QUIC and SATCOM

Ludovic Thomas, Emmanuel Dubois, Nicolas Kuhn (CNES)
Emmanuel Lochin (ISAE)

QUIC and SATCOM

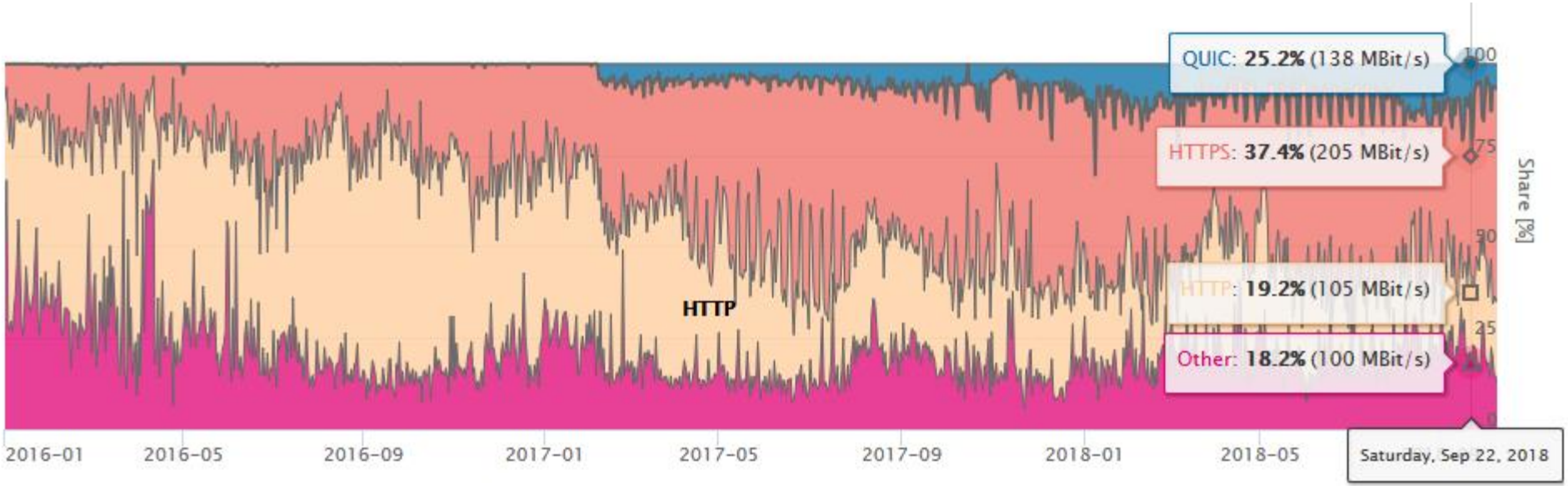
Why do we work on QUIC over SATCOM ?

Ludovic Thomas, Emmanuel Dubois, Nicolas Kuhn (CNES)
Emmanuel Lochin (ISAE)

cnes
CENTRE NATIONAL D'ÉTUDES SPATIALES

Why do we work on QUIC performance over SATCOM ?

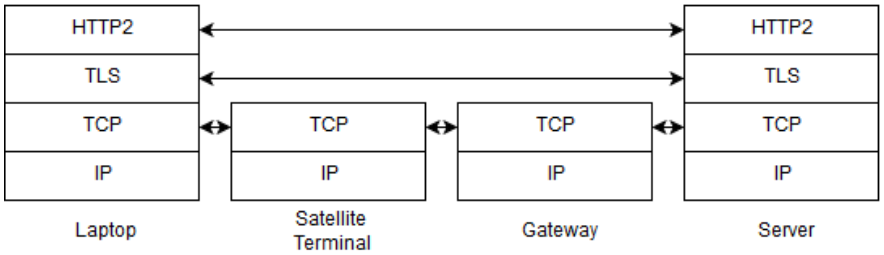
1- Because it is already here

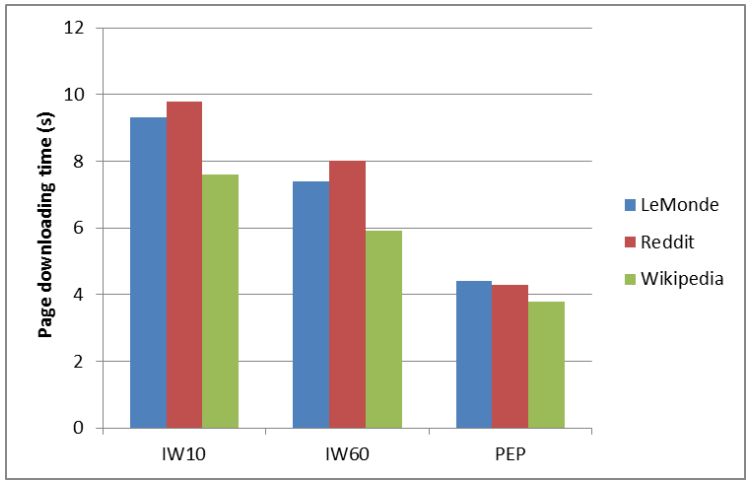


Christoph Dietzel Jan Rüth, Ingmar Poese and Oliver Hohlfeld. 2018.
A First Look at QUIC in the Wild. In Proceedings of the 19th Passive and Active Measurement Conference. 1–6.
https://doi.org/10.1007/978-3-319-76481-8_19
https://quic.netray.io/stats.html

Why do we work on QUIC performance over SATCOM ?

2- Because we (we = SATCOM) can not « split » QUIC traffic





TCP-split :

- Each TCP connection is split in 3 independent TCP connections

With TCP-split (PEP), we even do better than with IW (Initial congestion Window) of 60

SWOT analysis of QUIC and SATCOM

Strength

- 0 RTT handshake (complicated when TCP is splitted)

Weakness

- Can not be accelerated

Opportunity

- Quick deployment of new CC versions
- No PEP = cheaper ground segments

Threat

- Complexed adequate QoS for different applications (using e.g. DPI)
- Potential impact on the end-user QoE

Question

Is QUIC doing better than splitted-TCP for a SATCOM public access ?

QUIC and SATCOM

Testbed descrition

Ludovic Thomas, Emmanuel Dubois, Nicolas Kuhn (CNES)
Emmanuel Lochin (ISAE)

Testbed description

How can we trust our QUIC experiments ?

- By using Google servers

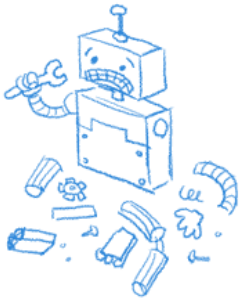
Target A (1 object, 5.3MB)

Target B (3 objects, 11 kB)

Google

404. That's an error.

The requested URL /test.html was not found on this server.
That's all we know.

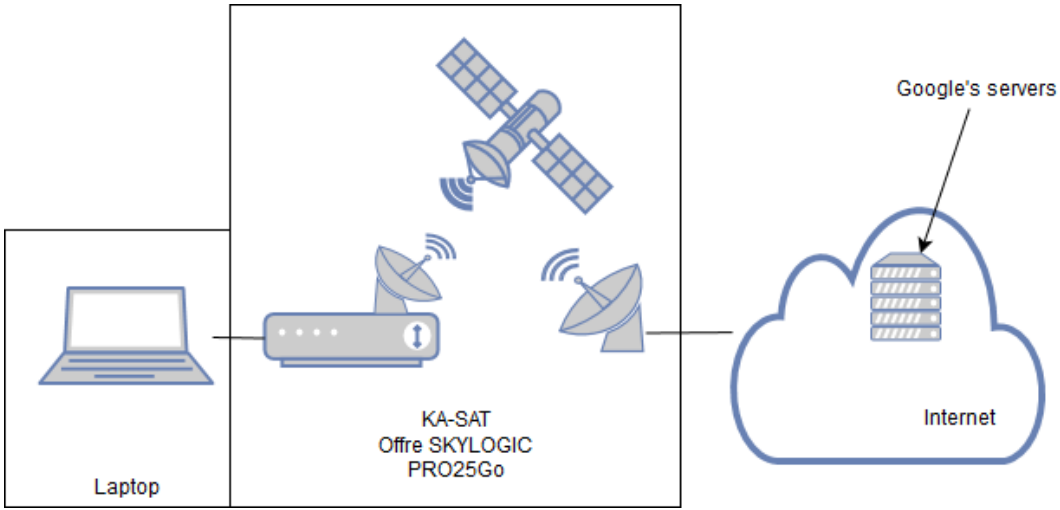


Testbed description

How can we assess actual end user perception ?

- By using a public SATCOM access
  - We « just » rent a SATCOM public access and connect our laptop to it

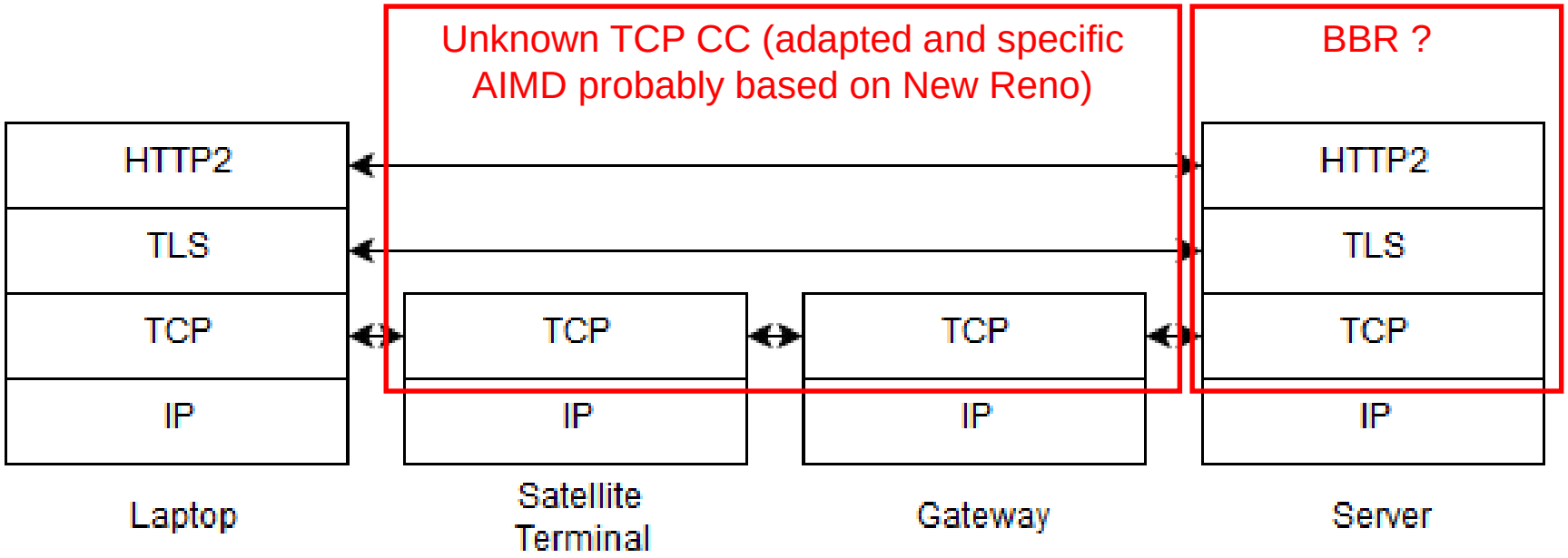
    + we get to have real end user experience
    - we have no views on the specific TCP implementations (and other operator tunings)



Testbed description

How can we assess actual end user perception ?

- Beware the optimized TCP in public SATCOM access



Testbed description

How can fairly compare QUIC/UDP vs optimized-TCP ?

- QUIC is end-to-end and TCP is split and optimized for SATCOM
- By using one browser with the QUIC enabled option
  - (using different browse can result in comparing apples and oranges)

Testbed description

How can we see if we are the only concerned by this issue ?

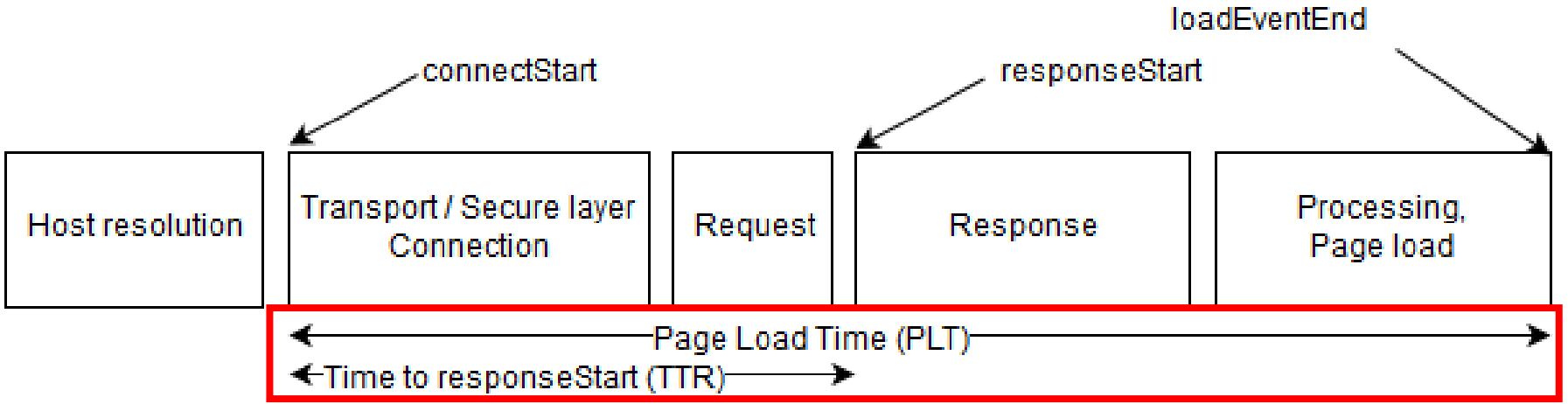
- By making our code available
- https://forge.net4sat.org/cnes/quxa-public

Testbed description

What do we exactly do ?

- Test unit : three web pages downloads before purging the browser profile.
- Each download : the client fetches one of the web pages and then closes the browser when the page is retrieved.
- Elapsed time between two loads is uniformly distributed between 5 and 15 seconds.

- We use Selenium automation tools to control the browser and retrieve W3C metrics

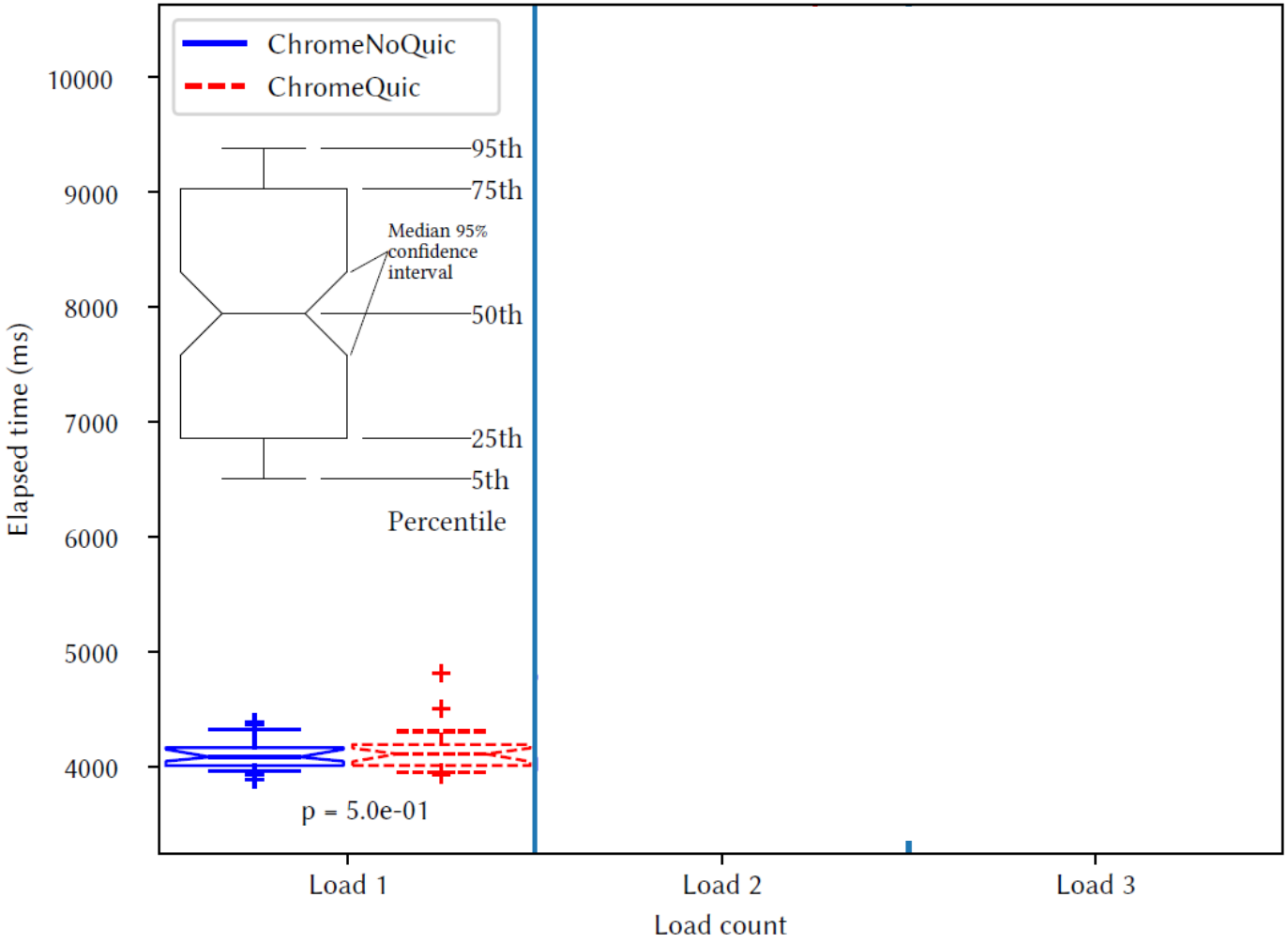


QUIC and SATCOM

Results

Ludovic Thomas, Emmanuel Dubois, Nicolas Kuhn (CNES)
Emmanuel Lochin (ISAE)

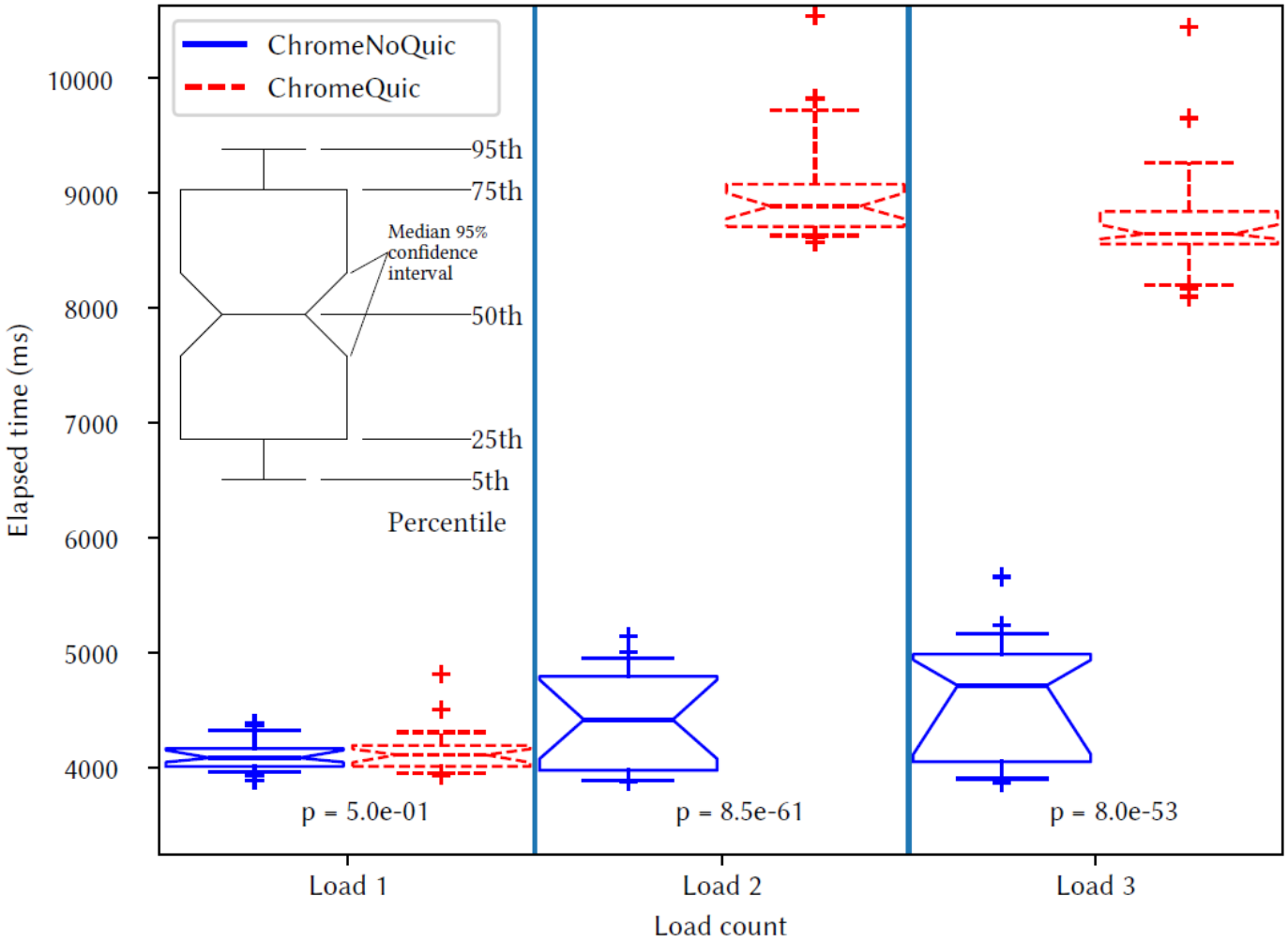
Large page download (target A)



Same PLT for both cases:

- First load is done with TCP

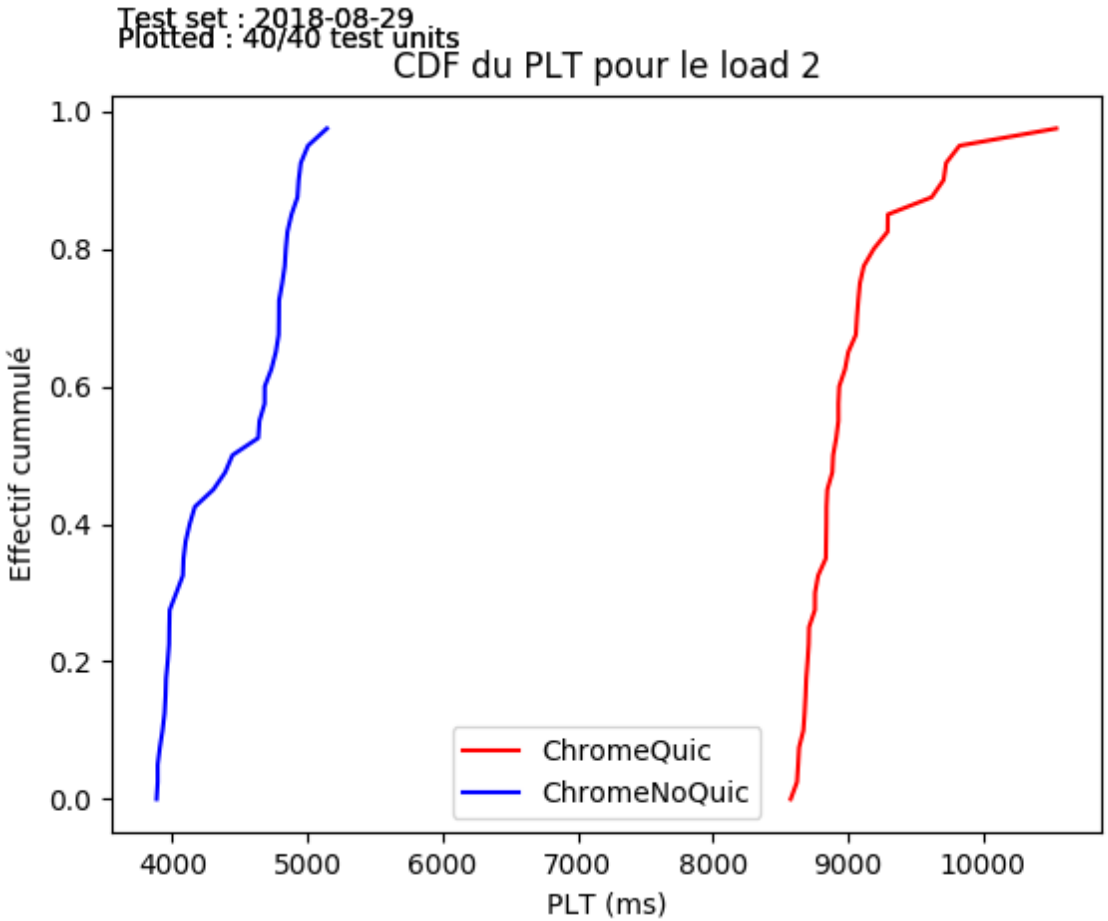
Large page downlaod (target A)



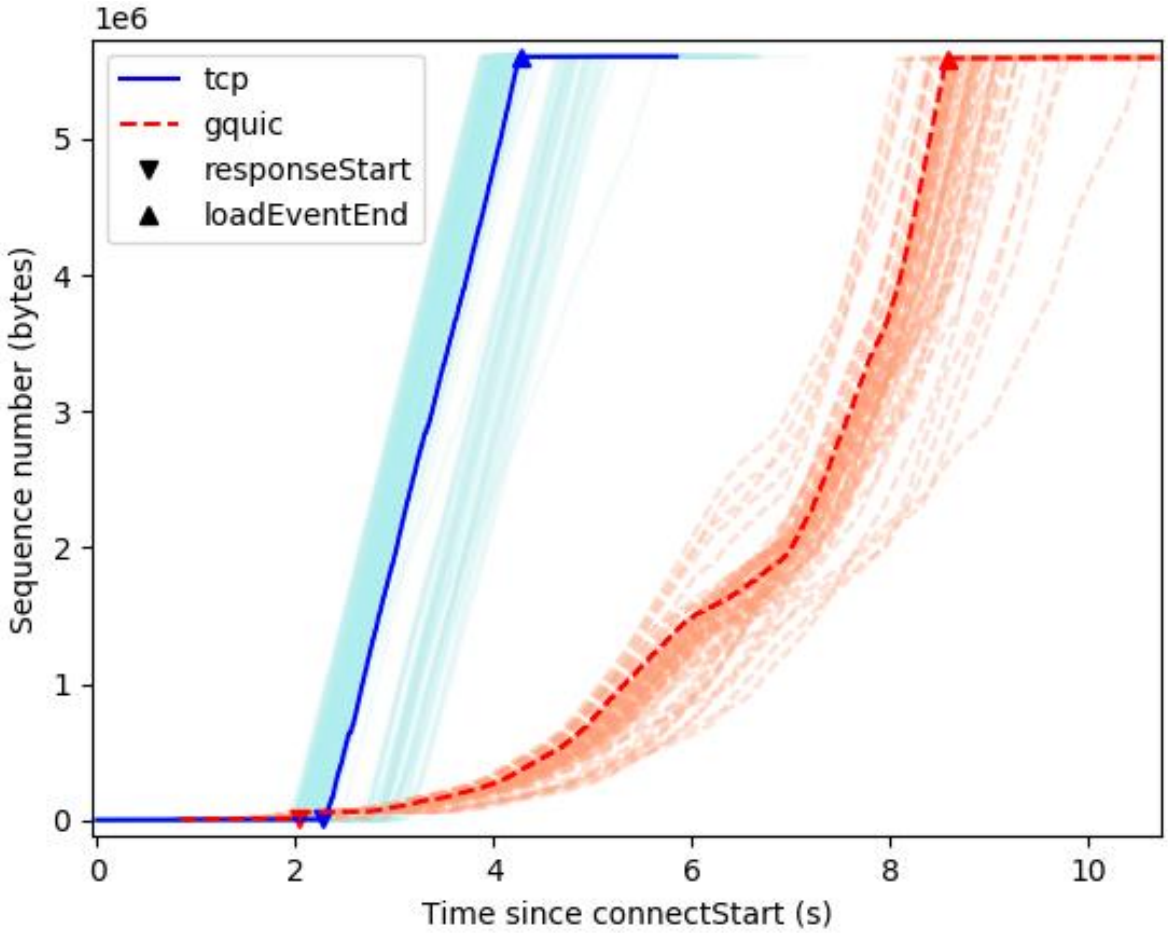
Once QUIC is know to be possible

- PLT is doubled with QUIC
- Strange increase in noQUIC PLT (probably some ISP tuning)

Focus on the load 2

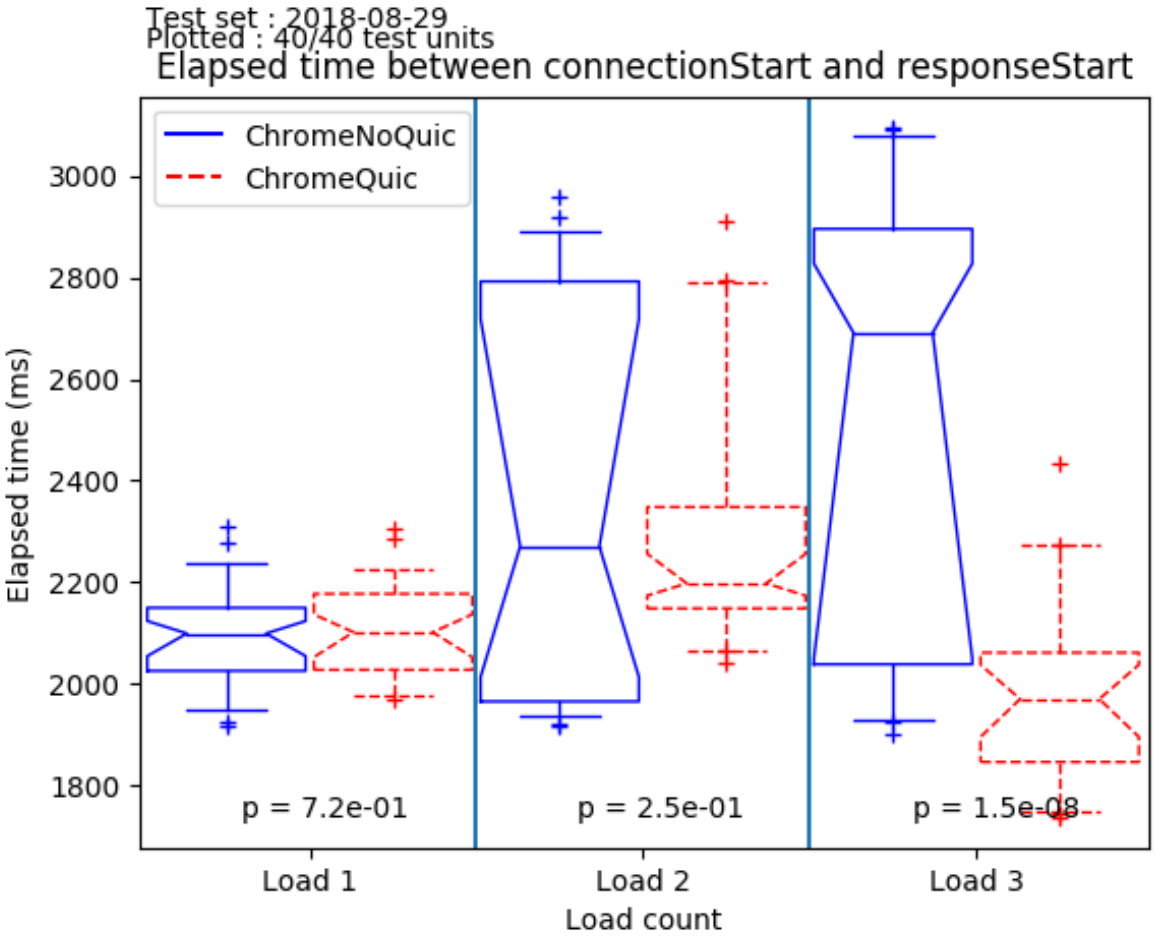


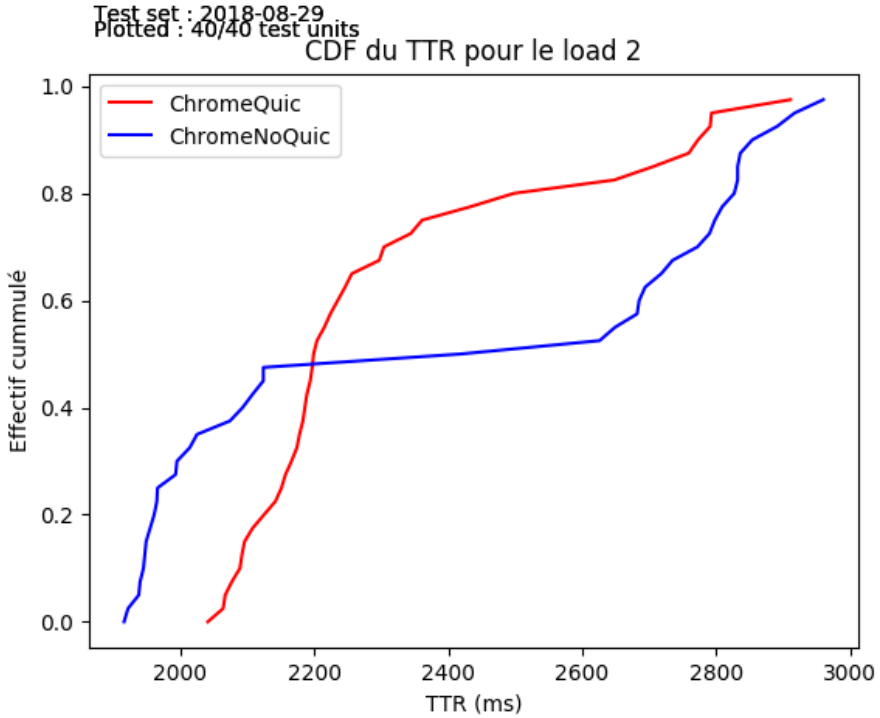
Sequence number (target A)



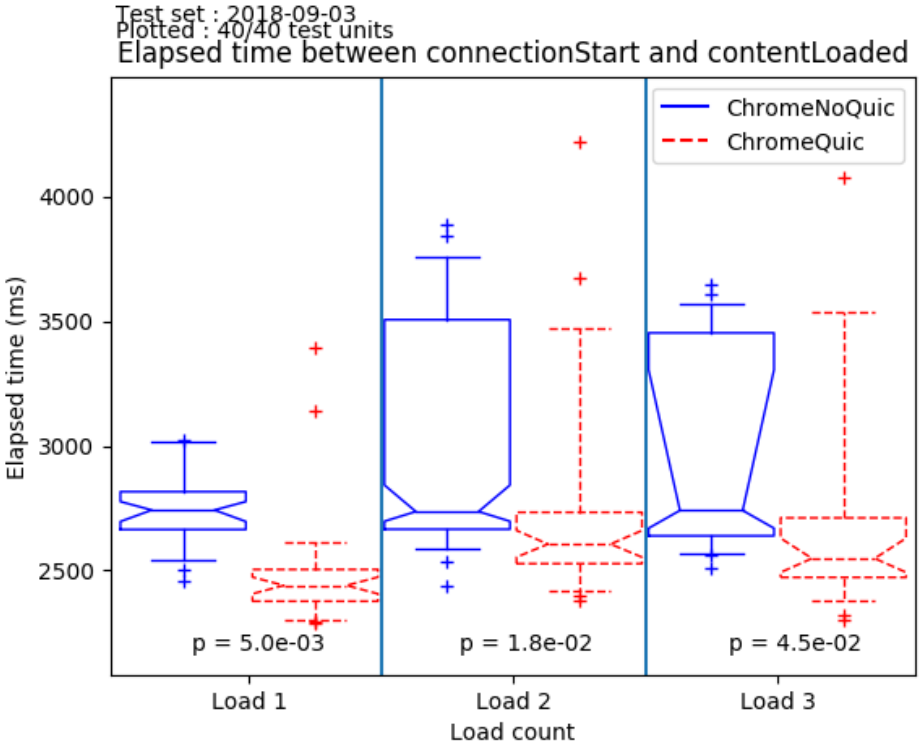
- Stable and high throughput with splitted-TCP
- It takes a while for QUIC to get out of the slow start and getting up to speed

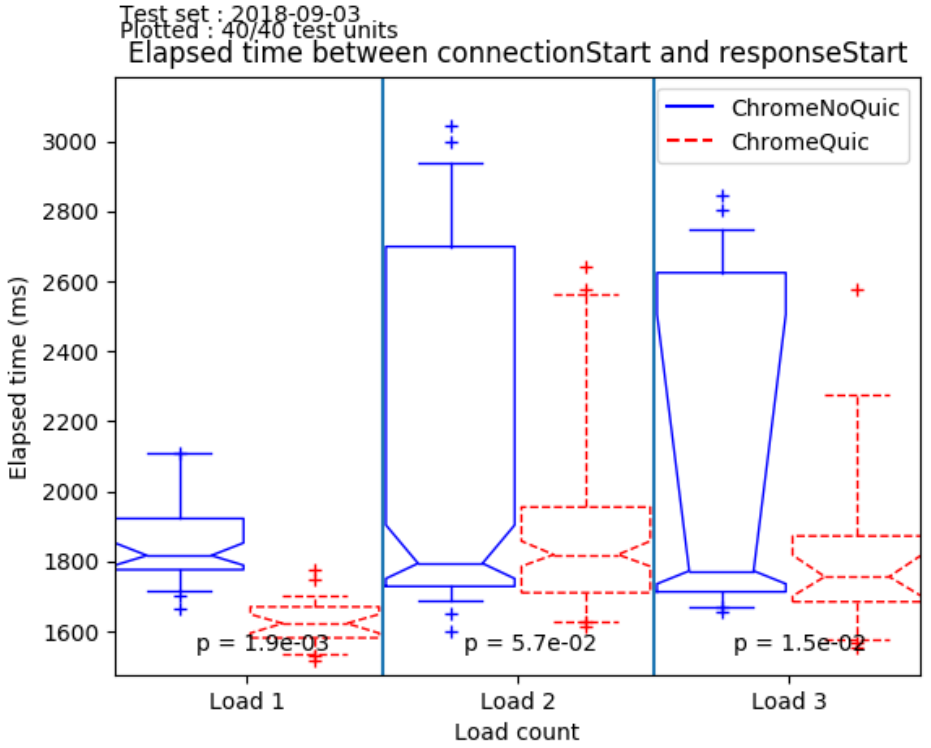
Time to responseStart (target A)





Page Load Time and Time to responseStart (target B)





QUIC and SATCOM

Conclusion

Ludovic Thomas, Emmanuel Dubois, Nicolas Kuhn (CNES)
Emmanuel Lochin (ISAE)

~~Question~~ Answer

Is QUIC doing better than splitted-TCP for a SATCOM public access ?

- For small files, QUIC wins
  - First data bytes arrive earlier
- For large files, splitted-TCP wins
  - Issue is « getting up to speed »
- More info on the paper:
  - https://arxiv.org/abs/1810.04970

~~Question~~ Answer

What is next ?

- Short term solution:
  - Send relevant informations to the QUIC server
    - IW, CC parameters, etc.
- Long term solution:
  - Let the server know we are on a SATCOM access
  - Work on a specific QUIC CC for SATCOM access
  - Waiting for the IETF-QUIC release

QUIC and SATCOM

Couple words on the tools

Ludovic Thomas, Emmanuel Dubois, Nicolas Kuhn (CNES)
Emmanuel Lochin (ISAE)

Few words on the transport experiment automation

Setting up such experiments takes a while

Running transport level experiments is costly

- OpenBACH : http://www.openbach.org
  - Experimental work – we would be happy to have feedbacks
  - Open-source orchestration tool
  - Based on simple unit jobs (e.g. tcp_probe, set a VoIP server, set a HTTP server, etc.)
  - Based on many open-sources project

Few words on the transport experiment automation

Example of what can be done with OpenBACH

- **Network metrology (QoS metrics)**
- **Multipath transport scenario**
- **(ongoing) Integrated QUIC related scenarios**
- **(ongoing) Reproducing the results of « Experimental Evaluation of BBR Congestion Control » Mario Hock, Roland Bless, Martina Zitterbart. IEEE ICNP 2017, Oct 10–13, Toronto, Canada**
  - To see if the same trend (BBR and CUBIC fairness) could be seen in SATCOM
  - To automatize TCP fairness experiments with an open-source tool