

**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".
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- Concluding that, WGLC...

# BACKUP

# Recap RFC 2330 Definitions: Type-P

## 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  $\geq 5$ , 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:  $0 \leq B \leq 65535$  ...

# 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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