Privacy Enhancements for PowerDNS and DNSdist

NGI Trust and Privacy Enhancing Technologies Program

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PowerDNS

Introduction, Open Source DNS Solutions

PowerDNS Recursor

- DNS resolving and caching server.

PowerDNS Authoritative Server

- Authoritative domain name hosting.

PowerDNS DNSdist

- Load Balancing,
- DoH and DoT encryption
- DDoS protection

Encryption of DNS Traffic

DNS Encryption is gaining traction

- DNS is one of the last remaining ‘non-encrypted’ protocols
- Risk interception of very personal data

Current Trend:

- DNS gets encrypted for a more secure connection from client to the resolver
- Client support for encrypted DNS is increasing
- IETF Encryption standard for DNS
  - DNS over TLS (DoT)
  - DNS over HTTPS (DoH)

DNS Privacy, Encryption, and DNS Providers

DNS Encryption with DoH and DoT

However:

- Interest is Encrypted DNS is increasing, but there is only limited uptake of encrypted DNS Services by network operators
- Browser Manufacturers are pushing for enhanced privacy to use this by default
- Number of ‘DoH’ providers is small, leading to centralization of DNS

There is a need for additional *privacy friendly, European, DoH deployments to prevent DNS centralization.*

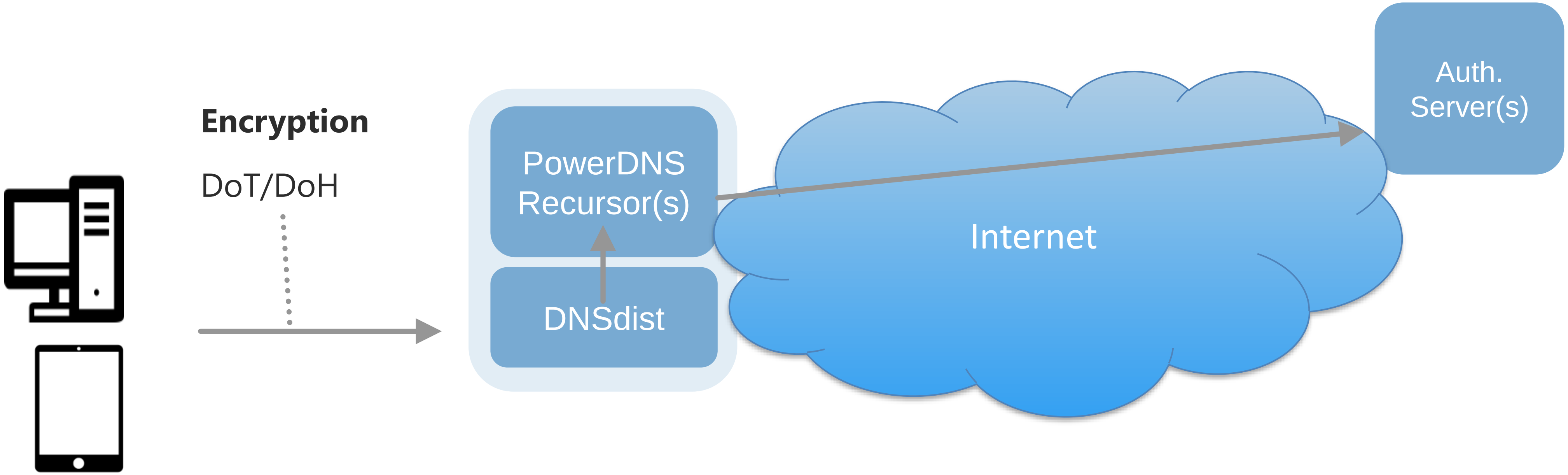
Privacy Enhancements for PowerDNS and DNSdist

Goal:

- Enhance the availability of open, trustworthy, privacy respecting DNS software
  - Allows any DNS provider, operator, or others to provide encrypted and privacy-oriented DNS services.
- This project aims to improve or add additional privacy features to the open source PowerDNS software

PowerDNS and DNSdist

Privacy Enhancements



Encryption

DoT/DoH

PowerDNS Recursor(s)

DNSdist

Internet

Auth. Server(s)

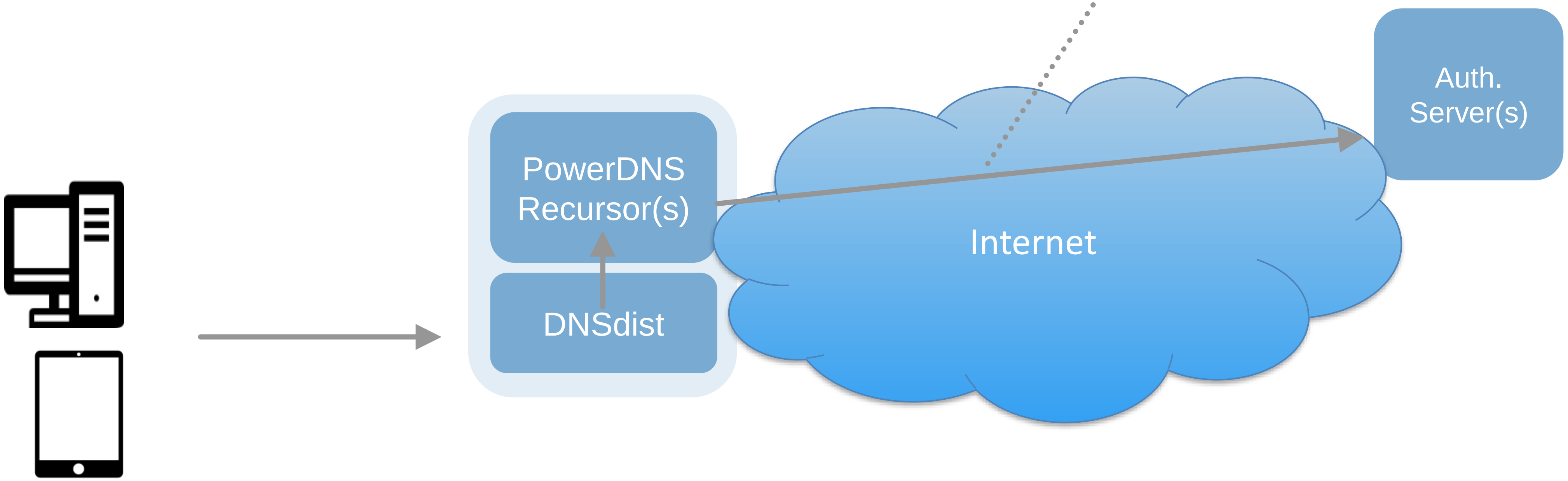
PowerDNS and DNSdist

Privacy Enhancements

Encrypt Traffic between

Recursor and Authoritative servers

- Initial IETF proposal for 'Discovery'
- Implement (PoC/draft) discovery standards



PowerDNS and DNSdist

Privacy Enhancements

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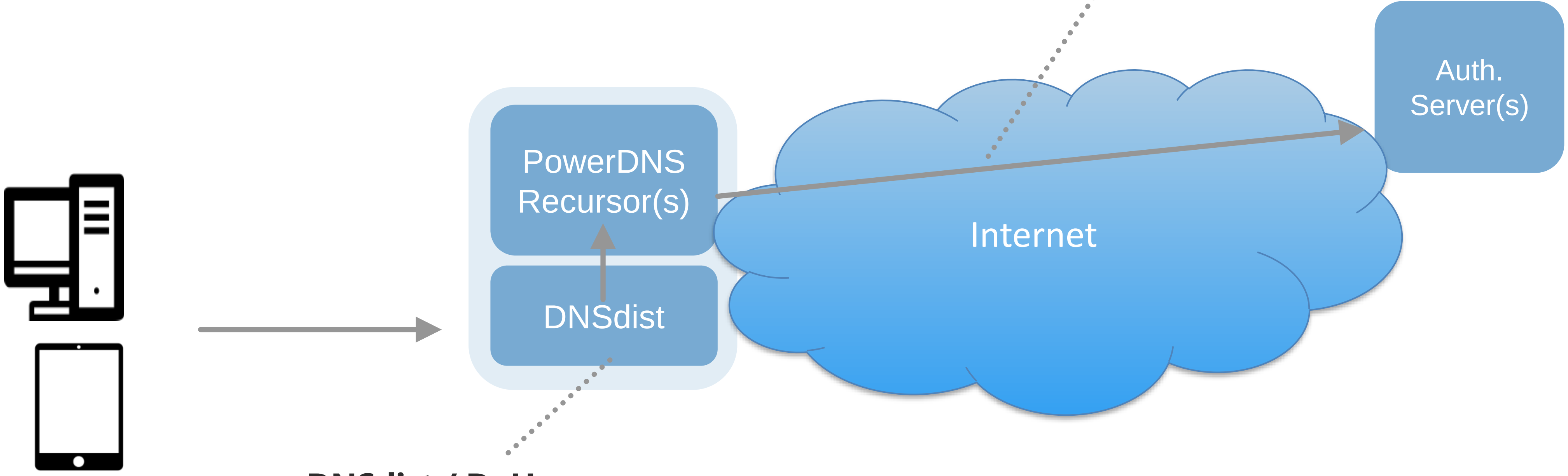

DNSdist / DoH

- Deployment impr. (a.o. support http-caches)

DoH performance testing tool

PowerDNS and DNSdist

Privacy Enhancements

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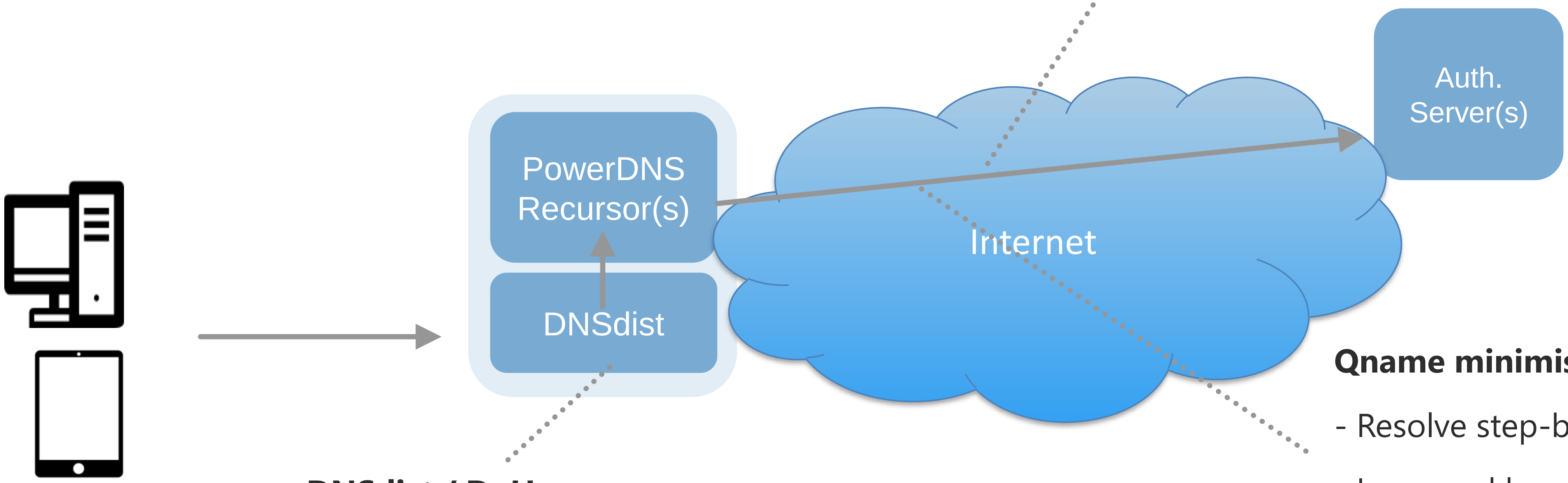

Qname minimisation

- Resolve step-by step

- Improved heuristics

EDNS(0)padding

- prevent information leakage

DNSdist / DoH

- Deployment impr. (a.o. support http-caches)

DoH performance testing tool

Summary

Privacy Enhancements for PowerDNS and DNSdist

- Encryption in DNS is gaining traction
  - Increased support on clients for DoH
  - a small number of parties offer encrypted DNS, bypassing traditional network resolvers
  - (so: This means more encrypted DNS traffic goes to less parties)

- To increase Privacy:
  - Privacy-focused (open source) DNS implementations and deployments is key
  - Allows EU operators (and others) to provide privacy-centric DNS

- This project implements further privacy enhancements for PowerDNS and DNSdist