Advanced Stream and Sampling Framework for IPPM

draft-morton-ippm-2330-update-01

Joachim Fabini and Al Morton

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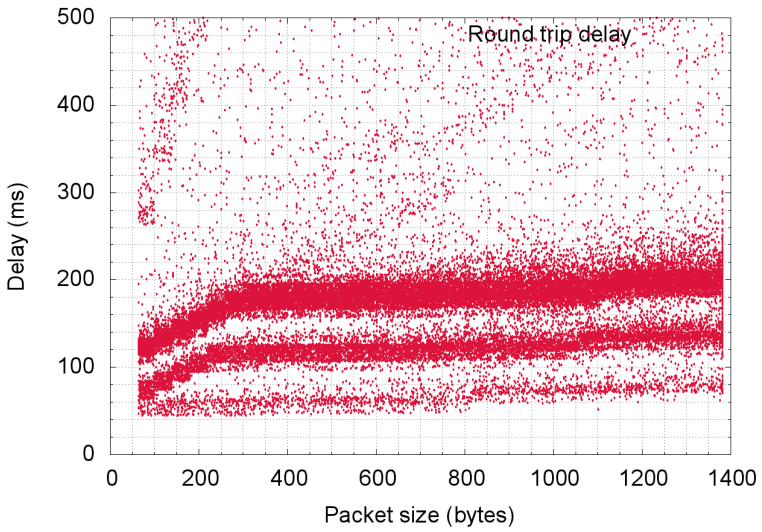
Status & Motivation

- 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
- Proposal: Update 2330



Scope of Advanced Framework

- Describe useful additional stream parameters
  - Restore repeatable measurements in modern networks
- Aspects
  - 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 paths

Main Comment: Define "**Reactive Network**"

- Sec 1.1 Reactive Network Behavior
  - Sensing packet arrival/inactivity for a flow of interest
  - Assessment intervals or multiple arrivals
  - Result in new mode of operation in one or more network components
  - Deterministic/Observable w.r.t. the flow of interest
  - Defined at a particular layer (e.g., reactive at IP layer)
- A network or path is said to be reactive when at least one link or host on the path exhibits reactive behavior

Examples: Reactive Behavior

Layer Independent:

- Link establishment in response to flow activity
  - This is why a concept of pre-test load is needed
- Channel capacity adaptation
  - Decision to increase or decrease capacity on a sub-IP link based on past or current flow rate.
  - Decision to use signaling channel for sporadic, small data packets instead of allocating dedicated bearer

Layer Dependent:

- Link-level compression of packet payload(s) depending on Type-P and higher-layer content
  - For instance JPEG file downsizing and –scaling in mobile networks (server-side optimizers)
- Content-based interception

Examples: NON-Reactive Behavior

- "Green" features
  - Activate idle fiber link when Util>X
  - Deactivate fiber link when Util<Y
- Policies triggering on total cell load
  - Mobile networks: bias of capacity allocation algorithms by current total cell load (all users)
- Channel adaptation between low-capacity or high-capacity on a sub-IP link appears random.
  - Fall-back to accommodate appearance of a legacy device
  - Signal quality (lower-layers, position, interference)
  - Activating or de-activating a dedicated VC on an xDSL link (e.g., some DSL modems do this when switching on or off a VoIP phone or an IPTV box, substantially reducing the capacity available for best-effort traffic).

Summary Status and Discussion

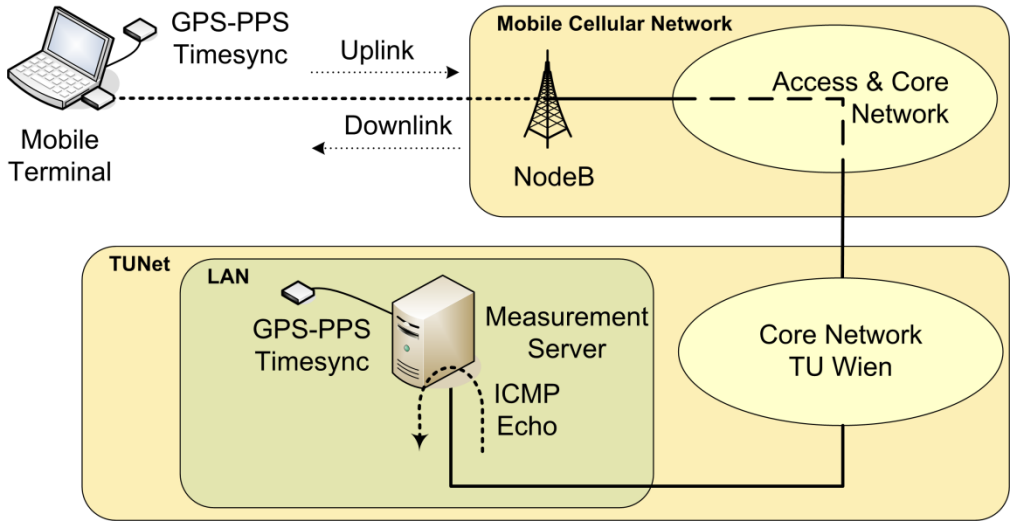
- Detailed discussion on the mailing list (2012)
- Support to do the work
- Adopt as a working group item?

- Possible future work: Define methods to test for reactive network behavior, based on fundamental IPPM metrics

Backup

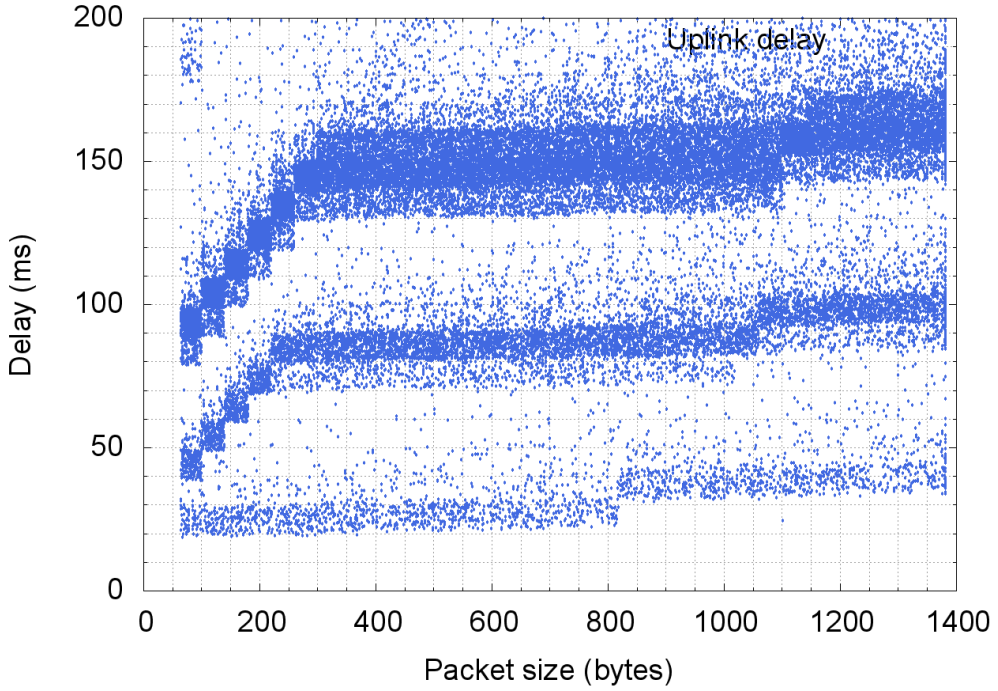
Measurement Methodology & Setup

- End-to-end ICMP round-trip delay measurements
- Initiated by UE (mobile client), reflected by server
- Client and server synchronous with global time (PPS, ~10µs).
- Randomness in space and time
  - Packets having random payload size are sent out at random start times



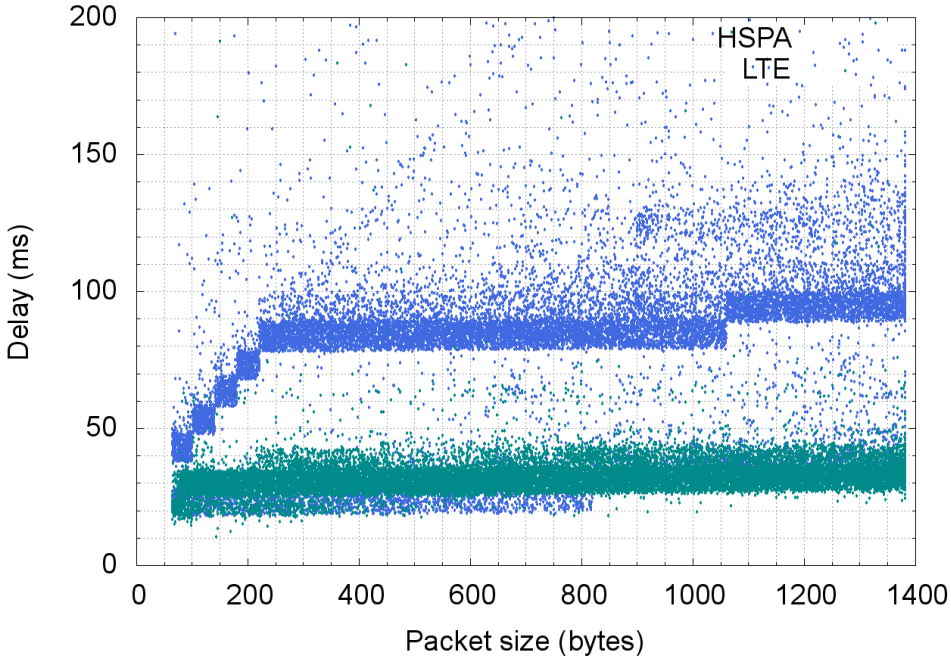
1. Expand elements of Type-P
2. Packet History Influence

- Test packet length
- Content optimization
- Flow state: multi-modal distributions



3. Access Technology Change (App-transparent)

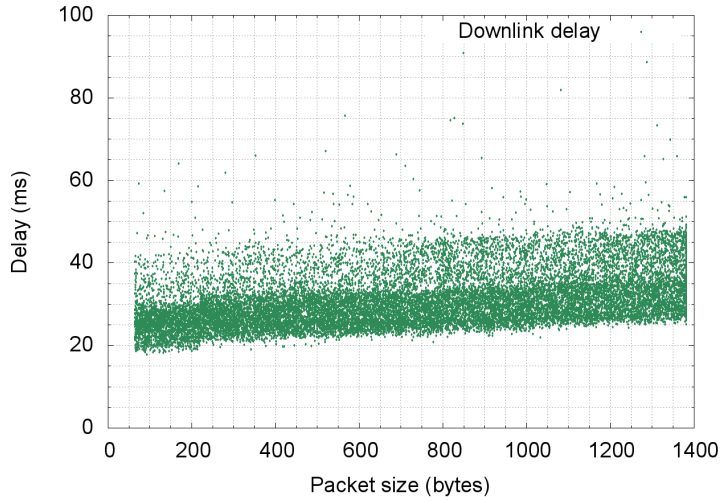
- Applications might not detect changes
- Overlayed
- Mobile measurements (LMAP)

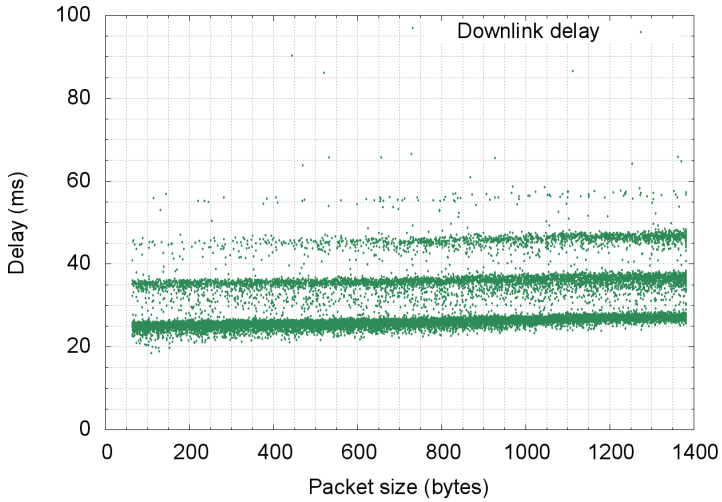


- Representativeness?

4. Time-slotted Networks

- First time-slotted segment cancels randomness
- Biased samples lead to multi-modal delay distributions





IPPM Feedback on the list

- Matt Mathis
  - Add “actionable” metrics
  - Pre-test load – special aspect of “packet history”?
- Rüdiger Geib, Matt Mathis
  - Characterization of special treatments
    - Traffic shaping
    - Flow suppression
  - Add as subtopic under Test Packet Type-P
  - Define “reactive network behavior”
  - Discussion of test traffic preferences in the wild

Goals – Next Steps

- Metric & Methodology **properties**:
  - Improve **Repeatability, Continuity, Extensibility**
  - Can/should we formalize these properties?
  - Assess “Quality of Measurement” to evaluate if properties are satisfied for two measurement sample sets?
  - Aim: find minimum set of parameters such that measurements have one or several of the above-mentioned properties.
- Classification: methodology-invariant metrics?