

**MOST
RELIABLE
NETWORK**

NET CHECK
2023

SERBIA'S MOST RELIABLE NETWORK

BENCHMARK MEASUREMENT OF
MOBILE NETWORKS IN SERBIA

MAY - JULY 2023

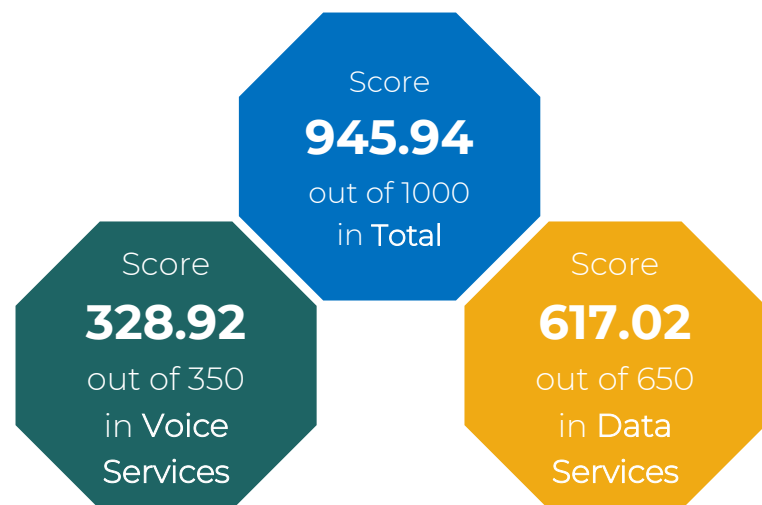
NET CHECK

SERBIA'S MOST RELIABLE NETWORK

Mobile network reliability refers to the consistent and dependable performance of mobile networks and is a critical factor in ensuring seamless and uninterrupted communication and data services for mobile users.

The reliability aspect primarily focuses on the fundamental KPIs in Voice and Data tests. The ranking results indicate the consistency with which an operator delivers its network services.

With an overall score of 945.94 points, mts/Telekom Srbija scored highest, followed by A1 and Yettel.



Quality
assurance
for modern
communication
networks

BENCHMARKING METHODOLOGY

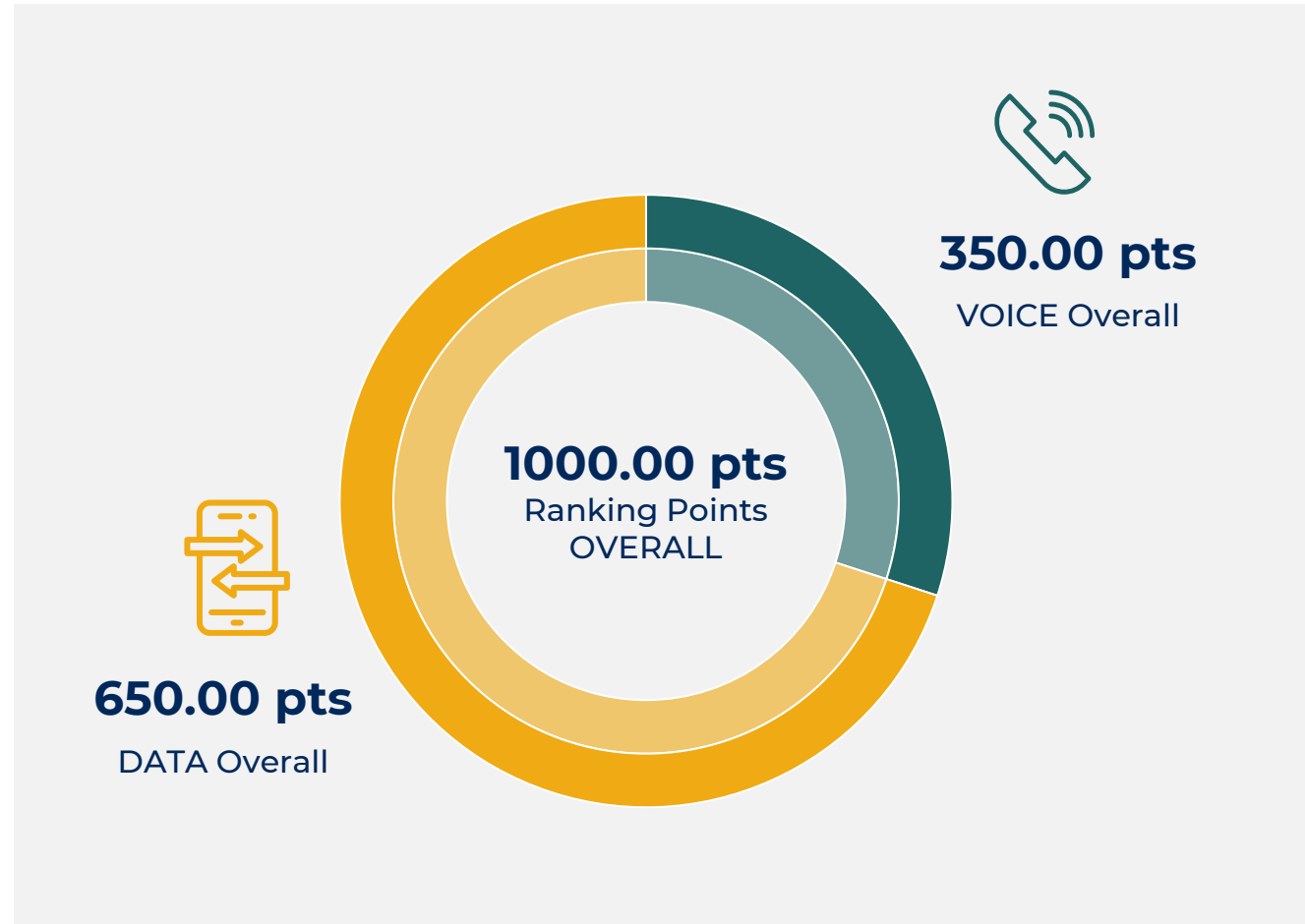
NET CHECK pairs engineering expertise with statistically rigorous methodologies to design network performance tests, collect data that represents consumer experience.

The main focus of NET CHECK ranking is an assessment of the end-user experience.

We evaluate service accessibility, retainability, network quality, and performance.

Performance is assessed with extensive drive tests in big cities, medium cities, small cities, and connecting roads.

The winner is found by weighting all data.



MEASUREMENT EQUIPMENT

For the drive tests, NET CHECK used SwissQual Benchmark II by Rohde & Schwarz. The measuring equipment was placed in the roof box of a passenger car, collecting data on the performance of voice and data services during the tests.

The phones were cooled down to avoid overheating due to sun and extensive use. The measuring equipment was placed in the roof box of a passenger car, collecting data on the performance of voice and data services during the tests. The phones were cooled down to avoid overheating due to sun and extensive use.

This approach allows performance measurement for all the operators simultaneously and on the same locations. For all tests, current models of Android mobile phones of Samsung were used.

NET CHECK

NET CHECK
attaches great
importance
to using high
quality and
state-of-the-art
measurement
technology
for all tests

DRIVE TEST ROUTE & MEASUREMENT SETUP

MEASUREMENT PERIOD: 31 MAY 2023 – 03 JULY 2023



4 big cities
8 medium cities
27 small cities
DRIVE TESTS

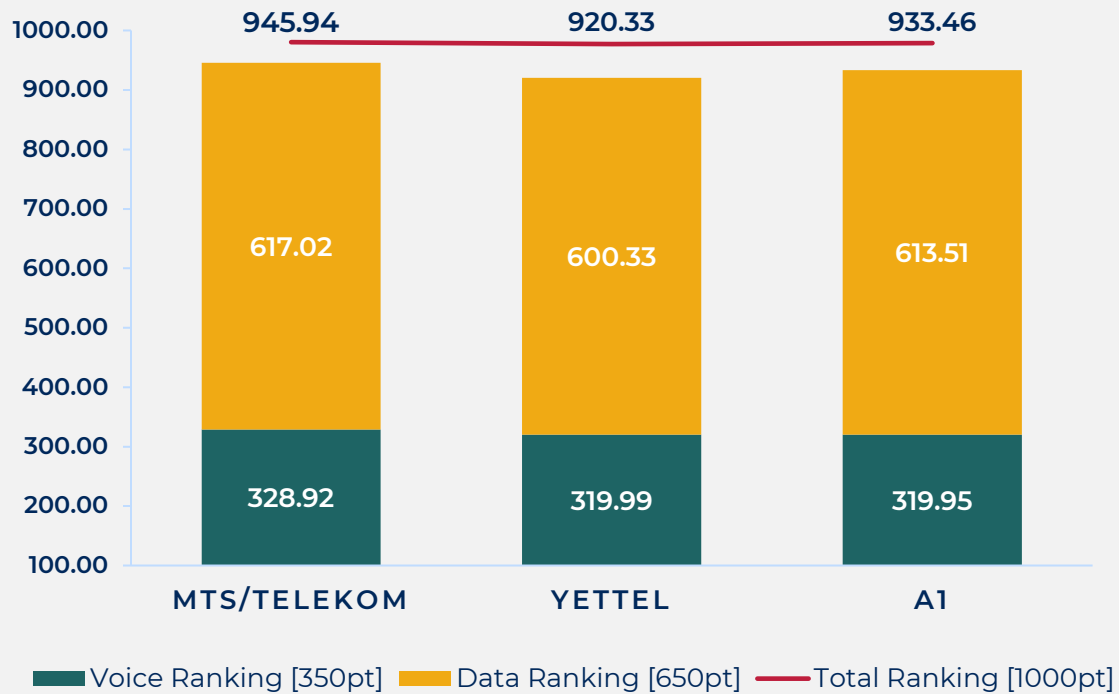
119 hours
CITY DRIVE TESTS

65 hours
CONNECTING ROADS

| | VOICE SERVICES | DATA SERVICES |
|-----------------------|--|--|
| DEVICE | Samsung S23+ | Samsung S23+ |
| MEASUREMENT EQUIPMENT | SwissQual Benchmark II (Rohde & Schwarz) | SwissQual Benchmark II (Rohde & Schwarz) |
| MEASUREMENT OBJECTIVE | Cities and Connecting Roads | Cities and Connecting Roads |
| SAMPLE COUNT | ~ 4,300 per operator | ~ 54,000 per operator |
| TEST CASE SCENARIO | <p>Max Call Setup Time: 30 (s) Call duration: 120 (s) Call window: 160 (s) Call mode: VoLTE preferred Speech quality: POLQA W</p> <p>Scenario: 4 x VoLTE preferred (2 x Classic Call + 2 x MultiRAB) + 1 x WhatsApp call</p> | <p>YouTube 4K (livestream) Web Browsing, static and dynamic (Kepler as static, and dynamic based on Alexa ranking) Download and Upload tests:</p> <ul style="list-style-type: none"> • HTTP time based: FDTT DL 10 (s)/ UL UDP FDTT 10 (s) • HTTP file based: FDFS DL/ UL (10MB/5MB) <p>Online gaming and online meeting simulations</p> |

OVERALL RESULTS

mts/Telekom Srbija is the first ranked.
A1 is in the 2nd place, and
Yettel takes the third position.



OVERALL RESULTS

945.94 pt

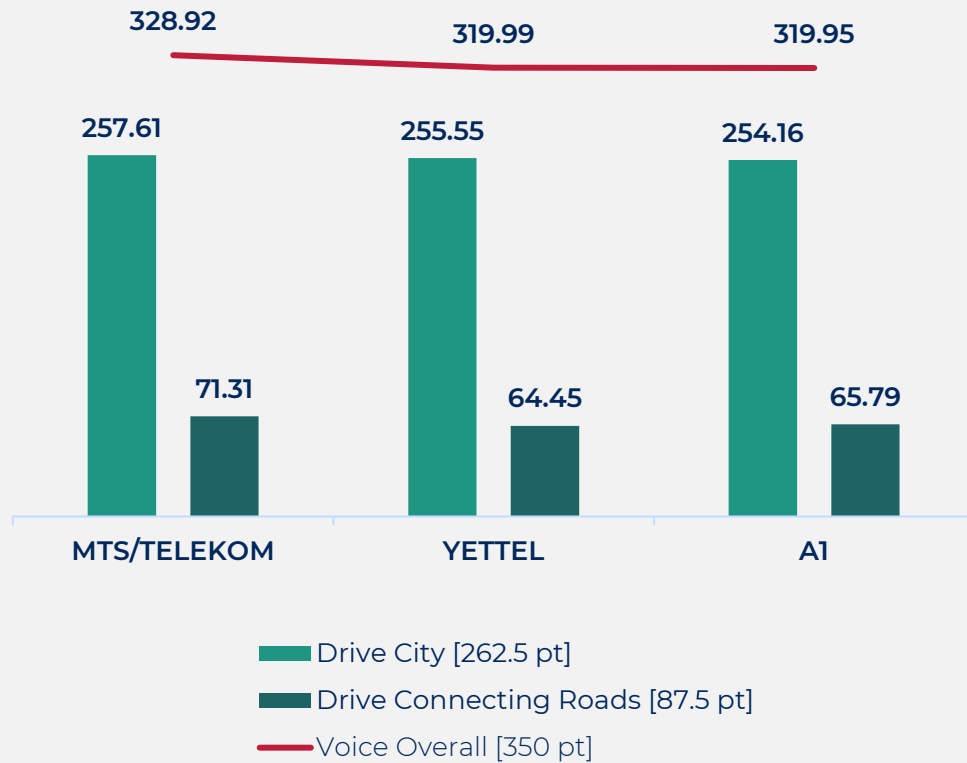
#1: mts/Telekom Srbija



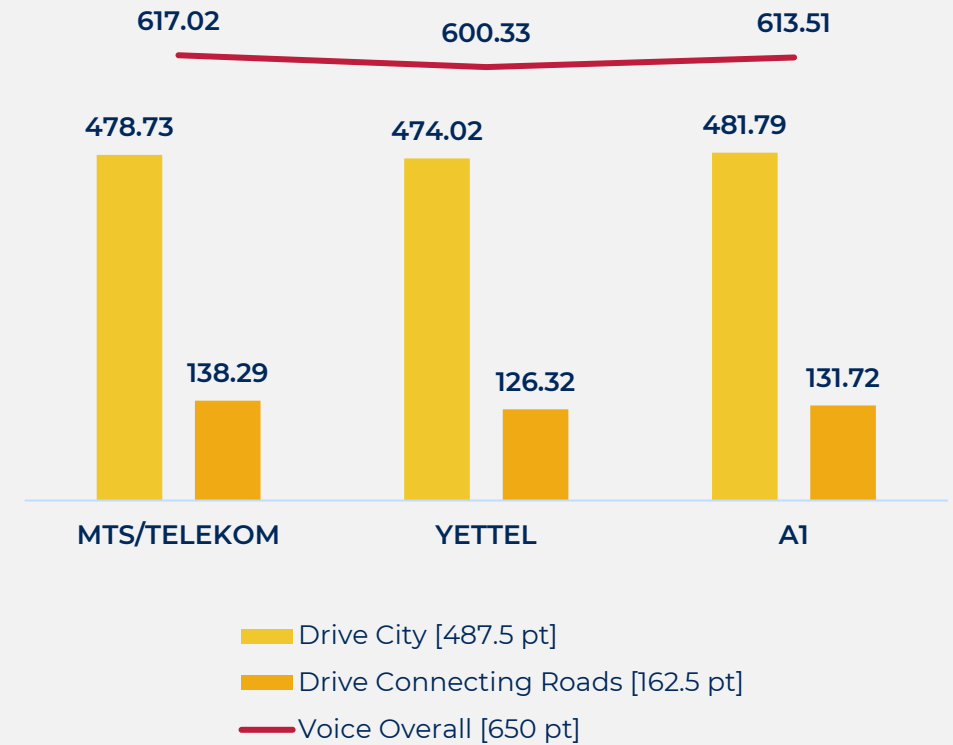
Telekom Srbija

VOICE & DATA RESULTS

mts/Telekom Srbija ranks first in the overall **voice** evaluation.



mts/Telekom Srbija and A1 with close score on **data** service.



DRIVE CITY & CONNECTING ROADS

VOICE RESULTS

| Ranking Identifiers | VOICE DRIVE - CITY | | | VOICE DRIVE - CONNECTING ROADS | | |
|--------------------------|--------------------|---------|---------|--------------------------------|--------|--------|
| | mts/Telekom | Yettel | A1 | mts/Telekom | Yettel | A1 |
| CLASSIC CALLS | | | | | | |
| Call Setup Success Ratio | 99.95% | 99.95% | 99.58% | 97.67% | 96.20% | 96.79% |
| Dropped Call Ratio | 0.00% | 0.14% | 0.05% | 0.97% | 2.15% | 1.97% |
| MOS <= 1.6 RATIO | 0.17% | 0.24% | 0.22% | 0.87% | 1.32% | 0.96% |
| WHATSAPP CALLS | | | | | | |
| Call Setup Success Ratio | 99.84% | 100.00% | 100.00% | 97.23% | 97.81% | 96.59% |
| Dropped Call Ratio | 0.16% | 0.16% | 0.00% | 0.63% | 0.96% | 0.96% |
| MOS <= 1.6 RATIO | 0.11% | 0.08% | 0.03% | 0.32% | 0.58% | 0.46% |

DRIVE CITY & CONNECTING ROADS

DATA RESULTS

| | DATA DRIVE - CITY | | | DATA DRIVE - CONNECTING ROADS | | |
|--|-------------------|----------------|----------------|-------------------------------|---------------|----------------|
| Ranking Identifiers | mts/Telekom | Yettel | A1 | mts/Telekom | Yettel | A1 |
| CLASSIC CALLS | | | | | | |
| Call Setup Success Ratio | 99.95% | 99.95% | 99.58% | 97.67% | 96.20% | 96.79% |
| DOWNLOAD (File Size 10MB) | | | | | | |
| FDFS DL Success Ratio (%) | 99.86% | 99.76% | 99.62% | 98.23% | 96.93% | 96.20% |
| UPLOAD (File Size 5MB) | | | | | | |
| FDFS UL Success Ratio (%) | 99.92% | 99.88% | 99.73% | 97.86% | 95.18% | 95.53% |
| DOWNLOAD (Test Duration 10 seconds) | | | | | | |
| FDTT DL 10 PCTL Data Rate [Mbit/s] | 30.80 [Mbit/s] | 23.79 [Mbit/s] | 62.14 [Mbit/s] | 19.67 [Mbit/s] | 7.21 [Mbit/s] | 42.41 [Mbit/s] |
| UPLOAD (Test Duration 10 seconds) | | | | | | |
| FDTT UL 10 PCTL Data Rate [Mbit/s] | 23.25 [Mbit/s] | 29.96 [Mbit/s] | 23.09 [Mbit/s] | 7.87 [Mbit/s] | 5.65 [Mbit/s] | 5.37 [Mbit/s] |
| BROWSING (Web Browsing) | | | | | | |
| HTTP Browsing Success Ratio | 99.79% | 99.80% | 99.88% | 98.34% | 96.58% | 96.47% |
| VIDEO STREAM (YouTube Live Stream 4k) | | | | | | |
| Video Stream Success Ratio [%] | 99.96% | 99.88% | 100.00% | 98.76% | 96.57% | 97.14% |



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