



# QUANTIFYING THE MOBILE EXPERIENCE OF GROUP VIDEO CALLS

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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

In 2020 video has become the major enabler of group communication. The COVID-19 pandemic and the resulting widespread limitations on people's movement and social activities have meant that people are spending an increasing amount of time at home, particularly during lockdowns, and have not been able to socialize in-person as freely as before. Many of the previously in-person social interactions became virtual group interactions and video communication played a key role in maintaining those relationships.

## Japan, the Netherlands and South Korea ranked at the top in our group video calling analysis

In our group video calling analysis — which included 75 countries — Japan, the Netherlands and South Korea shared the first position scoring 68.7 points, 68.6 points and 68.2 points, respectively. In our analysis, the results represent the likelihood that all smartphone users participating in a group video call of between two and eight people will have an adequate experience that will allow the call to run seamlessly, considering real-world measures of both the video and audio components of all the users on the call. We quantify group video calling on a 0 to 100 point scale, where the higher the scores, the higher the likelihood that all smartphone users in a group call had an adequate experience.

## European countries dominated the top ranks

Europe accounted for twelve out of the top 20 countries, although none of the “big five” — France, Germany, Italy, Spain and the U.K. — figured in the top 20; by contrast, Russia was the only European country in the bottom 20 countries of our analysis. Of the remaining 8 countries in the top 20 list, six countries were from the Asia Pacific region — Australia, Japan, New Zealand, Singapore, South Korea and Taiwan, and only Qatar and Uruguay came from the remaining regions.

## Group video calling scores were up to 42.3% higher on 5G than on 4G

We compared our group video calling scores observed on 4G and 5G networks in nine leading 5G countries, including Australia, the U.S. and South Korea. Our group video calling results measured on 5G networks scored between 7.3 points and 20.2 points higher than what we observed on 4G networks in most countries — which represented a relative increase of between 11.9% and 42.3%.

## Congestion at busy times of day hurts the group video calling experience

Opensignal analyzed how our group video calling measure varied across the hours of the day. Our data showed patterns suggesting that congestion was indeed a factor affecting the likelihood that all users participating in a group video call had an adequate connection. We observed this fluctuation occurred across most countries, but we also observed that countries achieving higher group video calling scores generally had a more consistent experience across the day compared to countries with a lower score.

# Group video communication has become mainstream in 2020

2020 has been an odd year, to say the least. Recent months have been characterized by many challenges encompassing most aspects of people's lives. In the wake of the COVID-19 pandemic, widespread limitations on people's movement and social activities — which in a number of countries became full lockdowns — required people to change the way they worked, spent their time, and also socialized.

## Multi-person video calling has moved beyond business use

People have been spending an increasing amount of time at home, particularly during lockdowns. Many of what would have previously been in-person social interactions took place virtually — including social gatherings, business meetings and lectures — and video communication played a key role in maintaining those relationships. While two-person video calling has been in common use for some time, 2020 has brought the rise of multi-person video calling.

Many of the communication apps adjusted to the new demand. WhatsApp upgraded its dedicated features to allow for eight video participants on a single mobile group call, up from four previously. Other popular mobile apps already supported group video communication, even on relatively small smartphone displays. For example, WeChat supports up to nine video participants. LINE supports four. The smartphone version of FaceTime, Skype and Zoom can connect to just as many participants as their PC equivalents but display a smaller number simultaneously on a smartphone display.

# Why quantifying group video calling requires a new approach

The existing measures of mobile experience used by the mobile industry currently focus on analyzing the experience of single users. Whether we look at mobile connection speeds, latency, or even more technical parameters like jitter and packet loss, we usually consider the experiences of single users in order to understand the average experience on a network.

Group video calling is different, especially in 2020 when families, friends and colleagues need to stay in touch remotely more than ever before.

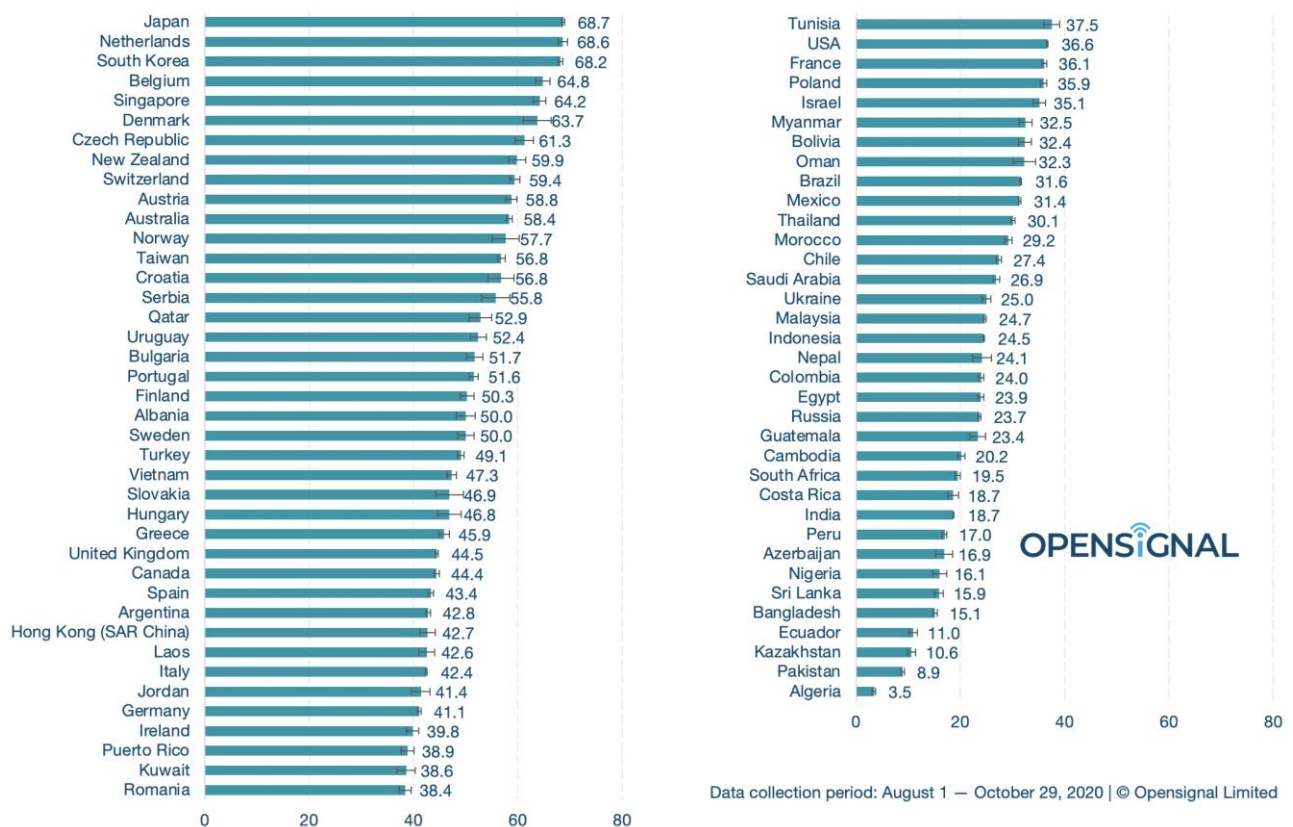
Understanding this new world requires a different way of thinking about the experience. Now there are situations where using arbitrary thresholds of network quality parameters or even taking the average experience of multiple users would not reflect their experience in the real world. A fitting example would be when multiple users are participating in a video call, where the average experience does not necessarily reflect what is really going on.

Imagine a video call where everyone has a seamlessly good mobile connection – except for one participant. That person has a very unstable connection and is also leading the call, resulting in all the other participants being unable to follow them and understand what they are saying. Or, as the person with the flaky connection struggles, tries reconnecting and adjusting their settings, the other participants have to wait while commenting on the issue. The experience of all participants in that video call will be damaged, even if the connection problem is eventually solved. In such a situation, measuring the average experience of one user will not help. Nor will examining the average experience of all participants. Either approach is unlikely to properly reflect the real experience of those users, as their experience was driven by the network quality of the participant with the worst mobile connection.

# Analyzing group video calling across 75 countries

Opensignal used an innovative approach to analyze group video calling across 75 countries starting from real-world measures of our users' voice and video experience. We found that the results spanned most of the 100-point scale, from 68.7 points in Japan to as low as 3.5 points in Algeria, showing that the group experience varies greatly across countries.

Analyzing group video calling results across 75 countries (0-100 points)



The results of our study were evenly distributed across the scale. Among the 75 countries we analyzed, the average group video calling score was 38.7 points.

Interestingly, in this analysis we observed several smaller-size countries scoring particularly well in comparison to many of the larger economies. This was likely the result of our approach being less sensitive to the high real-world measures of video and voice experience — which would normally raise the average experience seen in a country — and rather more sensitive to the number of users having a weak mobile connection. As it would be far easier for mobile operators in a smaller-sized country to provide an adequate experience to all their users compared to networks in a larger country — our results tended to favor countries of the former type.

## Japan, the Netherlands and South Korea top group video calling

The top ten countries in our analysis scored between 58.8 points and 68.7 points. They included mature mobile markets in Europe such as the Netherlands, Belgium and Denmark, as well as industrialized economies in the Asia Pacific region, such as Japan, South Korea and Singapore. On the other hand, the lowest ten countries scored 18.7 points and below, and included developing countries from Africa, South America and the Asia Pacific region.

European countries generally scored in the upper half of our table, with 23 of them showing results higher than the average, and only four scoring below it. Interestingly, the “big five” European countries — France, Germany, Italy, Spain and the U.K. — were all fairly close to the international average, with their scores ranging from 36.1 points to 44.5 points. The Nordic countries, as well as most of the other smaller-size mobile markets including Austria, Switzerland, the Czech Republic, Denmark, Belgium and the Netherlands scored in the higher part of the table, with 50 points or more.

We observed evidence of a global divide between more industrialized economies, fast growing ones and developing countries when it comes to group video calling. Of the European markets we analyzed, only Russia figured among the bottom 20% of the table, which was otherwise occupied by African, Middle Eastern, Asian and Latin American countries.

In the Americas, a large cluster of countries are positioned on the lower half of the table, although we observed a fairly long upwards tail ending with Uruguay at 52.4 points. The U.S. scored 36.6 points, almost eight points behind Canada (44.4 points) while Mexico and Brazil scored 31.4 and 31.6 points, respectively.

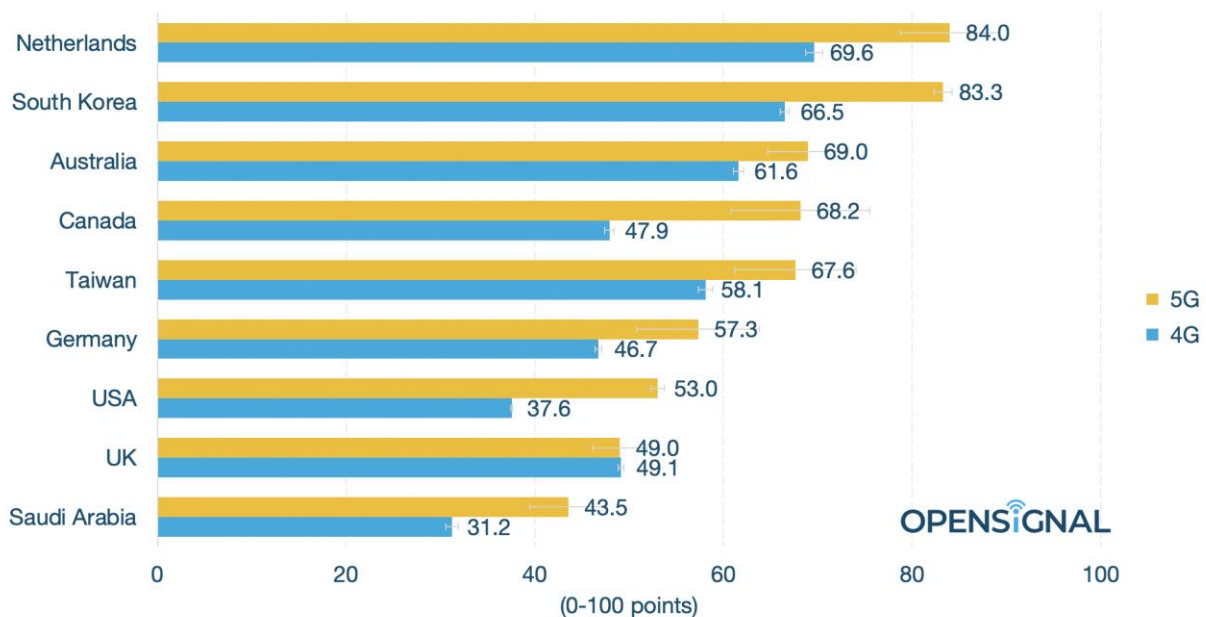
In Asia we observed countries in two main clusters at the far ends of the table. On one side, the high-scoring countries included Taiwan, Australia, New Zealand, Singapore, South Korea and Japan with scores ranging from 56.8

points to 68.7 points. On the opposite side, ten countries including India, Indonesia and Malaysia scored between 8.9 points and 24.7 points. Relatively few countries in the region scored outside of those two groups, with some notable ones including Hong Kong (42.7 points), Thailand (30.1 points) and Vietnam (47.3 points).

## 5G raised group video calling scores by an average of 11.8 points

Our data shows that 5G made a significant difference for group video calling. In most countries, when all participants were able to connect on 5G, the group video calling score was between 7.3 points and 20.2 points higher than when all users connected on 4G – which represented a relative increase of between 11.9% and 42.3%. Only in the United Kingdom did we observe a dead-heat between 5G and 4G scores.

### Analyzing group video calling results, by network generation



Data collection period: August 1 – October 29, 2020 | © Opensignal Limited

We compared our group video calling scores measured on 4G and 5G networks in nine leading 5G countries. The Netherlands and South Korea figured at the top of our table scoring 84 points and 83.3 points in group video calling on 5G networks, respectively. These scores were 14.4 points and 16.8 points higher compared to their respective scores measured on 4G.

Canada showed the highest improvement of 20.2 points between 4G and 5G group video calling scores, which were 47.9 points and 68.2 points, respectively.





This means that mobile users in Canada were 42.3% more likely to all have an adequate experience when on a group video call using 5G technology compared to 4G. Interestingly, Canada's 5G score was in line with those of Australia and Taiwan, as the three countries all scored within 2.4 points, but Australia and Taiwan's 4G baseline was more than 10 points higher than Canada's. This shows how much of a difference 5G networks made for our smartphone users experiencing group video calls in Canada.

The U.S. scored 37.6 points in group video calling on 4G networks and 53 points on 5G, a 41.2 percentage improvement of 15.5 points. Of the nine countries, the improvement we observed in the U.S. was the third highest in absolute terms — behind Canada and South Korea — but the second highest in relation to the respective 4G scores, very close to Canada's 42.3 percentage improvement.

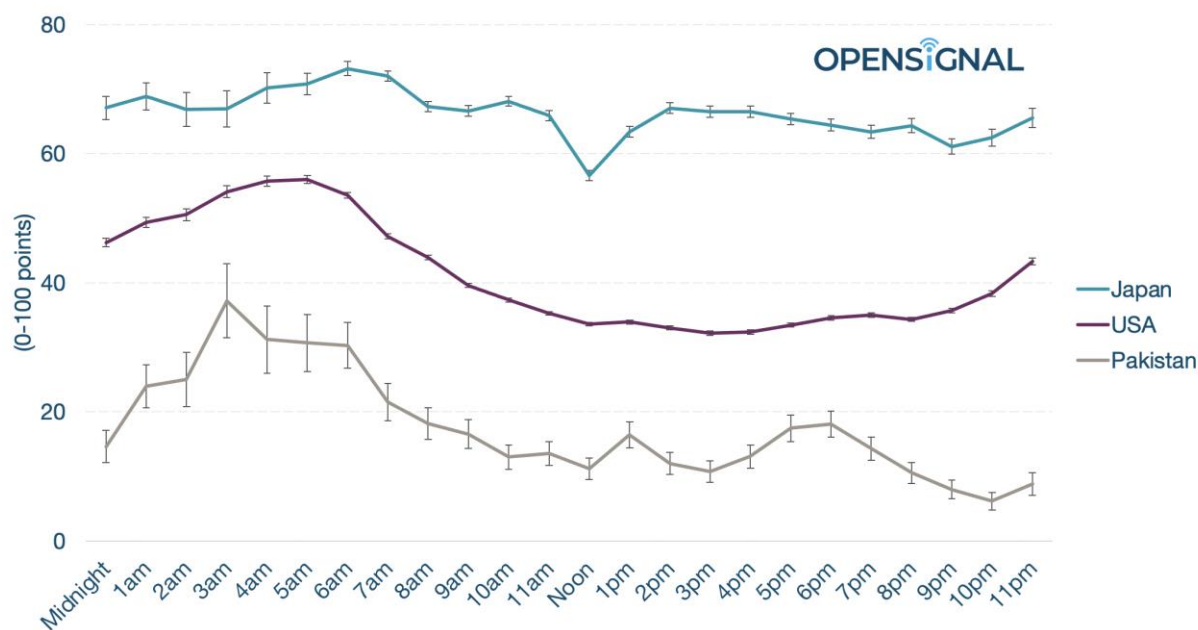


# Congestion and the time of day changed the group video calling experience

Opensignal previously showed that [mobile users' network experience varies across the hours of the day](#), and that congestion plays a key role in determining users' experience at peak hours.

Here, we have analyzed how our measure of group video calling varied across the hours of the day in Japan, the U.S. and Pakistan — three countries that ranked respectively at the top of our table, in the middle and towards the bottom. In all three countries we found patterns suggesting that congestion was indeed a factor affecting the likelihood that all users participating in a group video call had an adequate connection. However, the magnitude of congestion's impact on the experience varied considerably, as the countries in the lower portion of the table generally saw larger fluctuations during the day, while countries like Japan — that featured at the top of the table — showed much more consistent scores.

## Hourly group video calling scores in Japan, Pakistan and the U.S.



Data collection period: August 1 — October 29, 2020 | © Opensignal Limited

In Japan, our group video calling measure passed the 70-point threshold between 4 a.m. and 8 a.m. — when fewer people connected to the networks. During the rest of the day, Japan's scores generally fluctuated around 65 points, showing an inflection during the evening. However, we observed the lowest group video calling score of 56.6 points during the lunch hour at noon — when

the strain on the network is generally highest because of the large number of users consuming mobile data during their lunch break.

Also, in the U.S. and Pakistan we observed that our group video calling scores fluctuated during the hours of the day, but those swings were much wider. In the U.S., our group video calling scores ranged from 32.2 points between 3 p.m. and 4 p.m. up to 56 points seen in the small hours of the night — which represented a 74% increase compared to the busiest hour. On the other hand, in Pakistan we observed the highest score of 37.2 points between 3 a.m. and 4 a.m. which was more than six times higher than the lowest score we observed at 10 p.m. — 6.1 points.

Our data shows a common pattern across all countries, where mobile experience is highest during the small hours of the night and decreases during the day as more users connect to the networks and congestion increases. However, our data also shows that countries have different peak usage times: for example, Japan's score was lowest in the hour following noon, while in the U.S. and Pakistan we observed that the group video calling scores were lowest during the mid-afternoon and evening, respectively. Besides, we observed that countries having higher group video calling scores generally had a more consistent experience across the day, while countries having a lower score usually face a greater challenge in mobile congestion.

# Looking to 2021 and beyond

Group video calling has gained relevance in the wake of the COVID-19 pandemic as many people continue to work from home and connect with their colleagues over the phone, but also as people are restricted to socializing with family and friends virtually when governments' rules limit in-person interactions.

Group video calling has been invaluable as a means by which people can come together, share their experiences and maintain social relationships in a time when multiple challenges made it harder for everyone to be alone.

Now that consumers have tested the practicality of group video calling, we believe that it's unlikely we'll see it fade away in 2021 and beyond. Rather, we believe people will continue to use mobile group video calls to stay in touch with friends and relatives, but also keep using it in the business environment. Group video calling is very likely to stay and add to the [list of changes](#) brought into our world by the COVID-19 pandemic.

At Opensignal we pride ourselves on pioneering new and innovative ways of looking at the real-world mobile experience. We believe that no single measure can fully describe users' mobile experience, and that in order to improve our understanding we need to investigate mobile experience across its different forms and situations. Our innovative approach to the analysis of group communication provides a complementary perspective to existing measures, and it can help us — and the industry — improve our understanding of the real-world mobile experience.

Our study shows that the likelihood that all smartphone users in a group call had an adequate experience varied across countries, and across the day, as more people connected to mobile networks and caused congestion. Besides, our data shows that 5G networks made a significant difference on the group experience and that users participating on a group video call were up to 42.3% more likely to have an adequate experience when they all connected to 5G networks — showing once again the extent to which 5G can improve users' mobile experience.

# How we measured group video calling

Opensignal conducted this study on mobile experience using an alternative approach that investigates the experience of a group, taking into account each individual experience of those users forming it. This approach is built on the idea that the group communication experience depends on the connection quality of the user with the weakest link, and that just one participant having a poor connection hurts the experience of everyone on the call. We are not alone in this thinking: [WhatsApp](#) states in its mobile video calling network requirements that, “The quality of the video call will depend on the contact with the weakest connection”.

Our group video calling results represent the likelihood that all smartphone users participating in a group video call of between two and eight people will have an adequate experience that will allow the call to run seamlessly, considering real-world measures of both the video and audio components of all the users on the call. For simplicity, our analysis considered each country separately, making the assumption that users in any group video call would connect from the same country. The results are measured on an one-hundred-point scale (0 - 100), where the higher the scores, the higher the likelihood that all smartphone users in a group call had a “good enough” experience or, in other words, an adequate experience.

Opensignal's analysis of group video calling is sensitive to the number of users having a weak mobile connection: in fact, the more people in a population that have a weak mobile connection, the less likely it will be that all users on a video call will have an adequate experience, and that at least one user having a weak connection would ruin everyone's experience — regardless of how good the other participants' connections were. In effect, networks that have a small pool of users with a great experience would not see as high a score, as if we were to average the experience of their users because that would push up their score and not reflect the real group experience.

Similarly, we observed that larger countries with a higher number of users living in rural areas generally saw a lower score compared to smaller countries, or other countries where a higher percentage of the population lives in relatively small and concentrated urban areas. Mobile operators would generally find it more difficult to extend their networks and provide an adequate connection to all rural users in the former type of countries, compared to the latter — and that is why we saw several smaller-size countries come ahead of more developed economies in our group video calling results.

# Our Methodology

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

We collect billions of individual measurements every day from many 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

## Video Experience

Measures the average video experience of Opensignal users on 3G and 4G networks for each operator. Our methodology involves measuring real-world video streams and uses an ITU-based approach for determining video quality. The metric calculation takes picture quality, video loading time and stall rate into account. We report video experience on a scale of 0-100.

## Voice App Experience

Measures the quality of experience for over-the-top (OTT) voice services — mobile voice apps such as WhatsApp, Skype, Facebook Messenger etc. — using a model derived from the International Telecommunication Union (ITU)-based approach for quantifying overall voice call quality and a series of calibrated technical parameters. This model characterizes the exact relationship between the technical measurements and perceived call quality. Voice App Experience for each operator is calculated on a scale from 0 to 100.

## Games Experience

Measures how mobile users experience real-time multiplayer mobile gaming on an operator's network. Measured on a scale of 0-100, it analyzes how the multiplayer mobile Games Experience is affected by mobile network conditions including latency, packet loss and jitter to determine the impact on gameplay and the overall multiplayer Games Experience.

## Download Speed Experience

Measures the average download speed experienced by Opensignal users across an operator's 3G, 4G and 5G networks. It doesn't just factor in 3G, 4G and 5G speeds, but also the availability of each network technology. Operators with lower 5G or 4G Availability tend to have a lower Download Speed Experience because their customers spend more time connected to slower generation networks.

## Upload Speed Experience

Measures the average upload speed experienced by Opensignal users across an operator's 3G and 4G networks. Upload Speed Experience doesn't just factor in 3G and 4G speeds, but also the availability of each network technology. Operators with lower 4G Availability tend to have a lower Upload Speed Experience because their customers spend more time connected to slower 3G networks.

## 4G Availability

Measures the average proportion of time Opensignal users spend with a 4G connection on each operator's network.

## 4G Coverage Experience

Measures how mobile subscribers experience 4G coverage on an operator's network. Measured on a scale of 0-10, it analyzes the locations where customers of a network operator received a 4G signal relative to the locations visited by users of all network operators.