Expressing Communication Service Requirements in DNS Queries

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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

```
+-----------+-----------+-----------+-----------+-----------+-----------+-----------+-----------+
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
+-----------+-----------+-----------+-----------+-----------+-----------+-----------+-----------+
| Type      | Length    |
+-----------+-----------+-----------+-----------+-----------+-----------+-----------+-----------+
| Value,    | Length    |
| Bytes     | Long      |
| .          | .         |
| .          | .         |
| ...................  |
```

DNSOP WG
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

DNS

Request encoding desired QoS

Response encodes method of obtaining QoS

Application

Host

Network Operator

Destination

Early Hop

Network connection and traffic based on Response

Network
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

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• Any Questions?
END

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What Changes

User Interface

Application

Resolver

Recursive Server

Changed / New

Might Changed

No Change

Authoritative Server

Back End