

IPPM

What's Going On?

Current Chairs

Tommy Pauly

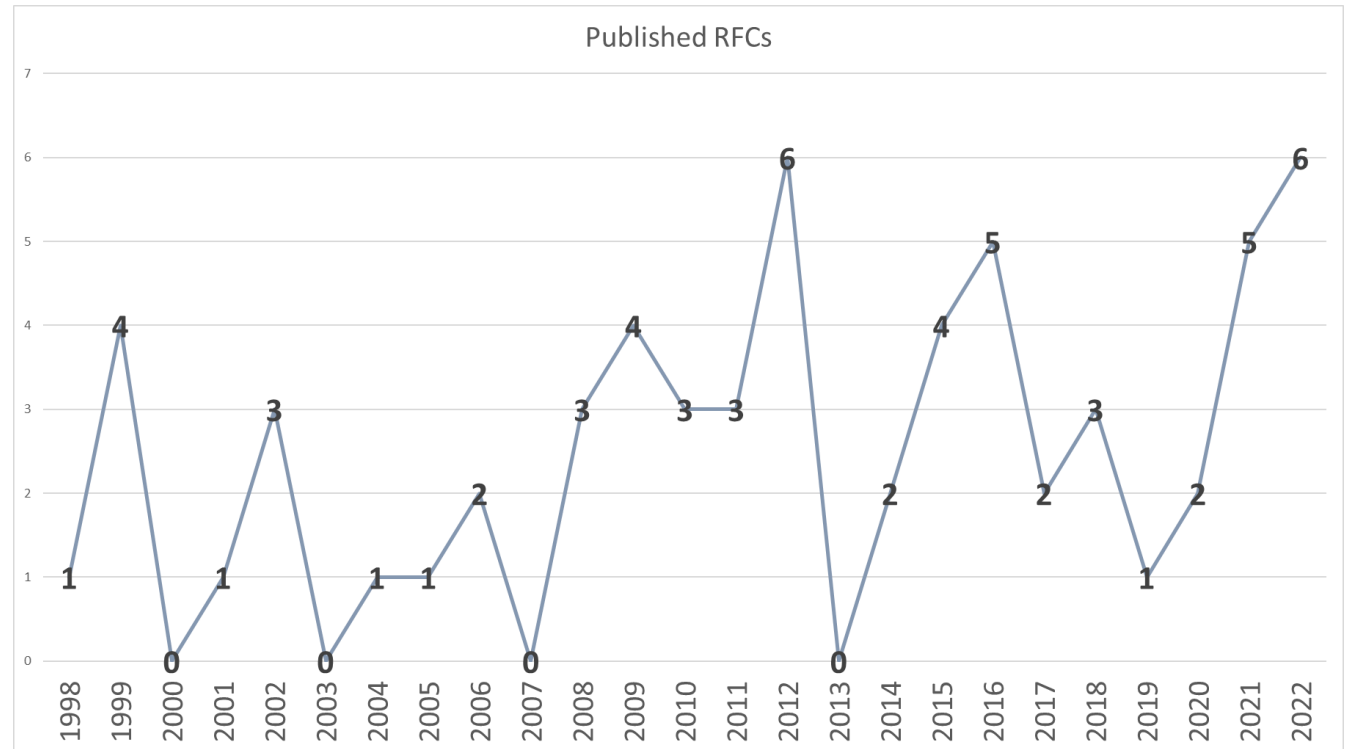


Marcus Ihlar



Some IPPM Data

- 62 published RFCs
- First RFC published in 1998 (RFC 2330)
- Most recent RFC in December 2022 (RFC 9342)
- 15 Active Documents



IP Performance Measurement

IP Performance Measurement

Methods

Metrics

Protocols

Metrics

“Standard metrics that can be applied to the quality, performance, and reliability of Internet data delivery services and applications running over transport layer protocols (e.g. TCP, UDP) over IP.”

One way delay

Packet delay variation

One-way packet loss

Roundtrip delay

Round-trip packet loss

Connectivity

ETC...

Methods

Active

“An Active Metric or Method depends on a dedicated measurement packet stream and observations of the stream.”

RFC 7799

Passive

“A Passive Metric or Method depends **solely** on observation of one or more existing packet streams. The streams only serve measurement when they are observed for that purpose, and are present whether or not measurements take place..”

RFC 7799

Hybrid

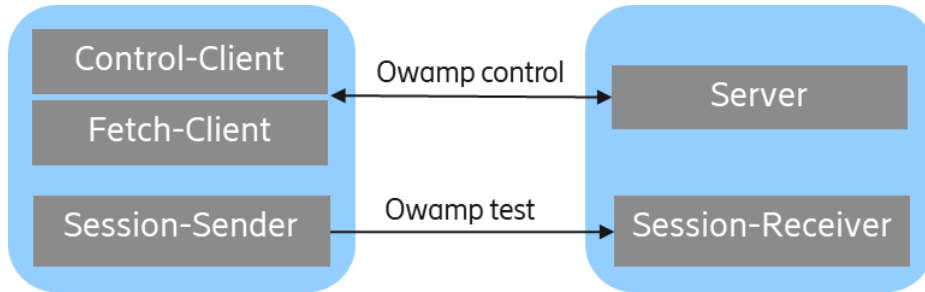
“Hybrid Methods are Methods of Measurement that use a combination of Active Methods and Passive Methods, to assess Active Metrics, Passive Metrics, or new metrics derived from the a priori knowledge and observations of the stream of interest.”

RFC 7799

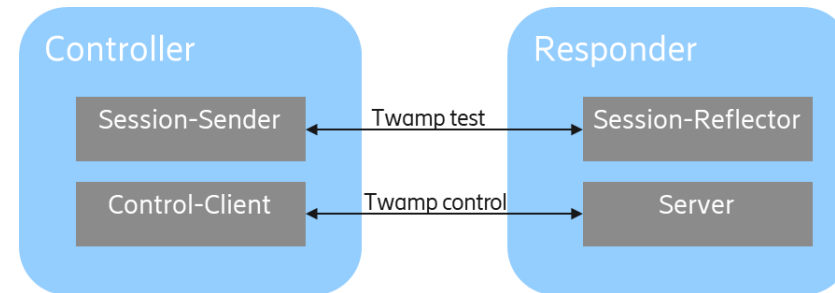
- Alternate-Marking Method
- Clustered Alternate-Marking Method
- In-Situ OAM
- One-way IP Capacity
- Etc ...

Active Measurement Protocols

One-way Active Measurement Protocol (OWAMP)



Two-way Active Measurement Protocol (TWAMP) / Simple Two-way Active Measurement Protocol (STAMP)



Current Status

Current Status

11 Working Group Document
4 Documents submitted to IESG

Active Work On

- New metrics
- New methods
- New protocols
- Protocol maintenance and extensions.

Two Broad Scopes



Measurements in “Limited Domains” where operators are in control of infrastructure.

Measurements of any network path between two hosts / endpoints.

Two Broad Scopes



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graph TD; A[Two Broad Scopes] --> B[Measurements in "Limited Domains" where operators are in control of infrastructure.]; A --> C[Measurements of any network path between two hosts / endpoints.]; B --> D[Alternate Marking]; B --> E[IOAM]; B --> F[Precision Availability Metrics]; C --> G["(O/T)WAMP extensions"]; C --> H[IP Capacity Measurements]; C --> I[Responsiveness Under Working Conditions];
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Measurements in “Limited Domains” where operators are in control of infrastructure.

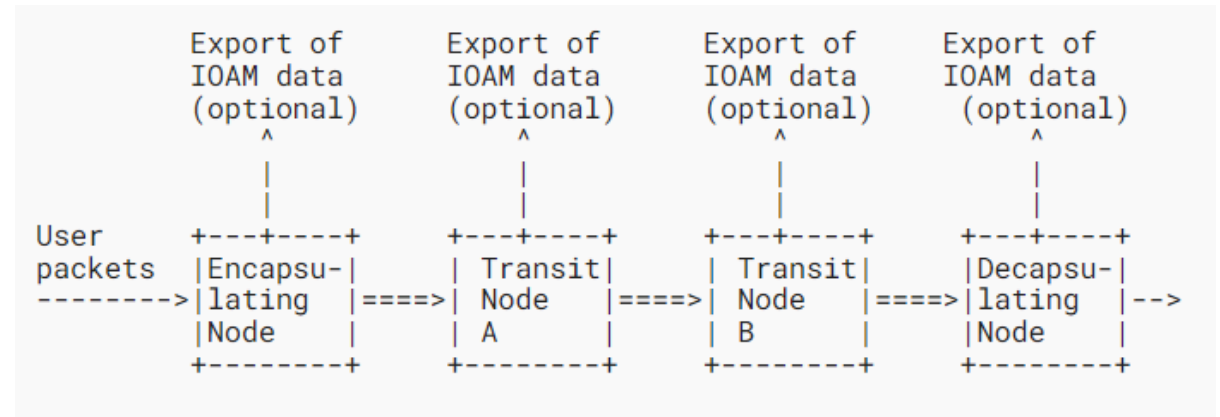
Alternate Marking
IOAM
Precision Availability Metrics

Measurements of any network path between two hosts / endpoints.

(O/T)WAMP extensions
IP Capacity Measurements
Responsiveness Under Working Conditions

In-situ Operations, Administration, and Maintenance (IOAM)

- Performance Monitoring and Tracing in “Limited Domains”
- IOAM records OAM information within the packet while the packet traverses a particular network domain.
- A domain consists of a set of nodes
 - IOAM Encapsulating nodes – adds IOAM options to packets
 - IOAM Transit nodes – reads / writes / processes IOAM data
 - IOAM Decapsulating nodes – removes IOAM options from packets
- IOAM data can be added directly to packets or exported as separate OAM packets.
- Designed to be independent from underlying encapsulating protocols.



IOAM data:

- Hop Limit
- Timestamp (seconds / fraction)
- Transit delay
- Queue depth
- Etc..

IOAM Status

- Published RFCs:
 - RFC 9197 – Data Fields for IOAM
 - RFC 9322 – IOAM Loopback and Active Flags
 - RFC 9326 – IOAM Direct Exporting
- IDs submitted to IESG:
 - draft-ietf-ippm-ioam-deployment
 - draft-ietf-ippm-ioam-conf-state
 - draft-ietf-ippm-ioam-ipv6-options
- Active working group documents:
 - draft-ietf-ippm-ioam-yang
 - draft-ietf-ippm-ioam-data-integrity

Responsiveness Under Working Conditions

- Measurement method and metric targeting end-users, with the main goal of highlighting how much responsiveness can degrade due to buffer bloat.
- Uses common web protocols (tcp, tls, HTTP2) to generate enough traffic to achieve “working conditions”, by gradually adding more load generating tcp-connections.
 - Working conditions are defined as “the condition where the path between the measuring endpoints is utilized at its end-to-end capacity and the queue at the bottleneck link is at (or beyond) its maximum occupancy.”
- Defines a “Responsiveness” metric in terms of Roundtrips Per Minute (RPM).
- Responsiveness is measured by sending probe-requests
 - HTTP GET on a separate connection (“foreign probes”)
 - HTTP GET multiplexed on the load-generating connection (“self probes”)
- Active WG Document: draft-ietf-ippm-responsiveness

IP Capacity Measurement

- Metrics and Methods for One-Way IP Capacity (RFC 9097).
- Protocol being specified in draft-ietf-ippm-capacity-protocol.
 - Uses UDP for both load generation and control messages.
 - Load is generated in one direction between a client and a server.
 - One endpoint sends “Load PDUs” and the other endpoint sends frequent status messages.
 - Various levels of encryption supported.
- Latency with/without Maximum IP-Layer Load, a.k.a. Working Latency or Responsiveness

Protocol Maintenance and Extensions

- draft-ietf-ippm-otwamp-on-lag
 - One-way/Two-way Active Measurement Protocol Extensions for Performance Measurement on LAG
- draft-ietf-ippm-stamp-on-lag
 - Simple Two-Way Active Measurement Protocol Extensions for Performance Measurement on LAG
- draft-ietf-ippm-stamp-srpm
 - Simple TWAMP (STAMP) Extensions for Segment Routing Networks
- draft-ietf-ippm-stamp-yang
 - Simple Two-way Active Measurement Protocol (STAMP) Data Model
- draft-ietf-ippm-encrypted-pdmv2
 - IPv6 Performance and Diagnostic Metrics Version 2 (PDMv2) Destination Option

What's Next?

16 Related Internet Drafts, lots of potential work.

Lightning Talks

1-slide presentations on new work.

What	Who
draft-mzbc-ippm-transit-measurement-option	T. Mizrahi
draft-wang-ippm-alt-mark-yang	X. Min
draft-teigen-ippm-app-quality-metric-reqs	B. Teigen
draft-olden-ippm-qoo	B. Teigen
draft-song-ippm-postcard-based-telemetry	H. Song
draft-ahuang-ippm-dex-timestamp-ext	A. Huang-Feng
draft-ahuang-ippm-ioam-on-path-delay	A. Huang-Feng
draft-ietf-opsawg-ipfix-on-path-telemetry	T. Graf
draft-zhou-ippm-enhanced-alternate-marking	G. Fioccola

Thank You