

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**

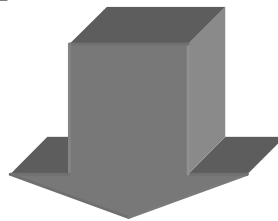
→ **Installation**

→ **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

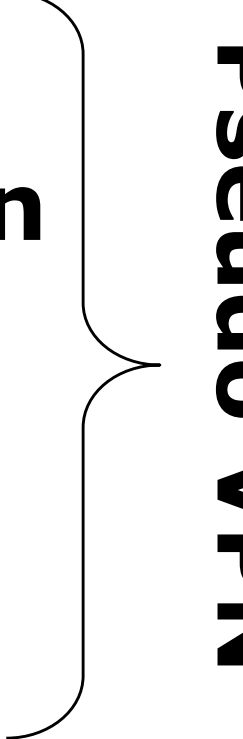
→ NAT traversal

→ Firewall traversal

→ Router traversal

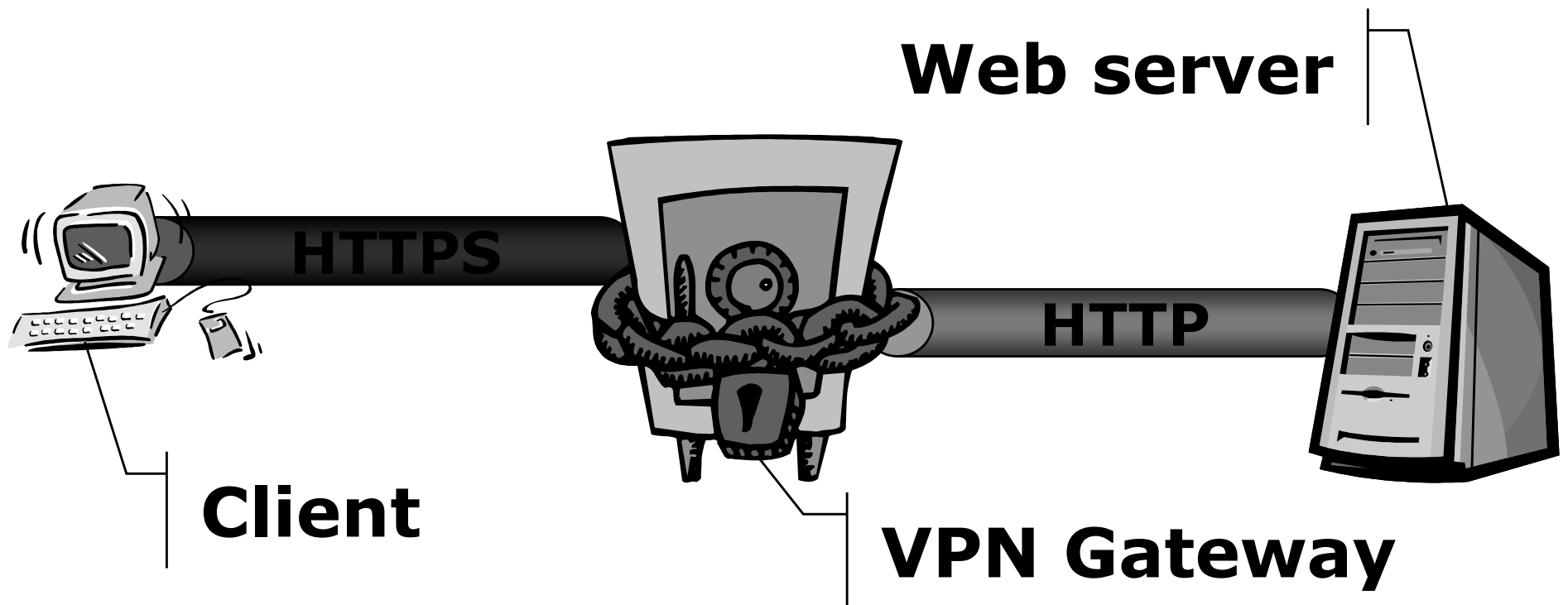
**→ SSL (pseudo)VPN enable
universal client (web browser)**

SSL VPN Flavors

- Web proxying
 - Application translation
 - Port forwarding
 - SSL'ed protocols
 - Application proxying
 - Network extension
 - Site-to-site connectivity
- 
- Pseudo VPN**

Proxying

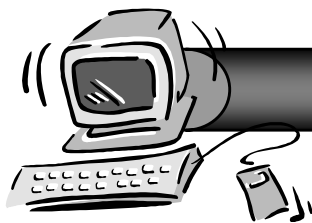
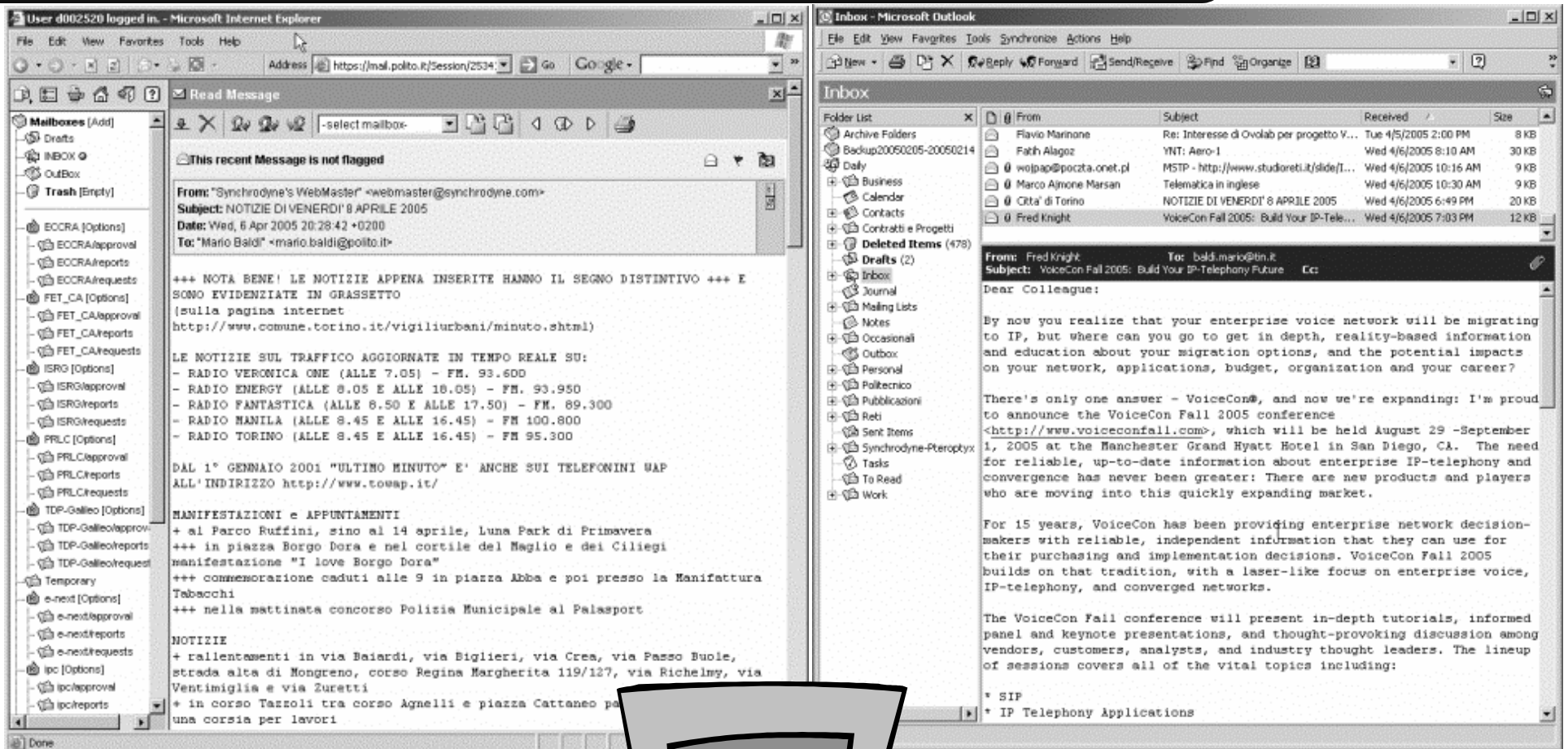
- VPN Gateway downloads web pages through HTTP
- Ship them through HTTPS



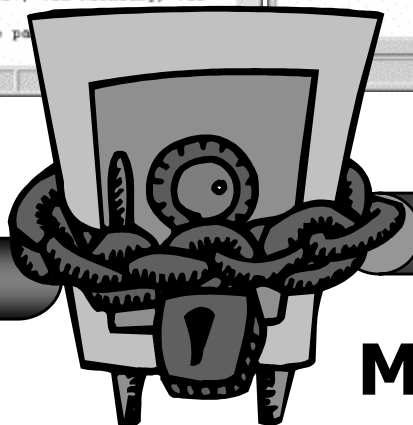
Application Translation

- **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**

Application Translation



HTTPS



POP3

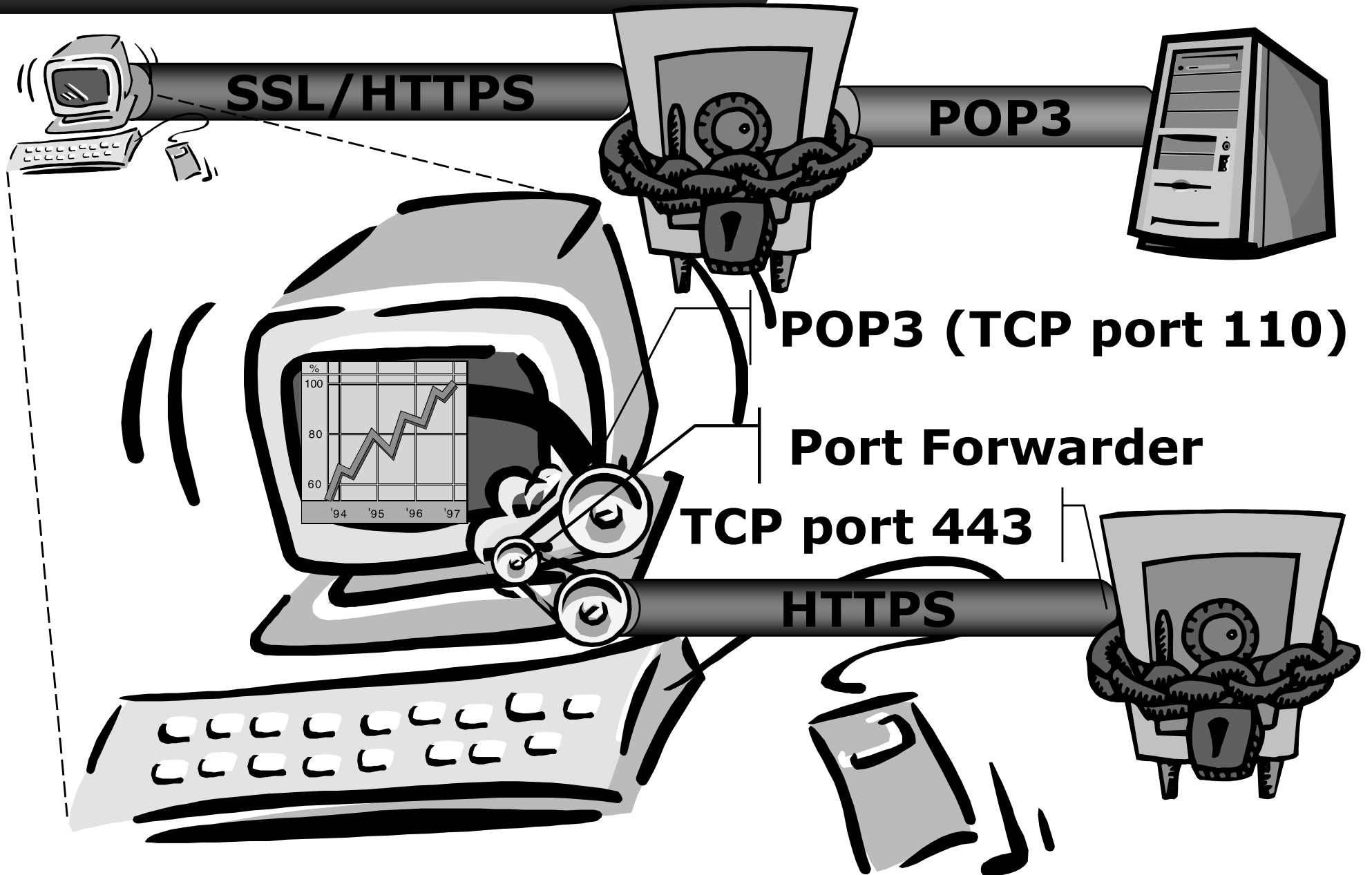
Mail server



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)**

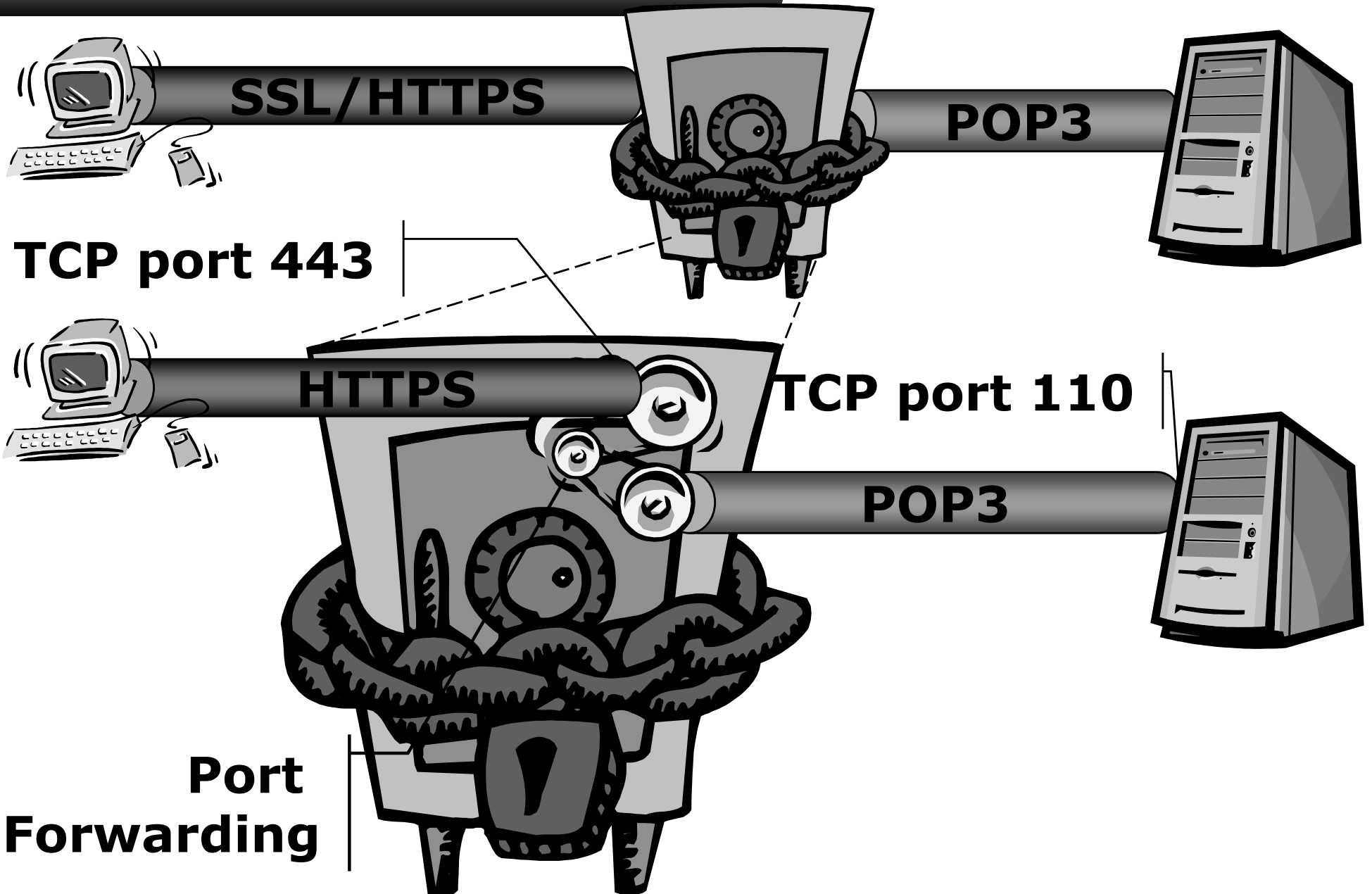
Port Forwarding



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



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**

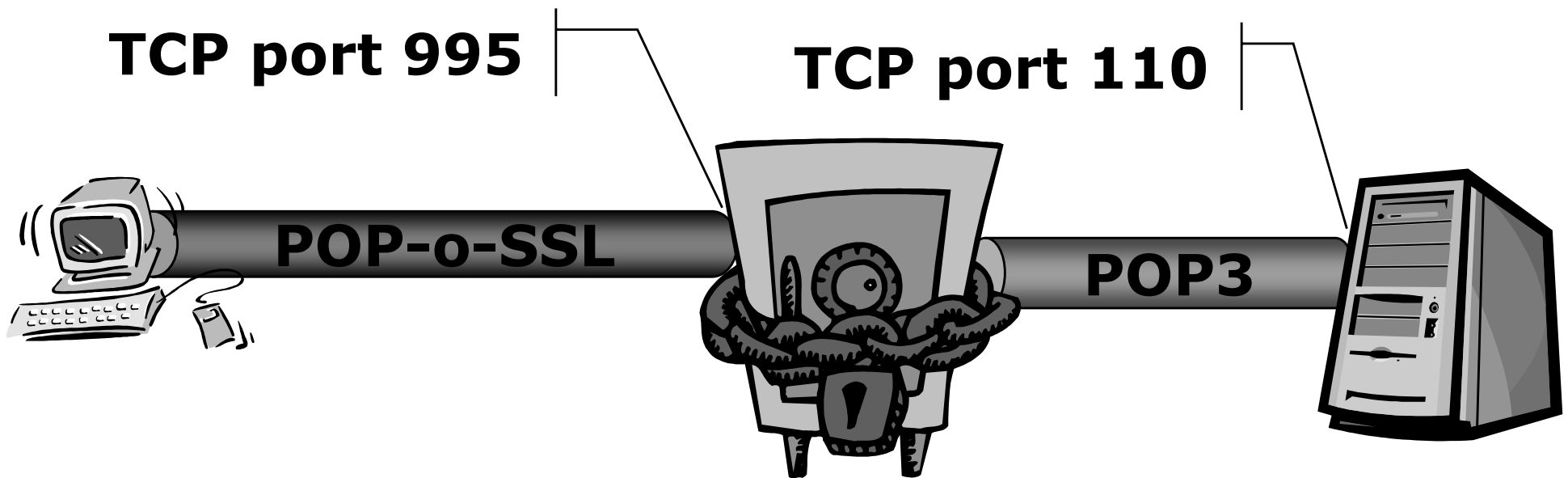
→ **E.g., POP-over-SSL, IMAP-over-SSL, SMTP-over-SSL**

→ **Client and server support required**

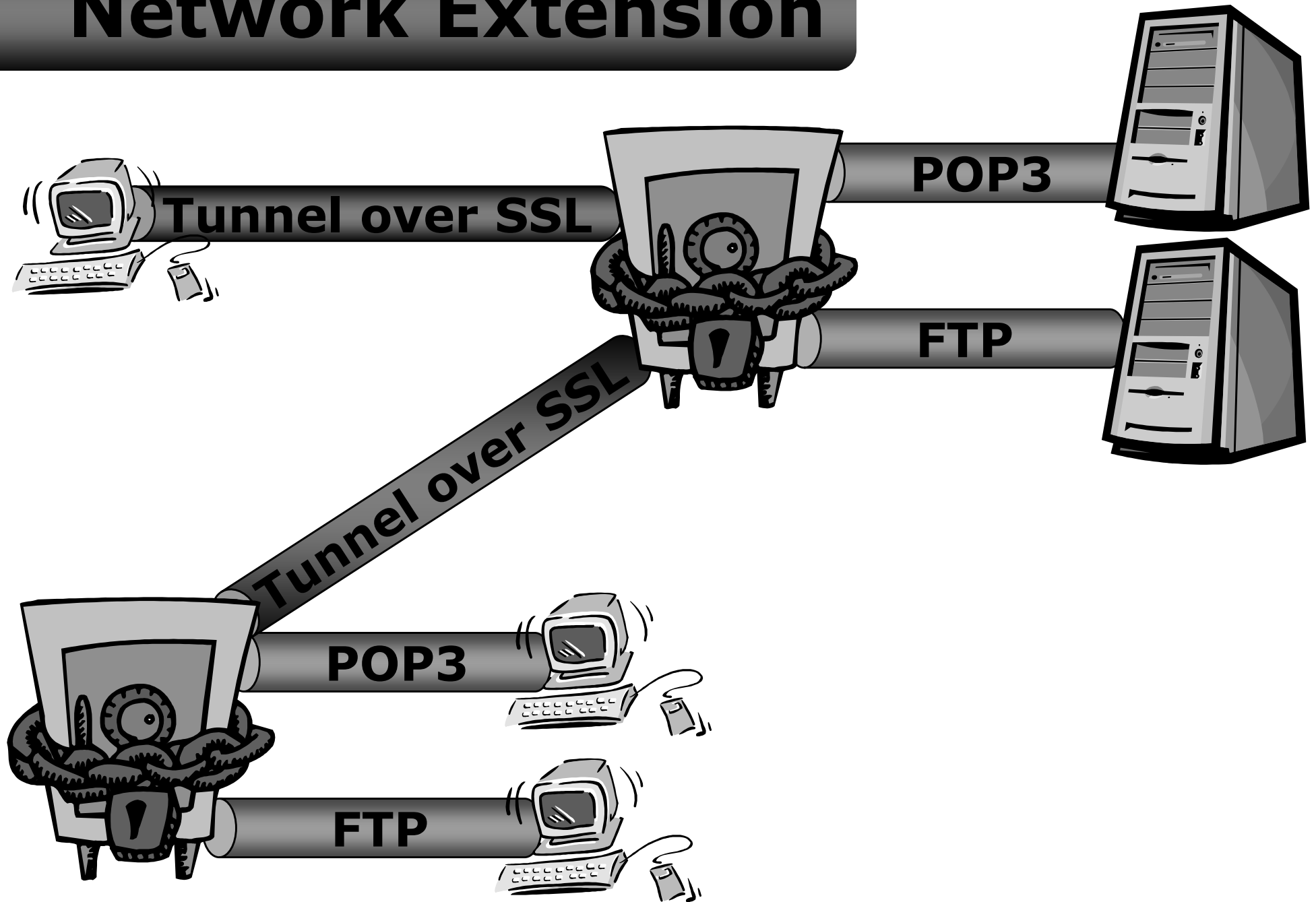


Application Proxying

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



Network Extension



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**

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