Expressing Communication Service Requirements in DNS Queries

Donald Eastlake d3e3e3@gmail.com
Haoyu Song haoyu.song@futurewei.com

Futurewei Technologies, Inc.

draft-eastlake-dnsop-expressing-qos-requirements

Goals

- DNS answers that can depend on the quality of communication services required.
  - For example, different answers if minimum latency is requested versus maximum bandwidth.
- Works through intervening recursive servers.
  - Meta RRs / OPT [RFC 6891] are not the answer.
- No changes to on-the-wire DNS protocol or messages.

DNS Queries

- DNS Query Dimensions
  - QNAME
    - Flexible, variable length hierarchically structured name of the relevant service / host.
  - QTYPE
    - Type of data being sought.
  - QCLASS
    - Vestigial, pretty much always IN.
- Only QNAME is useful for this so communication service requirements must be encoded there.

Existing Requirements Encoding in Names

- There already exists a standard way of encoding the communication protocol and service for which a query is being issued using prefix labels:

  _ldap._tcp.example.com

- This was initially standardized for the SRV RRtype [RFC 2782] but has been extended with various combinations of other leading underscore ("_") labels and other RRtypes such as TLSA, URI, and TXT [RFC 8552]. An IANA Registry exists.

Existing Encoding in Labels

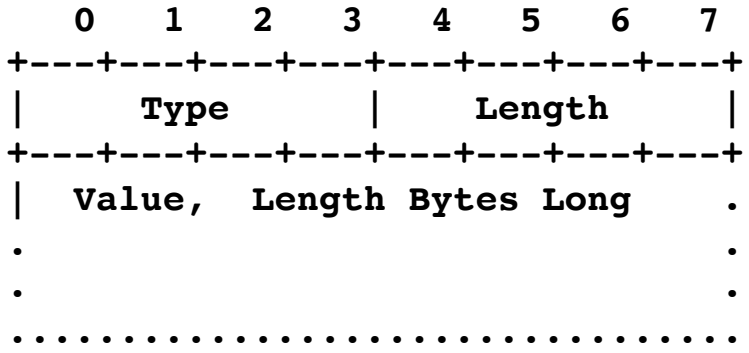
- Besides “leading underscore” labels, there are “R-LDH” (Restricted LDH (Letters Digits and Hyphen)) labels defined in [RFC 5890].
  - Specified to start with prefix of two letters/digits followed by two hyphens.
  - The only currently specified R-LDH prefix, “xn--”, indicates an internationalized (restricted Unicode) label [RFC 5890].
- Both underscore and R-LDH labels
  - Do not affect the DNS protocol on the wire.
  - Do not affect wildcard/CNAME/DNAME processing.
  - Do not change DNS security

Types of Communication Service Quality

- Coarse QoS
  - One of:
    - normal, minimize latency, maximize bandwidth, minimize jitter, minimize packet loss, minimize cost, …
- Specific QoS metrics
  - Any subset of:
    - Maximum acceptable latency
    - Minimum acceptable bandwidth
    - Maximum acceptable jittery
    - Maximum acceptable packet loss
    - …

Proposed Label Details

- A communication service quality requirements label
  - starts with “qs--”
  - followed by hexadecimal encoding of TLVs
    - for readability and case insensitivity
  - TLV structure, due to limited number of types and limited range of lengths, Type and Length in one byte



Example

- An example based on the draft.
  - Looking for minimum latency communications with example.com.

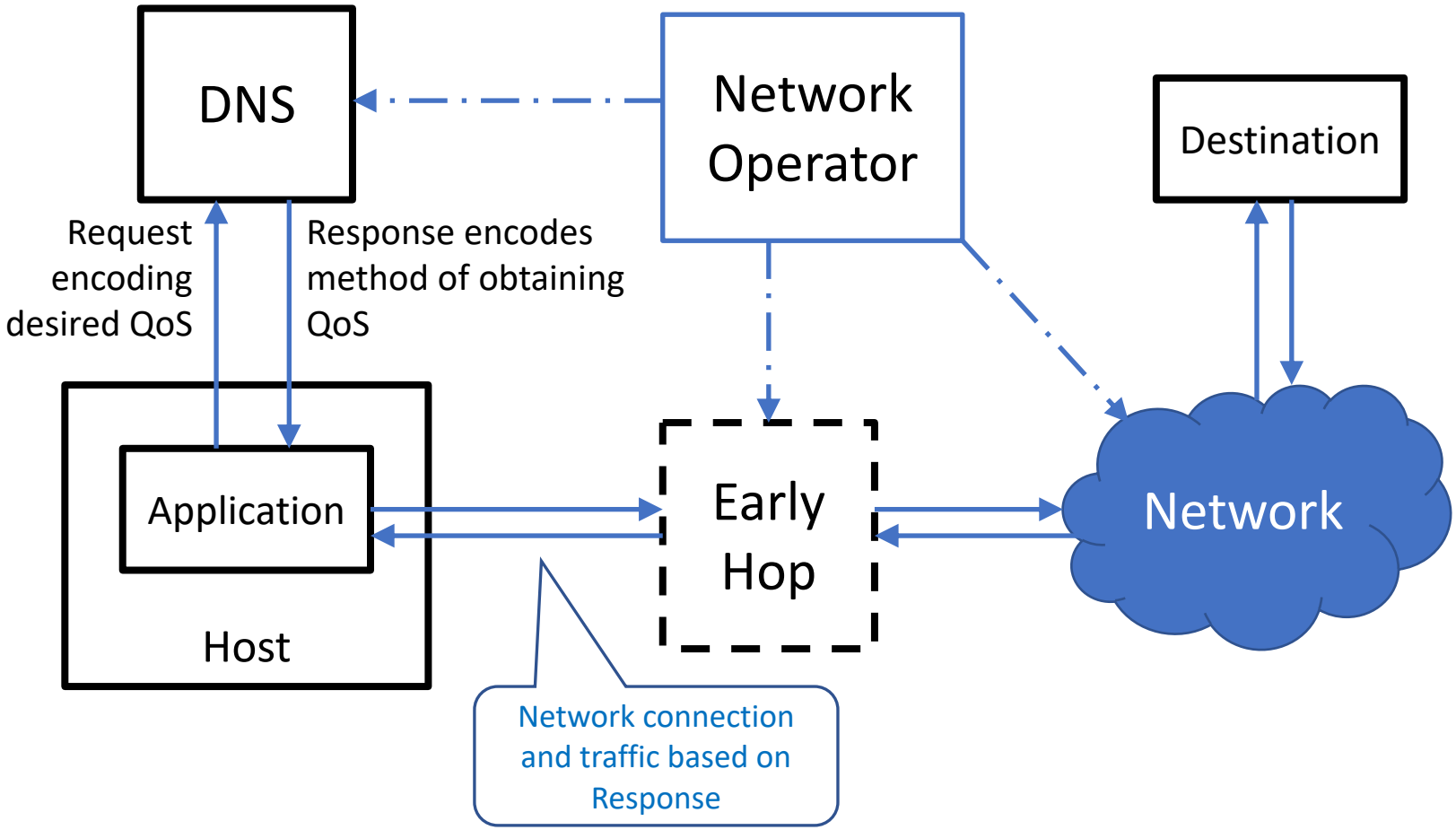
```
                    qs--  Prefix
                       1  TLV Type – Coarse QoS
                       1  TLV Length
                      08  TLV Value – minimum latency
             example.com  Remainder of domain name

qs--1108.example.com.     Complete domain name
```

What Data Might You Be Fetching?

- One possibility is a “semantic address”.
  - draft-farrel-irtf-introduction-to-semantic-routing
  - That is, an address that has not just a network interface identifier in it but also encodes additional information such as how to connect to that interface.
  - For example, an IPv6 address with additional information encoded in low order bits.

Network Connection



Authoritative Server Support of QoS Labels

- In the simplest case of just testing application use/creation of DNS names, leading QoS labels can be ignored by wildcarding.
- To support Coarse QoS or a very small number of specific QoS metrics, the number of possibilities is sufficiently limited that names could be stored in zones as usual.
- To support general QoS metrics, authoritative server extensions would be required.

Miscellaneous

- The draft
  - creates an IANA Registry for R-LDH labels
  - creates an IANA Registry for the service request Types

Next Steps

- Please take a look at the draft.
- Comments welcome.

For further information

- Main Draft:
  draft-eastlake-dnsop-expressing-qos-requirements

- Contacts
  - Donald Eastlake d3e3e3@gmail.com
  - Haoyu Song haoyu.song@futurewei.com

- Any Questions?

END

Donald Eastlake d3e3e3@gmail.com
Haoyu Song haoyu.song@futurewei.com

Futurewei Technologies, Inc.

draft-eastlake-dnsop-expressing-qos-requirements

What Changes