Overview

- Similarly to DNS in IP architecture, DNS in NDN can be used as a distribute database to store various types of information.
- DNS in NDN can be utilized to:
  - manage NDN namespace (i.e., provide an authoritative delegation of specific namespaces to specific organizations),
  - provide storage and lookup service for public key management (similarly to DNSSEC and DANE)
  - in many other solutions
- Design principles:
  - DNS has been working well enough over last 25 years
  - Unless it is proven necessary, the existing DNS design should be kept intact, with minimal modification to adapt the system to communication primitives (Interest data) provided by Named Data Networking architecture

Use case: Interest forwarding scalability problem

- Carried in Interest packets
- Forwarding in NDN

Encapsulating in NDN

- Carried in Interest packets
- Used by routers in forwarding, if content name is unknown

Applying map'n'encap approach

- All NDN names are application names
  - small number of them are directly routable world-wide
  - most of them routable only inside ISP networks
- Routable only inside ISP networks
  - Example applications names:
    - /com
    - /edu
    - /info
    - /org
    - /net
    - /edu-servers
- Scalable DFZ FIBs can contain top-level ISP and large content provider's names
  - /net/att
  - FIBs in ISPs may contain more specific location-dependent names
  - In ATT network, there could be /net/att/europe and /net/att/northamerica
- Routable only inside ISP networks

Scaling Interest forwarding with map'n'encap approach

General map'n'encap idea

- Core of the Internet maintains default-free zone (DFZ)
  - every ISP (dedicated ISP's address) has a route in DFZ
- Customer networks
  - prefixes for all internal networks and servers
  - default route to DFZ
- When sending packets between customer networks
  - map destination address to ISP address
  - encapsulate original packet inside a new packet with ISP address

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NDN-DNS lookup

- Two types of queries
  - iterative queries by caching resolvers
  - recursive queries by end clients
- New record type
  - mnemonic: FH
  - ID: 65429 (0xFFFD)
  - type: S
  - priority: the lower priority should be tried first
  - weight: probability of selection is proportional to the weight

App-based lookup

- Interest: Name: <scope>/*
- Data: Name: <scope>/*
- Signature: Name: <scope>/*

Iterative query

- Interest
  - Name: /scope/*
  - Forwarding hint: /scope/*
- Data
  - Name: /scope/*
  - Content: /scope/*

Recursive query

- Interest
  - Name: /scope/*
  - Optional query to which specific caching resolver, if working
- Data
  - Name: /scope/*
  - Signature: Name: /scope/*
  - Content: /scope/*

Example of IP map'n'encap: dual-handed ndnsim.net server

- ndnsim.net
  - 1.1.1.1

Example of NDN map'n'encap: dual-handed producer of /net/ndnsim prefix

- /net/ndnsim
  - /net/ndnsim
  - /net/ndnsim
  - /net/ndnsim
  - /net/ndnsim

Naming for NDN-DNS queries

- Iterative query
  - Interest
    - Name: /scope/*
    - Forwarding hint: /scope/*
  - Data
    - Name: /scope/*
    - Content: /scope/*

- Recursive query
  - Interest
    - Name: /scope/*
    - Optional query to which specific caching resolver, if working
  - Data
    - Name: /scope/*
    - Signature: Name: /scope/*
    - Content: /scope/*

Example of NDN-DNS lookup for ndnsim.net

- /net/ndnsim
  - /net/ndnsim
  - /net/ndnsim
  - /net/ndnsim
  - /net/ndnsim

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