mobileum

Action driven by intelligence

Roaming Quality Campaigns at Large-Scale Events

> EURO 2024 Germany
> Olympics 2024 Paris
> WorldCup 2022 Qatar

testing, assurance & observability

POWERED BY MOBILEUM

Table of Contents

This report is based on real data of a real benchmarking campaign ran by a real Mobileum customer.
The customer's name and benchmarked operators have been omitted to protect confidential information.

1. Executive Summary

This report consolidates the outcomes of Mobileum's benchmarking campaigns conducted during three major global sporting events — EURO 2024 in Germany, Olympics 2024 in Paris, and the World Cup 2022 in Qatar — to evaluate mobile network performance, roaming quality, and user experience under large-scale event conditions.

The campaigns were executed using Mobileum's GlobalRoamer® platform, combining self-managed and full-service testing packages. Across all events, Mobileum deployed both existing and additional probes at strategic, high-traffic locations such as stadiums and fan zones, enabling continuous assessment of Voice, SMS, Data, VoLTE, and 5G NR performance. Tests were conducted at regular cycles throughout each event to measure key KPIs, including call setup time, throughput, latency, attach success, and Mean Opinion Score (MOS) for voice quality.

During EURO 2024, ten probes were installed across nine German cities to assess operators' readiness and monitor 5G and VoLTE services. Results showed solid overall performance, but highlighted network degradation during match days as user density peaked. Speed benchmarking demonstrated how temporary congestion impacted download rates, emphasizing the value of proactive capacity planning and optimized steering of roaming policies.

The Olympics 2024 campaign focused on Paris and surrounding areas, where extra probes were added to the existing GlobalRoamer® infrastructure. The Mobileum customer achieved good CLI transparency and strong voice quality, though the analysis identified improvement areas in call set-up times, end-to-end SMS delivery, and 5G NSA throughput stability. VoLTE roaming activation was pending with certain partners, and performance fluctuations were observed in non-standalone 5G scenarios.

The Qatar 2022 World Cup campaign involved the installation of six additional probes near the main stadiums. The tests covered multi-technology performance from 3G to 5G. While most KPIs indicated high success rates across voice and messaging services, data tests revealed occasional low throughput in certain locations. Recommendations included closer coordination with roaming partners to optimize throughput and ensure consistent user experience during peak match hours.

Across all three campaigns, Mobileum's active monitoring approach proved critical for real-time issue detection, partner benchmarking, and post-event optimization. The insights derived demonstrate how early readiness testing and continuous benchmarking enable operators to strengthen network resilience and deliver seamless roaming experiences during the world's most demanding events.

ROAMING BENCHMARKING

Roaming Quality Campaigns at Large-Scale Events

EURO 2024 Germany Report

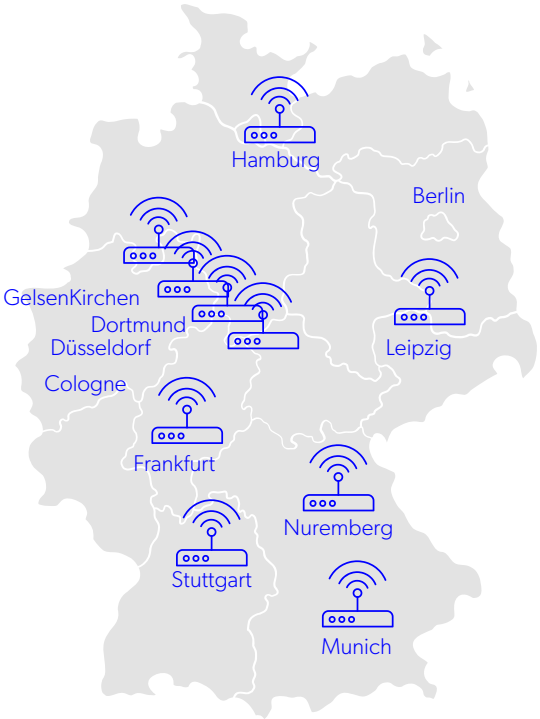
2. Roaming Benchmarking

EURO CUP 2024 GERMANY

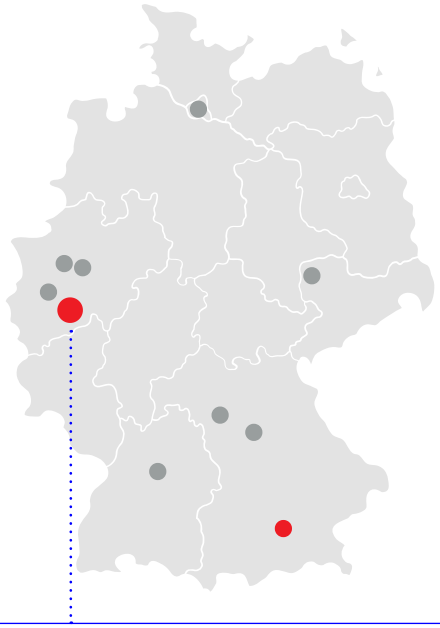
The reliability and performance of mobile networks are critical during large-scale events, such as the EURO Cup, where thousands of attendees rely on seamless connectivity for communication, social media, and access to real-time information. This report delves into the testing and monitoring of mobile networks in such environments, focusing on strategies employed to ensure optimal performance under high demand.

By examining the challenges and solutions related to network capacity, coverage, and user experience, this report aims to provide a comprehensive overview of the methodologies used to maintain robust mobile connectivity during major events. The findings will highlight the importance of pre-event testing, real-time monitoring, and post-event analysis in delivering a superior mobile experience to all users.

To assess the operators' readiness for the EuroCup and ensure the best user experience during massive stress on the network, Mobileum added 7 test units to its GlobalRoamer® platform in Germany. The 10 probes in strategic locations throughout the country (Cologne, Dortmund, Düsseldorf, Frankfurt, Gelsenkirchen, Hamburg, Leipzig, Stuttgart, and Nuremberg) allowed operators to evaluate the quality of essential services, networks, and technologies such as 5G and VoLTE, detect issues and failures, benchmark roaming providers, and proactively manage partnerships.



2.1
Zoom in per City - E.g. Cologne



Cologne, North Rhine-Westphalia

Highests everity: **CRITICAL**

Assigned alarms

Value: 13.20 Severity: **CRITICAL**

Path: /consulting/arielvergara/EuroCup024/Germany-Cologne/DownloadRate (KPIs-by-City@EuroCupStats)

2.2
KPIs Per City

EuroCupStats:
KPIs_by_City - 2024-06-03 01:00 to 2024-06-18 11:41 UTC+01:00

	Download Rate_Mbps	Upload Rate_Mbps	Latency _Milliseconds	Success Rate
Germany - Cologne	12.81	3.27	36.64	51.28
Germany - Dortmund	71.3	27.44	45.92	71.79
Germany - Düsseldorf	52.5	22.37	36.95	71.79
Germany - Frankfurt	46.27	24.98	40.39	71.79
Germany- Gelsenkirchen	60.81	34.89	35.41	71.79
Germany - Hamburg	76.87	27.11	40.95	71.79
Germany - Leipzig	54.36	29.64	58.51	71.79
Germany - Munich	42.38	8.23	33.72	67.44
Germany - Nuremberg	78.07	37.12	38.69	69.77
Germany - Stuttgart	77.25	26.02	46.68	71.79
Avg.	60.93	26.28	41.49	69.16

2.3
Download Data Speed - Per City

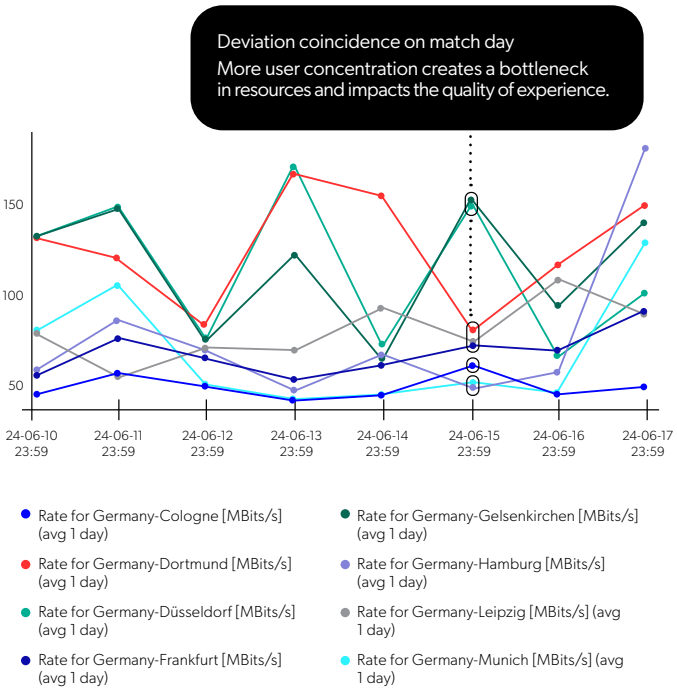
During peak usage periods like the UEFA EuroCup 2024, it is normal to observe a severe decrease in download speeds as the network handles a higher volume of data transfer. GlobalRoamer® identified points where the network struggled to keep up with demand, enabling targeted improvements. The data from peak usage times helped forecast future capacity needs and inform decisions about scaling infrastructure to handle high traffic, improving overall reliability, and user satisfaction.

Due to superior performance during peak usage, as indicated by our testing and monitoring tools, the operator was able to opt to use the second roaming partner over the main one to ensure optimal network performance, reliability, and a better roaming experience.

The next graphics show the type of information extracted from the reports and dashboards generated during the test periods that enabled operators make informed decisions.

2.4
Speed Benchmarking - Average per Day

EuroCupStats:
DL Speed 2024-06-10 00:00 to 2024-06-17 15:32 UTC+01:00



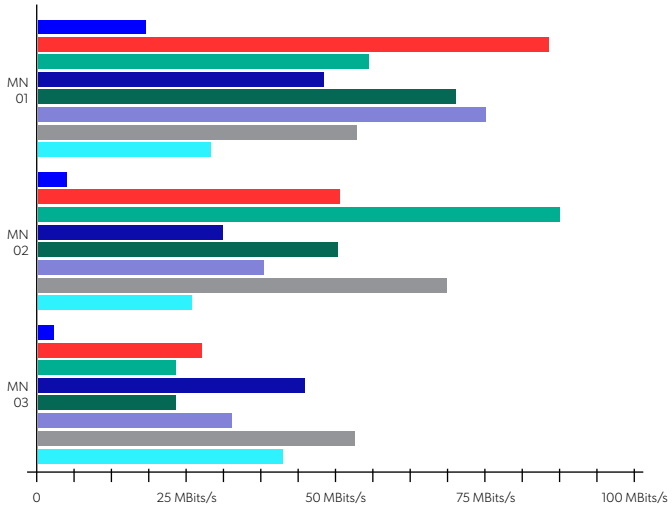
2.5
VPMN perspective on quality in each city

The temporal trend graphs indicate behavior over time and the degradation during concentrated network usage in a limited area, such as a stadium.

The operator can identify if their preferred partner is providing the data quality expected or if their steering policy requires revision.

2.6
Speed Benchmarking - Average per City

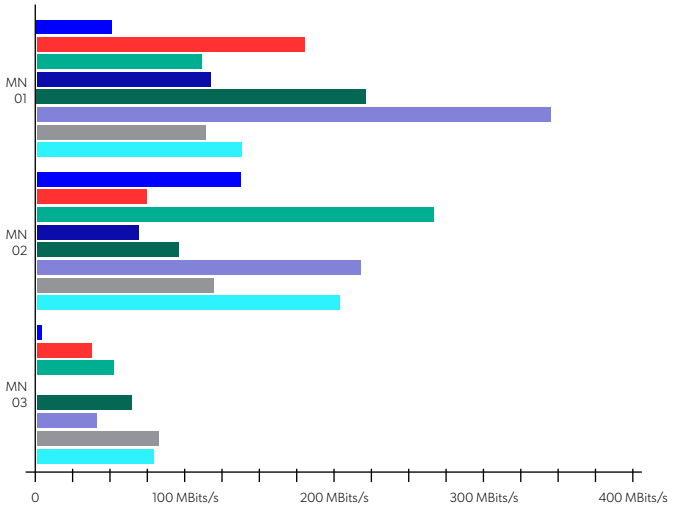
EuroCupStats:
Speed_Benchmarking_graph_AVG - 2024-06-03 00:00 to 2024-06-17 15:39 UTC+01:00



- Rate for Germany-Cologne [MBits/s] (avg 1 day)
- Rate for Germany-Dortmund [MBits/s] (avg 1 day)
- Rate for Germany-Düsseldorf [MBits/s] (avg 1 day)
- Rate for Germany-Frankfurt [MBits/s] (avg 1 day)
- Rate for Germany-Gelsenkirchen [MBits/s] (avg 1 day)
- Rate for Germany-Hamburg [MBits/s] (avg 1 day)
- Rate for Germany-Leipzig [MBits/s] (avg 1 day)
- Rate for Germany-Munich [MBits/s] (avg 1 day)

2.7
Speed Benchmarking - Maximum per City

EuroCupStats:
Speed_Benchmarking_graph_MAX - 2024-06-10 00:00 to 2024-06-25 11:07 UTC+01:00



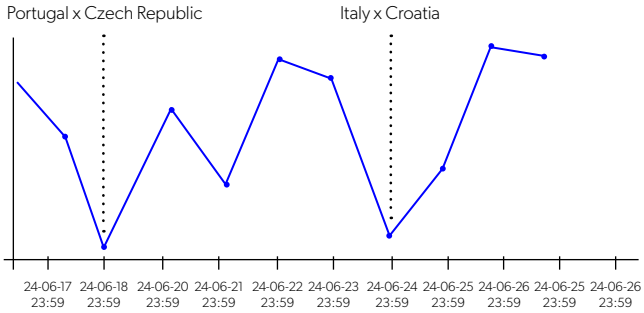
- Rate for Germany-Cologne [MBits/s] (avg 1 day)
- Rate for Germany-Dortmund [MBits/s] (avg 1 day)
- Rate for Germany-Düsseldorf [MBits/s] (avg 1 day)
- Rate for Germany-Frankfurt [MBits/s] (avg 1 day)
- Rate for Germany-Gelsenkirchen [MBits/s] (avg 1 day)
- Rate for Germany-Hamburg [MBits/s] (avg 1 day)
- Rate for Germany-Leipzig [MBits/s] (avg 1 day)
- Rate for Germany-Munich [MBits/s] (avg 1 day)

2.8 Speed Benchmarking - One City Trend

Below we can observe network degradation in Leipzig the games, when the sudden influx of users overwhelms the network's capacity with thousands of attendees simultaneously accessing mobile services for streaming, social media, and communication, thus exceeding the infrastructure's ability to handle the load.

The result is a noticeable decline in performance, as the network struggles to allocate sufficient resources to accommodate the surge in demand, impacting user experience and reliability. Monitoring at different times, before, during, and after the event, helps operators plan capacity and manage their steering agreements

Leipzig



2.9 Speed Benchmarking - Trend per City

EuroCupStats:
DownloadRate_Mbps_by_City - 2024-06-03 00:00 to 2024-06-17 15:39 UTC+01:00

	MAX	TREND OVER THE REPORT PERIOD
Munich	107.86	
Cologne	22.4	
Dortmund	160.64	
Frankfurt	58.34	
Hamburg	148.91	
Gelsenkirchen	122.16	
Düsseldorf	103.53	
Leipzig	64.62	
Stuttgart	120.45	
Nuremberg	106.23	

Notes

- The graph reflects the maximum download rate reached
- The threshold considered for this trend is 40 Mbps

2.10 5G IR.81 KPIs

The 5G IR.81 KPIs help operators verify if a 5G agreement is open and individually monitor compliance with GSMA standards.

EuroCupStats:
5G_IR81_KPIs - 2024-06-03 01:00 to 2024-06-18 11:38 UTC+01:00

	MNO 1	MNO 2	MNO 3
500 - AV - 5G NSA Coverage Indication	100	100	54.68
501 - AV - NR RSRP	-93.88	-93.89	-100.94
a_NR_RSRQ	-12.19	-12.11	-11.77
a_NR_SINR	15.98	15.5	18.85
501.1 - AV - 5G Signal	45.07	45.01	41.71
502 - AV - Restrict DCNR	0	19.57	71.93
503 - AV - PDPContextActivation_Success	97.59	0	37.21
504 - 5G_NSA_used	86.9	3.91	13.74
504 - AV - 5G ENDC Used Allocated (samples)	246	9	47
Completed Samples	281	230	342
505 - AV - Data Session Success	96.55	3.91	28.07
510 - AV - HTTP MBB Success	90.24	90	0
530 - AV - DownloadRate [Mbits_per_sec]	125.48	157.48	--
531 - AV - UploadRate [Mbits_per_sec]	40.2	47.9	--
532 - AV - Latency [Milliseconds]	23.61	158.88	--

Note

Mobileum's 5G NSA monitoring is fully compliant with IR.81 GSMA standard (latest version).

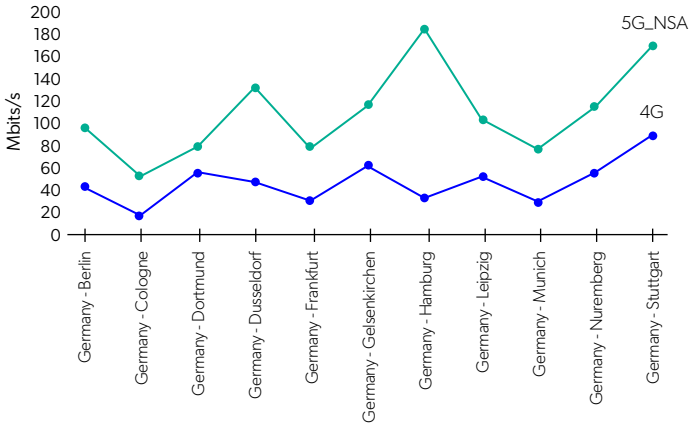
Link to GSMA IR.81 GRQ Measurements Implementation

2.11
4G - 5G Comparison

The charts below illustrate how 5G technology significantly enhances the quality of experience compared with 4G. While roaming, subscribers expect uninterrupted and reliable network coverage for seamless and hassle-free usage of multiple apps and mobile services.

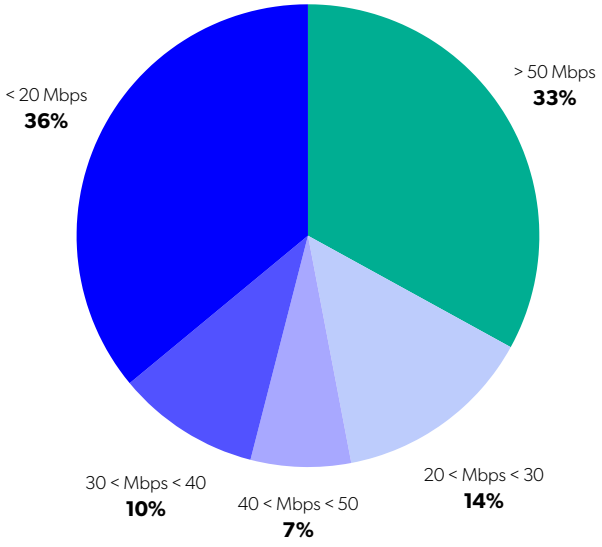
High expectations are the main driver to push the networks to evolve to 5G deployments with significantly faster and more reliable connectivity, higher data speeds, lower latency, and increased network capacity. 5G download speeds significantly enhance user experience during massive events allowing roamers to seamlessly stream videos, share content, and access real-time updates without network congestion.

AVERAGE DOWNLOAD SPEED [Mbits/s]	4G	5G_nsa	TOTAL
Germany - Berlin	35,20	92,06	127,27
Germany - Cologne	12,22	47,20	59,43
Germany - Dortmund	50,19	73,74	123,94
Germany - Dusseldorf	41,06	126,95	168,01
Germany - Frankfurt	24,90	72,34	97,25
Germany - Gelsenkirchen	55,70	110,97	166,68
Germany - Hamburg	25,82	182,66	208,48
Germany - Leipzig	45,88	100,57	146,44
Germany - Munich	22,37	68,85	91,21
Germany - Nuremberg	50,35	110,64	160,99
Germany - Stuttgart	84,89	166,35	251,25
TOTAL	**448,61**	**1152,34**	**1600,96**

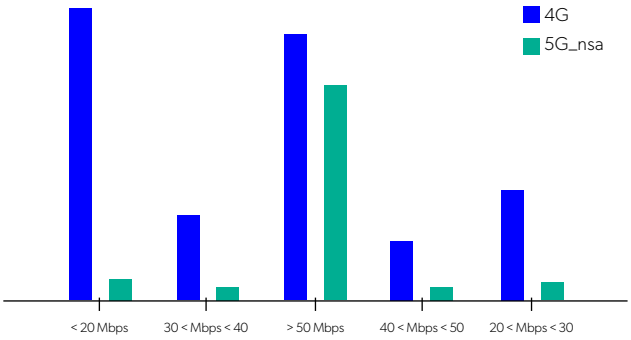


2.12
Download Speed Distribution 4G - 5G

Although figures related to the timeframe subscribers spent under 4G seem good enough, the speed falls to less than 20 Mbps, the worst category in the range established in this study. 5G shows significantly higher speed experience in this scale, which can push subscribers to higher usage making data packages offered by operators generate more revenues. Best Data experience equals higher revenues.



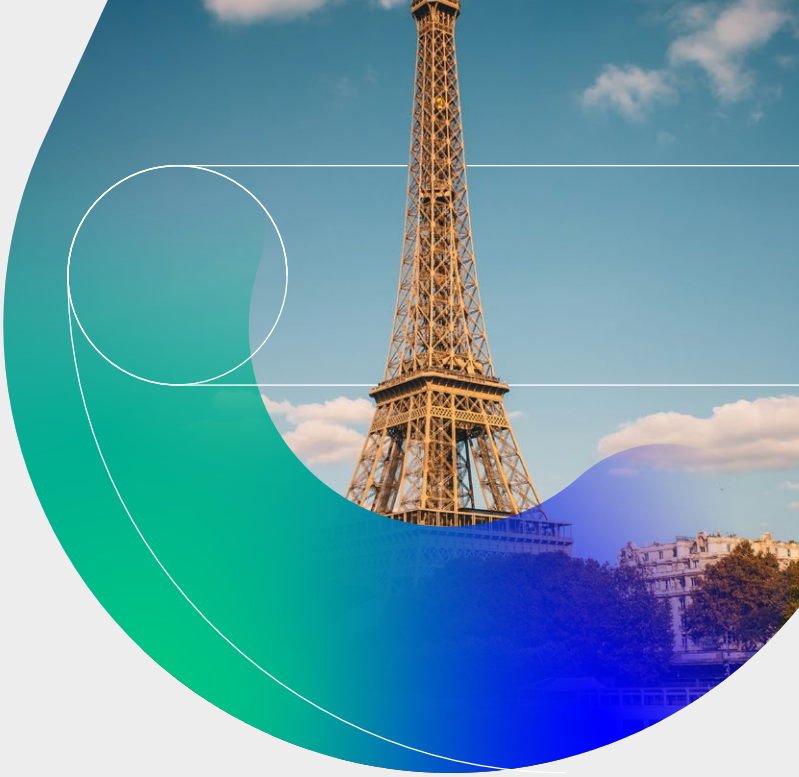
VALUES	4G	5G_nsa	GRAND TOTAL
> 50 Mbps	183	147	330
40 < Mbps < 50	41	9	50
30 < Mbps < 40	57	9	66
20 < Mbps < 30	75	12	87
< 20 Mbps	200	15	215



ROAMING BENCHMARKING

Roaming Quality Campaigns at Large-Scale Events

Olympics 2024



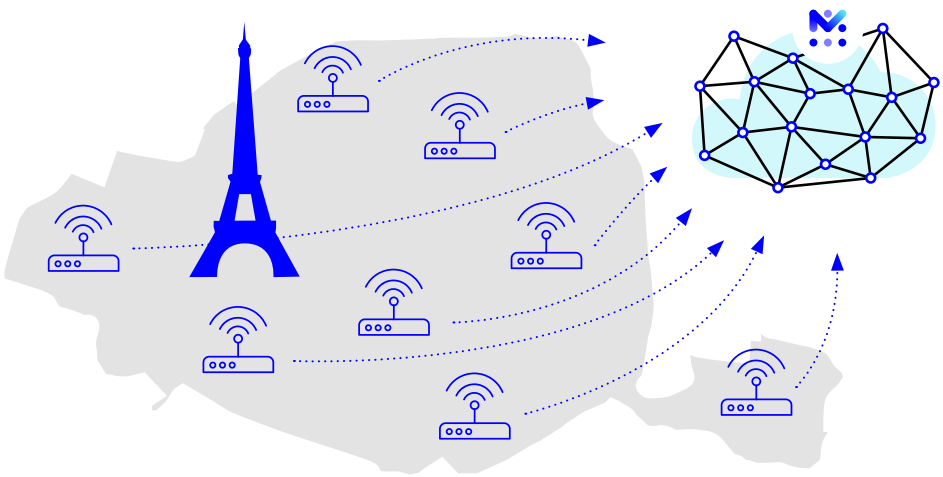
3. Roaming Benchmarking

OLYMPICS 2024

The Olympics 2024 benchmarking campaign was executed using Mobileum's GlobalRoamer® platform, leveraging both the Self-Managed and Full-Service testing packages. These included comprehensive test cases covering Voice Quality (VoLTE / 3G / 2G), SMS, HTTP Download, Ookla SpeedTest (LTE), CSFB Voice, IMS Register, VoLTE & SMS over IP, and 5G NR Data Testing (attach, PDP context activation, and speed). Tests were conducted at a frequency of four to six cycles per day across all major French mobile network operators.

In addition to existing GlobalRoamer® infrastructure, extra probes were installed throughout Paris and its surroundings to capture localized network conditions around the main sports venues and high-traffic areas.

Complementary Steering of Roaming (SoR) tests were also executed, including outbound SoR validation, location updates per hour, user distribution under the roaming partner, and monitoring of forbidden networks.



Data was consolidated daily and weekly to produce detailed performance reports and dashboards, enabling continuous assessment of key performance indicators such as call set-up time, data throughput, latency, and Mean Opinion Score (MOS) for voice quality.

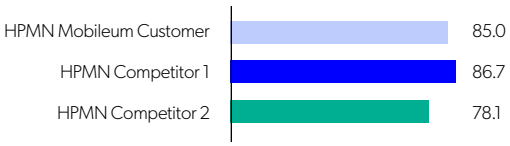
The results of the campaign revealed overall good network performance and service continuity, with the Mobileum customer showing strong results in CLI transparency and voice quality. However, some areas required further investigation and optimization — notably, call setup times, end-to-end SMS delivery, and 5G NSA throughput stability.

VoLTE roaming activation was still pending in certain partner networks, and data speed fluctuations were observed in non-standalone 5G scenarios. The findings presented in this report summarize these insights, highlighting the comparative results against competitors, identifying improvement areas, and providing recommendations for future large-scale event readiness.

3.1 Test Results and Analysis

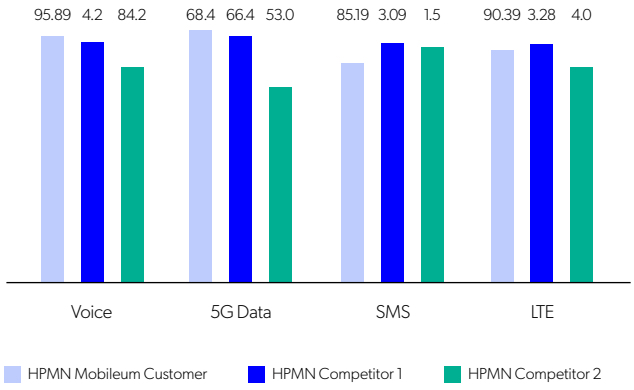
Overall Performance

The overall performance indicator for all countries shows that HPMN (Mobileum Customer) is slightly behind the other competitors. The Single Quality Indicator (SQI) per service clearly shows that this is due to the data services. The HPMN (Mobileum Customer) presented a good performance for voice and SMS.



Note

The GSMA recommended SQI and SSI values are 85% and above.



3.2
HPMN (Mobileum Customer) Performance per Roaming Partner

This chapter is dedicated exclusively to the HPMN (Mobileum Customer) performance measured and has the objective to go into more detail to address the areas where improvement is needed. The SQI per each of the roaming partners reported in paragraph 4.1 for each of the analyzed countries provides a quick comparison of the user experience in all roaming partners of a visited country.

After the comparison with the competitors, the results presented below should help to refine the SoR policy according to the performance. At the same time, they can be used to trigger detailed technical investigations where it is necessary to improve performance.

As a second step the SQI per service in each roaming partner is also reported. Further details are included in paragraph 4.1 and chapter 6.

In this section, detailed results are reported per visited country.

3.3
GRQ Matrix per Roaming Partner

France: FR MNO#1

Outbound Performance Analysis:
Outbound Campaign France
2024-02-01 00:00 to 2024-02-16 12:42 UTC+00:00

	MOBILEUM CUSTOMER	COMPETITOR 1	COMPETITOR 2
VoLTE Call Setup SR_MO (%)	100	--	--
VoLTE Call Setup SR_MT (%)	--	--	--
VoLTE Post Dial Delay_MO (msec)	1223.07	--	--
VoLTE Post Dial Delay_MT (msec)	--	--	--
VoLTE Call Completion Rate_MO (%)	93.75	45.01	--
VoLTE Call Completion Rate_MT (%)	--	--	--
VoLTE CLI_Transparency_MO (%)	100	--	--
VoLTE CLI_Transparency_MT (%)	--	--	--
VoLTE SpQ_Uplink_MO	4.5	--	-
VoLTE SpQ_Downlink_MO	4.49	--	--
VoLTE SpQ_Uplink_MT	--	--	--
VoLTE SpQ_Downlink_MT	4.49	--	--
SMSoIP_SR_MO (%)	55.56	0	--
SMSoIP_SR_MT (%)	55.56	--	--
CSFB Call Setup SR_MO (%)	100	100	--
CSFB Call Setup SR_MT (%)	100	100	--

	MOBILEUM CUSTOMER	COMPETITOR 1	COMPETITOR 2
CSFB CallEstablishDuration_MO (msec)	10382.19	10737.54	--
CSFB CallEstablishDuration_MT (msec)	9440	10639	--
CSFB VoiceCallAccessibility Rate_MO (%)	100	100	--
CSFB VoiceCallAccessibility Rate_MT (%)	100	100	--
GSM Call Setup SR_MO (%)	100	100	--
GSM Call Setup SR_MT (%)	100	91.67	--
GSM CallEstablishDuration_MO (msec)	7836.38	5678.83	--
GSM CallEstablishDuration_MT (msec)	8441	5951	--
GSM VoiceCallAccessibility Rate_MO (%)	100	100	--
GSM VoiceCallAccessibility Rate_MT (%)	100	91.67	-
GSM CLI_Transparency MO (%)	100	100	--
GSM CLI_Transparency MT (%)	100	100	--
GSM SpQ_Uplink_MO	3.51	4.08	--
GSM SpQ_Downlink_MO	3.47	3.98	--
GSM SpQ_Uplink_MT	3.3	3.74	--
GSM SpQ_Downlink_MT	3.69	3.94	--
LTE GPRS_Attach (%)	100	100	100
LTE PDP_CA_SR (%)	100	100	100
LTE PDP_Context Cutoff Ratio (%)	0	0	0
LTE HTTP SR (%)	94.44	100	100
LTE DownloadRate (Mbps)	14.48	27.95	16.82
LTE UploadRate (Mbps)	8.63	10.46	11.47
LTE Latency (ms)	48.06	48.91	57
5G_NSA GPRS_Attach (%)	100	100	100
5G_NSA PDP_CA_SR (%)	100	100	100
5G_NSA PDP_Context Cutoff Ratio (%)	0	0	0
5G_NSA HTTP SR (%)	100	100	100
5G_NSA DownloadableRate (Mbps)	47.47	45.28	58.55
5G_NSA UploadableRate (Mbps)	4.27	10.99	7.92
5G_NSA Latency (ms)	55.2	61.5	62.89

France: FR MNO#2

Outbound Performance Analysis:
France
2024-02-01 00:00 to 2024-02-16 12:42 UTC+00:00

	MOBILEUM CUSTOMER	COMPETITOR 1	COMPETITOR 2
VoLTE Call Setup SR_MO (%)	10382.19	10737.54	--
VoLTE Call Setup SR_MT (%)	100	--	--
VoLTE Post Dial Delay_MO (msec)	--	--	--
VoLTE Post Dial Delay_MT (msec)	1223.07	--	--
VoLTE Call Completion Rate_MO (%)	--	--	--
VoLTE Call Completion Rate_MT (%)	93.75	0	--
VoLTE CLI_Transparency_MO (%)	--	--	--
VoLTE CLI_Transparency_MT (%)	100	--	--
VoLTE SpQ_Uplink_MO	--	--	--
VoLTE SpQ_Downlink_MO	4.5	--	--
VoLTE SpQ_Uplink_MT	4.49	--	--
VoLTE SpQ_Downlink_MT	--	--	--
SMSoIP_SR_MO (%)	4.49	--	--
SMSoIP_SR_MT (%)	55.56	0	--
CSFB Call Setup SR_MO (%)	55.56	--	--
CSFB Call Setup SR_MT (%)	100	100	--
CSFB CallEstablishDuration_MO (msec)	100	100	--
CSFB CallEstablishDuration_MT (msec)	10382.19	10737.54	--
CSFB VoiceCallAccessibility Rate_MO (%)	9440	10639	--
CSFB VoiceCallAccessibility Rate_MT (%)	100	100	--
GSM Call Setup SR_MO (%)	100	100	--
GSM Call Setup SR_MT (%)	100	100	--
GSM CallEstablishDuration_MO (msec)	100	91.67	--
GSM CallEstablishDuration_MT (msec)	7836.38	5678.83	--
GSM VoiceCallAccessibility Rate_MO (%)	8441	5951	--
GSM VoiceCallAccessibility Rate_MT (%)	100	100	--
GSM CLI_Transparency MO (%)	100	91.67	--
GSM CLI_Transparency MT (%)	100	100	--
GSM SpQ_Uplink_MO	100	100	--
GSM SpQ_Downlink_MO	3.51	4.08	--

	MOBILEUM CUSTOMER	COMPETITOR 1	COMPETITOR 2
GSM SpQ_Downlink_MO	3.47	3.98	--
GSM SpQ_Uplink_MT	3.3	3.74	--
GSM SpQ_Downlink_MT	3.69	3.94	--
LTE GPRS_Attach (%)	100	100	100
LTE PDP_CA_SR (%)	100	100	100
LTE PDP_Context Cutoff Ratio (%)	0	0	0
LTE HTTP SR (%)	94.44	100	100
LTE DownloadRate (Mbps)	14.48	27.95	16.82
LTE UploadRate (Mbps)	8.63	10.46	11.47
LTE Latency (ms)	48.06	48.91	57
5G_NSA GPRS_Attach (%)	100	100	100
5G_NSA PDP_CA_SR (%)	100	100	100
5G_NSA PDP_Context Cutoff Ratio (%)	0	0	0
5G_NSA HTTP SR (%)	100	100	100
5G_NSA DownloadRate (Mbps)	47.47	45.28	58.55
5G_NSA UploadRate (Mbps)	4.27	10.99	7.92
5G_NSA Latency (ms)	55.2	61.5	62.89

France: FR MNO#3

Outbound Performance Analysis:
France
2024-02-01 00:00 to 2024-02-16 12:42 UTC+00:00

	MOBILEUM CUSTOMER	COMPETITOR 1	COMPETITOR 2
VoLTE Call Setup SR_MO (%)	--	--	--
VoLTE Call Setup SR_MT (%)	--	--	--
VoLTE Post Dial Delay_MO (msec)	--	--	--
VoLTE Post Dial Delay_MT (msec)	--	--	--
VoLTE Call Completion Rate_MO (%)	0	--	--
VoLTE Call Completion Rate_MT (%)	--	--	--
VoLTE CLI_Transparency_MO (%)	--	--	--
VoLTE CLI_Transparency_MT (%)	--	--	--
VoLTE SpQ_Uplink_MO	--	--	--
VoLTE SpQ_Downlink_MO	--	--	--
VoLTE SpQ_Uplink_MT	--	--	--
VoLTE SpQ_Downlink_MT	--	--	--

	MOBILEUM CUSTOMER	COMPETITOR 1	COMPETITOR 2
SMSoIP_SR_MO (%)	0	--	--
SMSoIP_SR_MT (%)	0	--	--
CSFB Call Setup SR_MO (%)	100	100	--
CSFB Call Setup SR_MT (%)	100	92.86	--
CSFB CallEstablishDuration_MO (msec)	13644	10874.85	--
CSFB CallEstablishDuration_MT (msec)	10906.35	10973.15	--
CSFB VoiceCallAccessibility Rate_MO (%)	100	100	--
CSFB VoiceCallAccessibility Rate_MT (%)	100	92.86	--
GSM Call Setup SR_MO (%)	100	100	--
GSM Call Setup SR_MT (%)	93.33	100	--
GSM CallEstablishDuration_MO (msec)	7422.19	5984	--
GSM CallEstablishDuration_MT (msec)	7273.07	6131.86	--
GSM VoiceCallAccessibility Rate_MO (%)	100	100	--
GSM VoiceCallAccessibility Rate_MT (%)	93.33	100	--
GSM CLI_Transparency MO (%)	100	100	--
GSM CLI_Transparency MT (%)	100	100	--
GSM SpQ_Uplink_MO	3.55	3.89	--
GSM SpQ_Downlink_MO	3.34	3.95	--
GSM SpQ_Uplink_MT	3.56	3.73	--
GSM SpQ_Downlink_MT	3.91	3.69	--
LTE GPRS_Attach (%)	100	100	100
LTE PDP_CA_SR (%)	100	100	100
LTE PDP_Context Cutoff Ratio (%)	0	0	0
LTE HTTP SR (%)	100	100	100
LTE DownloadRate (Mbps)	16.35	24.44	23.04
LTE UploadRate (Mbps)	5.64	8.45	9.74
LTE Latency (ms)	49.94	65	58
5G_NSA GPRS_Attach (%)	100	100	100
5G_NSA PDP_CA_SR (%)	100	100	100
5G_NSA PDP_Context Cutoff Ratio (%)	0	0	0
5G_NSA HTTP SR (%)	100	--	100
5G_NSA DownloadRate (Mbps)	53.11	--	81.22
5G_NSA UploadRate (Mbps)	8.49	--	12.44
5G_NSA Latency (ms)	48.83	--	77

3.4 Benchmarking Methodology

This appendix describes the methodology used to compare the user experience among the HPMN subscribers of the three mobile operators. First, the steering distribution across the available networks per country is reported. Then a single KPI gives the overall performance of each operator in the country as this can be considered a real benchmarking indicator.

3.4.1 Steering of Roaming

The first table per each country represents the steering distribution of each home network SIM in the roaming partners. This is derived from the location update success, since it is specified to which visited network the SIM has to be registered. Therefore, it is measured if a network is accessible in all cases and the percentage of success per each network is reported.

Automatic Location Update Distribution
LU distribution_ALL
2024-01-29 00:00 to 2024-02-16 15:09

	MOBILEUM CUSTOMER	COMPETITOR 1	COMPETITOR 2
Spain MNO1	0	100	0
Spain MNO2	100	100	0
Spain MNO3	0	100	100
France MNO1	100	100	0
France MNO2	100	0	100
France MNO3	0	100	100
Greece MNO1	100	100	100
Greece MNO2	0	100	100
Italy MNO1	100	100	0
Italy MNO2	0	50	100
Italy MNO3	100	0	0
Netherlands MNO1	100	100	100
Netherlands MNO2	0	100	0
Netherlands MNO3	0	100	100
Norway MNO1	100	100	100
Norway MNO2	100	100	100
Poland MNO1	100	100	100
Poland MNO2	0	100	100
Poland MNO3	0	100	100
USA MNO1	100	100	100
USA MNO2	0	100	100
USA MNO3	100	100	100

3.4.2 Country Single Quality Indicator for Benchmarking

To derive a simple and overall view to benchmark HPMN (Mobileum Customer) performance against the competitors, a Single Quality Indicator (SQI) was calculated and represented in a chart per country.

As a first step, the SQI per service originated in the visited network is calculated with the following weights:

Voice = 30%* CSSR + 25% * MOS + 30% * CCSR + 15% * CLI

SMS = 60% * SMS Success Ratio + 40% E2E Delay

Data = 50% * PDP CA SR + 15% * DL_Speed + 15% *UL_Speed Go + 25% * Latency

Where:

- **CSSR:** Call Set up Success Ratio
- **MOS:** Mean Opinion Score
- **CCSR:** Call completion Success Ratio
- **CLI:** Caller Line Identifier
- **PDP_CA_SR:** PDP Context Activation Success Ratio
- **DL_Speed:** HTTP Download Rate
- **UL_Speed:** HTTP Upload Rate
- **Latency:** HTTP Data Delay

For each visited network, a general SQI is calculated combining the SSI of each service.

Visited PLMN SQI = 35%* Voice (SSI) + 50% * Data (SSI) + 15% * SMS (SSI)

Country SQI = Average (visited PLMN SQI)

Finally, the Country Single Quality Indicator (SQI) per visiting subscriber is calculated as the average of the Visited PLMN SQI in that country.

The success rate KPIs have been calculated all on a scale between 0 and 100. All other KPIs have been fixed based on the max and minimum measurement obtained from the tests. The values adopted are depicted in the table below.

VOICE SSI	DESCRIPTION	CONTRIBUTION (%)	RANGE	GOOD IS
CSSR_VH	Call set up SR	35	0 - 100	100
CLI	Caller Line Identifier	15	0 - 100	min
CCR_VH	Call completion SR	30	0 - 100	100
MOS_VH	Voice quality MOS	25	0 - 5	max

DATA	DESCRIPTION	CONTRIBUTION (%)	THRESHOLDS	GOOD IS
PDP CA SR	PDP context success ratio	50	0 - 100	100
Upload Rate	HTTP Upload Rate	15		max
Download Rate	HTTP Download Rate	15		max
Latency	HTTP Data Delay	20		max

SMS	DESCRIPTION	CONTRIBUTION (%)	THRESHOLDS	GOOD IS
SuccessRate_VH	SMS delivered within 3 min	60	0 - 100	100
E2E Delay	End-to-End Delay	40		

All SQIs were compared by using a linear scale with the ranges indicated above. The Country SQI per each home network is represented in a single chart in the detailed analysis for each country.

3.5 Analysis and Conclusion

This benchmarking campaign highlighted several interesting points. First, the SIMs must stay in the country during the campaign because the anti-fraud and signaling security systems block retail SIMs that jump several times across eight countries on the same day and make data downloads. In addition, the data download must be controlled to avoid "abuse" detection over anti-fraud monitoring systems.

Based on the indicators in this report, although HPMN (Mobileum Customer)'s performance was overall good, it was inferior to Competitor 1. Improvement in these indicators would result in improved QoE.

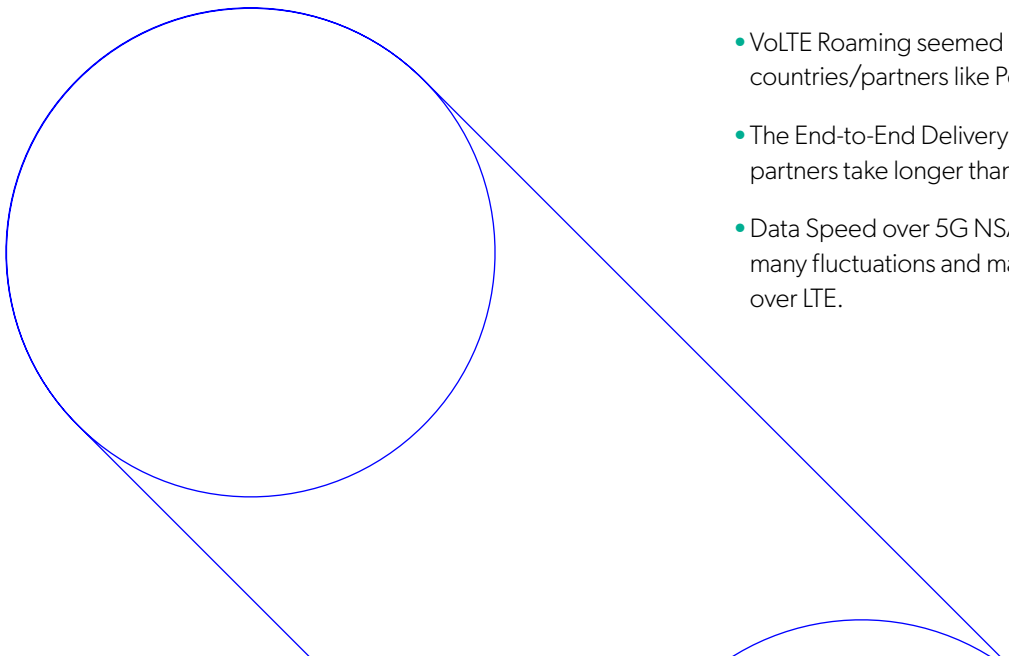
Some points require more investigation and focused testing.

Before a final conclusion can be reached a more comprehensive testing campaign would be required. This might depend also on the GRX/IPX used, in fact, some high round trip times, greater than 500ms, were measured for some European operators. In terms of throughput, the test results for HPMN (Mobileum Customer) show room for improvement when compared with Competitor 2.

In general, following this test campaign performed on behalf of a customer, Mobileum would recommend repeating certain test cases to root cause scenarios where there is room for improvement in resolving certain issues identified.

Remarks

- The Mobileum customer presented very good performance & experience in CLI (calling line identification) transparency.
- The overall call setup and call establishment times exceeded the expected thresholds.
- The Voice Quality based on the Mean Opinion Score was very good.
- VoLTE Roaming seemed not yet to be activated in certain countries/partners like Poland.
- The End-to-End Delivery times for SMS over IP in most partners take longer than standard expectations.
- Data Speed over 5G NSA (non-standalone) presented many fluctuations and many samples were fully executed over LTE.



ROAMING BENCHMARKING

Testing Managed Service

Qatar 2022 WoldCup Package
A Roaming Testing Report

4. Roaming Benchmarking

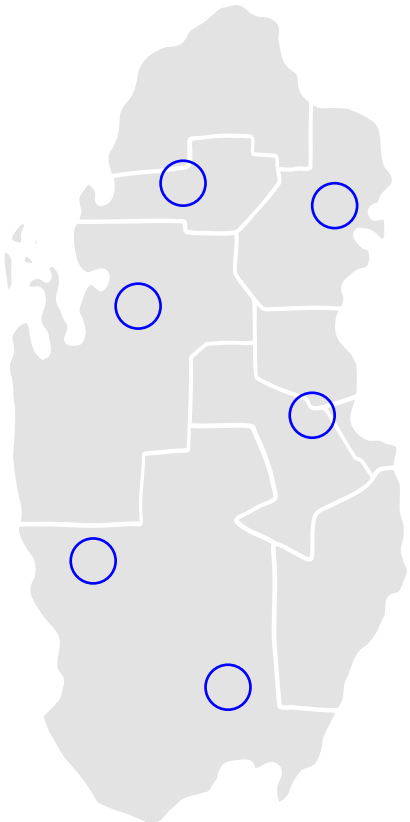
QATAR 2022 WORLDCUP

4.1 Testing Campaign Analysis Summary

The Qatar 2022 WorldCup Managed Service Campaign comprising 5G/4G/3G testing was executed for Qatar Networks. Mobileum installed 6 extra probes at the locations (near the stadiums) as determined by the customer.

Tested scenarios included:

- Standard SMS
- Voice Call
- HTTP Download
- Ookla Speedtest
- 5G Attach



This summary report highlights some of the failures observed in Qatar networks. The operators' names have been anonymized to protect their data. This report was issued by the Mobileum office located at Klingenhofstr. 50d, D-90411 Nuremberg, Germany.

OPERATOR 1

SCENARIO	AL THUMAMA (DOHA) STADIUM	LUSAIL STADIUM
Network Access	OK	OK
3G Voice Call	OK	OK
3G Call Setup (SR (%)	99.3	99.29
3G Call Setup Alert Duration (s)	5.84	5.79
3G MOS_LQO_1	3.72	3.71
3G MOS_LQO_2	3.16	3.33
3G CLI Exists (%)	100	100
3G CLI Check (%)	100	100
3G SMS	OK	OK
3G SMS Success (%)	99.29	99.28
3G SMS Send Duration (s)	2.8	2.83
3G SMS E2E Duration (s)	4.11	4.25
CSFB Call	OK	OK
CSFB Call Setup SR (%)	98.61	99,26
CSFB Call Setup Alert Duration (s)	8.69	8.76
CSFB Return to LTE Duration (%)	1.86	1.79
LTE SMS	OK	OK
LTE SMS Success (%)	99.31	99.27
LTE SMS Send Duration (s)	1.85	1.87
LTE SMS E2E Duration (s)	2.21	2.22
LTE HTTP Download	OK	OK
LTE Attach SR (%)	100	100
LTE Download SR (%)	98.62	99.28
LTE DNS Duration (ms)	210.48	211.11
LTE HTTP Download Duration (s)	2.72	2.57
LTE Ookla Speedtest	OK	OK
LTE Download Rate (Mb/s)	32.87	83.08
LTE Upload Rate (Mb/s)	18.74	26.23
LTE Latency (ms)	180.98	182.12
5G Attach	OK	OK
5G Attach SR (%)	100	100
5G Ookla Speedtest	OK	OK
5G Download Rate (Mb/s)	139.89	172.29
5G Upload Rate (MB/s)	25.61	36.08
5G Latency (ms)	179.79	180.37

OPERATOR 2

SCENARIO	AL THUMAMA (DOHA) STADIUM	LUSAIL STADIUM
Network Access	OK	OK
3G Voice Call	OK	OK
3G Call Setup (SR (%)	99.3	99.28
3G Call Setup Alert Duration (s)	5.05	5.15
3G MOS_LQO_1	3.82	3.84
3G MOS_LQO_2	3.68	3.84
3G CLI Exists (%)	100	100
3G CLI Check (%)	100	100
3G SMS	OK	OK
3G SMS Success (%)	98.6	100
3G SMS Send Duration (s)	3.38	3.65
3G SMS E2E Duration (s)	5.01	5.15
CSFB Call	OK	OK
CSFB Call Setup SR (%)	99.3	100
CSFB Call Setup Alert Duration (s)	7.93	8.06
CSFB Return to LTE Duration (%)	1.53	3.8
LTE SMS	OK	OK
LTE SMS Success (%)	100	100
LTE SMS Send Duration (s)	1.27	1.31
LTE SMS E2E Duration (s)	1.87	1.96
LTE HTTP Download	OK	OK
LTE Attach SR (%)	100	100
LTE Download SR (%)	95.14	98.55
LTE DNS Duration (ms)	192.66	189.23
LTE HTTP Download Duration (s)	2.21	2.21
LTE Ookla Speedtest	OK	OK
LTE Download Rate (Mb/s)	52.78	3.97
LTE Upload Rate (Mb/s)	27.82	3.42
LTE Latency (ms)	136.26	160.11
5G Attach	OK	n/a
5G Attach SR (%)	99.29	n/a
5G Ookla Speedtest	OK	n/a
5G Download Rate (Mb/s)	46.87	n/a
5G Upload Rate (MB/s)	40.94	n/a
5G Latency (ms)	150.24	n/a

4.2 Conclusions & Recommendations

Operator 1

3G, 4G, 5G – No issues were observed.

Operator 2

- 4G – Lusail Stadium – Ookla Speedtest – Low download/ upload rates were observed.
- 5G – Lusail Stadium – Attach, Ookla Speedtest – 5G network is available but not assigned to UE.
- 5G - Al Thumama (Doha) Stadium - Ookla Speedtest – Low download rates were observed.

Recommendation:

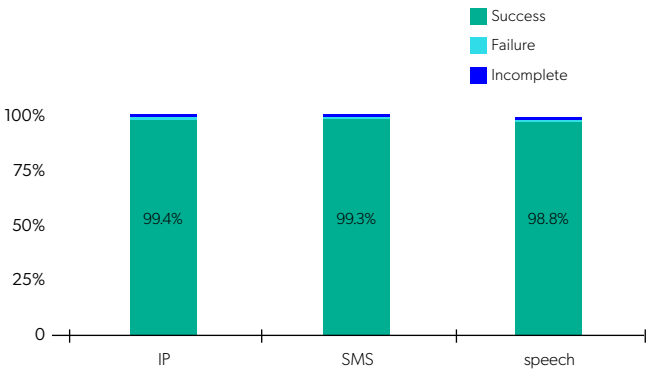
Contact the roaming partner and report low data rates observed.

The roaming partner should try to optimize the throughput for Operator 2 roamers.

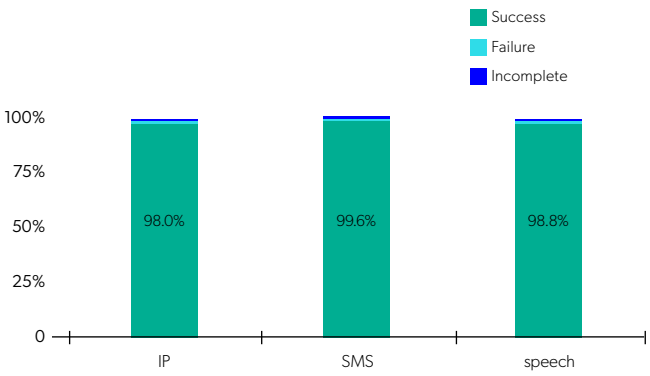
4.3 QoS Summary Report

Testing Period
2022-11-11 00:00 to 2022-12-19 00:00

Operator 1: Success Rate per TC



Operator 1: Success Rate per TC



Operator 1: QoS KPIs AVG Daily Trend

5G Data KPIs

KPI	11 NOV	12 NOV	13 NOV	14 NOV	15 NOV	16 NOV	17 NOV	18 NOV	19 NOV	20 NOV
5G Data KPIs	--	--	--	--	--	--	--	--	--	--
5G Attach SR [%]	100	100	100	100	100	100	100	100	100	100
5G Download Rate [Mb/s]	66.69	140.64	217.04	47.45	102.77	125.17	135.85	150.76	149.09	222.91
5G Upload Rate [Mb/s]	13.71	24.69	32.21	38.42	30.76	26.7	18.81	27.24	30.89	36.74
5G Latency [ms]	172.67	178.88	177.25	177.25	177.13	179.14	180.67	183.63	202.57	179.8

KPI	21 NOV	22 NOV	23 NOV	24 NOV	25 NOV	26 NOV	27 NOV	28 NOV	29 NOV	30 NOV
5G Data KPIs	--	--	--	--	--	--	--	--	--	--
5G Attach SR [%]	100	100	100	100	100	100	100	100	100	100
5G Download Rate [Mb/s]	218.59	172.67	149.75	189.32	127.73	143.15	189.65	175.16	178.19	160.67
5G Upload Rate [Mb/s]	35.16	33.5	35.23	31.78	23.9	23.89	27.4	24.3	25.36	34.93
5G Latency [ms]	182.75	187.14	201.38	187.17	181.88	177.33	178.33	184.17	185	180.43

KPI	01 DEC	02 DEC	03 DEC	04 DEC	05 DEC	06 DEC	07 DEC	08 DEC	09 DEC	10 DEC
5G Data KPIs	--	--	--	--	--	--	--	--	--	--
5G Attach SR [%]	100	100	100	100	100	100	100	100	100	100
5G Download Rate [Mb/s]	191.42	86.31	197.58	169.38	152.54	90.21	185.31	167.84	115.97	100.4
5G Upload Rate [Mb/s]	24.92	30.69	23.55	33.66	33.39	25.4	32.84	37.39	34.34	38.41
5G Latency [ms]	176.86	184.57	180.75	189.5	180.88	185	179.38	182.13	172.43	172.5

KPI	11 DEC	12 DEC	13 DEC	14 DEC	15 DEC	16 DEC	17 DEC	18 DEC	AVG
5G Data KPIs	--	--	--	--	--	--	--	--	--
5G Attach SR [%]	100	100	100	100	100	100	100	100	100
5G Download Rate [Mb/s]	114.2	181.77	246.47	151.93	181.32	183.19	148.69	175.75	155.68
5G Upload Rate [Mb/s]	34.62	33.32	33.85	31.32	31.63	31.1	30.64	33.29	30.71
5G Latency [ms]	173.63	173.13	170	179	174.25	172	174.13	168.13	180.08

3G KPIs

KPI	11 NOV	12 NOV	13 NOV	14 NOV	15 NOV	16 NOV	17 NOV	18 NOV	19 NOV	20 NOV
3G KPIs	--	--	--	--	--	--	--	--	--	--
3G Call Setup SR [%]	75	100	100	100	100	100	100	100	100	100
3G Call Setup Alert Duration [s]	5.94	5.68	5.59	6.28	5.53	5.85	6.03	6	6.1	5.69
3G MOS_LQ01	3.79	3.74	3.71	3.72	3.76	3.73	3.73	3.03	3.73	3.69
3G MOS_LQ02	3.22	3.24	3.23	3.35	3.3	3.36	3.21	2.92	3.25	3.33
3G CLI Exists [%]	100	100	100	100	100	100	100	100	100	100
3G CLI Check [%]	100	100	100	100	100	100	100	100	100	100
3G SMS Success [%]	75	100	100	100	100	100	100	100	100	100
3G SMS Send Duration [s]	3.55	2.92	2.76	2.73	2.68	3.17	2.73	2.68	2.74	2.72
3G SMS E2E Duration [s]	4.75	4.2	4.19	4.19	4.36	4.42	3.91	4.01	3.88	3.95

KPI	21 NOV	22 NOV	23 NOV	24 NOV	25 NOV	26 NOV	27 NOV	28 NOV	29 NOV	30 NOV
3G KPIs	--	--	--	--	--	--	--	--	--	--
3G Call Setup SR [%]	100	100	100	100	100	100	100	100	100	100
3G Call Setup Alert Duration [s]	6.25	5.74	5.7	5.6	5.54	5.91	5.63	5.46	5.76	6.15
3G MOS_LQ01	3.69	3.74	3.73	3.79	3.73	3.73	3.75	3.75	3.71	3.75
3G MOS_LQ02	3.28	3.39	3.11	3.03	3.21	3.18	3.03	3.22	3.33	3.34
3G CLI Exists [%]	100	100	100	100	100	100	100	100	100	100
3G CLI Check [%]	100	100	100	100	100	100	100	100	100	100
3G SMS Success [%]	100	100	100	100	100	100	100	100	100	100
3G SMS Send Duration [s]	2.56	2.68	2.8	2.85	2.86	3.37	2.87	2.77	2.85	2.72
3G SMS E2E Duration [s]	4.39	3.77	4.49	4.18	4.36	4.58	4.19	4.01	4.14	3.87

KPI	01 DEC	02 DEC	03 DEC	04 DEC	05 DEC	06 DEC	07 DEC	08 DEC	09 DEC	10 DEC
3G KPIs	--	--	--	--	--	--	--	--	--	--
3G Call Setup SR [%]	100	100	100	100	100	100	100	100	100	100
3G Call Setup Alert Duration [s]	5.78	6.32	5.56	5.99	5.53	5.63	5.37	5.59	6.13	5.58
3G MOS_LQ01	3.7	3.78	3.71	3.71	3.65	3.73	3.74	3.74	3.75	3.76
3G MOS_LQ02	3.39	3.18	3.14	3.22	3.22	3.15	3.26	3.3	3.18	3.36
3G CLI Exists [%]	100	100	100	100	100	100	100	100	100	100
3G CLI Check [%]	100	100	100	100	100	100	100	100	100	100
3G SMS Success [%]	100	100	100	100	100	100	100	100	100	100
3G SMS Send Duration [s]	2.79	2.64	2.79	2.72	2.69	2.53	2.77	2.83	3.13	2.87
3G SMS E2E Duration [s]	4.38	4.51	3.99	4.38	4.26	3.81	4.08	4.02	4.2	4.1

KPI	11 DEC	12 DEC	13 DEC	14 DEC	15 DEC	16 DEC	17 DEC	18 DEC	AVG
3G KPIs	--	--	--	--	--	--	--	--	--
3G Call Setup SR [%]	100	100	100	87.5	100	100	100	100	99.29
3G Call Setup Alert Duration [s]	6.12	5.64	6.24	5.59	6.45	5.72	5.69	5.56	5.82
3G MOS_LQ01	3.77	3.72	3.74	3.77	3.7	3.71	3.72	3.7	3.71
3G MOS_LQ02	3.07	3.35	3.12	3.28	3.17	3.31	3.35	3.46	3.24
3G CLI Exists [%]	100	100	100	100	100	100	100	100	100
3G CLI Check [%]	100	100	100	100	100	100	100	100	100
3G SMS Success [%]	100	100	100	100	100	100	87.5	100	99.29
3G SMS Send Duration [s]	2.78	3.07	3.09	2.62	2.67	2.64	3.01	2.7	2.81
3G SMS E2E Duration [s]	4.06	4.37	4.36	4.01	4.01	4.1	4.36	4.38	4.18

CSFB KPIs

KPI	11 NOV	12 NOV	13 NOV	14 NOV	15 NOV	16 NOV	17 NOV	18 NOV	19 NOV	20 NOV
CSFB KPIs	--	--	--	--	--	--	--	--	--	--
CSFB Call Setup SR [%]	100	100	100	100	100	100	100	100	100	100
CSFB Call Setup Alert Duration [s]	8.8	8.67	8.46	8.37	8.74	8.34	8.55	8.58	8.92	9.25
CSFB Return to LTE Duration [s]	1.67	1.72	1.86	1.84	2.01	1.75	1.69	1.7	1.69	1.71

KPI	21 NOV	22 NOV	23 NOV	24 NOV	25 NOV	26 NOV	27 NOV	28 NOV	29 NOV	30 NOV
CSFB KPIs	--	--	--	--	--	--	--	--	--	--
CSFB Call Setup SR [%]	100	100	100	100	100	100	100	100	100	100
CSFB Call Setup Alert Duration [s]	8.31	8.58	8.8	8.72	9.64	8.94	8.67	8.8	8.44	8.65
CSFB Return to LTE Duration [s]	1.9	2.1	1.83	1.75	1.86	1.86	1.7	1.64	2.08	2.17

KPI	01 DEC	02 DEC	03 DEC	04 DEC	05 DEC	06 DEC	07 DEC	08 DEC	09 DEC	10 DEC
CSFB KPIs	--	--	--	--	--	--	--	--	--	--
CSFB Call Setup SR [%]	100	100	100	100	100	100	100	100	100	100
CSFB Call Setup Alert Duration [s]	8.65	8.16	8.61	8.67	9.05	9.03	8.31	8.83	9	8.31
CSFB Return to LTE Duration [s]	1.87	1.85	1.72	1.87	1.73	1.7	1.87	1.88	1.71	1.66

KPI	11 DEC	12 DEC	13 DEC	14 DEC	15 DEC	16 DEC	17 DEC	18 DEC	AVG
CSFB KPIs	--	--	--	--	--	--	--	--	--
CSFB Call Setup SR [%]	100	100	100	100	100	100	87.5	100	98.92
CSFB Call Setup Alert Duration [s]	8.99	8.96	8.53	8.64	9.07	9.08	8.74	8.7	8.72
CSFB Return to LTE Duration [s]	1.73	1.89	1.67	2.02	1.84	1.84	1.86	1.82	1.83

LTE SMS KPIs

KPI	11 NOV	12 NOV	13 NOV	14 NOV	15 NOV	16 NOV	17 NOV	18 NOV	19 NOV	20 NOV
LTE SMS KPIs	--	--	--	--	--	--	--	--	--	--
LTE SMS Success [%]	100	100	100	100	100	100	100	100	100	100
LTE SMS Send Duration [s]	2.05	1.97	1.9	1.91	1.9	1.89	1.81	1.91	1.85	1.81
LTE SMS E2E Duration [s]	2.22	2.15	2.03	2.25	2.06	2.17	2.09	2.34	2.13	2.3

KPI	21 NOV	22 NOV	23 NOV	24 NOV	25 NOV	26 NOV	27 NOV	28 NOV	29 NOV	30 NOV
LTE SMS KPIs	--	--	--	--	--	--	--	--	--	--
LTE SMS Success [%]	100	100	100	100	100	100	100	100	100	100
LTE SMS Send Duration [s]	1.76	1.85	1.84	1.92	1.89	1.87	1.96	1.86	2.06	1.9
LTE SMS E2E Duration [s]	2.12	2.4	2.24	2.21	2.46	2.2	2.32	2.19	2.23	2.27

KPI	01 DEC	02 DEC	03 DEC	04 DEC	05 DEC	06 DEC	07 DEC	08 DEC	09 DEC	10 DEC
LTE SMS KPIs	--	--	--	--	--	--	--	--	--	--
LTE SMS Success [%]	100	100	88.89	100	100	100	100	100	100	100
LTE SMS Send Duration [s]	1.81	1.75	1.86	1.83	1.85	1.85	1.7	1.84	1.87	1.87
LTE SMS E2E Duration [s]	2.22	2.27	2.28	2.22	2.16	2.12	2.12	2.39	2.15	2.22

KPI	11 DEC	12 DEC	13 DEC	14 DEC	15 DEC	16 DEC	17 DEC	18 DEC	AVG
LTE SMS KPIs	--	--	--	--	--	--	--	--	--
LTE SMS Success [%]	88.89	100	88.89	100	100	100	100	100	99.29
LTE SMS Send Duration [s]	1.81	1.82	1.93	1.85	1.9	1.84	1.82	1.77	1.86
LTE SMS E2E Duration [s]	2.16	2.18	2.3	2.02	2.54	2.25	2.1	2.13	2.22

LTE Data KPIs

KPI	11 NOV	12 NOV	13 NOV	14 NOV	15 NOV	16 NOV	17 NOV	18 NOV	19 NOV	20 NOV
LTE Data KPIs	--	--	--	--	--	--	--	--	--	--
LTE Attach SR [%]	100	100	100	100	100	100	100	100	100	100
LTE HTTP Download SR [%]	100	100	100	100	100	100	100	100	100	100
LTE DNS Duration [ms]	199	192.25	206	204	209.25	208	199.67	200.88	218	213.5
LTE HTTP Download Duration [s]	2.39	2.65	2.21	2.24	3.09	2.22	2.43	2.48	2.5	2.42
LTE Download Rate [Mb/s]	40.68	76.69	47.56	32.39	22.09	89.18	49.08	90.96	61.68	94.38
LTE Upload Rate [Mb/s]	14.01	24.14	22.64	27.4	25.01	24.1	27.01	20.8	24.25	33.71
LTE Latency [ms]	179	174.88	179.38	179.88	177.63	175.29	178	182.5	188	182.67

KPI	21 NOV	22 NOV	23 NOV	24 NOV	25 NOV	26 NOV	27 NOV	28 NOV	29 NOV	30 NOV
LTE Data KPIs	--	--	--	--	--	--	--	--	--	--
LTE Attach SR [%]	100	100	100	100	100	100	100	100	100	100
LTE HTTP Download SR [%]	100	100	100	100	100	100	100	100	100	100
LTE DNS Duration [ms]	215.5	213.25	220.13	211.83	227.75	213.14	208.4	232.4	225.29	215.25
LTE HTTP Download Duration [s]	2.26	2.18	4.27	2.28	2.36	2.29	2.65	2.42	2.38	2.22
LTE Download Rate [Mb/s]	82.43	33.69	34.1	35.57	63.86	65.29	67.58	39.23	42.92	65.05
LTE Upload Rate [Mb/s]	26.37	19.48	20.11	25.38	22.09	21.35	13.93	23.39	16.34	21.97
LTE Latency [ms]	183.14	179.13	188.88	187	188.25	184.57	184	188.6	187.43	184.13

KPI	01 DEC	02 DEC	03 DEC	04 DEC	05 DEC	06 DEC	07 DEC	08 DEC	09 DEC	10 DEC
LTE Data KPIs	--	--	--	--	--	--	--	--	--	--
LTE Attach SR [%]	100	100	100	100	100	100	100	100	100	100
LTE HTTP Download SR [%]	100	100	100	100	100	87.5	100	100	75	100
LTE DNS Duration [ms]	210.5	208.43	204.38	216.5	213.63	218.14	205.38	201.75	198.33	205.63
LTE HTTP Download Duration [s]	2.17	2.17	2.34	2.44	2.93	3.26	2.18	2.84	5.49	2.11
LTE Download Rate [Mb/s]	54.17	62.06	61.66	84.9	81.76	25.82	26.63	74.14	48.05	36.88
LTE Upload Rate [Mb/s]	18.17	21.62	23.2	18.12	22.8	17.4	23.28	26.85	32.69	16.85
LTE Latency [ms]	182.88	184.29	185	183.88	185.88	189.88	181.5	180.13	176.75	173.38

KPI	11 DEC	12 DEC	13 DEC	14 DEC	15 DEC	16 DEC	17 DEC	18 DEC	AVG
LTE Data KPIs	--	--	--	--	--	--	--	--	--
LTE Attach SR [%]	100	100	100	100	100	100	100	100	100
LTE HTTP Download SR [%]	100	100	100	100	100	87.5	100	100	98.94
LTE DNS Duration [ms]	220.13	212.75	226	204.38	216	203.88	200.38	210	210.79
LTE HTTP Download Duration [s]	2.63	2.86	2.32	2.15	2.38	2.15	6.24	2.13	2.65
LTE Download Rate [Mb/s]	64.86	53.96	56.07	56.95	66.06	87.64	46.51	57.92	57.44
LTE Upload Rate [Mb/s]	24.44	22.37	22.25	19.12	23.48	21.7	19.59	21.61	22.4
LTE Latency [ms]	182.75	173.63	179	178.38	183.88	178.38	175	176.25	181.54

Operator 2: QoS KPIs AVG Daily Trend

5G Data KPIs

KPI	11 NOV	12 NOV	13 NOV	14 NOV	15 NOV	16 NOV	17 NOV	18 NOV	19 NOV	20 NOV
5G Data KPIs	--	--	--	--	--	--	--	--	--	--
5G Attach SR [%]	100	100	100	100	100	100	100	100	100	100
5G Download Rate [Mb/s]	11.7	50.77	31.98	29.04	41.18	60.89	70.92	56.18	46.42	--
5G Upload Rate [Mb/s]	17.31	32.52	35.12	28.64	40.49	52.14	35.84	36.85	42.42	--
5G Latency [ms]	146	157.75	148.75	148.5	152.75	155	159	145.75	150.5	--

KPI	21 NOV	22 NOV	23 NOV	24 NOV	25 NOV	26 NOV	27 NOV	28 NOV	29 NOV	30 NOV
5G Data KPIs	--	--	--	--	--	--	--	--	--	--
5G Attach SR [%]	100	100	100	100	100	100	100	100	100	100
5G Download Rate [Mb/s]	46.21	53.56	46.98	43.87	39.58	55.6	70.02	59.88	63.33	50.13
5G Upload Rate [Mb/s]	43.89	45.11	38.21	37.3	28.41	37.19	40.79	36.71	45.61	43.91
5G Latency [ms]	150.5	149	152.25	149.5	154.5	158.33	149.25	148.25	153.5	149.75

KPI	01 DEC	02 DEC	03 DEC	04 DEC	05 DEC	06 DEC	07 DEC	08 DEC	09 DEC	10 DEC
5G Data KPIs	--	--	--	--	--	--	--	--	--	--
5G Attach SR [%]	100	100	100	100	100	100	75	100	100	100
5G Download Rate [Mb/s]	68.59	26.06	29.82	8.46	35.73	34.35	54	37.26	21.48	33.25
5G Upload Rate [Mb/s]	41	37.42	41.2	41.08	50.66	36.67	44.43	53.98	45.88	53.76
5G Latency [ms]	152.75	150.25	146.75	150	149.25	152.5	139.25	147.25	155	156.5

KPI	11 DEC	12 DEC	13 DEC	14 DEC	15 DEC	16 DEC	17 DEC	18 DEC	AVG
5G Data KPIs	--	--	--	--	--	--	--	--	--
5G Attach SR [%]	100	100	100	100	100	100	100	100	100
5G Download Rate [Mb/s]	56.87	72.26	82.02	27.01	21.68	43.96	65.25	53.24	46.87
5G Upload Rate [Mb/s]	50.16	41.18	43.82	44.69	37.14	36.97	40.04	44.28	40.94
5G Latency [ms]	157.5	140.75	142.25	143.67	150.33	150.25	148.25	148.25	150.24

3G KPIs

KPI	11 NOV	12 NOV	13 NOV	14 NOV	15 NOV	16 NOV	17 NOV	18 NOV	19 NOV	20 NOV
3G KPIs	--	--	--	--	--	--	--	--	--	--
3G Call Setup SR [%]	100	100	100	100	100	100	100	100	100	100
3G Call Setup Alert Duration [s]	6.06	4.78	5.26	4.67	4.68	5.03	4.68	5.89	4.86	5.72
3G MOS_LQ01	4.09	3.92	4.01	3.75	3.85	3.73	3.86	3.75	3.9	3.7
3G MOS_LQ02	3.84	3.56	3.76	3.38	3.75	3.49	3.61	3.56	3.73	3.54
3G CLI Exists [%]	100	100	100	100	100	100	100	100	100	100
3G CLI Check [%]	100	100	100	100	100	100	100	100	100	100
3G SMS Success [%]	100	100	100	100	100	100	100	100	100	100
3G SMS Send Duration [s]	4.67	3.37	3.22	3.73	3.6	3.32	3.35	3.36	3.37	3.74
3G SMS E2E Duration [s]	6.53	4.74	4.75	5.08	5.52	5.15	4.61	4.82	4.85	5.13

KPI	21 NOV	22 NOV	23 NOV	24 NOV	25 NOV	26 NOV	27 NOV	28 NOV	29 NOV	30 NOV
3G KPIs	--	--	--	--	--	--	--	--	--	--
3G Call Setup SR [%]	100	100	100	100	87.5	100	100	100	100	100
3G Call Setup Alert Duration [s]	4.94	5.32	4.8	4.69	5.28	5.11	4.96	5	5.24	5.04
3G MOS_LQ01	3.78	3.8	3.89	3.88	3.74	3.74	3.66	3.62	3.82	3.77
3G MOS_LQ02	3.59	3.58	3.67	3.96	3.63	3.68	3.59	3.31	3.45	3.5
3G CLI Exists [%]	100	100	100	100	100	100	100	100	100	100
3G CLI Check [%]	100	100	100	100	100	100	100	100	100	100
3G SMS Success [%]	100	100	100	100	100	100	100	100	100	100
3G SMS Send Duration [s]	3.36	3.96	3.67	3.77	3.35	3.21	3.4	3.54	3.42	3.43
3G SMS E2E Duration [s]	5.11	5.62	5.55	5.96	4.87	5.07	4.91	5.05	5.26	4.89

KPI	01 DEC	02 DEC	03 DEC	04 DEC	05 DEC	06 DEC	07 DEC	08 DEC	09 DEC	10 DEC
3G KPIs	--	--	--	--	--	--	--	--	--	--
3G Call Setup SR [%]	100	100	100	87.5	100	100	100	100	100	100
3G Call Setup Alert Duration [s]	5.17	4.9	5.43	4.59	5.21	5.07	5.07	5.31	5.29	4.88
3G MOS_LQ01	3.75	3.78	3.7	3.79	3.79	3.81	3.84	3.93	3.85	3.95
3G MOS_LQ02	3.47	3.6	3.39	3.41	3.38	3.63	3.6	3.53	3.78	3.56
3G CLI Exists [%]	100	100	100	100	100	100	100	100	100	100
3G CLI Check [%]	100	100	100	100	100	100	100	100	100	100
3G SMS Success [%]	100	100	100	87.5	100	87.5	100	100	100	100
3G SMS Send Duration [s]	3.65	3.3	3.48	3.89	3.32	3.6	3.16	3.34	3.32	3.6
3G SMS E2E Duration [s]	5.27	4.62	5.16	5.52	4.66	5.01	4.54	5.13	4.72	4.89

KPI	11 DEC	12 DEC	13 DEC	14 DEC	15 DEC	16 DEC	17 DEC	18 DEC	AVG
3G KPIs	--	--	--	--	--	--	--	--	--
3G Call Setup SR [%]	100	100	100	100	100	100	100	100	99.29
3G Call Setup Alert Duration [s]	5.25	4.7	4.92	5.74	5.38	4.64	5.44	5.03	5.1
3G MOS_LQ01	3.8	3.88	3.89	3.87	3.77	3.71	3.98	3.73	3.83
3G MOS_LQ02	3.48	3.59	3.49	3.73	3.41	3.66	3.79	3.45	3.58
3G CLI Exists [%]	100	100	100	100	100	100	100	100	100
3G CLI Check [%]	100	100	100	100	100	100	100	100	100
3G SMS Success [%]	100	100	100	100	100	100	87.5	100	99.29
3G SMS Send Duration [s]	3.32	3.7	3.72	3.73	3.65	3.28	3.49	3.48	3.51
3G SMS E2E Duration [s]	4.57	5.24	5.45	5.16	5.5	4.66	5.25	5.09	5.08

CSFB KPIs

KPI	11 NOV	12 NOV	13 NOV	14 NOV	15 NOV	16 NOV	17 NOV	18 NOV	19 NOV	20 NOV
CSFB KPIs	--	--	--	--	--	--	--	--	--	--
CSFB Call Setup SR [%]	100	100	100	100	100	100	100	100	85.71	100
CSFB Call Setup Alert Duration [s]	7.31	7.67	8.51	8.16	7.74	7.61	7.69	7.88	7.58	7.99
CSFB Return to LTE Duration [s]	3.18	2.67	2.47	2.34	1.94	4.47	2.93	3.31	2.29	3.29

KPI	21 NOV	22 NOV	23 NOV	24 NOV	25 NOV	26 NOV	27 NOV	28 NOV	29 NOV	30 NOV
CSFB KPIs	--	--	--	--	--	--	--	--	--	--
CSFB Call Setup SR [%]	100	100	100	100	100	100	100	100	100	100
CSFB Call Setup Alert Duration [s]	8.45	8	7.63	7.79	7.85	8.49	7.54	7.52	7.57	8.17
CSFB Return to LTE Duration [s]	2.05	3.39	2.26	1.46	2.4	1.79	2.02	2.68	1.83	2.57

KPI	01 DEC	02 DEC	03 DEC	04 DEC	05 DEC	06 DEC	07 DEC	08 DEC	09 DEC	10 DEC
CSFB KPIs	--	--	--	--	--	--	--	--	--	--
CSFB Call Setup SR [%]	100	100	100	100	100	100	100	100	100	100
CSFB Call Setup Alert Duration [s]	7.96	7.56	8.12	8.06	8.3	8.02	7.92	8.03	7.5	8.16
CSFB Return to LTE Duration [s]	2.52	4.21	1.59	1.54	3.24	2.15	3.97	2.64	2.68	2.67

KPI	11 DEC	12 DEC	13 DEC	14 DEC	15 DEC	16 DEC	17 DEC	18 DEC	AVG
CSFB KPIs	--	--	--	--	--	--	--	--	--
CSFB Call Setup SR [%]	100	100	100	100	100	100	100	100	99.64
CSFB Call Setup Alert Duration [s]	8.87	7.99	8.2	8.18	8.33	8.16	8.36	7.97	7.99
CSFB Return to LTE Duration [s]	2.78	2.81	2.59	2.38	2.42	1.76	4.11	1.9	2.62

LTE SMS KPIs

KPI	11 NOV	12 NOV	13 NOV	14 NOV	15 NOV	16 NOV	17 NOV	18 NOV	19 NOV	20 NOV
LTE SMS KPIs	--	--	--	--	--	--	--	--	--	--
LTE SMS Success [%]	100	100	100	100	100	100	100	100	100	100
LTE SMS Send Duration [s]	1.11	1.1	1.12	1.12	1.12	1.81	1.14	1.19	1.2	1.93
LTE SMS E2E Duration [s]	1.69	1.61	1.74	1.83	1.63	2.22	1.64	1.8	1.7	3.19

KPI	21 NOV	22 NOV	23 NOV	24 NOV	25 NOV	26 NOV	27 NOV	28 NOV	29 NOV	30 NOV
LTE SMS KPIs	--	--	--	--	--	--	--	--	--	--
LTE SMS Success [%]	100	100	100	100	100	100	100	100	100	100
LTE SMS Send Duration [s]	1.14	1.72	1.09	1.1	1.14	1.09	1.1	1.12	1.12	1.8
LTE SMS E2E Duration [s]	1.62	2.26	1.67	1.69	1.76	1.59	1.81	1.68	1.6	2.58

KPI	01 DEC	02 DEC	03 DEC	04 DEC	05 DEC	06 DEC	07 DEC	08 DEC	09 DEC	10 DEC
LTE SMS KPIs	--	--	--	--	--	--	--	--	--	--
LTE SMS Success [%]	100	100	88.89	100	100	100	100	100	100	100
LTE SMS Send Duration [s]	1.12	1.16	1.64	1.07	1.73	1.08	1.12	1.12	1.11	2.35
LTE SMS E2E Duration [s]	1.63	1.77	2.19	1.58	2.33	1.68	1.69	2.27	1.73	3.44

KPI	11 DEC	12 DEC	13 DEC	14 DEC	15 DEC	16 DEC	17 DEC	18 DEC	AVG
LTE SMS KPIs	--	--	--	--	--	--	--	--	--
LTE SMS Success [%]	100	100	100	100	100	100	100	100	100
LTE SMS Send Duration [s]	1.06	1.17	1.08	1.77	1.09	1.07	1.07	1.74	1.29
LTE SMS E2E Duration [s]	1.66	1.77	1.54	2.39	2.76	2.61	1.69	2.39	1.91

LTE Data KPIs

KPI	11 NOV	12 NOV	13 NOV	14 NOV	15 NOV	16 NOV	17 NOV	18 NOV	19 NOV	20 NOV
LTE Data KPIs	--	--	--	--	--	--	--	--	--	--
LTE Attach SR [%]	100	100	100	100	100	100	100	100	100	100
LTE HTTP Download SR [%]	100	100	100	100	100	100	100	100	100	100
LTE DNS Duration [ms]	188.75	194.5	193.88	190.75	208.75	175.86	203.86	185	191.29	205.83
LTE HTTP Download Duration [s]	2.43	2.19	2.2	2.22	2.32	2.08	2.3	2.13	2.24	2.1
LTE Download Rate [Mb/s]	23.77	23	19.91	22.81	19.34	19.55	17.3	23.14	25.16	16.19
LTE Upload Rate [Mb/s]	10.13	10.97	12.78	11.04	8.26	9.98	8.59	11.91	13.24	9.6
LTE Latency [ms]	173.33	166.92	168	167.25	172.36	155.09	171	161.83	162.4	156.1

KPI	21 NOV	22 NOV	23 NOV	24 NOV	25 NOV	26 NOV	27 NOV	28 NOV	29 NOV	30 NOV
LTE Data KPIs	--	--	--	--	--	--	--	--	--	--
LTE Attach SR [%]	100	100	100	100	100	100	100	100	100	100
LTE HTTP Download SR [%]	100	87.5	100	100	100	100	75	100	83.33	100
LTE DNS Duration [ms]	197.14	192	195	213	190	193.86	187.67	175.2	181.4	194.75
LTE HTTP Download Duration [s]	2.21	2.11	2.14	2.22	2.12	2.21	2.45	2.08	2.14	2.15
LTE Download Rate [Mb/s]	11.6	22.49	25.49	33.06	20.9	23.2	30.13	31.44	26.81	15.29
LTE Upload Rate [Mb/s]	8.2	12.28	12.66	18.53	13.95	14.22	22.71	13.72	11.36	11.92
LTE Latency [ms]	165.27	157.18	165	171.75	161	165.7	155.75	160.57	165.86	164.83

KPI	01 DEC	02 DEC	03 DEC	04 DEC	05 DEC	06 DEC	07 DEC	08 DEC	09 DEC	10 DEC
LTE Data KPIs	--	--	--	--	--	--	--	--	--	--
LTE Attach SR [%]	100	100	100	100	100	100	100	100	100	100
LTE HTTP Download SR [%]	100	87.5	100	100	87.5	100	100	100	75	100
LTE DNS Duration [ms]	191.75	189.14	193.75	183.63	181.43	182.25	184.5	188.63	196	192.63
LTE HTTP Download Duration [s]	2.01	2.05	2.04	2.02	2.23	2.79	2.08	2.29	2.02	2.15
LTE Download Rate [Mb/s]	26.83	19.44	16.76	20.44	12.43	17.15	24.49	26.73	19.01	20.65
LTE Upload Rate [Mb/s]	12.79	11.13	10.11	11.99	12.61	11.18	11.44	12.43	12.26	12.71
LTE Latency [ms]	154.5	153	167.17	154.75	159.92	156	156.5	153.42	154.45	157.42

KPI	11 DEC	12 DEC	13 DEC	14 DEC	15 DEC	16 DEC	17 DEC	18 DEC	AVG
LTE Data KPIs	--	--	--	--	--	--	--	--	--
LTE Attach SR [%]	100	100	100	100	100	100	100	100	100
LTE HTTP Download SR [%]	100	87.5	100	100	100	100	87.5	100	96.81
LTE DNS Duration [ms]	193.5	192.86	205	179	185.13	188.38	192.57	175.5	190-95
LTE HTTP Download Duration [s]	2.11	2.04	2.21	2.04	2.07	2.07	4.04	1.97	2.21
LTE Download Rate [Mb/s]	20.06	12.36	22.28	18.36	19.03	22.61	11.53	29.5	20.87
LTE Upload Rate [Mb/s]	11.71	12.11	13.66	12.32	11.47	9.77	11.59	12.27	11.87
LTE Latency [ms]	161.75	163.58	162.2	156	161.42	160.08	158.08	157.33	161.2

QoS KPIs per Location

Operator 1

KPI	AL THUMAMA (DOHA) STADIUM	LUSAIL STADIUM	AVG
3G KPIs	--	--	--
3G Call Setup SR [%]	99.3	99.29	99.3
3G Call Setup Alert Duration [s]	5.84	5.79	5.82
3G MOS_LQO_1	3.72	3.71	3.71
3G MOS_LQO_2	3.16	3.33	3.24
3G CLI Exists [%]	100	100	100
3G CLI Check [%]	100	100	100
3G SMS Success [%]	99.29	99.28	99.29
3G SMS Send Duration [s]	2.8	2.83	2.81
3G SMS E2E Duration [s]	4.11	4.25	4.18
CSFB KPIs	--	--	--
CSFB Call Setup SR [%]	98.61	99.26	98.92
CSFB Call Setup Alert Duration [s]	8.69	8.76	8.72
3G SMS Send Duration [s]	1.86	1.79	1.83
LTE SMS KPIs	--	--	--
LTE SMS Success [%]	99.31	99.27	99.29
LTE SMS Send Duration [s]	1.85	1.87	1.86
LTE SMS E2E Duration [s]	2.21	2.22	2.22
LTE Data KPIs	--	--	--
LTE Attach SR [%]	100	100	100
LTE HTTP Download SR [%]	98.62	99.28	98.94
LTE DNS Duration [ms]	210.48	211.11	210.79
LTE HTTP Download Duration [s]	2.72	2.57	2.65
LTE Download Rate [Mb/s]	32.87	83.08	57.44
LTE Upload Rate [Mb/s]	18.74	26.23	22.4
LTE Latency [ms]	180.98	182.12	181.54
5G Data KPIs	--	--	--
5G Attach SR [%]	100	100	100
5G Download Rate [Mb/s]	139.89	172.29	155.68
5G Upload Rate [Mb/s]	25.61	36.08	30.71
5G Latency [ms]	179.79	180.37	180.08

Operator 2

KPI	AL THUMAMA (DOHA) STADIUM	LUSAIL STADIUM	AVG
3G KPIs	--	--	--
3G Call Setup SR [%]	99.3	99.28	99.29
3G Call Setup Alert Duration [s]	5.05	5.15	5.1
3G MOS_LQO_1	3.82	3.84	3.83
3G MOS_LQO_2	3.68	3.48	3.58
3G CLI Exists [%]	100	100	100
3G CLI Check [%]	100	100	100
3G SMS Success [%]	98.6	100	99.28
3G SMS Send Duration [s]	3.38	3.65	3.51
3G SMS E2E Duration [s]	5.01	5.15	5.08
CSFB KPIs	--	--	--
CSFB Call Setup SR [%]	99.3	100	99.64
CSFB Call Setup Alert Duration [s]	7.93	8.06	7.99
3G SMS Send Duration [s]	1.53	3.8	2.62
LTE SMS KPIs	--	--	--
LTE SMS Success [%]	100	100	100
LTE SMS Send Duration [s]	1.27	1.31	1.29
LTE SMS E2E Duration [s]	1.87	1.96	1.91
LTE Data KPIs	--	--	--
LTE Attach SR [%]	100	100	100
LTE HTTP Download SR [%]	95.14	98.55	96.81
LTE DNS Duration [ms]	192.66	189.23	190.95
LTE HTTP Download Duration [s]	2.21	2.21	2.21
LTE Download Rate [Mb/s]	52.78	3.97	20.87
LTE Upload Rate [Mb/s]	27.82	3.42	11.87
LTE Latency [ms]	163.26	160.11	161.2
5G Data KPIs	--	--	--
5G Attach SR [%]	99.29	--	99.29
5G Download Rate [Mb/s]	46.87	--	46.87
5G Upload Rate [Mb/s]	40.94	--	40.94
5G Latency [ms]	150.24	--	150.24

FAILURE DETAILS

TESTCASE ID	TIMESTAMP	TC NAME	VERDICT	TECHNOLOGY	LOCATION	NETWORK	CAUSE TEXT_L3	ERROR TEXT
1936498	17/12/2022 01:03	SMS_MO_MT	FAIL	3G	Lusail Stadium	Operator 1		SMS_Send Failed: RP cause mo: Network out of order (RP cause value 38)
1936686	17/12/2022 02:16	HTTP_Download_20	FAIL	4G	Al Thumama (Doha) Stadium	Operator 2		nodejs_Download Failed: OperationalError: read ECONNRESET
1909067	09/12/2022 03:19	HTTP_Download_20	FAIL	4G	Lusail Stadium	Operator 2		nodejs_Download Failed: Download session timed out
1867443	27/11/2022 04:17	Ookia_Speedtest	FAIL	5G_nsa	Al Thumama (Doha) Stadium	Operator 1		Ookia_SpeedTest: TimeoutException: Configuration - Timeout was reached
1902281	07/12/2022 05:03	Activate_PDP_Context	FAIL	4G	Al Thumama (Doha) Stadium	Operator 2		PDP_ContextActivation Failed: received CallFailed (Unspecified) after sending WDSStartNetworkInterface 150000 30010001310100021901004
1926747	14/12/2022 05:17	Ookia_Speedtest	FAIL	4G	Al Thumama (Doha) Stadium	Operator 2	Missing or unknown APN	PDP_ContextActivation Failed: received CallFailed (UnknownOrMissingAPN) (verbose call end reason: WDS3GPPCallEndReasons _UnknownAPN) after sending WDSStartNetworkInterface 150000 30010001310100021901004
1909353	09/12/2022 05:18	Ookia_Speedtest	FAIL	4G	Al Thumama (Doha) Stadium	Operator 2		Ookia_SpeedTest Failed: HTTP request failed with status "timeout"
1843793	20/11/2022 05:17	Ookia_Speedtest	FAIL	4G	Al Thumama (Doha) Stadium	Operator 2		PDP_ContextActivation Failed: received CallFailed (Unspecified) after sending WDSStartNetworkInterface 150000 30010001310100021901004
1930225	15/12/2022 05:17	Ookia_Speedtest	FAIL	4G	Al Thumama (Doha) Stadium	Operator 2		PDP_ContextActivation Failed: received CallFailed (Unspecified) after sending WDSStartNetworkInterface 150000 30010001310100021901004
1909409	09/12/2022 05:48	Ookia_Speedtest	FAIL	4G	Lusail Stadium	Operator 2		Ookia_SpeedTest Failed: HTTP request failed with status "timeout"
1833646	17/11/2022 05:47	Ookia_Speedtest	FAIL	4G	Lusail Stadium	Operator 2		Ookia_SpeedTest Failed: TimeoutException Configuration - Timeout was reached
1923392	13/12/2022 05:47	Ookia_Speedtest	FAIL	4G	Lusail Stadium	Operator 2	Missing or unknown APN	PDP_ContextActivation Failed: received CallFailed (UnknownOrMissingAPN) (verbose call end reason: WDS3GPPCallEndReasons _UnknownAPN) after sending WDSStartNetworkInterface 150000 30010001310100021901004
19094888	09/12/2022 06:18	HTTP_Download_20	FAIL	4G	Al Thumama (Doha) Stadium	Operator 1		nodejs_Download Failed: Download session timed out
1926981	14/12/2022 07:03	VoiceQuality_P863	FAIL	3G	Lusail Stadium	Operator 1	resources unavailable, unspecific	CallInitiate Failed: got NO CARRIER after ATD, GSM 4.08 Error (+CEER: Resources unavailable, unspecified)
1909646	09/12/2022 07:19	HTTP_Download_20	FAIL	4G	Lusail Stadium	Operator 1		nodejs_Download Failed TypeError: Cannot read property "statusCode" of undefined
1884982	02/12/2022 08:06	VoiceQuality_P863	INCONC	3G	Al Thumama (Doha) Stadium	Operator 2		timeout reached aborted after maximum testcase duration
1864583	26/11/2022 08:04	VoiceQuality_P863	FAIL	4G	Al Thumama (Doha) Stadium	Operator 2		PDP_ContextActivation Failed: received CallFailed (Unspecified) after sending WDSStartNetworkInterface 150000 30010001310100021901004
1864583	26/11/2022 08:04	VoiceQuality_P863	INCONC		Al Thumama (Doha) Stadium	Operator 2	unknown	LocationUpdate Failed: could not register to network 42702 registration denied, mobile LTE_Uu/2 at Qatar-Doha_ wc_Al_Thumama_Stadium
1909791	09/12/2022 08:18	HTTP_Download_20	FAIL	4G	Al Thumama (Doha) Stadium	Operator 2	Missing or unknown APN	PDP_ContextActivation Failed: received MBIM_COMMAND_DONE(CONNECT) (MBIM status INVALID_ACCESS_STRING, cause 27 (Unknown or missing access point name)) after sending MBIM_ COMMAND_MSG(CONNECT) to mobile
1827212	15/11/2022 08:18	Ookia_Speedtest	FAIL	4G	Al Thumama (Doha) Stadium	Operator 2		Ookia_SpeedTest Failed: HTTP request failed with status "timeout" (HTTP service access timeout)
18400845	19/11/2022 08:34	CSFB_MO_MT	FAIL	4G	Al Thumama (Doha) Stadium	Operator 2	normal call cleaning	CSFB_CallInitiate Failed got NO CARRIER after ATD. GSM 4 08 Error (+CEER Normal call cleaning)
1851138	22/11/2022 09:18	HTTP_Download_20	FAIL	4G	Lusail Stadium	Operator 2	Missing or unknown APN	PDP_ContextActivation Failed: received MBIM_COMMAND_DONE(CONNECT) (MBIM status INVALID_ACCESS_STRING, cause 27 (Unknown or missing access point name)) after sending MBIM_ COMMAND_MSG(CONNECT) to mobile
1834289	17/11/2022 10:18	Ookia_Speedtest	FAIL	4G	Al Thumama (Doha) Stadium	Operator 1		Ookia_SpeedTest Failed: HTTP request failed with status "timeout"
1841427	19/11/2022 12:34	CSFB_MO_MT	FAIL	4G	Al Thumama (Doha) Stadium	Operator 1	normal call cleaning	CSFB_CallInitiate Failed got NO CARRIER after ATD. GSM 4 08 Error (+CEER Normal call cleaning)

TESTCASE ID	TIMESTAMP	TC NAME	VERDICT	TECHNOLOGY	LOCATION	NETWORK	CAUSE TEXT_L3	ERROR TEXT
1917425	11/12/2022 12:52	SMS_MO_MT	INCONC	4G	Al Thumama (Doha) Stadium	Operator 1		timeout reached, aborted after maximum job duration of 5:00
1892975	04/12/2022 14:03	VoiceQuality_P863	FAIL	3G	Al Thumama (Doha) Stadium	Operator 2	normal call clearing	CallInitiate Failed: got NO CARRIER after ATD, GSM 4.08 Error (+CEER: Normal call clearing)
1892987	04/12/2022 14:07	SMS_MO_MT	FAIL	3G	Al Thumama (Doha) Stadium	Operator 2		SMS_Receive Failed: Timeout receiving expected SMS message: No messages received
19221069	12/12/2022 14:18	HTTP_Download_20	FAIL	4G	Al Thumama (Doha) Stadium	Operator 2		nodejs_Download Failed: TypeError: Cannot read property "statusCode" of undefined
1896484	05/12/2022 14:16	HTTP_Download_20	FAIL	4G	Al Thumama (Doha) Stadium	Operator 2		PDP_ContextActivation Failed: received CallFailed (Unspecified) after sending WDSStartNetworkInterface 150000 3001000131010000219010004
1889479	03/12/2022 13:52	SMS_MO_MT	INCONC	4G	Lusail Stadium	Operator 1		timeout reached, aborted after maximum job duration of 5:00
1875601	29/11/2022 14:16	HTTP_Download_20	FAIL	4G	Al Thumama (Doha) Stadium	Operator 2	Missing or unknown APN	PDP_ContextActivation Failed: received MBIM_COMMAND_DONE(CONNECT) (MBIM status INVALID_ACCESS_STRING, cause 27 (Unknown or missing access point name)) after sending MBIM_COMMAND_MSG(CONNECT) to mobile
1885928	02/12/2022 14:17	HTTP_Download_20	FAIL	4G	Al Thumama (Doha) Stadium	Operator 2	Missing or unknown APN	PDP_ContextActivation Failed: received MBIM_COMMAND_DONE(CONNECT) (MBIM status INVALID_ACCESS_STRING, cause 27 (Unknown or missing access point name)) after sending MBIM_COMMAND_MSG(CONNECT) to mobile
1886161	02/12/2022 16:07	Activate_PDP_Context	INCONC		Al Thumama (Doha) Stadium			timeout reached aborted after maximum job duration of 5:00
1921437	12/12/2022 17:03	Activate_PDP_Context	INCONC	4G	Al Thumama (Doha) Stadium	Operator 2		PDP_ContextActivation Invalid mobile behavior: received NoNetworkFound after sending NASGetCellLocationInfo 3000
1814911	11/11/2022 17:03	VoiceQuality_P863	FAIL	3G	Al Thumama (Doha) Stadium	Operator 1	normal call clearing	CallInitiate Failed: got NO CARRIER after ATD, GSM 4.08 Error (+CEER: Normal call cleaning)
1814940	11/11/2022 17:07	SMS_MO_MT	FAIL	3G	Al Thumama (Doha) Stadium	Operator 1		SMS_Receive Failed: Timeout receiving expected SMS message. No messages received
1925154	13/12/2022 17:48	Ookia_Speedtest	FAIL	4G	Lusail Stadium	Operator 2		Ookia_SpeedTest Failed: child process exited abnormally
1939014	17/12/2022 18:34	CSFB_MO_MT	FAIL	4G	Al Thumama (Doha) Stadium	Operator 1	normal call clearing	CSFB_CallInitiate Failed got NO CARRIER after ATD. GSM 4 08 Error (+CEER Normal call cleaning)
1900735	06/12/2022 18:18	HTTP_Download_20	FAIL	4G	Al Thumama (Doha) Stadium	Operator 1		nodejs_Download Failed: OperationalError: read ECONNRESET
1876255	29/11/2022 19:05	VoiceQuality_P863	INCONC		Lusail Stadium	Operator 1	unknown	LocationUpdate Failed: could not register to network 42702 registration denied, mobile LTE_Uu/2 at Qatar-Doha_wc_Al_Thumama_Stadium
1838955	18/11/2022 19:34	CSFB_MO_MT	FAIL	4G	Lusail Stadium	Operator 1	resources unavailable unspecified	CSFB_CallInitiate Failed got NO CARRIER after ATD. GSM 4 08 Error (+CEER Resources unavailable, unspecified)
1852598	22/11/2022 19:38	CSFB_MO_MT	INCONC	4G	Lusail Stadium	Operator 1		timeout reached, aborted after maximum job duration of 5:00
1883232	01/12/2022 20:05	VoiceQuality_P863	INCONC	3G	Al Thumama (Doha) Stadium	Operator 2		timeout reached, aborted after maximum testcase duration
1883250	01/12/2022 20:12	VoiceQuality_P863	INCONC	3G	Al Thumama (Doha) Stadium	Operator 2		timeout reached, aborted after maximum testcase duration
1862968	25/11/2022 21:03	VoiceQuality_P863	FAIL	3G	Lusail Stadium	Operator 2	normal call cleaning	CallInitiate Failed: got NO CARRIER after ATD. GSM 4 08 Error (+CEER Normal call cleaning)
1900995	06/12/2022 20:07	SMS_MO_MT	FAIL	3G	Al Thumama (Doha) Stadium	Operator 2		SMS_Receive Failed: Timeout receiving expected SMS message. No messages received
1880138	30/11/2022 22:24	Ookia_Speedtest	INCONC	4G	Al Thumama (Doha) Stadium	Operator 1		timeout reached, aborted after maximum job duration of 6:40
1942996	18/12/2022 23:02	Activate_PDP_Context	INCONC	4G	Al Thumama (Doha) Stadium	Operator 2		PDP_ContextActivation Invalid mobile behavior: received NoNetworkFound after sending NASGetCellLocationInfo 3000
1866715	26/11/2022 23:17	Ookia_Speedtest	FAIL	4G	Al Thumama (Doha) Stadium	Operator 2	Missing or unknown APN	PDP_ContextActivation Failed: received CallFailed (UnknownOrMissingAPN) (verbose call end reason: WDS3GPPCallEndReasons_UnknownAPN) after sending WDSStartNetworkInterface 150000 3001000131010000219010004

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