



**TUTELA** 

Benelux

State of Mobile Networks

Analysts

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NOVEMBER 2019

Annual Report

[www.tutela.com](http://www.tutela.com)

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Belgium, the Netherlands, and Luxembourg all finished within the top 10 in Tutela's recent [global ranking of mobile experience](#), cementing the Benelux region's status as a global powerhouse in mobile network excellence.

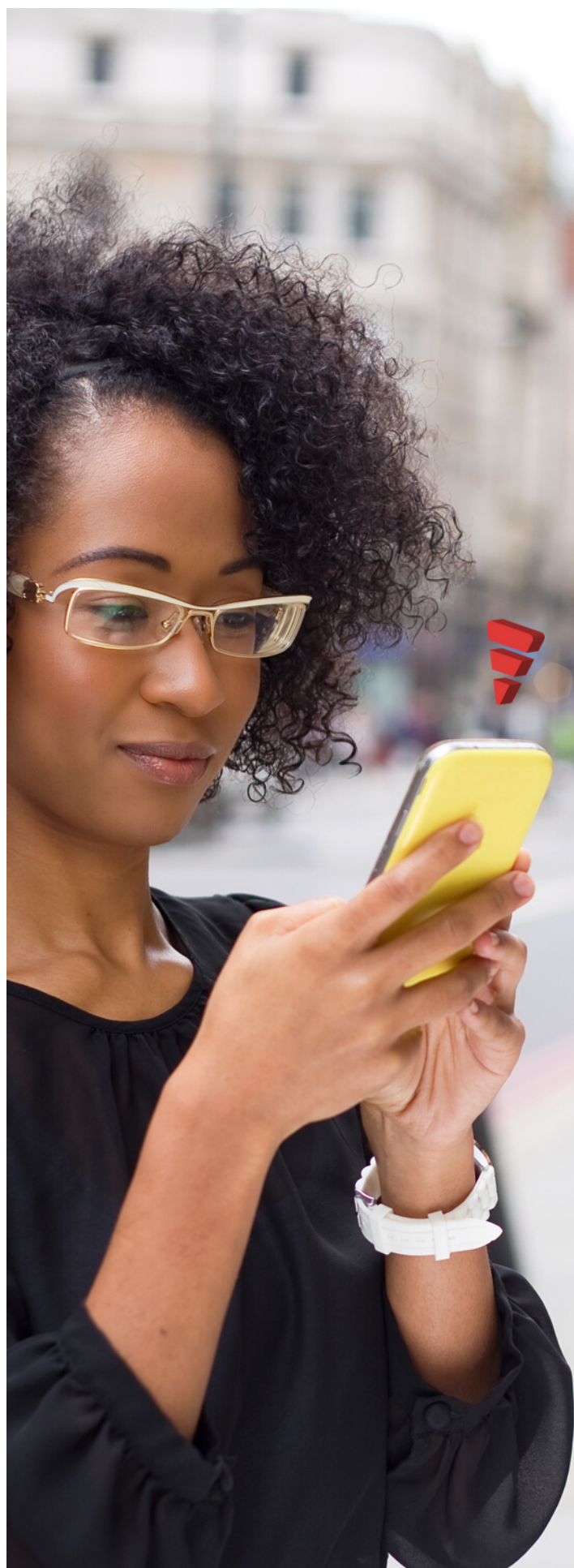
Although the three countries finished near each other for Excellent Consistent Quality, Tutela's signature metric for mobile experience, some significant differences are revealed when looking at the region operator-by-operator. Belgian subscribers are amongst the lowest users of data in Europe as it currently stands, but their appetite is growing quickly: Orange Belgium's launch of unlimited plans led to a 77% growth in mobile data last year, according to consultancy tefficient(1).

But for consumers, when it comes to picking a network, the variety of plans and perks on offer can obscure the underlying truths: a network is only as good as long as it works, and not all networks are created equal. To better understand Benelux's mobile networks, and how they perform from the consumer's perspective, Tutela has collected and analyzed 1.4 billion records, including over 13 million speed tests and 165 million latency measurements, from over 3.8 million devices (iOS and Android smartphones) between April 1st to 30th September 2019.

(1) tefficient, Industry analysis #1 2019  
<https://tefficient.com/wp-content/uploads/2019/03/tefficient-industry-analysis-1-2019-mobile-data-usage-and-revenue-fy-2018-per-operator-29-March.pdf>  
Retrieved 14 November 2019

## Key findings

- Mobile network experience in the highly urbanized Benelux region is some of the best in the developed world – the lowest Excellent Consistent Quality of any operator is 83.7%, which, for comparison, is better than the best-performing operator in all of the United States.
- Belgium’s Proximus delivered the best Core Consistent Quality in the report, showing that over 99% of the time, when its users have a signal, the network connection is good enough to do things like stream standard-definition video or use social media.
- Operators in the Netherlands did particularly well for download throughput, with Vodafone recording the fastest median download throughput of any operator in test – a blistering 31.1 Mbps. However, Dutch operators had some of the slowest upload speeds in the report, and other factors, such as a relatively high packet loss, meant that the Netherlands only placed second for Consistent Quality.



# Results overview

## TUTELA

Mobile experience results

Belgium, November 2019



Excellent Consistent Quality	 Winner		
Core Consistent Quality	 Winner		
Download throughput	 Winner		
Upload throughput	 Winner		
Latency		 Winner	

Results from 27,137,381,435 measurements taken in Common Coverage Areas between April 1st to September 30th 2019.

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



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

# Results overview

## TUTELA

Mobile experience results

Netherlands, November 2019



Excellent Consistent Quality	★ Winner			
Core Consistent Quality	★ Winner			
Download throughput		★ Winner		
Upload throughput	★ Winner			
Latency			★ Winner	

Results from 24,690,534,195 measurements taken in Common Coverage Areas between April 1st to September 30th 2019.

"T-Mobile delivered the highest percentage of Excellent Consistent Quality in Tutela's tests"



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

# Results overview

## TUTELA

### Mobile experience results

Luxembourg, November 2019



Excellent Consistent Quality	★ Draw		★ Draw
Core Consistent Quality	★ Winner		
Download throughput			★ Winner
Upload throughput			★ Winner
Latency	★ Winner		

Results from 1,963,770,980 measurements taken in Common Coverage Areas between April 1st to September 30th 2019.

"Tango and POST delivered the highest percentage of Excellent Consistent Quality in Tutela's tests"



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

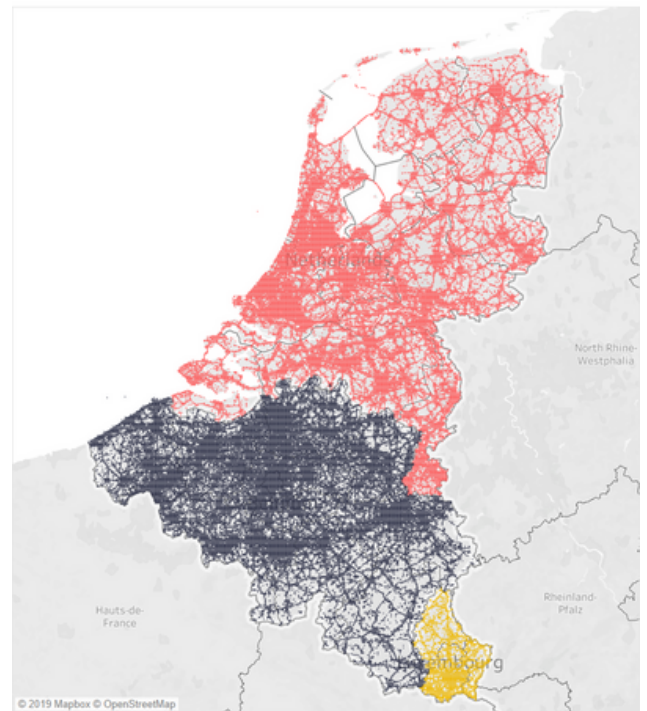
# Understanding this report

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 networks are (and are not) enabling users to do almost everything that they want to do on their smartphones.

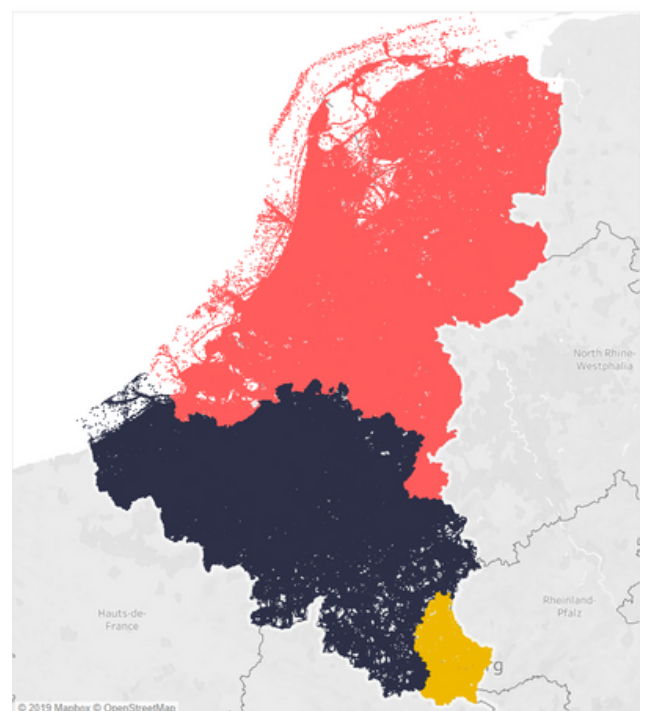
The methodology is covered in detail at the end of this report and [on our website](#), but simply put, there are two sets of thresholds, Excellent and Core. A connection that hits the Excellent threshold is sufficient for use-cases like 1080p video streaming or multiplayer gaming, while a Core connection 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. These were most recently re-assessed and updated [September 1st, 2019](#).

Common Coverage Areas are parts of the country where the majority of operators offer service. In this report, we present results nationally and from Common Coverage Areas, which helps present both a full national picture, as well as highlighting network conditions wherever operators are directly in competition.

**TUTELA** Common Coverage Areas (3G & 4G)



**TUTELA** Measurement Locations





# Consistent Quality

## Country comparison

Wireless networks across the Benelux region are some of the best in the world. In Tutela's recent Global State of Mobile Networks report, all three countries finished within the top 10 for Excellent Consistent Quality: Belgium ranked 7th overall, Netherlands 9th, and Luxembourg 10th. A similar pattern is evident in this report: Belgium placed first for Excellent Consistent Quality, with 89.8% of tests (taken when a user had signal) meeting Tutela's thresholds for uses like 1080p HD video streaming or multiplayer gaming. Netherlands was 1.6% behind Belgium on

the same metric, while Luxembourg was in a close third place on 87.6%. For Core Consistent Quality, the results were even closer. Belgium was in first place, with 98.8%, and the Netherlands and Luxembourg were tied for 2nd place. Core Consistent Quality reflects connections that are good enough for more routine use-cases, like web browsing, standard-definition video streaming, or VOIP calling. The data shows that in the overwhelming majority of cases when users have a signal, it's good enough for these kinds of applications.

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### Consistent Quality Percentage in Common Coverage Areas (3G & 4G)



# Consistent Quality

## Belgian operators

Belgium's first-place finish for Excellent Consistent Quality is largely thanks to Proximus's performance. Proximus users saw their tests pass the Excellent Consistent Quality thresholds 91.6% of the time, substantially better than the Belgian overall average of 89.8%. Orange and BASE tied for second place on Excellent Consistent Quality, with no daylight between their percentages.

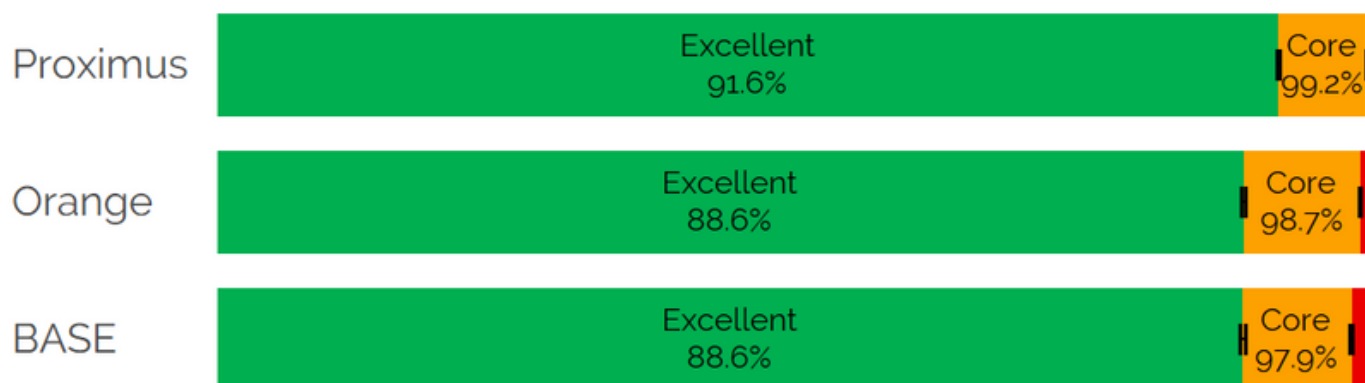
The gap between operators in Excellent Consistent Quality — 3% between Proximus and BASE/Orange — is substantially larger than the gap between operators on Core Consistent Quality. Proximus also finished in first place for Core Consistent Quality, but Orange was just 0.5% behind, and BASE, in

third place, had just 1.3% fewer tests meet the thresholds.

In practical terms, it is clear that there is a small but significant difference between operators in Belgium when it comes to network performance in more demanding situations. Although all three operators perform well compared to the international norm, Proximus has a small but significant advantage in Excellent Consistent Quality. The field is much closer for Core Consistent Quality, and it's clear that no matter which network a subscriber is on, their network connection is almost always fast, responsive, and reliable enough for simple applications.

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### Belgium Consistent Quality Percentage in Common Coverage Areas (3G & 4G)



# Consistent Quality

## Dutch operators

T-Mobile is the clear leader for mobile experience in the most demanding situations in the Netherlands. 92% of tests from its users pass the Excellent Consistent Quality thresholds, 3.3% more than for the next-closest operator, Vodafone. T-Mobile's Excellent Consistent Quality score was also the highest of any operator in the Benelux region – unsurprising, given that Tutela's recent Global Mobile Experience report showed that T-Mobile Netherlands is the fifth-best operator worldwide for Excellent

Consistent Quality. For Core Consistent Quality, Tutela's thresholds for less-demanding use-cases like SD video streaming, the results were much closer. T-Mobile was in first place, while Tele2 and KPN tied for second, just a few fractions of a percentage point behind. Vodafone, which placed a clear second for Excellent Consistent Quality, was in fourth place for Core Consistent Quality – although in this instance, the gap between first and last place was just 2%.

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### Netherlands Consistent Quality Percentage in Common Coverage Areas (3G & 4G)



# Consistent Quality

## Luxembourg operators

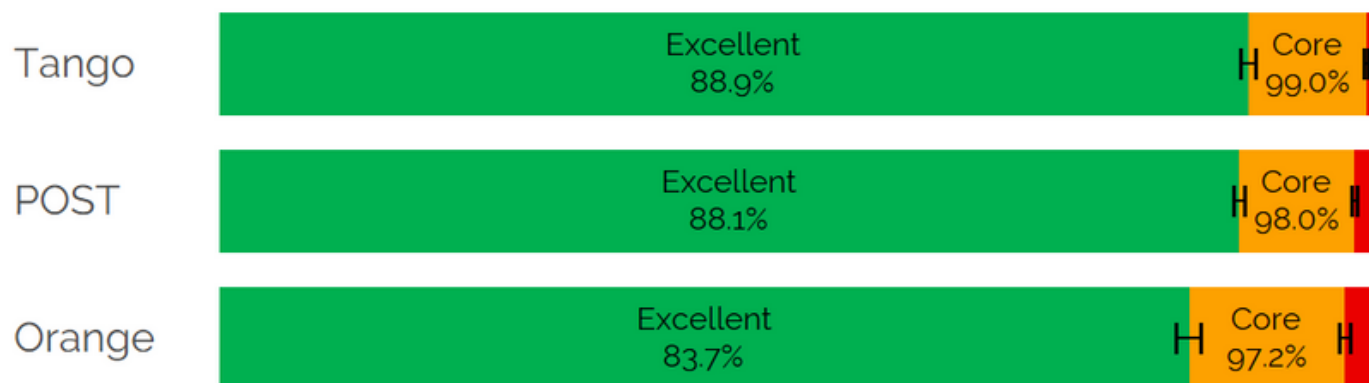
In Luxembourg, Tango and POST tied for first place in Excellent Consistent Quality, with both seeing around 88% of tests pass the thresholds for Excellent Consistent Quality. Orange was in third place, with 83.7% of tests passing the Excellent Consistent Quality thresholds. The difference was largely due to Orange's upload performance: the majority of Orange tests that failed the Excellent Consistent Quality thresholds failed due to upload performance, whereas download

throughput was the cause of the majority of failed Excellent tests on the Tango and POST networks.

For Core Consistent Quality, Tango was in first place, with 99.0% of tests passing the Core thresholds. POST came in second place, with Orange in third - although the gap between POST and Orange on Core Consistent Quality is just 0.8%, far less than the gap on Excellent Consistent Quality.

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### Luxembourg Consistent Quality Percentage in Common Coverage Areas (3G & 4G)

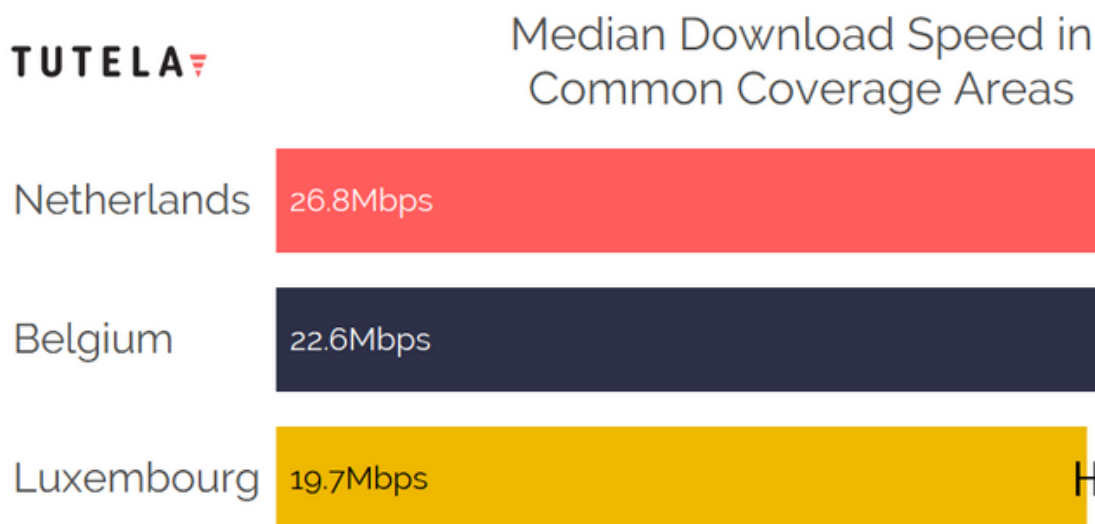


# Download throughput

## Country comparison

Across the Benelux region, the Netherlands had a compelling lead over second-place Belgium of 4.2 Mbps when it came to median download speed. However, the gap between second and third was smaller, at just 2.9 Mbps. Overall, all three countries had exceedingly high median download throughputs, suggesting the networks likely excel at download-heavy tasks such as downloading a large file or application on the go. A fast median download speed also indicates widespread deployment of modern LTE-Advanced technologies, including carrier aggregation and MIMO.

Overall, all three countries had exceedingly high median download throughputs

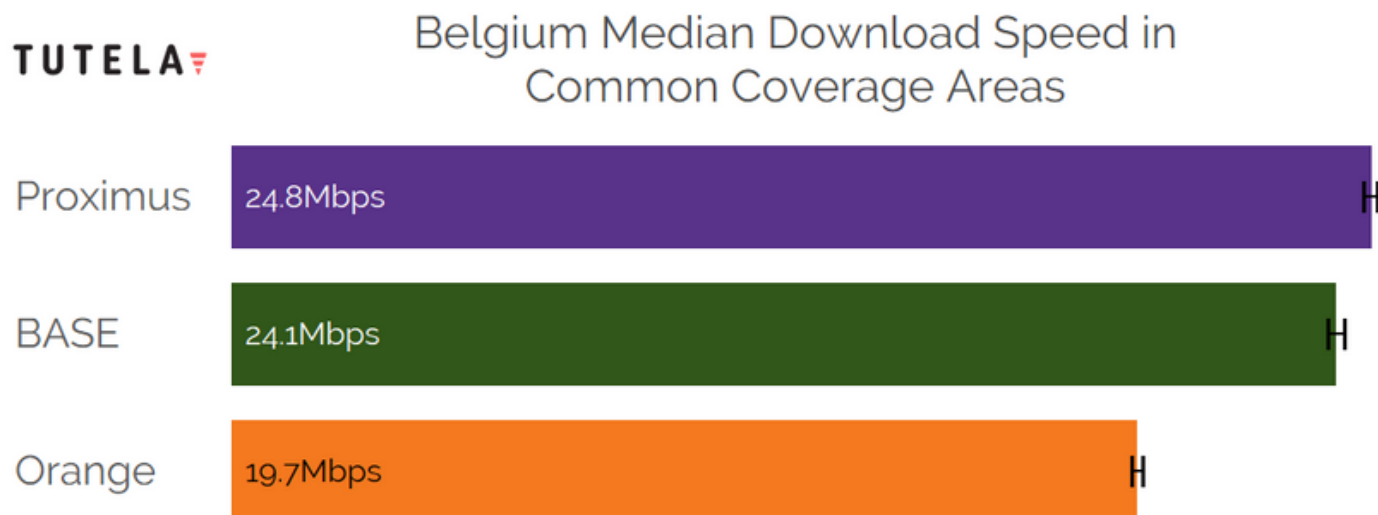


# Download throughput

## Belgian operators

Proximus came top in both Common Coverage Areas and nationwide for median download throughput at 24.8 Mbps. Orange ranked last in Belgium, with the lowest median download throughput of any of the 10 mobile operators tested at 19.7

Mbps. However, this speed indicates that the majority of the time, Orange's network is faster than the 5 Mbps download speed threshold Tutela uses for Excellent Consistent Quality.

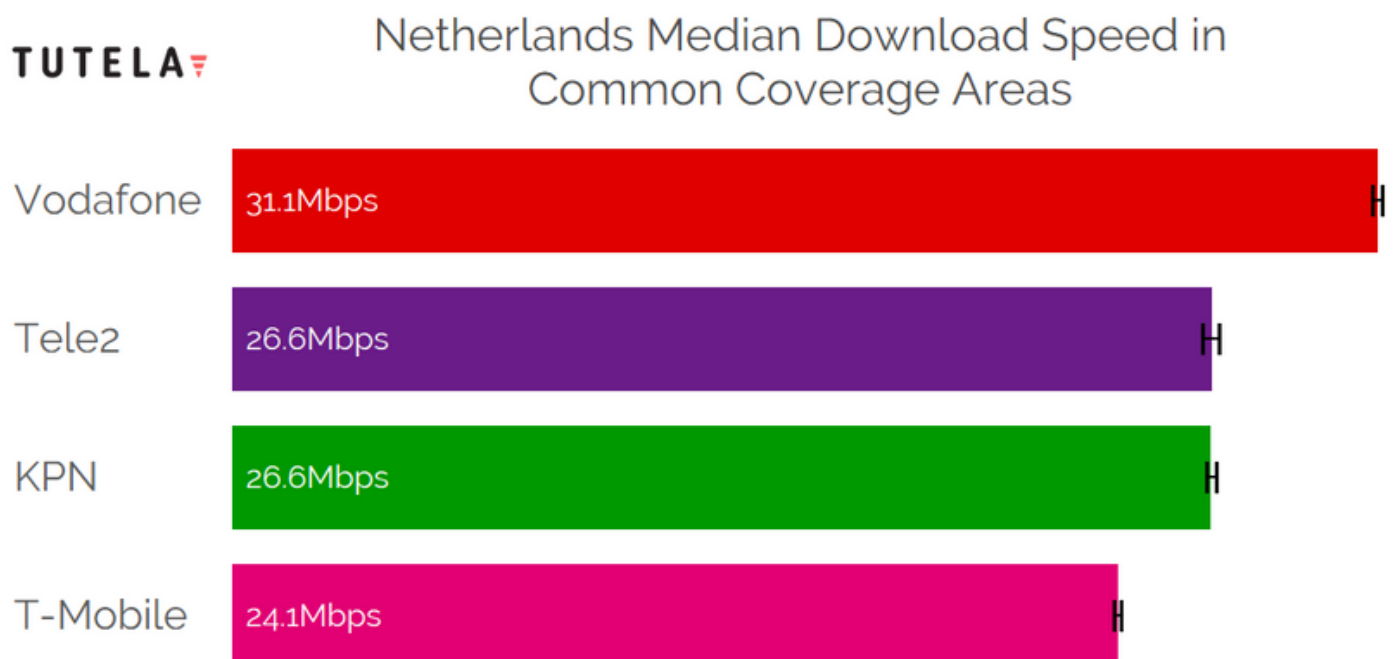


# Download throughput

## Dutch operators

Vodafone had a convincing lead when it came to median download throughput at 31.1 Mbps in Common Coverage Areas, 7 Mbps faster than fourth-place T-Mobile. However, all four operators offered blisteringly fast median download speed

when compared to the rest of the world, with the median download speed of the slowest operator nearly five times the 5 Mbps required to demonstrate an excellent network experience against Tutela's Excellent Consistent Quality standard.

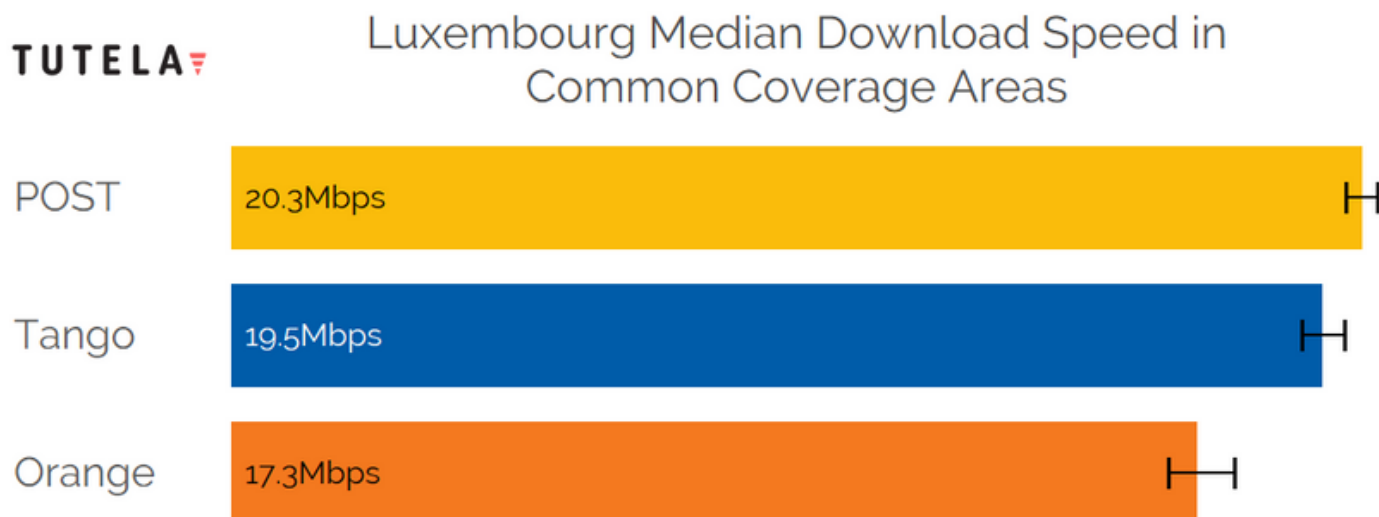


# Download throughput

## Luxembourg operators

All of Luxembourg's mobile network operators offered a relatively similar median download speed – ranging from joint-first place POST and Tango at around 20 Mbps, back to 3rd-place Orange, with an average

of 17.3 Mbps. These speeds were slower than operators in the Netherlands, and the leading operators in Belgium, but similar to Orange Belgium.



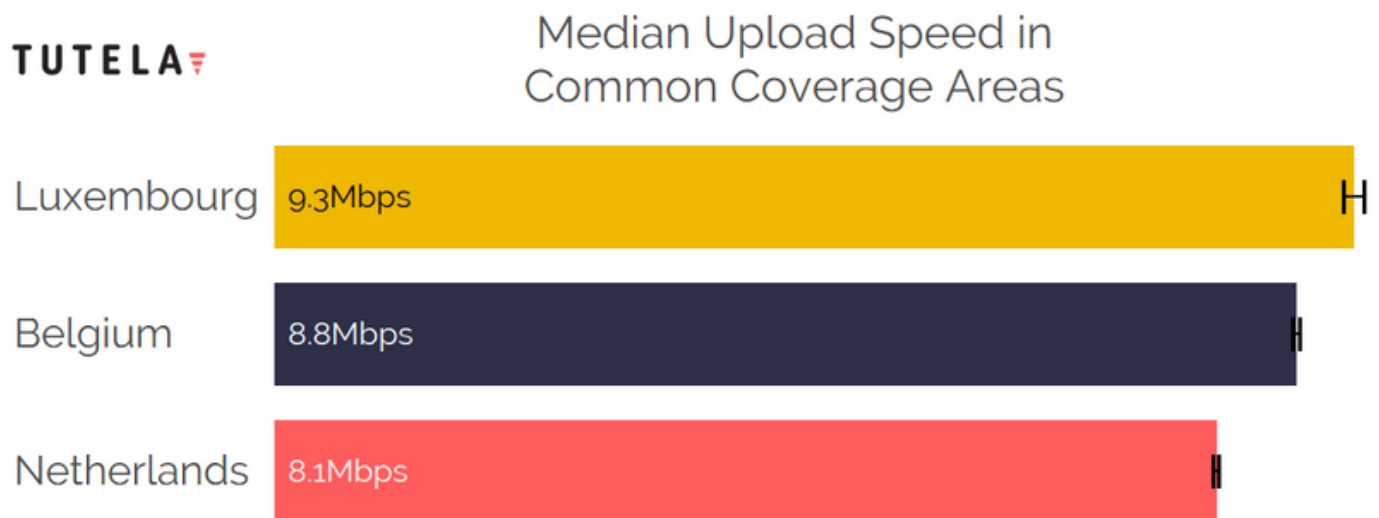


# Upload throughput

## Country comparison

Whilst median upload speeds were less than half the respective median download speed of each country, all three countries delivered impressive upload performance overall. Whilst median upload speeds were

less than half the respective median download speed of each country, all three countries delivered impressive upload performance overall.

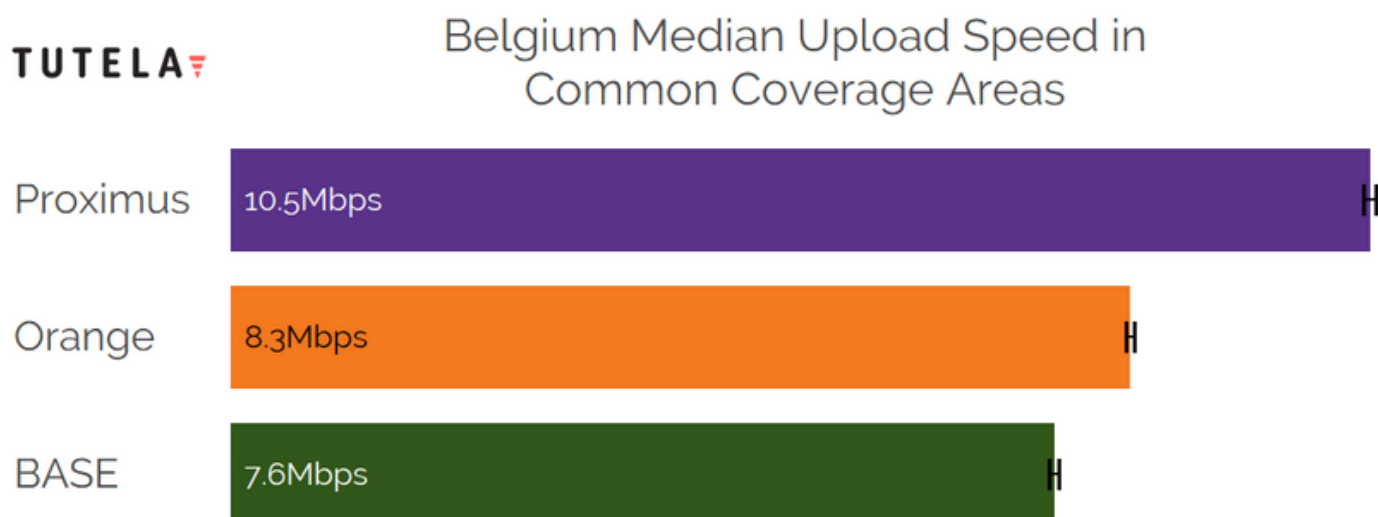


# Upload throughput

## Belgian operators

As was the case with download throughput, Proximus had a compelling lead in upload speed, over 2.2 Mbps faster than second-place Orange at 8.3 Mbps. The step down between Orange and BASE was much

smaller - just 0.7 Mbps. It's worth noting that overall, all operators had median upload speeds comfortably in excess of the 1.5 Mbps that Tutela requires to pass the Excellent Consistent Quality threshold.

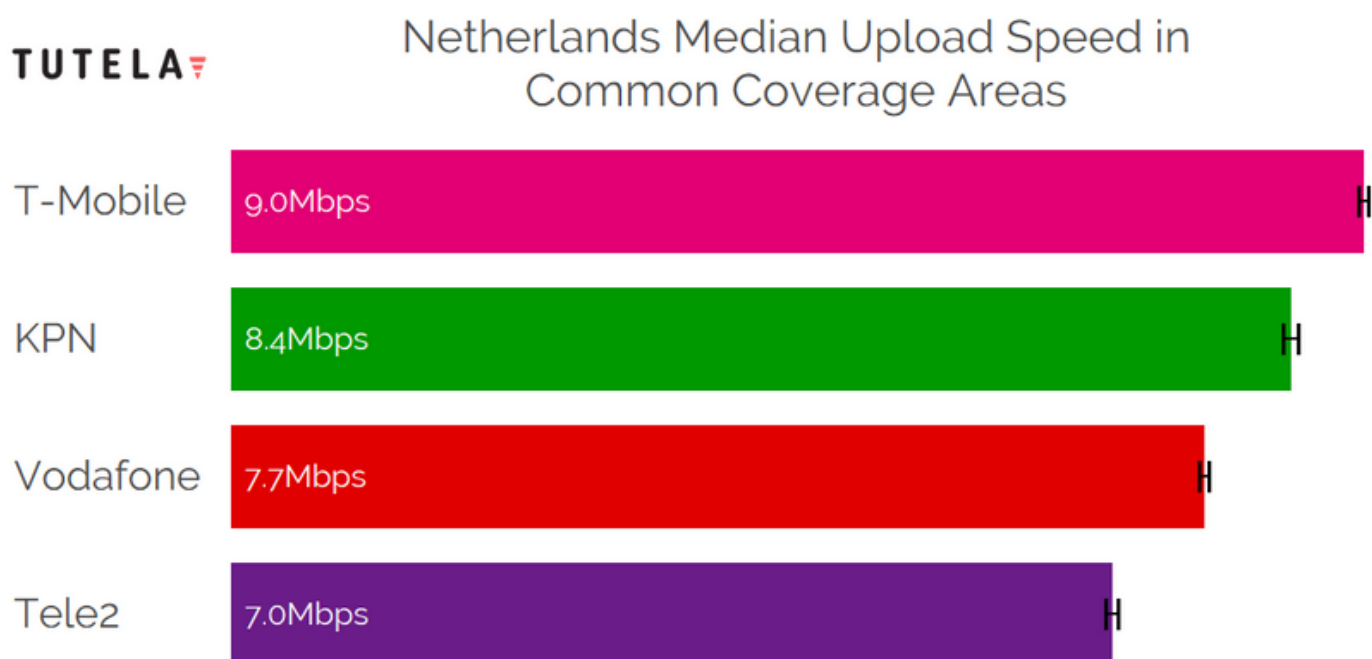


# Upload throughput

## Dutch operators

T-Mobile was first for upload throughput, with a median upload speed of 9.0 Mbps. It had a 0.6 Mbps lead over second-placed

KPN, at 8.4 Mbps, while Vodafone and Tele2 came in third and fourth place.

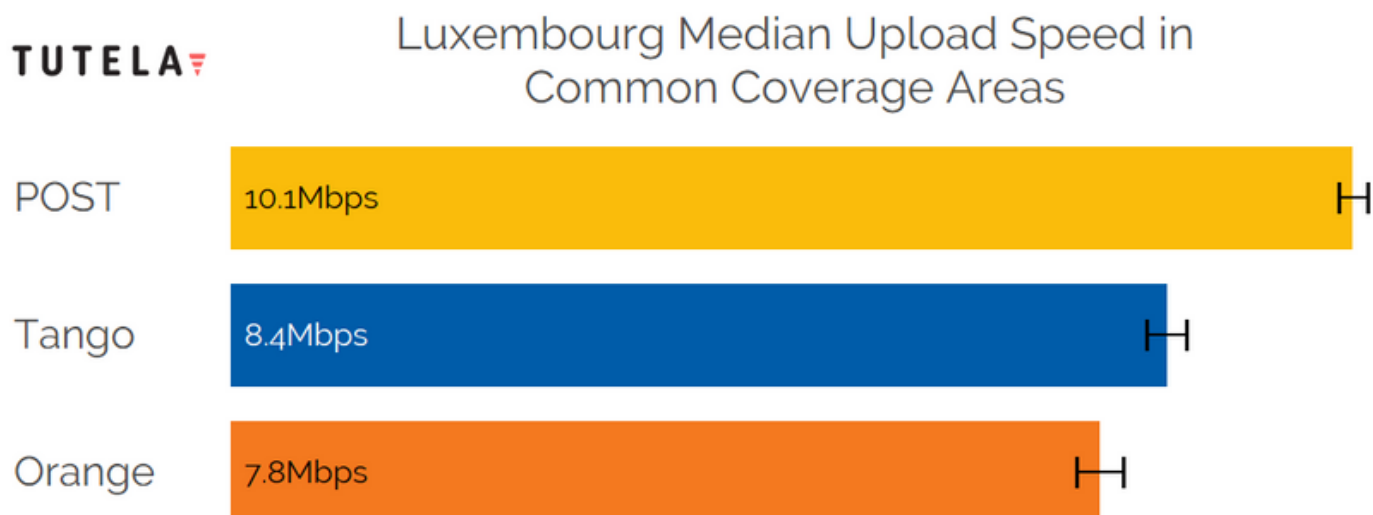


# Upload throughput

## Luxembourg operators

POST's lead in upload speed was compelling – it had a median performance of 10.1 Mbps making it not only the fastest network in Luxembourg but the network with the second-best upload speed in the Benelux

region. However, the gap between second and third place was far smaller, with Tango showing a median upload speed of 8.4 Mbps, and Orange 7.8 Mbps.



# Latency

## Country comparison

Luxembourg's median latency was notably small – just 14.1 ms overall – placing it top of the regional ranking overall. However, all three countries had impressively low one-way median latency, all below 20 ms (less than half of the Excellent Consistent Quality threshold for latency). This may be a factor of the urbanity of the regions, with The World Bank suggesting that more than 90% of the population (and a huge 98% in Belgium) live in urban areas where networks tend to be better, and latency tends to be low(2). Latency is critical for making mobile

network experiences feel “snappy” and responsive – it is particularly important for applications where real-time connectivity is important such as video calls or mobile multiplayer gaming, where any lag can be noticeable and have a detrimental impact on user experience. However, lower latency has also been demonstrated to have a clear impact on improving video experience over a mobile network connection, and has been measured to have a clear and noticeable impact on user satisfaction even just for social network usage and web browsing(3).

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### Median Latency in Common Coverage Areas



(2) The World Bank, Urban population (% of total population)

<https://data.worldbank.org/indicator/SP.URB.TOTL.in.zs>

Retrieved 14 November 2019

(3) BCG, Uncovering real mobile data usage and the drivers of customer satisfaction

<https://www.bcg.com/en-ca/publications/2015/telecommunications-customer-insight-uncovering-real-mobile-data-usage-drivers-customer-satisfaction.aspx>

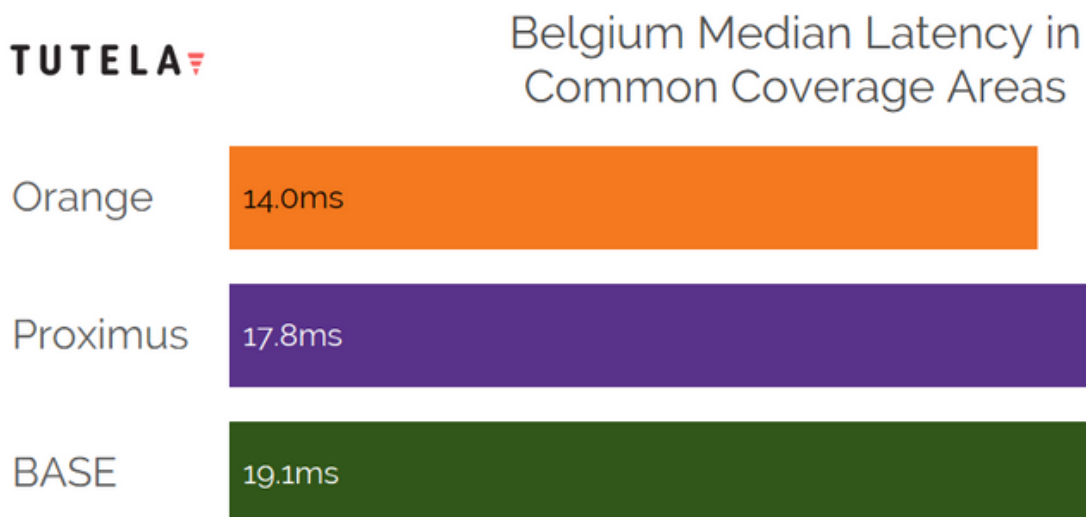
Retrieved 14 November 2019

# Latency

## Belgian operators

Orange had the lowest latency in Belgium, at 14 ms. This was a significant lead over second-place Proximus, where the median latency was 17.8 ms, although the step down between second and third place was

much smaller at just 1.3 ms. All providers offered a median latency far lower than the 50 milliseconds required to meet the Excellent Consistent Quality threshold in Tutela's testing.



# Latency

## Dutch operators

Tele2 had the best latency in common coverage areas at 12.9 ms, although just 3.4 ms separated first and fourth place, highlighting the sheer responsiveness of

Dutch networks. T-Mobile placed second at 14.8 ms, KPN third at 15.6 ms, and Vodafone fourth at 16.3 ms.

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### Netherlands Median Latency in Common Coverage Areas

Tele2

12.9ms

T-Mobile

14.8ms

KPN

15.6ms

Vodafone

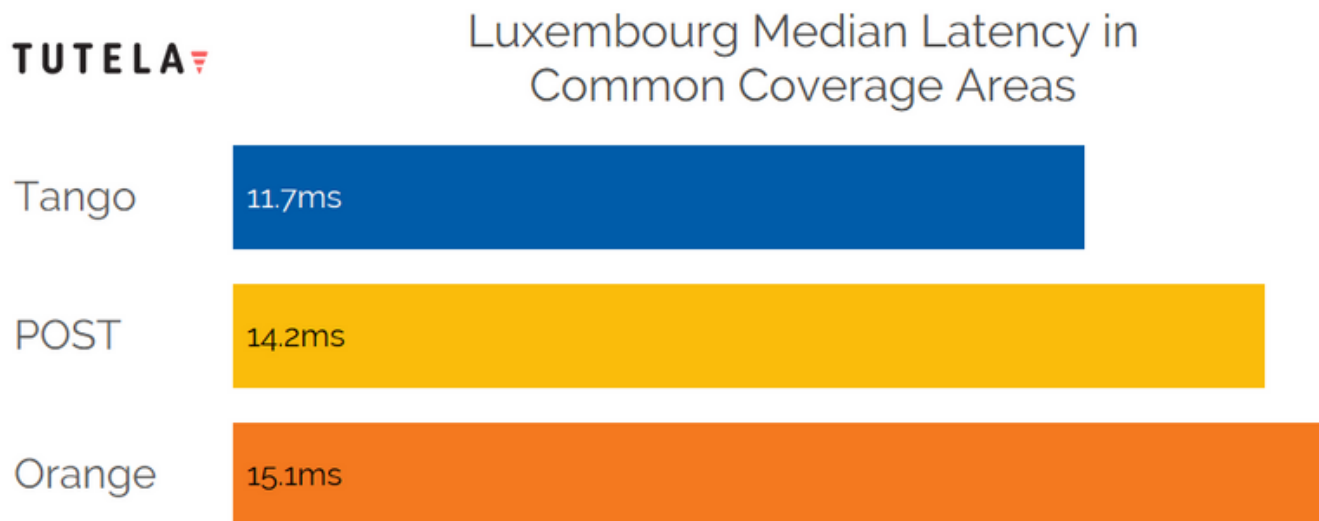
16.3ms

# Latency

## Luxembourg operators

Tango had the lowest latency in Luxembourg at 11.7 ms, making it the provider with the overall lowest latency in the Benelux region. Its result was a notable improvement over second and third place Post and Orange, at 14.2 and 15.1 ms

respectively. However, all three networks demonstrated extremely low response times, suggesting that in the vast majority of cases, latency is not an issue for users in Luxembourg.



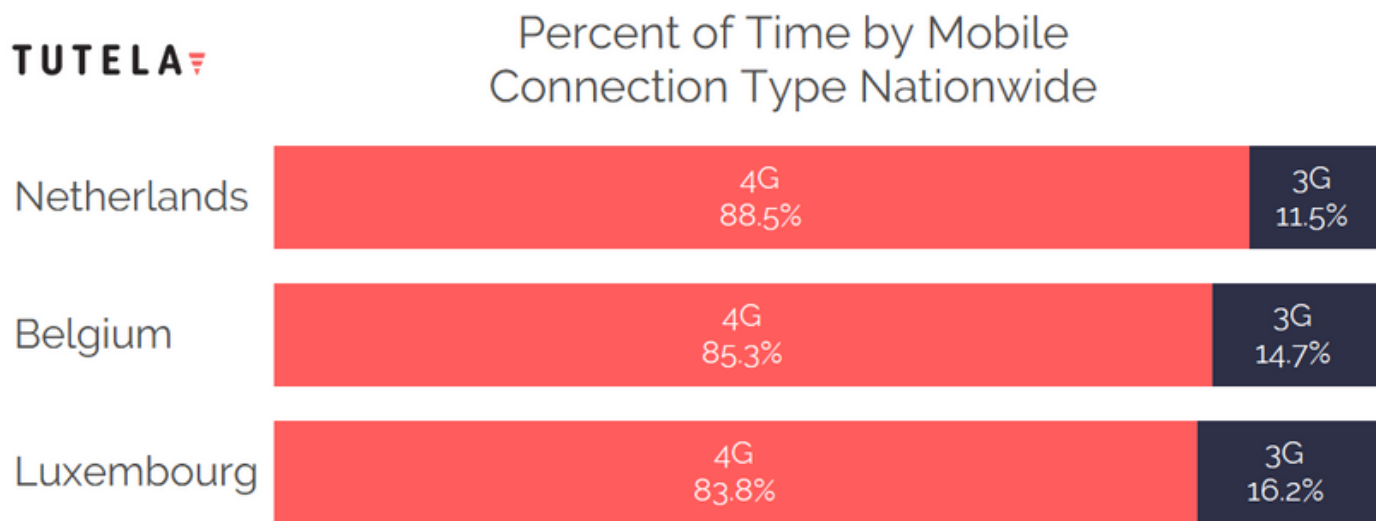


# Data usage

## Country comparison

Amongst the three countries, the Netherlands was the clear leader in 4G usage. Over 88% of time spent on a cellular network was spent on a 4G data connection, significantly better than the 85.3% and 83.8% achieved by Belgium and Luxembourg respectively. What's particularly interesting is that Belgium's national Excellent Consistent Quality was

89.8% – significantly higher than its 4G time-share percentage of 85.3%. That indicates that a good proportion of tests over a 3G network were good enough to hit Tutela's Excellent Consistent Quality thresholds – which, particularly given the requirement for a responsive 50ms latency, is especially impressive.



"In Belgium, a good proportion of tests over a 3G network were good enough to hit Tutela's Excellent Consistent Quality thresholds."

# Data usage

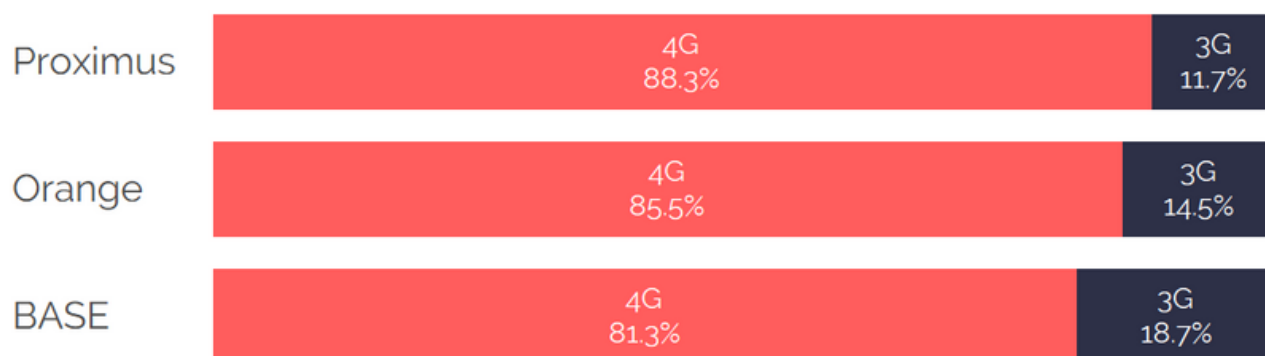
## Belgian and Dutch operators

Within Belgium, Proximus led for 4G usage, with its subscribers spending 88.3% of their time on a 4G connection. Orange was in second place, at 85.5%, while BASE was over four percentage points behind, at 81.3%. Tele2 users spent the greatest proportion of

time on 4G of any group of users in this report, with 92.9% of their time spent connected to a cellular network being over a 4G connection. Vodafone users were just a hair behind, at 91.8%, while KPN and T-Mobile both sat around 87%.

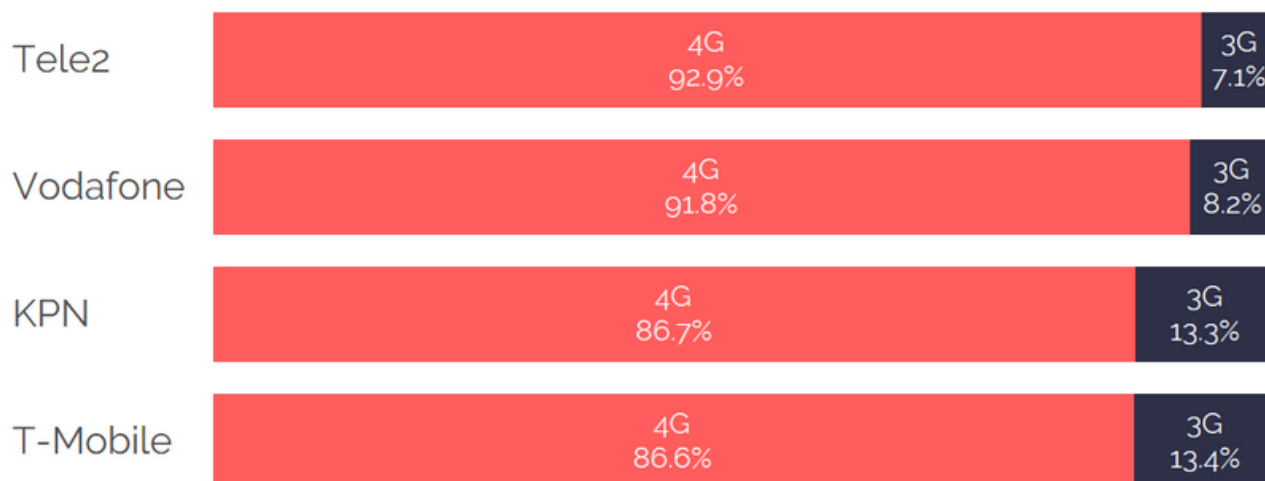
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### Belgium Percent of Time by Mobile Connection Type Nationwide



**TUTELA**

### Netherlands Percent of Time by Mobile Connection Type Nationwide

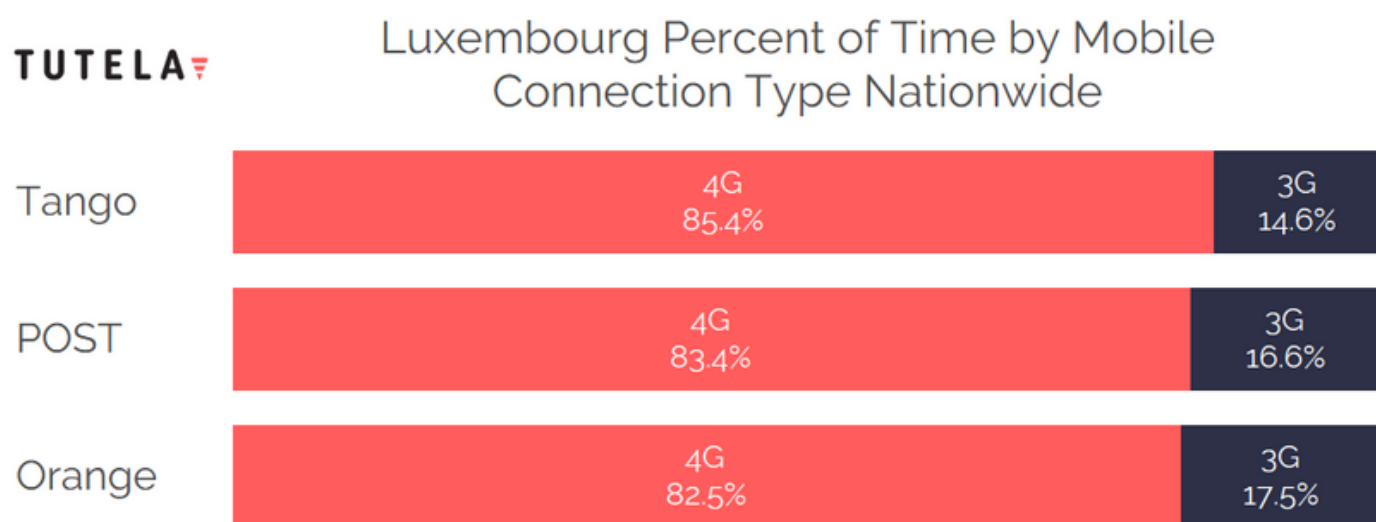


# Data usage

## Luxembourg operators

4G usage was relatively consistent amongst operators in Luxembourg. Tango and POST, the tied leaders for Excellent Consistent Quality, both saw their users spend a similar

amount of time on a 4G connection. Orange users were a percentage point behind, with 82.5% of their time on cellular spent connected to a 4G cell site.





## Methodology

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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 organisations in the mobile industry to understand and improve the world's networks.

Tutela collects data and runs network tests via software embedded in a diverse range of over 3000 consumer applications, which enable the measurement of real-world quality of experience for mobile users, 24/7. For this report, we gathered 1.4 billion records, including over 13 million speed tests and 165 million latency measurements, from over 3.8 million devices (iOS and Android smartphones) between April 1st and September 30th 2019.

Tutela measures network quality based on the real-world performance of actual network subscribers, 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 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 to LTE-Advanced 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.



# Consistent Quality

To more objectively evaluate when networks 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 bases the threshold values on the minimum performance requirements published by popular apps. We most recently updated our Consistent Quality thresholds on [September 1st, 2019](#).

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
Minimum acceptable value	5 Mbps	1.5 Mbps	50 ms	30 ms	1%

## Core Quality

KPI	Download throughput	Upload throughput	Latency	Jitter	Packet loss
Minimum acceptable value	1.5 Mbps	500 Kbps	100 ms	50 ms	5%

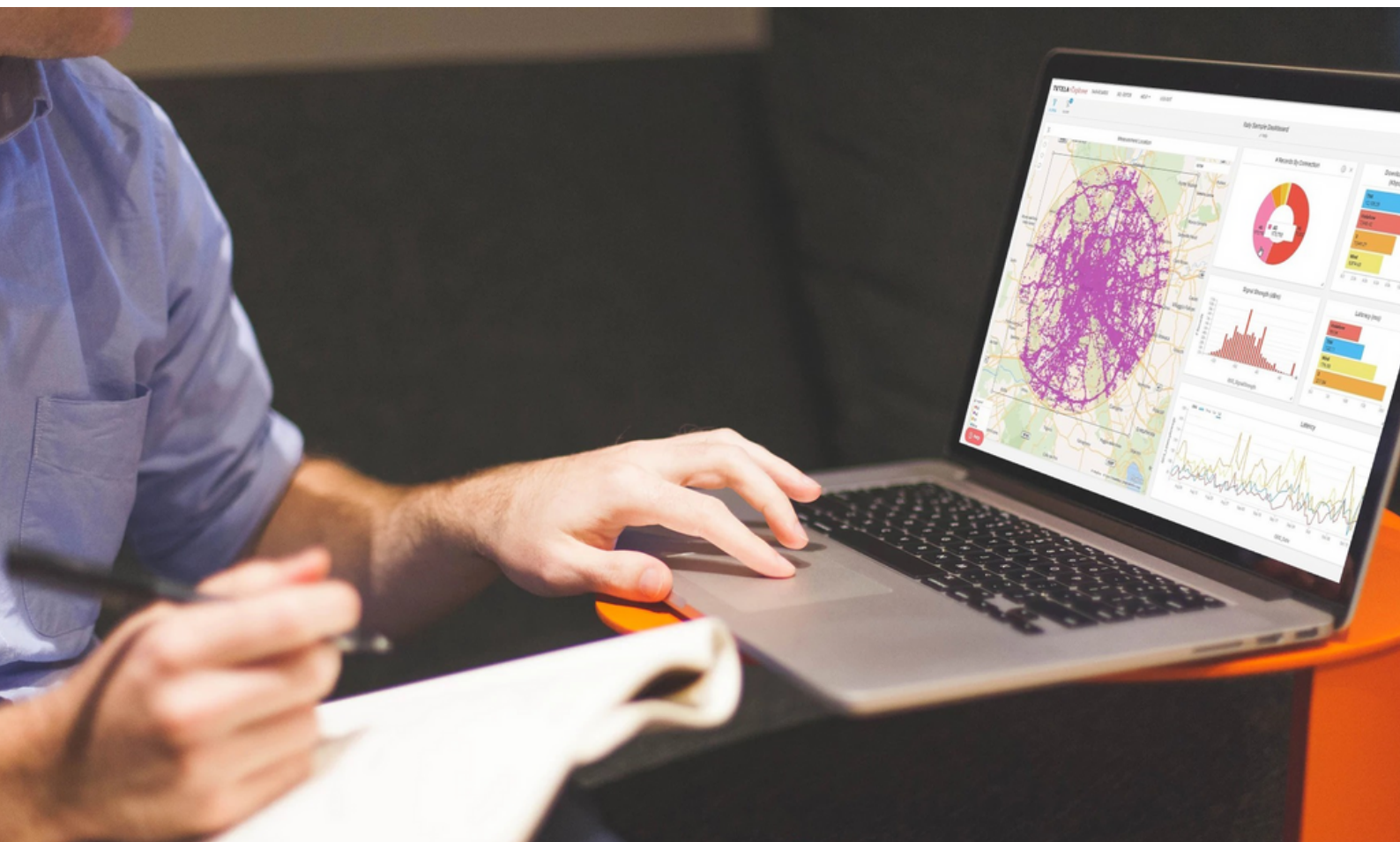
# Discover Tutela Explorer

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](http://www.tutela.com/explorer) to learn more

Learn more



# Appendix

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**Error Margins**

		Download Median	Upload Median	Latency Median	Excellent CQ	Core CQ					
Common Coverage Areas	Belgium	Orange	±0.13Mbps	±0.04Mbps	±0.00ms	±0.2%	±0.1%				
		BASE	±0.19Mbps	±0.04Mbps	±0.00ms	±0.2%	±0.1%				
		Proximus	±0.14Mbps	±0.06Mbps	±0.00ms	±0.1%	±0.0%				
	Luxembourg	Orange	±0.66Mbps	±0.21Mbps	±0.01ms	±1.0%	±0.5%				
		POST	±0.29Mbps	±0.14Mbps	±0.01ms	±0.5%	±0.2%				
		Tango	±0.41Mbps	±0.18Mbps	±0.01ms	±0.7%	±0.2%				
	Netherlands	KPN	±0.14Mbps	±0.06Mbps	±0.00ms	±0.2%	±0.1%				
		T-Mobile	±0.11Mbps	±0.04Mbps	±0.00ms	±0.1%	±0.1%				
		Tele2	±0.23Mbps	±0.05Mbps	±0.00ms	±0.2%	±0.1%				
		Vodafone	±0.14Mbps	±0.04Mbps	±0.00ms	±0.2%	±0.1%				
<hr/>											
National	Belgium	Orange	±0.12Mbps	±0.04Mbps	±0.00ms	±0.2%	±0.1%				
		BASE	±0.20Mbps	±0.04Mbps	±0.00ms	±0.2%	±0.1%				
		Proximus	±0.15Mbps	±0.05Mbps	±0.00ms	±0.1%	±0.0%				
	Luxembourg	Orange	±0.71Mbps	±0.20Mbps	±0.01ms	±1.0%	±0.5%				
		POST	±0.28Mbps	±0.14Mbps	±0.01ms	±0.5%	±0.2%				
		Tango	±0.42Mbps	±0.19Mbps	±0.01ms	±0.7%	±0.2%				
	Netherlands	KPN	±0.12Mbps	±0.06Mbps	±0.00ms	±0.2%	±0.1%				
		T-Mobile	±0.11Mbps	±0.04Mbps	±0.00ms	±0.1%	±0.1%				
		Tele2	±0.23Mbps	±0.04Mbps	±0.00ms	±0.2%	±0.1%				
		Vodafone	±0.15Mbps	±0.04Mbps	±0.00ms	±0.2%	±0.1%				
<hr/>											
Common Coverage Areas	Belgium	Download Median	±0.09Mbps	Upload Median	±0.03Mbps	Latency Median	±0.00ms	Excellent CQ	±0.1%	Core CQ	±0.0%
	Luxembourg	Download Median	±0.23Mbps	Upload Median	±0.09Mbps	Latency Median	±0.00ms	Excellent CQ	±0.4%	Core CQ	±0.2%
	Netherlands	Download Median	±0.07Mbps	Upload Median	±0.02Mbps	Latency Median	±0.00ms	Excellent CQ	±0.1%	Core CQ	±0.0%



# 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 GDPR.

For further information about the methodology, data and tools used to create this report, please contact [analysis@tutela.com](mailto:analysis@tutela.com) or visit [www.tutela.com](http://www.tutela.com).

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