Breaking SSL

Why leave to others what you can do yourself?

By Ivan Ristic

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Who is Ivan Ristic?

1) ModSecurity (open source web application firewall), 2) *Apache Security* (O'Reilly, 2005), 3) SSL Labs (research and assessment platform), 4) *ModSecurity Handbook* (Feisty Duck, 2010)

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SSL and TLS

1) Very well designed
2) Very widely used
3) Security backbone of the Internet
4) Secure on its own
5) Easily compromised when used with HTTP
6) Few people pay attention to it

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Why was SSL in the news recently?

2008 – MD5 collision and rogue CA generation (Sotirov et al.)

2009 – NUL byte certificate attacks (Moxie & Kaminsky separately)

2009 – Authentication Gap (Marsh Ray)

(And a couple of other, smaller, issues. Did someone mention SSL VPNs?)

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Moxie Marlinspike

If you need convincing how easy it is to defeat SSL, look for Moxie's ***sslstrip*** *and* ***sslsniff*** *tools.*

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Principal Active Threats

Man-in-the-middle (MITM) attacks:

- Rogue CA certificates
- Implementation flaws
- App and configuration vulnerabilities
- Usability issues
- Rogue certificate authorities!

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SSL Threat Model

(Get it from ssllabs.com.)

SSL Labs

Dedicated to SSL/TLS research. Lots of interesting projects.

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SSL Server Assessment

The most popular part of the site is the free SSL Sever Assessment tool.

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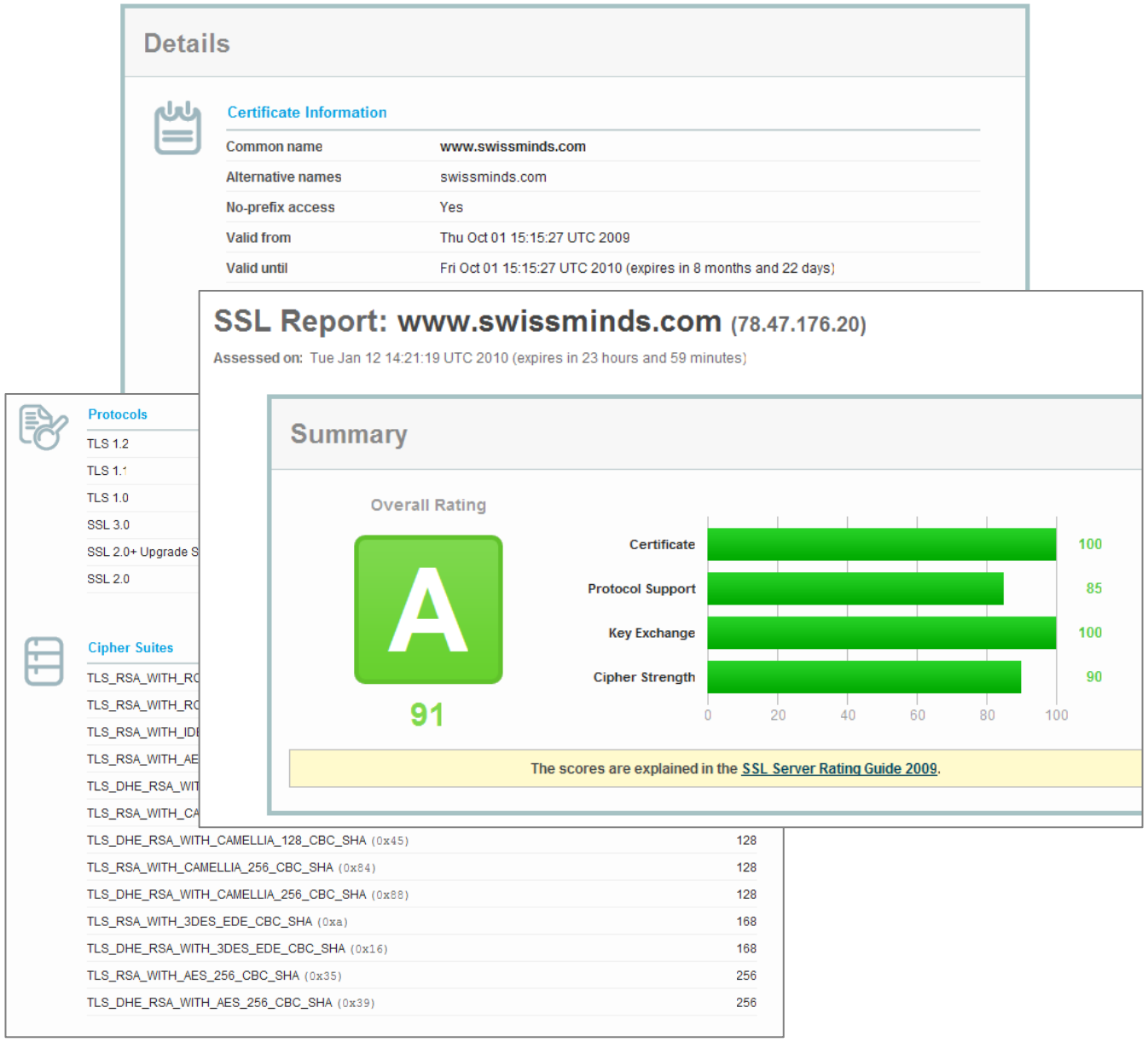
SSL Server Assessment

The most comprehensive assessment available.



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SSL Labs projects

- SSL Server Security Rating Guide
- SSL Server Security Online Assessment
- SSL Threat Model
- Passive SSL Client Fingerprinting tools

Planned:

- SSL Client Capabilities Database
- SSL Usage Tracking
- SSL Internet Survey (in progress!)

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Feature Presentation

SSL Deployment Mistakes

1 Inconsistent DNS configuration

- Your *www.example.com* address points to one web server, while *example.com* points to another
- It surprising how many high-profile sites suffer from this problem

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What does *microsoft.com* look like?

	Server	Domain(s)	Test time	Grade
1	**65.55.21.250** wwwco1vip.microsoft.com Ready	www.microsoft.com	Thu May 13 17:15:46 UTC 2010 **Duration:** 18.680 sec	A (85)
2	**207.46.197.32** (reverse lookup failed) Unable to connect to server	microsoft.com	Thu May 13 17:16:05 UTC 2010 **Duration:** 0.52 sec	-
3	**207.46.232.182** (reverse lookup failed) Remote host closed connection during handshake	microsoft.com	Thu May 13 17:16:05 UTC 2010 **Duration:** 0.132 sec	-

Warning: Inconsistent server configuration

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2 Different sites on 80 and 443

- You type *https://www.ssllabs.com* and expect to see the same site as on *http://www.ssllabs.com*
- This is the fate of every single site that uses virtual hosting
- Would you mind if questionable content appeared on *https://www.yourcompany.com*?

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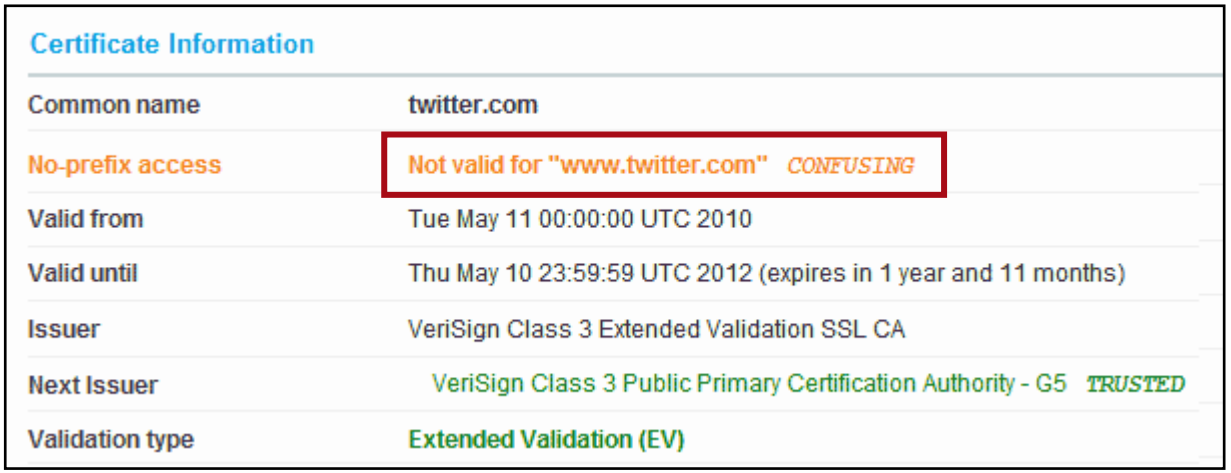
3 Using incomplete certificates

- You type *https://ssllabs.com* and expect to see the same site as on *https://www.ssllabs.com*
- Very confusing for users



Certificate Information	
Common name	twitter.com
No-prefix access	Not valid for "www.twitter.com" *CONFUSING*
Valid from	Tue May 11 00:00:00 UTC 2010
Valid until	Thu May 10 23:59:59 UTC 2012 (expires in 1 year and 11 months)
Issuer	VeriSign Class 3 Extended Validation SSL CA
Next Issuer	VeriSign Class 3 Public Primary Certification Authority - G5 *TRUSTED*
Validation type	Extended Validation (EV)

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4 Self-signed certificates

- Self-signed certificates are spoiling SSL security for all of us
- They are insecure
- We are teaching users to ignore warnings
- It's cheaper to buy a certificate than support a self-signed one

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5 Own CA certificates

- You configure a web site, don't want to pay small $ for a proper certificate, but don't mind spending a lot of time creating a custom CA?!
- Encouraging others to use your CA root is terribly insecure
- How well is your CA root protected?
- Any CA root can sign any site!

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6 Mixing SSL and plain-text on a site

- Difficult to implement securely
- Leads to user session compromise
- Trivial for the man in the middle to use *sslstrip* to convert HTTPS links to HTTP
- Even redirections problematic – only secure bookmarks work

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7 Using SSL for “important” bits

- Some sites will use SSL to protect authentication and nothing else
- They are vulnerable to session hijacking
- Some even allow users to change password without knowing the old ones

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8 Not using secure cookies

- Secure cookies are transmitted only over SSL
- Even if your site does not use plain-text anywhere (and does not even run on port 80), browsers can be tricked into revealing non-secure cookies by a MITM attacker
- You *must* use secure cookies everywhere

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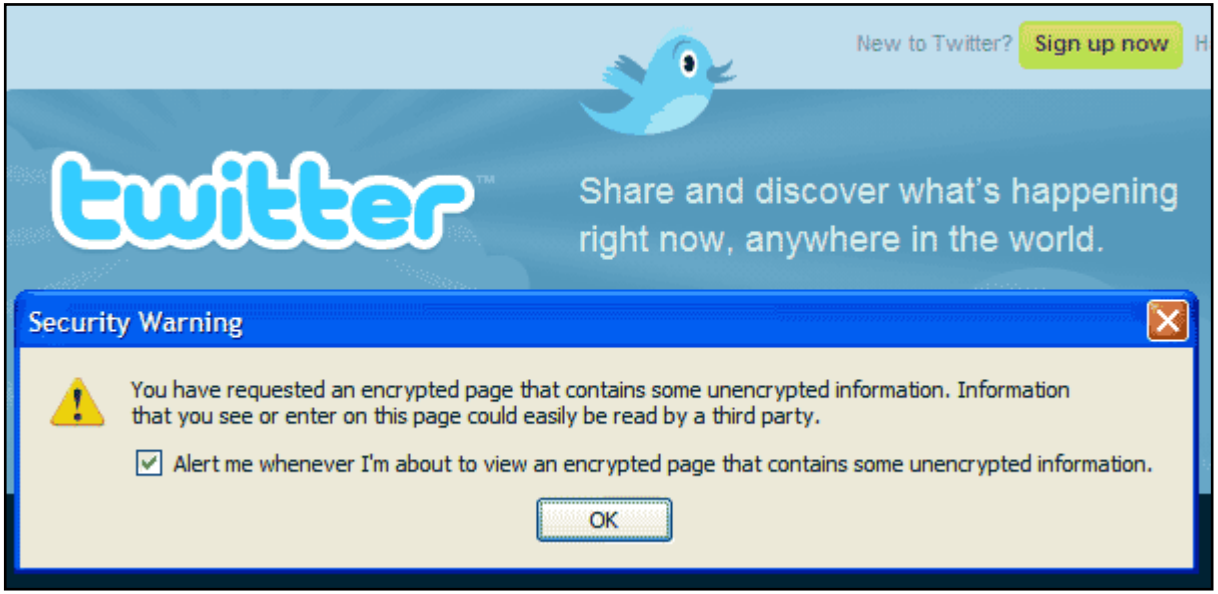
9 Mixed page content

- A single plain-text link is enough to compromise the entire "secure" SSL site



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10 Not using an EV certificate

- High-value web sites will often be a target of phishing attacks
- It is easy to mistype and end up at the wrong place, even if you are en experienced user
- The green glow helps ensure your users that they are in the *right* place

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Core Issues

1) Browsers accept invalid certificates
2) Insufficient security indications
3) Decoupled nature of HTTP and SSL
4) No broad support for virtual SSL hosting
5) Some sites use SSL some don't
6) The burden of security is on users

Message for today SSL is a rare application security area where we can make things 100% secure, with relatively small effort. **Why not get it right?**

Thank you!

The slides are available for download
from https://www.ssllabs.com

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