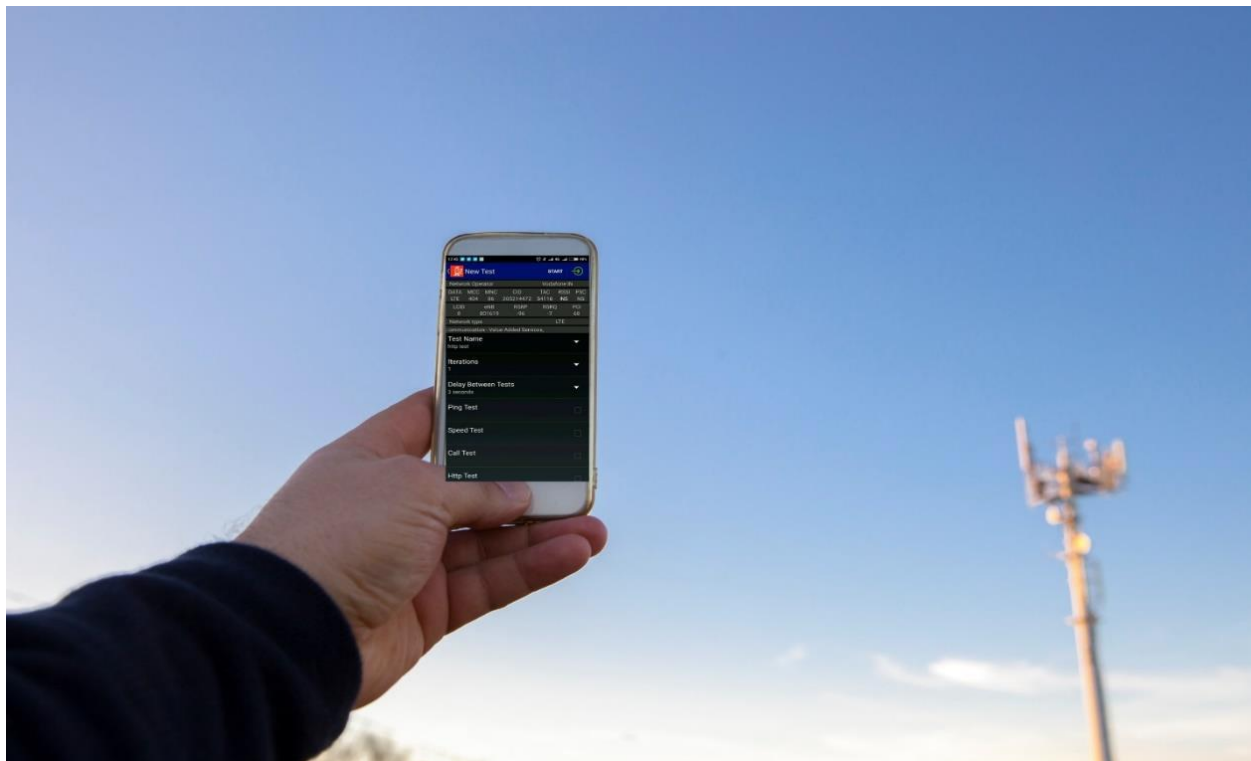


## RantCell Cloud Solution measurement and KPI's capabilities data sheet 5G, 4G, 3G and 2G



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## 1. 5G network measurement capabilities on commercial grade Android phone (non-rooted Android 10+ and supported devices only).

- Operator Name, MNC MCC
- Data connectivity type (no data, 5G)
- NR csiSINR
- NR ssSINR
- NR PCI
- NR csiRSRP
- NR ssRSRP
- NR csiRSRQ
- NR ssRSRQ
- NR TAC
- NCI
- GPS
- ISP
- APN (on some devices)
- NR Arfcn

### 1.1. User QoE KPI measurement supported on commercial grade devices on 5G mobile network.

#### 1.1.1 Voice calls (VoLTE calls while UE on 5G network)

- Call setup time
- Cell setup average time on multiple tests
- Call setup success rate
- Call drop rate
- Call setup failures
- Call handover rate
- Call failure causes – Setup failed network error, dropped call, weak signal, no network

#### 1.1.2 SMS

- SMS MO success rate
- SMS MT success rate
- SMS send / receive elapsed time (roundtrip time)
- SMS send failed causes – no network or network error

#### 1.1.3 Data

- Latency measurement RTT max, RTT min, RTT avg (Ping size variable)
- Ping success rate
- % of dropped packets based on ping.
- FTP download speeds with session time and file size indicator, percentage of RAN technology type used (5G, 4G, 3G and 2G), signal level capture
- FTP download average and Peak throughputs

- FTP upload speeds with session time and file size indicator percentage of RAN technology type used (5G, 4G, 3G and 2G), signal level capture
- FTP upload average and peak throughputs.
- HTTP download speeds with session time, average, peak.
- HTTP upload speeds with session time, average, peak

#### 1.1.4 Steam testing (video testing) on 5G

Stream Test KPI's	Indicators
Video Performance Rating	Video performance rating parameter indicates user experienced on video streaming in terms of video rating (Good, Fair and Poor)
Launch time	Launch time is time taken by the player to load all web view scripts and files
Load time	Initial buffer time is the measurement of the time taken for the player to initialize the video with buffer.
Stalled time	Stalled time is total time for which user experienced video stalling while playing
Stalled count	Stalled count is the number of times user experienced video stalling while playing
Total video play time	Video play time is the amount of time taken to play the video from start to end.
Resolution Percentage	Video played resolution with percentage (240px, 360px, 480px, 720px, 1080px)
Current status	Status of current video i.e. loading, buffering, playing etc.

#### 1.1.5 Drive testing QoE reports on 5G network

- GPS capture
- Capture of signal levels and RAN technology type while drive testing
- Percentage calculation of RAN technology type used while doing drive testing
- Percentage indicator of signal levels experienced during drive testing.
- Geographical areas where no signals reported
- Geographical areas where low data connectivity reported
- Geographical areas where no data connectivity reported
- Geographical areas where call drops are reported
- Identification of no data connectivity areas.
- Floor plan based indoor walk testing.

#### 1.1.6 5G Cell site monitoring

- 24 hours benchmarking on cell site data and voice calls performance (Static testing)
- Active alarm notifications when QoE tests fails
- Active alarm notification when cell site is off the air.

## 2. 4G network measurement capabilities on commercial grade Android phone (non-rooted device).

- Operator Name, MNC MCC
- Data connectivity type (no data, LTE)
- VoLTE supported
- eNbid
- ECID
- LCiD (Local cell ID)
- TAC
- PCI
- RSRQ, RSRP
- GPS
- ISP
- APN (on some devices)
- SNR
- CQI (on some devices)
- EARFCN (Android 10 and above on supported devices only)

### 2.1 User QoE KPI's measurement supported on commercial grade device on 4G mobile network

#### 2.1.1 Voice Calls

- Call setup time
- Call setup average time on multiple tests
- Call setup success rate
- Call drop rate
- Call setup failures
- Call handover rate
- Call failure causes – Setup failed network error, dropped call, weak signal, No network
- VoLTE supported

#### 2.1.2 SMS

- SMS MO success rate
- SMS MT success rate
- SMS Send/receive elapsed time (round trip time)
- SMS send failed causes – No network, Network error

#### 2.1.3 Data

- Latency measurement RTT max, RTT min , RTT avg (Ping size variable).
- Ping success rate.
- % of dropped packets based on ping.
- FTP download speeds with session time and file size indicator, percentage of RAN technology type used (2G,3G,4G), signal level capture.
- FTP download average and Peak throughputs.

- FTP upload speeds with session time and file size indicator percentage of RAN technology type used (2G,3G,4G), signal level capture.
- FTP upload average and peak throughputs.
- HTTP download speeds with session time, average, peak.
- HTTP upload speeds with session time, average, peak.
- Floor plan based indoor walk testing.

#### 2.1.4 Stream testing (video testing) on 4G

Stream Test KPI's	Indicators
Video Performance Rating	Video performance rating parameter indicates user experienced on video streaming in terms of video rating (Good, Fair and Poor)
Launch time	Launch time is time taken by the player to load all web view scripts and files
Load time	Initial buffer time is the measurement of the time taken for the player to initialize the video with buffer.
Stalled time	Stalled time is total time for which user experienced video stalling while playing
Stalled count	Stalled count is the number of times user experienced video stalling while playing
Total video play time	Video play time is the amount of time taken to play the video from start to end.
Resolution Percentage	Video played resolution with percentage (240px, 360px, 480px, 720px, 1080px)
Current status	Status of current video i.e. loading, buffering, playing etc.

#### 2.1.5 CSFB

- CSFB 4G to 3G success rate
- CSFB 4G to 3G fall back time.
- CSFB 4G to 2G success rate.
- CSFB 4G to 2G fall back time.
- 3G/2G to 4G reselection time.

#### 2.1.6 Drive testing QoE reports on 4G network

- GPS capture.
- Capture of signal levels and RAN technology type while drive testing.
- Percentage calculation of RAN technology type used while doing drive testing.
- Percentage indicator of signal levels experienced during drive testing.
- Geographical Areas where no signals reported.
- Geographical areas where low data connectivity reported.
- Geographical areas where no data connectivity reported.
- Geographical areas where call drops are reported.
- Identification of no data connectivity areas.

#### 2.1.7 4G cell site monitoring

- 24 hours benchmarking on cell site data and voice calls performance (Static testing).
- Active alarm notifications when QoE tests fails.
- Active alarm notification when cell site is off the air.

### 3. 3G network measurement capabilities on commercial grade Android phone (non-rooted device).

#### 3.1 3G network measurement capabilities on commercial grade Android phone (non-rooted)

- Operator Name, MNC MCC
- Data connectivity type (no data, UMTS, HSDPA, HSUPA, and HSPA+)
- CID
- LAC
- RSCP
- GPS
- ISP
- PSC
- RNC ID
- APN (on some devices)
- UARFCN (Android 10 and above on supported devices only)

#### 3.2 User QoE KPI's measurement supported on commercial grade devices on 3G mobile networks (non-rooted)

##### 3.2.1 Voice Calls

- Call setup time
- Call setup average time on multiple tests
- Call setup success rate
- Call drop rate
- Call setup failures
- Call handover rate
- Call failure causes – Setup failed network error, dropped call, weak signal, No network

##### 3.2.2 SMS

- SMS MO success rate
- SMS MT success rate
- SMS Send/receive elapsed time (round trip time)
- SMS send failed causes – No network, Network error

##### 3.2.3 Data

- Latency measurement RTT max, RTT min, RTT avg (Ping size variable).
- Ping success rate.
- % of dropped packets based on ping.



- FTP download speeds with session time and file size indicator, percentage of RAN technology type used (2G,3G,4G), signal level capture.
- FTP download average and Peak throughputs.
- FTP upload speeds with session time and file size indicator percentage of RAN technology type used (2G,3G,4G), signal level capture.
- FTP upload average and peak throughputs.
- HTTP download speeds with session time, average, peak.
- HTTP upload speeds with session time, average, peak.
- Failure causes for FTP and HTTP transfers.
- Floor plan based indoor walk testing.

### 3.2.4 Stream testing (video testing) on 3G

Stream Test KPI's	Indicators
Video Performance Rating	Video performance rating parameter indicates user experienced on video streaming in terms of video rating (Good, Fair and Poor)
Launch time	Launch time is time taken by the player to load all web view scripts and files
Load time	Initial buffer time is the measurement of the time taken for the player to initialize the video with buffer.
Stalled time	Stalled time is total time for which user experienced video stalling while playing
Stalled count	Stalled count is the number of times user experienced video stalling while playing
Total video play time	Video play time is the amount of time taken to play the video from start to end.
Resolution Percentage	Video played resolution with percentage (240px, 360px, 480px, 720px, 1080px)
Current status	Status of current video i.e. loading, buffering, playing etc.

### 3.2.5 Drive testing QoE reports on 3G

- GPS capture
- Capture of signal levels and RAN technology type while drive testing.
- Percentage calculation of RAN technology type used while doing drive testing.
- Percentage indicator of signal levels experienced during drive testing.
- Geographical Areas where no signals reported.
- Geographical areas where low data connectivity reported.
- Geographical areas where no data connectivity reported.
- Geographical areas where call drops are reported.
- Identification of no data connectivity areas.

### 3.2.6 3G cell site monitoring

- 24 hours automated benchmarking on cell site data and voice calls performance (Static testing)

- Active alarm notifications when QoE tests fails
- Active alarm notification when cell site is off the air.
- Automated SRAN (2G,3G and 4G) forced selection testing supported on devices supplied by RantCell.

#### 4. 2G network measurement capabilities on commercial grade Android phone (non-rooted device).

##### 4.1 2G network measurement capabilities on commercial grade Android phone (non-rooted)

- Operator Name, MNC MCC
- Data connectivity type (no data, GPRS, EDGE)
- CID
- LAC
- RSSI (RX lvl)
- GPS
- ISP
- APN (on some devices)
- BCCH ARFCN (Android 10 and above on supported devices only)
- BSIC (Android 10 and above on supported devices only)

##### 4.2 User QoE KPI's measurements supported on commercial grade devices on 2G mobile networks

###### 4.2.1 Voice calls

- Call setup time
- Call setup average time on multiple tests
- Call setup success rate
- Call drop rate
- Call setup failures
- Call handover rate
- Call failure causes – Setup failed network error, dropped call, weak signal, No network

###### 4.2.2 SMS

- SMS MO success rate
- SMS MT success rate
- SMS Send/receive elapsed time (round trip time)
- SMS send failed causes – No network, Network error

###### 4.2.3 Data

- Latency measurement RTT max, RTT min, RTT avg (ping size variable)
- Ping success rate
- % of dropped packets based on ping.
- FTP download speeds with session time and file size indicator, percentage of RAN technology type used (2G,3G,4G), signal level capture

- FTP download average and peak throughputs
- FTP upload speeds with session time and file size indicator percentage of RAN technology type used (2G,3G,4G), signal level capture.
- FTP upload average and peak throughputs.
- HTTP download speeds with session time, average, peak.
- HTTP upload speeds with session time, average, peak.
- Failure causes for FTP and HTTP transfers.
- Floor plan based indoor walk testing.

#### 4.2.4 Stream testing (video testing on 2G)

Stream Test KPI's	Indicators
Video Performance Rating	Video performance rating parameter indicates user experienced on video streaming in terms of video rating (Good, Fair and Poor)
Launch time	Launch time is time taken by the player to load all web view scripts and files
Load time	Initial buffer time is the measurement of the time taken for the player to initialize the video with buffer.
Stalled time	Stalled time is total time for which user experienced video stalling while playing
Stalled count	Stalled count is the number of times user experienced video stalling while playing
Total video play time	Video play time is the amount of time taken to play the video from start to end.
Resolution Percentage	Video played resolution with percentage (240px, 360px, 480px, 720px, 1080px)
Current status	Status of current video i.e. loading, buffering, playing etc.

#### 4.2.5 Drive testing QoE reports on 2G

- GPS capture
- Capture of signal levels and RAN data (EDGE, GPRS) technology type while drive testing.
- Percentage calculation of RAN technology type (EDGE, GPRS, no data) used while doing drive testing.
- Percentage indicator of signal levels experienced during drive testing.
- Geographical areas where no signals reported.
- Geographical areas where low data connectivity reported.
- Geographical areas where no data connectivity reported.
- Geographical areas where call drops are reported.
- Identification of no data connectivity areas.
- Floor plan based indoor walk testing.

#### 4.2.6 2G cell site monitoring

- 24 hours automated benchmarking on cell site data and voice calls performance (static testing).



- Active alarm notifications when QoE tests fails custom thresholds could be set.
- Active alarm notification when cell site is off the air.

#### 5. iOS version (Network measurement capabilities).

- GPS capture
- MCC, MNC, Operator name
- Network Generation type
- Data connectivity type (2G, 3G ,4G or Wi-Fi)
- Upload and download of FTP throughput KPIs
- Latency (Ping) tests.

#### 6. Wi-Fi network measurement capabilities on commercial grade Android phone (non-rooted device).

- Wi-Fi SSID
- Wi-Fi BSSID
- Wi-Fi RSSI
- Wi-Fi Frequency
- Wi-Fi Link-Speed
- Wi-Fi AP (meters)