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Stub to recursive

Overview: Summarise the most recent evolutions in how end-device DNS resolution is being done (~past 5 years)

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dnsprivacy.org

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Goal today is to bring awareness to this audience of fast moving changes: **The good, the bad and the ugly….**

RFC1034 RFC1035

No Security or Privacy in the original design!

RFC7258:
Pervasive Monitoring
is an attack

DPRIVE WG
formed

Goals:
1) Encrypt Stub-Rec DNS
2) Think about Rec-Auth?

Snowdon
Revelations

1987
2012
2013
2014
2016
2018

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RFC7766:
DNS-over-TCP

RFC7858:
DNS-over-TLS

Port 853

Snowdon
Revelations

2013

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Date	Event
2015 - 2018	Clients Servers
2015 - now	Set of 20 test DoT servers
Nov 2017	
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Need native Windows
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Easy to run a DoT server

RFC8310

✓

Opportunistic DoT:
just need IP address
(Android Pie default)

RFC8310

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[RFC8310]

Strict DoT: need
a name too

draft-rescorla-tls-esni

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Encrypted traffic bypasses local monitoring & security policies

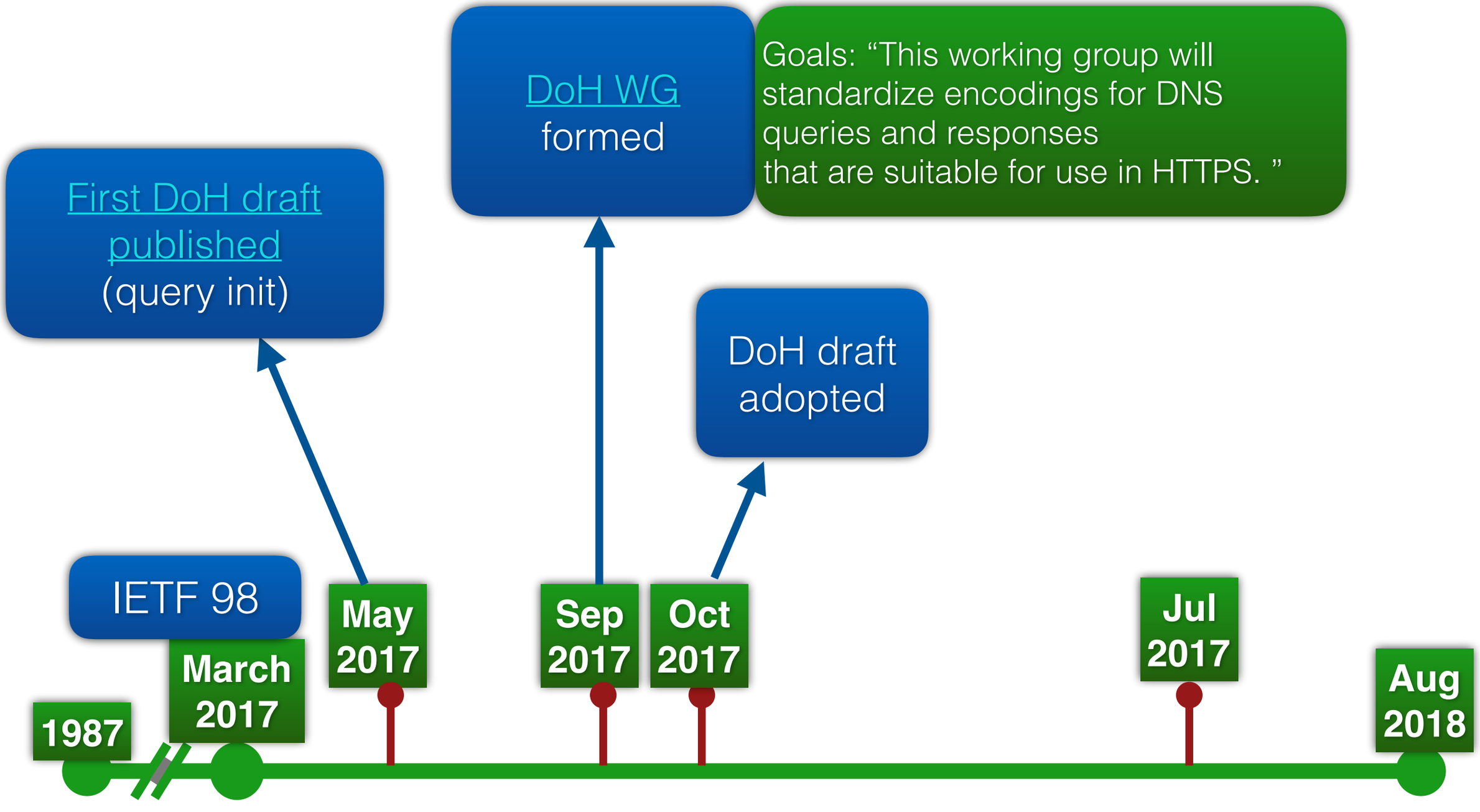
draft-rescorla-tls-esni

Encrypted traffic bypasses local monitoring & security policies

For DoT, seen as short term or rare…


WHAT IF I TOLD YOU BROWSERS
ARE GOING TO DO THEIR OWN DOH
imgflip.com

…..to their own chosen cloud resolver service!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DoH WG formed
Goals: “This working group will standardize encodings for DNS queries and responses that are suitable for use in HTTPS. ”
DoH draft adopted
IETF 98
1987
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May 2017
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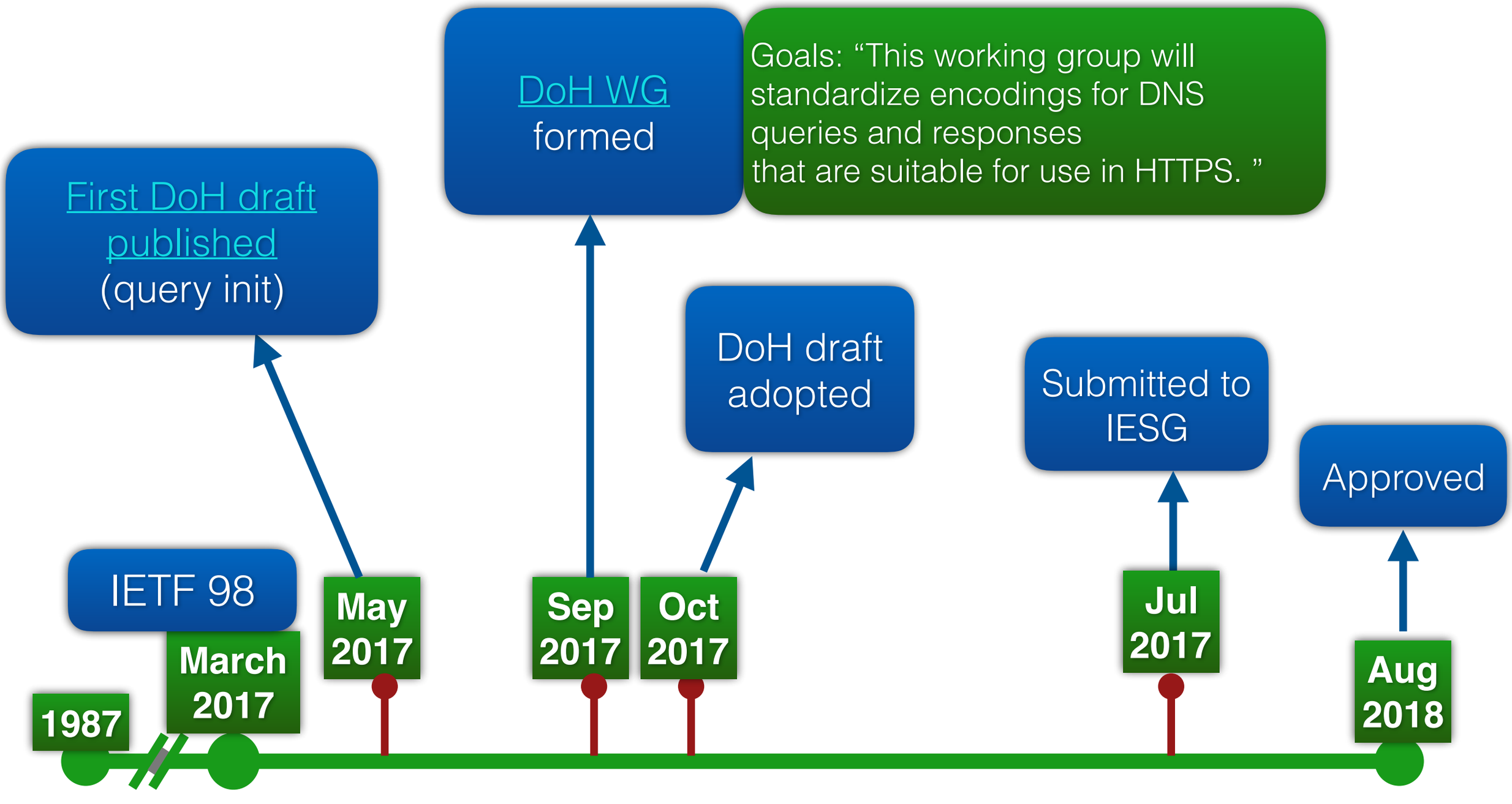
Oct 2017
Jul 2017
Aug 2018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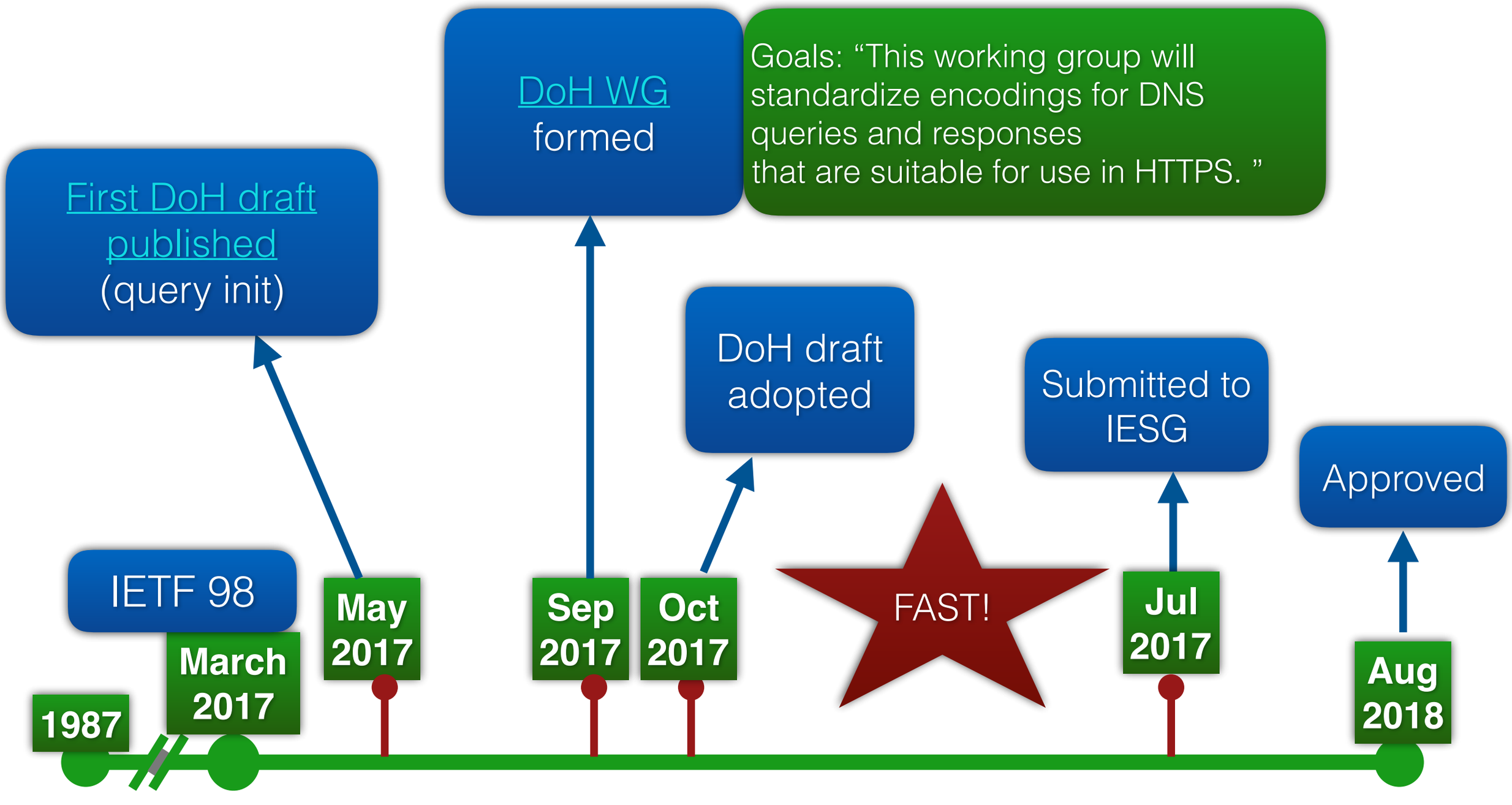
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Specification differences

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No ‘Opportunistic’

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Impossible to block JUST DNS traffic

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New privacy concerns

	Standalone	Large Scale
Servers	~10 other test servers	Cloudflare Google Quad9

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	Client	Servers
Implementations	Various experimental	Various experimental

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"**Moziflare**"

	Client	Servers
Implementations	Various experimental	Various experimental

Yandex Tenta

Dedicated DoH connections

Recent a PR to add config option

Yandex Tenta

Dedicated DoH connections

Recent a PR to add config option

Browser vendors control the client and update frequently.

Mozilla’s answer:

OS's are slow to offer new DNS features (DoT/DoH)

Selling point: "we care about the privacy of our users"

Performance: "reduce latency within browser"

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HTTPS everywhere: "it works… just use port 443, mix traffic"

Cool stuff: "JSON, Server Push, 'Resolverless DNS'…."

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DNS 2.0?

Dedicated DoH connections

Experiment & Future plans

Dedicated DoH connections

Experiment & Future plans

- **“We’d like to turn this [DoH] on as the default for all of our users”**
- **“Cloudflare is our ‘Trusted Recursive Resolver’ (TRR)”**

Dedicated DoH connections

Experiment & Future plans

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- **“Cloudflare is our ‘Trusted Recursive Resolver’ (TRR)”**

“With this [agreement], we have a resolver that we can trust to protect users’ privacy. This means **Firefox can ignore the resolver that the network provides** and just go straight to Cloudflare.”

Dedicated DoH connections

[Firefox Nightly ‘Experiment’]

[Experiment results]

[Another experiment in Firefox Beta announced]

Dedicated DoH connections

[Firefox Nightly ‘Experiment’]

[Experiment results]

1. Does the use of a **cloud DNS service** perform well enough to replace traditional DNS?”

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Dedicated DoH connections

[Firefox Nightly ‘Experiment’]

[Experiment results]

1. Does the use of a **cloud DNS service** perform well enough to replace traditional DNS?”

RESULTS: 6ms performance overhead is acceptable

“**We’re committed long term to building a larger ecosystem of trusted DoH providers that live up to a high standard of data handling.**”

[Another experiment in Firefox Beta announced]

Tweet from Mozilla developer

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Impact of TRRs? Applications using default TRRs fundamentally change the existing **implicit** consent model for DNS:

- (Current) Log onto a network and use the DHCP provided resolver
- (New?) Use an app and agree to app T&C's (including DNS?)

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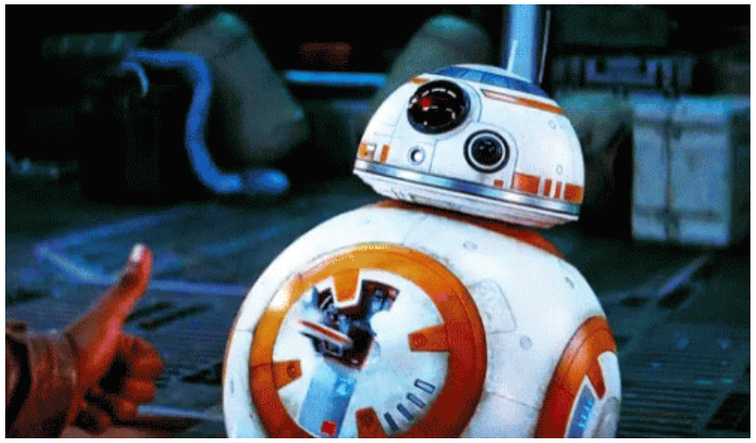
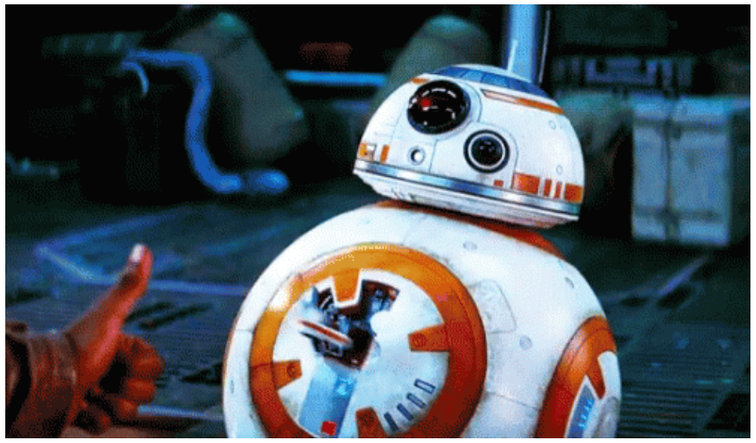
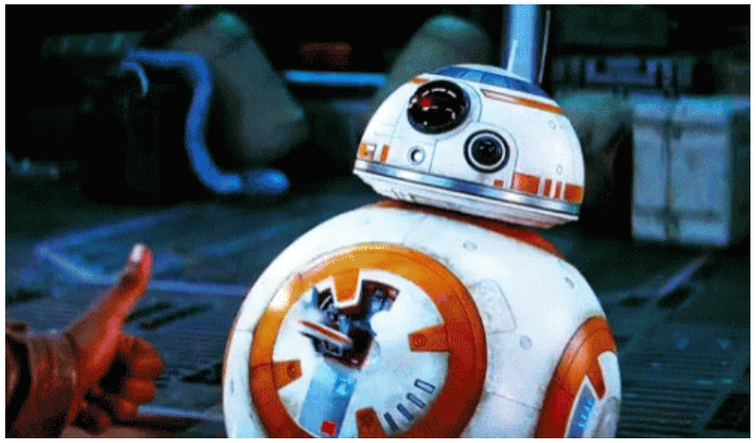
Potential **centralisation** of DNS resolution to a few providers?






I've got a bad feeling
about this...



Soon, DoH+TRR in this browser will be fully operational!

EPIC thread on DNSOP

Analysis of third party DNS by PowerDNS

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Lots of questions…

DoH discovery mechanism Best Current Practices

More detailed DNS-OARC talk

dnsprivacy.org twitter

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Stay tuned….