

best in test.

For adding something on top in Portugal and reaching an overall score of 952 dots in mobile network benchmarking survey we proudly award this certificate to

Vodafone Portugal

Score 952 out of 1000 in Total
Score 259 out of 270 in Voice Services
Score 465 out of 480 in Data Services
Score 228 out of 250 in Crowdsourced Quality



Hakan Ekmen
Global Networks Lead, Comms Industry





Measurement Overview

umlaut tested and measured the performance of its voice and data services on smartphones in comparison to other 5G/LTE mobile radio networks in metropolitan and rural areas of Portugal.

The audit was done as a performance benchmark performed by umlaut between 17.01.2024. and 09.02.2024 in cities and towns as well as on connection roads.

Dedicated measurements have been executed as drive tests and walk test using a Samsung Galaxy S23+.

All data measurements have been performed in 5G preferred mode. Voice measurements have been done in 5G/5G preferred mode on both sides, while call origin has been alternated.

In addition crowdsourced performance data has been collected and evaluated between CW35 2023 and CW06 2024.

The following pages provide a comparative overview about the performance results observed for the different tested service types.



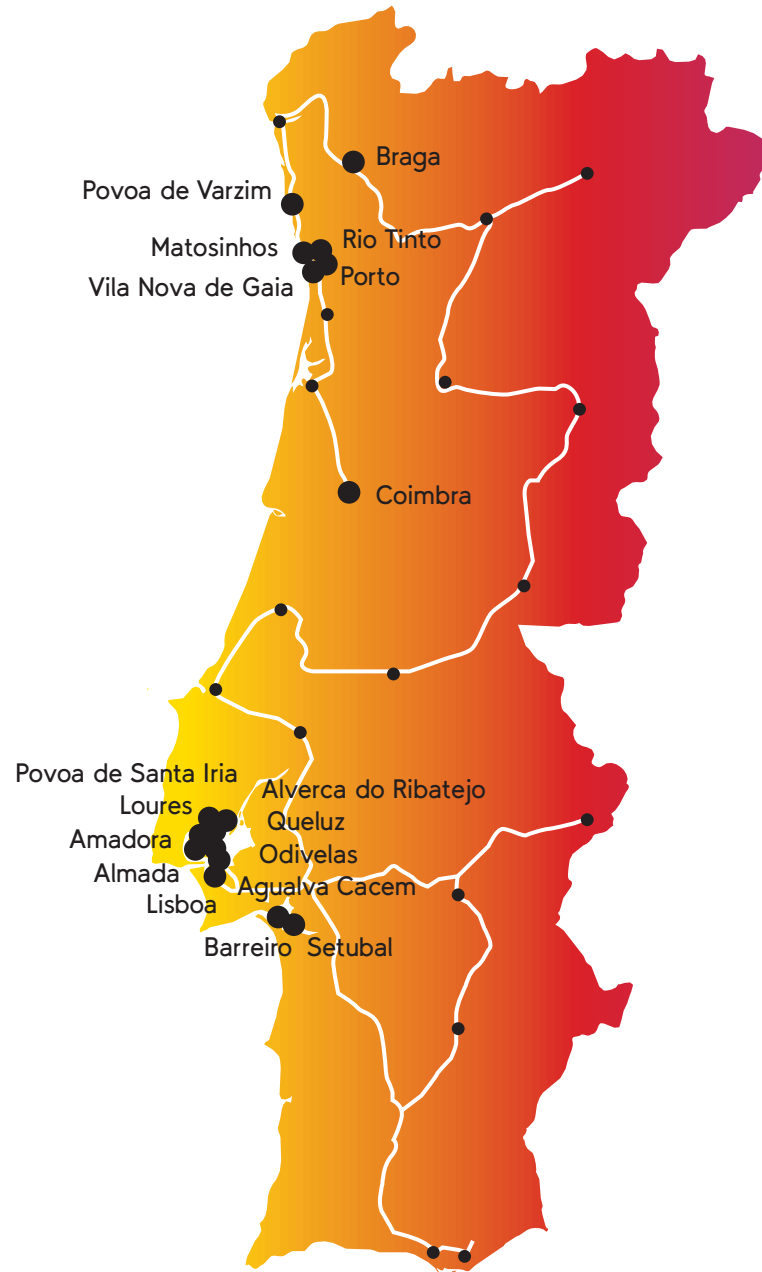
Measurement setup

Drivetest	Voice	Data
Device	Samsung Galaxy S23+	Samsung Galaxy S23+
Test Cases	Mobile-to-Mobile (M2M) Side1 (VoLTE, 5G pref.) to Side2 (VoLTE, 5G pref.) 105 sec call window 70 sec call duration 15 sec call setup timeout Multi-RAB traffic injection on both sides	Data 5G preferred HTTP DL datastream 7s HTTP UL datastream 7s HTTP 10MB DL fixed file transfer HTTP 5MB UL fixed file transfer Web Browsing – Kepler ETSI Ref. Page 8 Live web pages 2 YouTube videos ~45s (Full HD and Live Full HD) Interactivity eGaming Conversational App
Mobility and Route Types	Drivetest and Walktest Drivetest: 58% in Cities, 19% in Towns and 23% on Roads	
Samples	~ 11468	~ 78475
Dates	12 measurement days for DT and 5 measurement days for WT 17.01.2024. – 09.02.2024.	
Crowd Data Assessment	24 weeks CW35 2023 – CW06 2024	



Testing areas

Drive route



26 %
of population measured



6000 km
measuring distance



Crowdsourcing based test area



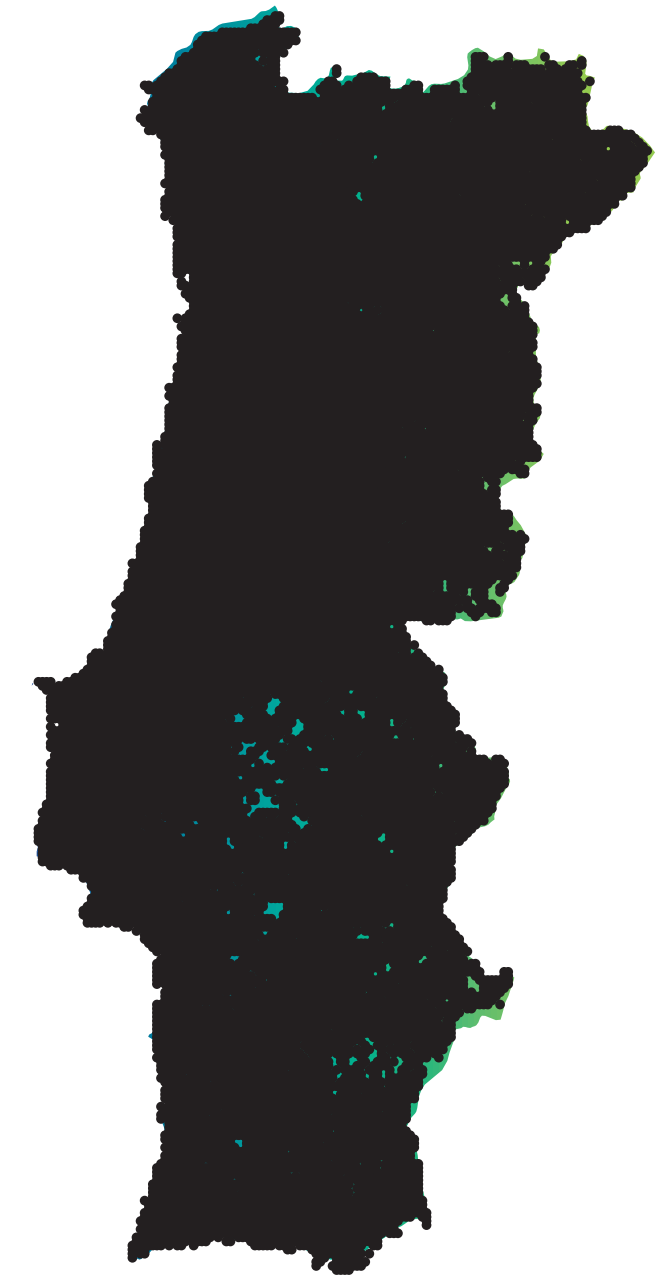
99.6 %
of the 'built-up area' covered



99.9 %
of the 'Population area' covered



91.390 km²
size of tested area





Claims




Best in test
Vodafone Portugal



Best in data
Vodafone Portugal



Best in voice
Vodafone Portugal



Best in Reliability
Vodafone Portugal



Methodology

The leader in mobile benchmarking, umlaut, has analyzed the mobile networks of Portugal with regards to mobile network performance. We measure smartphone voice and data performance based on extensive drivetests – from major metropolitan areas to smaller cities and connection roads.

We objectively define the routes and test methodology and publish the results through certificates or public benchmark reports. In addition crowdsourced performance data has been collected and evaluated. As the de-facto industry standard, our benchmarking methodology focuses on customer-experienced network quality and covers a wide range of mobile services. Today, more than 200 mobile networks in more than 120 countries are being evaluated by our unique scoring

methodology. It allows a technical analysis that is unprecedented in its level of detail and enables comparisons between the network performance and capability of each mobile network. Our public benchmarks as well as the certificate benchmarks help network operators to demonstrate how well they are delivering wireless connections to consumers, business users and enterprises and reveals the areas of improvement.



Score and breakdown

Vodafone Portugal achieved the highest overall score among competitors with 952 dots out of 1000.



→ Shown total scores are rounded.

Overall score considering Voice, Data and Crowdsourcing.

Total score

	Vodafone	MEO	NOS
Voice (max. 270)	259	256	245
Cities Drivetest	122 (96%)	96%	93%
Cities Walktest	40 (99%)	98%	96%
Towns Drivetest	54 (95%)	95%	84%
Roads Drivetest	54 (95%)	90%	89%
Data (max. 480)	465	459	454
Cities Drivetest	216 (98%)	96%	95%
Cities Walktest	72 (97%)	98%	96%
Towns Drivetest	96 (97%)	95%	94%
Roads Drivetest	96 (94%)	92%	93%
Crowdsourced Quality (max. 250)	228	228	232
Broadband Coverage	100 (92%)	93%	93%
Download Speed	56 (90%)	89%	91%
Upload Speed	19 (88%)	92%	91%
Latency	50 (93%)	92%	94%
Voice	11 (91%)	82%	94%
Stability	14 (94%)	95%	95%
Total	952	943	931

Shown scores are rounded.



Achieved percentage of the maximum score in each of the different data services.

Data	Service Group	max	Vodafone	MEO	NOS
Cities Drivetest	Web Browsing	48,6	99%	98%	99%
	File Download	48,6	98%	98%	98%
	File Upload	48,6	98%	97%	97%
	YouTube	48,6	97%	96%	97%
	OTT	21,6	97%	88%	73%
Cities Walktest	Web Browsing	16,2	98%	99%	100%
	File Download	16,2	99%	99%	99%
	File Upload	16,2	97%	96%	97%
	YouTube	16,2	95%	98%	97%
	OTT	7,2	97%	96%	79%
Towns Drivetest	Web Browsing	21,6	98%	98%	98%
	File Download	21,6	98%	97%	96%
	File Upload	21,6	96%	96%	95%
	YouTube	21,6	97%	96%	96%
	OTT	9,6	93%	84%	69%
Roads Drivetest	Web Browsing	21,6	96%	97%	98%
	File Download	21,6	95%	94%	93%
	File Upload	21,6	94%	91%	94%
	YouTube	21,6	94%	94%	97%
	OTT	9,6	90%	78%	69%



Achieved percentage of the maximum score in each of the different crowdsourcing services.

Crowd	Service Group	max	Vodafone	MEO	NOS
Crowdsourced Quality	Broadband Coverage	100	92%	93%	93%
	DL Speed	56	90%	89%	91%
	UL Speed	19	88%	92%	91%
	Latency	50	93%	92%	94%
	Voice	11	91%	82%	94%
	Stability	14	94%	95%	95%



Reliability



Reliability score considering Voice Reliability, Data Reliability and Consistent UE.

Total score

	Service Group	max	Vodafone	MEO	NOS
Reliability	Voice Reliability	149	96%	95%	88%
	Data Reliability	264	99%	98%	95%
	Consistent User Experience	117	93%	92%	94%

Score achievement in school grades:
outstanding (≥95%), very good (≥85% and <95%), good (≥75% and ≤85%), satisfactory (≤65% and <75%), sufficient (≤55% and <65%).



Voice KPI overview

Achieved values of all networks under test in each of the relevant Voice Key Performance Indicators (KPIs) for the geographical categories "Cities", "Towns" and "Roads".

Voice	Service Group	Unit	Vodafone	MEO	NOS
Cities Drivetest	Qualifier	[%]	99,6	99,6	99,2
	Call Setup Time (P90)	[s]	1,5	2,2	2,2
	Speech Quality (P10)	[MOS-LQO]	4,3	4,6	4,4
	Multirab connectivity	[%]	100,0	99,8	100,0
Cities Walktest	Qualifier	[%]	100,0	100,0	99,6
	Call Setup Time (P90)	[s]	1,3	2,3	2,1
	Speech Quality (P10)	[MOS-LQO]	4,5	4,7	4,6
	Multirab connectivity	[%]	100,0	99,7	100,0
Towns Drivetest	Qualifier	[%]	99,4	99,6	97,7
	Call Setup Time (P90)	[s]	1,4	2,3	2,2
	Speech Quality (P10)	[MOS-LQO]	4,3	4,5	4,2
	Multirab connectivity	[%]	100,0	99,8	100,0
Roads Drivetest	Qualifier	[%]	99,2	98,2	97,9
	Call Setup Time (P90)	[s]	1,5	2,5	2,4
	Speech Quality (P10)	[MOS-LQO]	4,2	4,3	4,1
	Multirab connectivity	[%]	100,0	98,7	100,0



Data Services KPI overview

Achieved values of all networks under test in each of the relevant Data Key Performance Indicators (KPIs) for the geographical category "Cities Drivetest".

Data Cities DT	KPI Name	Unit	Vodafone	MEO	NOS
HTTP Web Page DL Smartphone	Qualifier	[%]	99,9	99,8	99,9
	Overall Session Time	[s]	1,1	1,1	0,9
HTTP 10MB DL Smartphone	Qualifier	[%]	100,0	100,0	100,0
	Overall Session Time	[s]	1,0	0,8	0,7
	90% faster than	[Mbit/s]	47,8	83,4	116,4
	10% faster than	[Mbit/s]	384,6	323,9	373,8
HTTP 5MB UL Smartphone	Qualifier	[%]	100,0	100,0	100,0
	Average Session Time	[s]	1,6	1,8	1,5
	90% faster than	[Mbit/s]	16,6	14,6	16,9
	10% faster than	[Mbit/s]	68,8	56,0	73,4
HTTP DL FDTT	Qualifier	[%]	99,9	99,9	99,6
	10% faster than	[Mbit/s]	805,2	722,8	869,6
	faster than 20 Mbit/s	[%]	99,0	98,9	99,4
	faster than 100 Mbit/s	[%]	89,0	91,2	95,7
	Qualifier	[%]	99,9	100,0	99,7
HTTP UL FDTT	10% faster than	[Mbit/s]	137,6	120,0	117,7
	faster than 2 Mbit/s	[%]	100,0	99,9	100,0
	faster than 5 Mbit/s	[%]	99,3	99,5	99,5
	Qualifier	[%]	100,0	99,6	99,9
YouTube	Start Time	[s]	1,8	1,7	1,6
	AVG Resolution	[p]	1079,5	1078,9	1079,6
	Qualifier	[%]	99,9	99,8	99,8
YouTube Live Smartphone	Start Time	[s]	2,2	2,1	2,0
	AVG Resolution	[p]	1079,8	1079,7	1080,0
	Qualifier	[%]	98,5	97,0	98,1
Interactivity	Interactivity egaming	[%]	72,4	65,7	71,9
	Qualifier	[%]	100,0	99,7	92,0
Conversational App	Speech Quality (P10)	[MOS-LQO]	4,1	3,1	3,7



Data Services KPI overview

Achieved values of all networks under test in each of the relevant Data Key Performance Indicators (KPIs) for the geographical category "Cities Walktest".

Data Cities WT	KPI Name	Unit	Vodafone	MEO	NOS
HTTP Web Page DL Smartphone	Qualifier	[%]	99,8	99,9	100,0
	Overall Session Time	[s]	1,1	1,0	1,0
HTTP 10MB DL Smartphone	Qualifier	[%]	100,0	100,0	100,0
	Overall Session Time	[s]	0,7	0,6	0,7
	90% faster than	[Mbit/s]	78,0	155,1	108,4
	10% faster than	[Mbit/s]	404,0	320,0	301,4
HTTP 5MB UL Smartphone	Qualifier	[%]	100,0	100,0	100,0
	Average Session Time	[s]	1,7	1,9	1,7
	90% faster than	[Mbit/s]	21,3	15,9	18,5
	10% faster than	[Mbit/s]	60,8	50,1	53,7
	Qualifier	[%]	100,0	100,0	100,0
	10% faster than	[Mbit/s]	898,8	726,7	811,3
HTTP DL FDTT	faster than 20 Mbit/s	[%]	99,3	99,7	100,0
	faster than 100 Mbit/s	[%]	90,7	98,3	94,8
	Qualifier	[%]	99,7	100,0	100,0
HTTP UL FDTT	10% faster than	[Mbit/s]	149,6	115,0	105,8
	faster than 2 Mbit/s	[%]	99,7	99,7	100,0
	faster than 5 Mbit/s	[%]	99,7	98,6	99,7
	Qualifier	[%]	99,7	100,0	100,0
YouTube	Start Time	[s]	1,8	1,6	1,7
	AVG Resolution	[p]	1079,5	1079,2	1078,5
	Qualifier	[%]	99,7	100,0	99,7
YouTube Live Smartphone	Start Time	[s]	2,2	2,1	2,1
	AVG Resolution	[p]	1080,0	1080,0	1079,9
	Qualifier	[%]	99,3	99,3	97,9
Interactivity	Interactivity egaming	[%]	73,0	70,3	67,2
	Qualifier	[%]	100,0	100,0	94,0
Conversational App	Speech Quality (P10)	[MOS-LQO]	4,2	3,9	4,2



Achieved values of all networks under test in each of the relevant Data Key Performance Indicators (KPIs) for the geographical category "Towns".

Data Towns	KPI Name	Unit	Vodafone	MEO	NOS
HTTP Web Page DL Smartphone	Qualifier	[%]	99,8	99,9	99,7
	Overall Session Time	[s]	1,1	1,2	1,1
HTTP 10MB DL Smartphone	Qualifier	[%]	100,0	100,0	100,0
	Overall Session Time	[s]	0,8	1,1	1,1
	90% faster than	[Mbit/s]	64,1	41,5	39,3
	10% faster than	[Mbit/s]	366,3	305,3	362,0
HTTP 5MB UL Smartphone	Qualifier	[%]	100,0	100,0	99,7
	Average Session Time	[s]	2,0	2,1	1,7
	90% faster than	[Mbit/s]	13,5	12,3	15,4
	10% faster than	[Mbit/s]	69,0	54,7	73,2
	Qualifier	[%]	100,0	100,0	99,4
	10% faster than	[Mbit/s]	857,5	684,3	897,8
HTTP DL FDTT	faster than 20 Mbit/s	[%]	98,0	97,1	98,9
	faster than 100 Mbit/s	[%]	85,6	80,8	84,6
	Qualifier	[%]	100,0	100,0	100,0
HTTP UL FDTT	10% faster than	[Mbit/s]	125,3	111,3	119,9
	faster than 2 Mbit/s	[%]	99,4	100,0	99,1
	faster than 5 Mbit/s	[%]	97,4	99,4	97,4
	Qualifier	[%]	100,0	99,7	99,7
YouTube	Start Time	[s]	1,8	1,8	1,6
	AVG Resolution	[p]	1079,2	1078,8	1079,3
	Qualifier	[%]	100,0	100,0	99,7
YouTube Live Smartphone	Start Time	[s]	2,3	2,2	2,1
	AVG Resolution	[p]	1078,9	1079,4	1079,9
	Qualifier	[%]	98,9	94,8	98,6
Interactivity	Interactivity egaming	[%]	67,8	62,1	63,5
	Qualifier	[%]	99,2	98,9	91,9
Conversational App	Speech Quality (P10)	[MOS-LQO]	4,1	3,2	3,5



Data Services KPI overview

Achieved values of all networks under test in each of the relevant Data Key Performance Indicators (KPIs) for the geographical category "Roads".

Data Roads	KPI Name	Unit	Vodafone	MEO	NOS
HTTP Web Page DL Smartphone	Qualifier	[%]	99,4	99,7	99,8
	Overall Session Time	[s]	1,4	1,4	1,2
HTTP 10MB DL Smartphone	Qualifier	[%]	99,7	99,7	100,0
	Overall Session Time	[s]	1,9	2,0	1,9
	90% faster than	[Mbit/s]	23,5	22,8	26,5
	10% faster than	[Mbit/s]	230,8	246,2	230,9
HTTP 5MB UL Smartphone	Qualifier	[%]	99,5	99,7	100,0
	Average Session Time	[s]	2,3	3,3	2,5
	90% faster than	[Mbit/s]	9,5	5,9	8,4
	10% faster than	[Mbit/s]	53,1	41,7	53,6
HTTP DL FDTT	Qualifier	[%]	99,7	99,7	99,2
	10% faster than	[Mbit/s]	419,8	431,2	429,0
	faster than 20 Mbit/s	[%]	94,3	93,6	91,3
	faster than 100 Mbit/s	[%]	47,9	42,5	39,7
HTTP UL FDTT	Qualifier	[%]	99,7	99,5	99,7
	10% faster than	[Mbit/s]	78,6	75,8	79,4
	faster than 2 Mbit/s	[%]	99,4	98,4	99,2
	faster than 5 Mbit/s	[%]	97,2	95,1	94,7
YouTube	Qualifier	[%]	100,0	98,9	100,0
	Start Time	[s]	2,1	1,9	1,9
	AVG Resolution	[p]	1078,2	1075,1	1079,0
YouTube Live Smartphone	Qualifier	[%]	98,6	99,4	99,4
	Start Time	[s]	2,5	2,4	2,3
	AVG Resolution	[p]	1077,8	1076,2	1077,9
Interactivity	Qualifier	[%]	95,7	92,2	94,7
	Interactivity egaming	[%]	60,2	53,0	60,1
Conversational App	Qualifier	[%]	99,6	98,9	91,0
	Speech Quality (P10)	[MOS-LQO]	3,9	2,8	3,0



Crowd KPI overview

Achieved values of all networks under test in each of the relevant Crowd Key Performance Indicators (KPIs) for the categories "Broadband Coverage", "Download Speed", "Latency", "Voice Crowd" and "Stability".

Category	KPI name	Unit	Vodafone	MEO	NOS
Broadband Coverage	Coverage Quality	[%]	95.8	96.8	97.2
	Coverage Reach	[%]	91.4	95.6	91.9
	Time on broadband	[%]	96.4	96.0	97.3
Download Speed	Basic internet class	[%]	95.1	95.2	95.3
	HD video class	[%]	86.1	86.2	86.7
	UHD video class	[%]	27.1	29.2	31.8
Latency	OTT voice class	[%]	97.7	96.8	97.8
	Gaming class	[%]	91.6	92.4	91.3
Voice	HD voice	[%]	93.7	89.2	95.5
Download Speed Active	90% faster than	[Mbit/s]	6.5	5.4	6.7
	10% faster than	[Mbit/s]	154.3	164.9	215.2
	AVG data rate	[Mbit/s]	58.9	75.1	88.1
Upload Speed Active	90% faster than	[Mbit/s]	2.3	2.7	2.4
	10% faster than	[Mbit/s]	41.6	43.2	46.6
	AVG data rate	[Mbit/s]	18.8	20.5	21.4
Stability	Transaction success	[%]	94.1	94.6	95.2



umlaut – Part of Accenture

umlaut communications GmbH

Am Kraftversorgungsturm 3 · 52070 Aachen · Germany

Hakan Ekmen · Global Networks Lead, Comms Industry

cell +49 151 571 33 235 · hakan.ekmen@accenture.com

www.umlaut.com