Advanced Unidirectional Route Assessment (AURA)

draft-amf-ippm-route-04

J.I. Alvarez-Hamelin, A. Morton,

J. Fabini, C. Pignataro, R. Geib

Frank Brockners' Review

- Thanks! One key question to discuss in 4 minutes:
- RFC 2330 Terminology for nodes in the path:
  - host: a computer capable of IP comm, includes routers
  - router: a host which facilitates network-level communication between hosts by forwarding IP packets.
- RFC 8200: a host is not a router (but definition is not path-specific)
- Today, nodes in the path can be a coherent compute environment within a computer

Frank Brockners' Review (2)

- Options for new path terminology:

A. Retain host, add new Node term and definition:

  - RFC 2330 host: a computer capable of IP communication, includes routers
  - Node: Any network function on the path capable of IP-layer Communication, includes RFC 2330 hosts

B. Revise host (use the word node in a general way):

  - host: a node on the path possessing a coherent compute environment and capable of IP-layer Communication, includes RFC 2330 hosts

C.

  - ?

FB3: Align traceroute-style methods with hybrid methods.

- Suggest to harmonize section 3.5 with section 4.2; E.g. statements like "If a discovered host always replies using the same network address, regardless of the interface a packet arrives on, then multiple parallel links cannot be detected in that network domain." apply well to traceroute-style methods, but might not be true for hybrid methods like IOAM.
- Editors – seek and implement alignment

FB4: Updating RFC 5388 (section 3.6):

- IMHO it would be good to at least get all the **requirements for the update** spelled out here.
- Updating 5388 in an appendix would be a plus but it **would even be better if we had an updated data model as an IETF YANG model.**
- Punt the YANG model to a new I-D and just define the requirements in the current doc is a good solution IMHO.
- Other Opinions?

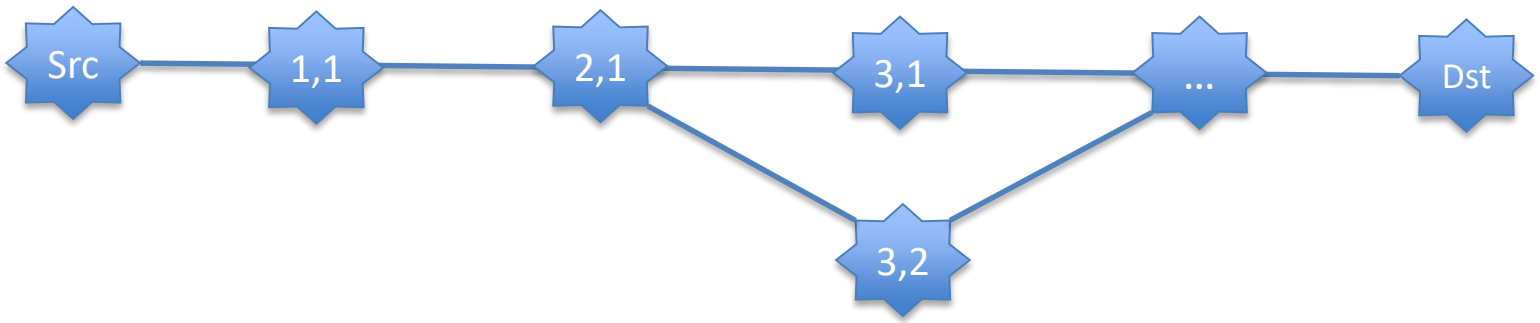
Next Steps

- IPPM WG Weigh-in on key questions!
  - Including @@@@ questions in the text
- Authors implement changes and FB –edits
- WGLC by IETF 106

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 ordered list:

```
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

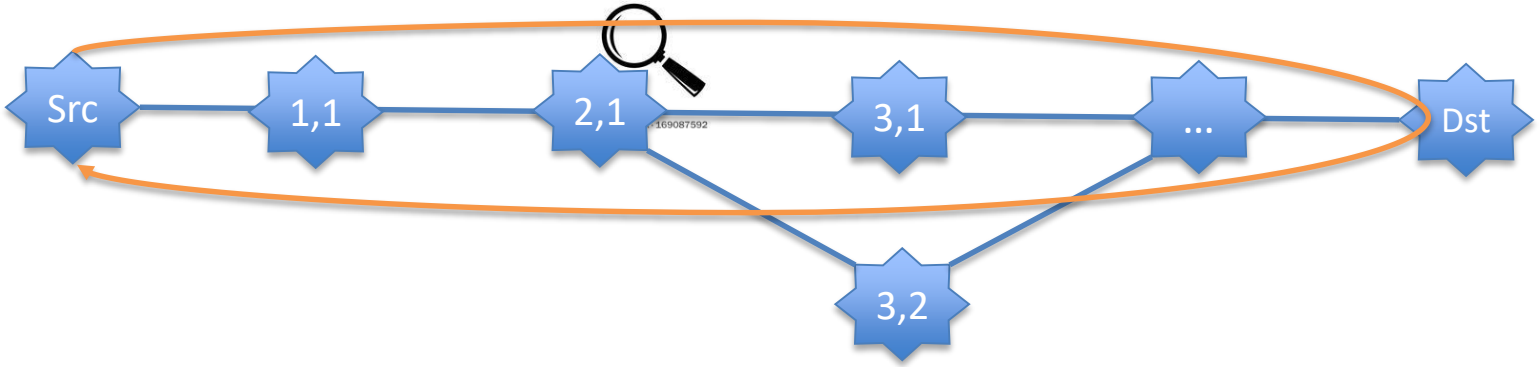
Background & Inputs

- 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 Routing Class C 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?