QUIC and SATCOM

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QUIC and SATCOM

Why do we work on QUIC over SATCOM ?

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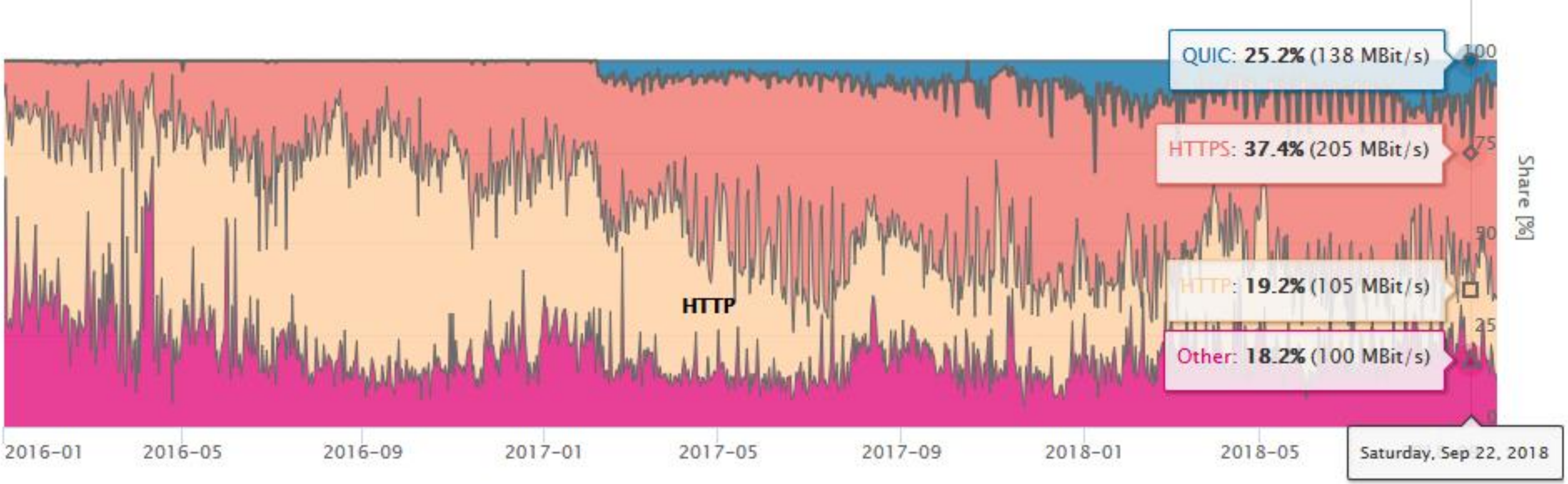
Why do we work on QUIC performance over SATCOM ?

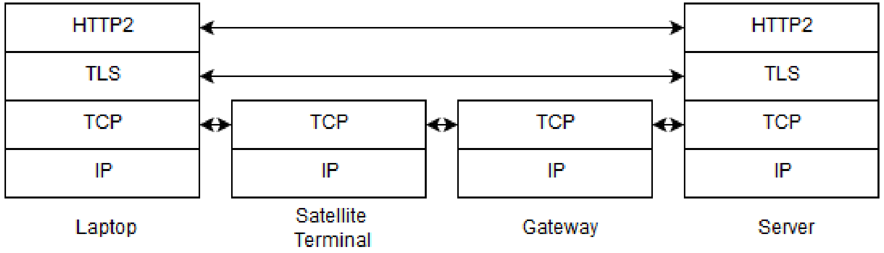
1- Because it is already here

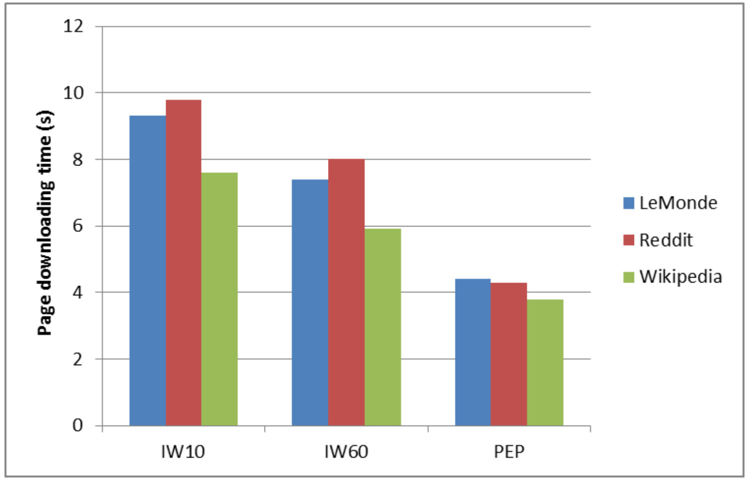


Christoph Dietzel Jan Rüth, Ingmar Poese and Oliver Hohlfeld. 2018.
A First Look at QUIC in the Wild. In Proceedings of the 19th Passive and Active Measurement Conference. 1–6.
https://doi.org/10.1007/978-3-319-76481-8_19
https://quic.netray.io/stats.html

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 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

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Testbed description

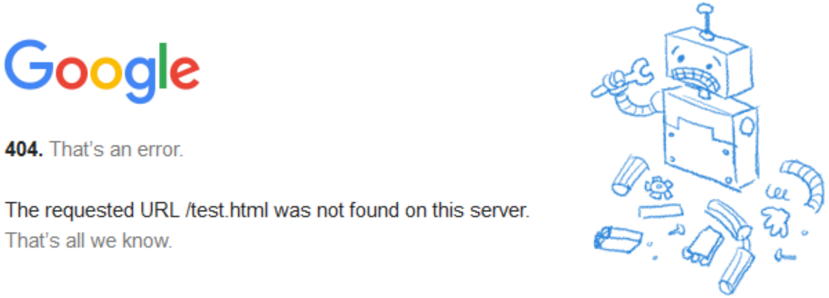
How can we trust our QUIC experiments ?

- ➢ By using Google servers

Target A (1 object, 5.3MB)

Target B (3 objects, 11 kB)

Pleiades Satellite Image - The Kennedy Space Centre, USA © CNES 2016, Distribution Airbus DS



Google

404. That's an error.

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

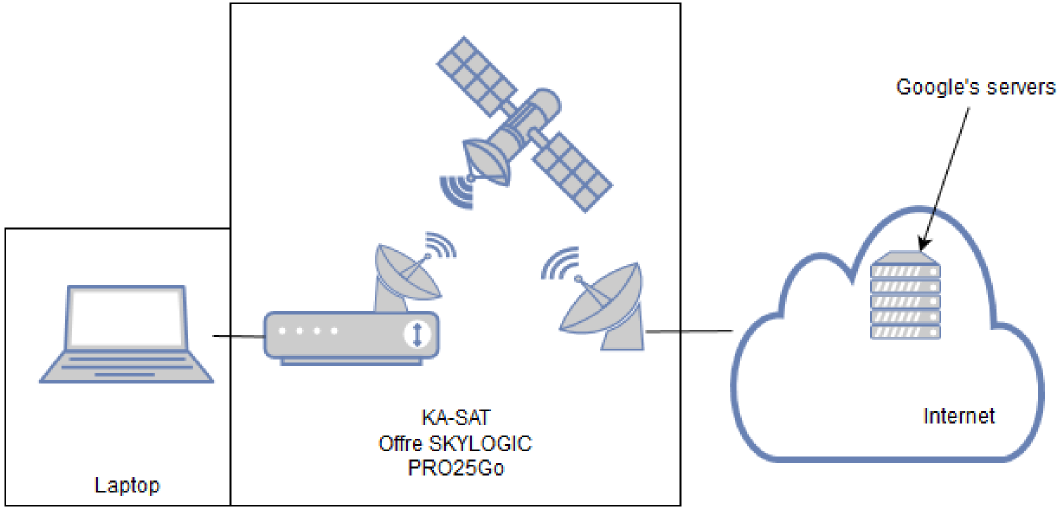
Testbed description

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

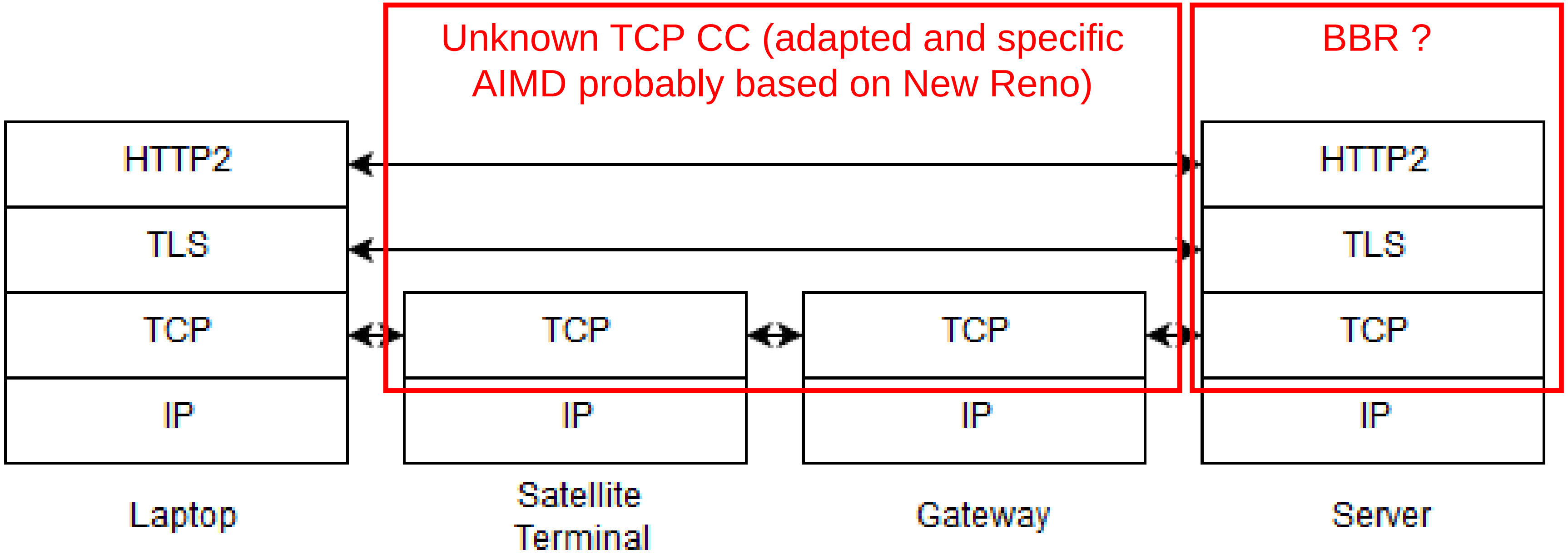
- we have no views on the specific TCP implementations (and other operator tunings)



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

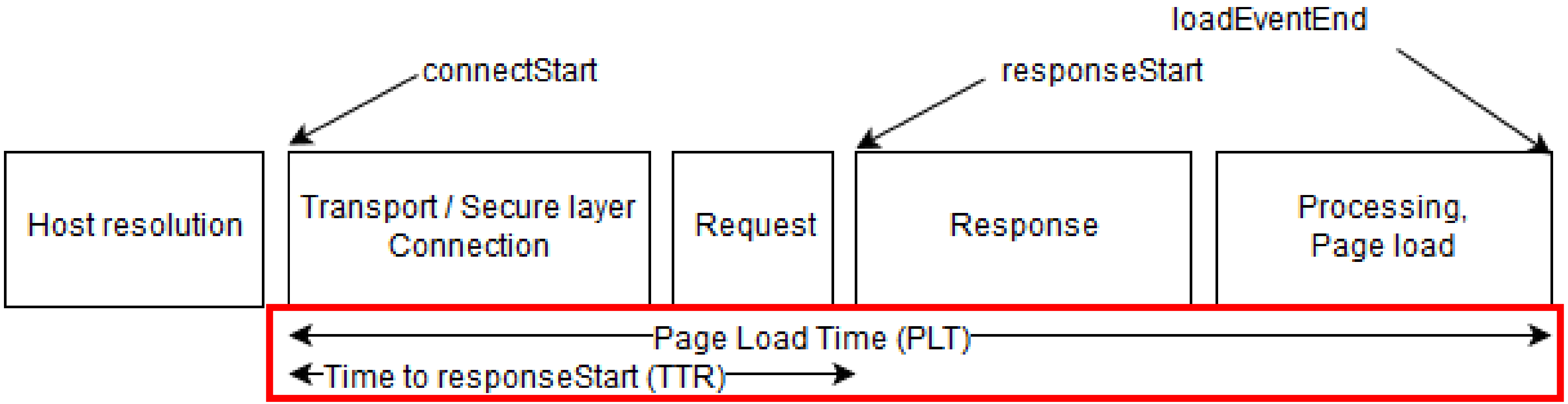
How can we see if we are the only concerned by this issue ?

- 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



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Results

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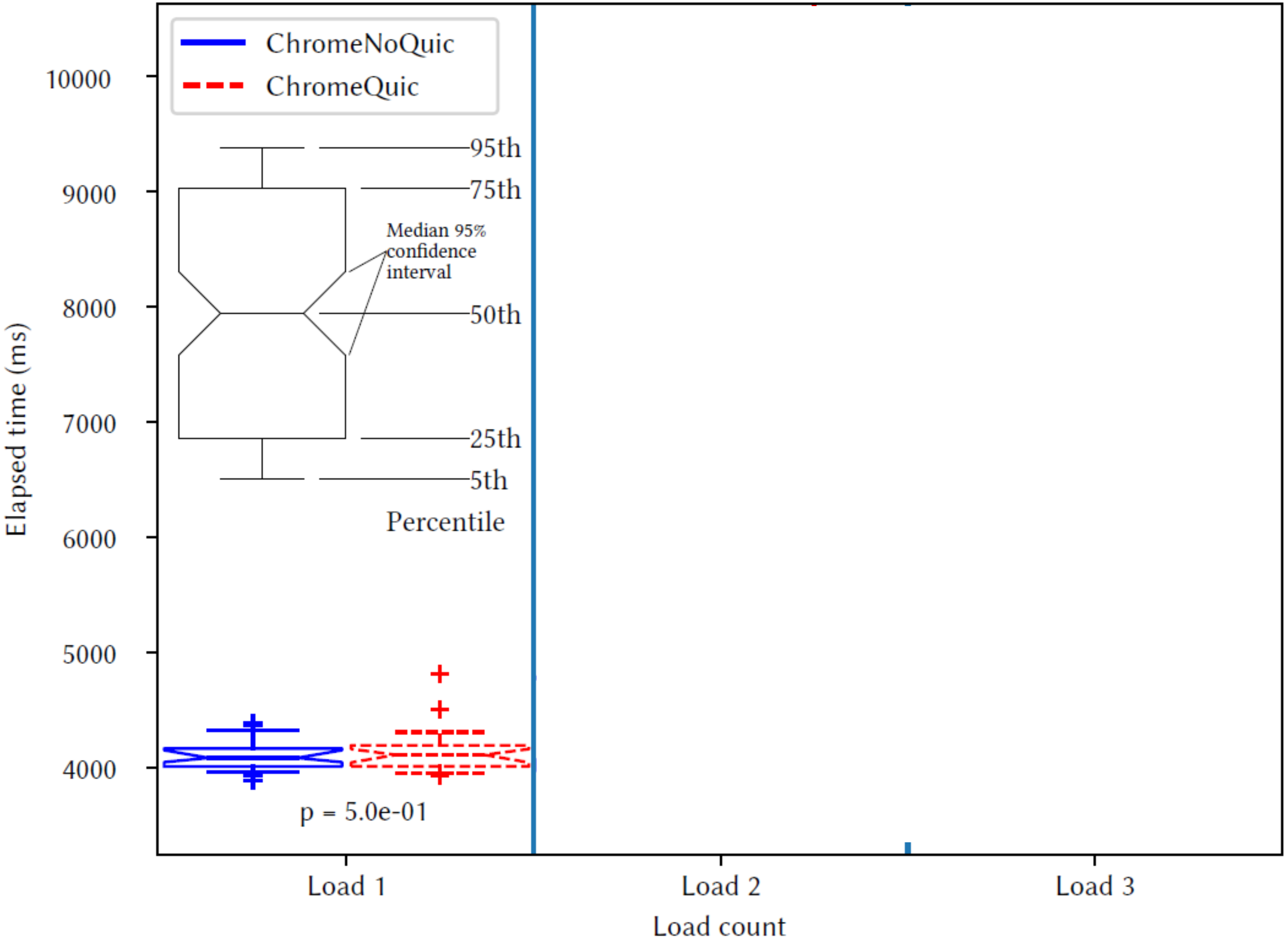
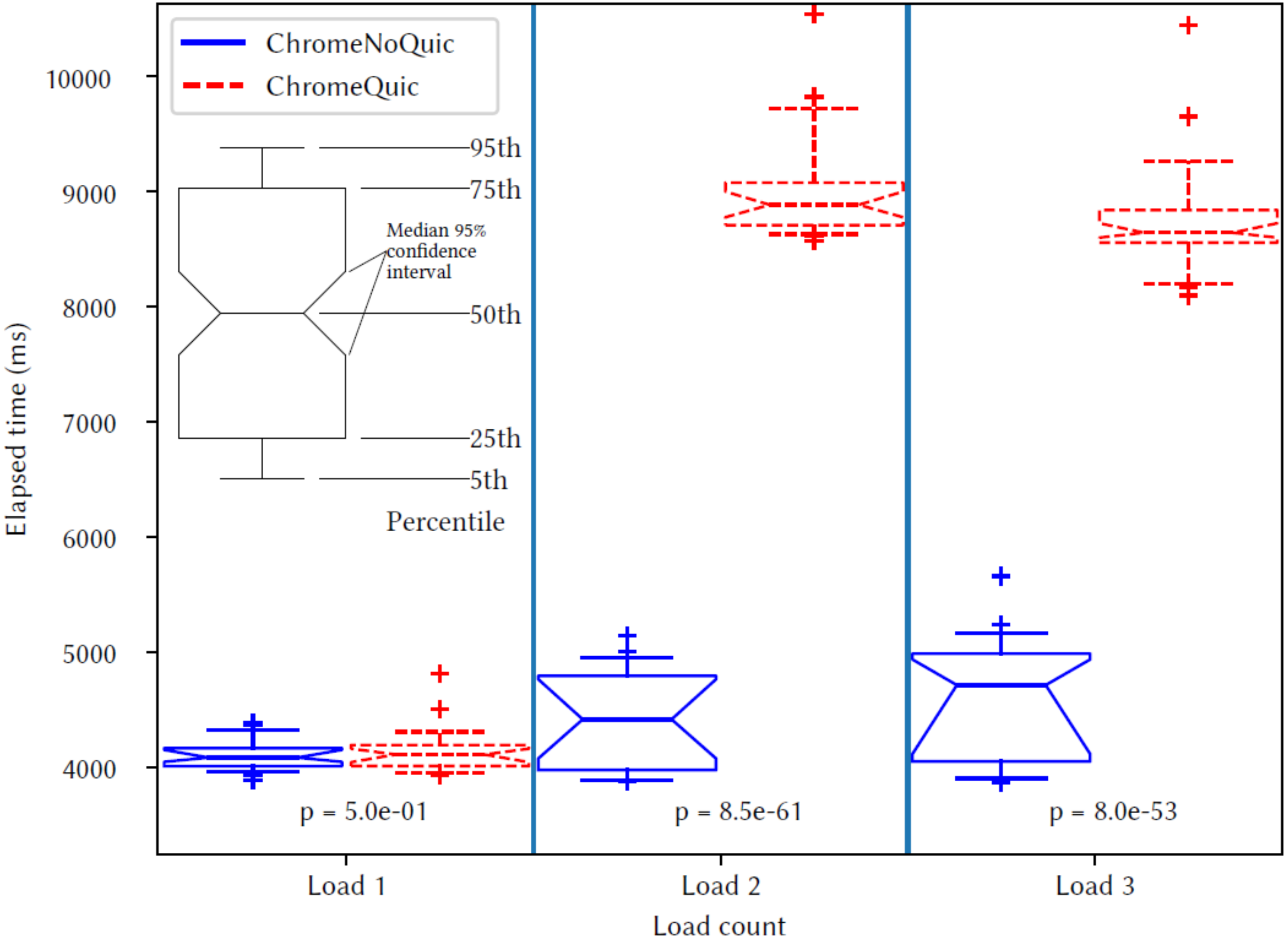
Large page download (target A)



Same PLT for both cases:

- First load is done with TCP

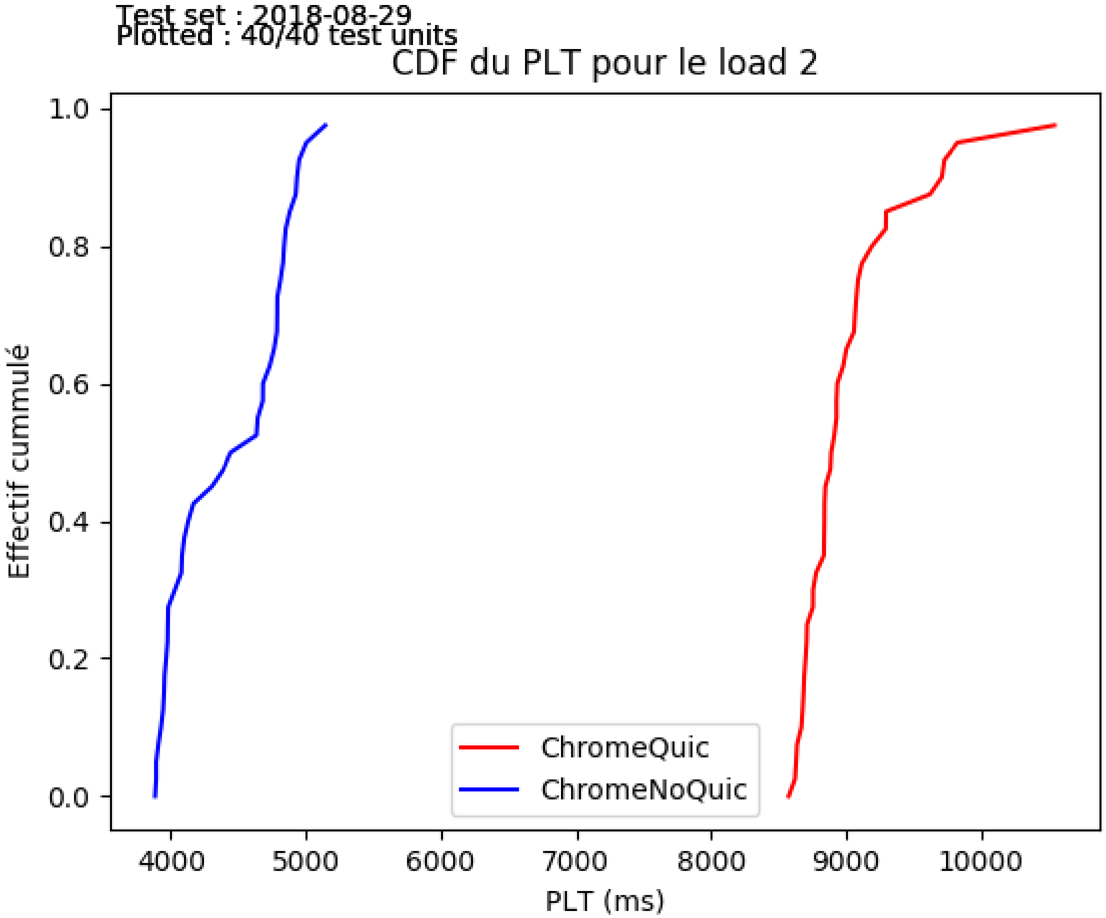
Large page downlaod (target A)



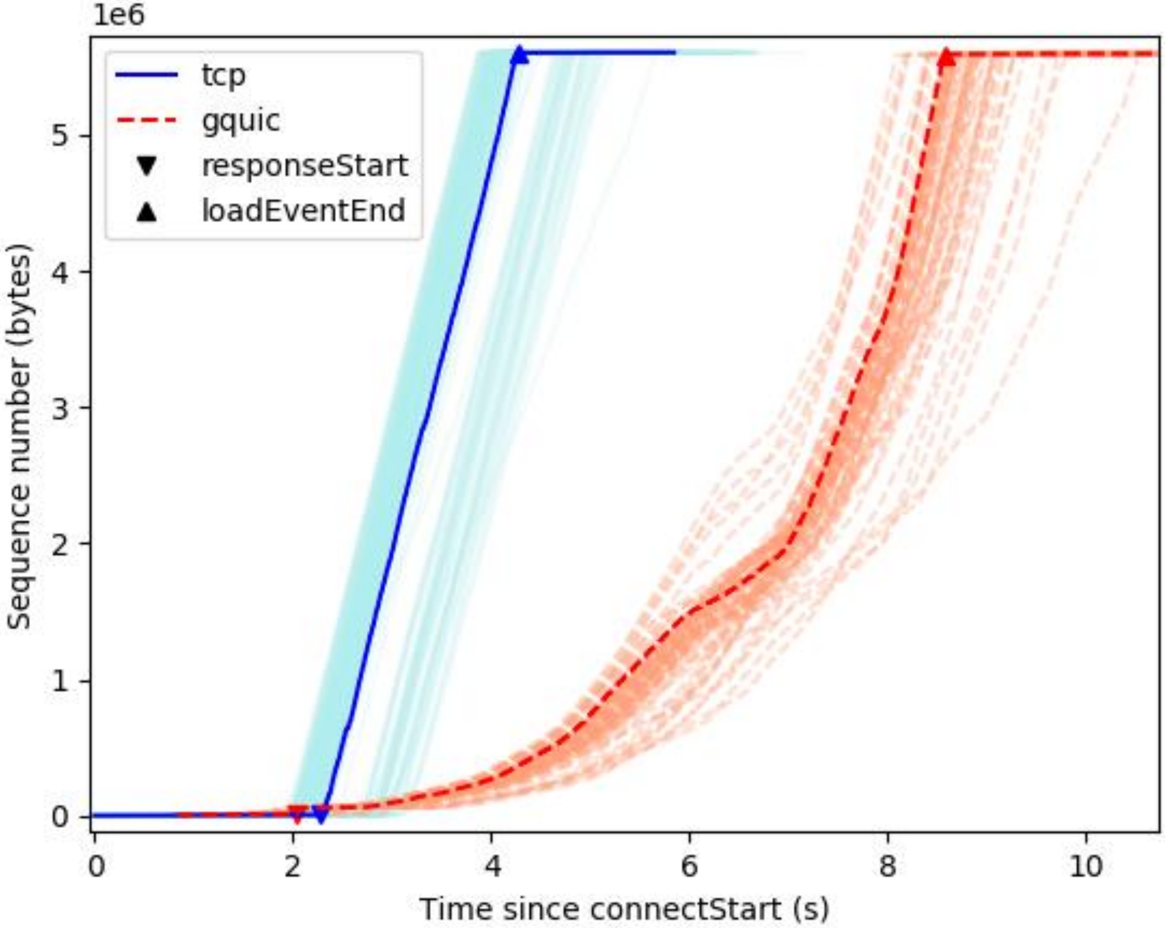
Once QUIC is know to be possible

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

Focus on the load 2

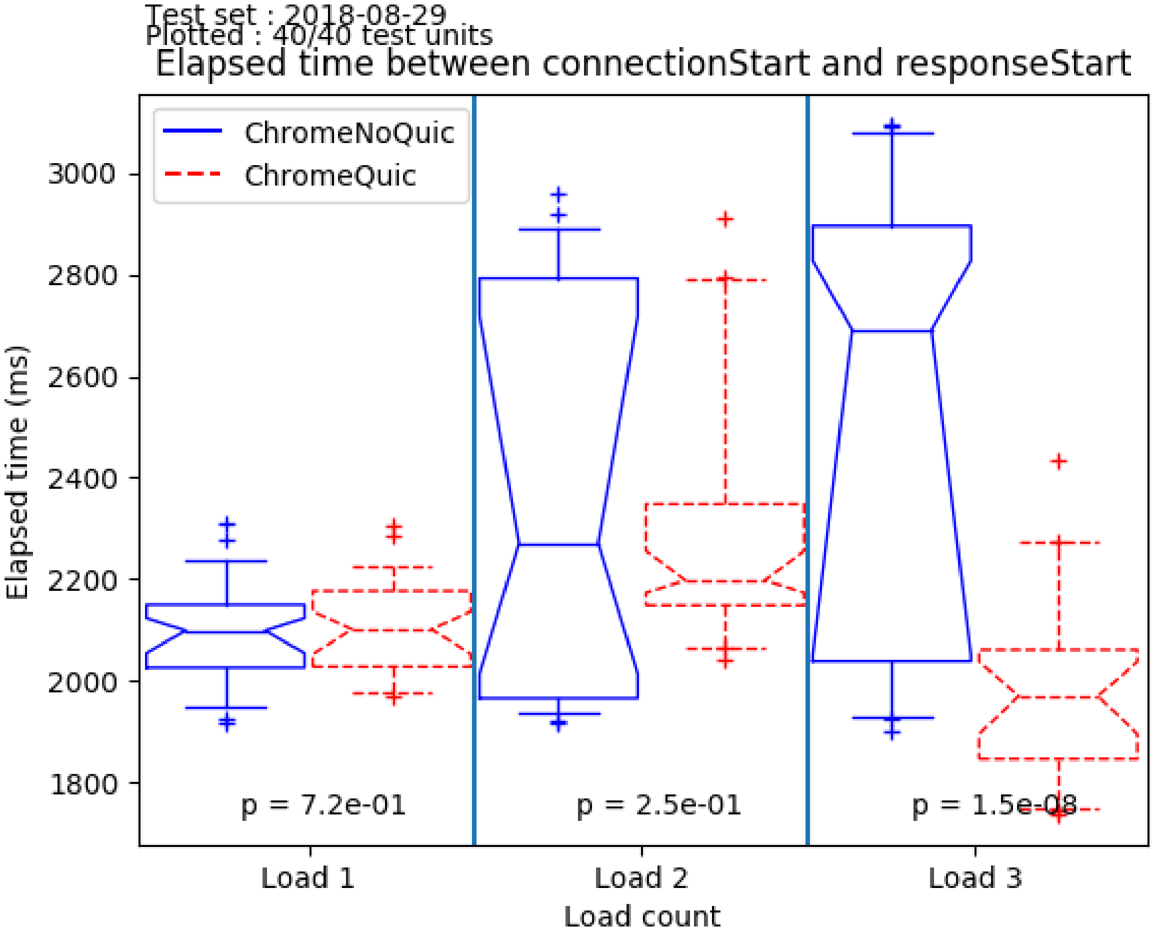


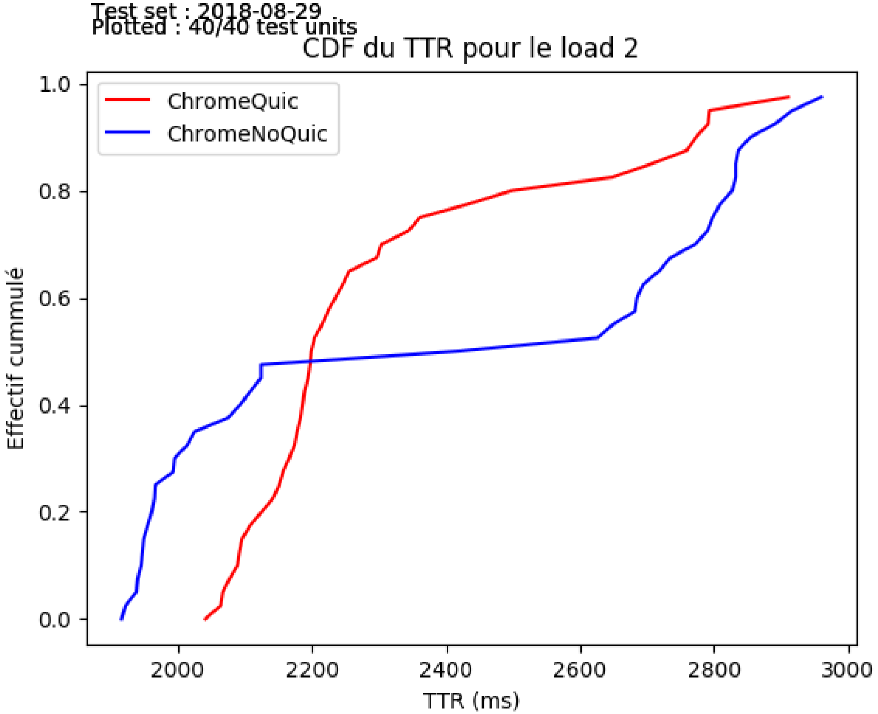
Sequence number (target A)



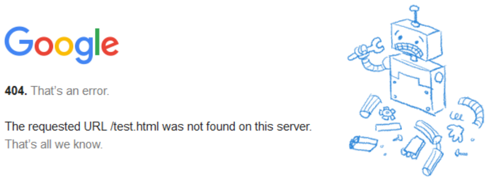
- Stable and high throughput with splitted-TCP
- It takes a while for QUIC to get out of the slow start and getting up to speed

Time to responseStart (target A)





Page Load Time and Time to responseStart (target B)



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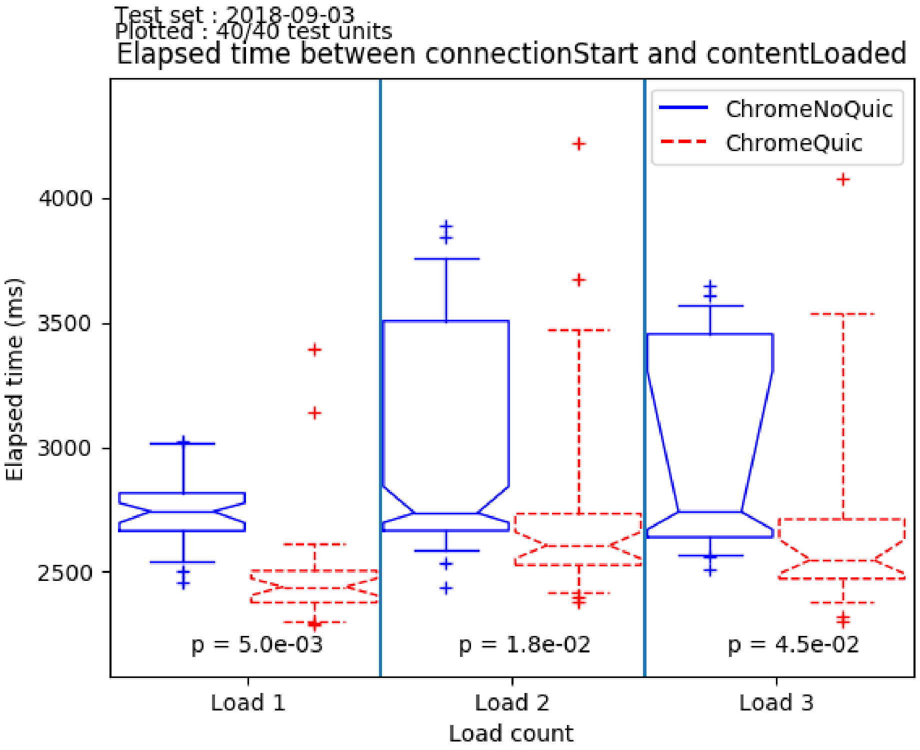

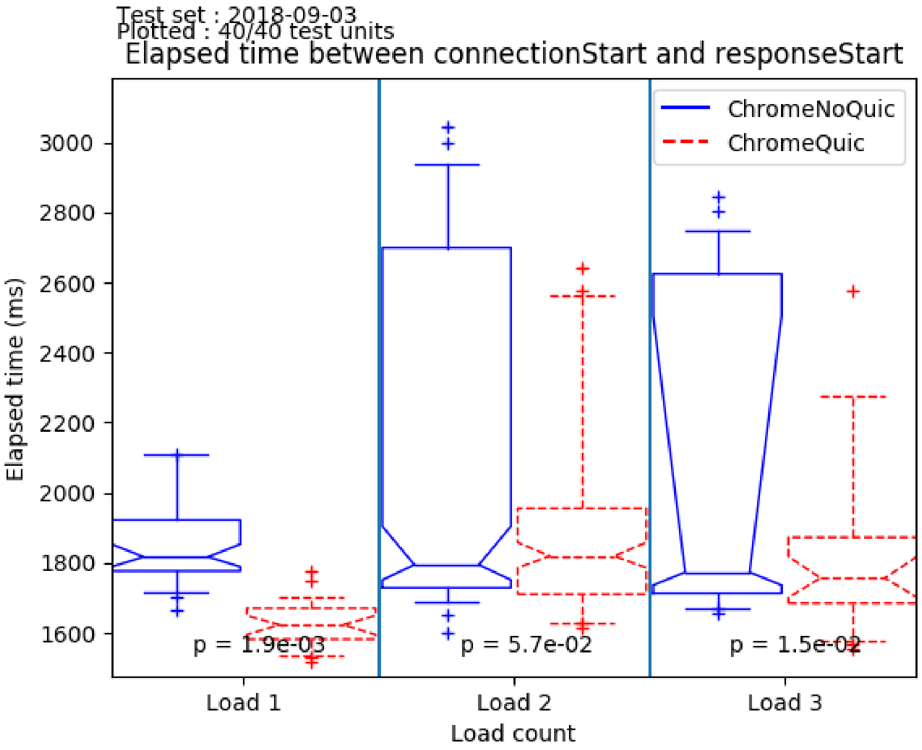

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Conclusion

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~~Question~~ Answer

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

- It depends …
- 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

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Couple words on the tools

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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