SPEEDCHECKER

USER EXPERIENCE ON MOBILE NETWORKS

Sierra Leone

October 2021

ABOUT THE DATA

Total number of samples:	**78,339**
Total number of unique devices:	**23,331**
Data collection period:	**1 October - 28 October 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.

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CROWDSOURCED USER EXPERIENCE INSIGHTS

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

Africell		17,793 samples
Download speed (Mb/s)	**9.24**	+/- 0.23
Upload speed (Mb/s)	**4.22**	+/- 0.14
Orange		41,090 samples
Download speed (Mb/s)	**16.59**	+/- 0.25
Upload speed (Mb/s)	**7.17**	+/- 0.15
QCell		19,411 samples
Download speed (Mb/s)	**4.13**	+/- 0.10
Upload speed (Mb/s)	**3.39**	+/- 0.09

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MNO COVERAGE BENCHMARK

Our mobile coverage benchmark compares MNO coverage footprint (where our devices detected MNO's presence) and availability of different RAT in those locations. Operators with a large footprint and with a good 4G coverage will score higher on the Mobile Coverage benchmark.

Separately, we also report 4G Mobile Coverage which looks at 4G technology only (and does not reflect 2G or 3G coverage in the calculation).

Data collection period: **1 Jan - 31 Oct 2021**

Africell

1,172,299 samples

Mobile Coverage	**216**
4G Mobile Coverage	**94**

Orange

754,561 samples

Mobile Coverage	**368**
4G Mobile Coverage	**180**

QCell

435,286 samples

Mobile Coverage	**188**
4G Mobile Coverage	**54**

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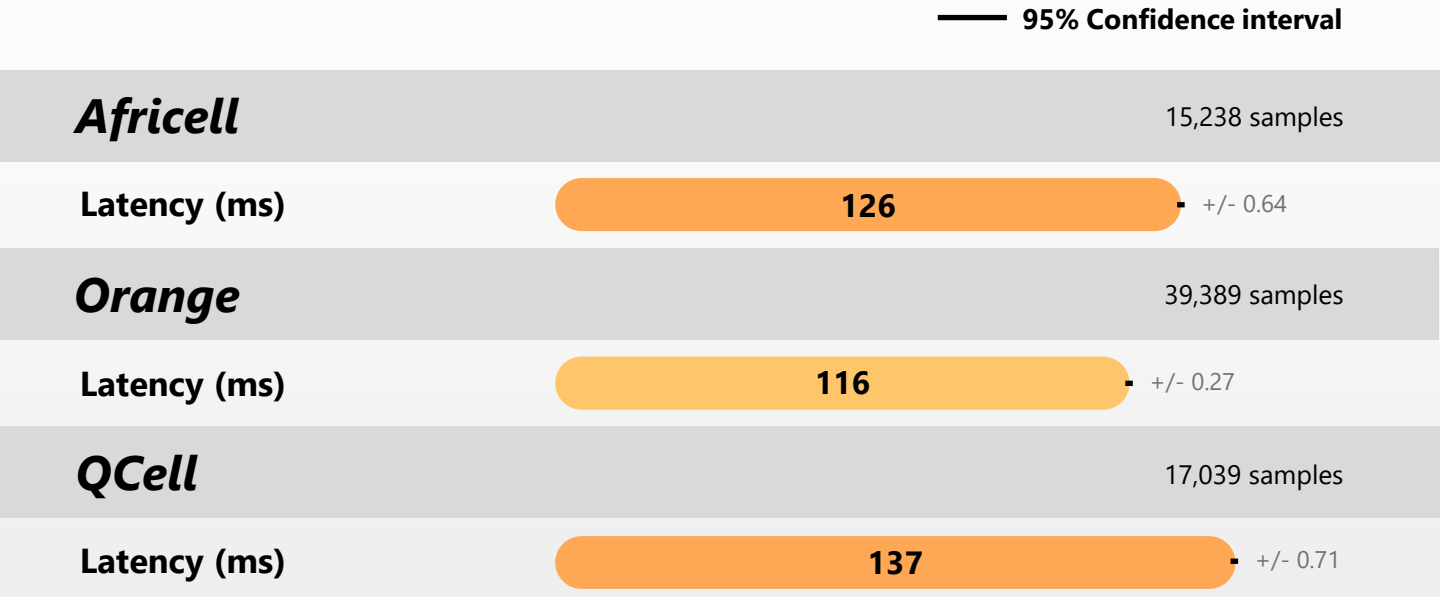
MNO LATENCY BENCHMARK

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.



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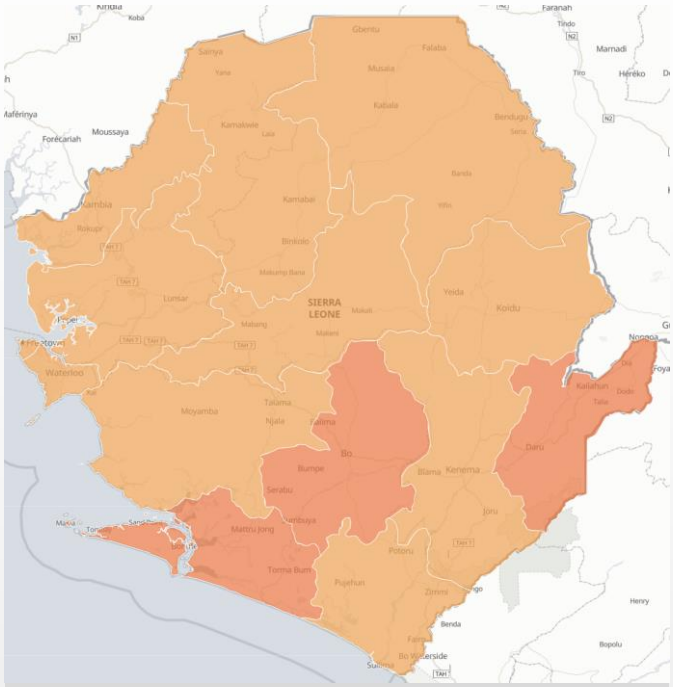
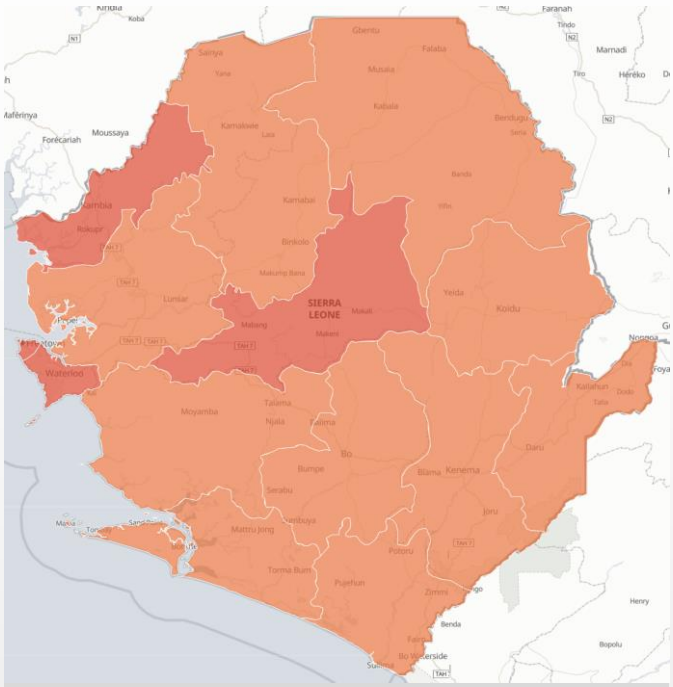
REGIONAL COMPARISON OF MNO DOWNLOAD SPEED PERFORMANCE

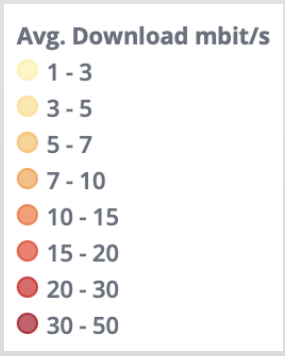


Africell



Orange

QCell



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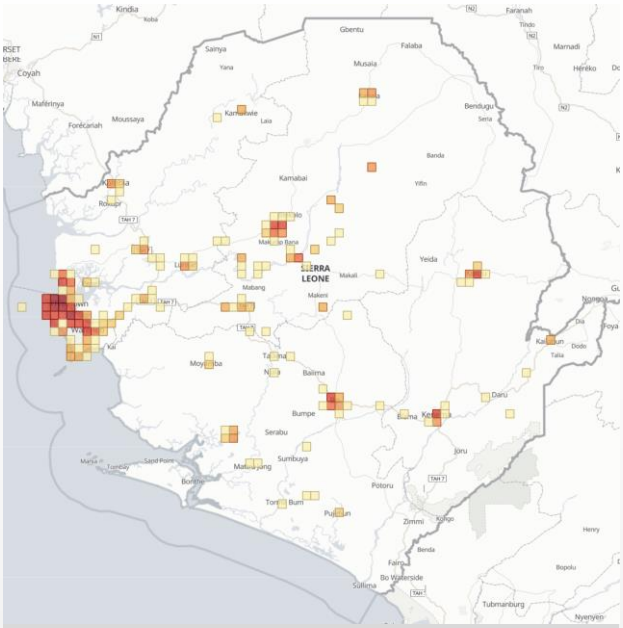
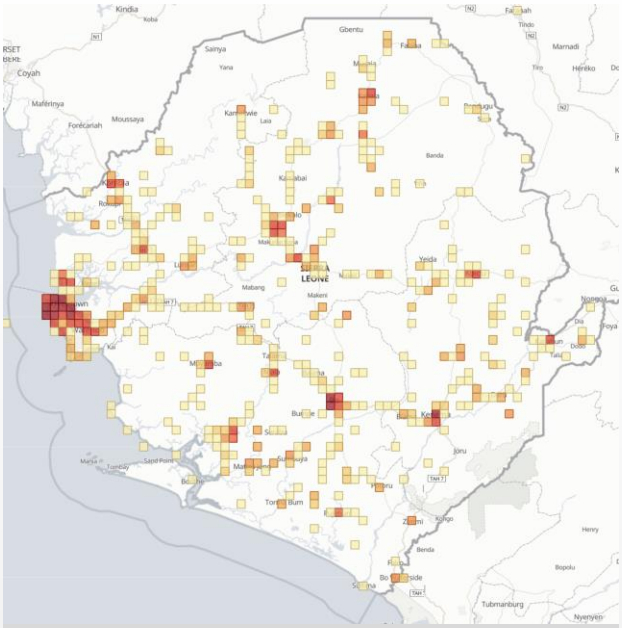
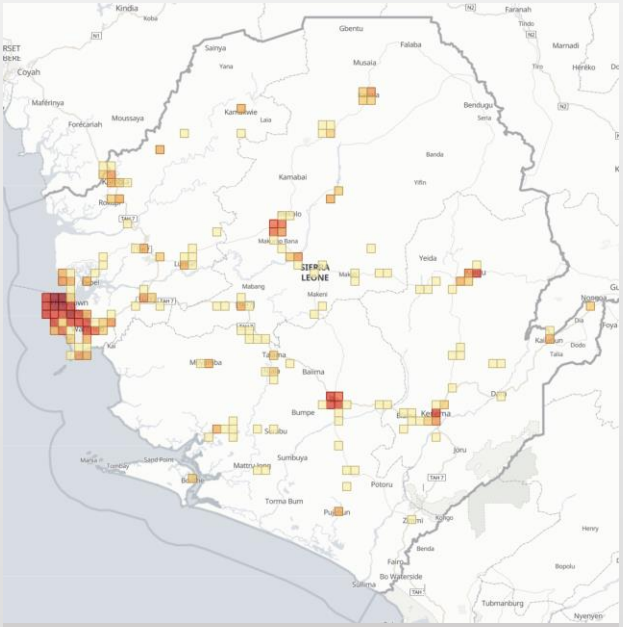
MEASUREMENT SAMPLES DISTRIBUTION



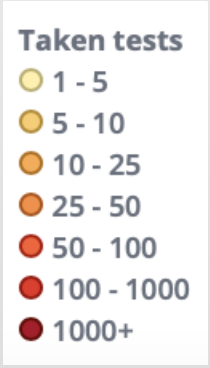
Africell



Orange



QCell



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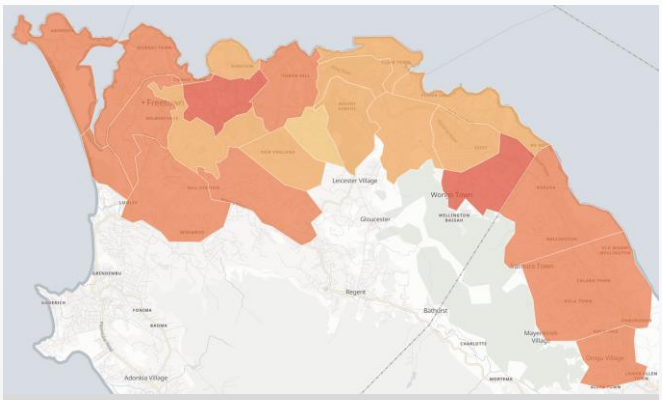
AVERAGE DOWNLOAD SPEEDS IN DIFFERENT REGIONS OF SIERRA LEONE

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

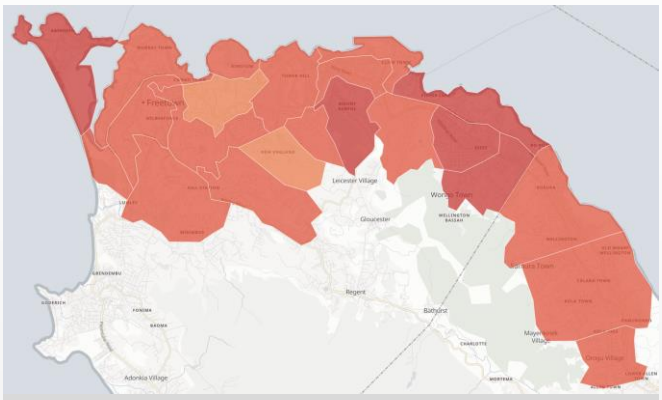
The fastest regions are at the top of the table measured in Mb/s.

Region	All operators	Africell	Orange	Qcell	Test count #
Kailahun	13.52	10.42	14.72	3.08	342
Moyamba	12.97	8.49	14.79	2.50	524
Tonkolili	12.45	7.28	16.60	1.62	685
Bonthe	12.45	13.93	12.57	3.69	360
Pujehun	12.41	8.43	13.38	4.37	236
Kambia	12.11	7.33	15.52	2.92	474
Western Rural	12.10	9.29	18.32	4.63	16,329
Western Urban	12.09	9.48	17.65	4.04	43,709
Bo	10.99	11.15	12.57	4.34	4,521
Bombali	10.86	7.61	13.32	2.93	3,064
Kenema	10.64	8.19	11.90	3.60	2,278
Koinadugu	10.61	8.16	11.69	3.63	834
Port Loko	10.51	8.13	13.84	3.89	1,449
Kono	9.72	7.33	13.64	3.24	991

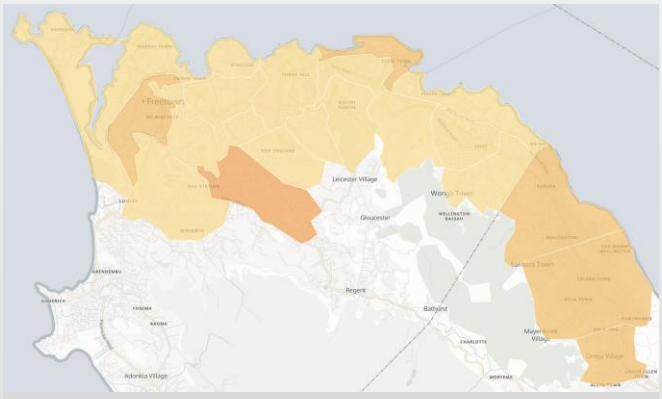
MNO DOWNLOAD SPEED PERFORMANCE IN FREETOWN



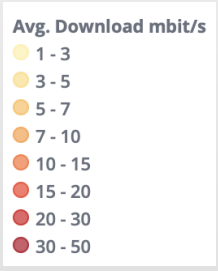
Africell



Orange



QCell



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AFRICA'S FASTEST MOBILE CHAMPIONS

Rank	Country	Average Country Download speed (Mb/s)	Mobile Network Champion	# Samples
1	Morocco	23.57	Maroc Telecom	147,819
2	South Africa	19.20	MTN	62,294
3	Tunisia	18.19	Tunisie Telecom	59,133
4	Mali	15.76	Orange	55,509
5	Malawi	13.71	TNM	36,443
6	Botswana	13.56	Orange	19,537
7	Namibia	13.35	MTC	49,990
8	Madagascar	13.24	Telma	18,300
9	Liberia	13.08	Orange	46,891
10	Mauritius	12.80	Mauritius Telecom	66,452
11	Cape Verde	11.89	CV Móvel	27,374
12	**Sierra Leone**	**11.87**	**Orange**	**78,339**
13	Chad	11.86	Moov	38,730
14	Gabon	11.70	Moov Gabon Telecom	30,420
15	Congo	11.67	MTN	30,426
16	Nigeria	11.55	Airtel	69,393
17	Kenya	10.66	Safaricom	137,495
18	Mozambique	9.67	Vodacom	63,979
19	Senegal	9.56	Orange	57,011
20	Angola	9.52	Unitel	119,175
21	Egypt	9.48	Telecom Egypt	222,590
22	Togo	9.39	Togocom	68,583
23	Burkina Faso	9.35	Onatel	70,384
24	Zambia	9.03	Zamtel	85,403
25	Ethiopia	8.75	Ethio Telecom	25,864
26	Djibouti	8.05	Djibouti Telecom	36,140
27	DR Congo	7.80	Orange	118,992
28	Sudan	7.79	Zain	68,478
29	Rwanda	7.65	KT Rwanda	46,212
30	Uganda	7.55	Airtel	65,345
31	Guinea	7.46	Orange	35,637
32	Ghana	7.42	Vodafone	71,333

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Rank	Country	Average Country Download speed (Mb/s)	Mobile Network Champion	# Samples
33	Lesotho	7.42	Vodacom	42,578
34	Gambia	7.24	Africell	36,503
35	Ivory Coast	7.18	MTN	71,312
36	Zimbabwe	7.12	Econet	138,872
38	Somalia	6.95	Hormuud Telecom	53,275
37	Tanzania	6.95	Airtel	203,547
39	Cameroon	6.78	MTN	68,677
40	Niger	6.70	Zamani Telecom	60,188
41	Benin	6.28	Moov	51,507
42	Algeria	5.40	Ooredoo	430,861
43	Burundi	5.12	Econet	13,822
44	Libya	4.28	Almadar Aljadeed	98,808
45	Mauritania	4.23	Moov Mauritel	32,426
46	Central African Republic	3.97	Orange	4,816

- some countries with smaller population have not been included in Africa's fastest mobile champions category as we did not collect enough samples to get to sufficient accuracy level. List of countries we missed: South Sudan, Swaziland, Seychelles, Equatorial Guinea, Guinea-Bissau, Eritrea, Sao Tome and Principe, Comoros

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AFRICA'S BEST COVERAGE CHAMPIONS

Rank	Country	Country Coverage Score	Mobile Network Champion	# Samples
1	Mauritius	928	Mauritius Telecom	3,895,394
2	Comoros	887	Comores Telecom	539,472
3	Seychelles	848	Airtel	304,166
4	Egypt	844	Vodafone	79,966,887
5	South Africa	816	Vodacom	112,860,127
6	Kenya	811	Safaricom	17,490,152
7	Swaziland	806	Eswatini Mobile	1,752,296
8	Morocco	757	Maroc Telecom	51,329,430
9	Tunisia	746	Ooredoo	31,096,547
10	Algeria	740	Mobilis	57,294,226
11	Malawi	737	Airtel	3,313,944
12	Nigeria	730	MTN	97,415,678
13	Ghana	715	MTN	41,034,962
14	Cape Verde	690	CV Móvel	732,830
15	Uganda	689	Airtel	14,266,814
16	Zambia	682	Airtel	10,745,644
17	Mali	643	Orange	3,672,303
18	Senegal	639	Orange	10,029,094
19	Gabon	623	Airtel	1,363,616
20	Togo	616	Togocom	11,735,444
21	IvoryCoast	606	Orange	9,840,970
22	Benin	593	MTN	6,655,699
23	Cameroon	592	Orange	12,295,614
24	Libya	592	Libyana	4,020,335
25	DR Congo	586	Airtel	9,647,935
26	Lesotho	582	Vodacom	755,039
27	Congo	570	Airtel	2,818,011
28	Tanzania	560	Airtel	10,965,403
29	Botswana	559	Orange	4,647,707
30	Rwanda	551	MTN	2,770,795
31	Gambia	544	Qcell	1,270,993
32	Djibouti	541	Djibouti Telecom	119,992

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Rank	Country	Country Coverage Score	Mobile Network Champion	# Samples
33	Liberia	533	Orange	766,632
34	Mozambique	523	Vodacom	4,958,483
35	Madagascar	519	Telma	4,054,462
36	Guinea-Bissau	518	Orange	330,736
37	Guinea	502	Orange	1,819,938
38	Somalia	500	Telesom	1,367,412
39	Angola	499	Unitel	10,496,351
40	Namibia	485	MTC	2,406,730
41	Equatorial Guinea	457	Getesa	860,761
42	Sao Tome & Principe	454	CST	105,915
43	Zimbabwe	446	Econet	20,075,782
44	South Sudan	441	MTN	411,425
45	Burkina Faso	440	Orange	9,366,221
46	Chad	439	Airtel	426,794
47	Sudan	435	Zain	3,569,650
48	**Sierra Leone**	**434**	**Orange**	**2,362,146**
49	Burundi	430	Lumitel	685,055
50	Niger	403	Airtel	9,171,766
51	Ethiopia	402	Ethio Telecom	13,185,535
52	Mauritania	361	Moov Mauritel	1,319,245
53	Central African Republic	347	Orange	148,314
54	Eritrea	315	Eritel	23,580

ARE YOU LOOKING FOR MORE DETAILED CROWDSOURCED DATA IN SIERRA LEONE?

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

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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.

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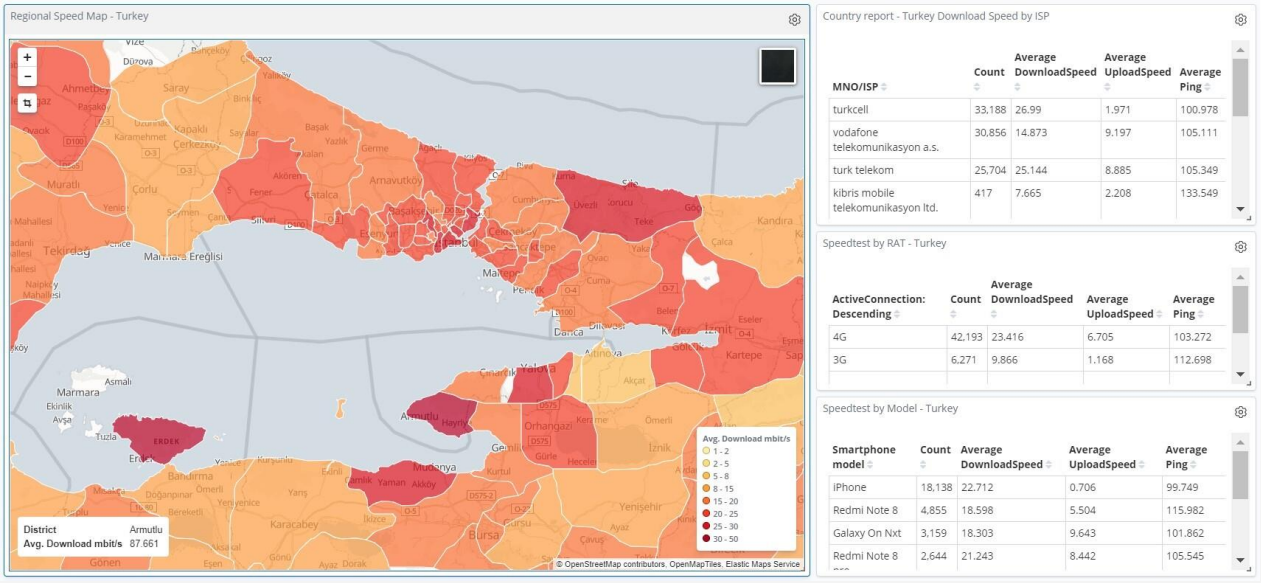
BASIC CROWDSOURCING SYSTEM

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



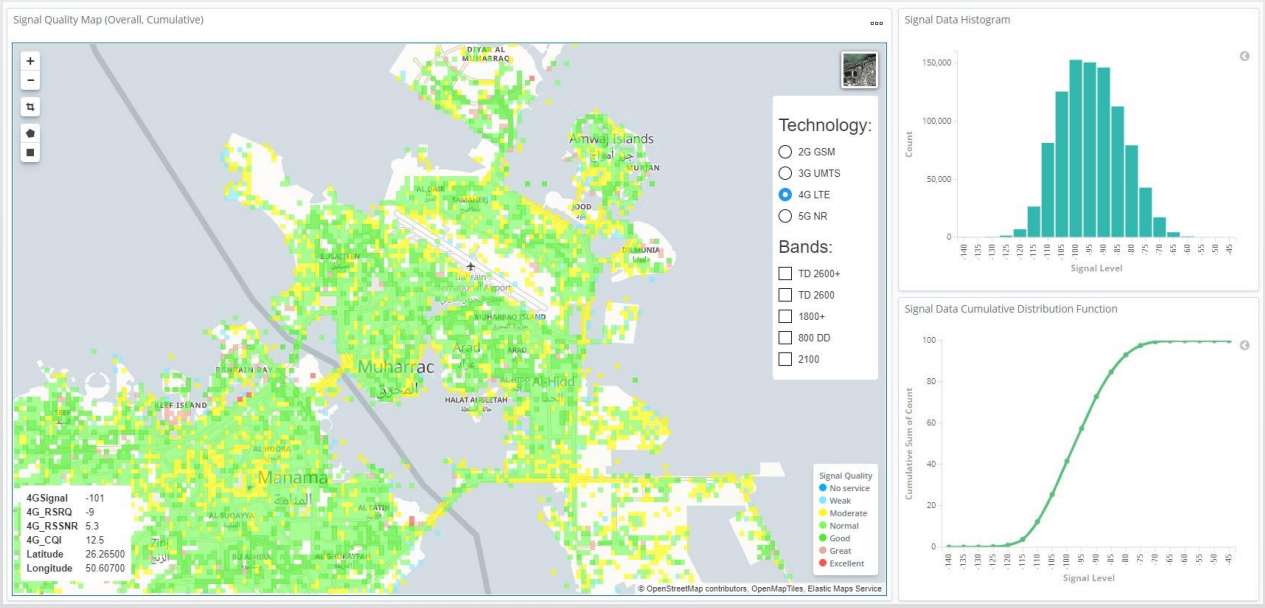
Internet Speeds

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

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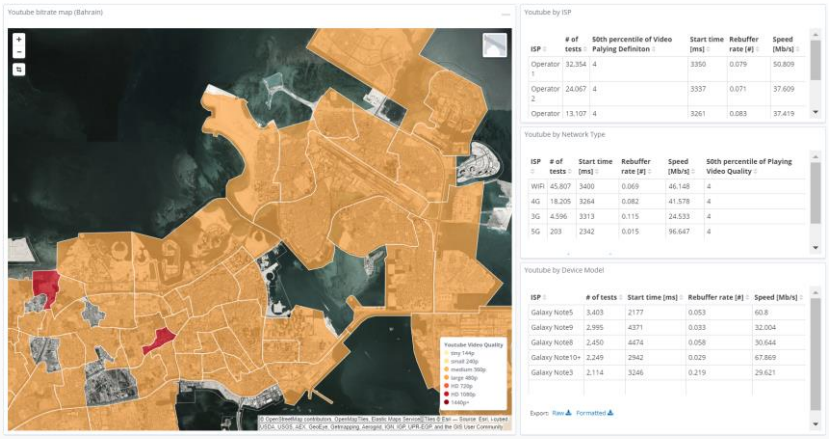
ADVANCED CROWDSOURCING SYSTEM



YouTube Quality

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

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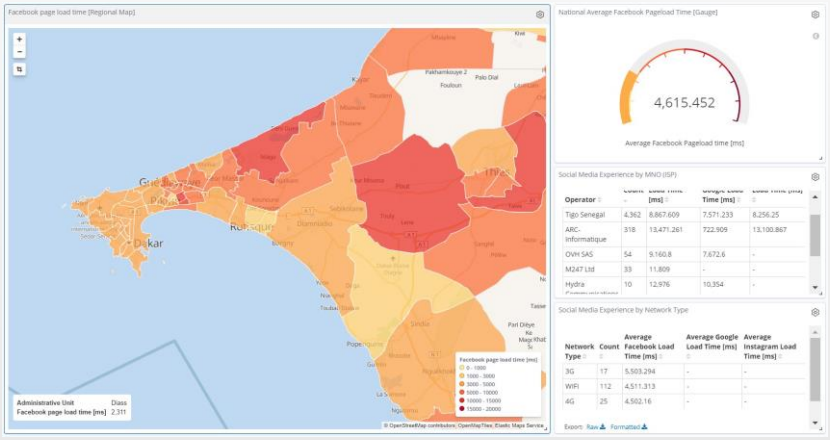

Social Media Experience

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

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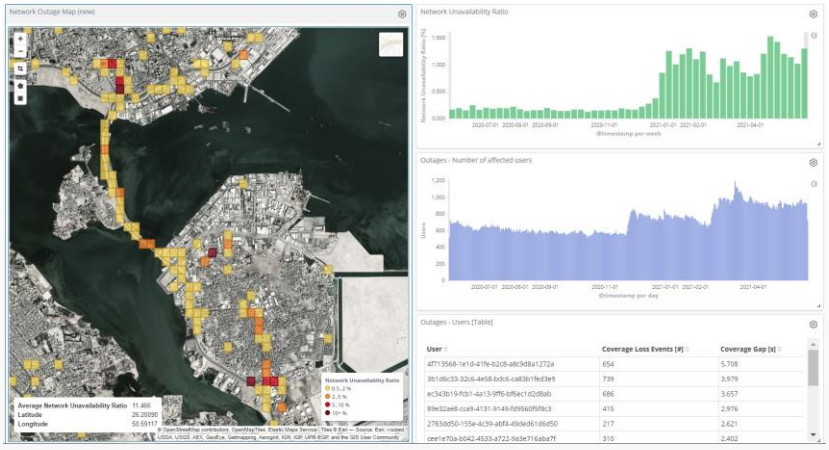
ADVANCED CROWDSOURCING SYSTEM



Outages

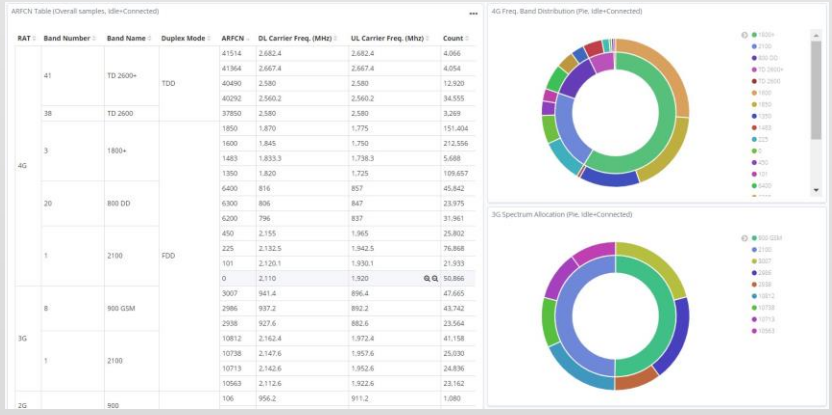
Network Availability is the number one metric for any network. While OSS data provides overall information, crowdsourcing is able to spot exact locations where subscribers are not able to attach to the network.

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

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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	$0 \leq Tp \leq 5$	1s
3	Duration of the downlink test	s	$5 \leq Td \leq 15$	5s
4	Duration of the uplink subtest	s	$5 \leq Tu \leq 15$	5s
5	Number of 'pings' during delay subtest	#	$5 \leq p \leq 20$	p = 10

COVERAGE SCORE METHODOLOGY

SpeedChecker has developed a robust and reliable methodology of assessing cellular coverage worldwide. Our data-driven approach is using billions of cellular measurements conducted by hundreds of millions of mobile devices.

Process

SpeedChecker data analysis process for mobile coverage involves four primary steps: collection, filtering, spatial aggregation, and summarization. The results of that process are used to determine coverage score on a country and operator level.

Collection

Millions of cellular measurements are received daily from Android devices around the world.

Filtering

Filtering is applied to ensure that only relevant measurements are used:

- Erroneous out-of-range measurements are excluded from datasets
- Measurements executed by inactive devices are excluded
- Measurements with inaccurate location are excluded

Spatial Aggregation

Filtered multi-RAT signal measurements collected for last 12 months are grouped into tiles of approximately 1 km2. All tiles where at least one operator service was detected are summed up to form a total country coverage footprint. Average signal strength is calculated per tile per RAT for each operator. Each operator is then assigned with a score per tile depending on average signal strength and particular RAT availability (higher RAT and stronger signal will contribute a higher score).

Summarization

Finally, scores from all tiles are summed up per operator. This forms the total operator coverage score. Total operator coverage score is then divided by the total country coverage footprint to produce an overall OPERATOR COVERAGE SCORE.

*RAT – Radio Access Type