Let's go HTTPS-only!

More Than Buying a Certificate

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Available at https://github.com/StephenKing/t3cvie16-https

Overview

- Intro
- Getting a Certificate
- Server Setup
- HTTP Headers
- Experience with https://typo3.org

Introduction

What's this all about?

Things that *you* (or your colleague) can do to secure your / your client's users.

Optionally: saves your / your client's butt / reputation, as it helps to prevent data leakage.

SSL vs. TLS

- We're always talking about the same thing, which is (nowadays) *TLS*.
  - (and the **S** in HTTP**S**, IMAP**S**, LDAP**S**, etc.)
- Older versions were called *SSL*
  - insecure/secure/draft scoresheet:
  - SSL 1.0, SSL 2.0, SSL 3.0, TLS 1.0, TLS 1.1, TLS 1.2, TLS 1.3
- It's the layer between TCP and the Application Layer protocol

```
$ openssl s_client -connect typo3.org:443
GET / HTTP/1.1
Host: typo3.org

HTTP/1.1 200 OK
Server: nginx/1.9.9
...
```

- This gives us an encrypted connection (with a stranger

Whom Do We Trust?

- Peer is verified using the trust chain of *Certificate Authorities* (CAs) signing the peer's certificate.
- Our device/software vendor dictates this *CA bundle* for us.
- Some hundreds certificate authorities are trusted (does not mean: *trustful*) by our OSs/UAs.
- If a web site uses a certificate signed by *any* of these CAs, everything is fine™ *
- This solves the *authenticity* problem (we know, with whom we're talking)

* given expiration date hasn't passed, yet.

Getting a Trusted Certificate

Getting a Trusted Certificate

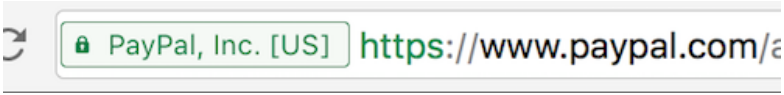
- Generate a key pair (private key + public key (unsigned))
- Generate a *Certificate Signing Request* (CSR)
- Send CSR to some CA (plus some money)
- Validate domain ownership by receiving an email
- You get the signed certificate back
- You place the private key + signed cert on your web server
- So, what's wrong here?
    - stupid manual process (there's no API for that - as you do it once per 1/2/3 year(s))
    - money
    - CAs have failed (badly!)

Let's Encrypt

- A free Certificate Authority ❤
  - Sponsored by Mozilla, EFF, and some others
  - SSL for the masses
- Cert lifetime of max. 90 days
- Yes, you have to automate that!
  - API/renewal protocol for certificates (*ACME*)
  - Official Python client, tens of third-party clients available
- Domain-Validation: Challenge is checked via
  - HTTP(S) (directory `.well-known/acme/` contains challenges)
  - DNS (TXT record with challenge needs to be set)
- Only usable for publicly reachable services (?)

Extended Validation Certs (EV)

- Green bar with company name in your UA



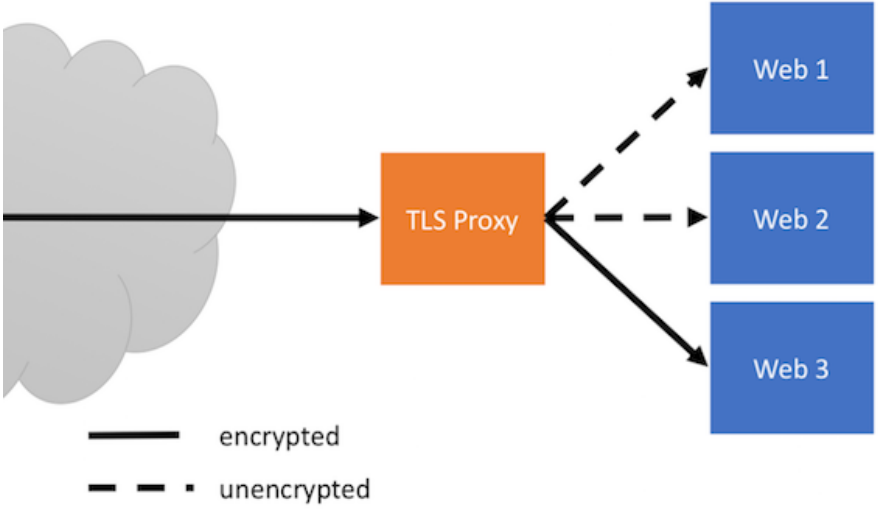
- Personal/company validation
  - Expensive
  - Personal presence required

Dedicated IP vs. SNI

- older days: you need a dedicated IP for SSL
  - problem: it's too late to send the `Host:` header, once connected via TLS
- nowadays: there's Server Name Indication (SNI)
  - informs server about targeted virtual host during TLS handshake
  - server picks key corresponding to that host name

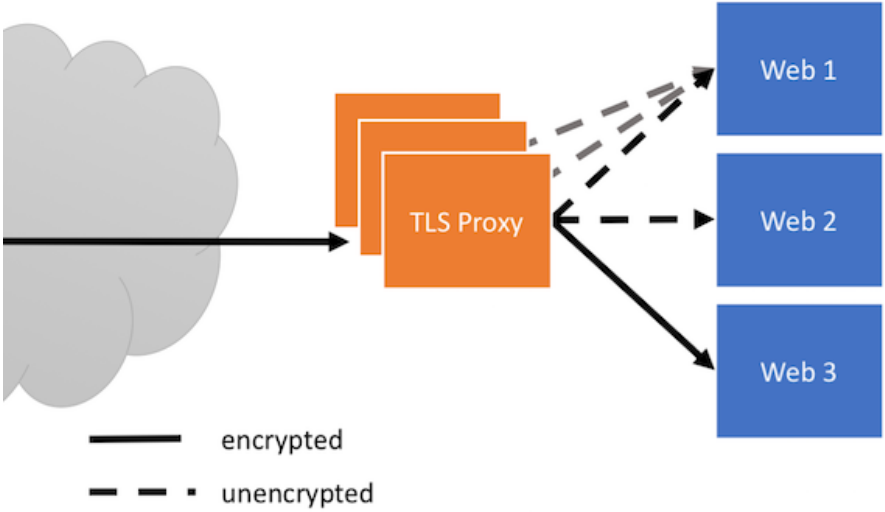
Server Configuration & Validation

TLS Proxy?



- I find it convenient
- Number of options available
  - Apache httpd, nginx, haproxy
  - Varnish Software's *Hitch* - anybody tried already?

TLS Proxy?



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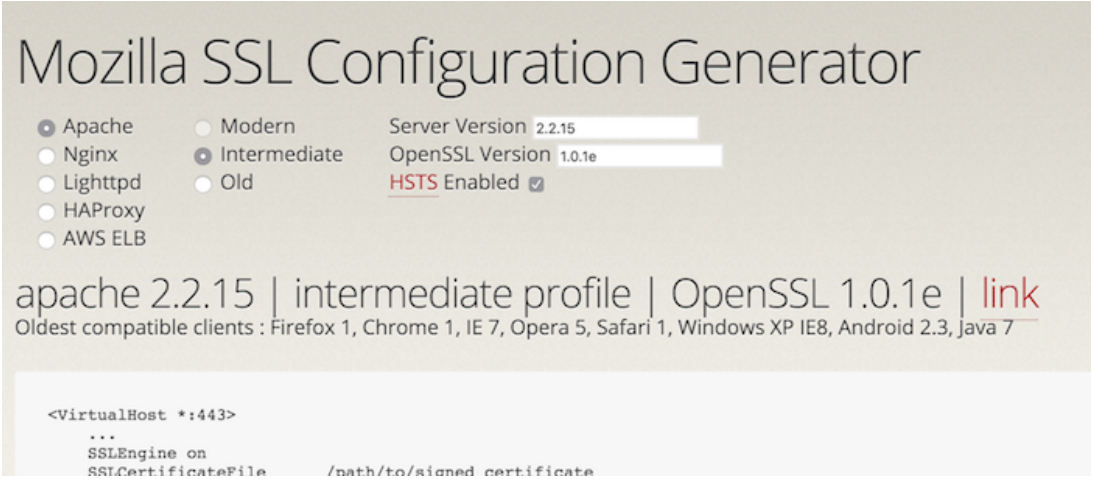
Server Configuration

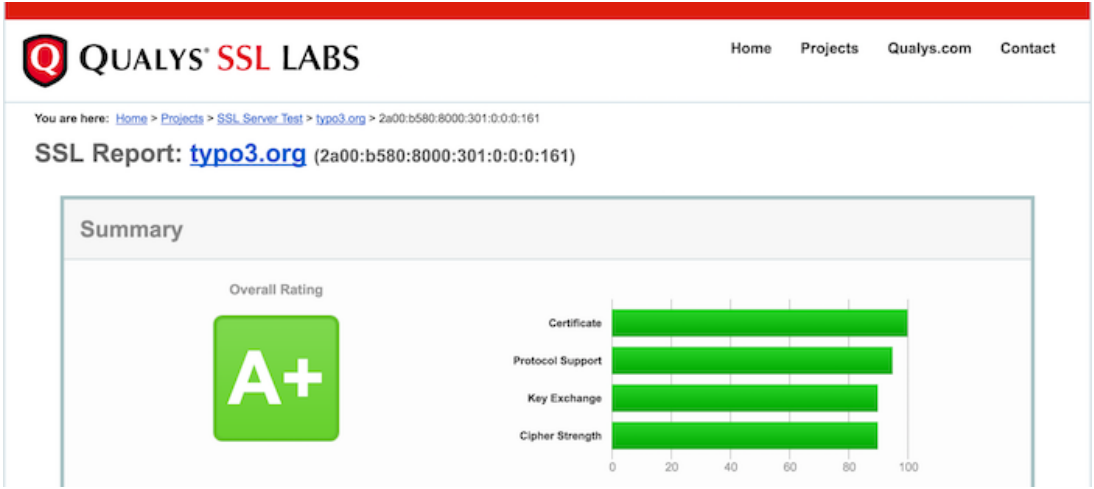
- Will not go into detail here, but used ciphers matter
- Use *Mozilla SSL Configuration Generator**



* https://mozilla.github.io/server-side-tls/ssl-config-generator/

Validation

- QUALYS SSL Labs' SSL Checker:
  - The best thing ever! ❤❤❤
  - Get an A+!



  - https://www.ssllabs.com/ssltest/
- There's also a command line client (`ssllabs-scan`) and API clients
  - Include it in your CI (?!)

Validation (cont'd)

- Supported TLS versions
- Insecure ciphers (RC4 etc.)
- Chain issues (missing / redundant certificates)
- TLS Vulnerabilities (BEAST, POODLE, Heartbleed & friends)
- (Strong) Forward Secrecy (Diffie Helman)
- Good HTTP headers as bonus (for the A+)

Secure Renegotiation	**Supported**
Secure Client-Initiated Renegotiation	Yes
Insecure Client-Initiated Renegotiation	No
BEAST attack	Mitigated server-side (more info) TLS 1.0: 0x5
POODLE (SSLv3)	No, SSL 3 not supported (more info)
POODLE (TLS)	No (more info)
Downgrade attack prevention	**Yes, TLS_FALLBACK_SCSV supported** (more info)
SSL/TLS compression	No
RC4	**Yes INSECURE** (more info)
Heartbeat (extension)	No
Heartbleed (vulnerability)	No (more info)
OpenSSL CCS vuln. (CVE-2014-0224)	No (more info)
Forward Secrecy	**No WEAK** (more info)
ALPN	No

Relevant HTTP Headers

Relevant HTTP Headers

- OWASP provides *List of useful HTTP headers* *
- Some are no-brainers (this slide), some are tough to implement
- Enforce XSS filter of browsers
  - `X-XSS-Protection: "1; mode=block"`
- Clickjacking protection
  - `X-Frame-Options:`
  - **deny** - no rendering within a frame
  - **sameorigin** - no rendering if origin mismatch
  - **allow-from**: DOMAIN - allow rendering if framed by frame loaded from DOMAIN
- Disable MIME-type sniffing (browser might guess that a file is executable)
  - `X-Content-Type-Options: nosniff`

* Open Web Application Security Project, https://www.owasp.org/index.php/List_of_useful_HTTP_headers

HTTP Strict Transport Security (HSTS)

- Defines that UA must contact the server via HTTPS for all future requests (for 6 months)

  ```
  Strict-Transport-Security: "max-age=15768000; includeSubDomains"
  ```

- Why?
  - You follow a link to `http://example.com` through a public hotspot
  - Everybody sees your cookies*
  - MITM can redirect you to arbitrary sites
  - MITM can inject arbitrary code / drive-by downloads

- HSTS would prevent connecting via `http://` and automatically ugprade to secure connection.

- Requirement: Site is reliably accessible via HTTPS

- Bonus / caveat: Most UAs will refuse to permit untrusted certificates

* Hopefully, cookie is set with `secure` option

Set-Cookie Options

- Cookie is sent to the UA using the `Set-Cookie: cookie_data` header
- `Set-Cookie: httponly` prevents JavaScript code to access the cookie (because XSS)
- `Set-Cookie: secure` prevents UA to send cookie data via plaintext (when HSTS is not used)

Content Security Policies

- Specifies, which sources a browser is allowed to load
  - If policy is violated, UA will not load affected resource
- Defined via HTTP header
  - `Content-Security-Policy: script-src 'self'`
  - Allows only own domain as source for `<script>` tags
- Why?
  - XSS!

```
Name: Steffen
Comment:
  Hello, my name is Steffen and I want to include
  <script src="https://st-g.de/evil.js" />.
  Excecute?
```

  - It should not happen, but it does!
- Great intro: https://scotthelme.co.uk/content-security-policy-an-introduction/

CSP: Options

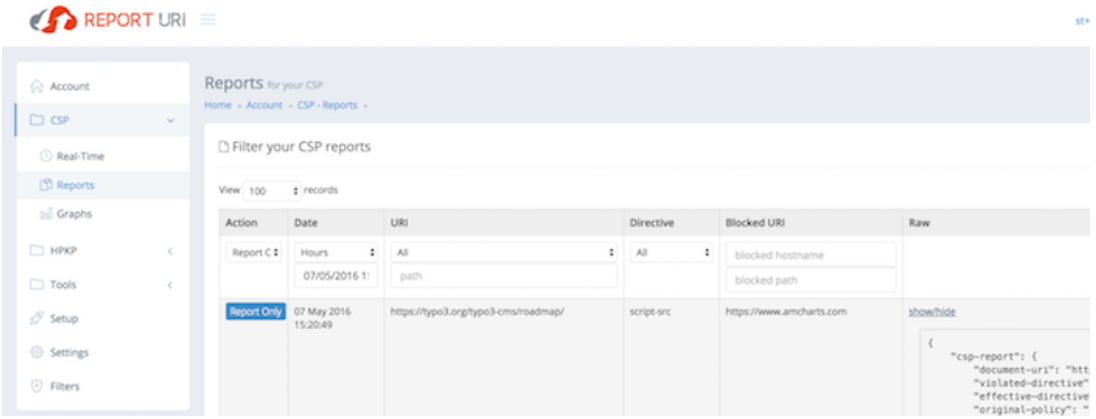
- **default-src**: Define loading policy for all resources type in case of a resource type dedicated directive is not defined (fallback),
- **script-src**: Define which scripts the protected resource can execute,
- **object-src**: Define from where the protected resource can load plugins,
- **style-src**: Define which styles (CSS) the user applies to the protected resource,
- **img-src**: Define from where the protected resource can load images,
- **media-src**: Define from where the protected resource can load video and audio,
- **frame-src**: Define from where the protected resource can embed frames,
- **font-src**: Define from where the protected resource can load fonts,
- **connect-src**: Define which URIs the protected resource can load using script interfaces,
- **form-action**: Define which URIs can be used as the action of HTML form elements,
- **sandbox**: Specifies an HTML sandbox policy that the user agent applies to the protected resource,
- **script-nonce**: Define script execution by requiring the presence of the specified nonce on script elements,
- **plugin-types**: Define the set of plugins that can be invoked by the protected resource by limiting the types of resources that can be embedded,
- **reflected-xss**: Instructs a user agent to activate or deactivate any

CSP: Report Mode

- CSP can kill your site
  - Test first!
- CSP allows to specify a report URI
  - Violations will be reported (not like with `sudo`) by browsers
  - Header `Content-Security-Policy-Report-Only:`
- What to use as Report URI?
  - https://report-uri.io, beautiful free service

```
Content-Security-Policy-Report-Only: default-src https:;
   report-uri https://<your-account>.report-uri.io/r/default/csp/reportOn
```

report-uri.io



https://report-uri.io/account/reports/csp/

CSP: Bonus

- allows to identify *mixed content*
- `upgrade-insecure-requests` allows to automatically load *mixed content* via HTTPS

CSP and TYPO3

- probably a tough job
- test on typo3.org:

```
Content-Security-Policy-Report-Only:
 script-src 'self' 'unsafe-inline' 'unsafe-eval'
   https://piwik.typo3.org https://maps.google.com
   https://*.googleapis.com https://cdn.jquerytools.org;
 style-src 'self' 'unsafe-inline'
   https://fonts.googleapis.com;
 report-uri https://typo3org.report-uri.io/r/default/csp/reportOnly
```

- you want to get rid of
  - `'unsafe-inline'`: allows inline JS
  - `'unsafe-eval'`: allows JS `eval()`
- you want to whitelist hashes of external resources

HTTP Public Key Pinning (HKPK)

- Overrides trust relationship of CAs delivered with OS/UA.
- Restricts (*"pins"*) the certificate accepted when connecting via TLS to specified fingerprints.

```
Public-Key-Pins: pin-sha256="cUPcTAZWKaASuY...oBAkE3h2+soZS7sWs=";
                 pin-sha256="M8HztCzM3elUxk...";
                 max-age=5184000;
                 includeSubDomains"
```

- Again, there is `Public-Key-Pins`**`-Report-Only`**:
  - again, http://report-uri.io supports us here
- Two hashes:
  - currently used key pair
  - backup key pair (*key* matters, doesn't have to be signed)
- Backup key is successor after current key
- Warning: Don't screw it up

what happened with

https://typo3.org

(few personal experiences)

Clients

- few human users
- many machines
  - PHP
  - PHP with cURL
  - `curl`
  - `wget
  - on new systems
  - on old systems
  - on *very* old systems
- hopefully, your site is visited by more humans

Redirects

(from HTTP to HTTPS)

were no issue!

PHP on Windows

does not trust any CA

you have to manually download CA bundle

Don't kill all at once..

- IPv6 first (poor man's blue-green deployment)
- *wget* on Debian 7 doesn't respect *subjectAltNames*
- Because sh*t happens (in parallel)

composer / composer

Watch 508 Star

Code | Issues 111 | Pull requests 24 | Pulse | Graphs

302 Redirect on SSL When Downloading Zip Archive Causes Issues #4782

Closed swimson opened this issue on Jan 17 · 31 comments

jakoch referenced this issue on Jan 23

"http://ftp.drupal.org/files/projects/drupal-7.39.zip" file could not be downloaded: Peer certificate CN=`j.ssl.fastly.net' did not match expected CN=`ftp.drupal.org' #4818

Closed

mbrodala commented on Jan 25

Now I saw a similar one:

```
[Composer\Downloader\TransportException]
The "http://typo3.org/extensions/repository/download/gridelements/7.0.1/t3x/" file could not be d
```

While you're at it..

Enable HTTP/2!

Summary

Enforce encrypted connections!

It makes a better world.

Use the available tools!

They help to validate your setup.

Set security-relevant headers!

on web server or in application
(only CSP & HPKP are hard to implement)

Thanks!