Advanced Unidirectional Route Assessment (AURA)

draft-amf-ippm-route-05

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Frank Brockners' Review

- RFC 2330 Terminology for nodes <u>in the path</u>:
    - host: a computer capable of IP comm, <u>includes routers</u>
    - router: a host which facilitates network-level communication between hosts by forwarding IP packets.
- Retain host, add new Node term and definition:
    - RFC 2330 host: a computer capable of IP communication, <u>includes routers</u>
    - Node: Any network function on the path capable of IP-layer Communication, includes RFC 2330 hosts

FB: Differentiate discussion of traceroute-style methods with hybrid methods.

- Discussion (3.6) Considerations that apply well to traceroute-style methods, but <u>might not be true for hybrid methods like IOAM</u>.

- Edited-in these categories for several items of section 3.6

Format of Results = Updating RFC 5388 (section 3.6):

- Frank: IMHO it would be good to at least get all the **requirements for the update** spelled out here.
  - Punt the YANG model to a new I-D and just define the requirements in the current doc is a good solution IMHO.
  - WG agreed
- Footer's Comments and Questions:
  - Resulted in adding another requirement for the future model, Original Sender's Time stamp
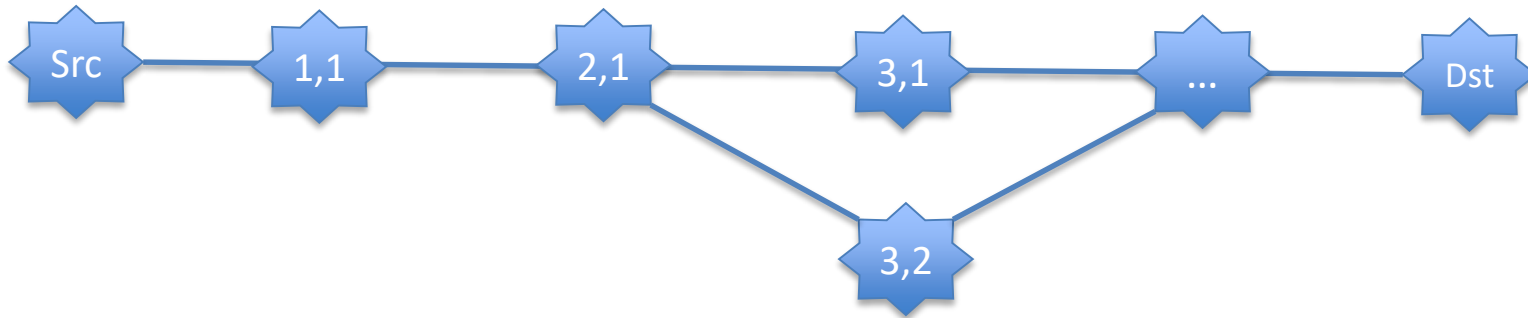
Next Steps

- Our goal at IETF-105:
  - WGLC by IETF 106
- Authors believe that WG is ready to see this draft on its way.
- WGLC, please.

BACKUP

Reminder: Route Ensemble
(not showing Src=`h(0,j)`)

```
Route Ensemble = {
    {h(1,1), h(2,1), h(3,1), ... h(N1,1)=Dst},
    {h(1,2), h(2,2), h(3,2),..., h(N2,2)=Dst},
    ...
    {h(1,m), h(2,m), h(3,m), ....h(Nm,m)=Dst}
}
```

Hops!

- Member Routes represented as an <u>ordered list</u>:

`Src=h(0,1), h(1,1), h(2,1), h(3,1), ... h(N1,1)=Dst`

- `h(i,j)` was a host, but we can learn more…
  - MUST include Host Identity
  - Arrival Interface ID (e.g., when [RFC5837] is supported)
  - Departure Interface ID (e.g., when [RFC5837] is supported)
  - Arrival Timestamp
  - Round-trip Delay Measurements

Lingering To Do&Done Items

- What happened to our Review volunteers?
- CMP: Packet Fields can ID a Flow (RFC 6438)
- CMP: Interface name and MTU (RFC 5837)
  - Use with Traceroute
- CMP: Add Cautions for Methods
  - Try to avoid good measurements used badly
- FB: Method using IOAM Loopback bit (UDP pinger)

Next Steps

Authors

- Ping-to-death the volunteer reviewers? Or Find More?

WG + authors

- Continue Temporal, Class C, MDA, Mid-Point
  - New material is found in Section 4
- Please Read and send your Review to the list
 - Still needed for sections 5 & 6, RT Delay and Analysis

Background & Inputs

- Route Metric developed/discussed IETF-99
- Scope refined@IETF-100, adopted afterward
  - Charter limits direct coverage below IP
- Generalized all definitions for IETF-101
  - "applicable to other network domains, if desired"
- Feedback from WG @102 session
  - Added Author: Rüdiger Geib -> Appendix
  - Yaakov Stein: Term "Ordered Graph" not correct
    - Use "Ordered List" instead. After discussion, we did!
  - Revised Methods : Temporal Comp & Class C; exist tools
  - Added initial Intermediate-Point route measurement section

Version 02+3 Development Areas

- Temporal Composition for Route Metrics
  - Past measurements influence current results!
  - Spot-check past measurements at critical hops (reduce measurement load & time)

- LB Hop treats Packets of <u>Routing Class C</u> equal
  - concept in RFC 2330 & 7799, a Metric Parameter
  - Each Member Route of Route Ensemble has one
  - Synergy with the Temporal Composition
  - very useful to know. **How useful is it?**

Route measurement at a mid-point?
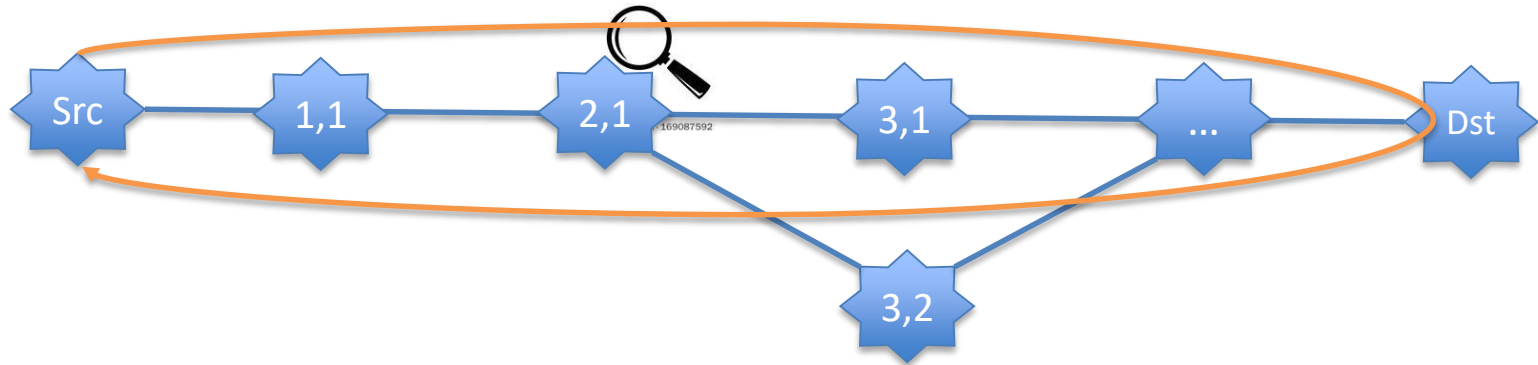
- Ex: Passive Observations indicate abnormal RTT
- End2End flow conforms to a "Routing Class C"
- Knowing the qualifications of that Class enable
  - Measurement of End2End flow's route
  - Examination of RTT to intermediate Hops.
  - Other diagnostic measurements launched from the mid-point: Multipath Detection Algorithm (MDA), etc.
  - Don't have to *spoof* the Src IP addrs for traceroute!

Preliminary Steps to Intermediate Point Route Assessment

- Monitored Packet stream described ~5-tuple
  - Calculate one or More Hash Function Values
  - Hash Value(s) that Define the Routing Class C
- Synthesized Route Measurement Packets
  - Source Port is main variable
  - Also, 4 bytes of data field
  - TCP or UDP Source Port range reduced
    - Keep Checksum Constant
    - Match the Hash Function value(s)

Generalized Definitions

- Host Identity:
  - The unique address for hosts communicating within the network domain. (e.g., Globally Routable IP address)
  - The Address for Normal comm and Error conditions

- Discoverable Host:
  - Hosts that convey their Host Identity according to the requirements of their network domain, such as when error conditions are detected
  - (IP) sends ICMP Time Exceeded when discarding
  - (IP) RFC 1122 and RFC 1812

Generalize: Definitions + more

- Cooperating Host:
  - MUST respond with Identity to interrogation, SHOULD provide other info (RFC 2119 terms)

- Remainder of Section 3:
  - IPaddrs, TTL, other layer-specific terms > general
  - Hop
  - Member Route
  - Route Ensemble

Methods of Measurement

- Two Classes, with likely different scopes
  - Active & Multiple Domain
  - Hybrid & Single Domain (at first?)
- Added 2119 Req's to Paris-Traceroute (active)
- Clarified Checksum calculations
- New Subsection on combining diff Methods
  - Ingress Hosts BOTH Discoverable and Cooperating
  - Key is overlapping Host Identities

Individual Background & Inputs

- Route Metric developed, then Introduced before IETF-99

- Rüdiger Geib's comments became our initial To Do List (7 items), replies, p/o -99 slides.

- Interim: Ext. comments: Carlos Pignataro
  - Many [CMP] comments addressed
  - Several remain: discuss TODAY! (Expand Scope)

- Off-list comments from Frank Brockners

- THANKS to reviewers so far

- https://tools.ietf.org/rfcdiff?url2=draft-amf-ippm-route-01.txt

Background & Inputs (for 01)

- Route Metric developed, then Introduced before IETF-99, WG adopted post-IETF-100

- Scope Discussion@IETF-100
  - Charter limits direct coverage
  - Can make definitions more general
  - Consider what work/applicable layers needed
  - Added Carlos Pignataro [CMP] as co-author

- THANKS to reviewers so far:
  - Rüdiger Geib, Frank Brockners

Discussion/Development Areas (01)

- Temporal Composition for Route Metrics
  - Past measurements influence current results
  - Can we spot-check past measurements at critical hops? (reduce measurement load & time)
- Hop/Route treats a Class C of Packets equally
  - very useful to know, incorporate as a Parameter
  - a concept of RFC 2330 & RFC 7799
- Interaction between Host Identity and ability to discern Subpaths
- Assessment at IP-layer reveals the Route Ensemble for "IP and Higher"

Questions for the IPPM WG (01)

- +Appendix? Illustrate applicability beyond IP?
  - Spencer: "consider first whether work needs to be done"
- Candidate: MPLS Ping & Tracert
  - RFC 8029 Deterministic Multipath & Timestamps
  - Can be applied to IP (already in IPv6 Datacenter)
  - RFC 6374 for Loss & Delay Measurement (Greg)
- Reporting the Metric: suggestions?