TUTELA

India

State of Mobile Experience

Analysts

Sneha Phatak

Annual Report

MARCH 2021

www.tutela.com

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Introduction

While the majority of the developed economies have already begun deploying 5G, India is anticipating delays in adopting new technologies. According to a recent report published by a Parliamentary Panel on Information Technology, the launch of 5G technology will be delayed until the end of 2021 or early 2022[1], with 5G spectrum auction for the 3300 MHz to 3600 MHz bands likely to happen in "the next six months or so"[2]. In the meantime, applications for 5G trials submitted by the four major operators in India are expected to be cleared imminently[3]. Although subscribers in India may have to wait a while to enjoy the benefits of 5G, the upcoming major spectrum auction will help boost capacity and improve network performance. Scheduled to begin on March 1, this auction primarily involves sale of spectrum for 4G services for frequency bands 700 MHz, 800Mhz, 900 Mhz, 2100 Mhz, 2300 Mhz and 2500MHz[4]. While Airtel, Vodafone Idea (now known as Vi) and Jio are all slated to be participating in this auction, they may reportedly invest conservatively in order to save funds for the future 5G auction as they aim to launch 5G later this year[5].

[1] LightReading, India still not ready to launch 5G
https://www.lightreading.com/5g/india-still-not-ready-to-launch-5g/d/d-id/767298
Retrieved 25/02/21

[2] The Hindu, Panel slams DoT for delay in 5G trials
https://www.thehindu.com/business/panel-slams-dot-for-delay-in-5g-trials/article33786016.ece
Retrieved 25/02/21

[3] The Economic Times, DoT likely to clear 5G trial applications in two weeks
https://economictimes.indiatimes.com/industry/telecom/telecom-news/dot-likely-to-clear-5g-trial-applications-in-two-weeks/articleshow/81061709.cms
Retrieved 25/02/21

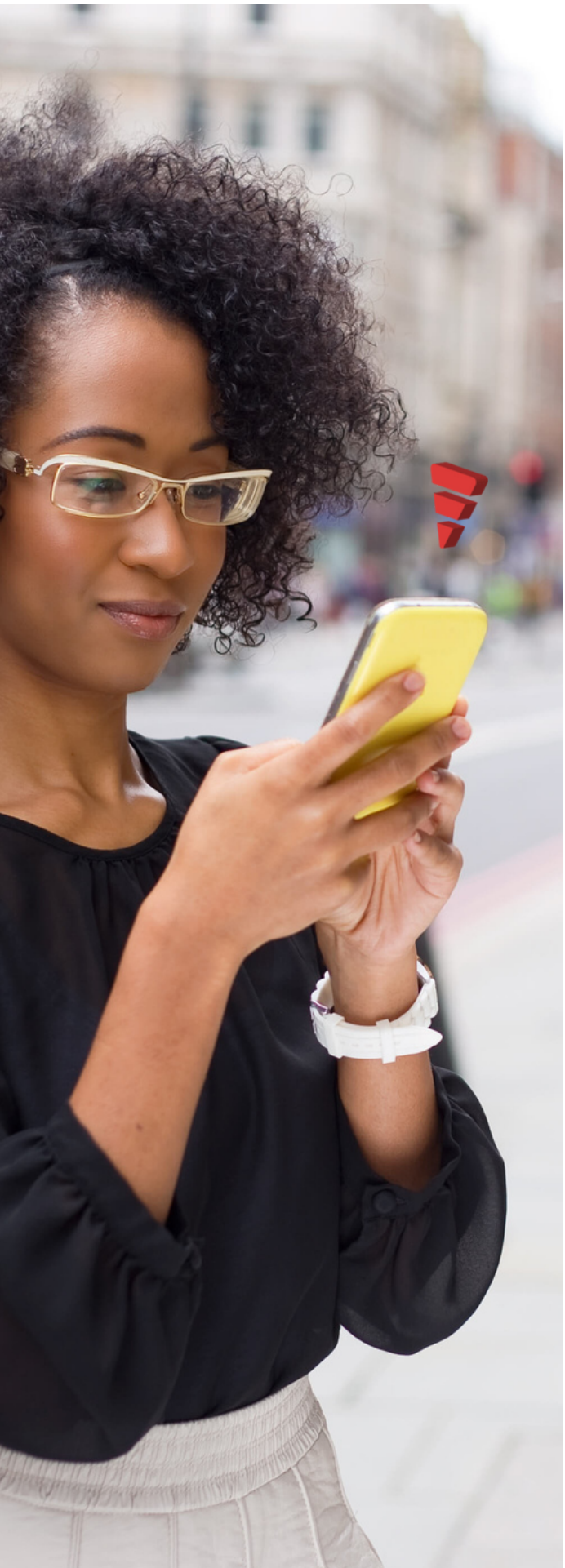
[4] The Hindu Business Line, Jio, Airtel, Vi put in ₹13,475-crore deposits for spectrum auction
https://www.thehindubusinessline.com/info-tech/jio-airtel-vi-put-in-13475-crore-deposits-for-spectrum-auction/article33873516.ece
Retrieved 25/02/21

[5] ET Telecom, Big 3 telcos to conserve cash to buy 3.3-3.6 GHz spectrum in near-term 5G auction: Analysts
https://telecom.economictimes.indiatimes.com/news/big-3-telcos-to-conserve-cash-to-buy-3-3-3-6-ghz-spectrum-in-likely-near-term-5g-auction-analysts/81152902
Retrieved 25/02/21

In Tutela's 2020 Global Experience Report[6], India ranked 96th in the Excellent Consistent Quality ranking, which is Tutela's metric for how often a connection meets the network requirements for some of the most demanding mobile use-cases like 1080p video streaming, real-time mobile gaming and HD group video conferencing. This ranking indicates that operators in India still have an uphill battle for delivering superior subscriber experiences. While acquiring more spectrum and welcoming adoption of newer, more flexible concepts like O-RAN are positive steps towards strengthening their network, how quickly operators act on expanding 4G as well as deploying 5G after acquiring additional spectrum through the upcoming auctions will impact the improvement in user experiences.

For this analysis of mobile network experience across India, Tutela has analyzed over 31 million speed and latency tests taken from real-world smartphone users, collected between August 1, 2020 and January 31, 2021.

[6] Tutela, Global Mobile Experience https://www.tutela.com/blog/global-mobile-experience-2020 Retrieved 25/02/21



Key findings

- Airtel established its dominance among Indian operators winning first place in four out of the six categories that were tested. The operator had the highest Excellent Consistent Quality at 56.6% as well as the highest Core Consistent Quality of 83.7% in Common Coverage areas across the country. Airtel also outperformed other operators for median download speeds and latency.

- Vodafone Idea (Vi) took the lead in the upload throughput category with a median upload speed of 5.2 Mbps. It was closely followed by Airtel with a median upload speed of 4.5 Mbps.

- Jio, which ranked third behind Airtel and Vodafone Idea in five out of six categories, came first in the coverage category. There was a significant difference in the relative area covered between first placed Jio with a total coverage score of 595 and last-placed BSNL Mobile's score of 316 with latter heavily dependent on 3G.

Results overview

TUTELA

Mobile experience results

India, March 2021

	airtel	Vi	Jio	BSNL
Excellent Consistent Quality	★ Winner			
Core Consistent Quality	★ Winner			
Download throughput	★ Winner			
Upload throughput		★ Winner		
Latency	★ Winner			
Coverage			★ Winner	

Results from over 31 million speed and latency tests taken from real-world smartphone users, collected between August 1, 2020 and January 31, 2021.

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

TUTELA
Best Mobile Network Experience
MARCH 2021

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

Understanding this report

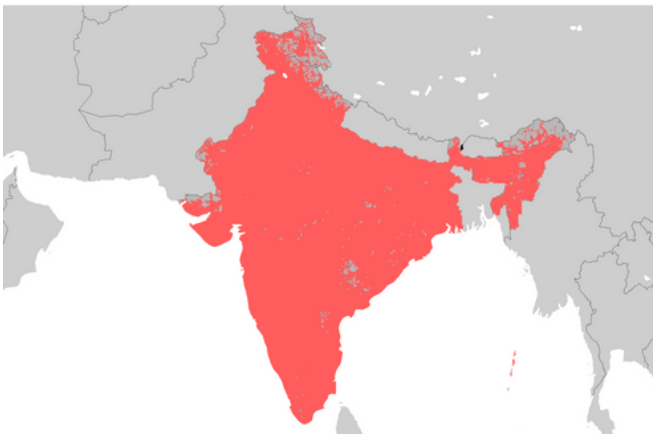
Tutela uses two key methodological components to best compare user experience across operators: Consistent Quality and Common Coverage Areas. Consistent Quality is a set of metrics that Tutela has developed to objectively evaluate when connections networks are (and are not) enabling users to do almost 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 2019 are not necessarily representative of year-on-year changes in the end-to-end user experience.

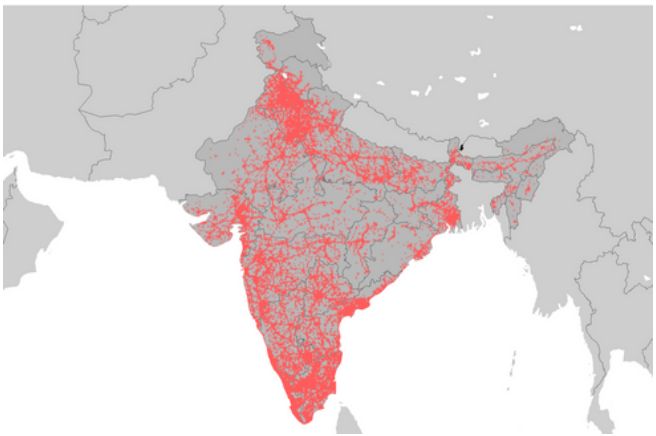
The methodology is covered in detail at the end of this report and on our website, but simply put, there are two sets of thresholds, Excellent and Core. A connection that hits the Excellent threshold is sufficient for use-cases like 1080p video streaming or multiplayer gaming, while a Core connection 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



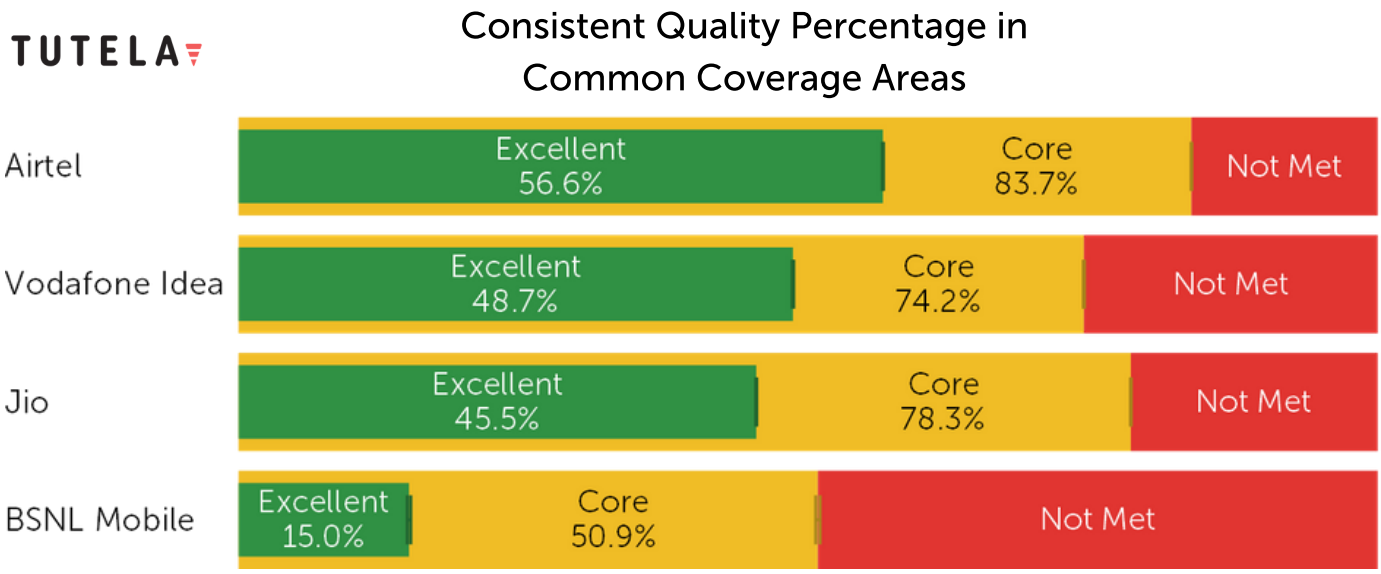
Common Coverage Areas



Consistent Quality

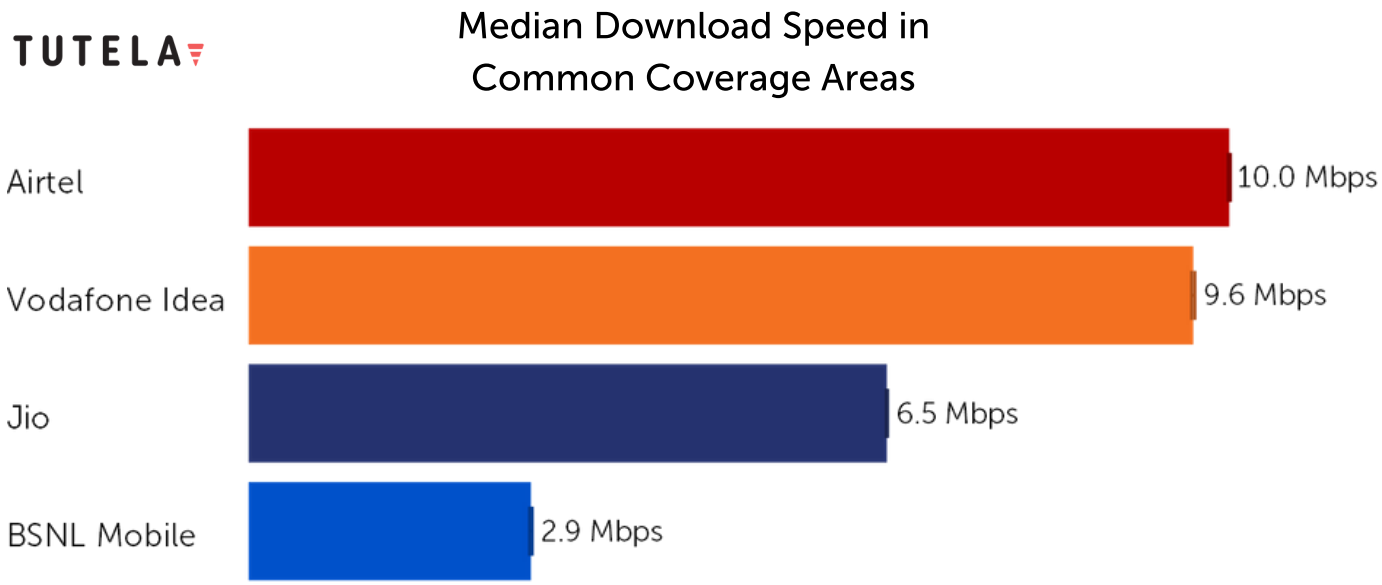
In Common Coverage Areas across India, Airtel had the highest Excellent Consistent Quality at 56.6%. Excellent Consistent Quality is Tutela's metric for user experience against a range of common but high-intensity use cases such as 1080p video streaming, live mobile video broadcasting, online gaming, and HD video calls. This was followed by Vodafone Idea, second at 48.7% and Jio, third at 45.5%. In last place at 15% was BSNL Mobile with a huge gap of about 30% between the state-owned operator and third place Jio. This is likely due to BSNL's continued reliance on 3G - a technology that is seldom capable of meeting the speed or latency thresholds that form key parts of the Consistent Quality metric.

Airtel again ranked first for Core Consistent Quality, Tutela's metric for when a connection is good enough for web browsing, social media sharing and SD video streaming, at 83.7%. Jio managed to grab second place for this category at 78.3%, closely followed by Vodafone Idea at 74.2%. BSNL Mobile subscribers had a substantially worse experience for everyday use-cases, trailing by approximately 23% behind Airtel with a Core Consistent Quality of just 50.9%.



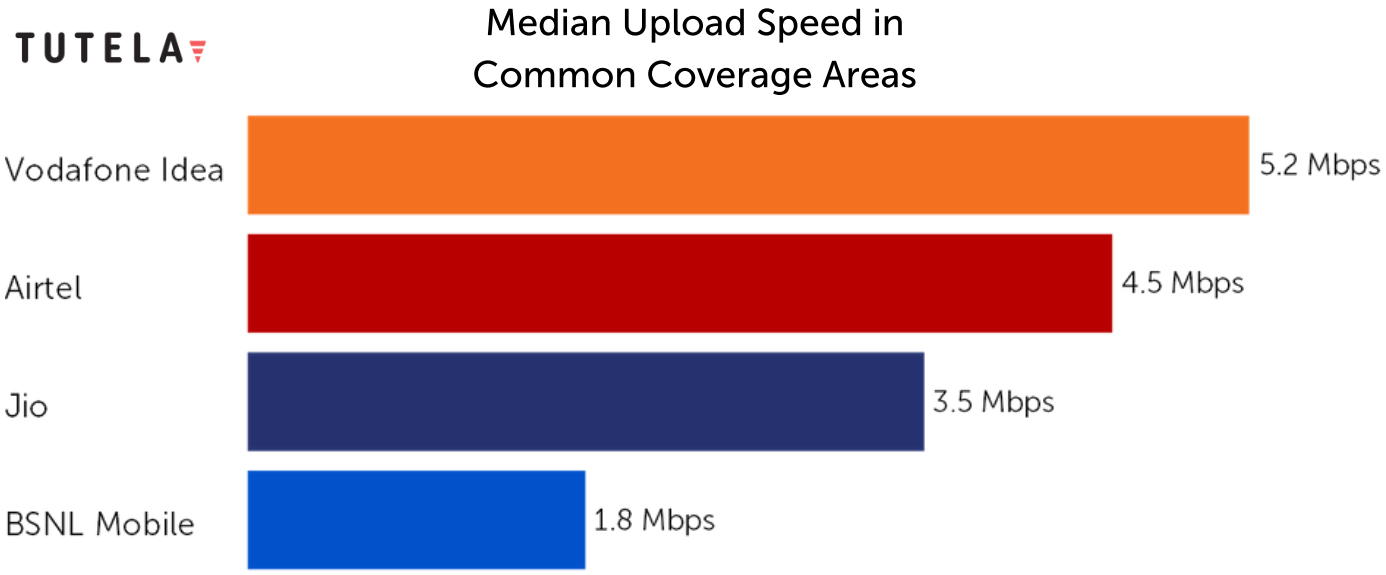
Download throughput

Airtel triumphed over the other operators for this metric again with a median download speed of 10 Mbps, closely followed by Vodafone Idea with a median download speed of 9.6 Mbps. Jio was in the third place with a median download throughput of 6.5 Mbps, whilst BSNL Mobile ranked last with a download speed of 2.9 Mbps which is about 7 Mbps slower than first placed Airtel.



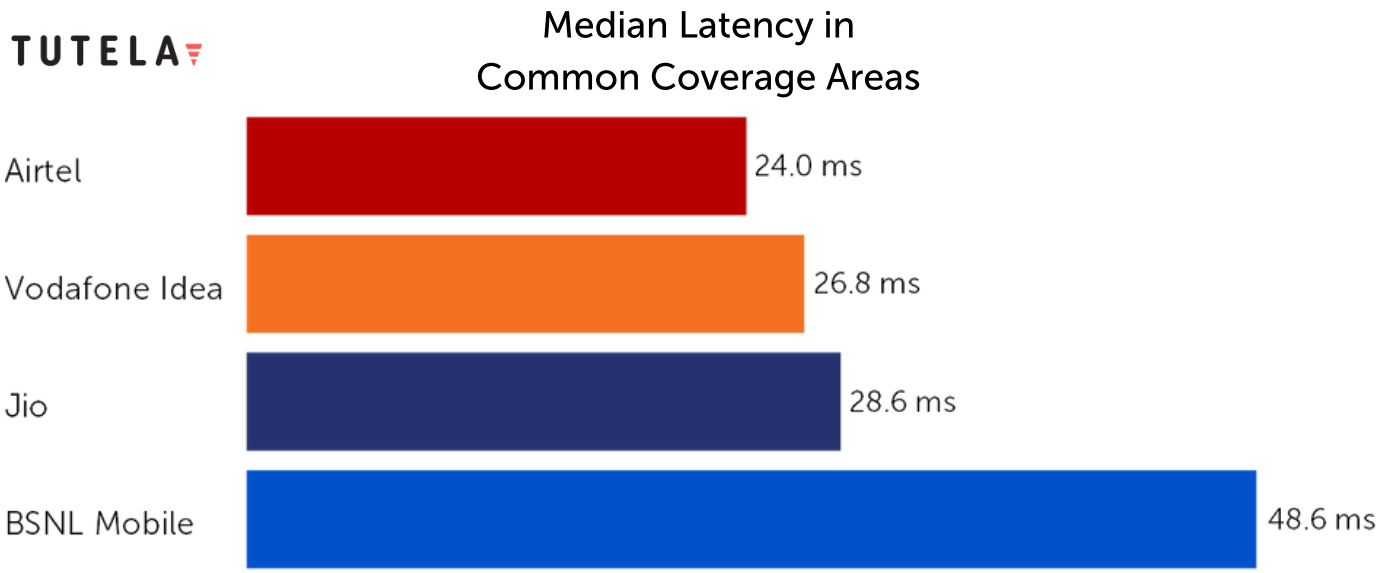
Upload throughput

Rankings between operators are much closer for upload speed as compared to download speed with the exception of one operator. Vodafone Idea outcompeted Airtel for this metric with a median upload speed of 5.2 Mbps, while Airtel had an upload throughput of 4.5 Mbps. Jio ranked third with a median upload speed of 3.5 Mbps - lagging behind Airtel by only 1 Mbps. BSNL Mobile placed last in this category with a median upload speed of 1.8 Mbps.



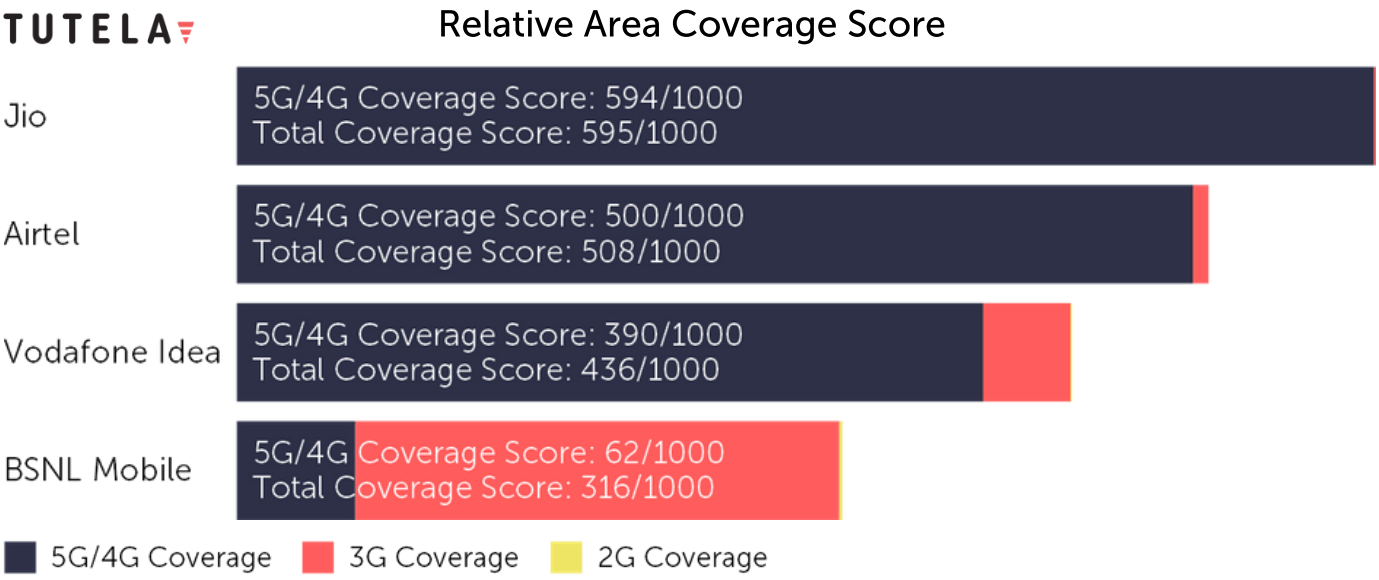
Latency

Airtel subscribers experienced the most responsive network on average in Common Coverage Areas across India with a median latency of 24 ms, which is more than 50% lower than Excellent Consistent Quality's threshold of 50 ms. Vodafone Idea ranked second with a median latency of 26.8 ms followed by Jio at 28.6 ms. The trend continued for BSNL Mobile with the operator placing last with a one-way latency of 48.5 ms – a whopping gap of over 24 ms between BSNL and first place Airtel. This is again likely due to BSNL's reliance on 3G, which traditionally has significantly higher latency than later connection technologies.



Coverage

Despite consistently placing third for Consistent Quality and its underlying metrics, Jio outperformed other operators in terms of the relative observed area covered for its subscribers, with a total coverage score of 595 - which is overwhelmingly made up of 4G coverage and a virtually insignificant amount of older technology due to Jio roaming on BSNL towers. Airtel was in second place with a 5G/4G score of 500 and a total coverage score of 508. Jio had a greater advantage over Vodafone Idea with a remarkable gap of over 159 and 204 points for total observed area coverage score and 5G/4G coverage score respectively. BSNL Mobile was in last place again with a total coverage score of 316 and a 5G/4G coverage score of just 62. This is due to its focus on providing rural coverage, often for older devices that do not show up in crowdsourced data.



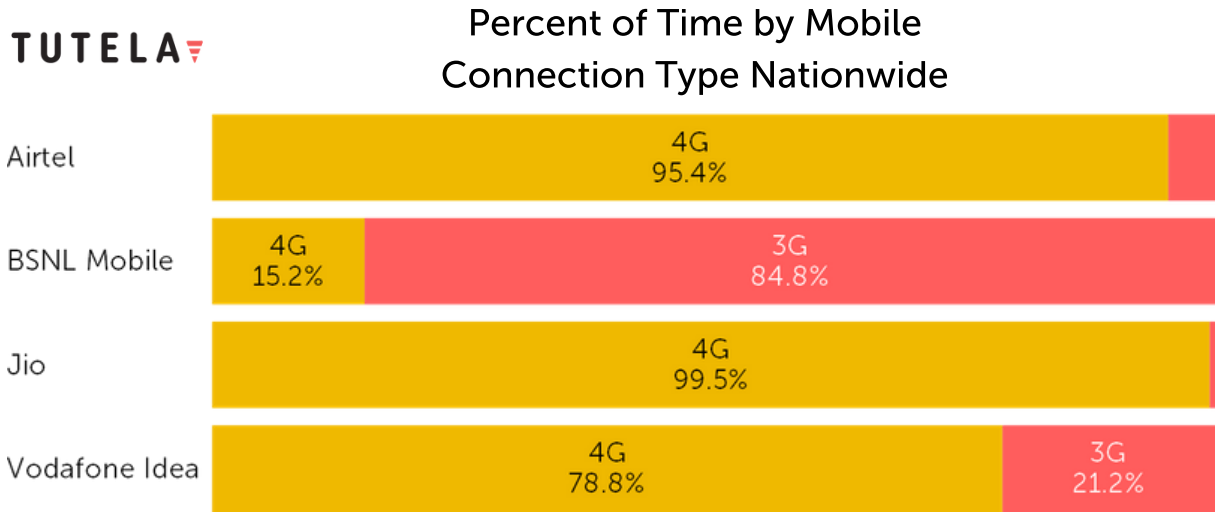
Technology usage

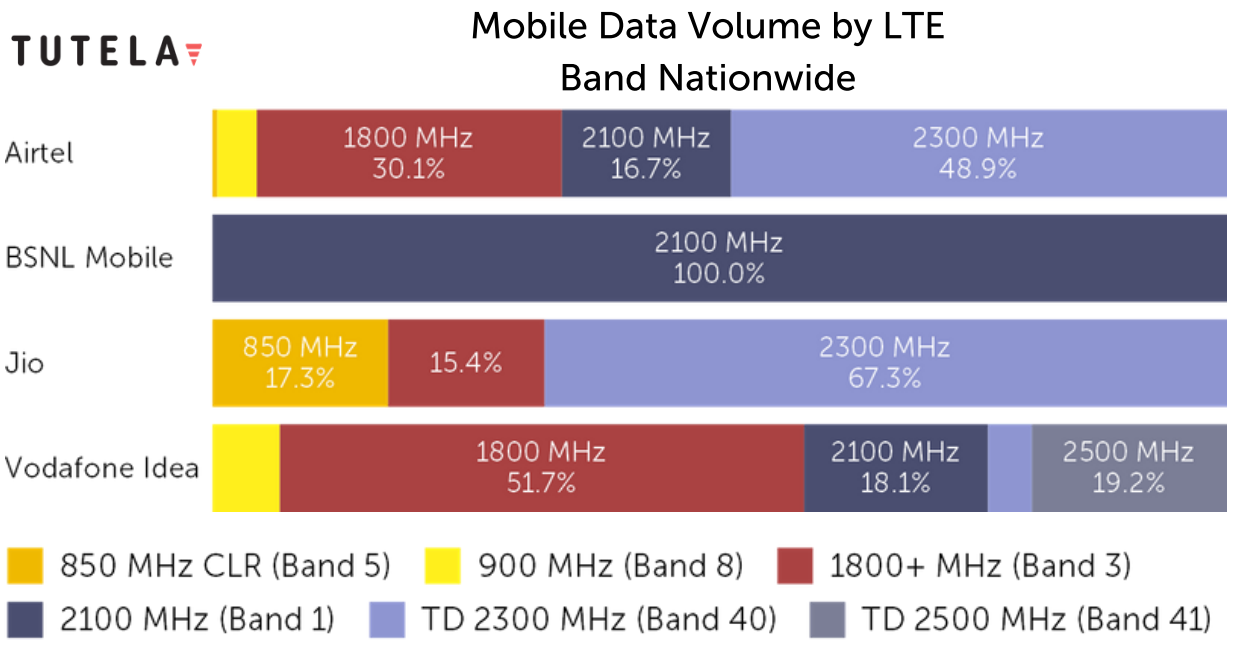
LTE spectrum usage in India currently relies on a mix of frequency bands ranging from 850 MHz to 2300 MHz with each operator taking a different approach to its distribution of spectrum. While Airtel and Jio rely heavily on the 2300 MHz band with 48.9% and 67.3% of their data usage allocated to this frequency respectively, Vodafone Idea uses very little of this band for its LTE data usage – instead favouring a split of 2100 MHz and 2500 MHz for much of its high-band usage. BSNL Mobile on the other hand is completely dependent on the 2100 MHz band for LTE data traffic, while Airtel and Vodafone Idea have 16.7% and 18.1% of their 4G data traffic transceived on this band respectively.

Vodafone Idea has the largest proportion of its LTE traffic go over mid-band (between 1-2000 MHz spectrum), using 1800 MHz as its primary band for 51.7% of LTE data usage, while Airtel and Jio have 30.1% and 15.4% of their data usage going over this spectrum respectively.

As far as the sub-1000 MHz bands are concerned, only Jio uses these frequencies to carry a significant amount of 4G data traffic, with 17.3% of data traffic using 850 MHz as the primary band. Airtel and Vodafone Idea both use sub-1000 Mhz spectrum, but at less than half the rate of Jio.

When comparing 3G and 4G usage in India, the majority of subscribers spend a higher percentage of time connected to 4G for all operators but BSNL Mobile, who was considerably late in launching 4G services. Jio outperformed other operators with its users connected to 4G 99.5% of the time, only falling back onto 3G in rare circumstances. Meanwhile, Airtel was close behind with its users spending 95.4% of the time on a 4G connection. BSNL subscribers spent just 15.2% of time on a 4G network, highlighting how reliance on the older 3G technology persists for this user base. Despite Vodafone Idea users spending just over 21% of the time on a 3G network, the operator still has plans to switch off this network later this year but it may need to carefully consider any future implications of shutting down 3G, especially around subscriber experience, before implementing this step.





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 31 million speed and latency tests between August 1, 2020 and January 31, 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

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Results Overview in Common Coverage Areas

	Download Throughput	Upload Throughput	Latency	Excellent CQ	Core CQ
Airtel	10.0 Mbps ± 0.01 Mbps	4.5 Mbps ± 0.01 Mbps	24.0 ms ± 0.008 ms	56.57% ± 0.05%	83.66% ± 0.03%
BSNL Mobile	2.9 Mbps ± 0.01 Mbps	1.8 Mbps ± 0.00 Mbps	48.6 ms ± 0.137 ms	14.97% ± 0.16%	50.86% ± 0.19%
Jio	6.5 Mbps ± 0.01 Mbps	3.5 Mbps ± 0.00 Mbps	28.6 ms ± 0.006 ms	45.45% ± 0.04%	78.34% ± 0.03%
Vodafone Idea	9.6 Mbps ± 0.02 Mbps	5.2 Mbps ± 0.01 Mbps	26.8 ms ± 0.019 ms	48.67% ± 0.07%	74.22% ± 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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