TUTELA

DACH

State of Mobile Experience

Analysts

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Annual Report

APRIL 2021

www.tutela.com

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Introduction

While the pandemic may have forced us all indoors for the past year and onto our phones, tablets, and computers for connectivity to the world, mobile operators in the DACH region pushed forward to continue providing the best mobile experience they can to their users.

5G continues to progress well in the region, with A1 Austria recently awarding Nokia with a contract to provide the country with this new coverage[1]. In Germany, while Vodafone recently upgraded 1000 of its sites to 5G standalone (SA) network in 170 cities and municipalities through its 3.5 GHz spectrum[2], Telefonica expanded its 5G coverage to over 30 cities using 3.6 GHz spectrum exclusively, aiming to cover 30% of the population by the end of 2021[3].

[1] Telecompaper, A1 Austria awards 5G core, radio contract to Nokia https://www.telecompaper.com/news/a1-austria-awards-5g-core-radio-contract-to-nokia--1372909

[2] RCRWireless, Vodafone activates 5G SA network in Germany https://www.rcrwireless.com/20210413/carriers/vodafone-activates-5g-sa-network-in-germany

[3] Telecompaper, Telefonica Germany brings 5G to 30 cities, plans to cover 30% of population this year https://www.telecompaper.com/news/telefonica-germany-brings-5g-to-30-cities-plans-to-cover-30-of-population-this-year--1377573

Telekom's 5G network already covers 80% of the German population and plans to reach 90% coverage by the end of the year[4]. As a way to make sure German mobile users are ready for the 3G sunsetting scheduled for end of 2021[5], the likes of Telefonica Germany are offering smartphone deals to its customers that may still be relying on 3G[6]. Telekom on the other hand, expanded 4G coverage by building LTE capacities at 1,690 locations as well as installing new LTE sites at 464 locations[7]. Telekom and Telefonica also signed a letter of intent for an infrastructure sharing deal to improve 4G coverage in less visited areas called "gray spots"[8]. In the 5G era, it's a positive sign that operators are also taking efforts to strengthen and expand their LTE network coverage especially when a large number of the subscribers are still dependent on 4G as outlined further in the report. It will be interesting to see how these initiatives impact actual subscriber experience in the future.

In order to benchmark mobile experience over the last six months, Tutela has evaluated over 12 million speed and latency tests, conducted on the smartphones of real-world users of national mobile operators within Common Coverage Areas, between October 1st, 2020 and March 31st, 2021.

[4] RCR Wireless, Deutsche Telekom to cover 90% of German population with 5G this year
https://www.rcrwireless.com/20210326/5g/deutsche-telekom-to-cover-90-percent-of-german-population-with-5g-this-year

[5] Telecompaper, Telefonica Germany accelerates 3G shutdown to end-2021
https://www.telecompaper.com/news/telefonica-germany-accelerates-3g-shutdown-to-end-2021--1362442

[6] Telecompaper, Telefonica Germany offers smartphone deals to transition to 4G
https://www.telecompaper.com/news/telefonica-germany-offers-smartphone-deals-to-transition-to-4g--1378621

[7] RCR Wireless, Deutsche Telekom builds up 5G capacities at 892 sites in two months
https://www.rcrwireless.com/20210312/carriers/deutsche-telekom-builds-up-5g-capacities-892-sites-two-months

[8] Telekom, Deutsche Telekom and Telefónica share network infrastructure to enhance network coverage
https://www.telekom.com/en/media/media-information/archive/cooperation-deutsche-telekom-and-telefonica-616090

Key findings

- Users in Switzerland benefit from having the best mobile experience in the DACH region, with the country having both the fastest download and upload speeds, and the most responsive network. Switzerland and Austria statistically tied for both the highest Excellent and Core Consistent Quality in the region. In Tutela's latest Global Mobile Experience report[9], Austria and Switzerland made it into the top 10 countries with the highest Excellent Consistent Quality, while Germany was 37th. At an operator-level in Switzerland, Swisscom dominated in all six metrics tested - including the highest Excellent Consistent Quality at 90.1%.

- A1 in Austria and Telekom in Germany also dominated in all six of their metrics tested - where A1 had the highest Excellent Consistent Quality at 90%, and Telekom had the highest Excellent Consistent Quality at 84.3%.

- While subscribers in all three countries spend the majority of their time connected to 4G, Swiss users on two out of three operator's networks spend more than 90% of their time on 4G. This is reflected in results for all the KPIs where Switzerland is either the leader or has tied with another operator for first place. In other countries in the DACH region, steps are being taken to improve 4G connectivity, for example, in Germany, operators have undertaken initiatives like active network sharing to close 4G coverage gaps in less visited areas[10].

"Swiss users on two out of three operator's networks spend more than 90% of their time on 4G."

[9] Tutela, Global Mobile Experience https://www.tutela.com/blog/global-mobile-experience-2020

[10] Telekom, Deutsche Telekom and Telefónica share network infrastructure to enhance network coverage https://www.telekom.com/en/media/media-information/archive/cooperation-deutsche-telekom-and-telefonica-616090

Results overview

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Mobile experience results

Austria, April 2021

	A1	3	Magenta
Excellent Consistent Quality	★ Winner		
Core Consistent Quality	★ Winner		
Download throughput	★ Winner		
Upload throughput	★ Winner		
Latency	★ Winner		
Coverage	★ Winner		

Results from over 12 million speed and latency tests within Common Coverage Areas, between October 1st 2020 and March 31st, 2021.

"A1 delivered the highest percentage of Excellent Consistent Quality in Tutela's tests"

TUTELA
Best Mobile Network Experience
APRIL 2021

Based on the highest Excellent Consistent Quality in Common Coverage Areas.

Results overview

TUTELA

Mobile experience results

Germany, April 2021

	T		O2
Excellent Consistent Quality	★ Winner		
Core Consistent Quality	★ Winner		
Download throughput	★ Winner		
Upload throughput	★ Winner		
Latency	★ Winner		
Coverage	★ Winner		

Results from over 12 million speed and latency tests within Common Coverage Areas, between October 1st 2020 and March 31st, 2021.

"Telekom delivered the highest percentage of Excellent Consistent Quality in Tutela's tests"

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Results overview

TUTELA

Mobile experience results

Switzerland, April 2021

	swisscom	Salt.	Sunrise
Excellent Consistent Quality	★ Winner		
Core Consistent Quality	★ Winner		
Download throughput	★ Winner		
Upload throughput	★ Winner		
Latency	★ Winner		
Coverage	★ Winner		

Results from over 12 million speed and latency tests within Common Coverage Areas, between October 1st 2020 and March 31st, 2021.

"Swisscom delivered the highest percentage of Excellent Consistent Quality in Tutela's tests"

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Best Mobile Network Experience
APRIL 2021

Based on the highest Excellent Consistent Quality in Common Coverage Areas.

Understanding this report

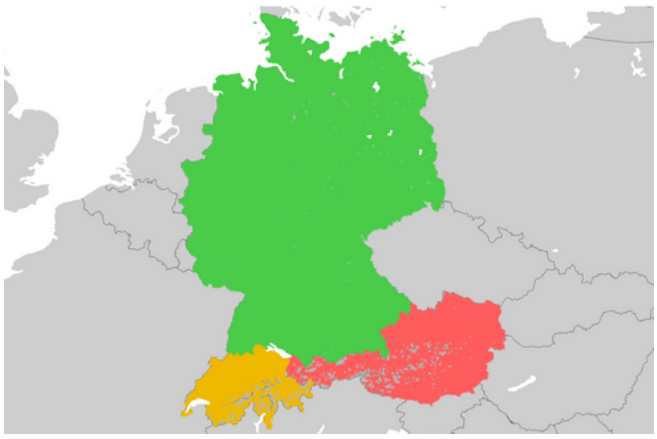
Tutela uses two key methodological components to best compare user experience across operators: Consistent Quality and Common Coverage Areas. Consistent Quality is a set of metrics that Tutela has developed to objectively evaluate when connections networks are (and are not) enabling users to do almost everything that they want to do on their smartphones.

To best serve Tutela's goal to accurately measure and represent the real-world, end-to-end experience of actual users, our methodology is subject to ongoing improvements, which allow us to update the methodology in line with changes in network technology, measurement capabilities, and the realities of how people use their smartphones. As of this report, the methodology includes an updated version of Consistent Quality that better accounts for reliability, an area-based Coverage Score, a more granular Common Coverage Areas definition, and the separation out of users on MVNO or flanker brands. As a result, changes in the numeric values in this report compared to the previous year are not necessarily representative of year-on-year changes in the end-to-end user experience.

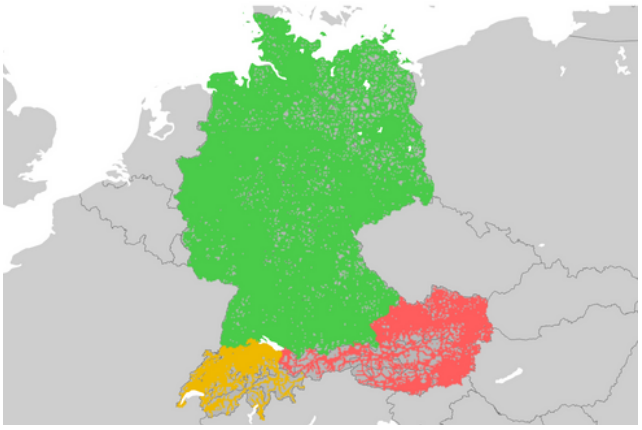
The methodology is covered in detail at the end of this report and on our website, but simply put, there are two sets of thresholds, Excellent and Core. A connection that hits the Excellent threshold is sufficient for use-cases like 1080p video streaming or multiplayer gaming, while a Core connection will stream standard-definition video or handle things like web browsing or uploading photos to social media. The percentages you see in this report represent the percentage of tests on a given operator that were above the Excellent or Core thresholds.

Common Coverage Areas are parts of the country where all national operators offer service, either on their own network or through a domestic roaming agreement. Comparing performance within common coverage areas ensures that user experience is being compared in places where networks are competing head-to-head, and ensures that operators with more diverse coverage are not being penalized. In this report, all performance metrics are taken from tests conducted in Common Coverage Areas only.

Measurement locations

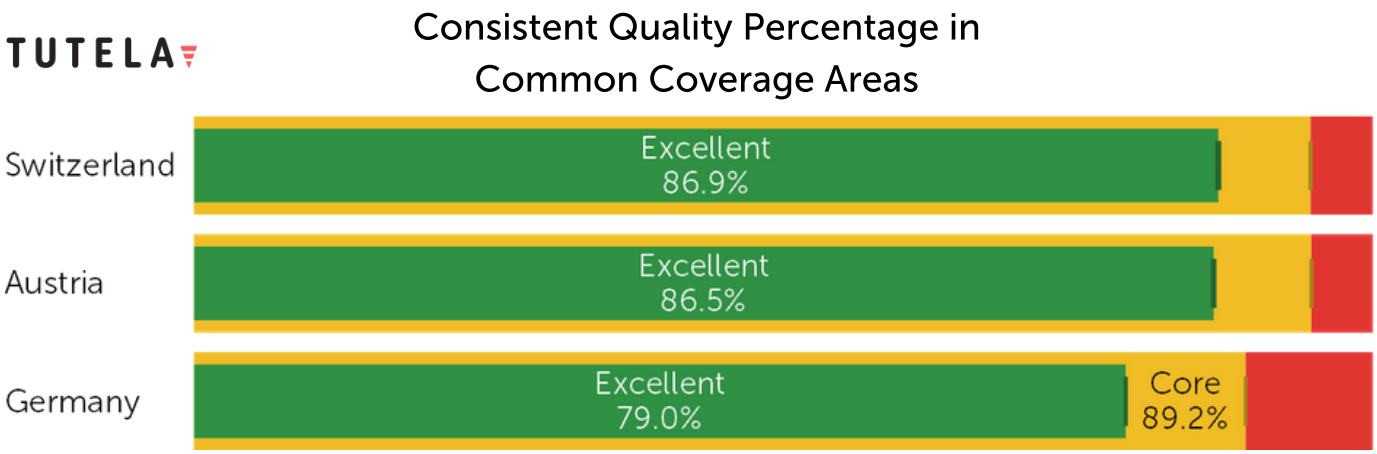


Common Coverage Areas



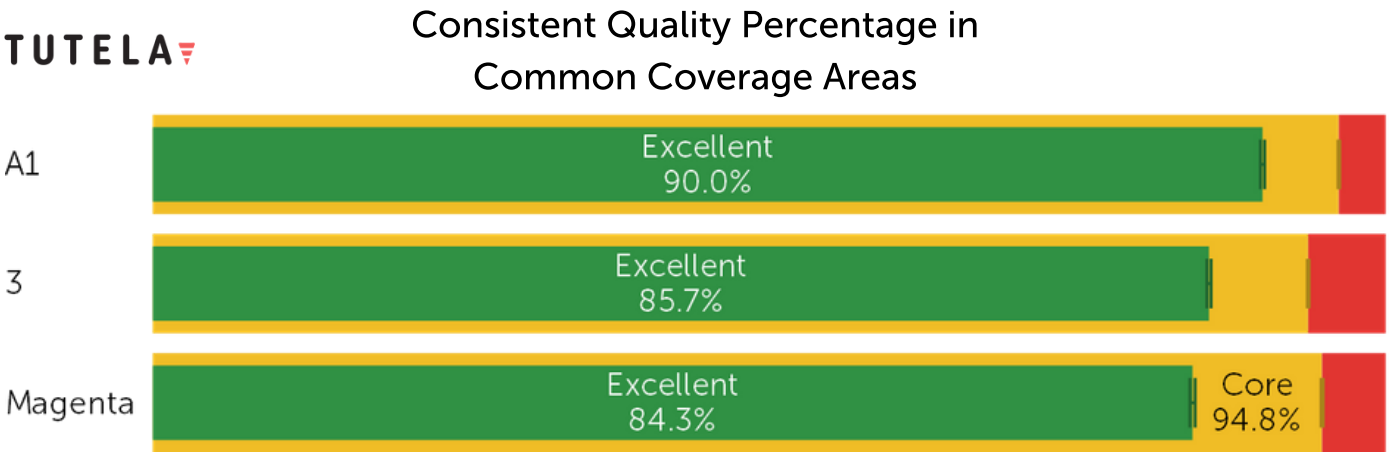
Consistent Quality

Switzerland and Austria were statistically tied for highest Excellent Consistent Quality in the DACH region, with over 86% of connections from subscribers on the main providers in each country having a network experience suitable for use-cases like 1080p video streaming, real-time mobile gaming or HD video calling. Germany was further back with an Excellent Consistent Quality of 79.0% and also behind in Core Consistent Quality with 10.8% of measurements not meeting the lower threshold. Germany was not far behind with an Excellent Consistent Quality of 79.0%. For Core Consistent Quality, meaning subscribers having a network connection capable of supporting use-cases like SD video streaming, social media sharing and web browsing, both Switzerland and Austria reached the 90% threshold and were also statistically tied for first place at 94.8%. Germany was again not far behind the two countries in this metric, with a Core Consistent Quality of 89.2%.



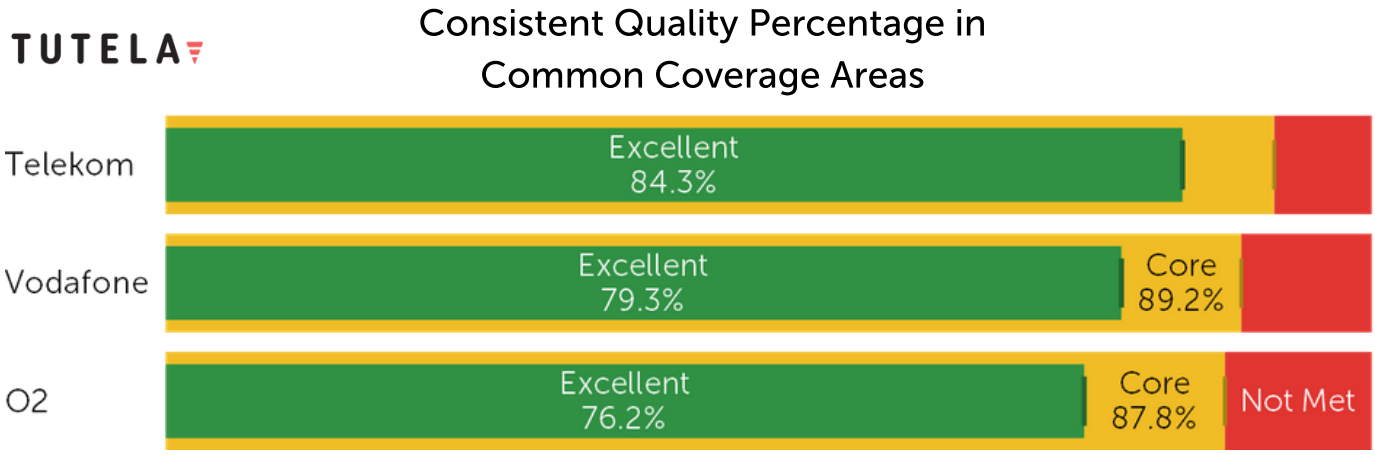
Consistent Quality

In Common Coverage Areas across Austria, A1 was in first place with the highest Excellent Consistent Quality at 90.0%, with 3 in second place by 4.3% and Magenta in third place by 5.7%. In regards to Core Consistent Quality, all operators easily reached the 90% threshold, with A1 out in front with 96.2%. Magenta moved up to second place with a Core Consistent Quality of 94.8%, while 3 was in third place with 93.7%.



Consistent Quality

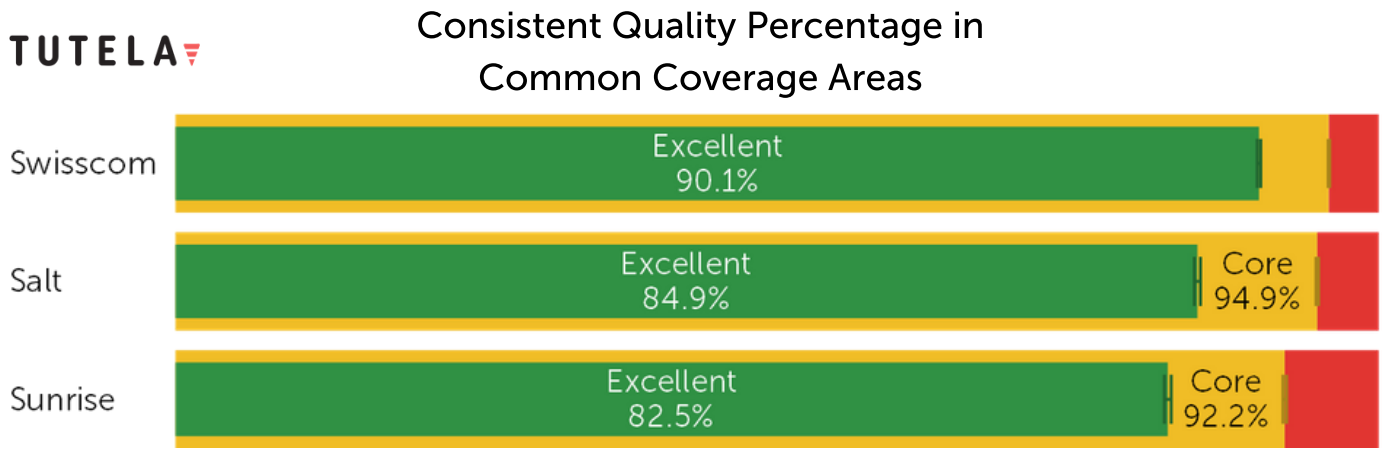
In Common Coverage Areas across Germany, Telekom was in first place with an Excellent Consistent Quality of 84.3%, while Vodafone was in second place with 79.3%. With a difference in performance of 8.1% behind first-place Telekom, O2 was in third place at 76.2%, Telekom was the only operator to reach the 90% threshold for Core Consistent Quality with 91.9%. However, the competition was really tight, with Vodafone in second place with 89.2% and O2 in third place with 87.8%, only 4.1% behind Telekom.



Consistent Quality

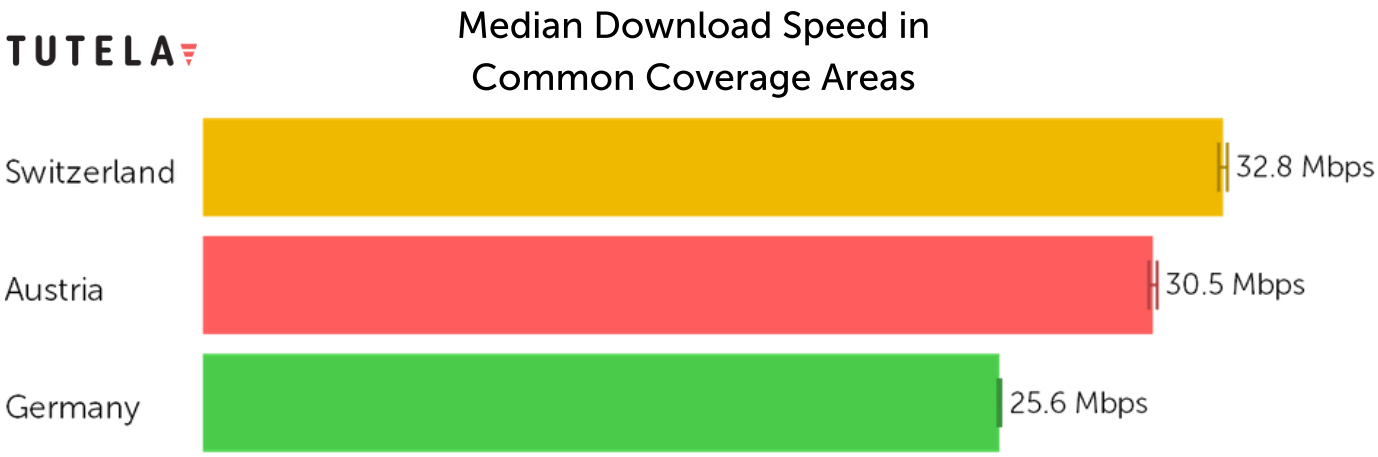
Swisscom was the winner for Excellent Consistent Quality in Common Coverage Areas across Switzerland at 90.1%. With a difference of 5.2%, Salt was in second place with 84.9%, followed by Sunrise at 82.5%.

All three operators reached the 90% threshold for Core Consistent Quality, with Swisscom in front with 95.9%. Salt was only 1% behind Swisscom, while Sunrise was in third place with 92.2%.



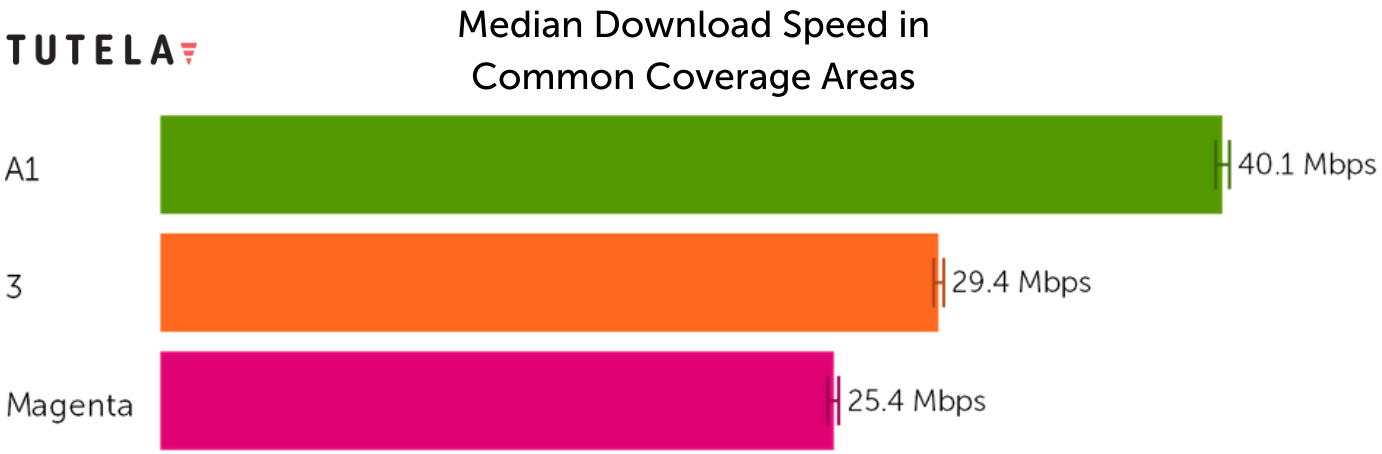
Download throughput

In similar fashion to the Consistent Quality metric with Switzerland and Austria vying for top spot, Switzerland narrowly took the lead over Austria in the download speed test with a median transfer speed of 32.8 Mbps - only 2.3 Mbps faster than Austria and 7.2 Mbps faster than third place Germany.



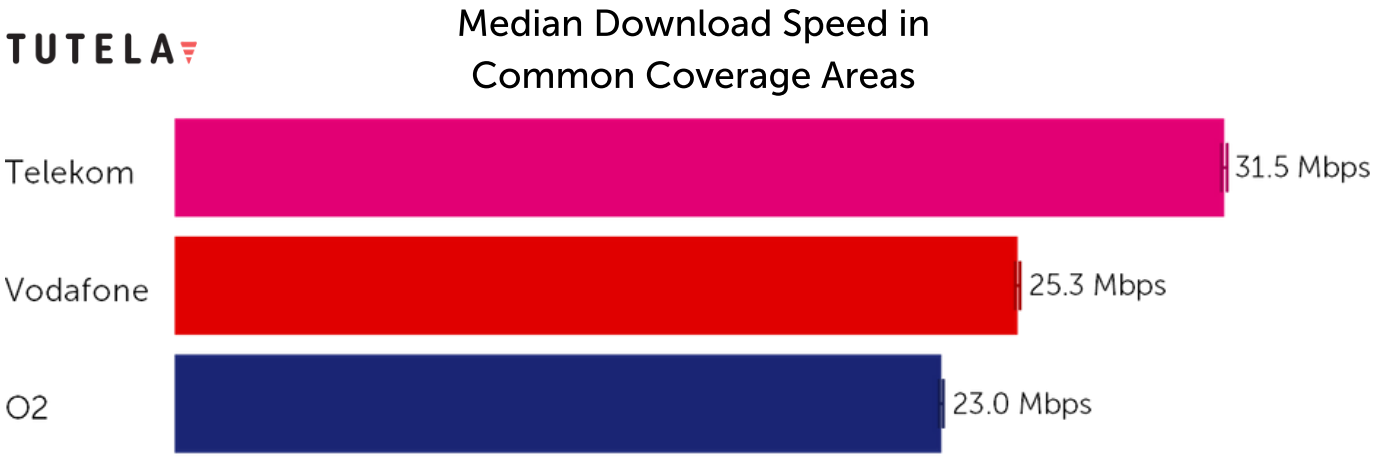
Download throughput

A1 had a clear lead over the other operators in the download speed test, with 10.7 Mbps separating second place 3 from first place A1. Magenta was in third place with a median download speed of 25.4 Mbps, 14.7 Mbps slower than A1.



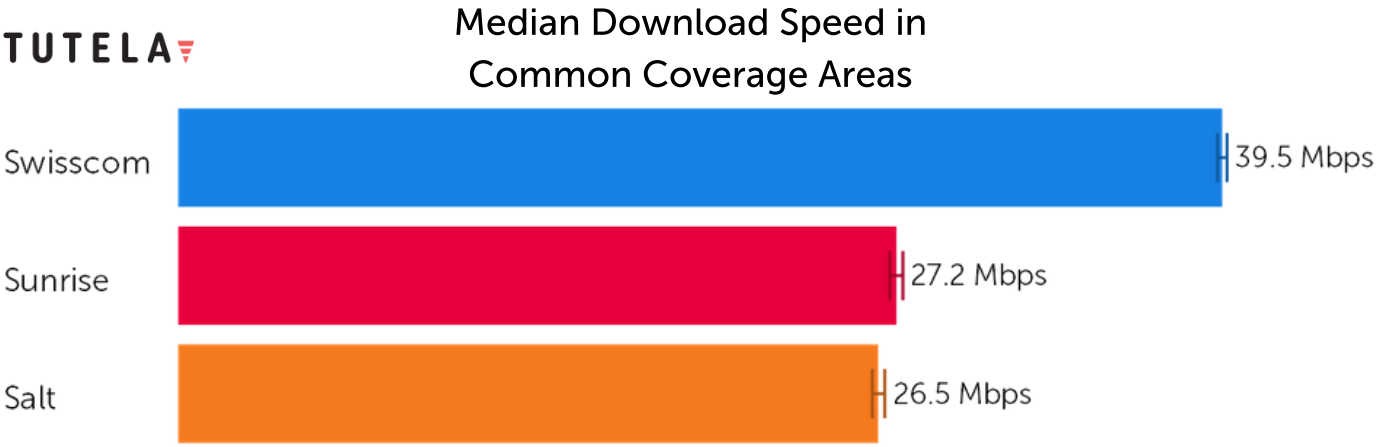
Download throughput

Telekom also found itself in the lead with the fastest median download speeds in Common Coverage Areas across Germany at 31.5 Mbps. Trailing behind by 6.2 Mbps, Vodafone was in second place with 25.3 Mbps, while O2 was hot on its heels with a median transfer speed of 23.0 Mbps.



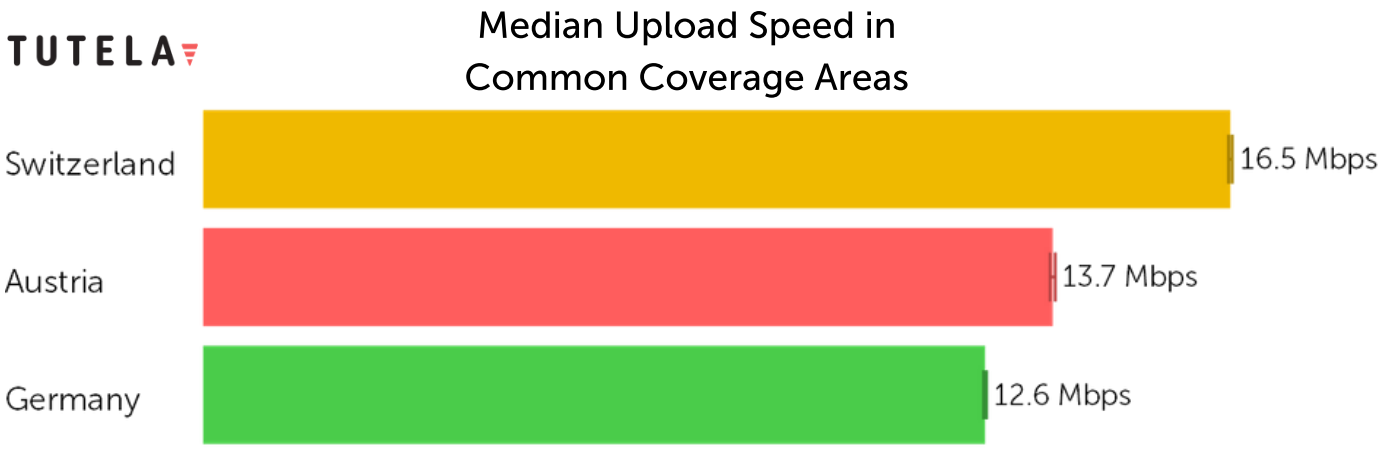
Download throughput

Swisscom dominated in the download speed test by at least 12 Mbps faster than the other operators in Common Coverage Areas across Switzerland at 39.5 Mbps. Sunrise and Salt dueled it out for second place, with Sunrise narrowly taking the spot with a median download speed of 27.2 Mbps, Salt just 0.7 Mbps behind.



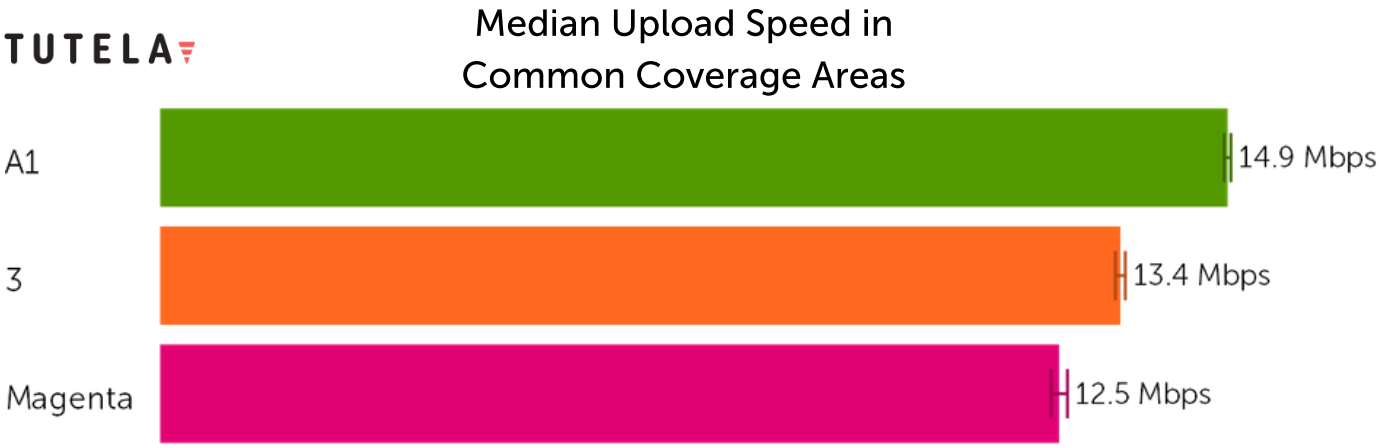
Upload throughput

In the upload speed test, Switzerland was the winner over Austria and Germany in the DACH region, with a median upload speed 2.8 Mbps faster than second place Austria, and 3.9 Mbps faster than third place Germany. Each country performed better in the download speed test than in uploads, with Switzerland's download speeds 16.3 Mbps faster than its uploads. For Austria, its download speeds were 16.8 Mbps faster than uploads, and Germany was 13 Mbps faster in downloads than uploads.



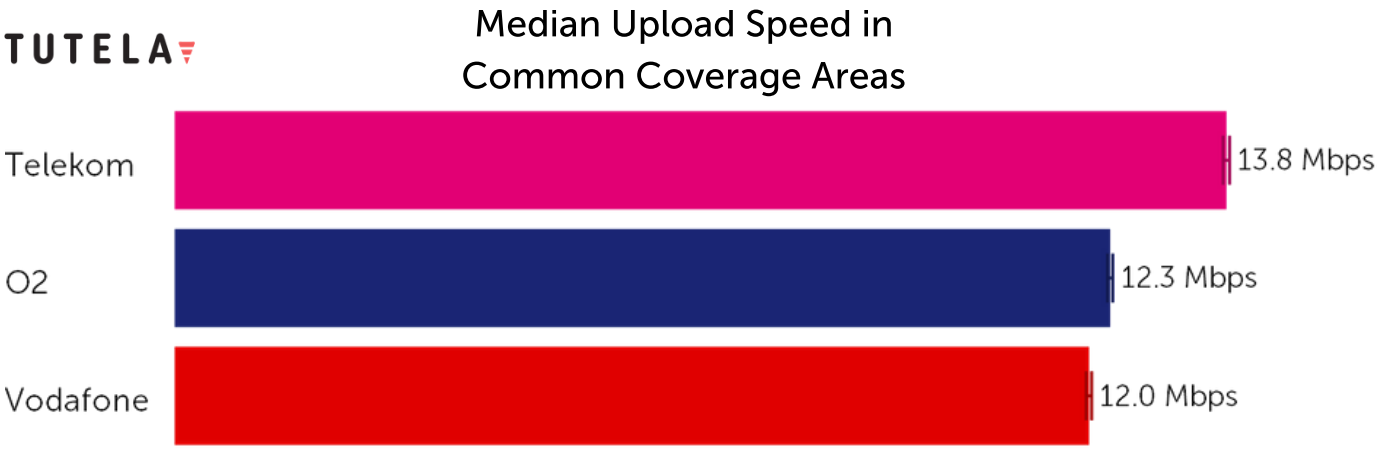
Upload throughput

In Austria, A1 had the fastest upload speeds at 14.9 Mbps. Despite the clear lead the operator had in the download speed test, for uploads 3 was only 1.5 Mbps behind A1, while Magenta was in third place with a median transfer speed of 12.5 Mbps, 2.4 Mbps slower than A1.



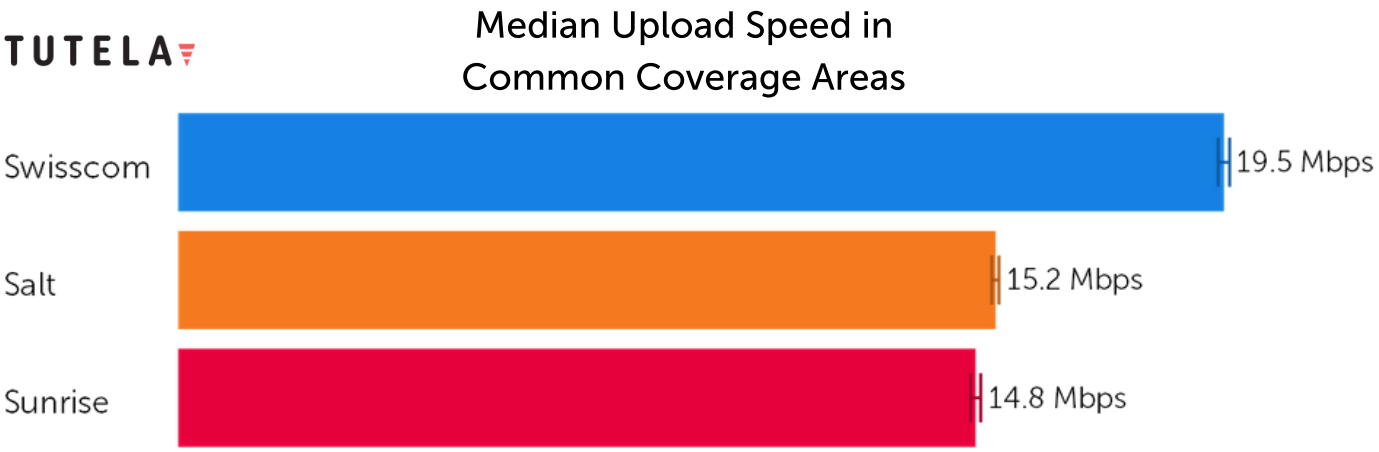
Upload throughput

In Common Coverage Areas across Germany, the competition was incredibly tight in the upload speed test with less than 2 Mbps separating first place Telekom at 13.8 Mbps and last place Vodafone at 12.0 Mbps. There were changes to the rankings, with O2 in second place with a median upload speed of 12.3 Mbps.



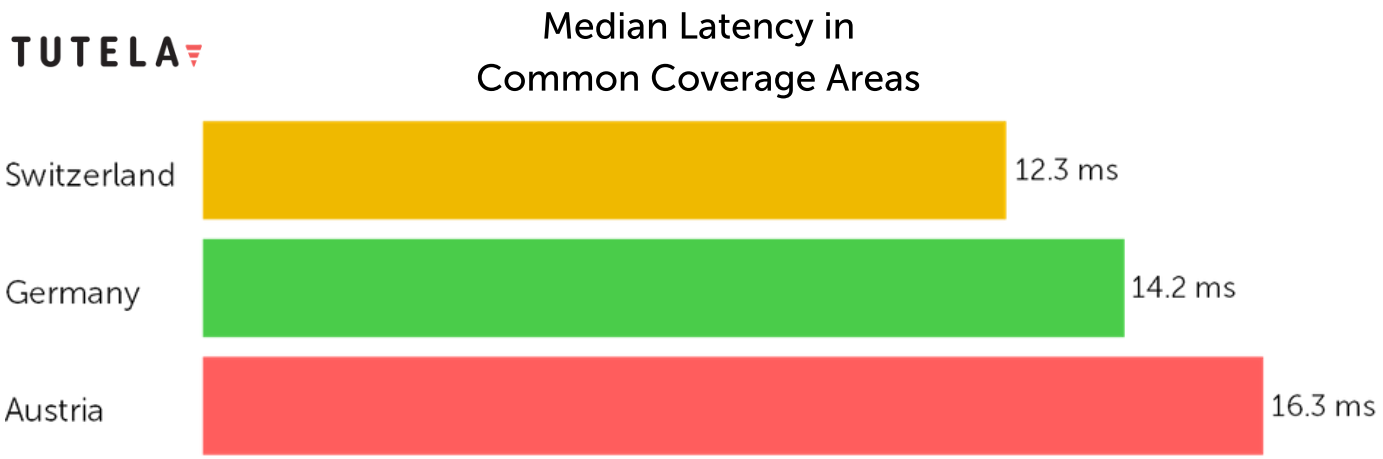
Upload throughput

Swisscom had the fastest upload speeds in Common Coverage Areas across Switzerland at 19.5 Mbps. Salt was 4.3 Mbps slower than Swisscom with a median transfer speed of 15.2 Mbps, followed by Sunrise in third place at 14.8 Mbps.



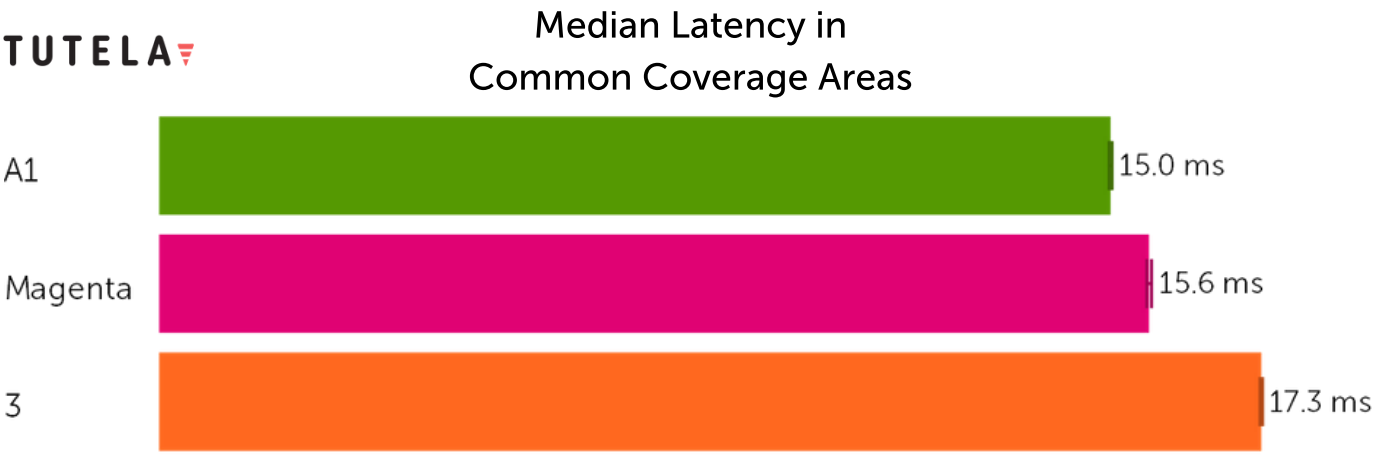
Latency

The trend remained consistent in this category as well with Switzerland in the lead having the lowest median latency of 12.3 ms. Lower latency means a more responsive network that feels 'faster' which is critical for demanding use cases like online gaming and real-time communications. Switzerland was closely followed by Germany with a median latency of 14.2 ms while Austria placed third with the highest one-way latency of 16.3 ms. Despite the difference in network responsiveness between the three countries, in general, all of them have an extremely low latency, much lower than the minimum threshold required to qualify for Tutela's Excellent Consistent Quality metric.



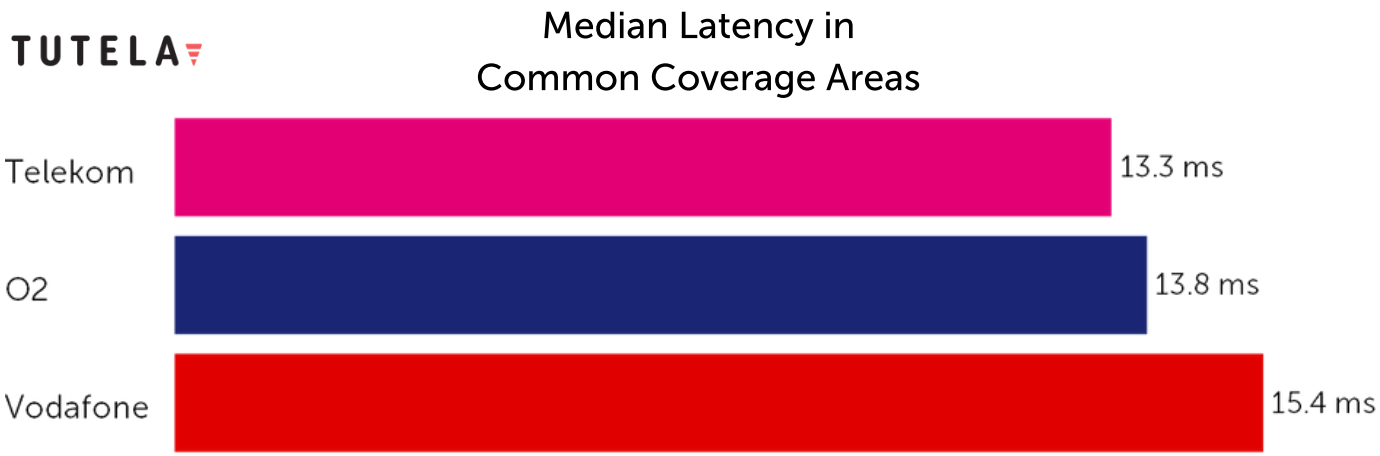
Latency

With a marginal difference between the two, A1 outperformed Magenta with a one-way latency of 15.0 ms while Magenta had a median latency of 15.6 ms and 3 lagged behind with a median latency of 17.3 ms.



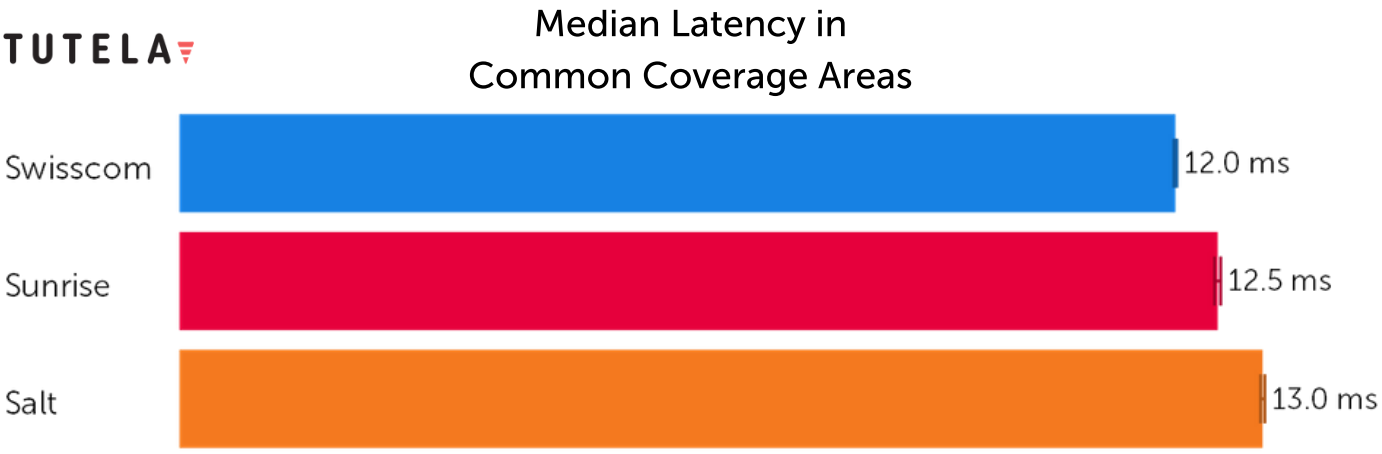
Latency

Telekom outperformed other operators with the best latency of 13.3 ms in Common Coverage Areas across Germany. It was followed very closely by O2 with a median latency of 13.8 ms while Vodafone trailed O2 by about two milliseconds with a one-way latency of 15.4 ms.



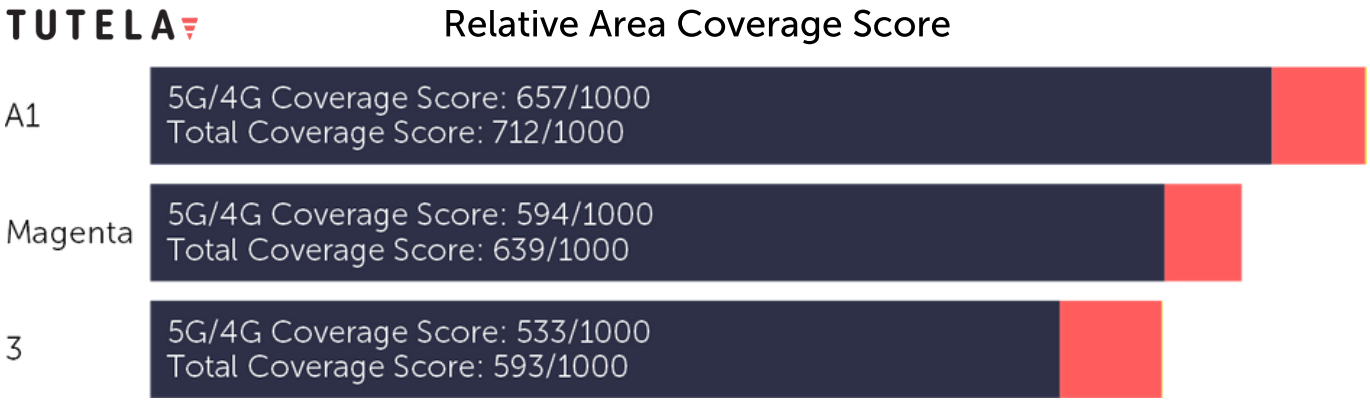
Latency

In Common Coverage Areas across Switzerland, the gap between operators was marginal with only a 0.5 milliseconds difference between each operator. Swisscom again topped the leaderboard in this category with a median latency of 12 ms followed by Sunrise with a latency of 12.5 ms and Salt in the third place with a median latency of 13 ms.



Coverage

In Tutela's newest metric, A1 demonstrated the greatest relative area coverage across Austria for both 5G/4G combined coverage and total coverage. The operator achieved a 5G/4G coverage score of 657, and total coverage score of 712. There was a 63 point difference between A1 and second place Magenta for 5G/4G coverage, while third place 3 had a 5G/4G coverage score of 533, 124 points behind A1. For total coverage, Magenta was in second place with a score of 639, while 3 was in third place with a score of 593, a 119 point difference. The difference between Magenta and 3 was much smaller, with only 46 points separating the two.



Tutela measures relative coverage between providers in a country by looking at the geographic area that an operator's subscribers have seen coverage, compared to the total area of the country where the subscribers of any operator can get a mobile connection. The geographic area covered by each operator, relative to the total covered area of the country, is presented as a score out of 1,000.

Tutela measures this coverage from the perspective of end users – that is to say, inclusive of times when coverage is provided as part of a domestic roaming agreement or shared infrastructure program. An equal number of representative samples are considered from each operator in a country to determine coverage. Coverage is assessed over the preceding 12 months to ensure any effects of seasonality are appropriately included.

Coverage

In Germany, Telekom demonstrated the greatest relative area coverage for both 5G/4G at 706 points, and total coverage at 744 points; only 38 points separating the two, showing Telekom's efforts in upgrading the country to the latest technology. Vodafone was in second place for 5G/4G with a coverage score of 638, 68 points behind Telekom, while O2 had a 5G/4G coverage score of 568, 138 points behind Telekom. For total coverage, Vodafone was in second place with only 72 points separating the operator from first place. O2 was 122 points behind Telekom but only 50 points behind Vodafone.

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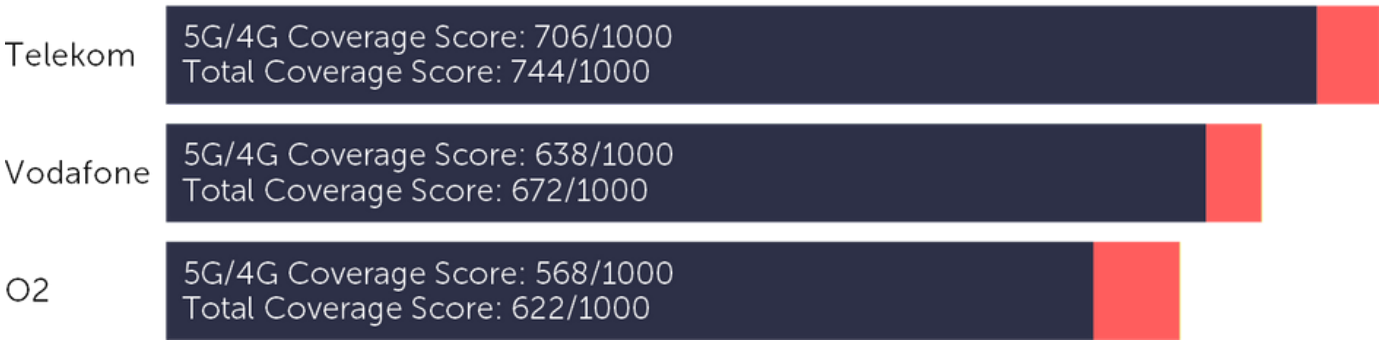
Relative Area Coverage Score



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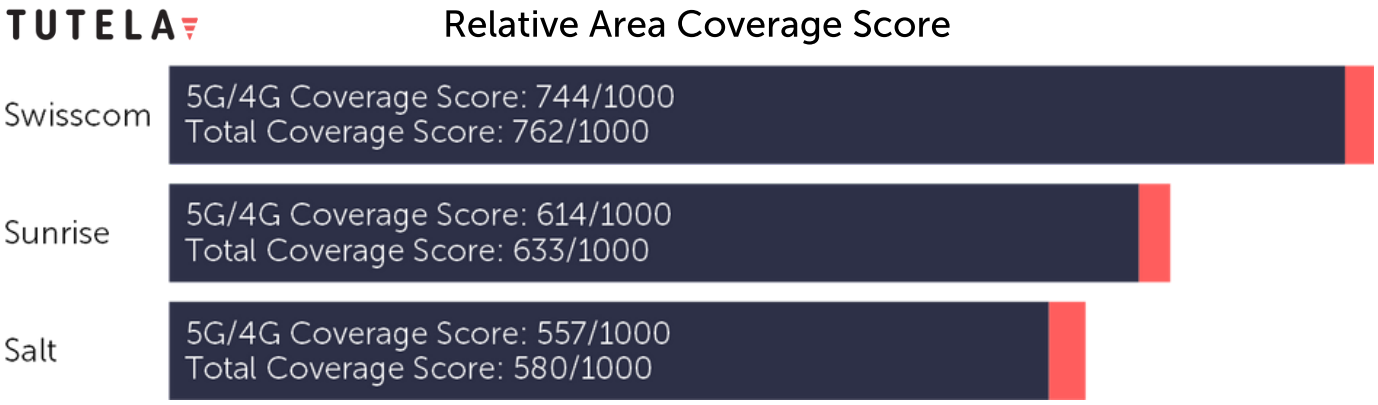
Coverage

In Switzerland, Swisscom had the greatest relative area coverage for both 5G/4G as well as total coverage at 744 and 762 points. Sunrise was in second place with a 5G/4G coverage score of 614, 130 points behind Swisscom, while Salt was in third place at a score of 557, lagging Swisscom by 187 points, but only 57 points separating it from Sunrise. Sunrise also placed second for total coverage with a score of 633, 129 points behind Swisscom. Salt placed third with a total coverage score of 580, 182 points behind Swisscom and merely 53 points behind Sunrise.



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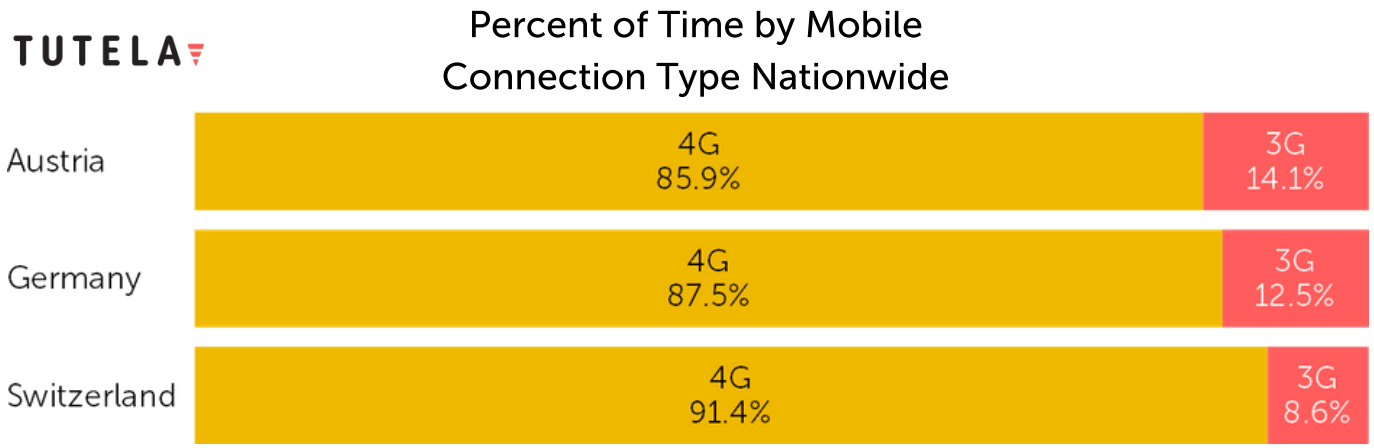
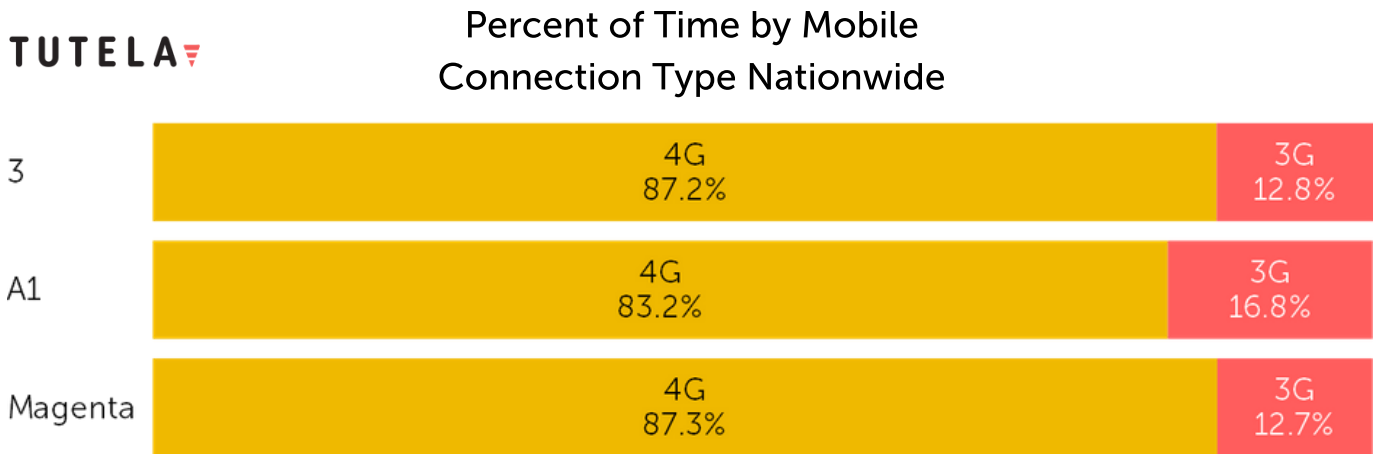
Technology usage

Switzerland had the highest proportion of time users spent connected to 4G at 91.4% followed by Germany at 87.5% which has improved over time. German operators have implemented initiatives that have helped improve 4G coverage such as building capacity through mobile sites and antennas. Austrian users on the main networks spent the least amount of time on 4G with subscribers spending 85.9% of time connected to 4G.



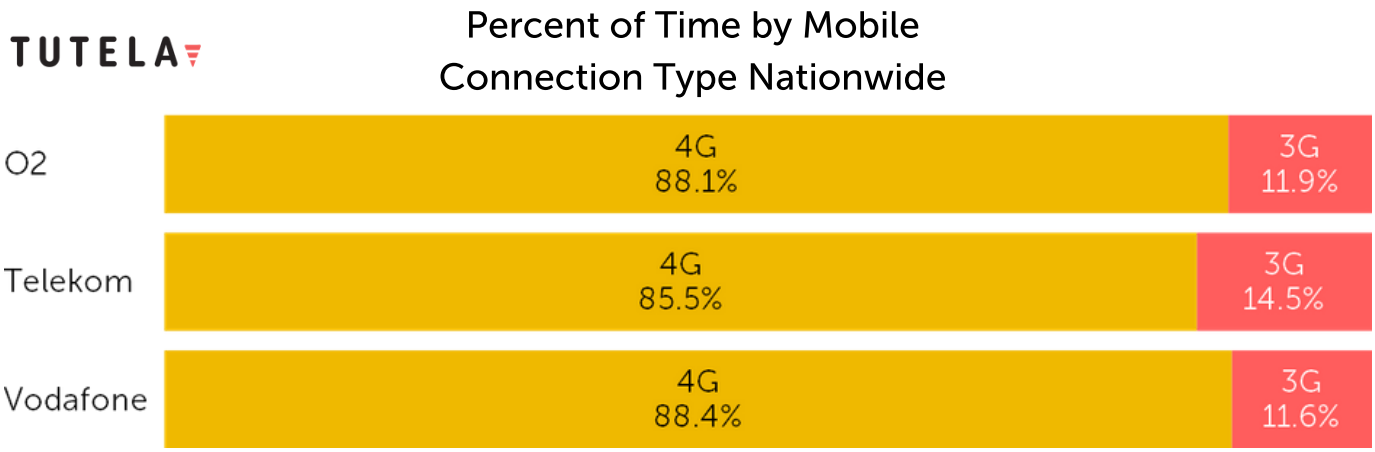
Technology usage

In Austria, subscribers on both Magenta and 3 spent about the same proportion of time on a 4G network at 87.3% and 87.2% respectively. At third place, A1 subscribers spent 83.2% of their time connected to 4G.



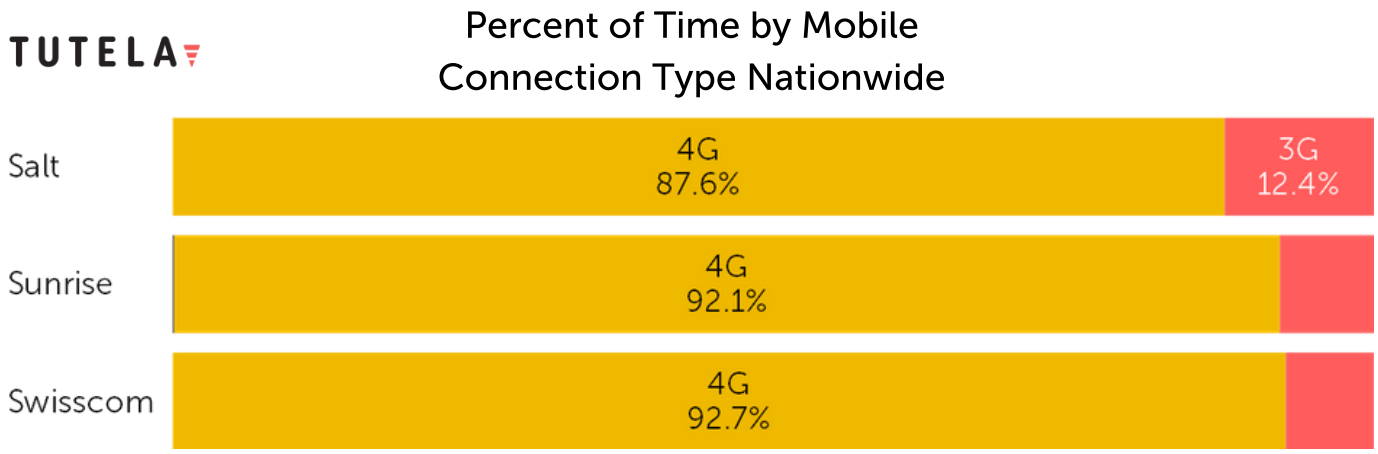
Technology usage

4G usage pattern in Germany is somewhat similar to Austria with users spending a similar proportion of time on 4G for both Vodafone and O2. While Vodafone users spent 88.4% of their time connected to 4G, O2 users spent 88.1% of their time on 4G. Lagging by about three percentage points, Telekom users were connected to 4G 85.5% of the time. The improvement in 4G coverage especially for Telekom has been due to targeted efforts on the operator's part in building capacity as previously outlined in the report.



Technology usage

The majority of Swiss subscribers spent their time connected to 4G with Swisscom and Sunrise users spending about the same proportion of time on 4G at 92.7% and 92.1% respectively. Salt user's spent 87.6% of their time being connected to 4G.



Methodology

Tutela is an independent crowdsourced data company with a global panel of over 300 million smartphone users. We gather information on mobile infrastructure and test wireless experience, helping organizations in the mobile industry to understand and improve the world's networks. Tutela is a member of the Comlinkdata family.

Tutela collects data and runs network tests via software embedded in a diverse range of consumer applications, which enable the measurement of real-world quality of experience for mobile users, 24/7. For this report, Tutela has collected over 12 million speed and latency tests, between October 1st, 2020 and March 31st, 2021.

Tutela measures mobile experience based on the real-world performance of actual network subscribers for a given brand, inclusive of occasions when a network or tariff may be throttled or congested. Results in this report are based on a testing configuration designed to represent the typical (rather than maximum) performance that users experience. We use a 2 MB file to perform our download testing and a 1 MB file to perform our upload testing. Latency performance in this report reflects one-way UDP latency. Tests are conducted against the same content delivery networks that power many of the world's most popular consumer applications and websites, and as such reflect the end-to-end performance of the network.

Consistent Quality

Download speed is most often used as a proxy for network quality, but while download throughput is important, it's just one of several crucial requirements for a "good" connection.

As operators have upgraded 3G networks through to the latest 5G technology, theoretical (and even real-world) peak throughput speeds have increased to where they vastly outstrip the maximum needed for any current use-case. Real-world speeds above 100 Mbps are now common in parts of the world, and with a 4K video stream — which itself is rarely something smartphone users need — using a fifth of that, average download speed has lost some of its relevance as the dominant statistic used to measure the quality of wireless networks.

At its most basic, a good connection is one that doesn't get in the way of users doing what they want to do. In the real world, smartphone users aren't running speed tests all day — they're browsing the web, using apps, voice calling their friends, streaming Netflix and YouTube, or making video calls. To more objectively evaluate when connections are (and are not) enabling users to do those things, Tutela has developed a standard called Consistent Quality.

Simply put, it's two sets of thresholds, called Excellent and Core. If a connection hits the Excellent standard, it's sufficient for the most demanding mobile use-cases, like HD group video calling or 1080p video streaming. A Core connection is good enough for SD video streaming, web browsing, emails, and VOIP calling, but users are more likely to experience delays or buffering when trying to use more demanding apps. Tutela also considers times when a Consistent Quality style test was attempted, but subsequently failed for distinguishable connectivity issues on the download or server response component, towards the total percentage of "failed" tests against both sets of thresholds. Tutela bases the threshold values on the minimum performance requirements published by popular apps. We most recently updated our Consistent Quality thresholds on September 1st, 2020. Tutela's consistent quality metric, as used in our reports, simply measures the percentage of time that users can hit the thresholds. The higher the number, the more often users have a Core or Excellent quality connection.

Excellent Quality

KPI	Download throughput	Upload throughput	Latency	Jitter	Packet loss	Time to first byte
Minimum acceptable value	5 Mbps	1.5 Mbps	50 ms	30 ms	1%	3.2 s

Core Quality

KPI	Download throughput	Upload throughput	Latency	Jitter	Packet loss	Time to first byte
Minimum acceptable value	1.5 Mbps	500 Kbps	100 ms	50 ms	5%	10.67 s

Discover Tutela Explorer

Tutela Explorer is a powerful cloud-based solution for real-time analysis of crowdsourced data. Using the platform, mobile operators can:

- Create coverage and quality maps
- Benchmark network quality and coverage across all operators
- Drill down to any KPI at city, street or even building level
- Analyse spectrum utilisation, performance and more

Visit www.tutela.com/explorer to learn more

Learn more

Appendix

TUTELA

Results Overview in Common Coverage Areas

	Download Throughput	Upload Throughput	Latency	Excellent CQ	Core CQ
Austria	30.5 Mbps ± 0.14 Mbps	13.7 Mbps ± 0.04 Mbps	16.3 ms ± 0.018 ms	86.51% ± 0.11%	94.80% ± 0.04%
Germany	25.6 Mbps ± 0.04 Mbps	12.6 Mbps ± 0.02 Mbps	14.2 ms ± 0.007 ms	79.05% ± 0.05%	89.23% ± 0.03%
Switzerland	32.8 Mbps ± 0.14 Mbps	16.5 Mbps ± 0.03 Mbps	12.3 ms ± 0.014 ms	86.91% ± 0.12%	94.74% ± 0.05%

About Tutela

Tutela Technologies, Ltd., is an independent crowdsourced data company with a global panel of over 300 million smartphone users. It gathers information on mobile infrastructure and tests wireless experience, helping organizations in the mobile industry to understand and improve the world's networks. Data and insights provided by Tutela are trusted by the engineering teams at mobile network operators and network equipment manufacturers around the world and used to compare operators as well as inform decisions in network and infrastructure planning and optimisation. The organization is headquartered in Victoria, British Columbia.

Tutela does not collect any sensitive personal data and is compliant with international privacy regulations including CCPA and GDPR.

For further information about the methodology, data and tools used to create this report, please contact analysis@tutela.com or visit www.tutela.com.

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