BEST MOBILE NETWORK

NET CHECK 2024

SERBIA'S BEST MOBILE NETWORK

BENCHMARK MEASUREMENT OF MOBILE NETWORKS IN SERBIA

APRIL - MAY 2024
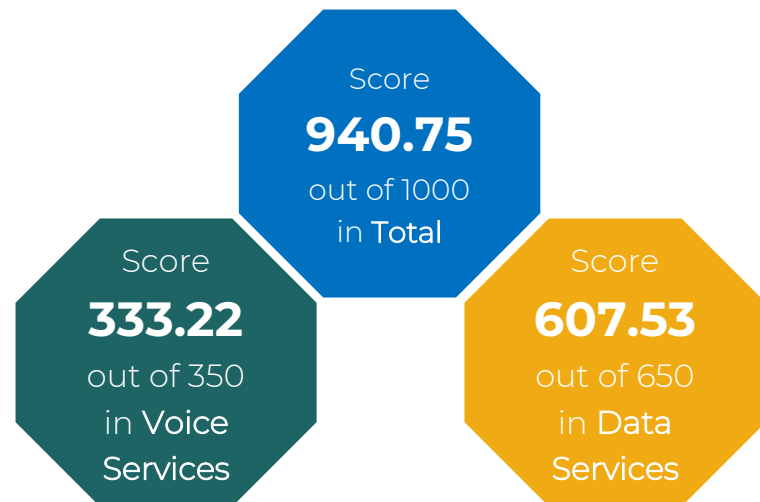
NET CHECK

# SERBIA'S BEST
# MOBILE NETWORK

Mobile networks can be compared in terms of quality through a combined assessment of accessibility, reliability, and quality of typical telecommunication services.

The results of an extensive and complex testing procedure are translated into ranking points and the ranking result reflects the overall end-user experience.

With an overall score of 940.75 points, Telekom Srbija / mts achieved the highest score, followed by A1 and then Yettel.

Score
**940.75**
out of 1000
in Total

Score
**333.22**
out of 350
in Voice
Services

Score
**607.53**
out of 650
in Data
Services

**Quality assessment of modern communication networks**

# BENCHMARKING
## METHODOLOGY

NET CHECK pairs engineering expertise with statistically rigorous methodologies in order to collect data on mobile network performance.

The focus is on precise, unbiased and balanced comparison between different mobile networks.

Different levels of service are evaluated, ranging from basic functionality to full technology potentials.

The needed amount of data is obtained through extensive drive testing in numerous cities various in size and along roads connecting them.

The Benchmarking Methodology is updated once a year, staying on top of the industry trends.

**350.00 pts**
VOICE Overall

**1000.00 pts**
Ranking Points
OVERALL

**650.00 pts**
DATA Overall

# MEASUREMENT
## EQUIPMENT

*SwissQual Smart Benchmarker* produced by the market leader Rohde & Schwarz was used. The measuring equipment was placed in the roof box of a passenger car, executing predefined voice and data service testing sequences.

The mobile phones that are a part of the measuring system were cooled down to avoid overheating due to sun and extensive use.

For all tests current models of Samsung Android smartphones were used.

This approach allows for simultaneous performance measurement off all available mobile networks in the same locations.

## 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: 23rd of APRIL – 23rd of MAY 2024**
**(no measurements during public holidays)**
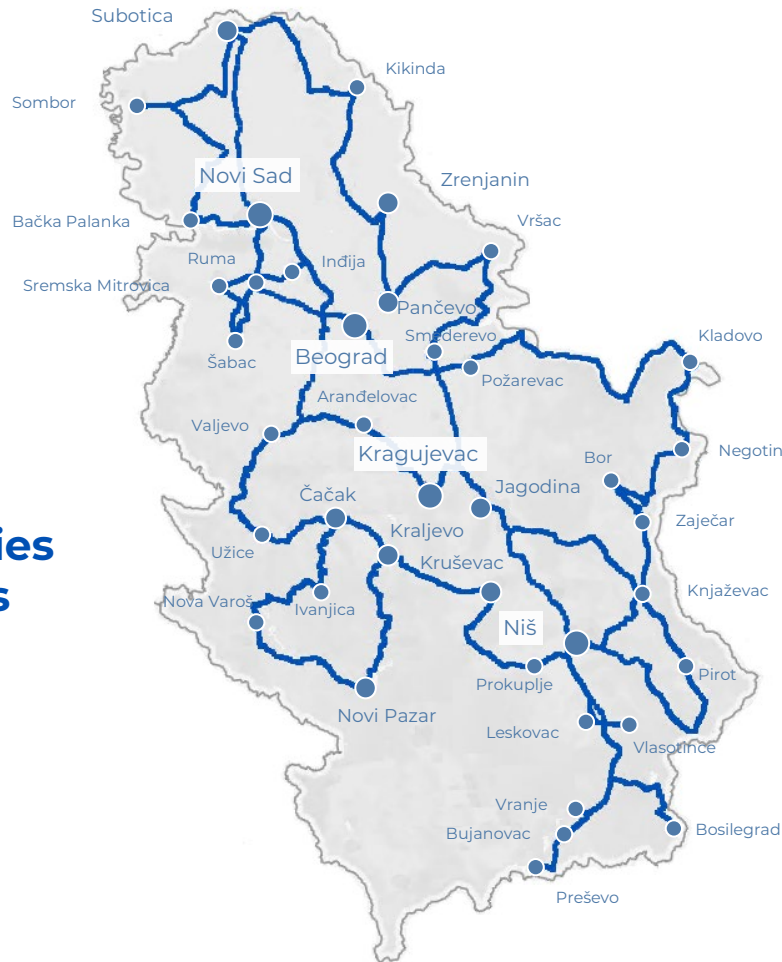


**4 big cities**
**8 medium cities**
**29 small cities**
**DRIVE TESTS**

**148 hours**
**CITY DRIVE TESTS**

**61 hours**
**CONNECTING ROADS**

| | VOICE SERVICES | DATA SERVICES |
|---|---|---|
| **DEVICE** | Samsung S23+ | Samsung S23+ |
| **MEASUREMENT EQUIPMENT** | SwissQual Smart Benchmarker (Rohde & Schwarz) | SwissQual Smart Benchmarker (Rohde & Schwarz) |
| **MEASUREMENT OBJECTIVE** | Cities and Connecting Roads | Cities and Connecting Roads |
| **SAMPLE COUNT** | ~ 4,500 per operator | ~ 48,000 per operator |
| **TEST CASE SCENARIO** | Max Call Setup Time: 30 (s)<br>Call duration: 120 (s)<br>Call window: 155 (s)<br>Call mode: VoLTE preferred<br><br>Scenario:<br>1 x WhatsApp Call +<br>4 x VoLTE preferred<br>(2 x Classic Call + 2 x MultiRAB) | YouTube (livestream HD), Web Browsing (Kepler as static, blic, halooglasi, tik tok, limundo, novosti, google, Instagram, and wikipedia as dynamic)<br>Download and Upload tests:<br>• HTTP time based (7s): FDTT DL / UDP FDTT UL<br>• HTTP file based: FDFS DL/ UL (10MB/5MB)<br>Interactivity tests |

# OVERALL
## RESULTS

**Telekom Srbija / mts** is the best ranked operator

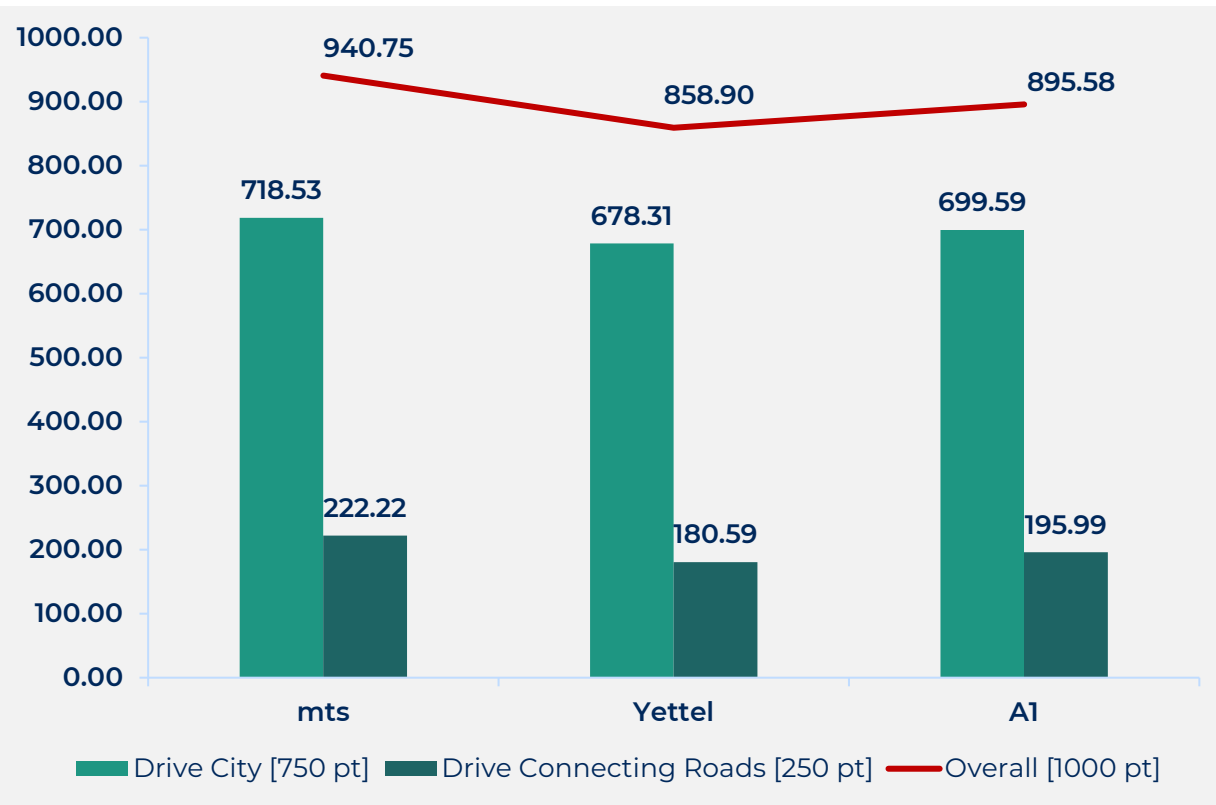**A1** took second place

**Yettel** ranked third
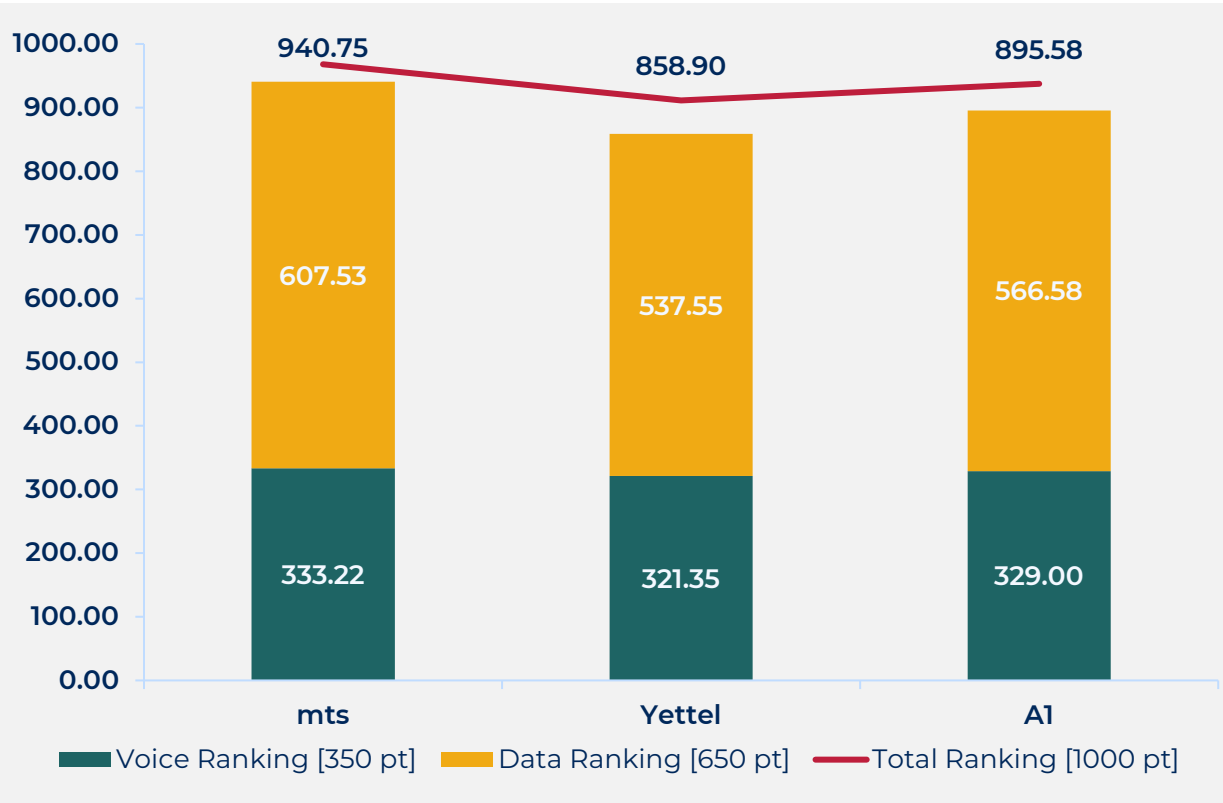


OVERALL RESULTS

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**940.75** pt

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#1: mts

mts
Telekom Srbija

**Chart — Voice Ranking, Data Ranking, Total Ranking:**

| Operator | Voice Ranking [350 pt] | Data Ranking [650 pt] | Total Ranking [1000 pt] |
|---|---|---|---|
| mts | 333.22 | 607.53 | 940.75 |
| Yettel | 321.35 | 537.55 | 858.90 |
| A1 | 329.00 | 566.58 | 895.58 |

# VOICE
## RESULTS
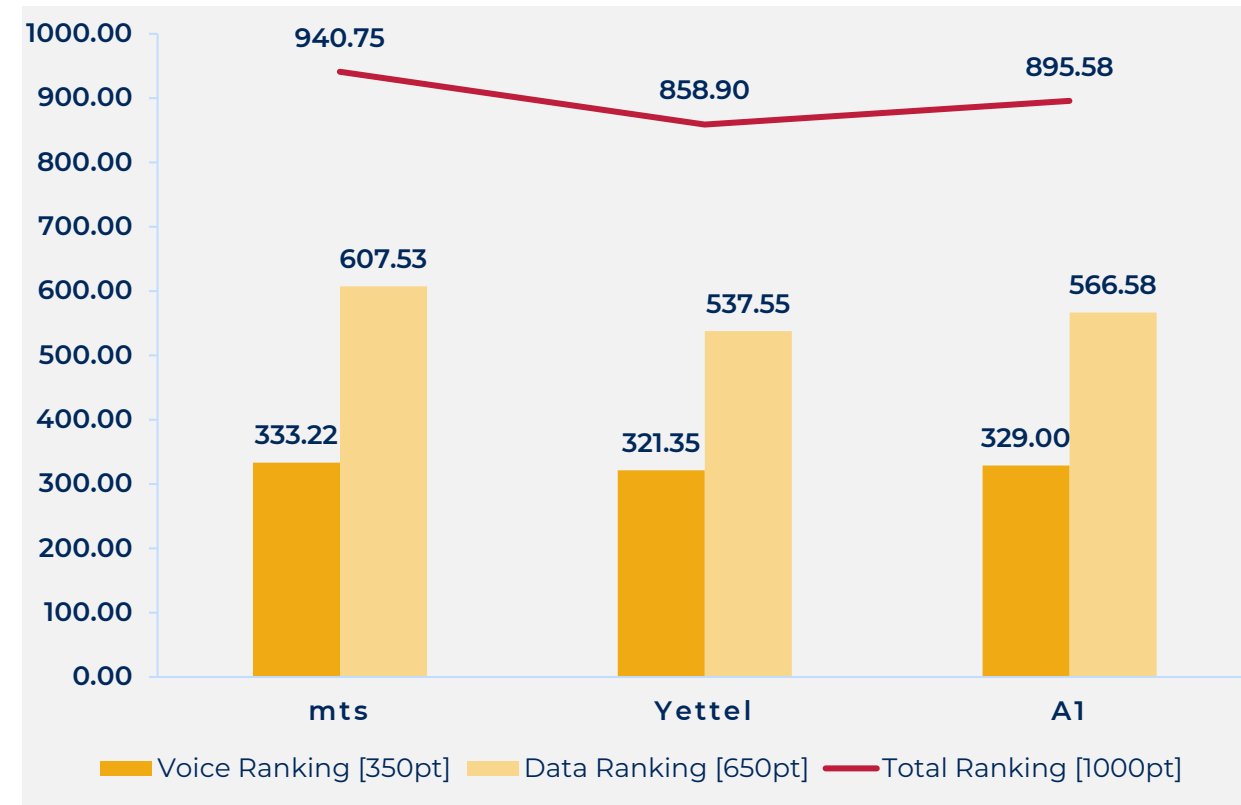
| Ranking Identifiers | VOICE DRIVE - CITY | | | VOICE DRIVE - CONNECTING ROADS | | |
|---|---|---|---|---|---|---|
| | mts | Yettel | A1 | mts | Yettel | A1 |
| **CLASSIC CALLS** | | | | | | |
| Call Setup Success Ratio | 99.92% | 99.84% | 99.96% | 99.59% | 96.08% | 95.89% |
| Dropped Call Ratio | 0.04% | 0.04% | 0.12% | 0.62% | 1.72% | 0.75% |
| AVG Call Setup Time | 3.14 [s] | 3.37 [s] | 3.10 [s] | 3.21 [s] | 3.66 [s] | 3.34 [s] |
| Call Setup Time > 15 s Ratio | 0.08% | 0.00% | 0.00% | 0.21% | 0.64% | 0.54% |
| MOS <= 1.6 RATIO | 0.38% | 0.35% | 0.13% | 1.29% | 1.32% | 0.86% |
| POLQA AVG MOS | 4.66 [MOS] | 4.61 [MOS] | 4.69 [MOS] | 4.58 [MOS] | 4.50 [MOS] | 4.61 [MOS] |
| Disturbed and Impaired Call Ratio | 0.04% | 0.00% | 0.04% | 0.42% | 0.98% | 0.32% |
| **WHATSAPP CALLS** | | | | | | |
| Call Setup Success Ratio | 100.00% | 100.00% | 99.86% | 98.51% | 95.56% | 95.54% |
| Dropped Call Ratio | 0.00% | 0.14% | 0.00% | 0.00% | 1.16% | 0.78% |
| MOS <= 1.6 RATIO | 0.11% | 0.14% | 0.05% | 0.79% | 0.62% | 0.46% |
| POLQA AVG MOS | 4.42 [MOS] | 4.39 [MOS] | 4.41 [MOS] | 4.37 [MOS] | 4.37 [MOS] | 4.38 [MOS] |
| Disturbed and Impaired Call Ratio | 0.00% | 0.00% | 0.14% | 0.38% | 1.57% | 0.39% |
| **MULTI RAB DATA** | | | | | | |
| Multi RAB Data Success Ratio | 100.00% | 100.00% | 100.00% | 98.03% | 96.42% | 96.22% |

# DATA
## RESULTS (1/2)

| Ranking Identifiers | DATA DRIVE - CITY | | | DATA DRIVE - CONNECTING ROADS | | |
|---|---|---|---|---|---|---|
| | mts | Yettel | A1 | mts | Yettel | A1 |
| **DOWNLOAD (File Size 10MB)** | | | | | | |
| FDFS DL Success Ratio (%) | 99.90% | 100.00% | 99.97% | 99.48% | 96.66% | 96.93% |
| **UPLOAD (File Size 5MB)** | | | | | | |
| FDFS UL Success Ratio (%) | 99.97% | 99.65% | 99.97% | 98.42% | 95.83% | 95.03% |
| **DOWNLOAD (Test Duration 7 seconds)** | | | | | | |
| FDTT DL 10 PCTL Data Rate [Mbit/s] | 47.51 [Mbit/s] | 21.69 [Mbit/s] | 40.44 [Mbit/s] | 38.06 [Mbit/s] | 8.21 [Mbit/s] | 36.81 [Mbit/s] |
| FDTT DL AVG Data Rate [Mbit/s] | 117.84 [Mbit/s] | 75.60 [Mbit/s] | 110.15 [Mbit/s] | 119.12 [Mbit/s] | 60.38 [Mbit/s] | 111.43 [Mbit/s] |
| FDTT DL 90 PCTL Data Rate [Mbit/s] | 197.32 [Mbit/s] | 144.80 [Mbit/s] | 192.82 [Mbit/s] | 208.92 [Mbit/s] | 135.48 [Mbit/s] | 192.50 [Mbit/s] |
| **UPLOAD (Test Duration 7 seconds)** | | | | | | |
| FDTT UL 10 PCTL Data Rate [Mbit/s] | 30.13 [Mbit/s] | 31.87 [Mbit/s] | 19.91 [Mbit/s] | 8.25 [Mbit/s] | 7.03 [Mbit/s] | 5.71 [Mbit/s] |
| FDTT UL AVG Data Rate [Mbit/s] | 71.96 [Mbit/s] | 74.01 [Mbit/s] | 45.61 [Mbit/s] | 50.52 [Mbit/s] | 48.06 [Mbit/s] | 32.09 [Mbit/s] |
| FDTT UL 90 PCTL Data Rate [Mbit/s] | 119.17 [Mbit/s] | 111.58 [Mbit/s] | 78.09 [Mbit/s] | 96.92 [Mbit/s] | 93.89 [Mbit/s] | 66.33 [Mbit/s] |
| **BROWSING (Web Browsing)** | | | | | | |
| HTTP Browsing Time to 1MB | 832.35 [ms] | 1106.30 [ms] | 914.94 [ms] | 885.41 [ms] | 1292.02 [ms] | 1006.93 [ms] |
| HTTP Browsing Success Ratio (%) | 99.76% | 99.53% | 99.72% | 99.41% | 96.10% | 96.45% |

# DATA
## RESULTS (2/2)

| Ranking Identifiers | DATA DRIVE - CITY | | | DATA DRIVE - CONNECTING ROADS | | |
|---|---|---|---|---|---|---|
| | mts | Yettel | A1 | mts | Yettel | A1 |
| **VIDEO STREAM (YouTube Live Stream HD)** | | | | | | |
| Video Stream Success Ratio (%) | 99.93% | 99.97% | 99.97% | 99.65% | 97.18% | 96.11% |
| Video Stream TTFP >= 10 s Ratio (%) | 0.00% | 0.07% | 0.03% | 0.09% | 0.28% | 0.09% |
| Video Stream Irritating Experience Ratio (%) | 0.03% | 0.14% | 0.10% | 0.00% | 0.19% | 0.00% |
| **INTERACTIVITY** | | | | | | |
| Interactivity Packet Error Ratio (%) | 0.64% | 5.15% | 0.97% | 1.61% | 5.66% | 3.70% |
| Interactivity Median RTT [ms] | 44.67 [ms] | 59.92 [ms] | 52.18 [ms] | 44.69 [ms] | 60.25 [ms] | 53.83 [ms] |
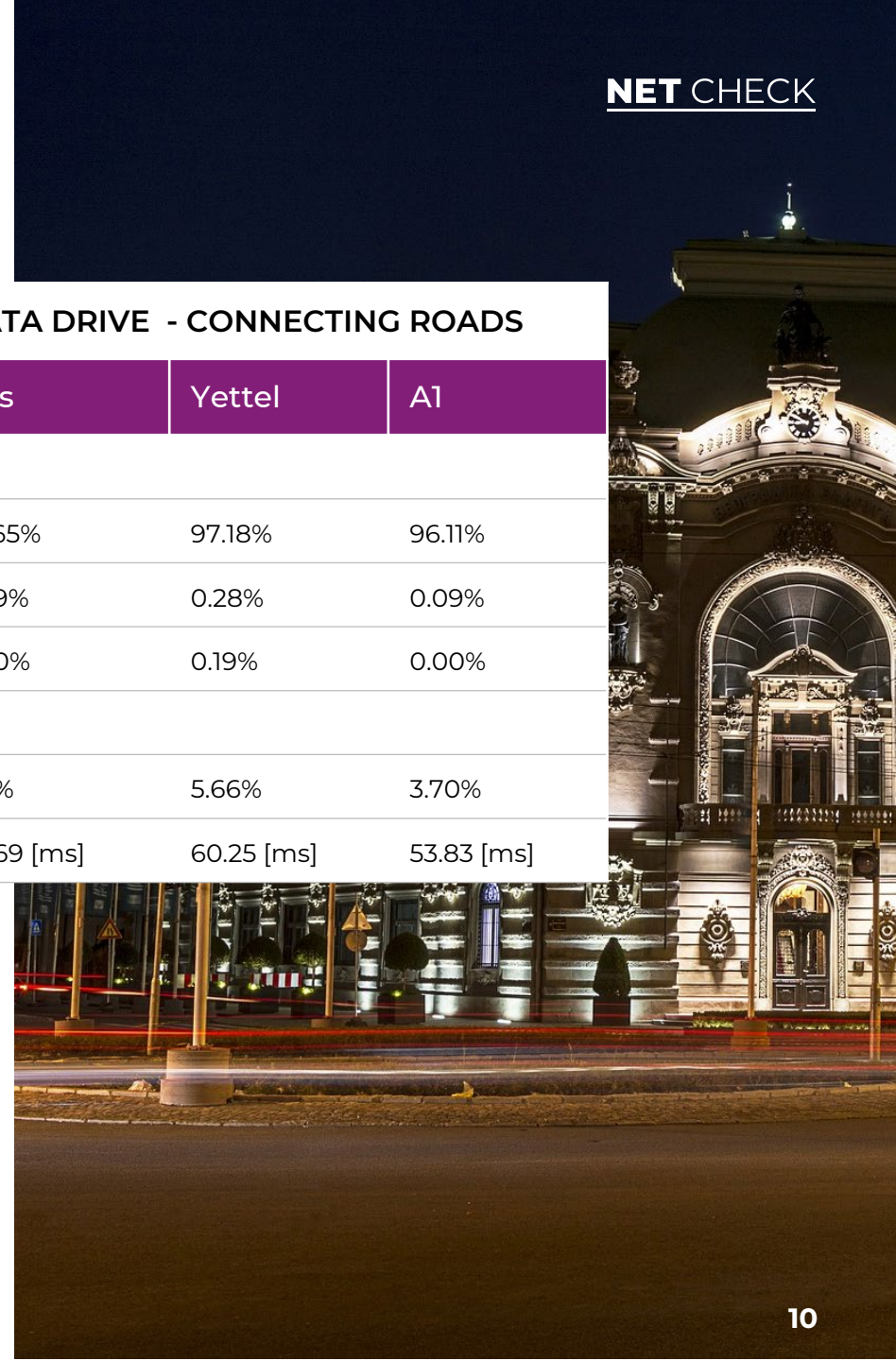
# SERBIA'S BEST MOBILE NETWORK

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