Making the web more secure with Let's Encrypt

David Calavera

Netlify

Vegan Grasshopper Cake

This vegan Grasshopper Cake is an organic chocolate cake with vanilla mint buttercream frosting, chocolate ganache, and mint chocolate hello kitty candies. This was Isabelle's birthday cake since she specifically requested fried mac-n-cheese hearts for dinner and a chocolate mint birthday cake for dessert. This is a must-make for any chocolate and mint lover.

Read More

Google Security Blog
The latest news and insights from Google on security and safety on the Internet

Moving towards a more secure web

September 8, 2016

Posted by Emily Schechter, Chrome Security Team

[Updated on 12/5/16 with instructions for developers]

Developers: Read more about how to update your sites here.

To help users browse the web safely, Chrome indicates connection security with an icon in the address bar. Historically, Chrome has not explicitly labelled HTTP connections as non-secure. Beginning in January 2017 (Chrome 56), we'll mark HTTP pages that collect passwords or credit cards as non-secure, as part of a long-term plan to mark all HTTP sites as non-secure.

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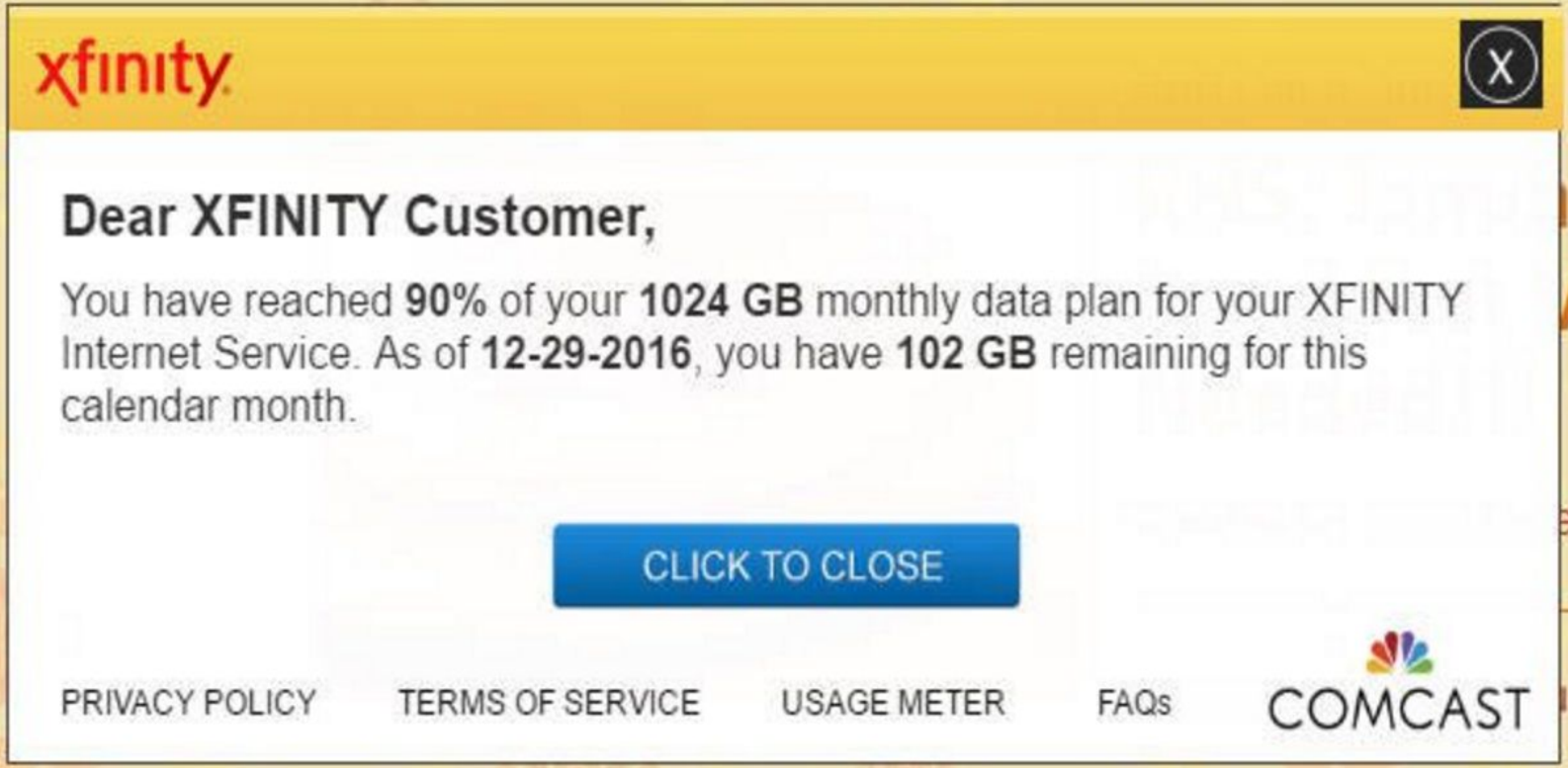
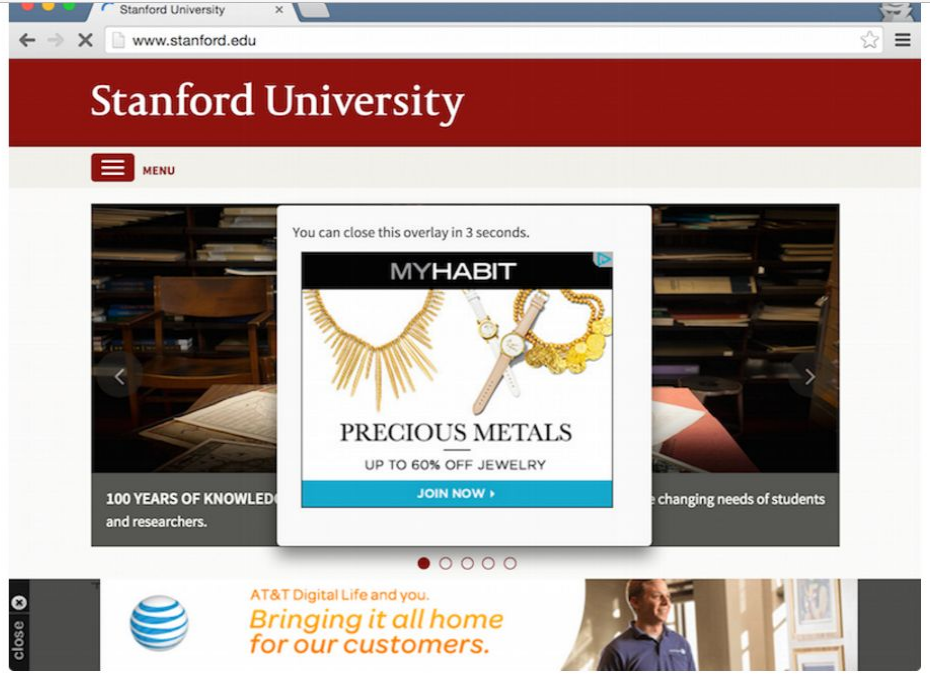


Scott Manley @DJSnM · 28 Dec 2016

Comcast is injecting Bandwidth cap warnings into websites. Remember, when I signed up for this I asked if there was a cap and they said no. pic.twitter.com/rCvzLNtpEu



Last I checked, Stanford doesn't hawk fashion accessories or telecom service.[1] And it definitely doesn't run obnoxious ads that compel you to wait.

Some ad-supported websites, like the Wall Street Journal, were also emblazoned with extra marketing material.

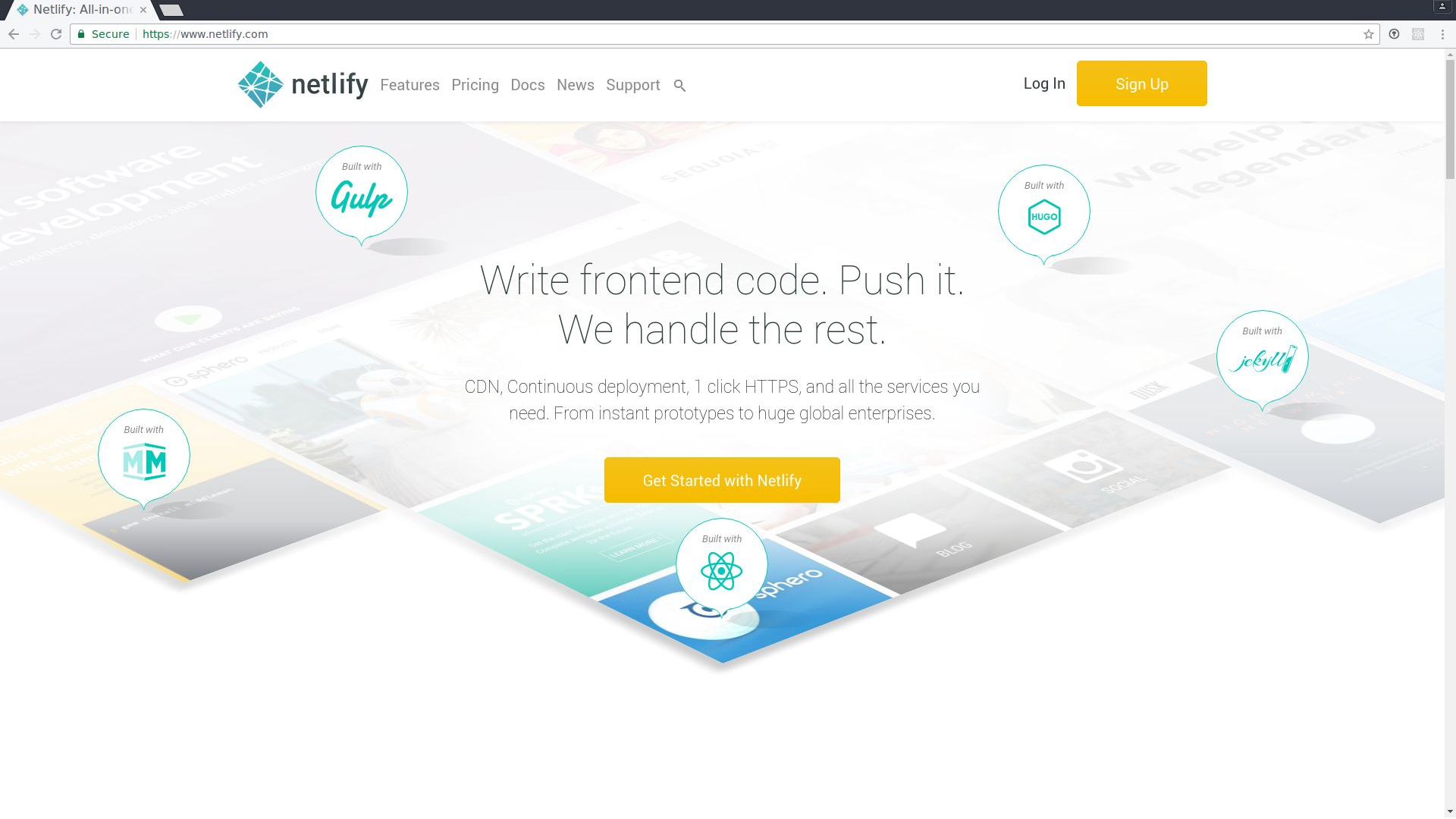
Call one of our experts now: (480) 463

SSL Certificates

Want customers to come back? Protect them.

- Safely accept credit cards on your website
- Make sure your customers feel safe
- 24/7 support (480) 463-8887

Get Started


Netlify: All-in-one
Secure
https://www.netlify.com
netlify
Features
Pricing
Docs
News
Support
Log In
Sign Up
Built with
Gulp
Built with
HUGO
Built with
jekyll
Built with
MM
Built with
Write frontend code. Push it.
We handle the rest.
CDN, Continuous deployment, 1 click HTTPS, and all the services you need. From instant prototypes to huge global enterprises.
Get Started with Netlify

HTTPS configuration

Free on all Netlify plans. Set a custom domain and enable secure connections instantly.

1. CONFIGURE A CUSTOM DOMAIN

2. ENABLE HTTPS

Enable HTTPS

This site's subscription allows Let's Encrypt TLS certificates for your domain.

Let's Encrypt is a fully automated install. We'll provision a TLS certificate from Let's Encrypt and Install it on our CDN.

Let's Encrypt Certificate

Let's Encrypt

Let's Encrypt is a **free**, **automated**, and **open** Certificate Authority.

Get Started Donate

FROM OUR BLOG

Jan 6, 2017

MAJOR SPONSORS

HTTPS Everywhere: Encryption for All WordPress.com Sites

The WordPress.com Blog

We're proud to support a more secure web — now for all custom domains on WordPress.com.

Barry

Apr 8, 2016 @ 5:10 pm

Today we are excited to announce free HTTPS for all custom domains hosted on WordPress.com. This brings the security and performance of modern encryption to every blog and website we host.

Best of all, the changes are automatic — you won't need to do a thing.

As the EFF points out as part of their Encrypt the Web initiative, strong encryption protects our users in various ways, including defending against surveillance of content and communications, cookie theft, account hijacking, and other web security flaws.

OCT 24

Implementing SSL/TLS for All Squarespace Sites

FRANKLIN ANGULO

How Etsy Manages HTTPS and SSL Certificates for Custom Domains on Pattern

Posted by **Andy Yaco-Mink** and **Omar** on January 31, 2017

In April of 2016 Etsy launched Pattern, a new product that gives Etsy sellers the ability to create their own hosted e-commerce website. With an easy-setup experience, modern and stylish themes, and guest checkout, sellers can merchandise and manage their brand identity outside of the Etsy.com retail marketplace while leveraging all of Etsy's e-commerce tools.

The ability to point a custom domain to a Pattern site is an especially popular feature; many Pattern sites use their own domain name, either registered directly on the Pattern dashboard, or linked to Pattern from a third-party registrar.

At launch, Pattern shops with custom domains were served over HTTP, while checkouts and other secure actions happened over secure connections with Etsy.com. This model isn't ideal though; Google ranks pages with SSL slightly higher, and plans to increase the bump it gives to sites with SSL. That's a big plus

> 60%

Sites with custom domain on Netlify use secure connections.

Automatic Certificate Management Environment (**ACME**)

https://tools.ietf.org/html/draft-ietf-acme-acme-05

github.com/
letsencrypt/boulder

Message Transport

https://tools.ietf.org/html/draft-ietf-acme-acme-05#section5

JWS payloads

A JWS is represented as a JSON object
containing some or all of these four members:

- "protected": BASE64URL(UTF8(JWS Protected Header))
- "header": JWS Unprotected Header
- "payload": BASE64URL(JWS Payload)
- "signature": BASE64URL(JWS Signature)

Replay protection

```
HEAD /acme/new-nonce HTTP/1.1
Host: example.com

HTTP/1.1 204 No Content
Replay-Nonce: oFvnlFP1wIhRlYS2jTaXbA
Cache-Control: no-store
```

Request URI Integrity

```
{ "protected": base64url({
   "alg": "ES256",
   "jwk": {...},
   "nonce": "6S8IqOGY7eL2lsGoTZYifg",
   "url": "https://example.com/acme/new-account"
  }),
```

Certificate Management

https://tools.ietf.org/html/draft-ietf-acme-acme-05#section6

Account creation

```
{ "protected": base64url({...}),
  "payload": base64url({
    "terms-of-service-agreed": true,
    "contact": ["mailto:admin@example.org"]
  }),
  "Signature": "RZPOnYoPhjszF...-nh6X1FPB519I" }
```

Certificate authorization

```
{ "protected": base64url({...}),
  "payload": base64url({
    "identifier": {
      "type": "dns",
      "value": "example.org"
    }
  }),
  "signature": "nuSDISbWMgE7H...QyVUyzf3Zawps" }
```

Certificate authorization

```
{ "status": "pending",
  "expires": "2018-03-03T14:09:00Z",
  "identifier": {
    "type": "dns",
    "value": "example.org"
   },
   ...
```

```
...
"challenges": [
   {"type": "http-01",
    "url": "https://example.com/authz/1234/0",
    "token": "DGyRejmCefe7v4NfDGDKfA"},
   {"type": "tls-sni-02",
    "url": "https://example.com/authz/1234/1",
    "token": "DGyRejmCefe7v4NfDGDKfA"},
   {"type": "dns-01",
    "url": "https://example.com/authz/1234/2",
    "token": "DGyRejmCefe7v4NfDGDKfA"}]
}
```

HTTP-01 Challenge

```
GET /.well-known/acme-challenge/token
Host: example.org


{ "protected": base64url({...}),
  "payload": base64url({
    "keyAuthorization": "evaGxfADs...62jcerQ"
  }),
  "signature": "Q1bURgJbD1c5...3pYdSMLioNN4" }
```

DNS-01 Challenge

```
_acme-challenge.example.org.
300 IN TXT "gfj9Xq...Rg85nM"
```

```
{ "protected": base64url({...}),
  "payload": base64url({
    "keyAuthorization": "evaGxfADs...62jcerQ"
  }),
  "signature": "Q1bURgJbD1c5...3pYdSMLioNN4" }
```

TLS-02 Challenge

```
CLIENTHELLO example.org:443
ServerName: gfj9Xq.Rg85nM.token.acme.invalid
```

```
{ "protected": base64url({...}),
  "payload": base64url({
    "keyAuthorization": "evaGxfADs...62jcerQ"
  }),
  "signature": "Q1bURgJ bD1c5...3pYdSMLioNN4" }
```

Certificate request

```
GET /acme/cert/asdf HTTP/1.1
Host: example.org
Accept: application/pkix-cert

HTTP/1.1 200 OK
Content-Type: application/pkix-cert
```

Certificate request

```
...

Link: </acme/ca-cert>;rel="up";title="issuer"
Link: </acme/revoke-cert>;rel="revoke"
Link: </acme/order/asdf>;rel="author"
Link: </acme/sct/asdf>;rel="ct-sct"
Link: </acme/some-directory>;rel="directory"
```

Certificate request

...

```
-----BEGIN CERTIFICATE-----
[End-entity certificate contents]
-----END CERTIFICATE-----
-----BEGIN CERTIFICATE-----
[Issuer certificate contents]
-----END CERTIFICATE-----
```

How can I interact with an ACME Authority?

Certbot

Secure | https://certbot.eff.org

home about certbot faq documentation support source code donate to EFF

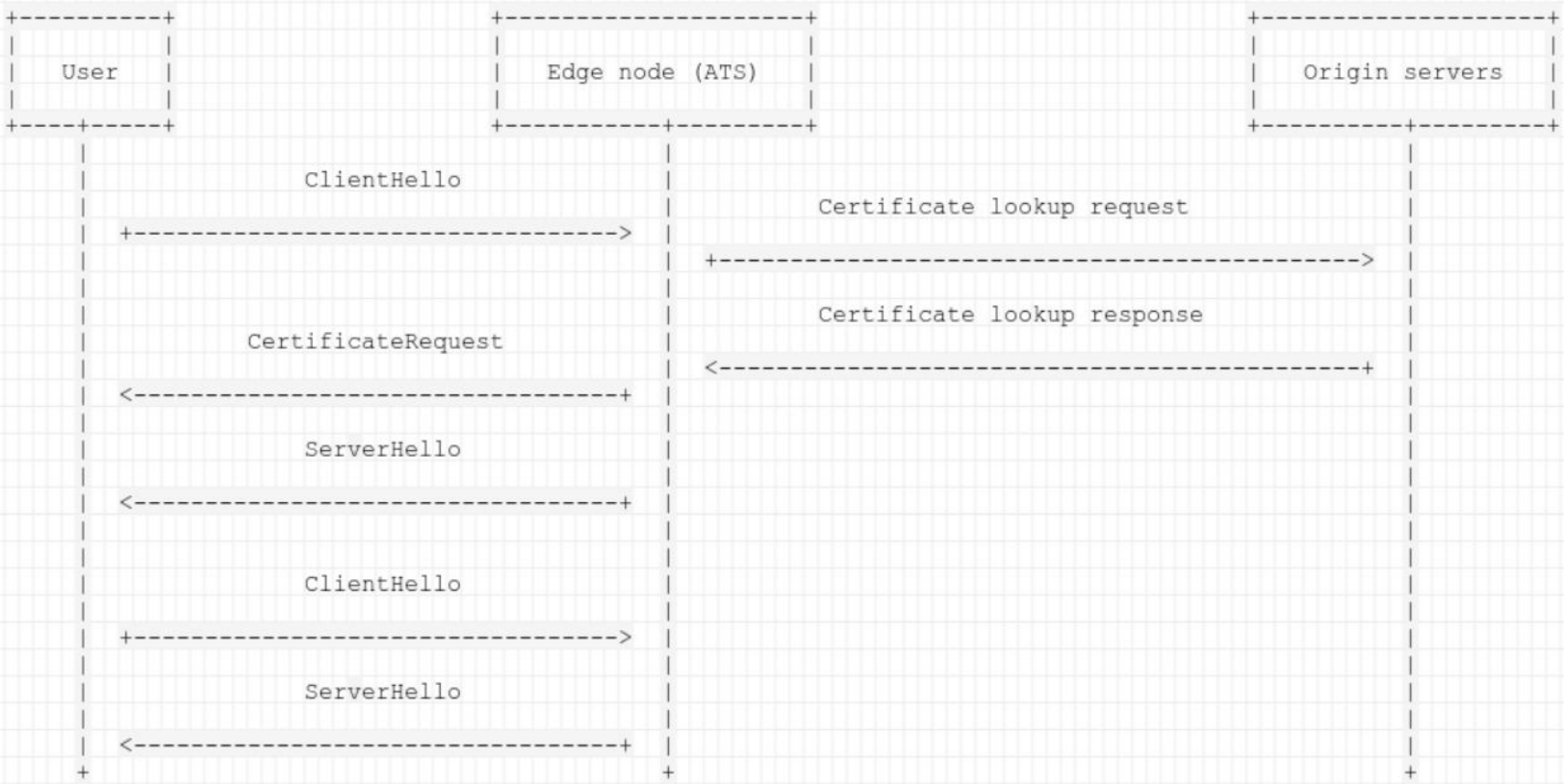
Automatically enable HTTPS on your website with EFF's Certbot, deploying Let's Encrypt certificates.

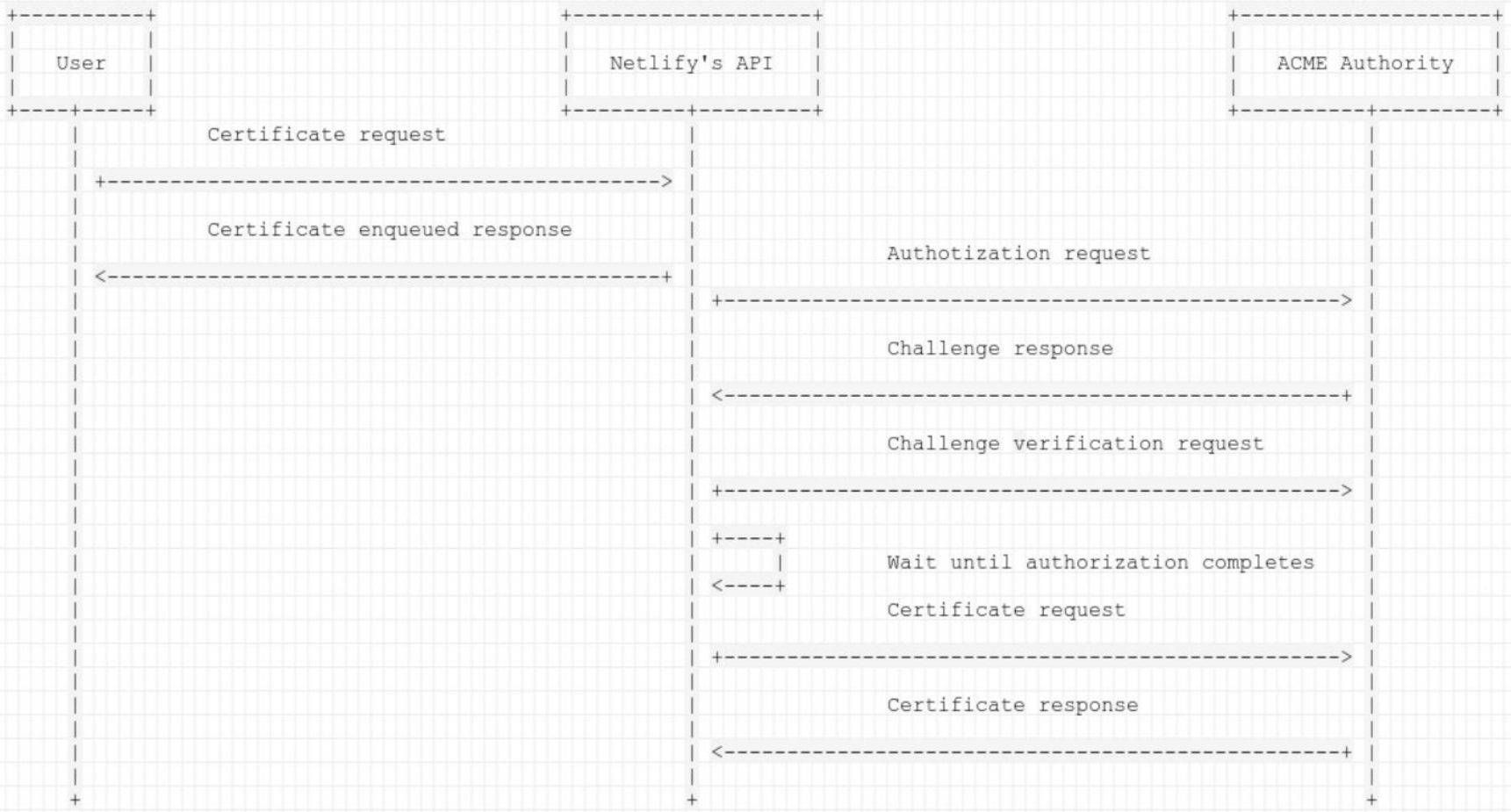
I'm using Software on System

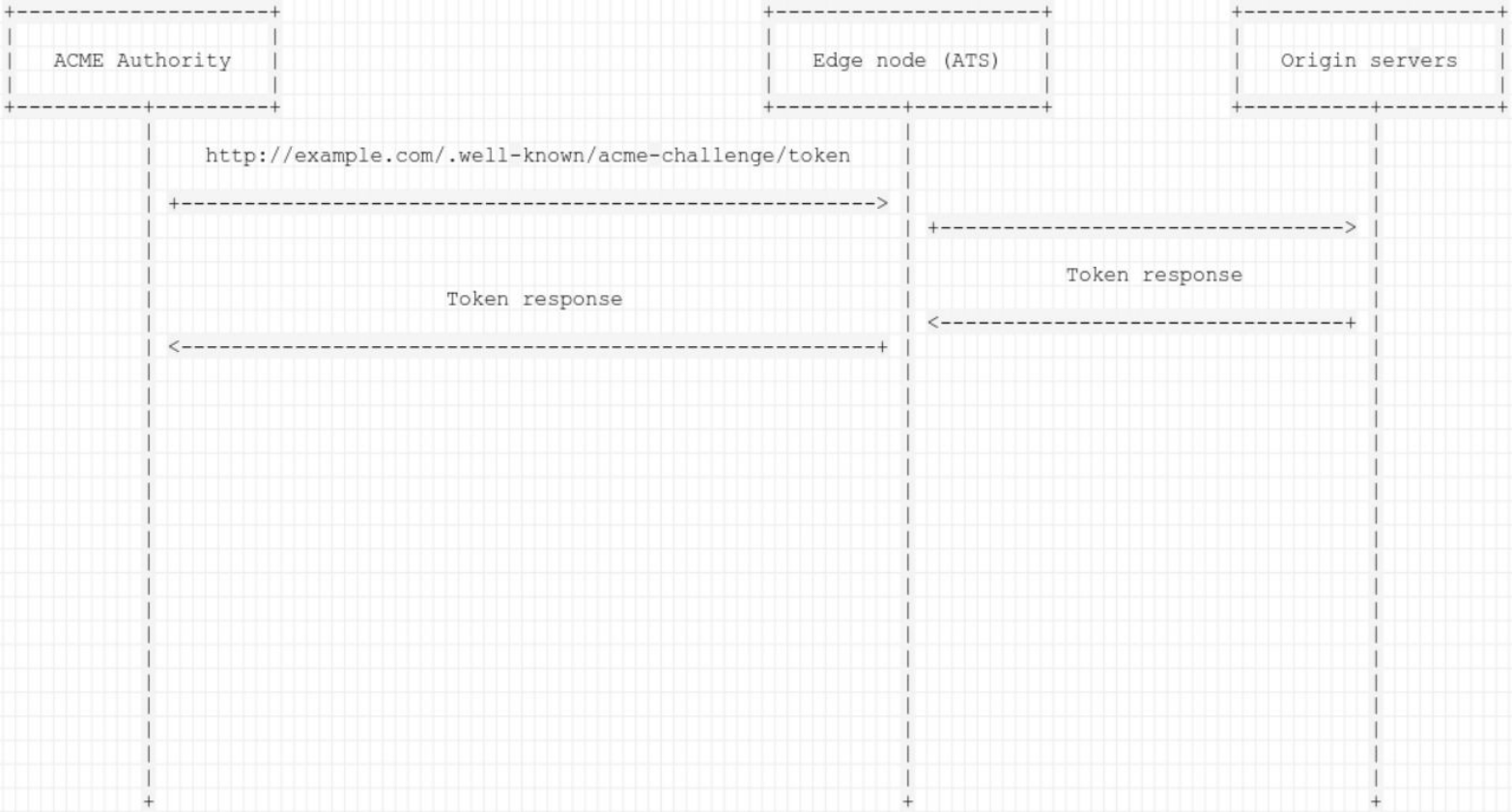
To get instructions for Certbot, choose your server software and the system it is running on from the dropdown menus above. You can then pick "advanced" if you want less automation and more control.

letsencrypt.org/docs/client-options

How does Netlify's Certificate Engine work?


User
Edge node (ATS)
Origin servers
ClientHello
Certificate lookup request
Certificate lookup response
CertificateRequest
ServerHello
ClientHello
ServerHello


User
Netlify's API
ACME Authority
Certificate request
Certificate enqueued response
Authotization request
Challenge response
Challenge verification request
Wait until authorization completes
Certificate request
Certificate response


ACME Authority
Edge node (ATS)
Origin servers
http://example.com/.well-known/acme-challenge/token
Token response
Token response

Lessons learned after provision thousands of certificates

1 Nobody knows how DNS propagation works

DNS resolution

> As a domain may resolve to multiple IPv4 and IPv6 addresses, the server will connect to at least one of the hosts found in A and AAAA records, at its discretion.

2 Beware of the rate limits

Rate limits

20 SAN Certificates per registered domain per week.
- example.org
- staging.example.org
- [PUT YOUR GIT BRANCH HERE].example.org

5 Duplicate Certificates per week.

3 The network is still **not** reliable

https://aphyr.com/posts/288-the-network-is-reliable

How **will** Netlify's Certificate Engine work in the future?

1 User facing API for DNS propagation verifications

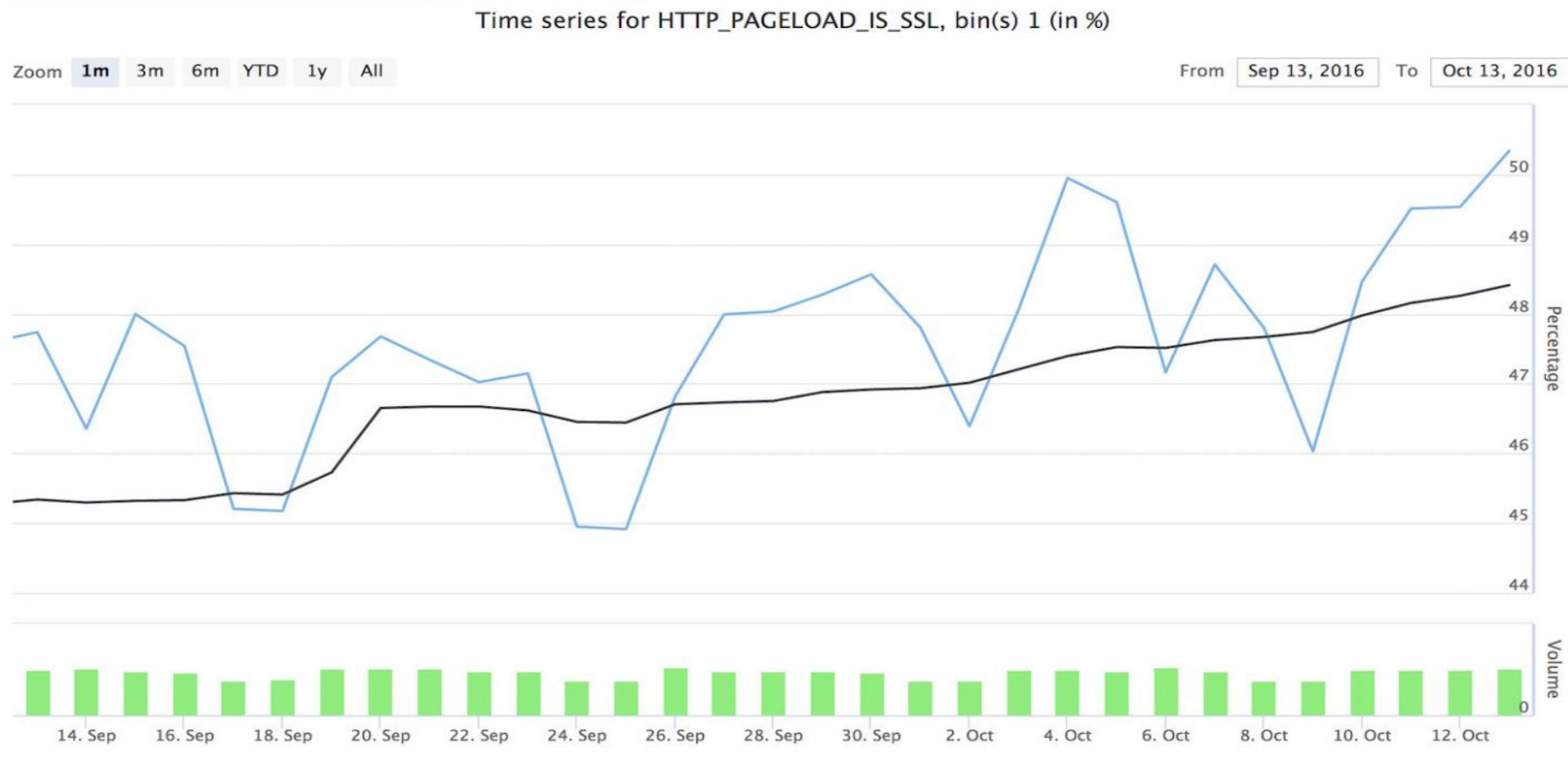
2 Certificate request batching and lazy provisioning

3 Based on message bus with better delivery guarantees

4 Open Source, independent service

HTTPS adoption has reached the tipping point

https://www.troyhunt.com/https-adoption-has-reached-the-tipping-point/



Let's Encrypt @letsencrypt · 14 Oct 2016

Yesterday, for the first time, @Mozilla telemetry shows more than 50% of page loads were encrypted with HTTPS.
pic.twitter.com/kADcLOLsQ7

Thank you for listening!

David Calavera

Netlify