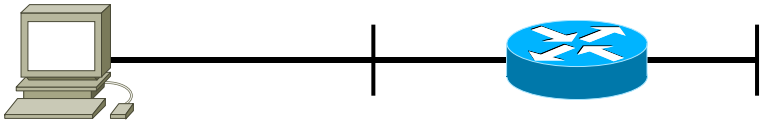
Router to Router VPN Gateway
(Extranet)



Router to VPN Firewall Gateway
(Extranet)



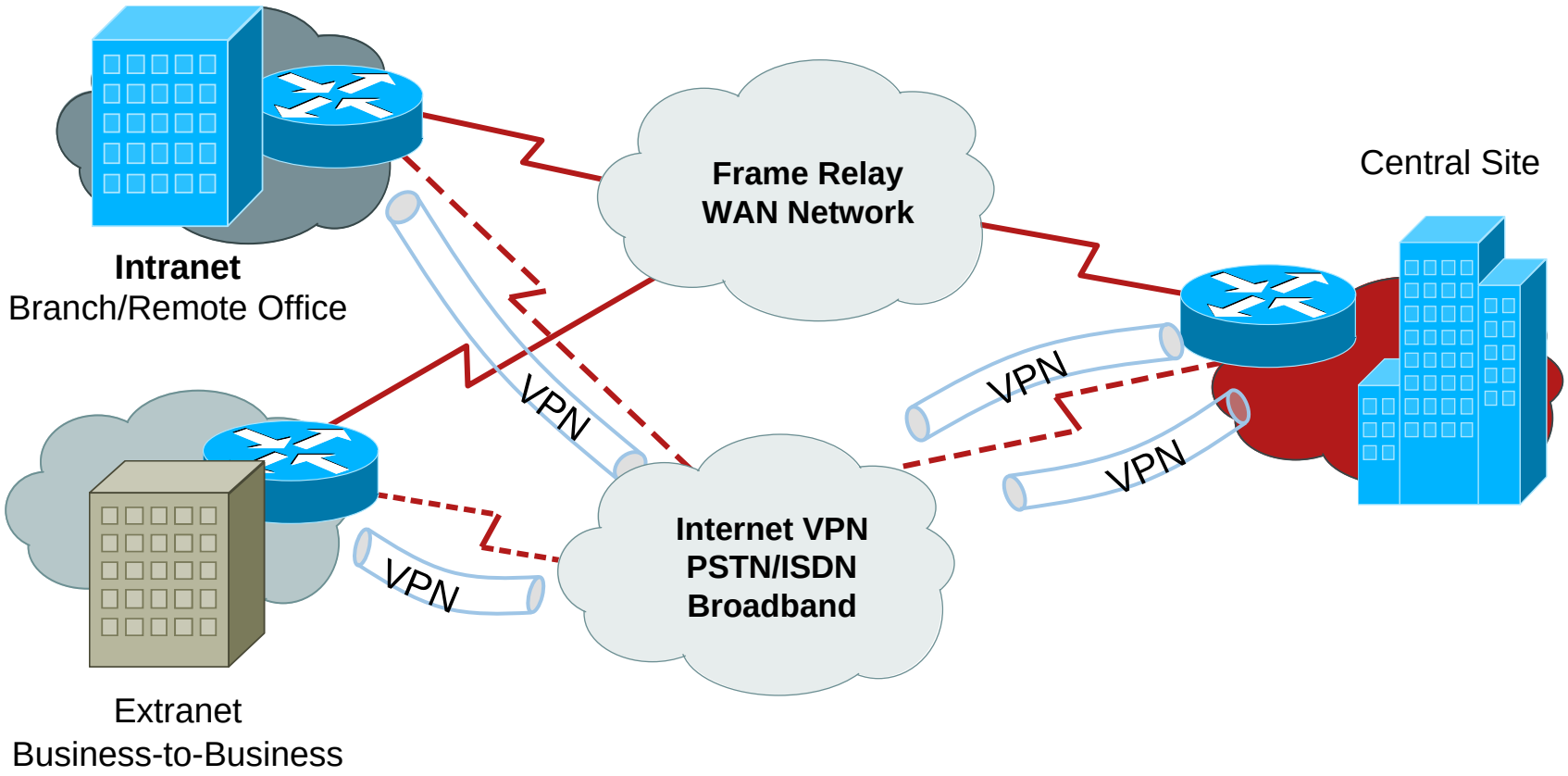
VPN Client to Router VPN via Dial-Up
(Access VPN)



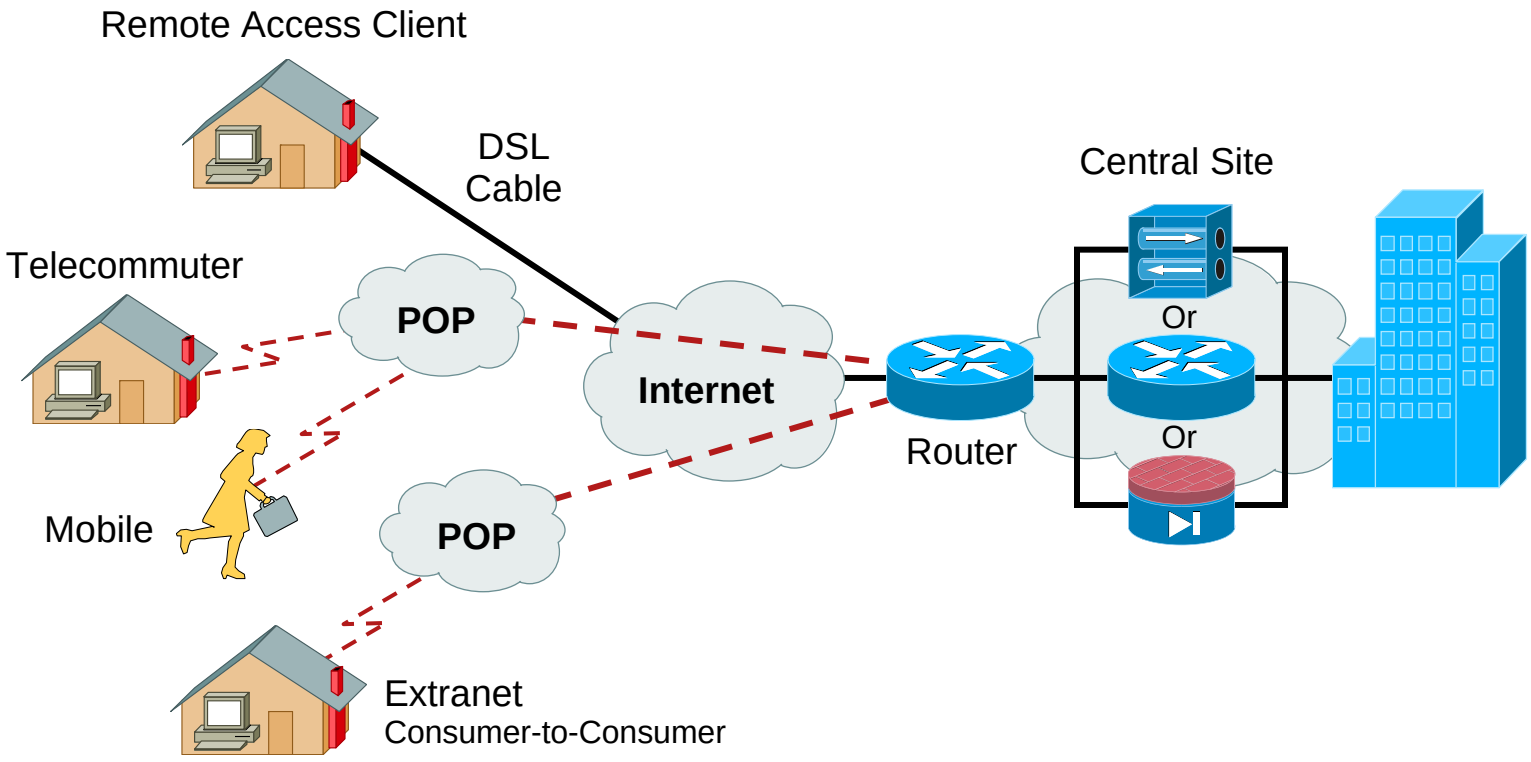
VPN Client to Router VPN Network
(Intranet)

Other Vendors to Router VPN
(Extranet)

Using Site-to-Site VPNs



Using Remote-Access VPNs



Remote Access Client

- Cisco VPN Clients (IPSec)
- Microsoft Win 9x/NT/2000/XP (LTTPP)
- Thire-party VPN client (PPTP)

Remote Access Gateway

- Cisco WAN Router
- Cisco Secure PIX Firewall
- Or IPSec or PPTP aware device to provide firewall/VPN Tunnel Termination

VPN Components

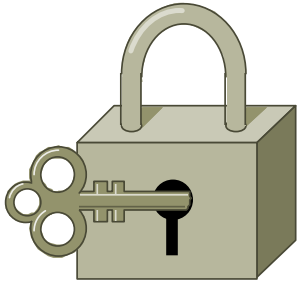
Separate Data
Tunneling

GRE
L2TP
MPLS
PPTP

Increase Protection
Encryption

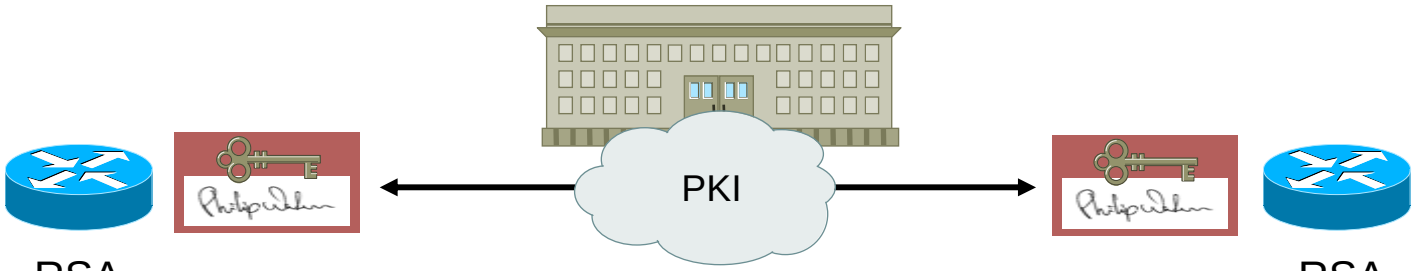
IPSec
DES, 3 DES
MPPE

Prevent Tampering
Integrity

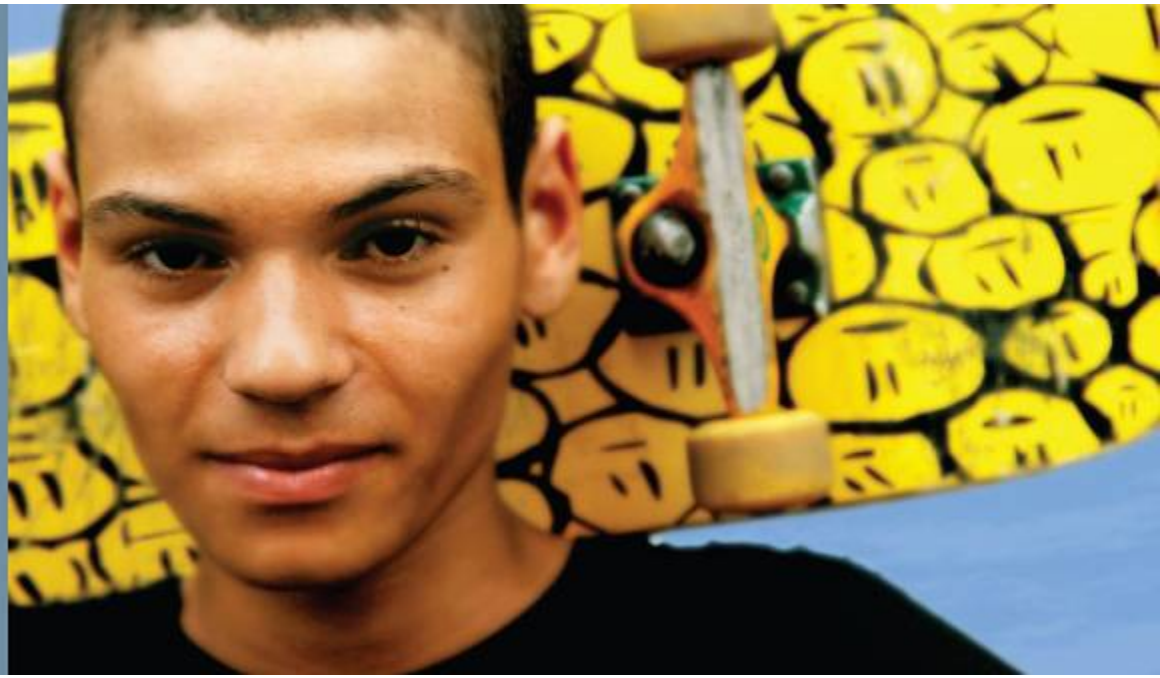


TCP Checksum
AH in IPSec

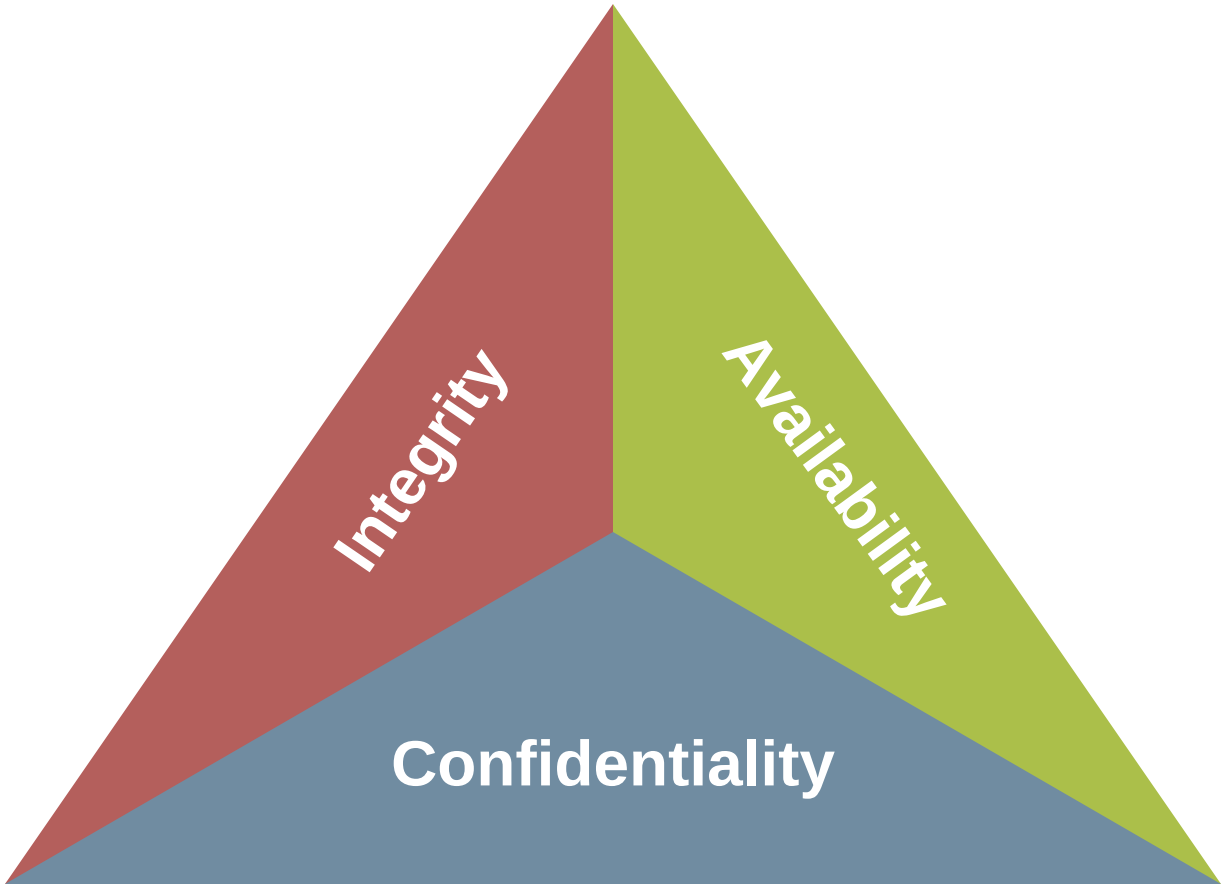
Identify Source
Authentication



VPN Security



What a VPN Must Provide



Network Security Model

Data Security Assurance Model (CIA)

Confidentiality

- Benefit
- Ensures data privacy
- Shuns
- Sniffing
- Replay

Integrity

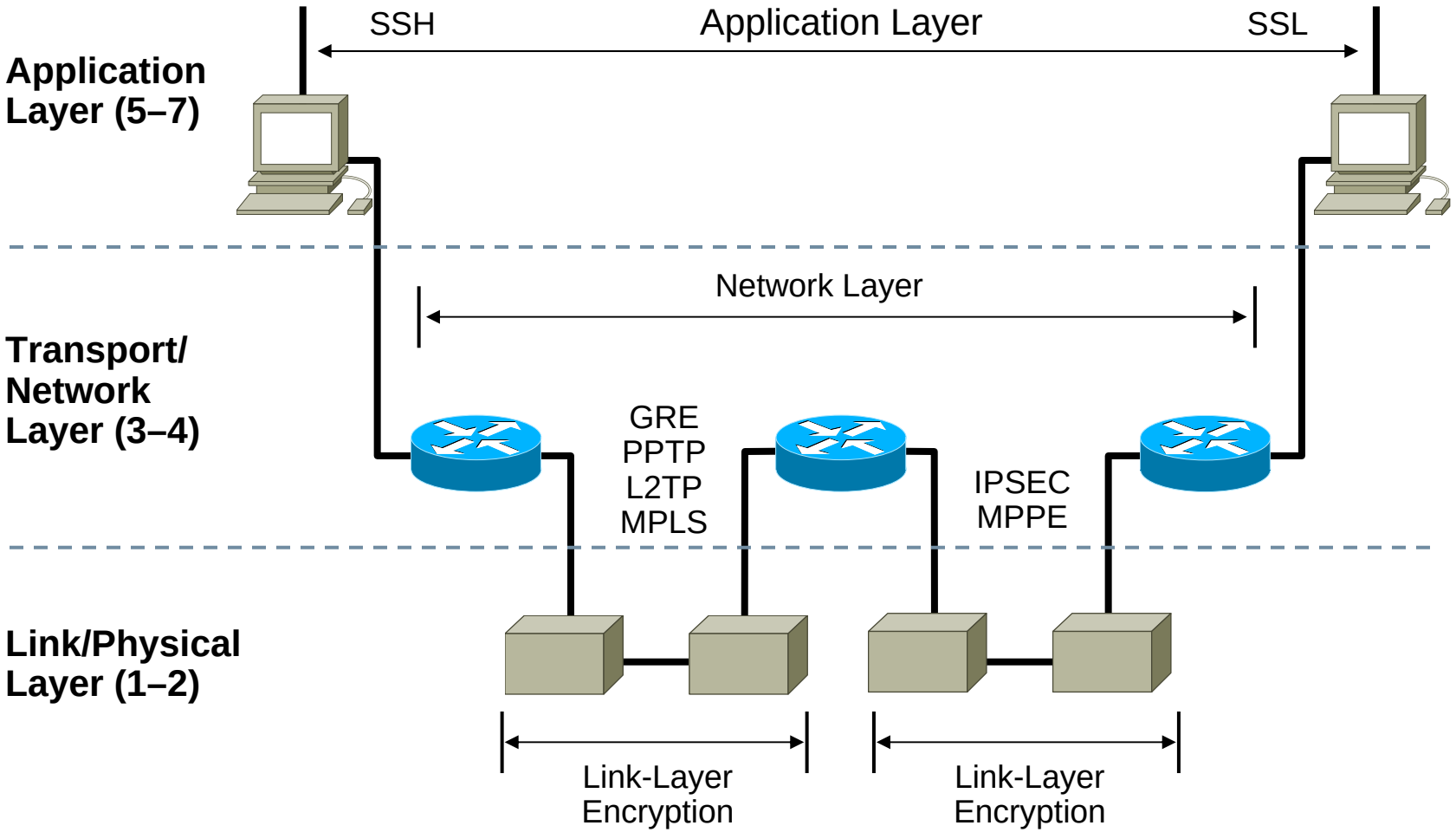
- Benefit
  - Ensures data is unaltered during transit
- Shuns
  - Alteration
  - Replay

Authentication

- Benefit
  - Ensures identity of originator or recipient of data
- Shuns
  - Impersonation
  - Replay

Data Confidentiality and Data Integrity Depend on Encryption and Encapsulation

VPN Technology Options



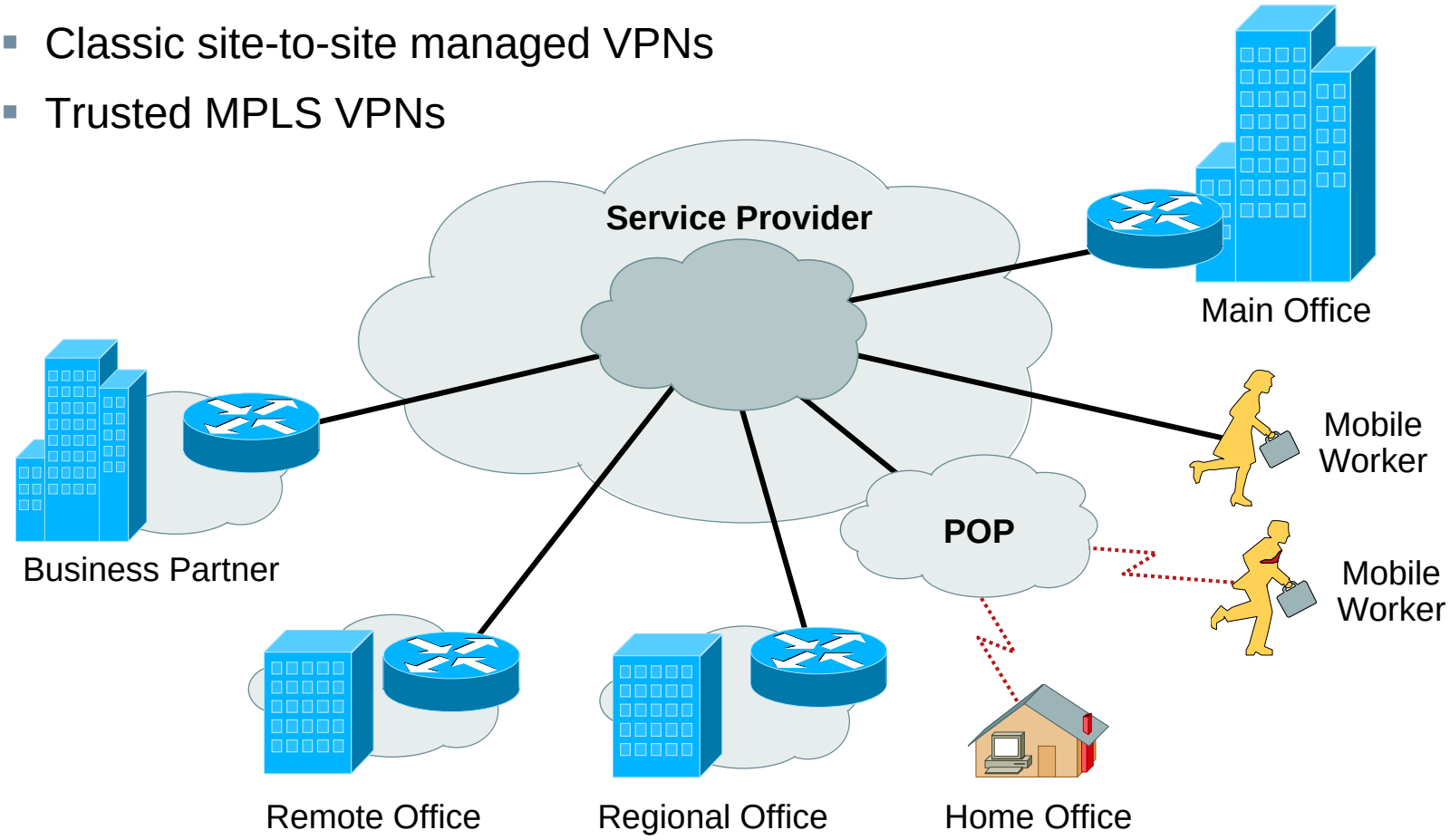
What Is an IPSec VPN?

Internet Protocol Security

- A set of security protocols and algorithms used to secure IP data at the network layer
- IPSec provides data confidentiality (encryption), integrity (hash), authentication (signature/certificates) of IP packets while maintaining the ability to route them through existing IP networks

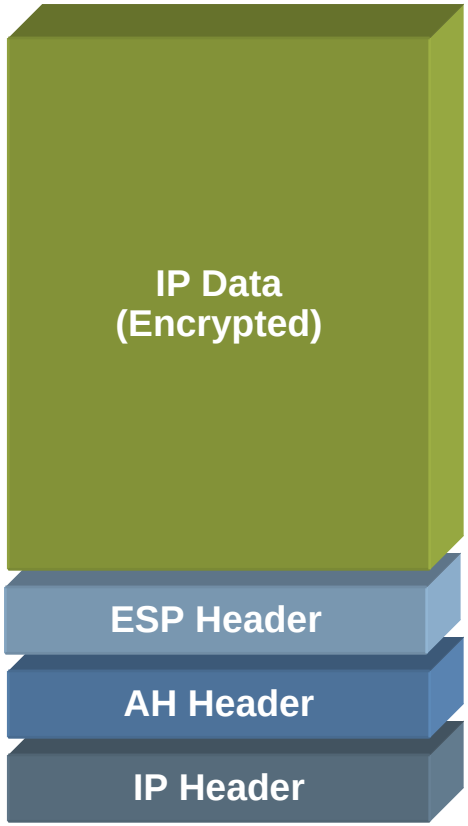
Advantages of IPSec

- Access VPNs
- Classic site-to-site managed VPNs
- Trusted MPLS VPNs

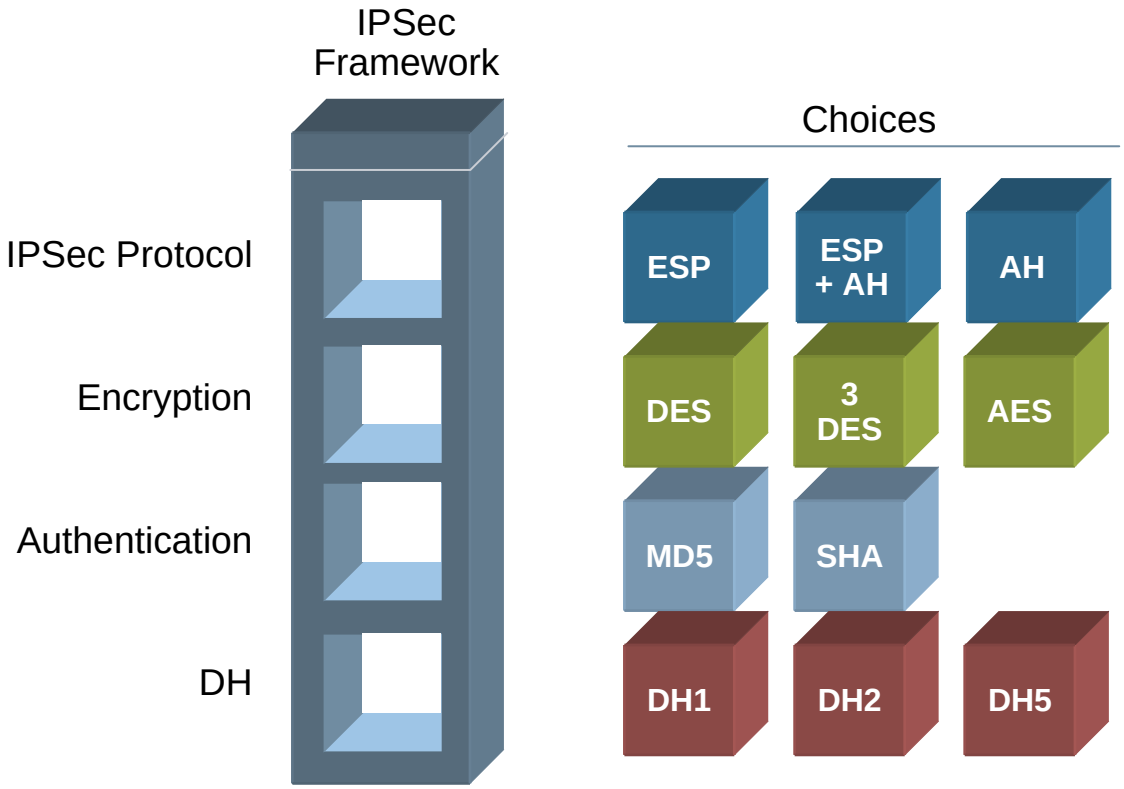


IPSec Key Points

- IPSec can ensure the confidentiality and/or the authenticity of IP packets
- The key points are
  - Two modes of propagation (transport and tunnel)
  - Security associations (SAs)
  - Two types of header (ESP and AH)



IPSec Framework



ESP—Encapsulating Security Payload

AH—Authentication Header

AES—Advanced Encryption Standard

MD5, SHA—Authentication

DH—Diffie-Hellman Identifier to Derive the Share Secret

Two Types of IPSec Security Protocols

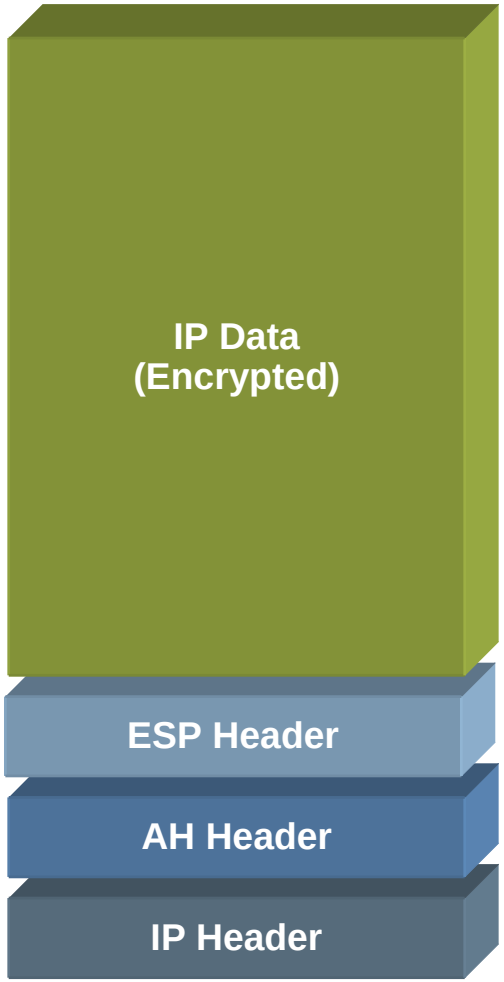
Authentication Header

- Ensures data integrity
- Provides origin authentication—ensures packets definitely came from peer router
- Uses keyed-hash mechanism
- Does **not** provide confidentiality (no encryption)
- Provides optional replay protection

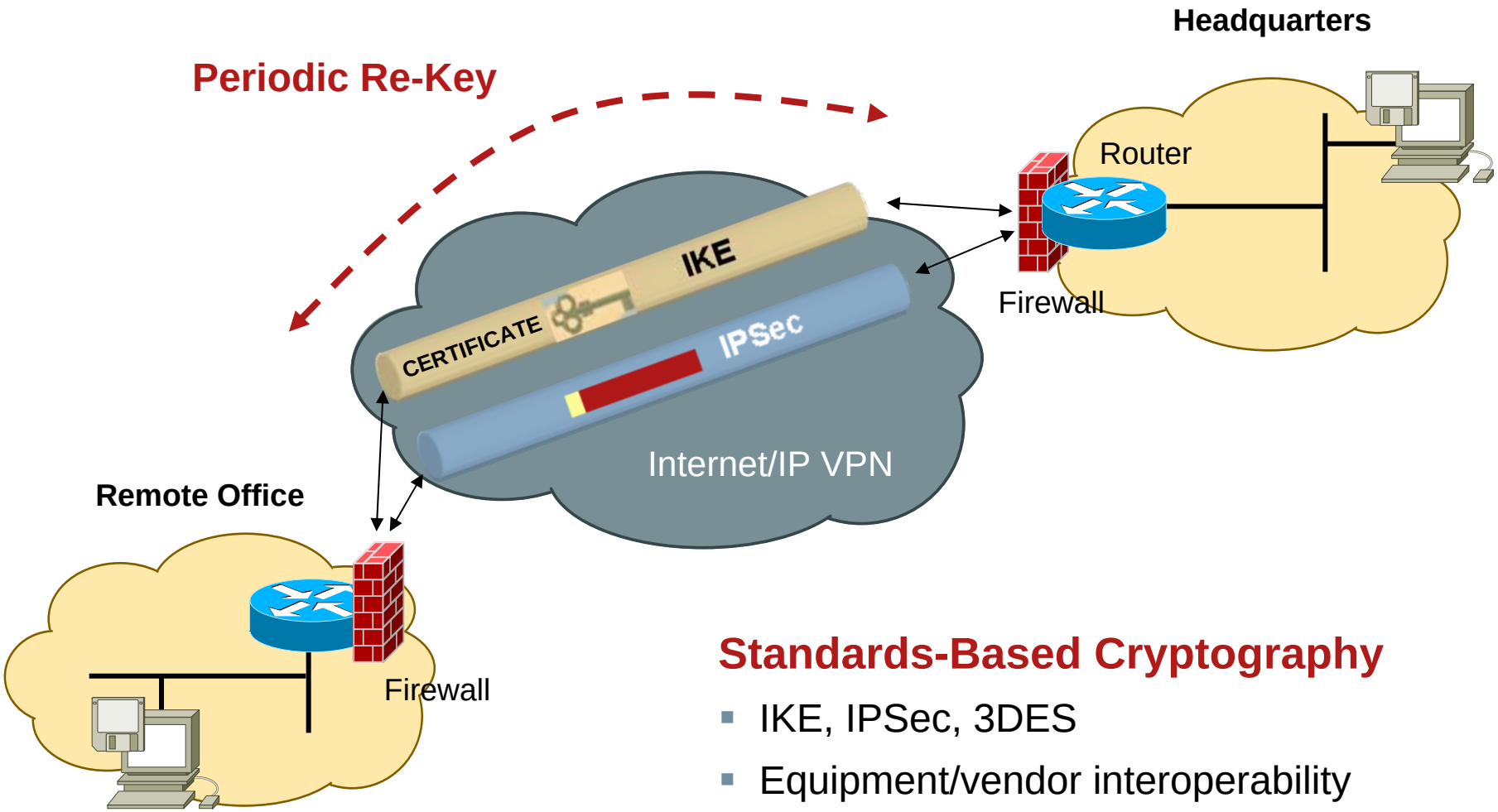
Encapsulating Security Payload

- Data confidentiality (encryption)
- Limited traffic flow confidentiality
- Data integrity
- Optional data origin authentication
- Anti-replay protection
- Does not protect IP header

IP Header with IPSec Information



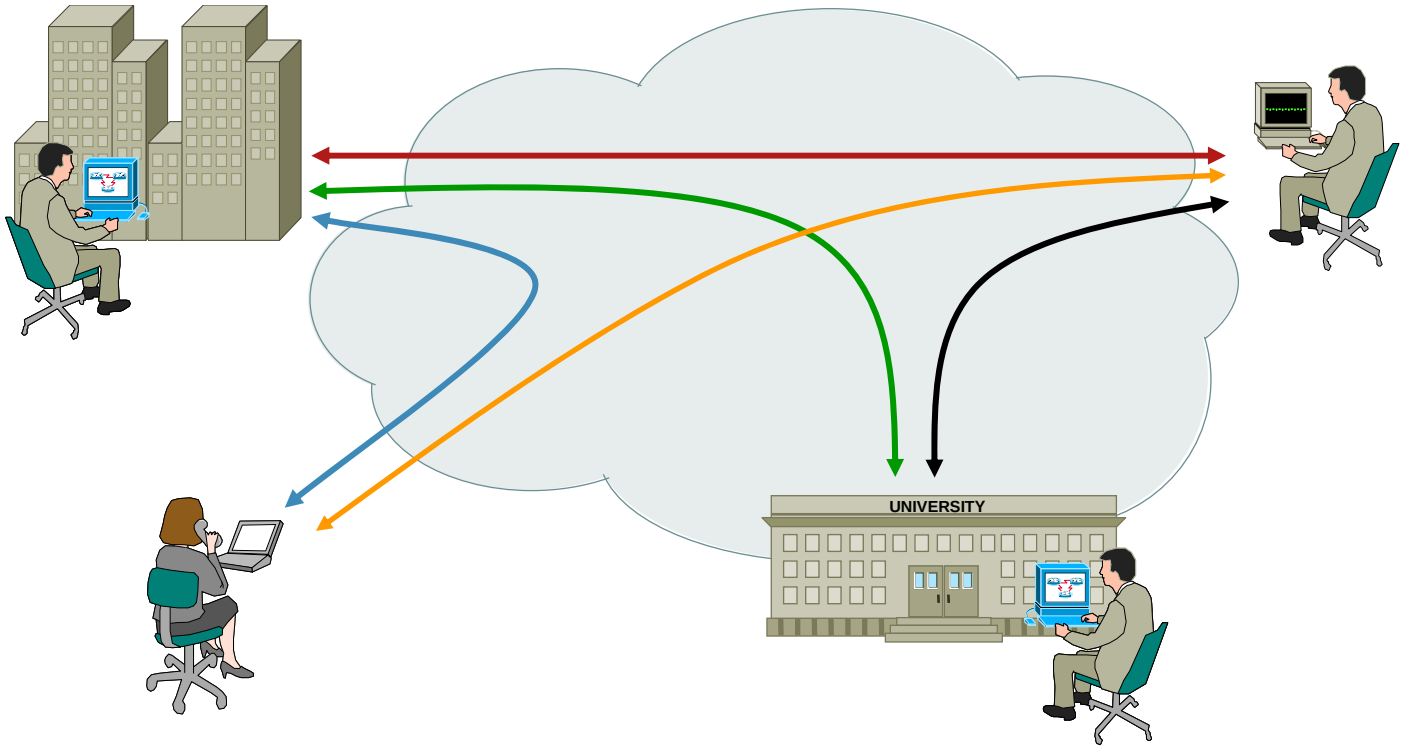
IPSec in a Standards World



Standards-Based Cryptography

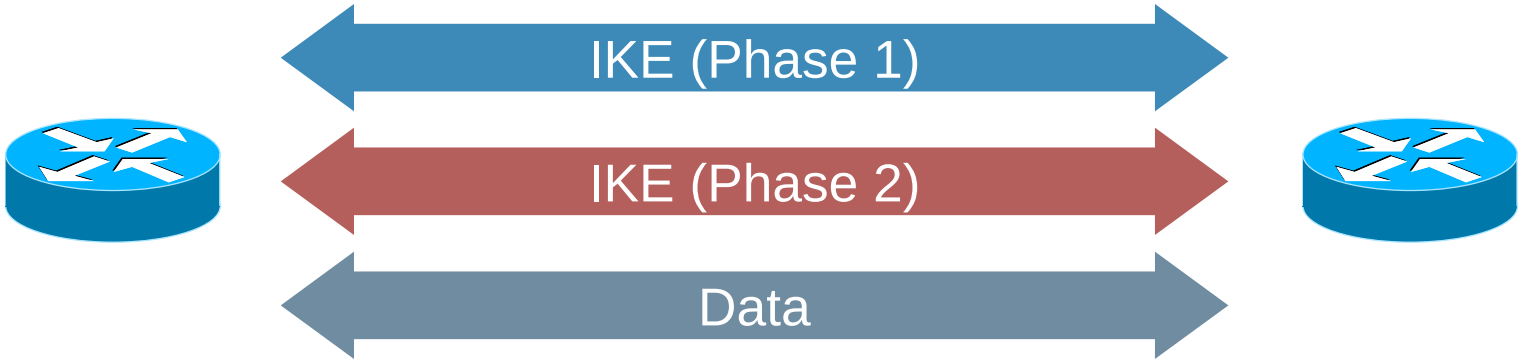
- IKE, IPSec, 3DES
- Equipment/vendor interoperability

IKE Benefits an IPSec Environment



- Ensure confidential communications in an unsecured network
- Also known as the **Key Management Nightmare!!!**

IPSec: Building a Connection



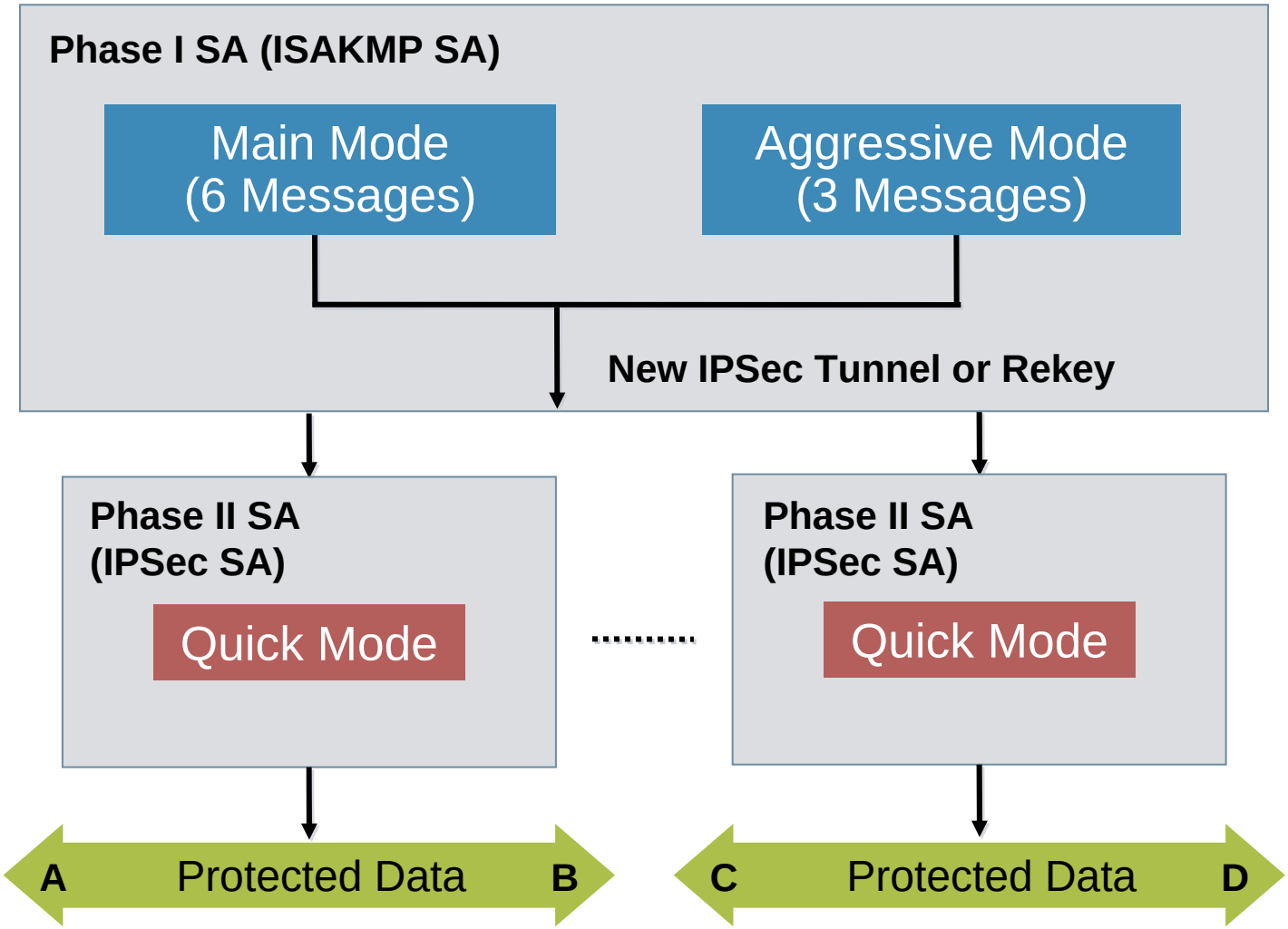
- Two-phase protocol:

  Phase 1 exchange: two peers establish a secure, authenticated channel with which to communicate; Main mode or Aggressive mode accomplishes a Phase 1 exchange

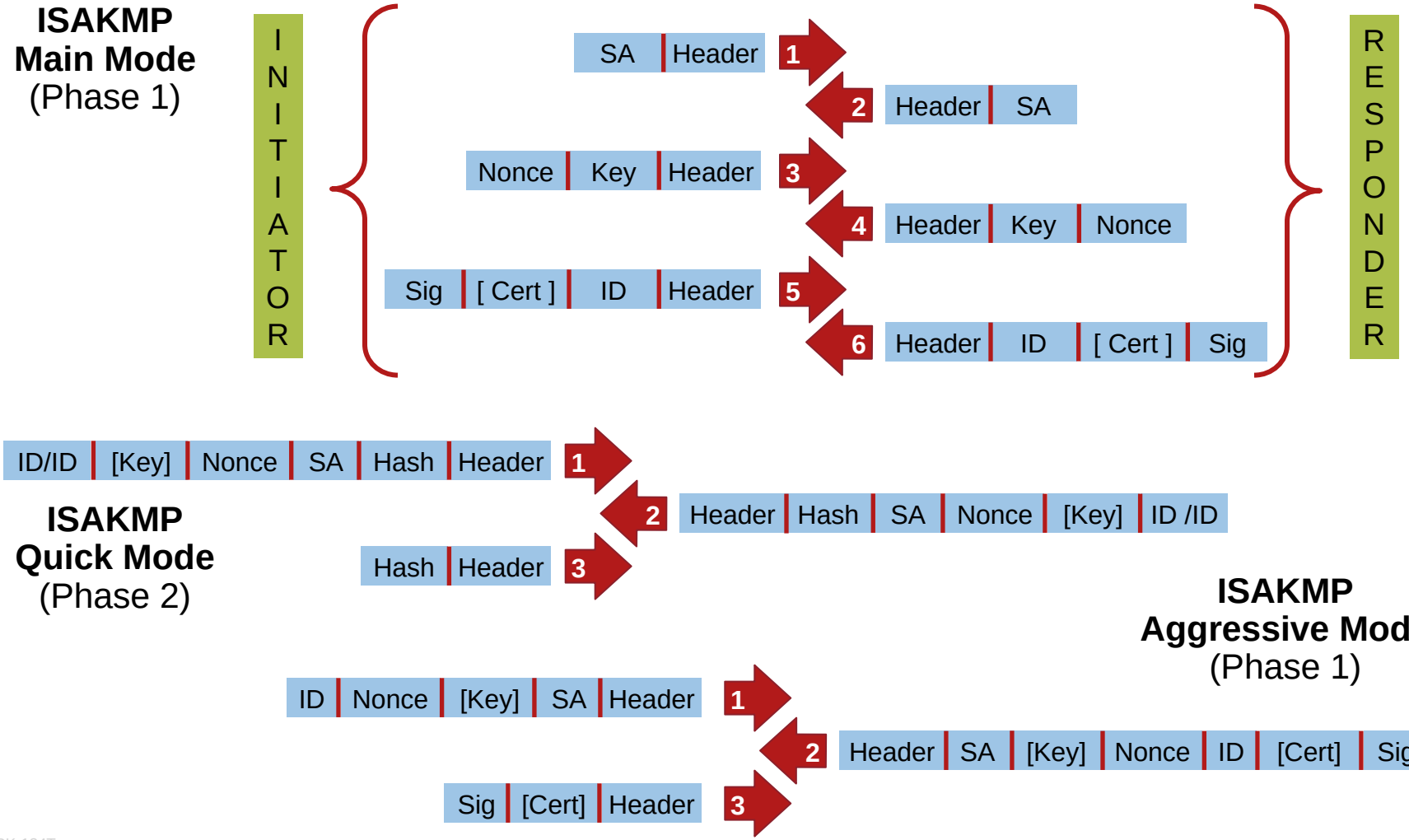
  Phase 2 exchange: security associations are negotiated on behalf of IPSec services; Quick mode accomplishes a Phase 2 exchange

- Each phase has its SAs: ISAKMP SA (Phase 1) and IPSec SA (Phase 2)

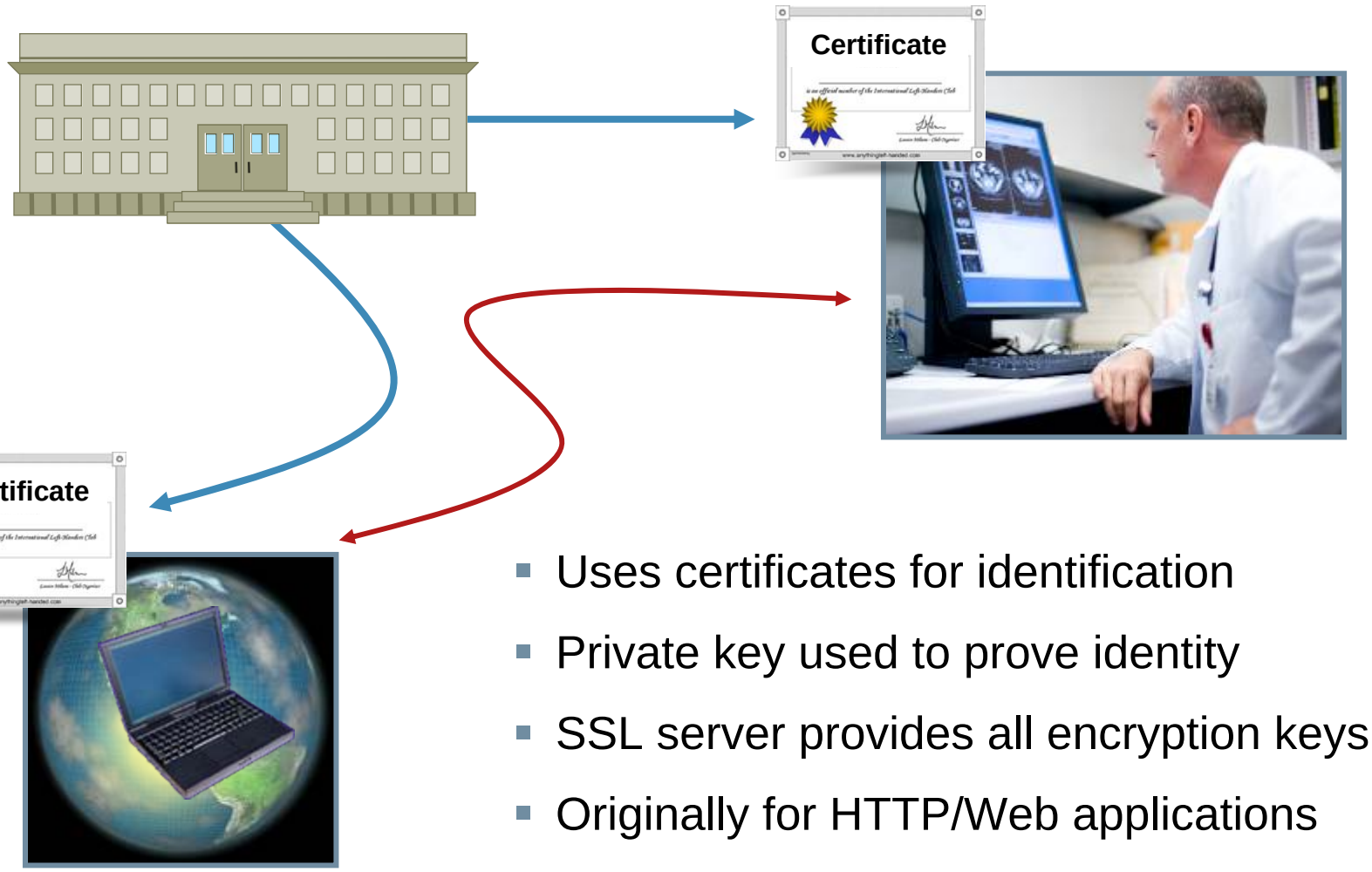
How Does IKE/IPSec Work?



ISAKMP Main, Quick and Aggressive Modes

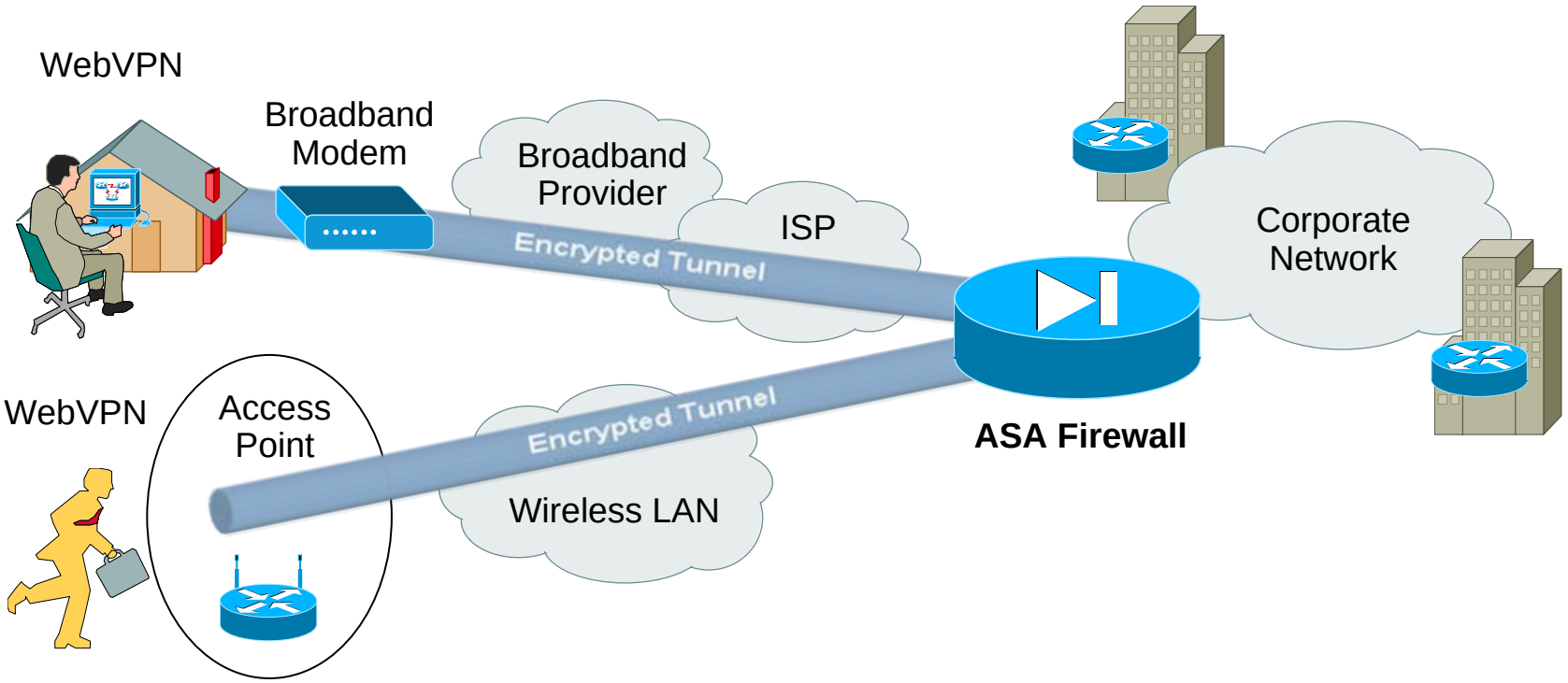


What Is a Web/SSL VPN?



- Uses certificates for identification
- Private key used to prove identity
- SSL server provides all encryption keys
- Originally for HTTP/Web applications

Web/SSL VPN Features



Feature

- Access to internal web sites (HTTP/HTTPS) including filtering
- Access to internal Windows (CIFS) File Shares
- TCP port forwarding for legacy application support
- Access to e-mail via POP, SMTP, and IMAP4 over SSL

Web/SSL VPN and IPSec Comparison

WebVPN

- Uses a standard web browser to access the corporate network
- SSL encryption native to browser provides transport security
- Application accessed through browser portal
- Limited client/server application accessed using applets

IPSEC VPN

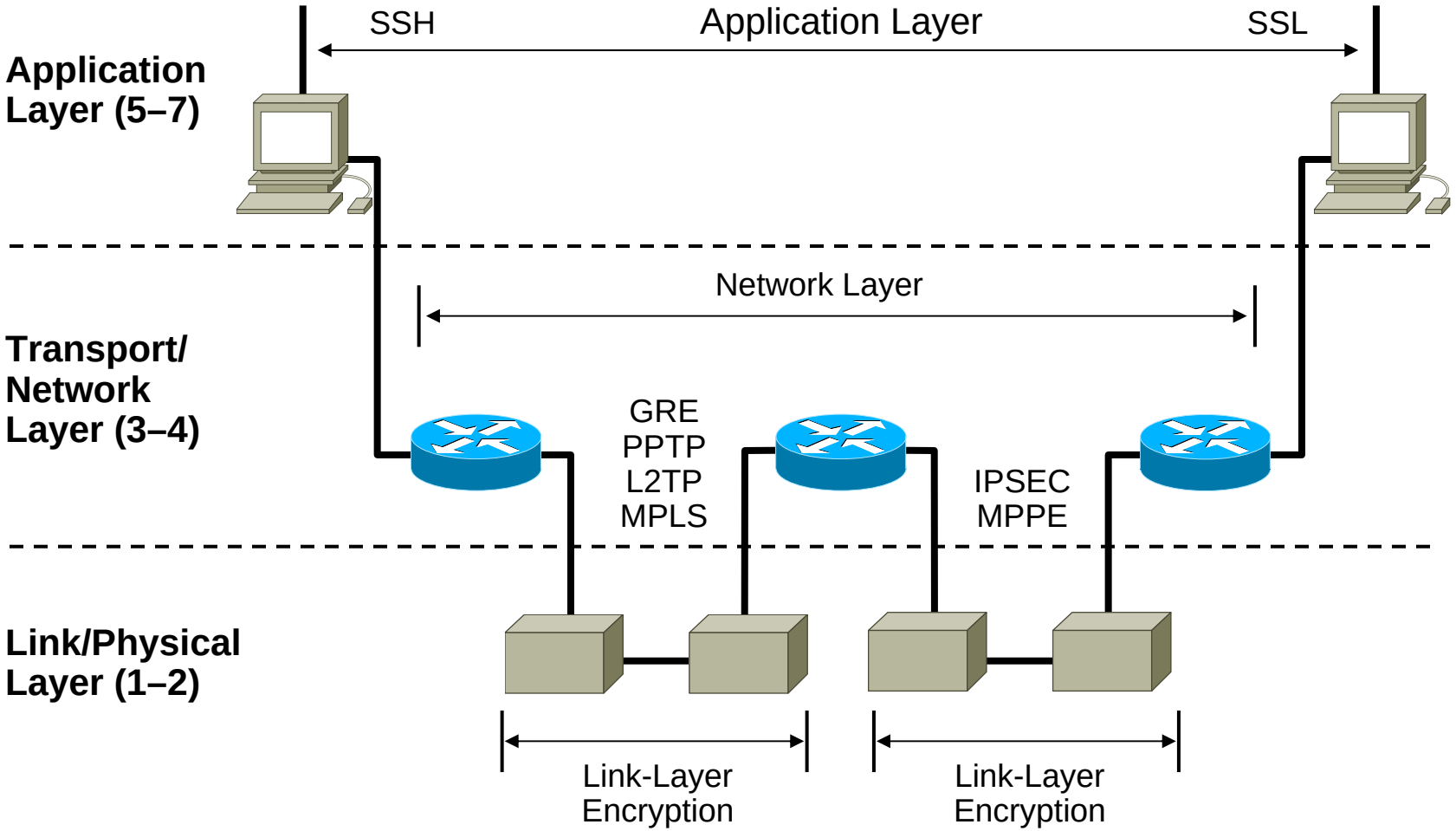
- Uses purpose built client software for network access
- Client provides encryption and desktop security
- Client establishes seamless connection to network
- All application are accessible through their native interface

What Is a PPTP VPN?

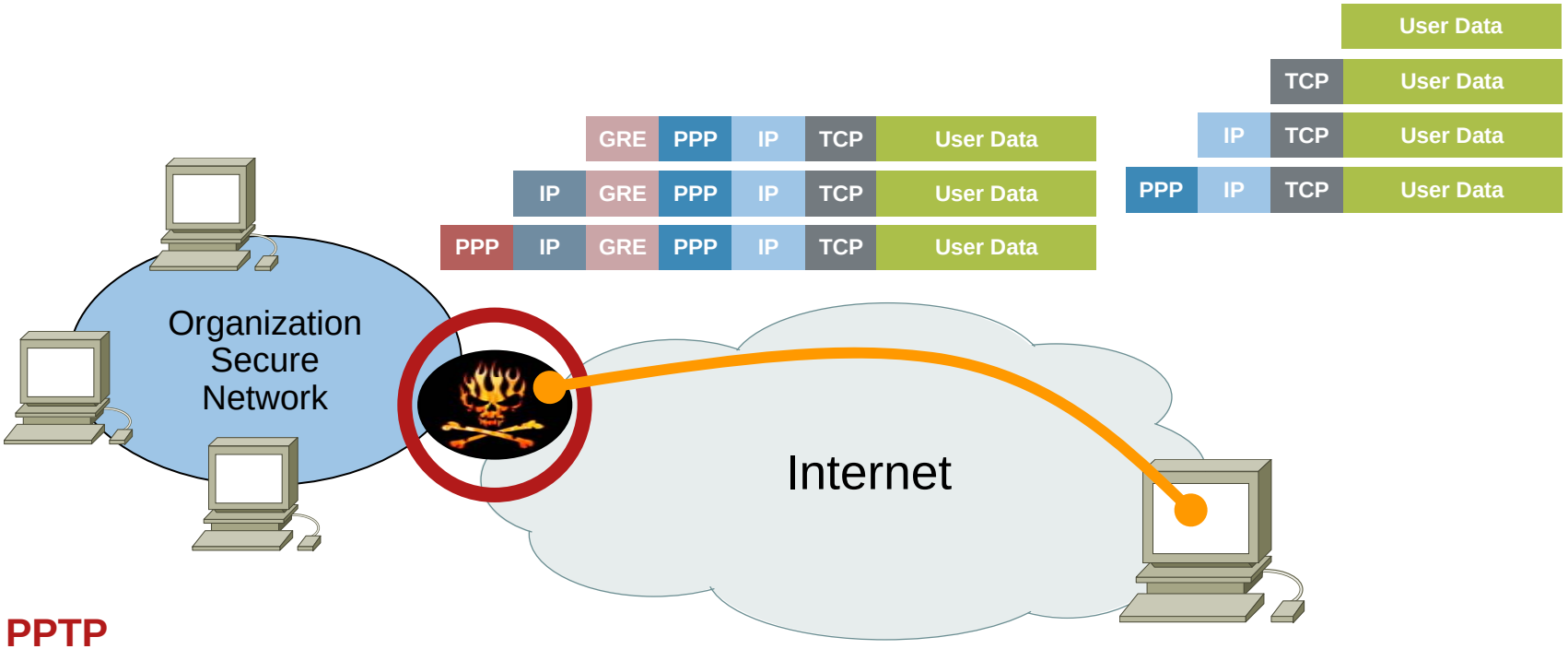
Point to Point Tunneling Protocol

- PPTP is a network protocol used in the implementation of Virtual Private Networks (VPN); RFC 2637 is the PPTP technical specification
- PPTP works on a client server model; PPTP clients are included by default in Microsoft Windows and also available for both Linux and Mac OS X; newer VPN technologies like L2TP and IPSec may replace PPTP someday, but PPTP/MPPE remains a popular network protocol especially on Windows computers

VPN Technology Options



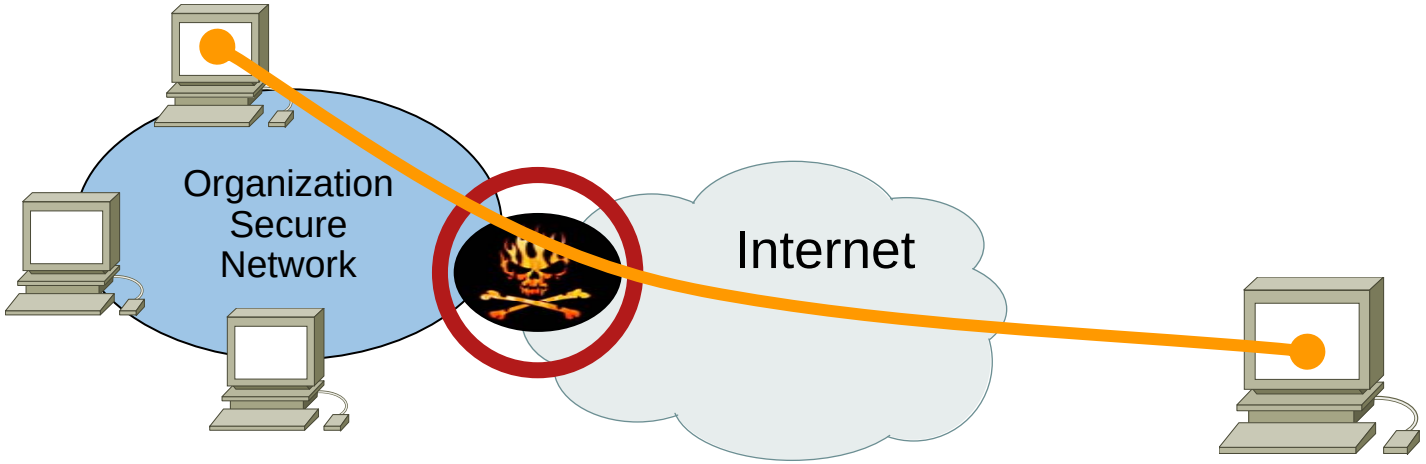
Benefits of PPTP



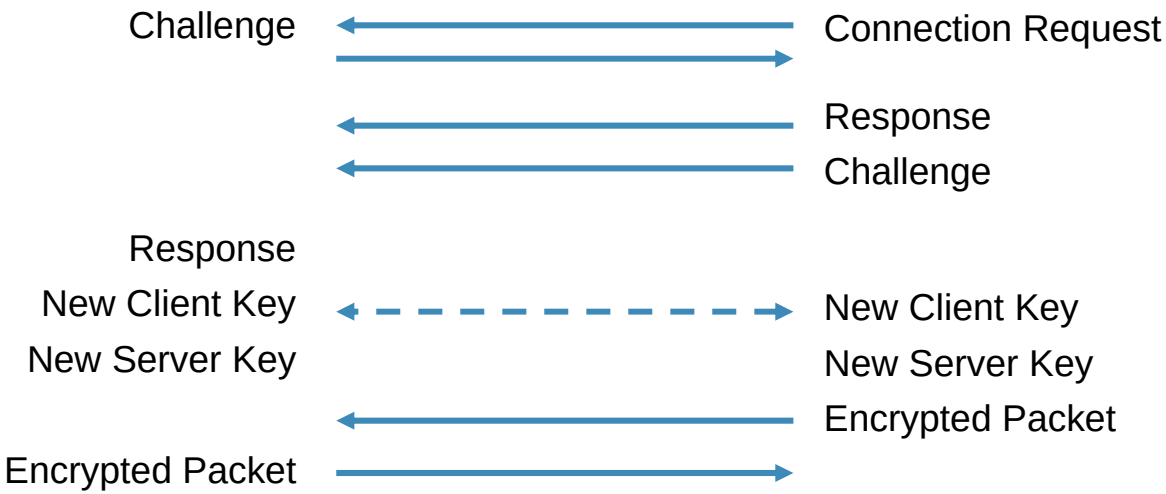
PPTP

- PPoE is point-point protocol over Ethernet
- Single tunnel between end-points: Single device support (GRE = generic routing encapsulation)
- Six bytes over overhead when compression used
- No tunnel authentication
- With RADIUS server supports authentication and accounting
- CHAP V2 fixes password, masquerading, and encryption weakness
- 40 or 128 bit RC4 packet encryption

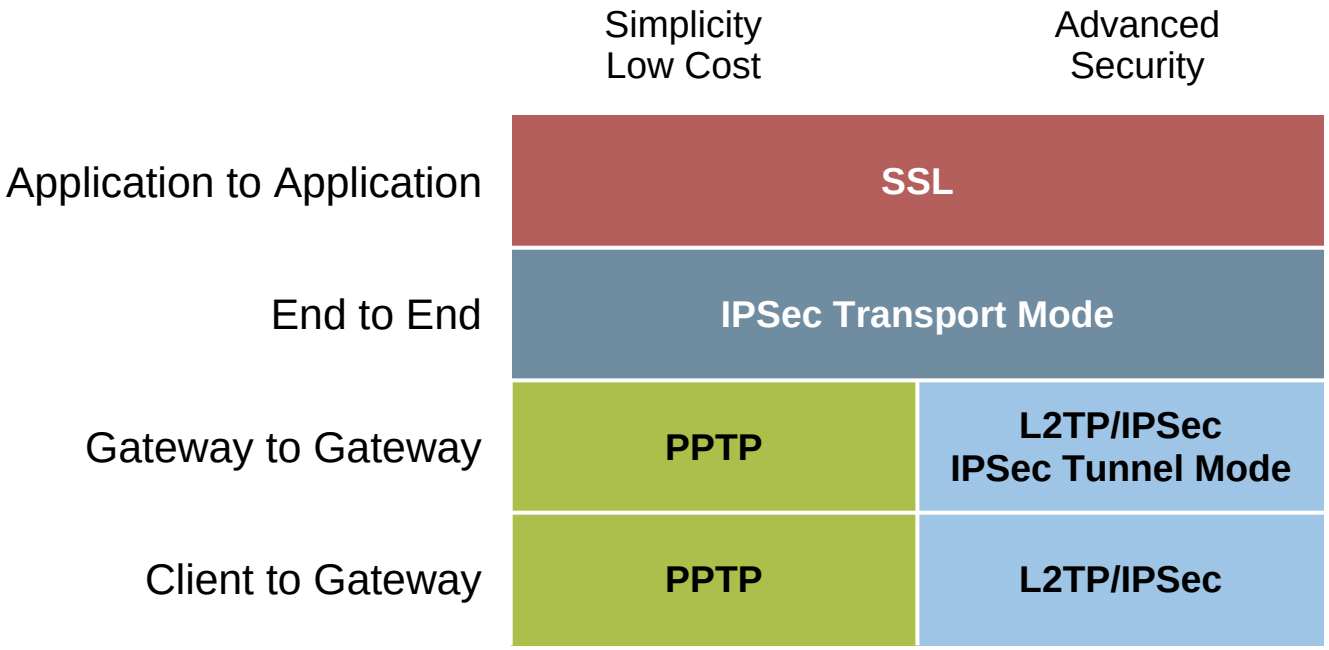
Is PPTP Secure? Yes



CHAP V2 Authentication with 40 or 128 bit RC4 Encryption



VPN Technology Comparison



PPTP—Point to Point Tunneling Protocol—Layer 2—Multiprotocol
L2TP/IPSec—Layer 2 Tunneling Protocol—Multiprotocol—Encryption and Authentication
IPSec—IP Security—Layer 3—IP Protocol—Encryption and Authentication
SSL—Secure Sockets Layer—Layer 6/7—Application—Encryption and Authentication

Summary

- Demonstration
- Introduction to VPNs
- VPN Security (IPSec, PPTP, SSL)
- VPN Technology Comparison
- VPN Group Exercise