OpenSignal

OpenSignal Metrics & Methodology

Methodology Overview

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"We're not interested in models, simulations or assumptions. Our goal is to directly measure user experience through the eyes of the users themselves."
— Brendan Gill, CEO

OpenSignal's objective is to report as accurately as possible the typical, real-world mobile experience as recorded by our users. We strongly believe that:

- The only thing that matters when assessing network performance is how it is experienced by subscribers themselves. This is best understood by capturing the real-world experience of users as they interact with the network in the places where they actually live, work and travel.

- By making this information transparently available, we address the important need for consumers to understand the most important aspect of network performance relative to them, namely how it translates to their user experience.

Although operators have been monitoring performance from when the very first networks were built, there remains a disconnect between the KPIs and what surveys say about customer experience. We believe that the only way to bridge this gap is to measure the network using the customer's actual experience as a starting point. This user-centric approach provides a rich source of real user data from which mobile operators can accurately understand and evaluate network performance and how it is actually experienced by subscribers.

Metrics OpenSignal Publically Reports On

Metric	Definition
Availability LTE	Shows the proportion of time OpenSignal users have an LTE connection available to them on each operator's network.
Download Speed 3G	Shows the average download speed for each operator on 3G connections as measured by OpenSignal users.
Download Speed LTE	Shows the average download speed for each operator on LTE connections as measured by OpenSignal users.
Overall Download Speed	Shows the average download speed experienced by OpenSignal users across all of an operator's 3G and 4G networks. Overall speed doesn't just factor in 3G and LTE speeds, but also the availability of each network technology. Operators with lower LTE availability tend to have lower overall speeds because their customers spend more time connected to slower 3G networks.
Latency 3G	Shows the average latency for each operator on 3G connections as measured by OpenSignal users. Latency, measured in milliseconds, is the delay data experiences as it makes a round trip through the network. A lower score in this metric is a sign of a more responsive network.
Latency LTE	Shows the average latency for each operator on LTE connections as measured by OpenSignal users. Latency, measured in milliseconds, is the delay data experiences as it makes a round trip through the network. A lower score in this metric is a sign of a more responsive network.

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How OpenSignal Collects and Analyzes Data

The data we collect is used to populate OpenSignal's coverage maps and to calculate the metrics in our reports.

Our process begins with collecting 2 billion individual measurements every day from consumer devices globally, totalling tens of millions of users worldwide. Next, we apply rigorous scientific analysis to arrive at the findings we share with our customers and with the industry. The measurement, aggregation and analysis process for all our metrics is subject to extremely high levels of scrutiny, applying modern and proven data science principles.

- Measurements are collected in both indoor and outdoor locations. The majority are recorded in indoor locations, which is not surprising, since that's where typical users spend the most time.

- OpenSignal collects measurements from tens of millions of smartphones worldwide, recorded 24/7, 365 days a year, under conditions of normal usage.

- OpenSignal does not use dedicated test servers. We measure the end-to-end consumer network experience and the full path from the user device all the way to the Content Delivery Networks (CDNs) such as Google, Akamai and Amazon.

- OpenSignal does not partner with any operator anywhere in the world to distribute or promote our apps.

- OpenSignal performs tests of network speed in both the foreground or Manual Mode (user initiated tests) and in the background or Automated Mode (no user interaction). The majority of measurements are generated through background testing. These tests are executed independently and at random intervals to capture what users are experiencing at a typical moment in time.

- Because of the breadth of measurements collected directly from users, this leads to capturing the network highs and lows much better and faster and enables operators to find problem areas more quickly. Before the advent of on-device measurements this was not feasible.

Interpretation & Analysis of Data

OpenSignal uses a rigorous post-processing system that takes the raw test results and calculates robust and representative average metrics. This includes some detailed cleansing and filtering of the raw data. For example, if a user failed to download any content, this measurement is eliminated and treated as a 'failed test' rather than being included in the average speed calculation. Also, when calculating metrics on a given network technology (e.g. 4G), we eliminate tests where we detected the network type changed (e.g. from 4G to 3G) during the duration of the test.

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Process	Action taken
Initial filtering	We automatically filter out certain entries, e.g. when a phone is in a call or if no device ID recorded.
Operator name mapping	We remove results from MVNO subscribers and subscribers who are roaming. Because they may be subject to different QoS restrictions than an operator's typical customers.
Selection of network type	We consolidate data into technology types e.g. when considering 3G connections, we include HSDPA, HSUPA and UMTS R99 into one group.
Dual-SIM devices	For each device if we fail to see a dominant network being used for tests we will remove that device from calculations.
Scientific averaging	We calculate a single average to ensure every device has an equal effect on the overall result. Effectively, we employ a 'one device, one vote' policy in our calculations.
Removing extreme values	We eliminate a percentage of extreme high and low values, to ensure data fidelity.

Calculating the Metrics

The remaining per device values are combined using a simple average to yield the OpenSignal metrics that are found in our reports and analysis. For each of our reports, we show the number of unique devices within the measurement period that contributed to the report and the number of individual tests or samples. The sample size will differ for each mobile operator, as users can only test their own network providers' performance.

We also provide an upper and lower level of confidence per operator. Confidence metrics provide information on the margins of error in the datasets. In cases where confidence intervals overlap the results must be declared as a draw. For this reason, some metrics have multiple operator winners in our reports.

About OpenSignal

OpenSignal, a mobile analytics company, is the global standard for measuring real-world mobile network experience. Using billions of measurements collected 24/7 from tens of millions of smartphones, OpenSignal analyzes real-world mobile network experience at the largest scale and frequency in the wireless industry: by operator and country, regionally and worldwide. OpenSignal believes measuring how the network performs directly through users' eyes is key to building better wireless networks. Network operators, telecoms regulators, equipment makers and analysts use OpenSignal's mobile analytics insights to inform industry analysis and make key business decisions.