SSL VPN
Virtual Private Networks based on Secure Socket Layer

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SSL VPN: What is that?

SSL as the central mechanism on which to base secure access

- Site-to-site VPN
- Remote access VPN
- Secure service access
  - Loose interpretation of VPN
    - SSL (pseudo)VPN
- Tunneling based on TCP or UDP
Why Not IPsec VPN?

- IPsec too difficult and/or too expensive to use securely
  - Too many options to be configured and administered
- Operates in kernel space
  - Failures potentially catastrophic
- Installation difficult and risky
- Concerns fade with maturity
Why SSL VPN

- Lower complexity
  - Installation
  - Configuration
  - Management
- Non-interference with kernel
- Most widely used
- Higher, more robust security
Compared to IPsec VPN

- No problem with NAT traversal
- No authentication of IP header
- ESP (encapsulation security payload) IPsec to be used
- Packets dropped at a higher level
- Critical with DOS attacks
Compared to PPTP

- Initially proprietary (Microsoft)
- Initially weak security
  - Fixed later
- Poor interoperability with non-Microsoft platforms
- GRE (generic routing encapsulation) tunneling
  - Possibly blocked by routers
SSL (pseudo)VPN

- IPsec VPNs connect networks
  - Or hosts to networks
- SSL VPNs connect
  - Users to services
  - Application clients to application servers
Why SSL (pseudo)VPN

→ No client code is to be installed
  → Usable anywhere (kyosk)
→ Applications available through web browser
  → Deploying HTTPS
→ Not a general security solution
  → Specific solutions suitable to selected applications
In Summary

SSL VPNs have a good chance of working on any network scenario

- TCP or UDP tunneling enable
- NAT traversal
- Firewall traversal
- Router traversal
- SSL (pseudo)VPN enable universal client (web browser)
SSL VPN Flavors

- Web proxying
- Application translation
- Port forwarding
- SSL’ed protocols
- Application proxying
- Network extension
- Site-to-site connectivity
Proxying

→ VPN Gateway downloads web pages through HTTP
→ Ship them through HTTPS
Application Translation

- Native protocol between VPN server and application server
  - E.g., FTP, STMP, POP
- Application user interface as a web page
- HTTP(S) between VPN server and client
- Not suitable for all applications
  - Look&feel might be lost
Port Forwarding

→ Port forwarder on client
→ Additional software
→ Platform dependent
  → Unless Java or ActiveX
→ Application points to localhost
  → To port X
→ Usual application port
    → E.g., TCP port 110 (POP3)
Port Forwarding

SSL/HTTPS

TCP port 443

POP3

POP3 (TCP port 110)

Port Forwarder

HTTPS
Port Forwarding

➔ Port forwarder sends data stream to SSL connection to VPN gateway

➔ To port Y

➔ Usually port 443 (HTTPS)

➔ VPN gateway forwards data stream to application server

➔ To port X

➔ E.g., TCP port 110 (POP3)
Port Forwarding

**SSL/HTTPS**
- TCP port 443

**POP3**
- TCP port 110

**HTTPS**
Port Forwarding

→ Works only with fixed port protocols

→ Problems with address and port in application layer protocol

→ SSL-VPN gateway must know application protocol to translate

→ Application layer gateway (ALG)
SSL’ed Protocols

- Secure application protocols
- Protocol-over-SSL
  - E.g., POP-over-SSL, IMAP-over-SSL, SMTP-over-SSL
- Client and server support required

POP-over-SSL
TCP port 995
Application Proxying

→ Compatibility with older servers
→ Client points at SSL-VPN gateway

TCP port 995

TCP port 110

POP-o-SSL

POP3
Network Extension

Tunnel over SSL

FTP

POP3

FTP

POP3
Products and Vendors

- Open VPN (openvpn.net)
- AEP
- F5 Networks
- NetScreen Technologies
- Netilla
- Nokia
- Symantec
- Whale Communications
Main Issues

➔ Interoperability
➔ Product specific features
➔ Implementation weaknesses
➔ Availability of client on specific platforms
Bibliography

