DNS Map
A DNS-Based Resolution System for IP Address Mappings

Christian Vogt

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Resolution System for IP Address Mappings

- Address indirection requires mapping resolution
- Low disruption and low state requirements desired
- Pure push or poll systems fail to satisfy both

<table>
<thead>
<tr>
<th></th>
<th>disruption</th>
<th>state</th>
</tr>
</thead>
<tbody>
<tr>
<td>Push systems:</td>
<td>low</td>
<td>all mappings</td>
</tr>
<tr>
<td>Poll systems:</td>
<td>delay or loss</td>
<td>only used mappings</td>
</tr>
</tbody>
</table>
Idea of DNS Map

To resolve IP address mappings with low disruption and low state requirements

Components

- DNS-based mapping resolution
  - Mappings stored in reverse DNS
  - New MAP resource record
- Pre-fetching
  - Initiate on early indication that mapping is needed
- Pre-fetching optimizes poll systems in general
**Mapping Encoding**

- **Granularity variable**
  - edge address prefix of any length
- **Relationship variable**
  - 1-to-1 or many-to-1
- **Prioritization**

**MAP resource records for 1.0.0.0.....0.C.B.A**
- map edge address prefix to transit address prefix

<table>
<thead>
<tr>
<th>MAP</th>
<th>Prefix</th>
<th>Prio</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABC::/48</td>
<td>1000::/48</td>
<td>1</td>
</tr>
<tr>
<td>ABC::/48</td>
<td>2000::/48</td>
<td>1</td>
</tr>
<tr>
<td>ABC::/48</td>
<td>2.0.0.2/32</td>
<td>2</td>
</tr>
</tbody>
</table>
Mapping Resolution via DNS

query for edge address, reply cached for edge address prefix
Mapping Resolution via DNS

initiating host

from DEF::2
to ABC::1

delay

indirection router

no mapping for edge address ABC::1

from DEF::2
to ABC::1

query for edge address, reply cached for edge address prefix

1.0.0.0.....0.C.B.A MAP ?

---- MAP ABC::/64 → 1000::/48
---- MAP ABC::/64 → 2000::2/128
---- MAP ABC::/64 → 2.0.0.2/32

from 3000::3
to 1000::1

original from DEF::2
original to ABC::1

from DEF::2
to ABC::1

responding host

ABC::1

indirection router

authoritative DNS server

DNS

Pre-fetching

query triggers mapping resolution; 1st packet undelayed
Analysis

Push + poll advantages
- low state requirements
- low delay

Reuse
- existing protocol
- existing infrastructure
- can be 2nd DNS instance

Flexibility
- dynamic preferences
- variable granularity

Security
- mappings from owner
- trustworthy delegation chain
- optional crypto-protection via DNSSEC
Conclusions

- Mapping resolution with low disruption and low state requirements

- Idea: Poll + pre-fetching
  - Mappings stored in reverse DNS (new MAP record)
  - Query for address, cached reply for prefix
  - Initiate on early indication that mapping be needed

- Future work
  - Pre-fetching for other poll systems