Introduction to VPN Technology

Cisco Systems

Agenda

Virtual Private Networks – An introduction

- Business Case
- Technical Overview
Why migrate to VPN?

VPNs – offer an enhanced feature set over FR with a solid ROI, and positions you well for future features, services and convergence.

- VPN has a superior cost/bandwidth structure in nearly all cases
- Site-to-Site VPNs allow easily configured extranets and teleworker solutions
- Many Service Providers offer VPN services with SLAs specifying BW, delay, and performance guarantees.
- VPNs allow you to take advantage of toll bypass and many enterprises have deployed full blown IP telephony solutions over VPN

Migration Business Case

**Migration ROI (T1 to T1)**

<table>
<thead>
<tr>
<th>Frame Relay</th>
<th>VPN</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5M (512k CIR) port speed</td>
<td>1.5M port speed</td>
</tr>
<tr>
<td>30 sites</td>
<td>30 sites</td>
</tr>
<tr>
<td>10% mesh ~ 2 PVCs per site</td>
<td>Cost for (29) 3745 = $632,000</td>
</tr>
<tr>
<td></td>
<td>Cost for 7206 (HE) = $47,885</td>
</tr>
<tr>
<td></td>
<td>Total NR cost = $679,885</td>
</tr>
<tr>
<td>Access Charge/Site = $6,313</td>
<td>Access Charge/Site = $2,059</td>
</tr>
<tr>
<td>Management = $920</td>
<td>Management = $797</td>
</tr>
<tr>
<td>Total Branch Access = $7,233</td>
<td>Total Branch Access = $2,856</td>
</tr>
<tr>
<td>Head End Access = $15,660</td>
<td>Head End Access = $15,660</td>
</tr>
<tr>
<td>Total Cost/month (80%) = $180,357</td>
<td>Total Cost per month = $98,498</td>
</tr>
</tbody>
</table>

$81,860 savings/month in access charges
Equipment paid off after 9 months

1yr ROI = 73%
Migration Business Case

Migration ROI (512k to T1)

<table>
<thead>
<tr>
<th>Frame Relay</th>
<th>VPN</th>
</tr>
</thead>
<tbody>
<tr>
<td>512k (128k CIR) port speed</td>
<td>1.5M port speed</td>
</tr>
<tr>
<td>50 sites</td>
<td>50 sites</td>
</tr>
<tr>
<td>10% mesh ~ 3 PVCs per site</td>
<td>Cost for (49) 1760s = $282,566</td>
</tr>
<tr>
<td>Access Charge/Site = $2,621</td>
<td>Access Charge/Site = $2,059</td>
</tr>
<tr>
<td>Management = $1,065</td>
<td>Management = $797</td>
</tr>
<tr>
<td>Total cost per branch = $3,686</td>
<td>Total cost per branch = $2,856</td>
</tr>
<tr>
<td>Total Head End Cost = $15,660</td>
<td>Total Head End Cost = $15,660</td>
</tr>
<tr>
<td>Total Cost/month (90%) = $176,706</td>
<td>Total Cost per month = $155,628</td>
</tr>
</tbody>
</table>

2x BW
2yr ROI = 58%

$21,078 savings/month in access charges
Equipment paid off after 19 months

Migration Business Case

Business Critical Apps

Market indicators for Enterprise Resource Planning (ERP), Supply Chain Mgmt (SCM), Customer Relationship Mgmt (CRM) apps:

- ERP—~$8 billion in 2001, with sustained an annual growth rate of 13% through 2005 (Gartner Group, 2001)
- SCM—$13.6 billion spent in 2000 and estimated to reach $50 billion by 2005 (Lou Gerstner, CEO, IBM, 2001)
- CRM—$20 billion spent in 2000 and estimated to reach $76 billion by 2005 (Gartner Group, 2001)

These applications require a highly available, scalable, and application-aware WAN solution.
Migration Business Case
Integrated Voice, Video and Data

Business Requirements:
• Cost savings through network convergence (voice + data)
• Productivity increase through new application support

VOIP/Video applications:
• Intra-enterprise voice transport, IP telephony
• Corporate Communications
• Elearning
• Videoconferencing

Application Requirements:
• Multipoint connectivity/mesh to support intra-enterprise calling
• QoS/SLA support required for business quality voice and critical apps
• Multicast support for content distribution applications

Source: IDC 2002

Migration Technical Case
VPN scales more cheaply/gracefully than FR

Frame Relay
PVCs are typically sub T1 and have lower CIRs
• Frame Relay PVCs do not scale cheaply or gracefully
• Each new site requires multiple new PVCs
• Hub and Spoke topology requires complicated routing schemes to avoid inefficient behaviour

VPN
VPNs are typically connected via a T1
• New sites are as easy as dropping in a new link, or just use the existing Internet link!
• All sites enjoy full line speed
• Provisioning is the same regardless of number of sites

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Migration Technical Case

**VPN is pervasive, and takes less time to provision**

- Private FR networks may not reach all branch offices or remote locations
- Frame Relay does not support remote workers
- PVCs can take over a month to provision

**Frame Relay**

- Central Site
- Private Frame Relay Network
- Branch Offices

**VPN**

- Central Site
- Multi Service VPN Network
- ISP
- Branch Offices

- Any branch or home that can access the Internet can securely connect to your corporate VPN
- VPN supports teleworkers and Extranets
- New VPN connections take days to provision

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**Migration Technical Case**

**VPN Bandwidth**

- Frame Relay typically offers CIR that is lower than circuit line speed (access rate equals T1, but CIR is only 512k)

- **VPNs** allow for full line rate BW speeds on a per remote basis
  - Higher BW at lower cost
Migration Technical Case

**VPN Security**

- Frame relay provides logical separation of traffic, not transport security
- VPNs provide a more scalable, easier to manage, and less expensive method for transport security than FR
- Several privacy standards requiring encryption have been enacted by governments worldwide (3DES, AES)
- VPN allows endpoint authentication

![Diagram of Frame Relay and VPN Network](image1)

**IPSec offers end to end Encryption**

**MPLS offers traffic separation, but also supports IPSec**

Migration Technical Case

**VPNs offers Equivalent QoS**

- With FR the Enterprise owns the Layer 2 link from end to end
- QoS control is very granular

- With VPN the Enterprise only owns out to the CPE, the SPE owns the rest of the link
- Edge QoS is available
- Most SPs offer an SLA
Migration Technical Case
Teleworker Deployments

• VPN Deployments lay the groundwork for future VOIP (QoS) enabled Teleworker deployments
• IPSec enabled CPE in Teleworker location utilizes the same head end gear as the branch offices

Service Providers Offering Services Including SLAs

• Cisco Powered Network designation created for V³PN service providers—“IP Multiservice VPN”
• V³PN (IP Multiservice VPN) SLA:
  ✓ Delay <= 60ms one way delay
  ✓ Jitter <= 20ms
  ✓ Packet loss <= .5%
  ✓ Edge QoS (highly preferred)
• SP’s are responsible for meeting the terms of the SLAs they provide to Enterprises
  – Similar to private Frame Relay CIR today
Case Study 1 – Why VPN and Voice-over-VPN

Alternative 1: Managed Frame Relay
- NYC Private Frame Relay
- Branch Offices
- 20 sites – >$45,000 per month
- 3 year commit, >$1.5M total

Alternative 2: Voice and Video enabled VPN
- NYC Service Provider
- Branch Offices
- 20 sites – <$20,000 per month
- 1 year commit, <$250K total

Only Cisco Delivers End-to-End, Fully Interoperable VPN Network Solution

Catalyst Switches
Voice Gateways and VPN head ends (6500)

Cisco IOS VPN Security Routers
Voice, Video integration with IPSec

Cisco IP Phone 7900
Phone handset with integrated QoS

Cisco CallManager
Call setup and signaling; Host IDS protection

PIX Firewall
Statefully inspects Cisco IP Telephony and Video streams

Cisco IOS VPN Security Routers
Integrated WAN, VPN, voice gateway and firewall for remote offices

Main Office
VPN
Remote Office
LAN
VPN Advantages

- **Cost Savings**
  - Increased bandwidth at lower cost
  - Lower phone bills
  - Lower backbone costs delivered by convergence
  - Reduces need for travel

- **Improved Productivity**
  - More users connected to the network
  - Same user experience and access as in corporate office
  - Enables new converged applications
  - Faster deployment times

The Network Delivers Efficiency

Why migrate now?

- VPNs offer an enhanced feature set over FR with a solid ROI, and positions you well for future features, services and convergence.

- Migrating now gives you access to more services
- Migrating now gives you greater flexibility
- Migrating now provides additional security and a solid ROI
- Migrating now paves the way for future convergence based solutions
Agenda

Voice and Video Enabled VPN (V^3PN) – An evolution of IPSec VPNs that delivers cost-effective integrated voice, video, and data connectivity to geographically dispersed locations.

- Business Case
- Technical Overview

V^3PN Deployment Models

Service Providers today are offering QoS SLA’s
Headquarters
IP Telephony/Services

Best effort today – SP’s currently developing QoS enabled offerings

Cisco Powered Network SP Partners
http://www.cisco.com/pcqi-bin/cpn/cpn_pub_bassrch.pl
VPN Deployment Model: Site-to-Site Branch Office

- Hub and Spoke Topology
- Cisco IOS VPN Routers
- QoS capable WAN media (Point to Point, Frame Relay, etc.)
- Service Provider offering QoS-based SLA for drop, delay and jitter, availability

Day in the Life... of a Cisco employee
**SOHO CPE Examples: DSL**

- Service Provider or Enterprise Manages VPN/Security and QoS
- Enterprise Manages VPN/Security and QoS

(Enterprise/SP Demarc Depends on Nature of Managed Services)

- Service Provider
- 3rd Party Modem
- DSL/VPN/FW/QoS
- Cisco IOS Device Required for QoS
- VPN/FW/QoS
- No QoS

**SOHO CPE Examples: Cable**

- Service Provider Manages VPN/Security and QoS
- Enterprise Manages VPN/Security and QoS

(Enterprise/SP Demarc Depends on Nature of Managed Services)

- Service Provider
- 3rd Party Modem
- Cable/VPN/FW/QoS
- Cisco IOS Device Required for QoS
- DOCSIS 1.1 Adds QoS
- Cable
- No QoS
IPsec and MPLS VPNs

Service Provider Options

Central Site | Service Provider | Branch Offices
---|---|---
MPLS VPN | No Encryption | |

- PE
- CPE
- IP
- MPLS

IPsec VPN

- PE
- CPE
- IP
- IPsec
- MPLS

IPsec over MPLS VPN

- PE
- CPE
- IPsec
- MPLS
- IP

IPsec to MPLS "Bridging"

- PE
- CPE
- MPLS
- IPsec
- MPLS

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V^3PN Services
What Does a Customer Choose?

- Traffic Separation provides adequate security, full-mesh functionality, Managed Service acceptable
  - MPLS VPN
- Traffic encryption required and/or Enterprise Customer wants control of security policy
  - IPSec VPN
  - IPSec VPN over MPLS
- “Backbone” services (e.g. MPLS, FR, T1, etc.) not available at location
  - IPSec VPN over Broadband Access
- “Best Effort” service/bandwidth is acceptable, cost is of utmost importance, resiliency not critical
  - IPSec VPN over Broadband Access

V^3PN Service Providers
Cisco Powered Network

Where to go for CPN Designation
http://www.cisco.com/cgi-bin/cpn/cpn_pub_bassrch.pl

Search for:
“IP-VPN Data”
and
“IP-VPN Multiservice”