

CERTIFICATE

P3 communications GmbH

Am Kraftversorgungsturm 3, D-52070 Aachen, Germany

hereby certifies that



Telekom Albania

Rruga 'Gjergj Legisi ', Laprake
Tirana, Albania

achieved a

Total Score of 794 of 1000

in the Mobile Benchmark Albania 08/2017.

(Score 265 of 400 in Voice, Score 529 of 600 in Data Services)

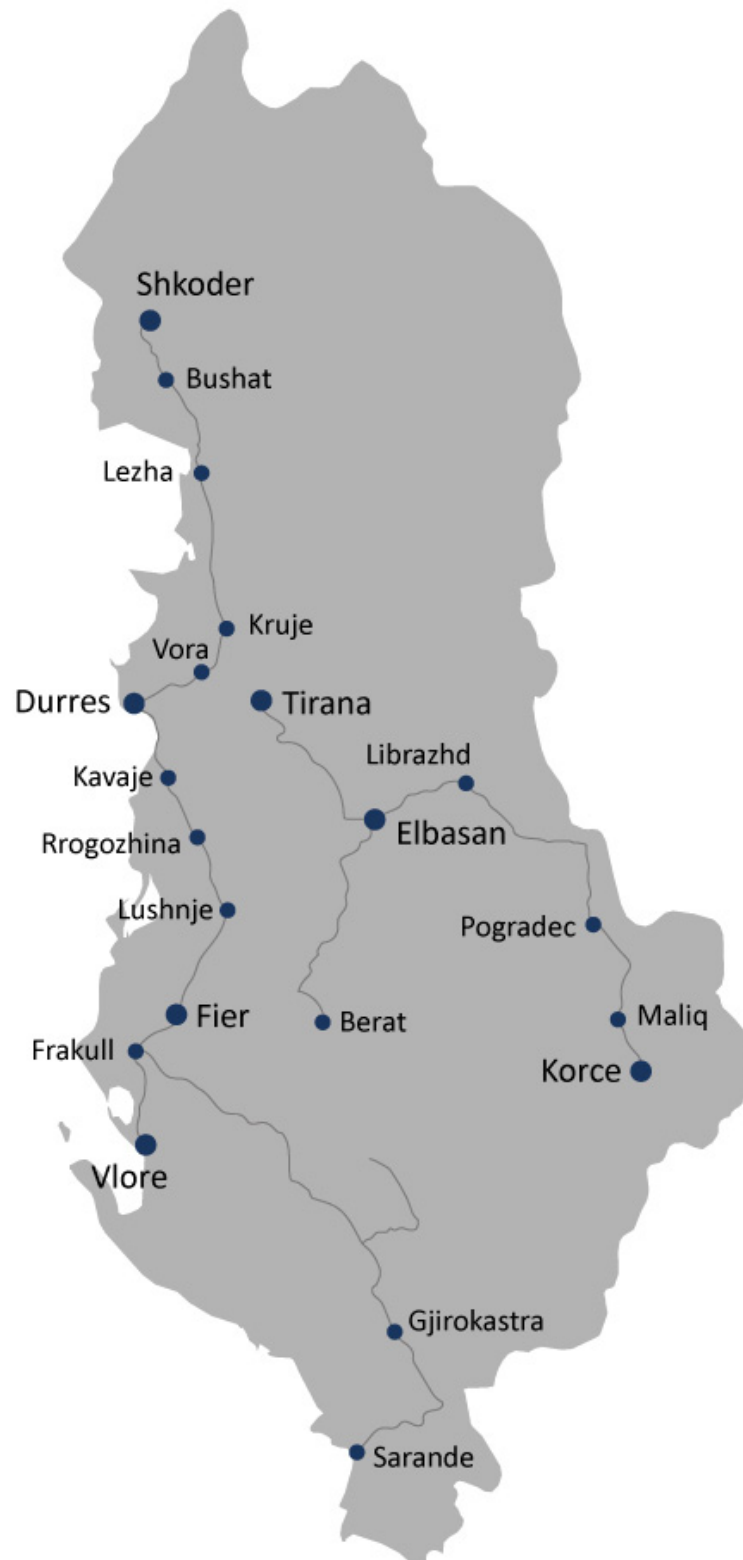


Maziar Kianzad
*Head of Network Testing
& Benchmarking*
September 2017

Measurement Setup

	Voice	Data
Device	Samsung Galaxy S7 cat9	Samsung Galaxy S7 cat9 Sony Xperia XZ cat9
Test Cases	Mobile-to-Mobile Side1 (4G preferred) to Side2 (4G preferred) Side1 (4G preferred) to Side2 (4G preferred) 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) YouTube video streaming - 45s
Mobility and Route Types	100% Drivetest 60% in Cities, 19% in Towns and 21% on Roads Cities, towns and roads	
Samples	~ 3200 per Operator	~ 1200 per Operator
Dates	12 measurement days 25.07.2017 – 07.08.2017	

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	265	309	248	178
	Cities	240	67%	82%	68%	45%
	Towns	80	71%	75%	68%	60%
	Roads	80	60%	66%	39%	28%
Data	Total	600	529	501	378	33
	Cities	360	89%	86%	69%	6%
	Towns	120	89%	86%	69%	4%
	Roads	120	85%	73%	39%	5%
TOTAL		1.000	794	810	626	211

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	85%	80%	73%	4%
	File Download	90	87%	88%	76%	9%
	File Upload	90	89%	87%	66%	0%
	YouTube	72	97%	93%	58%	12%
Towns	Web Browsing	36	85%	82%	73%	4%
	File Download	30	88%	86%	76%	8%
	File Upload	30	90%	85%	64%	0%
	YouTube	24	97%	92%	63%	7%
Roads	Web Browsing	36	80%	71%	41%	5%
	File Download	30	88%	81%	48%	8%
	File Upload	30	83%	62%	28%	0%
	YouTube	24	90%	83%	36%	7%

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	[%]	96,1	99,1	97,8	94,1
	Call Setup Time	[s]	5,7	6,1	6,2	7,1
	AVG Speech Quality	[MOS-LQO]	3,3	3,3	2,6	2,6
Towns	Qualifier	[%]	96,7	98,1	97,8	97,2
	Call Setup Time	[s]	5,4	6,2	6,0	7,2
	AVG Speech Quality	[MOS-LQO]	3,4	3,2	2,6	2,6
Roads	Qualifier	[%]	92,0	94,6	88,5	86,8
	Call Setup Time	[s]	5,4	6,2	6,2	7,6
	AVG Speech Quality	[MOS-LQO]	3,3	3,2	2,7	2,6

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	98,1	96,4	37,2
	Time to first Byte	[ms]	642	681	546	1204
	Kbytes first second	[KB]	383	301	362	79
HTTP Static Page DL	Qualifier	[%]	99,3	99,6	97,8	65,0
	Overall Session Time	[s]	1,4	1,0	1,8	7,0
HTTP file DL 3MB	Qualifier	[%]	99,6	99,6	98,6	88,4
	AVG Session Time	[s]	1,3	1,2	2,2	20,0
	90% faster than	[kbit/s]	12601	12401	6560	796
	10% faster than	[kbit/s]	47809	67024	48183	1939
HTTP file UL 1MB	Qualifier	[%]	99,7	99,4	96,3	0,0
	AVG Session Time	[s]	1,2	1,1	1,9	
	90% faster than	[kbit/s]	5046	4161	1655	
	10% faster than	[kbit/s]	16681	28470	19277	
HTTP DL FDTT 7s	Qualifier	[%]	99,9	99,9	98,5	88,2
	AVG throughput	[kbit/s]	53252	46430	40867	1801
	90% faster than	[kbit/s]	11840	14181	4967	1478
	10% faster than	[kbit/s]	103440	88811	85286	1966
HTTP UL FDTT 7s	Qualifier	[%]	99,7	98,7	95,9	0,0
	AVG throughput	[kbit/s]	20679	20792	19308	
	90% faster than	[kbit/s]	6453	4541	2182	
	10% faster than	[kbit/s]	40721	43008	38455	
YouTube	Qualifier	[%]	99,7	98,8	91,8	73,3
	Start Time	[s]	2,3	2,8	2,4	7,5
	Playouts w/o interruptions	[%]	99,9	100,0	98,3	97,4
	AVG Resolution	[p]	1075,6	1076,2	1067,6	476,1

Data Towns	KPI Name	Unit	Telekom	Operator 2	Operator 3	Operator 4
HTTP Live Page DL	Qualifier	[%]	99,7	98,6	97,6	32,4
	Time to first Byte	[ms]	648	691	561	1107
	Kbytes first second	[KB]	371	297	334	76
HTTP Static Page DL	Qualifier	[%]	98,6	100,0	96,8	59,5
	Overall Session Time	[s]	1,4	1,0	2,1	7,0
HTTP file DL 3MB	Qualifier	[%]	99,6	100,0	99,1	77,1
	AVG Session Time	[s]	1,3	1,5	3,8	20,3
	90% faster than	[kbit/s]	14167	8507	2404	745
	10% faster than	[kbit/s]	47857	59792	46620	1925
HTTP file UL 1MB	Qualifier	[%]	100,0	99,2	97,4	0,0
	AVG Session Time	[s]	1,1	1,3	2,6	
	90% faster than	[kbit/s]	5518	3382	1087	
	10% faster than	[kbit/s]	16478	25040	19704	
HTTP DL FDTT 7s	Qualifier	[%]	100,0	100,0	100,0	78,9
	AVG throughput	[kbit/s]	53164	42116	30440	1746
	90% faster than	[kbit/s]	17776	11565	2943	1249
	10% faster than	[kbit/s]	96678	77875	66217	1966
HTTP UL FDTT 7s	Qualifier	[%]	99,2	99,2	94,8	0,0
	AVG throughput	[kbit/s]	21655	17914	18308	
	90% faster than	[kbit/s]	6651	4682	1203	
	10% faster than	[kbit/s]	41200	36864	41589	
YouTube	Qualifier	[%]	100,0	98,8	94,6	70,1
	Start Time	[s]	2,4	2,8	2,6	7,4
	Playouts w/o interruptions	[%]	99,6	100,0	96,2	95,9
	AVG Resolution	[p]	1080,0	1073,7	1042,2	470,6

Data Roads	KPI Name	Unit	Telekom	Operator 2	Operator 3	Operator 4
HTTP Live Page DL	Qualifier	[%]	97,5	95,1	87,5	26,5
	Time to first Byte	[ms]	663	825	667	1285
	Kbytes first second	[KB]	354	248	246	79
HTTP Static Page DL	Qualifier	[%]	96,7	96,9	87,2	36,7
	Overall Session Time	[s]	1,7	1,7	3,1	6,8
HTTP file DL 3MB	Qualifier	[%]	98,8	98,8	90,6	55,6
	AVG Session Time	[s]	2,3	3,4	8,5	22,5
	90% faster than	[kbit/s]	7353	4311	1001	642
	10% faster than	[kbit/s]	37916	45697	31505	1921
HTTP file UL 1MB	Qualifier	[%]	98,5	94,6	84,0	0,0
	AVG Session Time	[s]	1,7	3,2	4,8	
	90% faster than	[kbit/s]	2571	1013	798	
	10% faster than	[kbit/s]	15067	17073	12818	
HTTP DL FDTT 7s	Qualifier	[%]	97,7	96,5	91,7	61,9
	AVG throughput	[kbit/s]	34634	23016	14177	1670
	90% faster than	[kbit/s]	9043	5836	1583	993
	10% faster than	[kbit/s]	66850	49403	48144	1961
HTTP UL FDTT 7s	Qualifier	[%]	97,0	92,2	79,3	0,0
	AVG throughput	[kbit/s]	15031	9199	6606	
	90% faster than	[kbit/s]	3224	1109	958	
	10% faster than	[kbit/s]	29053	20107	20498	
YouTube	Qualifier	[%]	97,4	96,1	75,8	50,5
	Start Time	[s]	2,7	3,3	3,4	7,1
	Playouts w/o interruptions	[%]	99,2	97,6	94,0	92,6
	AVG Resolution	[p]	1071,2	1056,0	996,7	466,1