NDNS: DNS in NDN

NAMED DATA NETWORKING

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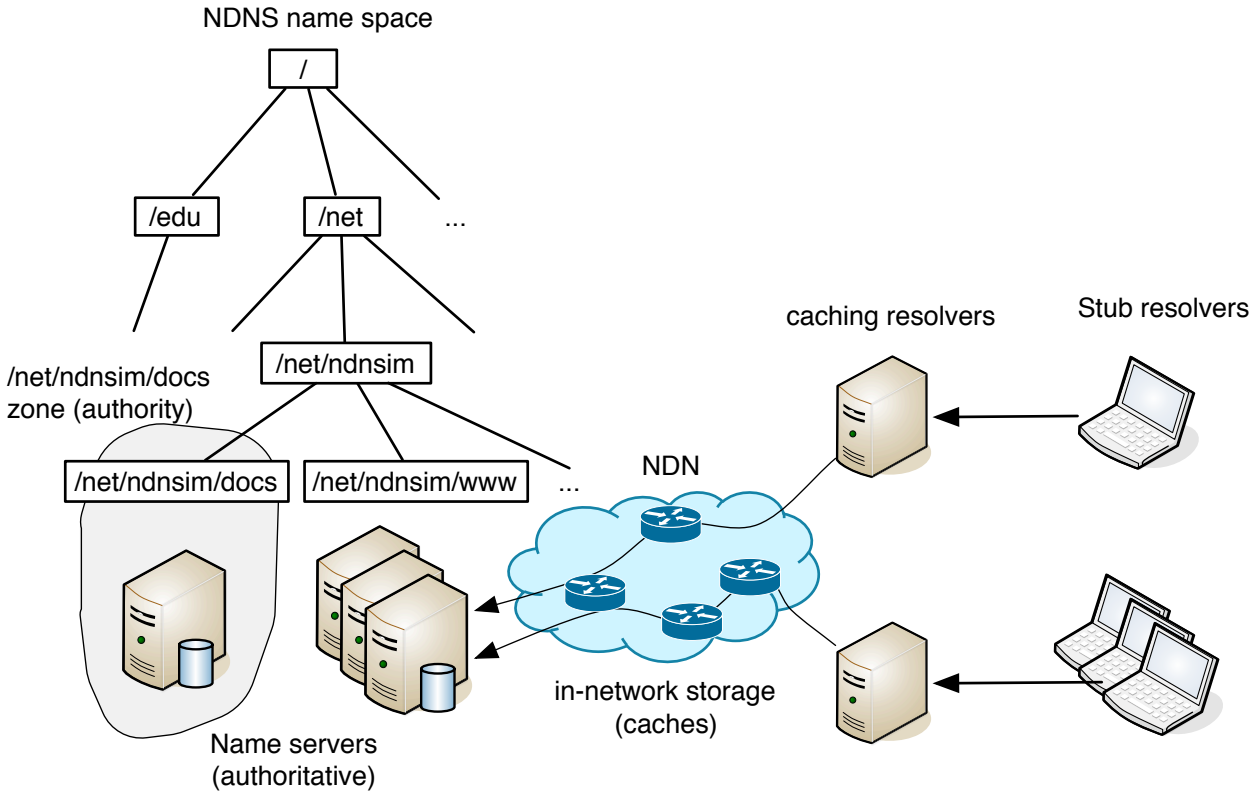
Overview

- NDN needs DNS-like system
  - Map names to names (e.g., to scale routing [1])
    - Some names can be reached directly (in FIB) and some need to be mapped to reachable
  - Always-on storage to save and lookup keys
    - Data production & consumption in NDN is asynchronous
- Data-centric design at the networking level require special considerations
  - Namespace design to allow use of in-network caches and realize per-packet data security

[1] A. Afanasyev, C. Yi, L. Wang, B. Zhang, and L. Zhang, "SNAMP: Secure Namespace Mapping to Scale NDN Forwarding," in *Proceedings of 18th IEEE Global Internet Symposium (GI 2015)*, April 2015.

NDNS Overview

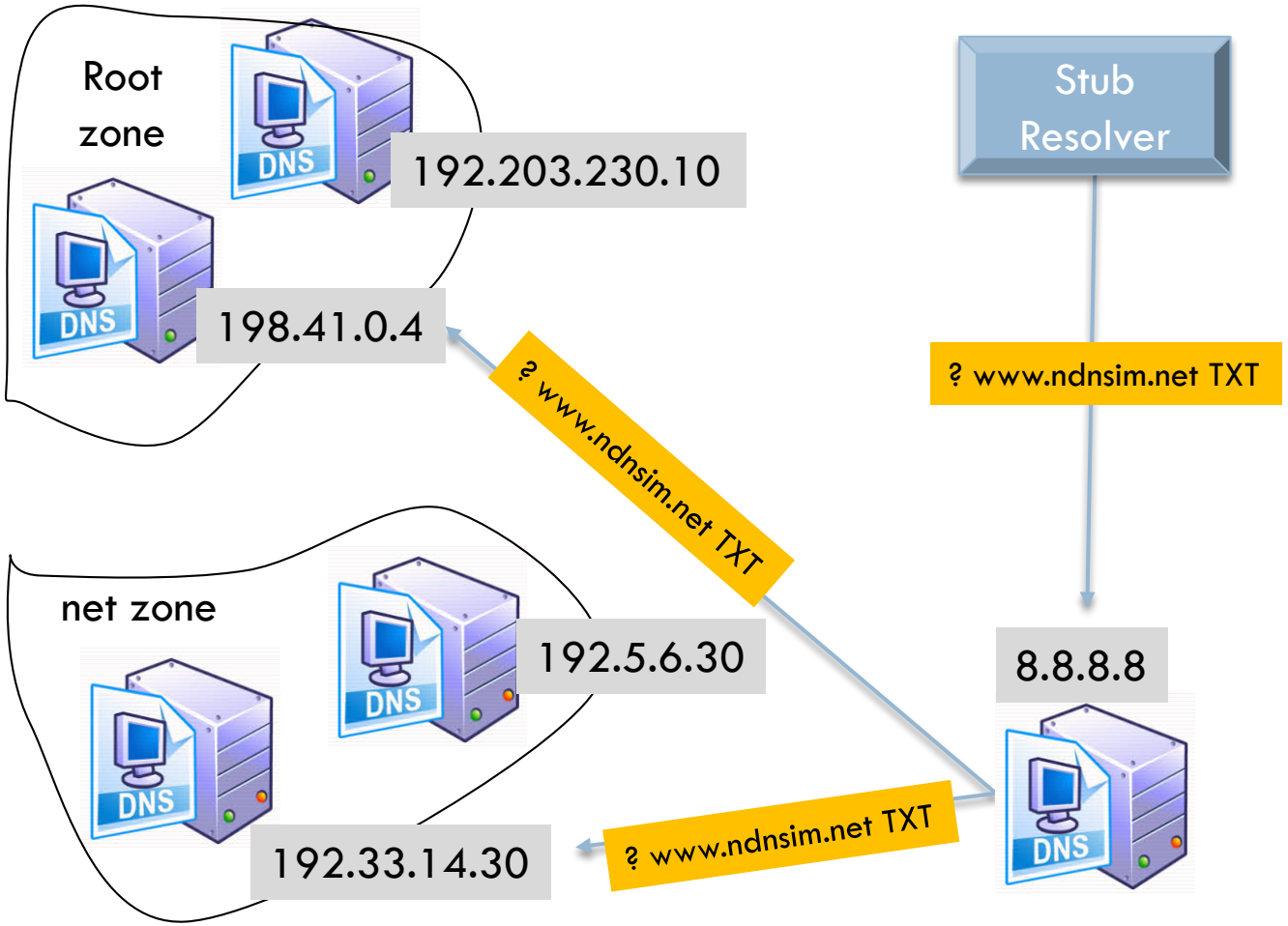
- Domain = NDN name
- Resource Record
  - Information associated with domain
- Zone
  - Dataset containing records associated with NDNS domain
- Authoritative Server
  - Data storage for an NDNS zone
- Caching Resolver
  - Helper to discover domain record
- Stub Resolver
  - Client module for record discovery



NDNS Design Space

- Replicate DNS protocol exactly
  - DNS is data-centric, but at app-level
  - Tradeoffs
- Designing natively data-centric NDNS
  - Data-centricity at the network-level
  - Tradeoffs

Replicating DNS (DNS)



- (!) Interest is a question not to the server, but to the network
- (?) In principle, can do point-to-point, but what could be the "name" of one of an NDNS zone?
- (!) Make NDNS servers be transparent "zone owners"

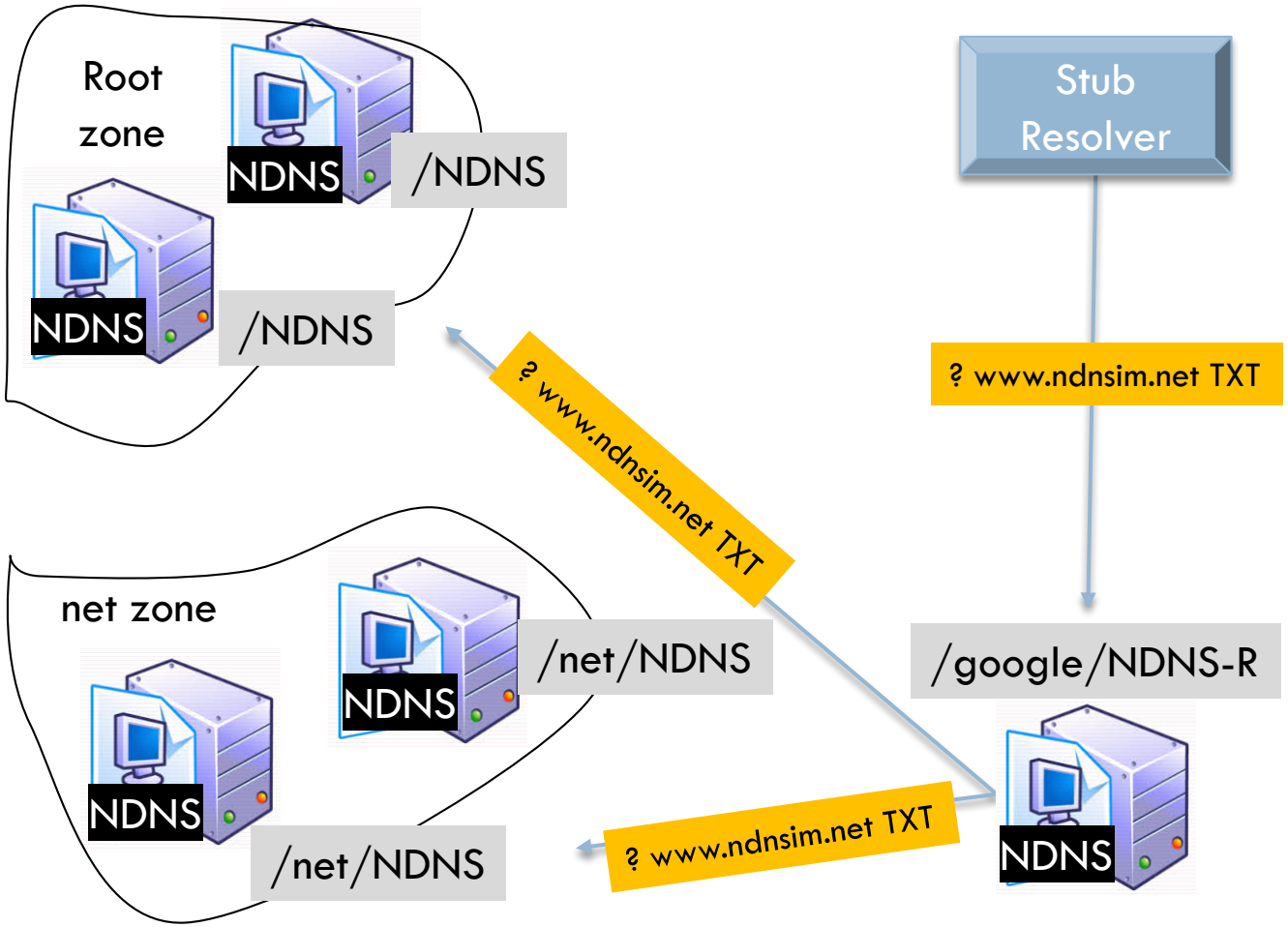
/NDNS/...

/net/**NDNS**/...

/net/ndnsim/**NDNS**/

/google/**NDNS-R**/

Replicating DNS (NDNS)



- (!) Interest is a question not to the server, but to the network
- (?) In principle, can do point-to-point, but what could be the "name" of one of an NDNS zone?
- (!) Make NDNS servers be transparent "zone owners" / service providers

/NDNS/...

/net/**NDNS**/...

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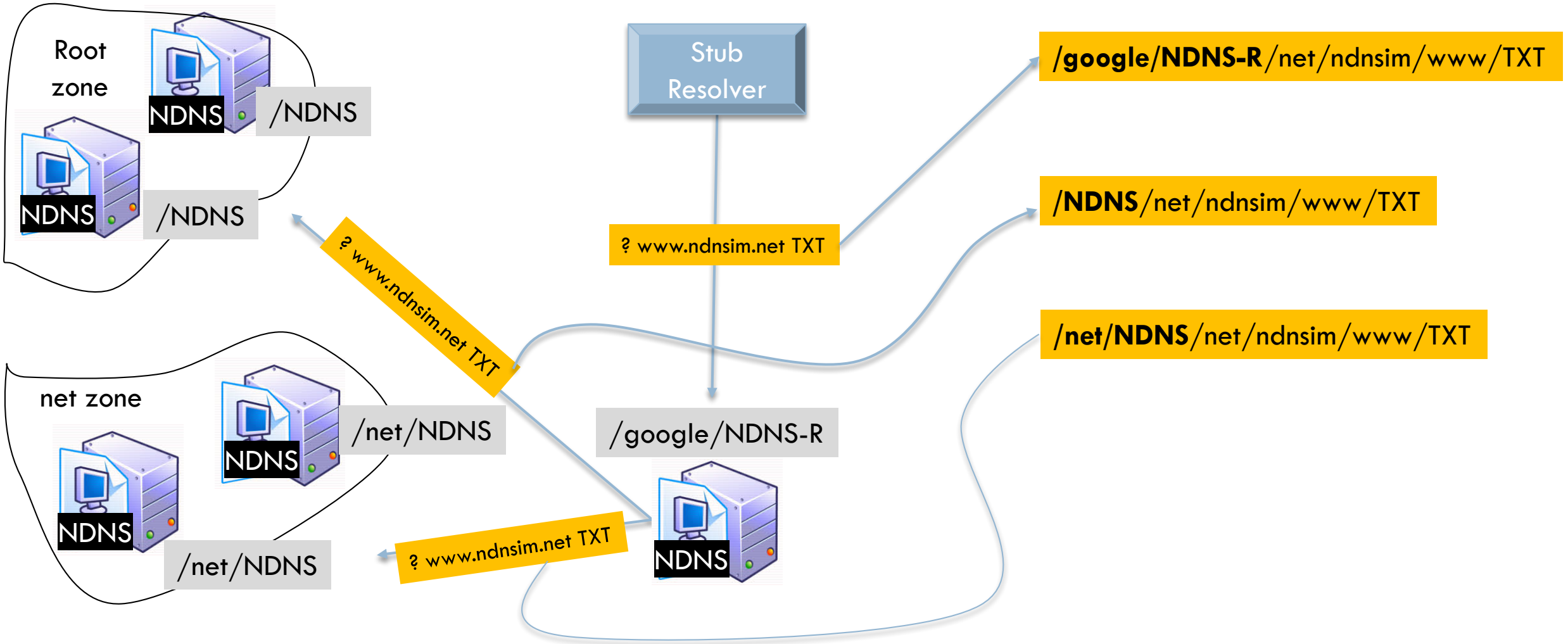
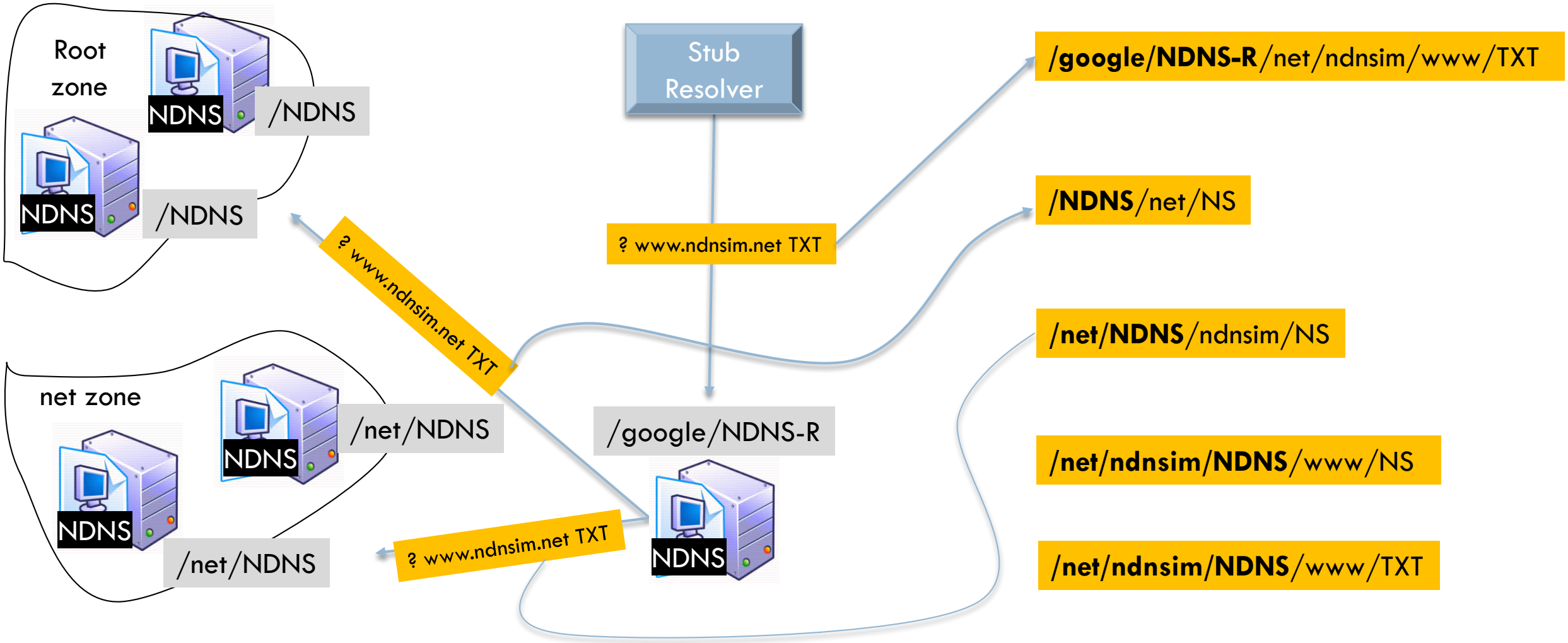
/google/**NDNS-R**/

Transforming DNS Query to NDN Interest (Option 1)



Transforming DNS Query to NDN Interest (Option 2)



Design Option Tradeoffs

/NDNS/net/ndnsim/www/TXT

/net/NDNS/net/ndnsim/www/TXT

- NDNS server can fully utilize its internal cache to return the requested record or next-level referral
- NDN sends query to the closest/available NDNS zone replica
- NDNS servers create response on the fly, e.g., encapsulating original record(s)
- Strict reliance on caching resolvers to scale system

Selected for recursive NDNS query

/NDNS/net/NS

/net/ndnsim/NDNS/www/NS

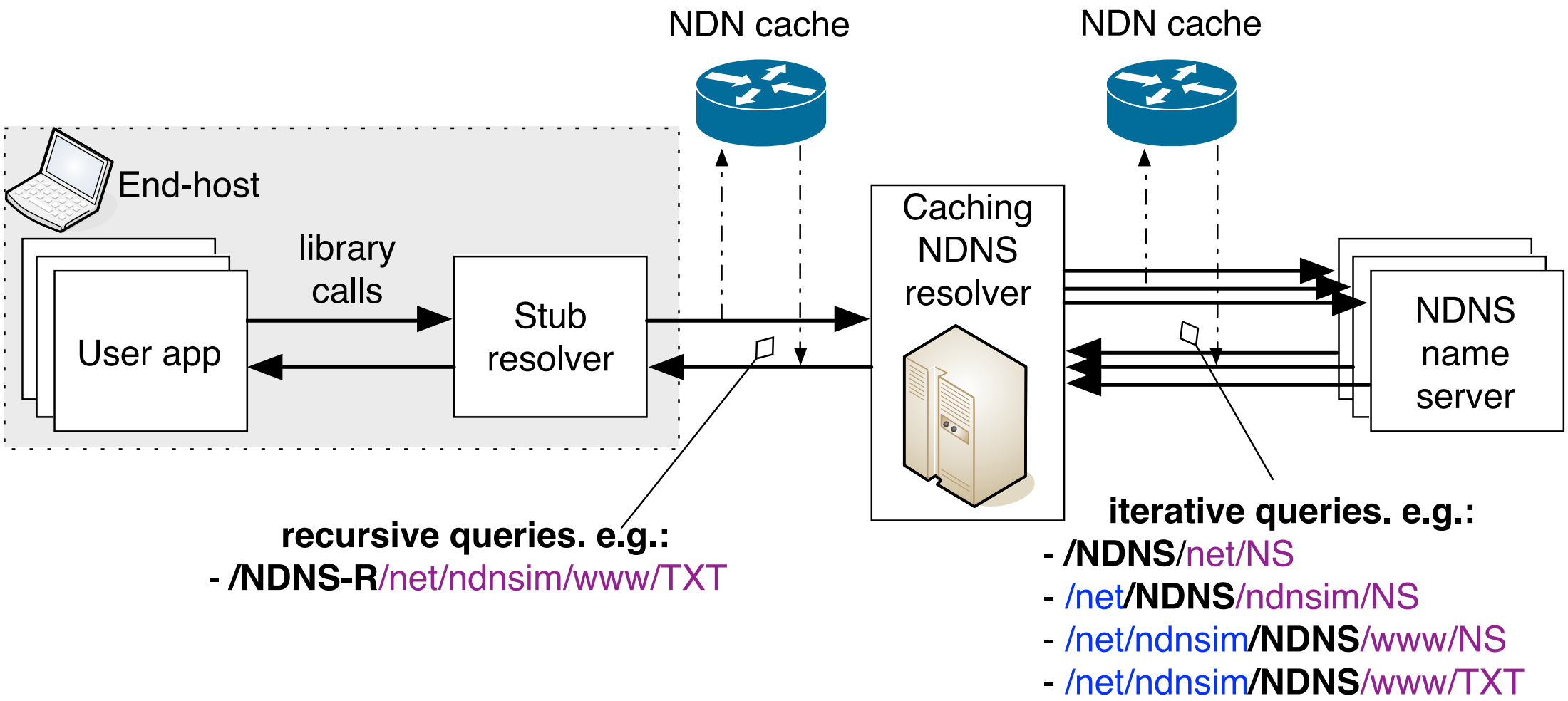
/net/NDNS/ndnsim/NS

/net/ndnsim/NDNS/www/TXT

- NDN sends query to the closest/available NDNS zone replica
- NDNS servers serve static responses
- Full use of NDN caches / scales independent whether caching resolvers exist or not
- NDNS servers cannot fully utilize caches, as the real question is not known

Selected for iterative NDNS query

NDNS Lookup Overview



Questions