

CERTIFICATE

P3 communications GmbH

Am Kraftversorgungsturm 3, D-52070 Aachen, Germany

hereby certifies that



Slovak Telekom a.s.

Bajkalská 28, 817 62 Bratislava
Slovakia

achieved „**Best in Test**“ with a

Total Score of **887 of 1000**

in the **Mobile Benchmark Slovakia 09/2017.**

(Score 343 of 400 in Telephony, Score 544 of 600 in Data Services)



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*Head of Network Testing
& Benchmarking*
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Measurement Setup

	Voice	Data
Device	Samsung Galaxy S7 cat9	Samsung Galaxy S7 cat9 Sony Xperia XZ cat9
Test Cases	Mobile-to-Mobile (M2M) Side1 (4G preferred) to Side2 (4G preferred) Side1 (VoLTE) to Side2 (VoLTE) 115 sec call window 70 sec call duration 15 sec call setup timeout Multi-RAB traffic injection on both sides	Data 4G preferred CA HTTP DL datastream 7s HTTP UL datastream 7s HTTP 3MB DL fixed file transfer HTTP 1MB UL fixed file transfer Web Browsing - Kepler ETSI Ref. Page 10 Live web pages (50% http / 50% https) 4 YouTube HD video ~ 45s
Mobility and Route Types	100% Drivetest 51% in Cities, 18% in Towns and 31% on Roads Cities, towns and roads	
Samples	~ 3800 per Operator	~ 1500 per Operator
Dates	14 measurement days 08.09.2017 – 25.09.2017	

Testing Route



Score Points and Breakdown

The following table indicates the score points achieved by the networks under test in the modules “Voice” and “Data Services” as well as the breakdown of achieved points in the geographical categories “Cities”, “Towns” and “Roads”.

Module	Infrastructure	Max.	Telekom	Operator 2	Operator 3	Operator 4
Voice	Total	400	343	317	183	42
	Cities	240	87%	82%	51%	11%
	Towns	80	86%	82%	50%	12%
	Roads	80	81%	68%	27%	8%
Data	Total	600	544	512	491	421
	Cities	360	94%	91%	85%	81%
	Towns	120	90%	83%	85%	71%
	Roads	120	83%	72%	70%	36%
TOTAL		1.000	887	829	674	463

Shown voice, data and total scores are rounded

The following table indicates the achieved percentage of the maximum score in each of the different data services.

Data	Service Group	Max.	Telekom	Operator 2	Operator 3	Operator 4
Cities	Web Browsing	108	89%	88%	87%	82%
	File Download	90	94%	88%	77%	76%
	File Upload	90	96%	91%	82%	82%
	YouTube	72	97%	97%	95%	85%
Towns	Web Browsing	36	89%	83%	87%	72%
	File Download	30	84%	77%	80%	64%
	File Upload	30	92%	81%	83%	73%
	YouTube	24	94%	91%	92%	77%
Roads	Web Browsing	36	78%	74%	69%	35%
	File Download	30	84%	75%	68%	34%
	File Upload	30	85%	69%	67%	32%
	YouTube	24	87%	71%	76%	46%

Voice KPI Overview

The following table indicates the 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 M2M	KPI Name	Unit	Telekom	Operator 2	Operator 3	Operator 4
Cities	Qualifier	[%]	99,0	98,0	96,0	70,0
	Call Setup Time	[s]	4,6	4,7	12,0	12,1
	AVG Speech Quality	[MOS-LQO]	3,5	3,4	2,5	2,7
Towns	Qualifier	[%]	99,0	99,0	96,0	79,0
	Call Setup Time	[s]	4,8	5,6	12,0	12,2
	AVG Speech Quality	[MOS-LQO]	3,6	3,2	2,5	2,7
Roads	Qualifier	[%]	97,0	95,0	88,0	71,0
	Call Setup Time	[s]	4,9	5,9	11,8	11,1
	AVG Speech Quality	[MOS-LQO]	3,5	3,1	2,4	2,5

Data KPI Overview

The following table indicates the achieved values of all networks under test in each of the relevant Data Key Performance Indicators (KPIs) for the geographical categories “Cities”, “Towns” and “Roads”.

Data Cities	KPI Name	Unit	Telekom	Operator 2	Operator 3	Operator 4
HTTP Live Page DL	Qualifier	[%]	99,4	99,4	99,4	98,0
	Time to first Byte	[ms]	523	569	549	524
	Kbytes first second	[KB]	389	360	360	368
HTTP Static Page DL	Qualifier	[%]	99,5	99,9	99,4	98,6
	Overall Session Time	[s]	1,2	1,3	1,3	1,3
HTTP file DL 3MB	Qualifier	[%]	99,9	99,4	99,5	99,0
	AVG Session Time	[s]	1,1	1,0	2,2	1,8
	90% faster than	[kbit/s]	21280	15190	5872	7441
	10% faster than	[kbit/s]	59850	60914	35661	37861
HTTP file UL 1MB	Qualifier	[%]	99,5	99,7	99,0	98,2
	AVG Session Time	[s]	0,7	0,9	1,2	1,0
	90% faster than	[kbit/s]	9663	6435	4718	6820
	10% faster than	[kbit/s]	23669	19763	14067	15564
HTTP DL FDTT 7s	Qualifier	[%]	99,1	99,2	99,0	98,5
	AVG throughput	[kbit/s]	85922	61015	22397	24460
	90% faster than	[kbit/s]	28105	21495	7164	7412
	10% faster than	[kbit/s]	158732	106116	41439	42923
HTTP UL FDTT 7s	Qualifier	[%]	99,7	99,6	99,2	97,7
	AVG throughput	[kbit/s]	32349	19927	12049	16788
	90% faster than	[kbit/s]	15202	8231	5073	8738
	10% faster than	[kbit/s]	47359	30113	18651	21101
YouTube	Qualifier	[%]	99,5	99,5	99,2	97,3
	Start Time	[s]	1,9	2,0	2,2	2,2
	Playouts w/o interruptions	[%]	99,9	100,0	100,0	99,2
	AVG Resolution	[p]	1078,4	1079,4	1075,0	1071,2

Data Towns	KPI Name	Unit	Telekom	Operator 2	Operator 3	Operator 4
HTTP Live Page DL	Qualifier	[%]	99,6	99,1	99,4	96,0
	Time to first Byte	[ms]	533	614	560	516
	Kbytes first second	[KB]	384	339	360	368
HTTP Static Page DL	Qualifier	[%]	99,7	99,2	99,5	96,0
	Overall Session Time	[s]	1,2	1,5	1,3	1,3
HTTP file DL 3MB	Qualifier	[%]	99,7	99,7	100,0	95,9
	AVG Session Time	[s]	1,5	2,4	2,0	1,9
	90% faster than	[kbit/s]	10682	5642	6745	8964
	10% faster than	[kbit/s]	42934	32009	34188	38462
HTTP file UL 1MB	Qualifier	[%]	99,4	99,4	99,4	96,5
	AVG Session Time	[s]	0,8	1,4	1,2	1,1
	90% faster than	[kbit/s]	9744	4244	4629	4650
	10% faster than	[kbit/s]	16495	12160	14164	15444
HTTP DL FDTT 7s	Qualifier	[%]	99,7	99,4	99,4	96,2
	AVG throughput	[kbit/s]	34862	21870	22406	27010
	90% faster than	[kbit/s]	12789	6239	7948	9337
	10% faster than	[kbit/s]	58225	44229	43212	46590
HTTP UL FDTT 7s	Qualifier	[%]	99,7	99,7	99,4	97,4
	AVG throughput	[kbit/s]	20647	9815	12177	15663
	90% faster than	[kbit/s]	15258	4798	5334	5890
	10% faster than	[kbit/s]	22450	14894	18429	21211
YouTube	Qualifier	[%]	98,7	98,7	98,4	96,1
	Start Time	[s]	2,0	2,4	2,1	2,1
	Playouts w/o interruptions	[%]	100,0	99,3	100,0	98,3
	AVG Resolution	[p]	1080,0	1071,4	1072,3	1073,6

Data Roads	KPI Name	Unit	Telekom	Operator 2	Operator 3	Operator 4
HTTP Live Page DL	Qualifier	[%]	95,4	95,3	93,2	63,1
	Time to first Byte	[ms]	546	671	581	531
	Kbytes first second	[KB]	378	329	348	349
HTTP Static Page DL	Qualifier	[%]	95,3	95,4	92,5	62,5
	Overall Session Time	[s]	1,3	1,6	1,4	1,5
HTTP file DL 3MB	Qualifier	[%]	95,8	96,3	93,2	62,1
	AVG Session Time	[s]	1,9	3,2	2,7	2,3
	90% faster than	[kbit/s]	9404	3924	4976	6161
	10% faster than	[kbit/s]	42553	41931	35950	39248
HTTP file UL 1MB	Qualifier	[%]	97,1	94,5	92,9	64,4
	AVG Session Time	[s]	1,1	2,1	1,8	1,8
	90% faster than	[kbit/s]	6954	1616	3761	2306
	10% faster than	[kbit/s]	16536	15391	14286	15564
HTTP DL FDTT 7s	Qualifier	[%]	97,1	95,9	94,3	61,9
	AVG throughput	[kbit/s]	36149	25177	21156	22371
	90% faster than	[kbit/s]	11349	4230	5082	6269
	10% faster than	[kbit/s]	61086	52336	43055	43776
HTTP UL FDTT 7s	Qualifier	[%]	94,6	95,2	90,8	62,6
	AVG throughput	[kbit/s]	19761	10823	12354	13443
	90% faster than	[kbit/s]	8361	1736	4288	2795
	10% faster than	[kbit/s]	22593	21504	19147	20739
YouTube	Qualifier	[%]	96,1	90,7	92,0	65,0
	Start Time	[s]	2,2	2,6	2,4	2,3
	Playouts w/o interruptions	[%]	99,3	99,2	99,4	98,5
	AVG Resolution	[p]	1066,7	1055,0	1065,3	1069,4