Motivation

• Networks have evolved
  • RFC 2330 assumes linear network behavior (“wire“)
  • Smart networks: Measurement results depend to a large extent on measurement stream (on-demand allocation)
  • RFC 2330 **metric and methodology properties** are a useful theoretical instrument - limited in real life now (repeatability)
• Network-internal **flow state** at layers below IP
• RFC 2330 prerequisites fail
Scope of Advanced Framework

• (A) Describe useful additional stream parameters
  Aim: improve measurements in modern networks
  • 1. Network treatment depends on Type-P (concept ext.)
  • 2. Packet history influences network/results
  • 3. Access technology may change during session
  • 4. Time-slotted service time in network path

• (B) Qualities of Metrics and Methodologies (New Section)
  • 1. Repeatability
  • 2. Continuity
  • 3. Actionable
  • 4. Conservative
  • 5. Spatial and Temporal Composition
  • 6. Poisson Sampling
Impact on Metric Definitions

• So far, none of the important aspects of the RFC2330 framework are changed in a way that would require modifications to the metric definitions.
• In other words, this is a true Update, clarifying and expanding RFC 2330
A: Stream Parameters

1. Network treatment depends on Type-P
   - Packet size, type, payload content (compressible)

2. Packet history influences network/results
   - On-demand capacity allocation

3. Access technology may change during session
   - Technology change transparent at network layer (potentially identical IP, e.g., policy-based handover HSPA - LTE)
   - Mobility issues currently not mentioned by RFC 2330 update – how to handle repeatability (identical parameters)?

4. Time-slotted service time in network path
   - Random sampling impossible beyond first time-slotted link
   - Prefer hop-by-hop measurements over end-to-end
   - Deploy randomness re-generation in intermediate nodes [TSRC]
Randomness Cancellation (TSRC)

- Ingress
- Egress
B: Qualities of Metrics and Methodologies (New Section)

1. Repeatability (same conditions, same result)
   - Practical relevance of “Identical” conditions?
   - Relax requirements: “minimum controlled parameter set”
   - Standards Track Advancement RFC 6576 “equivalence”

2. Continuity (meas. follow small changes in conditions)
   - Proposed to deprecate (Scenario: delay measurement samples in time-slotted networks, close to allocated timeslot)

3. Actionable (list discussion & model-based metrics)
   - Extension of “useful” requirement
   - Directed measurements should support localization of cause
   - Monitoring (“an error exists”) vs. Localization (“error in link x”)
B: Qualities of Metrics and Methodologies (New Section) (ctd.)

4. Conservative (minimize effect of active meas. traffic)
   • Challenged in paths exhibiting on-demand capacity allocation

5. Spatial and Temporal Composition
   • Updated by RFC 5835 and RFC 6049
   • “Complete Path” vs. “sub-path” vs. “randomness regeneration”

6. Poisson Sampling
   • Impact on reactive network elements
   • Recommended to truncate tail of distribution (for any mean rate)
Input: Req. Model-based Metrics

- Metrics must be **actionable** by the ISP
  - Valid for customer, etc…
- Metrics must be **vantage point invariant** over a significant range of measurement point choices
  - Q: Is “Ideal path” assumption realistic?
  - “Ideal path” concept prerequisite: sub-path parameters are insignificant with respect to the metric of interest.
  - **Hidden parameters might exist with impact on measurements!**
  - Example cases where such abstraction is **NOT** acceptable include: reactive networks, time-slotting, etc.
Input: Req. Model-based Metrics (c.)

- Metrics must be “repeatable” by multiple parties
  - (different take on repeatable definition)
  - “It must be possible for different parties to make the same measurement and observe the same results. In particular it is specifically important that both a consumer (or their delegate) and ISP be able to perform the same measurement and get the same result”
  - Depends to a large extent on measurement methodology
  - Consumer and ISP should have access to same measurement infrastructure
  - Explicit measurement infrastructure in place (LMAP)?
Summary Status and Discussion

• Todo:
  • More opinions needed – volunteers to read/review?
  • Consider draft-ietf-ippm-model-based-metrics-01 requirements – is abstraction realistic?
• TSRC applicable to other areas (e.g., LMAP)
  • Prefer hop-by-hop metrics over end-to-end?
  • Randomness re-generation, new measurement protocols?
Bibliography

Backup
Revised Definition „Repeatability“

RFC 2330: "A methodology for a metric should have the property that it is repeatable: if the methodology is used multiple times under identical conditions, the same measurements should result in the same measurements."

Update: "A methodology for a metric should have the property that it is repeatable: if the methodology is used multiple times under identical conditions, the methods should produce equivalent measurement results."