

Registry for Performance Metrics

draft-ietf-ippm-metric-registry-12

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Overall Registry Concept

- Problem: How can we specify with Precision the Metrics and Methods to Implement and Use?
 - Many Standardized Metrics with similar names
 - Registry enables all parties to be sure they're talking about the same Metric
 - Flexibility and customization of Generic Metrics seen as an advantage in standards development
 - Methods allow variables, system issues out-of-scope
- Provide Unique ID and detailed exposition
 - Raise the bar from Standard to Registered Metrics
 - Fix critical Parameters, but Allow Run-Time flexibility

Full Registry Concept & Format

- draft-ietf-ippm-metric-registry-12
- Each entry in the registry is a row
 - Series of columns
 - Typically ~1 column may be Not Applicable
 - Clustered in categories
- Each row is indexed by ID
 - 16 bit flat identifier
 - With associated name (i-d defines naming convention)
 - Auto-generate URI (pre-pend urn:ietf:metric: to name)
 - Auto-generate URL (location of text file with registry entry)
- Control & report protocols use URI
- Next slide shows category /column headings
 - Layout is purely presentational (slide not wide enough, neither is anyone's screen, which is why the text file presentation is available)

Categories & Columns

Category	Column
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Summary	ID	Name	URIs	Description	Ref	Change Ctrl	Ver
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Metric definition	Reference	Fixed parameters
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Method of measurement	Ref. Meth. (eg Section 3 of RFC XXXX)	Packet stream generation (active tests)	Traffic filter (passive tests)	Sampling distribution (for traffic filter)	Run-Time Parameter(s) (eg.MPaddress)	Role(s) (eg sender)
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Maybe a lot of info (~sub-columns)

Don't change nature of Method

Output	Type	Reference Method	Units	Calibration
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Admin info	Status	Requestor	Revision #	Date
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Comments	Full history
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Registry Draft Updates

- Adding Loss Metrics reaps new Name elements and clarifications.

IANA section in 3 parts (incl. maint. procedures)

1. URI

- urn:ietf:metrics:perf (was urn:ietf:metric)
- URL points to complete Registered Metric

2. Name element sets, request IANA create related registry with sub-registries (can add elements):

MetricType:	Method:	SubTypeMethod:
Spec:	Units:	Output:

More Updates

IANA Metric section (3rd item)

- Instructions on adding new entries
- Recognized Extension of Metric Registry
- Each entry will be mocked-up (partial view)

ID	Name	URIs	Description
1	RTDelay_Active_IP-UDP-Poisson_RFCXXXXsecY_Seconds_95Percentile	urn:ietf:metrics:perf:RTDelay_Active_IP-UDP-Poisson_RFCXXXXsecY_Seconds_95Percentile url: https://tools.ietf.org/html/draft-ietf-ippm-initial-registry-02#section-4	This metric assesses the delay of a stream of packets exchanged between two hosts (which are the two measurement points), and the Output is the Round-trip delay for all successfully exchanged packets expressed as the 95th percentile of their conditional delay distribution.
2	RTLoss_Active_IP-UDP-Poisson_RFCXXXXsecY_Percent_LossRatio	urn:ietf:metrics:perf: RTLoss_Active_IP-UDP-Poisson_RFCXXXXsecY_Percent_LossRatio url: https://tools.ietf.org/html/draft-ietf-ippm-initial-registry-02#section-4	This metric assesses the loss ratio of a stream of packets exchanged between two hosts (which are the two measurement points), and the Output is the Round-trip loss ratio for all successfully exchanged packets expressed as a percentage.
3	OWPDV_Active_IP-UDP-Poisson_RFCXXXXsecY_Seconds_95Percentile	urn:ietf:metrics:perf:OWPDV_Active_IP-UDP-Poisson_RFCXXXXsecY_Seconds_95Percentile url: https://tools.ietf.org/html/draft-ietf-ippm-initial-registry-02#section-5	An assessment of packet delay variation with respect to the minimum delay observed on the stream, and the Output is expressed as the 95th percentile of the packet delay variation distribution.
			6

Updates: NEW Name Elements

MetricType:

- RLDNS (Response Loss Domain Name Service)

Units:

- Ratio (unit-less)
- Percent (value multiplied by 100)
- Logical (1 or 0)

Output:

- Singleton <- now distinguished from Raw
- Raw (multiple Singletons)
- LossRatio (lost packets to total packets, ≤ 1)

Name Element Sub-registries (mock-up, partial view)

MetricType: a combination of the directional properties and the metric measured

Element	Name	Description	Reference	Change Controller
MetricType	RTDelay	Round Trip Delay	RFCXXXX Section 7.1.2	IETF
MetricType	RTDNS	Response Time Domain Name Service	RFCXXXX Section 7.1.2	IETF
MetricType	RLDNS	Response Loss Domain Name Service	RFCXXXX Section 7.1.2	IETF
MetricType	OWDelay	One-way Delay	RFCXXXX Section 7.1.2	IETF
MetricType	RTLoss	Round Trip Loss	RFCXXXX Section 7.1.2	IETF

To Do (?)

- Do the Name Element Sets cover Passive well-enough?

Initial Performance Metric Registry Entries

~~draft-mornuley-ippm-initial-registry-01,2,3~~

~~draft-morton-ippm-initial-registry-0,1,2,3,4~~

draft-ietf-ippm-initial-registry-04

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Feedback on the Registry Contents

- Seeking feedback on the current contents, and what else the WG (and regu-guests) want
- All Sections (4 thru 8) updated:
 - Key Metric: DNS Response Time **and Loss**
 - Many Questions answered/decided
- Based on work with IANA to clarify proposals with multiple metrics per section (7 and 8)
 - NOW applied this approach in section 4, 6, 7, 8, to include many loss ratio metrics.

Updates

New Metrics:

- RTLoss_Active_IP-UDP-Poisson_RFCXXXsecY_Percent_LossRatio
- RLDNS_Active_IP-UDP-Poisson_RFCXXXsecY_Logical_Raw
- OWLoss_Active_IP-UDP-Poisson-Payload250B_RFCXXXsecY_Percent_LossRatio
- OWLoss_Active_IP-UDP-Periodic-Payload142B_RFCXXXsecY_Percent_LossRatio

Discussion and comments

- Loss added in the simplest way
 - Huge Methodological overlap with Delay metrics
- Traceroute
 - Metric Proposed
 - Many methods of measurement
- ICMP Echo Request/Reply (wanted?)
 - In past, folks said Yes
 - But, will this be a basis for *comparisons* ??

Next Steps

- Discuss and close Open Issues:
 - DNS Response Time **and Loss**, section 6
 - @@@@ <Loss> would require support of ID generation and population in the Message. An alternative would be to use a random Source port on the Query Message, but we would choose ONE method before proceeding.
- Poisson distribution less-widely deployed, convert Sec 4 and 5 to Periodic instead (?)
 - 3 out of 4 authors agree! (so far)

Initial Performance Metric Registry Entries Part 2: MBM

draft-morton-ippm-mbm-registry-01

A. Morton, M. Mathis

A Test of the Registry Design

- Brian/Chair: How can Speed be specified as a Registry Entry, using Model-Based Metrics?
 - Should be part of the initial registry...
 - Name:
- `OWMBM_Active_IP-TCP-SustainedBurst_RFCXXXXsecY_Enumerated_PFI`
- Sustained Burst is described in 8.5.1 of [MBM]
- This test describes stream conditions to evaluate a `target_rate`, at target RTT and MTU
- Loss and RTT are the primary measurements
 - Needed Loss, have it now.
- Added remaining data formats
- Clarified Packet Stream Generation Parameters:
 - paced_bursts** Send bursts on a timer. Specify any 3 of: average data rate, packet size, burst size (number of packets) and burst headway (burst start to start).

Two-way street

- Started as a “test” of the Registry
- Main impact was on Name Elements
- Authors examined MBM specifications more deeply
 - Feedback is valuable
- Also, some feedback from MBM experimenter

Next Steps

- Further author and WG review
- Combine with Part 1? Or just keep separate?

Was the Registry Design efficient?

- short answer: YES
- Many Run-time Parameters:
 - Targets(rate,RTT,MTU), derating, SPRT params
- Additional parameters calculated in the model
- Primary Output: Pass/Fail/Inconclusive, or PFI
- Also Output Loss ratio and Mean RTT results
- Learned more about model specification, especially packet stream generation

BACKUP

How do I get a registry entry?

- Submit request to IANA, with columns filled in
 - Likely prior review in WG
- Review by performance metric experts
 - If necessary, work on improvements with requester
 - Does the proposed registry entry clearly define the metric & method of measurement?
 - Is it different from existing registry entries?
 - Is it operationally useful (significant industry interest or been deployed)?
- IANA adds to registry
- Similar process for revisions
 - Must be backwards compatible (eg editorial)
 - Otherwise create a new metric (& maybe deprecate old one)

Names, identifiers and URIs

- We keep identifiers, names and we automatically generate URIs
 - Identifiers are flat 16-bit integers
 - Names are unique within the registered metrics
 - URIs are generated by prepending `urn:ietf:params:performance:metric` to the name
- Also, a URL to a text file containing the Registry Entry

End Review, now some Entries

4. UDP Round-trip Latency Registry Entry

4.1. Summary

4.1.1. ID (Identifier)

4.1.2. Name

4.1.3. URI

4.1.4. Description

4.2. Metric Definition

4.2.1. Reference Definition

4.2.2. Fixed Parameters .

4.3. Method of Measurement

4.3.1. Reference Method

4.3.2. Packet Generation Stream

4.3.3. Traffic Filtering (observation) Details

4.3.4. Sampling Distribution

4.3.5. Run-time Parameters and Data Format

4.3.6. Roles

4.4. Output

4.4.1. Type

4.4.2. Data Format

4.4.3. Reference

4.4.4. Metric Units

4.5. Administrative items

4.5.1. Status

4.5.2. Requestor (keep?)

4.5.3. Revision

4.5.4. Revision Date

4.6. Comments and Remarks

passive ex: <https://tools.ietf.org/html/draft-mornulo-ippm-registry-columns-01#section-6>

4.2.1 Reference Definition

<Full bibliographic reference to an immutable doc.>

Almes, G., Kalidindi, S., and M. Zekauskas, "A Round-trip Delay Metric for IPPM", RFC 2681, September 1999.

[RFC2681]

<specific section reference and additional clarifications, if needed>

Section 2.4 of [RFC2681] provides the reference definition of the singleton (single value) Round-trip delay metric. Section 3.4 of [RFC2681] provides the reference definition expanded to cover a multi-value sample. Note that terms such as singleton and sample are defined in Section 11 of [RFC2330].

Note that although the definition of "Round-trip-Delay between Src and Dst at T" is directionally ambiguous in the text, this metric tightens the definition further to recognize that the host in the "Src" role will send the first packet to "Dst", and ultimately receive the corresponding return packet from "Dst" (when neither are lost).

4.2.2 Fixed Parameters

Type-P:

- o IPv4 header values:
 - * DSCP: set to 0
 - * TTL set to 255
 - * Protocol: Set to 17 (UDP)
- o UDP header values:
 - * Checksum: the checksum must be calculated
- o Payload
 - * Sequence number: 8-byte integer
 - * Timestamp: 8 byte integer. Expressed as 64-bit NTP timestamp as per section 6 of RFC 5905 [RFC5905]
 - * No padding (total of 9 bytes)

Timeout, Tmax: 3 seconds

4.3.1 Reference Method

<for metric, insert relevant section references and supplemental info>

The methodology for this metric is defined as Type-P-Round-trip-Delay-Poisson-Stream in section 2.6 of RFC 2681 [RFC2681] and section 3.6 of RFC 2681 [RFC2681] using the Type-P and Timeout defined under Fixed Parameters.

The method requires sequence numbers or other send-order information to be retained at the Src or included with each packet to disambiguate packet reordering if it occurs. Sequence number is part of the payload described under Fixed Parameters.

Refer to Section 4.4 of [RFC6673] for expanded discussion of the instruction to "send a Type-P packet back to the Src as quickly as possible" in Section 2.6 of RFC 2681 [RFC2681]. Section 8 of [RFC6673] presents additional requirements which shall be included in the method of measurement for this metric.

4.3.5 Run-time Parameters and Data Format

<list of run-time parameters, and their data formats>

- o Src, the IP address of a host (32-bit value for IPv4, 128-bit value for IPv6)
- o Dst, the IP address of a host (32-bit value for IPv4, 128-bit value for IPv6)
- o T0, a time (start of measurement interval, 128-bit NTP Date Format, see section 6 of [RFC5905]). When T0 is "all-zeros", a start time is unspecified and Tf is to be interpreted as the Duration of the measurement interval.
- o Tf, a time (end of measurement interval, 128-bit NTP Date Format, see section 6 of [RFC5905]), interpreted as the Duration of the measurement interval.
- o $1/\lambda$, average packet rate (for Poisson Streams). ($1/\lambda = 1$ packet per second, if fixed)
- o Upper limit on Poisson distribution (values above this limit will be clipped and set to the limit value). (if fixed, Upper limit = 30 seconds.)

4.3.5 Run-time Parameters and Data Format

(continued)

The format for $1/\lambda$ and Upper limit of Poisson Dist. are the short format in [RFC5905] (32 bits) and is as follows: the first 16 bits represent the integer number of seconds; the next 16 bits represent the fractional part of a second.

>>> should Poisson run-time params be fixed instead? probably yes if modeling a specific version of MBA tests.

MORE QUESTIONS -----

>>> Should we require that each Registry entry have a SINGLE output Format and Statistic ?

(now, the answer is yes)

>>> Should we require that each Registry entry specify the Test Protocol used to collect the metric ?

(seems impractical, MUCH duplication)

>>> Current Entries are Detailed. A kind of roadmap to IPPM Literature. Should we retain this practice (at the risk of non-equivalent metrics)? If you were implementing, would you find this detail helpful?

Section

Example Registry Entry Names: