

# CERTIFICATE

## **P3 communications GmbH**

Am Kraftversorgungsturm 3, D-52070 Aachen, Germany

hereby certifies that



## **Slovak Telekom**

Bajkalská 28, 817 62 Bratislava, Slovak Republic

achieved „**Best in Test**“ with a

Total Score of **874 of 1000**

in the **Mobile Benchmark Slovakia 01/2016**.

(Score 335 of 400 in Telephony, Score 539 of 600 in Data Services)

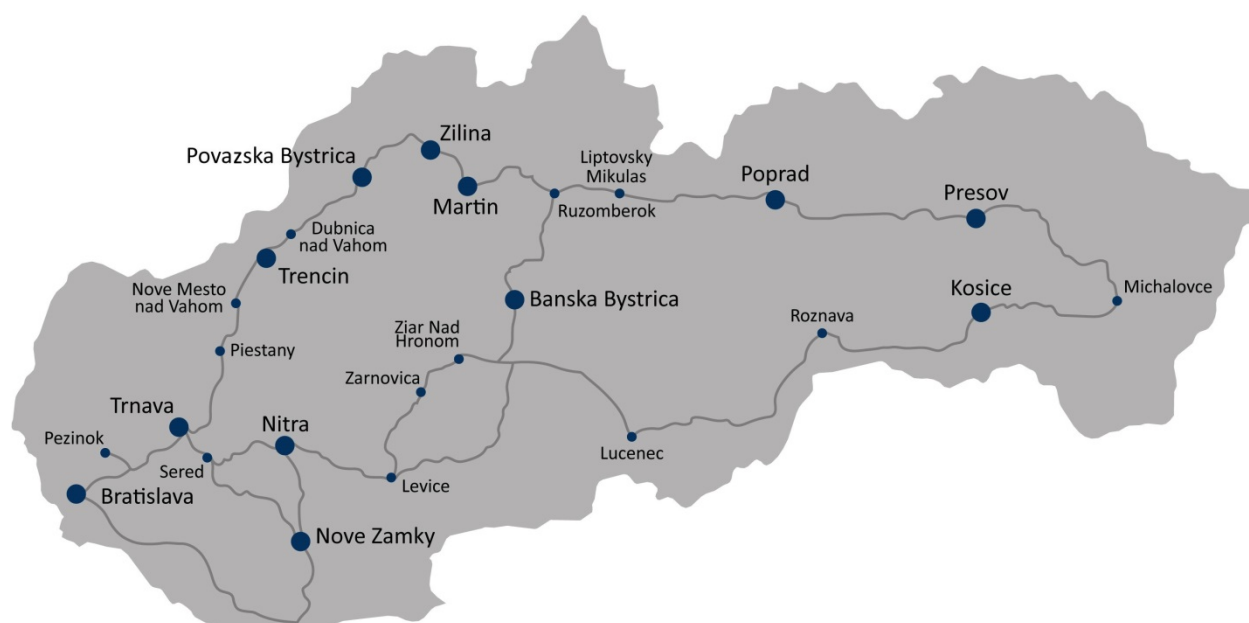


**Maziar Kianzad**  
*Head of Measurement  
and Testing Solutions*  
January 2016

## Measurement Setup

	Voice	Data
<b>Device</b>	Samsung Galaxy S5 LTE cat4 (SM-G900F) LTE/HSPA+ DC/HSUPA 5.76 P3 attenuator	Samsung Galaxy Note4 LTE cat6 (SM-N910F) LTE/HSPA+ DC/HSUPA 5.76 P3 attenuator
<b>Test Cases</b>	<b>Mobile-to-Mobile</b> Side1 (3G pref) to Side2 (4Gpref) 115 sec call window 70 sec call duration 15 sec call setup timeout Email traffic injection on both sides (1 email per call window)	<b>4G CA preferred</b> HTTP DL stress test 10s HTTP UL stress test 10s HTTP 3MB DL fixed file transfer HTTP 1MB UL fixed file transfer Web Browsing - Kepler ETSI Ref. Page 4 live web pages YouTube SD video - 30s clip YouTube HD video - 30s clip
<b>Mobility and Route Types</b>	100% drivetest Big cities, small cities and connecting roads	
<b>Samples</b>	~1200 per operator	~ 2700 per operator
<b>Dates</b>	January 11th – January 26th 2016	

## Testing Route



## Score Points and Breakdown

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

Module	Infrastructure	Max.	Telekom	Operator 2	Operator 3	Operator 4
<b>Voice</b>	<b>Total</b>	<b>400</b>	<b>335</b>	<b>315</b>	<b>266</b>	<b>80</b>
	big cities	260	84%	78%	66%	14%
	small cities and connecting roads	140	83%	80%	68%	31%
<b>Data</b>	<b>Total</b>	<b>600</b>	<b>539</b>	<b>511</b>	<b>443</b>	<b>419</b>
	big cities	390	93%	90%	90%	80%
	small cities	90	93%	87%	50%	74%
	connecting roads	120	78%	69%	41%	33%
<b>TOTAL</b>		<b>1.000</b>	<b>874</b>	<b>826</b>	<b>709</b>	<b>499</b>

Shown voice, data and total scores are rounded

The following table indicates the achieved percentage of the maximum score in each of the different infrastructural breakdown.

Data	Service Group	Max.	Telekom	Operator 2	Operator 3	Operator 4
Big cities	Web Browsing	136,5	91%	91%	91%	82%
	File Download	78,0	93%	88%	85%	76%
	File Upload	78,0	94%	87%	86%	80%
	YouTube	97,5	94%	93%	94%	81%
Small cities	Web Browsing	31,5	94%	90%	57%	76%
	File Download	18,0	91%	81%	65%	67%
	File Upload	18,0	91%	80%	46%	73%
	YouTube	22,5	94%	93%	33%	76%
Connecting roads	Web Browsing	42,0	75%	72%	41%	35%
	File Download	24,0	84%	73%	48%	31%
	File Upload	24,0	80%	64%	45%	28%
	YouTube	30,0	77%	67%	30%	36%

## Voice KPI Overview

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

Voice M2M	Kpi Name	Unit	Telekom	Operator 2	Operator 3	Operator 4
Big cities	Qualified	[%]	98,1	97,6	97,4	85,5
	Call Setup Time	[s]	5,9	7,3	9,9	8,4
	AVG Speech Quality	[MOS-LQO]	3,4	3,3	2,5	2,6
Small cities and connecting roads	Qualified	[%]	96,5	96,7	92,7	79,7
	Call Setup Time	[s]	6,7	7,9	8,1	8,6
	AVG Speech Quality	[MOS-LQO]	3,2	2,9	2,6	2,7

## 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 “Big Cities”, “Small Cities” and “Connecting Roads”.

Data big cities	Kpi Name	Unit	Telekom	Operator 2	Operator 3	Operator 4
HTTP live page DL	Qualified	[%]	98,9	98,9	99,2	96,8
	AVG Session Time	[s]	3,3	3,3	3,4	3,4
HTTP static page DL	Qualified	[%]	99,7	99,6	99,2	96,8
	AVG Session Time	[s]	1,2	1,3	1,3	1,2
HTTP file DL 3MB	Qualified	[%]	99,9	99,5	99,7	97,6
	AVG Session Time	[s]	1,2	1,4	1,8	1,8
	90% faster than	[kbit/s]	13029	11331	7856	9070
	10% faster than	[kbit/s]	53691	46512	35661	34985
HTTP file UL 1MB	Qualified	[%]	99,9	99,5	99,6	97,4
	AVG Session Time	[s]	1,1	1,2	1,4	1,2
	90% faster than	[kbit/s]	7421	4866	4944	5567
	10% faster than	[kbit/s]	12403	13491	9852	13008
HTTP DL FDTT 10s	Qualified	[%]	99,9	99,7	100,0	97,6
	AVG throughput	[kbit/s]	45316	33553	25940	23420
	90% faster than	[kbit/s]	17870	10615	9187	9902
	10% faster than	[kbit/s]	83583	62505	45599	40897
HTTP UL FDTT 10s	Qualified	[%]	99,9	99,3	99,9	98,5
	AVG throughput	[kbit/s]	24407	18014	13982	15231
	90% faster than	[kbit/s]	12133	4802	6034	6128
	10% faster than	[kbit/s]	40103	27629	18506	19640
Youtube SD	Qualified	[%]	99,6	99,3	99,9	97,2
	Start Time	[s]	1,1	1,2	1,2	1,3
	Playouts w/o interruptions	[%]	99,9	99,9	100,0	99,9
Youtube HD	Qualified	[%]	99,0	98,9	99,3	95,8
	Start Time	[s]	1,4	1,3	1,6	1,6
	Playouts w/o interruptions	[%]	100,0	99,4	99,4	99,3

Data small cities	Kpi Name	Unit	Telekom	Operator 2	Operator 3	Operator 4
HTTP live page DL	Qualified	[%]	99,7	98,9	92,9	95,5
	AVG Session Time	[s]	3,3	3,4	4,6	3,4
HTTP static page DL	Qualified	[%]	100,0	99,6	94,3	95,3
	AVG Session Time	[s]	1,2	1,4	3,6	1,2
HTTP file DL 3MB	Qualified	[%]	100,0	99,6	99,0	95,3
	AVG Session Time	[s]	1,2	2,1	7,4	1,7
	90% faster than	[kbit/s]	12800	6469	1862	9760
	10% faster than	[kbit/s]	40541	31788	6987	35139
HTTP file UL 1MB	Qualified	[%]	100,0	98,8	92,5	97,0
	AVG Session Time	[s]	1,0	1,3	5,9	1,6
	90% faster than	[kbit/s]	7470	4654	1004	4614
	10% faster than	[kbit/s]	10929	10959	1938	12579
HTTP DL FDTT 10s	Qualified	[%]	100,0	99,6	98,5	94,9
	AVG throughput	[kbit/s]	32591	17505	4574	25511
	90% faster than	[kbit/s]	17119	6971	1375	9579
	10% faster than	[kbit/s]	51485	30278	7908	44624
HTTP UL FDTT 10s	Qualified	[%]	100,0	99,6	95,6	96,2
	AVG throughput	[kbit/s]	18881	10539	1492	14780
	90% faster than	[kbit/s]	13261	4925	537	4251
	10% faster than	[kbit/s]	21665	14928	2020	22418
Youtube SD	Qualified	[%]	99,6	99,6	97,6	94,5
	Start Time	[s]	1,1	1,2	2,4	1,3
	Playouts w/o interruptions	[%]	100,0	100,0	98,5	100,0
Youtube HD	Qualified	[%]	99,2	99,1	84,7	95,0
	Start Time	[s]	1,6	1,5	3,4	1,6
	Playouts w/o interruptions	[%]	100	99,1	90,1	100,0

Data connecting routes	Kpi Name	Unit	Telekom	Operator 2	Operator 3	Operator 4
HTTP Live Page DL	Qualified	[%]	90,9	91,1	79,5	53,2
	AVG Session Time	[s]	3,5	3,8	4,1	3,5
HTTP Static Page DL	Qualified	[%]	94,1	93,4	81,9	52,2
	AVG Session Time	[s]	1,4	2,2	2,8	1,3
HTTP file DL 3MB	Qualified	[%]	94,8	93,7	88,0	54,0
	AVG Session Time	[s]	2,3	4,4	7,3	2,6
	90% faster than	[kbit/s]	7578	3261	1804	4566
	10% faster than	[kbit/s]	42254	28202	23278	33755
HTTP file UL 1MB	Qualified	[%]	92,0	90,4	85,1	52,6
	AVG Session Time	[s]	1,6	3,7	5,1	2,2
	90% faster than	[kbit/s]	3042	1130	926	1921
	10% faster than	[kbit/s]	11315	10283	8333	12140
HTTP DL FDTT 10s	Qualified	[%]	94,2	95,3	85,0	52,1
	AVG throughput	[kbit/s]	28911	15665	10403	21057
	90% faster than	[kbit/s]	8415	2596	1904	5008
	10% faster than	[kbit/s]	52675	34783	25643	41140
HTTP UL FDTT 10s	Qualified	[%]	95,9	93,7	84,4	54,5
	AVG throughput	[kbit/s]	14949	6387	4853	11796
	90% faster than	[kbit/s]	2825	589	1028	893
	10% faster than	[kbit/s]	21607	15304	16117	19289
Youtube SD	Qualified	[%]	92,7	93,7	84,3	51,9
	Start Time	[s]	1,6	1,7	2,2	1,4
	Playouts w/o interruptions	[%]	99,6	98,0	98,6	100,0
Youtube HD	Qualified	[%]	91,3	85,8	73,5	48,1
	Start Time	[s]	1,8	2,1	3,0	1,8
	Playouts w/o interruptions	[%]	99,6	97,4	85,2	97,4