



Systemics Group Nationwide Benchmark Test of Mobile Networks in Australia

August/September 2017

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Executive Summary

Systemics Group is a leading provider of independent Quality of Experience benchmarking services for mobile networks.

With benchmarking projects done in more than 20 countries testing the latest network technologies such as LTE Carrier Aggregation, LTE VoLTE, HD Voice, YouTube, browsing and streaming services we used our international experience to evaluate the quality of mobile networks in Australia.

Systemics Group conducted an independent National benchmark survey of Australia's three mobile networks Optus, Telstra and Vodafone in August and September 2017. The survey results showed Telstra as the best mobile operator in Australia in terms of quality of mobile services. It also showed very good performance of data services for all operators in Australia compared to other countries.

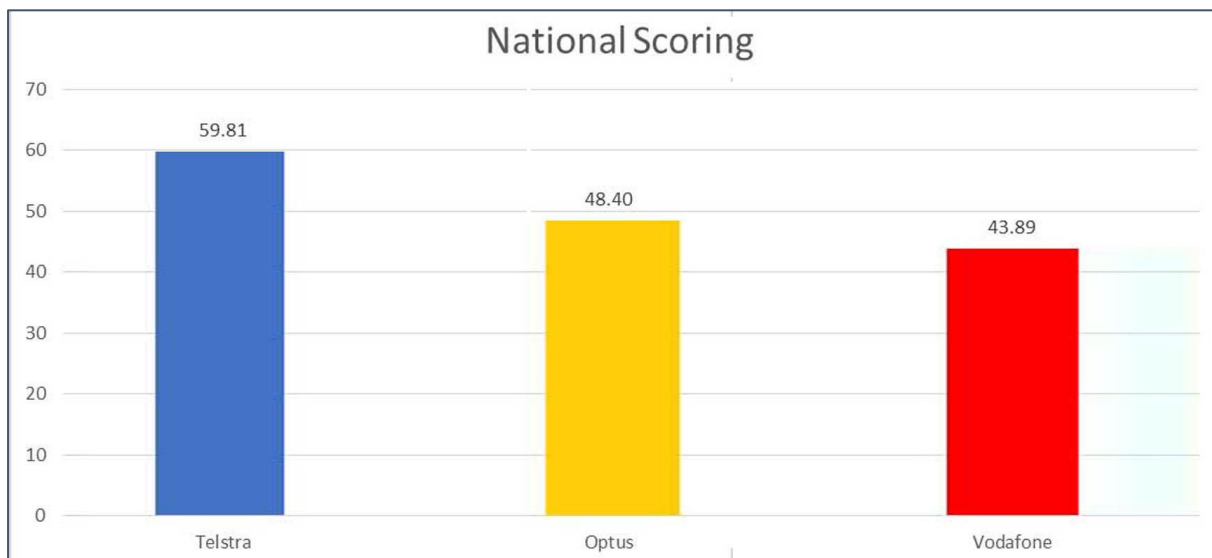
Despite the size of the country our aim was to conduct a truly national survey, covering a drive distance of more than 41 000 km, equivalent to driving the circumference of the earth and our largest scale public benchmark in a single country. The survey was done using the latest device (Samsung Galaxy S8) to show-case the best performance of *all* networks. The survey included a total measurement time of 680 hours, over 70 000 voice calls, and the transfer of just under 3 000 GB of data.

The survey was mainly done as a drivetest but it also included some walktests which were performed in the city centers of 5 largest cities in Australia.

The survey results

In our assessment of quality of mobile services Telstra was ranked as number one operator in Australia with a countrywide score of 59.81. Optus ranked second with a score of 48.4 and Vodafone achieved the lowest score of 43.89. Countrywide result of Telstra showed a clear gap over two other operators. Telstra scored higher overall nationally on all four major performance categories of Voice, Browsing, Data Speed, and Video (YouTube). It also took first place in all geographic categories including Major Cities, Small Cities, Main Highways and especially Rural and Remote areas.

Chart 1 – National Scoring



Key customer experience callouts include the fact Telstra had far more successful calls (made and held) than any either Optus or Vodafone (over 1600 more than Optus and 2100 more than Vodafone), and faster data speeds, especially on upload. Optus and Vodafone had shorter voice call setup time and slightly better voice call quality (MOS), but it is important to recognize that Telstra's average values of these KPIs were negatively impacted by fringe performance in the many areas of rural and remote areas of Australia that only Telstra covers. On the subject of coverage, Telstra covered over 2150 km more road than the nearest competitor Optus and over 5300 km more than Vodafone.

The survey showed some impressive values of Telstra network performance in rural and remote Australia category, which we defined as those roads that passed through the area with population density of less than 1 person per square kilometer. An average download data speed for Telstra in that category was 18.48 Mbps which translated to a very comfortable usage of data services.

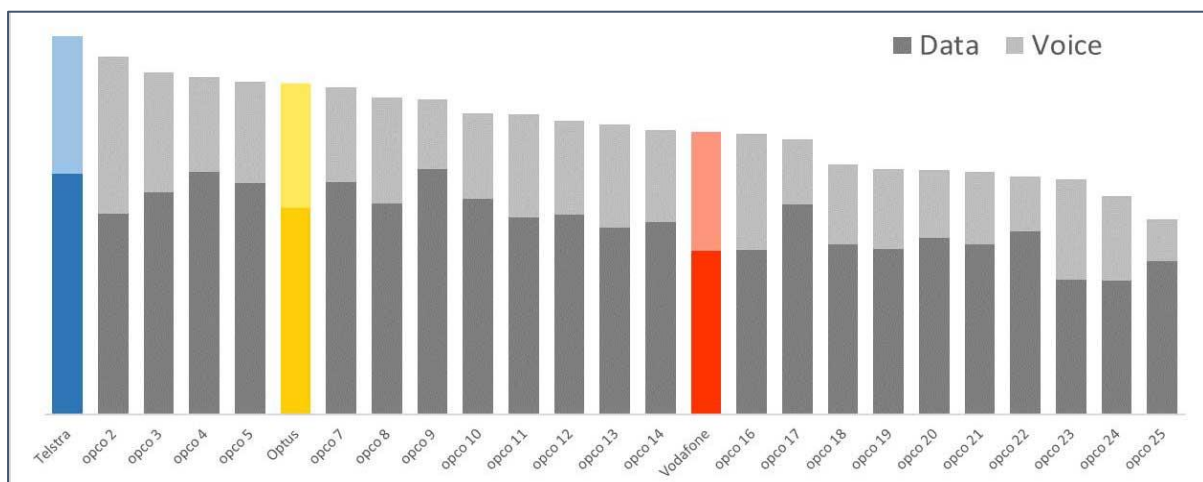
Table 1 – KPIs comparison

Total 41,459 km Driven	Telstra	Optus	Vodafone
% Calls successfully made and held to completion	93.43%	86.82%	85.43%
Number of Calls made and held to completion	22086	20406	19946
% of route with voice	99.76%	94.51%	86.86%
km of route with voice	41359km	39184km	36011km
% of route with 4G data	90.14%	87.15%	78.82%
km of route with 4G data	37373km	36131km	32676km
Voice call setup time (s)	3.6s	2.53s	3.3s
Voice MOS (higher is better)	3.591	3.736	3.749
Ave Data Speed DL kbps	47.75Mbps	46.82Mbps	45.01Mbps
Ave Data Speed UL kbps	26.85Mbps	18.89Mbps	19.16Mbps

Comparing the results of the quality of services in mobile networks in Australia with other countries where we did similar surveys we can highlight very good quality of LTE networks in Australia and wide radio spectrum allocated by all three operators to LTE. This translates into higher speed of mobile internet compared to European countries. Voice over LTE (VoLTE) is available from all three operators in Australia and in our test the majority of voice calls were carried out with VoLTE technology. Thanks to that the quality of voice services in Australia is better compared to most other countries where we performed similar projects.

The chart below presents ranks of Australian operators amongst recently benchmarked networks by Systemics Group in Europe. In this ranking Telstra has got the highest total combined score and all Australian operators are within the international top 15. When we compare data and voice services separately, Telstra ranks in both cases second among the global operators tested.

Chart 2 - Ranks of Australian operators vs. other benchmarked in Europe



The first rank of Telstra in this comparison has even more value when we consider that measurements in Australia were conducted also in very remote areas, which was not the case in other projects we performed in Europe.

The survey sample

In our approach to test mobile networks in Australia we wanted to achieve a truly national scale on the survey route by including the entirety of the Highway 1 route in our survey. We also tested 40 regional cities, in addition to the five major mainland capitals. Thanks to a very extensive coverage of the tested locations, we were able to include in our evaluation the fundamental importance of coverage in providing mobile services, especially in remote Australia. Drive routes of the survey were selected by Systemics Group and the tests conducted were those that we use in our independent testing of quality of mobile services globally.

The following cities and connecting roads were included in the survey.

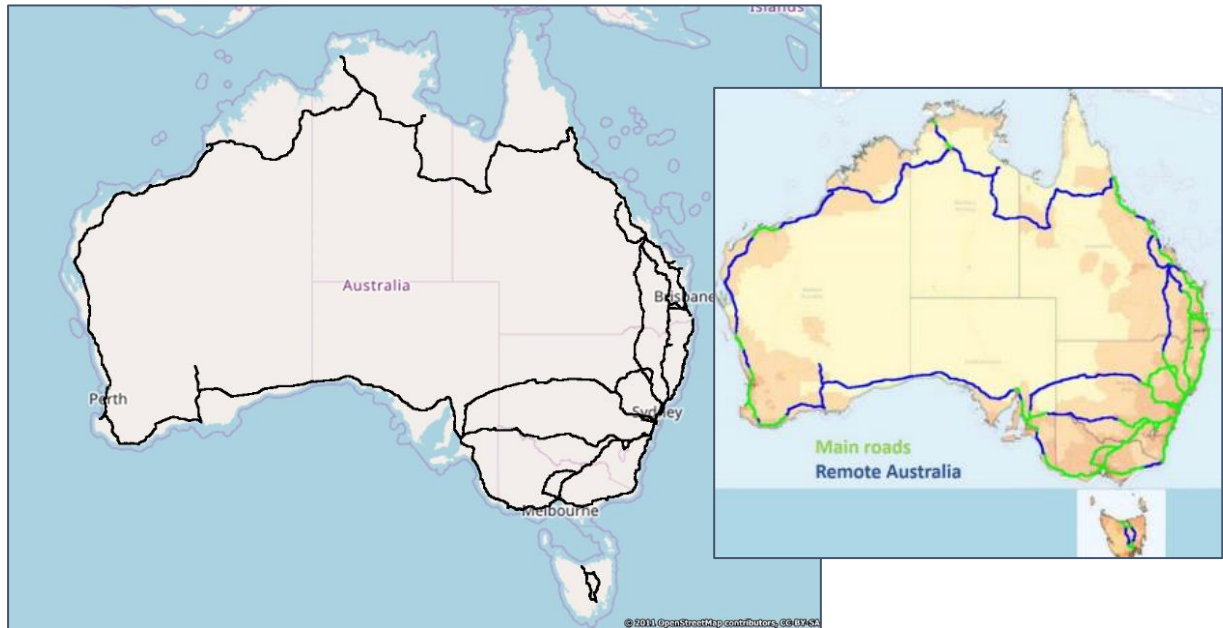
Table 2 - List of Major Cities included with distance driven

City	Distance	City	Distance
Adelaide	823 km	Melbourne	1770 km
Brisbane	911 km	Perth	890 km
		Sydney	3376 km

Table 3 - List of Small Cities included with distance driven

City	Distance	City	Distance
Albany	85 km	Hobart	224 km
Albury Wodonga	154 km	Kalgoorlie-Boulder	86 km
Ballarat	222 km	Launceston	154 km
Bathurst	86 km	Mackay	380 km
Bendigo	233 km	Mildura-Wentworth	95 km
Bowral-Mittagong	87 km	Newcastle	443 km
Bundury	120 km	Nowra-Bomaderry	130 km
Bundaberg	138 km	Orange	86 km
Busselton	85 km	Port Macquarie	87 km
Cairns	403 km	Rockhampton	377 km
Canberra	442 km	Shepparton-Mooroopna	86 km
Coffs Harbour	119 km	Sunshine Coast	311 km
Darwin	323 km	Tamworth	85 km
Devonport	68 km	Toowoomba	248 km
Dubbo	86 km	Townsville	221 km
Geelong	223 km	Traralgon-Morwell	129 km
Geraldton	86 km	Wagga Wagga	161 km
Gladstone-Tannum Sands	162 km	Warragul-Drouin	128 km
Gold Coast-Tweed Heads	578 km	Warrnambool	90 km
Hervey Bay	132 km	Wollongong	291 km

Picture 1 - Main Highways and Rural/Remote Roads driven (incl. all of Highway 1)



Picture 2 – Benchmarking tests in remote areas



Picture 3 - Benchmarking tests in snow-covered Tasmania



How the survey was conducted

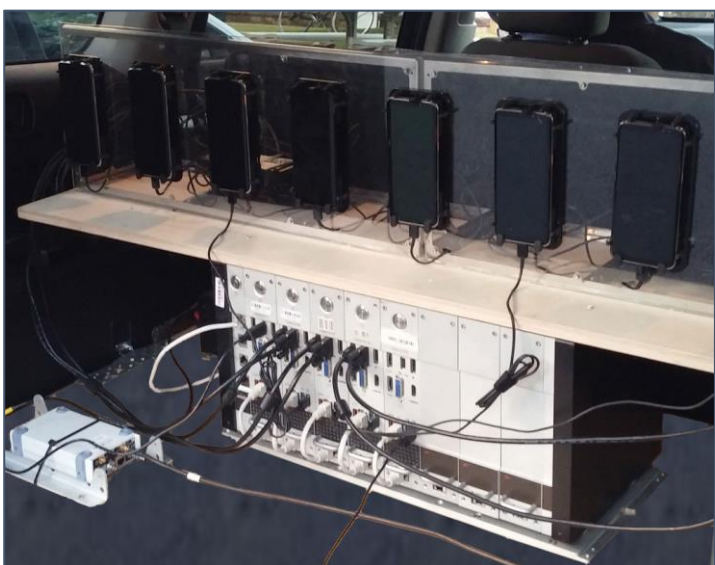
The measurements were conducted by four test teams - three teams performing drivetest and one team performing walk tests in city centers. The measurements were performed using Samsung Galaxy S8 terminals in SwissQual Diversity Benchmarking II and Freerider III systems. The project was managed out of Systemics Group APAC office in Kuala Lumpur, while data post-processing and reporting was done in our office in Warsaw.

We used commercially available SIM cards of all three operators, testing was done during day time, including the evening time which is often the peak time in usage of mobile data services.

Picture 4 - Measurement car



Picture 5 - Measurement system inside the car



The survey metrics

The survey included testing on four performance categories, Voice, Browsing, Data (speed), and YouTube (video). The specific metrics tested on each category are tabulated below:

Table 4 - Metrics on four performance categories

Voice	Voice – OSSR* – Success / All [%]	YouTube	YouTube HD – OSSR* – Success / All [%]
	Voice – Avg. Call Setup Time [s]		YouTube HD – Time to first picture [s]
	Voice – Avg. MOS		YouTube HD – Payout without interruptions [%]
	Voice – MOS < 2.3 [%]		YouTube HD – Avg. VMOS
Browser	HTTP Browser Liveweb – OSSR* – Success / All [%]	*OSSR: Overall Service Success Rate, represents the availability of services.	
	HTTP Browser Liveweb – Avg. Session Time [s]		
	HTTP Browser Reference Page – OSSR* – Success / All [%]		
	HTTP Browser Reference Page – Avg. Session Time [s]		
Data	HTTP Transfer DL – OSSR* – Success / All [%]		
	HTTP Transfer DL – Avg. Session Time [s]		
	HTTP Transfer DL – Avg. Data Rate [kbps]		
	HTTP Transfer DL Data Rate < 4 [Mbps] [%]		
	HTTP Transfer UL - OSSR – Success / All [%]		
	HTTP Transfer UL – Avg. Session Time [s]		
	HTTP Transfer UL – Avg. Data Rate [kbps]		
	HTTP Transfer UL Data Rate < 2 [Mbps] [%]		
	HTTP Transfer Capacity DL – OSSR* – Success / All [%]		
	HTTP Transfer Capacity DL – Avg. Data Rate [kbps]		
	HTTP Transfer Capacity DL Data Rate < 4 [Mbps] [%]		
	HTTP Transfer Capacity UL – OSSR* – Success / All [%]		
	HTTP Transfer Capacity UL – Avg. Data Rate [kbps]		
	HTTP Transfer Capacity UL Data Rate < 2 [Mbps] [%]		

The detailed scoring breakdown

The tabulation below illustrates the scoring calculated on the four performance categories, voice, browsing, data and YouTube, on each of the four geographic categories including major cities, small cities, main highways, and rural and remote areas, and how these were weighted and aggregated into the final score.

This shows how Telstra achieved the best result in all geographic categories, more clearly in small cities and Main Highways, and by a significant margin in Rural and Remote areas. The score Telstra archived in Major Cities was only marginally better than Optus and Vodafone, the narrower gap highlighted where these two carriers focus their network investment.

On the major performance categories Telstra achieved the highest score in browsing and YouTube performance in *all* four geographic categories. On data speed Telstra had the best result in all geographies except small cities where Optus has a very slight lead and with Vodafone achieving significantly lower results. Vodafone achieved the best score for voice calls in the largest cities category, while Optus had the best voice results in the small cities

category. In both of these cities categories the gap in voice calls among all three operators was very narrow. A wider gap was found for voice services on main highways and in rural and remote areas, where Telstra got the highest score.

Picture 6 - Aggregated view

		Main Cities			Smaller Cities			Main Roads			Rural and Remote Areas		
Service particular scores		Telstra	Optus	Vodafone	Telstra	Optus	Vodafone	Telstra	Optus	Vodafone	Telstra	Optus	Vodafone
	Voice max40	21,99	22,46	23,53	20,81	21,44	20,85	16,73	10,39	6,14	17,87	5,34	3,01
		+			+			+			+		
	Browsing max20	17,66	14,04	17,06	16,26	12,12	14,45	17,86	17,38	11,39	14,05	5,78	2,02
		+			+			+			+		
Aggregation Scores	Data max15	20,54	16,48	20,01	14,24	14,81	8,43	8,75	7,13	3,94	4,74	3,38	1,54
		+			+			+			+		
	YouTube max25	12,16	9,95	10,97	8,23	5,77	3,12	11,45	10,76	6,21	6,57	4,05	1,38
Aggregation Scores		=			=			=			=		
	Score	72,34	62,92	71,58	59,55	54,14	46,85	54,80	45,66	27,69	43,22	18,56	7,95
	Aggregation Weights	35%			25%			20%			20%		
Aggregation Scores		+			+			+			+		
	Weighted Score	25,32	22,02	25,05	14,89	13,53	11,71	10,96	9,13	5,54	8,64	3,71	1,59
		+			+			+			+		
		=											
Final score		Telstra	Optus	Vodafone									
		59,81	48,40	43,89									

Picture 7 - Main Cities details

		Main Cities		
Service particular scores		Telstra	Optus	Vodafone
	Voice max40	21,99	22,46	23,53
		+		
	Browsing max20	17,66	14,04	17,06
		+		
Aggregation Score	Data max15	20,54	16,48	20,01
		+		
	YouTube max25	12,16	9,95	10,97
Aggregation Score		=		
	Score	72,34	62,92	71,58
	Aggregation Weight	35%		
Aggregation Score		+		
	Weighted Score	25,32	22,02	25,05
		+		

Picture 8 - Smaller Cities details

		Smaller Cities		
		Telstra	Optus	Vodafone
Service particular scores	Voice max40	20,81	21,44	20,85
	+	+		
	Browsing max20	16,26	12,12	14,45
	+	+		
	Data max15	14,24	14,81	8,43
	+	+		
	YouTube max25	8,23	5,77	3,12
	=	=		
Aggregation Score	Score	59,55	54,14	46,85
Aggregation Weight		25%		
Weighted Score	Weighted Score	14,89	13,53	11,71

Picture 9 - Main Roads details

		Main Roads		
		Telstra	Optus	Vodafone
Service particular scores	Voice max40	16,73	10,39	6,14
	+	+		
	Browsing max20	17,86	17,38	11,39
	+	+		
	Data max15	8,75	7,13	3,94
	+	+		
	YouTube max25	11,45	10,76	6,21
	=	=		
Aggregation Score	Score	54,80	45,66	27,69
Aggregation Weight		20%		
Weighted Score	Weighted Score	10,96	9,13	5,54

Picture 10 - Rural and Remote Areas details

		Rural and Remote Areas		
		Telstra	Optus	Vodafone
Service particular scores	Voice max40	17,87	5,34	3,01
		+		
	Browsing max20	14,05	5,78	2,02
		+		
	Data max15	4,74	3,38	1,54
		+		
	YouTube max25	6,57	4,05	1,38
		=		
Aggregation Score		43,22	18,56	7,95
Aggregation Weight		20%		
Weighted Score		8,64	3,71	1,59

About Systemics Group

Systemics Group comprises of Systemics-PAB, Nexus Telecom, Commsquare and NetQPro. We operate globally with offices and subsidiaries in Poland, Germany, Switzerland, Belgium, Greece, Ireland, United Kingdom, Russia, Jordan, Malaysia and Canada.

Our mission is helping customers understand and address the variety of issues affecting quality in mobile telecommunication networks. Expert know-how developed over many years, combined with large scale operations and efficient cloud based data post-processing, allows us unparalleled flexibility in conducting high quality large benchmarking projects in multiple countries world-wide.