

The 2023 Mobile Network Test in Spain

For the eighth time, we – umlaut, part of Accenture, and connect – have conducted our comprehensive benchmark of the Spanish mobile networks. A close race shows three very good operators, ranking near together, and a runner-up that managed to substantially reduce the distance to its larger competitors.

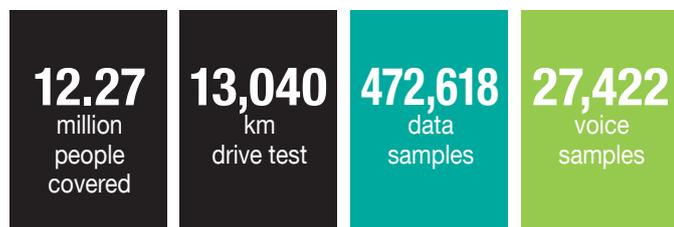
The carefully designed methodology of our 2023 benchmark in Spain represents a holistic approach to network benchmarking. It combines drive tests and walk tests for executing detailed voice and data measurements under controlled circumstances combined with a sophisticated crowdsourcing methodology. The drive tests and walk tests allow for the maximum capabilities of the networks to be evaluated. Crowdsourcing provides profound insights into the overall coverage of voice, data and 5G services as well as real-world User Download and Upload Speeds as well as Latencies. We have thoroughly weighed these components in order to give a realistic and conclusive assessment of the rated networks' true potential and performance.



Scope

The 2023 umlaut connect Mobile Network Test in Spain consists of drive tests and walk tests conducted from January 19th to February 8th, 2023. Four drive test cars together covered a total of 13,040 kilometres, visiting 20 cities and 23 towns. Additionally, one walk test team visited seven cities. The test areas account for 12.27 million people, or approx. 26 percent of the total Spanish population. In addition, the results of extensive crowdsourcing analyses, considering 24 weeks from end of August 2022 to mid-February 2023 are included in the score. Our detailed methodology is described on pages 10/11.

DRIVE TEST AND WALK TEST FACTS



CROWDSOURCING FACTS



The 2023 Mobile Network Test in Spain

The Spanish Mobile Operators



Movistar is the brand name the Spanish telecommunications company Telefónica uses for the mobile network in its home market. Telefónica S.A. is one of the largest telco companies in the world.

The company operates networks in 12 countries and is present in 33. It counted a total of 103,900 employees and achieved worldwide revenues of over €39 billion in its fiscal year 2022.

While the company introduced the Movistar brand in Latin American countries in 2005, it has been active in Spain since the launch of GSM services back in 1995. Today, Movistar is the largest mobile operator in Spain with approx. 19.3 million subscribers.

It offers GSM, UMTS/3G, LTE and 5G. Movistar is supporting 4G+ carrier aggregation with maximum speeds reaching up to 1 Gbps.

The operator claims to provide 4G coverage of more than 96 percent of the Spanish population. After having launched 5G in 2020, Movistar announced that by now, its 5G service is available in all autonomous communities of Spain.



Orange España is the brand name of France Telecom's mobile network in Spain. It has been operating under this name since 2006. Previously, the network was known as "Amena" – this brand name lives on in Orange Spain's portfolio as a low-cost offer that is only available via the internet. Also, its network serves a number of mobile virtual network operators such as Día Móvil, Happy Móvil, Pepphone, Simyo and others. With approx. 16.7 million mobile customers, Orange is now the second largest Spanish mobile operator.

In the fiscal year 2022, Orange Spain reported a revenue of €4.6 billion which contributed approx. 9.4 percent to the Orange Group's total revenue. Orange Spain has deployed 2G/GSM, 3G/UMTS, 4G/LTE and 5G. The operator claims that its 4G network reaches more than 97 percent of the Spanish population. Orange reports to have rolled out 5G in approx. 1500 cities and towns, reaching about 68 percent of the Spanish population.



Vodafone España has been present on the Spanish mobile communications market since the year 2000. Then, the British Vodafone Group acquired Airtel Móviles which had operated in Spain since 1994. With approx. 13.3 million subscribers, Vodafone has now become the third largest mobile operator in Spain. In its fiscal year 2022, Vodafone Spain achieved revenues of €3.7 billion which contributes about 10 percent to the whole Vodafone Group's financial results.

Vodafone's mobile network in Spain offers GSM, UMTS/ 3G, LTE and 5G. The Vodafone 4G network in Spain supports LTE 4 carrier aggregation (4CA or "4G+") with maximum speeds of 1 Gbps.

Vodafone España claims to offer the best LTE coverage in Spain, reaching approx. 98 percent of the Spanish population. The operator was the first to launch 5G in Spain and now reports to offer this new mobile network technology in approx. 1000 cities and towns, reaching 46 percent of the Spanish population.



Yoigo was the latest mobile operator to enter the Spanish market. Founded in 2000 under the name Xfera, the company started its actual operation in 2006, offering only a UMTS/3G network at 2100 MHz. At this time, the Swedish telecommunications company TeliaSonera acquired the majority of shares and rebranded the network as "Yoigo". In June 2016, the former MVNO Más Móvil bought the company. For its fiscal year 2022, Más Móvil reported revenues of €2.2 billion. Its latest customer numbers are 9.1 million mobile subscribers. Yoigo had a national roaming agreement with Movistar until the end of 2016. Since January 2017, Yoigo customers freely roam in the 2G, 3G and 4G networks of Orange at locations without Yoigo coverage. Yoigo operates own 3G, 4G and 5G networks. Thanks to its roaming agreements, the operator claims an LTE coverage of approx. 98 percent of the population. Yoigo claims to reach 74 percent of the population with 5G thanks to a combination of its own infrastructure and an agreement with Orange.

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Results at a Glance



In an overall close race, Movistar achieves the first place by improving its score by 15 points over the previous year's results. Movistar achieves the top rank due to the best results in the Data and Crowdsourcing categories. The operator is particularly strong in the data tests in smaller towns and on the roads, which is also confirmed by achieving the best sub-scores in the Download, Upload and Latency categories of the Crowdsourcing.



Orange basically maintains its very good result from the previous year. Spain's second-largest operator is leading in the Voice category and shows also the highest overall Reliability score. In the Data tests, Orange is particularly strong in the cities. Above that, the operator also leads in the Broadband Coverage and Stability sub-disciplines of the Crowdsourcing analyses.



Vodafone also achieves a very good result. It scores on a par with Orange in the Crowdsourcing, sharing the second place in this category. In the Data category, Vodafone is just one point behind Orange, and only two points in the Voice category. The operator shows particular strength in the voice tests in towns and on the roads as well as the crowdsourced HD-voice assessment.



Spain's smallest provider achieves the overall grade "good". It shows an impressive advancement in comparison to the previous year's result (+59 points) and manages to considerably reduce the gap to the larger three operators. Yoigo keeps well up particularly in the Data tests performed in the cities and also in the crowdsourced Latency and Stability assessments.

BEST IN TEST

MOVISTAR
2/2023

MOBILE NETWORK TEST IN SPAIN
www.connect-testlab.com

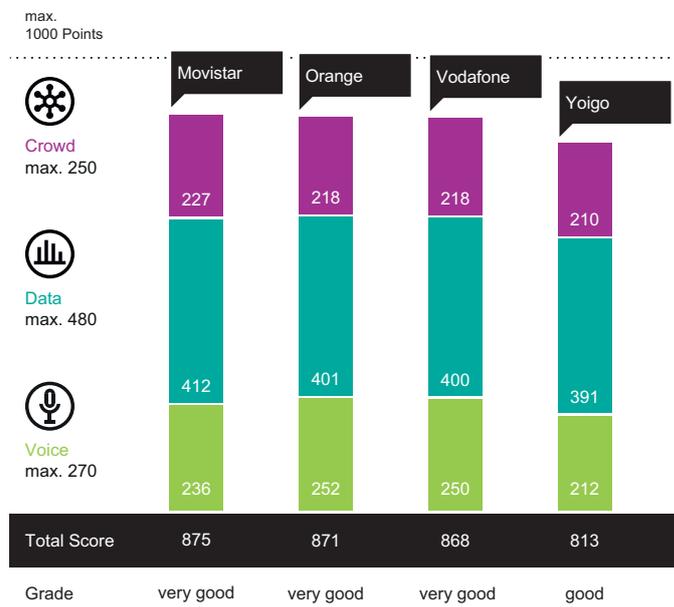
"We have a very tight result, seeing three operators on a similar performance level. Congratulations to Movistar for winning our Mobile Network Test in Spain by clearly improving over the previous year's results. Movistar, Orange and Vodafone are ranking close together, showing an overall very good level of performance. Yoigo made the biggest step ahead and significantly reduces the distance to the other candidates, showing an overall good result"

Hakan Ekmen, CEO Telecommunication at umlaut, part of Accenture



Overall Results		Movistar	Orange	Vodafone	Yoigo
Voice	max. 270.0 P.	236	252	250	212
Cities (Drivetest)	121.5	88%	95%	91%	80%
Cities (Walktest)	40.5	95%	99%	99%	87%
Towns (Drivetest)	54.0	90%	90%	95%	73%
Roads (Drivetest)	54.0	77%	87%	88%	75%
Data	max. 480.0 P.	412	401	400	391
Cities (Drivetest)	216.0	85%	88%	85%	85%
Cities (Walktest)	72.0	89%	93%	93%	92%
Towns (Drivetest)	96.0	85%	72%	75%	69%
Roads (Drivetest)	96.0	85%	78%	81%	77%
Crowd	max. 250.0 P.	227	218	218	210
Crowd	250.0	91%	87%	87%	84%
Connect Rating	max. 1000 P.	875	871	868	813

Percentages and points rounded to integer numbers.
For the calculation of points and totals, the accurate, unrounded values were used.



Shown voice, data, crowd and total scores are rounded.

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Voice

Voice

270 of 1000 Points

■ Movistar
■ Orange
■ Vodafone
■ Yoigo

ORANGE AHEAD IN BIG CITIES VOICE DRIVETESTS, VODAFONE RANKS SECOND AND MOVISTAR THIRD

In the voice tests conducted by umlaut's test cars while driving in Spain's big cities, Orange achieves the highest score, followed by Vodafone and then Movistar. Yoigo falls a little behind, but still achieves a fulfillment rate of 80 percent. Overall, the success rates show that most call attempts can be established. And high MultiRAB values mean that data connectivity is also still available when talking on the phone.

CITIES DRIVETEST

ORANGE



ORANGE AND VODAFONE ON A PAR LEADING IN VOICE IN BIG CITIES WALKTESTS, MOVISTAR FOLLOWS AT CLOSE DISTANCE

In the walktests, conducted in Barcelona, Madrid, Málaga, Palma de Mallorca, Sevilla, Valencia and Zaragoza, Orange and Vodafone are on a par with excellent results. Movistar follows at close distance, and also Yoigo performs well. Except Yoigo, all operators use to a high extent the potential of the voice technologies VoLTE (Voice over LTE) and the EVS codec (Enhanced Voice Services). Yoigo is using VoLTE, however not EVS yet.

CITIES WALKTEST

ORANGE & VODAFONE



VODAFONE LEADS IN SMALLER TOWN VOICE DRIVETESTS, MOVISTAR AND ORANGE RANK SECOND ON A PAR

In the voice tests conducted by umlaut's test cars while visiting 23 smaller towns in Spain (see route map on page 1), Vodafone takes the lead. Movistar and Orange rank second, scoring on a par in this discipline. Yoigo follows at some distance. The generally high level of success rates and MultiRAB connectivity however shows, that voice services are mostly working well also in the more rural areas of Spain.

TOWNS DRIVETEST

VODAFONE

Operator	Movistar	Orange	Vodafone	Yoigo
Cities (Drivetest)				
Success Ratio (%)	98.7	99.5	98.8	98.0
Call Setup Time P90 (s)	2.5	1.5	1.9	2.6
Speech Quality P10 (MOS-LQO)	3.9	4.1	4.2	3.2
MultiRAB Connectivity (%)	99.9	100.0	99.7	99.8
Towns (Drivetest)				
Success Ratio (%)	99.2	98.7	99.7	97.1
Call Setup Time P90 (s)	2.6	1.7	2.3	2.9
Speech Quality P10 (MOS-LQO)	3.9	4.1	4.1	3.2
MultiRAB Connectivity (%)	99.8	99.8	100.0	99.7
Roads (Drivetest)				
Success Ratio (%)	94.7	97.1	97.3	96.1
Call Setup Time P90 (s)	2.7	1.9	2.4	2.9
Speech Quality P10 (MOS-LQO)	3.7	3.8	4.0	3.1
MultiRAB Connectivity (%)	99.9	99.5	99.8	99.4
Cities (Walktest)				
Success Ratio (%)	99.8	99.9	100.0	98.8
Call Setup Time P90 (s)	2.4	1.5	1.8	2.4
Speech Quality P10 (MOS-LQO)	4.0	4.4	4.5	3.6
MultiRAB Connectivity (%)	100.0	99.8	99.9	99.6

VODAFONE SCORES BEST IN VOICE TESTS ON ROADS, ORANGE FOLLOWS AT VERY CLOSE DISTANCE

The Drivetests performed on Spanish roads are an important indication for drivers who want to conduct phone calls while driving in Spain. Here, Vodafone also takes the lead, with Orange following at a very close distance of just one percentage point. Movistar ranks third with a little more pronounced gap, and Yoigo manages to come quite close to the third-ranking Movistar. Generally, in this area there is some room for improvement with call failure rates of up to 5 percent.

ROADS DRIVETEST

VODAFONE

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Data

ORANGE AHEAD IN BIG CITIES DATA DRIVETESTS, MOVISTAR, VODAFONE AND YOIGO EQUALLY STRONG
In the data drivetests conducted in big Spanish cities, Orange takes a narrow lead. The three other candidates are following at close distance and together on the second rank – Movistar, Vodafone and Yoigo show the same degree of fulfillment in this discipline. Orange owes its leading position primarily to its high data rates in the download tests.



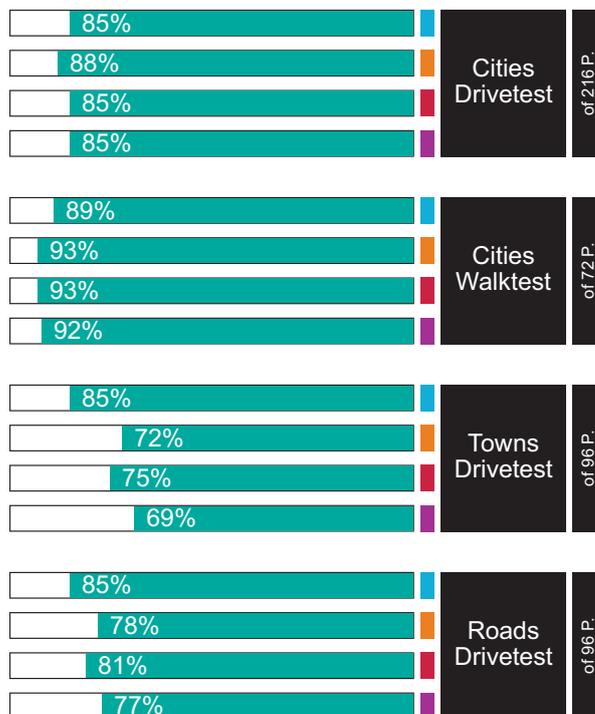
ORANGE AND VODAFONE TOGETHER ON FIRST PLACE IN BIG CITIES DATA WALKTESTS, YOIGO FOLLOWS CLOSELY
In the data walktests conducted in Spain's bigger cities, Orange and Vodafone are on a par on the first rank. Yoigo follows on second place, at a distance of only one percentage point. One of the reasons for this good position is Yoigo showing the best YouTube performance in this scenario. Also, its infrastructure sharing with Orange seems to pay out. Movistar comes in last, but still with a very good result.



Data

480 of 1000 Points

- Movistar
- Orange
- Vodafone
- Yoigo



Data Cities (Drivetest)	Movistar	Orange	Vodafone	Yoigo
Web-Page Download				
Success Ratio/Avg. Session Time (%/s)	99.1/1.5	99.2/1.4	98.9/1.3	99.3/1.5
File Download (10 MB)				
Success Ratio/Avg. Session Time (%/s)	99.6/3.0	99.0/2.8	99.4/2.9	99.6/4.4
90%/10% faster than (Mbps)	13.7/225.4	14.7/269.4	13.9/244.3	6.8/232.6
File Upload (5 MB)				
Success Ratio/Avg. Session Time (%/s)	99.2/3.0	99.6/2.9	99.4/2.6	99.6/3.3
90%/10% faster than (Mbps)	7.7/56.3	7.8/64.1	8.7/60.5	7.1/59.8
File Download (7 Seconds)				
Success Ratio (%)	98.6	99.4	98.3	99.8
10% faster than (Mbps)	519.3	656.9	585.0	582.2
Speed > 20Mbps / 100Mbps (%)	87.0/41.4	90.6/71.4	87.7/59.7	87.8/58.9
File Upload (7 Seconds)				
Success Ratio (%)	98.4	99.1	99.0	99.2
10% faster than (Mbps)	84.5	103.3	94.8	101.3
Speed > 2Mbps / 5Mbps (%)	97.9/94.4	98.0/94.6	98.3/95.4	98.1/93.2
Youtube				
Success Ratio/Start Time (%/s)	97.8/2.1	98.4/2.0	96.9/2.0	97.7/2.1
Time to Full Resolution (s)	9.7	9.5	9.3	9.5
Youtube live				
Success Ratio/Start Time (%/s)	96.4/3.2	96.7/3.2	93.6/3.1	97.5/3.3
Time to Full Resolution (s)	8.3	8.2	8.3	8.3
Youtube 4K Smartphone				
Success Ratio/Start Time (%/s)	95.1/2.2	95.7/2.2	94.5/2.2	89.0/2.3
Time to Full Resolution (s)	9.7	9.0	9.2	9.3
Conversational-App				
Success Ratio (%)	100.0	99.8	100.0	99.6
Speech Quality P10 (MOS-LQO)	3.4	2.8	3.3	2.8
Interactivity e-Gaming				
Interactivity e-Gaming (%)	63.5	58.4	65.0	51.9

Data Cities (Walktest)	Movistar	Orange	Vodafone	Yoigo
Web-Page Download				
Success Ratio/Avg. Session Time (%/s)	99.5/1.4	99.8/1.2	99.5/1.3	99.8/1.4
File Download (10 MB)				
Success Ratio/Avg. Session Time (%/s)	99.8/3.1	98.3/2.0	99.8/1.8	99.8/3.3
90%/10% faster than (Mbps)	12.0/237.4	39.5/286.7	28.8/296.5	8.9/248.4
File Upload (5 MB)				
Success Ratio/Avg. Session Time (%/s)	100.0/2.5	100.0/2.2	99.8/2.0	99.8/3.0
90%/10% faster than (Mbps)	11.3/58.8	12.3/67.7	11.2/68.8	8.1/64.9
File Download (7 Seconds)				
Success Ratio (%)	99.8	99.8	99.8	99.8
10% faster than (Mbps)	476.2	774.6	849.5	575.6
Speed > 20Mbps / 100Mbps (%)	87.1/39.2	95.7/80.7	91.9/76.2	91.3/72.1
File Upload (7 Seconds)				
Success Ratio (%)	99.8	100.0	99.4	100.0
10% faster than (Mbps)	88.6	113.6	118.4	112.2
Speed > 2Mbps / 5Mbps (%)	97.5/95.0	99.6/95.8	99.2/96.3	98.2/93.7
Youtube				
Success Ratio/Start Time (%/s)	98.1/2.0	98.8/2.0	98.5/2.0	100.0/2.0
Time to Full Resolution (s)	9.7	9.0	8.9	9.0
Youtube live				
Success Ratio/Start Time (%/s)	95.3/3.1	97.3/3.1	99.1/3.2	99.5/3.1
Time to Full Resolution (s)	8.2	8.3	8.1	8.1
Youtube 4K Smartphone				
Success Ratio/Start Time (%/s)	94.9/2.4	98.4/2.3	96.9/2.4	96.8/2.3
Time to Full Resolution (s)	9.3	8.5	8.3	9.0
Conversational-App				
Success Ratio (%)	99.9	99.8	99.8	100.0
Speech Quality P10 (MOS-LQO)	3.9	3.0	3.5	3.1
Interactivity e-Gaming				
Interactivity e-Gaming (%)	70.5	65.7	67.0	60.5

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Data

MOVISTAR LEADS IN DATA DRIVETESTS IN TOWNS, VODAFONE COMES IN SECOND AND ORANGE THIRD

In the data drivetests performed in the visited smaller towns, Movistar is ahead. The rest of the field follows at some distance, with Vodafone ranking second and Orange third. Yoigo comes in fourth, but at a comparably narrow gap. Movistar's lead in this category is manifested by the highest data rates and success ratios in most of the test disciplines.

TOWNS DRIVETEST

MOVISTAR

MOVISTAR ALSO AHEAD IN DATA DRIVETESTS ON SPANISH ROADS

In the data tests performed by our test cars on Spanish roads, Movistar also leads. Here, Vodafone follows at a narrow distance, with Orange and Yoigo ranking close together. As already observed in the voice drivetests, there is generally also some room for improvement regarding the Spanish operator's data performance on the roads.

ROADS DRIVETEST

MOVISTAR



Photo: Jorge Fernandez, Unsplash

Data Towns (Drivetest)	Movistar	Orange	Vodafone	Yoigo
Web-Page Download				
Success Ratio/Avg. Session Time (%/s)	99.4/1.6	98.9/1.8	98.7/1.5	98.3/1.9
File Download (10 MB)				
Success Ratio/Avg. Session Time (%/s)	99.6/3.4	98.7/7.3	99.2/4.5	98.9/8.5
90%/10% faster than (Mbps)	11.4/197.5	3.9/93.0	8.7/103.4	3.8/97.0
File Upload (5 MB)				
Success Ratio/Avg. Session Time (%/s)	99.6/3.8	98.9/3.9	99.7/3.5	99.4/5.1
90%/10% faster than (Mbps)	5.7/51.5	5.4/46.9	6.5/50.6	4.5/43.0
File Download (7 Seconds)				
Success Ratio (%)	99.3	99.3	99.0	99.0
10% faster than (Mbps)	436.8	112.7	131.9	138.8
Speed > 20Mbps / 100Mbps (%)	85.5/37.6	71.8/13.5	74.9/16.6	66.0/14.3
File Upload (7 Seconds)				
Success Ratio (%)	98.6	97.8	98.9	97.3
10% faster than (Mbps)	74.0	64.3	70.2	60.5
Speed > 2Mbps / 5Mbps (%)	98.0/91.8	97.2/91.4	98.5/93.5	96.3/89.2
Youtube				
Success Ratio/Start Time (%/s)	99.2/2.2	94.6/2.2	89.8/2.1	94.6/2.4
Time to Full Resolution (s)	9.5	10.0	9.5	9.8
Youtube live				
Success Ratio/Start Time (%/s)	96.1/3.3	88.4/3.5	81.6/3.3	91.6/3.5
Time to Full Resolution (s)	8.2	8.2	8.5	8.2
Youtube 4K Smartphone				
Success Ratio/Start Time (%/s)	96.2/2.3	89.2/2.3	86.0/2.2	84.2/2.4
Time to Full Resolution (s)	10.1	10.4	10.3	10.2
Conversational-App				
Success Ratio (%)	100.0	99.7	100.0	99.6
Speech Quality P10 (MOS-LQO)	3.3	2.8	3.5	2.7
Interactivity e-Gaming				
Interactivity e-Gaming (%)	58.2	49.8	59.1	41.3

Data Roads (Drivetest)	Movistar	Orange	Vodafone	Yoigo
Web-Page Download				
Success Ratio/Avg. Session Time (%/s)	98.8/1.7	97.5/1.8	98.7/1.5	98.1/1.9
File Download (10 MB)				
Success Ratio/Avg. Session Time (%/s)	99.6/3.9	98.8/6.3	99.1/4.3	98.9/6.9
90%/10% faster than (Mbps)	10.1/117.1	5.6/101.3	8.8/101.9	4.9/96.2
File Upload (5 MB)				
Success Ratio/Avg. Session Time (%/s)	99.8/5.6	98.5/6.0	99.1/4.9	99.4/6.6
90%/10% faster than (Mbps)	3.4/43.0	3.1/40.4	4.0/43.2	2.6/36.1
File Download (7 Seconds)				
Success Ratio (%)	99.2	98.7	99.1	98.4
10% faster than (Mbps)	171.8	132.3	127.6	125.3
Speed > 20Mbps / 100Mbps (%)	78.6/27.9	71.2/17.1	73.0/15.8	71.6/14.6
File Upload (7 Seconds)				
Success Ratio (%)	96.3	96.6	98.2	96.9
10% faster than (Mbps)	63.5	54.0	54.0	46.8
Speed > 2Mbps / 5Mbps (%)	95.2/84.6	95.6/86.7	96.0/86.7	94.0/83.0
Youtube				
Success Ratio/Start Time (%/s)	95.2/2.2	90.2/2.2	90.5/2.1	92.7/2.4
Time to Full Resolution (s)	9.8	9.9	9.8	9.8
Youtube live				
Success Ratio/Start Time (%/s)	94.1/3.4	88.2/3.4	81.7/3.3	89.4/3.4
Time to Full Resolution (s)	8.3	8.5	8.2	8.6
Youtube 4K Smartphone				
Success Ratio/Start Time (%/s)	91.1/2.3	84.2/2.3	86.7/2.2	83.2/2.4
Time to Full Resolution (s)	10.3	10.2	10.2	10.4
Conversational-App				
Success Ratio (%)	99.7	99.8	99.9	99.5
Speech Quality P10 (MOS-LQO)	3.2	2.7	3.2	2.7
Interactivity e-Gaming				
Interactivity e-Gaming (%)	55.1	50.2	54.8	41.6

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Data

ORANGE SHOWS HIGHEST SHARE OF SAMPLES WITH 5G IN CITIES AND TOWNS, MOVISTAR ON THE ROADS. OVERALL HIGH DATA RATES, PARTICULARLY WHEN NOT USING DSS.

5G is assumed to be the standard in our measurements. But to shed light on the progress of the 5G rollout, we look at the results of the KPI “Data rates of the 7 second Download tests”. This gives a good indication of the data rates which are supported thanks to the 5G technology. But as this assessment does not limit the overall results to the 5G-related aspects or factors such as 5G coverage or the measured latencies of 5G-only connections, we do not identify a separate 5G category winner.

That said, in our exemplary assessment, we see Orange showing the highest share of samples with 5G (5G-only as well as 5G and 5G-DSS combined) in the cities and towns, while Movistar is ahead on the roads. The observed data rates have risen considerably compared to the previous year, with Orange showing the highest average values in the cities, Movistar in smaller towns and Vodafone on the roads (but the latter with a relatively small share of samples showing a 5G connection). Yoigo manages to hold up well, particularly with the data rates obtained via non-DSS.



5G



Photo: Quique Olivar. Unsplash

Data rates 7s Download	Movistar			Orange			Vodafone			Yoigo		
	Share	Average (Mbps)	10% faster than (Mbps)	Share	Average (Mbps)	10% faster than (Mbps)	Share	Average (Mbps)	10% faster than (Mbps)	Share	Average (Mbps)	10% faster than (Mbps)
Samples with 5G												
Cities – Drivetest	33,4%	362,0	761,4	77,6%	395,0	696,2	64,4%	358,0	671,8	73,2%	316,8	618,2
Cities – Walktest	28,8%	392,4	732,1	86,5%	479,0	797,7	81,2%	469,5	888,7	77,7%	364,5	615,9
Towns – Drivetest	39,6%	279,4	608,7	12,5%	151,8	413,3	8,0%	270,3	482,9	19,5%	156,8	447,7
Roads – Drivetest	23,1%	143,1	332,9	3,6%	167,4	489,9	3,5%	313,9	536,4	3,9%	130,4	399,4
Samples with 5G-DSS												
Cities – Drivetest	30,2%	85,3	174,8	14,2%	50,5	100,8	–	–	–	11,1%	47,6	106,4
Cities – Walktest	22,1%	83,4	180,9	7,0%	49,5	112,4	–	–	–	6,5%	45,7	108,2
Towns – Drivetest	25,7%	71,7	142,8	57,4%	45,6	95,0	–	–	–	44,8%	42,9	93,1
Roads – Drivetest	20,5%	74,6	149,3	34,6%	61,4	144,3	–	–	–	33,9%	55,6	120,7

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Crowd

ORANGE LEADS IN OVERALL BROADBAND COVERAGE, CLOSELY FOLLOWED BY MOVISTAR

In terms of Coverage Quality (see definitions on p. 11), Orange is slightly ahead of Vodafone. In Coverage Reach and Time on Broadband, Movistar takes the lead, ahead of Orange and then Vodafone. Yoigo's customer experience in terms of coverage is similar to its competitors, as customers can benefit from the expansion of network coverage achieved by roaming mainly with Orange and Telefonica. The stated Coverage Reach, however, reflects the actual level of this operator's own network deployment and does not take into account the coverage expansion achieved by roaming. In contrast, Coverage Quality and Time on Broadcast reflect the combined coverages based on roaming.

BROADBAND COVERAGE

ORANGE

MOVISTAR AHEAD IN PASSIVE DOWNLOAD ANALYSIS

In the passively observed download data rates, Movistar ranks first in all observed speed classes. In the Basic Internet class (minimum of 2 Mbps), the other three operators perform closely together. In the HD Video class (at least 5 Mbps), the distances become a little more pronounced with Orange scoring ahead of Vodafone and then Yoigo. In the demanding UHD Video class (min. 20 Mbps), Vodafone performs ahead of Orange and Yoigo, which are scoring close together.

DOWNLOADS PASSIVE

MOVISTAR

MOVISTAR ALSO AHEAD IN ACTIVE DOWNLOAD ANALYSIS

The actively performed download tests are conducted to better approximate the maximum performance of a mobile internet connection. In this metric, Movistar also takes the lead, with Orange ranking second in all considerations. In the average and P10 (90 percent faster than) results, Yoigo scores higher than Vodafone, in the P90 (10 percent faster) aggregation, Vodafone is in turn ahead of Yoigo.

DOWNLOADS ACTIVE

MOVISTAR

MOVISTAR ALSO AHEAD IN ACTIVE UPLOAD TESTS

A similar result as in the active Download category can also be seen in the accompanying upload tests. Movistar again delivers the highest results in all considered KPIs. In the average and P90 throughputs, Orange ranks second, ahead of Vodafone and Yoigo. In the P10 values, Vodafone scores higher than Orange and then Yoigo.

UPLOADS ACTIVE

MOVISTAR

MOVISTAR PROVIDES THE SHORTEST LATENCIES, VODAFONE RANKS SECOND IN LATENCY ASSESSMENT

Movistar is well ahead in the latency category, both for the more relaxed OTT Voice class (roundtrip times up to 100 milliseconds) as well as in the more demanding Gaming class (up to 50 ms). Vodafone comes in second here, ahead of Orange. In the Gaming Class results, Vodafone and Yoigo are on a par.

LATENCY

MOVISTAR

Operators	Movistar	Orange	Vodafone	Yoigo
Broadband Coverage				
Coverage Quality (%)	93.6	94.6	94.4	92.8
Coverage Reach (%)	93.5	91.3	88.2	77.1
Time on Broadband (%)	96.8	96.6	96.4	95.9
Download Speed				
Basic Internet Class(%)	96.0	95.7	95.6	95.3
HD Video Class / UHD Video Class (%)	85.2/30.9	84.5/28.1	83.8/29.1	82.8/25.5
Latency				
Gaming Class / OTT Voice Class (%)	79.8/97.3	66.7/95.7	67.2/96.6	67.2/95.6
Voice				
HD Voice (%)	94.5	93.1	94.6	82.1
Download Speed (Active)				
Avg. Throughput (Mbit/s)	51.2	41.6	31.4	33.6
90% / 10% faster than (Mbit/s)	4.7/109.9	3.6/90.8	2.6/73.2	3.8/71.4
Upload Speed (Active)				
Avg. Throughput (Mbit/s)	19.2	16.1	15.6	13.2
90% / 10% faster than (Mbit/s)	2.4/42.6	1.8/37.2	2.3/35.6	1.6/29.1
Stability				
Transaction Success (%)	91.8	92.1	91.9	90.9

VODAFONE LEADS IN HD VOICE AVAILABILITY, SLIGHTLY AHEAD OF MOVISTAR

In the analysis of the availability of HD voice connections (i.e Voice over LTE with the current state of mobile network implementations in Spain), Vodafone takes the first place. In this assessment, Movistar follows at a close distance, and Orange at a little more pronounced gap. Here, Yoigo is trailing behind.

VOICE

VODAFONE

ORANGE CLOSELY AHEAD IN TRANSACTION STABILITY, ALL SPANISH OPERATORS STRONG IN THIS ASSESSMENT

In the Stability category, which looks at the success rates of regular transaction tests, Orange takes a narrow lead ahead of Vodafone and Movistar. Overall, all Spanish operators show strong results in this metric – proving that the Spanish networks are generally quite reliable.

STABILITY

ORANGE

The 2023 Mobile Network Test in Spain

Reliability

Reliability is not an additional category of our tests, but rather a different angle of looking at the results: For each KPI, our scoring distinguishes between “Qualifiers” (the expected basic performance) and “Differentiators” (the additional performance that exceeds the expected basics). The view at Reliability limits itself to most of the Qualifiers and the basic KPIs of the crowdsourcing – thus conveying an impression of the standards, a user can reasonably expect from a mobile network. The reference values in this representation are therefore only the subset of score points which we assigned to the Qualifiers. The resulting scores state the reliability with which an operator offers its network services. This approach concentrates on the compulsory basics instead of the highest peaks of a network’s performance.

ORANGE AHEAD IN RELIABILITY OVERALL, MOVISTAR FOLLOWING AT CLOSE DISTANCE

In the overall Reliability assessment in Spain, Orange takes a narrow lead ahead of Movistar, with Vodafone and Yoigo also showing a very good result in this discipline.

RELIABILITY OVERALL

ORANGE

ORANGE AHEAD IN VOICE RELIABILITY, VODAFONE FOLLOWING AT CLOSE DISTANCE

In the assessment of the Reliability of voice connections, Orange achieves the highest score. But Vodafone follows at a close distance of just one score point, particularly by achieving the full amount of possible points in the walktests. Movistar comes in third, also showing a high degree of voice reliability. Fourth-ranking Yoigo achieves a good result.

VOICE

ORANGE

MOVISTAR LEADS IN DATA RELIABILITY, YOIGO ON SECOND RANK IN THIS ASSESSMENT

In the Reliability assessment in the Data tests, Movistar takes the lead. But Yoigo follows on second rank at a distance of only two score points. In this aggregation, Orange ranks third ahead of Vodafone. As already seen in the Voice Reliability discipline, all candidates score stronger in the walktests than in the drivetests.

DATA

MOVISTAR

MOVISTAR AHEAD IN CROWDSOURCING, WITH ALL SPANISH OPERATORS RANKING CLOSELY TOGETHER

Movistar also takes a narrow lead in the crowdsourced KPIs. But the rest of the field follows at very close distance: Orange and Vodafone score on a par, only one score point behind Movistar. And Yoigo on the fourth place scores only one point behind the second-placed contenders.

CROWD

MOVISTAR

Operator		Movistar	Orange	Vodafone	Yoigo	
Voice	max. 149 points	128	136	135	118	
Drivetest		126	84%	91%	90%	78%
Walktest		22	98%	99%	100%	88%
Data	max. 222 points	196	190	184	194	
Drivetest		188	88%	84%	80%	85%
Walktest		33	92%	93%	95%	98%
Crowd	max. 123 points	114	113	113	112	
Crowd		123	93%	92%	93%	91%
Total	max. 493 points	438	439	432	424	



The 2023 Mobile Network Test in Spain

Methodology

The umlaut connect Mobile Network Test is the result of extensive drivetests and walktests, combined with a sophisticated crowdsourcing analysis.

Logistics

connect's network test partner umlaut, Part of Accenture, sent four measurement vehicles through the country, each equipped with twelve smartphones. For each network operator, a Samsung Galaxy S21+ took the voice measurements, and another S21+ established the connections for the new test case "conversational app" (see section "Data connections" below). In the actual data test, we used a Samsung Galaxy S22+. For all measurements, the smartphones were set to "5G preferred" – so wherever supported by the network, the data tests took place via 5G.

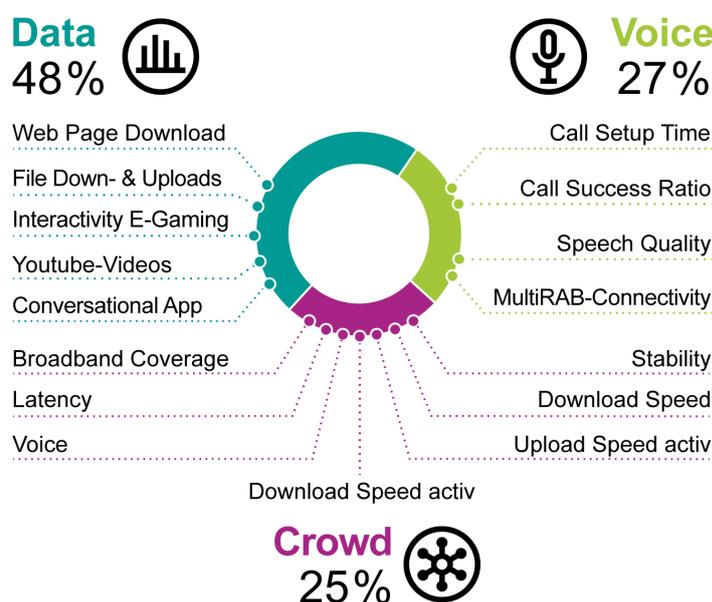
In addition to the drive tests, one walk test team carried out measurements on foot in each country, in zones with heavy public traffic such as railway station concourses, airport terminals, cafés, public transport and museums. The walk test programme also included journeys on long-distance railway lines. For the walk tests, the same three smartphone types were used per network operator for the same measurements as in the drive tests. The walk test team transported the smartphones in backpacks or trolleys equipped with powerful batteries. The firmware of the test smartphones corresponded to the original network operator version in each case.

The drive and walk tests took place between 8 am and 10 pm. For the drive tests, two vehicles were in the same city, but not in the same place, so that one car would not falsify the measurements of the other. On the connecting roads, two vehicles each drove the same routes, but one after the other with some time and distance between them. For the selection of the test routes, umlaut created four different suggestions for each country, from which connect blindly selected a route.

Voice connections

Voice connections account for 27 percent of the overall result. For this purpose, mobile telephone calls were established from vehicle to vehicle („mobile-to-mobile“) and their success rates, call set-up time and voice quality were measured. The smartphones of the walk test team made calls to a stationary (smartphone) remote station for the voice tests.

To ensure realistic conditions, data traffic was handled simultaneously in the background. We also recorded MultiRAB connectivity: the use of several "radio access bearers" provides data connections in the background of the voice calls. The transmission quality was evaluated with the POLQA wideband method suitable for HD voice. "VoLTE preferred" was configured on all phones – from 5G, the phones thus fall back to telephony via LTE.



Data connections

The data measurements account for 48 percent of the total result. Several popular live pages (dynamic) and the ETSI reference page known as the Kepler page (static) were retrieved to assess internet page calls. In addition, 10 MB and 5 MB files were downloaded and uploaded, respectively, in order to determine the performance for smaller data transfers. We also determined the data rate within a 7-second period when uploading and downloading large files. Since Youtube dynamically adjusts the played-out resolution to the available bandwidth, the rating takes into account the average image resolution or line count of the videos, the time to reach full resolution as well as the success rate and time to playback start.

To challenge network performance, the smartphones additionally retrieved videos in 4K (2160p). A typical over-the-top voice connection (OTT) is represented by the test case "conversational app". For this, we set up a voice channel via the SIP and STUN protocols using the OPUS codec and determined the success rate and voice quality. In addition, our measurements simulated a highly interactive UDP multiplayer session to determine the latency times of the connection and any possible packet losses. This was done in our newly added test point "Interactivity of eGaming". >>

The 2023 Mobile Network Test in Spain

Methodology

Crowdsourcing

Crowdsourcing results accounted for 25 percent of the overall rating. They show which network performance actually arrives at the user – however, the end devices and tariffs used also have an effect in this.

To obtain the data basis for these analyses, thousands of popular apps recorded the parameters described below in the background – provided the user agreed to the completely anonymous data collection. The measured values were recorded in 15-minute intervals and transmitted to the umlaut servers once a day. The reports contain only a few bytes, so they hardly burden the user's data volume.

Broadband Coverage

In order to determine the broadband *coverage reach*, umlaut laid a grid of 2 x 2 km tiles ("Evaluation Areas", in short EAs) over the test area. A minimum number of users and measured values had to be available for each EA. For the evaluation, umlaut awarded one point per EA if the network under consideration offered 3G coverage. Three points were awarded if 4G or 5G was available in the EA. The score achieved in this way was divided by the achievable number of points (three points per EA in the "common footprint" – the area of the respective country covered by all tested providers).

We also looked at the *coverage quality*. This KPI relates the number of EAs where a user had 4G or 5G reception to the total number of EAs in the common footprint.

The *time on broadband* in turn tells us how often a user had 4G or 5G reception in the period under consideration – regardless of the EAs in which the samples were recorded. For this purpose, umlaut sets the samples that show 4G/5G coverage in relation to the total number of all samples. Important: The percentage values determined for all three parameters reflect the respective degree of fulfilment – and not a percentage of 4G/5G mobile coverage in relation to area or population.

Data rates and Latencies

The *passive* determination of *download data rates* and *latencies* was carried out independently of the EAs and focused on the experience of each user. Samples that were captured via Wi-fi or when flight mode was activated, for example, were filtered out by umlaut before the analysis.

To take into account that many mobile phone tariffs throttle the data rate, umlaut defined three application-related speed classes: *Basic internet* requires a minimum of 2 Mbit/s, *HD video* requires 5 Mbit/s and *UHD video* requires 20 Mbit/s. For a sample to be valid, a minimum amount of data must have flowed in a 15-minute period.

Similarly, the latency of the data packets is assigned to an application-related class: Roundtrip times up to 100 ms are sufficient for *OTT voice services*, less than 50 ms qualify a sample for *gaming*.

In this way, the evaluation also does justice to the fact that the passively observed data rates depend on the applications used in each case. In order to better assess the maximum possible throughput, in addition to the passive observations, umlaut also conducted *active* measurements of *upload* and *download* data rates once a month. They determine the amount of data that could be transferred in 3.5 seconds.

For the determined values, we consider the average data rate, the P10 value (90% of the values higher than the specified threshold, a good approximation of the typical minimum speed) and the P90 (10% above this threshold), a view at the peak values.

Stability

Based on the determined data rates and additional browsing and connection tests, umlaut also examined when a broadband connection could be used at all. The averaged and weighted results define the percentage of *transaction success*.

HD Voice

The parameter *HD voice* shows the proportion of the user's voice connections that were established in HD quality – and thus via VoLTE (Voice over LTE). A prerequisite was that the smartphone supports this standard.

Reliability

umlaut divided all measured values into basic requirements ("Qualifier KPIs") and values related to peak performance ("Differentiator KPIs"). The presentation of *reliability* takes into account only the "Qualifier KPIs" from the voice and data category and the basic KPIs from crowdsourcing.

