

best in test

For adding something on top in Sweden and reaching an overall score of 968 dots in mobile network benchmarking survey we proudly award this certificate to

Telia Sweden

Score 968 out of 1000 in Total
Score 263 out of 270 in Voice Services
Score 468 out of 480 in Data Services
Score 237 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 Sweden.

The audit was done as a performance benchmark performed by umlaut between 08.11 and 06.12 2023 in cities and towns as well as on connection roads.

Dedicated measurements have been executed as drive tests outdoors 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 CW25 2023 and CW48 2023.

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 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
Mobility and Route Types	Drive test 100% ~ 51% in Cities, ~ 25% in Towns and ~ 24% on Roads	
Samples	~ 21,277 per Operator	~ 162,489 per Operator
Dates	23 measurement days 08.11.2023 – 06.12.2023	
Crowd Data Assessment	24 weeks CW25 2023 – CW48 2023	



Testing areas

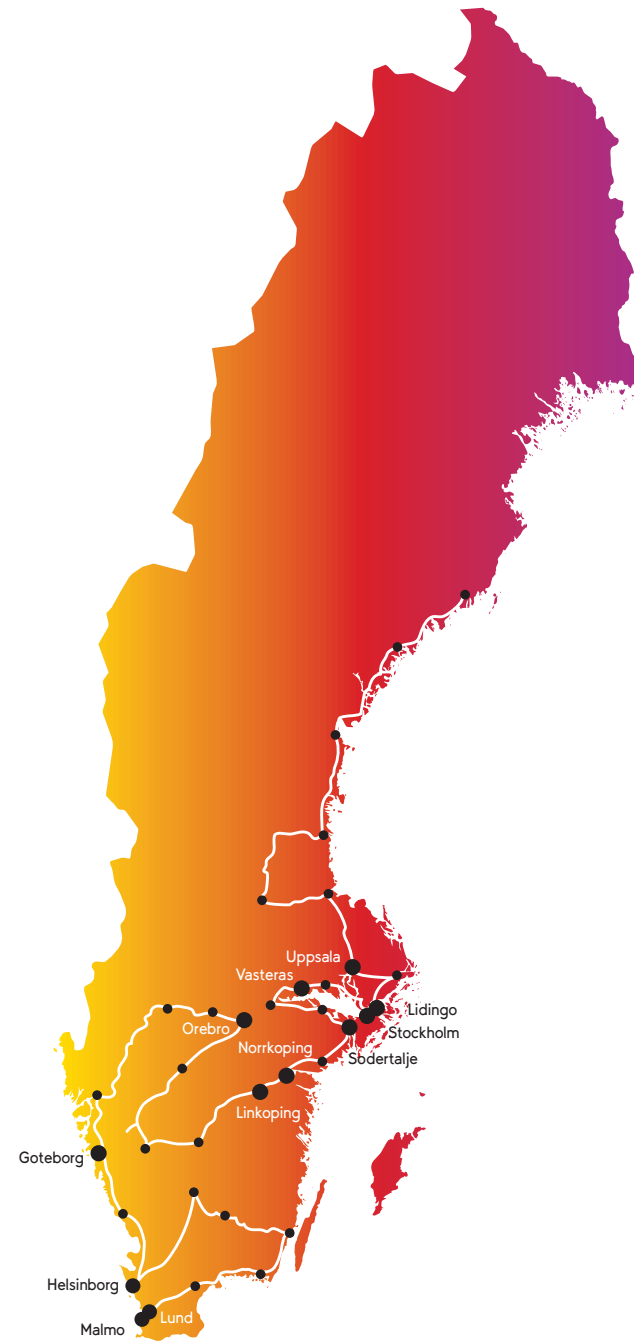
Drive route



~ 45 %
of population measured



10,270 km
measuring distance



Crowdsourcing based test area



98.6 %
of the 'built-up area' covered



97.5 %
of the 'Population area' covered




150,559 km²
size of tested area







Claims

Best in test
Telia Sweden



Best in data
Telia Sweden



Best in voice
Telia Sweden



Best in Reliability
Telia Sweden



Best in crowd-sourced quality
Telia Sweden



Methodology

The leader in mobile benchmarking, umlaut, has analyzed the mobile networks of Sweden 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-perceived 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

Telia achieved the highest overall score among competitors with 968 dots out of 1000.



Overall score considering Voice, Data and Crowdsourcing.

Total score

		Telia	Tele2	Tre	Telenor
Voice	max. 270	263	245	240	220
Cities Drivetest	162	98%	91%	89%	81%
Towns Drivetest	54	96%	94%	87%	86%
Roads Drivetest	54	98%	88%	90%	77%
Data	max. 480	468	443	446	429
Cities Drivetest	288	99%	95%	95%	96%
Towns Drivetest	96	98%	92%	90%	86%
Roads Drivetest	96	92%	83%	88%	72%
Crowdsourced Quality	max. 250	237	226	224	228
Broadband Coverage	112	94%	89%	85%	88%
Download Speed	75	95%	93%	94%	93%
Latency	50	95%	92%	94%	94%
Voice	13	97%	89%	95%	93%
Total	1000	968	914	910	877

Shown scores are rounded.



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

Data	Service Group	max	Telia	Tele2	Tre	Telenor
Cities	Web Browsing	64,8	100%	99%	97%	99%
	File Download	64,8	99%	93%	96%	96%
	File Upload	64,8	99%	94%	95%	95%
	YouTube	64,8	98%	96%	92%	96%
	OTT	28,8	97%	96%	95%	94%
Towns	Web Browsing	21,6	100%	96%	93%	91%
	File Download	21,6	98%	89%	86%	76%
	File Upload	21,6	98%	92%	91%	86%
	YouTube	21,6	97%	90%	88%	86%
	OTT	9,6	96%	94%	96%	94%
Roads	Web Browsing	21,6	97%	92%	96%	84%
	File Download	21,6	88%	76%	82%	65%
	File Upload	21,6	92%	83%	83%	69%
	YouTube	21,6	92%	81%	90%	68%
	OTT	9,6	94%	85%	93%	82%

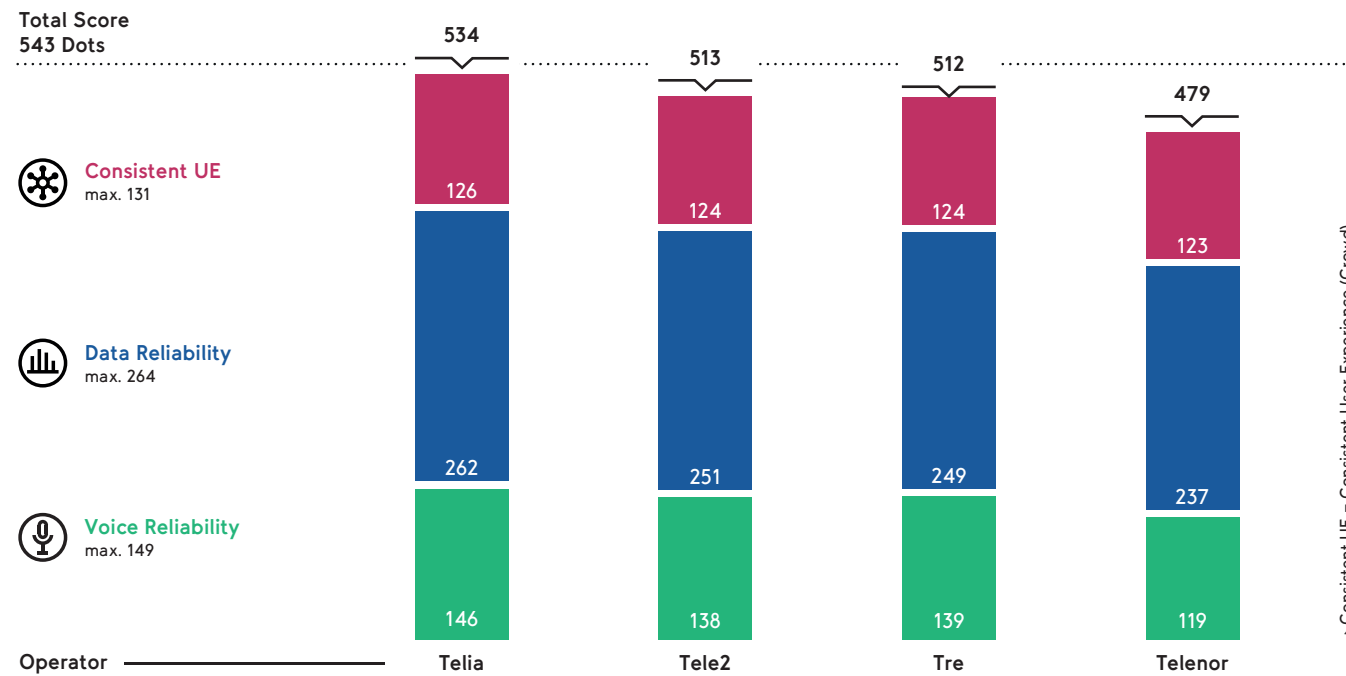


Achieved percentage of the maximum score in each of the different crowdsourcing services.

Crowd	Service Group	max	Telia	Tele2	Tre	Telenor
Crowdsourced Quality	Broadband Coverage	112	94%	89%	85%	88%
	DL Speed	75	95%	93%	94%	93%
	Latency	50	95%	92%	94%	94%
	Voice	13	97%	89%	95%	93%



Reliability



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

Total score

	Service Group	max	Telia	Tele2	Tre	Telenor
Reliability	Voice Reliability	149	98%	93%	94%	80%
	Data Reliability	264	99%	95%	94%	90%
	Consistent User Experience	131	97%	95%	95%	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	Telia	Tele2	Tre	Telenor
Cities	Qualifier	[%]	99,9	99,3	99,4	98,0
	Call Setup Time (P90)	[s]	0,9	2,7	4,0	3,7
	Speech Quality (P10)	[MOS-LQO]	4,3	4,1	4,2	4,1
	Multirab connectivity	[%]	100,0	99,3	100,0	99,9
Towns	Qualifier	[%]	99,6	99,8	99,1	98,8
	Call Setup Time (P90)	[s]	0,9	2,8	3,8	3,6
	Speech Quality (P10)	[MOS-LQO]	4,3	4,1	4,1	4,1
	Multirab connectivity	[%]	99,9	99,7	99,9	99,9
Roads	Qualifier	[%]	99,7	98,1	99,1	96,2
	Call Setup Time (P90)	[s]	1,0	3,0	3,7	4,0
	Speech Quality (P10)	[MOS-LQO]	4,2	4,0	4,2	3,8
	Multirab connectivity	[%]	99,9	99,5	100,0	99,7



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".

Data Cities	KPI Name	Unit	Telia	Tele2	Tre	Telenor
HTTP Web Page DL Smartphone	Qualifier	[%]	100,0	100,0	99,5	99,9
	Overall Session Time	[s]	0,9	1,1	1,0	1,1
HTTP 10MB DL Smartphone	Qualifier	[%]	100,0	99,8	99,9	100,0
	Overall Session Time	[s]	0,7	1,3	0,9	1,4
	90% faster than	[Mbit/s]	83,5	35,7	57,0	34,9
	10% faster than	[Mbit/s]	434,8	355,7	360,4	392,2
HTTP 5MB UL Smartphone	Qualifier	[%]	100,0	99,7	99,8	99,9
	Average Session Time	[s]	1,1	1,7	1,9	1,7
	90% faster than	[Mbit/s]	25,2	12,5	13,6	12,5
	10% faster than	[Mbit/s]	105,5	85,9	86,2	87,2
HTTP DL FDTT	Qualifier	[%]	100,0	99,1	99,6	99,7
	10% faster than	[Mbit/s]	1067,0	920,0	736,6	956,9
	faster than 20 Mbit/s	[%]	99,4	96,1	98,0	95,8
	faster than 100 Mbit/s	[%]	92,2	81,3	85,9	82,2
HTTP UL FDTT	Qualifier	[%]	100,0	99,4	99,8	99,8
	10% faster than	[Mbit/s]	159,2	120,9	115,4	123,0
	faster than 2 Mbit/s	[%]	99,9	99,8	99,7	99,7
	faster than 5 Mbit/s	[%]	99,4	98,5	98,4	97,9
YouTube	Qualifier	[%]	100,0	99,8	99,1	99,8
	Start Time	[s]	1,5	1,7	1,8	1,7
	AVG Resolution	[p]	1079,6	1078,7	1076,9	1078,7
YouTube Live Smartphone	Qualifier	[%]	99,9	99,6	99,0	99,6
	Start Time	[s]	1,9	2,1	2,1	2,1
	AVG Resolution	[p]	1078,2	1078,1	1078,7	1077,8
Interactivity	Qualifier	[%]	99,6	98,8	96,8	98,9
	Interactivity egaming	[%]	86,8	76,7	85,9	78,0
Conversational App	Qualifier	[%]	100,0	99,9	99,8	99,7
	Speech Quality (P10)	[MOS-LQO]	3,9	3,7	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 "Towns".

Data Towns	KPI Name	Unit	Telia	Tele2	Tre	Telenor
HTTP Web Page DL Smartphone	Qualifier	[%]	99,9	99,6	99,0	98,6
	Overall Session Time	[s]	1,0	1,3	1,2	1,2
HTTP 10MB DL Smartphone	Qualifier	[%]	100,0	100,0	100,0	98,5
	Overall Session Time	[s]	1,0	2,1	2,4	2,4
	90% faster than	[Mbit/s]	54,1	17,2	19,0	14,7
	10% faster than	[Mbit/s]	383,9	289,9	234,9	331,1
HTTP 5MB UL Smartphone	Qualifier	[%]	99,9	99,5	99,7	98,8
	Average Session Time	[s]	1,3	2,4	2,7	2,3
	90% faster than	[Mbit/s]	19,9	8,2	9,1	9,3
HTTP DL FDTT	Qualifier	[%]	99,9	99,6	99,7	96,6
	10% faster than	[Mbit/s]	988,0	790,4	470,4	832,6
	faster than 20 Mbit/s	[%]	97,7	87,9	91,8	89,4
HTTP UL FDTT	Qualifier	[%]	99,9	99,7	99,9	98,4
	10% faster than	[Mbit/s]	150,5	108,2	80,3	111,1
	faster than 2 Mbit/s	[%]	99,7	99,7	99,1	99,6
	faster than 5 Mbit/s	[%]	99,2	97,2	96,8	97,3
YouTube	Qualifier	[%]	99,9	98,6	98,8	98,3
	Start Time	[s]	1,6	1,9	2,0	1,8
	AVG Resolution	[p]	1079,2	1078,4	1075,5	1076,9
YouTube Live Smartphone	Qualifier	[%]	99,7	99,2	98,3	97,8
	Start Time	[s]	2,0	2,4	2,3	2,3
	AVG Resolution	[p]	1078,0	1073,7	1078,4	1077,4
Interactivity	Qualifier	[%]	98,6	98,4	98,2	97,5
	Interactivity egaming	[%]	83,0	66,5	78,6	72,5
Conversational App	Qualifier	[%]	99,8	99,9	99,8	99,8
	Speech Quality (P10)	[MOS-LQO]	3,9	3,8	3,9	3,6



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	Telia	Tele2	Tre	Telenor
HTTP Web Page DL Smartphone	Qualifier	[%]	99,7	98,8	99,4	96,6
	Overall Session Time	[s]	1,4	1,6	1,3	1,6
HTTP 10MB DL Smartphone	Qualifier	[%]	99,9	99,6	100,0	97,7
	Overall Session Time	[s]	3,2	6,5	3,6	6,0
	90% faster than	[Mbit/s]	10,5	4,8	11,8	5,2
	10% faster than	[Mbit/s]	180,2	181,9	112,4	177,2
HTTP 5MB UL Smartphone	Qualifier	[%]	99,7	99,6	98,6	96,7
	Average Session Time	[s]	3,1	5,2	3,9	5,6
	90% faster than	[Mbit/s]	6,4	3,8	4,9	3,7
HTTP DL FDTT	Qualifier	[%]	99,7	99,2	99,0	94,3
	10% faster than	[Mbit/s]	323,1	287,4	122,6	307,8
	faster than 20 Mbit/s	[%]	80,8	61,3	80,8	64,3
HTTP UL FDTT	Qualifier	[%]	99,7	99,2	99,0	94,3
	10% faster than	[Mbit/s]	323,1	287,4	122,6	307,8
	faster than 20 Mbit/s	[%]	80,8	61,3	80,8	64,3
	faster than 100 Mbit/s	[%]	45,9	30,1	19,1	31,7
YouTube	Qualifier	[%]	100,0	99,1	97,9	95,2
	10% faster than	[Mbit/s]	82,3	50,5	51,9	44,7
	faster than 2 Mbit/s	[%]	97,9	96,9	98,7	95,7
	faster than 5 Mbit/s	[%]	92,4	86,5	91,5	85,2
YouTube Live Smartphone	Qualifier	[%]	99,6	97,5	98,7	93,7
	Start Time	[s]	2,1	2,4	2,1	2,4
	AVG Resolution	[p]	1076,6	1067,6	1076,2	1068,3
Interactivity	Qualifier	[%]	98,6	96,9	98,0	93,4
	Start Time	[s]	2,6	2,9	2,5	2,9
	AVG Resolution	[p]	1070,1	1054,4	1073,5	1059,0
Conversational App	Qualifier	[%]	98,2	94,1	94,4	91,6
	Interactivity egaming	[%]	74,7	58,8	75,7	64,5
Conversational App	Qualifier	[%]	99,6	98,5	99,3	97,3
	Speech Quality (P10)	[MOS-LQO]	3,5	3,5	3,9	3,2



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	Telia	Tele2	Tre	Telenor
Broadband Coverage	Coverage Quality	[%]	98.9	98.0	98.4	98.7
	Coverage Reach	[%]	86.6	75.8	67.7	77.0
	Time on broadband	[%]	99.3	98.3	97.7	96.7
Download Speed	Basic internet class	[%]	97.8	96.5	96.9	96.8
	HD video class	[%]	91.7	87.4	89.4	88.6
	UHD video class	[%]	37.8	30.8	35.7	34.1
Latency	Gaming class	[%]	92.1	84.6	90.5	90.4
	OTT voice class	[%]	98.5	97.9	98.2	98.2
Voice	HD voice	[%]	98.0	92.5	96.2	95.0



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