Update for the IPPM Framework:
Adding Support for IPv6 and IP Options

(IP Options and IPv6 Updates for IPPM's Active Metric Framework: Packets of Type-P and Standard-Formed Packets)

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Background

• The IPPM Framework (RFC2330) identifies two key prerequisites for valid measurements:

1. Valid measurement packets
   • “Standard-formed” packets
   • “…all metric definitions … include an implicit assumption that the packet is *standard formed*”...
   • Explicit criteria catalogue

2. Result may depend on measurement packet type
   • Distinct treatment of measurement packets along the path
   • Abstract term: packet of Type-P
   • Measurement is representative for any type (Type-P) vs. result is valid for ICMP-packets-64-byte-payload
Motivation and History

- Any {RFC|draft|metric} that references IPv6 is out of scope of the RFC2330 IPPM framework!
  - RFC2330, sec. 15 “…includes a valid IP header: the version field is 4 (later, we will expand this to include 6)"

- **Trigger:** GEN-ART review of RFC 2679-bis
  - Input by Brian Carpenter: no IPv6 coverage
    - RFC 2679-bis only vs. IPPM update
    - Decision for IPPM update

- **IPv6-support for IPPM “outsourced” to dedicated draft**
  - Precondition for –bis RFCs to pass GEN-ART and IESG review
  - More documents pending in the queue (active-passive, PDM, …)
  - Avoid replication: one document can do the update for all.
Status

- Adoption as IPPM WG item, July 2016
- Extensive comments from Fred Baker and Marius Georgescu:
  - Extension Headers covered in Type-P and Standard Formed packet sections
  - Load Balancer as an example of Class C (equal treatment)
  - Examples where Type-P changes from Src to Dst.
  - IP address family coexistence means more circumstances to discuss (v4 v6 transition).
    - Major new section covers NAT, v4v6, Header Compression
Further Discussion needed

• handling of large packets in IPv6 (including fragment extension headers, PMTUD, PLMTUD),
• extent of coverage for 6LO and IPv6 Header Compression, and
• the continued need to define a "minimal standard-formed packet".

• Concluding that, WGLC…
RFC 2330, Sec. 13:

• “A fundamental property of many Internet metrics is that the value of the metric depends on the type of IP packet(s) used to make the measurement…”

• “…Whenever a metric's value depends on the type of the packets involved in the metric, the metric's name will include either a specific type or a phrase such as "type-P".

• “…Generic notion of a "packet of Type-P“…
  • Fully defined (port-http-tcp-connectivity-50byte-payload)
  • Partially defined (UDP packet)
  • Generic (Type-P)

• **Type-P becomes part of any metric definition**
  • Example: Define "IP-Type-P-connectivity" metric instead of "IP-connectivity" metric
RFC 2330 Update: Type-P

• Mention **special treatment of packets**
  • Diffserv, ECN, Router alert, extension headers, …

• **Identify case when Type-P changes along the path**
  • Type and length changes because of IPv4 <-> IPv6 translation, or
    IPv6 extension headers adding or removal
  • Modified values SHOULD be noted and reported with the results

• Discuss possible **impact of NAT along path**
  • Unpredictable impact on delay
  • Stateful NAT: state created on first packet: delay penalty

• **RFC2330 Note: class C equivalence for path (MAP RG!)**
  • “…it would be very useful to know if a given Internet component treats equally a
    class C of different types of packets. If so, then any one of those types of packets
    can be used for subsequent measurement of the component. This suggests we
    devise a metric or suite of metrics that attempt to determine C.”
Recap RFC 2330 Definitions: Std-Formed

RFC 2330, Sec. 14:

• “…all metric definitions … include an implicit assumption that the packet is *standard formed*”...
• “…a packet is standard formed if it meets all of the following criteria:…”
  • Length (IP header) = sizeof (IP header) + sizeof(payload)
  • Valid IP header: “version field is 4 (later, we will expand this to include 6)” (quote RFC2330!)
  • Header length >= 5, checksum is correct, no IP fragment.
  • Src and dest addr. correspond to the hosts in question.
  • TTL sufficiently large or 255
  • No IP options unless explicitly noted.
  • If transport header is present: valid checksum and fields.
  • Length B: 0 <= B <= 65535 …
RFC 2330 Update: Std-Formed Packet

- **IPv4 and IPv6** allowed
- Basic requirements (aggregated IPv4 and IPv6):
  - Valid IP header
  - Not an IP fragment.
  - Source and Destination addresses intended.
  - Transport header: valid checksum and valid fields
- Separate discussion of IPv4 and IPv6
  - IPv4 unchanged
- **IPv6**
  - Version field 6, total length including extension headers
  - Extension headers: none or correct types and correct order, extension header parameters conforming with IANA
  - Note controversies (RFCs 6564 and 7045): intermediate nodes inspect/add/delete/change IPv6 extension headers
Next Steps

• **Urgent need to update IPPM for IPv6**
  • RFCs and documents in queue depend on it!
  • Draft scope and structure is stable
  • Feedback and Input requested

• **Call for adoption as IPPM WG item.**

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