

Methodology: Availability Claims

Availability represents the percentage of users who spend the majority of their time on a given cellular technology, both on and off of their subscriber (SIM) network (i.e., roaming).

This document is intended to provide licensees of Ookla Marketing Rights and interested parties with transparency into the methodologies used to calculate and validate Availability claims. This document may be shared with regulatory bodies, media or others, as needed.

Availability claims are based on data from coverage scans taken on Android devices. Coverage scans are used to construct daily timelines for each device. Then, daily per-device durations on subscriber network, active network, and cellular technology (e.g., 3G, 4G, 5G) are calculated for a given geographic area of interest. Next, the percentage of time the device spends on each cellular technology is determined based on the geographic area and time period of interest. Each device is assigned to the cellular technology on which it spent the greatest amount of time. Finally, the proportion of devices on a given technology for a subscriber network comprise the final Availability metrics seen in Speedtest Intelligence®.

Process

Ookla's data analysis process consists of four main steps: collect, filter, normalize and aggregate. The outputs of this process are then leveraged to determine Availability claim approvals.



Collection

Android Speedtest® users can enable or disable coverage scan collection at any time. When enabled, Android devices running the Speedtest app capture key characteristics of each user's experience with the surrounding mobile networks throughout the day. Each coverage scan includes information about the mobile network that device is connected to — or not — as well as information about the connection to that network. These scans occur periodically or whenever another application refreshes the device's location.



Filtering

To ensure that the data is accurate and reflective of actual consumer experience, raw scan data is filtered using Ookla's proprietary data quality filters. Scans from devices with inactive SIM cards are excluded, as are scans from devices where relevant permissions have not been granted. We require there be evidence that the device has had service within recent history; this helps us exclude devices that do not have relevant service plans. We refer to these filters as our "service-active" and "5G active" filters. In order for a device to be service-active, a device must have recorded being in service within the half yearly claim period. In order for a device to be 5G-active, a device must have had 5G service at some point within the half yearly claim period. Additionally, scans with inconsistent indicators of cellular service are removed.



Normalization

Daily durations for a geographic area of interest are constructed from the device timelines by calculating the sum of durations grouped by device, subscriber network, active network and cellular technology category. However, because there can sometimes be a considerable gap in time between two scans, a maximum duration of 30 minutes is set.



Data Aggregation

Using daily samples, the percentage of time that a device spends on each cellular technology and subscriber network (both on- and off-network) is calculated for a given area and time period of interest. The device is assigned to the cellular technology on which it spent the most time. In the rare case that a device spends equal amounts of time on more than one category of cellular technology, they are assigned to the category representing the most advanced technology (e.g., 5G is chosen when a device spends equal time on 4G and 5G). The percentage of devices in each cellular technology category comprise the final Availability aggregates.

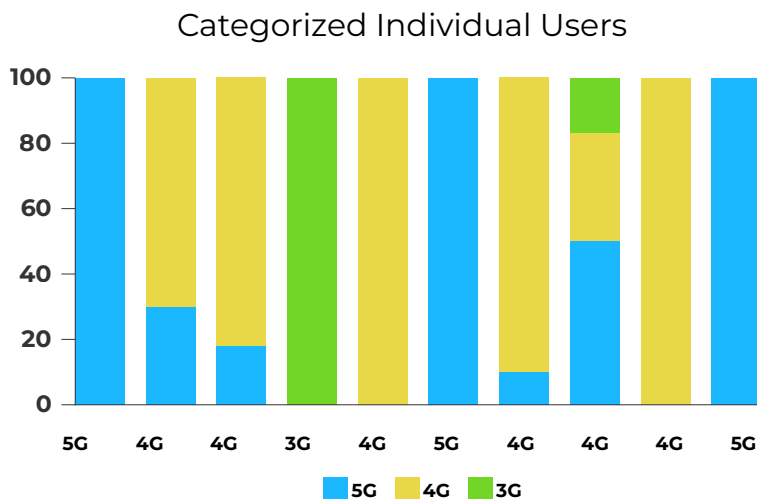


Statistical Evaluation

To evaluate Availability claims we use a logistic regression to model network availability by provider, and apply Dunnett's Contrasts, also called multiple comparisons to control (MCC), to the fitted model to compare all providers to the top-ranked provider and adjust for multiple comparisons.

Understanding Availability

Each bar represents the proportion of time a single user spends on each of three cellular technologies (3G, 4G and 5G). Each user is assigned to the technology on which they spend the most time, indicated by the label at the top of the bar. The number of users in each technology category are counted and divided by the total, 10, to calculate the proportion in each category and the aggregate Availability for the given time period.



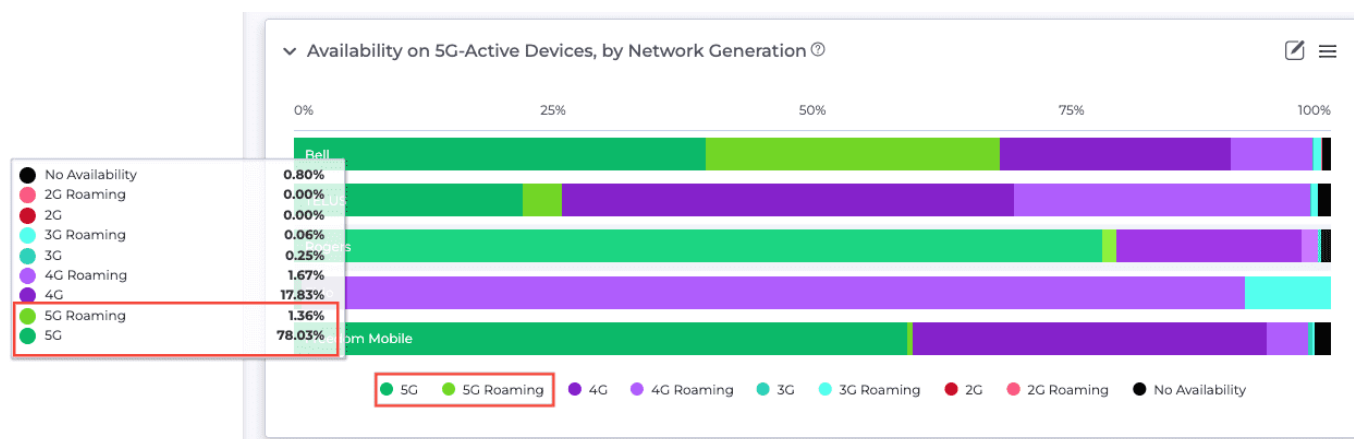
Market Availability

Technology	Users	Availability
5G	3	30%
4G	6	60%
3G	1	10%

*users spending the majority of their time on a single cellular technology

Interpreting Availability in the Speedtest Intelligence Portal

To determine the 5G Availability of a provider in the portal, we would look at 5G-Active Devices, then add 5G and 5G Roaming percentages.



4G Availability would be monitored in the Availability on Service-Active Devices, by Network Generation section, and would add the 4G, 4G Roaming, 5G and 5G Roaming percentages together, since 4G Availability is calculated on all 4G service-active devices with Availability on 4G or later cellular technology.

