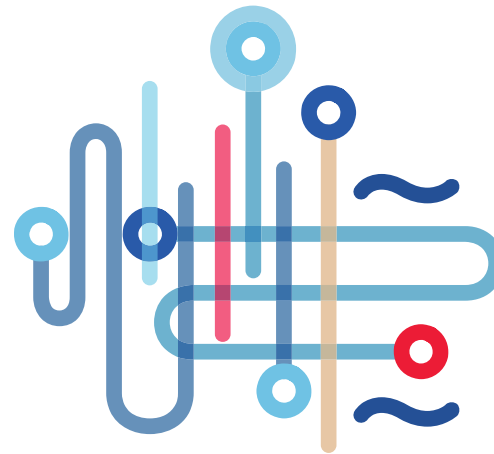




# RATEL internet measurements

Vesna Krzman





## **RATEL - Regulatory Agency for Electronic Communications and Postal Services**

---

- effectively implements the established electronic communications policy
- promotes competition in the sphere of electronic communications networks and services
- enhances capacity and/or quality,
- contributes to the development of electronic communications market and
- protects the interests of users of electronic communications and postal services.





## RATEL Internet measurements tools

---



<https://www.nettest.ratel.rs/en/map>



<http://benchmark.ratel.rs/en>



# RATEL NetTest

## Measuring the quality of Internet connection

<http://nettest.ratel.rs>

---



- Google Play & App Store and web browser
- QoS measurements in the context of net neutrality
- Loop mode measurements
- GDPR: Data anonymization when displaying measurement results
- Results in the open data format (csv, xml, json)

[https://data.gov.rs/sr/datasets/izmerene-brzine-interneta /](https://data.gov.rs/sr/datasets/izmerene-brzine-interneta/)





## RATEL NetTest tool



RATEL NetTest measures the connections from end user device to the measurement server in SOX (Serbian open eXchange).

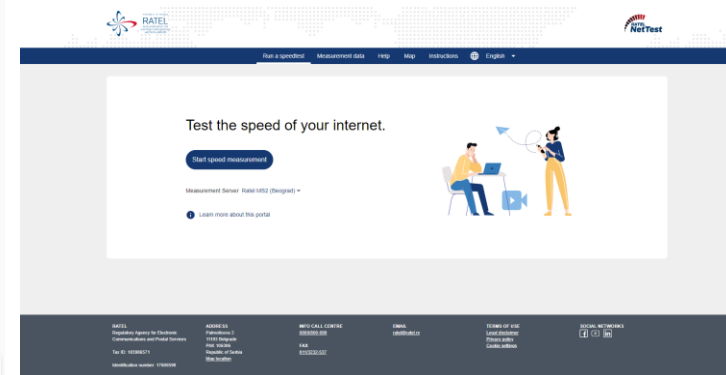
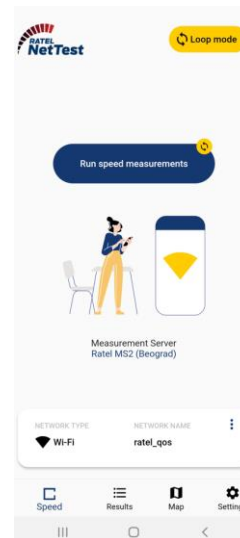
Ratel NetTest allows users to measure the speed and quality of their broadband internet connection and collects related information:

- download speed (from the measurement server to the user), DL
- upload speed (from the user to the measurement server), UL
- ping (latency),
- packet loss,
- transparency and quality of the connection and,
- signal strength (depending on the device and OS).



# RATEL NetTest

- Publicly available website
- Available for desktop, laptop and mobile devices
- Available in Serbian and English
- Results presented on the map



<https://www.nettest.ratel.rs/en>



## RATEL NetTest: Results

---

### Mobile application results



up to 60Mbps



up to 20Mbps

### WEB browser results



up to 80Mbps

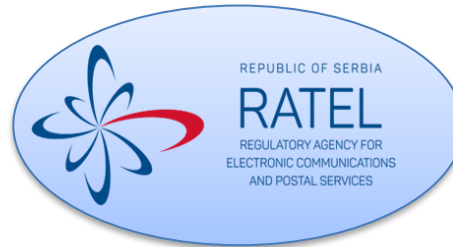
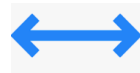


up to 40Mbps



## RATEL Benchmark of mobile networks

- RATEL carries out extensive benchmarking tests of the three mobile network operators: A1 Srbija, Telekom Srbija and Yettel.







## Benchmark scope

---

55 cities: Large, Medium & Small

All national roads of category one (IA and IB)

More than 15.000 km of drivetest route

More than 340 measurement hours

18 measurement phones

8.000 voice calls per network

8000 per each data service test





## Measurement scenario

---

SCENARIO



Measurement of:

- radio parameters for 2G/3G/4G technologies
- KPIs for voice and data services

Measurement server located at SOX with 1 Gbps connectivity to the internet

VOICE



Mobile-to-mobile, auto mode (4G/3G/2G)

MOC: MTC = 1:1

multiRAB

DATA



Auto mode (4G/3G/2G)

File DL, File UL, Capacity tests (DL/UL)

Web Browsing, YouTube, Ping



## Measurement data tests setup

---

Data tests were performed using smartphones and a dedicated measurement server located at the Serbian Open eXchange (SoX) in Belgrade, which ensured a fair transmission path to all three mobile networks.

### DATA



HTTP Download = throughput of a 10 MB file transmission over HTTP protocol from the measurement server to the smartphone

HTTP Upload = throughput of a 5 MB file transmission over HTTP protocol from the smartphone to the measurement server

Capacity Download = throughput of a 400MB file transmission over HTTP protocol from the measurement server to the smartphone in 10s

Capacity Upload = throughput of a 400MB file transmission over HTTP protocol from the smartphone to the measurement server in 10s

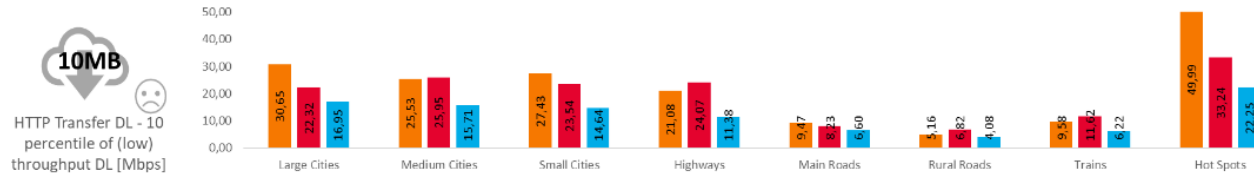
HTTP Browsing = Kepler + 4 Live pages

YouTube = Livestream HD

Ping = 40B and 800B



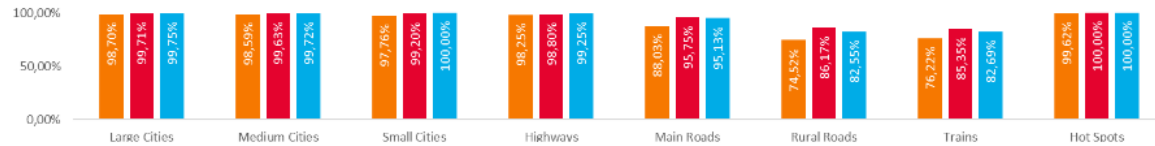
# KPIs for data tests: DL



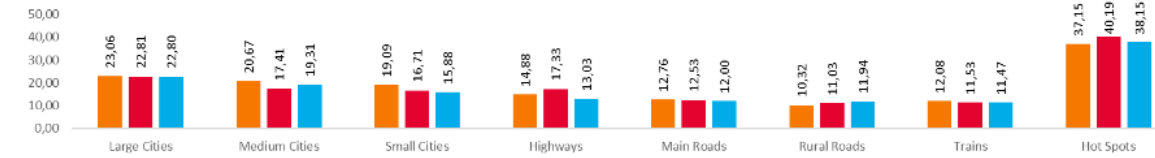


# KPIs for data tests: UL

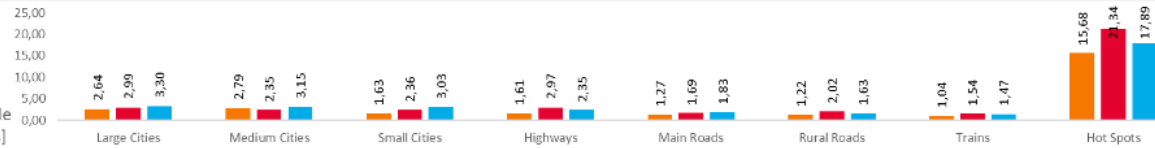
**5MB**  
Small file UL  
Session success rate [%]



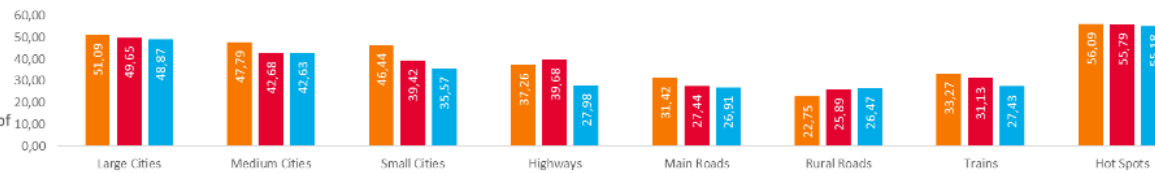
**5MB**  
HTTP Transfer UL -  
Average throughput  
[Mbps]



**5MB**  
HTTP Transfer UL - 10 percentile  
of (low) throughput UL [Mbps]



**5MB**  
HTTP Transfer UL - 90 percentile of  
(high) throughput UL [Mbps]





# Thank you

Vesna Krzman

[vesna.krzman@ratel.rs](mailto:vesna.krzman@ratel.rs)

+381-64-877-6016

