

Network test 2012

Hot on the heels of Austria and Germany, now Swiss mobile operators are put to the test. Who has the best network in the Alpine republic – and how does it compare with other countries?

Austria and Switzerland were long regarded as mobile role models in the German-speaking world. In the meantime, though, Germany has done a lot of catching up: the expansion of UMTS networks through to DC HSPA+ at 42 Mbit/s is forging ahead, and Telekom boasts the HD superior sound standard virtually everywhere in its network. Is Germany emerging from the mobile stone age to become a trendsetter? The Austrian and German results have already been published and are available at www.connect.de/netztest, so let's now turn to Switzerland. Three network operators vie for the favour of Swiss citizens: Swisscom, which originated from the former state-owned postal and telecommunications agency, comes top in terms of customer figures. It is followed by Sunrise and Orange, neck and neck with market shares of just under 20 percent. In Switzerland Orange is now independent of the large French parent company Orange S.A. as part of France Telecom.

LTE is still in the stars

Switzerland's LTE aspirations seem to be on hold. Unsurprisingly, as the spectrum auction and frequency allocation only took place in February 2012. Swisscom was the first network operator to launch an extensive commercial offering in December, Sunrise and Orange won't be following until 2013. So we will have to wait a while for initial results here.

Focus on telephony and data transfer

Two test vehicles with a total of nine test smartphones, three USB HSPA sticks and two network scanners were deployed to verify the current status of network technology, with a focus on telephony and data transfer. See page 3 for details of the procedure.

Bernd Theiss

Telephony

Last year Swiss network operators excelled in the reliability of mobile calls. Can they beat this excellent performance on the tougher test route?

In 2011, with success rates of between just under 98 and 99 percent in cities, the Swiss demonstrated what is technically feasible. However, the standards are higher now in 2012. So, aside from major cities like Zurich, Geneva, Basel and Bern, which are generally best served, this time much smaller cities with fewer than 50,000 inhabitants were also included on the test route, with Schaffhausen and Biel being the smallest towns (see p. 7). This year, tests also focused fully on HD Voice, that is on voice transmission with an extended frequency band and optimised compression algorithms to produce a more natural sound. Running parallel to telephony, data traffic (Multi RAB), also much higher than in 2011, also made the voice test more difficult. To pass the test with flying colours, calls had to be set up within 15 seconds, and the connection made and held for 75 seconds. During this period, a total of ten voice samples were transmitted and evaluated according to the POLQA algorithm, which is based on the latest psycho-acoustical findings.

Urban telephony

Orange fared best with the specified standards. Connections were made in an average of just 4.3 seconds, and in 98.4 percent of cases they remained stable until the end of the test cycle. In terms of mean voice quality Orange was rated a MOS-LQO

(Mean Opinion Score Listening Quality Objective) value of 3.1; this is equivalent to good mean voice transmission with a tendency towards good sound quality. 10 percent of the voice samples were under 2.7; from this value downwards, you have to strain your ears to follow what the person at the other end of the line is saying. Swisscom was just as good in absolute terms, with only 0.4 percent more errors and one second slower to set up a call. With regard to quality both Orange and Swisscom are comparable to the German Telekom. This is partly because these network operators have conducted an extensive rollout of the superior HD Voice sound quality standard. Sunrise does less well in this category with an error rate of 3.5 percent and voice quality that requires callers to listen attentively.

Motorway telephony

As you'd expect, the gap widens in the case of motorway calls. Swisscom produces satisfactory results with a call error quota of just under five percent; voice quality is almost up to urban standard. Orange also offers good sound on Swiss motorways, although its call success rate drops back to 93.1 percent. Interestingly, on some of the calls, the testers noted extended audio dropouts before connections resumed. Sunrise's error quota was again slightly higher than Orange's.

Telephony

Provider	Swisscom	Orange	Sunrise
Telephony (urban & rural)			
Success rate / call set-up time (%/s)	98/5.3	98.4/4.3	96.5/5.2
Voice quality / 10 % of voice samples worse than (MOS-LQO / MOS-LQO)	3.1/2.7	3.1/2.7	2.8/2.5
Telephony (motorways)			
Success rate / call set-up time (%/s)	94.7/5.6	93.1/5	92.6/6
Voice quality / 10 % of voice samples worse than (MOS-LQO / MOS-LQO)	3.1/2.6	3.1/2.6	2.8/2.4

How connect tests

P3 communications, *connect*'s test partner sets two test vehicles on the route. One tests telephony and data services separately with three HTC Sensation XE devices respectively. The smartphone type used has the advantage of supporting HD Voice so can pick up the sound benefit of the latest mobile telephony networks. The current evaluation algorithm Wideband POLQA is used to assess voice quality. At the same time as testing calls, 100 kilobyte mail transfers were run over the smartphones. This Multi RAB (Multi Radio Access Bearer) operation takes into account that smartphones frequently transmit data during calls. The software on three other HTC Sensation XEs in test vehicle 1 was adjusted so that data transfer could be measured automatically. The pre-installed browser thus automatically downloaded four popular typical websites one after the other: Google News, Wikipedia, Leo and ETSI. The telephone's operating system automatically down- and uploaded files, and its video player was used in standard definition for the YouTube tests.

Each of the test smartphones was controlled by a fully fledged industrial PC and connected to an external antenna over a 12 dB attenuator housed in a roof box. The reason being that the telephones thus measure performance at typical levels between indoor, in-car and outdoor conditions. A reinforced onboard power system with a second generator and battery ensured reliable power supplying at all times.

The second test vehicle was similarly equipped to the first. However, parallel Multi RAB data transfer was dispensed with during the telephony tests. Instead of using smartphones with their limited speed capacity to measure data rates, the best data sticks offered by the respective network operators were deployed. They were controlled by the network operators' own dashboard software on Windows 7 industrial PCs. Test results similar to those ideally achieved by a well-equipped notebook in the operator's network may thus be anticipated. As data links are usually required more on notebooks than per smartphone, in vehicle 2 YouTube videos were tried out both in standard and HD definition. The network operators had a chance to prove their mettle in conventional data up- and downloading on motorways. To avoid any costly downtimes, a stock of spare smartphones, data sticks and control systems was kept on board.

Data per smartphone

Network operators are supposed to provide fast smartphone access to Internet websites, emails and files. But do they all deliver the goods?

One HTC Sensation XE was used per network operator for the smartphone data test. The mobile phone cells faced up to challenging gross transmission rates of 14.4 Mbit/s (download) and 5.76 Mbit/s (upload); these were capped only by the notebooks with data stick (see p. 5). However, even the test phones had to share resources with the masses of citizens who now own a smartphone when competing for routine website accesses, file down-/uploads and YouTube sessions in standard definition. The largest network operator Swisscom with a market share of over 60 percent is well aware of the challenges this entails. It must ensure the necessary capacity in a denser or intensively used network – for ultimately all users share one cell's limited resources.

Urban transfer rates

Swisscom scored best in the test browsing session which consisted of accessing four very different yet typical popular websites. It took 39.2 seconds in all to download the websites, and things went wrong in less than one percent of cases. Orange managed to chalk up a success rate of 98.4 percent and took just two and a half seconds longer for all four websites together. Sunrise took 25 percent or ten seconds longer, but what counted more against it was a rise in error rate to 3.4 percent. As you soon note during Internet sessions, if something doesn't work, users hit the reload button as a natural reflex. When downloading files per smartphone, the situation usually isn't so cut and dried, and premature relaunching of the loading process can waste as much time as waiting for the tardy arrival of the last bytes. Happily, Swiss network operators are exceedingly reliable

in this respect with success rates of between 98.7 percent (Sunrise) and 100 percent (Swisscom). All are fine in terms of speed, although Orange is ahead on average data speed and completed 90 percent of tests at over 1 Mbit/s. Swisscom once more demonstrated its exemplary upload reliability, and the Swiss market leader also takes first place in the speed stakes. Sunrise comes very close to Orange for uploading, although both lag way behind the Swiss No. 1. Orange put up the most impressive performance in playing back films: this network operator showed Swisscom, and Sunrise even more so, what is possible with top success rates, the highest percentage of faultless transmissions and the shortest of pre-transmission delays.

Smartphones on motorways

Motorway tests are of course tougher by nature. However, Swisscom seemed undaunted and delivered a 97.1 percent success rate for downloading websites, tailed by Orange with a very respectable 94.6 percent. More astonishing is the fact that in a space of 42 seconds, neither took scarcely any longer to download the four websites on the motorway than in the city. By contrast, Sunrise was ten percent behind both in error rates and loading time, again reaping third place. This also applied to file downloading, with Orange again scoring on speed and Swisscom on reliability in a close-run race. Swisscom outstripped the competition by far in file uploading, with Sunrise lagging a little behind Orange overall. It was the same story with YouTube – thus ensuring that Swisscom also came out tops in the smartphone data tests.

DATA PER SMARTPHONE

PROVIDER	Swisscom	Orange	Sunrise
DATA PER SMARTPHONE (URBAN & RURAL)			
INTERNET WEBSITE ACCESSING			
Success rate (%)	99.2	98.4	96.6
Session time websites 1–4 (s)	39.2	41.6	49.6
FILE DOWNLOAD			
Success rate	100.0	99.7	98.7
Average session period (3 MB) / data rate (TE*) (s/kbit/s)	15.4/1614	14.1/1788	19.4/1288
90% faster than (kbit/s)	868	1092	708
FILE UPLOAD			
Success rate (%)	99.7	99.0	98.7
Average session period (1 MB) / data rate (TE*) (s/kbit/s)	8.3/1005	11.7/714	14.7/565
90% faster than (kbit/s)	633	280	324
YouTube (SD)			
Success rate (%)	94.1	96.4	87.9
Uninterrupted quota / start time (%/s)	93.3/6.3	96/6.1	86.4/8.2
DATA PER SMARTPHONE (MOTORWAY)			
INTERNET WEBSITE ACCESSING			
Success rate (%)	97.1	94.6	86.6
Session time websites 1–4 (s)	41.7	41.6	54.0
FILE DOWNLOAD			
Success rate	99.6	97.3	95.8
Average session period (3 MB) / data rate (TE*) (s/kbit/s)	19.7/1260	14.8/1701	24.2/1036
90% faster than (kbit/s)	653	979	536
FILE UPLOAD			
Success rate (%)	99.6	96.9	96.1
Average session period (1 MB) / data rate (TE*) (s/kbit/s)	11.9/701	12.2/683	20.5/404
90% faster than (kbit/s)	647	265	161
YOUTUBE (SD)			
Success rate (%)	92.5	89.6	82.7
Uninterrupted quota / start time (%/s)	91/8	88.4/7.2	82.3/10.2

* Time Equivalent

Data per notebook

Notebooks with data sticks can cause a gridlock on mobile networks. Which network operator can beat the strain test?

You need a latest generation USB data stick and the network's dashboard software to test the true capabilities of a mobile network. You also need a powerful computer. Using industrial computers configured according to these specifications, the second P3 communications test vehicle sought out fairly populous areas in the target region for its stationary one-hour tests.

Urban mobile broadband

The impact this test set-up and the stationary test locations had on performance compared to the smartphone tests is already demonstrated by the results of the standardised web browsing session accessing the four websites. Instead of around 40 seconds Swisscom took 13.5 seconds, just a little over a third of the time. At 98.8 to 99.2 percent for smartphones the success rate remained pretty stable. Sunrise ranks as a runner-up with a 1.4 percent higher error rate and 50 percent longer loading times. Although not much slower, Orange notches up one percent more errors.

Swisscom leads the way once more in file downloading, although it can't compete with German and Austrian performances in this category. Thanks to large-scale Dual Carrier HSDPA expansion, Orange has a considerable edge over Sunrise after its lapse

on Internet website retrieval. Although you can actually download files in a reasonable space of time at the speeds offered by Sunrise, reliability could have been better occasionally. This is even truer in the case of file uploading where Sunrise is struggling with low speeds and high error rates. The latter is also due to Sunrise exceeding the maximum permissible upload time (see *connect* 12/12, page 24).

Orange doesn't fare any better, all things considered. Although basically good, data rates are impaired by other measurements not taken into account. Swisscom alone combines low error rates and fast upload times to achieve a good overall upload performance. Swiss network operators have no trouble with YouTube in standard definition, however when it comes to high definition, only Swisscom is satisfactory; given the faults and interruptions with Orange and Sunrise, the term enjoyment can scarcely be applied to their video experience.

Broadband on the motorway

Overall the data speeds offered by Swisscom on motorways are absolutely acceptable. Close behind, Orange is also very good on downloads, although an increased error rate clouds its upload performance. In all, both supply the necessary efficiency for business customers, while Sunrise is far off the mark.

DATA PER NOTEBOOK

PROVIDER	Swisscom	Orange	Sunrise
DATA PER MOBILE BROADBAND (URBAN & RURAL)			
INTERNET WEBSITE ACCESSING			
Success rate (%)	98.8	96.5	97.4
Session time websites 1-4 (s)	13.5	19.8	19.4
FILE DOWNLOAD			
Success rate (%)	99.5	98.8	93.8
Average session period (10 MB) / data rate (TE*) (s/kbit/s)	16/5158	19/4350	28/2961
90% faster than (kbit/s)	2989	2657	1630
FILE UPLOAD			
Success rate (%)	97.5	87.1	88.9
Average session period (5 MB) / data rate (TE*) (s/kbit/s)	26.8/1540	27.1/1521	50.6/813
90% faster than (kbit/s)	699	1019	427
YOUTUBE SD			
Success rate (%)	97.8	98.1	97.3
Uninterrupted quota / start time (%/s)	96.8/2.5	97.1/2.9	94.3/2.8
YOUTUBE HD			
Success rate (%)	89.2	84.1	64.8
Uninterrupted quota / start time (%/s)	84.3/2.8	74.9/3.2	53.8/3.4
DATA PER MOBILE BROADBAND (MOTORWAY)			
DOWNLOAD			
Mean data rate (kbit/s)	5650	4038	2943
90% faster than (kbit/s)	1366	1056	322
UPLOAD			
Success rate (%)	98.2	96.1	95.0
Mean data rate (TE*)	1046	1062	409
90% faster than (kbit/s)	566	693	183

Network operators



swisscom

Another impressive display of its superiority by Swisscom in 2012.

Once more it ranks foremost among the Swiss network operators, only having to admit defeat to Orange in a close-run match for telephony in the towns. Although motorway telephony could have been better, Swisscom is undisputedly the best in Switzerland. And, as far as data transfer is concerned, the market leader is streets ahead – no matter where, in the city or on the motorway, and no matter how, smartphone or surf stick. Swisscom is the outright winner of the Swiss Network Test 2012.



Orange has been steadily improving since 2010, in 2012 the network operator came dangerously close to Swisscom in places.

Interestingly, although ahead in the cities, Orange is plagued by irksome stability problems on the motorways. Orange's data per smartphone performance in the cities is also very strong, while suffering in comparison to Swisscom from a lack of stability on the motorways; the data stick results paint a similar picture. Orange is a very good network operator for inner-city smartphone usage.



Despite tougher test procedures and stiffer standards, Sunrise bettered its 2011 results in 2012, although not enough to challenge the competition, which hasn't been idle either.

Sunrise telephony displays a higher error rate and slightly poorer sound. The provider did well in the data per smartphone category. However, its shortcomings resurfaced on the motorways and with the more demanding use of data sticks. Nonetheless, thanks to its chosen expansion strategy, Sunrise seems to have the potential to take a big step forward in the upcoming year.

Comparing routes and countries

Where the Swiss tests were conducted, and which of the three countries does best.

Like the network tests in Austria and Germany (www.connect.de/netztest) the two test vehicles went their separate ways in Switzerland to call at a large number of cities grouped per region.

Route details

The test plan included eleven cities of different sizes. The cities scrutinised particularly closely by the vehicles in alphabetical order: Basel, Bern, Biel, Geneva, Lausanne, Lugano, Lucerne, Schaffhausen, St. Gallen, Winterthur and Zurich. The first vehicle equipped exclusively with smartphones followed a fixed route through the city. The second vehicle with data sticks headed for busy well-served spots to test resources, albeit competing for them with other users. The vehicles took different routes over the motorways as far as possible when moving between cities and motorways.

Country comparison

The network tests in Germany, Austria and Switzerland were all based on the same lines. However, looking at the country comparison, aside from network expansion, you cannot fail to notice the influence of rival connection standards like DSL at least in some cases, and widely differing geographical circumstances. So it is perhaps due to the lesser presence of DSL that three Austrian network operators, Drei (Hutchison 3G), A1 Telekom Austria and Telekom Austria were all awarded the coveted “very good” in the network test, while only one provider respectively in Germany and Switzerland, Deutsche Telekom and Swisscom, succeeded in doing so although the same yardstick was applied.

NETWORK TEST RESULTS

PROVIDER	SWITZERLAND			GERMANY				AUSTRIA			
	Swisscom	Orange Switzerland	Sunrise	Telekom Germany	Vodafone	O2	E-Plus	Hutchison 3G	A1 Telekom Austria	T-Mobile Austria	Orange Austria
Smartphone telephony max. 170	137	138	115	143	121	133	114	146	143	148	135
Urban and rural	84%	88%	71%	87%	75%	84%	73%	86%	84%	90%	81%
Motorway mix	72%	66%	59%	77%	62%	65%	55%	85%	84%	81%	75%
Smartphone data (urban and rural) max. 140	130	127	111	129	128	119	108	135	134	139	125
Internet website access	94%	91%	81%	89%	92%	80%	83%	97%	96%	91%	89%
File download	99%	98%	90%	98%	95%	95%	88%	98%	94%	99%	94%
File upload	96%	89%	88%	97%	97%	85%	87%	98%	97%	95%	94%
YouTube	80%	87%	57%	87%	81%	85%	46%	95%	97%	83%	79%
Smartphone data (motorway) max. 30	27	26	22	25	24	20	20	30	28	22	22
Internet website access	93%	88%	72%	85%	82%	61%	71%	98%	91%	83%	76%
File download	95%	93%	87%	93%	87%	77%	73%	100%	93%	83%	77%
File upload	97%	87%	83%	93%	80%	67%	75%	98%	93%	83%	73%
YouTube	78%	78%	58%	57%	62%	62%	45%	98%	92%	33%	68%
Mobile broadband (urban and rural) max. 130	119	101	91	117	106	91	79	127	127	121	114
Internet website access	95%	82%	86%	93%	74%	82%	72%	99%	98%	96%	93%
File download	95%	92%	62%	88%	89%	76%	55%	98%	98%	89%	85%
File upload	84%	48%	37%	87%	85%	61%	42%	98%	97%	94%	93%
YouTube SD	94%	95%	91%	95%	93%	54%	72%	99%	99%	94%	87%
YouTube HD	70%	53%	38%	68%	62%	37%	37%	87%	95%	85%	40%
Mobile broadband (motorway) max. 30	27	25	17	27	18	18	13	27	26	19	18
File download	93%	90%	75%	100%	81%	77%	70%	100%	99%	79%	77%
File upload	83%	74%	38%	78%	38%	40%	15%	83%	77%	47%	43%
VERDICT max. 500	440 very good	417 good	356 satisfact.	441 very good	397 good	381 good	334 satisfact.	466 very good	458 very good	439 very good	414 good

Conclusion

Bernd Theiss, *connect* editor

Swisscom is again the outright winner in Switzerland. Congratulations. However, it is no longer the undisputed victor, Orange has been catching up steadily since 2010. For the first time, for instance, Orange even managed to beat Swisscom in urban voice telephony, although when we look at transfer routes that are difficult to cover, Switzerland's No. 1 comes into its own. Orange is also a close runner in data transfer per smartphone, however in close comparison Swisscom is that vital bit better. Sunrise is still in the process of transforming the network which might make it a serious contender for Swisscom and Orange next year.

In comparison to Switzerland, Germany doesn't shape up too badly at all this year. In the country comparison Deutsche Telekom actually takes the lead a point ahead of Swisscom, although overall the Swiss network operator puts up a more convincing performance. This, of course, applies all the more to the Austrian network operators, two of whom rank higher than Germany's No. 1, and the third just two points behind, while even the last one still rates "good". Customers in Switzerland and Germany can still only dream of such a good selection of mobile networks.

However, the situation may be entirely different next year, for at least Vodafone and Telekom will already be offering the LTE mobile telephony standard widely in Germany. By contrast, the Swiss will be hard put to do so as they are still in the trial phase, and in Austria the all-important 800 MHz bandwidths still have to be auctioned off.