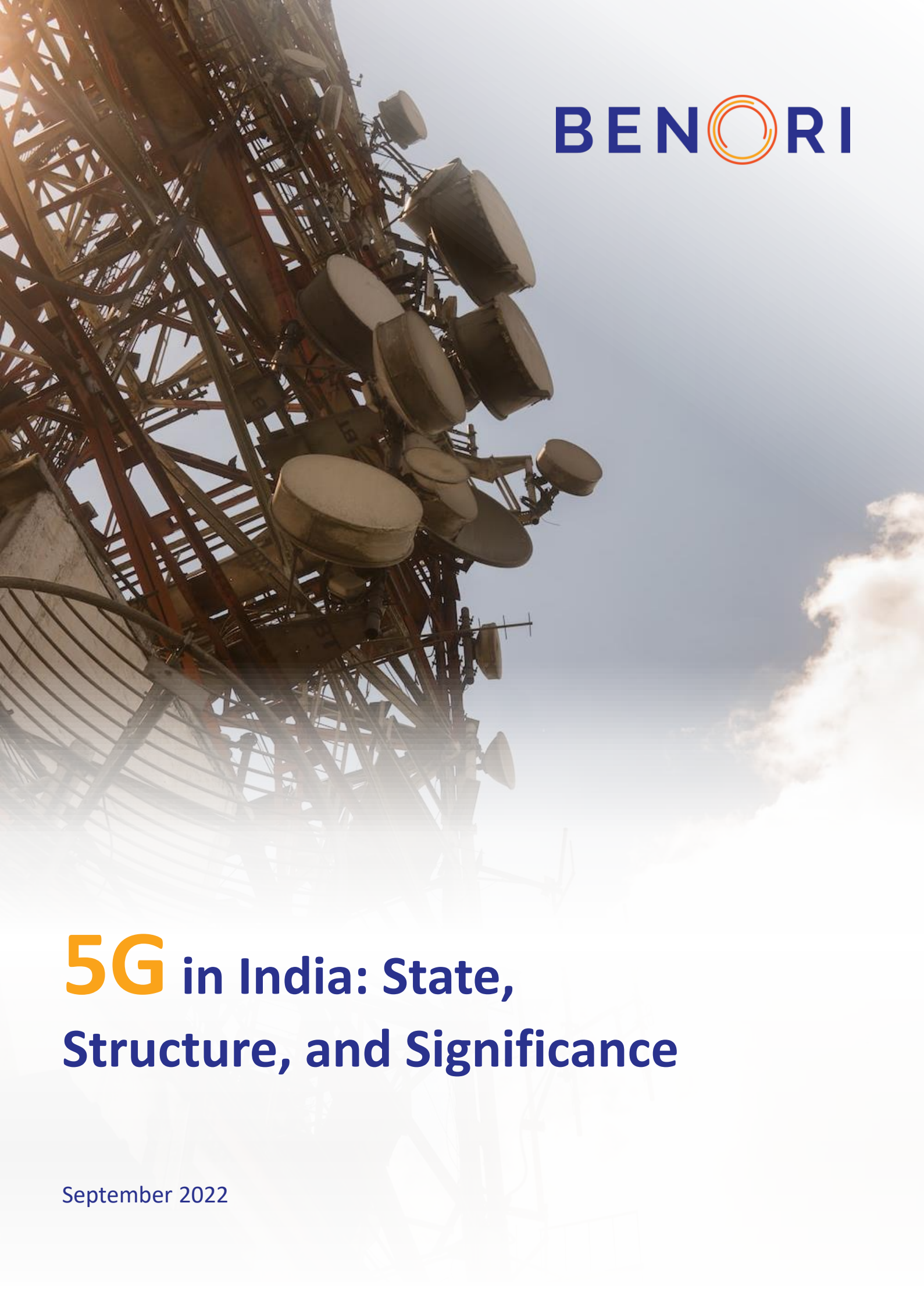

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5G in India: State, Structure, and Significance

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5G is the latest iteration of cellular technology that offers faster-than-ever internet speed, ultra-low latency, improved reliability, a large network capacity, increased availability, and a more uniform user experience. India is all set to roll out a 5G network in the coming months and join a select few countries to have a 5G network.

According to the Ericsson Mobility Report (November 2021), 5G is forecasted to account for around 39% of mobile subscriptions in India at the end of 2027, estimated at approximately 500 million subscriptions.

What enhanced capabilities does 5G have from its predecessor?

5G is expected to do much more than significantly improve the network connection. The technology can enable groundbreaking solutions — be it billions of connected devices gathering and sharing information in real-time to reduce road accidents; or life-saving applications that can take flight due to lag-free guaranteed connections; or predictive production lines that can prevent interruptions well before they occur. 5G with its characteristics of ultra-low latency, enhanced capacity, and reliability, will enrich end-user experience. Theoretically, 5G has a peak speed of 20 Gbps, while the peak speed of 4G is only 1 Gbps. 5G promises low latency of under 5ms, while 4G latency ranges from 60ms to 98ms. This will allow a faster download speed than 4G. The download speed of 4G is roughly around 1 Gbps, while for 5G the speed will be around 10 times more. The low latency can improve the performance of business applications as well as other digital experiences such as online gaming, video conferencing, and self-driven cars.

5G takes connectivity to the next level by delivering connected experiences from the cloud to clients. 4G uses 20 MHz channels while 5G uses 100-800 MHz channels. With increased bandwidth, there is less chance of interference, and therefore, improved chances of supporting a high download speed. 4G uses a low-frequency band of up to 6GHz, while 5G is likely to be operating up to 30 GHz in India. As 5G works at a low wavelength, it requires a smaller cell size as compared to 4G. Hence, the network will need more 5G cell towers as compared to 4G to cover the same area. This technology will enable a significant increase in the amount of data transmitted over wireless systems due to the availability of more bandwidth and advanced antenna technology.

Where does India stand in 5G?

Recently the Department of Telecom (DoT), India conducted a 5G spectrum auction. Reliance Jio was the highest bidder offering more than INR 88 thousand crore followed by Bharti Airtel, Vodafone Idea, and Adani Data Networks.

The 5G band are classified into three categories — low-band frequency, which ranges from 600 MHz to 2500 MHz, mid-band frequency, which consists of 3300 MHz, and high-band frequency which goes up to 26 GHz and is also called mmWave due to its low wavelength. Reliance Jio, Airtel, and Vodafone Idea acquired spectrums in all the three 5G bands whereas Adani Data Networks acquired spectrum only in the high-band frequency, which will be used to provide private network solutions for their business verticals such as ports, and power generation, and not for the consumer mobility space.

In terms of architecture, 5G services will be deployed under two types of architecture. The non-stand-alone architecture (NSA), which is built on the existing 4G network architecture and stand-alone architecture (SA) where entirely new architecture is built. Most telecom operators worldwide have 5G NSA deployments, since it uses the existing 4G LTE platform, making it cost-effective in the larger scheme of things. As an industry practice, telecom mobile network operators begin deploying 5G services in NSA and gradually, move to SA. As SA is built from scratch, keeping 5G specifications in mind, it can leverage the benefits of 5G better.

Reliance has made significant investments to build its stand-alone architecture and promises to build its pan-India True 5G network by end of next year.

The licensed providers will roll out 5G services in different phases. The first phase is expected to cover major metro cities and spread to other cities subsequently. So far, these providers have not disclosed definite prices. However, Vodafone and Airtel have claimed to go into the market with a competitive strategy and pricing similar to 4G.

There are high expectations from 5G. However, it comes with certain bottlenecks, e.g., many of the old devices will not be compatible. Hence, it will need to be replaced with new ones. The developing infrastructure needs high cost and security, and privacy issues are yet to be fully solved.

What is the road ahead?

As per Ericsson's report 5G for business: a 2030 market compass study, the projected value of the 5G-enabled digitalization revenues in India will be approximately USD 17 billion by 2030.
The benefits of 5G will introduce solutions such as e-health, connected vehicles, more immersive augmented reality and metaverse experiences, life-saving use cases, and advanced mobile cloud gaming among others. Education, finance, agriculture, healthcare, and transportation are among the sectors expected to benefit from 5G.

The technology is vital, both from a digital connectivity perspective, and to give a strong momentum to the Government of India's initiatives of digitalizing the country.
5G comes with a plethora of potential applications that can significantly benefit users in India. Apart from high-speed surfing and better connectivity, the new technology can enhance the accessibility of services such as healthcare and mobile banking as well as provide new opportunities to the underemployed and unemployed people in the country.
The pandemic has emphasized the importance of connectivity in every sphere of our lives — from enabling working from home and online education to bringing businesses online and connecting people. The Government of India's Digital India program, which focuses on empowerment, inclusion, and digital transformation relies heavily on connectivity, since its foundation and can realize its true potential with the 5G network. The 5G network can be a game-changer for India, propelling it to the big league in the future.

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