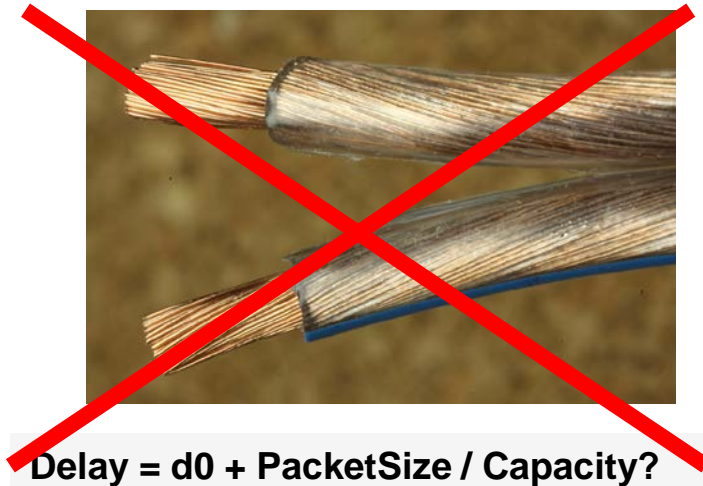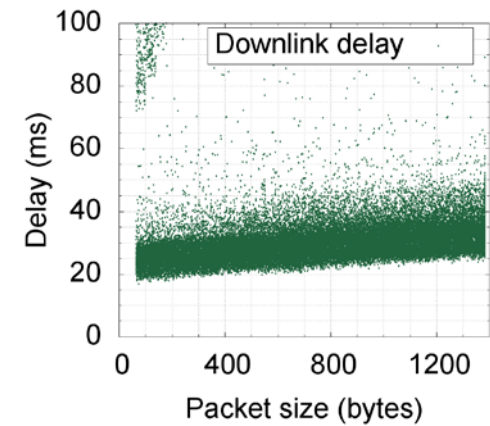# Access Network Measurements
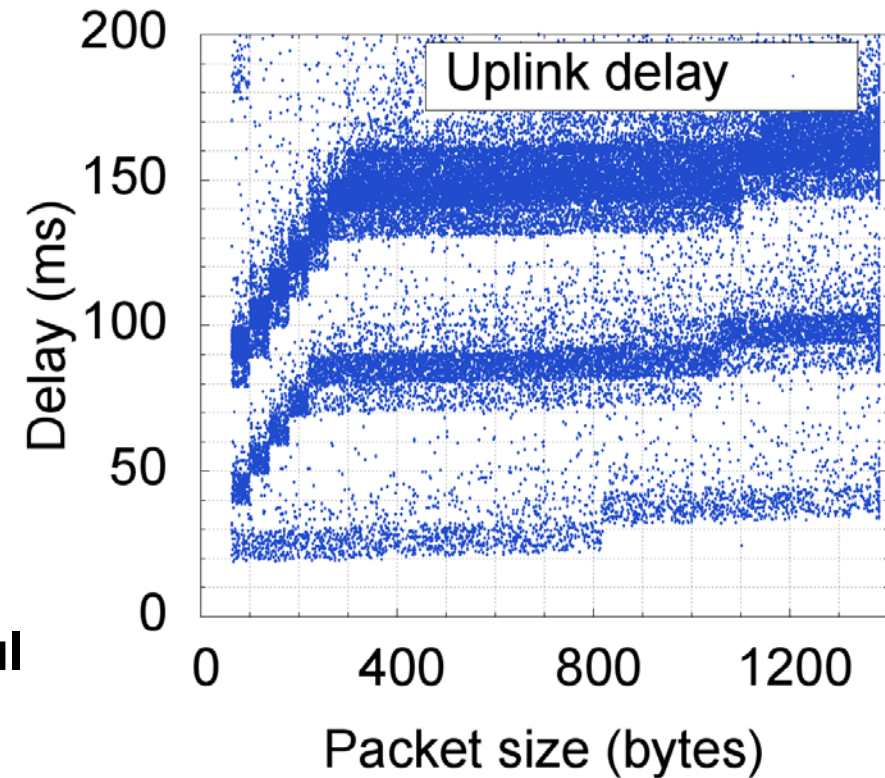
Source: http://commons.wikimedia.org/wiki/File%3ALautsprecherkabel_Makro_nah.jpg
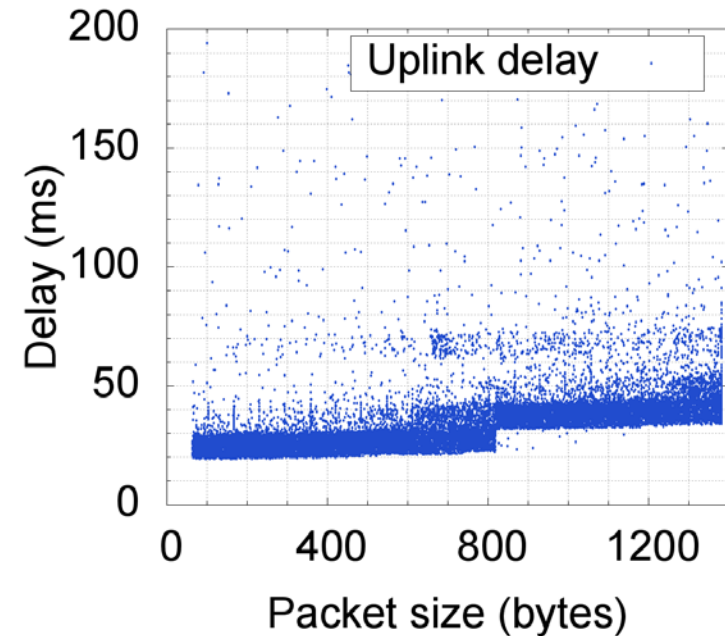
Delay = d0 + PacketSize / Capacity?

- **Access networks are session stateful**
  - Packet-based processing
  - Pronounced asymmetry uplink vs. downlink
- **Cellular Broadband Networks**
  - On-demand capacity allocation

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

On-Demand Capacity Allocation
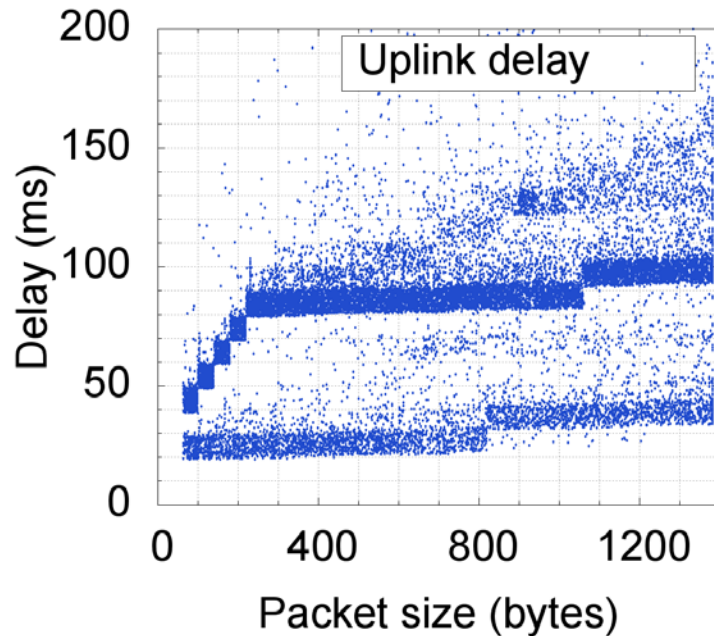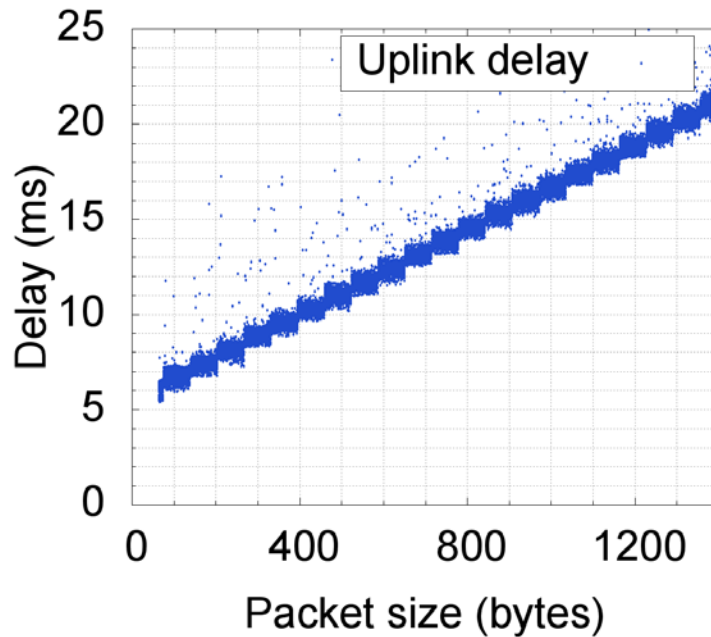

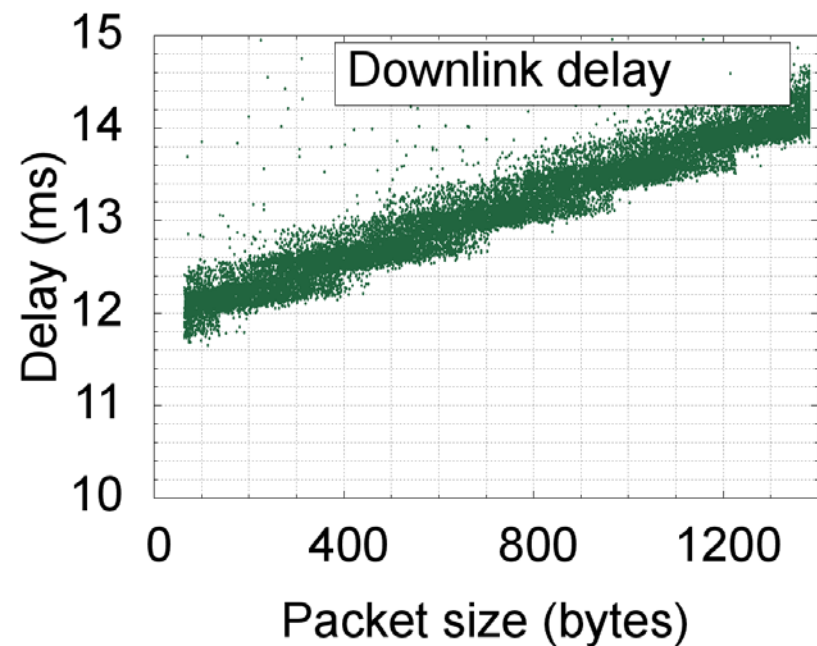**(a) HSPA low avg. bit rate**   **(b) HSPA higher avg bit rate**

- **Observations:**
  - **Stream patterns matter!** (application, measurements, …)
    - Packet inter-departure time, average bit rate, packet size, …
  - **Packet start-time matters (details at HOPS-NG IRTF meeting)!**
  - Start-time randomness imperative for unbiased results!

Delay vs. Capacity Reasoning

**(a) VDSL UL (768 kbit/s)**   **(b) VDSL DL (8 Mbit/s)**

- **Observations:**
  - **Delay not necessarily (inverse) proportional to link capacity!**
  - Reason in this case: interleaving activated on VDSL downlink

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

Conclusion

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- Networks and middleboxes bias on communications
  - At low load, when operating within specifications
- State vs. Coding
  - HSDPA 384k UL middlebox?
- **Access networks: middleboxes**
  - "Dormant" middlebox: time-domain vs. value-domain
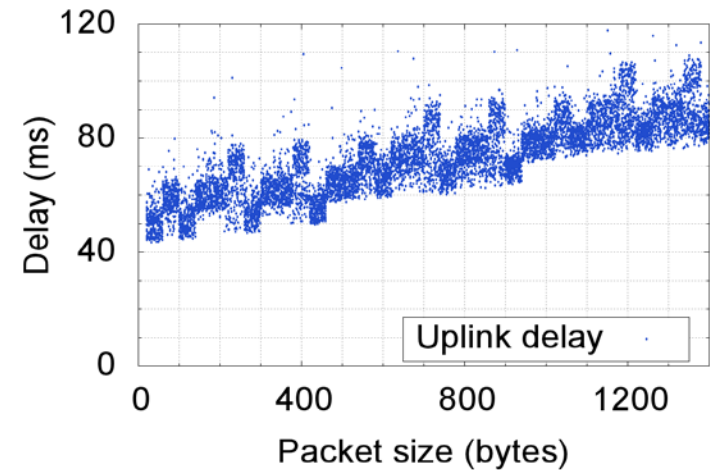
- **Main conclusion:
Think (at least) twice before abstracting access link behavior**

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

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

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