Measurement Tools: RDM

institute of
telecommunications
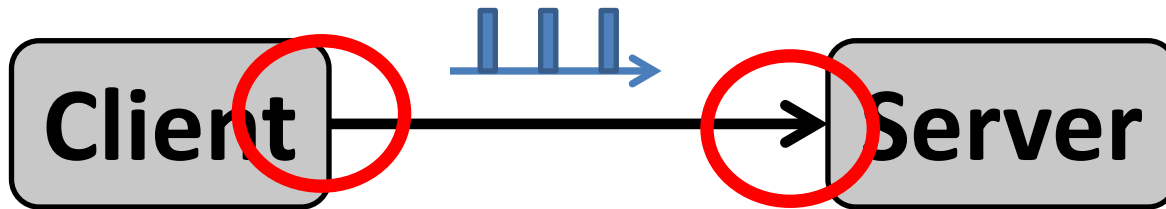
Common network abstraction
in models: **Copper Wires**

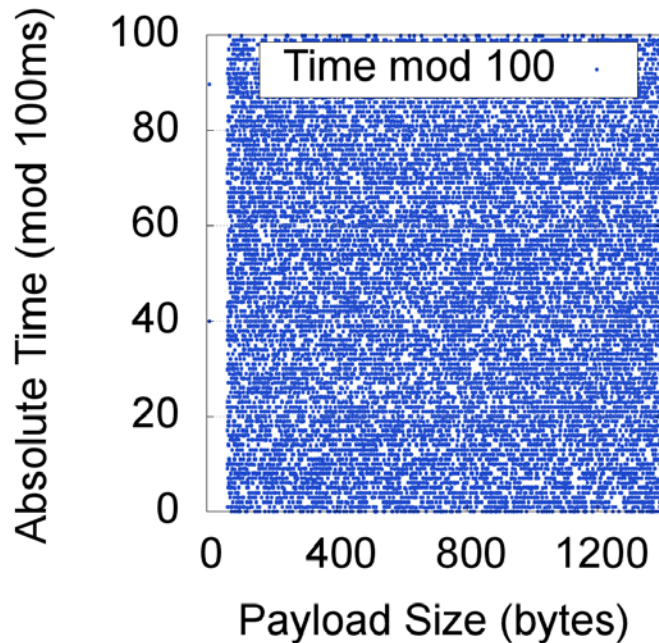**Delay = d0 + PacketSize / Capacity**

Source: http://commons.wikimedia.org/wiki/
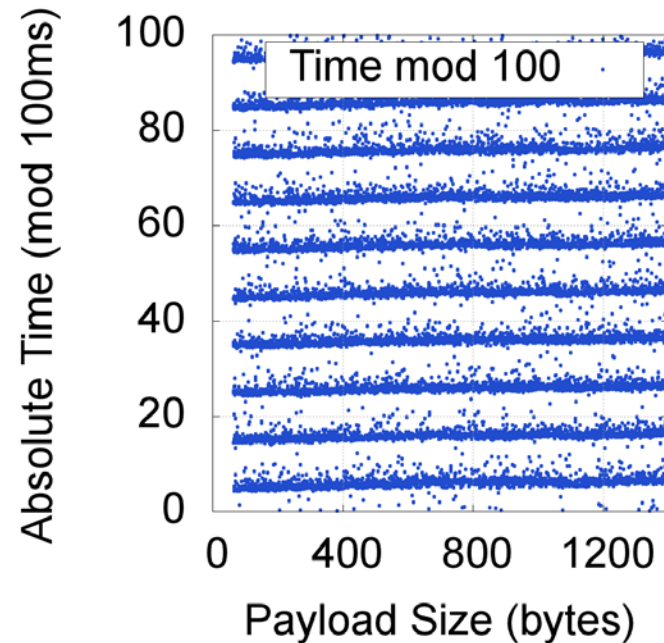File%3ALautsprecherkabel_Makro_nah.jpg

- (Access) Networks are stateful at layer 1 and/or 2
  - Session-awareness in terms of time (transparent)
  - **Dormant potential for changes in value-domain**

- Key observation **Middlebox**:
    a) in terms of **value** (modifies bits/value)
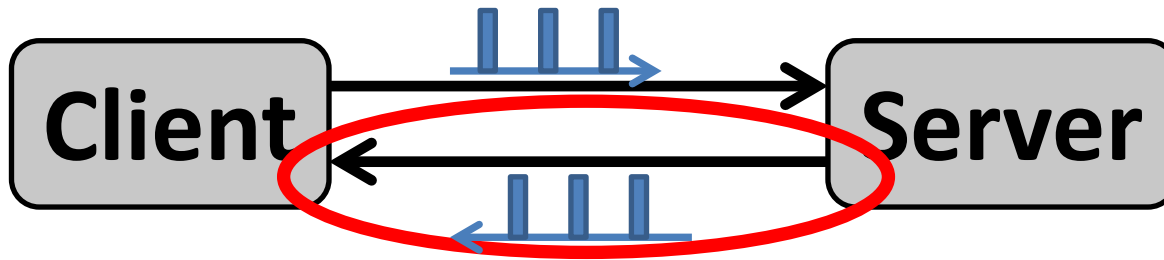   b) in terms of **time** (modifies timing)

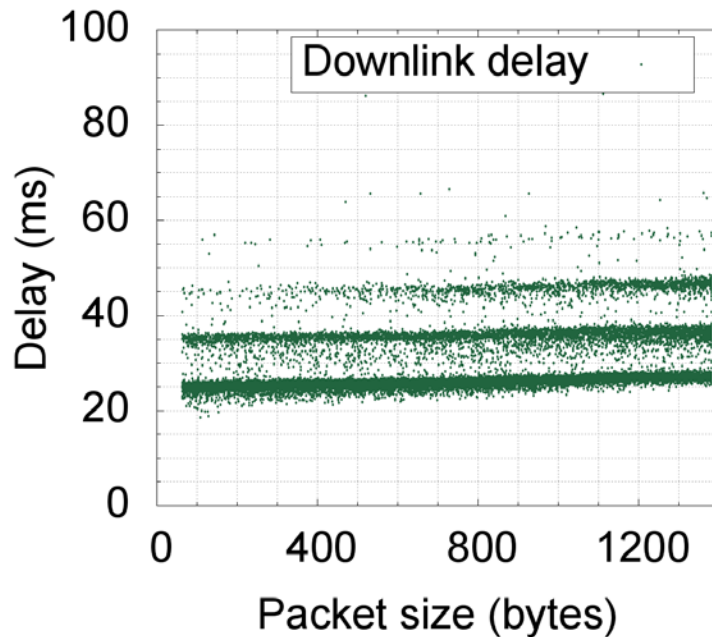- **Example: State and history** of time-slotted links
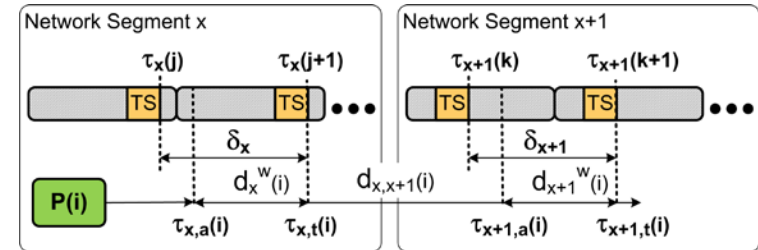 - Periodic service time
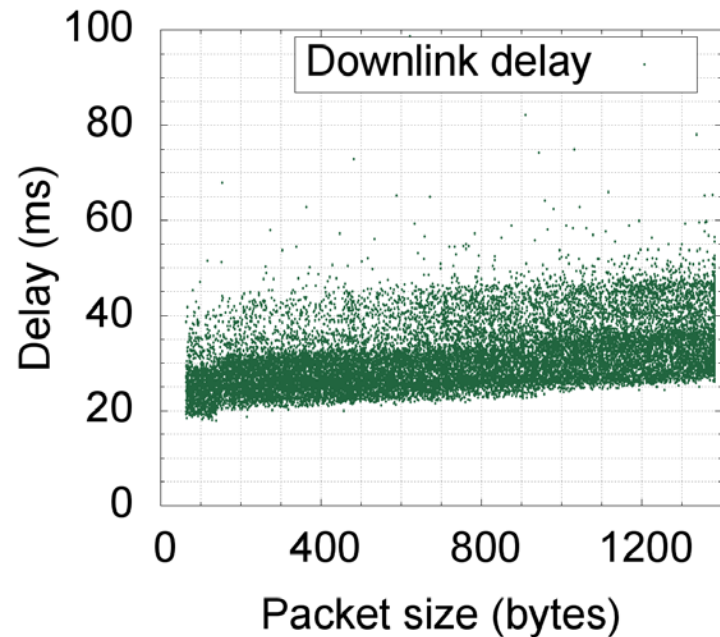

(a) Send time (client)

(b) Receive time (server)

- Consequence: **No random start time probes beyond first time-slotted link on a path**

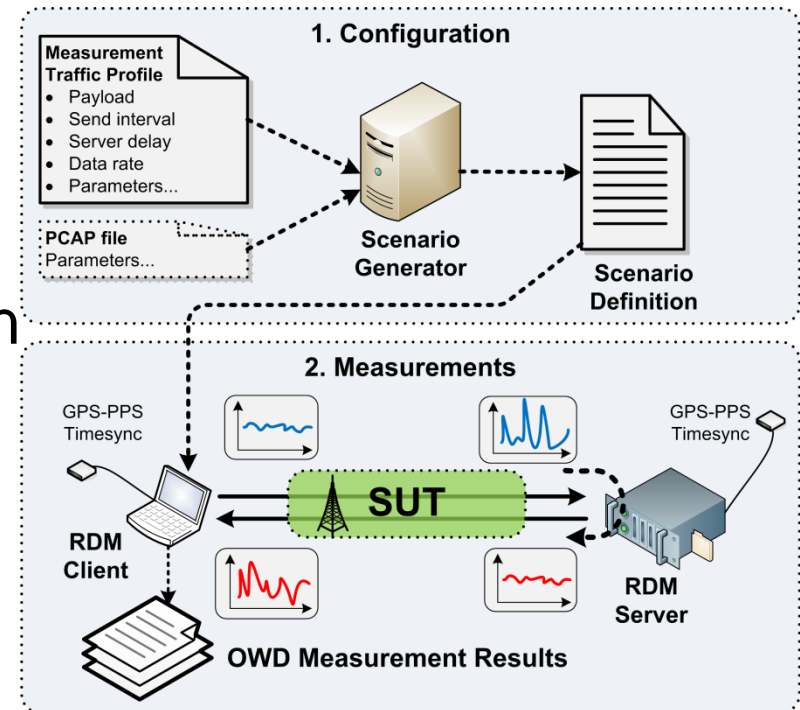- Example: reverse link one-way delay measurement HSPA

(a) Round-trip samples   **(b) Hop-by-hop measurement**

Measurement Tools: RDM

- Proposed solution: detect timing impairments
- Representative Delay Measurements (RDM) Tool [1], [2]

- **Key Concepts**:
  - Active Measurements
  - Time-synchronized hosts
  - Pre-computed stream definition
    - Random-payload (size)
    - Random start time/IDT
  - Configurable start time
  - Randomness re-generation in intermediate nodes

[1] Fabini and Abmayer: "Delay Measurement Methodology Revisited: Time-slotted Randomness Cancellation", doi:10.1109/TIM.2013.2263914
[2] Fabini et al.: „RDM: Facing the Challenge of Modern Networks", doi:10.4108/icst.Valuetools.2014.258181

Conclusions

- **Networks and systems bias on communications**
  - At low load, when operating within specifications
  - Applications, communications, and measurements
- Middleboxes
  - "Dormant" middleboxes: session state (packet timing).
  - Time-domain (transparent) vs. value-domain (visible)
- **Measurement methodology imperative**
  - One-way, hop-by-hop measurements
  - **Randomness re-generation** in intermediate nodes
  - Scenarios (repeatability)

Contact: Joachim.Fabini@tuwien.ac.at

Bibliography

[1] Fabini and Morton: IETF RFC 7312 "Advanced Stream and Sampling Framework for the IPPM"

[2] Fabini and Abmayer: "Delay Measurement Methodology Revisited: Time-slotted Randomness Cancellation", doi:10.1109/TIM.2013.2263914

[3] Fabini et al.: „RDM: Facing the Challenge of Modern Networks", doi:10.4108/icst.Valuetools.2014.258181

[4] Fabini and Zseby: „M2M communication delay challenges: Application and measurement perspectives", doi: 10.1109/I2MTC.2015.7151564

[5] Fabini and Zseby: „The Right Time: Reducing Effective End-to-End Delay in Time-Slotted Packet-Switched Networks", doi:10.1109/TNET.2015.2451708

Contact: Joachim.Fabini@tuwien.ac.at