Communications Regulatory Authority
State of Qatar

هيئة تنظيم الاتصالات
دولة قطر

CRA NETWORK AUDIT – 2022 QOS MEASUREMENTS SUMMARY

August 2023

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1. INTRODUCTION

As per the mandate provided to the Communications Regulatory Authority, to safeguard the interest of telecoms consumers, to publish information regarding the performance including comparisons of Quality of Service of the Service Providers, CRA has conducted Quality of Service (QoS) Network Audit for the year 2022. The summary of the findings of the audit are as below.

2. QUALITY OF SERVICE AUDIT

The QoS audit is conducted to benchmark the Key performance Indicators of the services viz. Voice calls, Short message service (SMS) and Data service offered to the consumers. The samples are collected based on normal consumer behavior and from areas weighted based on the population density for the State of Qatar.

2.1. Measurement Methodology

2.1.1. Voice Service Quality Testing

A voice measurement is a call to a Speech Quality Server for one minute duration and Mean Opinion Score (MOS) is recorded using POLQA algorithm.

2.1.2. Short Message Service

A 52 character sample SMS is send automatically and the received timings are recorded. Tests are conducted within and across networks.

2.1.3. Data Service Testing

- Data throughput measurement is carried out in a stationary environment by calculating the average throughput for completion of an entire session from/to a server located within the operators network. Different file size and their respective maximum permissible timeouts as mentioned in the below table are used while collecting the samples.

Measurement	Size / Timeout		
Download (MB)	10	50	100
Upload (MB)	5	25	50
Timeouts (seconds)	150	300	300

- Webpage accessibility measurement is carried out in drive test and stationary environment which includes download a standard test page from the server.

2.2. Equipment Used

- 2 UE's - LTE CAT 16 device (Smartphone)
- 4 UE's - LTE CAT 18 device (Smartphone)
- 6 UE'"s - 5G enable device CAT 20 (Smartphone)
- TEMS Paragon Drive test software
- Handheld device - 5G enable device CAT 20 with TEMS Pocket software

2.3. Measurement Timeline

- 02nd June 2022 till 13th October 2022

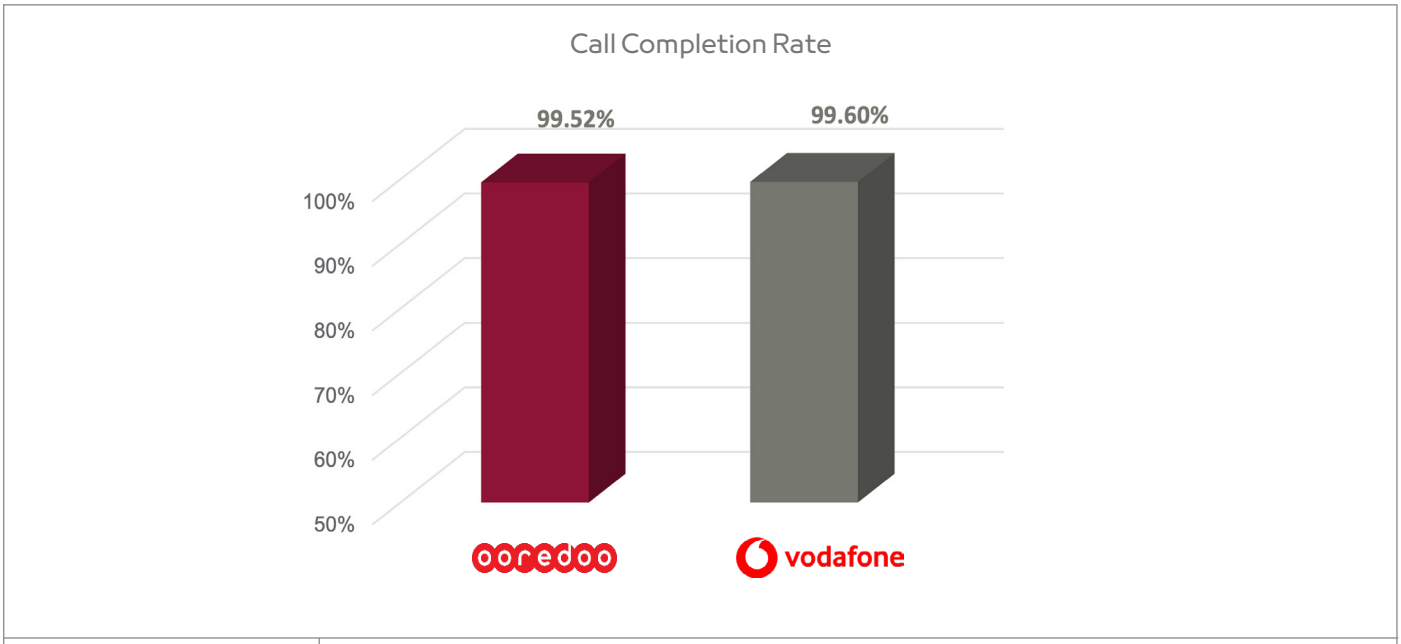
2.4. Samples (Rounded)

- Voice Service - 23000
- Voice (Speech Quality)-21300
- Short Message Service - 3550
- Data Service - 5850
- Web Service -186,000

2.5. Voice Service

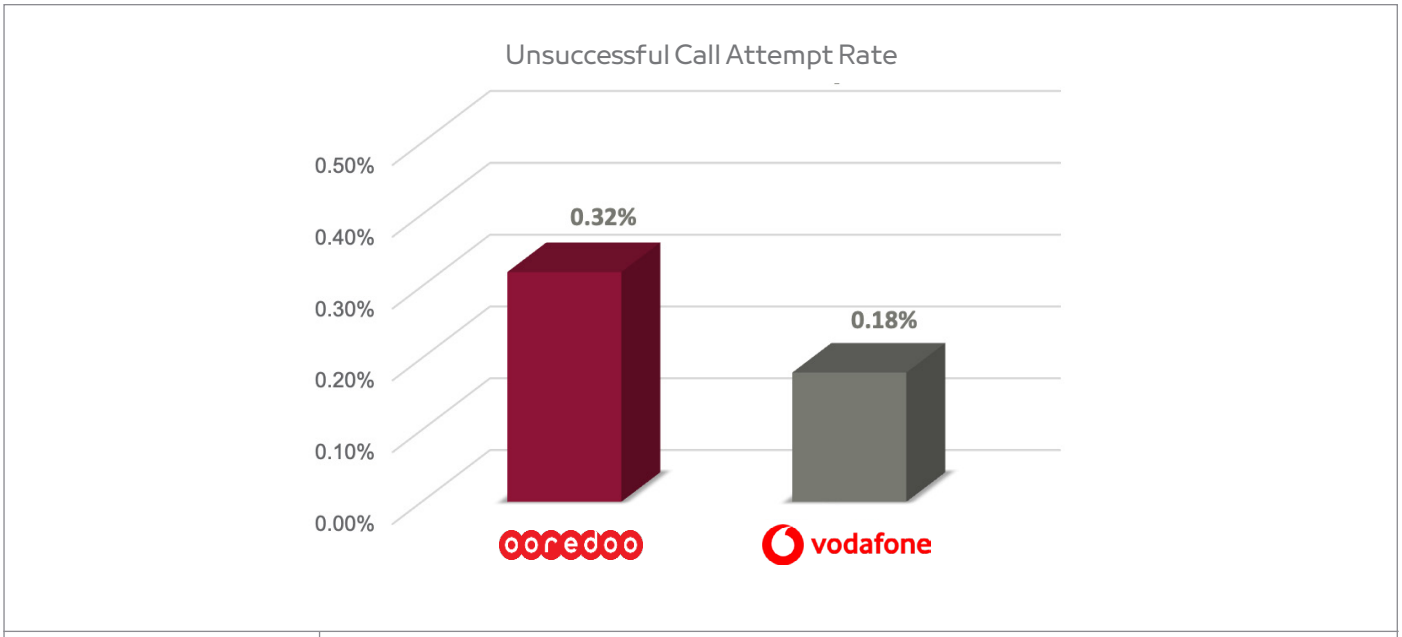
KPI	Definition
Call Completion Rate	Probability that a successful call attempt is maintained for 1 minute until it is released intentionally by user. $\text{Call completion rate} = \frac{\text{Number of normally ended calls}}{\text{All successful call attempts by all users}} \times 100$
Unsuccessful Call Attempt Rate	The call failure rate assesses the probability that the end user cannot complete the call within 30 seconds. $\text{Unsuccessful call attempt rate} = \frac{\text{Unsuccessful telephony service attempts by all users when service shown as available}}{\text{All telephony service attempts by all users}} \times 100$
Call Set Up Time	The call set-up time is the time period between sending of complete address information and receipt of call set up notification. Call setup time=t (Connect established) - t (User pressed button on terminal)
Voice Quality (MOS)	Voice quality in mobile networks is measured with algorithms based on ITU-T P.863 (POLQA), which covers the overall listening speech quality from narrowband (300 to 3'400 Hz) to super wideband (50 to 14'000 Hz) telecommunication scenarios as perceived by the user. The Mean Opinion Score (MOS) in both uplink and downlink, averaged for a call duration of 1 minute is reported.

2.5.1. Call Completion Rate



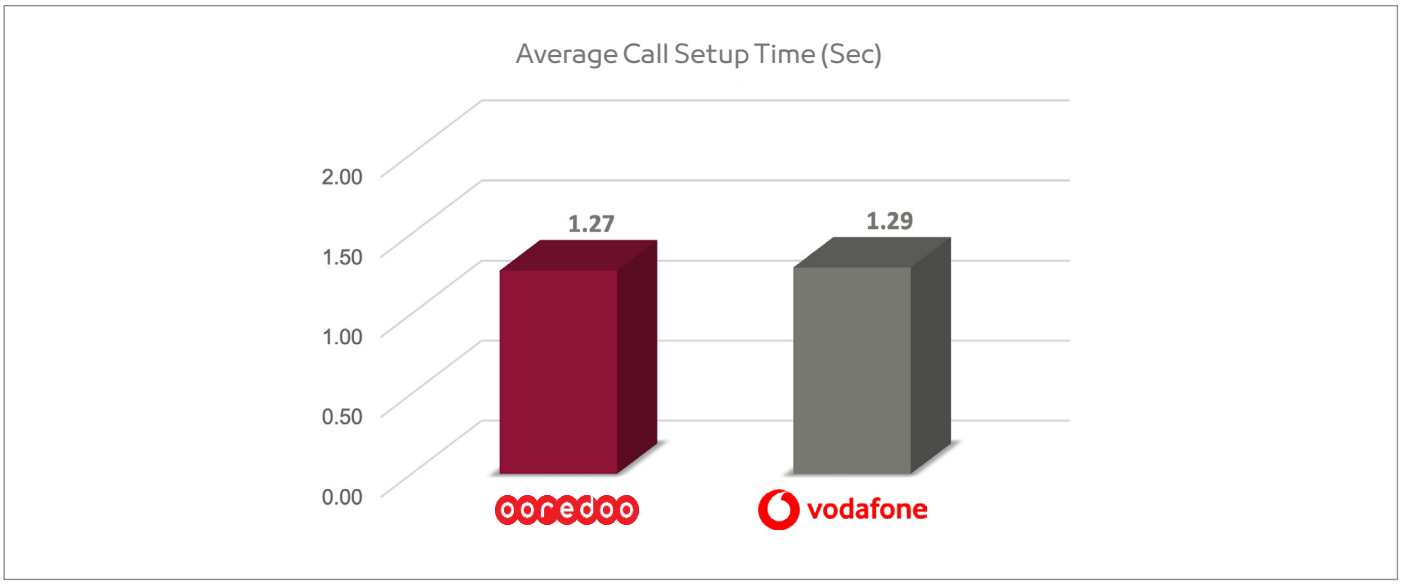
Statistical Accuracy	±0.09%	±0.08%

2.5.2. Unsuccessful Call Attempt Rate

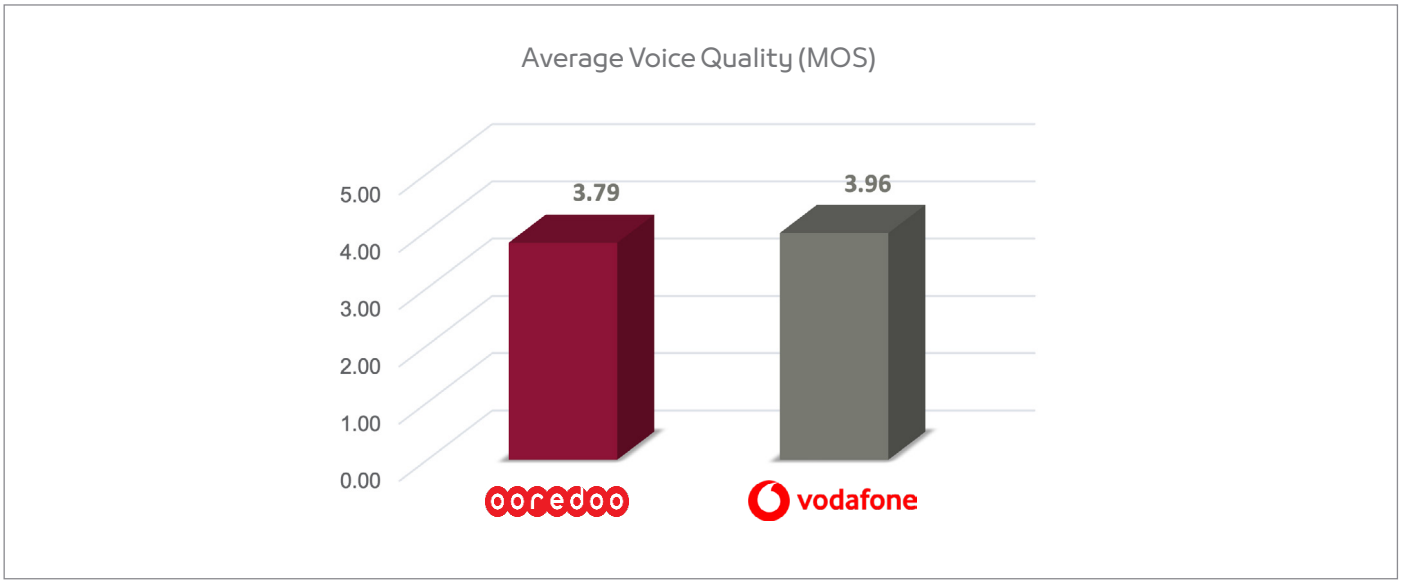


Statistical Accuracy	±0.07%	±0.05%

2.5.3. Call Setup Time

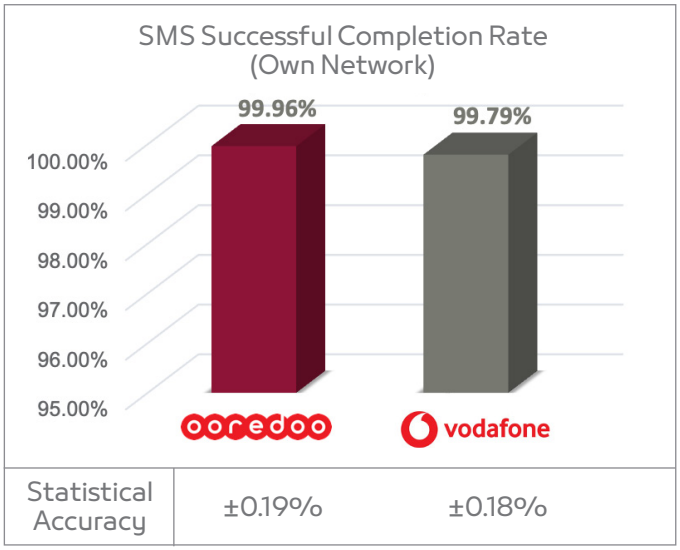


2.5.4. Voice Quality (MOS)

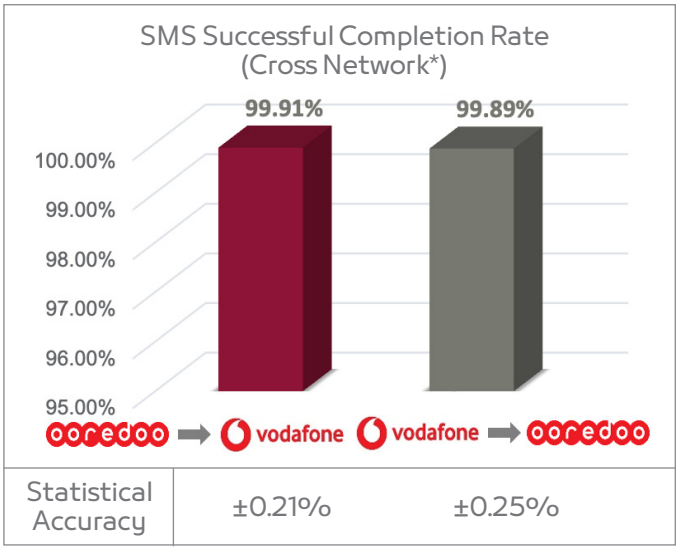


2.6. Short Message Service

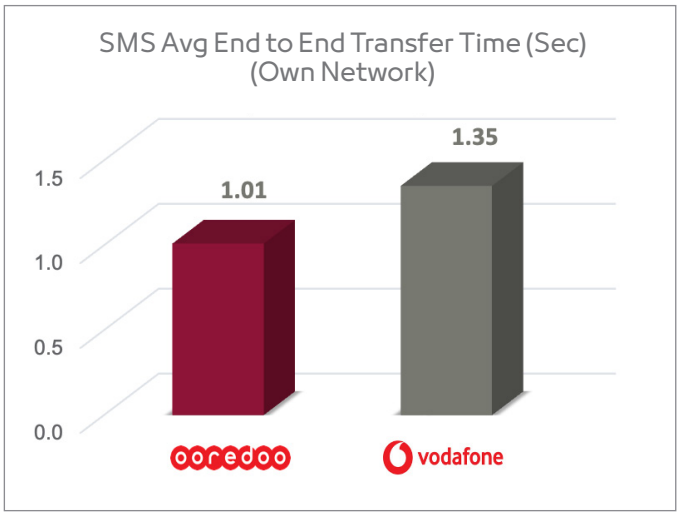
KPI	Definition
SMS Successful Completion Rate (Own & Cross Network)	$\text{SMS success rate} = \frac{\text{Number of SMS transfer completed}}{\text{Number of SMS Sent successfully}} \times 100$
SMS End to End Transfer Time	The SMS end to end delivery time is the period of time between sending a short message to the network and the message being received at the distant terminal (user device) SMS end to end delivery time=t (B,received)-t (A,send initiate)

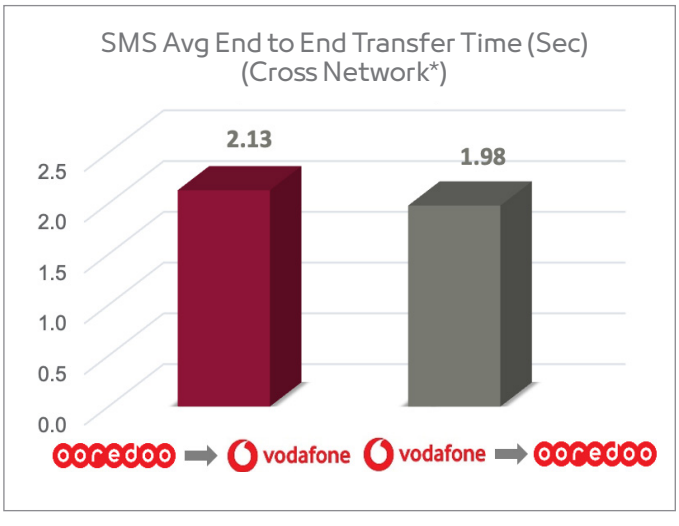


Statistical Accuracy	±0.19%	±0.18%



Statistical Accuracy	±0.21%	±0.25%



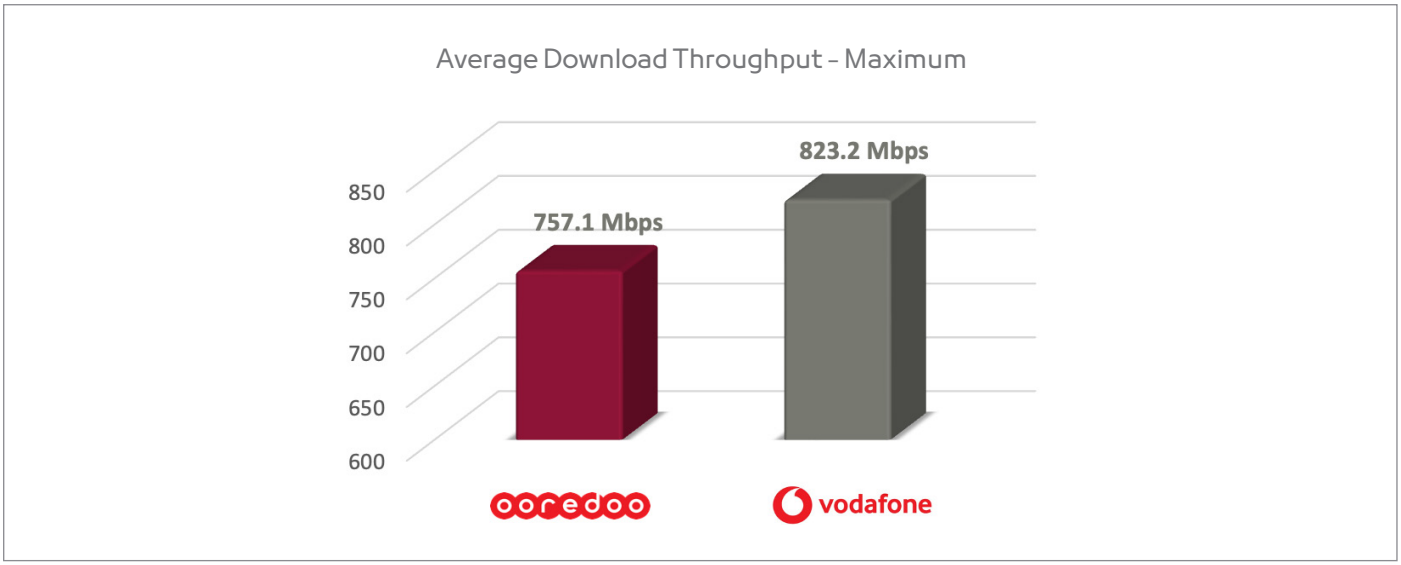


Note: The originating operator's does not have absolute control on Cross network KPI's which are termina ted in the other network.

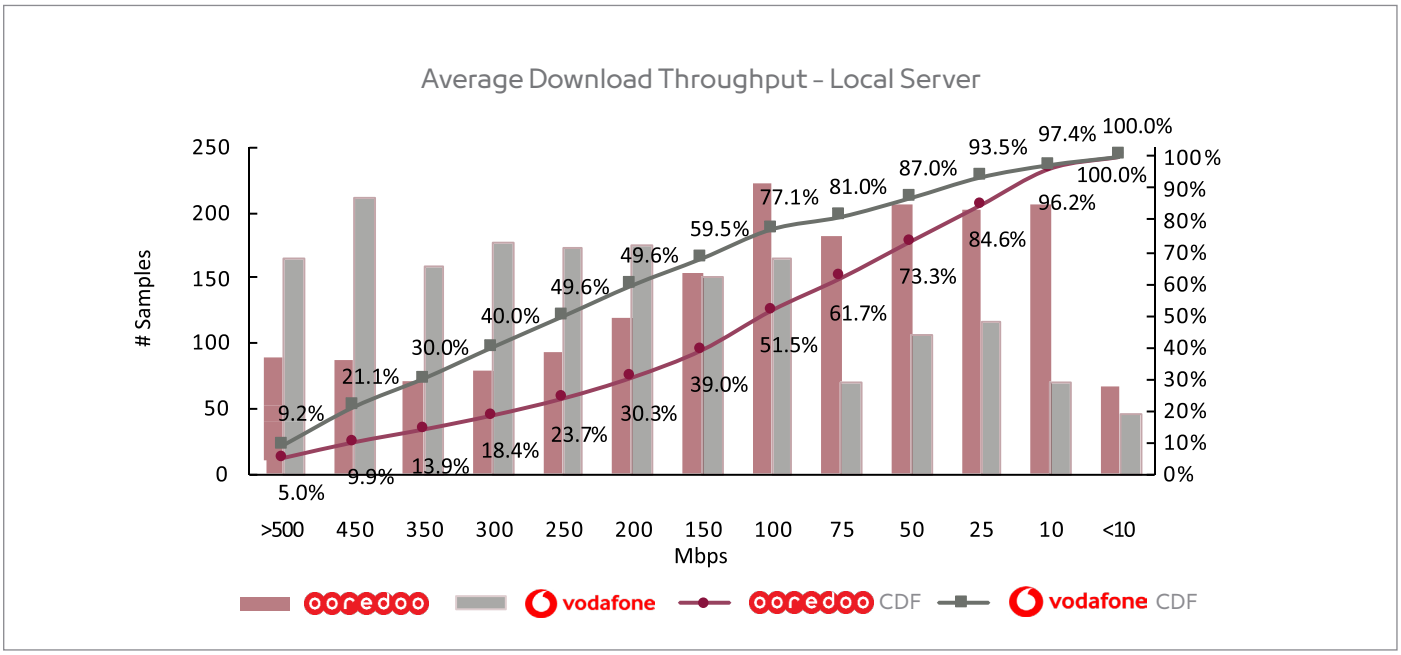
2.7. Data Services to Operator's Server

KPI	Definition
Data Download Throughput	Downloading a file via HTTP. The Average throughput to download the entire session is calculated.

2.7.1. Data Download Throughput Maximum

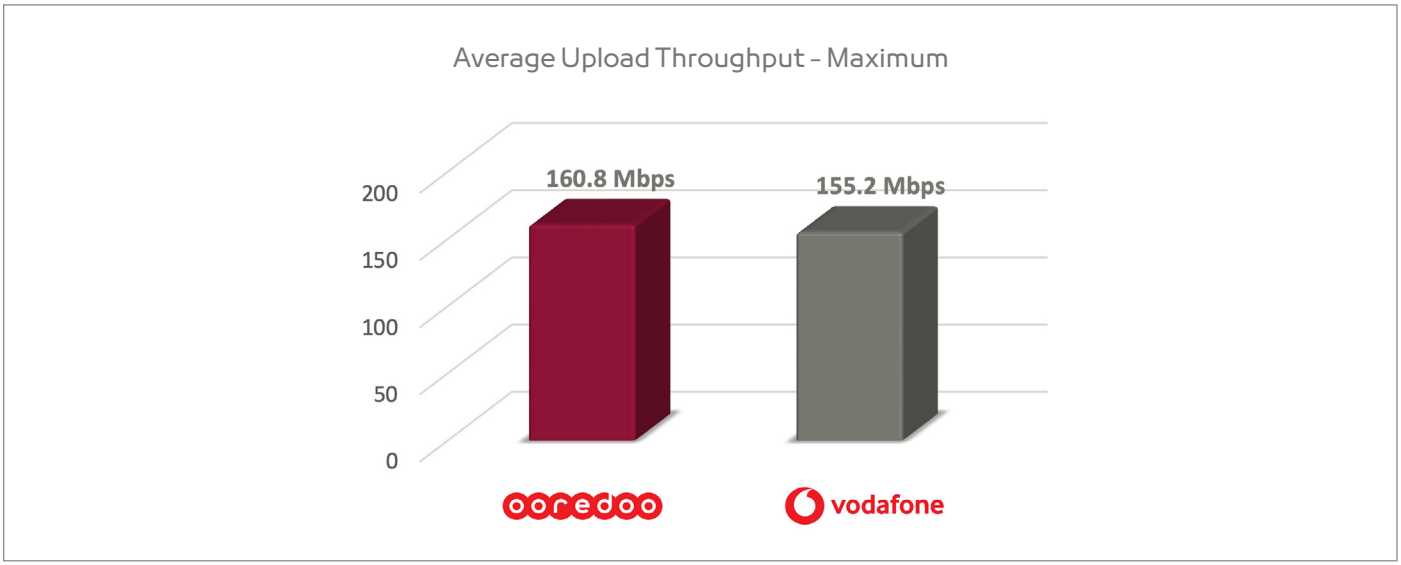


2.7.2. Data Download Throughput Distribution & Cumulative

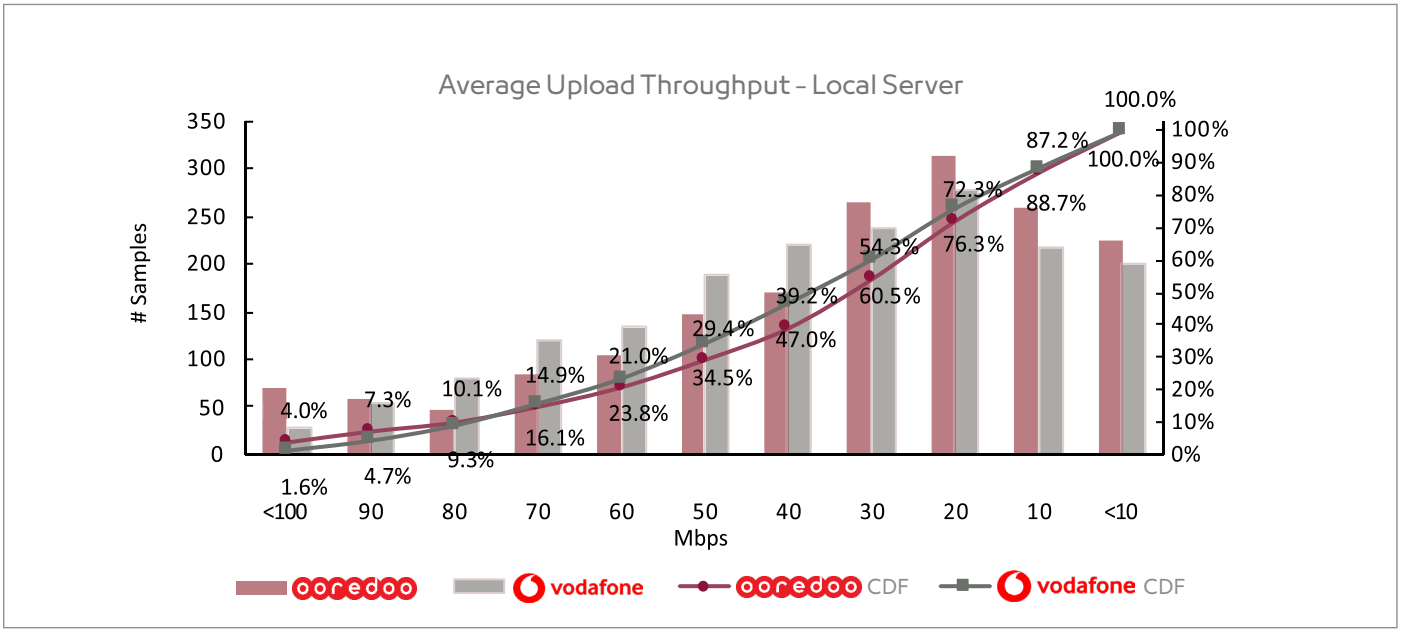


KPI	Definition
Data Upload Throughput	Uploading a file via HTTP. The Average throughput to upload the entire session is calculated.

2.7.3. Data Upload Throughput Maximum

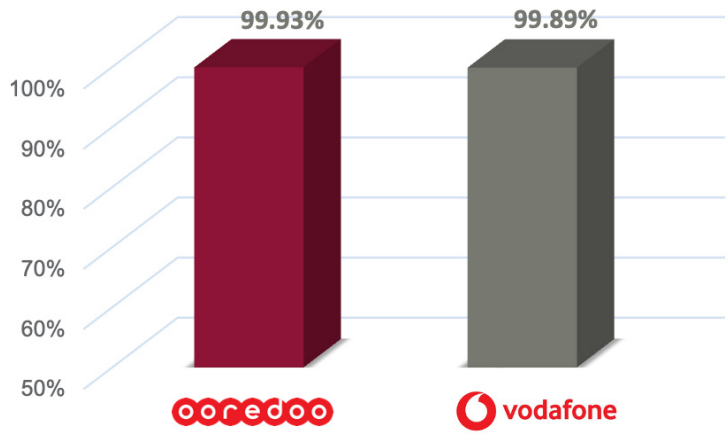


2.7.4. Data Upload Throughput Distribution & Cumulative



2.7.5. Webpage Download Success Rate

KPI	Definition
Successful Webpage Download Rate	Successful webpage download rate= $\frac{\text{Number of completed download session}}{\text{Number of session started successfully}} \times 100$

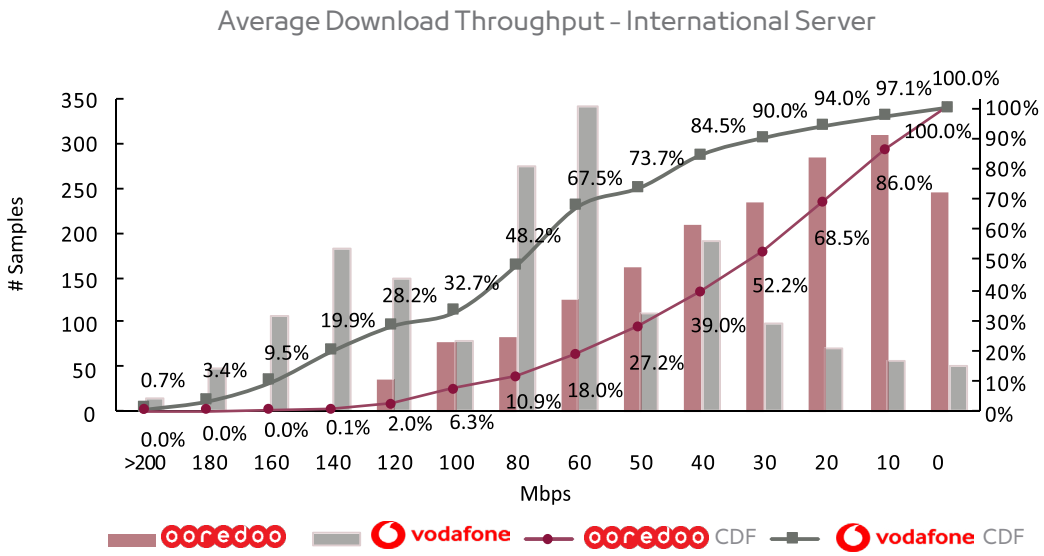


Statistical Accuracy	±0.01%	±0.02%

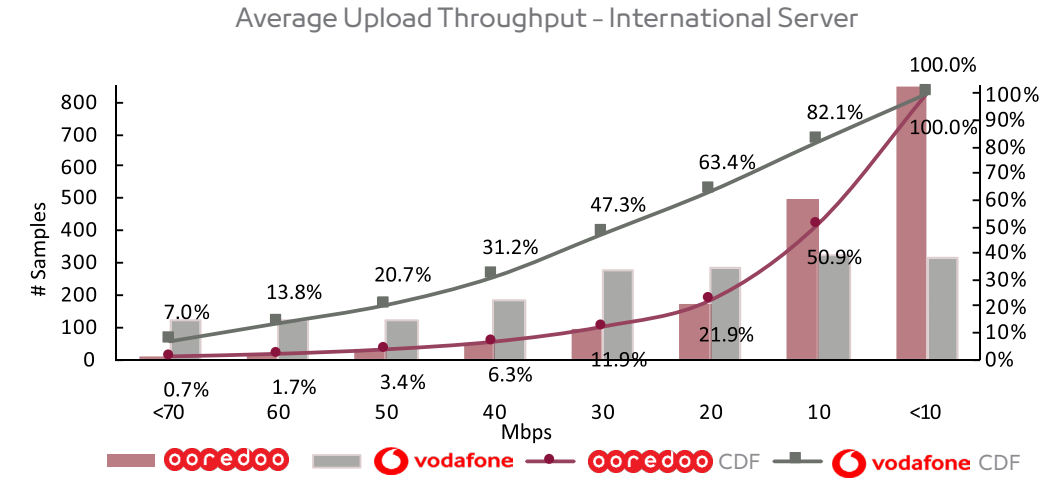
2.8. Data Services to International Servers

CRA conducted test to multiple international servers located in different locations outside Qatar, to portray typical user experience for data sessions. The average throughputs across different test samples are summarized below. The results are indicative and represents throughputs to the International servers, chosen by CRA and the identity of the locations of the servers are kept anonymous to the service providers. The throughput rates can vary depending on various factors for e.g. Internet traffic, Location of the server which may be beyond the operator's absolute control.

2.8.1. Data Download Throughput - Distribution & Cumulative



2.8.2. Data Upload Throughput - Distribution & Cumulative



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