IPCOMM2006

September 25-27 • Gaylord Opryland • Nashville, TN

Protect Yourself Against VoIP Hacking

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What Will Be Covered

How to assess the security of your IPT network:

- In house/external and ground rules/scope
- Discovery
- Security policy review and physical security checks
- Platform tests
- Network tests
- Application tests
- Links

Ground Rules and Scope

Internal or with external consultants

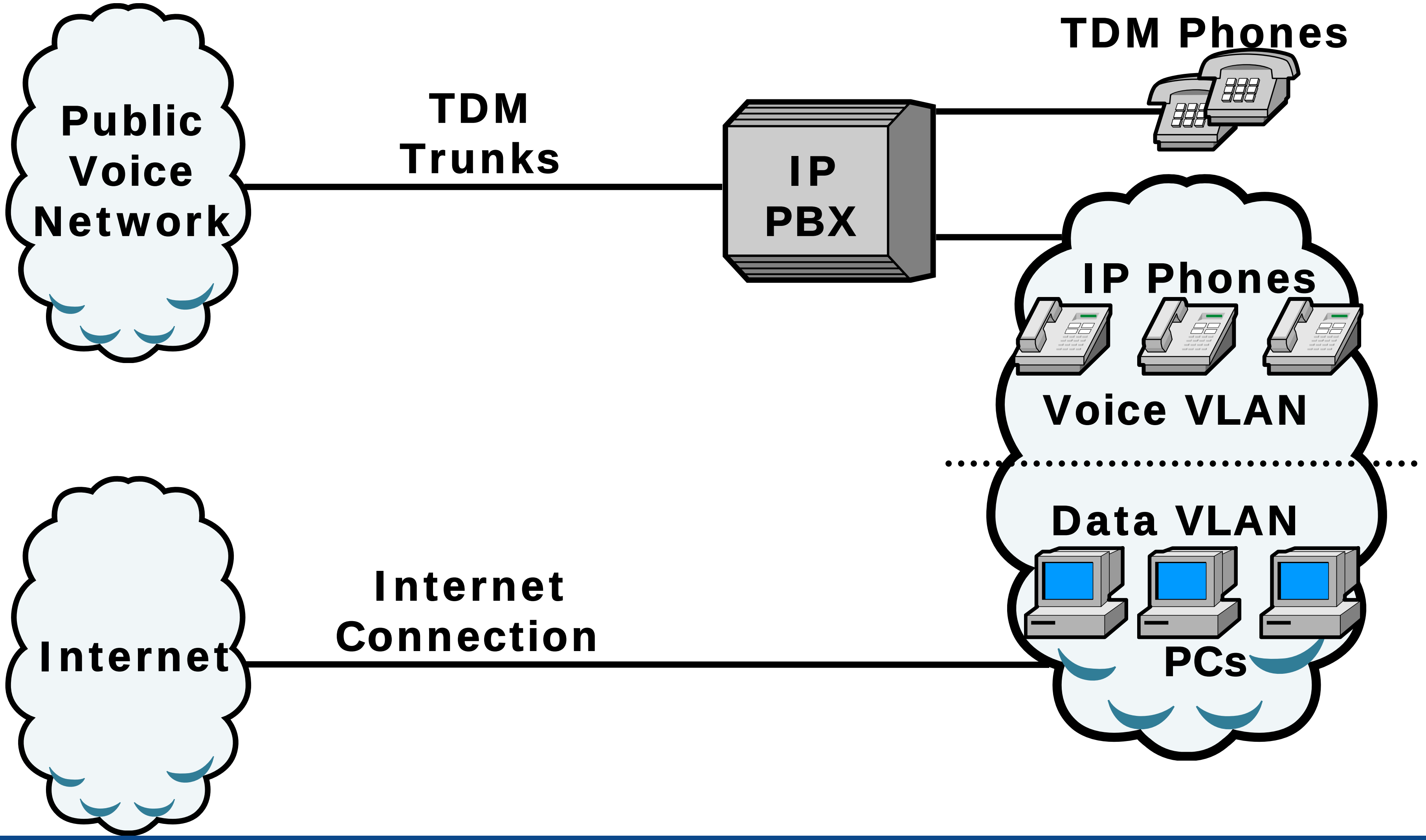
Ground rules:

- Internet and/or internal access
- How much information to start with
- Which group to work with, if any
- Agree how intrusive the test will be

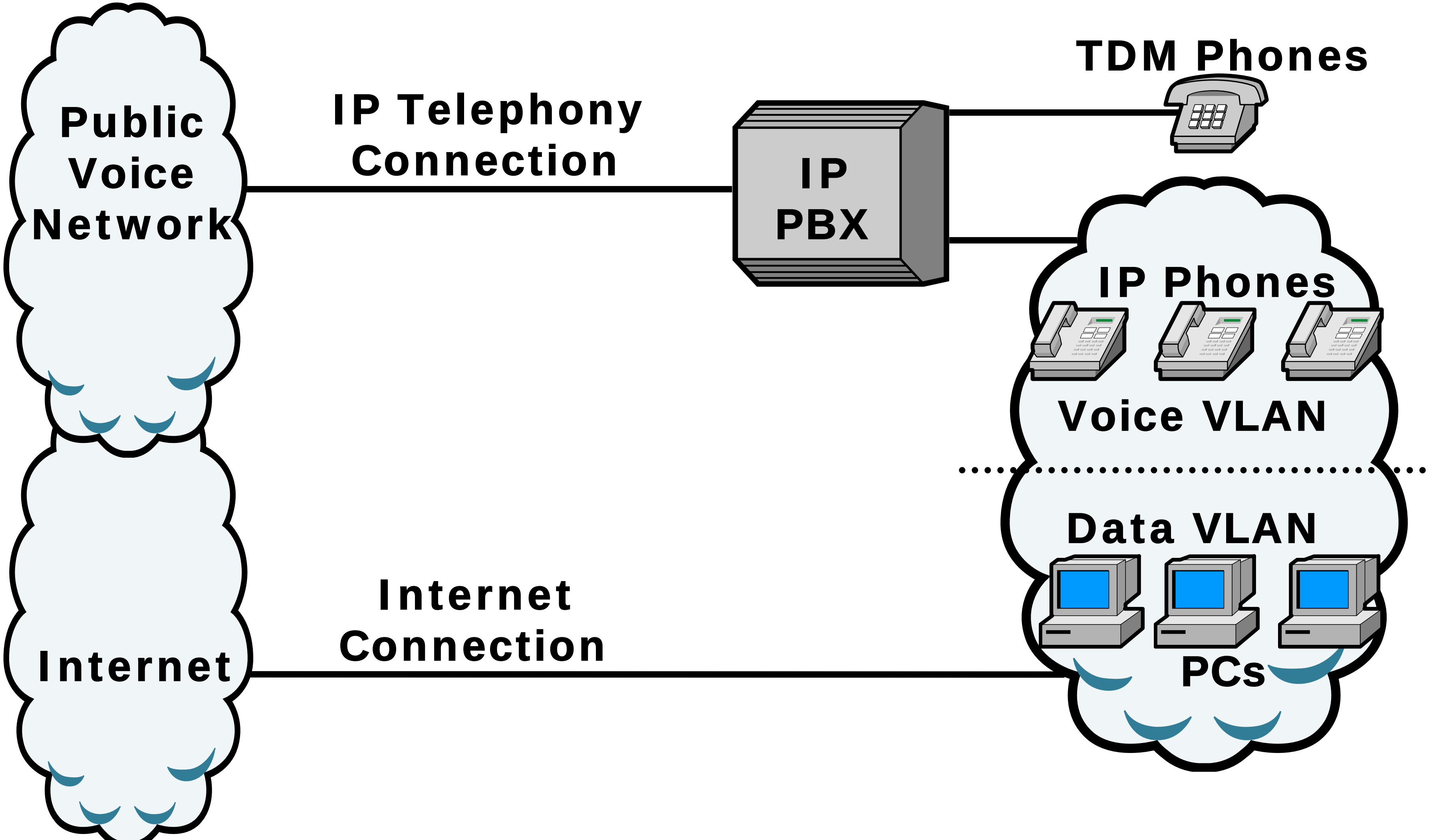
Scope:

- Number of sites
- Which systems/components to test

Internal Access?



External Access?



Policy Review/Physical Security

Review IP Telephony security policy:

- Use as a guide to verify IP Telephony system configuration

Physical security:

- Essential for core components
- If the network is not physically secure, many attacks are trivial for insiders
- All other security is moot if physical security is lacking
- Don’t forget to protect the IP phones

Security Policy/Physical Security Recommendations

Develop a written IP Telephony security policy.

Follow the security policy

Protect all core IP Telephony components

Enable protections for the IP phones

Control access to “public” IP phones

Discovery - Footprinting

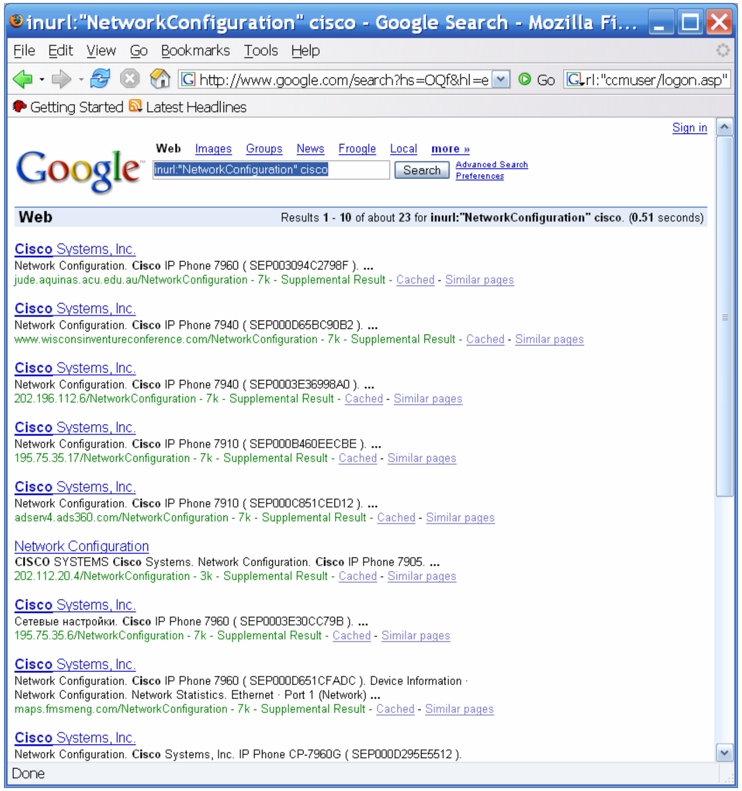
Search enterprise web site:

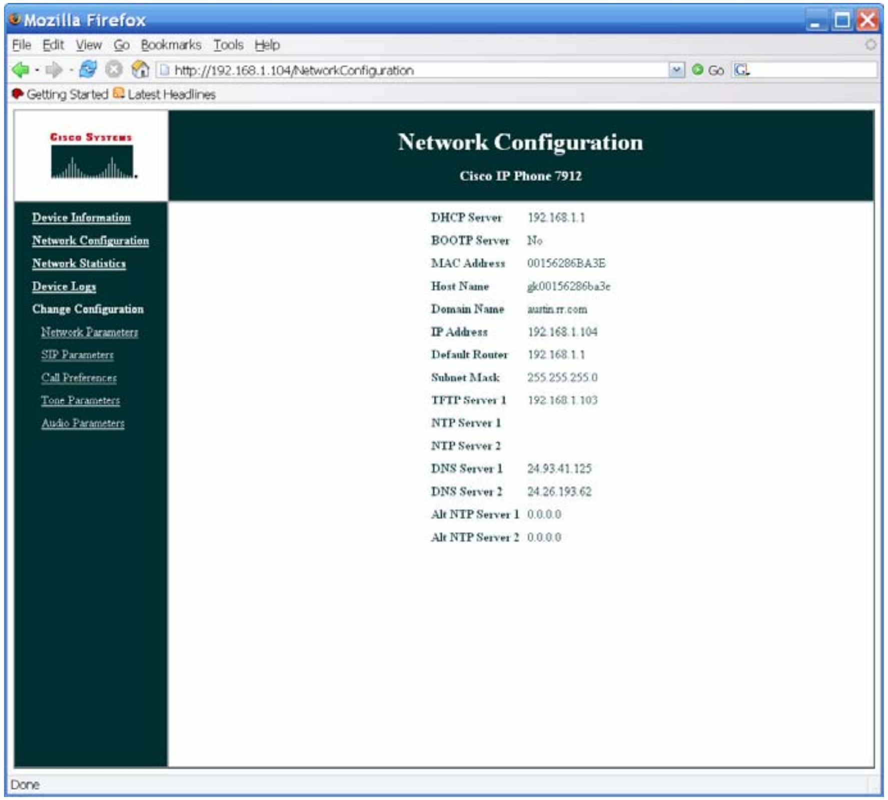
- Job listings
- Names, extensions, organization structure
- Voice mail greetings

Use Google to search for:

- Case studies/vendor Press Releases
- User resumes and postings
- Web based IP Telephony logins
- Vendor user forums

Discovery - Footprinting





Discovery - Scanning

Use various available tools to find more IP addresses:

- **fping** and **nmap**

Identify IP Telephony systems:

- Identify the system
- Identify operating system and software versions
- **nmap** is probably the best tool for this
- **nmap** has a very good database for IP Telephony
- Some commercial scanners support this as well

Discovery Recommendations

Remove what you can from corporate web site

Use google to determine your exposure

Make sure no systems are visible on the Internet

Make sure firewalls block scans

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Platform – IP PBX

Test for open or unnecessary network ports:

- **telnet** or other remote access
- Find application ports for later testing

Test operating systems for known vulnerabilities:

- Use general vulnerability scanners
- Use IP Telephony-specific scanners where possible

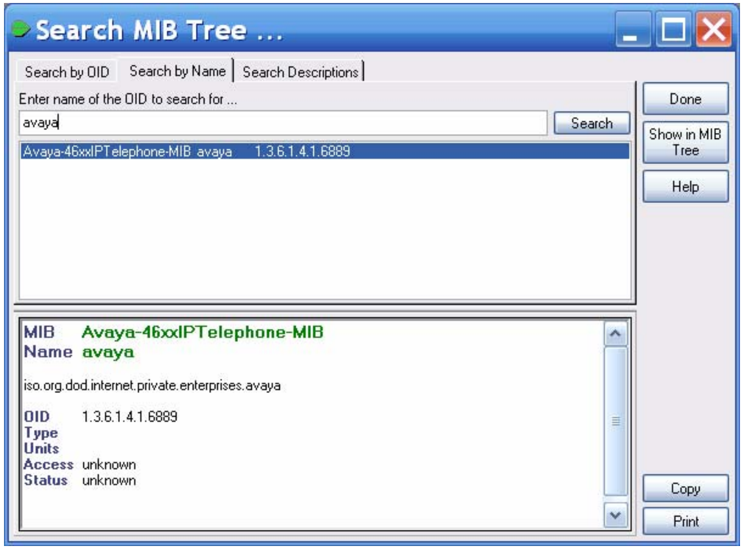
Test for default or weak passwords

Test for default configuration weaknesses

Platform – IP PBX

Test for SNMP weaknesses:

- Simple SNMP sweeps can provide a lot of information
- If you know the device type, you can use **snmpwalk**
- You can find the OID using **Solarwinds** MIB database



Platform – Support Services

Test DHCP and DNS

Test provisioning database

Test TFTP for open or unnecessary network ports:

- Many IP phones use TFTP for configuration/image files
- TFTP is rarely secured
- Use **tftpbrute** to guess the filename and download it
- Configuration files have usernames, passwords, etc.
- It may also be possible to corrupt a software image

Platform – IP Phones

Test for open or unnecessary network ports:

- **telnet** or other remote access
- Find application ports for later testing

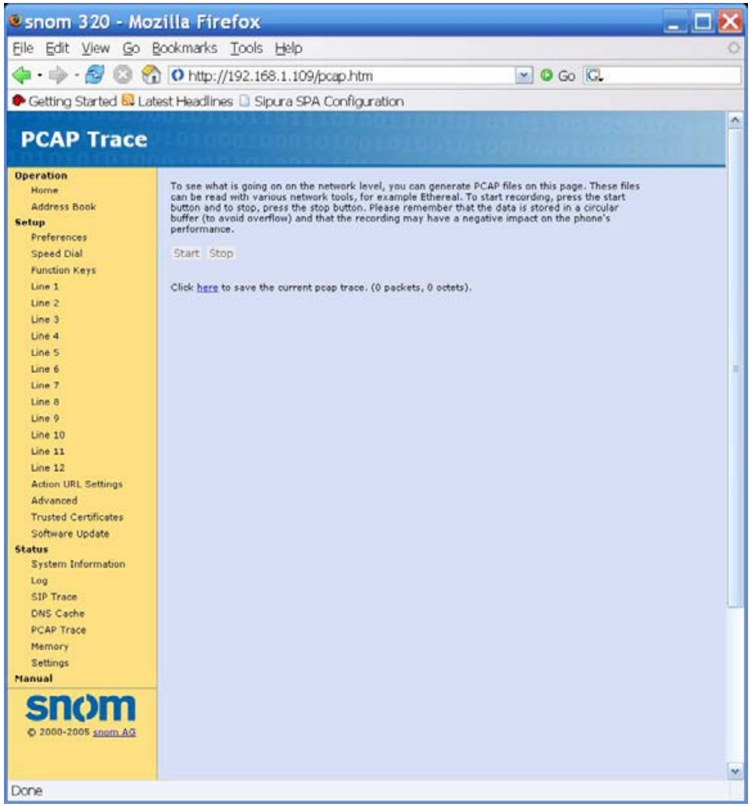
Test for default or weak passwords

Test for weak local physical protections

- Administrative access for some IP phones can be obtained when they are rebooted

Platform – IP Phones

You can do some interesting things if you get access to certain IP phones



Platform Recommendations

Remove unnecessary network services

Use secure network administration services

Use firewalls to block enumeration attempts

Use strong passwords – change them periodically

Use secure versions of SNMP

Secure DHCP, DNS, and database services

Avoid use of TFTP if possible

Prevent local manipulation of IP phones

Network – General

The data network is used to transport IP Telephony signaling/media

Any component is a potential target

Test security on switches, routers, hubs, VPNs, etc.

The IP Telephony network enables attacks such as:

- Denial of Service (DoS)
- Eavesdropping
- Man-in-the-Middle (MITM) attacks

Test to determine if the network is vulnerable

Network – DoS/Eavesdropping/MITM

Test for network DoS vulnerabilities:

- UDP floods
- TCP SYN floods

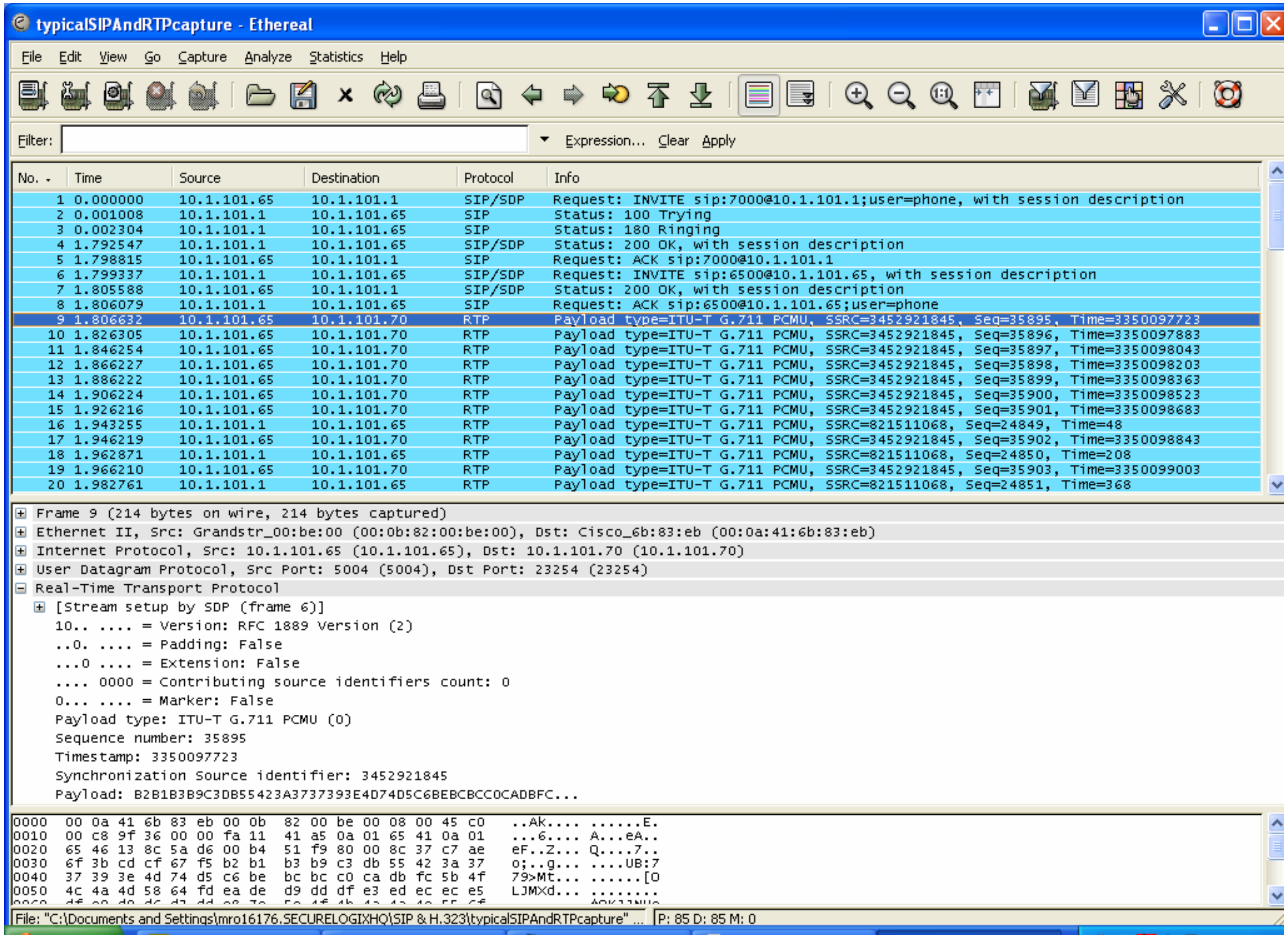
Test for eavesdropping:

- Easy to do if you have access to unencrypted data
- Test with **ethereal**, **CAIN**, **VOMIT**, **VoIPong**

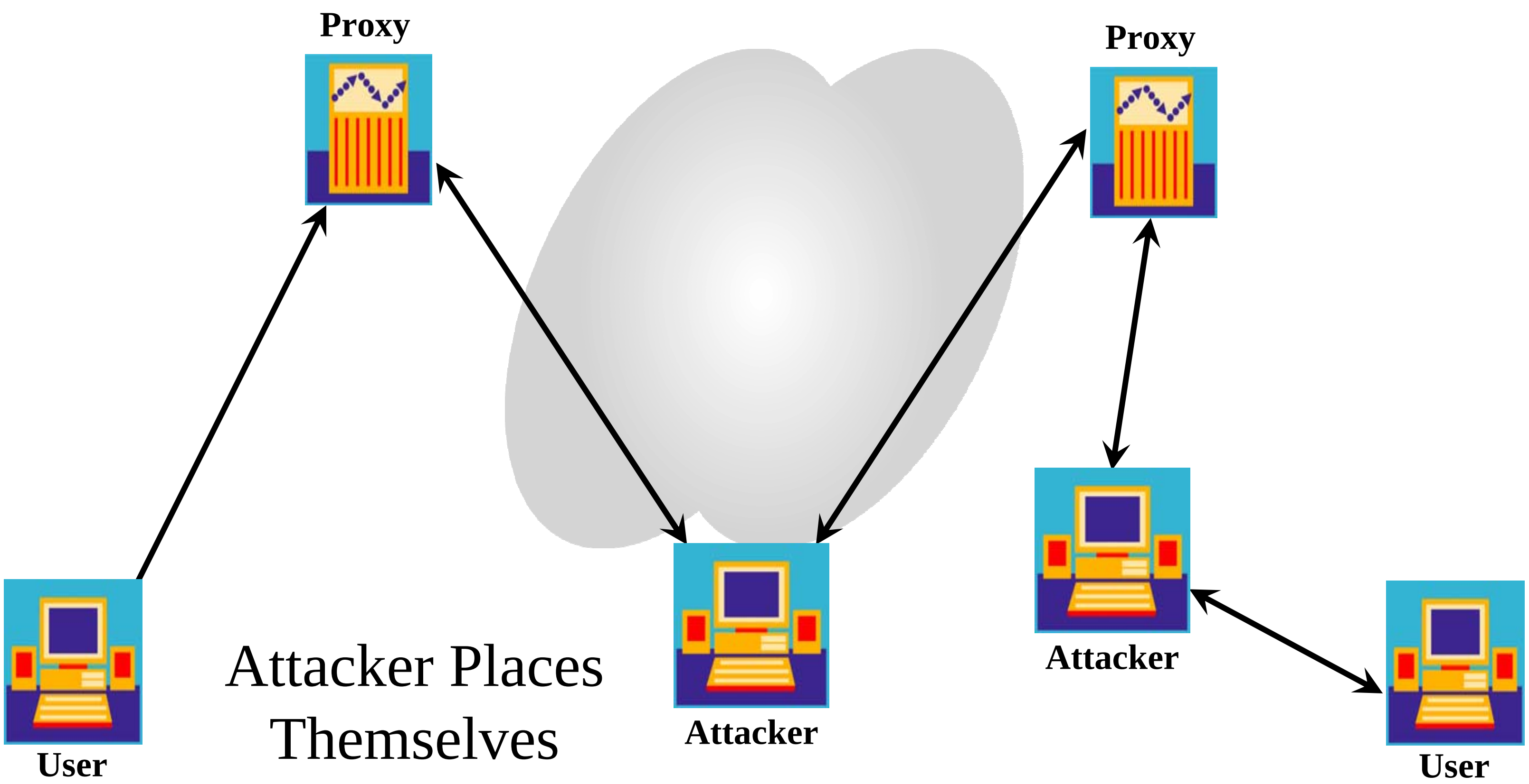
Test for MITM vulnerabilities:

- Easy to attack depending on network
- Test with **ettercap**, **dsniff**

Network – Eavesdropping



Network – Man-in-the-middle



Attacker Places Themselves Between Proxies Or Proxy/UA

Network Recommendations

Use NAC or other means of controlling network access

Use rate limiting on switches to control DoS

Use signaling and media encryption to prevent eavesdropping

Configure switches to prevent MITM attacks

Application - General

The “application” consists of the actual IP Telephony signaling and media exchanged over the network

The various components generating/consuming this information can be vulnerable to attack

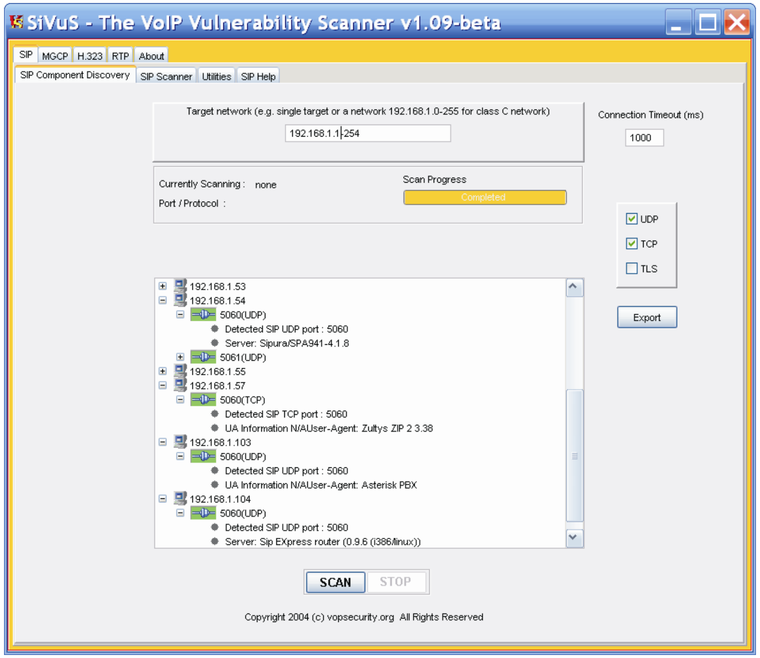
This will be especially true when IP Telephony is exchanged with a public network

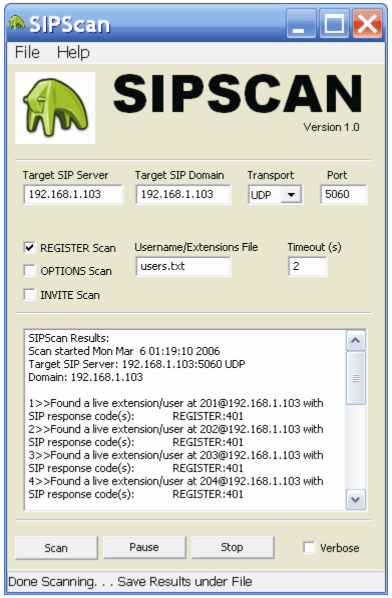
The examples used are for SIP, but similar issues exist with other protocols

Application – Scanning/Enumeration

Enumeration involves identification of valid users:

- Quite a few tools available
- SiVuS and SIPSCAN automate much of this for you:





Application – Fuzzing

“Fuzzing” is a term used to describe functional protocol testing

Involves sending various forms of malformed protocol requests, to test protocol processing software

Fuzzing has resulted in identification of many vulnerabilities in protocol processing software

Application – Fuzzing

```
INVITE sip:6713@192.168.26.180:6060;user=phone SIP/2.0
Via: SIP/2.0/UDP 192.168.22.36:6060
From: UserAgent<sip:6710@192.168.22.36:6060;user=phone>
To: 6713<sip:6713@192.168.26.180:6060;user=phone>
Call-ID: 96561418925909@192.168.22.36
Cseq: 1 INVITE
Subject: VovidaINVITE
Contact: <sip:6710@192.168.22.36:6060;user=phone>
Content-Type: application/sdp
Content-Length:0
```

Application – Fuzzing

```
INVITE sip:6713@192.168.26.180:6060;user=phone SIP/2.0
Via: aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa
aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa
aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa
aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa
From: UserAgent<sip:6710@192.168.22.36:6060;user=phone>
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Content-Type: application/sdp
Content-Length:0
```

Application – Fuzzing

Most vendors test their protocol implementations

Still a good idea though to test deployed system

There are freeware and commercial fuzzers available:

- www.ee.oulu.fi/research/ouspg/protos/index.html
- www.codenomicon.com

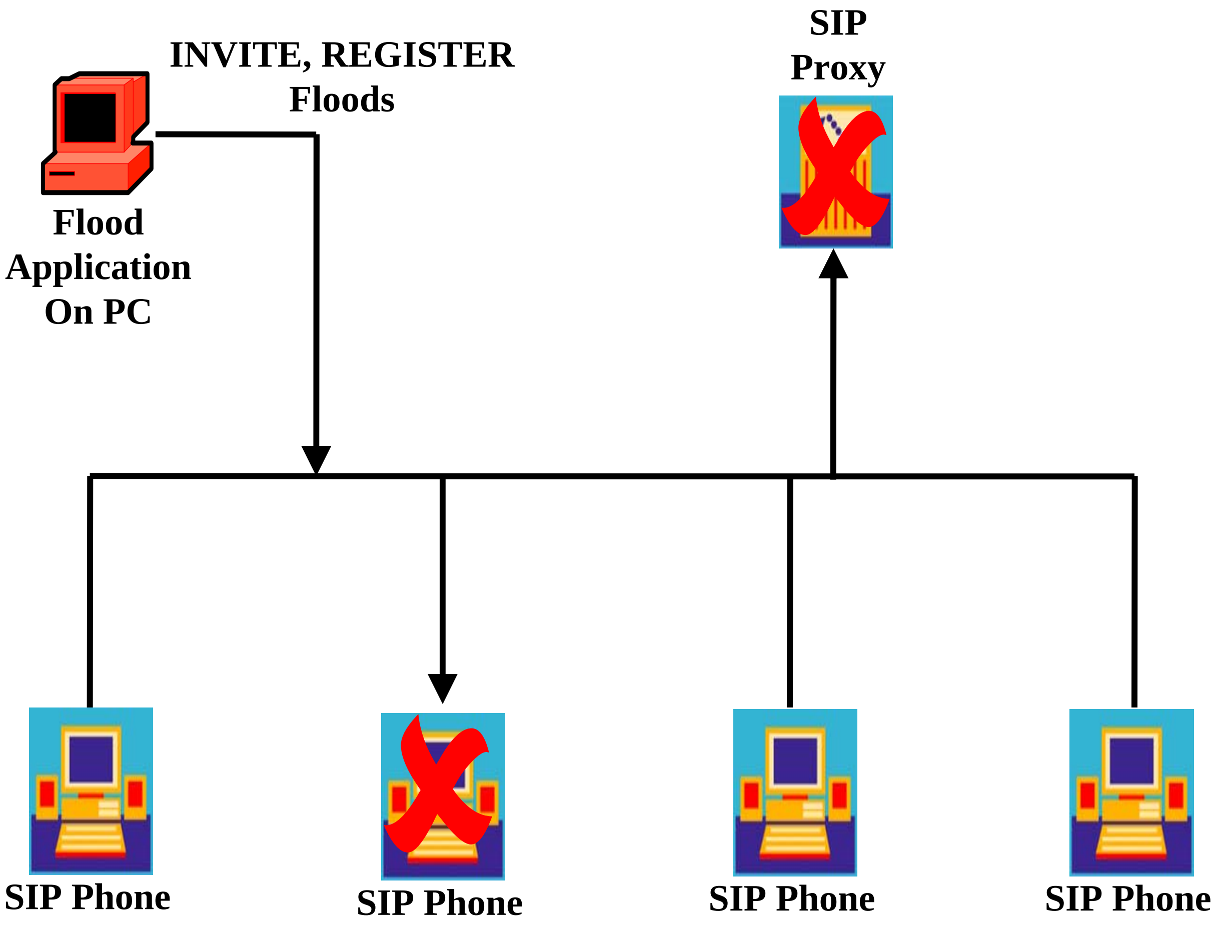
Application – Service Disruption

There are many types of service disruptions possible

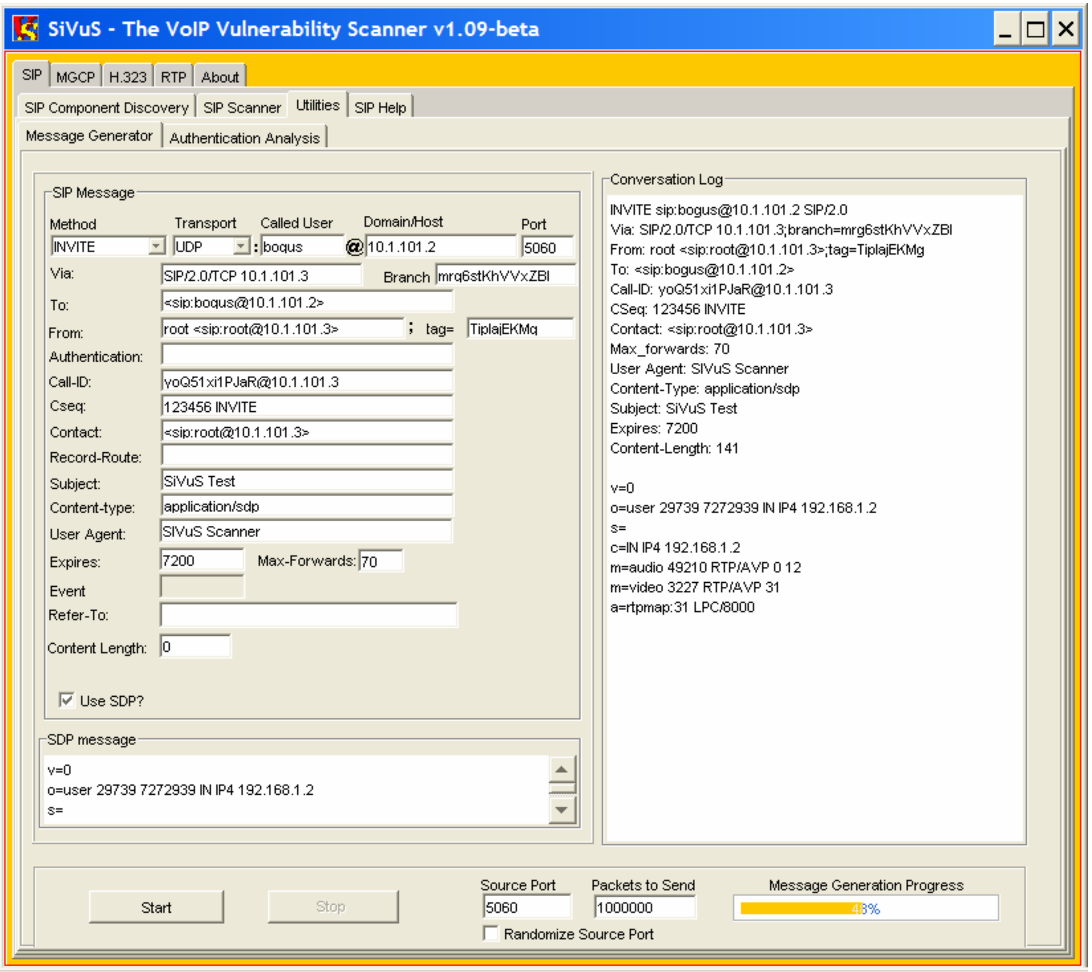
Testing for them is necessary, to determine if your system is vulnerable

The following several slides describe several types of possible attacks

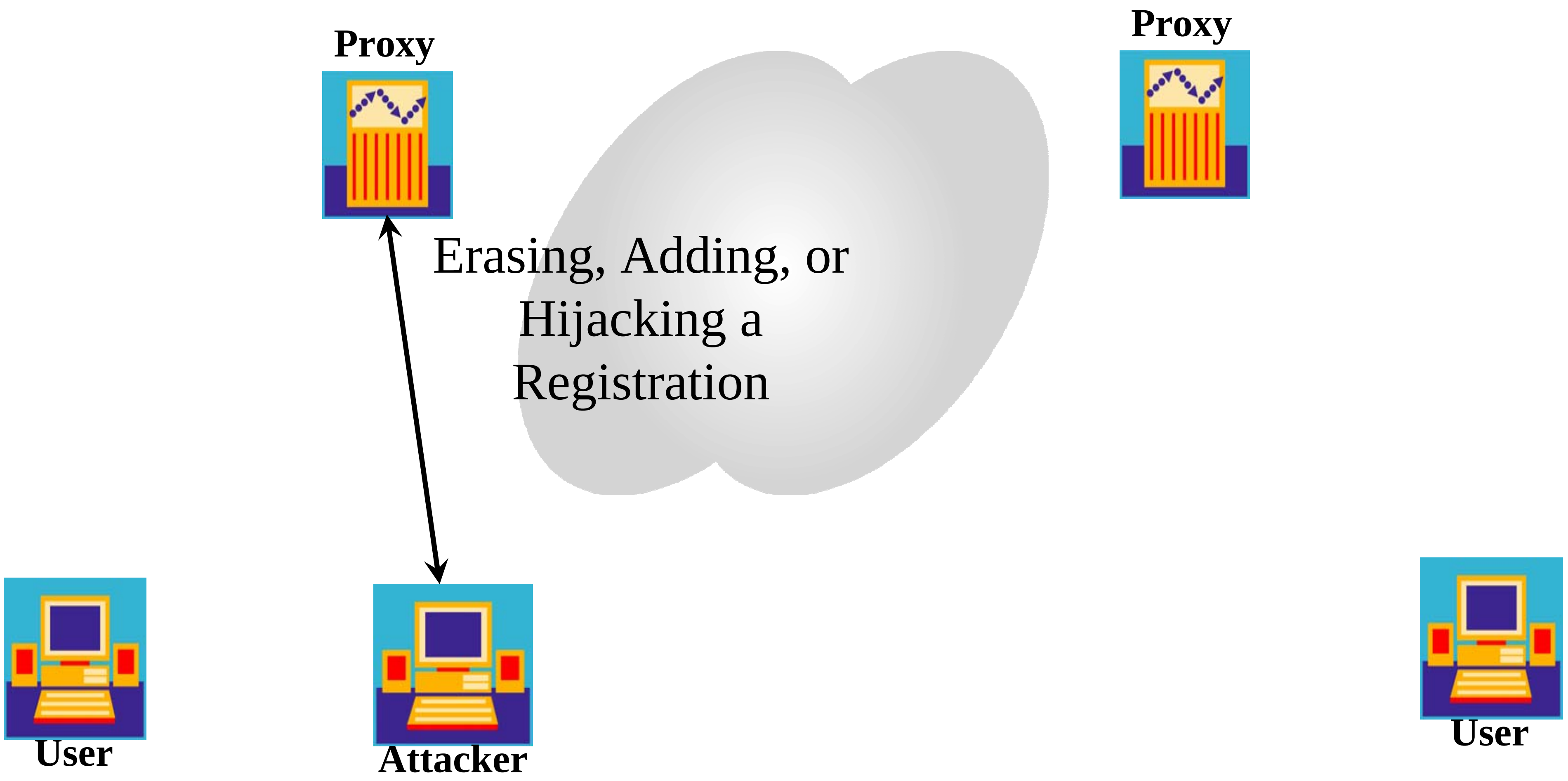
Application – Denial of Service



Application – Denial of Service



Application – Registration Manipulation



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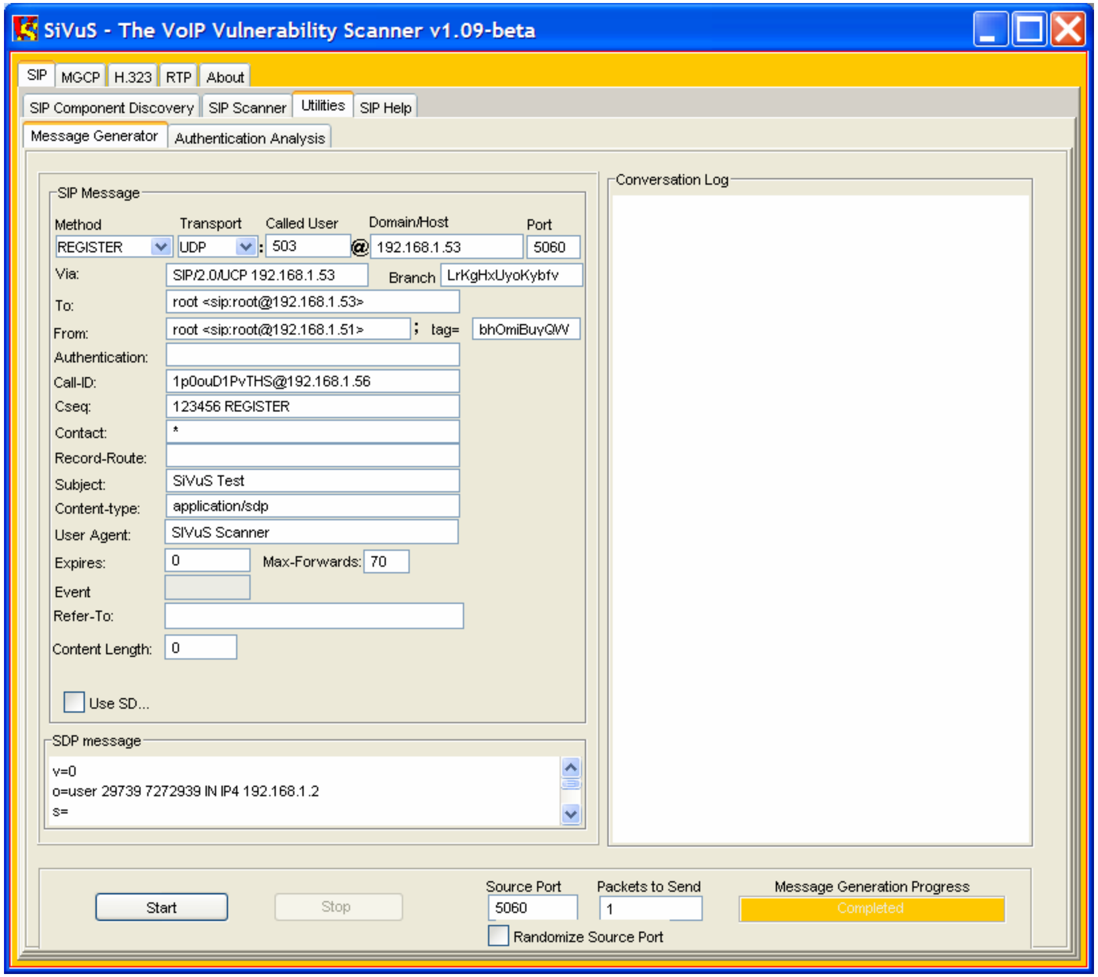
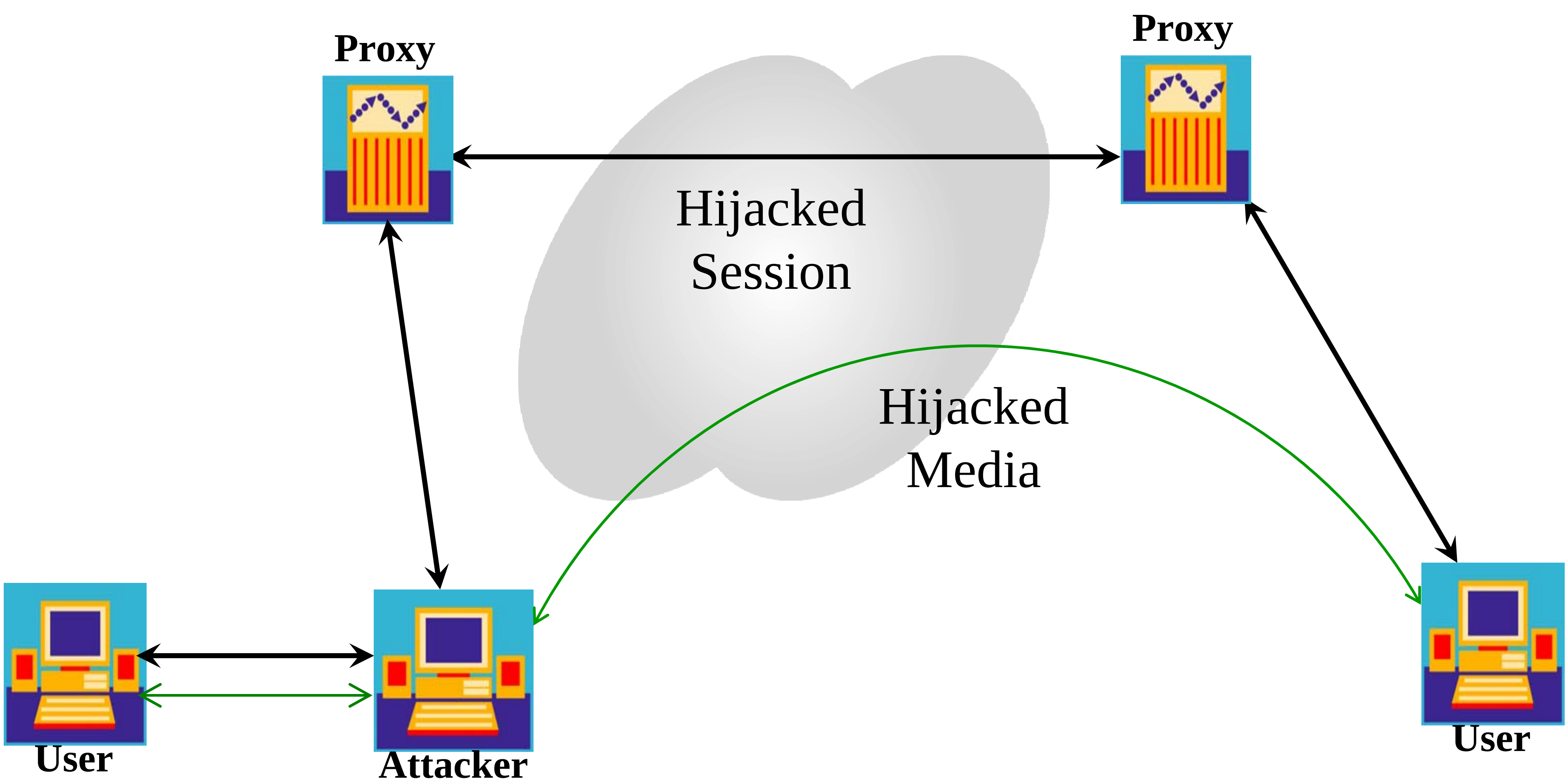
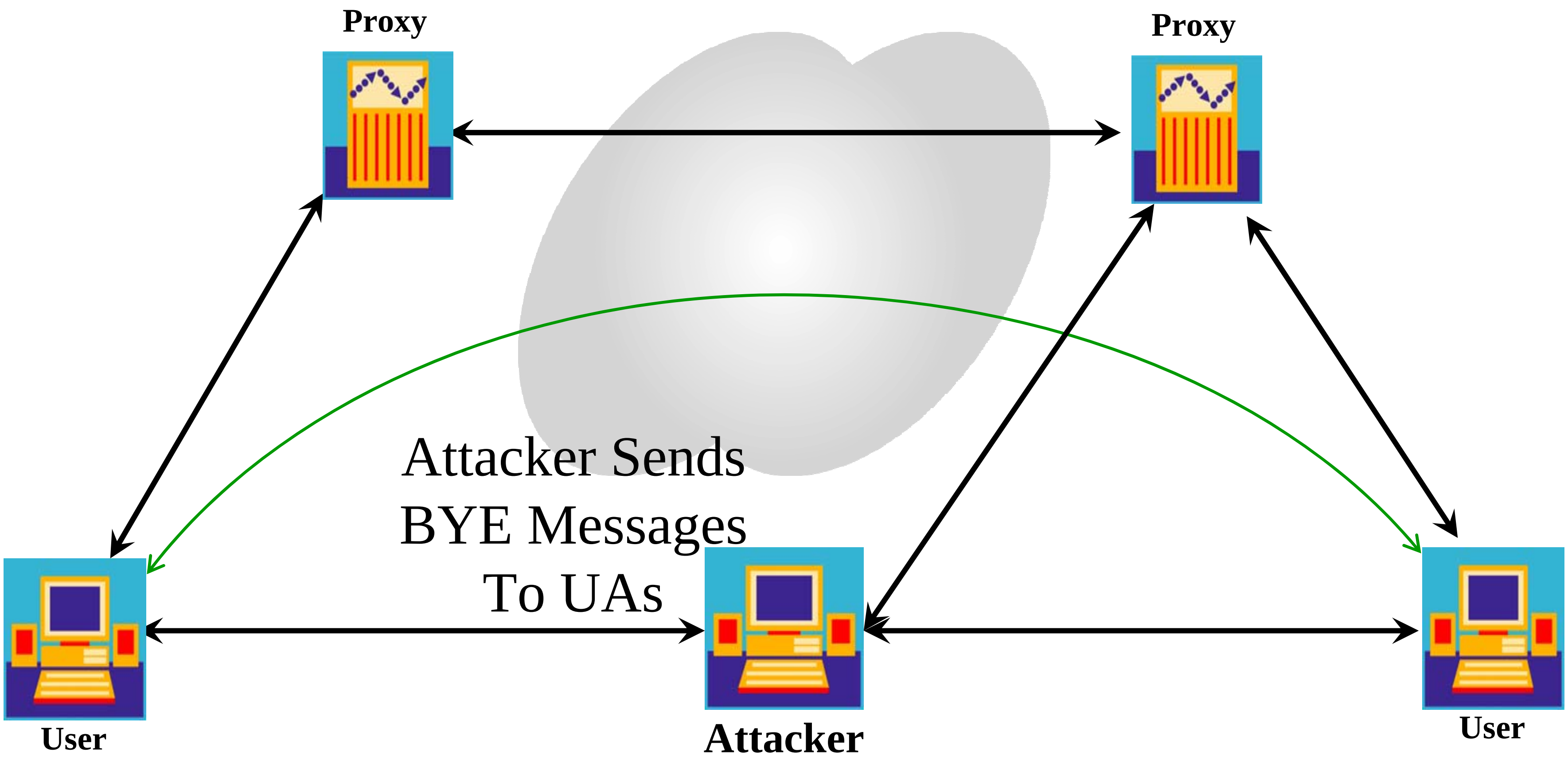
Application – Registration Manipulation



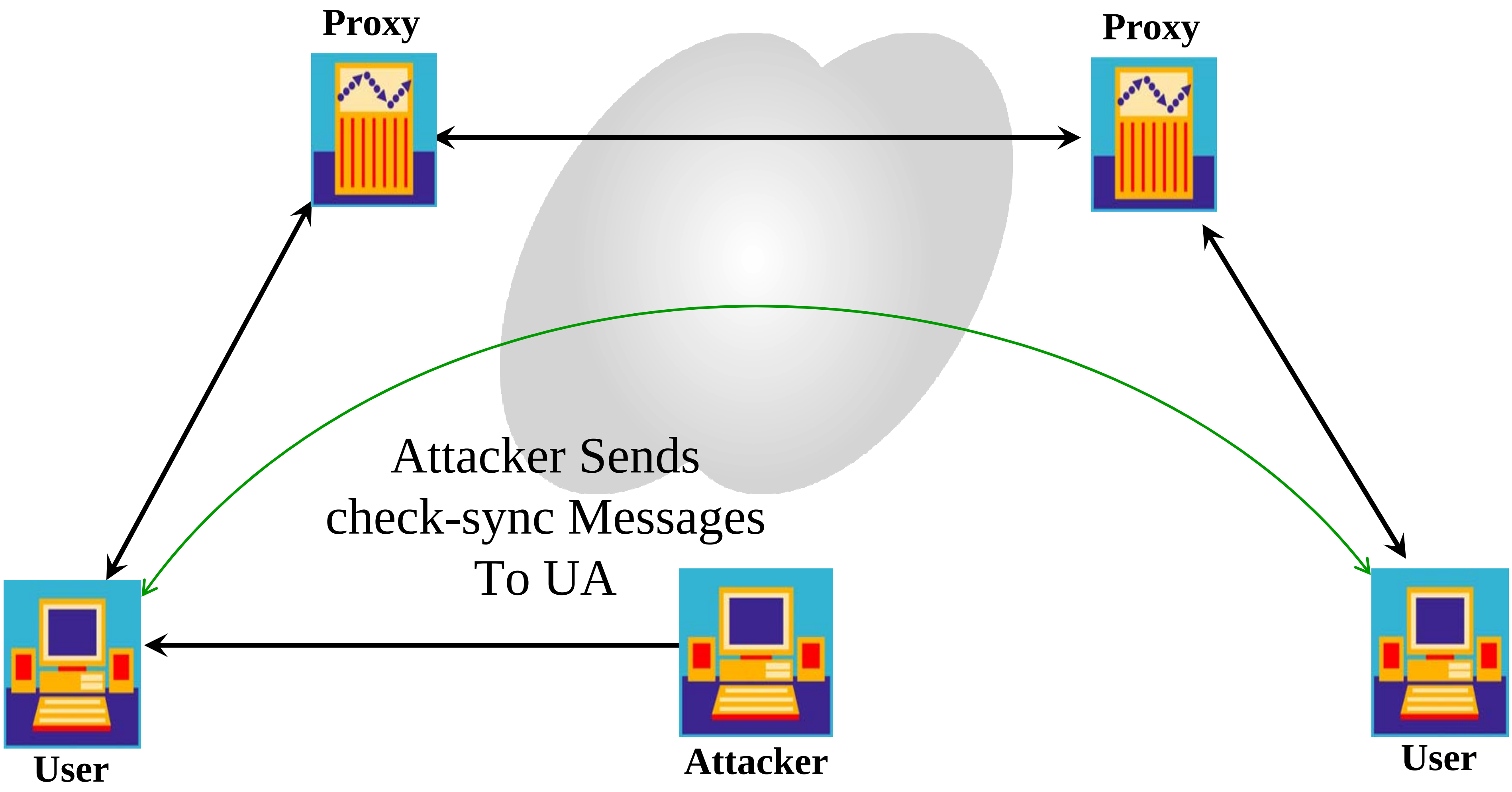
Application – Registration Hijacking



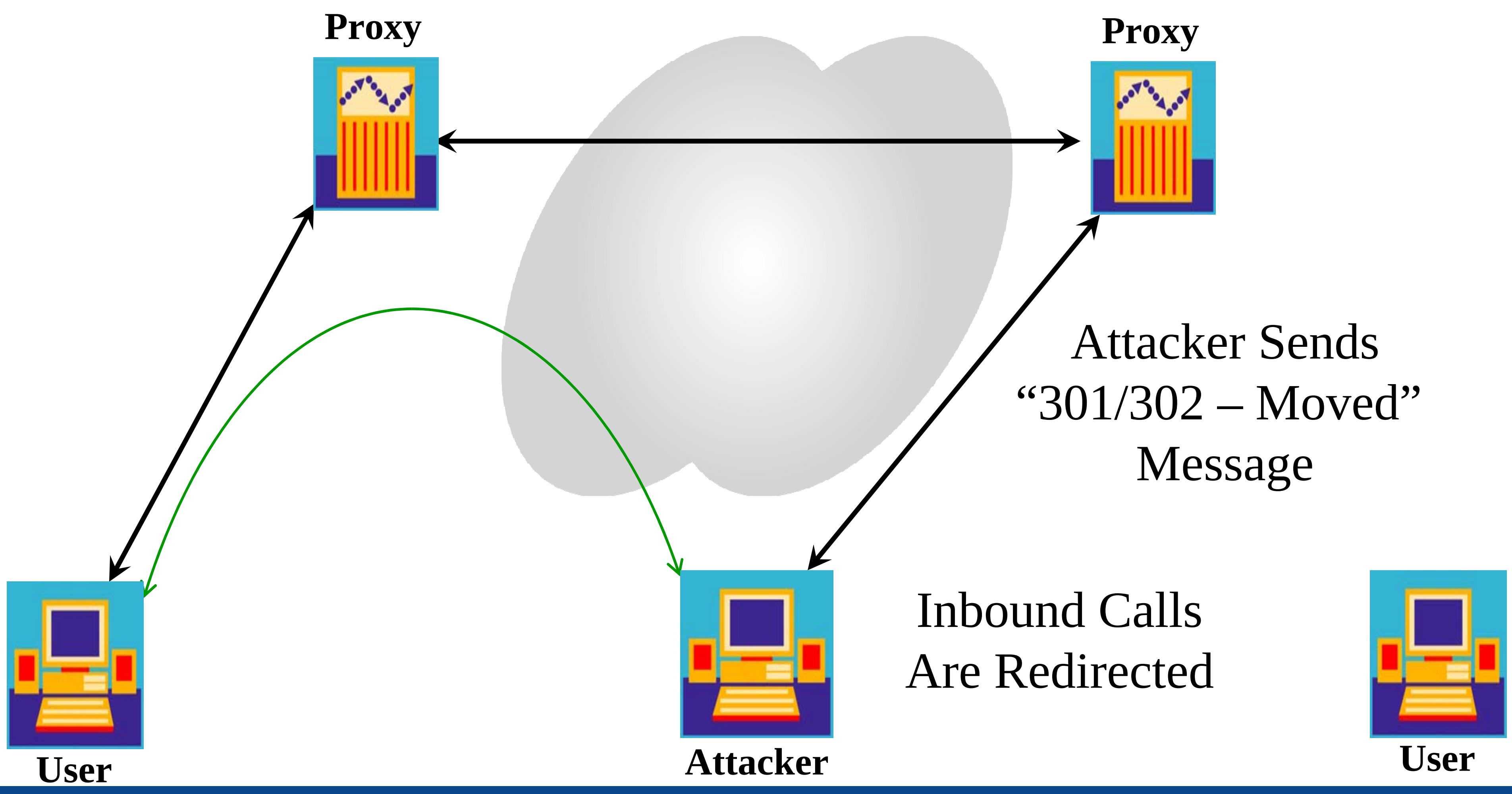
Application – Session Teardown



Application – Check Sync Reboot



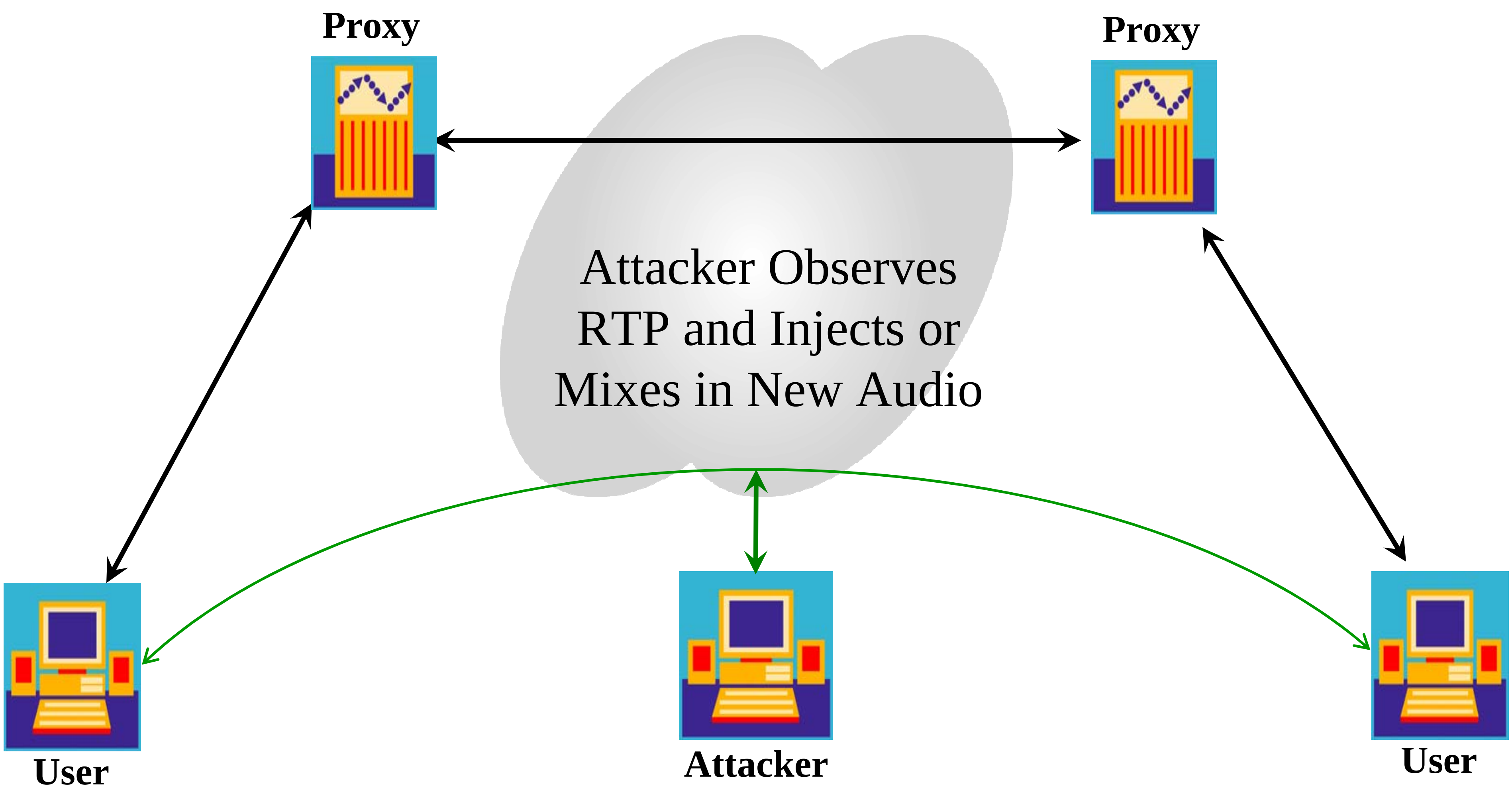
Application – Redirection



Attacker Sends
“301/302 – Moved”
Message

Inbound Calls
Are Redirected

Application – RTP Injection/Mixing



Other Attack Tools

dirscan – active directory scanning

authtool – cracks digest authentication passwords

invite_flood – generates a flood of INVITE requests

register_flood – generates a flood of REGISTER requests

udpflood/rtpflood – generates a flood of UDP or RTP packets

erase_registrations – removes a registration

add_registrations – adds one or more bogus registrations

reghijacker – hijacks a registration (with authentication)

teardown – tears down a call

check_sync_reboot – reboots a phone

rtpinjector – injects/mixes audio

sip_rogue – application level MITM tool

more on the way...

Application – Recommendations

Use application firewalls to monitor signaling and media for attacks

Use authentication to prevent rogue devices from injecting packets

Use encryption prevent signaling and media eavesdropping

Links

SIP attack tools – www.hackingvoip.com

ethereal – www.ethereal.com

wireshark – www.wireshark.com

SiVuS – www.vopsecurity.org

Cain and Abel - http://www.oxid.it/cain.html

Fuzzing - http://www.ee.oulu.fi/research/ouspg/protos/index.html

Codenomicon – www.codenomicon.com

Asterisk – www.asterisk.org

Trixbox – www.trixbox.org

Key Points to Take Home

In order to secure your VoIP network, you must understand the issues

You need to actively test your network, to find out if vulnerabilities exist

There are many tools available to enable this

It is a good idea to enlist the help of a trusted third party to perform or assist with the testing

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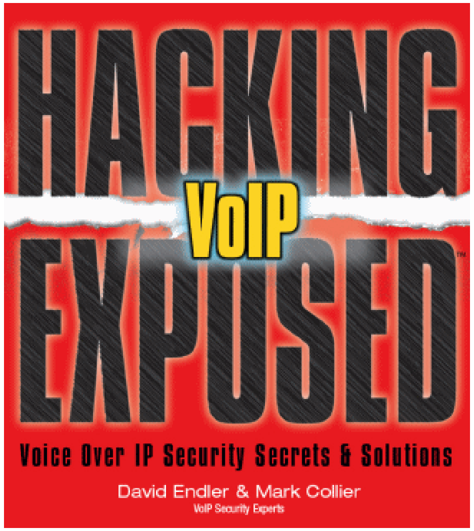
QUESTIONS?



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