



THE STATE OF MOBILE NETWORK EXPERIENCE

Benchmarking mobile on the eve of
the 5G revolution

MAY 2019

Author

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Opensignal active userbase:



Total Devices
43,614,234



Total Measurements
139,960,248,468



Data Collection Period
Jan 1st - Mar 31st, 2019

Opensignal is the independent global standard for analyzing consumer mobile experience. Our industry reports are the definitive guide to understanding the true experience consumers receive on wireless networks.

Key Findings

Download Speed Experience scores range from over 50 Mbps to under 2 Mbps

South Korea was the only country to score over 50 Mbps in Download Speed Experience, with the majority of countries scoring in the 10-20 Mbps range across our users. We saw a huge range of scores in this metric, with the lowest average score being less than 2 Mbps.

No country manages to break the 30ms Latency Experience milestone

In only 13 of the 87 countries we rated our users averaged Latency Experience scores under 40 milliseconds, while none scored under 30ms. One continent dominated our Latency Experience analysis, with six European countries in our top 10. 5G's designers target much improved latency as one of their goals.

Europe best for Video Experience – but no market has an Excellent rating

Of the top 25 countries who achieved Very Good ratings in Video Experience, only six were from outside Europe. Our users in Norway and Hungary both scored just over 74 points (out of 100) – meaning no country has yet achieved an Excellent Video Experience rating.

Over 5 Mbps separated the top 10 in Upload Speed Experience

The biggest variation between Upload Speed Experience scores of our users was at the top end of the table, where the gap between leader Denmark and tenth-placed Canada was over 5 Mbps.

Strong showings for the U.S. and India in 4G Availability

Only four European countries made our 4G Availability top 10 – the fewest of any of our award metrics. And both the U.S. and India made the top 10, despite being distinctly mid-table in all our other key metrics.

Europe dominates Opensignal's key metrics

A look at the leading countries across Opensignal's metrics shows the preeminence of Europe. In a ranking of the 10 countries who scored highly across all five of our key metrics, only two were from outside Europe.

Introduction

The world is poised on the brink of the 5G revolution. We're already seeing [early commercial launches](#) in leading mobile regions. While the majority of operators in mature markets are planning to upgrade in the next couple of years, 5G is likely to take several years to reach the average consumer, due to spectrum availability and the sheer time and costs involved in rolling out the next generation of mobile networks.

In this report, we've taken a deep dive into the global mobile network experience of today's consumers. We looked at data from January through March, the timeframe just prior to the first 5G services launching in South Korea and the U.S. We examined 87 countries and compared their performance across all five of our [key award metrics](#): 4G Availability, Video Experience, Download and Upload Speed Experience, and Latency Experience.

We've found that 4G is becoming more and more ubiquitous, even in developing markets. Our analysis shows that the average 4G Availability across the 87 countries experienced by our users is close to 80%, with 15 markets scoring over the 90% mark. The top ends of our tables were largely dominated by European countries, but no one country appeared in the top 10 for all five of our key metrics. European countries, however, dominated, racking up far more top 10 entries than any other region.

Opensignal's latest State of Mobile Network Experience report provides the benchmark to assess to what extent the real-world 5G experience will be superior to the existing mobile network experience enjoyed by billions of consumers worldwide.

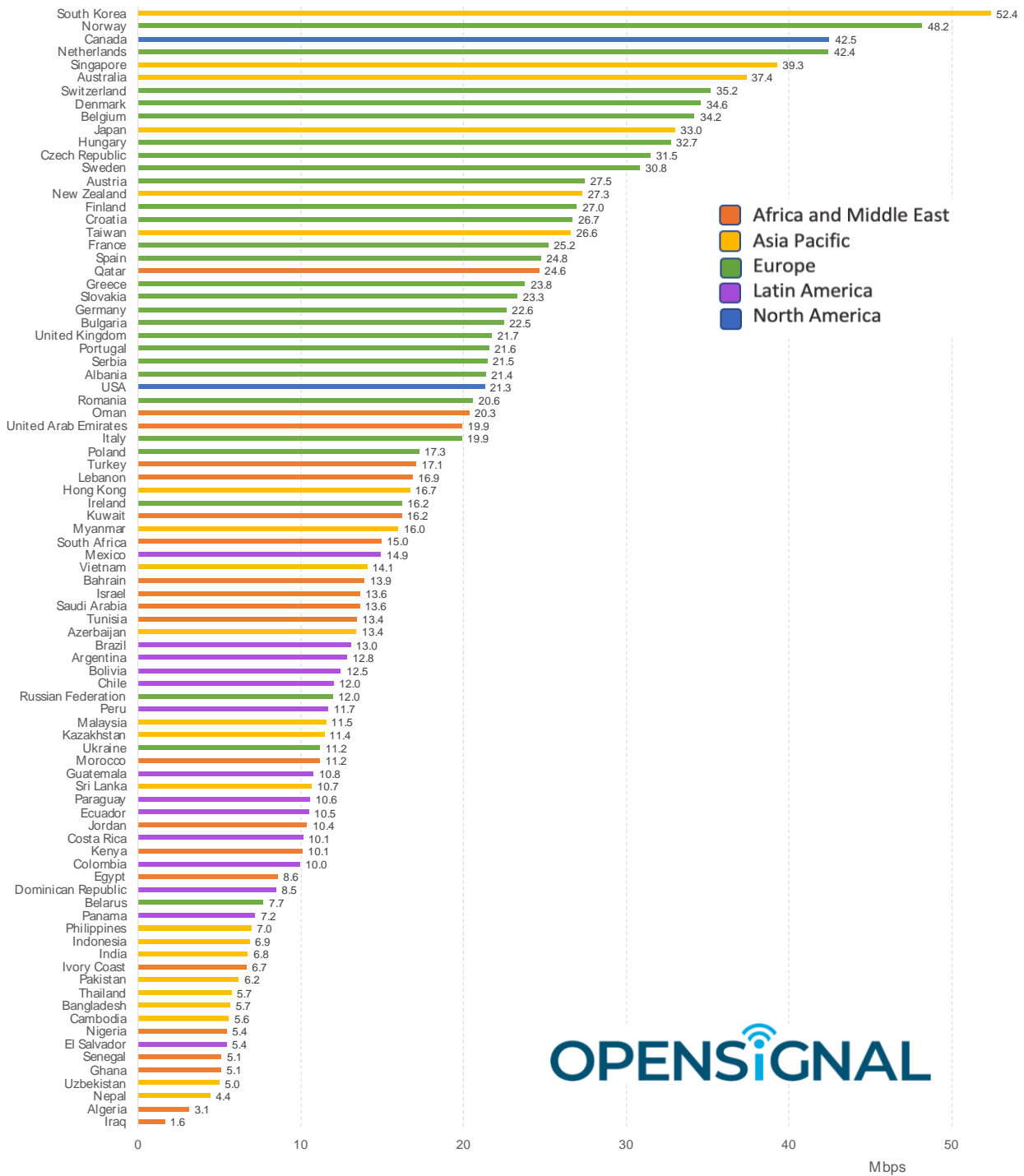
It's very early days for 5G, but we're already seeing some notable commercial network launches. 5G won't just deliver faster speeds. The new technology will provide a blanket of capacity, built using new high-bandwidth, high-frequency spectrum bands that will help mitigate the congestion which we see impacting the mobile network experience across many of our metrics. And the upgrades won't just be felt in speed — 5G will offer great improvements to latency, opening up a whole new world of mobile use cases. But it will take 5G a long time to become as ubiquitous as 4G. This report offers a snapshot of the 4G mobile network experience as we step into the 5G era.

South Korea passes 50 Mbps in Download Speed Experience – but the global average is less than 20 Mbps

On the eve of 5G's launch, South Korea was the only country where smartphone users enjoyed average mobile Download Speeds over 50 Mbps, although Norway was close behind with 48.2 Mbps. Then there was a bit of a drop in speeds to the next two countries, Canada and the Netherlands, where we measured Download Speed Experience at just over 42 Mbps. The remaining six of the top 10 markets scored in the 33-40 Mbps range. The global average score of the 87 countries we analyzed was 17.6 Mbps – barely a third of the top score.

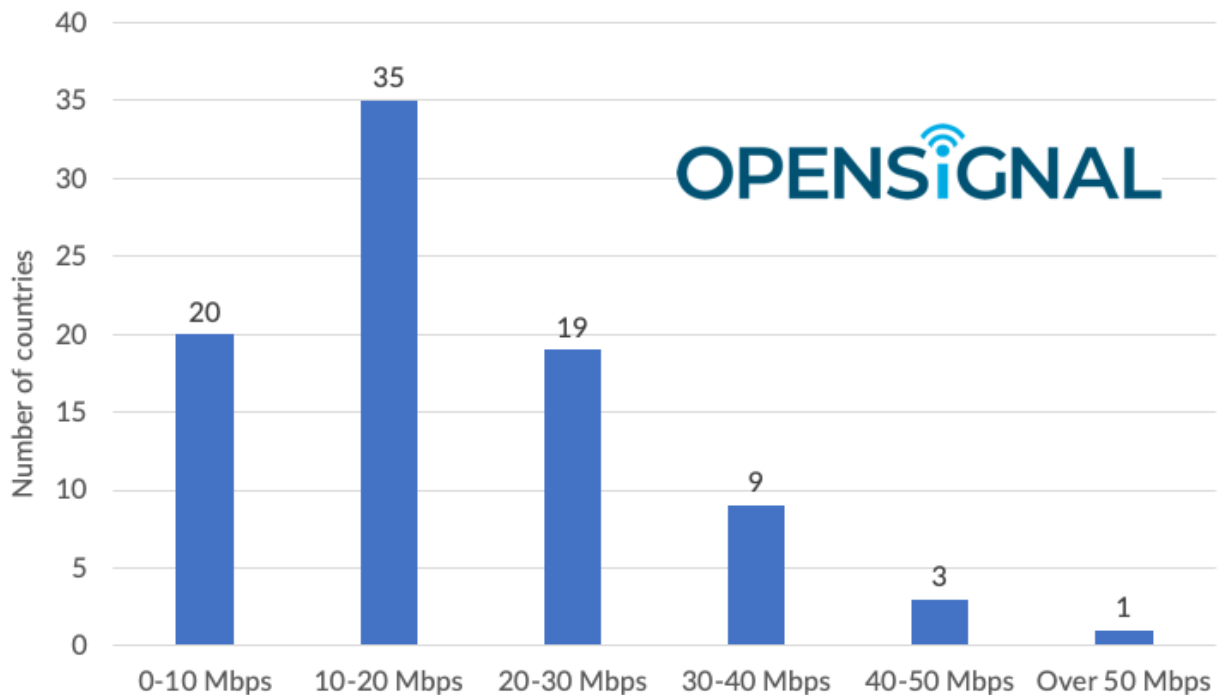
Canada's impressive third place is little surprise, since our most recent report on Canada found our users on all three operators experienced over 35 Mbps in Download Speed Experience, while speeds of over 60 Mbps weren't uncommon in the country's biggest cities.

Download Speed Experience



We saw the widest variety of scores of all our award metrics in Download Speed Experience, with average speeds ranging from over 50 Mbps to less than 2 Mbps. There were 13 countries with Download Speed Experience scores over 30 Mbps, while 35 of the 87 markets we measured fell into the 10-20 Mbps range, and 20 scored under 10 Mbps.

Number of countries by Download Speed Experience range



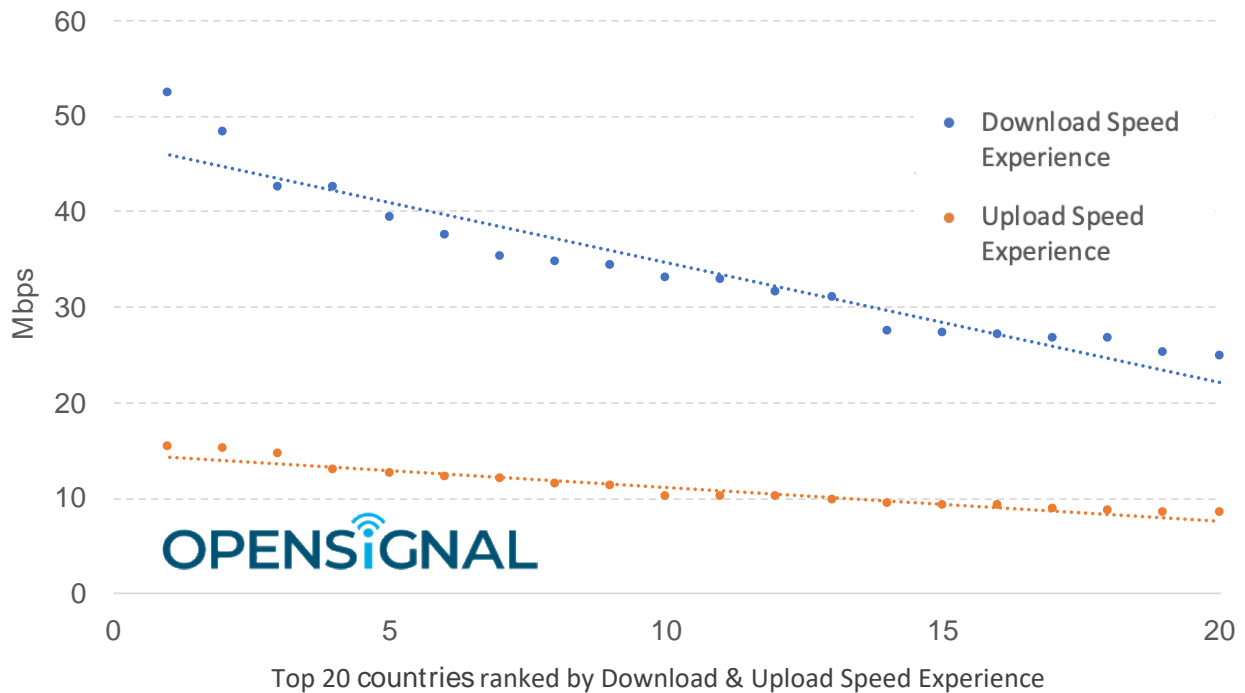
Top Upload Speed Experience scores showed a range of over 5 Mbps

A lot of the hype around 5G has been based on the huge increases in mobile network speeds it could deliver. But we are still seeing a huge range of experiences across our speed metrics. In Upload Speed Experience, top countries Denmark and South Korea both scored over 15 Mbps, while Iraq scored an average speed under 1 Mbps.

Interestingly, the widest variation between Upload Speed Experience scores was at the top end of the table. The gap between number 1 (Denmark) and number 10 (Canada) was over 5 Mbps, while below that there were 40 countries within 5 Mbps of Canada's score.

If we compare this variable with our Download Speed Experience scores though, we saw a much steeper drop-off in our download measurements with speeds more than halving among the top 20 countries. While this is partly due to a couple of outliers at the top of our Download Speed Experience table, it also illustrates the wide range of speeds experienced, even in the world's fastest markets.

Top 20 country scores by Download Speed Experience vs. Upload Speed Experience



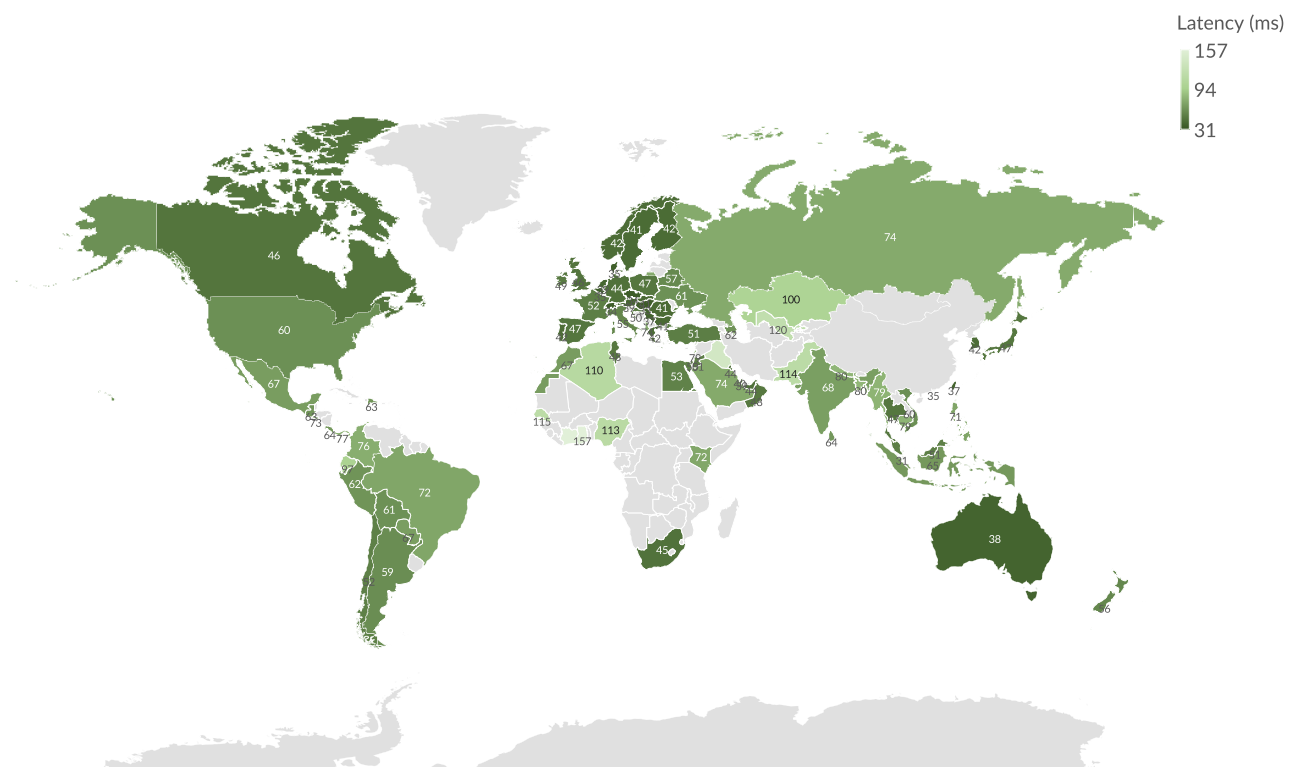
Upload speeds are typically slower than download, as current mobile broadband technologies tend to be focused on providing the best possible download speeds. But upload speed is becoming increasingly important as consumer mobile habits shift away from downloading and consuming to uploading and creating and sharing content like smartphone-created photos and videos.

A strong showing from Europe across Latency Experience

5G will not just offer great improvements in speed. The next generation of mobile technology is likely to bring great improvements in latency, opening up a whole new world of mobile use cases. But what's the current benchmark for 5G to beat? Our analysis of the global Latency Experience shows just 13 countries scored under 40 milliseconds, while none have yet managed to pass the 30ms bar (although Singapore came tantalizingly close on 30.7ms).

A couple of high-flying markets – Norway and the Netherlands – were notably absent from our Latency Experience top 10 (although the Netherlands only narrowly missed out, coming in 12th). But a look at our global heatmap shows that Europe still leads for responsive mobile experiences which are important for online gaming and real-time communications.

Latency Experience (milliseconds)



indicative of a superior overall mobile network experience, since there are many other factors to consider beyond our key metrics. And a couple of markets, India and the U.S., appear in just one top 10 but are some way behind in our other metrics. But the prevalence of European markets among the leading countries is clear.

Comparison of leading countries in Opensignal key metrics

Rankings in each metric (out of 87 countries)

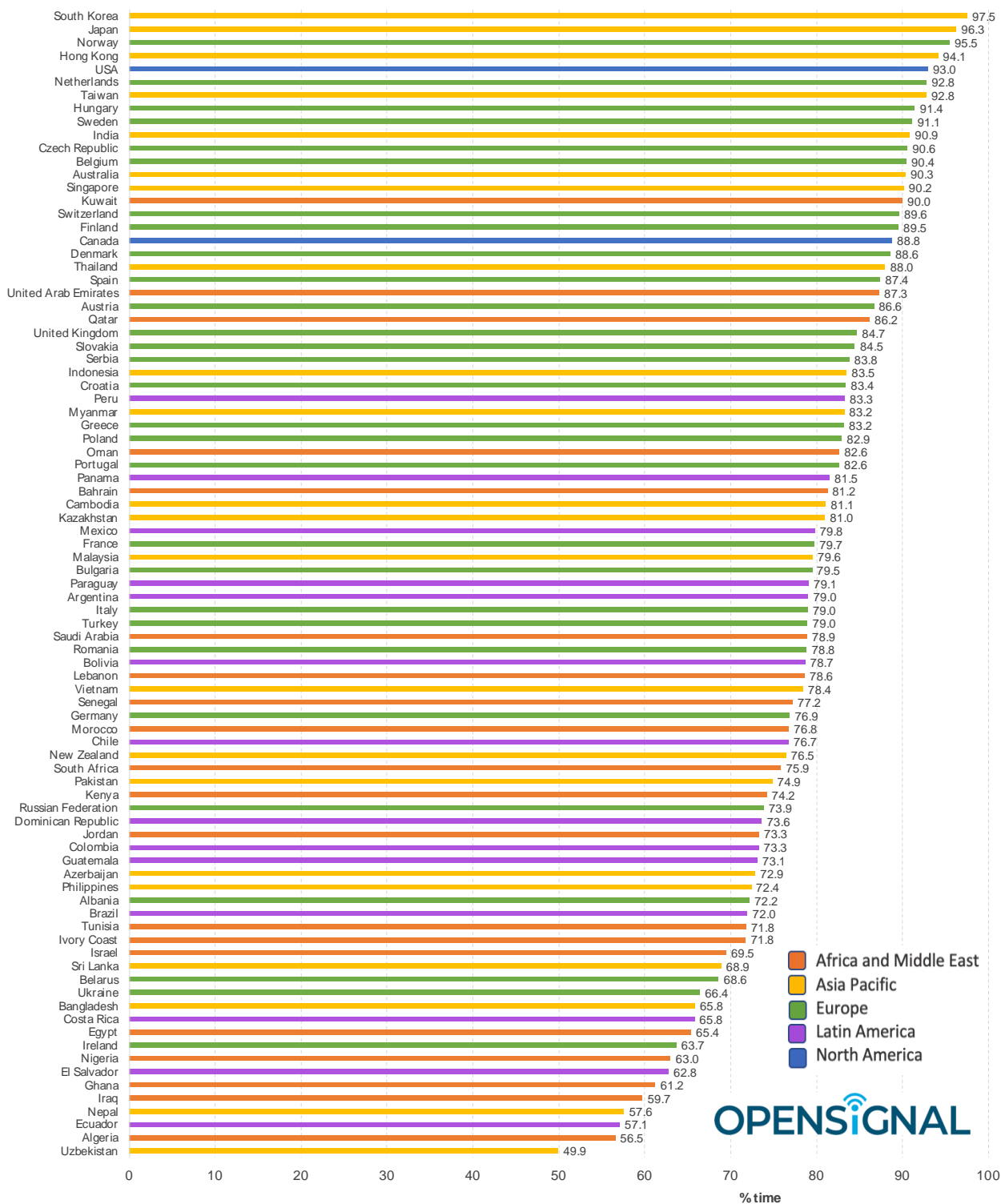
	4G Availability	Video Experience	Download Speed Experience	Upload Speed Experience	Latency Experience
Australia	13	15	6	22	10
Austria	23	4	14	17	11
Belgium	12	8	9	7	7
Canada	18	17	3	10	29
Czech Republic	11	3	12	5	3
Denmark	19	5	8	1	6
Hong Kong	4	27	38	31	5
Hungary	8	2	11	8	2
India	10	74	74	78	63
Japan	2	18	10	16	33
Netherlands	6	6	4	6	12
Norway	3	1	2	3	23
Serbia	27	23	28	28	7
Singapore	14	9	5	5	1
South Korea	1	24	1	2	21
Sweden	9	7	13	13	18
Switzerland	16	10	7	9	4
Taiwan	7	14	18	14	9
USA	5	58	30	39	50

High rankings for the U.S. and India in 4G Availability

This report provides the definitive way to compare mobile network experience between countries, to set a benchmark against which we can compare any new 5G launch. And one of the core metrics to define the mobile user experience is 4G Availability. Comparing this metric across 87 countries, we saw only four European countries in our top 10 – the fewest of any of our award categories. In all of our other mobile network experience measures, we saw at least half of the top 10 ranked countries from Europe.

However, neither Switzerland nor Singapore featured in the top-ranked countries for 4G Availability, despite both appearing in the top 10s for all our other mobile network experience metrics. And users in Japan scored second place for 4G Availability, despite barely appearing in the top countries for our other four categories. At the other end of the table, we only saw five countries with 4G Availability scores under 60%, while Uzbekistan was the only market to see users spending less than 50% of the time on 4G.

4G Availability



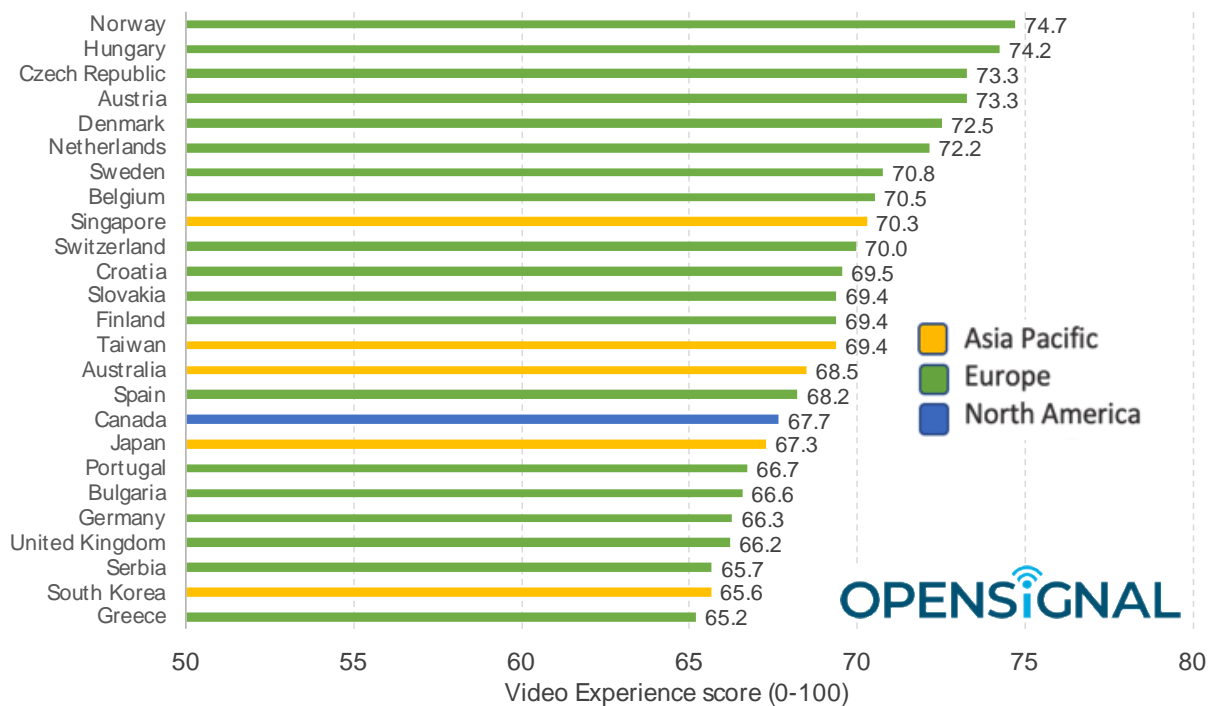
One of the standout countries to feature in the top five of our 4G Availability rankings was the U.S. The country is distinctly mid-table across all of our other key award metrics but managed a fifth-place finish in 4G Availability. In our most recent Mobile Network Experience USA report, we saw Verizon overtake T-Mobile following a fierce battle in this metric. This rivalry has driven up 4G Availability in the country, leading to a world-class position for the U.S. in our rankings.

The other notable country at the top of our 4G Availability ranking was India, which also achieved a spot among the top 10 countries. The story of India's remarkable rise to the top of our 4G Availability table began with the debut of Jio in 2016, which seriously disrupted the market with its aggressive low-cost unlimited data bundles. The operator rolled out its 4G network at a remarkable rate, hitting 97.5% 4G Availability in our last report on India – the highest score among operators we have ever measured in any of our country reports. Jio's success has in turn fuelled huge rises in LTE reach among its rivals, propelling India into our top 10 for 4G Availability – a remarkable achievement for a relatively new LTE market with such a vast geographical size and population.

Video Experience dominated by Northern and Central European markets

Offering a combination of big capacity and low latency, 5G has the potential to revolutionize the mobile Video Experience. But what's the benchmark to beat in our current global markets? The top end of our Video Experience table was dominated by European countries. Norway led in mobile Video Experience followed by Hungary – with only six non-European countries among the top 25 who all scored a Very Good rating (65-75 out of 100). 5G should mean more consumers will be able to enjoy a good mobile Video Experience more often because of the increased mobile capacity new high frequency 5G spectrum will provide to mobile operators.

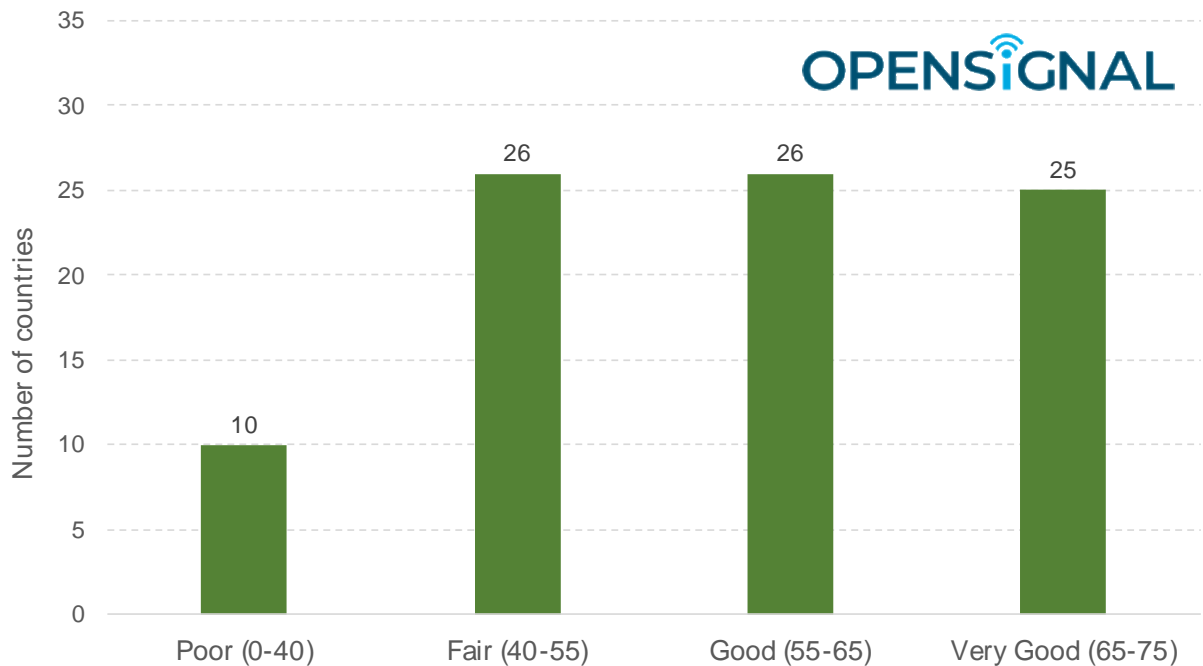
Video Experience countries with a Very Good rating



Norway and Hungary both scored just over 74 points – meaning users in no country have yet enjoyed an Excellent Video Experience rating (over 75). But we saw 10 countries with scores over 70 in our measurements, meaning we expect most of these to achieve an Excellent rating in the next year.

Europe's dominance of Video Experience extended well beyond the top of the table. Of the 25 countries that achieved Very Good (65-75) ratings, only six were from outside Europe: Singapore, Taiwan, Australia, Canada, Japan and South Korea. Lower down the table, we saw users in 26 countries enjoy a Good (55-65) Video Experience rating, while the same number scored Fair (40-55) ratings. The remaining 10 markets fell into the Poor (0-40) category. For a deep dive into our Video Experience metric, please see our State of Mobile Video report.

Number of countries by Video Experience rating



Data collection period: Jan. 1, 2019 - Mar. 30, 2019 (Source: Opensignal)

The 5G revolution begins

It's very early days for 5G, but we've seen a number of commercial launches over the past couple of months, with the U.S. and Asia leading the charge. A lot of markets are still in the process of reallocating spectrum bands for 5G use. But once the first networks are up and running and 5G devices become more widely available, we expect to see the new technology take off in a big way provided the real-world 5G experience is significantly better than the existing mobile experience.

We've seen 4G technology transform the way we use mobile devices beyond the basic voice and messaging services of the early 2000s. Faster and more ubiquitous data connectivity has spread to almost every corner of the globe, and everyday mobile experience has now grown into entirely new sectors such as online gaming, streamed video and instant financial services. And with a plethora of new services and use cases being made real by the hyper-fast speeds and low latency promised by 5G, the mobile network experience is set to metamorphize once again in the next decade.

	Download Speed Experience (Mbps)	Upload Speed Experience (Mbps)	Latency Experience (ms)	4G Availability (%)	Video Experience (out of 100)
Albania	21.4	6.2	74.1	72.2	57.6
Algeria	3.1	1.8	109.9	56.5	30.5
Argentina	12.8	4.8	58.9	79.0	58.5
Australia	37.4	8.2	37.6	90.3	68.5
Austria	27.5	8.8	38.6	86.6	73.3
Azerbaijan	13.4	3.4	61.9	72.9	53.5
Bahrain	13.9	4.8	40.1	81.2	55.4
Bangladesh	5.7	1.7	80.4	65.8	40.5
Belarus	7.7	4.3	56.5	68.6	51.2
Belgium	34.2	11.9	35.3	90.4	70.5
Bolivia	12.5	6.0	60.6	78.7	58.9
Brazil	13.0	4.5	71.5	72.0	52.1
Bulgaria	22.5	8.2	40.7	79.5	66.6
Cambodia	5.6	2.3	79.0	81.1	38.6
Canada	42.5	10.2	46.4	88.8	67.7
Chile	12.0	5.8	52.2	76.7	49.3
Colombia	10.0	3.6	75.6	73.3	48.8
Costa Rica	10.1	4.1	63.8	65.8	48.3
Croatia	26.7	10.0	50.4	83.4	69.5
Czech Republic	31.5	12.5	33.7	90.6	73.3
Denmark	34.6	15.3	34.8	88.6	72.5
Dominican Republic	8.5	3.2	62.7	73.6	46.8
Ecuador	10.5	3.7	97.3	57.1	46.8
Egypt	8.6	2.8	53.2	65.4	51.2
El Salvador	5.4	2.4	73.2	62.8	43.8
Finland	27.0	10.0	41.6	89.5	69.4
France	25.2	6.1	51.6	79.7	62.5
Germany	22.6	7.6	44.4	76.9	66.3
Ghana	5.1	1.8	157.1	61.2	34.7
Greece	23.8	6.9	42.0	83.2	65.2
Guatemala	10.8	5.7	62.8	73.1	51.0
Hong Kong	16.7	7.1	34.5	94.1	64.6
Hungary	32.7	11.4	33.4	91.4	74.2
India	6.8	2.1	67.9	90.9	42.7
Indonesia	6.9	3.1	64.6	83.5	46.7
Iraq	1.6	0.7	139.4	59.7	18.8
Ireland	16.2	5.8	48.9	63.7	61.7
Israel	13.6	7.9	49.8	69.5	52.9
Italy	19.9	7.3	55.1	79.0	64.1
Ivory Coast	6.7	2.1	156.5	71.8	38.9

	Download Speed Experience (Mbps)	Upload Speed Experience (Mbps)	Latency Experience (ms)	4G Availability (%)	Video Experience (out of 100)
Japan	33.0	9.1	47.2	96.3	67.3
Jordan	10.4	5.3	51.3	73.3	55.7
Kazakhstan	11.4	4.9	99.8	81.0	52.4
Kenya	10.1	3.8	72.1	74.2	44.1
Kuwait	16.2	8.5	44.2	90.0	62.9
Lebanon	16.9	5.4	79.3	78.6	56.0
Malaysia	11.5	4.6	51.4	79.6	51.9
Mexico	14.9	7.0	66.9	79.8	58.3
Morocco	11.2	4.0	66.5	76.8	50.4
Myanmar	16.0	6.6	78.7	83.2	62.6
Nepal	4.4	1.1	80.1	57.6	37.7
Netherlands	42.4	12.2	38.8	92.8	72.2
New Zealand	27.3	7.6	55.5	76.5	64.5
Nigeria	5.4	1.5	112.5	63.0	37.9
Norway	48.2	14.5	42.3	95.5	74.7
Oman	20.3	6.5	47.9	82.6	62.1
Pakistan	6.2	2.4	114.0	74.9	41.8
Panama	7.2	4.7	77.5	81.5	45.6
Paraguay	10.6	4.4	67.5	79.1	57.6
Peru	11.7	5.9	62.1	83.3	45.5
Philippines	7.0	2.2	71.0	72.4	35.1
Poland	17.3	6.3	47.1	82.9	63.0
Portugal	21.6	8.0	42.2	82.6	66.7
Qatar	24.6	8.5	38.9	86.2	64.8
Romania	20.6	7.8	41.3	78.8	62.3
Russian Federation	12.0	4.8	73.6	73.9	58.8
Saudi Arabia	13.6	6.6	73.5	78.9	55.6
Senegal	5.1	1.5	115.3	77.2	30.9
Serbia	21.5	7.4	37.1	83.8	65.7
Singapore	39.3	12.9	30.7	90.2	70.3
Slovakia	23.3	8.5	40.7	84.5	69.4
South Africa	15.0	4.6	44.7	75.9	58.7
South Korea	52.4	15.1	42.2	97.5	65.6
Spain	24.8	9.2	46.6	87.4	68.2
Sri Lanka	10.7	3.6	63.9	68.9	48.6
Sweden	30.8	9.7	41.4	91.1	70.8
Switzerland	35.2	11.2	34.0	89.6	70.0
Taiwan	26.6	9.3	37.3	92.8	69.4
Thailand	5.7	3.4	47.1	88.0	42.6
Tunisia	13.4	4.3	48.0	71.8	56.0

	Download Speed Experience (Mbps)	Upload Speed Experience (Mbps)	Latency Experience (ms)	4G Availability (%)	Video Experience (out of 100)
Turkey	17.1	6.1	51.0	79.0	60.4
Ukraine	11.2	5.1	60.6	66.4	54.5
United Arab Emirates	19.9	6.4	44.1	87.3	60.5
United Kingdom	21.7	7.4	46.0	84.7	66.2
United States of America	21.3	6.3	60.0	93.0	51.3
Uzbekistan	5.0	1.5	120.5	49.9	37.1
Vietnam	14.1	5.5	59.5	78.4	55.2

Our Methodology

Opensignal measures the real-world experience of consumers on mobile networks as they go about their daily lives.

We collect over 3 billion individual measurements every day from tens of millions of smartphones worldwide. Our measurements are collected at all hours of the day, every day of the year, under conditions of normal usage, including inside buildings and outdoors, in cities and the countryside, and everywhere in between. By analyzing on-device measurements recorded in the places where subscribers actually live, work and travel, we report on mobile network service the way users truly experience it. We continually adapt our methodology to best represent the changing experience of consumers on mobile networks and, therefore, comparisons of the results to past reports should be considered indicative only.

Confidence Intervals

For every metric we calculate statistical confidence intervals indicated on our graphs. When confidence intervals overlap, our measured results are too close to declare a winner. In those cases, we show a statistical draw. For this reason, some metrics have multiple operator winners.

In our bar graphs we represent confidence intervals as boundaries on either sides of graph bars. In our supporting-metric charts we show confidence intervals as +/- numerical values.

Our Metrics

4G Availability

4G Availability shows the proportion of time Opensignal users with a 4G device have a 4G connection. 4G Availability is not a measure of coverage or the geographic extent of a network.

Video Experience

Video Experience quantifies the quality of mobile video experienced by Opensignal users on real-world video streams.

To calculate Video Experience, we directly measure video streams from end-user devices, using an ITU-based approach to quantify factors such as load times, stalling and video resolution over both an operator's 3G and 4G networks. Video Experience for each operator is calculated on a scale from 0 to 100.

4G Video Experience. This metric quantifies the quality of mobile video for each operator on LTE connections as experienced by Opensignal users on real-world video streams.

3G Video Experience. This metric quantifies the quality of mobile video for each operator on 3G connections as experienced by Opensignal users on real-world video streams.

Download Speed Experience

Download Speed Experience shows the average download speed experienced by Opensignal users across an operator's 3G and 4G networks.

It factors in 3G and 4G download speeds along with the availability of each technology.

4G Download Speed. This metric shows the average download speed for each operator on LTE connections as measured by Opensignal users.

3G Download Speed. This metric shows the average download speed for each operator on 3G connections as measured by Opensignal users.

Upload Speed Experience

Upload Speed Experience measures the average upload speeds experienced by Opensignal users across an operator's 3G and 4G networks.

It factors in 3G and 4G upload speeds along with the availability of each technology.

4G Upload Speed. This metric shows the average upload speed for each operator on LTE connections as measured by Opensignal users.

3G Upload Speed. This metric shows the average upload speed for each operator on 3G connections as measured by Opensignal users.

Latency Experience

Measured in milliseconds, latency refers to the delay users experience as data makes a round trip through the network.

Our Latency Experience metric is calculated as an average of the individual 3G and 4G latency measurements based on the proportion of time Opensignal users spend connected to each network type. A lower score in this metric is a sign of a more responsive network.

4G Latency. This metric shows the average latency for each operator on LTE connections as measured by Opensignal users.

3G Latency. This metric shows the average latency for each operator on 3G connections as measured by Opensignal users.