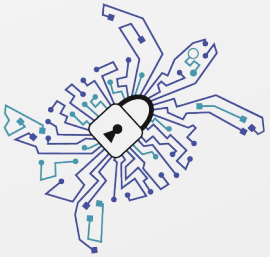
DNS-over-HTTPS Intro für ISPs

ATNOG Juli 2019



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- Non-profit Privacy Infrastruktur Provider
- Privacy Enhancing Technology Dienste für die Öffentlichkeit
- 2018 gegründet
- Top 3 Tor Relay Operator (weltweit)
- DoH und DoT Resolver Betreiber
- ISPA Member

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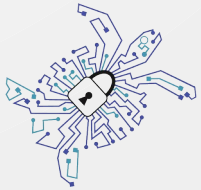
Ziele dieses Vortrags

- Welche Probleme löst DoH?
- Wie sieht DoH technisch aus?
- Browser Deployment Strategien
- Potentielle neuen Herausforderungen für ISPs
- DNS Zentralisierung: Risiko + Mitigation



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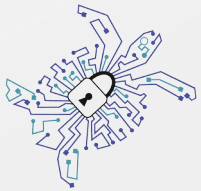
Warum DNS Traffic schützen?



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User/Browser

DNS Resolver

de.wikipedia.org Webserver

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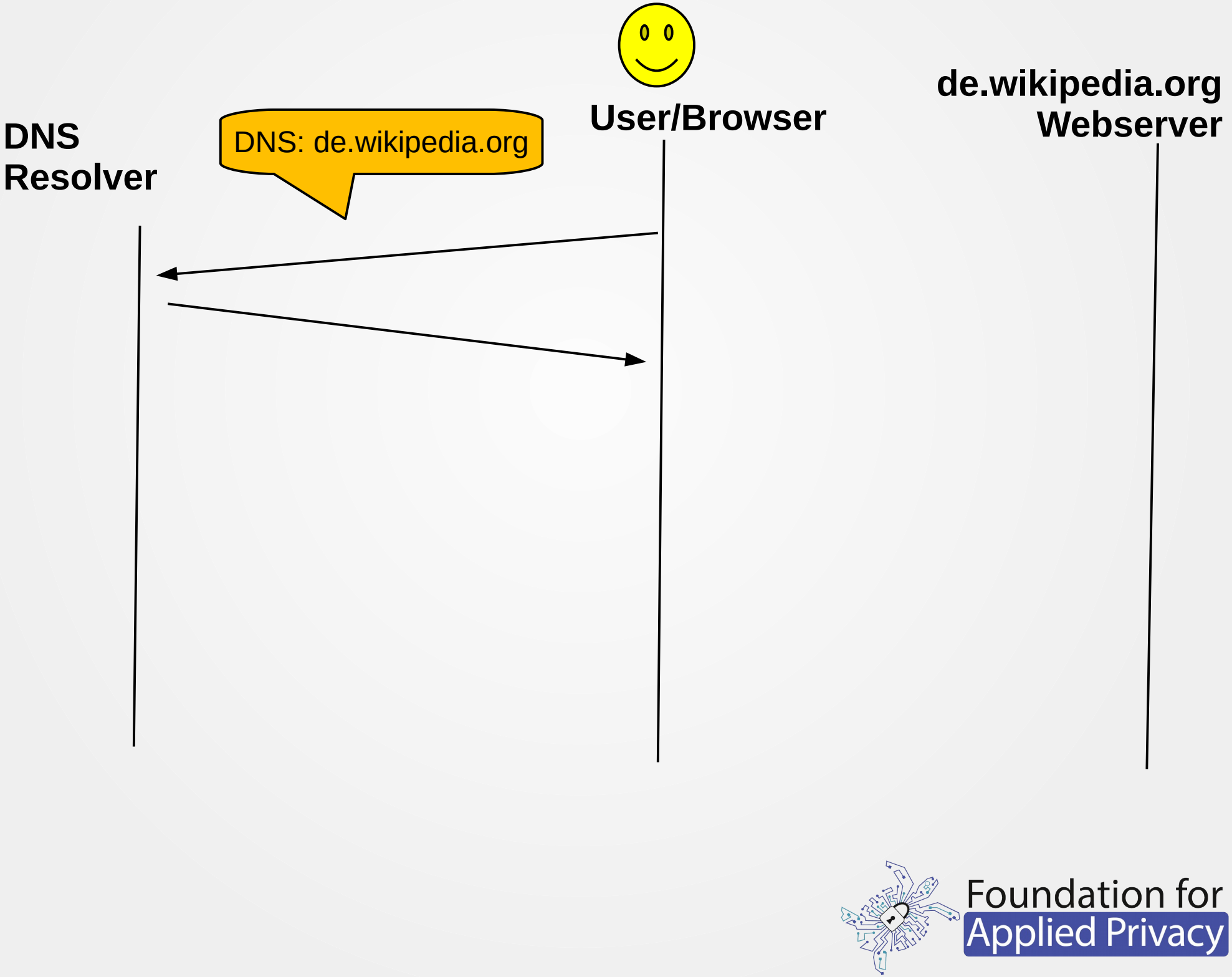

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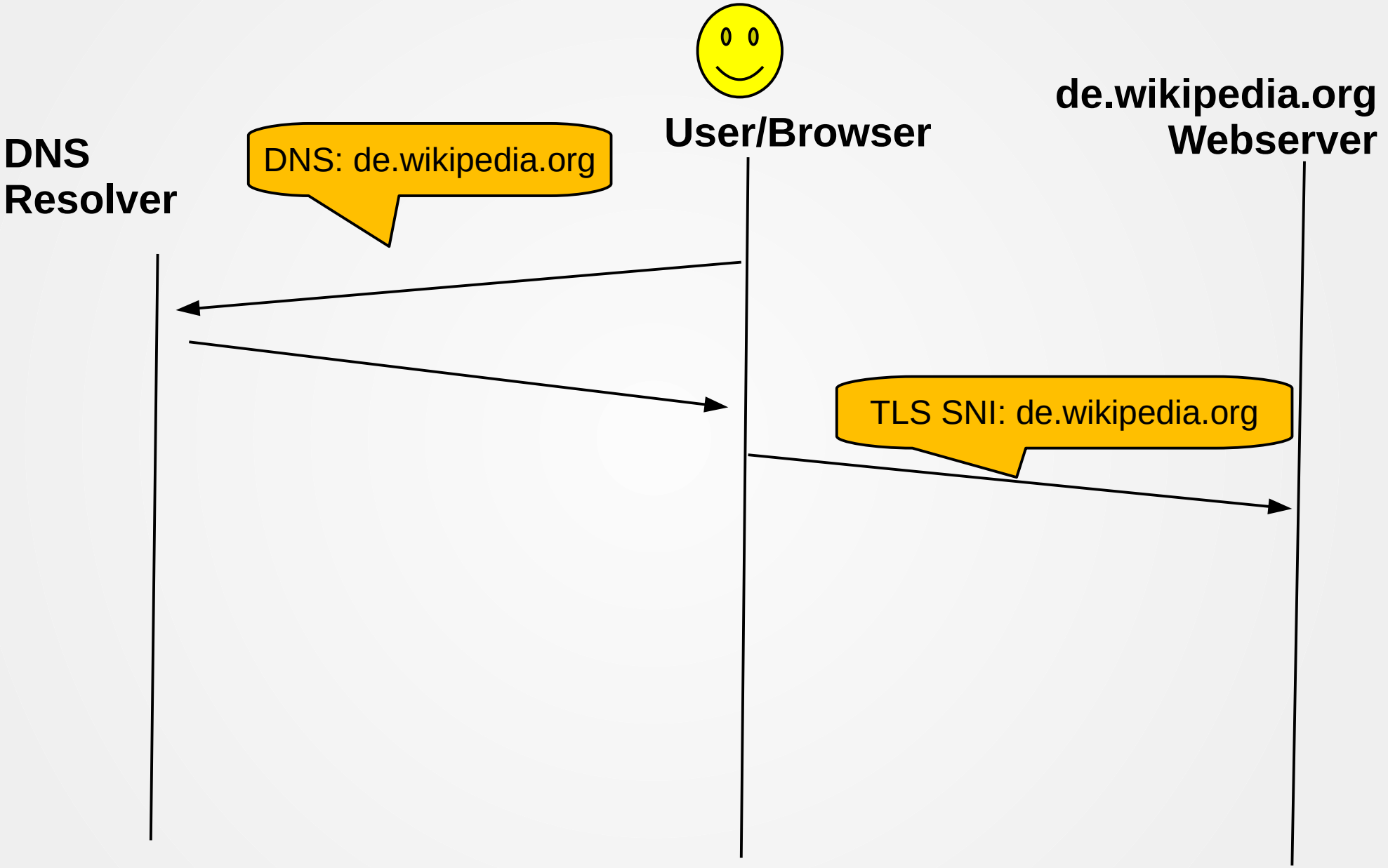

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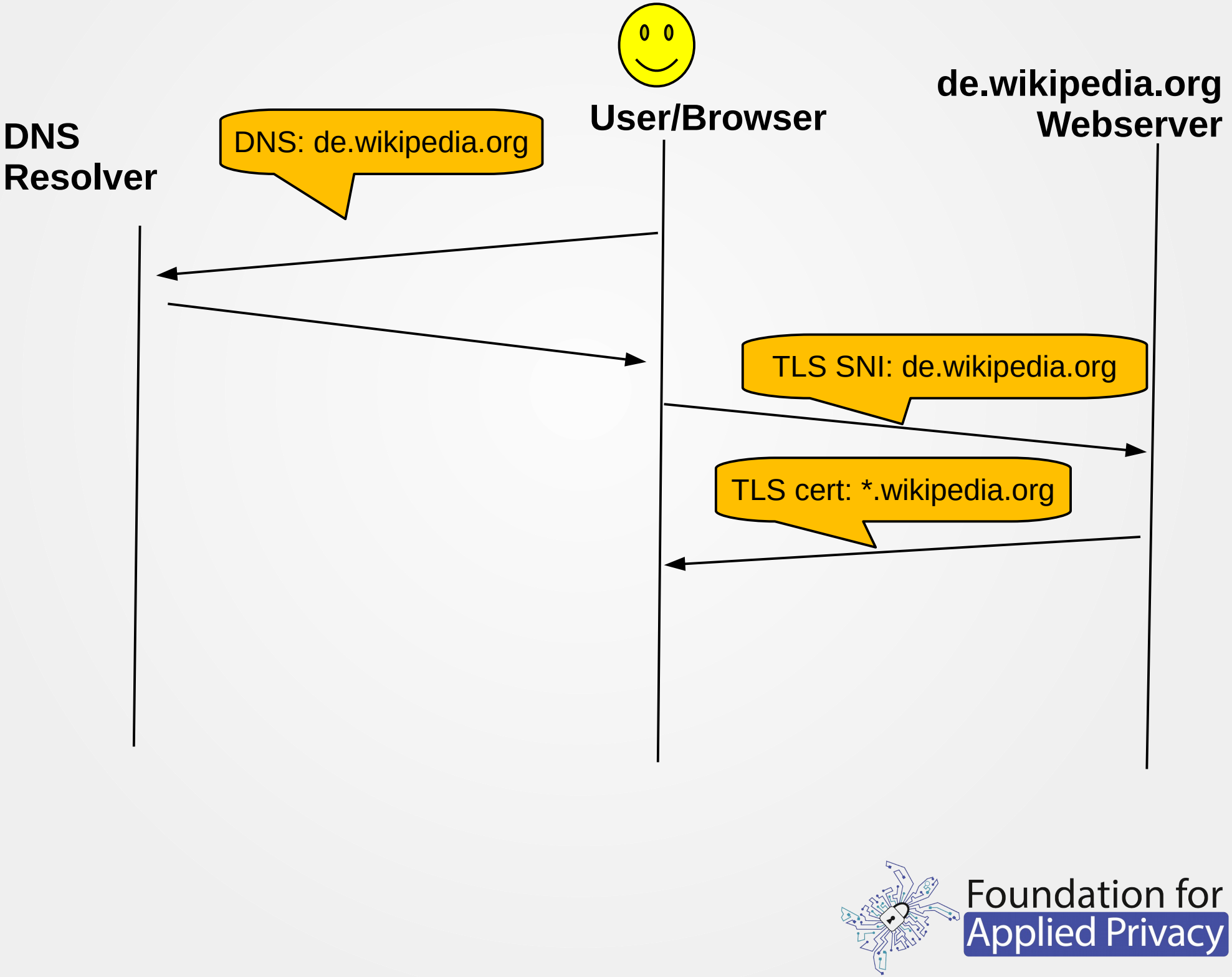

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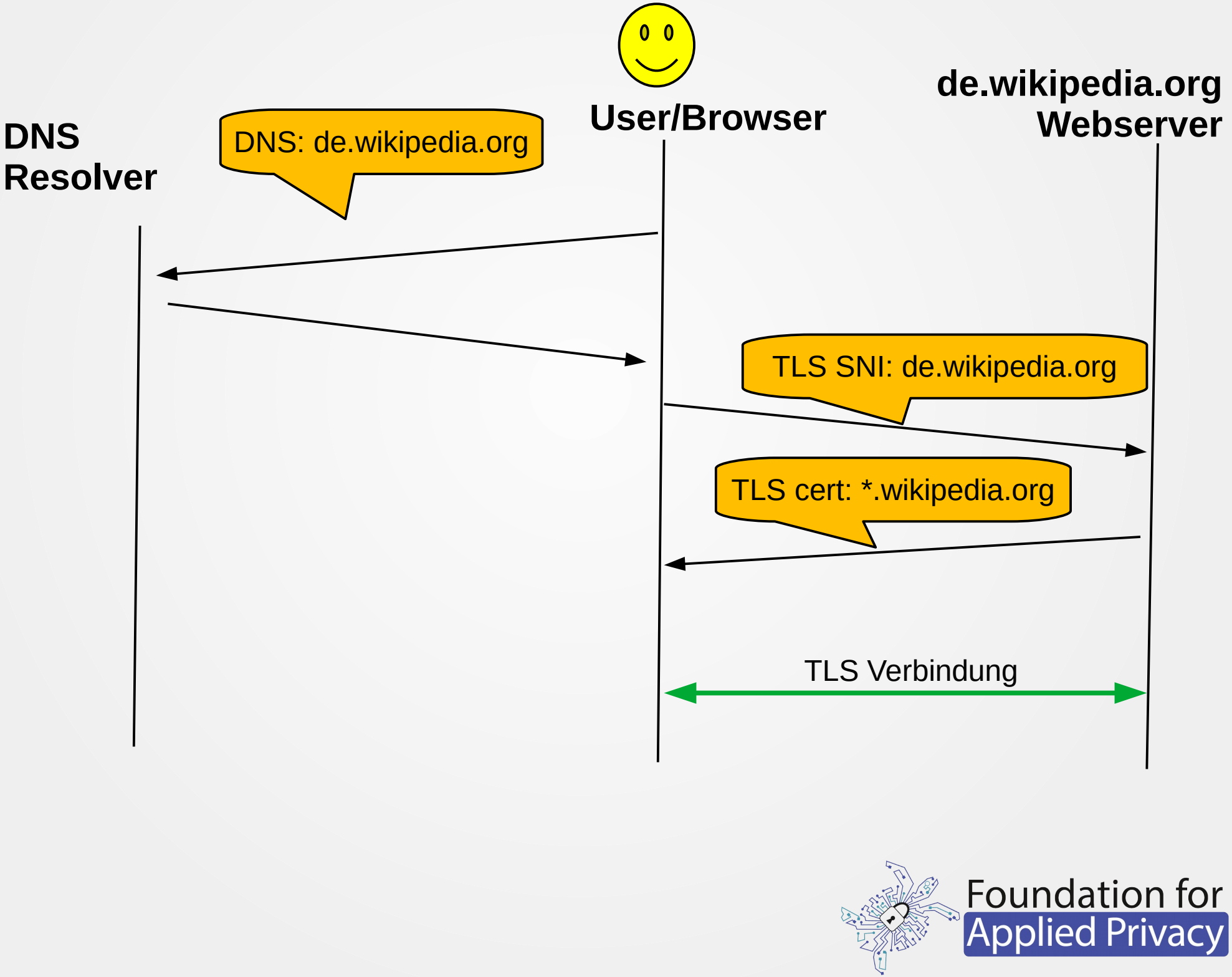

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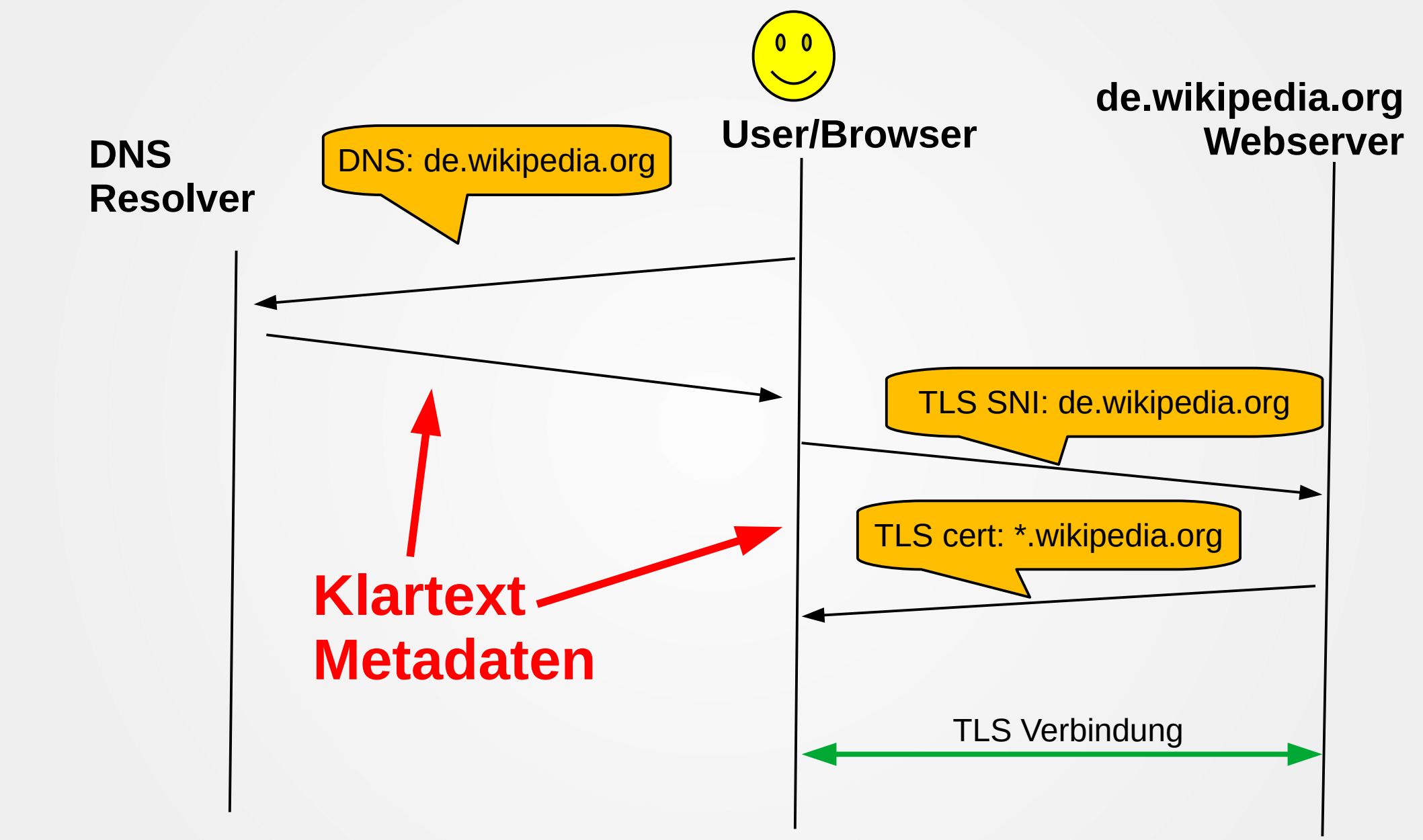

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BEST CURRENT PRACTICE

Internet Engineering Task Force (IETF)
Request for Comments: 7258
BCP: 188
Category: Best Current Practice
ISSN: 2070-1721

S. Farrell
Trinity College Dublin
H. Tschofenig
ARM Ltd.

May 2014

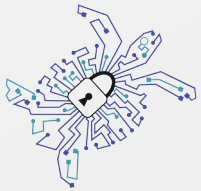
Pervasive Monitoring Is an Attack

Abstract

Pervasive monitoring is a technical attack that should be mitigated in the design of IETF protocols, where possible.

Ziel

Schutz von Metadaten (Hostnamen)



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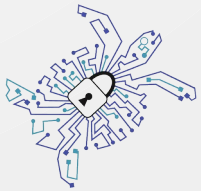
DNS



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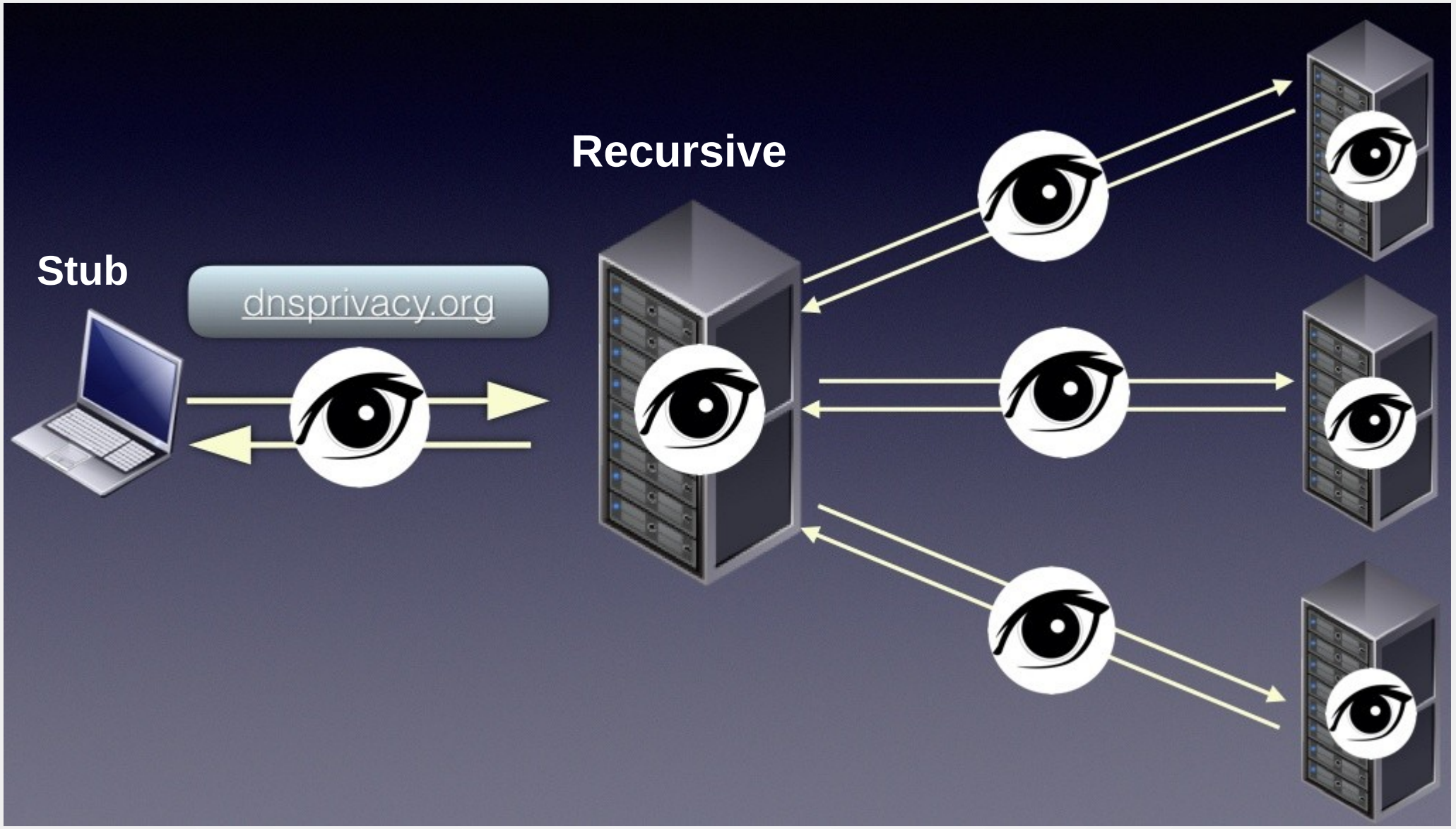

Quelle: dnsprivacy.org

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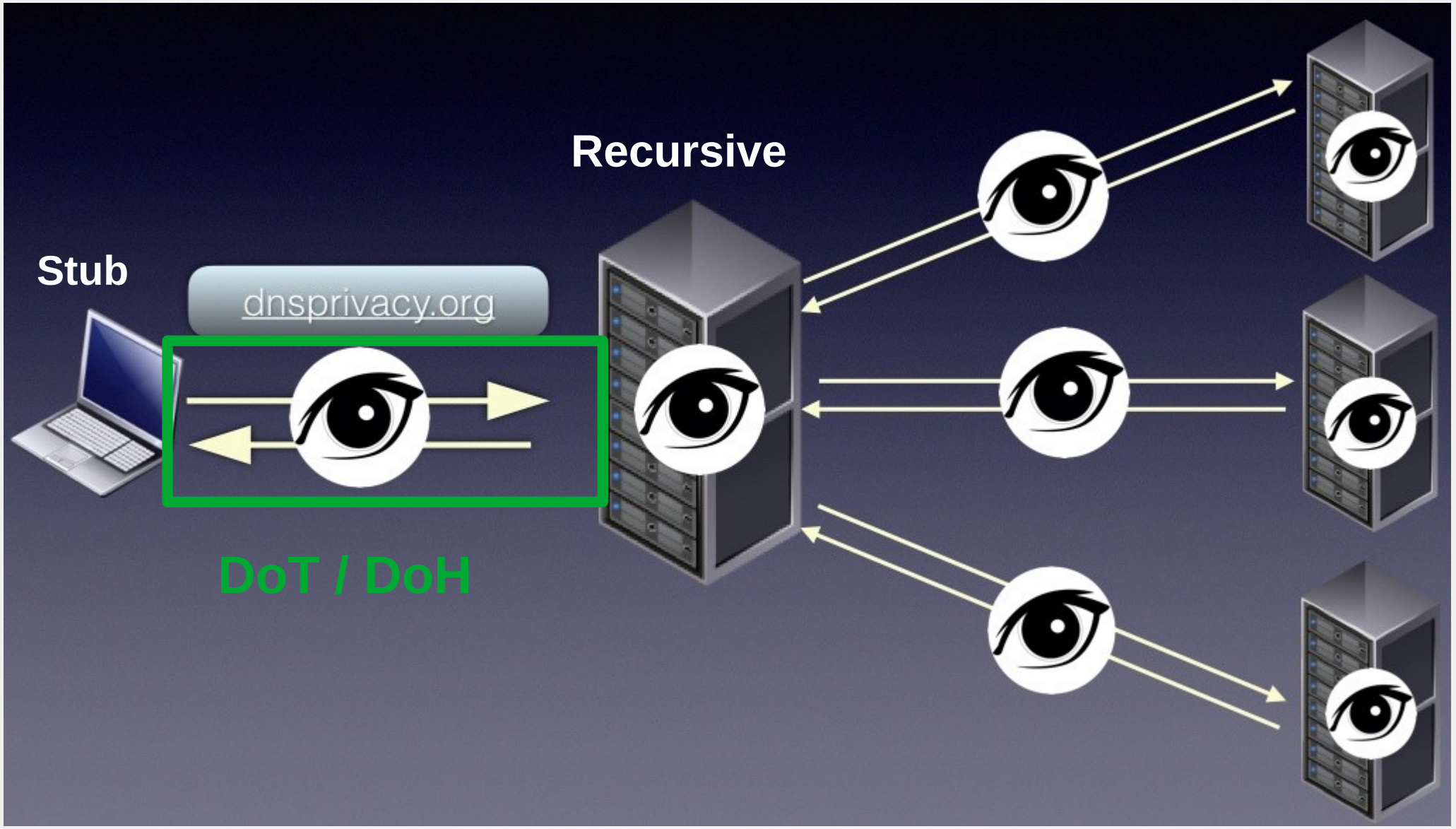

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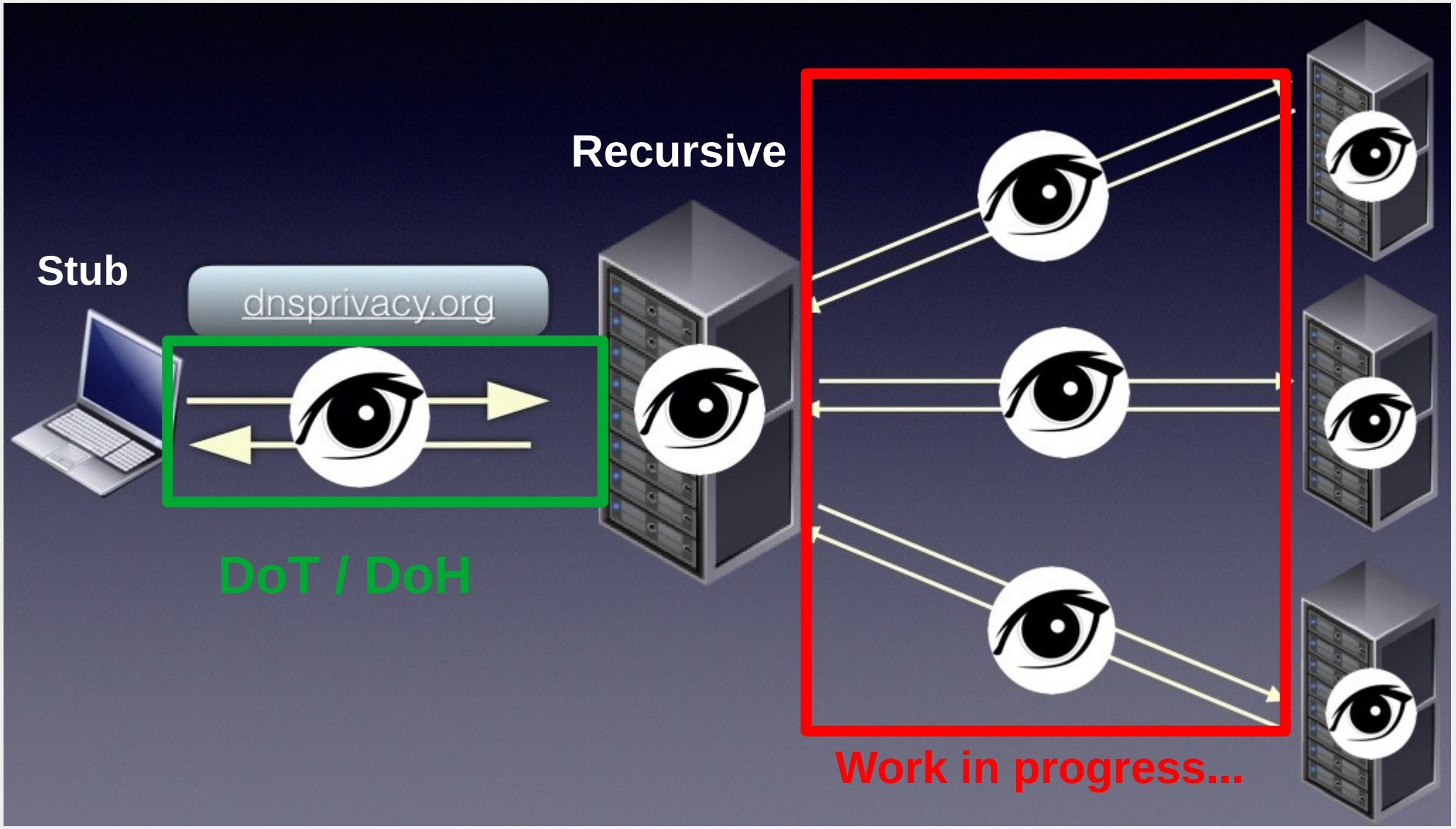

Quelle: dnsprivacy.org

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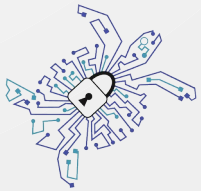
DNS-over-HTTPS (DoH)

RFC 8484 (Okt 2018)



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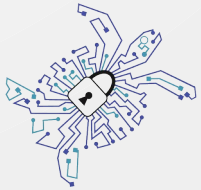
DoH - Motivation

- DNS Traffic vertraulich übertragen
- DNS Traffic vor Manipulation schützen
- soll auch in restriktiven Netzen funktionieren (in denen zB. nur 53/80/443 erlaubt ist)
- vor allem von Browsern getrieben



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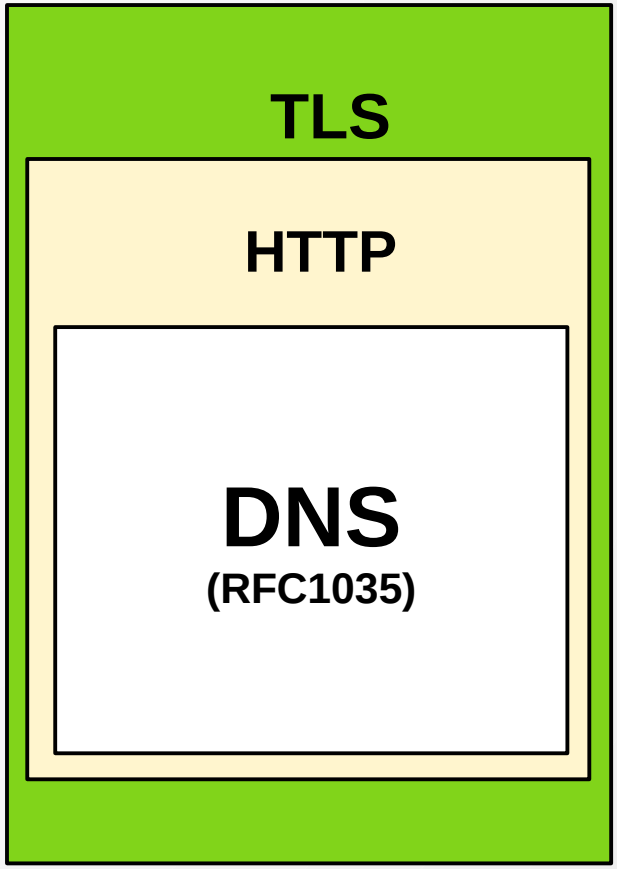
DoH

- HTTPS (TCP/443)
- **POST**
- oder GET (base64url)
- HTTP/2 (empfohlen)
- Content Type: application/dns-message



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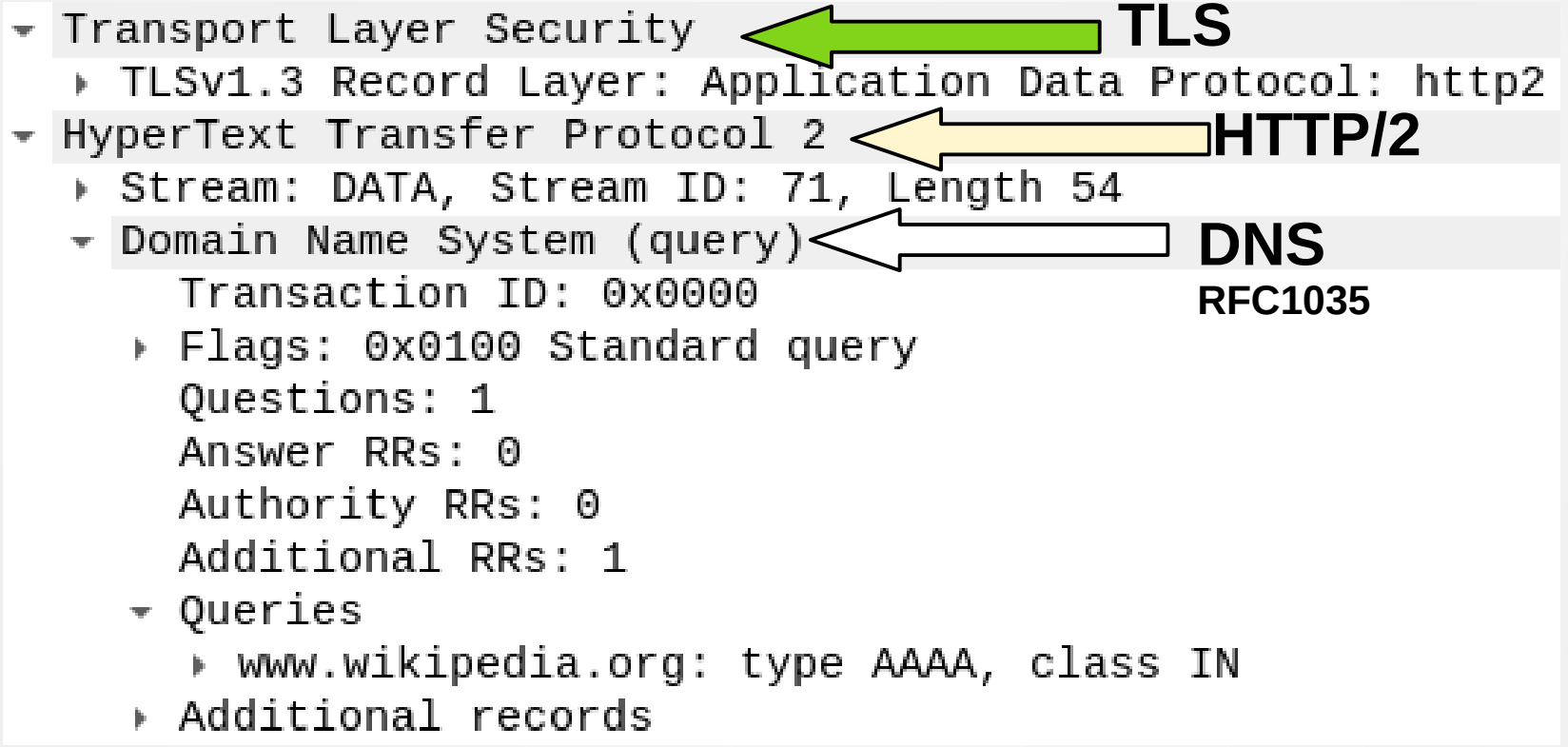
DoH Anfrage (**entschlüsseltes** Beispiel)



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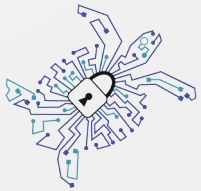
DoH Client Software

- Firefox
- Chrome (angekündigt)
- Jigsaw Intra (Android)
- dnscrypt-proxy (hat auch DoH Support)
  - DNSCloak (iOS)
  - Simple DNSCrypt (Windows)
- curl, ...



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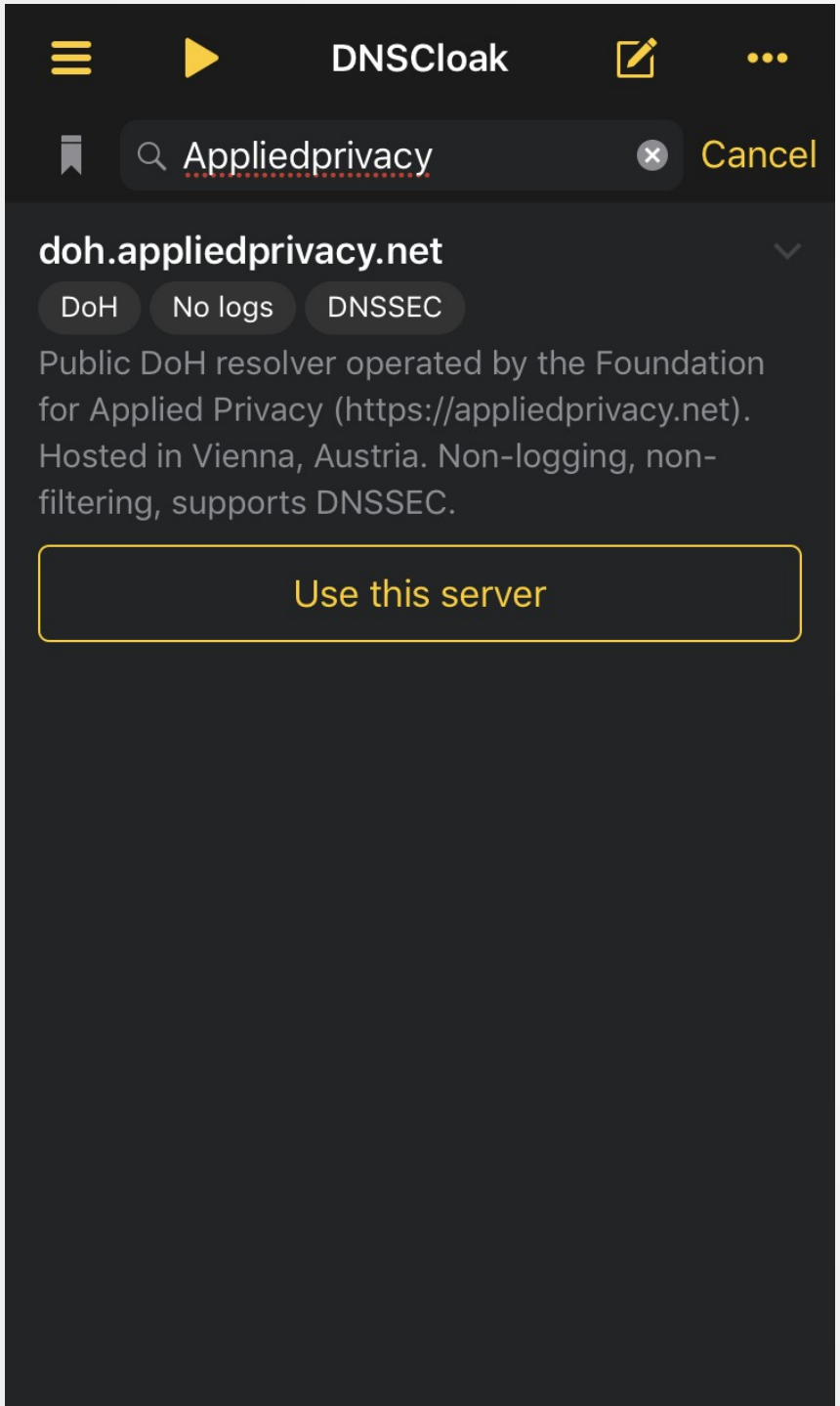
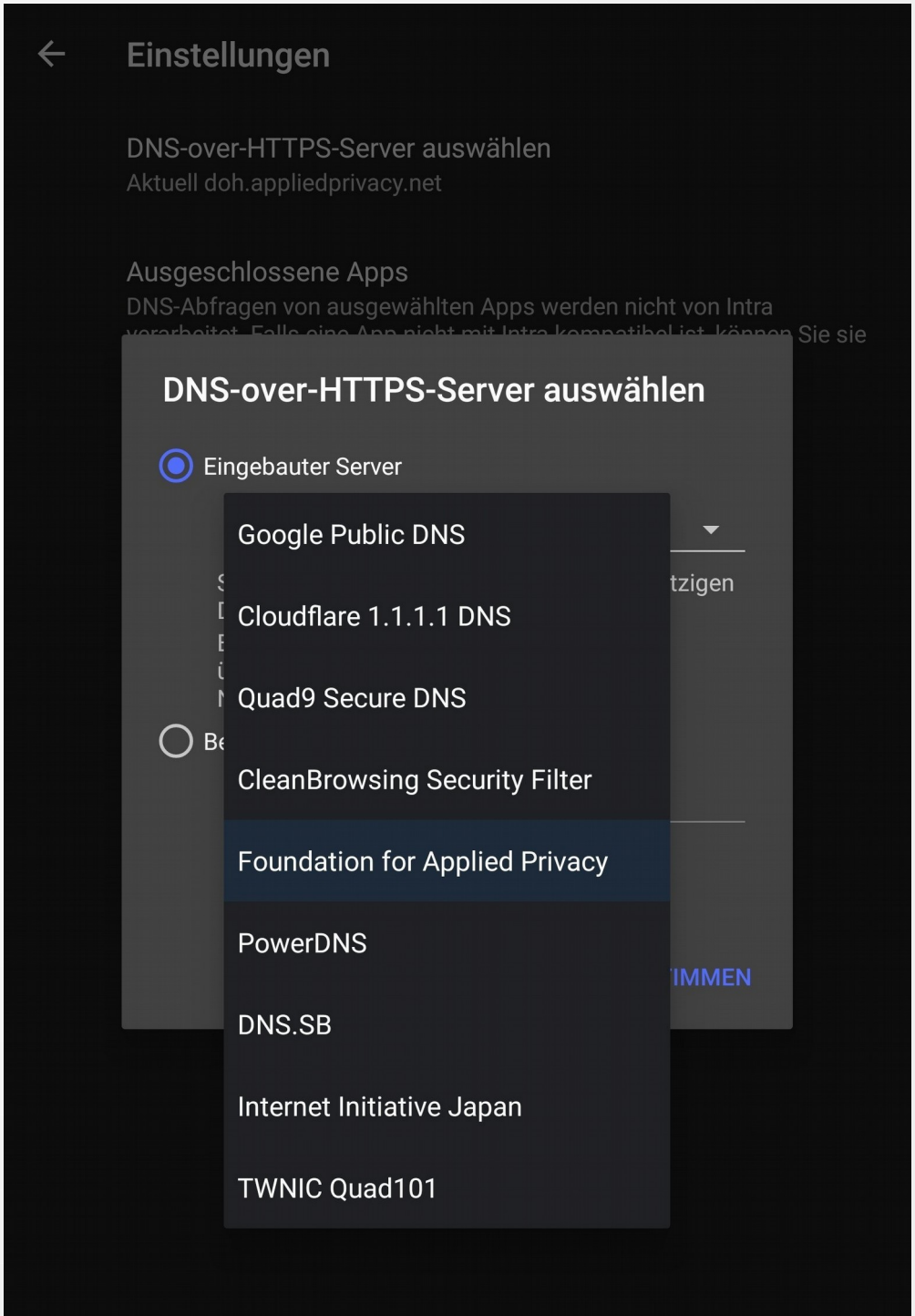
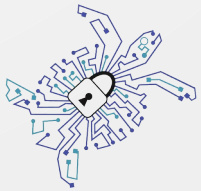
DNSCloak (iOS)



Jigsaw Intra (Android)



DoH Deployment Strategien von Firefox/Chrome



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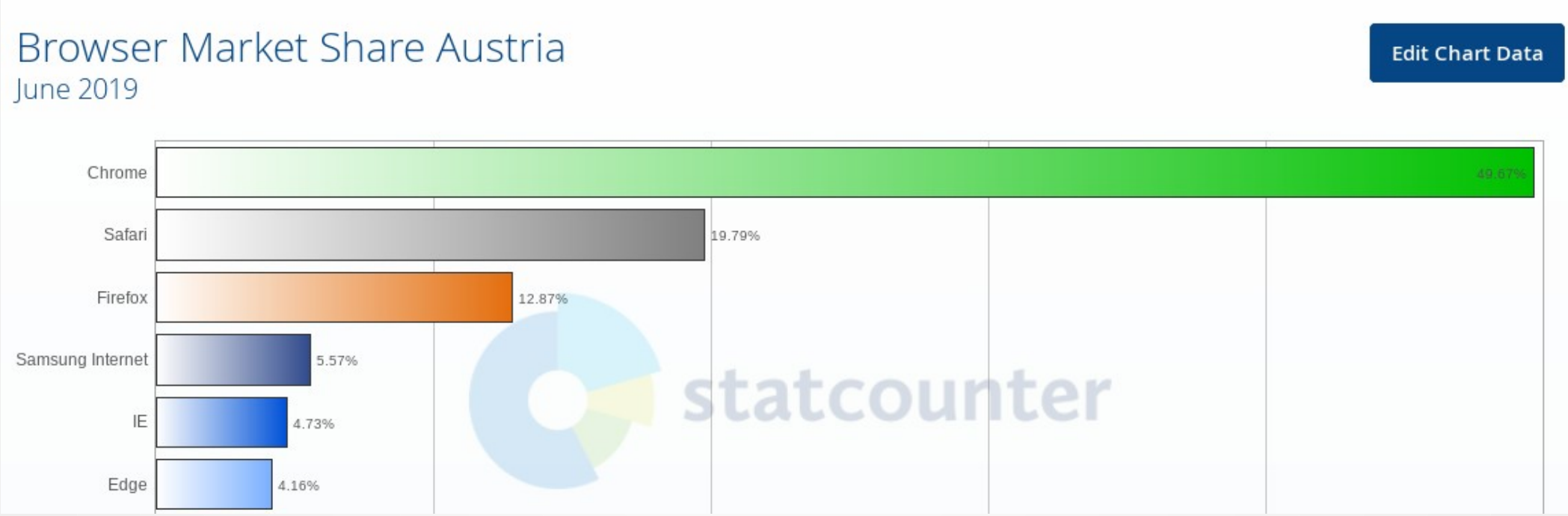

http://gs.statcounter.com/browser-market-share/all/austria/#monthly-201906-201906-bar

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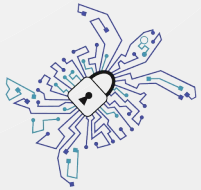
Googles Pläne für Chrome (angekündigt)

- DoH wird nicht global per default aktiviert
- Automatisches Upgrade zu DoH sofern vom bereits verwendeten Resolver unterstützt
- Statische Liste im Browser (Resolver IP -> DoH URI)

https://mailarchive.ietf.org/arch/msg/dns-privacy/kpt6ZYMN5H3DsXPVi_QldmbAdJw



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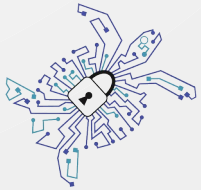
Mozillas DoH Pläne für Firefox (angekündigt)

- Mozilla will DoH per default aktiviert
- Eine (kurze) Liste an default DoH Server (TRR) soll mit Firefox ausgeliefert werden
- Zeitplan noch nicht bekannt

https://mailarchive.ietf.org/arch/msg/doh/po6GCAJ52BAKuyL-dZiU91v6hLw



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Mozilla / Cloudflare Kritik

Quelle: https://ungleich.ch

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Mozilla / Cloudflare Kritik

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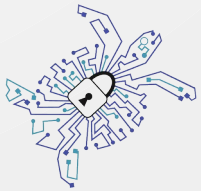
Mozillas Trusted Recursive Resolver Anforderungen (Auszug)

- kein Datenweitergabe an Dritte
- Speicherlimit nicht-aggregierter Daten: 24h
- QNAME Minimization (RFC 7816)
- kein EDNS Client Subnet (RFC 7871) sofern keine verschlüsselte Verbindung mit authoritativen NS



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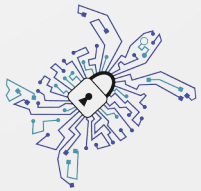
Mozillas Trusted Recursive Resolver Anforderungen (Auszug)

- keine Filter die nicht rechtlich vorgeschrieben oder vom Benutzer bestellt sind

- Filterlisten müssen öffentlich sein

- Kein NXDOMAIN Hijacking
- jährliche Transparenzberichte



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MUST READ: Amazon Prime Day 2019: How and when to find the best deals

UK ISP group names Mozilla 'Internet Villain' for supporting 'DNS-over-HTTPS'

UK government and local ISPs are putting the pressure on browsers to drop plans to support DoH protocol.

By Catalin Cimpanu for Zero Day | July 4, 2019 -- 22:55 GMT (23:55 BST) | Topic: Security

ZDNet

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ISPA withdraws Mozilla Internet Villain Nomination and Category

Posted on 9th July 2019

Last week ISPA included Mozilla in our list of Internet Villain nominees for our upcoming annual awards.

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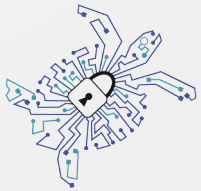
Potentielle neue Herausforderungen für ISPs



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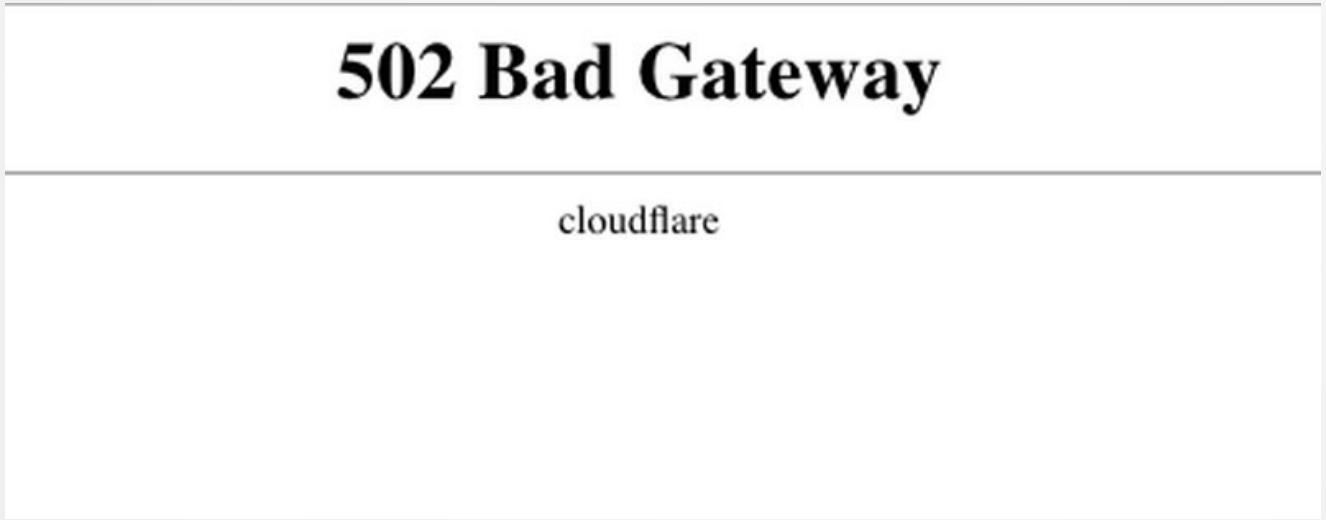
End-User Support

Wen werden Endbenutzer anrufen wenn das “Internet nicht geht” (weil der DoH Provider down ist)?



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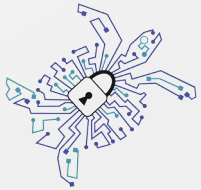
Content Caches

- DNS spielt eine wesentliche Rolle bei der Traffic Steuerung zu “lokalen” Caches
- Authoritative Nameserver verwenden dazu die Client-IP Adresse/Subnet, bzw. die Resolver IP Adresse
- Mozilla Firefox: Tests mit/ohne ECS



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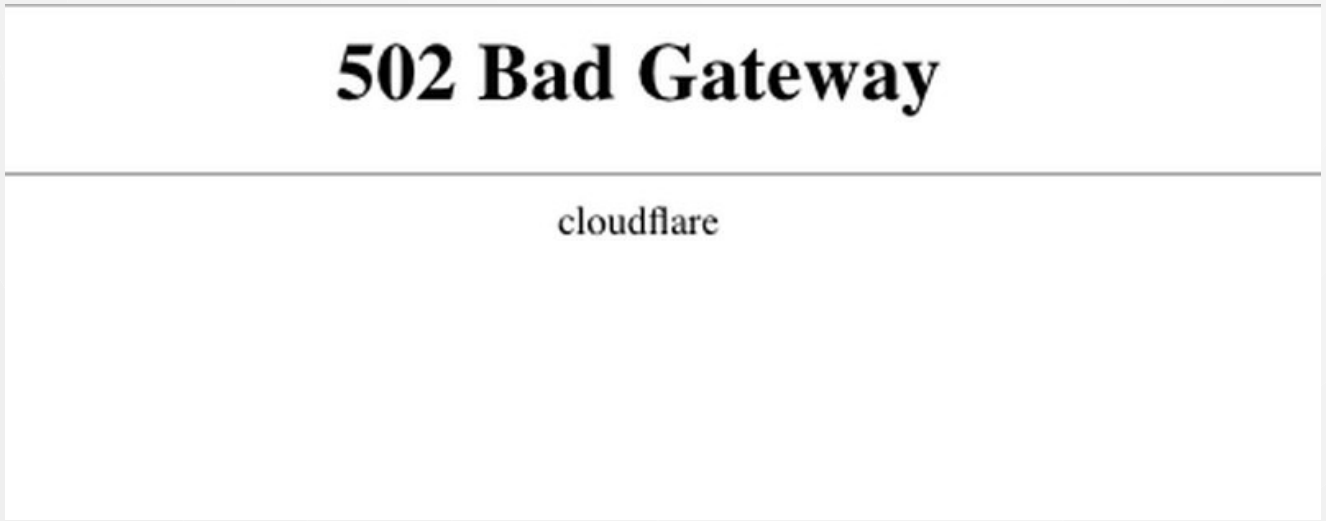
Risiko: DNS Zentralisierung

DoH birgt das Risiko einer Zentralisierung der globalen DNS Resolver Infrastruktur.



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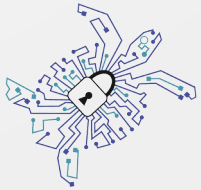
Risiko: DNS Zentralisierung

- Empfehlung: DNS Resolver Infrastruktur auf DoH/DoT upgraden

- DoH/DoT Discovery Protokoll auf die Roadmap setzen.

  IETF Work in Progress:

  https://datatracker.ietf.org/doc/draft-sah-resolver-information/



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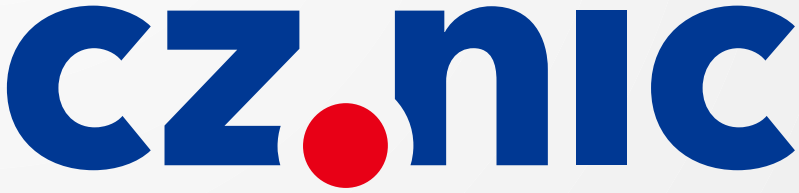
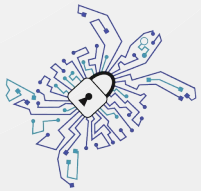
DoH Server Software

- dnsdist

- Knot Resolver



- siehe Slides vom DNSheads Vienna Meetup (Juni 2019)



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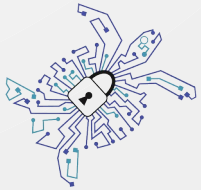
Fazit

- DoH schützt DNS Traffic und hat das Potential die DNS Welt nachhaltig zu verändern

- pot. schnelle Verbreitung durch Firefox
- primär wird die Verwendung von zentralisierten Providern kritisiert – nicht das Protokoll selbst

- Empfehlung: DoH und DoT Upgrade der bestehenden DNS Resolver Infrastruktur auf die Roadmap setzen



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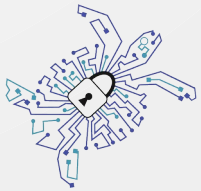
Fragen?

contact@appliedprivacy.net

https://twitter.com/applied_privacy

https://appliedprivacy.net



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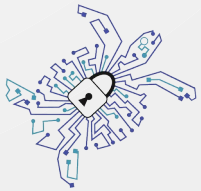
Deploy RPKI

Why it's time to deploy RPKI (RIPE NCC)
https://www.youtube.com/watch?v=Y9vbbxr-GbI (2min)
https://rpki.readthedocs.io/en/latest/

Bonus Slides Unlocked



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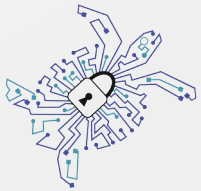
DoH / DoT – DNSSEC?

- Löst unterschiedliche Probleme
- Am besten in Kombination eingesetzt
- Browser haben jedoch aktuell kein DNSSEC Support



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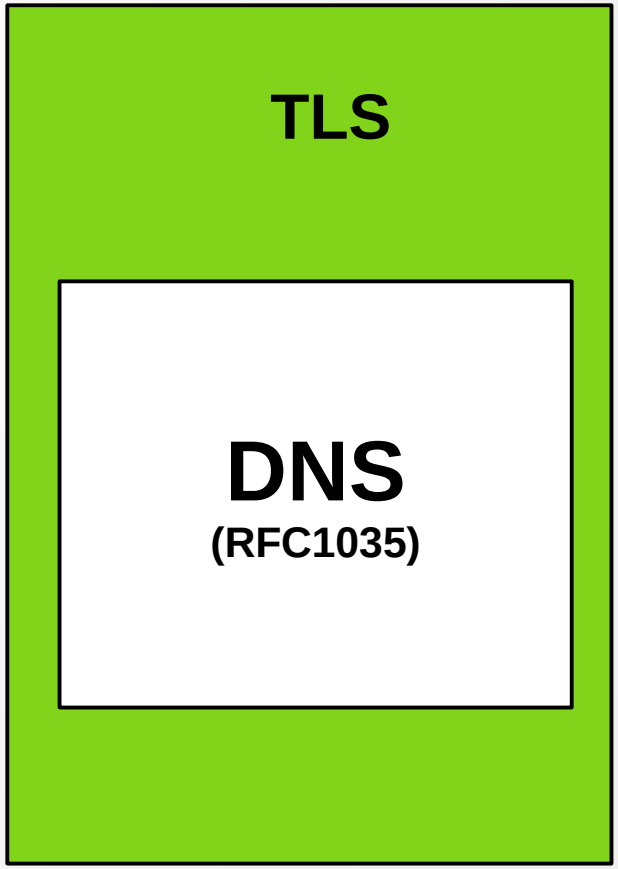
DoT

- >=TLS 1.2
- TCP Port 853
- inoffiziell auch beliebt: Port 443



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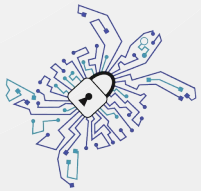
Information Leak	**Lösung**
IP Adresse	CDN/vHosts
TLS SNI	Work in Progress: Encrypted SNI (ESNI)
TLS Zertifikat	Verschlüsselt ab TLS 1.3
OCSP	OCSP Stapling
DNS	**DoH/DoT**/…



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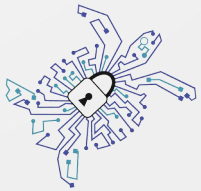
QNAME Minimization



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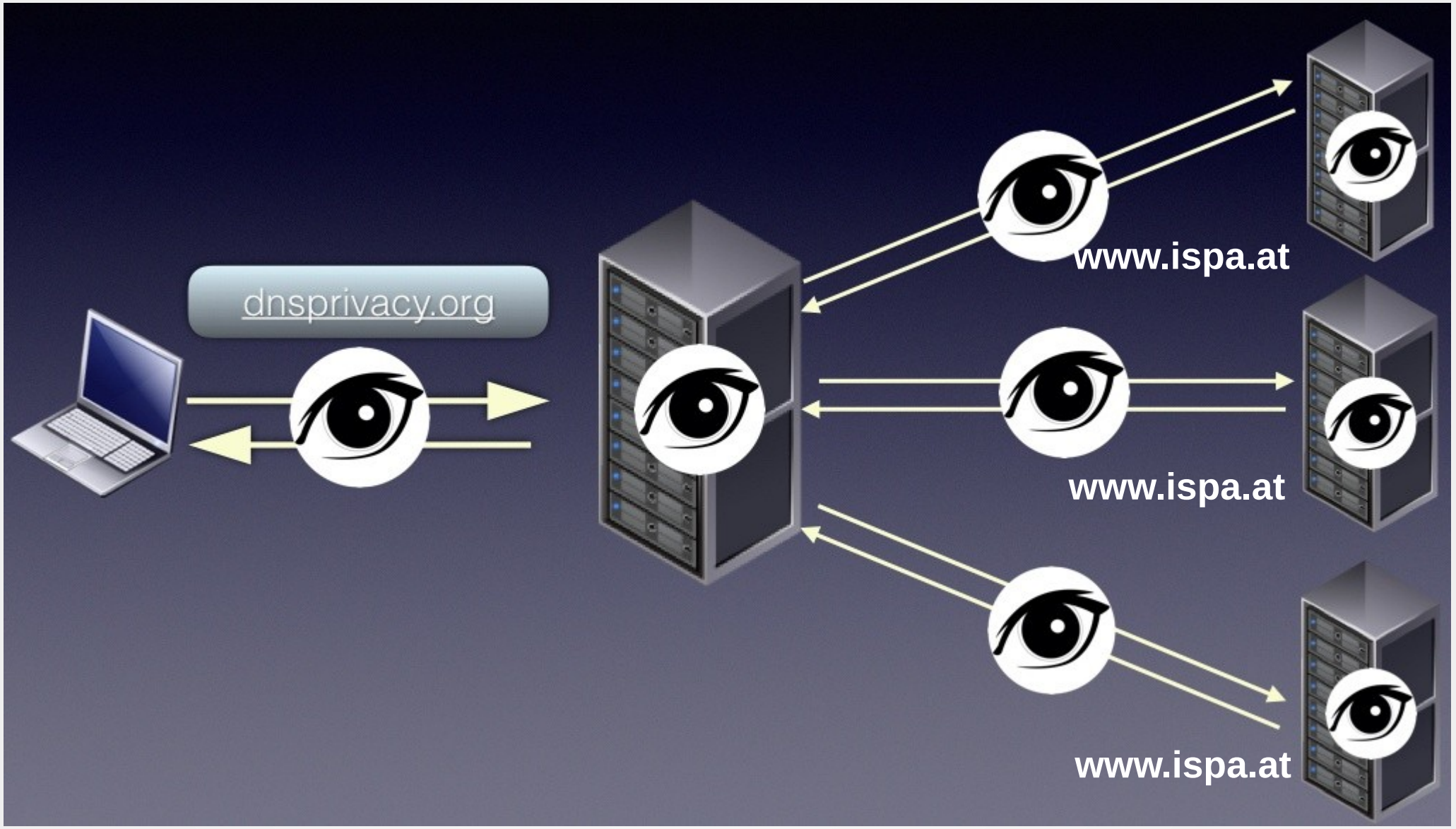

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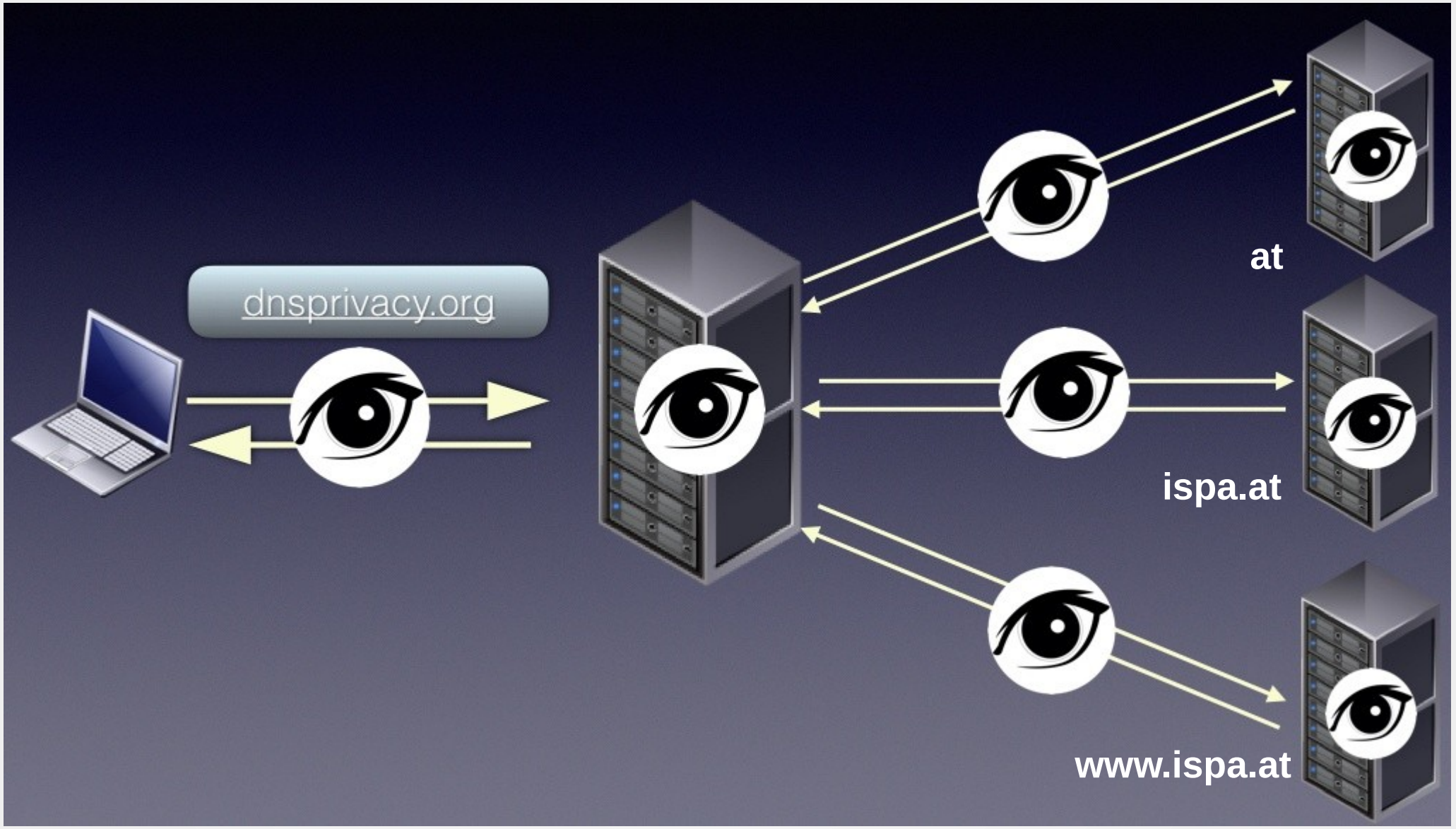

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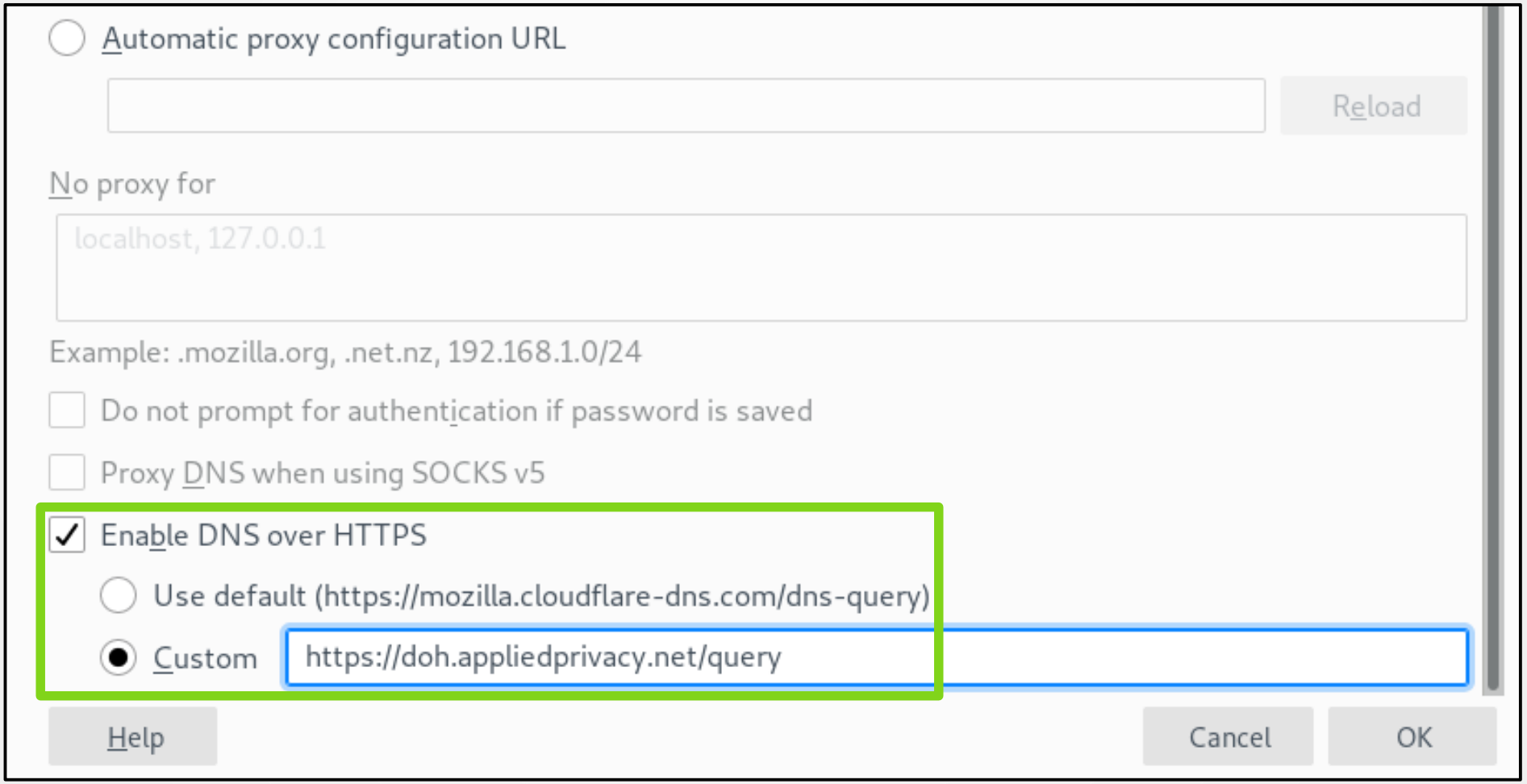
DoH mit Firefox nutzen



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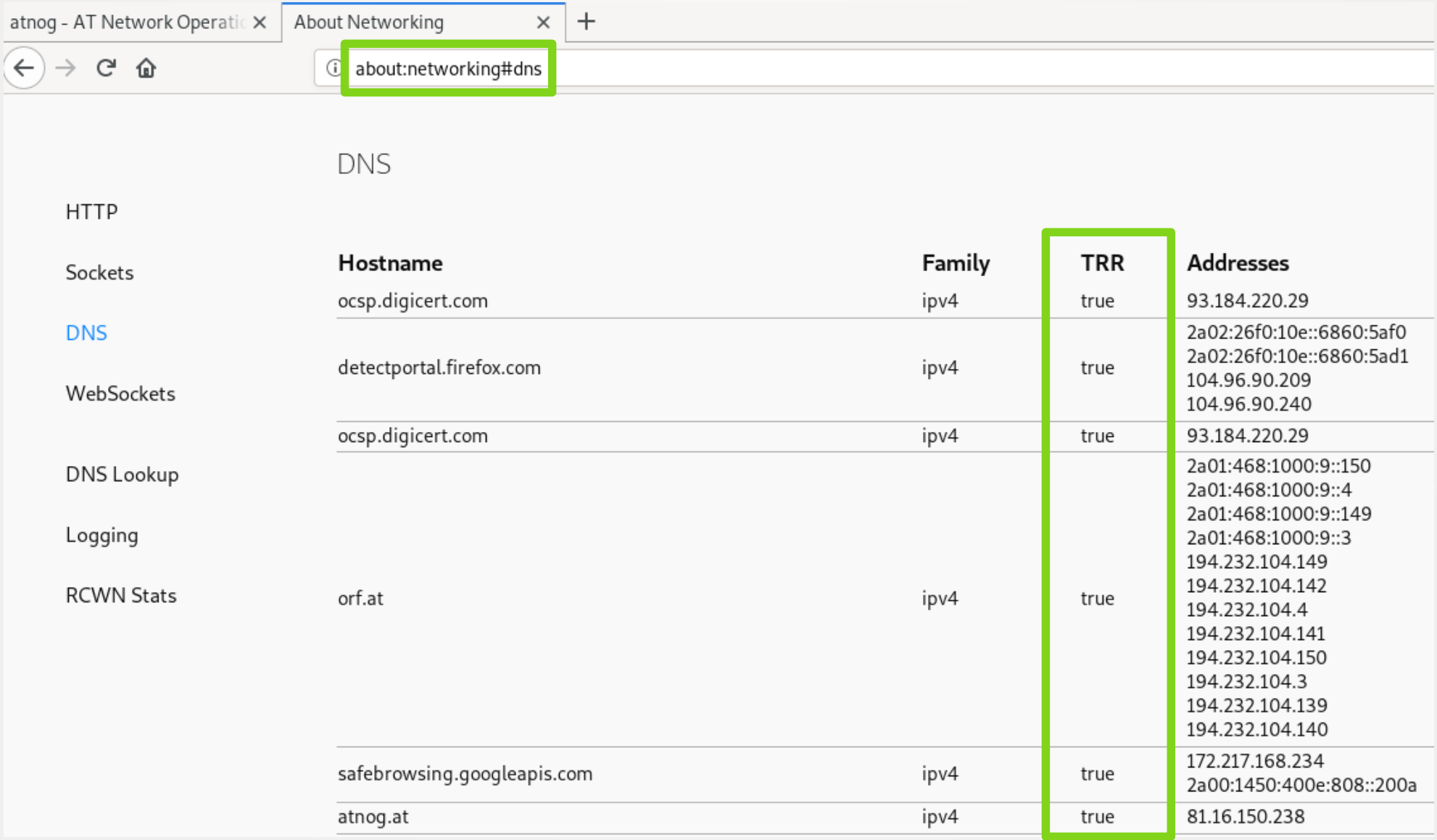
DoH in Firefox



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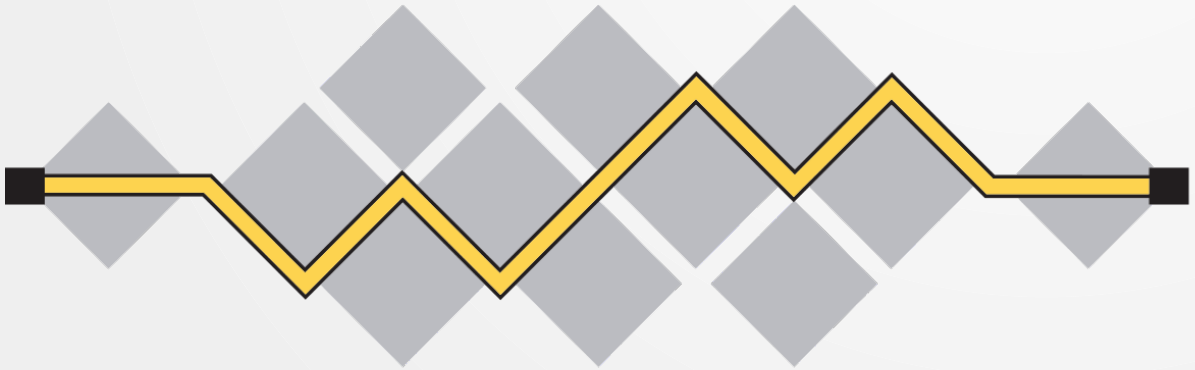
DNS Privacy - Zukunft

- DoH/DoT Server Discovery Protokolle
- Verschlüsselung zu authoritative Server
- DNS over QUIC



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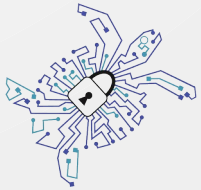
Root Zone on Loopback



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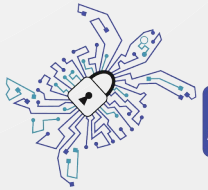
EDNS Client Subnet



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