Continuing to Evolve Internet Routing Beyond 'Mere' Reachability

IETF 113

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Goal for this Draft

Our work is intended to seed discussions of how the observed evolution of the Internet's routing system can continue

Want to *engage with the RTG WG* community to identify (and agree on?) possible next steps on ensuring that routing evolution

Structure of this Draft

Starting with The Original Purpose Of The Routing System…

- Network routing originally designed to enable <u>forwarding of IP packets towards destination addresses</u>

- <u>Locator semantic</u> of IP addresses fundamental to this
  - Assigned in context of network topologies

- <u>Distributed decision making</u> in intermediary routers
  - May lead to routing problems

- Key are <u>methods</u> for selecting path and <u>criteria</u> for doing so

- <u>Traffic engineering</u> may avoid such routing problems

…Progressing Towards Extensions Beyond 'Mere' Reachability…

NOTE: Draft observes/surveys those extensions but does not suggest any specific ones!

- Table 1 lists
  - <u>Purpose</u>: what is the intended purpose of the extension
  - <u>Approach</u>: what is the underlying technical approach to achieve desired purpose
  - <u>Examples</u>: known solutions to achieve desired purpose
- Ultimately, this may lead to a taxonomy for <u>capabilities</u> of a routing system and <u>approaches</u> to achieving those capabilities
- Table 1 lists **12** purposes, **26** approaches, and **58** references to examples

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|   Purpose   |   Approach  |               Examples                  |
+=============+=============+=========================================+
|Path Selection| Preferential|        IS-IS Extensions [RFC5305]        |
|  for Traffic |   Routing   |                                         |
|  Engineering |             |                                         |
|--------------+-------------+-----------------------------------------|
|              | Policy-based| PBR models [RFC1104] Inter-domain       |
|              |   Routing   |     policy routing [RFC1479]            |
+--------------+-------------+-----------------------------------------+
|              |Flow Steering|                 TBD                     |
+--------------+-------------+-----------------------------------------+
|              |    Path     | PCE [RFC4655] PCEP [RFC5440] PCEP        |
|              | Computation |      Extension [RFC8231]                |
+--------------+-------------+-----------------------------------------+
|              |    IRTF     | Path-aware Networking RG [PANRGref]      |
|              |             |          Path properties                |
|              |             |[I-D.irtf-panrg-path-properties] Past    |
|              |             |        efforts evaluation               |
|              |             |  [I-D.irtf-panrg-what-not-to-do]        |
+--------------+-------------+-----------------------------------------+
|Path Selection|  Multicast  |IP multicast [RFC1112] IPv6 addressing   |
|for Multicast |             | [RFC4291] MBone [MBONEref] MADCAP       |
|              |             | [RFC2730] MALLOC [RFC6308] MASC         |
|              |             | [RFC2909] MZAP [RFC2776] MSDP           |
|              |             |    [RFC3618] SSM [RFC4607]              |
|              |-------------+-----------------------------------------|
|              |  Automatic  |            AMT [RFC7450]                 |
|              |  Multicast  |                                         |
|              |  Tunneling  |                                         |
+--------------+-------------+-----------------------------------------+
                                          .
                                          .
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Key observation is that Internet routing has been evolving!

…To The Issues Those Extensions May Cause

Section 4 discusses possible issues with the approaches taken to achieve the desired purposes

Specifically:

- <u>Limiting routing semantics</u>, e.g., by fitting new purposes into limitations of old realizations (e.g., content naming within IPv6 address limits)

- <u>Complexity and efficiency</u>, related to
  - Repetitive encapsulation
  - Introducing path stretch
  - Complicating traffic engineering

- <u>Security</u>, e.g., through integrating of (new) solutions into deployed systems

- <u>Fragility</u>, e.g., through interaction with other purposes and their approaches

- <u>Interoperability</u>, forward and backward, e.g., when using packet fields beyond previously agreed semantics

Asking RTG WG community to recognize the following cornerstones for evolving Internet routing

1. Further evolution of the Internet's routing system MUST take a <u>wider architectural approach</u>

2. With research and development on routing solutions continuing, <u>these works MUST be brought into the process of IETF</u> engagement and standardization

3. The <u>RTG WG SHOULD play a role in the engagement with research and development</u> since the 'Future of Internet Routing' (FIR) is at the heart of its charter ("*The Routing Area working group (RTGWG) is chartered to provide a venue to discuss, evaluate, support and   develop proposals for new work in the Routing Area*" [RTG WG charter])

Suggesting the Following Actions

1. Establish suitable efforts within the RTG WG (e.g., as a sub-group) OR

2. Support the establishment of suitable efforts as a standalone FIR (Future of Internet Routing) WG OR

3. Support the establishment of suitable efforts within the IRTF, where those efforts directly liaise with the RTG WG through regular updates in its meetings.

IETF – RTG WG

We ask for your support through comments here, on the list, or by signing https://etherpad.wikimedia.org/p/routing.addressing.manifesto

We are NOT asking to risk the investment of the Internet for the mere benefit of making architectural progress but instead want to ensure continued evolution without the issues that may significantly worsen if we continue business as usual!

THANKS!

QUESTIONS? / COMMENTS?

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