ODNS: Oblivious DNS

Anne Edmundson, **Paul Schmitt**, Nick Feamster, Jennifer Rexford, *Princeton University*
Allison Mankin, *Salesforce*

OARC 28
9 March 2018

PRINCETON
UNIVERSITY

Conventional DNS

Client

Recursive

Root Server

TLD Server
1.1.1.1

Name Server
2.2.2.2

Conventional DNS

Client

www.foo.com ??

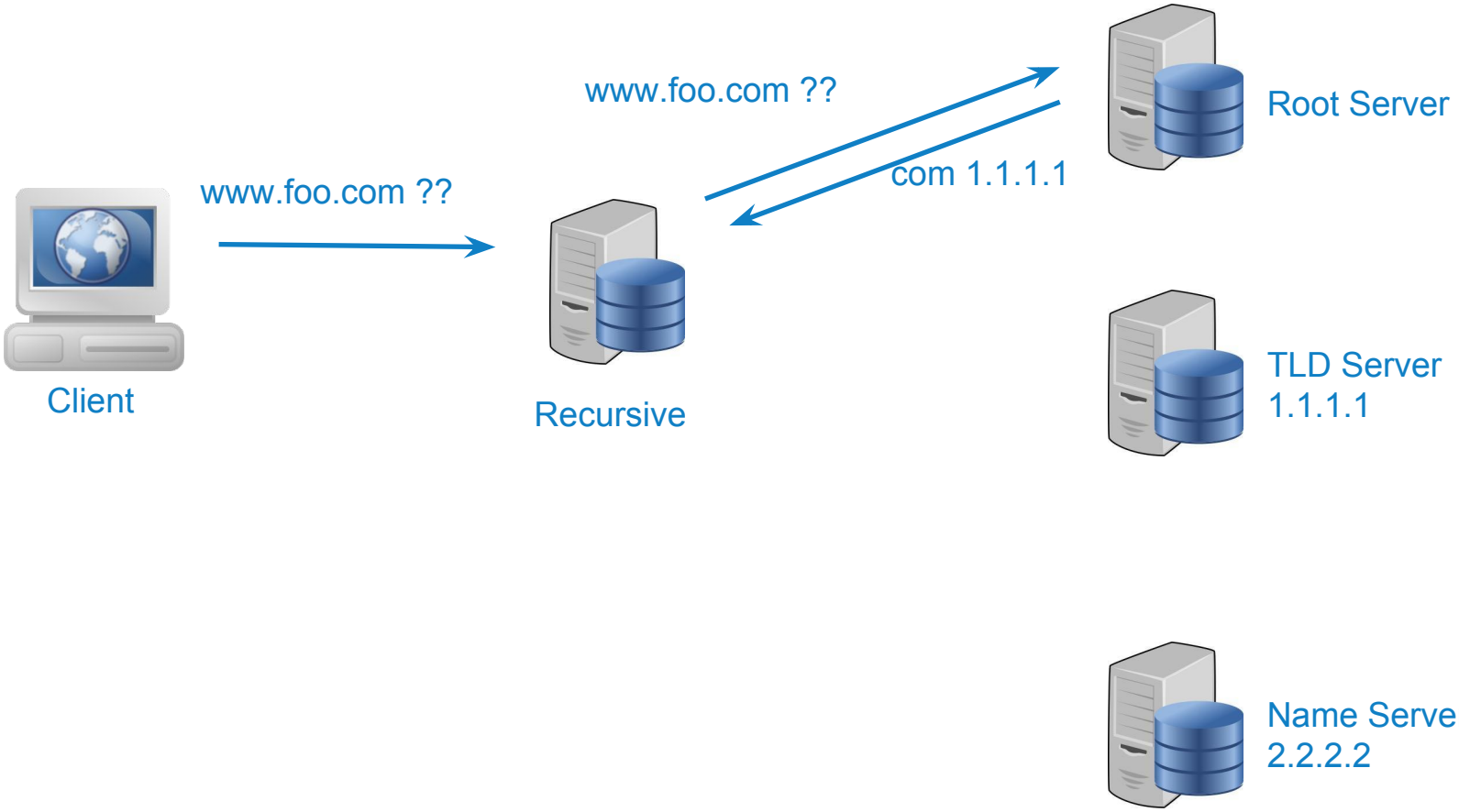
Recursive

Root Server

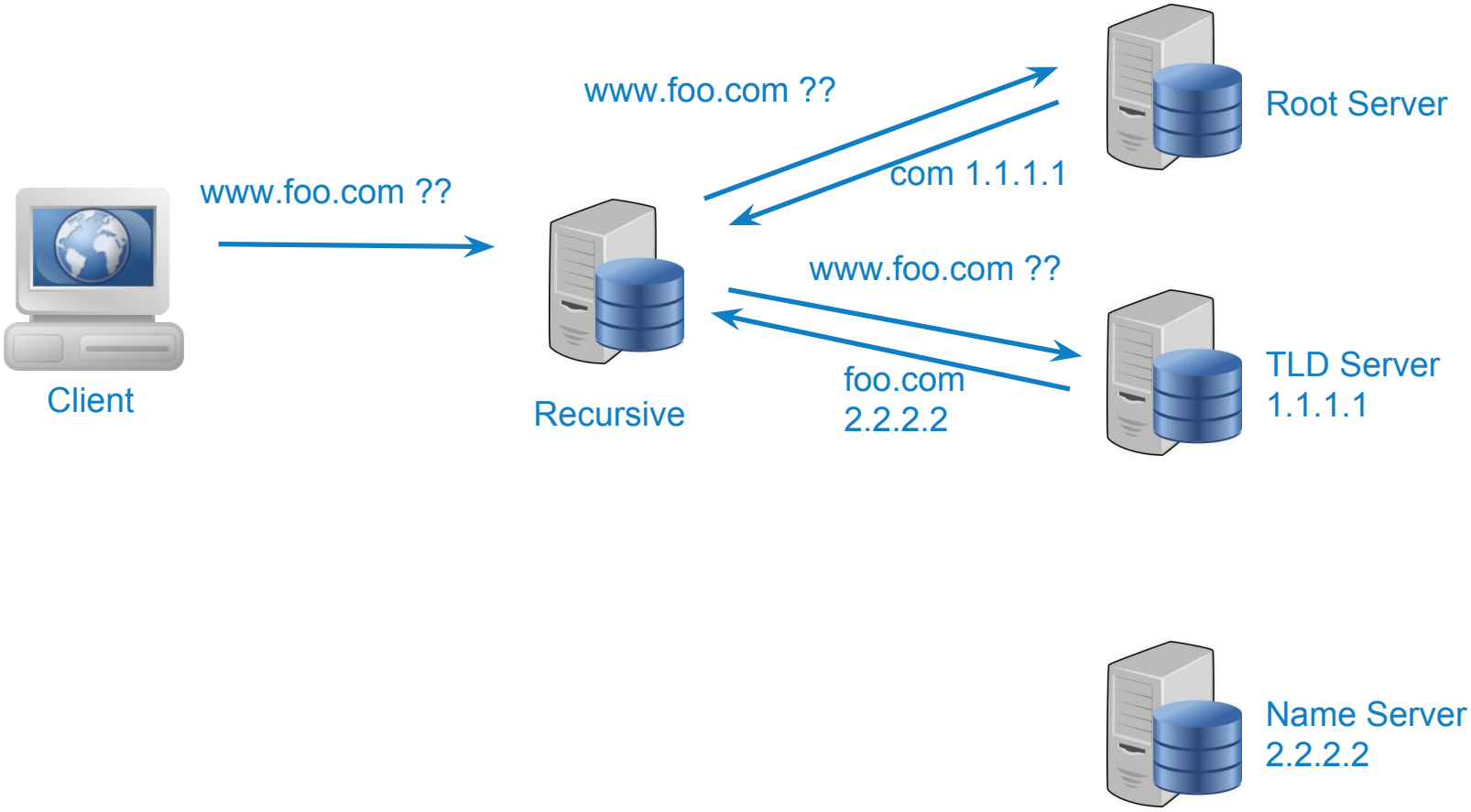
TLD Server
1.1.1.1

Name Server
2.2.2.2

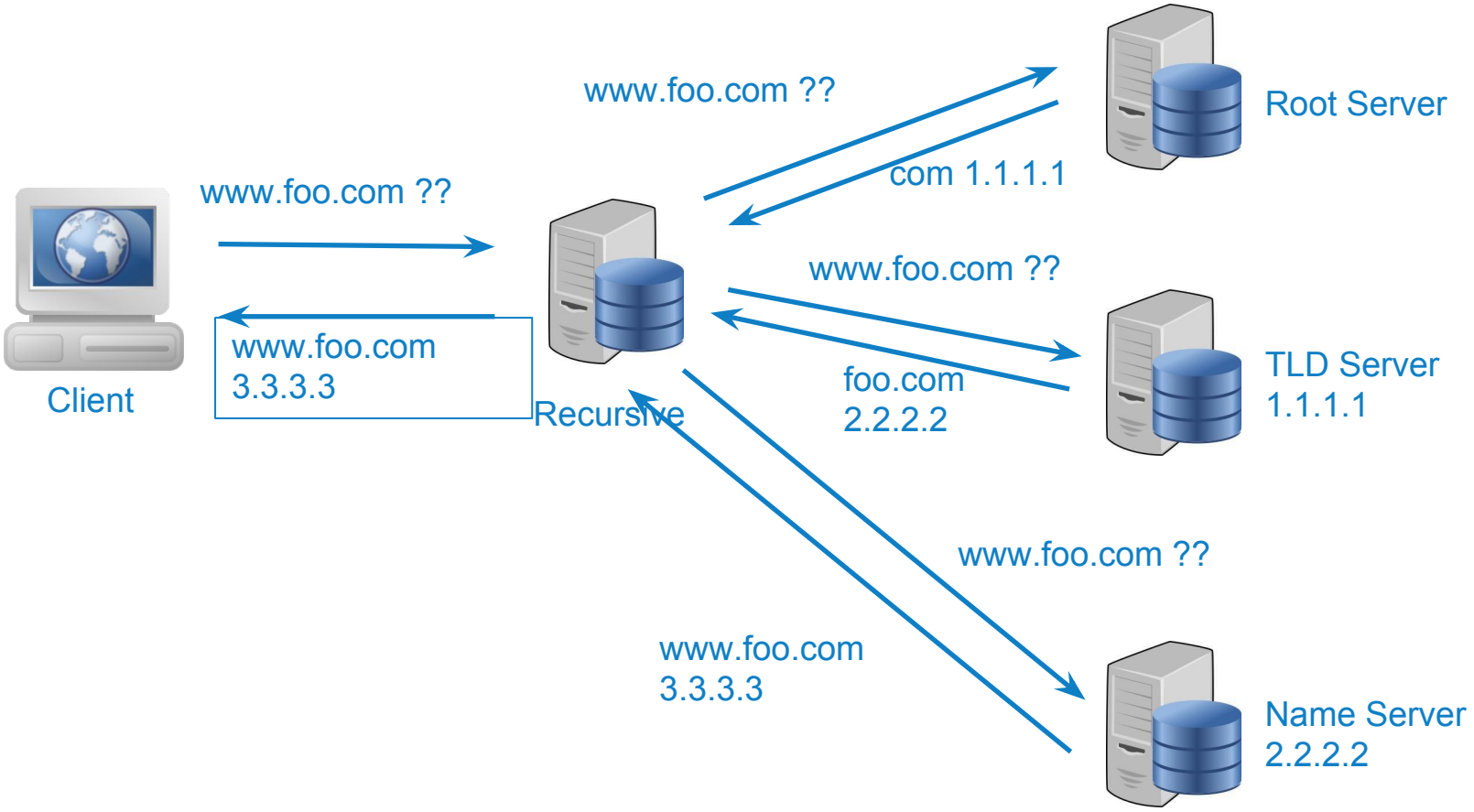
Conventional DNS



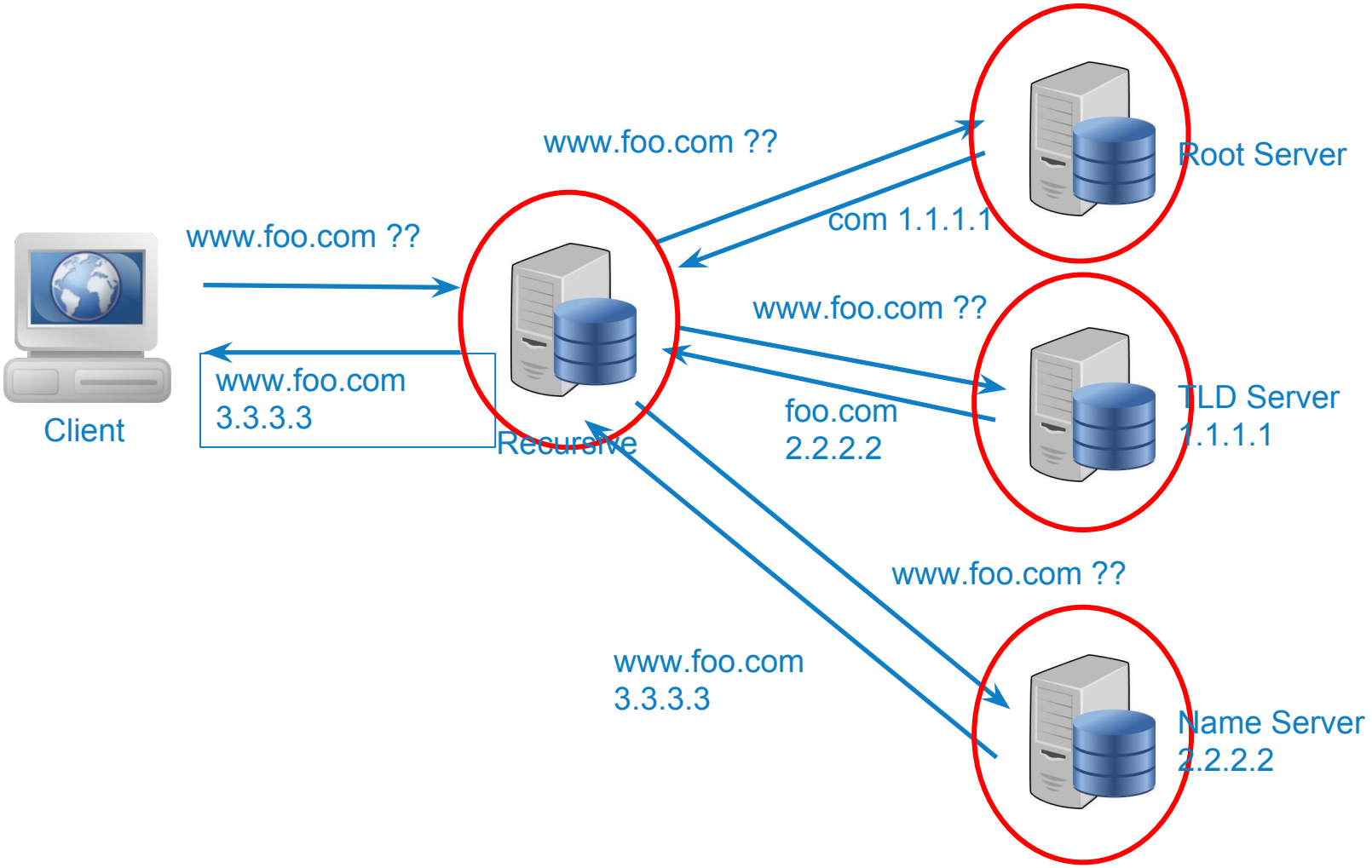
Conventional DNS



Conventional DNS



Conventional DNS



Threat Model

- **User Data**: a user's identity, queries, browsing patterns
- **Attacker's Goal**: learn about user data
- **Attacker's Capabilities**:
  - monitor traffic
  - gain access to DNS logs

Threat Model

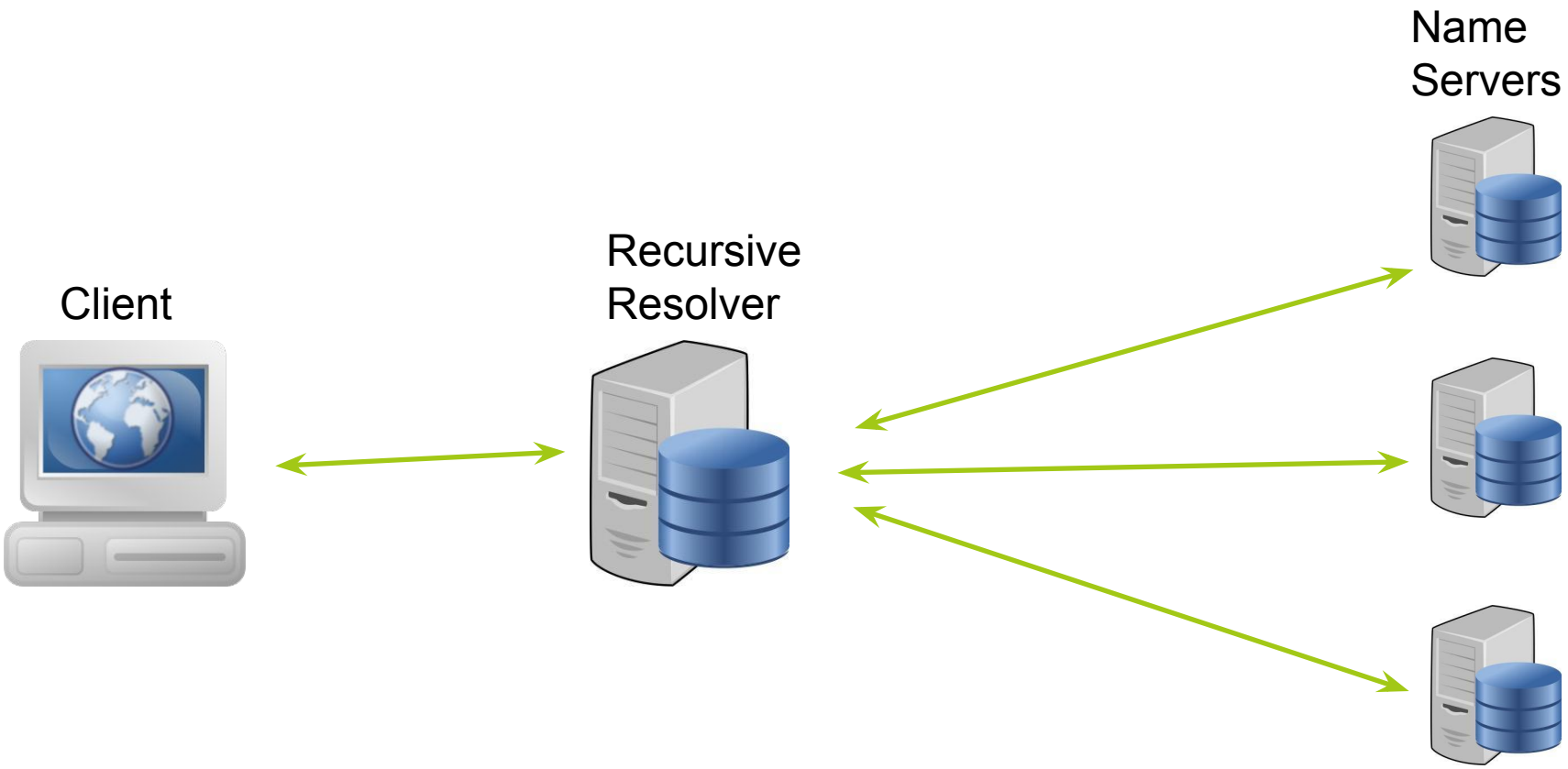
- **User Data**: a user's identity, queries, browsing patterns
- **Attacker's Goal**: learn about user data
- **Attacker's Capabilities**:
  - monitor traffic
  - gain access to DNS logs

DNS operators could be targets of data requests

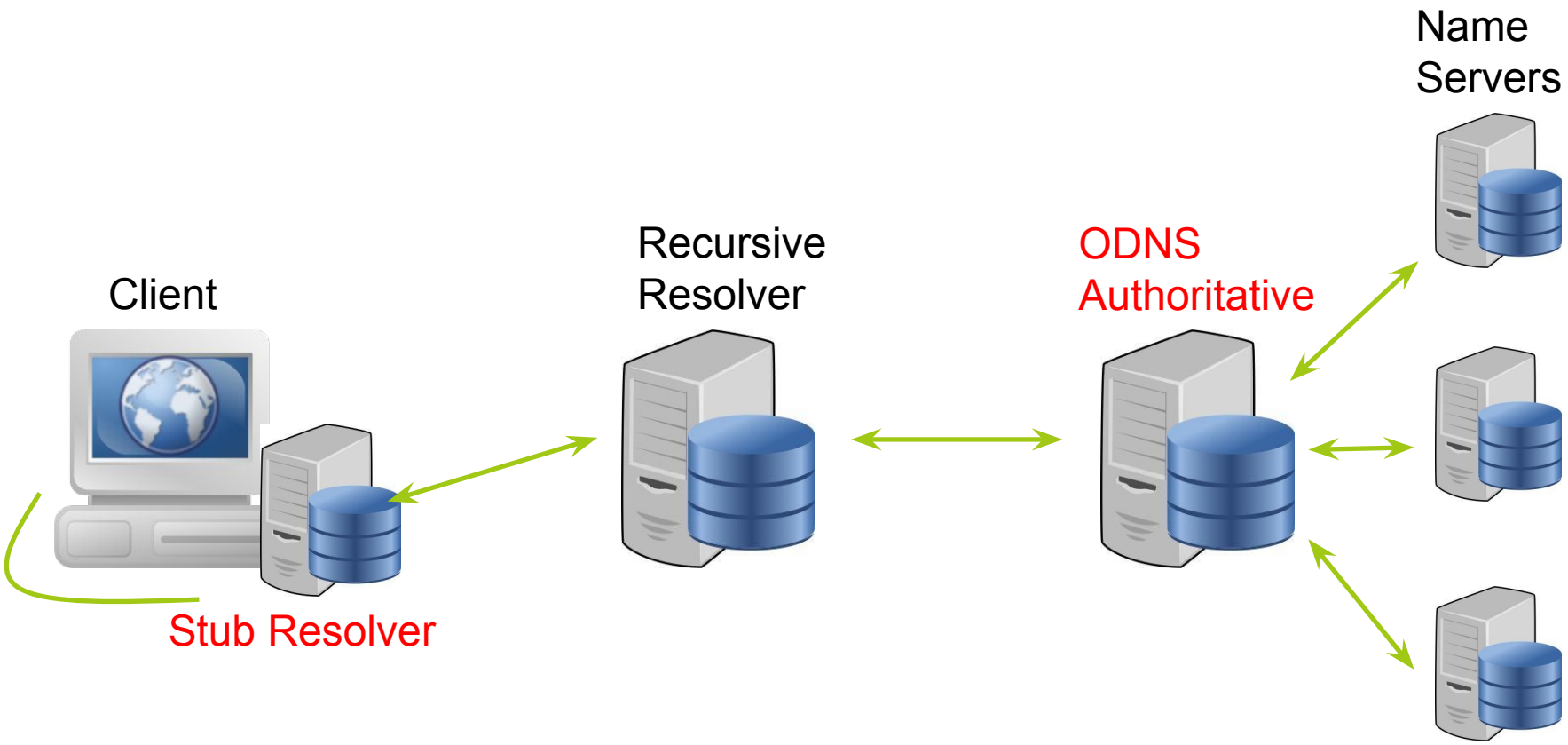
Existing Approaches

- DNS Query Name Minimization
- DNS-Over-TLS
- Quad9
- Onion Services (via Tor)

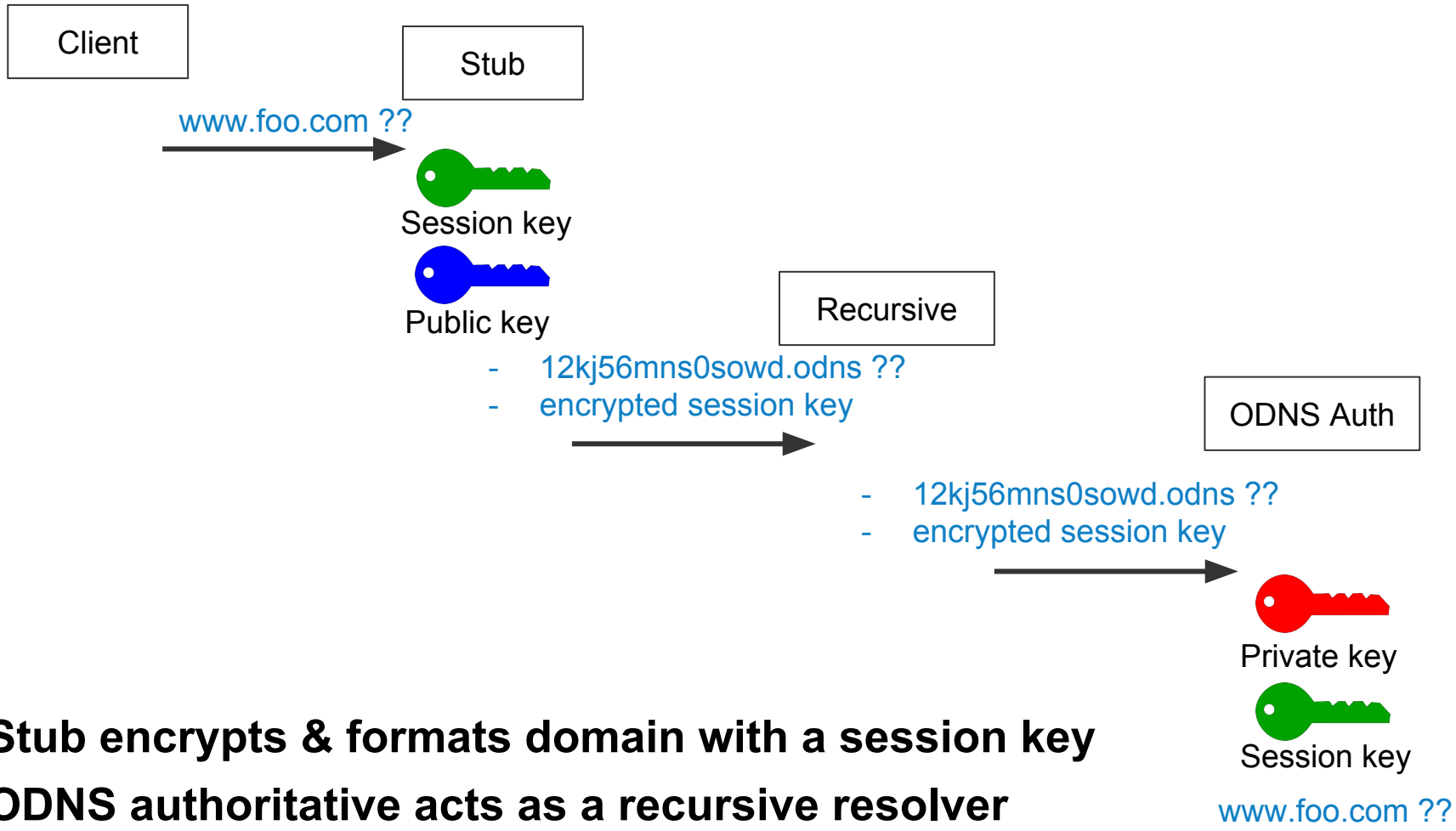
ODNS Overview



ODNS Overview



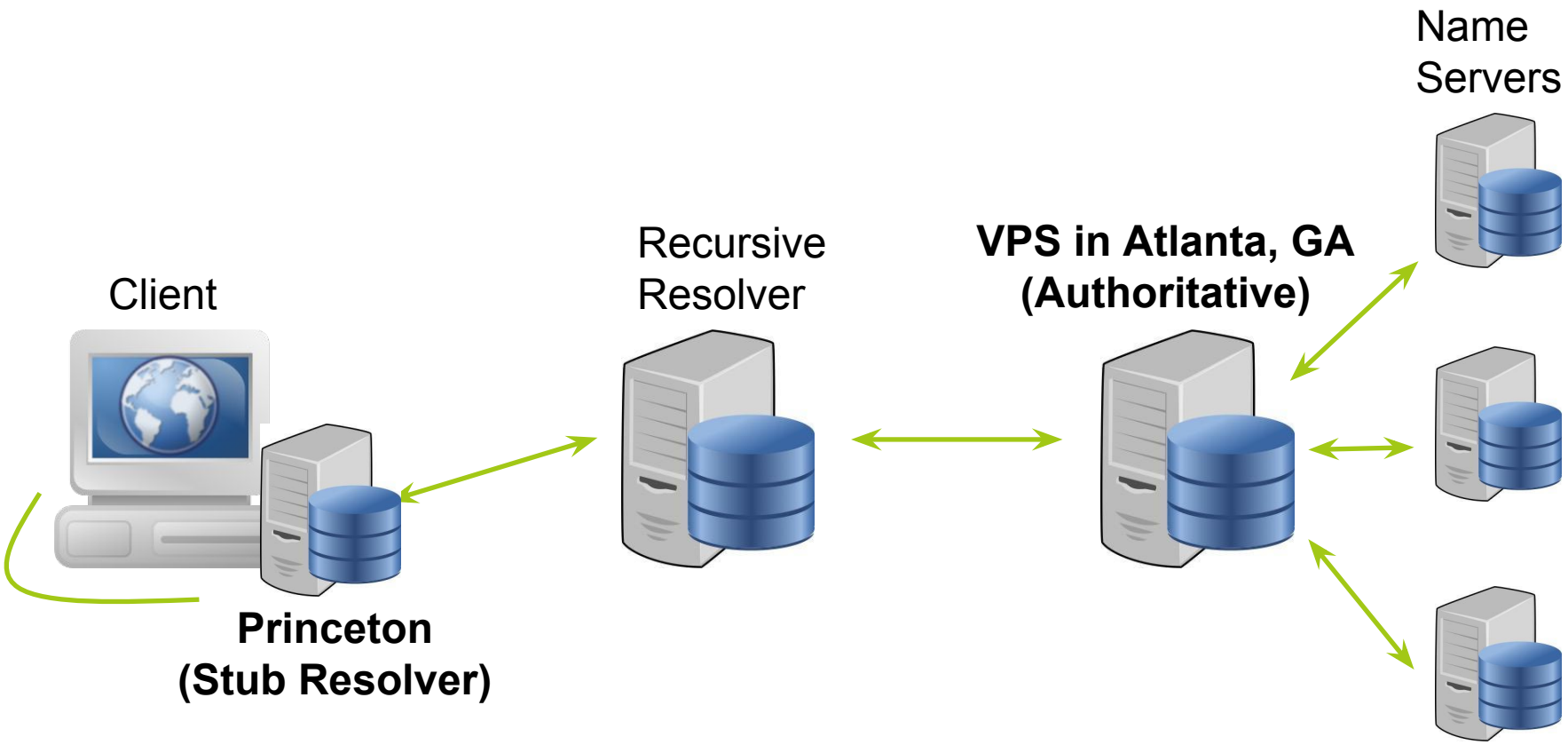
ODNS Privacy Overview



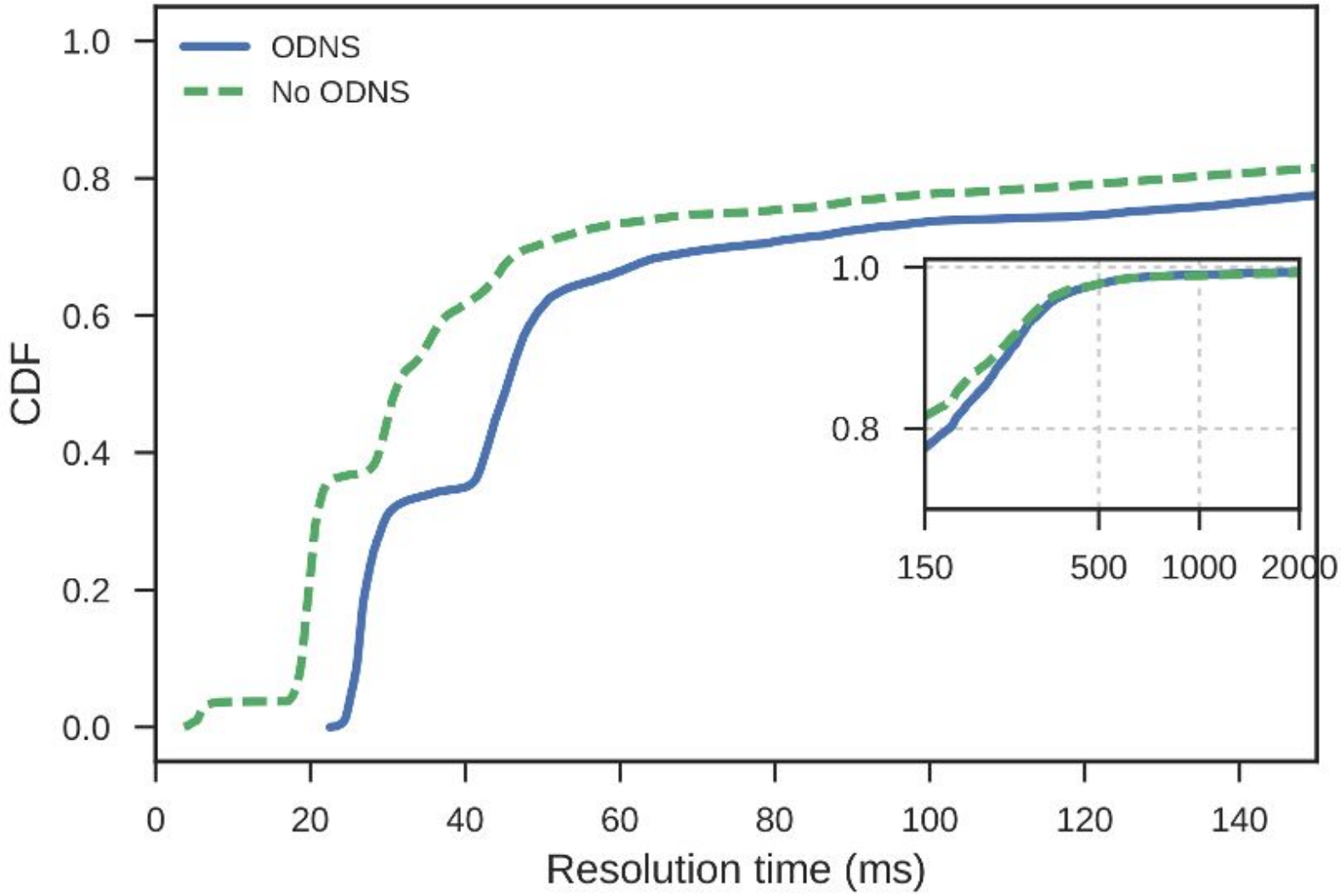
Stub encrypts & formats domain with a session key

ODNS authoritative acts as a recursive resolver

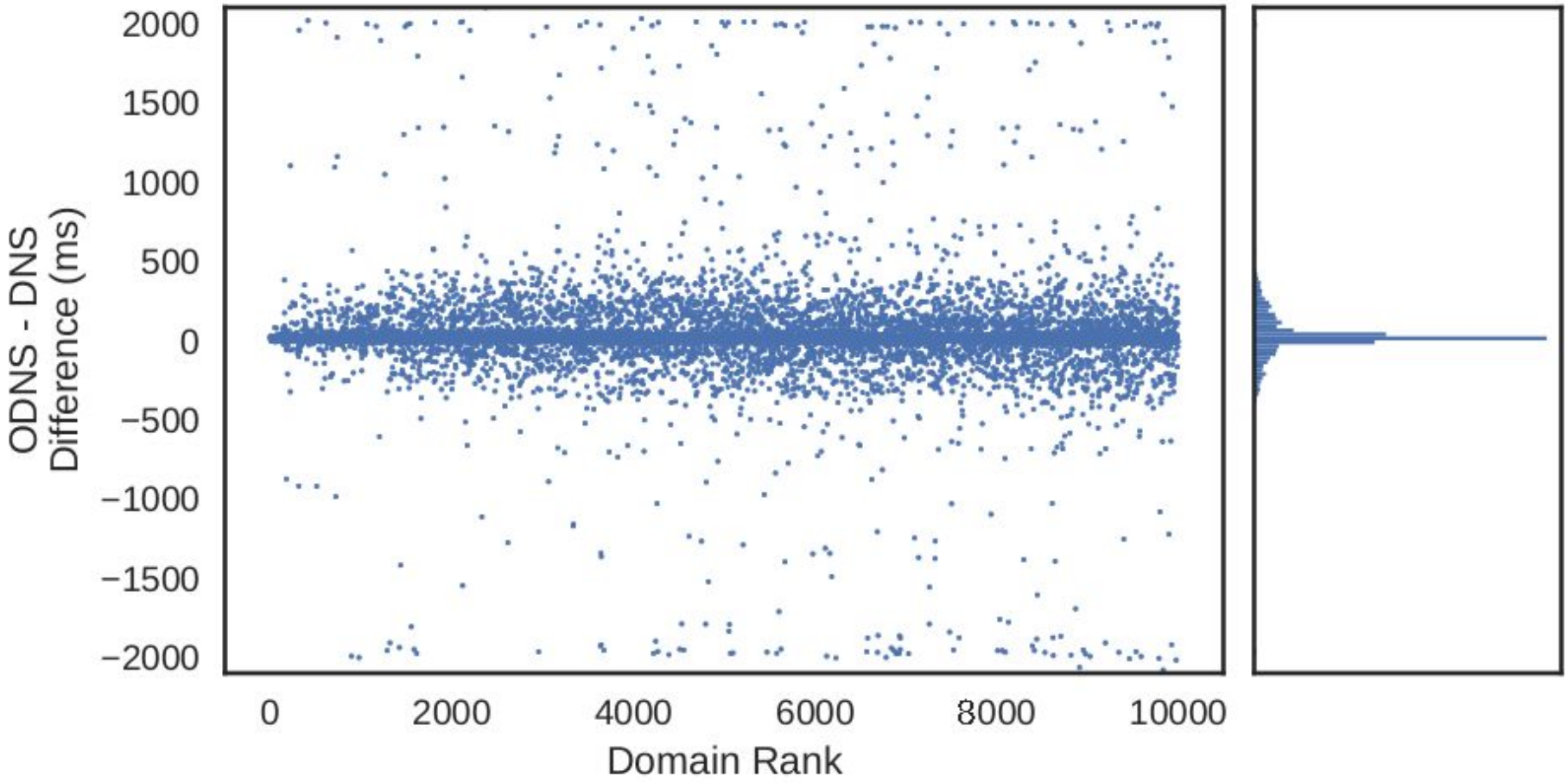
Prototype & Testbed



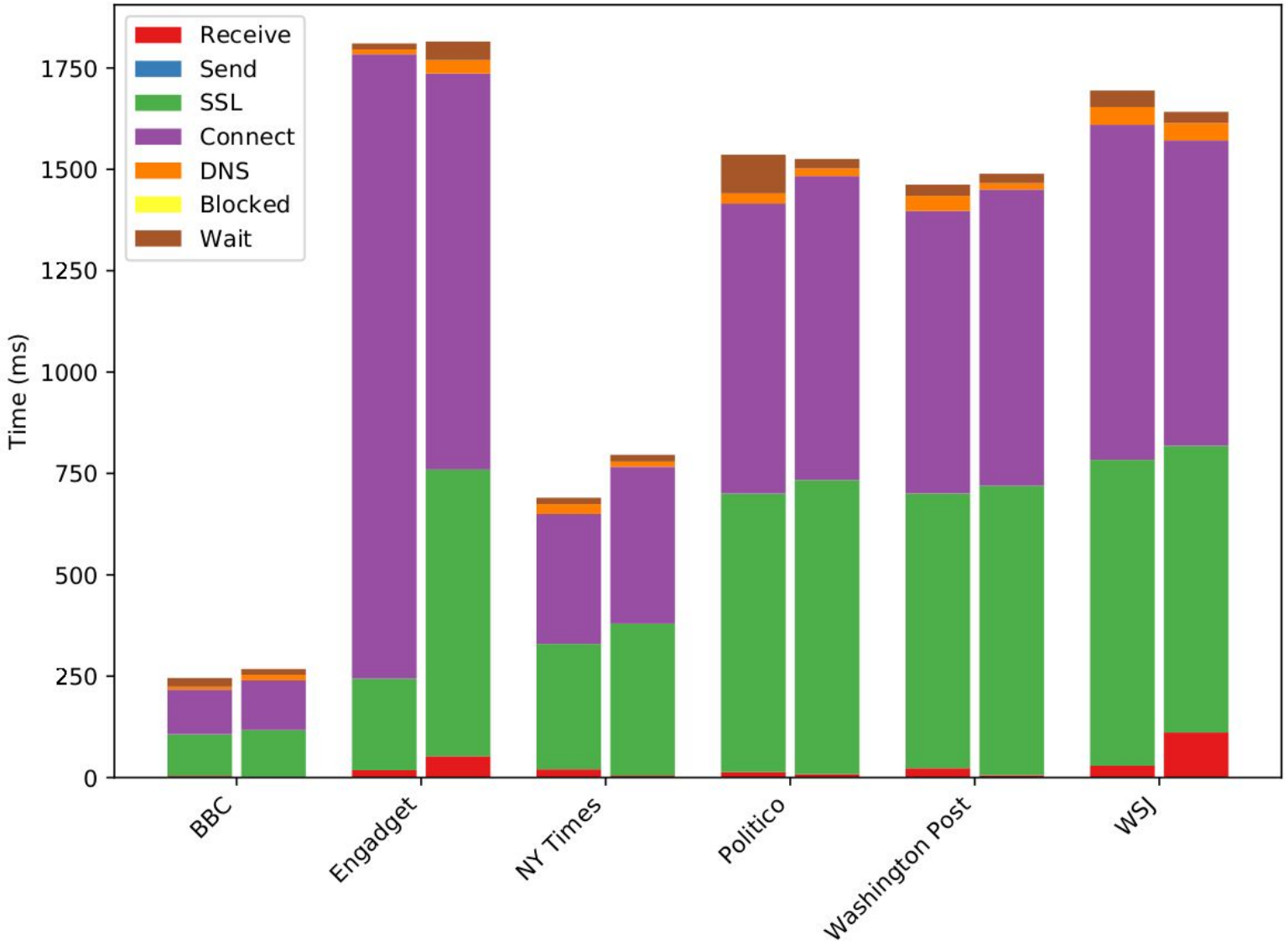
ODNS Overhead (1)



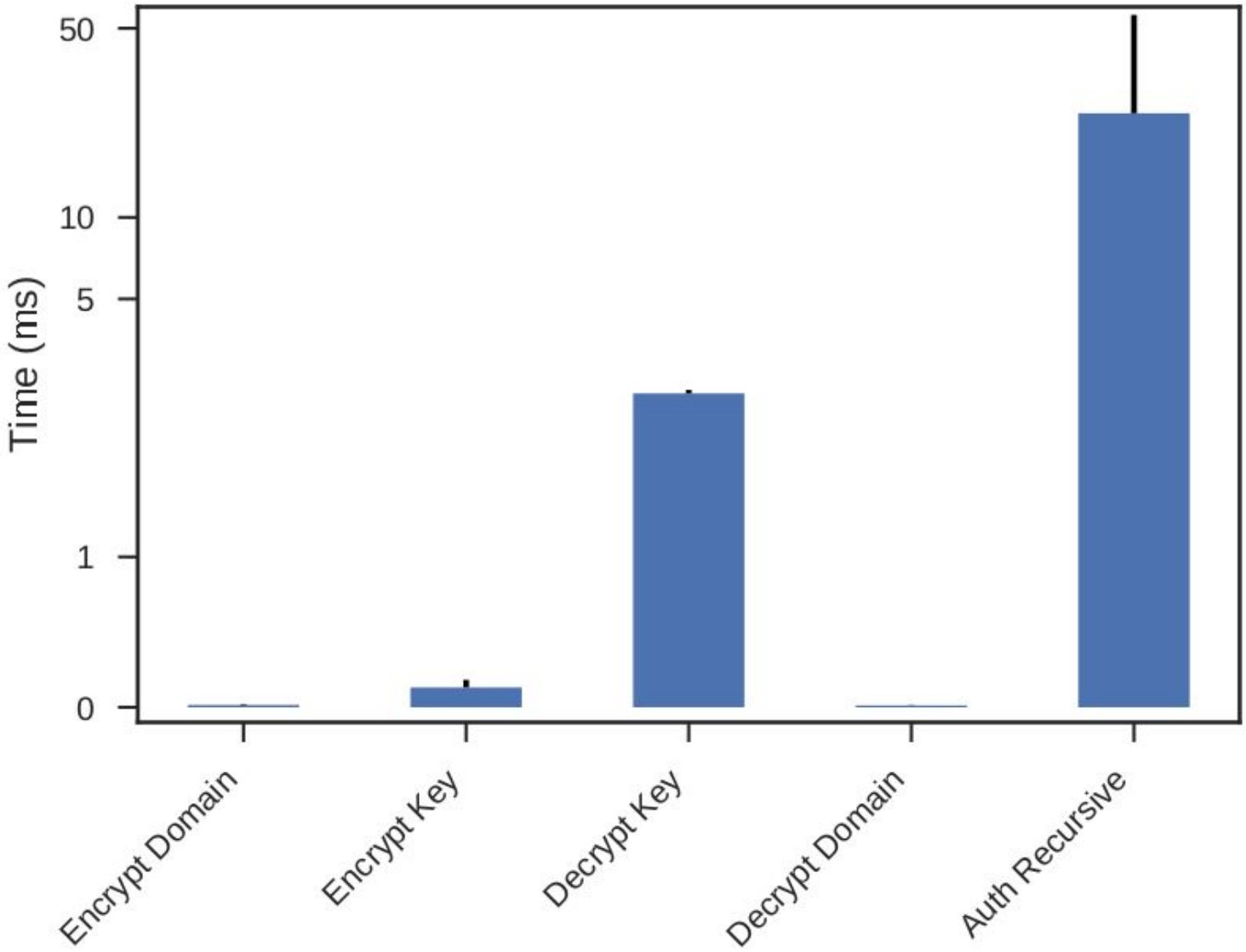
ODNS Overhead (2)



ODNS Overhead (3)



ODNS Function Overhead



Conclusion

- Designed ODNS to protect privacy by decoupling clients' identities with their requests
- Implemented and evaluated a prototype of the design
- Future
  - Implementation based on Knot
  - Explore authoritative replication
  - Examine impact on caching

Questions?

pschmitt@cs.princeton.edu

PRINCETON
UNIVERSITY