Advanced SSL: The good, the bad, and the ugly

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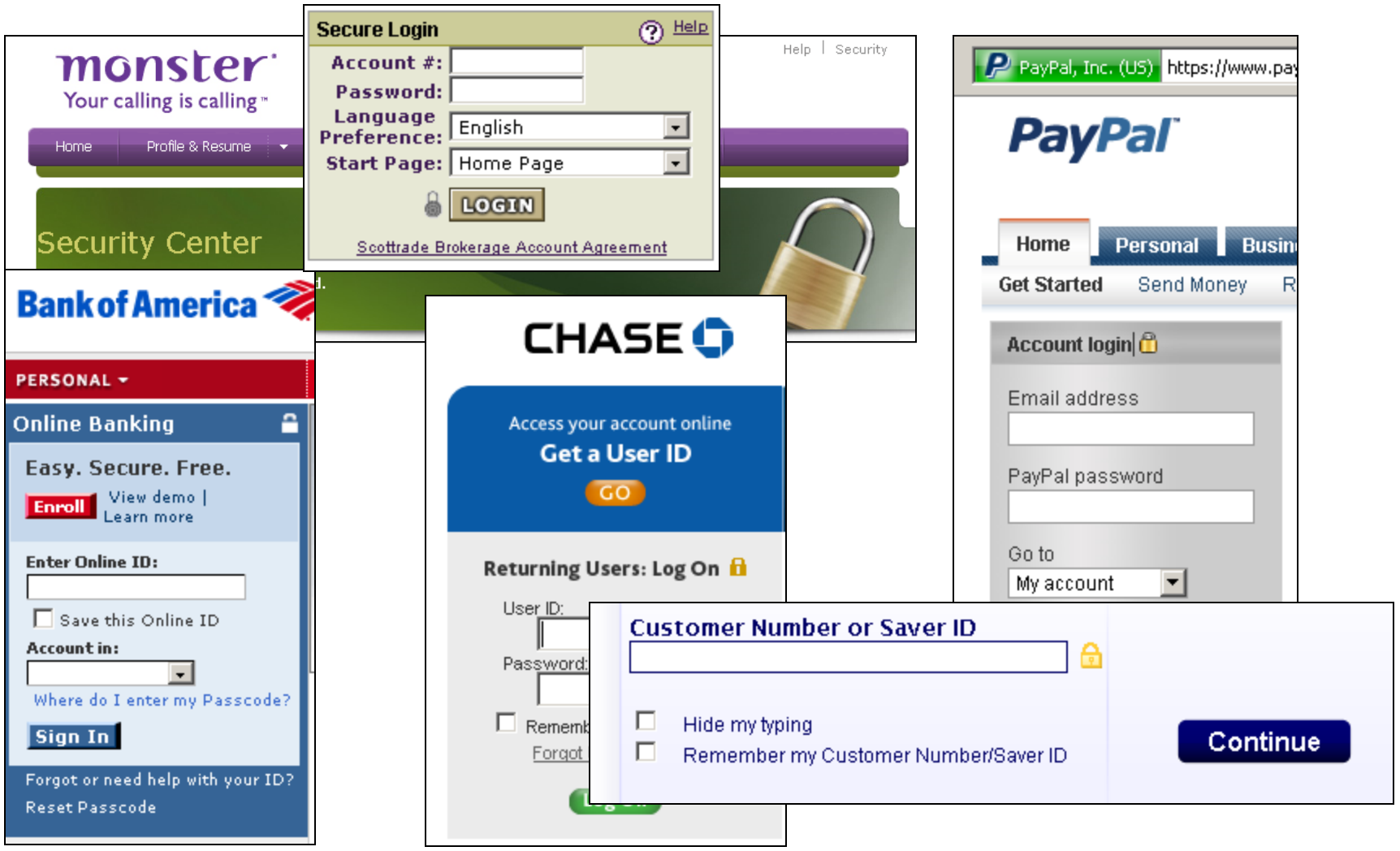
Who am I?

- Senior Application Security Engineer
  @ Aspect Security
- Creator & Leader OWASP AppSensor
- Security Blogger
  - http://michael-coates.blogspot.com
- Life Outside Security?
  - Motorcycle, Triathlons

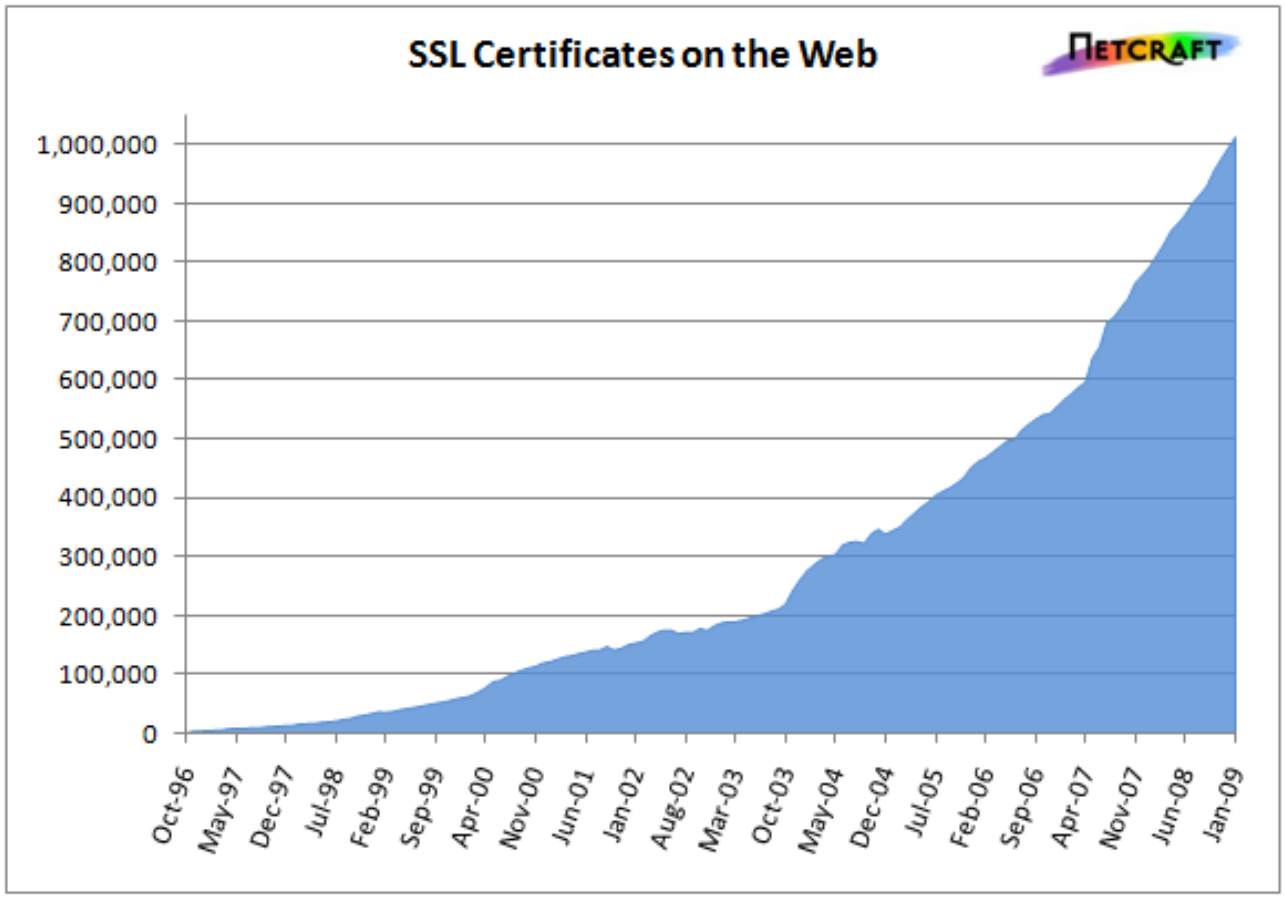
SSL: Super Shiny Locks

Padlock != Secure



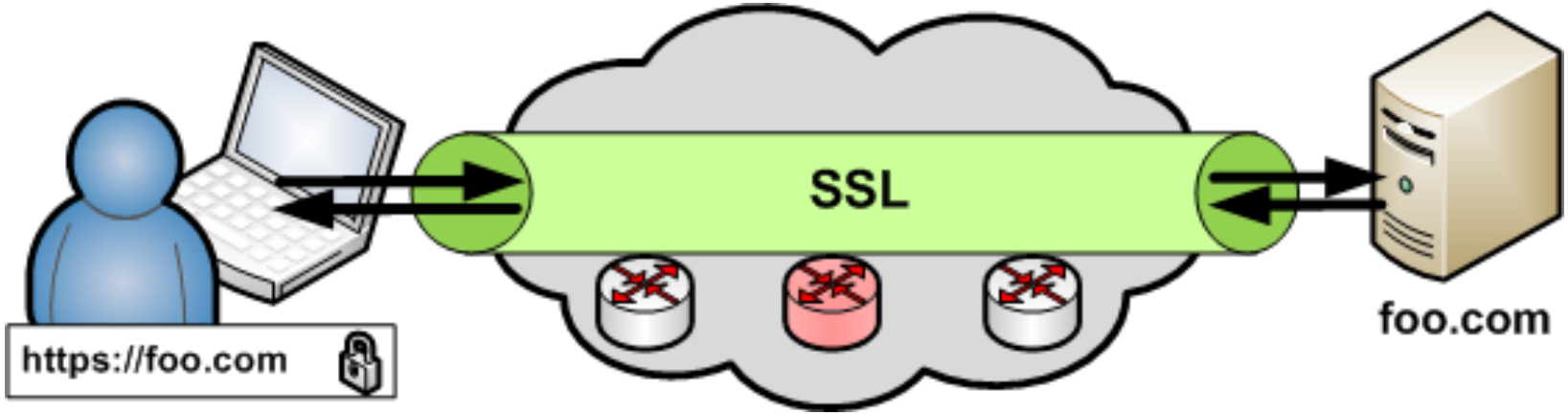
SSL Growth

- > 1 Million SSL Certificates



The Good

- Confidentiality
- Integrity
- Replay Protection
- End Point Authentication



The Bad - Usability

The security certificate presented by this website was not issued by a trusted certificate authority

The security certificate presented by this website was issued for a different website's addres.

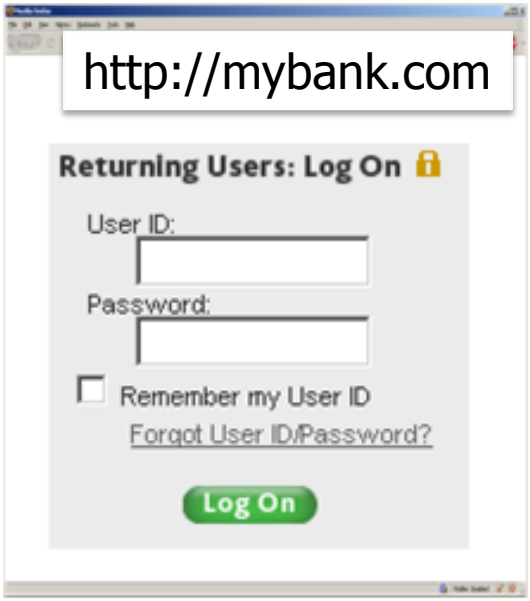
The Bad – User Expectations

- How did you get to the site?
- Is HTTPS in the URL?
- Are those zeros or o's?
- Did you get any browser warning messages?
- Did you click "ok" or "accept" to any popup boxes?

> "I've told many people about the https and they didn't know!" – dad

The Bad – Websites are Configured Wrong!

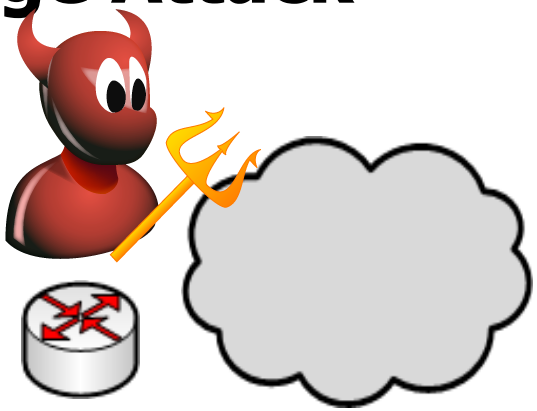
- Scenario 1: Non-SSL Landing Page




```
<form method="POST" action="https://mybank.com/login" >
  Username: <input type="text" name="user"> <br>
  Password: <input type="password" name="pass"> <br>
</form>
```

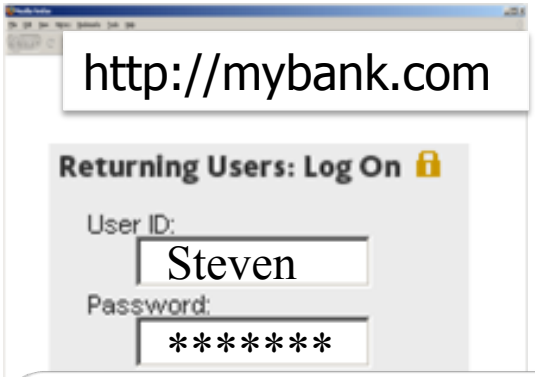
Non-SSL Landing Page Attack

HTTP REQUEST
GET http://mybank.com



mybank.com

HTTP Response



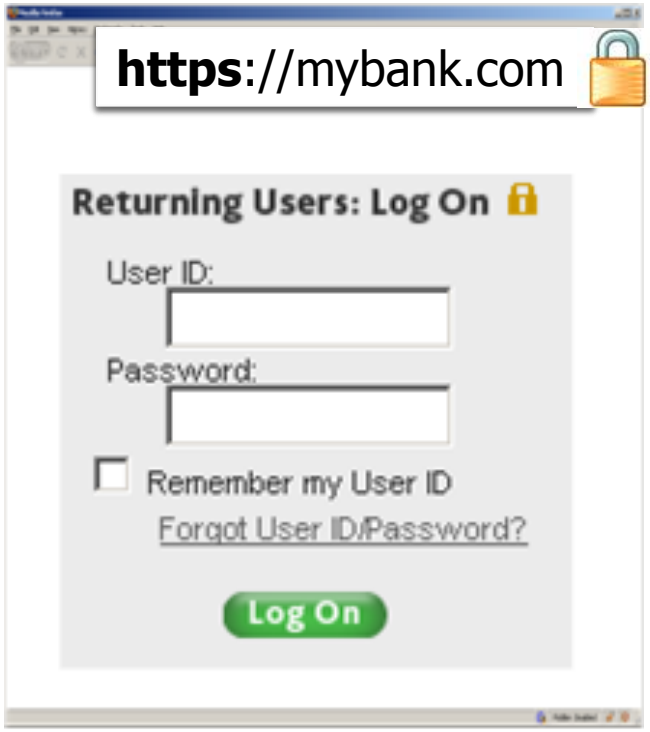
...
<form method="POST"
action="https://mybank.com/
login" >
...

HTTP POST
POST http://mybank.com

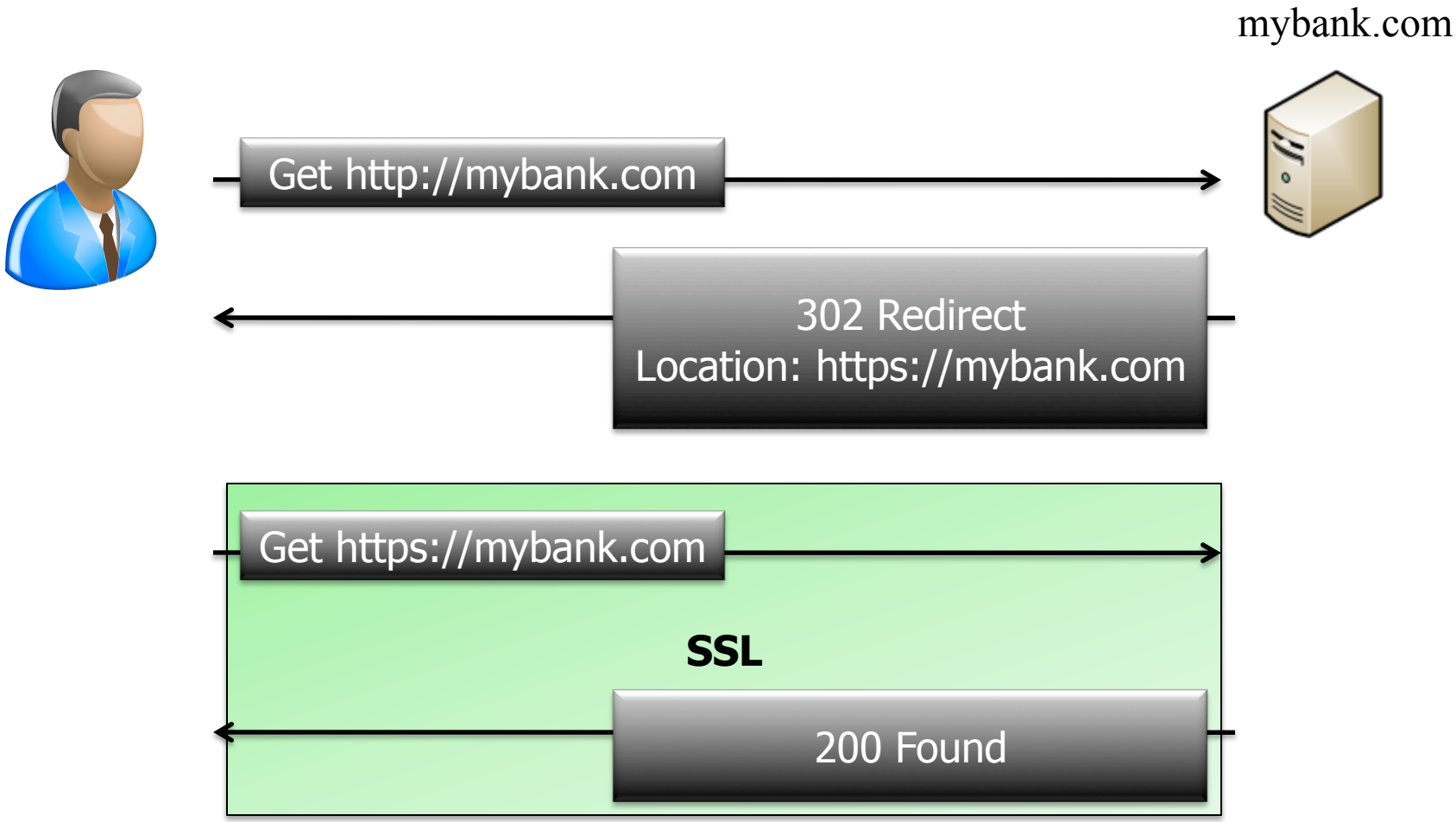
user:Steven&pass:JOSHUA

The Bad – Websites are Configured Wrong!

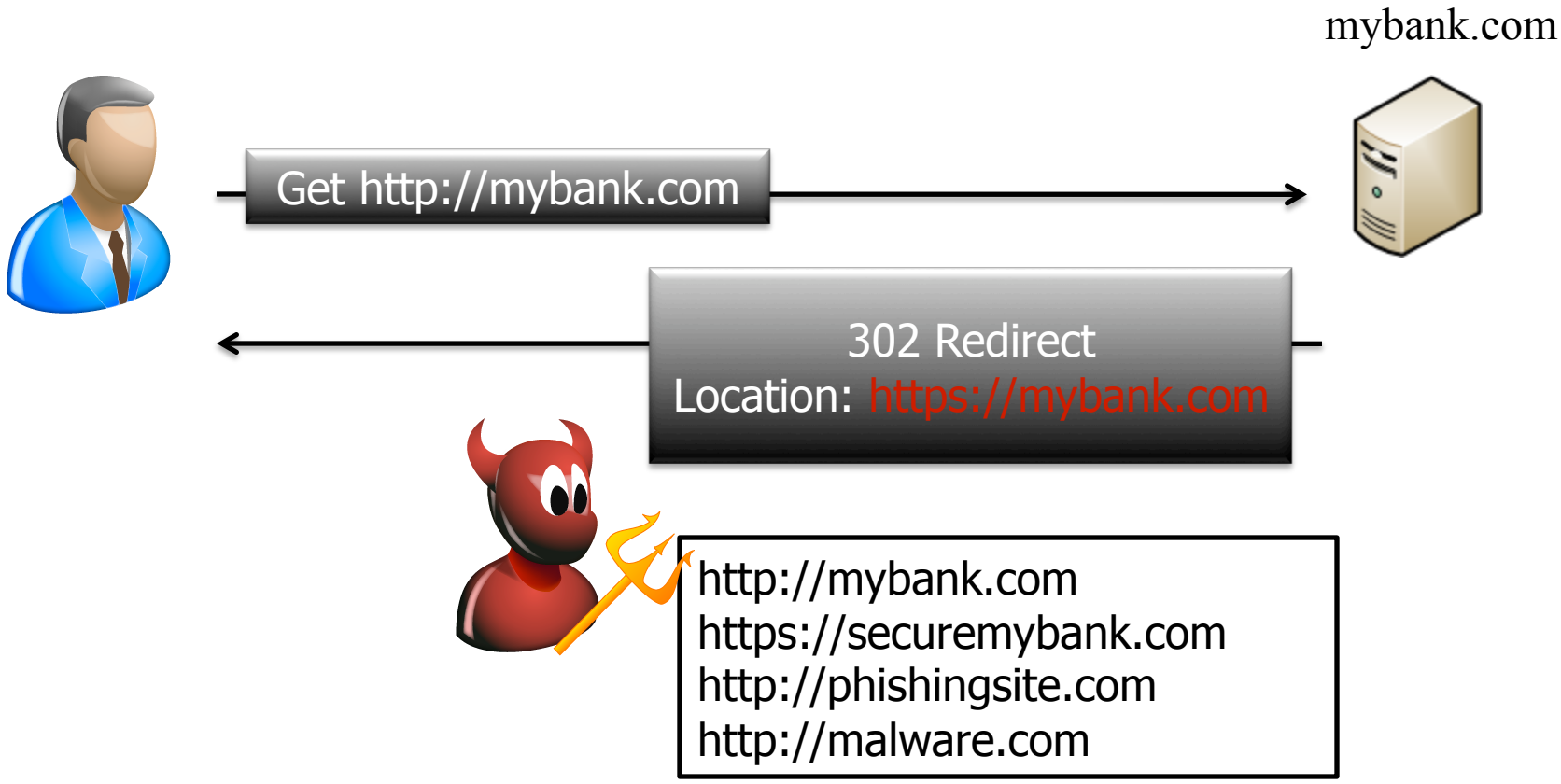
- Scenario 2: HTTP to HTTPS redirects



HTTP to HTTPS redirects

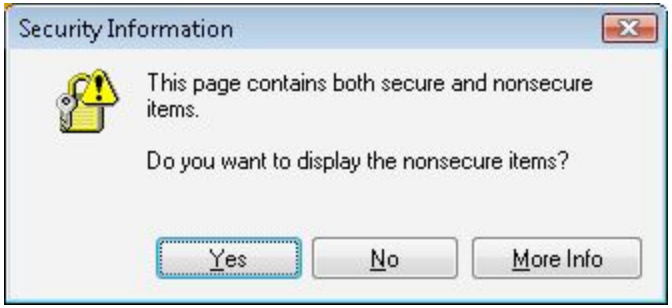


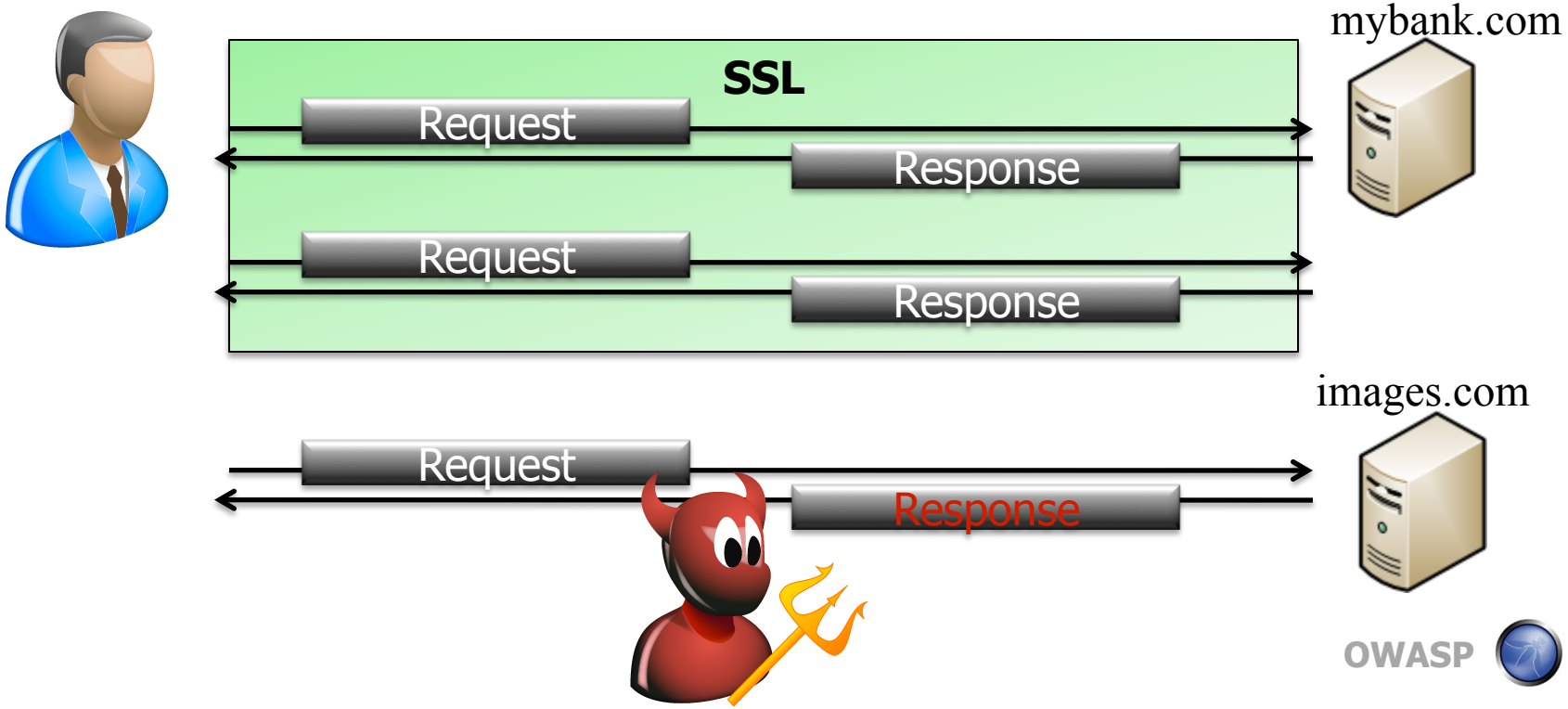
HTTP to HTTPS redirects



The Bad – Websites are Configured Wrong!

- Scenario 3: Mixed Content





The Bad – Not All SSL is equal

- View Ciphers by Strength

  openssl ciphers <strength> -v

- Test Server:

  openssl s_client -connect site.com:443 -cipher <strength>

- Test Client:

  openssl s_server -www -cert cacert.pem -key cakey.pem

<strength>=NULL|LOW|MEDIUM|HIGH|FIPS

FIPS Approved Ciphers

ADH-AES256-SHA
DHE-RSA-AES256-SHA
DHE-DSS-AES256-SHA
AES256-SHA
ADH-AES128-SHA
DHE-RSA-AES128-SHA
DHE-DSS-AES128-SHA
AES128-SHA
ADH-DES-CBC3-SHA
EDH-RSA-DES-CBC3-SHA
EDH-DSS-DES-CBC3-SHA
DES-CBC3-SHA

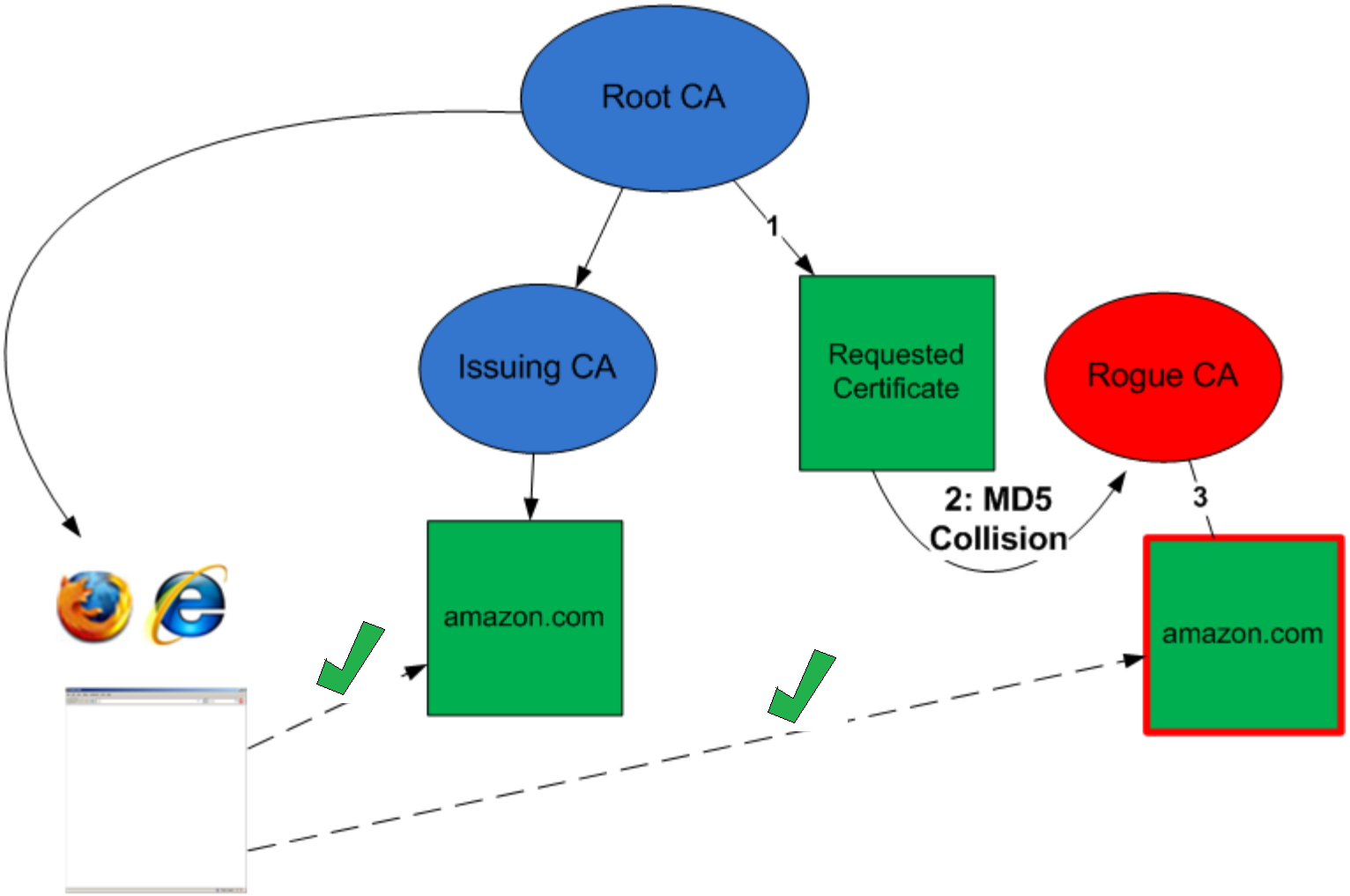
LOW Strength Ciphers

ADH-DES-CBC-SHA
EDH-RSA-DES-CBC-SHA
EDH-DSS-DES-CBC-SHA
DES-CBC-SHA
DES-CBC-MD5

The Ugly

- MD5 Collision Rogue CA Creation
  - Alexander Sotirov, Marc Stevens, Jacob Appelbaum, Arjen Lenstra, David Molnar, Dag Arne Osvik, Benne de Weger
  - http://www.win.tue.nl/hashclash/rogue-ca/
- SSLstrip
- Null Prefix Attacks Against SSL/TLS Certificates
  - Moxie Marlinspike
  - http://www.thoughtcrime.org/software/sslstrip/
  - http://www.thoughtcrime.org/papers/null-prefix-attacks.pdf

MD5 Collision Rogue CA



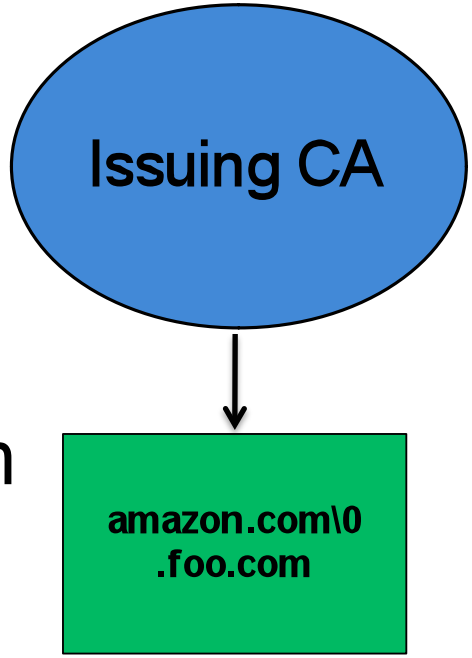
Null Prefix Attack

Part 1: Certificate Authority

- CA verifies ownership of root domain

www.foo.com == www.anything.foo.com==nonexistent.a.b.c.foo.com

- What about? amazon.com\0.foo.com



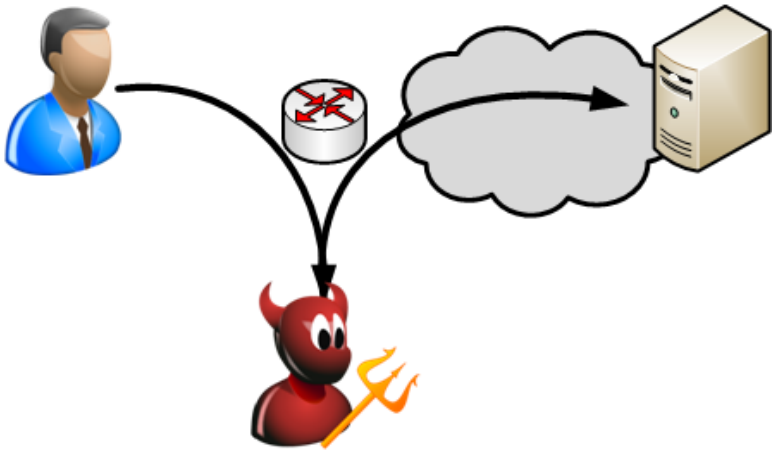
Part 2: Browser SSL Verification

- Microsoft CryptoAPI - \0 is eos

amazon.com == amazon.com\0.foo.com

- Vulnerable: "Firefox, Internet Explorer, Chrome, Thunderbird, Outlook, Evolution, Pidgin, AIM, irssi"

SSLstrip



- MitM SSL Connections
  - ARP Spoofing
  - IP Tables
- Auto Strip SSL -> HTTPS to HTTP
- Execute Null Prefix Attack
- Block Certificate Revocation Messages
  - OCSP Attacks

Is There Hope?

- Average User == Not Technical
- Most Deployments Vulnerable
- Specialized Tools Available

Doing It Right…

The Application

- ☑ SSL only
- ☑ No HTTP -> HTTPS redirects : HTTP shows "User Education" message
- ☑ No SSL errors or warnings

The User

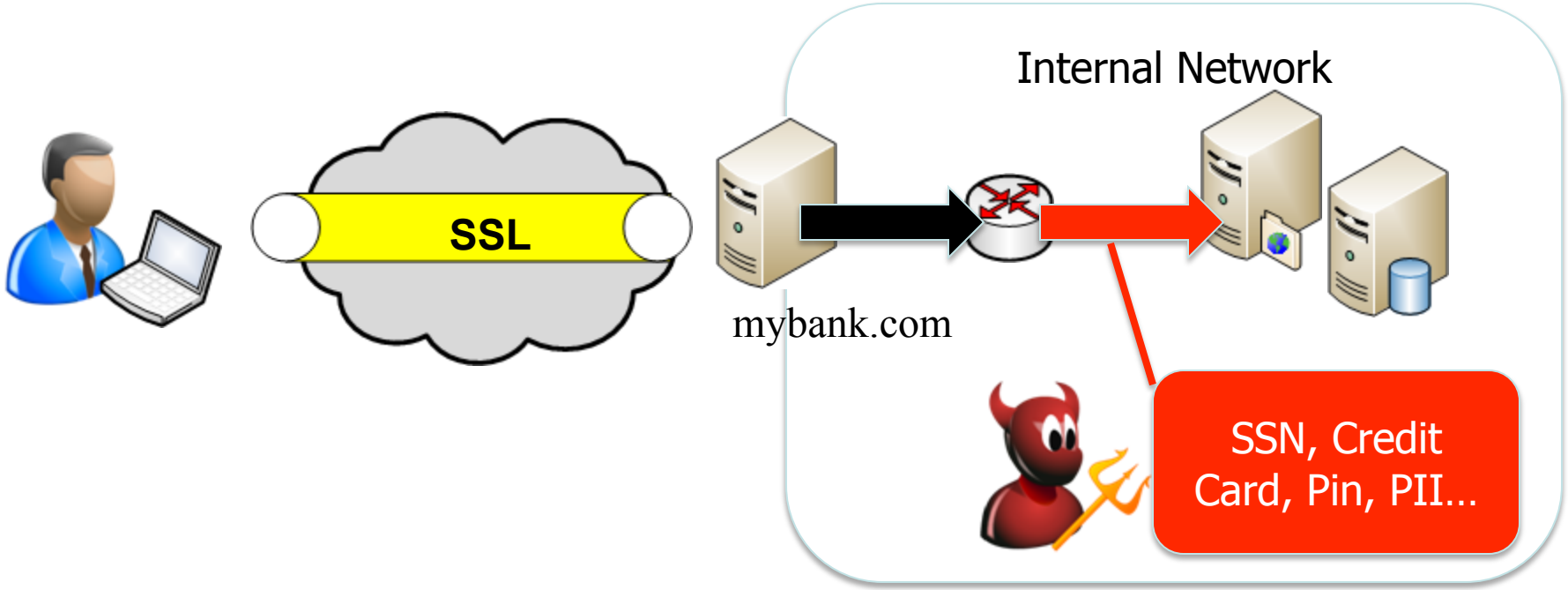
- ☑ Bookmark the HTTPS page
- ☑ Stop if any SSL warnings/errors presented

The Browser

- ☑ Set realistic user expectations
- ☑ **Provide "Secure" mode option**

Internal Network SSL

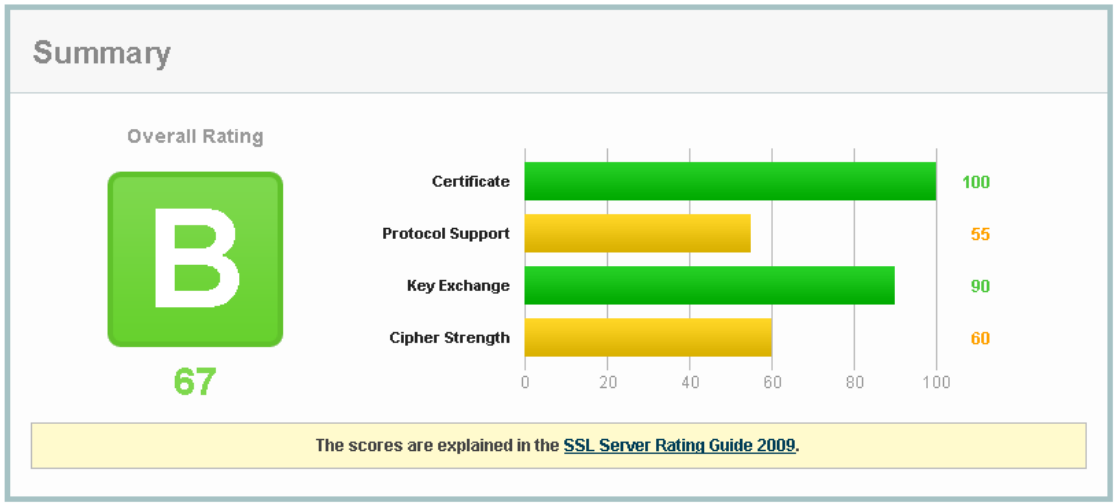
- Protect the data on internal network too!



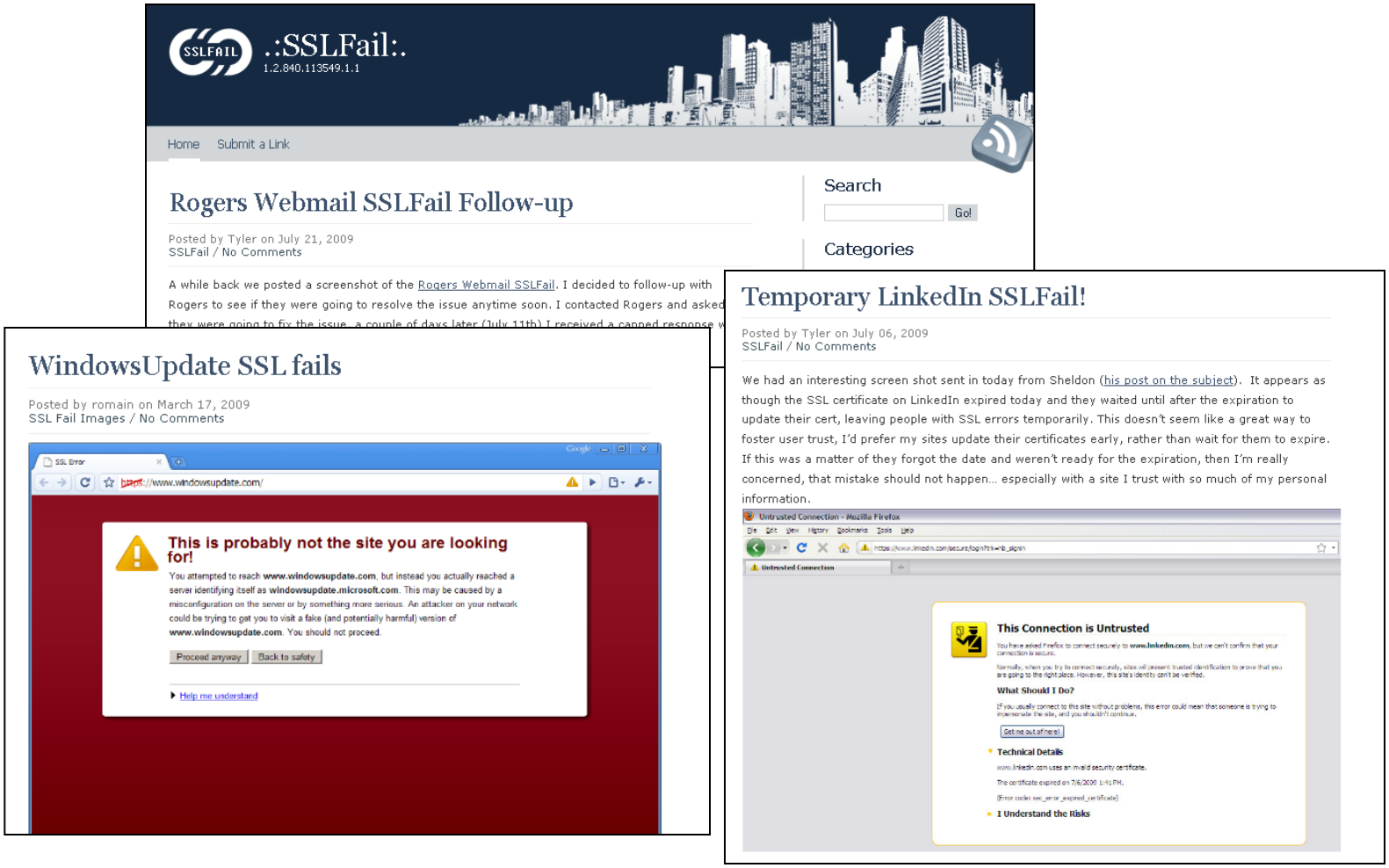
Resources - ssllabs.com (Ivan Ristic)

Recently Seen		Recent Best-Rated		Recent Worst-Rated	
amazon.com	B (67)	sparklit.com	A (91)	webmail.verto.com.br	F (0)
chase.com	B (72)	www.startssl.org	A (88)	webmail.stiefel.com	F (0)
bankofamerica.com	C (60)	ais2.uniba.sk	A (88)	www.kaching.com	F (0)
gmail.google.com	C (64)	blog.startcom.org	A (88)	imperva.com	F (0)

SSL Report: amazon.com (72.21.207.65)



Resources – sslfail.com (Tyler Reguly, Marcin Wielgoszewski)



Thanks

- Questions:

Lobby –or-

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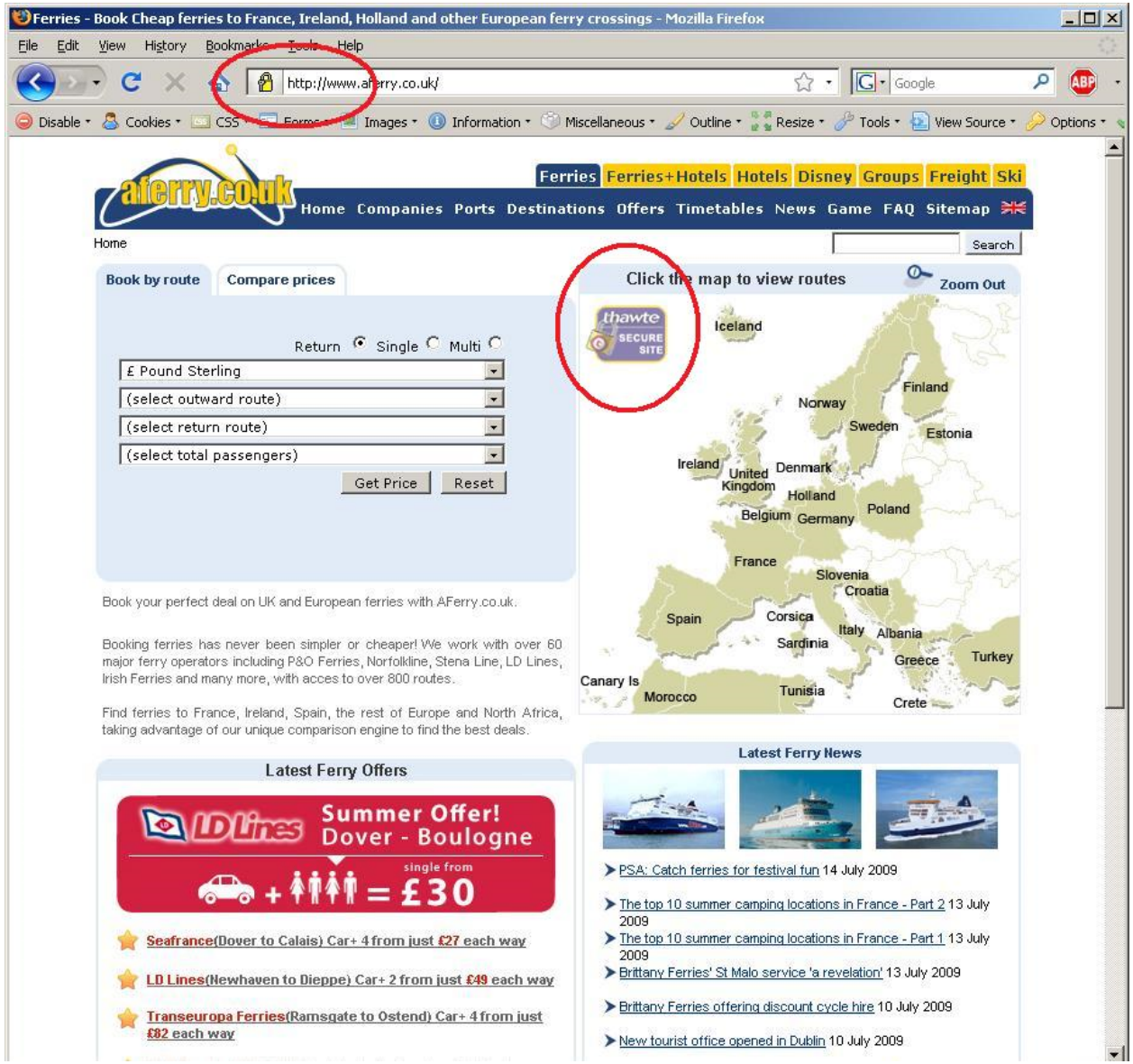
http://michael-coates.blogspot.com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(select return route)
(select total passengers)
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Reset
Click the map to view routes
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