

Measuring QoS in fixed and mobile networks

Marić Ivona, spec. sci. E.E.
Manager for Cable Distribution Systems

Vujović Ivan, spec. sci. E.E.
Senior advisor for RF spectrum control & monitoring

- ❖ Agency for Telecommunications was established by the decision of the Government of Montenegro of 08th February 2001 as an independent regulatory body, functionally independent of all entities that exploit telecommunications networks, provide electronic communications network, equipment or provide services.
- ❖ After adoption of the Law on Postal Services, in 2005 the Agency was also added the competencies related to postal affairs, and after adoption of the Law on Electronic Communications in August 2008, the Agency has continued its work as the Agency for Electronic Communications and Postal Services (EKIP).

❖ Law on Electronic Communications

- ✓ Article 155, Quality of service, paragraph 2: *"Parameters for establishing the quality, methods of their measuring and publishing and the deadlines for their submission, in accordance with the best practice and usual and technologically guaranteed quality of standard equipment, shall be prescribed by the EKIP"*
- ✓ **"Rulebook on quality of service"** - measurements performed by operators and EKIP
- ✓ Measurements performed by operators:
 - in accordance with ETSI standards
 - in fixed and mobile electronic communication networks
 - submit reports
 - the publication of reports (operators and Agency)
- ✓ Subscriber agreement (Article 151)- *"subscription agreement contains in particular the minimum levels of quality of service offered, in accordance with the regulations of the Agency on the parameters of services."*

❖ Law on Electronic Communications

- ✓ Article 155, Quality of service paragraph 4 *“For the purposes of complaints about the agreed Internet access speed in the fixed electronic communications network, the EKIP shall make available to the users the measuring of Internet access speed”*
- ✓ platform for measuring <http://izmjeribrzinu.ekip.me/> (to measure the speed of internet connection to the server that is located in Montenegro and it is connected to the Internet through a network of Crnogorski Telekom)
- ✓ OOKLA-The Global Standard in Internet Metrics
- ✓ Platform helps you proactively manage your connectivity services through a set of highly customizable broadband performance testing and monitoring tools

❖ Measurement

- ✓ *Number of measurements from the same IP address is unlimited*
- ✓ *This methodology provide accurate data on the following:*
 - *Download speed*
 - *Upload speed*
 - *Ping*
 - *Jitter*
 - *Firewall*
 - *Packet loss*

- ✓ Measurement process
 - Municipality
 - Operator
 - Packet



Rezultati posljednjeg mjerenja:

Brzina preuzimanja podataka: **15753** Kbps (brzina prenosa je 1969.1 KBps)
Brzina slanja podataka: **404** Kbps (brzina prenosa je 50.5 KBps)
Kasnjenje: **2** ms
Varijacija kašnjenja: **111** ms
Broj izgubljenih paketa: **-1%**
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❖ Results



OOKLA

Ponovite test

Kasnjenje



2 ms

Varijacija kasnjenja



6 ms

Paketi

Test preskocen

Firewall

Test preskocen

Brzina

Brzina preuzimanja podataka

14.38 Mb/s



Brzina slanja podataka

0.50 Mb/s



Podijelite rezultate

🏠 Klijent 85.94.125.179 - Crnogorski Telekom a.d.Podgorica

Rezultati posljednjeg mjerenja:

Brzina preuzimanja podataka: **14384** Kbps (brzina prenosa je 1798 KBps)

Brzina slanja podataka: **500** Kbps (brzina prenosa je 62.5 KBps)

Kasnjenje: 2 ms

Varijacija kasnjenja: 6 ms

Broj izgubljenih paketa: -1%

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EKIP

2015-11-13

1:08 PM CET



Download Speed

14.38 Mbps



Upload Speed

0.50 Mbps

Server
EKIP Server

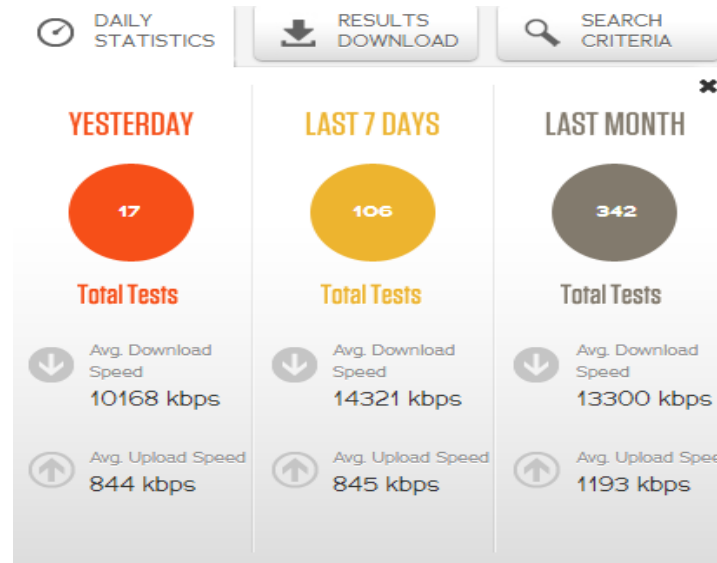


Ping
2 ms

ISP
Crnogorski Telekom a.d.Podgorica

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❖ Reports



Measurement report for period 01.01.2015. - 17.11.2015.					
Set criteria: speed of 0.5 given in packets					
total number of measurements	meet the criteria	does not meet criteria	download<, upload<	download>, upload<	download<, upload>
3577	2546 (71.2%)	783 (21.9%)	160 (20.4%) (4.5%)	205 (26.2%) (5.7%)	412 (52.6%) (11.5%)

❖ Feature plans:

- All operators to be directly connected to the measurements platform in Montenegro
- To make application which allow measurement by smartphones
- Upgrade software: before start measurement check on which way PC is connected to the internet, if there is another active internet connection, etc.

Measuring QoS for GSM/UMTS/LTE networks

❖ **Why Agency do this measurements?**

- ❖ To encourage competition between mobile operators
- ❖ To provide customers totally independent results about QoS, which is in accordance with ITU QoS regulation requirements
- ❖ To fulfill law and rulebooks requirements assign to EKIP



Equipment:

- ❖ In late July 2011, EKIP bought mobile measuring station (Renault Traffic Passenger) for control and measuring quality of services of GSM and UMTS networks. Firstly, measuring equipment set consist of GSM/UMTS radio network analyzer (R&S TSMQ scanner), 6 measuring mobile terminals Nokia C5 with PESQ license, 7 GSM/UMTS antennas, control-measuring software ROMES and post processing software Network problem analyzer version 4.60. All equipment are delivered by Rohde & Schwarz.
- ❖ These days will be finished upgrade of equipment in DMCMS. New part of equipment will be 6 Samsung galaxy S3 (with LTE measuring capabilities and 2 of them with license for POLQA measurement), 3 more GSM/UMTS antennas, updated softwares ROMES and Network problem analyzer to version 4.85.
- ❖ This equipment upgrade will provide ability to measure QoS parameters and signal coverage of GSM/UMTS/LTE networks and speech quality measurements by POLQA standard.



Digital mobile control-measuring station Renault Traffic Passenger (DMCMS)

Agency for Electronic Communications & Postal Services
RF Spectrum Control & Monitoring Department and Department of Network and Services



Digital mobile control-measuring station Renault Traffic Passenger (DMCMS)

- ❖ **In 2012. and 2013. EKIP did measurement campaigns on GSM/UMTS networks**

Measurement configuration:

- ❖ 100% drivetest, measuring operators networks at the same time
- ❖ Voice service:
 - ❖ 1) mobile to answering machine (installed in operators network)
- maximum call setup time 15s, call duration 60s, call window 90s
 - ❖ 2) mobile to mobile (by PESQ with speech samples on Montenegrin language)
- ❖ Separately measured GSM and UMTS networks and then together (auto mod)
- ❖ Approximately 1500 call samples per operator, covered approx. 90% population

❖ **Parameters for 2012. and 2013.:**

❖ **By technology :**

- ❖ GSM: RxLev, RxQual, FER, C/I, Timing Advance, TxPower, AMR DL and UL, handover analysis, Telephony Service Non-Accessibility, Telephony Setup Time, GSM band usage (GSM900 GSM 1800)
- ❖ UMTS: RSCP (CPICH), RSSI, Ec/No, TxPower, TCH BLER, AMR DL and UL, Uplink interference, handover analysis, Telephony Service Non-Accessibility, Telephony Setup Time, UMTS band usage
- ❖ Dual auto GSM/UMTS: handover analysis, Telephony Service Non-Accessibility, Telephony Setup Time, Telephony Speech Quality (Sample Basis) , Telephony Speech Quality (Call Basis), Telephony Cut-off Call Ratio



- ❖ Reports are made separately for each operator per technology, and statistical evaluation of results (confidence level, error margins etc.) were done in accordance with ETSI standard.
- ❖ After finishing measurement campaign, EKIP informed public about results. Reports were good accepted and had influence on increase fund for operators network development.



- ❖ In 2015. EKIP will improve measurements by measuring networks based on LTE technology and measuring speech quality by POLQA standard.
- ❖ **Measuring plan for 2015:**
- ❖ 100% drivetes, measuring operators networks in same time
- ❖ Voice service:
- ❖ 1) mobile to answering machine (installed in operators network)
 - maximum call setup time 15s, call duration 65 s, call window 100s
- ❖ 2) mobile to mobile (by POLQA with speech samples on Montenegrin language)
- ❖ Data service:
- ftp download (3 MB file), ftp upload (1MB file), browsing experience (http static and dynamic web page)
- ❖ Approximate number of samples ~3000 per operator per services
 - Measurement campaign will cover approx 80% of population

❖ **Parameters for 2015:**

❖ **By technology:**

- ❖ GSM (RxLev, RxQual, C/I)
- ❖ UMTS (RSCP, Ec/No)
- ❖ LTE (RSRP, RSRQ)
- ❖ Network neutral (Radio Network Unavailability, Attach Failure Ratio)

❖ **By services:**

- ❖ Data: PDP Context Activation Failure Ratio, PDP Context Activation Time, PDP Context Cut – off Ratio, FTP service Non – Accessibility, FTP Session Failure Ratio, FTP Main Data Rate download/upload (with fixed maximum duration of time transfer), HTTP Service Non-Accessibility, HTTP Service Setup Time, HTTP Session Failure Ratio, HTTP Mean Data Rate download (with fixed maximum duration of time transfer))
- ❖ Voice: Telephony Service Non-Accessibility, Telephony Setup Time, Telephony Speech Quality (Sample Basis) , Telephony Speech Quality (Call Basis), Telephony Cut-off Call Ratio)

❖ **Reporting:**

- ❖ One report for urban areas with separate data and voice results
- ❖ Another report for whole country with separate data and voice results

Thank you for your attention !

ivan.vujovic@ekip.me

ivona.maric@ekip.me

www.ekip.me