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Path Leading Approach to 5G Deployment for the Indian Communication Service Providers

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Abstract

5G technology & services are at doorstep for the India Consumer and it's expected to be reality very soon as a result of successful completion of the 5G Spectrum Auction in India with super active participation by the all the major Indian Communication Service Providers (ICSPs) and new enterprise entrant. 5G enabled networks will enable different sets of innovative use cases and enable CSPs to address fundamental needs of the better network coverage, lower latency, capacity and obviously better customer experience to offer to retail and enterprise customers. 5G is proficient address the growing mobile traffic demands of Indian Consumers and be profitable by delivering new level of cost-efficiency, digitalization, and new revenue streams with innovative use cases.

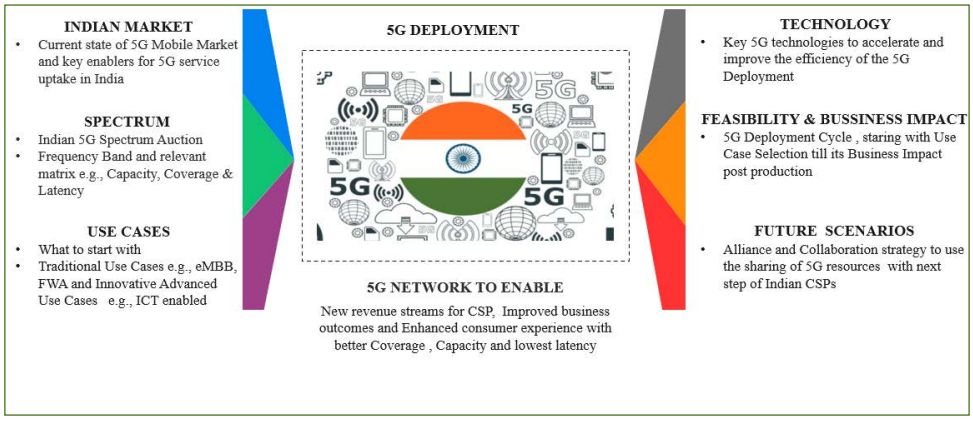
This paper elaborates 5G deployment approach including various 5G business and technology dimensions of the 5G deployment in India with potential future collaboration approach to deliver a better quality of service and enhanced customer experience for Indian Consumers soon.

Keywords: 5G Technologies, 5G Mobile Market, Spectrum Auctions, Use Cases, Business Impact, Indian Mobile Industry, Network Sharing

Introduction

Indian domestic consumers are experiencing coexistence of intensely evolving digital mobile communication technologies over last three decades while 2G enjoyed the substantial period followed by 3G, and 4G Communications services offered by the Indian CSPs.

5G Deployment Indian CSPs will required to assess various business and technology dimensions to be successful in their deployment and generate new revenue streams by offering the relevant new services as per the needs of Indian Consumer. Framework shown in Fig. 1 illustrate some of the key such dimensions with more details in the subsequent sections.



Source: Prepared by Author.

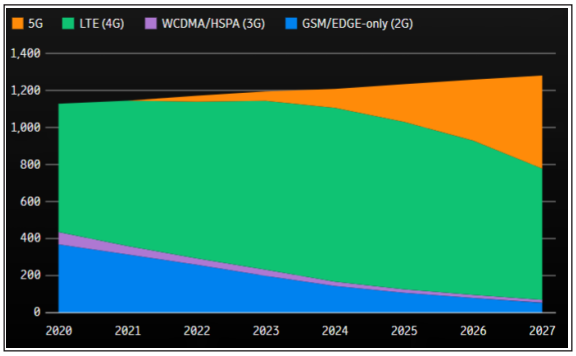
Fig. 1: Framework with some of the Key 5G Business & Technology Dimensions

Broadly there are two main ways the Telecom industry has classified 5G - An evolution of the access layer and or more broadly an evolution of entire network. Entirely it depends upon the type CSPs be it green filed or brown filed operator in India.

5G use cases are very much crucial for the success of 5G and hence it's going to be always starting point for any deployment scenario for Indian CSPs too. Broadly there are two major categories of use cases - Traditional use cases like enhanced mobile broadband (eMBB) and fixed wireless access (FWA) could be two potential use cases to be launched by the India CSPs at early stage of 5G operation in India at the beginning; gradually Advanced use case, i.e., second category of use case will gain momentum with further 5G rollout. Broadly these are the use cases in Automotive, AR/VR, Robotic, Healthcare, utility etc. It will be for the Enterprise B2B customer segment for CSP. Key Technologies and 5G Spectrum are another key milestone for CSP to go for speedy deployment post resent success of Indian 5G Spectrum Auction.

India Market Outlook

Indian consumers and enterprises have shown eagerness to adopt 5G. Referring to Ericsson Mobility studies conducted for India, 5G is projected to account for almost 40 percent of mobile subscriptions – 500 million – by the end of 2027 as shown in Fig. 2. Although 5G spectrum auction are concluded recently in August 2022 and 5G services are yet to be launched commercially in India, there is a good foundation through proactive interest and readiness by Indian CSPs for 5G uptake in India in shorter period.

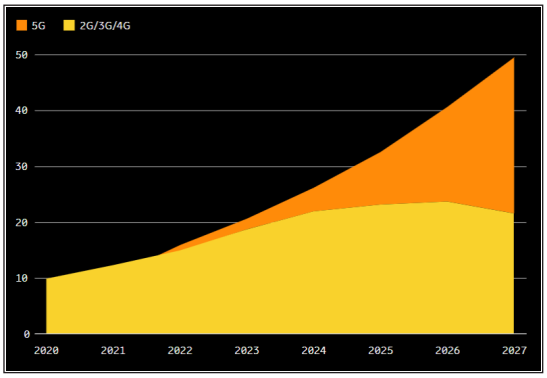


India region include India, Bhutan, and Nepal for the above depiction.

Source: Ericsson Report, June 2022.

Fig. 2: India Region Mobile Subscriptions by Technology (Million)

In addition, smartphone users in the Indian region are forecast to consume 50GB of data per month on average as reveled in study conducted by Ericsson Consumer Lab.



Source: Ericsson Report, June 2022.

Fig. 3: India Region Mobile Data Traffic (EB Per Month)

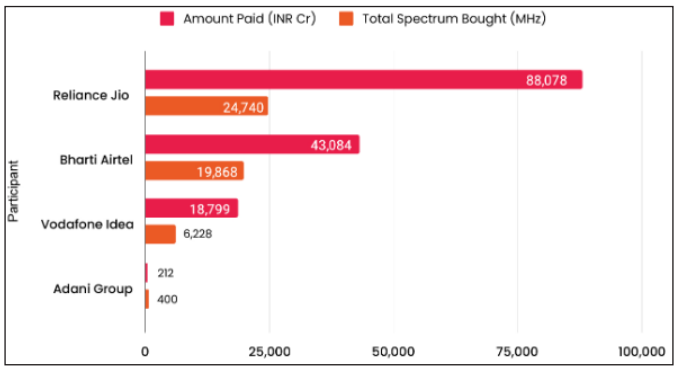
It is expected that 40 million smartphone users could take up 5G in its first year of availability. Availability of the 5G ready devices in Indian mobile market is another significant catalyst for 5G service uptake post commercial launch expected soon. Although it's expected that traditional use cases like enhanced mobile broadband (eMBB) and fixed wireless access (FWA) could be potential use cases at the beginning. As per Ericsson Study Indian consumer are equally ready to spend ~ 45-50% more to get better quality of mobile and high-speed internet services bundled plans. It's considered to be a win-win proposition and an opportunity for CSPs to grow the revenue with innovative retail and enterprise use cases with increase in 5G Rollout. Some of the sectors like manufacturing, healthcare, utilities, and Indian retail industry could be the front runner for 5G uptake. It will play significant role in achieving India's digital inclusion goal by bringing broadband to rural area and some of the results of 5G trials conducted by various Indian CSPs and other global CSPs are very positive sign.

5G Spectrum Auction

India is a second largest mobile market in terms of the number of subscribers after China. Government of India recently concluded 5G Spectrum auction successfully for 600MHz to 26GHz in August 2022 where all the main Indian CSPs participated. Although auction was delayed by various reasons like pandemic however participation and outcome of auction created a way forward for the deployment of 5G technology in coming months.

It's expected that roughly 25+ cities in India will have 5G coverage by the end of 2022 as per the statement made by Indian Govt Authorities.

The auction offered a total of 72GHz of spectrum licenses within the 600MHz to 26GHz frequencies with a 20-year validity with spectrum to be financed over 20 equal annual installments. It was with set a reserve price of INR3.2 billion ($40.5 million).



Source: inc42.

Fig. 4: 5G Spectrum Bought vs Payment vs Participants, India August 2022

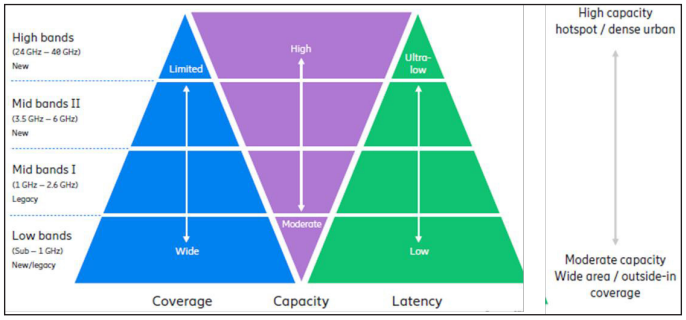
Giant Telecom Companies like Reliance, Vodafone Idea, Bharti Airtel and Adani Group which provides enterprise solutions under its Adani Data Networks subsidiary were key successful bidder of 5G Spectrum concluded in August 2022 in India.

As a fair play policy, The Indian government reserved a spectrum designated for enterprises to deploy private cellular networks to accelerate digital transformation across various sectors including automotive, healthcare, agriculture and energy. Companies like Amazon, Google and Meta Platforms and many others may pursue it to deploy private network in future depending upon the demand and requirements.

5G Frequency Band and its Relevant Significances

Each 5G spectrum band has different physical properties depending upon their respective frequency bands in use for deployment.

Prominently bands are - High Band (24GHz-40GHz), Mid Band-II (3.5GHz-6Ghz), Mid Band-I (1GHz-2.6GHz) and Low Band (Sub-1GHz) as indicated in Fig. 5. Key fundamental matrix relevant for the 5G deployment are capacity, coverage, and latency. Depending upon the 5G deployment frequency of CSP there will be high probability that 5G network may have the capacity for one matrix, may see the degradation of another matrix and vice versa. Hence its very much essential for CSPs to take trade off approach into consideration while planning 5G deployment. CSPs specific 5G services/use cases (for example eMBB, Fixed Wireless Access or IOT related) should be another parameter to fine tune the key matrix while planning a 5G deployment and service quality.



Source**:** IEEE- Survey on Low Latency towards 5G RAN, Core Network and Cashing Solution and Ericsson.

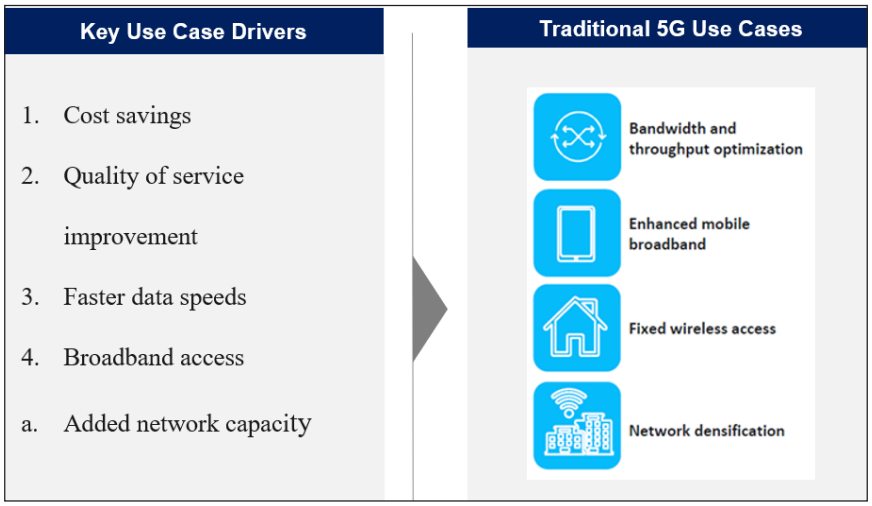
Fig. 5: 5G Frequency Band Trade off Approach as Per Needs

5G Use Cases

At the beginning of 5G in India, it's expected that of the 5G Technology will enable traditional use cases such as enhanced mobile broadband (eMBB) and fixed wireless assess (FWA) while positioning Indian CSPs to support next generation use cases as they grow with 5G deployment in next 1-2 years. These use cases may include the massive Internet of Things (IoT) services enabling various application in different sectors like Manufacturing, Healthcare, Logistics, Automotive and utility sectors.

There are many more sectors where relevant use cases can be innovated powered by 5G as we move forward in 5G rollout and can be implemented as new revenue stream.

Traditional 5G Use Cases and Key Drivers



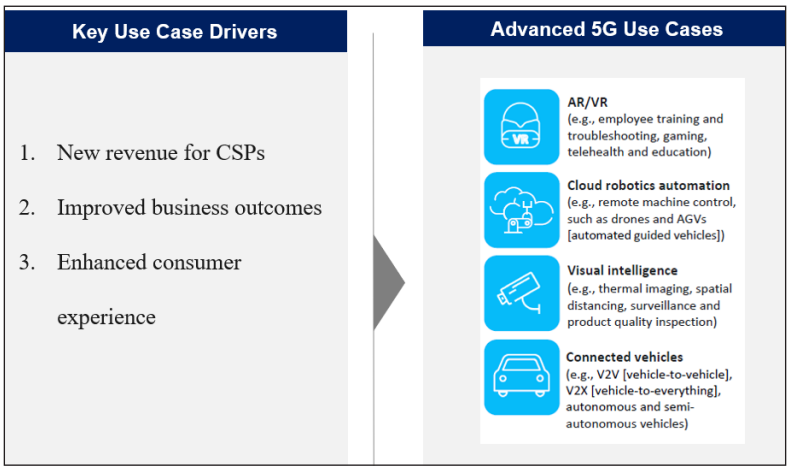
Source: TBR, June 2022.

Fig. 6: Traditional 5G Use Cases and Key Drivers

Referring to other global 5G deployment experience specially from US and China, key traditional use case i.e., enhanced mobile broadband (eMBB) will remain the primary use case for 5G at the beginning for Indian CSPs too as CSPs embrace the technology to stay competitive by providing subscribers with better quality of service and support for new devices. However, LTE will be dominating in near term and gradually consumer may migrate to 5G with strong marketing and commercial campaign push by Indian CSPs.

CSPs in many developed and developing countries globally are leveraging 5G FWA to provide competitive high-speed broadband services as well. Indian CSPs may also leverage FWA in many cases in greenfield environments, such as rural areas with an objective to reach to unreached.

Advanced 5G Use Cases and Key Drivers



Source: TBR, June 2022.

Fig. 7: Advanced 5G Use Cases and Key Drivers

Referring to experience of the 5G deployment by the various CSPs in some of the key market like China and US its evident that the advanced 5G Use Cass will be more widespread by 2024-25 and beyond when CSPs expands their capabilities in areas including network slicing and other.

5G Key Technologies

Broadly there are two main ways the Telecom industry has classified 5G: An evolution of the access layer and or more broadly an evolution of entire network. Entirely it depends upon the choice of the Indian CSPs. Most of the Indian CSP are brown field and they have running pan India operation using 2G, 3G and 4G technologies. It's evident that coexistence of multiple Mobile technologies going to be sustained for considerable time in India before any sunset of the technology like 2G.

Some of the key 5G technologies could enable 5G Network and provide capabilities to Indian CSPs based on the global benchmarking and deployment success.

Integrated Access and Backhaul (IAB)

Using millimeter (mm) wave spectrum for backhaul/ fronthaul via IAB could help CSPs cost-effectively accelerate 5G deployments in areas where deploying fiber is not viable. Specially in remote and rural places. IAB can also provide CSPs with a time to market benefit for 5G service.

Sidelink

Sidelink technology will support advanced 5G use cases by enabling devices such as automotive vehicle and or other innovative use cases to communicate without transmitting data via a network, providing greater flexibility for devices outside the range of network infrastructure.

Massive MIMO

CSPs will leverage massive MIMO to obtain significant capacity and coverage gains as well as to provide improved spectrum efficiencies.

5G Core

Transitioning to a cloud-native 5G core will yield benefits for CSPs, including OpEx savings and the ability to provide customers with dedicated network slices.

Open Virtual RAN (vRAN)

Open vRAN will enable CSPs to more cost-effectively add network capacity to support data traffic growth in the 5G era. Open vRAN also enables CSPs to integrate multiple network functions into commodity hardware while minimizing vendor lock-in.

Carrier Aggregation

Tethering disparate spectrum bands together using carrier aggregation enables operators to optimize 5G coverage, capacity, and latency.

It is also expected that Indian CSPs will have to align with local government mandates pertaining to 5G such as open RAN and security compliance requirements. Although there may variously benefits of complying this mandate like more cost-efficient operation and enable a path forward to becoming a digital service provider.

Device Availability

Availability of the 5G ready devices in Indian mobile market is another significant catalyst for 5G service uptake post commercial launch of 5G services. Costs of 3GPP-compliant devices have come down, multiple handset manufacturing are coming with their 5G range of products. It's another driver to make 5G more adaptable in lesser time.

Future Scenarios

As we see India is at the early stage of adoption of 5G Technology and spectrum auction enable to speedy deployment of 5G network for Indian CSPs in coming months and by end of 2022 it's expected to have minimum 25+ Indian cities with 5G Network Coverage.

Despite the competitive implications in Indian Mobile Market moving forward there will be high possibility of collaboration and cooperation amongst the CSPs and or Telecom Equipment Vendors or IT Software & Services companies to accelerate 5G deployment, nationwide coverage and reduce the cost. CSPs may also pursue an alliance with 5G vendors and technology partners to launch and sustain the advanced initiatives/use cases, fixed wireless, and rural connectivity at the later stage of 5G in India.

Globally Network Resource sharing practice is getting in place although India used to have site sharing mechanism historically. Some of the leading Global CSPs like AT&T, KDDI, Verizon, China Mobile and many more are collaborating with other CSPs within same market in order to be effective in offering their 5G services seamlessly

to end consumers. It's mentioned in Fig 8. We may see something similar in Indian market too in coming couple of years as and when 5G deployment takes the complete momentum to address the needs of remote and rural areas.

5G Network-sharing Agreements	
AT&T and DISH	KDDI and SoftBank
BCE and TELUS	LG Uplus, KT and SK Telecom
Charter and Verizon	Malaysian government and operators
China Broadnet and China Mobile	Masmovil and Orange
China Telecom and China Unicom	Orange and Vodafone
Comcast and Verizon	Telefonica UK (O2) and Vodafone
DISH and T-Mobile	Telstra and TPG Telecom
Fastweb and Wind Tre	TIM and Vodafone

Source: TBR, June 2022.

Fig. 8: Some of the Key CSP's 5G Network Resource Sharing Collaboration

For example, a) Telstra and TPG Telecom announced a 10-year network agreement, expected to close by the end of 2022, which will provide TPG access to around 3,700 Telstra mobile network assets. Telstra will gain access to TPG's 4G and 5G spectrum and be able to deploy infrastructure on up to 169 existing TPG Telecom mobile sites. b) In June 2022 DISH announced it signed an amendment to its 2020 Master Network Services Agreement with T-Mobile. The renewed agreement provides DISH Wireless lower roaming rates to access TMobile's network and entails T-Mobile helping.

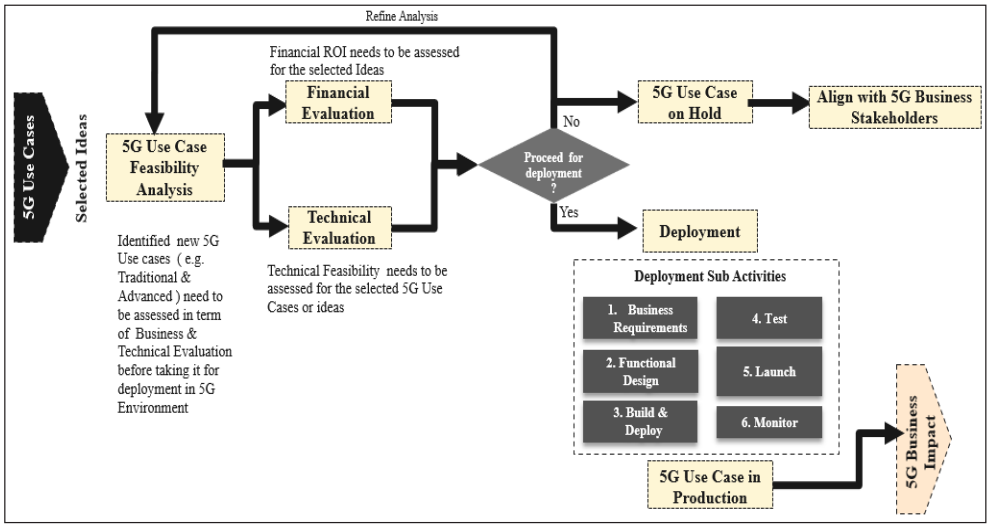
What Next

Airtel India: According to Airtel, they will commence rolling out the 5G network in India by the beginning of October 2022 in partnership with major tech giants like Ericsson Samsung and Nokia. Airtel aims to serve all the customers in towns and cities, including rural areas, by the year 2024.

Reliance Jio India: Reliance Jio wants to launch 5G as a demo test program in few metro cities first of India and move on gradually to the rural areas.

Feasibility and Business Impact

For the 5G deployment it is much expected to start with identification of relevant use cases and its feasibility with reference to business and technical aspects before even considering it for the deployment. It's very much essential for CSP to investigate it. Proposed Use case to deployment approach cycle provide the key aspects of such validation of relevant use case before considering it for deployment with its expected business impact. Majority of use cases will have life and this model is very much essential once 5G service is in operation and need to revisit existing or new use case as and when required.



Source: Prepared by Author.

Fig. 9: Deployment Approach from Identified Use Case to its Deployment

5G Business Impact

Total Investment and ROI are going to be crucial in Indian 5G Deployment context too when CSPs need to decide where, when and how to deploy 5G. Indeed, Indian CSPs might have assessed key 5G investment parameter as part of their Spectrum strategy and accordingly they have procured a respective 5G spectrum of the considered Indian State or Province.

Just like some of the other countries 5G will coexist and interwork with 4G for many considerable time to come, and majority of these 5G deployments are expected to be as non-stand-alone (NSA) initially. It will result into reduction of latency to data transmission and ensuring good coverage and mobility.

According to Global Data's India Mobile Broadband Index 2022 study, 5G sales in India are predicted to reach $9 billion by 2026, accounting for 37.7% of total mobile service revenues. The favourable economic impact of future 5G networks will be enormous. According to the GSMA, by 2030, 5G would add US$960 billion to global GDP2.

Business impact analysis is going to be recurring milestone for all the 5G Use cases identified and selected by the Indian CSPs before considering it for deployment. Generally Traditional use case (eMBB) services – with higher data rates, lower latency, and more capacity, may not be that financial lucrative at the beginning of the 5G deployment but it will have other significant benefit for Indian Consumers in terms of better quality of service, offload the 3G/4G spectrum and migrate section of customers towards 5G. The 5G comes with lower latency, which would significantly improve the operations of business applications and digital experiences like online gaming, connected cars, video-conferencing, and smarter devices as an additional revenue stream for CSP. It is also expected that Indian CSPs will have to align with local government mandates pertaining to 5G such as open RAN and security compliance requirements. Although there will be various benefits of complying this mandate like more cost-efficient operation and enable a path forward to becoming a digital service provider in long run.

Conclusion

For the 5G deployment Indian CSPs will required to access various business and technology dimensions to be successful in their deployment and generate new revenue streams by offering the relevant new services as per the needs of Indian Consumer. India recently concluded 5G Spectrum auction successfully for 600MHz to 26GHz in August 2022 and all the Indian Communication Service Providers are looking forward to deploy much awaited 5G Mobile and Enterprise services in India.

Indian CSPs are looking forward to exciting 5G Journey with innovative use cases both in retail and enterprise segments and looking forward to business impact through new revenue stream and better customer experience for end user group in very competitive market like India.

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