Advanced Unidirectional Route Assessment (AURA)

draft-amf-ippm-route-03

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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 addr 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)
Lingering To Do 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

• Complete ToDo work items

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
BACKUP
Route Ensemble (not showing $\text{Src} = h(0,j)$)

Route Ensemble = {
    \{h(1,1), h(2,1), h(3,1), \ldots h(N1,1) = \text{Dst}\},
    \{h(1,2), h(2,2), h(3,2), \ldots, h(N2,2) = \text{Dst}\},
    \ldots
    \{h(1,m), h(2,m), h(3,m), \ldots h(Nm,m) = \text{Dst}\}
}
Hops!

• Each Route represented as an ordered graph:

\[ \text{Src=} h(0,1), h(1,1), h(2,1), h(3,1), \ldots h(N1,1)=\text{Dst} \]

• \( h(i,j) \) was a host, but we can learn more...
  – MUST include Host Identity
  – Arrival Interface ID
  – Departure Interface ID
  – Arrival Timestamp
  – Round-trip Delay Measurements
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 & Tracet
  – 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?