The Wi-Fi Enabler for an Inclusive Internet
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Next Generation Wi-Fi could be Transformational for India

Connectivity has become the most essential part of the way we live and work through smartphones, tablets and laptops using wireless technology to support untethered access. We are aware that these devices are primarily connected via mobile cellular technology or Wi-Fi. While the mobile 3GPP technologies such as 4G & 5G hog all the limelight, Wi-Fi is the quiet one which does the heavy lifting of data for the indoors i.e., home or office, which are the primary places of access for most of us.

The introduction of the next generation of Wi-Fi i.e., Wi-Fi 6 & Wi-Fi 6E marks the beginning of a new era in Wi-Fi. The previous generations (going back 20 years) of Wi-Fi focused on increasing data rates and speed, but the next generation of Wi-Fi has focused on efficiency and performance, promising true multi user communications on both the down link and uplink through a new channel sharing capability. In fact, the proposed Wi-Fi 6E with an additional 1200 MHz, is nothing short of a paradigm shift for connected offices, homes and public areas such as stadia, airports, railway stations, etc. It is hoped that the decision on spectrum for the same is made early so we don’t lag behind the advanced nations in the spirit of ‘Aatmanirbhar Bharat’.

Lockdowns around the world due to Covid-19 had led to a global shift to remote work and online learning, resulting in significant change in the internet usage pattern shifting from enterprise and education networks to primarily consumer broadband networks. High density of devices such as smart phones, tablets, laptops & PCs, computer accessories, AR/VR headsets, wireless cameras, gaming devices and smart home devices are likely to drive growth both in home and enterprise space.

While 5G and Wi-Fi 6 are being deployed at the same time, people often try to compare these two technologies which are from entirely different pedigrees and serve different use cases. For the ordinary user, the utility will depend on the context. In general, Wi-Fi 6 will be capable of peak speeds that are superior to what is practical for 5G, but will depend on the back-haul the access point is connected to. If the back-haul is on fiber as is the case in most offices and homes, then the Wi-Fi experience would be unmatched, while 5G would provide a great experience outdoors. Since the Wi-Fi data would probably cost a fraction vis-a-vis mobile data on 5G, the next generation Wi-Fi will remain popular.

In India, where the tele-density of wired broadband is still an abysmal 1.5%, public Wi-Fi will remain a key potential technology for enabling high speed experience for the masses. 5G rollout will cost billions of dollars including expensive spectrum, and will take time for the services to reach the common man and the growing “digital experience divide” can be bridged by a thriving public Wi-Fi eco-system. The PM WANI initiative has the potential to address this divide and spur entrepreneurship. While it is heartening to see the improved adoption of PM WANI, we should introspect on how it can be made viral and tap on the entrepreneurial energy of the youth. While government intervention and support is welcome, the secret sauce remains in enabling the business case of the Wi-Fi entrepreneur and this is still work in progress.

I hope you find this edition insightful and informative, and look forward to your suggestions and involvement in nurturing this vital Wi-Fi ecosystem for realising the true potential of a digitally connected India.
The Government’s introduction of the Prime Minister Wi-Fi Access Network Interface (PM-WANI) scheme adequately establishes that Public Wi-Fi is the practical way to accelerate broadband penetration in the country, and help attain the national goals of Digital India and Broadband for All. The initiative envisions the achievement of the NDCP target of 10 million public Wi-Fi hotspots across the nation by 2022. PM WANI is expected to largely alter India’s shortcomings of Public Wi-Fi hotspots and lead to a seamless delivery of Wi-Fi services to the citizens at affordable rates and more consistent Quality of Experience/broadband speeds. It will also lead to explosive growth in business and employment opportunities for small local or village-level entrepreneurs, the kirana stores, tea-shops, etc., especially in rural areas; thereby propelling socio-economic development and inclusion, as well as rural digital connectivity. Moreover, it would lead to enormous demand and scope for developing components for these hotspots, boosting Aatmanirbharta.

Wi-Fi hotspots also have immense potential to generate vast economic benefits for the country - as an enabler of rural broadband, entrepreneurship, IoT connectivity and as a catalyst for rural economic activity. Addressing network congestion and improving the quality of services leads to considerable costs for the telecom industry. Offloading mobile data to Wi-Fi networks will not only help improve the network performance but also effectively lead to substantial savings for the telecom service providers in this regard.

An independent study by Prof. Rekha Jain has noted that the Economic Value of Unlicensed Spectrum for Wi-Fi in India would be INR 12.70 lakh crores by 2025 (in 2.4 GHz, 5 GHz, 6 GHz and 60 GHz bands), assuming that both 6 GHz and V bands are unlicensed in 2023. This is a significant contribution and we need to strengthen capacity by unlicensing new spectrum in 6 GHz and V bands (60 GHz), which would support the growth of advanced wireless services like Wi-Fi 6E as well as next generation technologies like Wi-Fi 7 and 5G NR-U, and innovative services like SRDs, AR/VR, etc. in the country.

With Wi-Fi 6E certifications having been commenced by Wi-Fi Alliance, it is expected to enter the Indian market soon, and would synergize with the PM WANI model, to offer faster speeds of up to 10 Gbps, increase in overall capacity, and reduction in congestion at Wi-Fi hotspots.

Given the rising demand and uptake of high-quality data content, the price sensitivity of the Indian market, and the growing work-from-home and work-from-anywhere culture, growth of Public Wi-Fi hotspots becomes an absolute necessity. All stakeholders must come together to expeditiously implement the historic policies of liberalised Wi-Fi and PM-WANI.

This edition of BIF’s Bi-annual Communique – Broadband Bits & Bytes, is intended to provide interesting and informative perspectives, insights and viewpoints from highly knowledgeable and experienced industry experts on various aspects of this vital issue; besides giving a quick glance into the latest activities and updates of the Forum.

I would also like to take this opportunity to thank our esteemed members, valued associates and partners, honourable advisors, and the dedicated Directorate team, for their invaluable efforts, support and contributions in continually driving BIF’s objectives towards a better, digitally connected India.

Happy reading!!
Dear All,

It gives me great pleasure to present to you the latest edition of Broadband Bits & Bytes - BIF’s Bi-Annual Communique. This edition of the Communique is focused on one of the determining factors for the onward journey of India’s fledgling Digital Economy – Wi-Fi.

While data consumption has been a steadily increasing trend for the country, when it comes to inclusive growth, India still ranks in the 49th place in The Inclusive Internet Index 2021. The Index, conducted by The Economist Intelligence Unit and based on a rigorous benchmark of national-level internet inclusion in 120 countries across four categories: Availability, Affordability, Relevance and Readiness, observes that India’s positioning can largely be attributed to underperformance in the Availability pillar, and weak performance owing to low internet usage and quality, besides the issue of gender gap in mobile phone and internet access. So there undeniably is much work that remains to be done to up the ante - both in terms of availability and quality of internet services across the entire nation.

Public Wi-Fi hotspots, one of the most widely accepted technologies for proliferation of broadband services globally, offers the most efficient and fast solution, as they can be deployed rapidly and with great effect. Wi-Fi has tremendous advantages including rapid scalability, and apart from being less dependent on Capex heavy infrastructure, provides the dual benefit of speed and throughput. Growing the number of Wi-Fi hotspots can offer a much-needed break for telecom service providers to offload cellular data onto Wi-Fi networks - which greatly reduces congestion on their existing burdened networks. Proliferation of broadband through Public Wi-Fi is definitely the right step towards Digital India and the consequential multi-fold benefits thereon.

With the data usage trends indicating continued rapid growth and heavy consumption of video content streaming, video calling, and similar high bandwidth applications, the need for anywhere everywhere connectivity through Public Wi-Fi will be critical for India’s digital future. The Government’s acknowledgement and response in this regard has been truly commendable. The introduction of PM WANI scheme was a historic step towards large-scale deployment of Wi-Fi hotspots across the country, to make available better quality of experience and reliable connectivity for users at affordable prices. Further, the proliferation of Public Wi-Fi hotspots under PM WANI will not only create employment but also enhance disposable incomes in the hands of small and medium entrepreneurs and boost the GDP of the country.

These are but a few limited views on this dynamic and extensive topic, wherein we have collated various insights, perspectives and viewpoints of leading experts, advisors and members. My sincere thanks and compliments to each of the esteemed contributors for their invaluable support.

I would also like to take this opportunity to thank the BIF leadership, especially the President, for his vibrant leadership and guidance in driving BIF ahead and for our many learnings and achievements gained in the process. My compliments and thanks also to our most efficient Directorate team for their boundless enthusiasm, dedication and efforts towards establishing BIF as the leading Think Tank for the Digital Communications ecosystem in the country.
In 2015, the Indian government announced the launch of Digital India, a set of campaigns and projects that sought to increase digital services and connectivity in the country and use the internet to make government services available to its citizens. Around a year later, the same government imposed digital banking and transactions on millions of unaware citizens with demonetisation. Soon, almost all services, including benefits, subsidies and other welfare schemes including rations through the Public Distribution System, were linked to Aadhaar and connected digitally. The state of Jharkhand even reported deaths when people did not receive their rations because of a linking failure. When the country lacks basic connectivity infrastructure, incidents like this where people miss out on welfare are all too common. Now almost two years into the pandemic, Digital India has seen some of its toughest challenges. There are reports that the number of internet users has grown during this period and will reach around 900 million by the end of the year. India is predominantly rural, and studies show that the country’s rural internet base is growing faster than its urban counterpart and will soon surpass it as well.

There have been several projects and schemes that have been announced over the years to try to make rural connectivity possible. The government’s National Optic Fibre Network, launched in 2012 and later renamed BharatNet, had such plans to connect all the panchayats with broadband. Their site claims that 25,000 kilometres of fibre had been laid. While this is good news, many of the basic infrastructural problems still remain. How does the internet reach the farthest corners of the country when there is sometimes irregular or even no electricity?

In a piece I wrote for the mint in 2015, I had discussed the possibility of using the active community of Community Radios to act as rural Internet Service Providers. These radio towers have 100 ft broadcast towers, a leased

Rural Wi-Fi: Can it be a game-changer for Digital India?

By Mr. Osama Manzar
Founder and Director, Digital Empowerment Foundation

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There have been several projects and schemes that have been announced over the years to try to make rural connectivity possible. The government’s National Optic Fibre Network, launched in 2012 and later renamed BharatNet, had such plans to connect all the panchayats with broadband. Their site claims that 25,000 kilometres of fibre had been laid. While this is good news, many of the basic infrastructural problems still remain. How does the internet reach the farthest corners of the country when there is sometimes irregular or even no electricity?

In a piece I wrote for the mint in 2015, I had discussed the possibility of using the active community of Community Radios to act as rural Internet Service Providers. These radio towers have 100 ft broadcast towers, a leased
line and membership fees could have helped provide access in areas where the radios are active.

So far, a lot of this has been achieved using community networks. While community networks are not the only form of rural connectivity, it is a very important one; one that we at DEF has also shown to yield several success stories. Community networks are local telecommunications infrastructures that are built, managed and used by local communities in areas where other commercial providers do not provide services. At the core of the concept of community networks, are the ideas of decentralisation, de-monopolisation and democratisation. Deploying wired internet across a geographically vast, spread-out and diverse country comes with high costs, which for a private provider is a challenge. Crises at public-funded companies like BSNL meant many in need of connectivity were losing out. Even for community networks, there are hurdles of scale, sustainability and long-term viability. While community networks already had been recognised by the TRAI as “public Wi-Fi networks” since 2016, there were not a lot of groups working to build last-mile connectivity. We at DEF have been working with the Internet Society on a project Wireless for Communities, where community-operated networks are created utilising the unlicensed spectrum bands (2.4- 5.8 GHz). We also work with communities on the ground, providing them with training to build these networks. Air Jaldi and Gram Marg are others who have been trying to implement community Networks, and BSNL’s 2020 announcement of AirFibre also tries to make use of unlicensed spectrum to provide connectivity.

The challenges we faced the most were similarly related to the associated costs and sustainability. Despite the mentioned recognition by TRAI, there was an evident lack of a framework that could easily make community networks spread out. But now, in 2020, the government has announced its project PM-WANI, (Wi-Fi Access Network Interface), which “envisages provision of Broadband through Public Wi-Fi Hotspot providers.” WANI will work somewhere similar to the old school PCOs (Public Call Office), which has been a suggestion we submitted at a TRAI consultation in 2016. WANI brings into place a framework, gets rid of the licensing issues, allowing local shops to sell internet access on a community level. Even though some of the interviews our team conducted on the ground mention of a lack of clarity from the government’s end on the implementation and dissemination, and some apprehensions regarding the initial investment cost for the devices like routers, WANI has the potential to be self-sustaining as it increases earnings for these local centres as well as boosting connectivity around the area.

Last-mile connectivity is important for all institutions. Like the recently announced K-FON project by the Kerala government had planned to bring internet connectivity to all the government offices, hospitals and educational institutions, there must be a policy level implementation to ensure that rural Wi-Fi can be made use of in a similar manner. The WANI has a decentralised framework, but the decisions and policies framed also would need to step beyond the MEITY or the Department of Telecommunications and into the other ministries, like health, education, or agriculture, if all sectors are to be connected. For example, a policy mandating all schools or hospitals or health centres requiring an internet connection within target date would push these institutions to make use of the infrastructure provided by WANI or other provisions for rural internet.

While we at DEF have always maintained that the internet is a necessity, a basic right and a tool for empowerment, the pandemic has highlighted and reinforced the urgency of getting connectivity to every corner. With weaker policies, the last two years saw millions of students lose out on education, and even more lose out on access to government services. When reports say that only 20 per cent of children had access to education during the pandemic, we see why these new schemes will be important for the future of Digital India.
In this so-called well-connected world, we are yet to witness developments in the high bandwidth areas. The Fibre Optics Cables have been extremely significant in establishing a backbone architecture which has opened us to newer opportunities. But the hunger to be more efficient still remains the same. As humans, we want to leave no stone unturned. Thus, we constantly race to build newer technologies, reduce cost, improve speed, stop paying licensing fees to the government, etc. What did we do? We built Free Space Optics. The only technology that’s proven to be used both on ground and space with ultra-low latency, secured, cost efficient and unlicensed EM bands features.

**What’s Free Space Optics Communications?**

It’s communication using Lasers which transmits gigabits of information through the wireless medium in a clean line of sight using Transmitters and receivers. It’s straight out of a Sci-Fi movie wherein you point a laser and it takes a backup of the whole Data Centre in a flash. This is just the beginning. It’s an out of spectrum band technology and works in EM bands in radio silence. It’s been there since the 1970s and no significant work was seen until the late 2000s as there was no need for such high bandwidth applications and other certain requirements.
The technological development carried over by different organisations like NASA, MIT, FSONA, CableFree, etc. together accounted for about $256m. The technology was proven by 1997 and commercial products started to roll out by 2003. Although these products were able to send just over 600 Mbps over a km distance, they were saleable only to military and other research focused institutions.

Currently every other player in the telecom industry is looking out for ways to reduce OPEX. Many have come up with ways like establishing Joint Ventures, reducing Manpower, increasing FDIs, etc. but what happens to be the problem is the hefty licensing fees levied. Although we do not oppose this way of working, we do feel that the telecoms should not be just considered as private players in the ecosystem. They are helping the government by bridging the digital gap for better India. Thus said, the unlicensed bands are available to carry on such activities.

FSO is an out-of-band technology that is essentially an EM wave which perfectly fits into the connectivity model. Citoto proposes a vertically integrated model that includes middle mile connectivity using FSOS and end mile connectivity using Wi-Fi routers in the unlicensed 2.4/5 bands. Although there’s absolutely no problem in the middle mile, we might face a problem in the end mile Wi-Fi connection due to crowded unlicensed bands. To address this situation Citoto is building a mesh topology using FSOS (low cost) so that the broadband connectivity can be relied on FSOS more than radios. In doing so, we eliminate the licensing fees, not completely, but to be substantially low in rural areas where telecoms are facing a problem to establish a business-revenue model.

This verily is a game changer in the rural markets and thus, the Rural India Initiative. We see a dispersed population settlement, difficult terrains and little to no digitalisation use cases in these areas. Thus, the telecoms find it difficult to even set up an infrastructure as the ROI might just drift away using current network elements. We propose a complete Wi-Fi based end mile connectivity here as Wi-Fi very well is the single best invention of mankind in unlicensed bands: Excellent bandwidth, ability to penetrate objects and most importantly has a good range. The Citoto FSO system doesn’t require a tower to be installed (cost saver) but a clean line of sight would do the work. The mesh APs and Wi-Fi 6 routers can be deployed over vast areas and support Voice, data protocols with increased bandwidths. I believe this is going to be a game changer mostly in the rural space as against dense urban population for Internet Broadband access. On the contrary, Citoto develops such topology for Private Organisational Networks without use of the internet to keep data secure and further lower Operational Costs.

India-bred World Class Technology by Citoto

We at Citoto, do not believe in reinventing the wheel and also every penny saved is a penny earned. The product-based industries should focus on developing new products together to reduce cost and increase productivity. We analysed the developed products and focused on working on the limitations and building new use cases. The emitting light diodes are popular amongst the fabrication industries, thereby we analysed those components closely. We have built our product portfolio focusing on these aspects of range, bandwidth capabilities and meshing protocols.

FSO is a point-to-point technology that focuses on transmitting information wirelessly in the air medium. This medium is filled with dust, heat waves, turbulence, sunlight penetration, heavy winds, rain, fog, moisture, etc. The link distance, Transmitter Electronics, Atmospheric Turbulence, Laser Beam Wander, normalized irradiance variance, etc. are some other important factors affecting the current system topology.

These problems are addressed by us to make this system more efficient. We use a technology called CPOC (Combined Planate Optical Conversion) for light convergence that enables us to reach larger distances. Also, a multi reflector system for reducing the packet loss. The mesh protocols help us to maintain uptime between different locations using multiple nodes. Although packet losses still cause some hindrance, we really can’t go against nature. We have developed products for different applications ranging from 1 Gbps to 40 Gbps channels and distances up-to 21km terrestrially.

This is essentially considered as a middle mile technology for establishing end mile backbone architecture. But we believe by reducing the cost further, it can be used for end mile connectivity. The major advantage using this system is that it works in unlicensed bands and thus no hefty spectrum fees to the government. Currently telecom pays 40% of its revenue to the government for using similar bandwidth spectrums or even less. This uses a 1550nm information channel with Class 1M laser which is eye-safe. Our 5G product is designed specifically to handle 5g Protocols.
Providing seamless access to Internet through Wi-Fi Access Points (APs) using indigenous PM-WANI stack (Wi-Fi Access Network Interface), brings out much needed potential for affordable and rapid way of connecting the unconnected, especially given the unfeasible business case of rolling out expensive traditional broadband infrastructure in rural areas, plagued with a lower affordability and revenue potential.

PM-WANI promises to provide significant impetus to the nation’s digital ambition – ubiquitous connectivity, digital inclusion and enabling infrastructure. In addition, productivity improvements from Wi-Fi based access for the overall economy can also translate into tangible benefits to the economy.

The WANI architecture, enables seamless authentication and roaming between different Wi-Fi networks, obfuscating the need for repeated authentication. With convenient one-time authentication, and the benefit of roaming, the architecture offers greater security and ease of connecting to potential consumers. WANI effectively does away with the need for One-Time Passwords that are typically required by public WiFi for egregiously short durations of time, after the initial registration on the App-based Portal.

PM-WANI will also facilitate customers of Public Data Office Aggregator (PDOA) to roam and use his/her data pack in any other network connected with its “Central Registry”. The WANI architecture is completely
unbundled and the 'WANI Wi-Fi Hotspots' are interoperable. Any customer authenticated by an App provider can use any ‘WANI Wi-Fi Hotspot’ operated by any PDO/ PDOA for accessing the internet. If any two PDOAs intend to enter into a roaming agreement for permitting each other’s customers to access internet from any Wi-Fi Access Point associated with them, then that is also feasible. Any commercial arrangement amongst PDOAs has nothing to do with interoperability for accessing the internet.

Roaming occurs when a wireless client device moves outside the usable range of one wireless access point (AP) and connects to another AP - usually one with a stronger signal. There is no “roaming” issue as far as the AP is concerned. As long as the APs are setup properly, client devices can roam seamlessly from one AP to another.

The actual “handoff” process, according to the IEEE 802.11 standard, is dictated by the client device. This process involves the client device disconnecting from one AP and then re-associating with another. This process consists of 3 phases:

i. **Scanning**: As the device moves away from the AP to which it is connected and the RSSI (Received Signal Strength Indicator) values begin to drop below certain levels, the client device sends out probe packets to identify AP alternatives. Upon discovery of accessible APs, the device then selects its next AP based on certain criteria, as defined by the device itself.

ii. **Authentication**: During this phase, the client device sends an authentication request to the new AP and waits for a response from the AP to approve or reject the request.

iii. **Re-association**: Upon approval by the new AP, the client sends a re-association request and waits for a response. Once the re-association is complete, the new AP sends out a disassociation packet to the old AP so that the routing tables can be updated. The handoff process is now complete.

If APs are properly configured, research has demonstrated that this handoff process typically takes less than 500 milliseconds (less than 1/2 second), with the scanning phase contributing to the majority of the delay.

It is also worth mentioning that the scanning phase can be reduced substantially simply by ensuring that only valid wireless profiles are stored on the device and initiated by client device’s “roam trigger.”

The client decides when it is time to drop one AP and move to another. Some client devices are more sophisticated and do a better job of determining at what point to let go of an AP, while others will measure only RSSI values and may hang on for a longer period of time before triggering a roam to a new AP. This all can be streamlined in WANI architecture while adopting efficient technology or protocols for Wi-Fi roaming which WANI fully supports, as shown below:
PM-WANI For Village-level Entrepreneurs:

Developing a culture of village-level entrepreneurship has been a longstanding goal of the Indian Government. PM-WANI brings an opportunity for entrepreneurship to villages. Here’s how:

- In rural areas, low-income tier families still do not have access to the internet.
- An initial capital investment in WANI compliant hotspots will boost entrepreneurship and last-mile connectivity.
- The rural entrepreneur can set up around 10 Hotspots around the village, and start distributing internet bandwidth over them at costs reasonable to the consumer base in the area.
- Over time, these hotspots recover the initial amount invested, and start generating profits.
- There are many beneficiaries through this project: The village, the people residing in it, and the budding entrepreneurs who want to see a developed community and country.

To facilitate ease of doing business and encourage local shops and small establishments to become Wi-Fi providers, the Government has not kept any requirement of license or registration for becoming a PDO and no fees are required to be paid to DoT. In fact, PDOAs, who aggregate the last-mile providers (PDOs) also do not require any licence. These PDOAs just have to register, for which no fee is charged. Unlike licensed TSPs/ISPs who pay a certain percentage of their revenue as licence fee, PDOAs or App providers are not required to share their revenues with the government.

There is a tremendous opportunity in India for the proliferation of public Wi-Fi hotspots. PM WANI (PM Wi-Fi Access Network Interface) can result in rapid scale-up of the internet in rural areas, which will be transformative given the low level of penetration (there) compared to urban areas.

The PM-WANI scheme would enable small shopkeepers to provide Wi-Fi service. This will boost incomes as well as ensure our youth gets seamless internet connectivity. It will also strengthen Digital India mission.

India’s appetite for data appears to be insatiable, with the country now having over 800 million broadband connections. However, the growth potential is still very high. More than 50% of rural masses around 500 million more are to be connected.

The main objective of this, apart from creating connectivity and access for all, is also job creation. In the new policy, the government has outlined the vision of creating 4 million additional jobs in the telecom sector. And when we look at the kind of potential that WANI platform and the public data office and data
office aggregator concepts alone represent; we can, indeed unleash huge employment potential, if we are able to put in place this architecture and make it available for people across the country.

PM-WANI will allow small entrepreneurs such as tea shops, to set up and maintain Access Points. Whereas, device manufacturers, payment companies, ISPs/Telcos and Consumer Internet companies can provide the remaining pieces to set up Public Data Offices (PDOs).

The framework represents an exciting opportunity to do for data what PCOs did for Long Distance Calling. It will bring a new generation of users and entrepreneurs into the market to bridge the need of last mile connectivity. The opportunities created are immense and will benefit 100s of millions of users in India waiting to get affordable access to Internet.

A schematic business model canvas for the opportunities and collaborations is tabulated below:

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<td>• Govt. Telco’s - BSNL</td>
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<td>• Pvt. Telco’s</td>
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<td>(Reliance Jio, Airtel, Vodafone-Idea)</td>
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<tr>
<td>• WANI Compliance’s manufactures and Application / software</td>
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<td>• Investors</td>
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<td>• Company Management</td>
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<tr>
<td>• Key Resources</td>
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<tr>
<td>• WANI Compliant Software &amp; Application Cost</td>
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<td>• Cost for the creation of PDOA infrastructure</td>
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<td>• Aggregation of Bandwidth Cost</td>
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<td>• PDO Wi-Fi Hotspot funding, Deployment, Operation and Maintenance</td>
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<td>• Employees and office Cost</td>
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<td>• Sales and Marketing Cost</td>
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Let us Make it Happen, together!!
PM WANI: Bridging the digital divide in India

Air, Water, Food, Internet. The modern age has evolved to a new set of basic needs.

From being a luxury, the internet has now become a fundamental need for humankind, a basic necessity for a convenient lifestyle. In fact, as per a recent World Economic Forum report, internet access is linked to improved economic outcomes and can help bring development, education, and jobs to communities. In India, we very recently realized the importance of a reliable, low-cost internet connection which proved particularly vital when the COVID-19 pandemic caused nationwide lockdowns and prevented in-school education for many children.

Unfortunately, this represents only one half of the story. While taking online classes, the first instruction given by teachers in private schools is that each child must keep their video on. On the other hand, the first instruction that teachers in the Government or low-income schools give to the students is to keep video off. 4 hours of online classes may consume up to 3 GB of internet, which is way more than the daily limit of 1.5 GB that most mobile internet plans offer. Add to it the speed and stability issues. This reality may just be the trailer to a new digital divide that we are creating amongst have and have nots.
Unlike air, water or food, the consumption of internet can be infinite. The more the better. In the post Covid era, an average family may require ~8 GB of internet per day for productive usage. Wired broadband that may solve it is not as affordable. With an upfront cost of around 2,000 rupees and monthly costs of around 700 rupees, it becomes a non-starter for most families. No wonder India has only 21 million wired internet connections, and compared to China the penetration is just 1/40th.

This realization has ensured that, both the government and private players are stirring rapidly to spread high-speed connectivity in order to help put India on a global map of digital transformation. In line with this, the Government of India recently approved a framework for the proliferation of broadband internet through PM Wi-Fi Access Network Interface or PM WANI scheme. The initiative aims to elevate high speed internet connectivity in the country entailing a complete framework involving multiple elements -- Public Data Office (PDO), Public Data Office Aggregators and app providers.

PDOs are designed much like the ubiquitous PCOs or public communication offices of the past. Any store can double up as a PDO managed by aggregators or PDOAs like i2e1, which establish, maintain, and operate these Wi-Fi access points and deliver broadband services to subscribers.

Unlike the western construct that emphasizes public Wi-Fi at open market places, stadiums, malls, etc. to provide continuous connectivity, PM WANI solves the problem of proliferation of broadband services near homes in an affordable way. This approach has widespread benefits - ease of access to education, different skill learning programs, entertainment and much more.

PM WANI enables it using a two-pronged approach:

1. From a user perspective, where connecting to any kind of Wi-Fi will be a home like experience, connecting to various kind of hotspots is going to be as seamless as home and that will fundamentally bring a change especially in lower income areas where people are not as connected.

2. From a business perspective, it is solving an Indian problem in an ingenious way. PM WANI gives Wi-Fi to public closer to homes; users are not travelling to public spaces to use internet but rather bringing hotspots closer to homes.

At an architecture level, PM WANI has two visionary aspects:

1. It opens a shared economy where any consumer can share their internet with someone else and earn from this resale.

There is no need for a license for a user to share his/ her internet and thereby become a PDO. Imagine this as Airbnb of internet.

2. It also opens a platform play since PDO aggregators (called PDOAs) can work with multiple Internet Service Providers and Local Service providers to create a ubiquitous network. Imagine this as an UBER of internet.

Both these aspects ultimately reduce the cost to customers and improve user experience. Hence, PM WANI is pathbreaking in its approach and can have far reaching effect on faster, and unlimited internet delivery in the country.

Initial results in few communities in Delhi have shown users getting unlimited high speed internet near their homes for as low as INR 5 per day at 50 Mbps speeds!

PM-WANI promises to be a strategic national initiative and is designed with finest architectural principles in mind. The success of WANI will surely catapult India’s digital story into the next orbit.
Due to the ever-increasing pace of digital transformation of the society, the Internet/Broadband connectivity has assumed great significance in our lives. The delivery of services such as healthcare, education, financial or citizen services through digital means to the population at large requires a ubiquitous communication infrastructure. The Covid-19 pandemic has further highlighted the need for such an infrastructure in our lives.

Unfortunately, a sizable Indian and global population is still not connected to Internet despite a tremendous growth of communication technology in the last few decades. As per the “Facts and Figures 2021” report from ITU, approximately 37% of the world population, i.e., ~2.9 billion people are still not using the Internet (in 2021). Almost all of this offline population (~96%) live in developing countries, e.g., close to 40% of population in India is still not connected to Internet. Similarly, more than half of the African population finds itself in the same boat. As can be anticipated, even within these developing countries, the rural areas lag behind the urban ones.

High-speed Internet connectivity has traditionally been enabled through wireline infrastructure such as Fiber-to-the-Home (FTTH) and (very high bit-rate) Digital Subscriber Line (DSL). But a pervasive fiber/DSL network, reaching the homes of most citizens, is not available in developing countries. For example, there are only ~2.3 crore wireline subscribers in India, a country of over 130 crore people. The rural India has even lower wireline tele-density with only ~19.3 lakh subscriptions among a population of ~90 crore. In this scenario, cellular technology has started serving as the primary means of broadband/Internet connectivity in the country with more than 77 crore cellular broadband connections. However, even cellular access may not be available in many parts of the rural India due to challenges such as low ARPU (average revenue per user), sparse population density, lack of uninterrupted supply of electricity, etc. Besides, even when it is available, not everybody is able to afford cellular connectivity despite it being cheap. Other developing countries too face similar challenges, rendering a sizable global population unconnected or with limited connectivity.
In this scenario, the technologies like 5Gi and Wi-Fi have the potential to play a crucial role in extending the reach of Internet. The 5Gi is a 5G Radio Interface Technology developed by TSDSI. The key feature of 5Gi is support for large coverage area cells, which can be used to provide affordable broadband connectivity in rural areas, especially sparsely populated areas. The 5Gi has already been accepted as an IMT-2020 technology (an ITU term for “5G“) by ITU in its Recommendation M.2150 and it is expected to be a part of 3GPP specifications too. Once the 5Gi compliant equipment are available in the market, they are expected to help greatly in increasing the footprint of cellular broadband connectivity in rural areas.

The Wi-Fi technology, with its wide range of benefits, is another attractive option for providing broadband connectivity to unconnected population. Wi-Fi is an especially affordable technology, with very low CAPEX and OPEX. The associated network devices are cheap to procure and easy to manage and maintain. The village level entrepreneurs, running the Wi-Fi based Common Service Centres in rural India, are able to perform a basic maintenance of the Wi-Fi infrastructure with limited training. Wi-Fi is also an energy efficient technology and locally available renewable energy sources can easily be used to power the Wi-Fi Access Point (AP) devices; it is not necessary to have a grid-based supply to run them. The latest Wi-Fi standards such as Wi-Fi 5, 6 and 6E support very high data rates too, even going up to ~10 Gbps. A key advantage of the technology is its immense popularity and most of the mobile devices available in the market today support Wi-Fi access capability. It also appears that a large number of 5G use cases, especially mobile broadband (eMBB) and IoT use cases, can also be supported through Wi-Fi access. We think that the rural fiber network, being laid down under BharatNet project by the government of India, supplemented with the Wi-Fi access technology will be able to provide affordable broadband connectivity to the vast population living in our villages. Wi-Fi technology can also support long-range (2-5 km long) microwave links, which can be created using IEEE 802.11n/ac standards in the 5 GHz band. These long-range radio links can be used to provide backhaul connectivity to remote regions where there is no fiber/DSL based connectivity. It is possible to achieve a capacity of up to 400 Mbps over such links.

Globally, the popularity of the Wi-Fi technology has been growing continually since its inception; it is estimated that mobile users use Wi-Fi connectivity for over 50% of their usage time in most major economies. Though the Wi-Fi usage time figures are relatively lower for India, less than 10%, it is expected to rise in future. The National Digital Communication Policy 2018 of India views Wi-Fi technology and public Wi-Fi network as one of the key mechanisms for broadband proliferation in the country. The NDCP 2018 envisions ~1 crore Wi-Fi hotspots in the country by year 2022.

Considering the huge popularity of the Wi-Fi technology, the 3GPP 5G standards has also come up with a converged 5G core architecture supporting both Wi-Fi (non-3GPP) & LTE/5G (3GPP) access technologies in a unified manner. IEEE is also coming up with a standard called “Frugal 5G networks”, enabling closer integration of Wi-Fi and cellular access technologies to provide seamless connectivity to users in rural areas. It is expected that these developments would give further fillip to the usage of Wi-Fi technology and public Wi-Fi network and they will complement 4G/5G/5Gi in providing broadband connectivity across the globe, including India.

References:
2. “The Indian Telecom Services Performance Indicators”, April – June 2021, Telecom Regulatory Authority of India
4. “Highlight of Telecom Subscription Data as on 30th September 2021, Telecom Regulatory Authority of India
5. TRAI Recommendations on Proliferation of Broadband through Public Wi-Fi Networks
7. 3GPP TS 23.501, “System architecture for the 5G System (5GS)”, V17.1.1, June 2021
Years ago Tech gurus predicted that everything would go digital, there would be massive amounts of data created and used, hence the need for a secure and competent highly available Digital Communication System. During the pandemic created by Covid, almost all services went online. Schools, Healthcare, Commerce, Finance all saw great dependency on the internet, even small artisans turned to the internet to remain visible and sell their goods. Unfortunately, the pandemic also saw a huge gap between the haves and the have nots, when it comes to availability and accessibility to the Internet. In the field of Education, since almost everything went online, it was Connect or remain uneducated. So many kids were deprived of education, because they had no devices and no access to the internet. If India had public Wi-Fi hotspots with connected devices, everyone could have accessed the internet for education, telehealth and other services. Hundreds and millions of Indians would have been connected and made use of the digital services. They would have been educated, undergone medical treatment, as well as earned their livelihoods from home. So it goes beyond any debate that Public Wi-Fi hotspots are most essential for Digital India. Public Wi-Fi should be technology neutral with no compromise on speed or data usage.

These would provide:

1. Open classrooms providing for school & continuous skill development for the under privileged.
2. Telehealth services, Agriculture, education, etc.
3. Access citizen centric government applications.
4. Access in emergency conditions when mobile and internet connectivity is lost, like floods, torrential rains, earthquakes.

The PM-WANI Program announced by the Government on 9th December 2020, for boosting the Number of Public Wi-Fi hotspots across the country is an excellent initiative. It delinks the provisioning of Public Wi-Fi services from the internet bandwidth providers and permits even the small and micro entrepreneurs like the mom-and-pop stores, the tea shops, etc. to provide Public Wi-Fi services without even having to obtain any licence/permission to do so and without paying any License fees. This, if properly implemented, is likely to lead to mushrooming of Public Wi-Fi hotspots across the country, especially in the much needed rural areas and give the much needed boost for acceleration of Digital India.

However, Public Wi-Fi comes with greater responsibilities for the network providers:

1. It has to be a robust network infrastructure providing no compromise on speed or data usage, with use of a good combination of products & services.
2. Fail over systems need to be built in, to maintain speed and access.
3. Security tools and measures to protect from cyber-crimes, since there is a fast evolving and ever expanding threat scenario.
4. Stringent security measures need to be enforced to avoid all kinds of Cybercrimes. A Security Operations Centre (SOC) to be maintained.
5. Need for trained and skilled manpower.
6. Regular audits including shadow IT, remote/personal devices, etc.

With these precautionary measures well implemented, India can benefit largely from Public Wi-Fi based on the PM-WANI Program.

The Government and Industry and the entire ecosystem must make this happen.
Why Public Wi-Fi is the most potent means for enabling mass adoption of digital services?

Rural population makes up for a significant majority of the Indian population, but rural tele-density is only 60%, which is a stark contrast to urban figures (141%). Despite rising internet penetration in the country, there continues to be a digital divide, and this is the paradox of the Indian telecom story.

India has already built a robust identity and payment infrastructure with Aadhar and UPI. It also has a robust infrastructure to provide government services and other internet-based services to rural India through the Common Service Centres. Coupled with access to internet, the opportunities for local transformation are immense, from employment and local entrepreneurship and most important access to government services. Public Wi-Fi can also enable a multi-user experience, which has positive ramifications to accelerate online education. A holistic transformation of the educational system can be enabled by collaborative technologies that allow individuals to create, adapt and share content and best practices.

According to Cisco Annual Internet Report (2018-2023), there will be nearly 623 million public Wi-Fi hotspots across the world by 2023, up from 169 million hotspots as of 2018. By 2023, Asia Pacific will have the highest share of global public Wi-Fi hotspots at 46 percent. Public Wi-Fi along with community hotspots are included in the forecast. Given these projections and the size of the Indian telecom market, having about one sixth of total telecom subscribers in the world, by 2023, India should have a minimum of 100 Million public Wi-Fi hotspots.

India has already undertaken efforts to ensure a secure, future-proof public Wi-Fi and the country will reap its benefits in the days to come.

Undeniably, internet penetration is a significant driver of a nation’s economic development. According to the World Bank, a 10% increase in the number of internet users can grow a country’s GDP by 1.4%. Research by BIF & iCRIER demonstrates that a 10% increase in the use of mobile apps can result in a 3.3% increase in India’s GDP. The pandemic has accelerated the digitalisation trend due to lockdowns and safe distancing measures. Now, more than ever, there is a significant need for high quality data connectivity anywhere and at all times. Rapidly digitalising India has been ranked highly among “Break Out Economies” in the third edition of the Digital Evolution Scorecard. Over the years, India has made significant progress on digital adoption and the divide is rapidly narrowing. It is a given that Public Wi-Fi pose to be a great enabler for the country as it will increase the proliferation of internet services and establish last mile connectivity. Access to high quality public Wi-Fi along with regional language digital services to enable two-way communication will provide immense economic value for consumers and industries, microenterprises, farmers, government, labour force, and other stakeholders. The vision of truly Digital India can fully be realised with the setting up of Public Wi-Fi spanning the length & breadth of the country.
Membership & Associates:
- Indus Towers and Tata Consultancy Services (TCS) have joined BIF as Patron Members
- Digital Empowerment Foundation (DEF) has joined BIF as a Professional Member
- Citoto, Koo and i2e1 have joined BIF as Startup Members

Awards & Recognitions:
- Mr. BK Syngal, Principal Advisor, BIF has been inducted into the New Internet IPv6 Hall of Fame as one of the distinguished inductees selected for the New Internet 6HoF 2021.
- Mr. SN Gupta, Treasurer, BIF, has been felicitated by the Commonwealth University, Kingdom of Tonga with an honorary PhD degree - Honoris Causa Doctorate, for his contribution to Industry and Society through his Business Model Innovation - “Hotspots as Managed Service”.

White Papers/Reports:
- **Satellites for 5G & Rural Connectivity** - Authored by Mr. Anil Tandan, Principal Advisor, BIF & Group CTO, Lycamobile UK Limited, and Mr. Gaurav Kharod, Managing Sales Director, South Asia and India, Intelsat. The White Paper highlights the role and importance of Satellite Communications in the 5G Ecosystem, especially for serving the rural and remote areas.
- **Research Study on the Proposed Non-Personal Data Bill** - Authored by Prof. Rekha Jain and Prof V. Pingali, the study undertakes a critical assessment of the proposed NPD framework and brings out key questions and considerations to be addressed while creating a framework to regulate data for economic purposes.
- **Frequency Sharing for Radio Local Area Networks in the 6 GHz Band in India** - Report prepared by RKF Engineering Solutions LLC, USA, a leading Engineering & Technical Solutions Organisation based on an India-specific co-existence study conducted on sharing of the entire 1200 MHz spectrum in the 6 GHz band for Wi-Fi usage along with the existing users, after according full protection in sync with the ITU-RR Rules.
- **Building an Inclusive Digital Society for Rural India** - A Report by ICRIER commissioned by BIF, was launched during a High Level Round Table with Minister (Valedictory Session) at the IIGF 2021 on 27th November 2021, chaired by Shri Rajeev Chandrasekhar, MoS, MeitY, in the presence of Mr. Maarten Botterman, ICANN Board Chairman; Shri Ajay Sawhney, Secretary, MeitY; Shri Anil Jain, CEO, NIXI; Shri BK Syngal; Ms. Anriette Esterhuysen, Chair, MAG IGF and Ms. Navika Kumar Group Editor, Times Network & Editor-in-Chief, Times Network Navbharat.
- **Unpacking Social and Economic Gains from Encryption** - A Report developed by Aapti Institute commissioned by BIF, informing the economic and social value of end-to-end (E2E) encryption. The same has been shared with all concerned Government officials/departments and relevant stakeholders.
The Digital Dialogues & Key Events:

- **27th July 2021**: The Digital Dialogues on ‘Building the Digital Economy: Opportunities for Growth and Partnership’ organised with Dr. Mike Short C.B.E., Chief Scientific Advisor, DIT, Government of UK as Chief Guest, and Mr. T.K. Paul, Member (T), Digital Communications Commission (DCC), Government of India; Mr. J.S. Deepak, Chairman of the CII Task Force on Digital Infrastructure, former Ambassador of India to WTO and former Secretary – Telecom, DoT; Mr. K.T. Rajan, Cluster Head - Technology & Innovation, India and Deputy Head of Mission, DIT, British Deputy High Commission; and Mr. R.K. Pathak, DDG-IC, DoT as Special Guests.

- **18th August 2021**: The Digital Dialogues session on the theme of ‘Satcom & 5G – The Final Frontier’ was held, wherein a BIF White Paper on “Satellites for 5G & Rural Connectivity” was released by the Chief Guest – Mr. A.K. Tiwari, Member (T), DCC, Government of India. Also present on the occasion as Special Guests were Mr. Nicholas Chuberre, Rapporteur, 3GPP NTN Work Item; Shri Kishore Babu, DDG (S.R.I.), DoT and Shri R. Shakya, DDG (Satellite), DoT.

- **26th August 2021**: 7th edition of BE’s Virtual Conference on 100 Smart Cities India held with BIF as Knowledge Partner. The Welcome Address was delivered by BIF President Mr. T.V. Ramachandran, and Mr. Debashish Bhattacharya, Sr. DDC, BIF, moderated a Panel Discussion with 6 leading experts on Smart Cities, wherein Mr. R. Srinivas, Advisor, TCPO, MoHUA presided as Session Chair.

- **7th October 2021**: A session of The Digital Dialogues on 6 GHz spectrum band was held wherein a Report commissioned by BIF on Frequency Sharing for Radio Local Area Networks in the 6 GHz Band in India was released by Chief Guest – Prof. Abhay Karandikar, Director, IIT Kanpur. Also present on the occasion as Special Guests were Mr. Ted Kaplan, CEO & Chief Systems Engineer, RKF Engineering; Dr. Farinaz Edalat - Senior Scientist, RKF Engineering; Mr. Michael Mandall, Chief Scientist, RKF Engineering; Dr. Punit Rathod, Lead - Technical Standards, Qualcomm; and Prof. Kiran Kuchi, Dean - Research & Development, IIT Hyderabad.

- **21st October 2021**: The Digital Dialogues session on ‘Delicensing of 6 GHz Spectrum’ held with Prof. Abhay Karandikar, Director, IIT Kanpur; Ms. Dorothy Stanley, Chair of the IEEE 802.11 Working Group; Mr. Claus Hetting, CEO & Chairman Wi-Fi NOW; Dr. C.S. Rao, Founder & CEO, Quadgen Networks; Mr. Ted Kaplan, CEO & Chief Systems Engineer, RKF Engineering; and Prof. Rekha Jain, Sr. Visiting Professor at ICRIER and former Executive Chair at the IIMA Idea Telecom Centre of Excellence as esteemed Expert Speakers.

- **17th December 2021**: The Digital Dialogues session on ‘Delicensing of 6 GHz Spectrum’ held with Prof. Abhay Karandikar, Director, IIT Kanpur; Ms. Dorothy Stanley, Chair of the IEEE 802.11 Working Group; Mr. Claus Hetting, CEO & Chairman Wi-Fi NOW; Dr. C.S. Rao, Founder & CEO, Quadgen Networks; Mr. Ted Kaplan, CEO & Chief Systems Engineer, RKF Engineering; and Prof. Rekha Jain, Sr. Visiting Professor at ICRIER and former Executive Chair at the IIMA Idea Telecom Centre of Excellence as esteemed Expert Speakers.
Major Policy & Regulatory Updates:

- **TRAi Recommendations on Enabling Unbundling of Different Layers Through Differential Licensing (issued on 19th August 2021)** – The recommendations uphold the objectives of the ‘Propel India’ mission of the NDCP 2018, are in line with the best global practices, and would pave a progressive way forward for the sector in terms of improved technological prowess, facilitate entry of new players to boost healthy competition, promote innovation and ease of doing business, effective operations and economies of scale. Besides significant cost-efficiencies, the recommendations, when implemented, would also act as a catalyst in enhancing investments in the sector.

- **TRAi Recommendations on Licensing Framework for Satellite-based connectivity for Low Bit Rate Applications (issued on 26th August 2021)** – Greatly liberalising and forward-looking, the recommendations, when implemented, would enable cost reductions, remove supply constraints, and allow ease of doing business, helping bring this highly efficient and advanced technology into the mainstream as a viable, cost-effective connectivity means. These well-balanced recommendations address the interests and requirements of all the stakeholders, across the Digital Communications as well as Space verticals. They would resolve long pending issues of scarcity of satcom capacity, significantly reduce regulatory costs, promote healthy competition and innovation, and would lead to increased efficiency in delivery of services.

- **TRAi Recommendations on Roadmap to Promote Broadband Connectivity and Enhanced Broadband Speed (issued on 31st August 2021)** – The recommendations come forth as extremely motivating and enabling for the future of the broadband sector. Revising the minimum download speed of wired broadband to 2 Mbps and categorisation based on download speeds would ensure minimum quality and help consumers make informed decisions. A pilot DBT program suggested to create demand among rural users, the requirement for licensees to meet subscriber increase targets in smaller cities, towns and rural areas, will both ensure greater rural digital inclusion. Fundamental and far-seeing recommendations have been made towards addressing the critical RoW issue via multiple measures, including a Centrally Sponsored Scheme (CSS) to incentivise States/UTs by linking the quantum of incentive to the net improvement in the BRI score of that State/UT, to encourage them to ease and simplify the RoW norms.

- **Telecom Relief Package (announced on 15th September 2021)** – The Union Cabinet approved 9 structural reforms and 5 procedural reforms plus relief measures for the Telecom sector, expected to generate employment opportunities, promote healthy competition, protect interests of consumers, infuse liquidity, encourage investment and reduce regulatory burden on TSPs. Meant to boost proliferation and penetration of broadband and telecom connectivity, these prospectively applicable measures include rationalisation of AGR, rationalisation of Bank Guarantees, rationalisation of Interest Rates/Penalties; extending spectrum tenure by 10 years; removing SUC; creating an auction calendar; self KYC; 4 years moratorium for payment of AGR dues, among others.

Standards Update:

- **Merging 5Gi and 3GPP specifications (17th December 2021)** – A plan of action was agreed at the 3GPP TSG RAN plenary (RAN#94-e) to allow the merger of 5Gi into 5G, with specific milestones set for both 3GPP and TSDSI. With broad support from many TSDSI member companies, as well as global cellular vendors and multiple operators, TSG RAN contribution (RP-213532) outlines the framework and steps to be taken to facilitate the intended merger. Once 3GPP receives communication regarding the completion of the pertinent actions by TSDSI, the CRs currently endorsed will be finally approved and implemented into the 3GPP Rel-17 NR specifications.
July 2021

- **27th July 2021**: The Digital Dialogues on ‘Building the Digital Economy: Opportunities for Growth and Partnership’ organised with Dr. Mike Short C.B.E., Chief Scientific Advisor, DIT, Government of UK as Chief Guest, and Mr. T.K. Paul, Member (T), Digital Communications Commission (DCC), Government of India; Mr. J.S. Deepak, Chairman of the CII Task Force on Digital Infrastructure, former Ambassador of India to WTO and former Secretary – Telecom, DoT; Mr. K.T. Rajan, Cluster Head - Technology & Innovation, India and Deputy Head of Mission, DIT, British Deputy High Commission; and Mr. R.K. Pathak, DDG-IC, DoT as Special Guests.

August 2021

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**September 2021**

- **22nd September 2021**: BIF Cyber Trust & Safety Group addressed students of classes 9 and 10 of Adarsh Public School, Bali Nagar on Cybersecurity and Safety.

- **28th September 2021**: BIF Cyber Trust & Safety Group addressed students of classes 9 and 10 of Saraswati Vidyalaya Girls School, Daryaganj on Cybersecurity and Safety

- **29th September 2021**: AGM (2020 – 2021) of IPTV Society (BIF)

**October 2021**

- **7th October 2021**: BIF organised a technical session of The Digital Dialogues on the theme of “Opportunities & Challenges in IPv6 Implementation” with participation from Shri Anil Jain, CEO, NIXI, MeitY as Special Guest; Ms. Deepa Tyagi, Sr. DDG, TEC, Ministry of Communications as Chief Guest; and Mr. Geoff Huston, Chief Scientist, APNIC; Mr. B. Nagaraj, Sr. Executive Vice President, RIL; Mr. Prasanna Gokhale, CTO, ACT; Mr. Satya N. Gupta, Chair, Bharat IPv6 Forum; Mr. Anupam Agarwal, Chairman, IIFON; and Ms. Amrita Choudhury, Director, CCAOI as Expert Speakers.
• 21st October 2021: A session of The Digital Dialogues on 6 GHz spectrum band was held wherein a Report commissioned by BIF on Frequency Sharing for Radio Local Area Networks in the 6 GHz Band in India was released by Chief Guest – Prof. Abhay Karandikar, Director, IIT Kanpur. Also present on the occasion as Special Guests were Mr. Ted Kaplan, CEO & Chief Systems Engineer - RKF Engineering; Dr. Farinaz Edalat - Senior Scientist, RKF Engineering; Mr. Michael Mandall, Chief Scientist, RKF Engineering; Dr. Punit Rathod, Lead - Technical Standards, Qualcomm; and Prof. Kiran Kuchi, Dean - Research & Development, IIT Hyderabad.

November 2021

INDIA SATCOM 2021

• 23rd-24th November 2021: BIF’s flagship Annual Event – India SatCom 2021, with the theme ‘Mainstreaming Satcom for Accelerating Digital India’ was organized successfully with the Inaugural Session having Dr. P.D. Vaghela, Chairman, TRAI as Chief Guest; with Shri K. Rajaraman, Secretary - DoT & Chairman - DCC and Shri Radhakrishnan D, CMD, NSIL as Special Guests of Honour, along with esteemed industry stalwarts, along with senior government dignitaries from NITI Aayog, TRAI, DoT, DoS, ISRO, NSIL, TEC, as well as other leading government stakeholders over the two days.
Day 1: INAUGURAL SESSION

**India SatCom 2021**
7th International Virtual Summit
23rd & 24th November 2021
MAINSTREAMING SATCOM FOR ACCELERATING DIGITAL INDIA

India’s largest and most comprehensive conference for Broadband and Broadcasting through Satellite

**DAY-1  23rd November 2021  INAUGURAL SESSION  (1630 – 1800 Hrs IST)**

**EMINENT SPEAKERS**

- **Chief Guest**
  - Dr. P. Vijayakshma
  - Director, ISRO

- **Special Guests of Honour**
  - Dr. K. Rajasree
  - Chairman & Secretary, ISAC, Dept. of Space
  - Shri Radhakrishnan D.
  - CEO, NICL
  - Mr. T.K. Math
  - President, BIF
  - Mr. A. Venkatesh
  - Director, BIF

**Co-Chairs**
- Mr. Ramesh Varma
  - DRDO, TVS

**Eminent Speakers**
- Mr. Rahul Vats
  - Co-Chair, BIF's Satellite Committee (Director, ISRO)
- Mr. Satish Gaonkar
  - Managing Director, ISAC, Dept. of Space
- Mr. T.K. Math
  - President, BIF
- Mr. A. Venkatesh
  - Director, BIF

**Supporting Organisations**
- Department of Telecommunications
- TRAI
- ISAC
- BIF

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24  Bits & Bytes
Day 2: Session 2 – Complementary Role of Satcom to help achieve Broadband for All
December 2021

- 17th December 2021: The Digital Dialogues session on ‘Delicensing of 6 GHz Spectrum’ held with Prof. Abhay Karandikar, Director, IIT Kanpur; Ms. Dorothy Stanley, Chair of the IEEE 802.11 Working Group; Mr. Claus Hetting, CEO & Chairman Wi-Fi NOW; Dr. C.S. Rao, Founder & CEO, Quadgen Networks; Mr. Ted Kaplan, CEO & Chief Systems Engineer, RKF Engineering; and Prof. Rekha Jain, Sr. Visiting Professor at ICRIER and former Executive Chair at the IIMA Idea Telecom Centre of Excellence as esteemed Expert Speakers.
BIF @ EVENTS & ENGAGEMENTS
(July 2021 – December 2021)

August 2021

• 13th August 2021: Mr. Rajat Mukarji, Director General, BIF, represented BIF President Mr. T.V. Ramachandran as an eminent panellist in the ITU-DEF Stakeholders Consultation on “The Role of the Internet and International Internet-related public policy in mitigating the impact of COVID-19 and possible future pandemics”.

• 26th August 2021: 7th edition of BE’s Virtual Conference on 100 Smart Cities India held with BIF as Knowledge Partner. The Welcome Address was delivered by BIF President Mr. T.V. Ramachandran, and Mr. Debashish Bhattacharya, Sr. DDG, BIF, moderated a Panel Discussion with 6 leading experts on Smart Cities, wherein Mr. R. Srinivas, Advisor, TCPO, MoHUA presided over as Session Chair.

• 27th August 2021: Mr. Rajat Mukarji, Director General - BIF, moderated a session on “5G & Fintech – Expectations vs Reality” at the Fintech Festival India.

September 2021

• 15th September 2021: 3rd edition of Voice & Data’s TLF 5G Conference on “5G: For Delivering Transformation” held, supported by BIF.

• 23rd – 24th September 2021: BIF Co-Organised the 5G India 2021 Virtual Conference along with Bharat Exhibitions.
October 2021

- **7th October 2021**: BIF was represented by Mr. Debashish Bhattacharya, Sr. DDG as an Expert Speaker at the South Asia Regional Digital Initiative (SARDI) Dialogue Series held by USAID.

- **13th – 14th October 2021**: Mr. Rajat Mukarji, DG, BIF attended the inaugural session of the launch of PM Gati Shakti Mission, and Mr. Debashish Bhattacharya, Sr. DDG, attended Day Two of the proceedings of the event.

- **20th October 2021**: Mr. Rajat Mukarji, DG, BIF participated as a panelist in the session on ‘Funding Avenues for Building a Robust Digital Infrastructure in India’ at the CII Digital Infrastructure Summit.

- **29th October 2021**: Mr. T.V. Ramachandran, President – BIF, delivered the Keynote Address at an Industry Webinar on ‘NSDTS & Trusted Supply Chains’ organised by FTI Consulting. Mr. Rajat Mukarji, DG, BIF took part in the deliberations.

November 2021

- **18th November 2021**: AVIA’s Satellite Industry Forum (SIF) 2021, supported by BIF

- **18th November 2021**: Mr. Rajat Mukarji, Director General - BIF delivered the Welcome Address at the Inaugural Session of Data Centre India 2021 Virtual Conference organized by BE with BIF as Knowledge Partner.
• **25th – 27th November 2021:** The India Internet Governance Forum (IIGF 2021) was jointly organized by MeitY and NIXI, centered around the theme “Empowering India through Power of Internet”. With over 5000 attendees over 19 sessions, 36 speakers participating and 15 languages covered, the event successfully brought diverse stakeholders of internet governance together to discuss the roadmap for digitization, reaffirm India as an essential participant globally and towards developing inclusive, democratic and multi-stakeholder based internet governance policy and practices. MoCIT, MoS MeitY and Secretary-MeitY all participated actively throughout the 3 days of the event. BIF being the main initiator of this historic measure, has been heavily involved in the entire proceedings of IIGF 2021 since the conceptualisation stage to its execution, with myself being the Vice Chairman of the main Coordination Committee, and several Members, Advisors and the Directorate team involved and participating actively throughout, besides steering several critical workshops and submitting important White Papers.

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**December 2021**

• **15th December 2021:** DQDeepTech Virtual Event 2021, themed ‘Unlocking the Next Tech Frontier’ held, supported by BIF

• **21st December 2021:** BIF President Mr. TV Ramachandran addressed the Opening of Post-IIGF 2021 with the Workshop on “Strengthening Multistakeholderism: Opportunities for India”

• **22nd December 2021:** Mr. Rajat Mukarji, DG – BIF participated as a Panelist in a Post-IIGF 2021 Workshop on ‘Democratization of Internet’, along with other industry stalwarts.
Snapshots of some prominent Media Coverage received by BIF during July-December 2021

Mandate to share data may hinder start-ups

TV RamaChandran

DoT says in advanced stage of finalising TRAI recommendations on low bit rate applications

"We are in the final stage of finalising the recommendations on low bit rate applications and we will be releasing them in the next 2-3 weeks." (The Economic Times, 2021)

A Collective Effort Needed for Satcom: Dr. PD Vaghela, Chairm. TRAI, at India Satcom 2021

Satcom: Govt sets up committee for single window clearance, says DoT secy K Rajaraman

Bits & Bytes
Government simplifying clearance processes for satcom services: DoT Secretary

The authorities are simplifying the clearance process of satellite operators to launch 5G services within the next two years. The Department of Telecom (DoT) has made it easier for operators to launch 5G services.

BIF: Regulatory Certainty to Make Satcom an Affordable Option for India

The DoT has simplified the clearance process for satellite operators to launch 4G and 5G services. This will enable operators to launch 5G services within the next two years.

Unbundling of layers to bolster competition, efficiency: BIF on TRAI recommendations

The DoT has proposed a comprehensive framework for the unbundling of layers to boost competition and efficiency.

India requires $10 billion/year spending to bridge digital divide: Former DoT Secy J S Deepak

India needs to spend $10 billion per year to bridge the digital divide.

5G technology offers opportunities for India: DoT

5G technology offers significant opportunities for India.

Satcom Fever: Why satellite broadband could be a game-changer in India

Satellite broadband could be a game-changer in India.

Time to look beyond the UP: The India Internet Governance Forum (IIGF)

The II GF is an important step to look beyond the UP and consider the needs of other states.
Mediascape

Snapshots of some prominent Media Coverage received by BIF during July-December 2021

Government focused on enabling policies to strengthen digital infrastructure: DoT official

Media

TSSC, BIF sign pact to meet industry’s skilling requirements for 5G, IoT, WiFi

Taking care of a billion pulses

Driving internet inclusion & safety

BIF writes to DoT, seeks reversal of hike in import duties on components, PCBAs, writes to DoT, finance ministry

Kant pitches for a single national cloud

34 Bits & Bytes
New satellite broadcasting standards to enable VSAT players to leverage SatCom technologies: BIF

This has the potential to enhance digital connectivity and enable high capacity cellular and Wi-Fi bandwidth to all locations within the country, which is requisite for the conduct of e-panchayats and India’s vision towards the 5G technology, the independent body said.

By Vivasvan - May 20, 2021, 12:31 AM

Can't auction satellite spectrum

The terminal concept of economics may apply and the government, therefore, is not applicable.

Global firms say new DoT rules will ease delivery of satcom-based services

DoT revises satellite communication licence norms to facilitate growth of domestic sector

BIF: New Modernised Specifications a Giant Step towards Effective Satcom

World Telecom Day 2021: BIF President TV Ramachandran on role of digital communication services

India must get satcom to take off
HI-LEVEL COMMITTEES

- AI & IoT
- Broadband Infrastructure
- Device Ecosystems
- FTTX
- ICAG (Internet Content, Applications & Governance)
- ICT for Inclusive Ability (PwD)
- Manufacturing Network
- New Technologies
- Rural Digital Initiatives
- Satcom
- Cross-Sectoral Digi Infra (CSDI)
- Spectrum & Regulatory Framework
- Startup & MSME
- Wi-Fi
- Working Group on Academia & Standards

ICT for Inclusive Ability (PwD)
WHITE PAPER ON THE OCCASION OF WORLD WIFI DAY ON PROLIFERATION OF BROADBAND THROUGH WIFI by T V RAMACHANDRAN, PUNEET CHAWLA, MANOHAR RAJA
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An Independent Policy Forum and Think Tank for Digital Transformation

**VISION**
Empowering Consumers with Efficient and Economical Broadband

**MISSION**
Proliferation of high quality broadband in the country in a technology-neutral, service-neutral and all-inclusive manner

**OBJECTIVE**
Promote, Support and Enhance all policy, regulatory & standards initiatives for the development & enhancement of the entire broadband ecosystem in the country
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