



Innovations in Clouds,  
Internet and Networks

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MARCH 1 - 3, 2016

# TURN Servers Impacts Over WebRTC QoE in 4G Network

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- I. Context
- II. WebRTC
- III. Mouth-to-Ear delay
- IV. Experiment and results
- V. Conclusion & further works

## Changes to communication services

### 2G/3G

- Mobile communications services provided by the network operators

### 4G LTE

- Communications still provided by network operators (VoLTE)
- OTT (Skype, Hangouts, Facebook...)

## Two main actors in the ecosystem

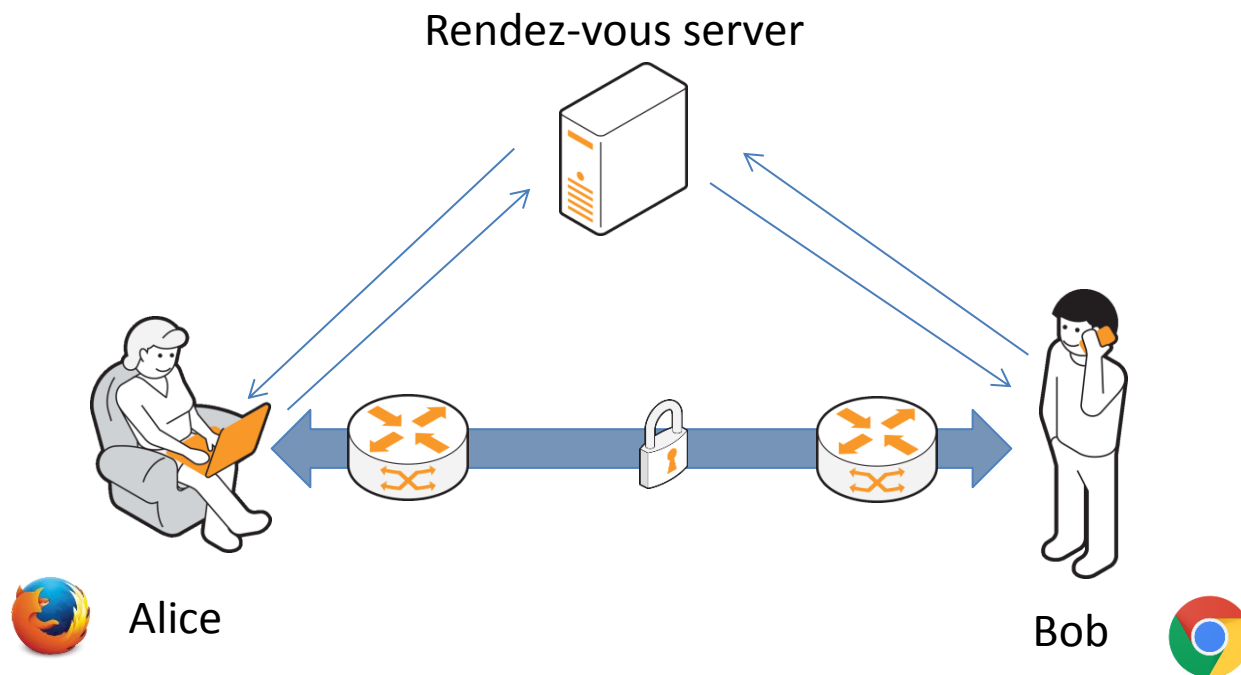


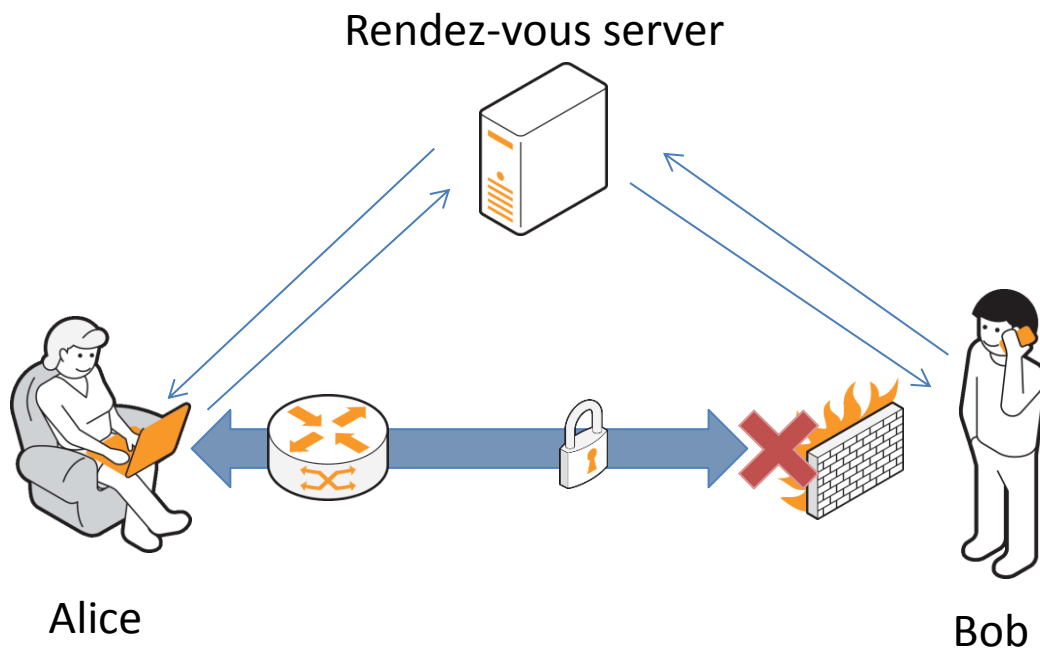


# WebRTC

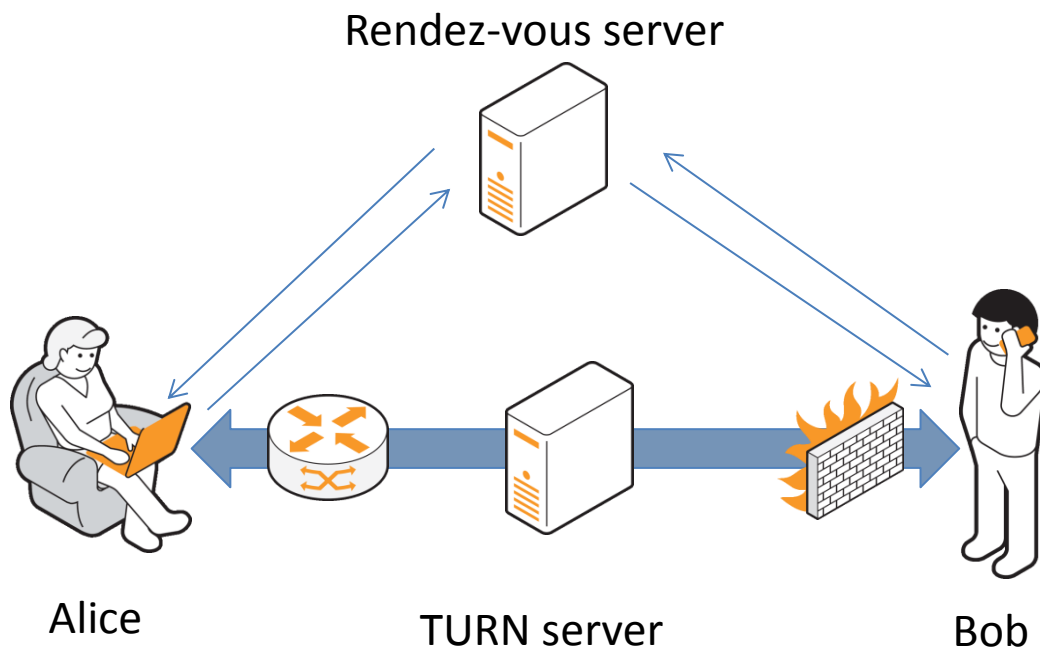
## Web Real Time Communications

- Browser to browser (P2P)
- JavaScript API
- Encrypted (DTLS & SRTP)





- Firewall
- Symmetric NAT
- Routing issues



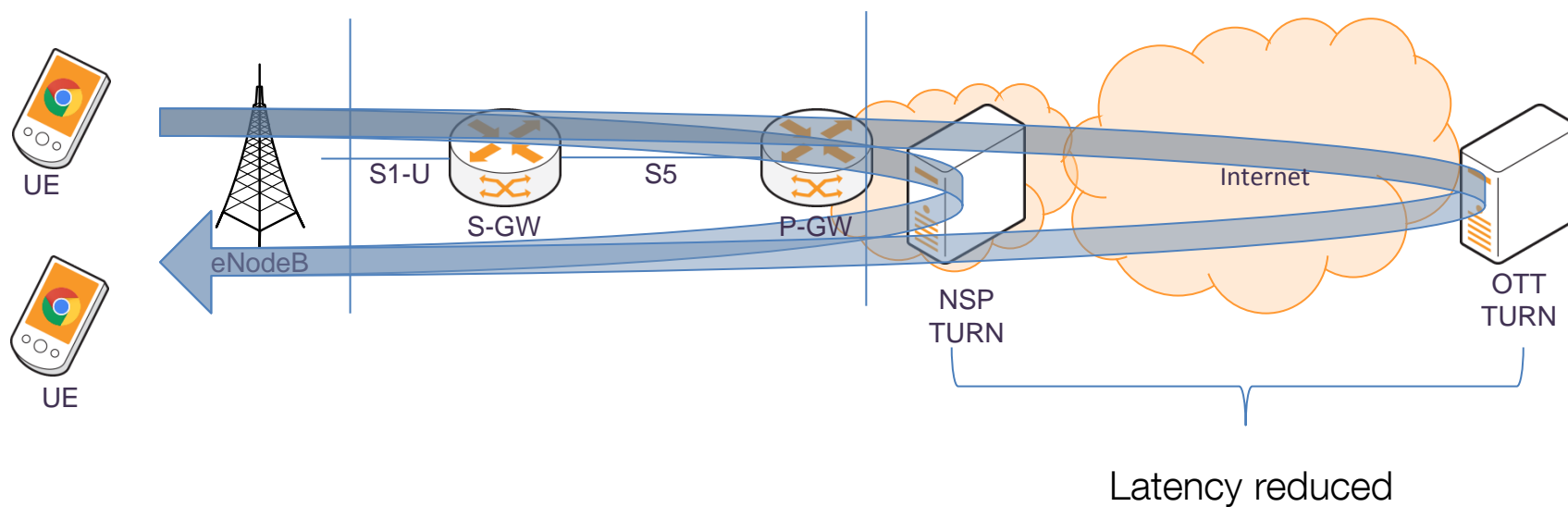




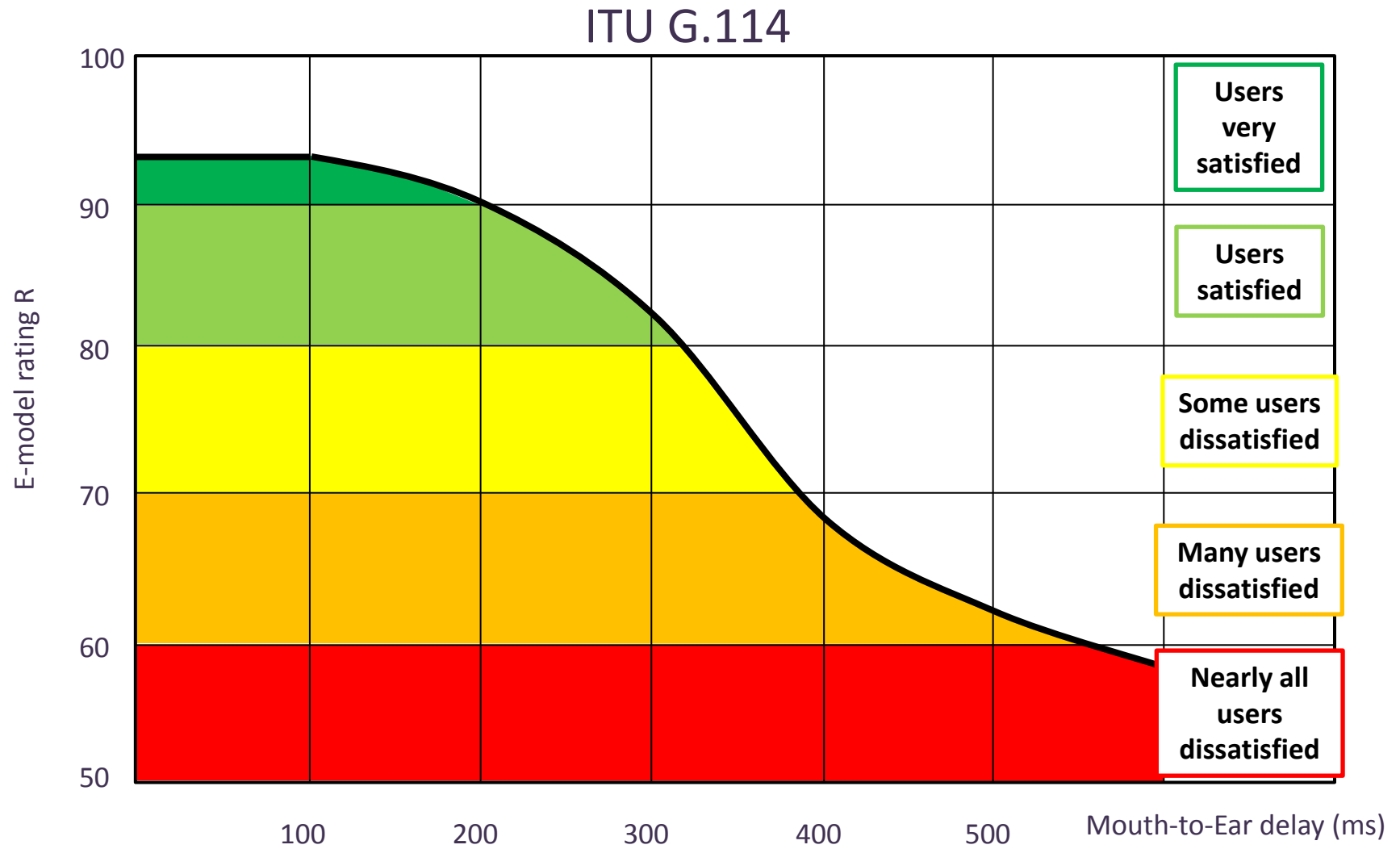
## TURN server

- Software designed (Open sources solutions: COTurn, RFC5766-Turn-server...)
- could be hosted in Clouds

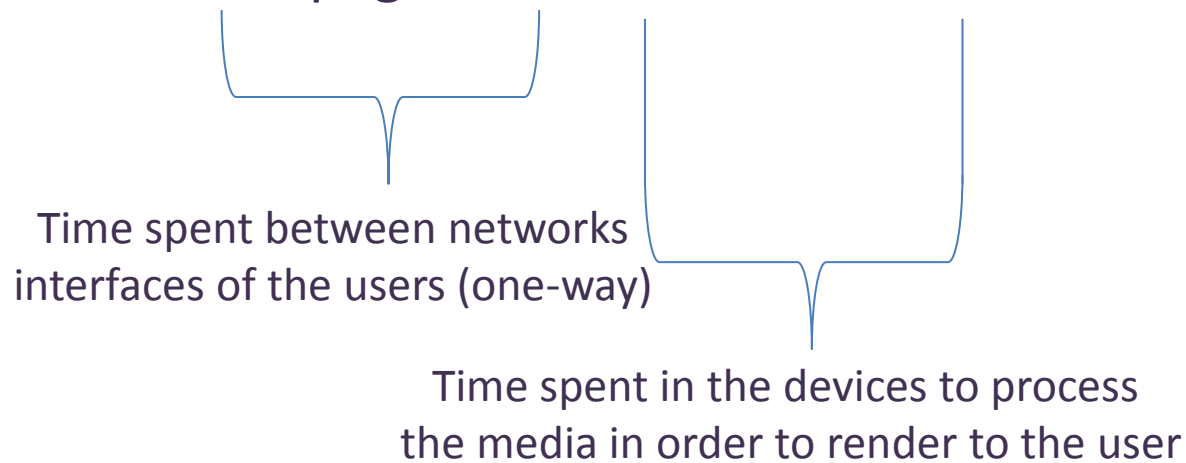
## WebRTC in 4G network



*NSP: Network Service Provider*



$$\text{MTE} = \text{Propagation} + \text{Buffers} + \text{Render}$$



Time spent between networks  
interfaces of the users (one-way)

Time spent in the devices to process  
the media in order to render to the user

## GetStats Function

Jitter  
(Buffer)

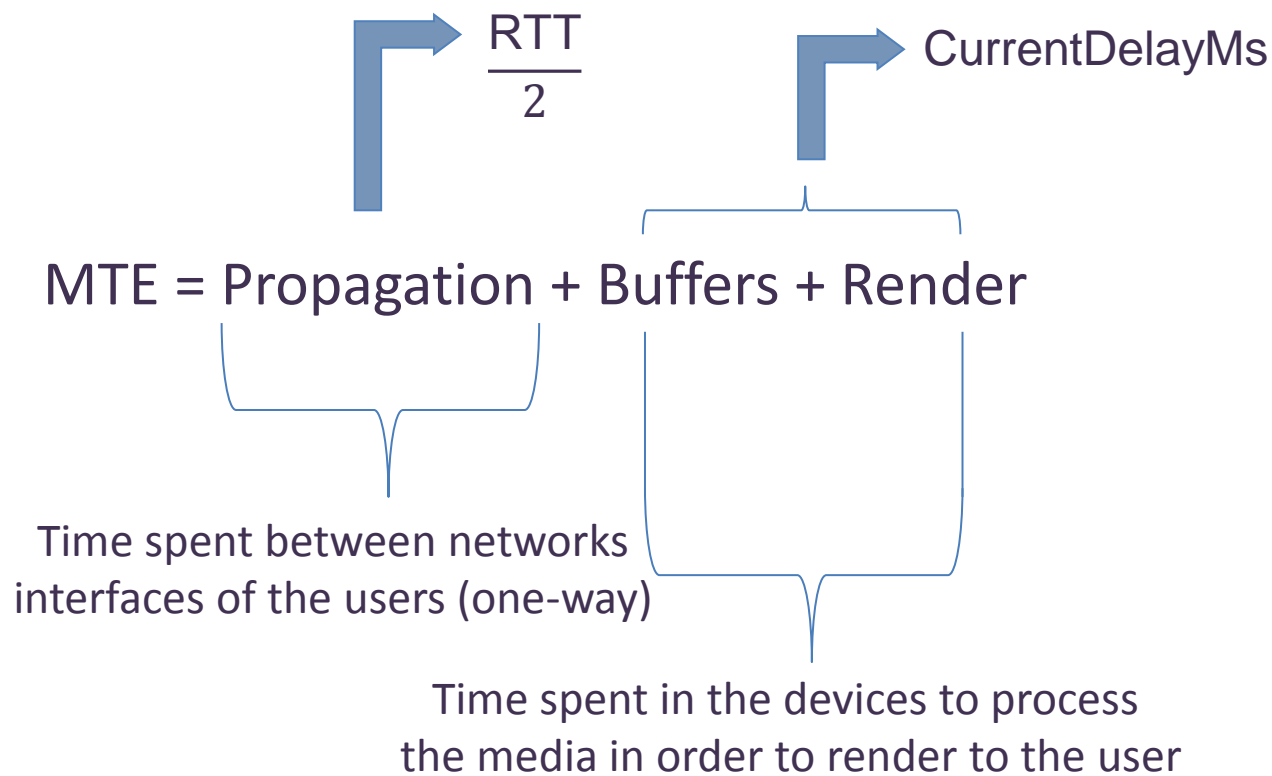
Latency

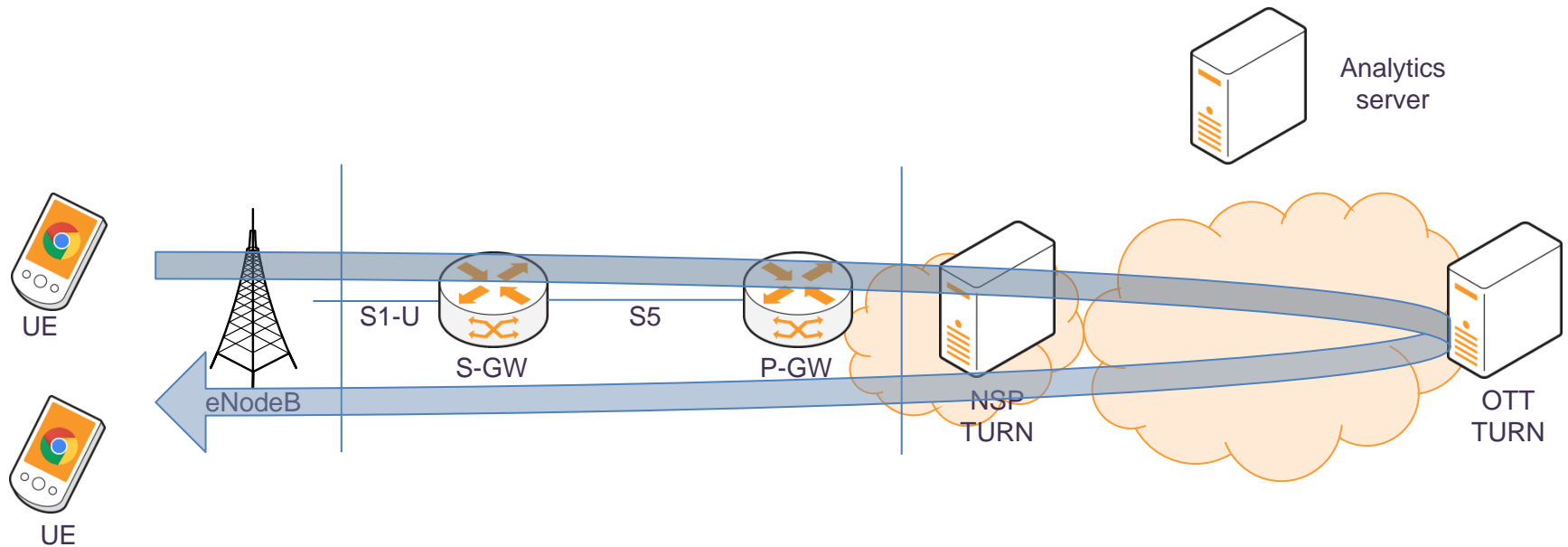
Packet Loss

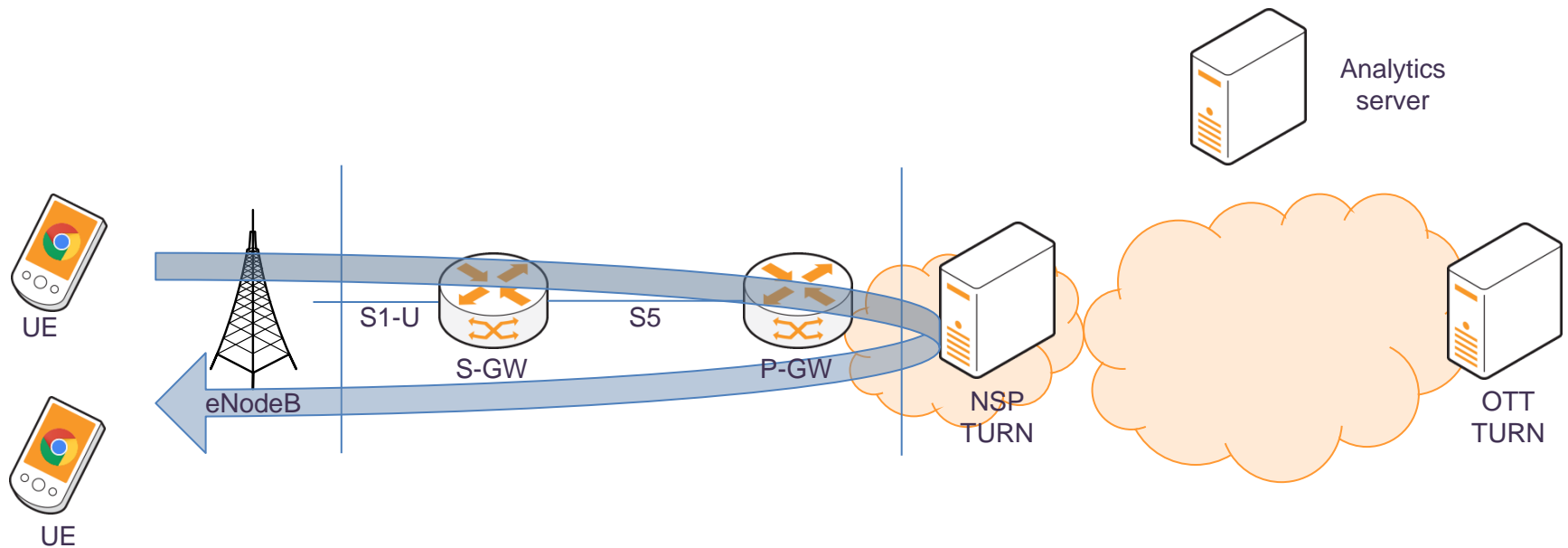
Bandwidth

IP address,  
port  
(ICE  
Candidates)

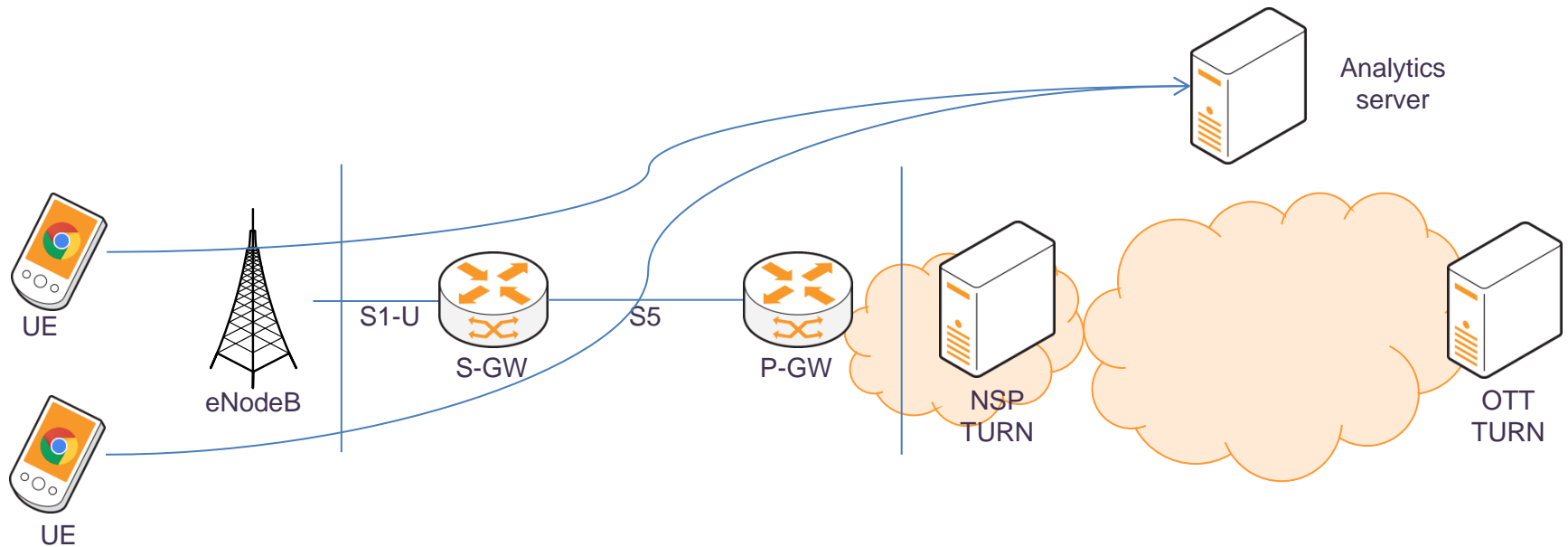
...











Boxplot

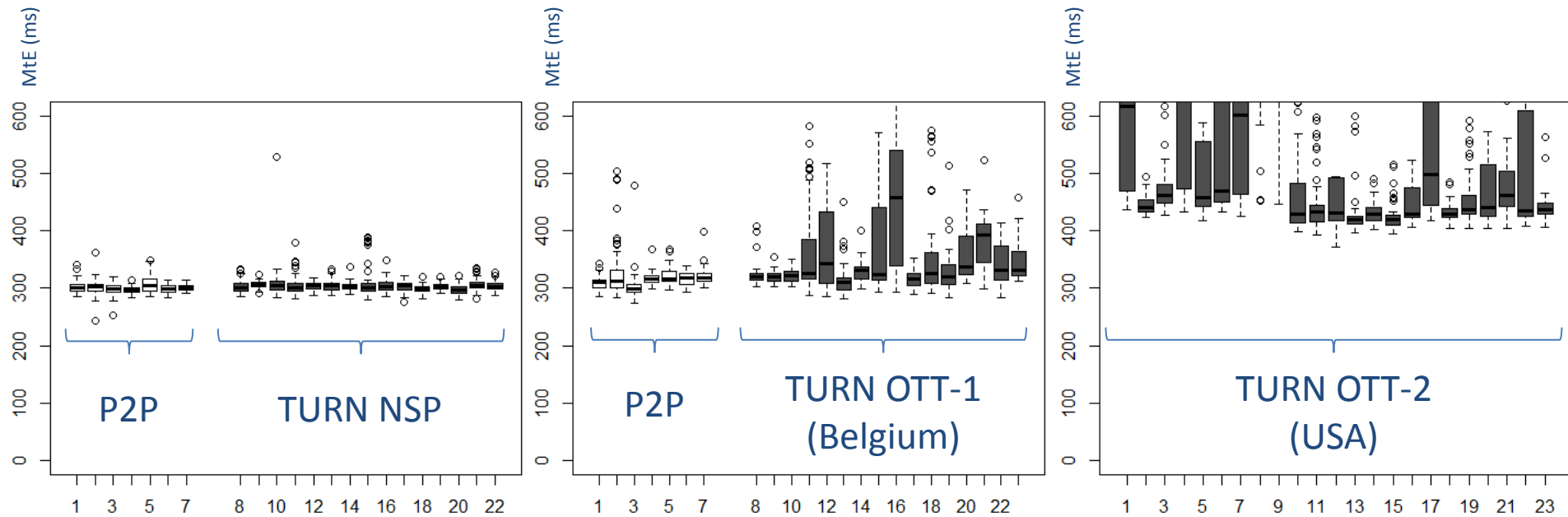


A: Median

B(Q1) – C(Q3) box: 25% -- 75% points

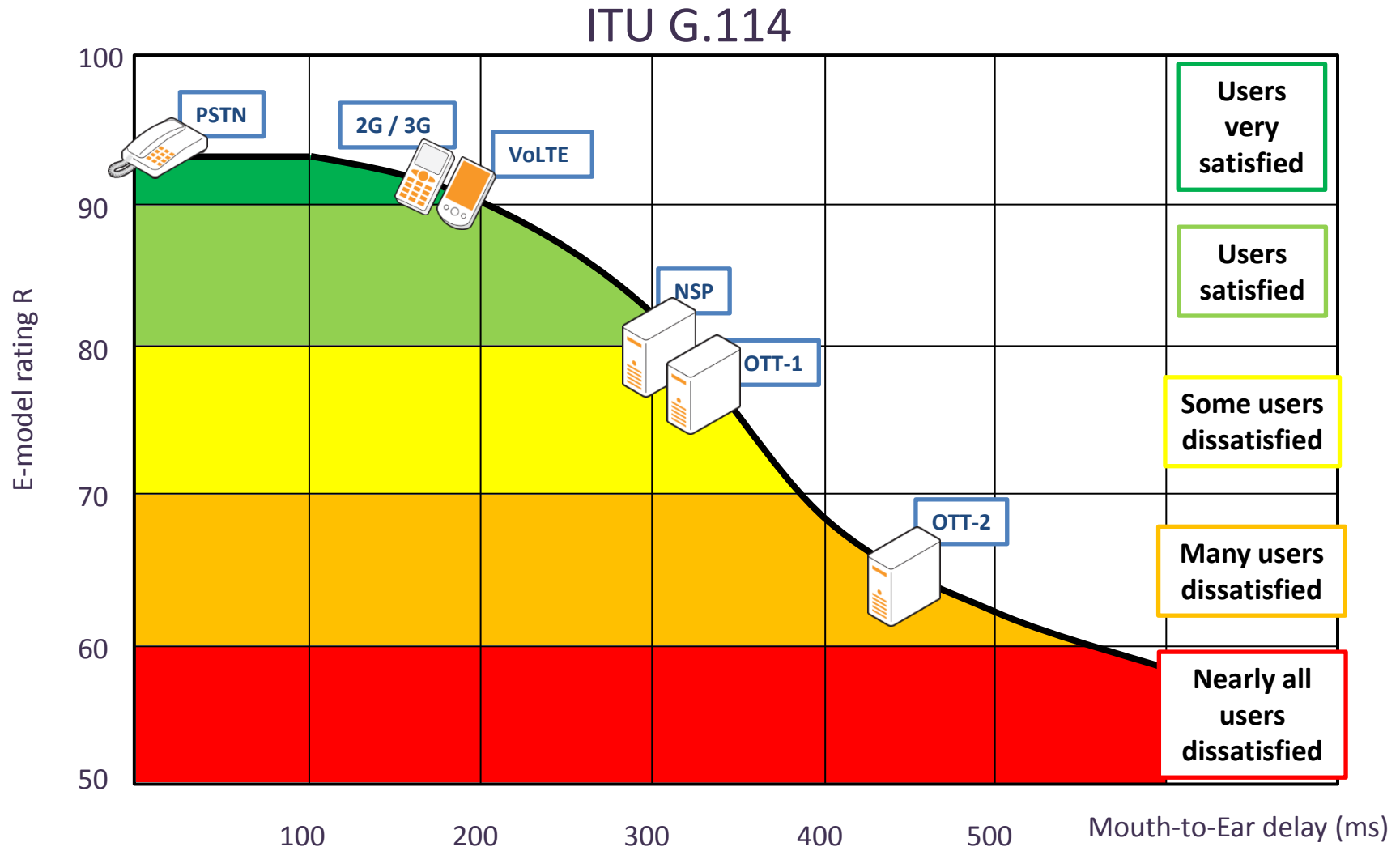
D-E (whiskers): Relevant values

F: outliers



X-axis: Call ID

Y-axis: Mouth-to-Ear delay (ms)



## Conclusion

- Using TURN server close to the original path of media, calls perform as well as P2P
- Continental TURN servers perform half the time as well as P2P
- TURN server far from the client does not perform as well
- Regarding the Mouth-To-Ear delay, WebRTC does not perform as well as VoLTE, 2G/3G switched circuit

## Further works

- Generalize the results: More calls, more devices, different browsers...
- Studying specialized network services



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## Thank you!

