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Gap Analysis of IPPM Passive Measurements
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Abstract

This document performs a gap analysis of the current state of IPPM WG and ongoing work, in terms of passive measurements, according to the new charter of the IPPM WG.

Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC 2119](#) [[RFC2119](#)].

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[1.](#) Introduction

The IPPM working group has been recently re-chartered. According to the new charter, passive measurement and hybrid measurement methods are now included. This document performs a gap analysis of the current status of work in the IPPM WG in terms of passive measurements. [Section 2](#) of the document gives a brief introduction of passive measurement. [Section 3](#) summarizes the current status of the IPPM, and gives an analysis on what is missing or was not considered, for passive measurements, in terms of framework of metrics, measurement of metrics, registry, etc. [Section 4](#) lists the future work required for passive measurements based on the gap analysis. The analysis for hybrid measurements is out of the scope of this document.

[2.](#) Passive Measurements VS Active Measurements

Passive and active measurements are two common approaches for monitoring the network. The passive approach measures real traffic and does not increase the traffic on the network for the measurements. This makes it attractive for in-service monitoring,

network trouble-shooting and fault location. Since the passive approach may require viewing packets on the network, there can be privacy or security issues. The active approach relies on the capability to inject test packets into the network, but as such it creates extra traffic. The benefit of active measurements is that

they can be run from virtually anywhere in the network. One difficulty, though, is that the discrete nature of active probing limits the resolution of the measurements. There is also evidence of limitations of probe-based packet loss measurement in low-loss environments. Both passive and active measurements have their strengths and should be regarded as complementary.

[3.](#) Gap Analysis for Passive Measurements

This section gives an analysis on what is missing for passive measurements in relation to IPPM, in terms of framework of metrics, measurement of metrics and registry.

[3.1.](#) Framework for IP Performance Metrics

The IETF IP Performance Metrics (IPPM) working group first created a framework for metric development in [[RFC2330](#)], which enabled development of many fundamental metrics. [[RFC2330](#)] has been updated once by [[RFC5835](#)], which describes a detailed framework for composing and aggregating metrics originally defined in [[RFC2330](#)].

The ongoing work [[I-D.ietf-ippm-2330-update](#)] proposes to update the IPPM Framework with advanced considerations for measurement methodology and testing. It describes new stream parameters for both network characterization and support of application design using IPPM metrics. All the previous work done for IP performance metrics framework and the ongoing update for the framework has the assumption, which is not explicitly stated, that the measurement method of the metrics is active measurement.

The result of this is, while many of the current framework aspects are still applicable to passive measurement, some of them are not applicable. In one example, [section 11 of \[RFC2330\]](#) introduces a separation between three distinct notions: singletons, samples, and statistics, which are not applicable to passive measurements, since the test packet is not required for passive measurements, nor is the

sampling.

But there are certainly equivalent concepts in passive measurements. For example, consider using TCP traffic to determine the two-way delay between two hosts. A singleton would be the timing of a single sequence number - acknowledgement pairing, a sample would be a collection of these, and the statistical metric would take the minimum, over a short time interval (in order to reduce or eliminate think-time and delayed-ACK effects). In another example, the concept of a packet of type "P", while still applicable in principle, will have to be specified differently. An updated or new passive framework document is needed, while equivalent concepts need to be carried over as much as possible with passive-friendly definitions.

3.2. IP Performance Metrics

The IPPM WG has defined more than 30 metrics, the most recently published document that defines metrics is [[RFC6049](#)]. The commonly used metrics include IPPM Metrics for Measuring Connectivity [[RFC2678](#)], One-way Delay Metrics [[RFC2679](#)], One-way Packet Loss Metrics [[RFC2680](#)], Round-trip Delay Metrics [[RFC2681](#)], One-way Loss Pattern Sample Metrics [[RFC3357](#)], IP Packet Delay Variation Metric [[RFC3393](#)], IPPM Metrics for periodic streams [[RFC3432](#)] etc.

All the existing metrics defined follow the framework for IP performance metrics [[RFC2330](#)], which has the implicit assumption that the measurement method of the metrics is active measurement. Passive methodologies for existing [[RFC2330](#)] based active metrics need to be defined, which would require loosening some of the constraints as well as changes to the guidelines. For example, the measurement methodologies for One-way Delay Metrics [[RFC2679](#)] and

One-way Packet Loss Metrics [[RFC2680](#)] call for, amongst other things, selection of the Src and Dst addresses at the Src host. This will be difficult to achieve for passive measurement.

Careful examination and thorough analysis needs to be made, in order to decide, which aspects of current metrics need to be redefined for passive measurements, and which aspects could be reused by passive measurements as is.

[3.3.](#) Registry

[RFC4148] defines an initial registry of the metrics defined in the IPPM WG and the rules to manage the registry. However, [[RFC4148](#)] was obsoleted by [[RFC6248](#)] because it was "not believed to be feasible or even useful to register every possible combination of Type P, metric parameters, and Stream parameters using the current structure of the IPPM Metrics Registry". This led to the [[RFC4148](#)] registry having "very few users, if any".

The ongoing work [[I-D.bagnulo-ippm-new-registry-independent](#)] and [[I-D.bagnulo-ippm-new-registry](#)] creates, a registry for commonly used metrics, defines the rules for assignments in the new registry and performs initial allocations, respectively.

[[I-D.bagnulo-ippm-new-registry-independent](#)] proposes one particular registry structure with independent registries for each of the fields involved, while [[I-D.bagnulo-ippm-new-registry](#)] explores an alternative structure with a single registry with multiple sub-registries. The metrics for passive measurement should be taken into consideration for both registry structure designs.

[4.](#) Future Work for Passive Measurement

Based on the above gap analysis, it could be concluded that the following new work needs to be done in the IPPM working group:

1. Framework for metrics: A passive-friendly updated framework document is needed for passive measurement.
2. Metrics: Careful examination on currently defined metrics, particularly the measurement aspects, needs to be made by the working group. Some metrics need to be updated for passive measurement, some

metrics may be reused by passive measurements as is. New metrics may also need to be defined for passive measurement.

3. Registry: The passive measurement should be taken into consideration for the ongoing registry structure design work.

[5.](#) Security Considerations

This document does not bring new security issue to IPPM.

[6.](#) IANA Considerations

This document makes no request to IANA.

[7.](#) Acknowledgements

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[8.](#) References

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