

# best in test

For adding something on top in Romania and reaching an overall score of 915 dots in mobile network benchmarking survey we proudly award this certificate to

## Vodafone Romania

Score 915 out of 1000 in Total  
Score 264 out of 270 in Voice Services  
Score 437 out of 480 in Data Services  
Score 214 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 Romania.

The audit was done as a performance benchmark performed by umlaut between 23.02.2024 and 23.03.2024 in cities and towns as well as on connection roads.

Dedicated measurements have been executed as drive and walk tests 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 CW40 2023 and CW11 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: 54,62% in Cities, 19,69% in Towns and 25,68% on Roads Walktest: 100% Cities	
Samples	20278	145653
Dates	23.02.2024. – 23.03.2024	
Crowd Data Assessment	24 weeks CW40 2023 – CW11 2024	



# Testing areas

## Drive route

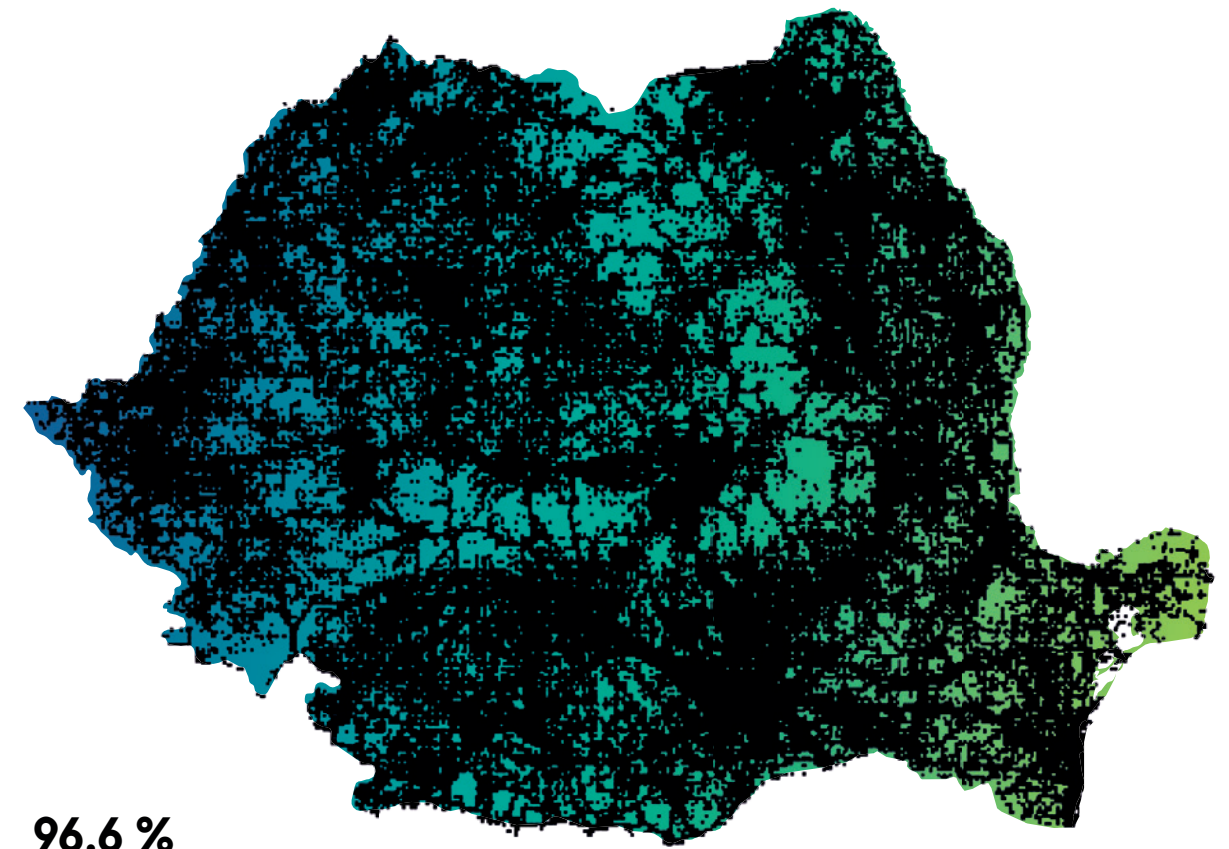


**8700 km**  
measuring distance



**24 %**  
of population measured

## Crowdsourcing based test area



**96.6 %**  
of the 'built-up area' covered




**97.6 %**  
of the 'Population area' covered




**139,536 km<sup>2</sup>**  
size of tested area



# Claims

**Best in test**  
Vodafone Romania



**Best in data**  
Vodafone Romania



**Best in voice**  
Vodafone Romania



**Best in Reliability**  
Vodafone Romania



# Methodology

The leader in mobile benchmarking, umlaut, has analyzed the mobile networks of Romania 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.

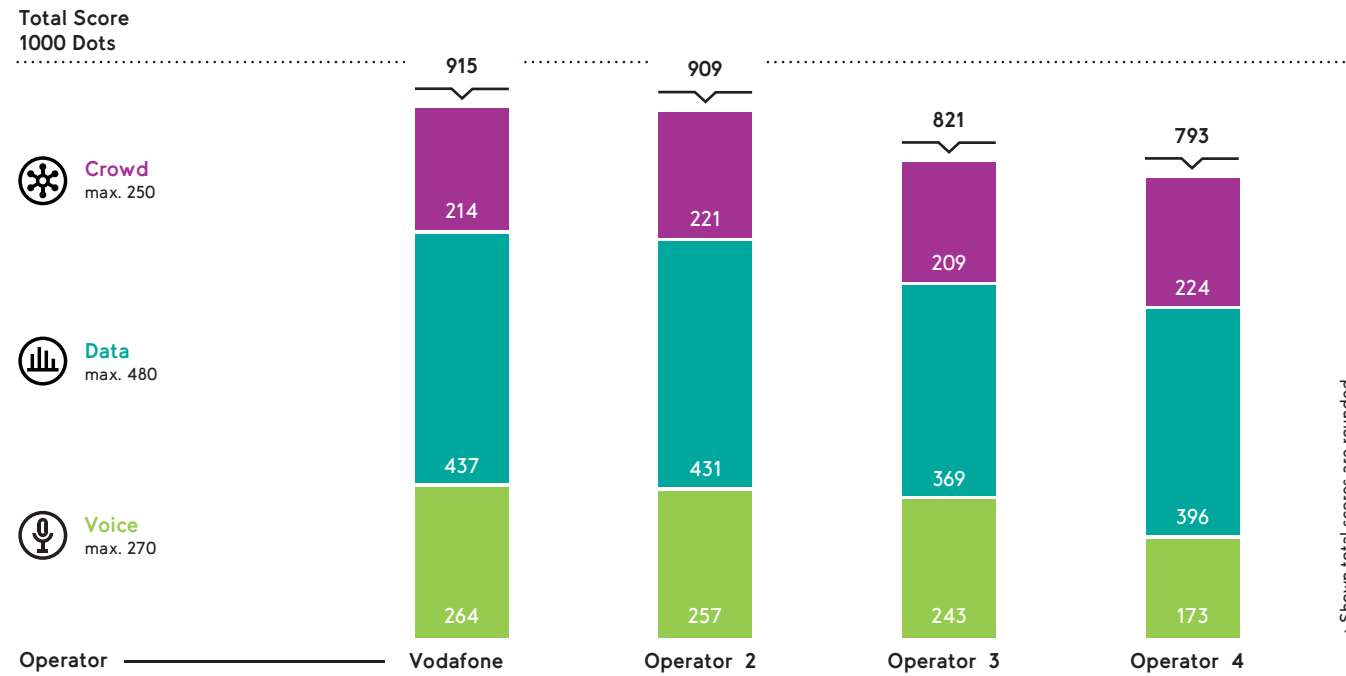
Today, more than 200 mobile networks in more than 120 countries are being evaluated by our unique scoring methodology.

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 Romania achieved the highest overall score among competitors with 915 dots out of 1000.



→ Shown total scores are rounded.

Overall score considering Voice, Data and Crowdsourcing.

## Total score

	Vodafone	Operator 2	Operator 3	Operator 4	
<b>Voice</b> (max. 270)	264	257	243	173	
Cities Drivetest	122	98%	96%	92%	59%
Cities Walktest	41	100%	98%	92%	75%
Towns Drivetest	54	99%	96%	93%	69%
Roads Drivetest	54	94%	91%	82%	63%
<b>Data</b> (max. 480)	437	431	369	396	
Cities Drivetest	216	93%	93%	76%	86%
Cities Walktest	72	95%	96%	76%	87%
Towns Drivetest	96	90%	87%	82%	79%
Roads Drivetest	96	86%	82%	75%	74%
<b>Crowdsourced Quality</b> (max. 250)	214	221	209	224	
Broadband Coverage	100	85%	89%	84%	95%
Download Speed	56	80%	85%	74%	83%
Upload Speed	19	89%	91%	88%	79%
Latency	50	88%	89%	88%	89%
Voice	11	88%	86%	83%	95%
Stability	14	93%	93%	95%	94%
<b>Total</b>	1000	915	909	821	793

Shown scores are rounded.



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

Data	Service Group	max	Vodafone	Operator 2	Operator 3	Operator 4
Cities Drivetest	Web Browsing	48,6	99%	97%	95%	92%
	File Download	48,6	88%	94%	53%	80%
	File Upload	48,6	93%	93%	65%	84%
	YouTube	48,6	96%	92%	91%	88%
	OTT	21,6	81%	78%	73%	85%
Cities Walktest	Web Browsing	16,2	100%	100%	95%	93%
	File Download	16,2	96%	97%	56%	86%
	File Upload	16,2	95%	96%	64%	82%
	YouTube	16,2	97%	96%	92%	87%
	OTT	7,2	84%	81%	66%	87%
Towns	Web Browsing	21,6	98%	95%	94%	89%
	File Download	21,6	83%	77%	71%	77%
	File Upload	21,6	87%	90%	80%	70%
	YouTube	21,6	96%	90%	87%	79%
	OTT	9,6	78%	73%	78%	84%
Roads	Web Browsing	21,6	96%	91%	85%	83%
	File Download	21,6	79%	76%	63%	70%
	File Upload	21,6	80%	85%	76%	67%
	YouTube	21,6	92%	81%	75%	76%
	OTT	9,6	78%	66%	73%	78%

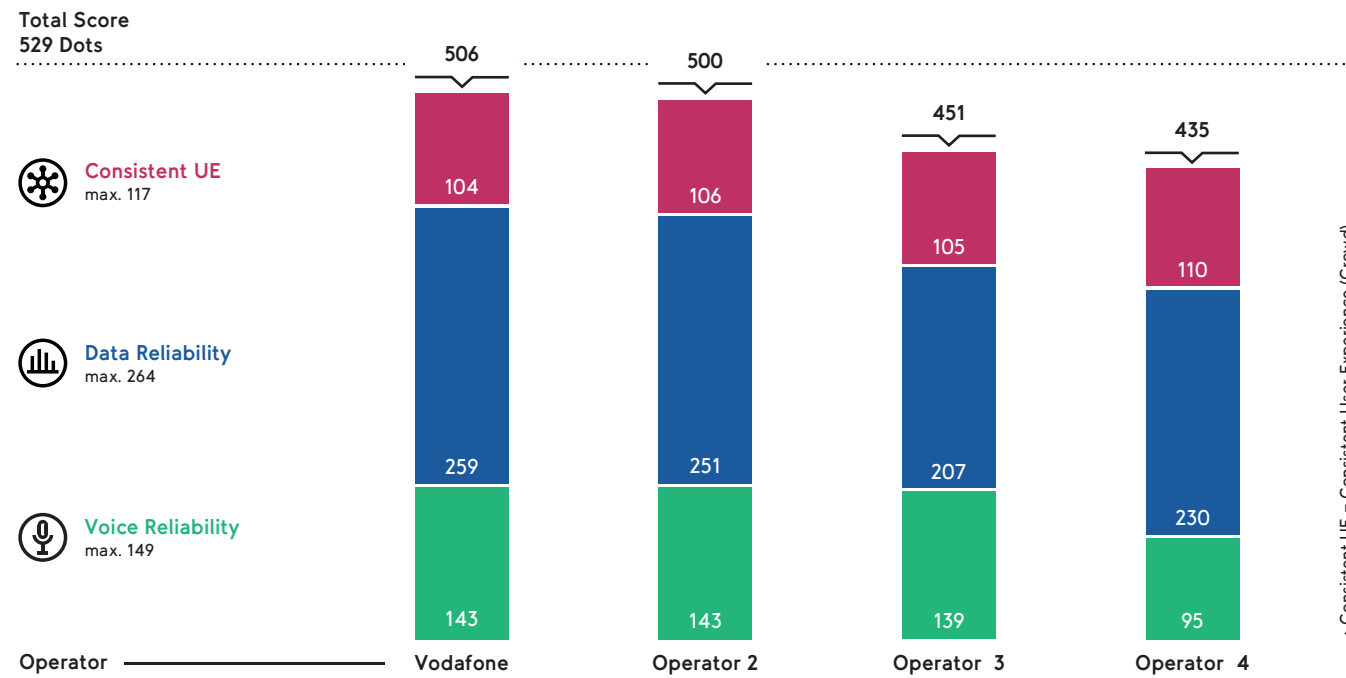


Achieved percentage of the maximum score in each of the different crowdsourcing services.

Crowd	Service Group	max	Vodafone	Operator 2	Operator 3	Operator 4
Crowdsourced Quality	Broadband Coverage	100	85%	89%	84%	95%
	DL Speed	56	80%	85%	74%	83%
	UL Speed	19	89%	91%	88%	79%
	Latency	50	88%	89%	88%	89%
	Voice	11	88%	86%	83%	95%
	Stability	14	93%	93%	95%	94%



# Reliability



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

## Total score

	Service Group	max	Vodafone	Operator 2	Operator 3	Operator 4
Reliability	Voice Reliability	149	97%	96%	94%	64%
	Data Reliability	264	98%	95%	78%	87%
	Consistent User Experience	117	89%	91%	90%	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	Operator 2	Operator 3	Operator 4
Cities Drivetest	Qualifier	[%]	99,7	99,8	99,9	96,5
	Call Setup Time (P90)	[s]	1,1	2,4	2,0	5,1
	Speech Quality (P10)	[MOS-LQO]	4,7	4,5	4,2	3,1
	Multirab connectivity	[%]	99,9	100,0	91,8	96,5
Cities Walktest	Qualifier	[%]	100,0	100,0	99,8	96,8
	Call Setup Time (P90)	[s]	1,1	2,4	2,0	2,4
	Speech Quality (P10)	[MOS-LQO]	4,7	4,7	4,3	3,7
	Multirab connectivity	[%]	100,0	100,0	86,5	99,5
Towns	Qualifier	[%]	99,9	99,6	99,7	96,5
	Call Setup Time (P90)	[s]	1,1	2,3	2,1	2,5
	Speech Quality (P10)	[MOS-LQO]	4,7	4,5	4,2	3,2
	Multirab connectivity	[%]	100,0	100,0	97,7	98,5
Roads	Qualifier	[%]	98,6	98,7	96,3	93,8
	Call Setup Time (P90)	[s]	1,2	2,4	2,1	3,4
	Speech Quality (P10)	[MOS-LQO]	4,5	4,0	4,0	3,1
	Multirab connectivity	[%]	99,5	99,4	97,9	95,6



### 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	Operator 2	Operator 3	Operator 4
HTTP Web Page DL Smartphone	Qualifier	[%]	99,8	99,7	99,6	99,0
	Overall Session Time	[s]	1,1	1,1	1,5	1,4
HTTP 10MB DL Smartphone	Qualifier	[%]	99,7	99,9	100,0	99,7
	Overall Session Time	[s]	1,8	1,7	2,9	2,6
	90% faster than	[Mbit/s]	30,5	30,9	16,8	20,1
HTTP 5MB UL Smartphone	10% faster than	[Mbit/s]	149,7	268,5	109,7	148,4
	Qualifier	[%]	100,0	99,8	99,8	99,2
	Average Session Time	[s]	2,2	2,2	2,2	3,5
HTTP DL FDTT	90% faster than	[Mbit/s]	12,0	11,7	11,9	6,3
	10% faster than	[Mbit/s]	45,5	58,9	53,3	50,5
	Qualifier	[%]	100,0	99,6	90,3	99,2
HTTP UL FDTT	10% faster than	[Mbit/s]	233,5	606,8	161,4	204,3
	faster than 20 Mbit/s	[%]	95,9	97,2	91,0	90,4
	faster than 100 Mbit/s	[%]	48,1	76,5	28,4	39,4
YouTube	Qualifier	[%]	99,9	99,7	90,8	99,2
	10% faster than	[Mbit/s]	64,0	95,8	72,5	84,4
	faster than 2 Mbit/s	[%]	99,8	99,6	99,6	98,6
	faster than 5 Mbit/s	[%]	97,9	98,3	97,6	92,3
YouTube Live Smartphone	Qualifier	[%]	99,8	99,3	99,6	98,9
	Start Time	[s]	1,7	1,9	2,3	2,2
	AVG Resolution	[p]	1079,1	1078,4	1078,8	1077,3
Interactivity	Qualifier	[%]	99,9	99,3	99,3	98,5
	Start Time	[s]	2,3	2,5	2,8	2,6
	AVG Resolution	[p]	1079,7	1078,8	1078,5	1077,8
Conversational App	Qualifier	[%]	98,7	93,8	89,6	95,4
	Interactivity egaming	[%]	37,8	37,3	31,9	53,3
Conversational App	Qualifier	[%]	99,8	99,8	99,9	99,8
	Speech Quality (P10)	[MOS-LQO]	4,0	3,7	3,5	3,4





### 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	Operator 2	Operator 3	Operator 4
HTTP Web Page DL Smartphone	Qualifier	[%]	100,0	100,0	99,7	99,1
	Overall Session Time	[s]	1,0	1,1	1,5	1,3
HTTP 10MB DL Smartphone	Qualifier	[%]	100,0	100,0	100,0	100,0
	Overall Session Time	[s]	1,1	1,1	2,5	2,6
	90% faster than	[Mbit/s]	47,8	48,2	23,8	23,7
	10% faster than	[Mbit/s]	186,0	297,4	118,3	175,5
HTTP 5MB UL Smartphone	Qualifier	[%]	100,0	100,0	99,7	99,7
	Average Session Time	[s]	2,1	2,0	2,4	4,4
	90% faster than	[Mbit/s]	15,1	16,2	14,0	4,2
HTTP DL FDTT	Qualifier	[%]	100,0	100,0	83,3	99,7
	10% faster than	[Mbit/s]	318,9	655,4	177,3	267,1
	faster than 20 Mbit/s	[%]	99,3	98,0	91,7	91,4
	faster than 100 Mbit/s	[%]	76,7	87,9	35,4	48,6
HTTP UL FDTT	Qualifier	[%]	100,0	100,0	81,7	100,0
	10% faster than	[Mbit/s]	74,9	98,7	72,7	100,5
	faster than 2 Mbit/s	[%]	99,7	100,0	98,7	96,6
	faster than 5 Mbit/s	[%]	99,0	99,0	97,5	88,7
YouTube	Qualifier	[%]	100,0	100,0	99,7	98,3
	Start Time	[s]	1,7	1,9	2,3	2,1
	AVG Resolution	[p]	1079,2	1079,1	1078,9	1075,5
YouTube Live Smartphone	Qualifier	[%]	99,7	100,0	99,3	98,6
	Start Time	[s]	2,1	2,4	2,8	2,5
	AVG Resolution	[p]	1080,0	1079,8	1078,4	1077,9
Interactivity	Qualifier	[%]	99,3	96,0	80,8	94,5
	Interactivity egaming	[%]	41,4	38,0	28,3	54,7
Conversational App	Qualifier	[%]	100,0	100,0	99,9	99,9
	Speech Quality (P10)	[MOS-LQO]	4,1	4,1	3,8	3,8



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	Operator 2	Operator 3	Operator 4
HTTP Web Page DL Smartphone	Qualifier	[%]	99,9	99,7	99,5	98,4
	Overall Session Time	[s]	1,2	1,5	1,6	1,5
HTTP 10MB DL Smartphone	Qualifier	[%]	99,8	99,6	99,8	99,8
	Overall Session Time	[s]	2,2	3,6	3,4	2,9
	90% faster than	[Mbit/s]	23,4	14,2	14,4	17,8
	10% faster than	[Mbit/s]	108,0	107,6	95,1	106,9
HTTP 5MB UL Smartphone	Qualifier	[%]	100,0	100,0	100,0	99,4
	Average Session Time	[s]	2,9	2,8	3,0	4,9
	90% faster than	[Mbit/s]	6,7	9,0	7,6	4,1
HTTP DL FDTT	Qualifier	[%]	100,0	99,6	97,6	98,5
	10% faster than	[Mbit/s]	148,7	206,2	111,6	174,3
	faster than 20 Mbit/s	[%]	94,4	87,2	90,8	89,9
	faster than 100 Mbit/s	[%]	29,7	31,4	14,4	285,0
HTTP UL FDTT	Qualifier	[%]	99,4	99,8	96,9	97,5
	10% faster than	[Mbit/s]	58,3	67,1	62,7	56,8
	faster than 2 Mbit/s	[%]	99,4	99,8	99,1	96,1
	faster than 5 Mbit/s	[%]	95,4	97,1	94,8	88,2
YouTube	Qualifier	[%]	99,8	99,8	98,6	98,0
	Start Time	[s]	1,8	2,3	2,2	2,3
	AVG Resolution	[p]	1078,9	1077,4	1078,0	1078,5
YouTube Live Smartphone	Qualifier	[%]	100,0	98,8	98,6	96,4
	Start Time	[s]	2,4	2,9	2,7	2,8
	AVG Resolution	[p]	1079,5	1077,3	1077,4	1076,4
Interactivity	Qualifier	[%]	97,3	90,1	97,3	94,3
	Interactivity egaming	[%]	33,2	24,5	33,2	51,0
Conversational App	Qualifier	[%]	99,6	100,0	99,9	99,7
	Speech Quality (P10)	[MOS-LQO]	4,1	3,6	3,7	3,6



### 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	Operator 2	Operator 3	Operator 4
HTTP Web Page DL Smartphone	Qualifier	[%]	99,4	98,4	97,3	96,5
	Overall Session Time	[s]	1,3	1,5	1,8	1,6
HTTP 10MB DL Smartphone	Qualifier	[%]	99,8	99,8	98,9	98,2
	Overall Session Time	[s]	4,1	5,7	6,6	4,7
	90% faster than	[Mbit/s]	9,8	6,5	5,4	9,8
	10% faster than	[Mbit/s]	93,1	75,6	75,5	73,8
HTTP 5MB UL Smartphone	Qualifier	[%]	98,9	99,2	98,5	96,2
	Average Session Time	[s]	5,5	4,5	6,4	6,8
	90% faster than	[Mbit/s]	3,5	4,8	3,1	2,7
	10% faster than	[Mbit/s]	34,8	37,1	37,3	28,3
HTTP DL FDTT	Qualifier	[%]	99,7	99,0	96,5	97,2
	10% faster than	[Mbit/s]	107,4	126,3	86,5	89,7
	faster than 20 Mbit/s	[%]	75,4	76,0	60,8	78,0
	faster than 100 Mbit/s	[%]	12,4	16,4	5,0	6,3
HTTP UL FDTT	Qualifier	[%]	98,7	98,8	97,7	96,2
	10% faster than	[Mbit/s]	49,8	60,9	50,1	33,2
	faster than 2 Mbit/s	[%]	95,9	97,8	95,5	95,0
	faster than 5 Mbit/s	[%]	85,5	92,1	85,9	83,9
YouTube	Qualifier	[%]	99,0	96,8	96,2	95,9
	Start Time	[s]	2,0	2,3	2,6	2,3
	AVG Resolution	[p]	1075,7	1076,7	1069,4	1074,1
YouTube Live Smartphone	Qualifier	[%]	98,7	95,5	95,2	93,8
	Start Time	[s]	2,6	2,8	3,1	2,8
	AVG Resolution	[p]	1074,7	1074,9	1062,5	1074,7
Interactivity	Qualifier	[%]	93,9	85,3	91,3	89,3
	Interactivity egaming	[%]	33,4	26,6	31,6	46,0
Conversational App	Qualifier	[%]	99,8	99,3	99,4	99,0
	Speech Quality (P10)	[MOS-LQO]	4,0	3,3	3,4	3,6



### 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	Operator 2	Operator 3	Operator 4
Broadband Coverage	Coverage Quality	[%]	95.6	97.6	97.1	99.1
	Coverage Reach	[%]	81.8	71.8	85.5	88.1
	Time on broadband	[%]	93.6	95.3	95.5	99.2
Download Speed	Basic internet class	[%]	94.7	93.1	95.0	94.5
	HD video class	[%]	84.5	67.9	86.2	84.8
	UHD video class	[%]	23.8	18.7	26.4	26.1
Latency	Gaming class	[%]	83.1	83.2	84.2	83.0
	OTT voice class	[%]	96.0	96.2	96.4	96.5
Voice	HD voice	[%]	92.1	89.3	90.9	96.4
Download Speed Active	90% faster than	[Mbit/s]	3.7	5.1	4.9	4.5
	10% faster than	[Mbit/s]	78.6	78.5	96.1	86.6
	AVG data rate	[Mbit/s]	32.9	35.3	42.7	38.8
Upload Speed Active	90% faster than	[Mbit/s]	2.8	2.5	3.0	2.0
	10% faster than	[Mbit/s]	36.7	38.3	40.3	34.8
	AVG data rate	[Mbit/s]	17.2	17.4	19.1	15.9
Stability	Transaction success	[%]	92.6	94.8	93.4	94.3



**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](mailto:hakan.ekmen@accenture.com)

[www.umlaut.com](http://www.umlaut.com)