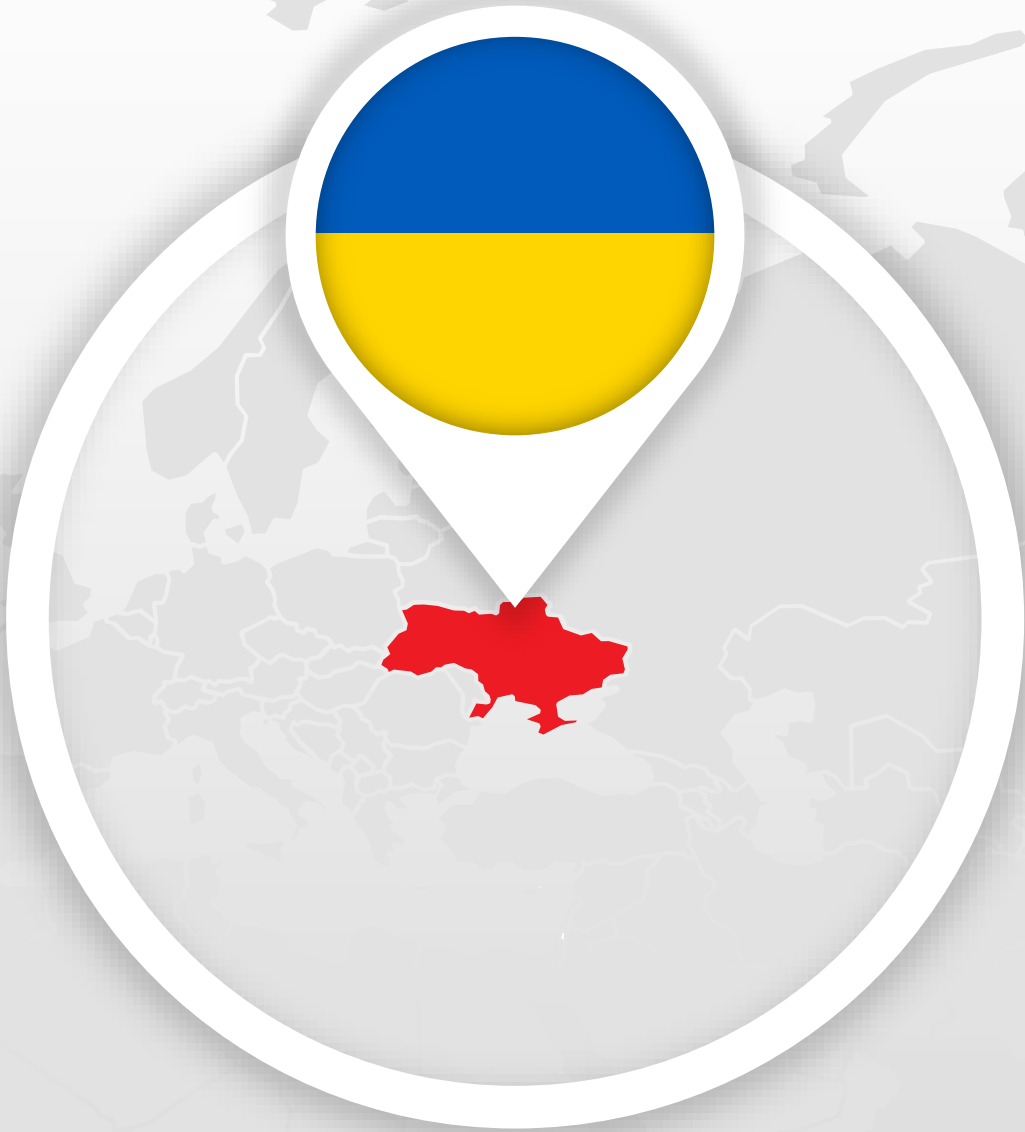




SPEEDCHECKER

USER EXPERIENCE ON MOBILE NETWORKS



Ukraine

June 2021

ABOUT THE DATA

Total number of samples:	107,281
Total number of unique devices:	65,391
Data collection period:	4 June - 15 June 2021

ABOUT THE REPORT

SpeedChecker aims to benchmark operators on the user experience and, therefore, the metrics in this report are designed with this in mind. Users accessing the services on the Internet are affected not only by the quality of the radio access network but also by other factors such as the mobile device performance, network backhaul capacity and interconnections to other networks.

Our [methodology](#) is designed to take into account all of those factors. Our metrics do not show the highest possible speeds or the lowest latencies that a particular operator can provide locally. The majority of the content accessed on the Internet is on CDNs and that is why SpeedChecker uses CDNs to perform the tests. Operators who have great radio access network as well as great connections to CDNs offer superior user experience and score better in our reports.



MNO SPEED BENCHMARK

The following table shows average download and upload speeds per MNO.

The measurements were made across the whole country and across the whole spectrum of available Radio Access Technologies (3G, 4G, 5G if available).

— 95% Confidence interval

Kyivstar		43,893 samples
Download speed (Mb/s)	24.70	+/- 0.30
Upload speed (Mb/s)	12.39	+/- 0.26
lifecell		27,569 samples
Download speed (Mb/s)	13.63	+/- 0.21
Upload speed (Mb/s)	6.38	+/- 0.14
Vodafone		31,625 samples
Download speed (Mb/s)	24.64	+/- 0.32
Upload speed (Mb/s)	11.33	+/- 0.25

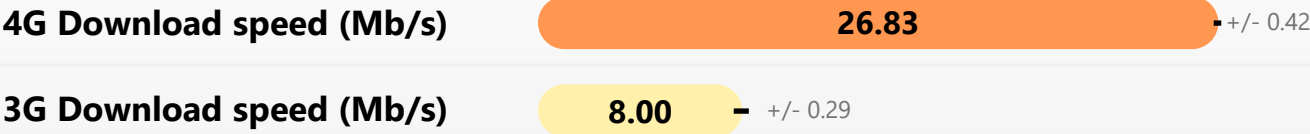
MNO 4G AND 3G DOWNLOAD SPEED BENCHMARK

The following table shows average download speed per MNO and particular RAT.

— 95% Confidence interval

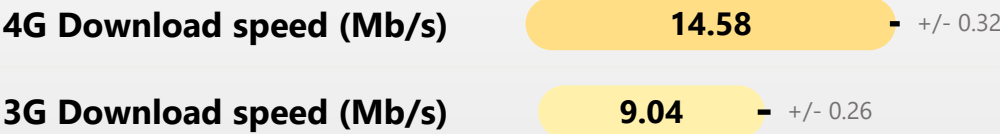
Kyivstar

20,421 samples



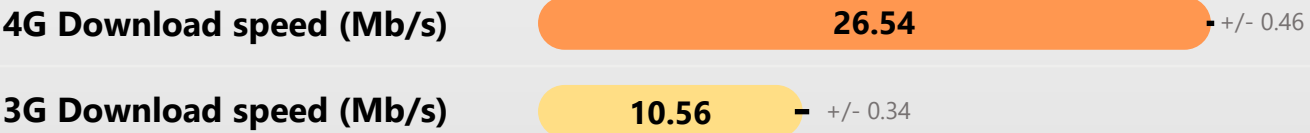
lifecell

13,024 samples



Vodafone

14,756 samples



MNO LATENCY BENCHMARK

As described in our [data collection methodology](#), latency is measured to the CDN endpoints. Operators who interconnect with CDNs well tend to offer better user experience in latency-sensitive applications as well as score well in our latency comparison.

— 95% Confidence interval

Kyivstar		41,948 samples
Latency (ms)	53.94	+/- 0.34
lifecell		26,738 samples
Latency (ms)	55.71	+/- 0.43
Vodafone		30,555 samples
Latency (ms)	47.70	+/- 0.32

MNO 4G AVAILABILITY BENCHMARK

Our 4G availability metrics correspond to the % of the tests done on 4G vs 3G. This metric does not represent 4G coverage.

— 95% Confidence interval

Kyivstar

54,500 samples

4G availability (%)

77.43

lifecell

25,200 samples

4G availability (%)

80.16

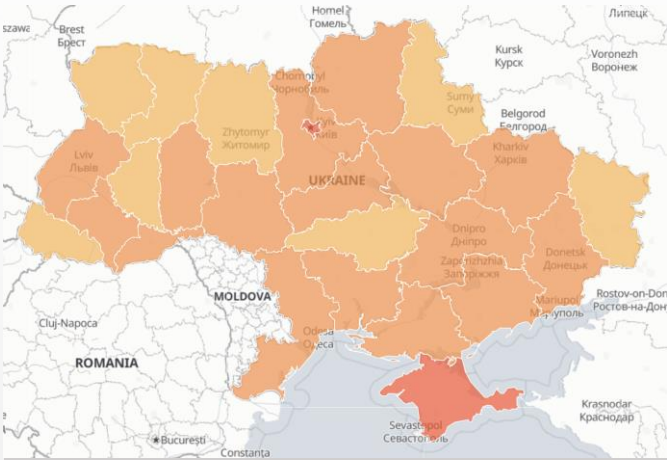
Vodafone

36,000 samples

4G availability (%)

74.44

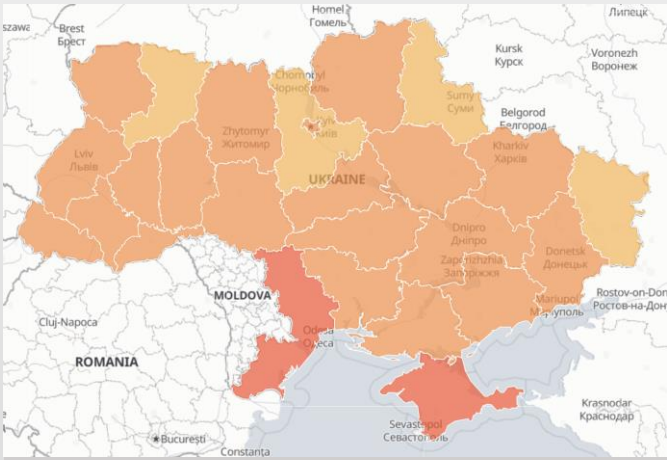
REGIONAL COMPARISON OF MNO DOWNLOAD SPEED PERFORMANCE



Kyivstar



lifecell



Vodafone

Avg. Download mbit/s

- 0 - 10
- 10 - 15
- 15 - 20
- 20 - 30
- 30 - 50
- 50 - 75
- 75 - 100

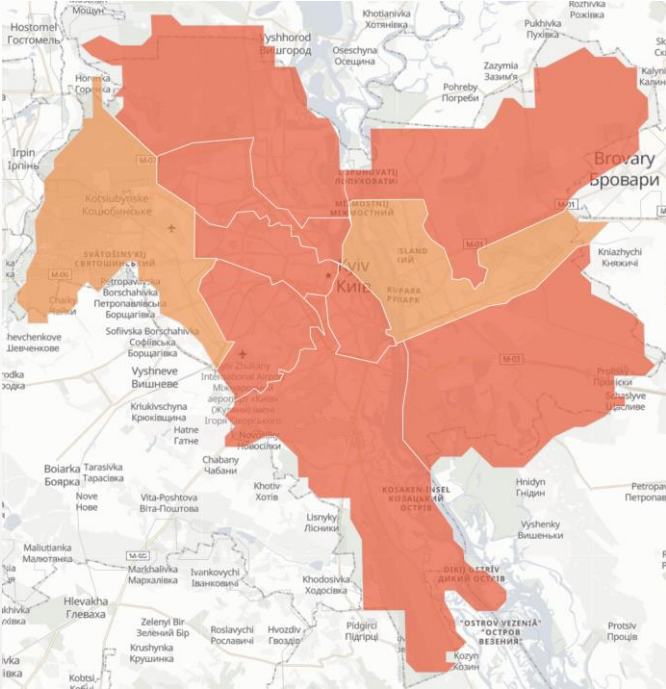
AVERAGE DOWNLOAD SPEEDS IN DIFFERENT REGIONS OF UKRAINE

The following table shows the average download speeds in different regions of Ukraine . The 2nd column is an average of all MNOs in a particular region.

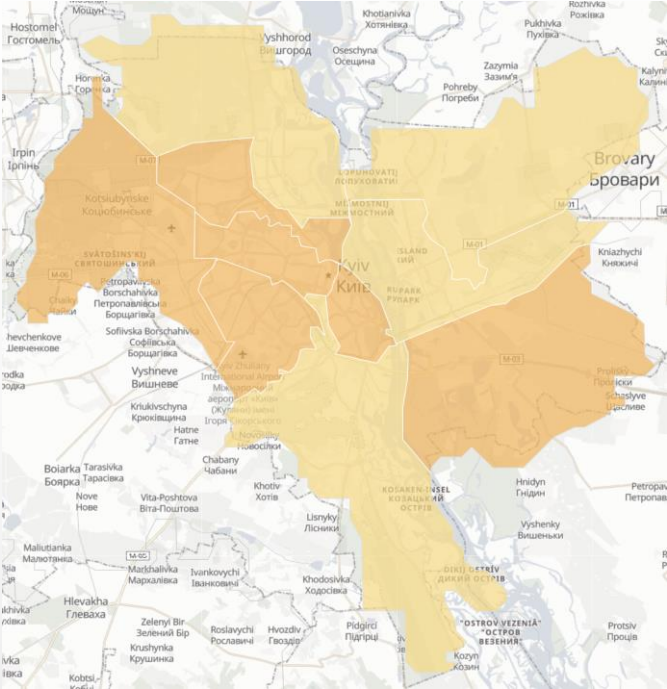
The fastest regions are at the top of the table measured in Mb/s.

REGION	ALL OPERATORS	KYIVSTAR	LIFECELL	VODAFONE	TEST COUNT #
Kiev City	25.31	33.35	15.57	28.36	21,802
Odessa Region	24.38	29.65	13.33	30.22	9,357
Chernivtsi Region	24.08	23.76	17.8	25.9	1,162
Zaporizhzhya Region	24.04	26.75	12.92	25.64	4,132
Kherson Region	22.04	23.2	10.56	24.04	2,388
Kharkiv Region	21.86	23.45	13.96	24.5	7,983
Dnipropetrovs'k Region	21.01	22.42	11.14	26.88	9,741
L'viv Region	20.92	23.5	14.12	28.99	5,353
Poltava Region	20.46	22.9	12.78	20.46	2,973
Ivano-Frankivs'k Region	20.07	20.24	14.47	21.86	2,037
Donets'k Region	20.03	22.26	8.1	21.03	2,912
Ternopil' Region	19.64	18.84	15.69	26.06	1,469
Mykolayiv Region	19.58	21.29	12.53	25.36	2,756
Kiev Region	19.57	26.33	13.8	16.91	8,116
Transcarpathia Region	19.47	17.33	14.3	22.44	1,759
Chernihiv Region	19.23	21.98	12.5	27.12	2,330
Khmel'nyts'kyi Region	19.18	20.65	13.07	24.16	2,174
Kirovohrad Region	18.97	18.62	10.14	22.28	1,964
Volyn Region	18.92	18.86	15.28	21.23	1,678
Rivne Region	18.7	19.91	14.35	18.23	2,009
Sumy Region	18.52	19.24	10.78	19.72	1,695
Cherkasy Region	18.5	23.31	13.47	22.49	2,310
Vinnytsya Region	18.36	21.71	10.8	24.99	3,391
Zhytomyr Region	17.78	18.85	11.94	22.27	2,579
Luhans'k Region	15.47	15.18	8.86	18.17	855
Crimea Region	11	30.88	13.17	36.31	1,491

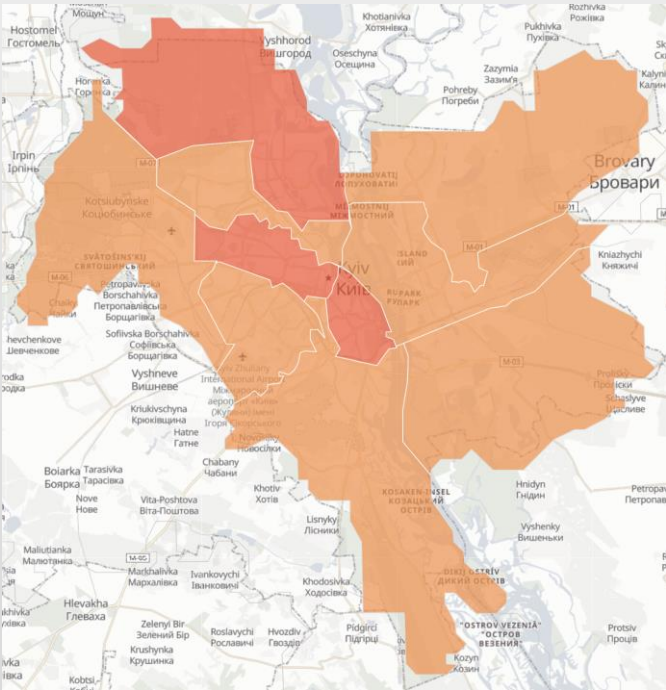
MNO DOWNLOAD SPEED PERFORMANCE IN KYIV



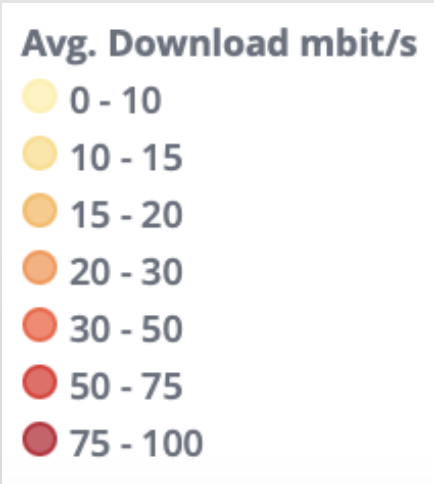
Kyivstar



lifecell



Vodafone



ARE YOU LOOKING FOR MORE DETAILED CROWDSOURCED DATA IN UKRAINE?

What you see in this free report is a high-level snapshot of the crowdsourced data we offer to our clients.

Our crowdsourcing system contains billions of data points collected from mobile devices worldwide.

Unlike our competitors, we can sell access to the data with different granularity: Our clients can pick data they need with significant cost savings associated with a reduced scope.

CONTACT US FOR MORE INFORMATION



FLEXIBILITY IS IN OUR DNA

Our customers value our flexible and modular approach in delivering our solutions. There is no one size fits all in providing crowdsourcing projects. Customers increasingly require tailored solutions which will satisfy all technical, operational and legal requirements.



With reduced scope comes reduced price. Our Basic KPI set is a more cost effective way to get speed test data. Our Advanced KPI set is more comprehensive with 100+ active and passive KPIs.



Crowdsourcing is about trade-offs. Do you want more tests or do you want tests to run longer ? Do you want to collect data passively without impacting the network and user bandwidth or run active tests which will stress and assess the capacity better?



Do you want us to host the solution for fast & easy deployment or do you require data to be within your data center for compliance purposes?

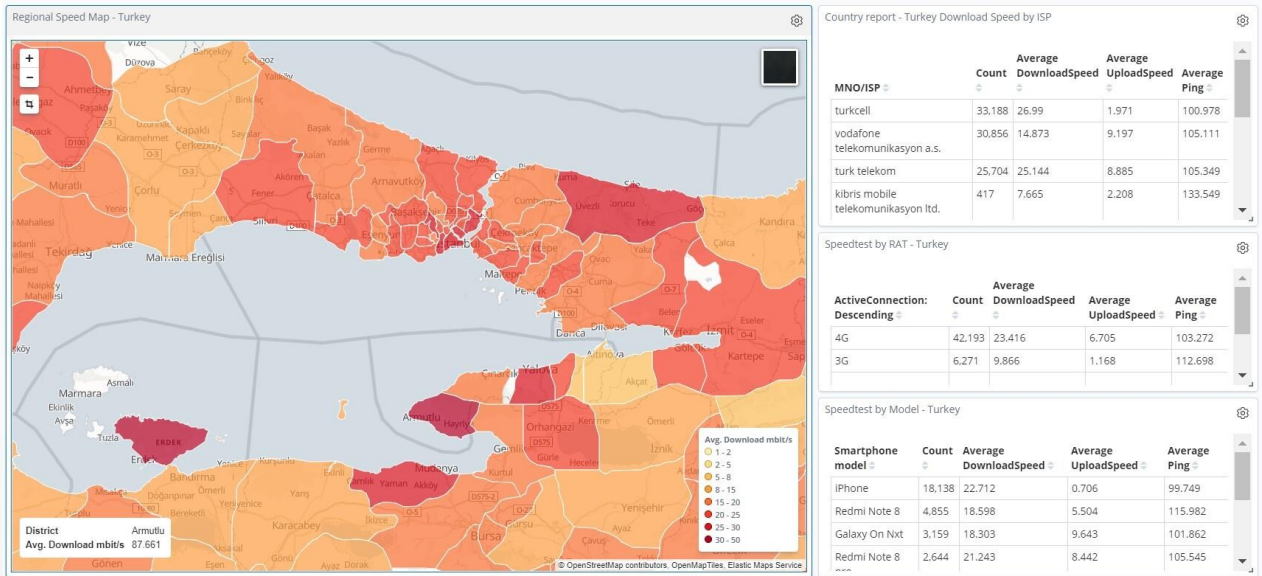


You not only want the data but you also want your own app or web-based tester? We can do it all. Our team can produce iOS, Android, HTML, Windows and MAC clients tailored to your specific needs.

 **[CONTACT US FOR MORE INFORMATION](#)**

BASIC CROWDSOURCING SYSTEM

Our Basic Crowdsourcing System offers full analytical options like our Advanced system but with the limitation of a smaller Basic KPI set.



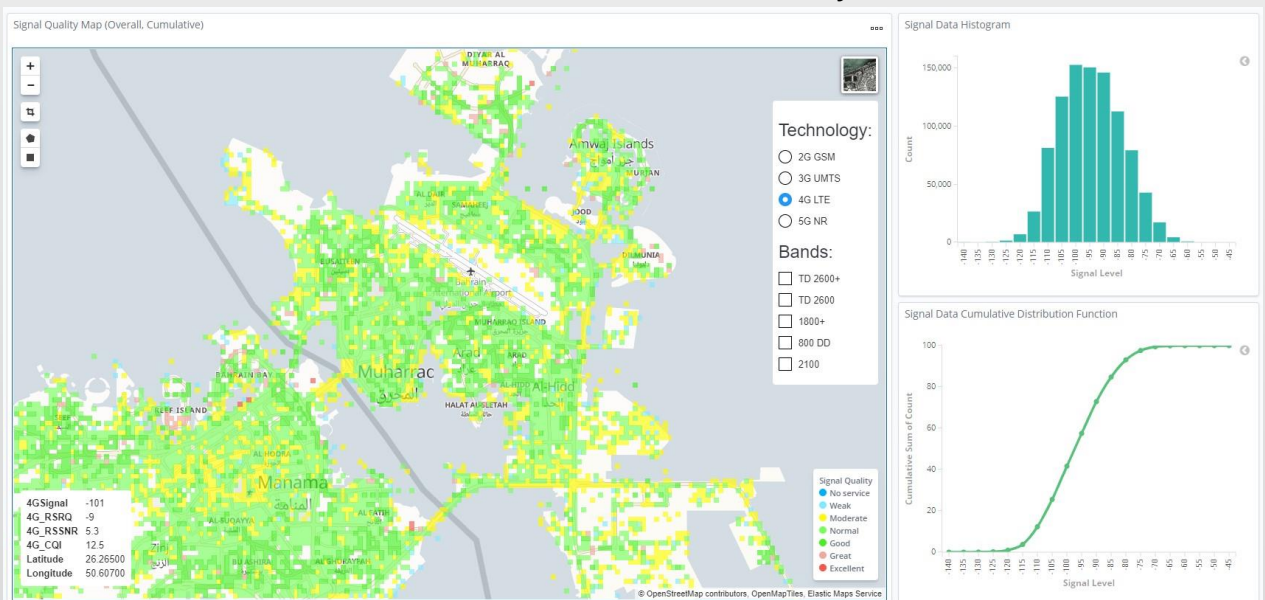
Internet Speeds

[See Full Screen image](#)

Basic KPIs include speed test data along with device and network information but do not contain Streaming Video, detailed Radio KPI's nor passive measurements.

ADVANCED CROWDSOURCING SYSTEM

Step up from our Basic system to our Advanced Crowdsourcing system with more than 100+ KPIs to analyse



Coverage Analysis

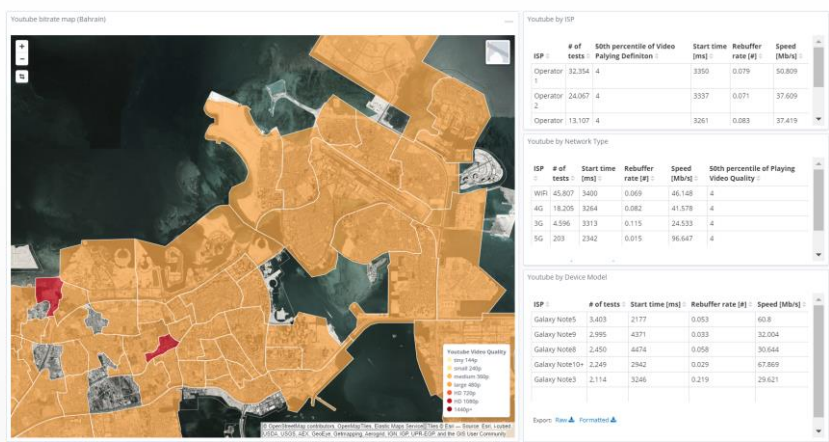
[See Full Screen image](#)

- Statistical research on the basis of millions of crowdsourced samples
- Multiple signal metrics RSRP, RSRQ, SNR, RSSI, CQI
- Split by MNO, Radio Access Type, Band (down to individual ARFCN)
- Possibility to filter by: Speed (e.g. High Speed Scenario) and Indoor



SPEEDCHECKER

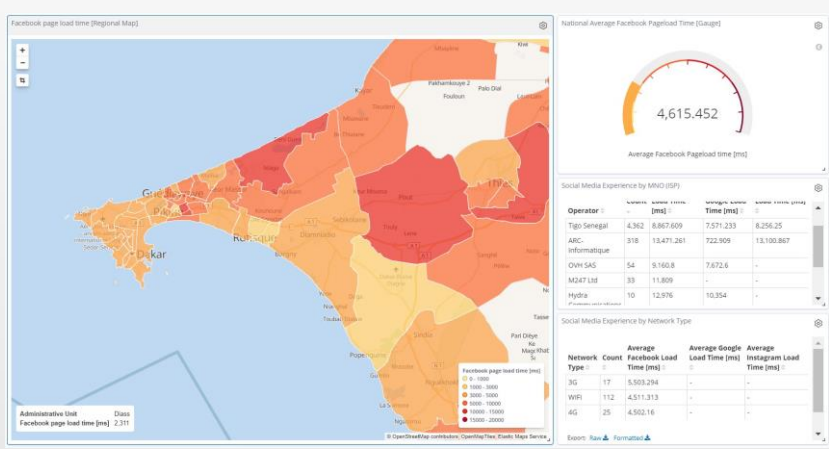
ADVANCED CROWDSOURCING SYSTEM



YouTube Quality

YouTube quality dashboard provides information about YouTube regional performance. It features metrics such as YouTube playing definition, buffering time, start delay.

[See Full Screen image](#)



Social Media Experience

Social media experience dashboard shows regional performance of major social media platforms such as Facebook, Google and Twitter.

[See Full Screen image](#)

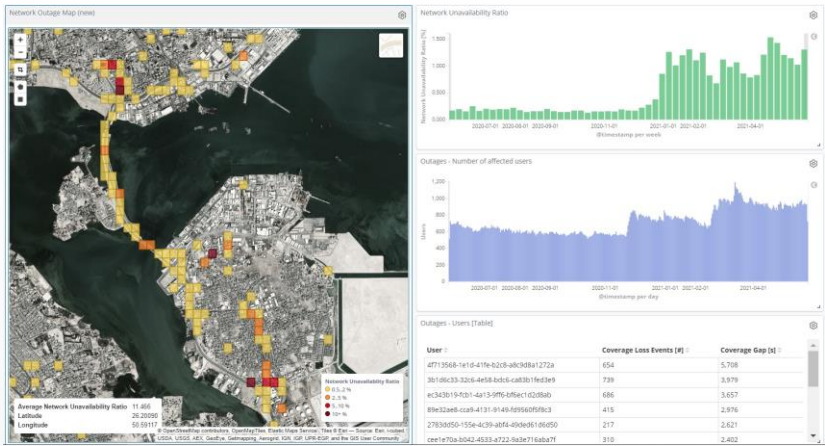


Point of Interest Performance

Reveals Internet performance in specific important locations such as Airports, Malls, Stadiums and other places located outside of drive test routes.

[See Full Screen image](#)

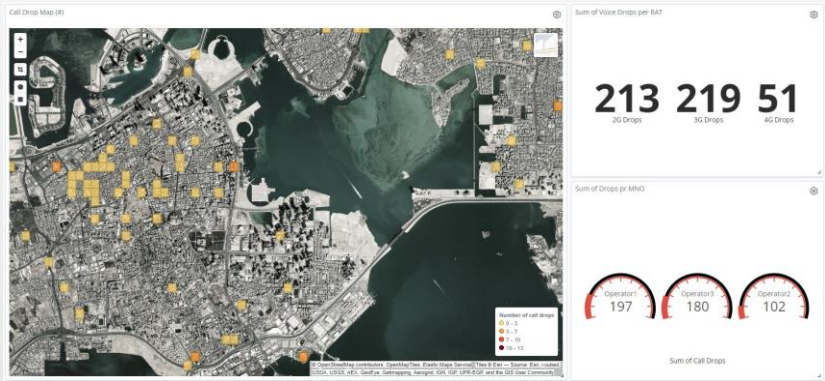
ADVANCED CROWDSOURCING SYSTEM



Outages

Network Availability is the number one metric for any network. While OSS data provides overall information, crowdsourcing is able to spot exact locations where subscribers are not able to attach to the network.

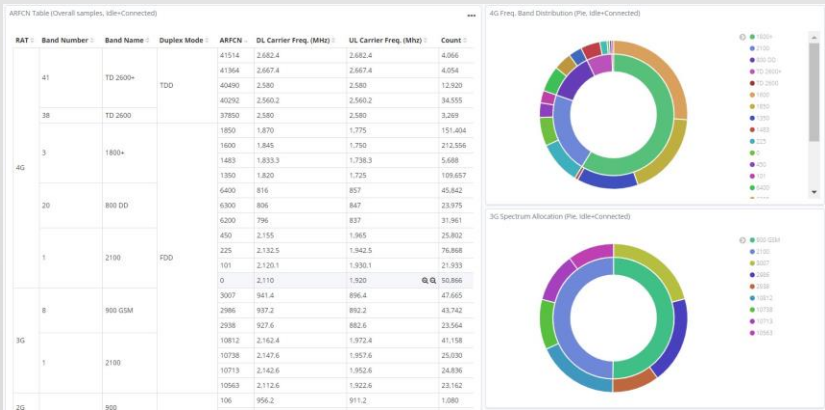
[See Full Screen image](#)



Voice Quality

The Voice Quality dashboard shows the user issues visualized on a map to spot any areas where users are making calls and their quality is not satisfactory or where calls are being dropped.

[See Full Screen image](#)



Spectrum Usage

Spectrum utilization dashboard allows the monitoring of how the available spectrum is used in various locations. It may reveal the load balancing situation or the fact that individual band are overloaded or unloaded.

[See Full Screen image](#)

DATA COLLECTION METHODOLOGY

Our data is collected from end user devices running Android and iOS systems. All measurements are executed towards a CDN that has a large geographical footprint and hosts a significant part of the content that is being accessed by the users. This ensures our results are a good approximation of the user's actual quality of experience.

All measurements must contain accurate location information using GPS or wi-fi geolocation methods. Measurements are considered only from the apps that have been approved by SpeedChecker. Submitted measurements are checked to see if they are within expected ranges and additional security precautions are implemented to ensure measurement data is not being manipulated.

The data collection process aims to deliver a single measurement sample from every device in our crowdsourcing system device pool and we strive to remove all duplicates. Due to privacy settings on some users phones we cannot reliably detect unique devices therefore some devices have contributed to more than 1 measurement into this dataset.

MEASUREMENT METHODOLOGY

The methodology is based on the concept of the [ITU-T Q.3960 \(2016\)](#) "Framework of Internet related performance measurements" and "Supplement 71 to ITU-T Q-series Recommendations".

This test methodology aims at delivering an accurate measurement of the maximum bandwidth available over a given internet connection. This is achieved by transferring multiple parallel data streams over separate TCP connections within a predefined amount of time. The transferred data consists of randomly generated data with high entropy.

#	Parameter	Unit	ITU Range	Current Setting
1	Number of parallel threads	#	$1 \leq n \leq 10$	Dynamic addition from 1 to 10
2	Duration of pre-test	s	$0 \leq T_p \leq 5$	1s
3	Duration of the downlink test	s	$5 \leq T_d \leq 15$	5s
4	Duration of the uplink subtest	s	$5 \leq T_u \leq 15$	5s
5	Number of 'pings' during delay subtest	#	$5 \leq p \leq 20$	$p = 10$