

# Real Time Monitoring and Troubleshooting of Web browsing sessions

Antoine SAVERIMOUTOU, Bertrand MATHIEU

Orange Labs – Institut Mines Telecom Atlantique

[antoine.saverimoutou@orange.com](mailto:antoine.saverimoutou@orange.com)

RIPE 76 14-18 May 2018

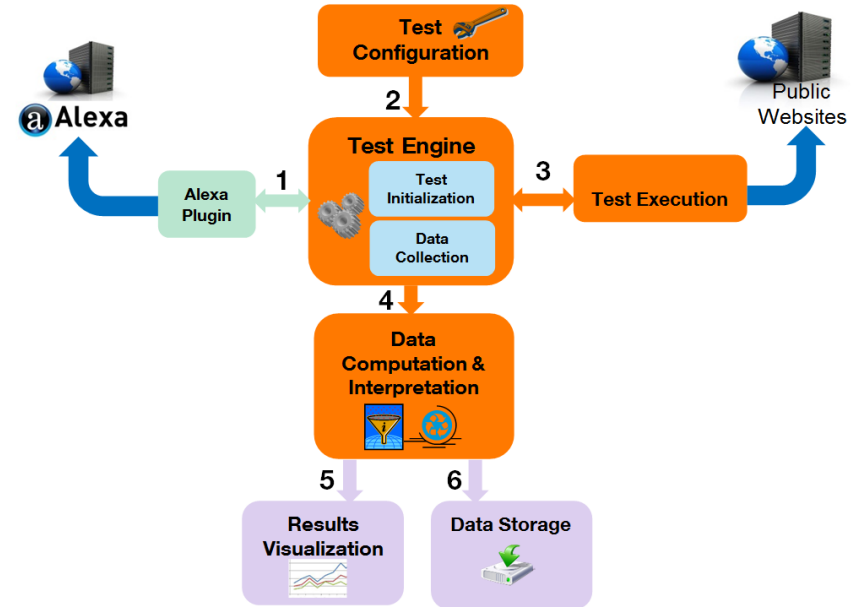
# Context

- New trends towards application level Internet protocols (e.g QUIC),
- New web metrics are brought along by W3C and research community to better qualify and quantify users' experience,
- Goal: Identify bottleneck in web browsing sessions:
  - Domestic network or devices,
  - Internal operator's network or border network,
  - Distant Web server.

Proposal of a tool to evaluate web browsing Quality of Experience (QoE),  
**MORIS : Measuring and Observing Representative Information on webSites**

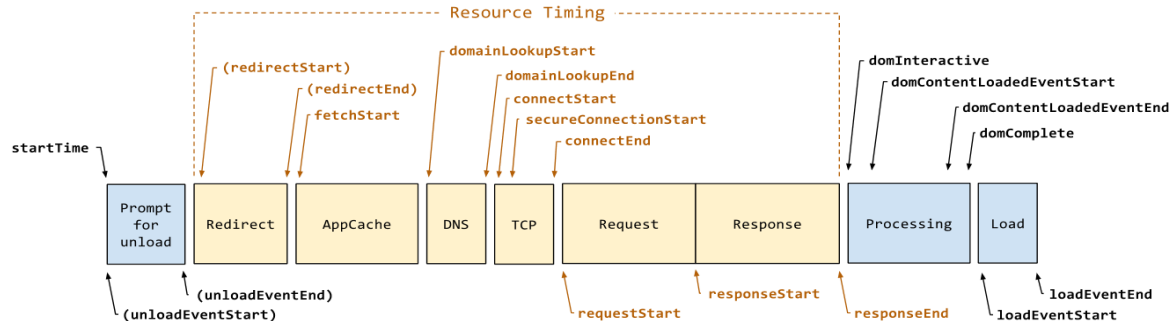
# MORIS: Architecture

- *Alexa Plugin*.
  - Websites to be measured
- *Test Configuration*.
  - Set up configurations
- *Test Engine*.
  - Drive measurement campaigns
- *Test Execution*.
  - Perform measurements (graphical or in headless mode)
  - Collect data (web metrics, HAR, network capture, etc.)
- *Data Computation & Interpretation*.
  - Computation (server localization, % of resources delivered protocol-wise, origin/non-origin domains, etc.)
- Automated graphical analysis and visualization
- Data storage



# Web metrics

- PLT (Page Load Time): Time between first request being sent and entire web page loaded,
- Resource Timing: Characteristics of the resources downloaded,
- ATF (Above The Fold) : Loading time of the visible portion of the web page ,
- Paint Timing API: Measure a web page loading progression through time,
- TFVR (Time for Full Visual Rendering): Loading time of each resource in the visible portion of the web page.



# Configurable monitoring parameters

- Browser: Chrome, Firefox, Safari, etc. (Graphical or Headless)
- Connection: First (Disabled cache), Repeat (activated cache)
- Protocol: HTTP/1.1, HTTP/2.0 or QUIC
- Network: ADSL, FIBER, Wifi or mobile
- With/without proxy
- Adaptable browser's window size
- Visible portion: End-user's web page visible surface at first glance
- Disk and RAM availabilities
- Ping time retrieved from network capture (here only main web page)
- Ad blockers: None, uBlockOrigin, AdBlock Plus, Ghostery
- Number of downloaded resources
- Protocol through which resources are downloaded
- First pixel on screen
- Visual loading time
- Time for full visual rendering
- Page load time

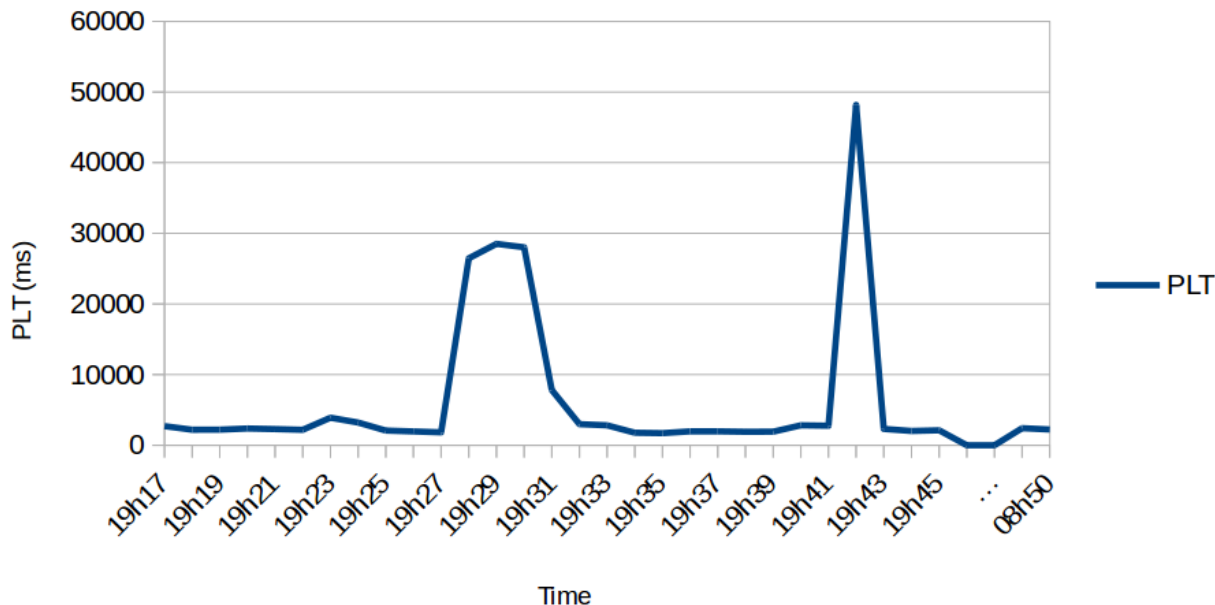
**All parameters are customizable**

# Monitoring results

20180126_115209.939066	BEGIN MEASUREMENTS	20180126_115220.631134	VLT: 770.6 ms
20180126_115220.630743	START UNIT TEST http://www.youtube.fr	20180126_115220.631154	TFVR: 1679.8 ms
20180126_115220.630778	Browser: chrome	20180126_115220.631175	PLT: 2715 ms
20180126_115220.630800	Connection asked: repeat	20180126_115220.631194	% Ress before 1st Paint: 27.027027027 %
20180126_115220.630817	Protocol asked: quic_enabled	20180126_115220.631214	% Ress before TVFR: 73.02554 %
20180126_115220.630837	NetIface: wired_adsl	20180126_115220.631235	Nb Domains: 6
20180126_115220.630858	Time Day: 11H	20180126_115220.631254	Nb Asia Domains: 0
20180126_115220.630878	Window size: 1200 x 800	20180126_115220.631273	Nb SA Domains: 0
20180126_115220.630901	Visible Portion: 47.0512820513 %	20180126_115220.631293	Nb NA Domains: 6
20180126_115220.630922	FreeDisk: 91.1 %	20180126_115220.631312	Nb Africa Domains: 0
20180126_115220.630943	FreeRAM: 81.65 %	20180126_115220.631332	Nb EU Domains: 0
20180126_115220.630962	Ping wwMain: 57.5 ms	20180126_115220.631351	Nb Antart Domains: 0
20180126_115220.630980	AddBlock use: YES	20180126_115220.631370	Nb Aust Domains: 0
20180126_115220.630998	MainWWW size: 520671	20180126_115220.631389	Nb Secured Domains: 6
20180126_115220.631015	Nb Resources: 37	20180126_115220.631409	Nb Unsecured Domains: 0
20180126_115220.631035	h1 share: 0.0 %	20180126_115220.631428	SpeedIndex: 2837.49747728
20180126_115220.631055	h2 share: 54.0540540541 %	20180126_115220.631449	END UNIT TEST
20180126_115220.631074	hq share: 45.9459459459 %	20180126_115220.703620	END MEASUREMENTS
20180126_115220.631094	Push share: 0.0 %		
20180126_115220.631114	1st Paint: 909.2 ms		

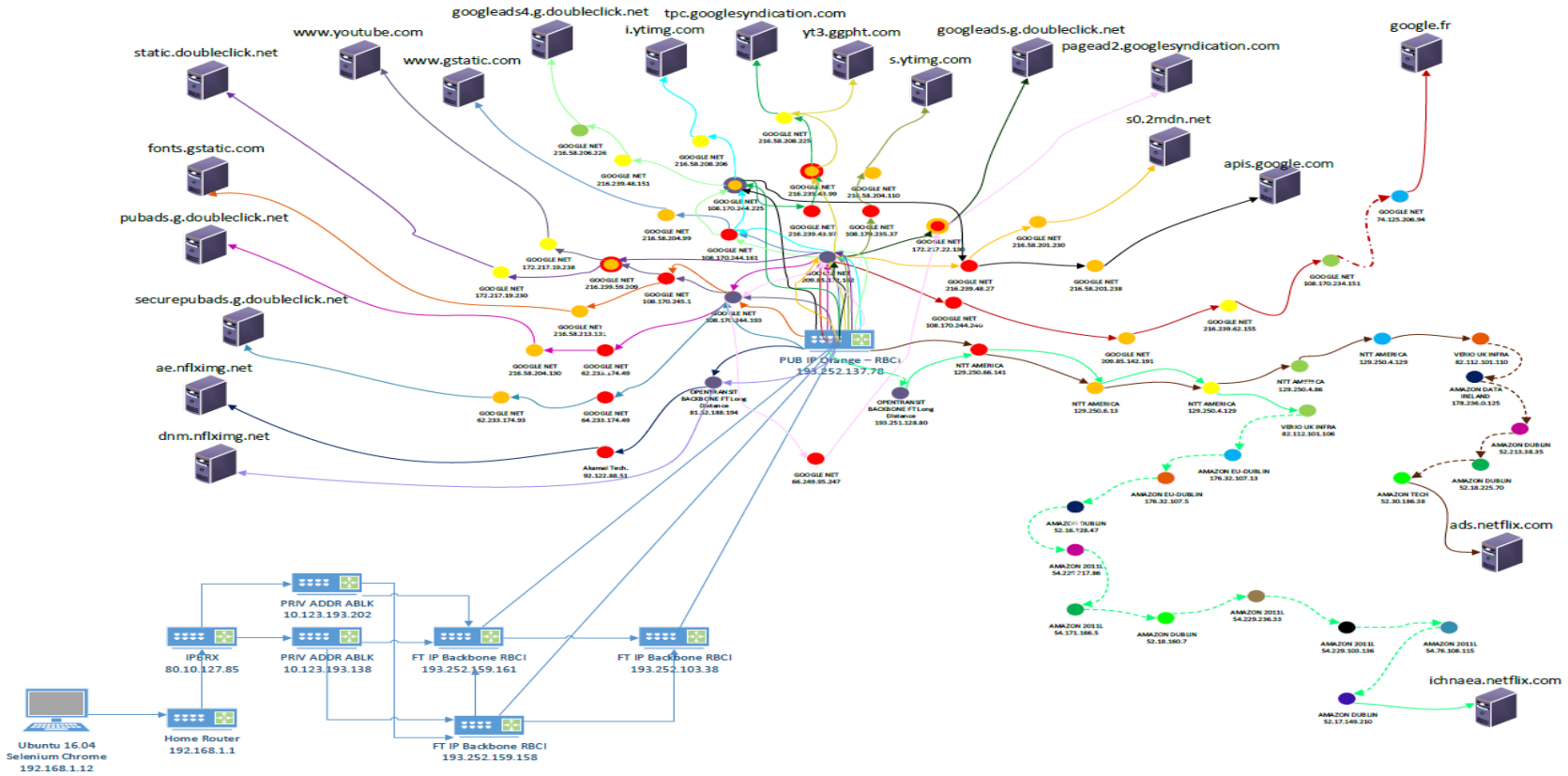
# Troubleshooting

- Example of bottleneck identification



```
"domains":{  
  "www.youtube.com":{"transferSize":1191871,"contentSize":0,"headerSize":14164,"requests":23,"timings":{"blocked":0,"dns":1,"connect":1294,"send":0,"wait":2165,"receive":3932}},  
  "easylist-downloads.adblockplus.org":{"transferSize":520646,"contentSize":0,"headerSize":294,"requests":1,"timings":{"blocked":0,"dns":29,"connect":510,"send":0,"wait":103,"receive":1054}},  
  "googleads.g.doubleclick.net":{"transferSize":120,"contentSize":0,"headerSize":1028,"requests":1,"timings":{"blocked":0,"dns":31,"connect":487,"send":0,"wait":42,"receive":0}},  
  "yt3.ggpht.com":{"transferSize":14658,"contentSize":0,"headerSize":3093,"requests":5,"timings":{"blocked":0,"dns":50,"connect":849,"send":0,"wait":451,"receive":7}},  
  "i.ytimg.com":{"transferSize":337343,"contentSize":0,"headerSize":17676,"requests":38,"timings":{"blocked":0,"dns":133,"connect":15249,"send":3,"wait":2983,"receive":778}}
```

# Networking complexity of web browsing





# Proposal for integration

- Integrate the tool to RIPE anchors as VMs (pilot phase as of now)
- Tool adaptable to corresponding parameters for web browsing measurement campaigns
- Obtain finer details regarding IP Maps (not only main web page)

# Conclusion

- Provide a free tool to the RIPE community to perform measurements on an application layer
- Perform measurement campaigns on a worldwide scale
- Identify the download-link of the requests from content servers
- Offer measurements' capabilities of RIPE NCC for troubleshooting

# Thank you

Contact:

{antoine.saverimoutou, bertrand2.mathieu}@orange.com

# Internet protocols through time

