Broadband Data Collection

Data Specifications for Mobile Speed Test Data

November 18, 2022

Table of Contents

Change Log

Revision	Date	Comments
1.0	2022-03-09	Initial release.
1.0.1	2022-03-17	Added Change Log; updated spectrum_band field to record a string value instead of integer in Mobile Speed Test Data specification.
1.1	2022-09-15	Added Section 6 Entity Mobile Testing Methodology Information; updated text of Section 1 Overview.
1.2	2022-11-08	Fixed typos; updated data validation information throughout Section 5.1 to match BDC system validations.
1.3	2022-11-18	In Sections 2.1. and 2.1.2, clarified that, for bulk mobile crowdsource data, the listed Test Object attributes are optional if the test includes at least one download or upload speed measurement.

1 Overview

As part of the Federal Communication Commission's (FCC or the Commission) Broadband Data Collection (BDC), individuals and entities can take on-the-ground speed tests of mobile network coverage and submit the results of those tests to the FCC.

The speed test results for the BDC may be collected and submitted to the FCC via different mechanisms depending on who takes the speed test and the purpose of the test. Specifically, mobile speed test data fall into five categories:

1. Consumer Crowdsource: speed tests that are (a) conducted by members of the general public using the FCC Speed Test app or an approved third-party mobile app, and (b) are not intended to formally dispute a mobile service provider's claimed coverage. These test results are not considered valid challenge data and will be used by the Commission to inform its understanding of mobile coverage data.
2. Consumer Challenge: speed tests conducted by members of the general public using the FCC Speed Test app or an approved third-party app that are submitted to formally dispute a mobile service provider's claimed coverage.
3. Entity Crowdsource: speed tests that are (a) conducted by service providers, state, local, or Tribal governments, or other entities using their own hardware or software, and (b) are not submitted to formally dispute a mobile service provider's claimed coverage. These test results are not considered valid challenge data and will be used by the Commission to inform its understanding of mobile coverage data.
4. Entity Challenge: speed tests conducted by service providers, state, local, or Tribal governments, or other third-parties using their own hardware or software that are submitted to formally dispute a mobile service provider's claimed coverage.
5. Provider Response: speed tests that are conducted by service providers using their own hardware or software, and are submitted to provide on-the-ground measurements in response to a challenge or a Commission verification inquiry.

Consumers or members of the general public interested in submitting mobile speed tests as crowdsourced data or as part of the challenge process may use the FCC Speed Test app or other third-party apps approved by the Office of Engineering and Technology (OET) on iOS or Android devices to conduct and automatically submit data. All consumer speed test data must be transmitted to the FCC's BDC system by the third-party app developer from its servers via an Application Programming Interface (API), and such data must conform to the specifications detailed below.

Entities – including service providers, state, local, and Tribal governments, as well as other third-parties (e.g., consumer groups, non-governmental groups, etc.) – interested in submitting mobile speed tests as crowdsourced data or as part of the mobile challenge process may use their own hardware or software to conduct bulk collections of mobile speed tests. Such bulk speed test data must be submitted in the BDC system either via file upload or through use of the BDC filer API, and such data must conform to the specifications detailed below. An entity interested in submitting such data must first be authenticated in the BDC system.

Service providers that submit on-the-ground measurements in response to a challenge or a Commission verification inquiry may use their own hardware or software to conduct mobile speed tests. All provider response speed test data must be submitted in the BDC system either via file upload or through use of the BDC filer API, and such data must conform to the specifications detailed below. A service provider submitting such data must first be authenticated in the BDC system.

Section 5 of this document provides the data structure used for all mobile speed test data collected as part of the BDC. The data must be submitted in a JavaScript Object Notation (JSON) file format and match the specifications below. Sections 2 through 4 explain which attributes detailed in the common data structure are optional and which values may be null, depending on the type of entity submitting the data, the purpose of the data, the device operating system, and other factors. Section 6 describes the information that entities must provide when using their own hardware or software to collect on-the-ground speed test data.

Instructions for governmental entities, other entities, and mobile providers on how to use the API to submit data into the BDC system will be provided at a later date.

This document provides guidance on the requirements of the Commission's rules and explains how to make the required filings in the system. The rules governing the Broadband Data Collection (formerly known as the Digital Opportunity Data Collection) can be found in 47 CFR § 1.7004 *et seq.* Additional information on the rules can be found in the FCC's BDC orders, which are available at https://www.fcc.gov/BroadbandData/resources on the "Releases" tab.

The FCC may publish updates to this document. In addition, other materials related to the BDC generally, and mobile speed test data specifically, have been and will be made available on the FCC's Broadband Data Collection Resources page of the FCC's website at https://www.fcc.gov/BroadbandData/resources and at the online help center at http://www.fcc.gov/BroadbandData/help..

2 Crowdsourced Data

2.1 Mobile Crowdsourced Data

Mobile crowdsourced data is submitted by authenticated entities in the BDC system using either a file upload process (in the system's challenge process module) or a filer API. In addition, authorized mobile speed test app providers can submit consumer crowdsourced speed test results to the BDC system via an API. All mobile crowdsourced data must be submitted as tabular data file in a standardized format specified below.

Crowdsourced data may contain less information than required for mobile challenges, but otherwise will use the same data specifications and API specifications. Consumers and entities submitting crowdsourced data must provide identifying information and certify to the accuracy of the data.

Data Name	Parties	Description / Notes
Mobile Consumer Crowdsourced Data	Consumers	Records of mobile speed tests or other mobile measurements (e.g., signal strength, etc.) in tabular format. *- Note: providers will be notified when mobile consumer crowdsourced data have been submitted but such data do not, on their own, initiate the mobile challenge process or otherwise obligate a provider to respond.*
Mobile Entity Crowdsourced Data	Service Providers Governmental Entities Other Entities	Records of mobile speed tests or other mobile measurements (e.g., signal strength, etc.) in tabular format. *- Note: providers will be notified when mobile entity crowdsourced data have been submitted but such data do not, on their own, initiate the mobile challenge process or otherwise obligate a provider to respond.*

2.1.1 Mobile Consumer Crowdsourced Speed Test Data

This file must contain records of each mobile speed test. The file must be in JavaScript Object Notation (JSON) format and match the specifications provided in **Section 5.1**.

For crowdsourced data, the following **Test Object** attributes are optional so long as the test includes at least one download or upload speed measurement:

- download
- upload
- latency

To account for limitations on the iOS platform, the following attributes are optional or have values that may be null when submitting crowdsourced data for devices running iOS:

- **Submission Object**
  - device_tac
  - net_mobile_country_code
  - net_mobile_network_code
  - sim_mobile_country_code
  - sim_mobile_network_code
- **Download Test Object**
  - carrier_aggregation_flag
  - network_connected_flag
  - network_available_flag
  - network_roaming_flag
- **Upload Test Object**
  - carrier_aggregation_flag
  - network_connected_flag
  - network_available_flag
  - network_roaming_flag
- **Latency Test Object**
  - carrier_aggregation_flag
  - network_connected_flag
  - network_available_flag
  - network_roaming_flag
- **Cell Object**
  - physical_cell_id
  - cell_connection
  - signal_strength
  - rssi
  - rsrp
  - rsrq
  - sinr
  - csi_rsrp
  - csi_rsrq
  - csi_sinr
  - cqi
  - spectrum_band
  - spectrum_bandwidth
  - arfcn

2.1.2 Mobile Entity Crowdsourced Speed Test Data

This file contains records of each mobile speed test in JavaScript Object Notation (JSON) format matching the specifications provided in **Section 5.1**. All attributes and values are required (unless the attribute is nullable and the value is null).

For crowdsourced data, the following **Test Object** attributes are optional so long as the test includes at least one download or upload speed measurement:

- download
- upload
- latency

3 Challenge Process Data

3.1 Mobile Challenge Data

Speed test data for the BDC mobile challenge process can be submitted by authenticated entities in the BDC system using either a file upload process or a filer API. In addition, authorized mobile speed test app providers can submit mobile challenge speed test results from consumers into the BDC system via an API. All mobile crowdsourced data must be submitted as tabular data file in a standardized format specified below.

Challenge data submitted by consumers may be taken on iOS devices and therefore contain less information than is required for challenge data submitted by governmental or other entities, but in both cases challenge data must contain more information than required for crowdsourced data. Otherwise, the data will use the same data specifications and API specifications. Consumers submitting challenge data via mobile app must provide identifying information and certify to the accuracy of the data.

Data Name	Parties	Description / Notes
Mobile Consumer Challenge Speed Test Data	Consumers	Records of mobile speed tests, including download, upload, and latency test metrics, challenging a provider's coverage data. *- Note: certain technical measurements are unavailable on iOS devices and thus are optional for consumer challenge data.* *- Note: providers will be notified when mobile challenge data have been submitted and a challenge created. Once an area is challenged, providers have 60 days to respond.*
Mobile Entity Challenge Speed Test Data	Service Providers Governmental Entities Other Entities	Records of mobile speed tests, including download, upload, and latency test metrics, challenging a provider's coverage data. *- Note: all technical measurements are required for entity challenge data, and thus entities cannot use iOS devices to submit such data.* *- Note: providers will be notified when mobile challenge data have been submitted and a challenge created. Once an area is challenged, providers have 60 days to respond.*

3.1.1 Mobile Consumer Challenge Speed Test Data

This file must contain records of each mobile speed test. The file must be in JavaScript Object Notation (JSON) format and match the specifications provided in **Section 5.1**.

To account for limitations on the iOS platform, the following attributes are optional or have values that may be null when submitting challenge data for devices running iOS:

- **Submission Object**
  - device_tac
  - net_mobile_country_code
  - net_mobile_network_code
  - sim_mobile_country_code
  - sim_mobile_network_code
- **Download Test Object**
  - carrier_aggregation_flag
  - network_connected_flag
  - network_available_flag
  - network_roaming_flag
- **Upload Test Object**
  - carrier_aggregation_flag
  - network_connected_flag
  - network_available_flag
  - network_roaming_flag
- **Latency Test Object**
  - carrier_aggregation_flag
  - network_connected_flag
  - network_available_flag
  - network_roaming_flag
- **Cell Object**
  - physical_cell_id
  - cell_connection
  - signal_strength
  - rssi
  - rsrp
  - rsrq
  - sinr
  - csi_rsrp
  - csi_rsrq
  - csi_sinr
  - cqi
  - spectrum_band
  - spectrum_bandwidth
  - arfcn

3.1.2 Mobile Entity Challenge Speed Test Data

This file must contain records of each mobile speed test. The file must be in JavaScript Object Notation (JSON) format and match the specifications provided in **Section 5.1**. All attributes and values are required (unless the attribute is nullable and the value is null).

4 Provider Response Data

4.1 Mobile Provider Response Data

Mobile service providers whose coverage data have been challenged may optionally submit either the results of mobile speed tests or infrastructure information as response data, along with other data relevant to rebut the challenge, or else concede the challenge. Mobile service providers that are the subject of an inquiry as part of the Commission's verification process must submit either the results of mobile speed tests or infrastructure information. Regardless of the type of data submitted in response to a challenge or verification inquiry, the Commission may subsequently require the mobile service provider to submit additional information if needed to ensure an adequate review, including but not limited to either infrastructure or mobile speed test data (to the extent not the option initially chosen by the provider) or data collected from network transmitter monitoring systems or software (to the extent available in the provider's network).

Response speed test data submitted by mobile service providers must contain the same level of information required for challenge data submitted by governmental or other entities and must conform to the same data specifications and API specifications. The data must be submitted in the BDC system via file upload or an API. Mobile service providers submitting response data must provide certifications to the accuracy of the data.

Data Name	Parties	Description / Notes
Mobile Provider Response Test Data	Service Providers	Records of mobile speed tests, including download, upload, and latency test metrics, measuring the provider's coverage for the area subject to challenge or verification inquiry in tabular format. *- Note: providers have 60 days to submit response data.*

4.1.1 Mobile Provider Response Speed Test Data

This file must contain records of each mobile speed test. The file must be in JavaScript Object Notation (JSON) format and match the specifications provided in **Section 5.1**. All attributes and values are required (unless the attribute is nullable and the value is null).

5 Common Data Formats

5.1 Common Mobile Speed Test Data

This section details the data structure common for all mobile speed test data in the Broadband Data Collection. This file contains records of each mobile speed test in JavaScript Object Notation (JSON) format matching the specifications in the table and sections below:

Field	Data Type	Example	Description / Notes
submission_ category	Enumerated	Consumer Challenge	Category of data submission. *- Value must be one of the following:* *{Consumer Crowdsourced|Consumer Challenge|Entity Crowdsourced|Entity Challenge|Provider Response|Other}*
contact	Contact Object		Contact information about the user. *Note: the specifications for the Contact Object are described in **Section 5.1.1**.*
submissions	Array [Submission Object]		List of crowdsourced data or challenge submissions. *Note: the specifications for the Submission Object are described in **Section 5.1.2**. It includes the Test Object, which includes the Download Test Object, Upload Test Object, and Latency Test Object. Each of these contains at least two Location Objects and one or more Cell Objects.*

5.1.1 Contact Object

Field	Data Type	Example	Description / Notes
name	String	Jane Broadband	Full name of the user.
email	String	jane.broadband@fcc.gov	Email address of the user. *- Value must match valid email address format, e.g.: atom@domain.tld.*
phone	String	888-225-5322	Phone number of the user. *- Value must match valid US phone number format, if not null: 000-000-0000.* *- Value may be null if the submission_category value is Consumer Crowdsourced, Entity Crowdsourced, Provider Response, or Other.*

5.1.2 Submission Object

Field	Data Type	Example	Description / Notes
test_id	String	1643422599	Unique identifier used by the app or entity to differentiate tests. *- Value must be unique across all data submitted by a third-party speed test app vendor if the submission_category value is Consumer Crowdsourced or Consumer Challenge.* *- Value must be unique across all data submitted by the same entity if the submission_category value is Entity Crowdsourced, Entity Challenge, Provider Response, or Other.*
device_timestamp	Datetime	2022-01-28T10:44:34-05:00	Timestamp of the time at which the test submission data were transmitted to the app's servers, measured by the device. *- Value must match valid ISO-8601 format including seconds and timezone offset, e.g.: YYYY-MM-DD[T]hh:mm:ss±hh:mm*
server_timestamp	Datetime	2022-01-28T10:44:35-05:00	Timestamp of the time at which the test submission data were transmitted to the app's servers, measured by the server. *- Value must match valid ISO-8601 format including seconds and timezone offset if not null, e.g.: YYYY-MM-DD[T]hh:mm:ss±hh:mm* *- Value must correspond to transmission recorded in the server_source_ip_address and server_source_port values as measured by the server, if not null.* *- Value may be null if the submission_category value is Consumer Crowdsourced, Entity Crowdsourced, Provider Response, or Other.* *- Value may be null if the submission_category value is Entity Challenge and the device_imei value is not null.*

Field	Data Type	Example	Description / Notes
server_source_ ip_address	String	172.58.189.169	Source IP address of the device submitting test submission data, measured by the server. *- Value must be in valid IPv4 or IPv6 format if not null.* *- Value must correspond to transmission recorded in the server_timestamp and server_source_port values as measured by the server, if not null.* *- Value may be null if the submission_category value is Consumer Crowdsourced, Entity Crowdsourced, Provider Response, or Other.* *- Value may be null if the submission_category value is Entity Challenge and the device_imei value is not null.*
server_source_port	Integer	3743	Source TCP port of the device submitting test submission data, measured by the server. *- Value must correspond to transmission recorded in the server_timestamp and server_source_ip_address values as measured by the server, if not null.* *- Value may be null if the submission_category value is Consumer Crowdsourced, Entity Crowdsourced, Provider Response, or Other.* *- Value may be null if the submission_category value is Entity Challenge and the device_imei value is not null.*

Field	Data Type	Example	Description / Notes
device_imei	String		International Mobile Equipment Identity (IMEI) of the device. *- Value must correspond to a valid 15-digit IMEI.* *- Value may be null if the submission_category value is Consumer Crowdsourced, Entity Crowdsourced, Consumer Challenger, Provider Response, or Other.* *- Value may be null if the submission_category value is Entity Challenge and the server_timestamp, server_source_ip_address, and server_source_port values are not null.*
device_type	Enumerable	Android	Type of device. *- Value must be one of the following:* *{iOS|Android|Other}* *- Value must be iOS or Android if the submission_category value is Consumer Challenge or Consumer Crowdsourced.* *- Value must be Android or Other if the submission_category value is Entity Challenge or Provider Response.*
manufacturer	String	Google	Name of the device manufacturer.
model	String	PIXEL 6	Name of the device model
operating_system	String	Android 12	Name and version of the device operating system.
device_tac	String	35142059	8-digit Type Allocation Code of the device. *- Value is not available on iOS and may be null for these device types.* *- Value may be null if the app does not have requisite permissions, or the device does not return a valid value or else returns a value of unknown.*
device_id	String	a255e318-df8d-46d1-a23b-9589e4d2e53e	Unique device or application installation identifier.

Field	Data Type	Example	Description / Notes
app_name	String	FCC Speed Test app	Name of the mobile speed test app. *- Value is required and must match an approved App Name string for the third-party speed test app if the submission_category value is Consumer Challenge or Consumer Crowdsourced.* *- Value may be null if the submission_category value is Entity Challenge, Entity Crowdsourced, Provider Response, or Other.*
app_version	String	2.0.4058	Version of the mobile speed test app. *- Value is required and must match an approved App Version string for the third-party speed test app if the submission_category value is Consumer Challenge or Consumer Crowdsourced.* *- Value may be null if the submission_category value is Entity Challenge, Entity Crowdsourced, Provider Response, or Other.*
provider_name	String	Acme Wireless	Name of the mobile service provider.
sim_mobile_ country_code	String	310	Numeric string of the mobile service provider's mobile country code reported from the SIM card. *- Value may be null when device is not connected to a network.*
sim_mobile_ network_code	String	001	Numeric string of the mobile service provider's mobile network code reported from the SIM card. *- Value may be null when device is not connected to a network.*
net_mobile_ country_code	String	310	Numeric string of the mobile service provider's mobile country code reported from the connected network. *- Value is not available on iOS and may be null for these device types.*
net_mobile_ network_code	String	001	Numeric string of the mobile service provider's mobile country code reported from the connected network. *- Value is not available on iOS and may be null for these device types.*
in_vehicle_flag	Boolean	false	Boolean flag indicating whether the test was conducted while in-vehicle or outdoors.

Field	Data Type	Example	Description / Notes
external_ antenna_flag	Boolean	false	Boolean flag indicating whether an in-vehicle test was conducted using an antenna external to the vehicle. *- Value must be false when in_vehicle_flag is false.* *- Value may be null if the submission_category value is Consumer Crowdsourced, Consumer Challenger, Provider Response, or Other.* *- Value is required when the submission_category value is Entity Challenge or Entity Crowdsourced.*
scheduled_test_flag	Boolean	false	Boolean flag indicating whether the test was automated / scheduled or was user-initiated. *- Value is required when the submission_category value is Consumer Crowdsourced or Entity Crowdsourced.*
tests	Test Object		Information about the test metrics. *- Note: the specifications for the Test Object are described in **Section 5.1.3**.*

5.1.3 Test Object

Field	Data Type	Example	Description / Notes
download	Download Test Object		Information about the download test metric. *- Note: the specifications for the Download Test Object are described in **Section 5.1.4**.*
upload	Upload Test Object		Information about the upload test metric. *- Note: the specifications for the Download Test Object are described in **Section 5.1.5**.*
latency	Latency Test Object		Information about the latency test metric. *- Note: the specifications for the Download Test Object are described in **Section 5.1.6**.*

5.1.4 Download Test Object

Field	Data Type	Example	Description / Notes
timestamp	Datetime	2022-01-28T10:43:57-05:00	Timestamp of the time at which the connection for the test metric was initialized (i.e., prior to any warmup period during which the connection stabilized). *- Value must match valid ISO-8601 format including seconds and timezone offset, i.e.: YYYY-MM-DD[T]hh:mm:ss±hh:mm*
warmup_ duration	Integer	3000622	Duration in microseconds that connection took to stabilize (e.g., TCP slow start) before the test metric commenced.
warmup_bytes_ transferred	Integer	126172134	Measured total amount of data in bytes that were transferred during the period the connection took to stabilize (e.g., TCP slow start) before the test metric commenced.
duration	Integer	5000567	Duration that the test metric took to complete in microseconds.
bytes_transferred	Integer	356944896	Measured total amount of data in bytes that the test metric transferred.
bytes_sec	Integer	71380884	Measure number of bytes per second that the test metric transferred.
locations	Array [Location Object]		List of geographic coordinates of the locations measured during the speed test. *- Note: the specifications for each Location Object element are described in **Section 5.1.7**.*
cells	Array [Cell Object]		List of cellular telephony information measured during the speed test. *- Note: the specifications for each Cell Object element are described in **Section 5.1.8**.*
targets	Array [String]	["sp2-vm-ashburn-us.samknows.com"]	List of hostname or IP address of target server(s) used for the test metric. *- Value may be null or an empty array if the success_flag value for the Download Test object is false.* *- Value is required when the success_flag value for the Download Test object is true.*
success_flag	Boolean	true	Boolean flag indicating whether the test completed successfully and without a change in state or connectivity.

Field	Data Type	Example	Description / Notes
carrier_ aggregation_flag	Boolean	true	Boolean flag indicating whether the network used carrier aggregation during the test metric. *- Value is not available on iOS and may be null for these device types.* *- Value must be null for 3G tests.* *- Value may be null if the device does not return a valid value or else returns a value of unknown.*
network_ connected_flag	Boolean	true	Boolean flag indicating whether the network is connected. *- Value is not available on iOS and may be null for these device types.*
network_ available_flag	Boolean	true	Boolean flag indicating whether the network is available. *- Value is not available on iOS and may be null for these device types.*
network_ roaming_flag	Boolean	false	Boolean flag indicating whether the network is roaming. *- Value is not available on iOS and may be null for these device types.*

5.1.5 Upload Test Object

Field	Data Type	Example	Description / Notes
timestamp	Datetime	2022-01-28T10:44:09-05:00	Timestamp of the time at which the connection for the test metric was initialized (i.e., prior to any warmup period during which the connection stabilized). *- Value must match valid ISO-8601 format including seconds and timezone offset, i.e.: YYYY-MM-DD[T]hh:mm:ss±hh:mm*
warmup_ duration	Integer	3000213	Duration in microseconds that connection took to stabilize (e.g., TCP slow start) before the test metric commenced.
warmup_bytes_ transferred	Integer	43057388	Measured total amount of data in bytes that were transferred during the period the connection took to stabilize (e.g., TCP slow start) before the test metric commenced.
duration	Integer	5000051	Duration that the test metric took to complete in microseconds.

Field	Data Type	Example	Description / Notes
bytes_transferred	Integer	78724624	Measured total amount of data in bytes that the test metric transferred.
bytes_sec	Integer	15744764	Measure number of bytes per second that the test metric transferred.
locations	Array [Location Object]		List of geographic coordinates of the locations measured during the speed test. *- Note: the specifications for each Location Object element are described in **Section 5.1.7**.*
cells	Array [Cell Object]		List of cellular telephony information measured during the speed test. *- Note: the specifications for each Cell Object element are described in **Section 5.1.8**.*
targets	Array [String]	["sp2-vm-ashburn-us.samknows.com"]	List of hostname or IP address of target server(s) used for the test metric. *- Value may be null or an empty array if the success_flag value for the Upload Test object is false.* *- Value is required when the success_flag value for the Upload Test object is true.*
success_flag	Boolean	true	Boolean flag indicating whether the test completed successfully and without a change in state or connectivity.
carrier_aggregation_flag	Boolean	true	Boolean flag indicating whether the network used carrier aggregation during the test metric. *- Value is not available on iOS and may be null for these device types.* *- Value must be null for 3G tests.* *- Value may be null if the device does not return a valid value or else returns a value of unknown.*
network_connected_flag	Boolean	true	Boolean flag indicating whether the network is connected. *- Value is not available on iOS and may be null for these device types.*
network_available_flag	Boolean	true	Boolean flag indicating whether the network is available. *- Value is not available on iOS and may be null for these device types.*

Field	Data Type	Example	Description / Notes
network_ roaming_flag	Boolean	false	Boolean flag indicating whether the network is roaming. *- Value is not available on iOS and may be null for these device types.*

5.1.6 Latency Test Object

Field	Data Type	Example	Description / Notes
timestamp	Datetime	2022-01-28T10:44:19-05:00	Timestamp of the time at which the test metric commenced. *- Value must match valid ISO-8601 format including seconds and timezone offset, i.e.: YYYY-MM-DD[T]hh:mm:ss±hh:mm*
duration	Integer	5065782	Duration that the test metric took to complete in microseconds.
round_trip_time	Integer	20768	Round-trip latency in microseconds.
jitter	Integer	3148	Round-trip jitter in microseconds.
packets_sent	Integer	200	Number of packets sent during the test.
packets_received	Integer	200	Number of packets received during the test.
locations	Array [Location Object]		List of geographic coordinates of the locations measured during the speed test. *- Note: the specifications for each Location Object element are described in **Section 5.1.7**.*
cells	Array [Cell Object]		List of cellular telephony information measured during the speed test. *- Note: the specifications for each Cell Object element are described in **Section 5.1.8**.*
targets	Array [String]	["sp2-vm-ashburn-us.samknows.com"]	List of hostname or IP address of target server(s) used for the test metric. *- Value may be null or an empty array if the success_flag value for the Latency Test object is false.* *- Value is required when the success_flag value for the Latency Test object is true.*
success_flag	Boolean	true	Boolean flag indicating whether the test completed successfully and without a change in state or connectivity.

Field	Data Type	Example	Description / Notes
carrier_ aggregation_flag	Boolean	true	Boolean flag indicating whether the network used carrier aggregation during the test metric. *- Value is not available on iOS and may be null for these device types.* *- Value must be null for 3G tests.* *- Value may be null if the device does not return a valid value or else returns a value of unknown.*
network_ connected_flag	Boolean	true	Boolean flag indicating whether the network is connected. *- Value is not available on iOS and may be null for these device types.*
network_ available_flag	Boolean	true	Boolean flag indicating whether the network is available. *- Value is not available on iOS and may be null for these device types.*
network_ roaming_flag	Boolean	false	Boolean flag indicating whether the network is roaming. *- Value is not available on iOS and may be null for these device types.*

5.1.7 Location Objects

Each element of the "locations" array contains the geographic coordinates of the locations measured at the start and end of the speed test, as well as during the test (if measured).

Field	Data Type	Example	Description / Notes
timestamp	Datetime	2022-01-28T10:44:07-05:00	Timestamp of the time at which the location was recorded. *- Value must match valid ISO-8601 format including seconds and timezone offset, i.e.: YYYY-MM-DD[T]hh:mm:ss±hh:mm*
latitude	Decimal	38.8860976	Unprojected (WGS-84) geographic coordinate latitude in decimal degrees of the reported location where the test was conducted. *- Value must have minimum precision of 6 decimal digits.*

Field	Data Type	Example	Description / Notes
longitude	Decimal	-76.9962846	Unprojected (WGS-84) geographic coordinate longitude in decimal degrees of the reported location where the test was conducted. *- Value must have minimum precision of 6 decimal digits.*
horizontal_ accuracy	Numeric	2.0	Horizontal accuracy of the location, radial, in meters measured from the device. *- Value may be null if the device does not return a valid value or else returns a value of unknown.*
speed	Numeric	0	Speed in meters per second measured from the device. *- Value may be null if the submission_category value is Consumer Crowdsourced, Entity Crowdsourced, or Other.* *- Value may be null if the device does not return a valid value or else returns a value of unknown.*
speed_accuracy	Numeric	1.0	Speed accuracy in meters per second measured from the device. *- Value may be null if the device does not return a valid value or else returns a value of unknown.*

5.1.8 Cell Objects

Each element of the “cells” array contains telephony information about the cell / carrier.

Field	Data Type	Example	Description / Notes
timestamp	Datetime	2022-01-28T10:43:57-05:00	Timestamp of the time at which the cell information was measured. *- Value must match valid ISO-8601 format including seconds and timezone offset, i.e.: YYYY-MM-DD[T]hh:mm:ss±hh:mm*
cell_id	Numeric	33275650	Measured mobile broadcast cell identifier. *- Value is not available on iOS and may be null for these device types.* *- Value may be null if the device does not return a valid value or else returns a value of unknown.*

Field	Data Type	Example	Description / Notes
physical_cell_id	Integer	391	Measured Physical Cell Identity (PCI) of the cell. *- Value is not available on iOS and may be null for these device types.* *- Value must be null for 3G tests.* *- Value may be null if the device does not return a valid value or else returns a value of unknown.*
cell_connection	Enumerated	2	Connection status of the cell. *- Value must be one of the following codes:* *0 – Not Serving* *1 – Primary Serving* *2 – Secondary Serving* *- Value is not available on iOS and may be null for these device types.* *- Value may be null if the device does not return a valid value or else returns a value of unknown.*
network_ generation	Enumerated	5G	String representing the network generation of the cell. *- Value must be one of the following:* *{2G|3G|4G|5G|Other}*
network_subtype	Enumerated	NRNSA	String representing the network subtype of the cell. *- Value must be one of the following:* *{1X|EVDO|WCDMA|GSM|HSPA|HSPA+| LTE|NRSA|NRNSA}* *- Note: this value must be NRSA when the cell is in standalone mode and NRNSA when the test is in non-standalone mode for 5G-NR tests.*
signal_strength	Integer	-103	Measured signal strength in dBm of the cell. *- Value is not available on iOS and may be null for these device types.* *- Value may be null if the device does not return a valid value or else returns a value of unknown.* *- Note: this value represents the Received Signal Strength Indication (RSSI) for 3G tests or the Reference Signal Received Power (RSRP) for 4G LTE or 5G-NR tests.*

Field	Data Type	Example	Description / Notes
rssi	Integer	-73	Measured Received Signal Strength Indication (RSSI) in dBm of the cell. *- Value is not available on iOS and may be null for these device types.* *- Value may be null for 5G tests.* *- Value may be null if the device does not return a valid value or else returns a value of unknown.*
rsrp	Integer	-103	Measured Reference Signal Received Power (RSRP) in dBm of the cell. *- Value is not available on iOS and may be null for these device types.* *- Value must be null for 3G tests.* *- Value may be null if the device does not return a valid value or else returns a value of unknown.* *- Note: this value represents the Synchronization Signal (SS) for 5G-NR tests and the Channel-specific Reference Signal (CRS) for 4G LTE tests.*
rsrq	Integer	-12	Measured Reference Signal Received Quality (RSRQ) in dB of the cell. *- Value is not available on iOS and may be null for these device types.* *- Value must be null for 3G tests.* *- Value may be null if the device does not return a valid value or else returns a value of unknown.* *- Note: this value represents the Synchronization Signal (SS) for 5G-NR tests and the Channel-specific Reference Signal (CRS) for 4G LTE tests.*

Field	Data Type	Example	Description / Notes
sinr	Integer	2	Measured Signal to Interference and Noise Ratio (SINR) in dB of the cell. *- Value is not available on iOS and may be null for these device types.* *- Value must be null for 3G tests.* *- Value may be null if the device does not return a valid value or else returns a value of unknown.* *- Note: this value represents the Synchronization Signal (SS) for 5G-NR tests and the Channel-specific Reference Signal (CRS) for 4G LTE tests.*
csi_rsrp	Integer	-103	Measured 5G Channel State Information (CSI) RSRP in dBm of the cell. *- Value is not available on iOS and may be null for these device types.* *- Value must be null for 3G or 4G LTE tests.* *- Value may be null if the device does not return a valid value or else returns a value of unknown.*
csi_rsrq	Integer	-12	Measured Channel State Information (CSI) RSRQ in dB of the cell. *- Value is not available on iOS and may be null for these device types.* *- Value must be null for 3G or 4G LTE tests.* *- Value may be null if the device does not return a valid value or else returns a value of unknown.*
csi_sinr	Integer	2	Measured Channel State Information (CSI) SINR in dB of the cell. *- Value is not available on iOS and may be null for these device types.* *- Value must be null for 3G or 4G LTE tests.* *- Value may be null if the device does not return a valid value or else returns a value of unknown.*

Field	Data Type	Example	Description / Notes
cqi	Integer	4	Measured Channel Quality Indicator (CQI) of the cell. *- Value is not available on iOS and may be null for these device types.* *- Value must be null for 3G tests.* *- Value may be null if the device does not return a valid value or else returns a value of unknown.*
spectrum_band	String	n41	Spectrum band used by the cell. *- Value is not available on iOS and may be null for these device types.* *- Value may be null for 3G tests.* *- Value may be null if the device does not return a valid value or else returns a value of unknown.* *- Note: the reported band value corresponds to the Operating Bands tables as follows:* *- 4G LTE: 3GPP TS 36.101 section 5.5* *- 5G-NR: 3GPP TS 38.101 table 5.2-1*
spectrum_ bandwidth	Numeric	100.0	Total amount of spectral bandwidth used by the cell in MHz. *- Value is not available on iOS and may be null for these device types.* *- Value may be null if the device does not return a valid value or else returns a value of unknown.*
arfcn	Integer	528000	Measured physical RF channel number of the cell. *- Value is not available on iOS and may be null for these device types.* *- Value may be null if the device does not return a valid value or else returns a value of unknown.*

6 Entity Mobile Testing Methodology Information

6.1 Overview

Mobile broadband service providers, governmental entities, and other third parties must submit a complete description of their data collection methodology when using their own hardware and software to gather on-the-ground speed test data. Parties must collect the required metrics that the FCC Speed Test app and OET-approved apps must gather as set forth above.

Parties must provide a narrative overview of the testing solution, including a description of the test methodology and a URL link to the test solution product (if available). They should also include, if available, product images, sample reports from test campaigns conducted using this product, and any other information that is useful in determining the product test and measurement capabilities.

In addition to the narrative overview, parties must also submit structured information about their test methodologies via a web form in the BDC system, described below.

6.2 Entity Mobile Testing Methodology Data

This web form requires filers to enter a description of the testing methodology the used to collect the Entity Mobile Crowdsourced/Challenge Information.

Field	Data Type	Example	Description / Notes
Methodology ID	String	Acme Wireless Drive Test - Team B	Unique name identifying the testing methodology used to collect the mobile speed test data.
Narrative	File Upload		Narrative explanation of the methodology used to conduct the mobile speed tests. *- File must be a valid Word Document (.DOC/.DOCX), OpenDocument (.ODT), Portable Document Format (.PDF), or plain text (.TXT) file.*
Category	Enumerated	App-based	Category of testing methodology. *- Value must be one of the following:* ▪ *App-based* ▪ *Software-based* ▪ *Hardware-based*
Supported Technologies	Enumerated	4G LTE 5G-NR NSA 5G-NR SA	List of radio access technologies supported by the device(s) used for testing. *- Value(s) must be one or more of the following:* ▪ *3G* ▪ *4G LTE* ▪ *5G-NR NSA* ▪ *5G-NR SA*

Field	Data Type	Example	Description / Notes
Testing Environment	Enumerated	In-vehicle	Testing environment used for the test setup. *- Value must be one of the following:* ▪ *In-vehicle* ▪ *Outdoors*
Antenna Type	Enumerated	External	Type of antenna used for the test setup. *- Value must be one of the following:* ▪ *External* ▪ *Internal*
External Antenna Height	Decimal	0.5	Height of external antenna in meters. *- Value must be ≥ 0 if Antenna Type value is "External".* *- Value must be null if the Antenna Type value is "Internal".*
External Antenna Gain	Decimal	5.0	Gain of external antenna in dB. *- Value must be ≥ 0 if Antenna Type value is "External".* *- Value must be null if the Antenna Type value is "Internal".*
Data Plan Type	Enumerated	Unlimited (Not Subject to any Data Usage Management)	Type of data plan used by the devices. *- Value must be one of the following:* ▪ *Unlimited (Subject to Typical Consumer Data Usage Management)* ▪ *Unlimited (Not Subject to any Data Usage Management)* ▪ *Other*
Data Plan Description	String		Description of data plan used by the device(s) in the test setup. *- Value may be null unless the Data Plan Type value is "Other".*

6.3 Entity Mobile Test Servers Data

This web form requires filers to enter a description of the test servers corresponding to the methodology used to collect the Entity Mobile Crowdsourced/Challenge Information.

Field	Data Type	Example	Description / Notes
Server ID	String	Acme Wireless Stackpath Cloud	Unique name identifying the test server record.
Server Count	Integer	15	Minimum count of test servers available for transmitting data for a speed test.

Field	Data Type	Example	Description / Notes
Server Type	Enumerated	Geographically-distributed / Nationwide Test Servers with Common Configuration	Type of test server(s) for which the test record applies. *- Value must be one of the following:* ▪ *Geographically-distributed / Nationwide Test Servers with Common Configuration* ▪ *Non-distributed / Region-specific Test Server(s)*
Server Location - State	Enumerated		State or territory in which the test servers are located. *- Value must be null if the Server Type value is "Geographically-distributed / Nationwide Test Servers with Common Configuration".* *- Value must be a valid state or territory from the latest U.S. Census Bureau data if not null.*
Server Location - County	Enumerated		County or other subdivision within the state or territory in which the test servers are located. *- Value must be null if the Server Type value is "Geographically-distributed / Nationwide Test Servers with Common Configuration".* *- Value must be a valid county or county-level subdivision for the selected state from the latest U.S. Census Bureau data if not null.*
Server Capacity - Incoming	Decimal	100.0	Minimum one-way provisioned capacity of test server link in Gbps given capabilities of existing hardware – incoming to the test server. *- Value must be > 0.*
Server Capacity - Outgoing	Decimal	100.0	Minimum one-way provisioned capacity of test server link in Gbps given capabilities of existing hardware – outgoing from the test server. *- Value must be > 0.*
Server Client - Type	Enumerated	iPerf	Type of client software running on the test server(s). *- Value must be one of the following:* ▪ *iPerf* ▪ *Ookla* ▪ *Other*
Server Client - Description	String		Description of the client type used by the test server(s). *- Value may be null unless the Server Client Type value is "Other".*

Field	Data Type	Example	Description / Notes
Server Client - Protocol	Enumerated	TCP	Transport layer network protocol used by the client software running on the test server(s). *- Value must be one of the following:* ▪ *TCP* ▪ *UDP* ▪ *SCTP* ▪ *Other*
Server Client - Port	Integer		Network port used by the client software running on the test server(s). *- Value may be null.*
Server Client - Buffer Length	Integer		Buffer length used by the client software running on the test server(s). *- Value may be null.*
Server Client - Max Connections	Integer		Maximum number of simultaneous connections allowed by the client software running on the test server(s). *- Value may be null.*
Server Client - Configuration Description	String		Description of any other configuration of the client software running on the test server(s). *- Value may be null.*