

Mobile Network Performance Benchmarking

Governorate of
Dhofar

Regulatory & Compliance Unit
Quality of Service Department



Contents

Background

Test Methodology

Performance Indicators Definition

Results

Conclusion

1. Background

A comprehensive field test was conducted independently by TRA to assess and benchmark the performance of Omantel and Ooredoo mobile voice and data networks in Dhofar Governorate.

Field Survey Date & Time: 28th - 31st July 2016 from 9:00 A.M. to 09:00 P.M.

Services Tested

Network	Service	Technology
Omantel	Voice	2G, 3G
	Data	2G, 3G, 4G
Ooredoo	Voice	2G, 3G
	Data	2G, 3G, 4G

Test Area

Governorate	Wilayat
Dhofar	Shalim, Sadah, Mirbat, Taqah, Thumrait, Mazyona, Rakhyut, Dhalkut, Salalah

2. Test Methodology

The following test configuration was used for measurements:

Service Tested	Technology Mode	Objective	Test sequence	KPIs measured
Omantel- Mobile voice	Open (2G, 3G)	To check network accessibility, retain-ability, mobility, service integrity and coverage	Calls of 60 sec duration with a 20 sec idle wait time between them to allow for cell reselection from 2G to 3G mode, where applicable.	CSSR, CDR, CSR, RxLev, RSCP.
Omantel- Mobile data	Open (2G, 3G, 4G)	To check data network performance and coverage	FTP DL/UL, HTTP file download from the service providers network and ping test.	Latency, Ping Packet Success Rate, Avg. downlink/uplink throughput, RSCP, RSRP.
Ooredoo- Mobile voice	Open (2G, 3G)	To check network accessibility, retain-ability, mobility service integrity and coverage	Calls of 60 sec duration with a 20 sec idle wait time between them to allow for cell reselection from 2G to 3G mode, where applicable.	CSSR, CDR, CSR, RxLev, RSCP.
Ooredoo- Mobile data	Open (2G, 3G,4G)	To check data network performance and coverage	FTP DL/UL, HTTP file download from the service providers network and ping test.	Latency, Ping Packet Success Rate, Avg. downlink/uplink throughput, RSCP, RSRP.

3. Key Performance Indicators Definition

Mobile voice performance was measured based on the following set of KPIs:

Call Setup Success Rate (CSSR)– This indicator is used to measure the percentage of calls successfully established without facing blockage in the network as a ratio of the total number of call attempts made to access and establish a voice call. [\(to check network accessibility\)](#)

Call Drop Rate (CDR) – This indicator is used to measure the percentage of calls dropped due to technical problems or coverage gaps in the service provider’s network as a ratio of the total number of calls successfully established. [\(to check network retain-ability\)](#)

Call Success Rate (CSR) – This indicator is used to measure the percentage of calls successfully established without facing blockage in the network as a ratio of the total number of call attempts made to access and establish a voice call and then successfully terminated from the user-end without being dropped or disconnected from the network side due to a technical irregularity. [\(to check service integrity\)](#)

Mobile data performance was measured based on the following set of KPIs:

Packet Latency - Packet delay, which represents the time taken for data packets to pass through the GPRS bearer in a round-trip time from the mobile to the server in the service provider’s core network and back to the mobile. [\(to check delay in the network\)](#)

Ping Packet Success Rate is the percentage of packets lost between designated routes in the network. It is used to indicate the loss of data packets during transmission over a telecommunications network. [\(to check data integrity\)](#)

Average downlink throughput (HTTP/FTP) - This is the average downlink throughput (rate at which data/bits are transferred to the user) experienced by a user while downloading content from the Internet. [\(to check download speed\)](#)

Average uplink throughput (FTP) - This is the average uplink throughput (rate at which data/bits are transferred from the user end to the internet) experienced by a user while uploading content over the Internet. [\(to check upload speed\)](#)

Performance Indicators Definition continued

Coverage is assessed based on the following radio parameters:

Reference Signal Received Power (RSRP) – This indicator measures the linear average of the received power on reference signal resource elements in the downlink during the drive test ([to check 4G coverage](#)).

Received Signal Code Power (RSCP) – This indicator measures the received signal code power of the pilot channel in the downlink during the drive test ([to check 3G coverage](#)).

Received Signal Level (RxLevSub) - This indicator measures the received signal strength in downlink during the drive tests ([to check 2G coverage](#)).

The following convention is used for the coverage plot.

4G/LTE Serving Cell RSRP (dBm)		3G/WCDMA CPICH RSCP (dBm)		2G/GSM RxLevSub (dBm)		Classification	Penetration Level
	Range		Range		Range		
	≥ -85		≥ -80		≥ -75	Excellent	Indoor
	≥ -95 and < -85		≥ -87 and < -80		≥ -82 and < -75	Good	
	≥ -105 and < -95		≥ -100 and < -87		≥ -95 and < -82	Fair	In-Car
	≥ -120 and < -105		< -100		< -95	Weak	Outdoor Only

- **Green** indicates that the signal strength measured is sufficient to establish communications indoor, in-car and outdoors.
- **Yellow** indicates that the signal strength measured is sufficient to establish communications inside the car and outdoors.
- **Red** indicates that the signal strength measured is sufficient to establish communications outdoors only.

4. Results

4.1 Mobile Voice Coverage



The map above shows signal strength measured for Omantel voice service in the Governorate of Dhofar. The colours depict the level of signal strength with dark green being the strongest and red being the weakest.

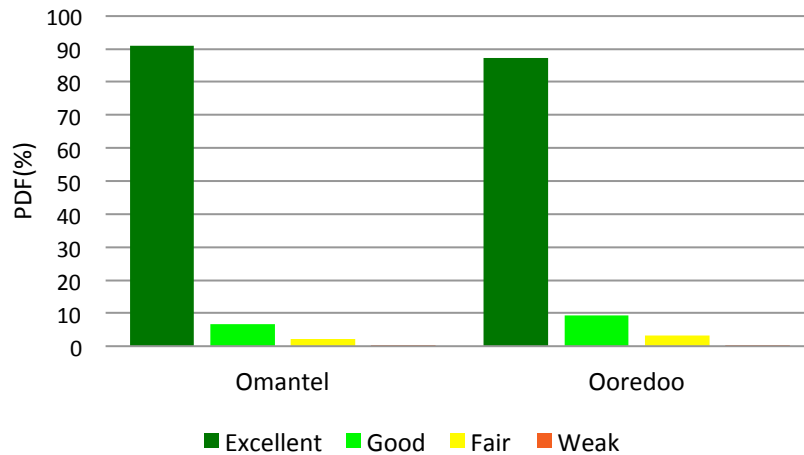


The map above shows signal strength measured for Ooredoo voice service in the Governorate of Dhofar. The colours depict the level of signal strength with dark green being the strongest and red being the weakest.

4. Results

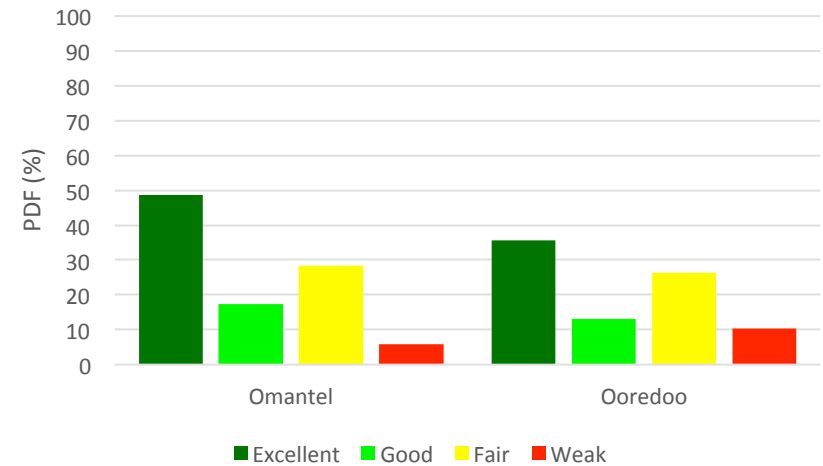
4.1 Mobile Voice Coverage

Voice Coverage Distribution - Wilayat Centers



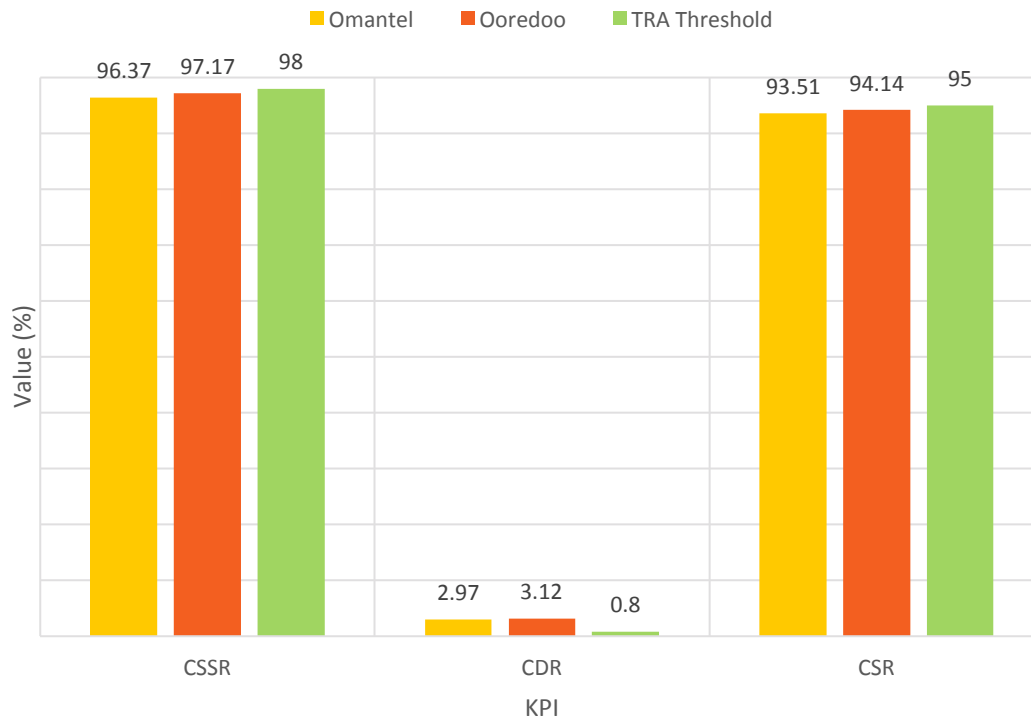
The percentage of indoor voice coverage in the Wilayat Centers for Omantel is 97.63% as compared to Ooredoo's 96.55%.

Voice Coverage Distribution - Highways



The percentage of in-car voice coverage on the Highways for Omantel is found to be 94.14% while for Ooredoo its 75.07%.

4.2 Mobile Voice Performance



	Omantel	Ooredoo
Call Attempts	524	495
Call Established	505	481
Call End	490	466
Call Drop	15	15

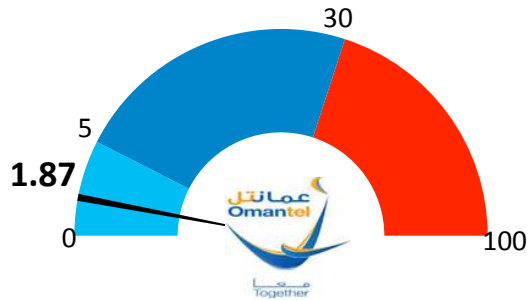
CSSR: Call Setup Success Rate (**Higher is better**)

CDR: Call Drop Rate (**Lower is Better**)

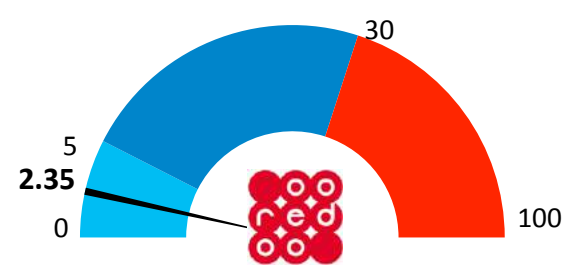
CSR: Call Success Rate (**Higher is better**)

Both Omantel and Ooredoo exhibit fair voice performance in the Governorate of Dhofar. The overall KPI values achieved fall short of TRA thresholds for all voice service KPIs

4.3 Mobile Data Download Speed

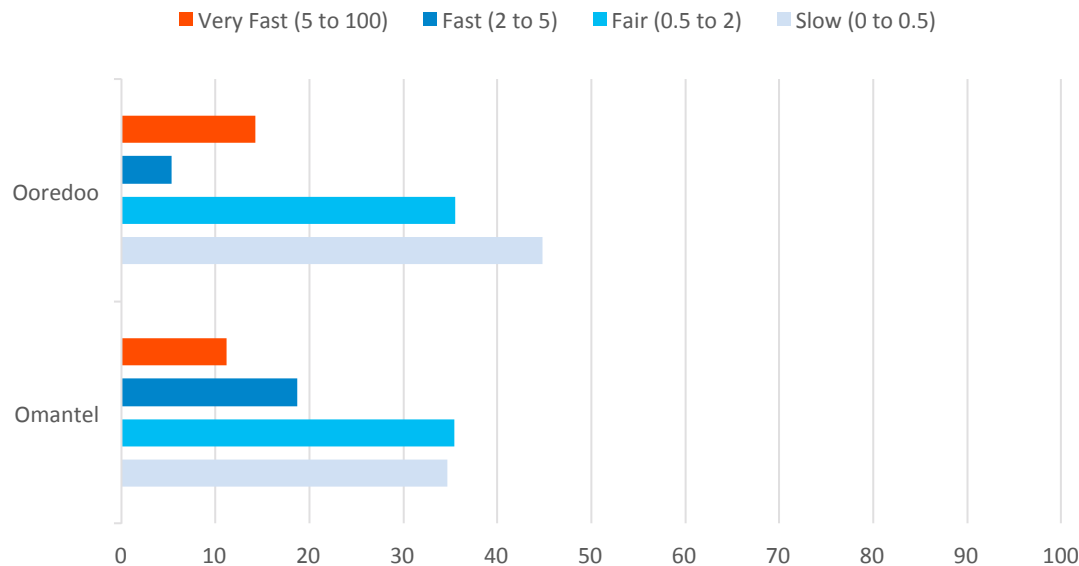


The overall average download speed for Omantel is 1.87 Mbps

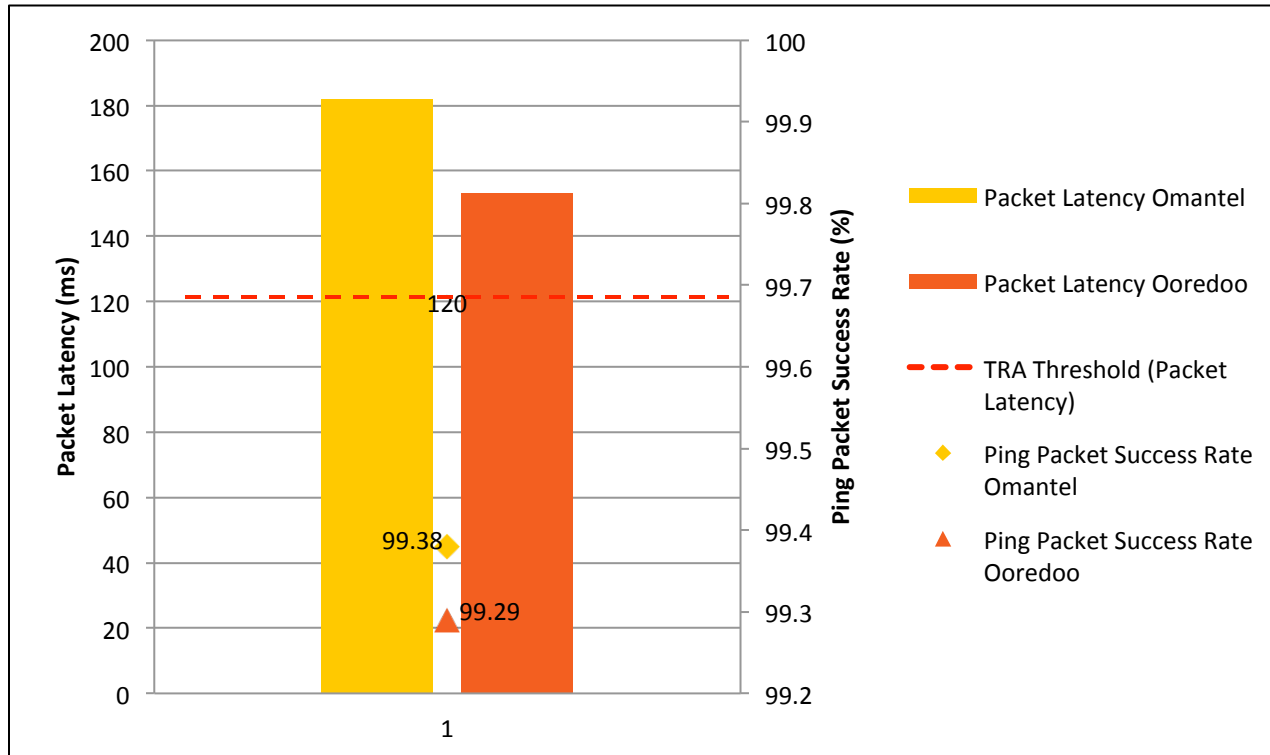


The overall average download speed for Ooredoo is 2.35 Mbps

Speed Distribution (Mbps)



4.4 Mobile Data Performance



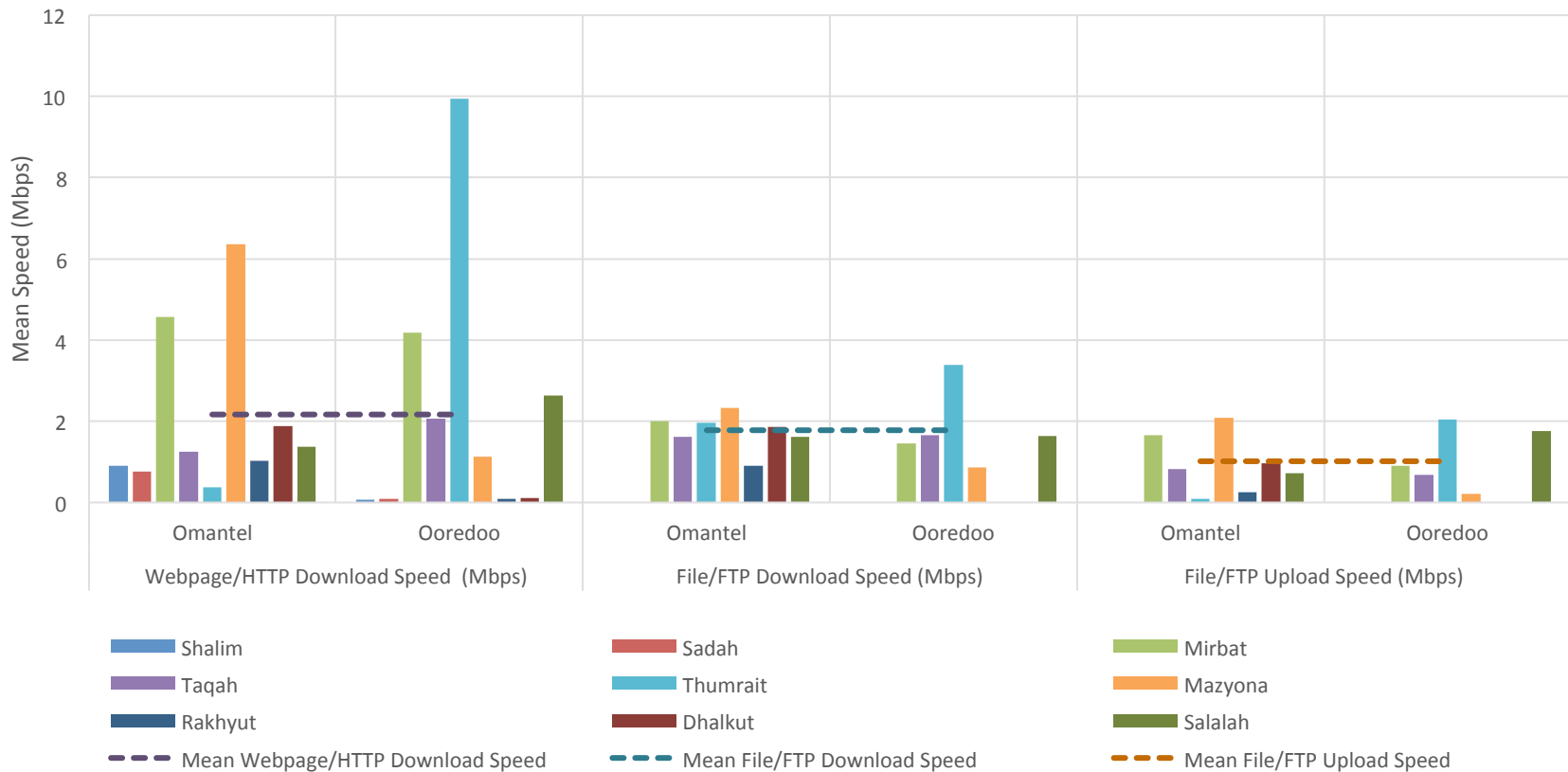
Packet Latency (ms): Lower is Better

Ping Packet Success Rate: Higher is Better

- The overall packet latency for Omantel is 182.15 ms
- The overall packet latency for Ooredoo is 153.20 ms

4.5 Mobile Data Performance Per Wilayat

Mobile Data Performance – Wilayat Centers



The overall average speed for downloading a webpage in Dhofar Governorate is 2.16 Mbps for both Operators combined. The overall average speed for uploading a file is 1 Mbps.

5 Conclusion

Results Summary

- In general, Omantel mobile network exhibits stronger voice service coverage than Ooredoo in the Wilayat Centers and Highways of Dhofar Governorate.
- The percentage of indoor voice coverage in the Wilayat Centers for Omantel is 97.63% as compared to Ooredoo's 96.55 %.
- The percentage of in-car voice coverage on the Highways for Omantel is found to be 94.14% while for Ooredoo its 75.07%.
- Both Omantel and Ooredoo exhibit fair voice service performance in Dhofar Governorate.
- The overall average download speed for Ooredoo mobile data network is 2.35 Mbps as compared to Omantel data network which is found to be 1.87 Mbps.
- On average, Omantel mobile data network exhibits higher packet delay (latency) in Dhofar Governorate. Although Ooredoo is also on the higher side its average packet delay is lower than Omantel.
- Omantel has broadband network available in all Wilayat Centers of Dhofar Governorate, however, the low retain-ability on the broadband network causes the end-user terminal to switch to 2G data network resulting in overall slow download speeds.
- Ooredoo data network lacks broadband coverage in Wilayat's of Shalim, Sadah, Rakhyut and Dhalkut.
- The overall average webpage download speed for Dhofar Governorate is 2.16 Mbps for both Operators combined, the overall average upload speed is 1 Mbps.
- Omantel data network is below the overall average speed for download and upload in Wilayat Salalah whereas Ooredoo is found to be higher.
- Both Operators are below the overall average download speed for file/FTP download in Dhofar Governorate.

5 Conclusion

Basis of results

- The coverage information is based on the geographical drive test route used during the measurement exercise.
- The classification of coverage thresholds and estimated signal penetration level is based on indoor penetration loss of 20 dBm and in-car penetration loss of 7 dBm.
- The exercise has been conducted independently by TRA without sharing any information with the service providers about the date, time, type of tests being performed or test location.
- The results of the exercise are based on the data collected from the field at a certain instance of time and day; network behaviour may vary with traffic variations over time and events.
- The TRA thresholds mentioned for various KPIs are for indicative purpose only as these thresholds/targets are set for overall network performance and calculated using a pre-defined methodology over the course of a quarter, and not drive test where the number of samples are limited.
- Industry standard tools and work best practices are ensured during the data collection process.
- Individual consumer experience may vary depending on a number of factors including but not limited to the end-user terminal performance, end-user perception of service quality, type of application used, in-building signal losses etc.