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ADoX deployment in the wild

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ADoX Deployment initiative

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Initial IETF 123 ADoX Deployment initiative (July 2025)

A initial meeting was held to evaluate the current activities around and interest in deployment of ADoX.
The minutes can be found here.

OARC 45 Table topic (Oct 2025)

Over 2 days at OARC 45 informal lunchtime discussion sessions were held on this topic. Notes can be found here.

RIPE BoF on ADoT/Q deployment (Oct 2025)

https://ripe91.ripe.net/programme/meeting-plan/sessions/48/

Source: https://dnsprivacy.org/adox_status_and_deployment/

RFC 9539: Unilateral Opportunistic Deployment of Encrypted Recursive-to-Authoritative DNS

RFC 9539: unilateral and opportunistic

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"This document sets out steps that DNS servers (recursive resolvers and authoritative servers) can take unilaterally (without any coordination with other peers) to defend DNS query privacy against a passive network monitor."

…

"This guidance provides opportunistic security (see [RFC7435]), that is, encrypting things that would otherwise be in the clear, without interfering with or weakening stronger forms of security."

Source: https://datatracker.ietf.org/doc/rfc9539/

RFC 9539: protocol choices

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"The protocol described in this document specifies the use of DoT and DoQ without authentication of the server.

This document does not pursue the use of DNS over HTTPS, commonly called "DoH" ([RFC8484]), in this context because a DoH client needs to know the path part of a DoH endpoint URL. Currently, there are no mechanisms for a DNS recursive resolver to predict the path on its own, in an opportunistic or unilateral fashion, without incurring an excessive use of resources. If such mechanisms are later defined, the protocol in this document can be updated to accommodate them."

Source: https://datatracker.ietf.org/doc/html/rfc9539#name-protocol-choices

RFC 9539: security considerations

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"The guidance in this document provides defense against passive network monitors for most queries. It does not defend against active attackers.

…

However, implementers cannot rely on the guidance in this document for robust defense against active attackers: they should treat it as a stepping stone en route to stronger defense."

Source: https://www.rfc-editor.org/rfc/rfc9539.html#name-security-considerations

Adoption: authoritative nameservers

Measurements (March 2026)

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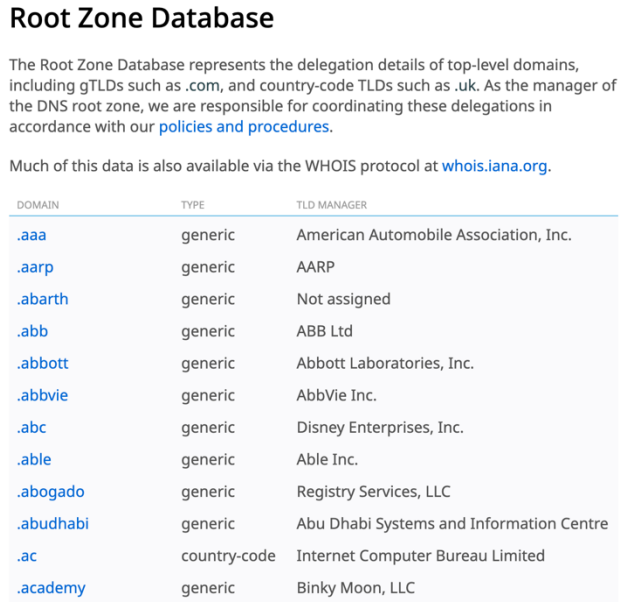
Input: root / 1,436 TLDs / 331M registered domains

For each domain:

- Get NS records
- Get A/AAAA records of nameservers
- Attempt ADoT and ADoQ (no certificate validation)
- Resolve domains at corresponding ADoT/ADoQ nameservers



Root Zone Database

The Root Zone Database represents the delegation details of top-level domains, including gTLDs such as .com, and country-code TLDs such as .uk. As the manager of the DNS root zone, we are responsible for coordinating these delegations in accordance with our policies and procedures.

Much of this data is also available via the WHOIS protocol at whois.iana.org.

DOMAIN	TYPE	TLD MANAGER
.aaa	generic	American Automobile Association, Inc.
.aarp	generic	AARP
.abarth	generic	Not assigned
.abb	generic	ABB Ltd
.abbott	generic	Abbott Laboratories, Inc.
.abbvie	generic	AbbVie Inc.
.abc	generic	Disney Enterprises, Inc.
.able	generic	Able Inc.
.abogado	generic	Registry Services, LLC
.abudhabi	generic	Abu Dhabi Systems and Information Centre
.ac	country-code	Internet Computer Bureau Limited
.academy	generic	Binky Moon, LLC

Source: https://www.iana.org/domains/root/db

Adoption rates: root

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B-root (USC/ISI): supports ADoT over IPv4/IPv6

```
$ kdig @170.247.170.2 . SOA +norec +tls

;; TLS session (TLS1.3)-(ECDHE-X25519)-(RSA-PSS-RSAE-SHA256)-(AES-
256-GCM)
;; ->>HEADER<<- opcode: QUERY; status: NOERROR; id: 38683
;; Flags: qr aa; QUERY: 1; ANSWER: 1; AUTHORITY: 13; ADDITIONAL: 1

...

;; ANSWER SECTION:
.                       86400   IN  SOA a.root-servers.net.
nstld.verisign-grs.com. 2026043000 1800 900 604800 86400

...

;; Received 296 B
;; Time 2026-04-30 09:57:21 CEST
;; From 170.247.170.2@853(TLS) in 32.4 ms
```

H-root (ARL): supports ADoT/ADoQ over IPv4/IPv6

```
$ kdig @2001:500:1::53 . SOA +norec +quic

;; QUIC session (QUICv1)-(TLS1.3)-(ECDHE-X25519)-(ECDSA-SECP256R1-
SHA256)-(AES-256-GCM)
;; ->>HEADER<<- opcode: QUERY; status: NOERROR; id: 0
;; Flags: qr aa; QUERY: 1; ANSWER: 1; AUTHORITY: 13; ADDITIONAL: 27

...

;; ANSWER SECTION:
.                       86400   IN  SOA a.root-servers.net.
nstld.verisign-grs.com. 2026043000 1800 900 604800 86400

...

;; Received 868 B
;; Time 2026-04-30 10:00:15 CEST
;; From 2001:500:1::53@853(QUIC) in 16.9 ms
```

Adoption rates: TLDs

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	ADoT v4	ADoT v6	ADoQ v4	ADoQ v6
arpa	✓	✓	✓	✓
kg	✓	✓	✓	✓
cy	✓	✗	✗	✗
gr	✓	✗	✗	✗
.ελ	✓	✗	✗	✗

Adoption rates: registered domains

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	ADoT v4	ADoT v6	ADoQ v4	ADoQ v6
Nameservers	1,577	935	201	160
Domains	3,072,005	2,400,316	1,989,501	2,238,248

3,074,281 (0.93%) registered domains support some form of ADoX

2,585 (0.32%) nameserver IPs support some form of ADoX

Biggest adopters: NS IPs

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	Organisation	ADoT domains	Organisation	ADoQ domains
1.	One.com A/S	1,962,493	One.com A/S	1,962,493
2.	JSC TIMEWEB	394,068	WEDOS Internet, a.s.	255,548
3.	JSC "RetnNet"	389,006	NetActuate, Inc	14,066
4.	WEDOS Internet, a.s.	276,492	Hetzner Online GmbH	3,794
5.	Nazwa.pl Sp.z.o.o.	150,875	Naquadria S.R.L	2,937

Biggest adopters: NS domains

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	Operator	ADoT domains	Operator	ADoQ domains
1.	*.one.com	1,437,545	*.one.com	1,437,545
2.	*.timeweb.ru	400,684	*.hostnet.nl	396,138
3.	*.timeweb.org	400,651	*.wedos.cz	255,218
4.	*.hostnet.nl	396,138	*.wedos.eu	255,090
5.	*.wedos.cz	269,645	*.wedos.com	254,984
6.	*.wedos.eu	269,474	*.g1-dns.com	84,931
7.	*.wedos.com	269,246	*.g1-dns.one	84,931
8.	*.nazwa.pl	150,812	*.antagonist.nl	43,879
9.	*.g1-dns.com	84,931	*.antagonist.net	43,879
10.	*.g1-dns.one	84,931	*.desec.org	13,978

ADoX domains per TLD

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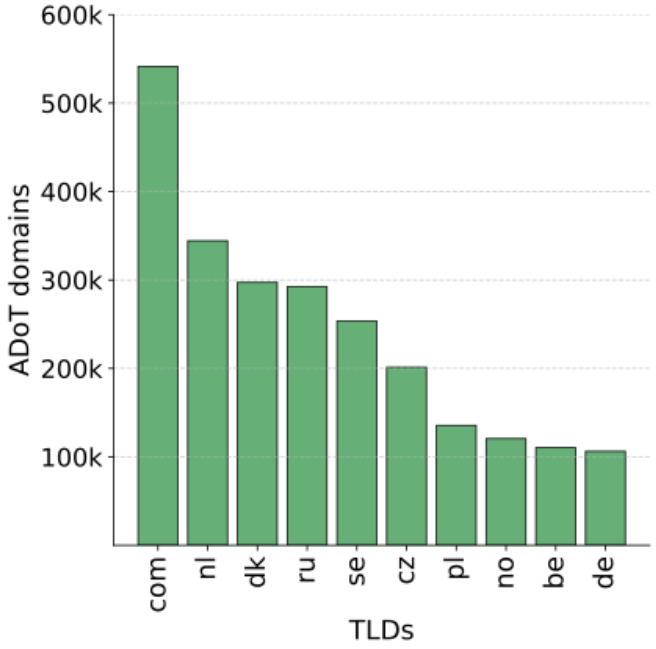
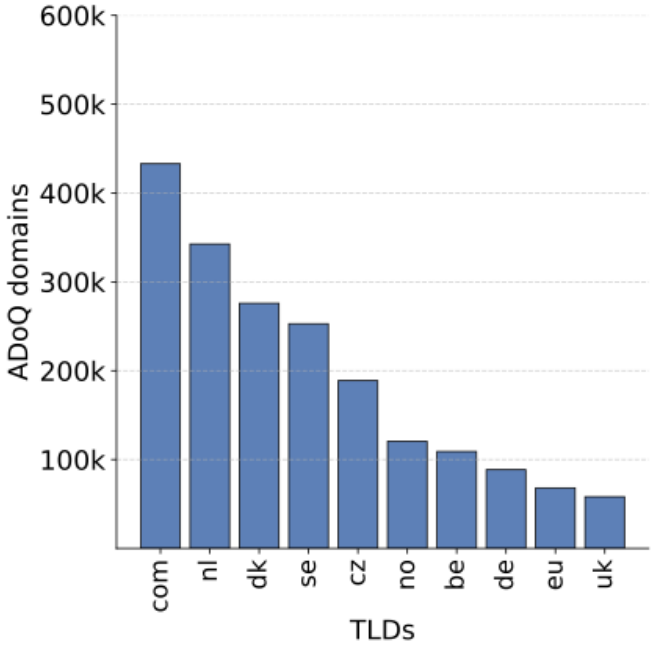


Total ADoT TLDs: 774



Total ADoQ TLDs: 683

ADoX domain popularity (Tranco)

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Rank	ADoT domain	Rank	ADoQ domain
5.	facebook.com	**147.**	one.one
12.	instagram.com	**1713.**	loteriadehoy.com
15.	fbcdn.net	**2006.**	one.com
27.	wikipedia.org	**3901.**	eu.org
41.	whatsapp.net	**6284.**	sport1.de
55.	whatsapp.com	**8769.**	hostnet.nl
80.	wa.me	**9961.**	lectio.dk
105.	root-servers.net	**10367.**	digitalaudience.io
109.	cdninstagram.com	**15342.**	wedos.cz
121.	cdn77.org	**16899.**	bloggersdelight.dk

Adoption:
recursive resolvers

Measurements (Nov 2025 / April 2026)

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Input: 1.2M IPv4 open resolvers / 331k IPv6 responsive hosts,

RIPE Atlas probes

For each resolver:

- Query a unique subdomain of dot.adox-deployment.com
- Query a unique subdomain of doq.adox-deployment.com
- Check responses and who is contacting nameservers

Adoption rates

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Open resolvers (April 2026):

- ADoQ: none
- ADoT: 5,642
  - Most forward to Quad9 and the Foundation for Applied Privacy
  - 2 non-forwarders (Amazon and netcup IPs)

RIPE Atlas probes (November 2025):

- ADoQ: none
- ADoT: 44 probes
  - 42 forward to Quad9
  - 2 forward to the Foundation for Applied Privacy

Takeaways

- Deployment exists, but is sparse and highly concentrated
- Less than 1% of registered domains support ADoX
- One operator is responsible for the great majority of deployments

Thanks!

adox-deployment.com