

# CERTIFICATE

## **P3 communications GmbH**

Am Kraftversorgungsturm 3, D-52070 Aachen, Germany

hereby certifies that



## **Magyar Telekom Nyrt.**

1013 Budapest, Krisztina krt. 55. Hungary

achieved „**Best in Test**“ with a

**Total Score of 928 of 1000**

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

(Score 357 of 400 in Telephony, Score 571 of 600 in Data Services)



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## Measurement Setup

	Voice	Data
<b>Device</b>	Samsung Galaxy S7 cat9	Samsung Galaxy S7 cat9 Sony Xperia XZ cat9
<b>Test Cases</b>	<b>Mobile-to-Mobile (M2M)</b>  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	<b>Data 4G preferred CA</b>  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
<b>Mobility and Route Types</b>	100% Drivetest 53% in Cities, 20% in Towns and 27% on Roads Cities, towns and roads	
<b>Samples</b>	~ 5300 per Operator	~ 1400 per Operator
<b>Dates</b>	<b>13 measurement days</b> <b>12.09.2017 – 26.09.2017</b>	

## 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
Voice	<b>Total</b>	<b>400</b>	357	339	306
	Cities	240	90%	87%	78%
	Towns	80	91%	86%	75%
	Roads	80	85%	79%	72%
Data	<b>Total</b>	<b>600</b>	571	533	564
	Cities	360	95%	90%	94%
	Towns	120	94%	88%	94%
	Roads	120	96%	87%	95%
<b>TOTAL</b>		<b>1.000</b>	928	872	870

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
<b>Cities</b>	Web Browsing	108	93%	92%	89%
	File Download	90	95%	81%	96%
	File Upload	90	98%	90%	95%
	YouTube	72	95%	97%	97%
<b>Towns</b>	Web Browsing	36	94%	91%	91%
	File Download	30	93%	81%	94%
	File Upload	30	94%	84%	95%
	YouTube	24	98%	98%	96%
<b>Roads</b>	Web Browsing	36	93%	90%	90%
	File Download	30	99%	83%	99%
	File Upload	30	94%	82%	97%
	YouTube	24	99%	93%	94%

## 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
<b>Cities</b>	Qualifier	[%]	99,3	99,0	98,8
	Call Setup Time	[s]	4,0	4,4	7,3
	AVG Speech Quality	[MOS-LQO]	3,6	3,5	3,6
<b>Towns</b>	Qualifier	[%]	99,8	98,9	98,8
	Call Setup Time	[s]	4,4	4,5	8,0
	AVG Speech Quality	[MOS-LQO]	3,5	3,5	3,4
<b>Roads</b>	Qualifier	[%]	98,2	96,5	97,6
	Call Setup Time	[s]	4,6	4,7	8,5
	AVG Speech Quality	[MOS-LQO]	3,5	3,4	3,2

## 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
HTTP Live Page DL	Qualifier	[%]	99,6	99,6	99,7
	Time to first Byte	[ms]	431	472	512
	KBytes first second	[KB]	420	413	434
HTTP Static Page DL	Qualifier	[%]	99,7	99,8	99,7
	Overall Session Time	[s]	1,0	1,2	1,8
HTTP file DL 3MB	Qualifier	[%]	99,9	99,9	100,0
	AVG Session Time	[s]	0,8	1,9	0,8
	90% faster than	[kbit/s]	22071	7884	22443
	10% faster than	[kbit/s]	74166	38005	79208
HTTP file UL 1MB	Qualifier	[%]	99,9	99,8	99,6
	AVG Session Time	[s]	0,6	0,9	0,8
	90% faster than	[kbit/s]	11827	6668	9118
	10% faster than	[kbit/s]	27701	17279	24242
HTTP DL FDTT 7s	Qualifier	[%]	99,5	100,0	99,7
	AVG throughput	[kbit/s]	77325	21867	75150
	90% faster than	[kbit/s]	29227	7820	28421
	10% faster than	[kbit/s]	133604	39104	131780
HTTP UL FDTT 7s	Qualifier	[%]	99,9	99,6	99,5
	AVG throughput	[kbit/s]	31852	16877	28259
	90% faster than	[kbit/s]	14988	9189	10633
	10% faster than	[kbit/s]	44583	21848	40876
YouTube	Qualifier	[%]	99,0	99,5	99,6
	Start Time	[s]	2,0	2,2	2,0
	Playouts w/o interruptions	[%]	99,9	100,0	99,7
	AVG Resolution	[p]	1079,6	1076,6	1078,5

Data Towns	KPI Name	Unit	Telekom	Operator 2	Operator 3
HTTP Live Page DL	Qualifier	[%]	100,0	99,4	99,8
	Time to first Byte	[ms]	474	502	471
	KBytes first second	[KB]	408	410	438
HTTP Static Page DL	Qualifier	[%]	100,0	99,8	100,0
	Overall Session Time	[s]	1,1	1,2	1,7
HTTP file DL 3MB	Qualifier	[%]	100,0	100,0	100,0
	AVG Session Time	[s]	0,9	2,3	0,9
	90% faster than	[kbit/s]	17148	5793	16628
	10% faster than	[kbit/s]	71943	39088	76727
HTTP file UL 1MB	Qualifier	[%]	100,0	99,7	100,0
	AVG Session Time	[s]	1,0	1,2	1,0
	90% faster than	[kbit/s]	6703	4202	7898
	10% faster than	[kbit/s]	25992	16964	24024
HTTP DL FDTT 7s	Qualifier	[%]	100,0	100,0	100,0
	AVG throughput	[kbit/s]	62028	22258	71119
	90% faster than	[kbit/s]	18573	8526	24652
	10% faster than	[kbit/s]	122182	42815	128748
HTTP UL FDTT 7s	Qualifier	[%]	99,3	99,7	99,6
	AVG throughput	[kbit/s]	27064	13007	25870
	90% faster than	[kbit/s]	8648	3683	9526
	10% faster than	[kbit/s]	41516	21080	38916
YouTube	Qualifier	[%]	99,6	100,0	99,3
	Start Time	[s]	2,1	2,3	2,0
	Playouts w/o interruptions	[%]	100,0	99,7	100,0
	AVG Resolution	[p]	1080,0	1074,6	1078,7

Data Roads	KPI Name	Unit	Telekom	Operator 2	Operator 3
HTTP Live Page DL	Qualifier	[%]	99,5	99,2	99,5
	Time to first Byte	[ms]	499	506	508
	KBytes first second	[KB]	407	386	426
HTTP Static Page DL	Qualifier	[%]	99,6	99,4	99,1
	Overall Session Time	[s]	1,1	1,5	1,9
HTTP file DL 3MB	Qualifier	[%]	100,0	99,1	99,7
	AVG Session Time	[s]	1,0	3,0	1,1
	90% faster than	[kbit/s]	15121	4531	12931
	10% faster than	[kbit/s]	63158	33473	68571
HTTP file UL 1MB	Qualifier	[%]	98,7	99,1	99,7
	AVG Session Time	[s]	1,2	2,0	1,0
	90% faster than	[kbit/s]	4176	1666	5695
	10% faster than	[kbit/s]	25940	16300	25165
HTTP DL FDTT 7s	Qualifier	[%]	99,7	99,3	100,0
	AVG throughput	[kbit/s]	51958	17146	46596
	90% faster than	[kbit/s]	17970	5563	13192
	10% faster than	[kbit/s]	96562	35134	92283
HTTP UL FDTT 7s	Qualifier	[%]	100,0	98,6	99,5
	AVG throughput	[kbit/s]	23064	11448	25856
	90% faster than	[kbit/s]	4802	2197	7223
	10% faster than	[kbit/s]	40100	20770	40195
YouTube	Qualifier	[%]	100,0	98,9	98,4
	Start Time	[s]	2,1	2,5	2,1
	Playouts w/o interruptions	[%]	100,0	98,4	99,7
	AVG Resolution	[p]	1079,3	1062,7	1075,7