What is a VPN?
Introduction: What is a VPN?

- Virtual
- Private
- Network
Introduction to VPN

VPN Defined

Remote Office

Home Office

Internet/IP, Frame Relay, ATM

Main Office

Business Partner

Service Provider Network

Mobile Worker
Introduction (continued):

- Four Categories:
  - Trusted VPN
  - Secure VPN
  - Hybrid VPN
  - Provider-provisioned VPN
VPN TOPOLOGY

How does a VPN work?
VPN Topology: Types of VPNs

- Remote access VPN
- Intranet VPN
- Extranet VPN
VPN Topology: Remote Access VPN

Client-Initiated Remote Access VPNs

- Client-Initiated Tunnel
- IPSec/PPTP/2TP Tunnel
- L2TP/L2F Tunnel
- VPN Cloud (internet, IP)
- VPN Router
- Main Office

NAS

PSTN

NAS-Initiated Tunnel
VPN Topology: Intranet VPN
VPN Topology: Extranet VPN
VPN Topology: Advantages and Disadvantages of VPN

• Advantages:
  • Greater scalability
  • Easy to add/remove users
  • Reduced long-distance telecommunications costs
  • Mobility
  • Security
VPN Topology: Advantages and Disadvantages of VPN

- Disadvantages
  - Lack of standards
  - Understanding of security issues
  - Unpredictable Internet traffic
  - Difficult to accommodate products from different vendors
VPN Topology: What is needed?

- Existing hardware (Servers, workstations, …)
- Internet connection
- VPN - Router/Switch
- Software to create and manage tunnels
- Security Device such as firewall
VPN Topology: How it works

- Operates at layer 2 or 3 of OSI model
  - Layer 2 frame – Ethernet
  - Layer 3 packet – IP

- Tunneling
  - allows senders to encapsulate their data in IP packets that hide the routing and switching infrastructure of the Internet
  - to ensure data security against unwanted viewers, or hackers.
What are the components of VPN?
VPN Components

- Protocols
- Security
- Appliances
VPN Components: Protocols

- **IP Security (IPSec)**
  - Transport mode
  - Tunnel mode
- **Point-to-Point Tunneling Protocol (PPTP)**
  - Voluntary tunneling method
  - Uses PPP (Point-to-Point Protocol)
VPN Components: Protocols

- Layer 2 Tunneling Protocol (L2TP)
  - Exists at the data link layer of OSI
  - Composed from PPTP and L2F (Layer 2 Forwarding)
  - Compulsory tunneling method
Example of packet encapsulation
VPN Components: Security

- Encryption
  - Technique for scrambling and unscrambling information
  - Unscramble – called clear-text
  - Scrambled information – cipher-text
VPN Components: Security

- Keys
  - Secret code that the encryption algorithm uses to create a unique version of cipher-text
  - 8-bits keys = 256 combinations or two to the eighth power
  - 16-bits keys = 65,536 combinations or two to the 16th power
  - 56-bits keys = 72,057,594,037,927,900 or two to the 56th power
  - 168-bits keys …
VPN Components: Security

- Authentication
  - Determine if the sender is the authorized person and if the data has been redirect or corrupted
  - User/System Authentication
  - Data Authentication
VPN Components: Appliances

- Intrusion detection firewalls
  - Monitors traffic crossing network parameters and protects enterprises from unauthorized access
  - Packet-level firewall checks source and destination
  - Application-level firewall acts as a host computer between the organization’s network and the Internet
How can companies benefit from VPN?
VPN Productivity and Cost Benefits: Benefits

- Extends geographic connectivity
- Boosts employee productivity
- Improves Internet security
- Scales easily
VPN Productivity and Cost Benefit: Costs

- Costs associated with implementing VPN
  - In House implementation
  - Outsourced implementation
  - Middle Ground implementation
QUALITY OF SERVICE (QoS)

WHAT IS QoS?
What is QoS?
VPN Productivity and Cost Benefits: Quality of Service

• Question: “Do I get acceptable response times when I access my mission critical applications from a remote office?”
QoS Options

• Two models are available for QoS functionality:
  • Differentiated Services Model (DiffServ)
  • Integrated Services Model (IntServ)
Differentiated Services Model (DiffServ)
Integrated Services Model (IntServ)
THE FUTURE OF VPN

Where is VPN headed?
Future of VPN

• VPN popularity
  • Companies choosing VPN
  • Cost efficient?
  • New way of communicating?
Future of VPN: Companies with VPN

Table 1
U.S. Companies with VPN

- Current 47.5%
- Planned 23.3%
- No 28.5%
- Don't know 0.7%
Any questions?