

# SSL VPN

Virtual Private Networks based on  
Secure Socket Layer

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# SSL VPN: What is that?

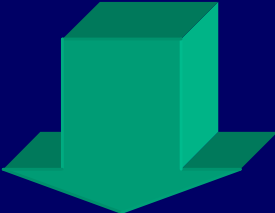
SSL as the central mechanism on which to base secure access

- 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 (kiosk)**
- **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**

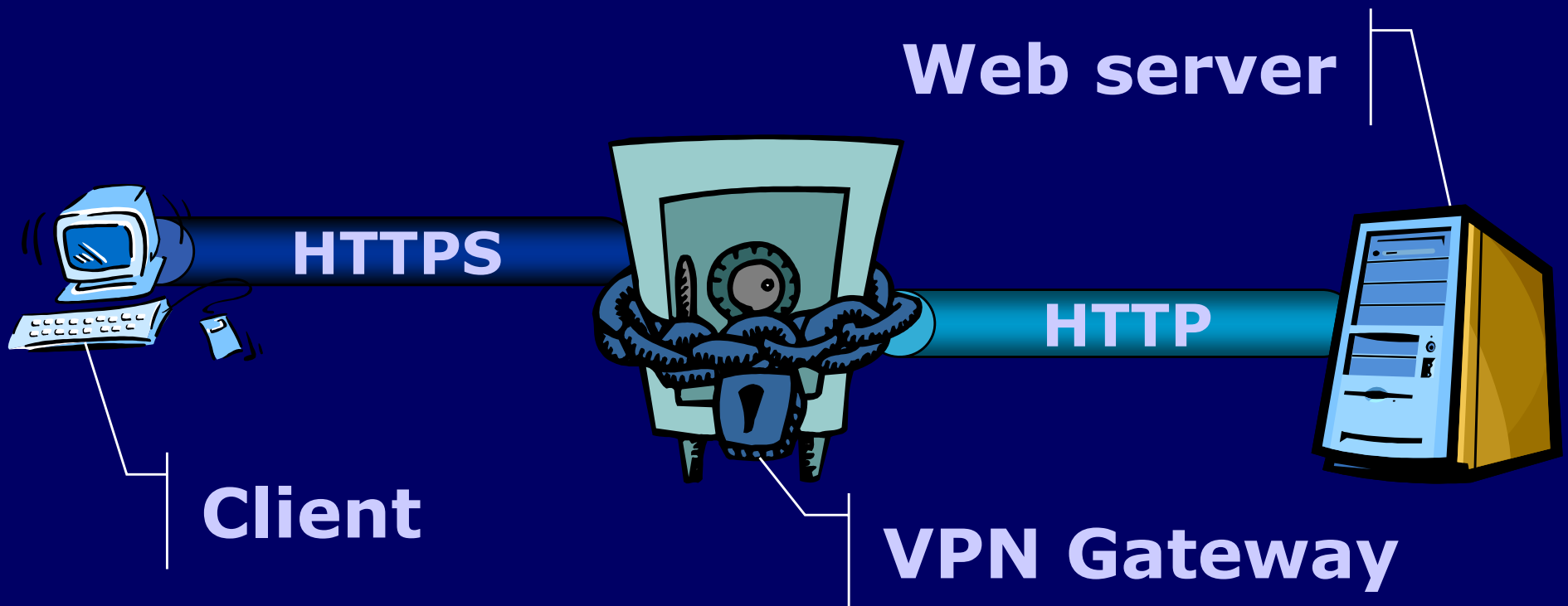
**→ SSL (pseudo)VPN enable  
universal client (web browser)**

# SSL VPN Flavors

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

# Proxying

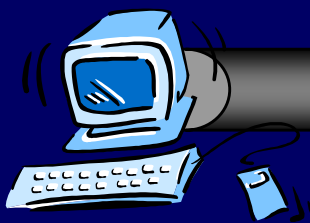
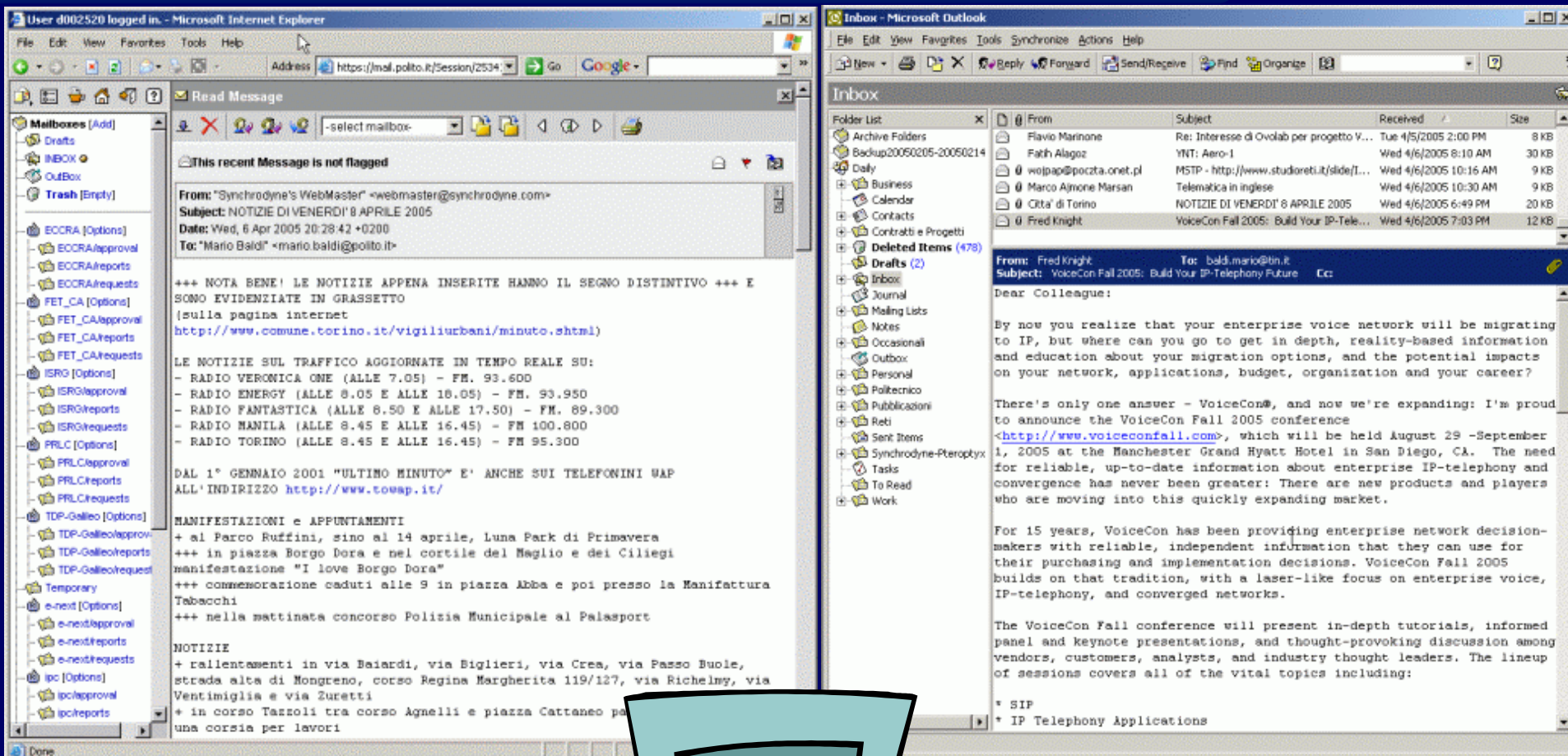
- VPN Gateway downloads web pages through HTTP
- Ship them through HTTPS



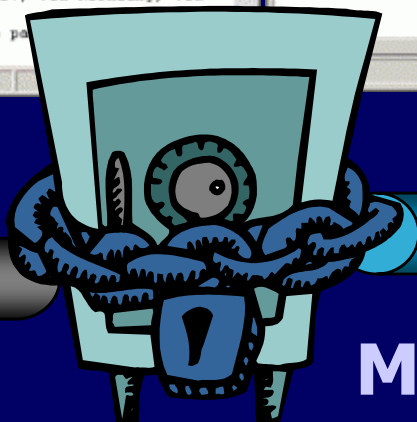
# Application Translation

- 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

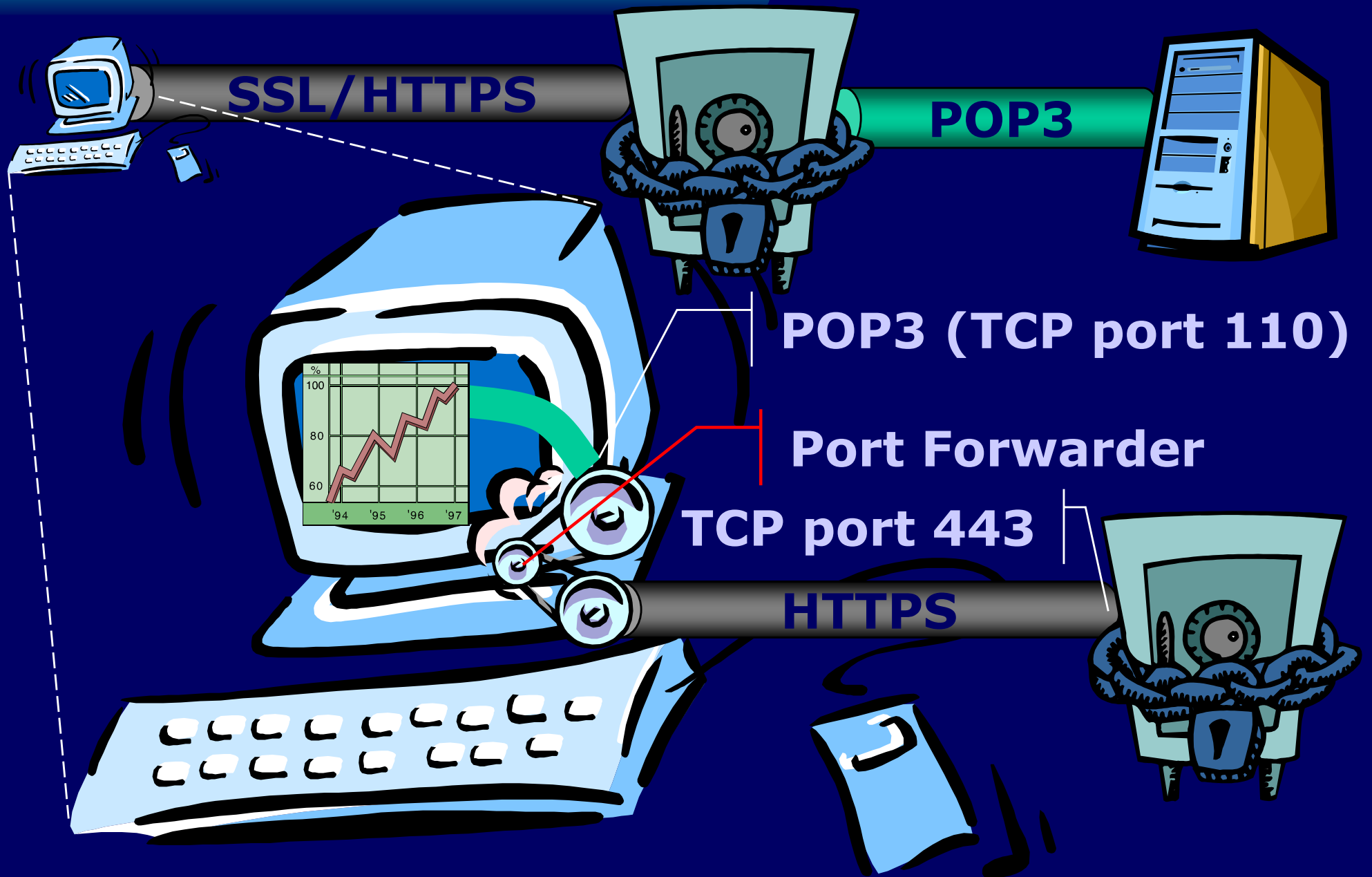
Mail server



# 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

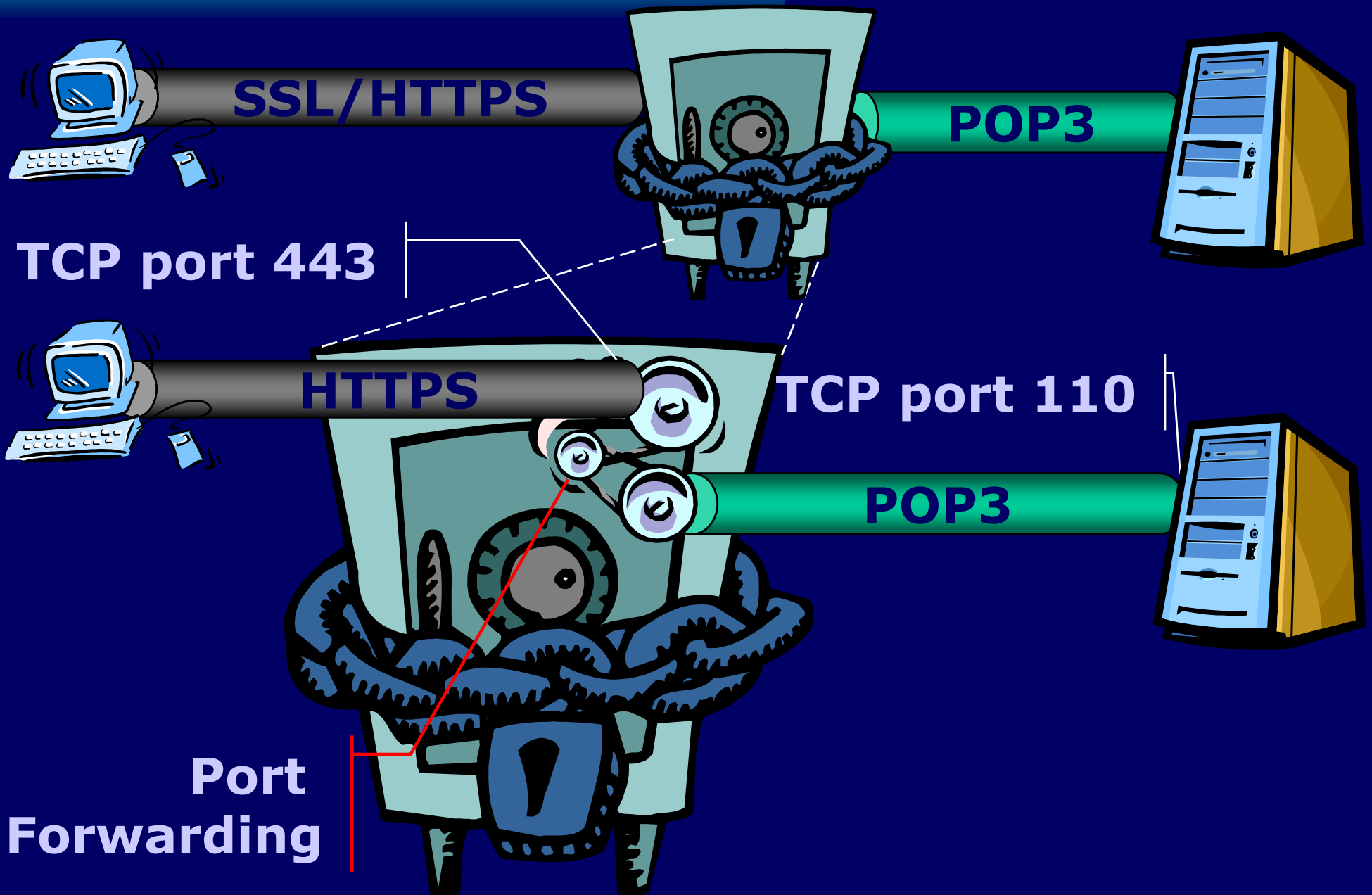




# Port Forwarding

- 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

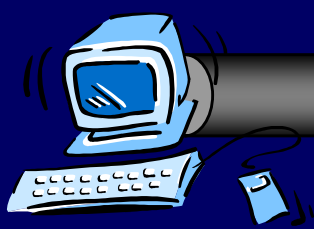


# Port Forwarding

- 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



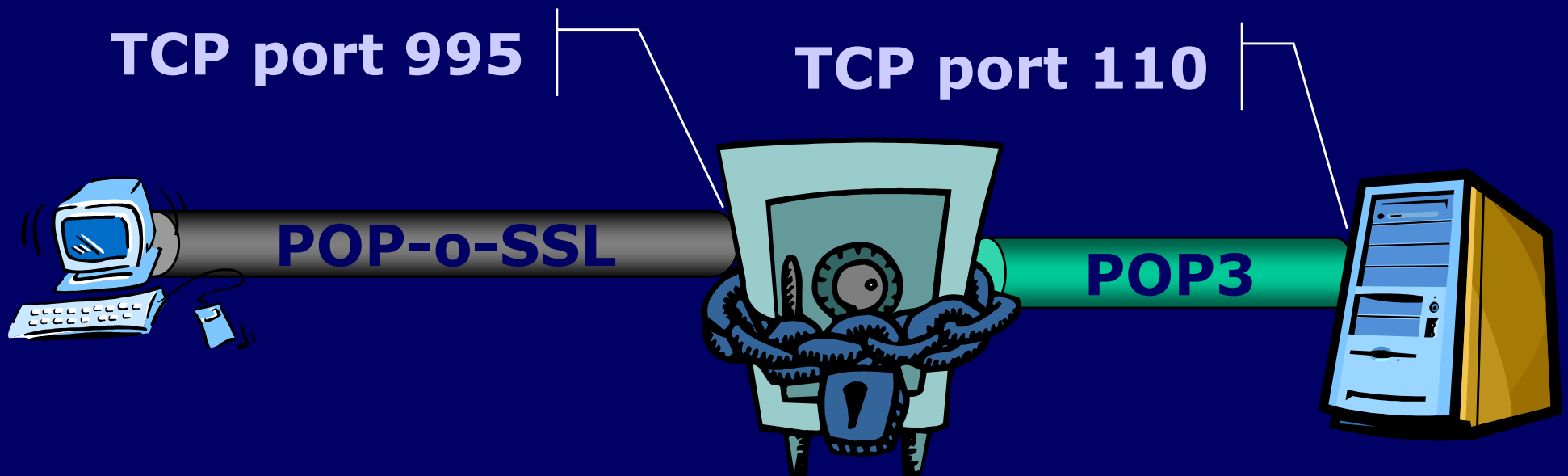
**POP-over-SSL**

**TCP port 995**

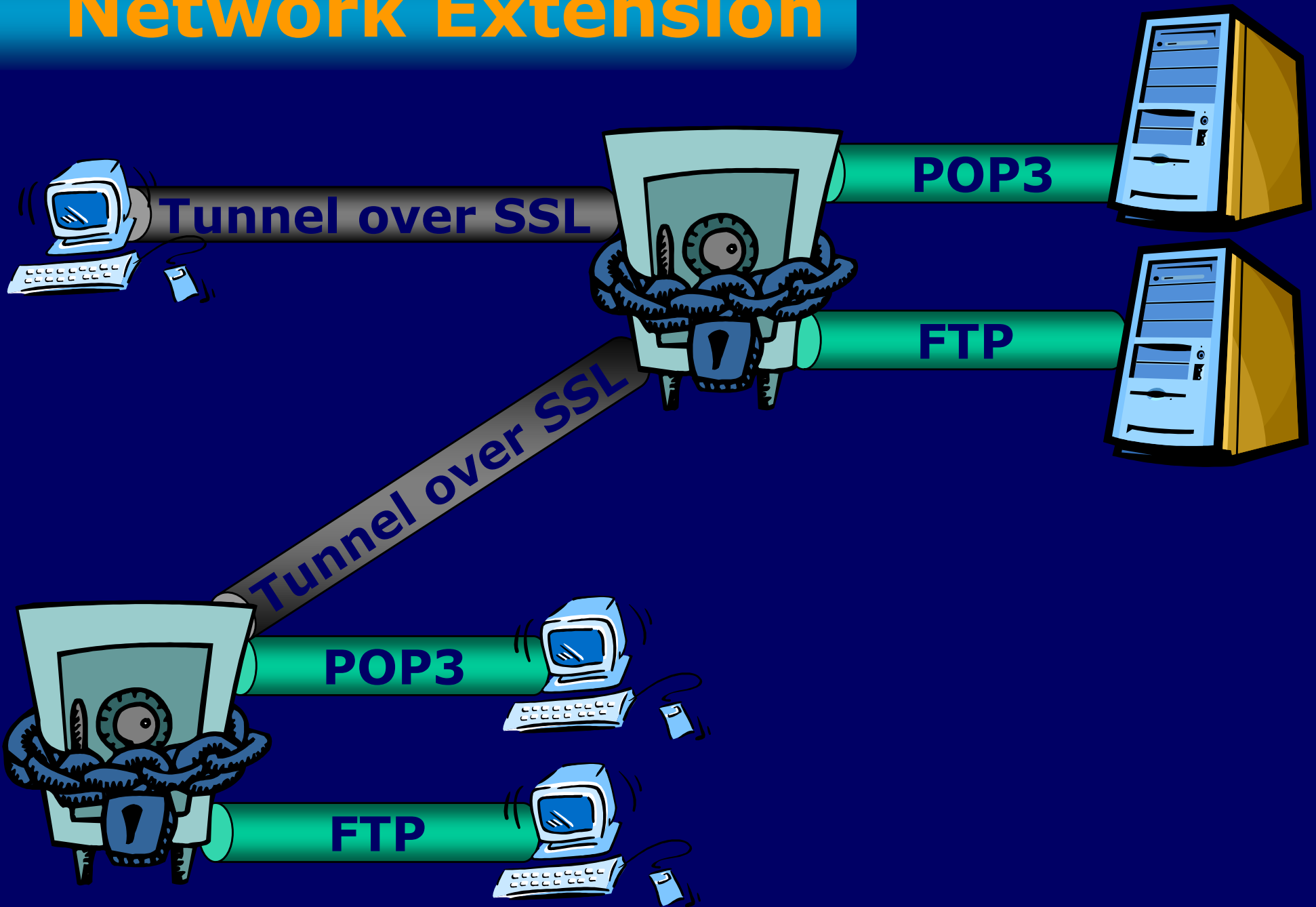


# Application Proxying

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



# Network Extension



# Products and Vendors

→ Open VPN ([openvpn.net](http://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

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