

# State of Telecom: A journey to 5G in India

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India is not yet ready for 5G. There is, however, a strong push by stakeholders and policymakers like TSDSI, startups, Department of Telecom and TRAI. While I missed participating in the Indian Mobile Congress 2019, the event itself, the conversations surrounding it and elsewhere, give a fair idea of how the road to 5G is shaping up.

5G, it is said, is the next big thing since Artificial Intelligence. It is the ideal Super Highway of Convergence. Whatever we have seen since the 2000's - involving human to human (H2H) and M2H (Machine to Human) activities, or more so, transactions, or 'events' are becoming possible. With humans and machines being the 'entities' at the edge, the medium involving digital bits - telecommunication in short is morphing into a powerful utility going beyond the essentials.

Cloud ( data storage infrastructure) & by extension data centres; devices / sensors, by extension Internet of Things ( IoT); the medium ( both the transport and physical layer - both in terms of technology & formats) have changed a lot, and enormous efforts have gone into creating a synchronous yet diverse infrastructure.

## 1995 to 2015: The tryst with Internet

### *Baby Steps*

I never had Internet in my college. We had landline at home or college. Our refuge was the college library. First, the telephones were landline - POTS they called - Plain Old Telephone System. My Electronic and Communication course started with Morse Code and ended with the Spread Spectrum project. I spent a lot of time in the college library to figure out how spread spectrum worked, and then worked with 6 college mates to create our own Codec unit of the spread spectrum device. The project struggled till the day before the externals, and finally, worked on the D- Day. The idea of looking at telecom and Internet did not occur to me till I stepped out of college. All the information needed were acquired old school - handwritten notes or photocopies of books and journals in the library.

My own first experience with Internet was a dialup modem. I remember the late 1990's sitting in Reuters and Wipro offices' and in Kolkata, dialling that number, username and password, and listening patiently to the hush and brrr... sound of a modem. And seeing the Yahoo or Hotmail websites were a luxury. Once a day access to the Internet-Land, after a day long effort was a dream. Beyond the websites, there was email and chat rooms. Communities with common interests - from spiritual to sleazy spawned and one could hop from chat room to chat rooms. Then came Internet calling - one could call through yahoo messenger and the likes.

That was good old BSNL then and VSNL. Both were India's Government run Service Providers. VSNL was then acquired by Tata's. We felt that there was something bigger than a PC and a modem, and the magic of people everywhere being able to reach each other through these two pieces of equipment adorning a table.

*"I think the way I feel about the internet is the way some people feel about the ocean. It's so huge and unknowable, but also totally predictable. You type a line of symbols and click enter, and everything you want to happen, happens. Not like real life, where all the wanting in the world can't make something exist."*

— Becky Albertalli, [The Upside of Unrequited](#)

Yes, Internet is an ocean. We discovered that when we found that Sify, an Internet Service Provider (ISP) based in Chennai, India. Sify had launched Internet cafes, and we were able to get hourly based internet outside office. We never understood the ability of a company to create the cafes as a public service. With more access to Internet, our horizons expanded. We understood that people could sit in different places and then through their computers, could chat, send and receive emails, and call - basically communicate. Voice and video calls through Internet were still evolving.

### *Advent of the Browser*

In the 2000's, we had more definite use of the Internet. The browsers exploded on one side - starting the evolution of websites, and programs around browsers. Browsers became the window to the world of the web. Applications spawned around the web browser. Early players like Netscape made life simple in terms of understanding and accessing Internet.

*Netscape brought the Internet alive with the browser. They made the Internet so that Grandma could use it, and her grandchildren could use it. The second thing that Netscape did was commercialize a set of open transmission protocols so that no company could own the Net. --- Thomas Friedman*

The browser essentially made Internet simple and open. This led to more players and developers bringing in technology to common person's use. The browser essentially was one window with an address bar- one could just type the name ( domain name) that one could remember and through series of hops, the browser could open pages in different servers / websites across the world.

*“Any sufficiently advanced technology is indistinguishable from magic.”*  
— Arthur C. Clarke, [\*Profiles of the Future: An Inquiry Into the Limits of the Possible\*](#)

The underlying magic of the TCP-IP protocol and Domain Name Service, conversion of human understandable names to internet protocol address ( IP address), which in turn matched machine addresses ( MAC) with internet protocol addresses unleashed itself to a simple magic. The World Wide Web now was a mesh of routers & switches connected to servers across the world.

### ***The Search Engine (2)***

Things changed dramatically in the early 2000's. Beyond communication, chat and emails, humans want to do something always - search for information. The story goes like this - quoting from Yahoo's own finance page:

Back in 1998, two individuals, Larry Page and Sergei Brin, who were unknown to the technology company offered to sell their little startup to AltaVista for \$1 million so they can resume their studies at Stanford.

The company that Page and Brin were looking to sell was the soon-to-be patented PageRank system and represents the core of Google's existence.

AltaVista turned down the offer to acquire the company. Similarly, Yahoo wanted its users to spend more time on its own platform, contrasting PageRank, which sends a user to the most relevant web site. Then Google launched on its own. A simple web page with plain white background and a blank field - and a search button.

*“I did Google him, you know.”*  
*“Oh, so you GOOGLED him Oh, well, that changes everything then, doesn't it? What could I possibly worry about now that I know you've conducted such a thorough Internet search?”*  
— Alyson Noel, [\*Fated\*](#)

The Internet just got simpler. The word 'Internet Search' has been replaced by Google since. It is a common word in vogue today. The browser, aka., the Google page now became the new launch point for the 21st century Internet user. With that single field, one could get any information she could want, at the click of a mouse.

Major businesses built websites and created content to ensure that they could catch the netizens' eyes while they 'googled' away. Intelligence built at the back end, called 'search engines' came up with prioritization algorithms, suggestions that could be paid for. Views and clicks became 'Action Items' of the new age businesses.

Personally, the Internet was not 'free' anymore. Users could pay for privileged content on a subscription basis but mostly free, as Steve Jobs said, 'If a product is free, you are the product'. The search engine has changed the world 'marketing and advertising' would be done to reach thousands of users. Businesses became global overnight. New agencies spawned as Search Engine Optimization (SEO) or Internet Marketing specialists.

### **Core and the Edge**

While the Internet user was having her cake and eating it too, the Internet duck was smiling at the browser level, and was paddling furiously underneath. The change in the underlying network technology involved development of both the core and the edge. The personal computer ( PC) had become the ubiquitous device at the edge ( the human side).

With next generation routers and switches spawning higher switching power and smarter protocols at both physical and the transport layer, including Virtual LANs and new WAN protocols, the Internet became more powerful.

The underlying physical infrastructure moved from coaxial copper to multimode and single mode fibers. The quality of optical fibers increased due to improvements in the field of material science. This would be the single biggest physical infrastructure achievement in the world of Telecom. The fibers could serve for more than 30 plus years, and can handle improved speed as digital bits are transformed into photonic variations and back.

Personally, I had life time experiences and fond memories of laying the fiber, configuring the switches during the first decade of the 21<sup>st</sup> century as a telecom engineer. I also had the opportunity to setup two Internet Service providers in South India. I did not know that a bigger play was happening at that time.

## Telecom Opens up in India - the 2G saga.

India opened its telecommunication sector when it moved into the 2G orbit. I was a telecom engineer with Wipro till 2005 and I had commissioned two Internet Service providers ( ARM & Wipronet), &one paging company ( Usha Martin Telecom) and who were my clients - both for telecom installation and service. I did not realize that I was a cog in the big wheel of telecom, as the 2G era was ushered in. India's moment in Telecom had come.

*“We were one of the first countries in the world to have telecom. In 1850, the first telegraph line was opened in Calcutta city for the use of the East India Company.”*

— Pradip Baijal, [THE COMPLETE STORY OF INDIAN REFORMS: 2G, POWER & PRIVATE ENTERPRISE: A Practitioner's Diary](#)

With such an enviable start, it was only imperative that India connected its entire populace to the Internet. And that would usher in the growth era. I remember my first cell phone - a Siemens - it was not a smart phone, but a phone with an antenna. It was digital screen like the LCD watch, green in color. Both incoming and outgoing were charged. We could send and receive text. The joy of talking while walking at any time we wanted changed our lives.

At this point, the Internet and the Mobile were separate. Internet was wired in the last mile. At office or in Internet cafes, there were Ethernet cables with RJ45 cables running to the Ethernet port of the computer. The speed was around 100 Mbps, and eventually we could reach 1G in certain offices - I had the opportunity of configuring switches - Cisco and 3Com, in particular, at the edge.

And back to India's journey: There were more than 23 telecom players - from Russia, Sweden, Norway, France and elsewhere, who came into life in different 'telecom' circles. With the support of Greenbacks and Euros, foreign investors and telecom companies felt that this was a golden opportunity. Spectrum was auctioned and all of them got a slice of the pie. It turned out to be a farce and would fizzle away as the decade wore along. Many of the starters disappeared due to combination of corruption, bad regulation, politics and legal quagmire. India had failed in its first major reform since its opening up of economy in 1991. The 2G saga was a bad episode, and lot of lessons were to be learnt.

### 3G – the birth of the mobile Wi-Fi & broadband (1):

In 2007, about 40 countries in across the world, and in 2008, India, entered the 3G era. The 3G standard is perhaps well known because of a massive expansion of the mobile communications market post-2G and advances of the consumer mobile phone. An especially notable development during this time is the smartphone (for example, the iPhone, and the Android family), combining the abilities of a PDA with a mobile phone, leading to widespread demand for mobile internet connectivity.

3G has also introduced the term "mobile broadband" because its speed and capability make it a viable alternative for internet browsing, and USB Modems connecting to 3G networks are becoming increasingly common.

3G mobile telephony was relatively slow to be adopted globally. In some instances, 3G networks do not use the same radio frequencies as 2G so mobile operators must build entirely new networks and license entirely new frequencies, especially so to achieve high data transmission rates. Other delays were due to the expenses of upgrading transmission hardware, especially for UMTS, whose deployment required the replacement of most broadcast towers. Due to these issues and difficulties with deployment, many carriers were not able to or delayed acquisition of these updated capabilities.

### *The Wi-Fi era : Divorcing the wire*

I do not remember when I got my first Wi-fi at home. But I had broadband in 2006. It was a modem that had a DSL Port where the wire from outside would pop through a door frame and connect to the router. I had a home computer and it was connected to the DSL modem. This was till 2009. The last mile was still wired at home.

*Wireless technology is creating entrepreneurship on a small scale that allows a single woman to set up a business in a small village or a single farmer or fisherman to access and disseminate market information in order to get the best price for their products. --- Peggy Johnson*

Well, then it should be 2009 - when I moved to Mumbai, when I got my first DSL plus Wi-Fi modem. It has been 10 years of Wi-fi. What a freedom! That was the time I also moved from a home computer to a personal laptop. When the last mile is 'unleashed' you go mobile. It was fun to browse from any part of the house.

Wi-fi at office & at home enable moving around a lot. It was easier to have one computing unit per person, and enabled office emails, work from home options, work-on-commute options etc. The walk-and-talk became move-and-do world! Imagine the same for businesses - with flexibility, people could do things within the wi-fi range, and work on the Internet.

For a while, I remember, using Reliance – Huawei data-USB, and Airtel Wifi device, which would, when plugged in, create a Wi-fi hotspot. But the experience was patchy, even though the convenience was alluring. That was the birth of mobile hotspots. Even now, the hotspots are patchy.

In my experience, 3G networks were never as visible or user friendly – but we had to climb that steps to reach 4G, when you had the actual trailer but could not see the full movie.

**2015- till date:**

#### **4G – The promise of the future**

4G is the fourth generation of broadband cellular network technology, succeeding 3G. A 4G system must provide capabilities defined by International Telegraphic Union - in IMT Advanced. Potential and current applications include amended mobile web access, IP telephony, gaming services, high-definition mobile TV, video conferencing, and 3D television.

The first-release Long Term Evolution (LTE) standard was commercially deployed in Oslo, Norway, and Stockholm, Sweden in 2009, and has since been deployed throughout most parts of the world. It has, however, been debated whether first-release versions should be considered 4G LTE.

Airtel was the first service provider to offer 4G services in 2012. Reliance Jio, was born in 2016, became India's first 4G only carrier. Today, Airtel remains the fastest network, with Reliance leading in network coverage at 98%.



(Source: Nokia MBIT index)

India's 4G mobile data Internet usage greater than entire population of South America, according to a report. Reports indicate that 2018 year has been the seminal year for 4G telecom growth, as India became the largest feature phone population country in the world.

'India needs more time for 4G infrastructure to stabilize. (3), says, Ookla's co-founder and general manager, Doug Suttles, I tend to agree. All you must do is to travel to an airport vicinity, a highway or in a train. You will find that the signal falling back to 2G and 3G – and most of the applications, which rely on 4G would not work. Voice calls on LTE therefore not as dependent. As the telecom operators have sunk in a lot of investments, it would make sense to expand the 4G reach further in the rural areas. Telecom operators are looking to expand into rural India, where the next 1 billion users of Internet are coming from India's rural hinterland.

#### **'A video is better than thousand pictures'**

*"I'm just Phil from Rossendale. And now people are screaming for me 'cause I make YouTube videos - it's just crazy!"*  
— Phil Lester

Enter Youtube - you can watch a movie rather than a set of pictures. And that is a whole new experience. I had one attempt at a video channel, a groggy video when the Chennai 2015 floods happened. But the fact is that most of us have seen a video once a day since 2015. More than picture and text, videos have a lasting impact. For research, entertainment, education, awareness, appeal and fiction, we use videos to good effect. As a standalone form of content, I find videos make good sense.

From cables to Direct-to-home (DTH) channels, we find that the world has moved to Internet - with use of Video on Demand channels like Amazon Prime or Netflix. The ultimate movie experience is now at home, and not in a theatre. And it also has democratized movie making to a large extent. Hitherto newbies come with amazing short and long form content in videos.

My son, a millennial, is now more interested in launching his own career in video movie making. A FIDE rated chess player, he prepares for his matches using Youtube Videos. That more is a proof that videos can contribute to the development of skills! He also works on gaming strategy videos with his gang, and that is another subject altogether. You cannot take the video out of the millennial.

### ***Social media: Beyond talk, Be social***

I never had an Orkut account. I had been using Yahoo! account - which gave me the opportunity to get social. Some of my attempted gigs during my IIM stint were through Yahoo Chat rooms, especially in Singapore. City or country specific chat rooms were the closed to social, that one could get before 2009.

2009, I got into Facebook. Facebook itself moved from text to pictures; pictures to videos. Most people want to share what they do, think & opine on social media. Friends, pages and groups are identity and community forms.

*“You are what you share.”*

— Charles Leadbeater, [\*We Think: The Power Of Mass Creativity\*](#)

Sometimes, Facebook is catharsis. I have met new people, runner friends, discovered old colleagues and alumni, and new friends I am wanton to connect. It also turned out to be my album - bringing back memories of the past years. Finally, the messenger. The movie *Social Network* describes how people have the urge to share little things.

Linkedin has been the next big thing in my life. Hitherto impossible to meet professionals in my field, respect, respond and reciprocate making things happen in my business and career. I met my business partners through Linkedin and Facebook.

Twitter is the celebrity side of the social media. You can reach, insinuate, spite and vomit at almost any celebrity, and honestly, it is the dirty of them all.

New age social media networks like Snapchat, TikTok, Instagram thrive on videos; and as we have seen earlier, a video talks more than a thousand pictures. Political and social lives are affected on a day to day basis.

You might be aware that India is the largest Facebook and Whatsapp country. Most rural Indians have now smartphones that pack Facebook & Whatsapp. TikTok seems to be the latest fad.

### ***Smart Phones: Mobile is the Internet***

The Nokia 3310 was my last non-smart phone. But legend has it that a phone still has 70% battery even after 25 years!

My first smartphone was a blackberry. It was given to Wipro employees as an email + phone combination. The phone had other applications. The famous QWERTY keyboard of blackberry is still one of the best. You could thud away like a laptop keyboard, and it's sturdy keys would hold fast.

*“In their phones were antennas, and these antennas sniffed out an invisible world, as if by magic, a world that was all around them, and also nowhere, transporting them to places distant and near, and to places that had never been and would never be.”* — Mohsin Hamid, [\*Exit West\*](#)

The world became smaller when we switched to Samsung Android phones or iPhones. Location services guided by Global Positioning Systems enable one to identify a person's location and then guide food delivery, taxi cabs and other services. A smaller handheld, having memory of more than 1 million times than the hard disk of the world's first computer, empowers a human to do many things at the press or touch of a button.

*“Mobile phones ... they're not for communicating, they're for broadcasting. Broadcasting The Show Of Me.”*

— Adam Nevill, [\*Last Days\*](#)

Now put together the video, social media and the mobile phone, I can clearly see that we have one device that has taken away the old school - killed many industries like the calendar, alarm clock and the camera; the Public Call office ( PCO's) which were ubiquitous and the landlines at home. Mobile phones are the sixth greatest invention after the fire, wheel, steam engine, electric bulb and the Internet. It is part of my life, both professional and personal - and taking further things nearer and nearer things further.

### **Convergence: The big event all along**

So what had been happening all along? A big event - an event that is a melting pot of technology and humans called convergence.

*The world is being re-shaped by the convergence of social, mobile, cloud, big data, community and other powerful forces. The combination of these technologies unlocks an incredible opportunity to connect everything together in a new way and is dramatically transforming the way we live and work. ~ Marc Benioff*

This is the biggest event since 1995. In the 30-year journey of Telecom, I have, as a drop in the ocean and cog in the wheel, journeyed the waves and tides of different technology evolutions to converge and disrupt the way business, economy, society & nations evolve and behave.

This is one huge tsunami that many can see but cannot fathom. The essence of 5G is convergence. The boundaries between the SMAC technologies disappear into one piece - we can call it 'platform' and what remains to be talked is the applications. Some of them are

1. Click and Mortar - new age businesses like Uber, AirBnB etc., ;
2. Autonomous Cars - self driven cars connected with GPS, traffic control systems;
3. Internet of Things - millions of devices speak through their sensors and 'things' to sense, act and control action and correction across different applications in manufacturing, telecom, oil & gas, and healthcare;
4. Smart Devices - Television, Wearables, Robots and Drones - each having inherent smartness involving parameters, attributes, content, location and rendering services for different applications;
5. Smart Cities & Infrastructure - Wholesome building, traffic, water, sewer, waste management, utility, security and other systems managed through Internet.

### **5G is the next leap forward (4)**

Beyond the enhancements in the underlying technology, the new 5G wireless devices have 4G LTE capability, as the new networks use 4G for initially establishing the connection with the cell, as well as in locations where 5G access is not available.

5G can support up to a million devices per square kilometer, while 4G supports only up to 100,000 devices per square kilometer

### **5G Usage scenario**

The ITU-R has defined three main uses for 5G. They are Enhanced Mobile Broadband (eMBB), Ultra Reliable Low Latency Communications (URLLC), and Massive Machine Type Communications (mMTC). Enhanced Mobile Broadband (eMBB) uses 5G as a progression from 4G LTE mobile broadband services, with faster connections, higher throughput, and more capacity.

Ultra-Reliable Low-Latency Communications (URLLC) refer to using the network for mission critical applications that requires uninterrupted and robust data exchange. Massive Machine-Type Communications (mMTC) would be used to connect to a large number of low power, low cost devices, which have high scalability and increased battery lifetime, in a wide area. Neither URLLC nor mMTC are expected to be deployed widely before 2021. (4)

The key factor remains that 4G penetration will be the focus of telecom operators and equipment manufacturers for the next 24 months, while the 5G spectrum auction scenario matures. The fact that 4G / LTE will be the fall back for 5G means that 4G needs to stabilize first and penetration needs to increase.

The opportunity for Indian stakeholders to play a global game is here and now. This essentially is for telecom software, device, network manufacturers to look at a global market and push thrust on exports. On the other hand, as the individual pieces of technologies come together, the Indian Mobile Congress brings out the intent of the Indian fraternity.

*“We cannot afford to miss the 5G bus for India. The significance of 5G for India cannot be overlooked. 5G will help us leapfrog infrastructure challenges and bridge the digital divide. 5G is not an incremental technology but an integration of systems. Its economic impact alone will have about \$1 trillion by 2035.” - Manoj Sinha, Minister of State (Independent Charge) for Ministry of Communications, Government of India (5)*

While the intent is clear, India is far from ready. Telecom providers like Bharti Airtel, Vodafone-Idea and Reliance Jio, the last three standing telecom operators bring about their concerns on the price of spectrum and ROI.

*"5G is going to be a game changer and will have massive impact but to get this happen we will have to come together. The Indian government needs to get the spectrum price right for investments to continue. The government must relook at the prices set for the upcoming 5G spectrum auction. The return on capital in the industry is lower than 1%, while the price is significantly high" - Gopal Vittal, CEO, Bharti Airtel.*

The benefits shall still outweigh the investments. However, there are still entry barriers for various stakeholders. Standards, spectrum, pricing, right of way for fiber optics are some of the key issues. 5G trials are yet to start. Telecom hardware makers - Huawei and Ericsson have pledged support to 5G trials. Most startups, the latest stakeholders, are yet have incentive, facility or support to create 5G use cases. India is therefore, still 24 months away from embracing 5G.

Personally, my interest to telecom was turned on when we were exploring telecom as an investment theme in our first fund in India. We were looking to start a telecom fund in 2020 - but understood that 5G is the single biggest high tide that will lift all the stakeholder's boats. But with lack of clarity, we have concluded that we may not get the right investment opportunities that can mature and scale without policy and platform clarity. We may consider investing in the last part of our investment cycle as a flower in a bouquet, and not as a primary subject. However, my personal interest remains.

My next article will look at depth the 4G to 5G evolution with a 360 degree view – political, investments, operators, equipment providers, software providers, startups, government's role, regulation and policy.

Please write back your feedback / response and queries to [the1.speaks@gmail.com](mailto:the1.speaks@gmail.com)

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**Ashok Subramanian** is a business strategist, investment banker & private equity professional running financial and research advisory companies through which he advises & raises capital through first principle approach. He runs Wiselane Ventures Pvt Ltd., a Bangalore based Strategic Ventures Company which focuses on solving growth, turn around and funding needs & challenges of businesses through Private Equity Capital, Structured Finance, Stressed Asset Buyouts & Mergers & Acquisitions. Through his other group companies, he raises equity and debt for SMEs and early stage ventures and technology startups. He has advised technology companies to scale rapidly in revenue and sales the consulting phase of his entrepreneurship. He has worked with Reuters and Wipro before starting on his own. He comes with 23+ years of technology business, Investment Banking, Private Equity, Consulting and leadership experience in leading and advising businesses on Private Equity, Structured Finance & Turnaround. He also has immense experience managing P&L and managing customer relationships with CXO connect, mentoring sales, relationship, delivery and functional teams to deliver customer/employee satisfaction, revenue and profit goals, manage large customers/deals, manage technology-alliances and complex projects. He has worked with BFSI, telecom, media, utilities, mining, manufacturing, hi-tech, retail, healthcare customers, in India and abroad. An Electronics and Communication Engineering graduate and a Management Graduate from IIM Calcutta, Ashok was the chairman of the Students Activities Committee (SAC) of IEEE chapter of his Engineering college and was awarded the Best Student Award for his contributions by IEEE. He is an avid technology enthusiast and a writer. He writes regularly in LinkedIn Pulse & Medium.com, a leading blog site.

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