

THE BIGGEST AND MOST IMPACTFUL TELECOM REFORMS IN THE LAST ONE YEAR UNDER THE HON'BLE MINISTER ASHWINI VAISHNAW

These reforms covered a sweeping Policy overhaul, structural reforms in existing rules and Procedural reforms to ensure Ease of Doing Business.



ROLLING OUT OUR MEGA SMART CITIES

51

It is time to enable smart cities and communities by providing solutions that optimize building performance, improve safety and enhance comfort, while reducing the overall carbon footprint.

— Vijay Sankaran, Global Vice President and CTO, Johnson Controls





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[CONTENTS]

08 COVER STORY

THE BIGGEST AND MOST IMPACTFUL TELECOM REFORMS IN THE LAST ONE YEAR UNDER THE HON'BLE MINISTER ASHWINI VAISHNAW

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COVER STORY

- 08** 6 Waves of Telecom Reforms in India – the last being the most impactful and transformational

- 12** Telecom Reforms – Fueling Public Wi-Fi services – A landmark decision on License Exempt Spectrum

- 14** Spectrum Policy for R&D and Manufacturing

- 16** Short-range radio applications – Maximum use of Spectrum for public good

- 20** One Year Mark of Landmark Reforms in Telecom Sector - bold policy decisions by Hon'ble MOC Shri Ashwini Vaishnaw has had enormous economic impact on the sector

- 26** One Year of Telecom Reforms September 2021

- 32** Telecom Reforms – bold reforms never seen before

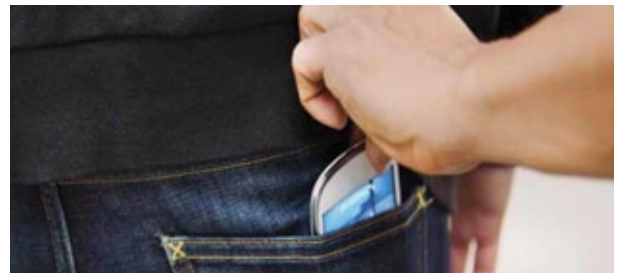
- 36** 5G may shake up the old order - opening up a new front for next generation Policy reforms

TELECOM INFRASTRUCTURE

- 40** Telecom Infrastructure – Electricity Board Connection & Energy Related Challenges
-

TECHNOLOGY

- 42** The public cloud – perfect for 5G India
- 46** Universal Acceptance (UA) of Top Level Domain (TLD) Names and E-mail Addresses using these addresses
- 51** Building India's Smart Sustainable Megacities of the Future
- 58** Data Gravity Drives Data Center Growth in India and APAC
- 63** Need for a National level Central Equipment Identity Register (CEIR) System



INSIGHT

- 65** The C-DoT Story – Recollections of the early days – The Idea, The Vision, The Promise, The Formative Years
-

VIEWPOINT

- 70** C-DoT's network management system (NMS) for BharatNet (the largest Fiber network in the world)
-

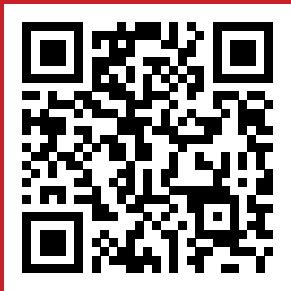
REGULARS **6** Voicemail **7** Opening Note

[NEXT ISSUE]



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**GAJENDRA
UPADHYAY**

[OPENING NOTE]

POLICY MAKING IN TELECOM WITNESSES A FRESH APPROACH

There is a whiff of fresh air in the policy making corridors – the reforms in the last one year have infused a lot of positive energy in the industry.

This was visible in the recently concluded 5G spectrum auctions. It was a smooth process with a very positive response from the industry. Over 60,000 Mhz of frequencies in all bands (see table) were sold. These frequencies will be used for both 5G as well as for ramping up existing mobile and data services.

OPERATOR WISE SPECTRUM HOLDINGS AFTER THE AUCTIONS

Spectrum Share	700 MHz	800 MHz	900 MHz	1800 MHz	2100 MHz	2300 MHz	2500 MHz	3300 MHz	26 GHz	Total (2 x FDD + TDD)
Reliance Jio	220	225		281		880		2,440	22,000	26,772
Bharti Airtel		20	156	328	215	790		2,200	17,600	22,028
Vodafone Idea			141	351	200	30	390	850	5,350	8,005
BSNL / MTNL			116	6	110		280	880	8,800	10,424
Others										
Aircel			13	75	65					306
RCOM/SSTL		59	10	17	65					302
Adani Group									400	400

For the first time in the last 30 years, according to India’s most successful pioneer in the telecom sector, Mr Sunil Mittal, who brought mobile services to the country in 1994, the entire process of releasing the spectrum, accepting payments and handing back the Bank Guarantees was quick, seamless and completed in hours.

This has never happened before. Operators would spend months following up – post auctions – just to make payments to the Government. Our cover story covers this change in the last one year. We have views from top leaders in the industry who have experienced this first hand and endorse its impact on the industry. Reforms have touched all aspects from big policy decisions to routine operational bottlenecks that had become a thorn in the side for the industry in the last two decades.

Removing these pain points and streamlining the approach was always fraught with inter-ministerial squabbling and fear of changing the status quo. It is a testament to the bold, purposeful and fearless policy making of this government to bring ease of doing business that they have succeeded in removing undesirable hurdles for operators.

This is the 6th wave of telecom reforms (as one of our columnists recounts) in our country. But as has been true with technologies in the past, new 5G services will open the doors for a new paradigm.

Entry of non-telecom, technology players – especially in the lucrative enterprise space – will Shake up the industry in the next few years. And there will be need for more regulatory reforms soon (we have a great story on this).

The true sense and feel of 5G services will soon be felt and seen across sectors like health, surveillance & public safety, smart cities, education, agriculture, sports, mining, logistics, smart energy and a host of other industries. This was amply clear from the nearly 100+ ideas that were identified in a 5G hackathon hosted by the DoT and over 400 startups are participating and taking this forward.

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6 WAVES OF TELECOM REFORMS IN INDIA – THE LAST BEING THE MOST IMPACTFUL AND TRANSFORMATIONAL

In summary, the last wave of reforms under the dynamic and visionary leadership of the present Hon'ble Minister Shri Ashwini Vaishnaw have been the most comprehensive ever in this sector.



BY PRAVEEN SHARMA

First Wave – 1994 – '97:

National Telecom Policy (NTP) 1994 was formulated for the purpose of opening the Indian markets for foreign direct investment (FDI) as well as domestic investment in the telecom sector. The Policy also aimed at providing 'world class' telecom services and development of an indigenous capacity in India. (See Box)

NTP '94 paved the way for private sector participation. This industry had been so far an entirely Government controlled monopoly – both in provision of telecommunications services and manufacturing of equipment.

The policy recognized the need and importance of private sector for economic development and to bridge the resource gaps. NTP '94 envisaged the provision of basic or fixed line telephone services by private companies. This would compete with the then Department of Telecom (DoT) which ran the networks – and which later became Bharat Sanchar Nigam Limited (BSNL). This Policy paved the way for the establishment of an independent regulatory body; separation of DoT's operational, policy setting, and ministerial functions.

It was only partially successful in encouraging private sector participation in mobile and basic telephone services as well as other value-added services (VAS).

Telecom reforms in India has had a checkered history. For those of us who have been associated with telecom sector for past more than 3 decades both from within and outside of the Government, these reforms have come in waves. Each time the reforms addressed crucial issues, supporting the sector and enabling the industry towards growth and change. These waves have often ebbed and flowed in a single continuum.

Licenses were granted to eight Cellular Mobile Telephone Service (CMTS) operators. Two licenses were granted in each of the metropolitan cities based on the concept of “beauty parade”. Most eligible selected on the basis of defined criteria.

This was followed by a second phase of implementation in December 1995 – through a competitive bidding process.

The country was divided into 19 circles (roughly equal to a single State, excluding some states like North East which were combined into a single Circle and the four metro cities). These were categorized into category A, B and C circles on the basis of the potential of each circle to generate revenues and the economic profile of the State.

A total of 34 licenses 18 Telecom circles were issued to private companies. Two licenses were granted to CMTS in each service area. Competitive bidding resulted in highly inflated bids and license fee commitments by the bidders. These ultimately led to defaults and unsustainable results.

A review was initiated by the Atal Bihari Vajpayee Government in 1998 and through a series of High Level Committee reports and decisions – many new reforms were initiated. Among them was the setting up of an independent Telecom Regulatory Authority of Indian, (TRAI) through an Act of Parliament in the year 1997.

The Second Wave – 1999

The second wave of telecom reforms was in-built in the failure of private sector participation due to their over-commitment in the amounts bid for CMTS and Basic Service licenses. Many licensees defaulted in payment of license fee and made a representation to the Government for relief against the high license fee for the survival of the telecom industry. In order to save the industry, the Government of the day, in consideration of the representations of the Licensees offered a new package, known as the migration package, provided for

in “National Telecom Policy 1999”, giving an option to the licensees to migrate from fixed license fee to revenue sharing fee. Thus the second wave of reforms saved the health of the private Telecom Operators by absolving CMTS and Basic Service Operators from the liability to pay committed huge amount of license fee to a license fee based on revenue share model, contours of which were outlined in the migration package letter of DoT dated 22.07.99 and which all these licensees accepted unconditionally and migration package became effective from 01.08.99. The license fee as percentage of gross revenue under the license was payable w.e.f. 01.08.1999. The Government was to take a final decision about the quantum of the revenue share to be charged as license fee after obtaining recommendations of TRAI fixing 15% of the gross revenue of the Licensee as provisional license fee. Migration package provided that the gross revenue for the purpose of computation of license fee would be the total revenue of the licensee company excluding the PSTN related call charges paid to DOT/MTNL and service tax collected by the licensee on behalf of the Government from their subscribers. Definition of Gross Revenue also became source of dispute between Operators and DoT which led to judgments of Supreme Court in 2011 (AUSPI Judgment) and in 2019 (AGR Judgment) in favor of DoT which became reason for reforms in the year 2021. Migration package also took away right of CMTS and Basic Service Operators from operating in an exclusive regime of limited number of players in a service area and gave right to Government for introducing any number of players. This in fact led to third wave of telecom reforms.

The Third Wave 2001-2004

BSNL was issued licenses for provision of CMTS as third operator in various parts of the country. Further, 17 fresh licenses were issued to private companies as fourth cellular operator in September/ October, 2001, one each in 4 Metro cities and 13 Telecom Circles. CPP regime, introduced in the year 2003, catalyzed the proliferation and growth of mobile telephony services. Introduction of Unified Access Service License regime in the year 2004

The last wave of reforms under the dynamic and visionary leadership of the present Hon'ble Minister Shri Ashwini Vaishnaw (2021 onwards) have been a game changer as they not only provided the necessary liquidity to operators but also eased operational hurdles that was a bottleneck for the industry. This boosted the Ease of Doing Business in the sector.

with the migration path for existing CMTS and BSOs to UAS license and licensing new players for UAS license at the entry price determined in the year 2003 for the fourth CMTS license subject to availability of spectrum increased the competition in the market which led to competitive tariffs and further growth in mobility services in India .

The Fourth Wave 2010-2013

While third wave ensured competitiveness in the market by issuance of more licenses and allocation of spectrum to provide 2G services, however, it restricted the use of spectrum to offer advance technologies. Operators holding 800 MHz spectrum band could only offer the CDMA services, whereas technologies were available to provide high speed internet services through CDMA EVDO. The restriction put in place to use the spectrum allocated administratively along with the license did not allow the country to experience advance technological services for a long time.

Government held first ever spectrum auction for 2100 MHz (3G spectrum) and 2300 MHz (Broadband Wireless Access Spectrum) in the year 2010 paving the way for delinking spectrum allocation from grant of license and issue of a new license regime subsequently in the year 2013 post extensive consultation with the Regulator TRAI and post policy formulation in form of NTP 2012. National Telecom Policy-2012 (NTP-2012) recognized the evolution from analog to digital and the need of convergence between various services, networks, technologies and overcome the segregation of licensing and regulatory framework to improve the affordability, delivery of multiple services and enhanced access. Hence, after considering the TRAI Recommendations, DoT framed the new Unified License Regime (UL Regime) which delinked the allocation of spectrum from license, formed one single license under which for various services, operators are allowed to obtain the respective service authorization e.g. Access Services, Internet Services, National Long Distance, International Long Distance etc. While there is no mandatory requirement for the operators to migrate to the UL, however, DoT has done away with the issuance of individual service specific

licenses and all new applicants for any service license henceforth were required to obtain Unified License only wherein existing operators were required to migrate to UL upon expiry of their existing licenses . Thus, the fourth wave introduced one single Unified licensing framework encompassing all the telecom services and set forth auction as a method for allocation of access spectrum in the country.

The Fifth Wave-2018

After considering the recommendations of TRAI on Virtual Network Operators (VNOs), DoT, on 31.08.2018 issued the guidelines for Grant of Unified License (Virtual Network Operators). With the introduction of VNO, DoT further delinked the delivery of services from the network services and introduced the regime to facilitate those entities who intend to deliver services using networks of other operators (termed as Network Service Operators). While the fourth wave delinked the spectrum from the license, fifth wave was one step further towards the convergence where same network can be used to provide various services independent of network layer which allowed one set of operator to deliver the services and another distinct set of operators can own the network used to deliver such services. Another important milestone to increase traction for UL-VNO licenses was allowing lease line/bandwidth charges and the charges paid by the VNO licensees to the TSP/NSOs as deductions treating it as pass through charges while calculating license fee. This had a significant advantage to small UL-VNO Licensees leading to substantial increase in the UL-VNO licenses.

The Sixth Wave 2021 onwards

While the telecom sector went through many structural reforms, the legacy issues related to the disputes on license fee calculation, definition of Adjusted Gross Revenue (AGR) and lack of clarity in the license conditions continued to trouble the balance sheets of operators.

Entry of new operators with pure 4G play the data service rates in the telecom sector reduced substantially. This led to intense competition and exit of many players by way of mergers or insolvency proceedings.



The judgment on AGR in the year 2019 further added to the financial distress of the sector with the clear danger of and the sector was looking at another exit thereby reducing to 2+1 (2 private player and 1 PSU).

However, Govt. recognized the importance of the telecom sector, more so, during its performance in meeting COVID-19 challenges which lead to huge surge in data consumption due to online education, Work from Home, interpersonal connection through internet-based applications, virtual meetings etc. and Government approved major structural and procedural reforms to further boost the proliferation and penetration of broadband and telecom connectivity along with strengthening the financial position of the sector.

These reforms included reduction in Bank Guarantees against License Fee and other levies, rationalization of interest rates, removal of penalties, spectrum auction related reforms, promoting Ease of Doing Business, SACFA related reforms, KYC simplification, simplification of OSP guidelines, discontinuation of wireless operating license, exemption of License fee for M2M Application Service providers and only simple registration is required, removal of NOCC charges, surrender of spectrum is permissible after 10 years, VSAT backhaul connectivity for cellular networks and Wi-Fi access points etc. To address the liquidity requirement of the operators, Government further provided relaxation in terms of moratorium period for payment towards AGR judgment and spectrum payouts etc.

The sixth wave reforms has been a game changer as it not only provided the necessary liquidity to the operators but also eased various operational issues thereby boosting the Ease of Doing Business in the sector.

Despite a series of waves in telecom reforms, there is still need for another wave to take the sector into another orbit, strengthen B2B players and relax compliances for B & C Category Licensees.

DoT has already started consultation to revamp the legal framework of telecom sector and geared towards ensuring that the regulatory framework is in sync with the global best practices with the aim to create a framework which will be win-win for all stakeholders.

DoT should keep in mind that the “same service same rule” principle should apply while finalizing the new legal framework. Keeping pace with technology advancements and addressing needs of a changing market and evolving business models is imperative.

In summary, the last wave of reforms under the dynamic and visionary leadership of the present Hon'ble Minister Shri Ashwini Vaishnaw have been the most comprehensive ever in this sector. 🙌

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KISHORE BABU YGSC

Telecom Reforms – Fueling Public Wi-Fi services – A landmark decision on License Exempt Spectrum



It is almost three years ~ 1000 days, since the NDA Government took the historical decision to delicense a large quantum of spectrum for public Wi-Fi services. This article reviews the intricacies, impact and how it has become the base to trigger equitable, affordable access in digitalization in the country

In our digital world of today, Wi-Fi signals keep us online and connected – even while travelling at airports and railway stations or in public places like shops, restaurants, malls, bus stands, we look for available Wi-Fi networks to connect and go online.

Keeping the needs of our digital dreams to bring the entire nation online, the Hon'ble Minister of Communications, Shri Ashwini Vaishnaw and the Department of Telecommunications took a visionary decision in 2018 to make a large part of the 5GHz band license exempt from licensing requirements. This has provided providing a big boos for public Wi-Fi hotspots and enabled the proliferation of Wi-Fi and RLAN (Radio Local Area Networks) services in public as well as at enterprise levels.

Wifi is synonymous with high-speed-wireless broadband services, despite the low cost of mobile data today. This is why, in order to bring larger parts of our country and all strata of society into the digital mainstream – whether urban or rural – on an equal footing, the PM WANI program has been launched. PM WANI aims at bringing affordable broadband services to the common man in the country.

Public Wi-Fi hotspots have played a major role in helping students connect to online classes, infotainment and even working from home (logging in from cafes or

malls). Its reach cuts across boundaries of class and economic levels.

Initially the 2.4 GHz band was identified – with a limited spread of 83.5 MHz in the spectrum band – for offering public Wi-Fi services. As this band became saturated and posed technical limitations for the new generation of services, many countries started delicensing large segments in the 5GHz band, which drove deployment of Public-Wi-Fi hotspots over the last few decades.

Despite its popularity, India remained stuck in the 2007 policy, which allowed only a quantum of 50 MHz for outdoor and Public WiFi use. This situation continued till 2018 when the NDA Government decided to in the interest of our digital nation to align this in line with other countries that had already made larger quantities of the band license exempt in the last two decades. The government noticed the key importance of the 5GHz band, to boost public internet, enterprise services and network connectivity.

Post the Hon'ble Supreme Court judgement on spectrum in 2012, there had been a lull in spectrum reforms except for some periodic auctions. The big bang reforms as part of the National Digital Communication Policy changed this status quo and an overhaul of the National Frequency Allocation Plan was made in 2018. There were some radical and transformatory decisions taken. One of theme being to dedicate an additional

“ Wi-Fi 5, Wi-Fi 6 are the new generation Wi-Fi technologies with capability to deliver gigabit Wi-Fi services (3.5-9.6 Gbps speeds). They use carrier sizes of 80 MHz, 160 MHz. With pre 2018 scenario, it was not possible to deploy these next generation Wi-Fi services for common man as India had only 50 MHz for outdoor use in the popular 5 GHz band since 2007. ”

“Historically no country has taken such a decision to open up such large quantities in one go in 5GHz band for the benefit of public to maximize socio economic benefits.”

Band (MHz)	Quantity (MHz)	License Exempt Spectrum: Pre 2014 (MHz) (2005 & 2007)		License Exempt Spectrum: Post 2018 (MHz)		Addition
		Indoor	Outdoor	Indoor	Outdoor	
2400-2483.5	83.5	83.5	83.5	83.5	83.5	Nil
5150-5875	605	350	50	605	605	555 MHz-Outdoor (1110%) 255 MHz-Indoor (73%)

550 MHz band for outdoor use to the nation to help set up public Wi-Fi and RLAN services. The Department of Telecommunications, conducted elaborate inter-ministerial consultations to make this happen and to avoid any overlapping and interference – and it obtained technical and policy inputs for promoting this public good to take us closer to becoming an inclusive digital nation.

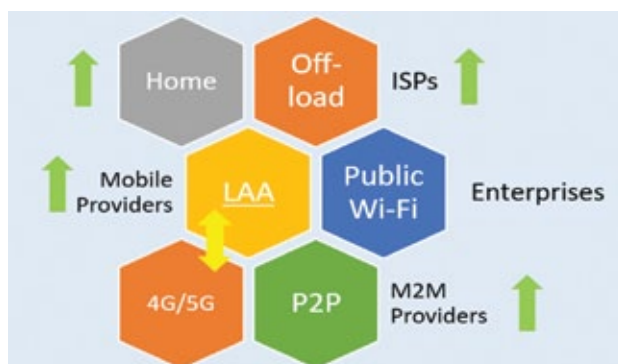
This single decision to exempt licensing for Wi-Fi spectrum has made a significant impact on enhancing the reach of Internet in public places. IT has complemented the efforts of telecom service providers for network connectivity.

It is well known that wide use of Wi-Fi spectrum for internet use, reduces the congestion and strain on valuable mobile spectrum – freeing up the network for more important voice and data calls. This is called mobile data offload (moving the Internet access to Wifi from mobile networks) thus enabling mobile customers higher voice quality and data services.

There is also an innovative use of Wi-Fi spectrum by the service providers through ‘Licensed Assisted Access’, wherein TSPs can use this spectrum to augment and complement high throughput services for mobile users. The Wi-Fi technology uses listen before talk (LBT) methodology enabling repeat use of carriers by multiple users in the same neighborhood with minimum interference. The operations include Dynamic Frequency Selection and Trans Power Control as methods to minimize interference.

What makes this license exempt so important for Digital India?

An important and scarce resource like spectrum, which is crucial for mobile and wireless, has been opened and allows anyone or any enterprise to deploy and use it without any



regulatory or policy interference and free of cost. This is important for our country to enable cheaper services.

Since it permits low power operations, multiple operators can deploy services anywhere and everywhere. The spectrum is free to operate with the condition of non-interference and non-protection, so that it takes care of other radio services and users in the band through a collaborative oversight by the stakeholders themselves.

Today, lakhs of public Wi-Fi hotspots have been deployed. Market reports also quote that apart from public Wi-Fi, lakhs of RLAN links have also been deployed by service providers for internal network connectivity and enterprise digitalization in the last three years – contributing to enhanced digitalization in line with the objectives of National Broadband Mission and Digital India.

[ISPs: Internet Service Providers; LAA: Licensed Assisted Access; P2P: Point to Point Links; M2M: Machine to Machine Communications]

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Spectrum Policy for R&D and Manufacturing

A visionary set of reforms to position India as an attractive destination and a hub for wireless technologies



BY KISHORE BABU YGSC

Wireless technologies are playing an important role in delivering next generation communications technologies for ubiquitous connectivity to various industry verticals. These cuts across widely used services like the mobile phones, Internet of Things, (IoT), machine to machine or M2M, satellite communications, smart cities, logistics, transportation, e-education, e-health, e-agriculture to.

Before this simplified method of licensing was initiated, any spectrum required for R&D, manufacturing, demonstrations of new technology, or setting up proof of concept for technology trials etc., required a long drawn coordination with DoT – whether it was for indoor or outdoor use.

The clearances for using such spectrum took long and the license duration of for such use was limited in time. Sometimes this did not suffice to complete the project of

trial. Often the period of license was 6 months (or at the most one year) in the case of indoor use; it was 3 months (or maximum 6 months) for outdoor trials.

Further, for outdoor trials, there was a fee which included royalty charges for spectrum. Even for the short duration of the trial license, there was a requirement to obtain separate import licenses – which was mandatory for procuring wireless systems / modules for R&D. Separate demonstration license was required for demos in other locations. And a separate wireless equipment possession license was needed over and above. These gamut of terms and conditions and compliances made the wireless R&D an extremely complex process and imposed a regulatory burden on the institutions.

It was with this in mind that the Department of Telecommunications brought in a key set of reforms in 2019 together with a comprehensive spectrum policy

The 2019 spectrum policy was aimed as an enabler to boost research and development of wireless technologies in manufacturing and to make the country a hub for innovation.

DoT launched online licensing of spectrum for “R&D, Demonstration and Manufacturing and Testing licenses” on its Saral sanchar portal on 29th June, 2021.

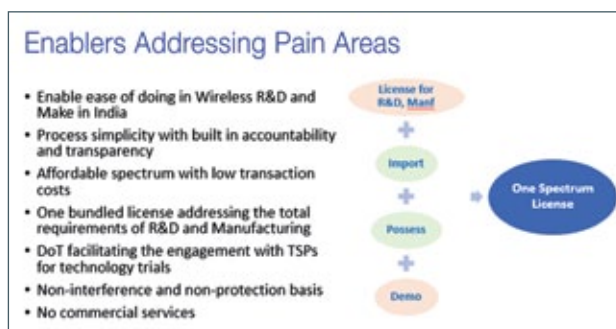
for R&D, Manufacturing and Demonstration of wireless technologies – that permitted licensing and use at a nominal transaction cost. It also enhanced trust and accountability for the user.

The key terms were:

- I. License through Self-declaration (instant issue of licenses) for Indoor Experimentation (R&D), Indoor Demonstration and Manufacturing.
- II. One bundled license, which includes different erstwhile licenses viz., Use of Spectrum, import of related products and sub-assemblies, demonstration, possession of wireless equipment.
- III. Deemed approval within 6 to 8 weeks from the date of application for all outdoor radiating licenses.
- IV. Duration of license: R&D spectrum for indoor ONE year and renewable; R&D spectrum for outdoor TWO years and renewable; Technology trials for TWO years; Manufacturing license for FIVE years from the erstwhile limitation of two years.
- V. Spectrum is offered in all bands including new, unused, licensed bands opening gates for Indian R&D to meet global market needs
- VI. The Spectrum is offered on “Non-interference and non-protection basis” and on “No commercial services”.

All of this has been part of the process of promoting ease of doing business and R&D. It has also increased transparency and timely delivery of services. DoT further launched an online license module for Experimentation (R&D), Demonstration and Manufacturing & Testing licenses on Saralsanchar portal on June 29, 2021.

This online module was added to the existing online license/clearance modules viz., SACFA (Standing Advisory Committee on Radio Frequency Allocations), ETA (Equipment Type Approval) (through self-declaration), Non-Network license, Satellite licenses, DPL (Dealer Possession License) licenses, Amateur licenses etc.



Spectrum licensing for R&D and manufacturing will be a huge boost for Make in India and design driven manufacturing in the country using wireless technologies. India hosts several Global Innovation Centers (GICs) for Electronics and IT Industry. GICs, Indian industry, including MSMEs will be encouraged now to multiply their wireless technology development activities with near zero compliance burden.

Apart from speed of approval, the USP of the license, is its bundled approach. All the other necessary licenses for R&D and manufacturing viz. possessing of wireless equipment, import of necessary modules & subsystems, demonstration of R&D products is offered in the same license. The industry itself has noted that this is one of the best global policies in offering spectrum for R&D and manufacturing at affordable costs with near zero transaction cost.

The initiative has already resulted in R&D investments in the country. Several 5G testbeds are already established by the industry and R&D companies making use of this policy. Several startups and SMEs are developing products in wireless technologies vying with their global majors in 4G and 5G technologies. More investments are envisaged in wireless technology development including in 6G competing with global peers by enhancing India’s attractiveness as an R&D destination.

Apart from creating jobs in R&D it is creating Indian IPRs for solutions that can go global. 🇮🇳

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Short-range radio applications – Maximum use of Spectrum for public good

Short-range Radio Devices or SRDs are assuming crucial importance for citizens as well as for specialized use cases like medical implants, assistive listening devices, smart grids like gas, water, electricity grids, and transportation



BY KISHORE BABU YGSC

There are numerous applications of radio services that go beyond the simple voice and data provided by Public Telecom Service Providers (TSPs). Wireless connectivity over short distances, at low power can be used to bring many societal applications. In general, these services are provided by Short-range Radio Devices (SRD)¹.

SRDs are assuming crucial importance for citizens as well as for specialized public and private sector use cases. Machine-to-Machine (M2M) communications and Internet of Things (IoT) employ SRDs and Ultra-Wideband (UWB)² devices. Digital India has a wide-spread need for ubiquitous connectivity applications for both rural and urban needs. Whether smart villages, smart cities, smart communities, smart homes or disaster management, the use cases are diverse and many.

SRD devices, consuming low power and operating across short ranges, include medical implants, assistive

listening devices, devices for smart grids (electricity, gas, water), multimedia, radio-determination devices, transport telematics and many.

More specifically, the devices which we commonly use for bluetooth, cordless, audio-video systems, wireless-car keys, car parking radars, RFID devices in malls & logistics, wearable radio devices, sensors for agriculture, transport safety, health monitoring devices, factory monitoring of machines & gears, indoor positioning and so on are all within this category of devices. Ultra-Wideband devices have many industrial and public applications including ground probing radars, wireless structural integrity testing.

Many of us use such SRDs regularly in our day to day life. But very few have any knowledge about the spectrum or the radio frequency utilized. These frequencies are a license exempt resource and have made these applications and devices possible for public convenience and safety. Enhancing the quality of life manifold.

Though not exhaustive the following categories are amongst those regarded as SRDs

Telecommand: The use of radiocommunication for the transmission of signals to initiate, modify or terminate functions of equipment at a distance.

Telemetry: The use of radiocommunication for indicating or recording data at a distance.

Voice and video: In connection with SRDs, voice covers applications like walkie-talkie, baby monitoring and similar use. Citizen band (CB) and private mobile radio (PMR 446) equipment is excluded.

Equipment for detecting avalanche victims: Avalanche beacons are radio location systems used for searching for and/or finding avalanche victims, for the purpose of direct rescue.

Railway applications: Applications specifically intended for use on railways comprise mainly the following three categories:

Automatic vehicle identification: The automatic vehicle identification (AVI) system uses data transmission between a transponder located on a vehicle and a fixed interrogator positioned on the track to provide for the automatic and unambiguous identification of a passing vehicle.

Balise system: Balise is a system designed for locally defined transmission links between train and track. Data transmission is possible in both directions. The physical data transmission path length is of the order of 1 m, i.e. it is significantly shorter than a vehicle.

Loop system: The loop system is designed for the transmission of data between train and track. Data transmission is possible in both directions. There are short loops and medium loops which provide for intermittent and continuous transmissions.

Road transport and traffic telematics: Road transport and traffic telematics (RTTT) systems are defined as systems providing data communication between two or more road vehicles and between road vehicles and the road infrastructure for various information-based travel and transport applications, including automatic toll-collection, route and parking guidance, collision avoidance and similar applications.

Equipment for detecting movement and equipment for alert: Equipment for detecting movement and equipment for alert are low power radar systems for radiodetermination purposes. Radiodetermination means the determination of the position, velocity and/or other characteristics of an object, or the obtaining of information relating to these parameters, by means of the propagation properties of radio waves.

ALARMS

Alarm in general: The use of radiocommunication for indicating an alarm condition at a distant location.

Social alarms: The social alarm service is an emergency assistance service intended to allow people to signal that they are in distress and allow them to receive the appropriate assistance.

Model control: Model control covers the application of radio model control equipment, which is solely for the purpose of controlling the movement of the model (toy), in the air, on land or over or under the water surface.

Though not exhaustive the following categories are amongst those regarded as SRDs (Contd.)

Inductive applications: Inductive loop systems are communication systems based on magnetic fields generally at low RF frequencies. Inductive applications include for example car immobilizers, car access systems or car detectors, animal identification, alarm systems, item management and logistic systems, cable detection, waste management, personal identification, wireless voice links, access control, proximity sensors, anti-theft systems including RF anti-theft induction systems, data transfer to handheld devices, automatic article identification, wireless control systems and automatic road tolling.

Radio microphones: Radio microphones (also referred to as wireless microphones or cordless microphones) are small, low power (50 mW or less) unidirectional transmitters designed to be worn on the body, or handheld, for the transmission of sound over short distances for personal use. The receivers are more tailored to specific uses and may range in size from small hand units to rack mounted modules as part of a multichannel system.

RF identification systems: The object of any RF identification (RFID) system is to carry data in suitable transponders, generally known as tags, and to retrieve data, by hand- or machine-readable means, at a suitable time and place to satisfy particular application needs. Data within a tag may provide identification of an item in manufacture, goods in transit, a location, the identity of persons and/or their belongings, a vehicle or assets, an animal or other types of information. By including additional data the prospect is provided for supporting applications through item specific information or instructions immediately available on reading the tag. Read-write tags are often used as a decentralized database for tracking or managing goods in the absence of a host link.

Ultra low power active medical implant: The ultra-low power active medical implant (ULP-AMIs) is part of a medical implant communication systems (MICS) for use with implanted medical devices, like pacemakers, implantable defibrillators, nerve stimulators, and other types of implanted devices. The MICS uses transceiver modules for radiofrequency communication between an external device referred to as a programmer/controller and a medical implant placed within a human or animal body.

Wireless audio applications: Applications for wireless audio systems include the following: cordless loudspeakers, cordless headphones, cordless headphones for portable use, i.e. portable compact disc players, cassette decks or radio receivers carried on a person, cordless headphones for use in a vehicle, for example for use with a radio or mobile telephone, etc., in-ear monitoring, for use in concerts or other stage productions.

RF (radar) level gauges: RF level gauges have been used in many industries for many years to measure the amount of various materials, primarily stored in an enclosed container or tank. The industries in which they are used are mostly concerned with process control. These SRDs are used in facilities such as refineries, chemical plants, pharmaceutical plants, pulp and paper mills, food and beverage plants, and power plants among others.

From time to time, certain bands are made license exempt to enable rollout of other new services for the society and public good.

License Exempt Bands for SRDs UWDs (2018)

The NFAP (National Frequency Allocation Plan) 2018, under Annexure 1, lists bands offered as license exempt for operation of specific applications at very low powers. Till 2014, there were total 9 bands delicensed or made license exempt for a few applications. It was always like opening up one or two bands for such applications despite availability of global device ecosystem.

The objective of all the spectacular spectrum reforms by the Department of Telecommunications (DoT) post 2015 was to infuse more consumer and industrial services taking the advantage of well-developed global device ecosystem. As a big bang reform, in 2018, the DoT made over 40 bands license exempt for several innovative consumer and industrial radio services (Ref. Table below).

Sl. No	Year	# of Bands made license exempt	Key Applications
1	2005	4	Remote control of cranes, RFID, Wi-Fi
2	2008	1	Cardiac monitoring and medical implants
3	2009	1	RFID
4	2010	1	indoor applications
5	2012	1	
6	2014	1	RFID
7	2015	4	Inductive, RFID, Short Range Radars
8	2018	40	Wireless Access Systems, RLAN, Wi-Fi, Inductive devices ³ , Active medical implant devices ⁴ , High duty cycle or Continuous transmission device ⁵ , Assisted listening devices ⁶ , Personal Mobile Radio ⁷ , Radio determination device, RFID
9	2018	UWDs	Generic ultra-wideband devices ⁸ , Location tracking system ⁹ , Ultra-wideband device installed in Road and Rail Vehicle, Material sensing device using ultra-wideband technology ¹⁰ , Building material analysis device ¹¹

The delicensing norms also took measures to protect other radio services in the bands, wherever necessary. DoT has mandated global standards / technical requirements for these license exempt services on non-interference and non-protection basis to protect licensed services. The SRDs make use of various technical mechanisms such as Listen Before Talk, proximity, Low Duty Cycle (LDC) / low active time, Transmit / Total Power Control (TPC), Dynamic Frequency Selection (DFS), Detect and Avoid (DAA) mitigation among others.

Market reports indicate that post 2018, several thousands of device models have obtained ETA (Equipment Type Approval) from DoT indicating mega rollout of such applications for public and industrial use. It means, more services, indigenous development, more jobs and most importantly the free spectrum is enabling maximization of socioeconomic benefits contributing for country's GDP growth in a big way. 🇮🇳

1. The ITU Report SM. 2153-8 defines that the term 'short-range radio device' (SRD) is intended to cover radio transmitters which provide either unidirectional or bidirectional communication and which have low capability of causing interference to other radio equipment. Such devices are permitted to operate on a non-interference and non-protected basis. SRDs use either integral, dedicated or external antennas and all types of modulation and channel pattern can be permitted subject to relevant standards or national regulations.
2. "ultra-wideband device or equipment" means a short-range device having a bandwidth of at least 50 MHz;
3. Car immobilisation, animal identification, alarm systems, cable detection, waste management, personal identification, wireless voice links, access control, proximity sensors, anti-theft systems, including radio frequency anti-theft induction systems, data transfer to hand-held devices, automatic article identification, wireless control systems and automatic road tolling
4. Active medical implant device covers the radio part of active implantable medical devices that are intended to be totally or partially introduced, surgically or medically, into the human body or that of an animal, and where applicable their peripherals.
5. Combined audio or video transmissions and audio or video sync signals, mobile phones, automotive or home entertainment system, wireless microphones, cordless loudspeakers, cordless headphones, radio devices carried on a person, assistive listening devices, in-ear monitoring, wireless microphones for use at concerts or other stage productions, and low power analogue FM transmitters
6. Radio communications systems that allow persons suffering from hearing disability to increase their listening capability. Typical system installations include one or more radio transmitters and one or more radio receivers
7. Used for determining the position, velocity and/or other characteristics of an object, or for obtaining information relating to these parameters.
8. Device that is using ultra-wideband technology for communication applications such as personal computers, handheld terminals, cable modems, set-top boxes, indoor access points etc.
9. System intended for location tracking of people or objects;
10. Device designed to detect the location of objects within a structure or to determine the physical properties of a material;
11. Material sensing device detects the location of objects within a building structure, or to determine the physical properties of building material;

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One Year Mark of Landmark Reforms in Telecom Sector - bold policy decisions by Hon'ble MOC Shri Ashwini Vaishnaw has had enormous economic impact on the sector

The situation appeared dire! Banks stood to be impacted the worst if the industry were unable to stem the bleeding. The Indian Banks' Association (IBA) wrote to the Government and conveyed that the adverse developments in the telecommunications sector could potentially lead to failures

COMPILED BY AANCHAL GHATAK

Background: Financial situation in the telecom industry

The telecom sector, has been under various kinds of stress over the last decade. The Industry revenue of Rs. 2.66 lakh crores in the year 2016-17 declined by 1.88% to Rs. 2.61 lakh crores in the year 2020-21 because of a combination of factors – including the pandemic, a declining ability to pay for new subscriptions and the financial burden on operators due to incompatible policies.

For example, the Adjusted Gross Revenue (AGR),

which is derived from the Gross Revenue after making all permissible deductions (e.g., payments made to other operators for using their networks, income from interest and dividends, services not directly provided under the telecom license) also declined from Rs. 1.85 lakh crores in 2016-17 to Rs. 1.78 lakh crore in the year 2020-21, a decrease of 3.78%.

Further, the gross Average Revenue per User (ARPU) per month as per TRAI figures had declined from Rs. 122 in the year 2014-15 to approximately Rs. 104 in the year 2020-21 (for wireless subscribers). It is only after the

The compounded AGR dues and interest on those dues had piled up to a gigantic number, and this was a blow to the financial position of nearly all telecom service providers (TSPs).

new set of reforms that the ARPU has started to climb back up again – to the great relief of the industry and its viability.

Given the older definition of AGR, before 2015, which did not allow for many of the deductions that TRAI recommended in its 2015 recommendations, the dues payable by the industry kept on compounding.

Finally, after the Hon'ble Supreme Court's Judgement, which upheld the position of the Government in the definition of AGR, the entire industry was severely and adversely impacted. The compounded AGR dues and interest on those dues had piled up to a gigantic number, and this was a blow to the financial position of nearly all telecom service providers (TSPs).

The situation appeared dire! Banks stood to be impacted the worst if the industry were unable to stem the bleeding. The Indian Banks' Association (IBA) wrote to the Government and conveyed that the adverse developments in the telecommunications sector could potentially lead to failures, resulting in vanishing competition, a duopoly framework that would be harmful to consumers, resulting in unsustainable operations, and severe losses for the banking system -- which has huge exposures in this sector.

The IBA made certain suggestions to the Government on easing the stress for this sector. It emphasized in its letter that if the existing stress in the sector continues for long, it would result in dramatic and negative outcomes due to failures which would have repercussions like:

- a) Banking sector will be directly hit due to their large exposure.
- b) There will be significant revenue loss to Government (AGR dues, Spectrum charges, GST, etc.).
- c) Employees will be laid off, and there will be both direct and indirect job losses.
- d) IT sector, banks and others who are dependent on telecom network for their services would be directly impacted.

- e) Economic recovery, post Covid-19, may stall due to negative sentiments and declining contribution to GDP from the core telecom sector.

AGR amended

In March 2022, the telecom industry proposed to the government that revenue from payments banks, rental income, and e-commerce operations be excluded from calculations of adjusted gross revenue (AGR).

This is to reduce as many disputes as possible, and a negative and positive list was prepared, which will specify that components like revenue from payments bank, rental income and e-commerce platforms, will be excluded from AGR. This will reduce levies and liabilities for the telcos and open up newer fields for business.

The changes will be incorporated into the notification that amended the AGR definition from 1 October, 2021, eliminating the need for the government to issue a separate amendment to the unified license agreement, which binds telecom operators to a revenue sharing arrangement with the government.

Need for Reforms

At this stage, if any TSP had decided to go into proceedings under Insolvency and Bankruptcy Code (IBC), this may have had a cascading and deleterious effect on banking sector, and the overall growth of economy. It also would not be conducive to realization of Government dues and revenue. To mitigate the financial stress, and ease the cash flow situation of TSPs reducing risk of default of bank loans. We also need to enhance capital investment capacities for growth of telecom infrastructure for 4G and 5G.

Reforms

Related to easing liquidity and enabling healthy cash flow situation to TSPs:

- **Reforms:**
 - 4-year moratorium of annual spectrum instalments of past auctions excluding 2021 auction and annual AGR dues instalments. With an option to convert the interest component of instalments under moratorium into equity for Gol.

Reduction of SUC by removing incremental Spectrum Usage Charges or SUC would reduce the total financial burden on Operators significantly.

- Rationalizing definition of Gross Revenue /Adjusted Gross Revenue as per TRAI recommendation, by majorly excluding non-telecom revenue from AGR.
 - Rationalizing the FBG/PBG requirements by reducing it to 20% of the existing stipulated requirement.
 - Rationalizing interest rate and penalty.
 - **Impact:**
 - The grant of four-year moratorium in respect of spectrum instalments will reduce the cash flow from TSPs to the tune of Rs. 1,02,113 crores during the moratorium period.
 - The grant of four-year moratorium in respect of AGR related dues instalments will reduce the cash flow from TSPs to the tune of Rs. 72,193 crores in the next four years.
 - Due to financial stress, one major operator (VIL) is facing sustainability issues. The moratorium given now, ensures healthy competition, thus avoiding duopoly.
 - Enabling healthy cash flow for TSPs, thus enabling them to invest in 5G and other technologies.
 - Reducing the BGs requirement to 20%, can reduce the existing 10,000 Crore BGs to around 3,000 crore BGs (for 3 major private TSPs). Thus reducing the costs of maintaining these FBGs.
 - Reducing the banks' exposure to telecom companies, and also decrease in NPAs pertaining to telecom companies.
 - Reducing the financial costs of operations for telecom service providers.
 - Rationalizing the interest rate and penalty, reduces the interest burden on TSPs in case of delay in payments by the TSPs.
 - Decision to return the FBGs pertaining to all auctions except 2021 auction, then approximately 27,000 Crore amount FBGs are returned to TSPs.
- Related to Spectrum & its availability:**
- **Reforms:**
 - Conduct of spectrum auction on regular annual basis, preferably in last quarter of every year.
 - Requirements to submit FBGs to securitize Deferred Annual Spectrum payment instalments and Performance Bank Guarantee (PBG) for roll out obligations etc. in future spectrum auctions is dispensed with.
 - Zero % SUC on spectrum acquired through future auctions.
 - No incremental 0.5% SUC on spectrum sharing.
 - **Impact:**
 - Operator flexibility to manage his spectrum holdings as per the business needs.
 - Conduct of spectrum auction on regular basis on annual basis leads to certainty in timing of spectrum availability accordingly would help operators to plan their spectrum needs better.
 - Dispensing off with submission of FBGs and PBGs, decreases the cost of operations by reducing the cost of maintenance of FBGs/PBGs.
 - No SUC on spectrum of future auctions, and no incremental costs of spectrum sharing, decreases the SUC charges, and at the same time encourages better utilization of spectrum through sharing. The exact impact of no SUC on the spectrum of future auctions would depend on the amount of spectrum the TSPs purchased in 2022 auction, and the amount of spectrum they would purchase in the future auctions. Reduction of SUC by removing incremental SUC charges on sharing would not only increase the spectrum utilizing by incentivising the spectrum

The government has relaxed the rates of interest in the case of delay in payment of license fees or any other dues payable under the license.

sharing, but also would reduce total cost of spectrum for TSPs.

Structural Reforms

Adjusted Gross Revenue Reforms

As part of the structural reforms, the government has redefined AGR to exclude non-telecom. AGR clauses in the UL Agreement, UASL Agreement and UL VNO Agreement were amended to exclude license fee payment obligations on the TSPs. Previously, annual license fee was calculated as a percentage of AGR.

Bank Guarantee Reforms

Under this structural reform, the government has significantly reduced the amount of Financial Bank Guarantee (FBG) to be submitted by the TSPs as license fees. For UL licenses, the maximum amount to be submitted as FBG and Performance Bank Guarantee (PBG) for different services has been reduced from Rs. 44 crore to Rs. 8.8 crore and Rs. 220 crore to Rs. 44 crore respectively. License holders now also have the option to submit bank guarantees centrally at one place instead of at Licensed Service Area (LSA) wise. This avoids submission of multiple BGs.

Rationalization of Interest Rates

The government has relaxed the rates of interest in the case of delay in payment of license fees or any other dues payable under the license. Earlier, delays in the payment of dues that brought about interest of 4% above Marginal Cost of Lending Rate (MCLR) of State Bank of India (SBI) has now been reduced to 2% above MCLR of SBI. The monthly compounding has also been replaced with annual compounding.

No Bank Guarantees for Future Auctions

Henceforth for auctions held, bank guarantees are no longer needed. However the DoT will separately address eligibility criteria to ensure all participants have the necessary financial capability.

Spectrum Reforms

Spectrum assigned in all future auctions will now be for a period of 30 years as against the 20 year tenure in

past auctions. In the case of spectrum acquired by TSPs prior to the reforms, these shall continue to be assigned for 20 years. Spectrum Usage Charges (SUC) will not be levied for spectrum acquired in future auctions. Also the additional 0.5% levy on SUC rate with regard to spectrum sharing has been scrapped. Additionally, to help ease the financial burden, TSPs can now surrender spectrum after a minimum period of ten years for a surrender fee, subject to an intimation one year prior to surrendering.

Foreign Direct Investment (FDI) Reforms:

Under the new Reforms, 100% FDI is now allowed under the automatic route in the telecom sector. Previously, though 100% FDI was permitted, only 49% was through automatic route. The rest 51% was through government route.

Reforms to Address TSPs Liquidity Requirements

Taking into consideration the financial challenges faced by telecom companies, the Reforms have brought various measures to ease liquidity and cash flow. The government has provided an option of a moratorium of upto four years in annual payment of dues arising out of the AGR judgement with the Net Present Value (NPV) of the due amounts being protected.

Procedural Reforms

KYC Reforms

Know Your Customer (KYC) Reforms now have simplified and consumer-friendly KYC norms for obtaining new mobile connections and converting pre-paid connections to post-paid connections. The Reforms brought for more straightforward, quicker, less expensive, and consumer-friendly KYC norms for getting a new mobile connection and switching from pre-paid to post-paid connections.

The KYC procedure based on Aadhaar has been reinstated. For a small fee of Rs. 1, the TSPs obtain the demographic information and client photo from the Aadhar database as part of a fully digital process. Additionally, testing and verification with the help of government agencies are no longer required, but TSPs must nonetheless verify security-related compliances during implementation and notify DoT and the Ministry of Home Affairs of any steps taken.



Impact

Additionally, the alternative process of self-KYC for granting new mobile connections has been allowed. Customers can now apply for a connection from their home or place of business and have the SIM delivered by doing so using an app or portal where their documents can be electronically authenticated using DigiLocker or UIDAI. Last but not least, the One Time Password (OTP) based conversion from pre-paid to post-paid and vice versa has also been supplied in the OM.

Spectrum auctions to be held in last quarter of every financial year.

CAF Reforms

Physical Customer Application Forms (CAF) will be replaced by digital storage of data. This cost saving measure will free up warehouse spaces used by telecom service providers that previously were required to store 300-400 crore paper CAFs.

The cumbersome requirement of licenses under Customs Notification for wireless equipment has been removed, paving the way for ease of doing business. This is replaced with a self-declaration.

SACFA Reforms

The Standing Advisory Committee on Radio Frequency Allocation (SACFA) clearance for telecom towers is eased. DoT will accept data based on self-declaration and automated time-bound approval through its Saral Sanchar portal.

Spectrum Reform

Spectrum auctions will typically take place in the final

quarter of every fiscal year (fixed calendar). Instead of the current 20 years, the future spectrum auctions will take place over a period of 30 years. After a 10-year lock-in period from the date of acquisition, a telecom will be able to give up its spectrum.

The additional SUC (Spectrum Usage Charges) of 0.5% for spectrum sharing has been eliminated in order to promote it. The radio frequencies allotted to the mobile industry and other industries for wireless communication are referred to as spectrum.

The importance of these reforms

- **Bringing Back Competition** A four-year moratorium would incentivize businesses to spend money on customer support and cutting-edge technologies.
- **Encouragement of Business Ease:** The government chose to eliminate a contentious retrospective tax soon before allowing 100% FDI in the sector (through the automatic route).
- Together, these imply a return to an environment that is favourable to investors.
- **Promoting Digital India:** The telecom industry is one of the main drivers of the economy, and the government's plans would help it realise the objectives of Digital India.
- **Additional Technological Advancement:** Taken together, these policies would open the door to significant industry investments, including the deployment of 5G technology, and would result in the creation of more jobs. 🙌



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One Year of Telecom Reforms – Starting September 2021

The Telecom reforms have laid a path for Ease of Doing Business in the industry. What is amazing is the speed and clarity of decision making and the leadership shown by the DoT leadership, under the vision of the Hon'ble Minister of Communications, Shri Ashwini Vaishnaw ji – realizing the vision of Hon'ble Prime Minister



BY RAHUL VATTS

In September last year (2021), the Government announced seminal reforms in the telecom sector. It aimed to liberate the sector from the shackles of past policy constraints and their challenges. These reforms heralded a new dawn in the Indian telecom industry. Its objective was to catalyse and impel growth. Telecom is a vital foundation and bedrock of the entire digital world. Most importantly, the reforms paved the way for maintaining a sustainable level of competition with three private and one state owned telecom operator – which was essential to serve a large market like India.

Apart from ensuring that the crisis in which industry found itself was addressed, the government used the opportunity to create a much broader and bolder framework for the industry, that would ensure Ease of Doing Business (EoDB) in the sector and the economy as a whole. EoDB reforms will encourage the industry to invest fearlessly and take decisions to support India's digital ambitions.

What was at stake? Let us contextualize

India's digital economy has entered a phase of

Nevertheless, the reforms have shown a path to industry, and the Government hasn't stopped on the reform journey yet. What amazes us is the speed of clarity, solid decision making and leadership shown by the DoT leadership, under guidance of Hon'ble Minister of Communications thus realizing the vision of Hon'ble prime Minister.

exponential growth with digital solutions contributing to fast and inclusive growth by bringing more and more people online. India has the potential to become one of the biggest digital ecosystems in the world as the country moves towards achieving the USD 5 trillion GDP goal set by the Government.

Next generation networks with technologies such as 5G will be the spine that will support India's digital ecosystem and spur economic growth. A healthy telecom industry will also spur innovation and investments in allied industries like network equipment, smartphones, data centers, etc. and help create large number of jobs and contribute to India's Aatmanirbhar vision.

Indian Telecom, in its 25+ years of journey, created a massive subscriber base of 1.2 billion Indians. Telecom Service Providers (TSPs) have rolled out close to 500,000 mobile towers, over 2.2 million BTSs, lakhs of KMs of fiber and thousands of microwave towers for connectivity. Thousands of distributors, hundreds of thousands of retailers and millions of resellers covering the length and breadth of the country.

As per an estimate by the GSMA Intelligence, in 2021, the firms in mobile ecosystem supported almost 3.4 million jobs and their activity indirectly supported the employment of more than 1.25 million people. The sheer number of people employed directly and indirectly, gives one an idea of how vast the impact of the industry has been on the Indian socio-economy as a whole – supporting jobs and families. Further, the 5G networks and services being rolled out, could benefit the Indian economy by over \$455 billion between 2020 and 2040.

The report also says that the mobile ecosystem in India has contributed almost \$17 billion to public funding, through direct taxes (VAT on handsets and services)

and indirect taxes (e.g. corporation and employment taxes) in 2021.

According to industry estimates, the telecommunications industry has put in INR ~12,000 billion (or Rs 12 lakh crores) worth of investments with close to INR 5000 billion towards spectrum commitments and approximately INR 7000 billion of infrastructure spend.

The entire Digital India edifice of today is built upon the digital connectivity enabled by TSPs – this will also be the backbone and foundation for the digital future of our country. Hence a sustainable, healthy and progressive Telecom industry is a sine-qua-non for a healthy, resilient socio-economy.

Reforms and their impact on the industry

The government ushered in structural and procedural reforms plus relief measures for TSPs. While on the structural side, it rationalized definition of AGR, Bank Guarantees, interest rates at MCLR+2%, doing away with SUCs on future auctioned spectrum, and 100% FDI via automatic route among others; on procedural reforms it came out with measures such as annual auction calendar, KYC reforms with fee for e-KYC slashed to Re1/-, and permitting app based self-KYC, paper CAF forms replaced with digital storage, and SACFA clearance for telecom towers.

Further, it worked on liquidity requirements for the industry: allowed moratorium on AGR dues and spectrum purchased in auctions pre-2021, option to pay interest in deferment via equity.

ONE year down the reforms path

Documents, Procedures and Compliances through the procedural reforms related to KYC and SACFA, have

Apart from ensuring that the crisis in which industry found itself was addressed, the government used the opportunity to create a much broader and bolder framework for the industry.

Post reforms, Airtel alone is now digitizing over 100 crore (or 1 billion) customer acquisition forms, CAFs. Once it is completed it would provide a huge reprieve in terms of cost of compliance and storing them in warehouses.

eased the customer's onboarding journey and cut down cost of compliance for industry.

The digitization of paper customer acquisition forms or CAFs: Over the years, the industry built billions of customers and kept their ID proofs in physical copies, which accumulated through multiple subscriber re-verification exercises again creating huge volumes of paper records.

As per government estimates, the industry had 400 crore (or 4 billion) paper CAFs lying in various warehouses across the country. The cost and logistics of keeping such large volumes of paper records is a burden for the industry. Post reforms, Airtel alone is now digitizing over 100 Crore CAFs, and once completed it would provide a huge reprieve in terms of cost of compliance and maintaining them in warehouses.

e-KYC using Aadhaar: In a country where over 95% customers are prepaid, it is important to simplify the process of obtaining a new connection and keep cost of acquisition affordable so that all sections of the population stand to benefit from digitization.

The e-KYC – using Aadhaar based verification and customer onboarding at just Re 1/- per authentication, instead of Rs 20/- that was proposed earlier has benefited the industry too. With two biometric authentications needed for every subscriber along with a yes / no confirmation, the total cost for every CAF used to be Rs 42 per activation.

Today the Aadhaar based activation method is robust and secure. Customers get instantly activated as the authentication happens in real-time at Rs 1 only.

At Rs. 42/- per subscriber – the TSPs would have been either subsidizing that cost of customer acquisition

(as customers do not want to pay this) or using other methods like paper CAFs.

Another customer friendly reform was that allowed pre-paid to post-paid and post-paid to pre-paid migration of same customer, using the OTP method. Earlier migration would mean verifying the subscriber afresh though nothing would change except her ask to move to a different SIM (pre/post). With the OTP based process, it makes it hassle free not only for TSPs but more importantly for the customer, as no change in demographic details and eliminates need for physical KYC and documentation. The real impact is on ease of business process and also seamless service for the customer.

The simplification of standing advisory committee on radio frequency allocation or SACFA procedures, has had a huge impact on the time to roll out services. This has now made setting up and activating a telecom tower / site a breeze. The clearance of sites has now moved online – all the members of the SACFA committee can see the applications online and most of these sites are automatically cleared unless there is a specific problem. Sites for providing mobile coverage are cleared in a matter of days, compared to earlier times when it used to take months. Many lakhs of sites were pending clearances when the reforms were initiated. This has now reduced to a few thousand in less than a year. With auto clearances and a clear view of pending sites, the online process of SACFA clearance may seem like a small procedural change but it has an exponential and telescopic impact on the speed of roll out of services.

Faster clearances means faster compliances and a quick start of services. It also leads to increased revenue realization for both operators and government as services contribute to taxes to the exchequer.

Telecom Service Providers (TSPs) have rolled out close to 500,000 mobile towers, over 2.2 million BTSs, lakhs of KMs of fiber among others. A significant number of distributors and retailers.

Government of India
Ministry of Communications
Department of Telecommunications
Wireless Planning & Coordination Wing
(SACFA Secretariat)

618, Sanchar Bhavan,
20- Ashoka Road, New Delhi-110001
Date: 06.10.2021

No.: K-19013/13/2005-CFA

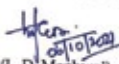
OFFICE MEMORANDUM

Subject: Simplification of SACFA clearance process for installing towers.

In pursuance to Cabinet Decision, the SACFA clearances process for installing towers shall be through self-declaration / automated time bound approvals on SaralSanchar Portal of DoT. The procedure will be as below:

- (i) Applicant will file SACFA cases indicating technical parameters like Frequency, Radiated Power, Emission, Bandwidth, Antenna Parameters etc. on SaralSanchar Portal of DoT.
- (ii) Applicant have to upload Frequency earmarking/assignment letter, challan copy (it will not be required after integration of Bharatkosh), any other document (if required). The self-declaration/undertaking, as per Annexure-I, shall be integral part of the application
- (iii) The payment will be made only through integrated Bharatkosh portal as soon as payment gateway is integrated with SaralSanchar.
- (iv) System will clear cases automatically and applicants can download system generated SACFA clearance from SaralSanchar Portal of DoT.
- (v) Cases not meeting auto-settled criteria of AAI/JCES, will be processed by Members through their integrated systems and will be cleared/rejected the cases within 30 days.
- (vi) Upon clearance, applicants can download system generated SACFA clearance from SaralSanchar Portal of DoT.

2. In case of material deviation in the actually installed tower vis-a-vis approved parameters, remedial action may be ordered by the WPC HQ. This order will also apply to all cases pending as on the date of issue of this order.


(L. D. Meghwal)
Sr. Deputy Wireless Advisor to the Government of India
Ph. 011 2303 6508

To,
All concerned.

Annexure-I

Declaration/Undertaking by Applicants

I,(name designation of authorised signatory) on behalf of..... (name of applicant) hereby declare that;


- a) the technical parameters of wireless stations and antenna as well as the tower are correct to the best of my knowledge;
- b) the frequencies, radiated power, emission/BW indicated herein have been assigned in the applied LSA/locations to us and the assignment as well as Service License, as applicable, are valid as on date;
- c) all the prescribed instructions/orders issued on re-assignment of spectrum resources like Access spectrum, MW Access, MW Backbone, etc. from WPC Wing/DoT from time-to-time, have been fulfilled and complied with.

I,(name designation of authorised signatory) on behalf of..... (name of applicant) hereby undertake that;

- a) in case of any violation of the above declaration, the penal actions as imposed by WPC Wing/DoT from time-to-time will be complied with; and
- b) in case revocation of SACFA clearance issued based on wrong declaration or otherwise, the desired remedial action will be taken within the time as prescribed by SACFA Committee. Failing which, the penal actions as imposed by WPC Wing/DoT from time-to-time will be complied with.

(Name of authorised signatory) _____
Designation _____
Office stamp _____

Place: _____
Date: _____



Reducing the financial stress on licensees

The moratorium of upto four years in annual payments of dues arising out of the AGR judgement, and a four-year moratorium on spectrum purchased in past auctions (pre-2021) brought down the immediate liability of TSPs to manageable levels and provided much needed clarity for planned capex spends on network roll outs.

The rationalization of multiple Bank Guarantees across all licensed service areas to a more practical and pragmatic requirement to keep a single BG at significant lower levels than required earlier (80% against License Fee and other similar levies) has helped free-up crucial working capital funds.

It is not out of place to state that having huge BGs per LSA would block crucial credit lines of Telcos, would add-up any charges like margin money to keep the BGs current. The credit lines can now be put to more productive and efficient use for business needs like expansions and investments.

In previous auctions, the government required TSPs to submit BGs to secure their installment payments. This displayed an extreme lack of faith in the auction participants and begged the question, why would a TSP be allowed to participate in the auction if there were such doubts over their ability to pay? Thankfully, the government trusted a mature industry, and done away with this requirement completely.

While the AGR definition reform will help industry on a prospective basis, there are still some challenges that need clarity e.g. need to define 'Telecom activities' which should ideally be 'licensed telecom activities'. It is desirable that Gross Revenue should be simple, comprehensive and not subject to conflicting interpretations and for purpose of License Fee charged as a percentage of revenue should only include revenue received/receivable directly from the customer(s) on account of provision of licensed telecom services.

Nevertheless, the reforms have shown a path to industry, and the Government hasn't stopped on the reform journey yet. What amazes us is the speed of clarity, solid decision making and leadership shown by the DoT leadership, under guidance of Hon'ble Minister of Communications thus realizing the vision of Hon'ble prime Minister.

In-fact, outside of September reforms government has taken some more steps in bringing EoDB for TSPs. Let us look at two recent examples:

5G networks and services alone could benefit the Indian economy by over \$455 billion between 2020 and 2040.



The pleasant surprise in just concluded 5G auction

The 5G spectrum auction witnessed ~71 percent of the total 72,098 MHz of spectrum getting sold, garnering \$19 billion for exchequer. But it is the action post auction, which was a pleasant surprise.

This time - the auction concluded on August 1st, harmonization process was over by August 4th and Airtel received its letter of allocation on August 17th, within hours of clearing its dues. This is a first for the industry.

In earlier auctions, the process of release of spectrum could take months due to harmonization issues, even after TSPs had made their payments towards spectrum. This delay meant TSPs losing precious time value of their investments, delayed network roll-out and consumers left waiting for faster, better connectivity. In recent 5G auction, the government alacrity ensured that the entire process of harmonization and allocation was completed within days.

The Government along-with 5G spectrum, also allocated critical E-band spectrum that is essential for 5G backhaul to carry massive data traffic.

Rights of Way (RoW):

Right of Way rules were always complicated. Permissions for laying ducts, cables and setting up towers cut across multiple jurisdictions at the Centre, States and municipal bodies.

All of this has become simpler now under the PM Gati Shakti scheme. The government launched the Sanchar portal for facilitating RoW approvals. In August 2022, the government further amended the rules aimed at facilitating 5G network rollouts.

There was foresight and vision in doing this as these are critical for 5G, which requires massive network densification using small cells deployment – which are important for use of street furniture to provide coverage in densely populated and commercial areas of a city or town.

Setting up small cells requires timely permissions from agencies and authorities and a pricing mechanism that is equitable. That is precisely what the latest RoW reforms have done. With all states on board on online application process, and hopefully, on alignment of charges as well; India would soon see massive rollout of fiber, 5G infrastructure.

The Way Forward and Conclusion

As we complete the anniversary of the pivotal telecom reforms announced in September 2021, in totality, these have all delivered significant EoDB, and efforts in this direction must continue to making India truly Digital. 🇮🇳

Rahul Vatts is Chief Regulatory Officer (India & South Asia), Bharti Airtel. He is also Director – OneWeb India and Vice Chairman of Indian Space Association (ISpA).

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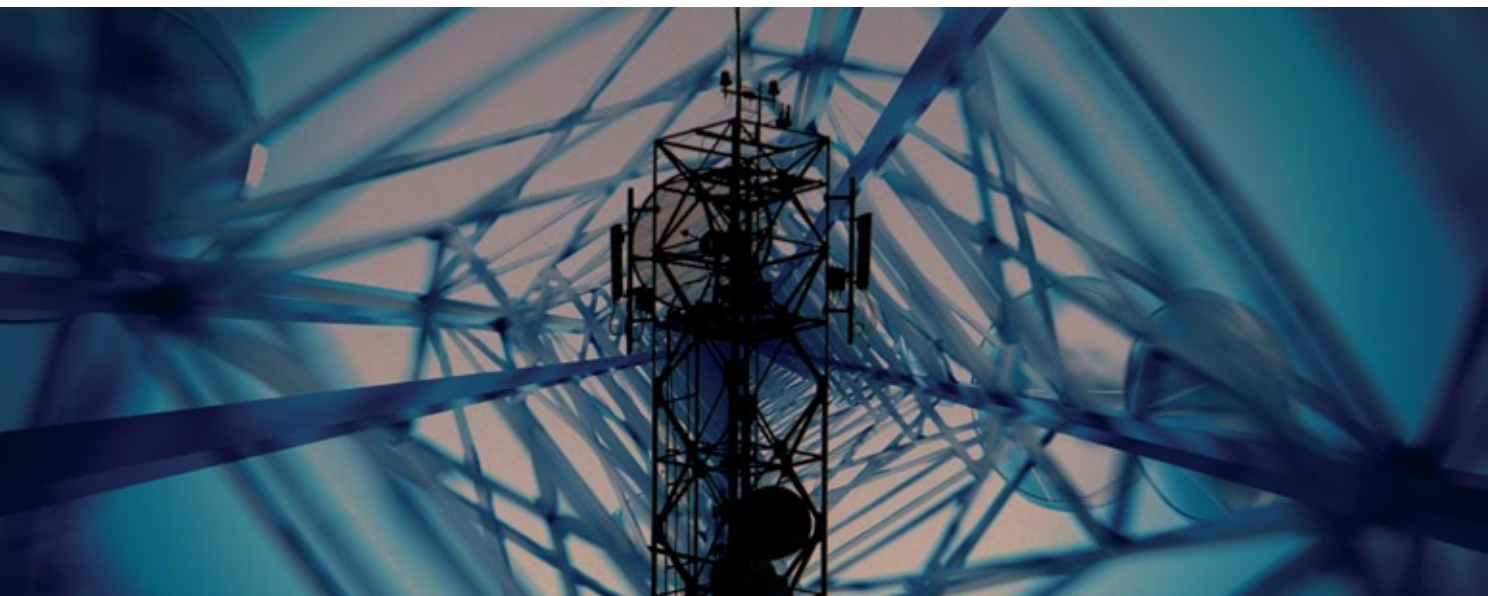
PIHU



KHUSHPREET KAUR

Telecom Reforms – bold reforms never seen before

We appreciate the Union Cabinet chaired by Hon'ble Prime Minister Shri Narendra Modi, who approved a mix of structural and procedural reforms to address the short-term liquidity needs as well as long-term issues of the telecom sector last September



BY LT. GEN. DR. SP KOCHHAR

The Telecom industry has laid the foundations of Digital India and is working to bring state-of-the-art telecommunication services to the customers.

Be it video calls, online payments, watching web series on OTT, ordering food online, or voice commands to Alexa, the list is never-ending, thanks to the technology and the connectivity. The debt-laden telecom sector contributed

to making our lives more comfortable. But the sector has been faced with an array of challenges.

We appreciate the Union Cabinet chaired by Hon'ble Prime Minister Shri Narendra Modi, who approved a mix of structural and procedural reforms to address the short-term liquidity needs as well as long-term issues of the telecom sector last September.

All of these reforms in the telecoms sector over the last one year, cumulatively reinforce the vision of the Hon'ble Prime Minister, Shri Narendra Modi, to ensure connectivity to unconnected, far-flung, remote and non-accessible areas and bringing in Ease of Doing Business to the sector.

The boldness of the reforms are reinforced by the following: In the last financial year, the government was expected to receive approximately INR 53,000 crore SUC and LF, but a huge amount from this corpus will be foregone as operators would opt for a moratorium. No words can convey the boldness to make these decisions that benefits the sector and the country.

While there is a list of nine reforms that were introduced, a few are on top priority and are making a direct & heavy impact on the telcos.

Know Your Customer

e-KYC: The Aadhaar based e-KYC process for issuing mobile connections has been a big benefit as it enabled a faster, more secure, digital way of on-boarding of subscribers – this was in line with the Digital India framework. There were concerns regarding the pricing for these verifications as the charges set by UIDAI in 2020 was a burden. The telecom industry had requested DoT to address this.

The e-KYC rate, was revised, to the great relief of the industry -- to just 1 rupee. This has been bold and a great value for industry and consumer.

Self KYC or S-KYC: The Self-KYC process approved by the Cabinet as enabled individuals to apply for a mobile connection from anywhere -- using a mobile application or a portal. SIM cards are delivered to their location. This is a digital and contact less process and another valuable, safe and convenient service for consumers.

By enabling customers to convert from prepaid to postpaid or vice versa, a big pain point was reduced for users. It eased the process of switching. Customers did not need to submit the documents all over again. Together with S-KYC these reforms have given a huge boost in ease of doing business (EoDB) and being user friendly for subscribers at the same time.

Bank Guarantee Rationalized

The terms of the license agreement require TSPs to submit a Financial Bank Guarantee (FBG) to securitize their license fee and spectrum usage charges. These

were reviewed on half yearly basis. A huge challenge the industry faced: dues related to CAF (Customer Application Forms) and EMF penalties were included and added to the FBG during the reviews. Sometimes these issues were legally under review and sub-judice with interim protection from courts.

Thus the policy to reduce bank guarantee by 80% against license fee and similar levies – demanded by operators for long – was a boon. Operators have already spent Lakhs of crores in setting up networks across the country and are backed by reputed business groups known for delivering on their financial commitments. The Financial and Performance BGs was a huge burden on operators. The new rules make more funds available to operators that can be deployed for expansion of networks.

100% Foreign Direct Investment in Telecom Sector

Though 100% FDI in the telecom sector was permitted -- only 49 percent was through the automatic route while the rest 51 percent was through a government approval route. The policy reform to allow 100 percent FDI under the automatic route was a positive development. And another positive step in Ease of Doing Business. More foreign investments will allow creation of a robust infrastructure for technologies like 5G. Emerging opportunities in the field of IoT, AI, AR, VR etc will also receive a boost.

Interest Rate Rationalized/Penalties removed

Another reform which reduced the financial burden, from October 2021, related to delayed payments of License Fee (LF)/Spectrum Usage Charge (SUC). The interest component rate was reduced to SBI's MCLR plus 2% -- instead of the MCLR plus 4%. Interest was compounded annually instead of monthly; penalty and interest on

The RoW Rules of 2022 introduced as amendments in the current guidelines will prove to be a big support for creating 5G infrastructure, both to existing infrastructure and deployment of new infrastructure.

The Self-KYC process approved by the Cabinet as enabled individuals to apply for a mobile connection from anywhere – using a mobile application or a portal. SIM cards are delivered to their location.

penalty was removed. This has also reduced the financial burden on operators.

Rationalization of Adjusted Gross Revenue

One of the other major reforms on the financial side related to Adjusted Gross Revenue (AGR). This excluded the non-telecom revenues on a prospective basis from the definition of AGR, for example revenues from activities under a license by the MIB (ministry of information & broadcasting), amount received from USOF, and cash flows from dividends, interest, fluctuations in foreign exchange, sale of property etc were all excluded.

The sector is truly delighted to see this reform as this was one of the longest pending requests. This was indeed a path-breaking step that brought back a catalyzing effect on investments in the sector.

The bigger and more laudable reason for welcoming these reforms is something that was unthinkable in earlier years. So, while operators stand to benefit from these reforms, it is estimated that the government will face some revenue loss in the next four financial years.

In the last financial year, the government was expected to receive approx. INR 53,000 crore SUC and LF, but a huge amount from this need to be foregone as operators would have opted for the moratorium. No words can convey the boldness of these decisions and the benefits to the sector.

Facilitating Right of Way (RoW) for Telecom Infrastructure

The RoW Rules of 2022 introduced as amendments in the current guidelines will prove to be a big support for creating 5G infrastructure, both to existing infrastructure and deployment of new infrastructure. The high costs in getting permissions for laying of cables and access to buildings etc, were a major challenge. This is now eased. The telecom sector also sees the introduction of 5G RoW application form on GatiShakti Sanchar Portal as a positive step by the government which will speed up the installation process of digital infrastructure.

All of these cumulatively reinforce the vision of Hon'ble Prime Minister, Shri Narendra Modi to ensure

connectivity to unconnected, far-flung, remote and non-accessible areas.

COAI would also like to make further suggestions to make ROW process and charges quicker and transparent:

- Enforceability by Legal backing for RoW Rules 2016 and any amendment to the rules thereof. All policies for ensuring and delivering Critical Telecom Infrastructure (CTI) should be uniformly implemented across the country. It should be backed by an Act of Parliament as only Acts and Rules under the Act are enforceable. Guidelines seldom have the desired impact. Further, as a first step all central ministries should be mandated to comply with RoW Rules 2016 & any amendment to the rules thereof.
- Implementation of the State RoW policy by Local Bodies/ Municipal corporations/Wards etc. in letter and spirit: Implementation of the State policy at local bodies/ Municipal corporation/Wards remain a challenge impacting Rollout of Underground and Overhead fiber. Clear directions need to be issued to all Local Bodies/ Municipal Corporation/ Wards etc. to adopt and implement the RoW Policy of their State in both letter and spirit.
- The use of Street Furniture for deployment of Telecom Infrastructure i.e. Small Cells and Aerial fiber should be facilitated by State Governments and Local bodies.
- Removal of the Concept of Compensation: The concept of compensation for use of land in connection with the grant of RoW rights should be done away with as utility of land is in no way adversely affected owing the to grant of RoW for Underground Cable (UGC).

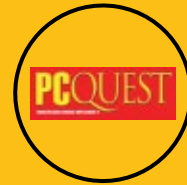
No bank guarantees (BGs) for auctions

We would also request that for auctions held henceforth, no BGs should be required to secure instalment payments. Industry has matured and the past practice of BG is no longer required. 🙏

Lt. Gen. Dr. SP Kochhar, Director General, COAI
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5G may shake up the old order - opening up a new front for next generation Policy reforms

Technology obsolescence and the advent of new platforms have been shaking up old and established markets and this may happen again



BY PROSENJIT DATTA

The successful conclusion of the 5G spectrum auctions, which fetched the government revenues of Rs 150,173 crore, would have been a cause for cheer. But the 5G revolution is likely to only exacerbate the telecom headache that has defied all the medicines that the government has tried out so far.

It is likely to make the older telecom service providers face competition from non-telecom companies that plan

to get into the 5G game and focus on the most lucrative segments of the business.

Readers of this publication are well aware of the twists and turns of the Indian telecom revolution since the sector was liberalised. The telecom story has been pretty beneficial for Indian citizens – competition between mobile service providers and some policy interventions ensured that voice telephony charges became the

Older telecom players are likely to face competition from technology platforms that have not provided services so far – but may very well barge into the segment.

The 5G technology brings traditional telecom players like Airtel and Vi face to face in competition with non-telecom players like the Cisco, Facebook, the Adani group.

cheapest in the world first, and after the advent of 4G services, data prices of mobile broadband have also fallen to record lows.

It has mostly been bad for the majority of global and domestic firms that forayed into it, and quite a recurring pain point for successive governments. Two things have been responsible for the pain. The first is the inevitable march of technology. The second involved successive government's bumbling policy responses – which the present Government has done its best to sort out and pave the way for the future (this is our cover story).

The first two generations of mobile telephony mostly had to do with the voice market. 3G brought in some degree of data though the speed of transmission was not really practical for too many applications. 4G though brought in true mobile broadband while 5G speeds will enable both consumer and enterprise applications that are truly remarkable.

However, the generational changes in technology had a side effect. It has required companies to invest heavily and consistently to upgrade networks while competition has ensured wafer thin margins.

While 1G, 2G and 3G largely favoured legacy players who had got into the game early and painstakingly built networks and acquired spectrum, the advent of 4G along with a policy tweak, heavily favoured new entrants who did not have to deal with legacy cost issues.

Policies of the Past

The policy responses of different governments could however be said to be the real issue that has haunted the sector. When mobile telephony was first introduced in the country, the government of the day restricted the number of players and handed out licenses and spectrum only to the highest bidders in each circle. It quickly led to the winner's curse – telecom service providers were unable to get enough consumers because of exceedingly high

prices and also started defaulting on the license fees.

The next government introduced the revenue share model to solve this issue. It also allowed more competition in every circle and made a few tweaks to policy – all of which made the service more affordable and helped the penetration of telephony to the remotest portions of the country.

But then the authorities got greedy. First, it decided that the revenue share – the adjusted gross revenues (AGR) due to the government – would be calculated based on total revenues of the telecom service firm and not just the telecom operation revenues. At the same time, the government also handed out new licenses without following all the norms that had been prescribed for doing that. Both would come to haunt the government.

The spate of licenses handed out while disregarding well set out procedures ended up creating a controversy – the so called 2G Scam – that would at least be one of the main reasons why the government of the day failed to get re-elected.

But the biggest issue was really the AGR dues and it would come back to haunt the government. The AGR dues case was fought all the way up to the Supreme Court. Eventually, the Supreme Court upheld the government's stance. But in the ensuing period, excessive competition, high license and spectrum fees, the advent of a wholly IP and data centric 4G technology, the entrance of Reliance with its JIO brand of services, combined with deep pockets – pretty well drove the existing players to the brink of bankruptcy.

By the time the government won its case, the telecom sector was in deep distress and had turned pretty well unviable. Reliance Jio had a clean balance sheet, while Airtel, despite its legacy costs and debt, was in a reasonably good condition. Earlier, Vodafone and Idea, the other two surviving players had merged to form Vi

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but even now the combined entity is losing subscribers and mired in too much debt.

Positive Policy Shift by the Present Government

The government's decision post the Supreme Court verdict to allow telecom service providers with huge AGR dues to convert part of it to equity shares – which would be taken by the government – has been a huge reprieve (albeit could be temporary) for Vi.

It could lead to a long term issue for the government though. Vi has taken up the government's offer and the latter will end up as the majority owner of the company after the conversion. This makes the government the owner of two loss making telecom entities – BSNL and MTNL – as well as the majority shareholder of Vi, which is still not out of the woods financially.

The government's recently announced package worth Rs 164,000 crore for BSNL doesn't address the main problem – it has been systematically losing market share, will start offering 4G services when its three private sector peers are planning 5G rollouts and is still to merge with MTNL without which it doesn't have a footprint in the Delhi and Mumbai markets.

Most importantly, the package doesn't address the main issue – the inability of BSNL to take quick decisions which is absolutely essential to survive in the telecom arena. Unless BSNL is cut free and allowed unfettered decision making to respond to market forces, as it had done in 2002 when it launched a nationwide 2G mobile service that till today remains the most wide in reach (in the remotest of regions). BSNL's problems aren't about to go away very soon, but there is renewed hope, as the new Minister, Hon'ble Shri Ashwini Vaishnaw has extended a helping hand to ensure BSNL flies again.

This brings us back to the 5G auctions and why it could aggravate an old problem. That of technology obsolescence and the advent of new platforms shaking up old markets.

The 5G technology brings traditional telecom players like Airtel and Vi face to face in competition with non-

telecom players like the Cisco, Facebook, the Adani group and new competitors in the enterprise segment (called captive non private networks of CNPN).

Some of them have bought spectrum while others have obtained UASL licenses in the hope of capturing a new market through collaboration or partnerships to get into the market and start offering 5G services. Initially it will focus on the lucrative enterprise market (which even today comprises nearly 40 to 50% of the market. But later these players will find a way to reach the end consumer – the retail customers.

5G allows providers to offer enterprises and consumers solutions like the Metaverse or Smart Factories and solutions that go far beyond normal telecom services. This will take away a large slice of the 5G pie that existing operators will be looking at.

While this will not affect Jio too much given that it is building 5G standalone networks and has a strong balance sheet, it may create difficult times for the legacy networks and operators that have a big debt burden. The cost of 5G spectrum and the investments required to make networks 5G ready will require additional capital, most likely to be raised via more debt.

For Vi, the limited benefit it got by converting its AGR dues to equity for the government, will not prove to be a long term succour. For BSNL and MTNL, without their own 5G networks and spectrum, it could add to the diminishing of market share – but this is expected to be sorted out immediately after the 4G launch – using equipment and technology developed indigenously by CDOT and TCS.

But the days are not far when the Government will soon have to deal with these new issues arising from new technologies. There will be need to find better solutions for the telecom sector and the continuing march of technology. 🌟

Prosenjit Datta is Former Editor, Business Today and BusinessWorld Magazines
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Telecom Infrastructure – Electricity Board Connection & Energy Related Challenges

While the availability of Electricity Board (EB) connection for the functioning of telecom sites have improved over the years, there is still a substantial percentage of sites where the availability of 24X7 uninterrupted power is a challenge

BY T.R.DUA

Telecom connectivity is now an essential service. Uninterrupted power, 24x7 is a fundamental requirement to keep these services running. For telecom networks to function, towers need to be energized. This critical aspect is being fulfilled by telecom infrastructure providers.

According to the license conditions, a telecom operator needs to maintain a network availability higher than 99.5% of the time. Without power this is impossible. Thus, assured power, 24x7 is a prerequisite for tower sites. Energy is a significant component of tower site operations.

For the implementation of deliverables enshrined in the National Digital Communication Policy 2018, National Broadband Mission has been launched by the Government of India which aims to achieve “Broadband for All” by 2022. The success of the National Broadband mission would not only depend upon the availability of telecom infrastructure in the rural and far-flung areas but also upon the availability of 24X7 power supply across all the urban/semi-urban/rural locations for powering the telecom installations.

Telecom Infrastructure providers are in the domain of providing passive infrastructure such as telecom towers, dark fiber, duct space and Right of Way to the telecom service providers and provide passive infrastructure on plug and play basis which includes enabling the power solutions for the telecom sector in terms of Grid supply, battery and alternate power sources such as DG set/ renewable etc. in order to enable the wireless communications. The service providers are registered with the Department of Telecom, Ministry of Communications as Infrastructure provider category1 (IP-1).

There are more than 7 Lakh telecom towers in the country that host almost 23 Lakh BTSs to provide 2G, 3G and 4G services on a PAN India basis and serve about 1.2 billion customers in the country currently.

Current Landscape of Power availability for Telecom Industry

While the availability of Electricity Board (EB) connection for the functioning of telecom sites have improved over the years, there is still a substantial percentage of sites where the availability of 24X7 uninterrupted power is a challenge. This warrants use of DG sets and consumption of precious commodity diesel at the sites, resulting in adverse impact on country's economy, including pollution and the dollar reserves of the Government of India.

Barring a handful of states as shown below, getting even 20 hours of uninterrupted EB supply is an issue, leading to increase in CAPEX and OPEX for the Telecom Infrastructure providers and overall cost of providing services to the citizens of the country.

Challenges of the Telecom Infrastructure Providers

- **Unavailability of 24X7 Electricity Board (EB) Supply:** In absence of availability of 24X7 power supply, telecom infrastructure providers are forced to depend upon alternate energy means like DG sets etc. This leads to increased CAPEX investments and increased OPEX due to higher cost of generation and diesel pilferage etc.
- **Exorbitant connection / last mile and miscellaneous charges:** Some states charge huge amounts as infrastructure charges for providing new connections. Even the charges for the last mile are exorbitant in some states and at times the last mile is not maintained by the DISCOMs.

Green Open Access Rules, 2022 have been notified on 06.06.22. These rules are for promoting generation, purchase and consumption of green energy. Rules enable simplified procedure for the open access to green power.

- **EB tariff levied under Commercial category for telecom sector:** While the telecom tariffs in India are the lowest, the Electricity tariffs are being charged at substantial high rates under the commercial category. In most states the difference between both the category is significant, leading to burden overall telecom sector.
- **Priority Electricity Connection, EB connection pending issues:** New power connections can take anywhere up to 30-60 days, some states link NOC from Municipal Corporation as a pre-requisite for applying a new EB connection.
- **Billing Challenges, Online Delivery of Bills and payments:** The Telecom sector generates huge revenues for the DISCOMs, however the treatment is at par with a normal/residential customer, ideally we should be treated as a corporate customer. Majority of states have no centralized billing, provision of bills through e-mail etc. thereby unnecessarily adding physical collection / downloading of thousands of bills from the portal.
- **Non-Availability of Smart/Pre-payment Meters, faulty meter replacement:** Currently the presence of Smart meter in the country is negligible even in Urban areas. The Electricity (Rights of Consumers) Rules 2020, clearly states that –

No connection shall be given without a meter and such meter shall be the smart pre-payment meter or pre-payment meter.

Since telecom network is present at the site, functioning of a smart meter is very much possible.

Issues related to Open Access

Power purchased through open access policy is currently a very costly affair and non-viable option. Open access allows large users of power – typically having a connected load of 1 megawatt (MW) and above, to buy cheaper power from the open market (Green Open Access Rules 2022, notified on 6th June, 2022, Green open access limit has been reduced to 100 KW).

Green Energy Initiatives

While as a nation building and socially responsibility Industry, the telecom infrastructure industry is in sync with Government of India's green energy initiative and fully support the same. We have been working with the Government on use of alternative energy sources like Solar, PNG, Diesel blending etc. Need of the hour is surely to move to greener alternatives of energy source, however, the onus of producing Green energy is, and should, lie with the Energy companies.

Recent important developments, Support from Government

- **Electricity (Rights of Consumers) Rules, 2020** on December 21, 2020, by the Ministry of Power. Giving right of consumers to have minimum standards of service for the supply of electricity from DISCOMs and the duty of every DISCOM to supply electricity on request made by an owner or occupier of any premises.
- **Amendment rules to the Electricity (Rights of Consumers) Rules, 2020**, 20th April 2022 Gazette notification of Ministry of Power, amendment rules to the Electricity (Rights of Consumers) Rules, 2020. Distribution licensee to ensure 24X7 uninterrupted power supply to all the consumers cities with a population of 100,000 and above.
- **Green Open Access Rules, 2022** have been notified on 06.06.22. These rules are notified for promoting generation, purchase and consumption of green energy. Rules enable simplified procedure for the open access to green power
- **Recommendations of the Working Group to the FOIR on "Cross Sector Collaborative Regulation between Telecom Regulators and Electricity Regulators".** A well thought through and effective cross-sector partnership between Telecom and Power sector, benefitting both sectors through increased scales, leveraging shared resources, improve reach and amplify overall developmental impact. 🙌

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The public cloud – perfect for 5G India

5G is written to a cloud-native standard, so all Telcos have the chance to instantly move to launch 5G services by using the public cloud



BY DANIELLE ROYSTON

India's 5G auction closed August 1, with four telcos spending a record-breaking INR 1,50,173 crore to get in on the game. Now, the race is on. Reliance Jio is out of the gate first, having spent INR 88,078 crore for 24,740 megahertz of airwaves—and then announcing it would launch 5G service in Delhi, Mumbai, Chennai, and Kolkata by Diwali in late October 2022, followed by a nationwide rollout of a 5G standalone (SA) network by the end of 2023.

That takes some bravado, and leaves everyone wondering what the other telcos in India are going to do to match them. Thankfully, 5G is written to a cloud-native standard, so now these Telcos have the chance to keep up by using the public cloud.

After all, elsewhere around the world, Telcos are already on the 5G highway. Just look at the biggest hyperscaler partnerships happening globally. Vodafone

Telcos are moving to the public cloud because of the huge benefits. Benefits that are especially true for India's unique telco market.

AT&T spends about a billion dollars on its roughly 100-million subscribers, so it's spending about \$10 a sub, which is much higher than what a Telco would spend on a public cloud (about \$1)

has signed a strategic partnership with Google to move all of its on-premise analytical workloads to Google Cloud. Last year, AT&T sold its network cloud business to Microsoft, which is refactoring it to run natively on Azure. And then the news that rocked the industry: the move by US company DISH to go all in on the public cloud, building its entirely new 5G network on Amazon Web Services (AWS).

Telcos are moving to the public cloud because of the huge benefits. Benefits that are especially true for India's unique telco market.

Scale & Price – benefits of Public cloud

The public cloud is perfect for India for two reasons: it can provide the scale required for the large Indian market at a low price – which is ideal to sustain the low average revenue per user (ARPU) recoveries.

In terms of scale, India is huge. Home to 1.4 billion people and a billion subscribers, it's the second-biggest market in the world after China. That means any software a Telco chooses has to be carrier-grade, able to handle the most scale and the hardest use cases, and provide the highest performance. Basically, rock-star software.

At the same time, India is a market with nearly the lowest average revenues per user or ARPU in the world—approximately \$2 / month for India versus a low-side estimate of \$20 for the US.

This combination presents a unique challenge for telco operators in India. They need tier-zero, carrier-grade software to handle the scale, so they look to the big vendors like Amdocs, Nokia, and Ericsson. But they also need the lowest price so they can make the numbers work business-wise, and these vendors' solutions typically cost tens of millions of dollars.

What do you do? You look to the public cloud. Finally, we have an enabling technology that solves this previously unsolvable equation.

The public cloud can handle the scale

Public cloud data centers are built to support the world's

biggest Internet companies like Amazon, Microsoft, and Google. Amazon built many aspects of AWS to support its own explosive growth and huge demands. AWS is also highly scalable:

- When Amazon's retail business outgrew its expensive Oracle databases, it made its own better and cheaper versions, which eventually became DynamoDB.
- Intel chips were expensive, so it created Graviton, which beat Intel's x86-based instances by 40% on price and 7x on performance with the Graviton2 in 2019.
- And then in 2021, it beat that by another 25% on speed, while using 60% less power with the Graviton3.
- AWS also provides variable data-storage pricing, so you can pay less to store data you need infrequently or not as fast.

Because of the public cloud and the hyperscalers' investments, telcos do not need to build their own data centers. They can use cutting-edge, high availability and fully scalable data centers of AWS, Azure or Google Cloud. Further the operational costs are minimized as it is a pay-by-use – based on daily, hourly or even minute by minute usage of the resources. It can be more one day and less on another. The hyperscaler data centers are built on the best technology and supported by the world's best experts in the domain. The AWS region in Hyderabad, currently under construction is a world class data center. For Telcos to take advantage of all this they have to select tools that are truly cloud native.

What is cloud native?

Most vendors – be it Amdocs, Ericsson, Huawei, Nokia, or Oracle – talk about their new “cloud-native” versions of legacy products. Their products are projected as being ready to support 5G spectrum. But mostly this is “cloud washing” -- which is rebranding an old product by adding some “cloud” functions to it.

Cloud native software solutions are those that are built for the public cloud from scratch. When software and

This is the dawn of a new era in telco software which is cloud-native. It can scale to meet massive growth. At massively cheaper pricing. As Telcos upgrade to 5G, this makes eminent sense.

services are truly cloud native, they are live on a public cloud and 80% less expensive than their on-premise cohorts.

How can a product be tested whether it is truly “cloud native”? Here is a list I put together of the top five ways to tell if a vendor’s “cloud native” application is truly cloud native (and a hilarious video I recorded with Ray Le Maistre at TelecomTV).

But taking all points together, it’s pretty easy to tell. There’s a simple test: the price. If it’s not 80% cheaper than the on-premise version, it’s not cloud native.

Real cloud versus fake cloud

Totogi, a public-cloud-based telco software company where I’m acting CEO, offers the fully cloud native Totogi Charging System on AWS Marketplace, with a starting price of one penny (between 80 paise - Rs 1/=) for the first 500-million transactions per month in a pay-as-you-grow model.

Amdocs is also on AWS Marketplace, selling its Digital Brands Suite at \$400,000 USD for upto 100,000 users. The page says it is a Software as a Service (SaaS). So, If it is on AWS Marketplace, it seems like it should be cloud-native. But the price seems awfully high. Let’s take a look.

If we take \$400,000 and divide it by 100,000 subscribers, that’s about \$4 per subscriber. The fine print on the Amdocs AWS Marketplace page says, “All orders are custom,” and also, “additional taxes or fees may apply.”

What fees could that be? Services to implement, customize, or integrate to other systems of the Telcos. Recently, I was perusing the Amdocs 2021 annual report. Looking at the company’s mix of revenues, about 40% is for products and the remainder 60% is for services.

So, using this ratio from the annual report, customers should expect that the product will be 40% and additional fees and services will be 60% of the total price. So, that’s actually going to be about a million dollars for 100,000 subscribers, which works out to about \$10 each.

That math holds up if we look at Amdocs’ largest customer, AT&T. It famously spends about a billion dollars on its roughly 100-million subscribers, so it’s spending about \$10 a sub. So, what we’re seeing here is that Amdocs has not updated its pricing model for the public cloud. Compare that to Totogi, where prices will work out to be about \$1 per subscriber. With this price point, it’s a no-brainer to adopt truly public cloud products. Especially for Telcos in India.

This is the dawn of a new era in telco software. The new technology is cloud-native. It can scale to meet your needs—easily. The telltale sign it’s the real thing is massively cheaper pricing. For Telcos it makes eminent sense, especially as they upgrade to 5G.

The race is on. Not only are public cloud solutions infinitely scalable and cheaper, they’re also faster to deploy. Jio has thrown down the gauntlet, putting a stake in the ground and planning to launch next year. The best advice to the other telcos – Bharti Airtel, Vodafone Idea, Adani Enterprises (and anyone else with 5G plans) – is to use the technology of the public cloud in order to get the benefits of scale, speed, and lower price. 🙌

Danielle Royston, CEO and Founder, TelcoDR & Acting CEO, Totogi

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PCQuest September 2022 edition talks about Evolution of workplaces - Collaborative spaces mixed with virtual offices.

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Universal Acceptance (UA) of Top Level Domain (TLD) Names and E-mail Addresses using these addresses

Do internet-based applications accept all valid domain names and e-mail addresses?



BY AKSHATJOSHI

“Universal Acceptance” in the context of domain names and e-mail addresses may sound ironic to users of the Internet – which is itself a universal network.

We see domain names and e-mails everywhere. Apps / websites which we use from the time we wake up till we go back to sleep – from exercise, ordering breakfast, working, learning, or recreational activities on YouTube/ Spotify/Jio Saavn – all are linked to some domain name. The “account” that links users to the apps, use e-mail in the back-end.

The problem arises because domain names and e-mail addresses are almost entirely in one script – Latin which is used for English. Other scripts are rare, though this was introduced a long time ago.

This is not a reflection of the lack of technology support.

Technology support exists for them in the form of “Internationalized Domain Names” (IDNs) since early 2003, and more formally in a robust manner since 2008. The only thing that is holding back a wider adoption is

Why are regional language TLDs which were issued by the Internet Corporation for Assigned Names and Numbers (ICANN) in 2012, still not accepted universally by all computer systems, servers and websites?

These domains are called Internationalized Domain Names (IDNs). They allow use of domain names in local languages and scripts.

IDNs are formed using characters from different scripts, such as Arabic, Chinese, Cyrillic or Devanagari.

These are encoded by the Unicode standard and used as allowed by relevant IDN protocols.

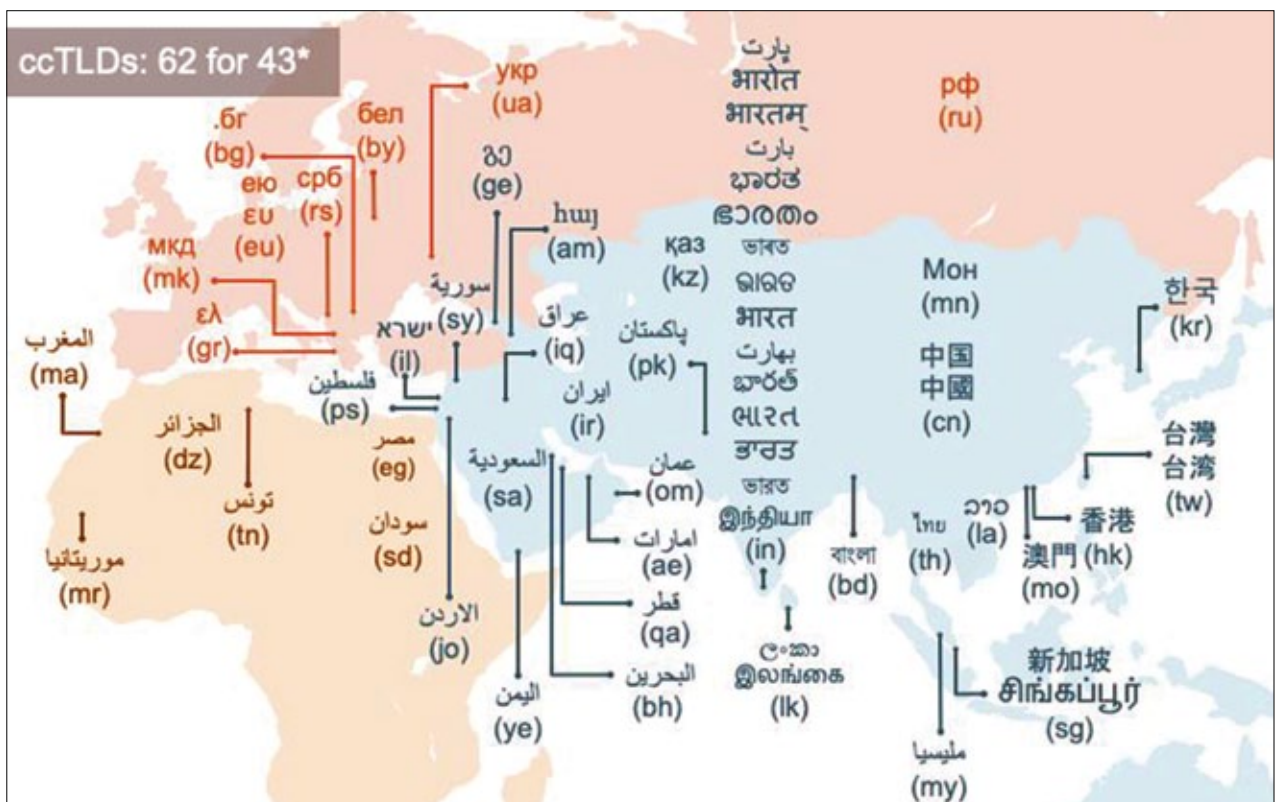
ICANN instituted the IDN Program to assist in the development and promotion of a multilingual Internet using IDNs.

Today we have IDN top-level domains (TLDs) in 37 languages and 23 scripts.

These are all in production and delegated into the Internet root zone system.

Languages covered are: Arabic, Armenian, Assamese, Bangla, Belarusian, Bengali, Bulgarian, Chinese, Georgian, Greek, Gujarati, Hebrew, Hindi, Japanese, Kannada, Kashmiri, Kazakh, Korean, Lao, Macedonian, Malay, Malayalam, Mongolian, Oriya, Persian, Punjabi, Russian, Sanskrit, Santali, Serbian, Sindhi, Sinhalese, Tamil, Telugu, Thai, Ukrainian, and Urdu. The scripts include Arabic, Armenian, Bengali, Cyrillic, Devanagari, Georgian, Greek, Gujarati, Gurmukhi, Han, Hangeul, Hebrew, Hiragana, Kannada, Katakana, Lao, Latin, Malayalam, Oriya, Sinhala, Tamil, Telugu, and Thai.

A quick snapshot of some of the IDN country code TLDs that are now available: <https://www.icann.org/en/system/files/files/idns-where-are-we-now-16jun21-en.pdf>



[TECHNOLOGY]

MULTI LINGUAL INTERNET

the classic “chicken and egg” – that is demand and supply issue.

Before getting into details, let’s see some of the possible IDNs:

- <https://www.thai-language.com> (THAI LANGUAGE)
- <https://www.gujarati-language.com> (Gujarati Language)
- <https://www.arabic-language.com> (ARABIC)

The above are fully functional domain names in

Here are some examples of Internationalized Email Addresses:

- ອີເມວ-ທົດລອງ@ສາກົນ-ການຄອມມັດ-ທົດລອງ.ລາວ (LAO)
- ඉ-තැපැල්-පිරික්සීම@විශ්ව-සමමුති-පිරික්සීම.ලංකා (Sinhala)
- 電子郵件測試@普遍適用測試.台灣 (Chinese Traditional script)
- ईमेल-परीक्षण@सार्वभौमिक-स्वीकृति-परीक्षण.संगठन (Devanagari)

The above email IDs are fully functional.

Emails sent to any of these email IDs will receive an automated reply with words as showed in the image below. Email Address Internationalisation (EAI) is an effort within the UA group.

The limitation for sending such emails is that users will have to use an e-mail service that is able to communicate with the Internationalized Email IDs.

It may help to check with the provider of the e-mail service to include that functionality, as it is central to an inclusive internet – but this can be a tedious task today. To check if the email service provider is maintaining an EAI aware mail-server, there is a wonderful service

hosted by UASG named “EAI Check” ----- <https://uasg.tech/eai-check/>.

Enter the email ID in use and it will give a response whether or not that email service is aware of the “SMTPUTF8” flag, which forms the backbone of EAI aware implementations.

Apart from the language TLDs, the ICANN had also introduced over 1000 new domains for different categories, that went beyond the well known, .COM, and .ORG. For example:

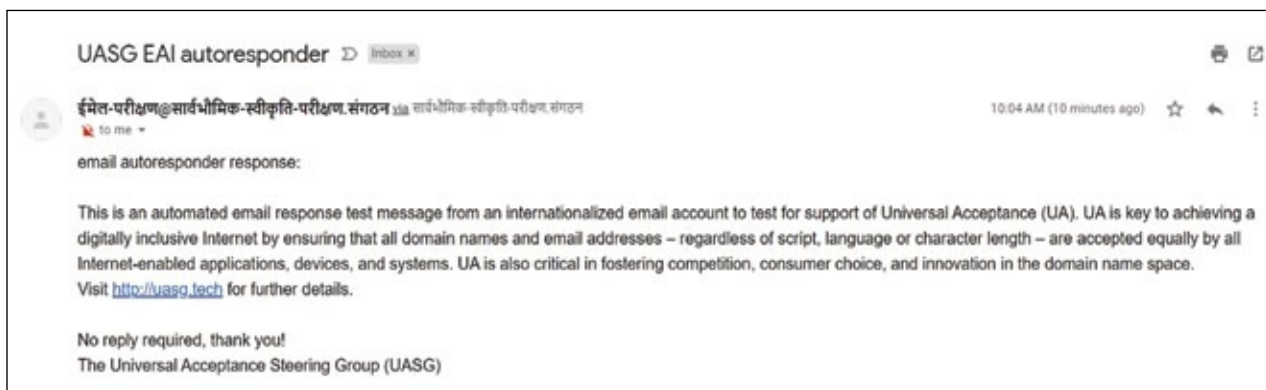
- .MUSIC
- .TECHNOLOGY
- .ISTANBUL
- .SKY

The existing internet userbase, which deals with textual aspects of internet services, largely understands English language and Latin script.

There is a limited userbase that accesses the internet in their own language/script – a large part of these are in the Russian language and a few other languages. Most other users think that such a service is un-available.

This further accentuates the problem of adoption of IDNs and new Top-Level domains. A majority of the world’s software systems offering services do not allow non-Latin characters in the domain names and e-mail IDs.

Thus, when users submit these, they are considered as spam and filtered out or rejected. The new top-level domains also get blocked by some string specific restrictions like length validation.



Operations for UA Compliant software-systems



Internet Corporation for Assigned Names and Numbers (ICANN), the guardian of names and numbers in the Internet eco-system, and the administrative body for policy -- has started to take steps towards sensitization of the user-communities and software developing community on this aspect.

This led to the formation of the the “Universal Acceptance Steering Group”, a group comprising of individuals representing more than 120 companies holding stakes in the Internet ecosystem.

In concrete terms, Universal Acceptance of Domain Names and Email Addresses is defined by a set of five operations, which when implemented and followed in a software-system ensures “Universal Acceptance” of all domains and thus is UA compliant.

The five operations are:

1. Accept
2. Validate
3. Store
4. Process
5. Display

1. Accept

In any user-input accepting field, on the user-interface of the software, all the characters that can be used as a part of the domain name or e-mail field, should be able to be inputted by the user and the software should ensure proper font and formatting of the same so that the inputted text is clearly visible and readable for the user. In addition to the precautions required on the software implementer’s side, there could be some issues at the user side as well which might prevent the Unicode characters in the IDNs from getting rendered correctly. To alleviate those issues, users can refer to the guidelines by the Unicode Consortium here.

2. Validate

There should not be any discriminatory checks that needlessly invalidate the technically viable formats of the domain names and e-mail IDs including those in local languages. To understand the possible reasons of these validation checks, this blog explains the details:

<https://thinktrans.hashnode.dev/what-is-the-ultimate-goal-of-the-domain-name-and-email-id-validation>

3. Store

When it comes to storing the user-submitted text for later processing, the text should be saved either in its original form as submitted or in a format that is devoid of any lossy conversions which can alter the fundamental nature of the inputted text. Typically, UTF-8 is one of the most common and universally acceptable formats for Unicode storing data.

4. Process

Processing of the text, as per the Unicode norms can happen at two stages throughout the its journey.

4.1 Process on input:

Before the processing of the text onto the database, there are various possible Unicode routines, which are applicable for faithful handling of the Unicode text. Those processes, can/should be applied onto the text beforehand. Now the ambiguity of the “can/should” is expressed at this point as whether to apply those conversion routines, or at what stage to apply them is totally dependent on the business logic, the control of which rightfully lies with the software developer. Typically, these processes involve

1. Conversion/Non-conversion from Unicode to Punycode

If the string is going to get stored in the database column that is not Unicode enabled (for code legacy



reasons, otherwise it is definitely recommended to fully Unicode compliant database structure) then the developer might want to convert the Unicode string to Punycode. However, if there are a set of operations expected by the developer on the stored domain names, e.g., some sort of searching and sorting, it is desired that the Unicode form of the domain name be preserved.

2. Conversion as per the Unicode Normalization

Typically, as per the IDNA protocol, the domain name has to be in a “Normalized” form. This helps prevent the dual representation of the same label. A developer, as per the business logic can take appropriate call if this conversion is needed at this stage.

4.2 Process on output:

This operation on the text often follows after the text is retrieved from the database and is on its way to subsequent processing for further journey into the user-interface. All the conversions/ processes applied on the “Process on input” can either be maintained or reversed or newly applied onto the text, depending on the requirement and business logic.

5. Display

Finally, after the text is retrieved from the back-end of the system, it should be able to be rendered back into its Unicode form as understandable by the native user of the script/language. The software-systems which can comply with all the above 5 major operations while dealing with the IDNs and Internationalized Email Addresses, can be considered to be truly compliant with the notion of the “Universal Acceptance”.

Why is this so important at ICANN?

ICANN as a body is entrusted with the responsibility

of maintaining and managing the policy in relation to the names and numbers, typically domain names and IP addresses. In addition to this, ICANN has become a global forum for internet policy development discourse. Throughout the discussions at various ICANN meetings, “on-boarding of the next billion” frequently forms the core of the discussions.

Given the current linguistic spread and the demographics of the new internet users, catering to the needs of the non-Latin and non-English users becomes vital.

As per the ICANN’s Strategic Plan for fiscal years 2021 - 2025, ICANN’s strategic goal is;

Foster competition, consumer choice, and innovation in the Internet space by increasing awareness and encouraging readiness for Universal Acceptance, IDN implementation, and IPv6.

This is supported by the technical protocol developments on the IDN and Internationalized Email front.

Thus, two of the major aspects of this discourse, the technical feasibility of the multilingual identifiers as well as the availability of the affordable internet in otherwise non-connected regions of the world, have been fulfilled.

This leaves only the third side, that is enablement of the internet-based service’ ability to cater to the truly multilingual internet to be fulfilled. It is towards that goal, that ICANN wants support from the community. 🙌

Akshat Joshi is founder of ThinkTrans a Startup working in the techno-multi lingual Internet domain

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Building India's Smart Sustainable Megacities of the Future

Digital Technologies and Advanced Analytics Critical to Creating People-centric, Healthy, Net-zero Infrastructure



BY VIJAY SANKARAN

India is projected to house 416 million new urban dwellers by 2050. In less than a decade, Delhi is expected to overtake Tokyo as the world's most populous city by 2030. By the next decade, Bengaluru, Chennai and Hyderabad are expected to become megacities, with some of the fastest economic growth in the world.

Increasingly, technology will be used in the development and running of cities of the future – and India's up and coming megacities will be no different. With the climate crisis becoming the most pressing challenge of our time, sustainability is no longer an opt-in for cities of the future; it needs to be part of their DNA. Going forward, digitalization is the key to meeting our environmental and reduced emissions goals.

Smart Sustainable Cities of the Future

It's imperative that cities reimagine their current infrastructure models and envision a connected, sustainable future for the community. Case in point: the buildings in which we spend so much of our daily lives play a big part in contributing some 40% to global carbon emissions.

Less than 1% of all commercial buildings and homes worldwide are net zero, according to a report by the World Green Building Council. A "net zero building" is defined as a highly energy-efficient building which generates or supplies the energy it needs to operate from renewable sources to achieve net zero carbon emissions. To avoid the worst impacts of climate change, the global

A large Indian industrial property developer is using Johnson Controls OpenBlue solution to remotely measure and monitor energy and water usage for all its 44 smart parks across India. It uses OpenBlue – a suite of tailored, AI-powered service solutions such as remote diagnostics, predictive maintenance, compliance monitoring, advanced risk assessments and more.

non-profit organization urges a “dramatic and ambitious transformation”. This will include reducing carbon emissions from buildings by at least 80% of what they are today to achieve the COP21 target by 2050.

We are now living through a fourth Industrial Revolution, also known as Industry 4.0. This refers to the integration of physical assets with advanced digital technologies, such as the internet of things (IoT), AI, robots, drones, 3D printing, cloud computing and more. These digital technologies specialize in communicating, analyzing and acting on data – offering organizations, consumers and society better, deeper insights.

In particular, digitalization can help address sustainability concerns within the buildings industry. Software can gather and analyze data about energy, water, materials and emissions involved in every phase of a building’s lifecycle: its design, construction, operation, renovation and end-of-life. Leveraging data can help companies evaluate the total environmental impact of their property portfolio, as well as estimate the impact of any retrofit.

Smart buildings underpin the development of sustainable cities with a “people-first” approach to construction. The convergence of IoT and ubiquitous computing generates enormous data and information about the building into actionable resources. For instance,

smart thermostats can intuitively adjust the temperature, humidity and light based on occupants’ preferences and climatic conditions.

A smart building becomes more operationally sustainable by adapting more easily to changing conditions. Advanced analytics can help to identify further energy savings and emissions reductions opportunities across buildings, while AI-enhanced technology can help avoid unplanned repairs and maximize uptime of large heating, ventilation and air-conditioning (HVAC) systems, which account for up to 70% of a building’s energy consumption. A smart building is able to use these insights to understand how human activities and floor space impact its building energy performance, and in turn measures the sustainability and efficiency of the building in supporting occupants’ physical health and mental well-being.

An average commercial building produces about 150GB of data every day. By establishing standards for operational data sharing on new developments, city planners can evaluate the overall impact on surrounding environment. For instance, city authorities can require the inclusion of green space in exchange for permission to build additional commercial office space, thus creating a win-win scenario for the city and the building owners.

Partner for the Sustainability Journey

Companies should start by defining where they are in their sustainability journeys, and then define their destination. For example, they can establish where they sit on the sustainability spectrum via a scoring model, which evaluates their processes, systems and data points.

That makes it easier to set realistic goals, whether they are a multinational company aiming for net zero Scope 1 emissions, a manufacturer targeting a higher environmental, social and governance (ESG) rating, or a factory attempting to measure its environment, health and safety (EHS) leading indicators.

As a certified Grade 1 Energy Service Company (ESCO), with the widest portfolio of solutions for buildings, Johnson Controls is improving energy efficiency and achieving net zero for customers (buildings and smart city infrastructure owners) in India.

Standard Chartered is using Johnson Controls OpenBlue solution across its Asia Pacific operations, which involves some 100 buildings, to reduce the bank’s annual energy costs.

As the global leader in smart, healthy and sustainable buildings, Johnson Controls enables smart cities and communities by providing solutions that optimize building performance, improve safety and enhance comfort. The company has 137 years of expertise in the built environment, with one of the widest portfolio of building technologies including building controls and automation, HVAC, industrial refrigeration, security and fire protection.

Whatever the sustainability objectives – boosting energy efficiency, reducing costs or minimizing carbon emissions – Johnson Controls OpenBlue technology guides companies at different stages of their digitalization journey to deliver on net-zero outcome and risk management goals.

OpenBlue is a complete suite of connected solutions that delivers impactful sustainability, new healthy

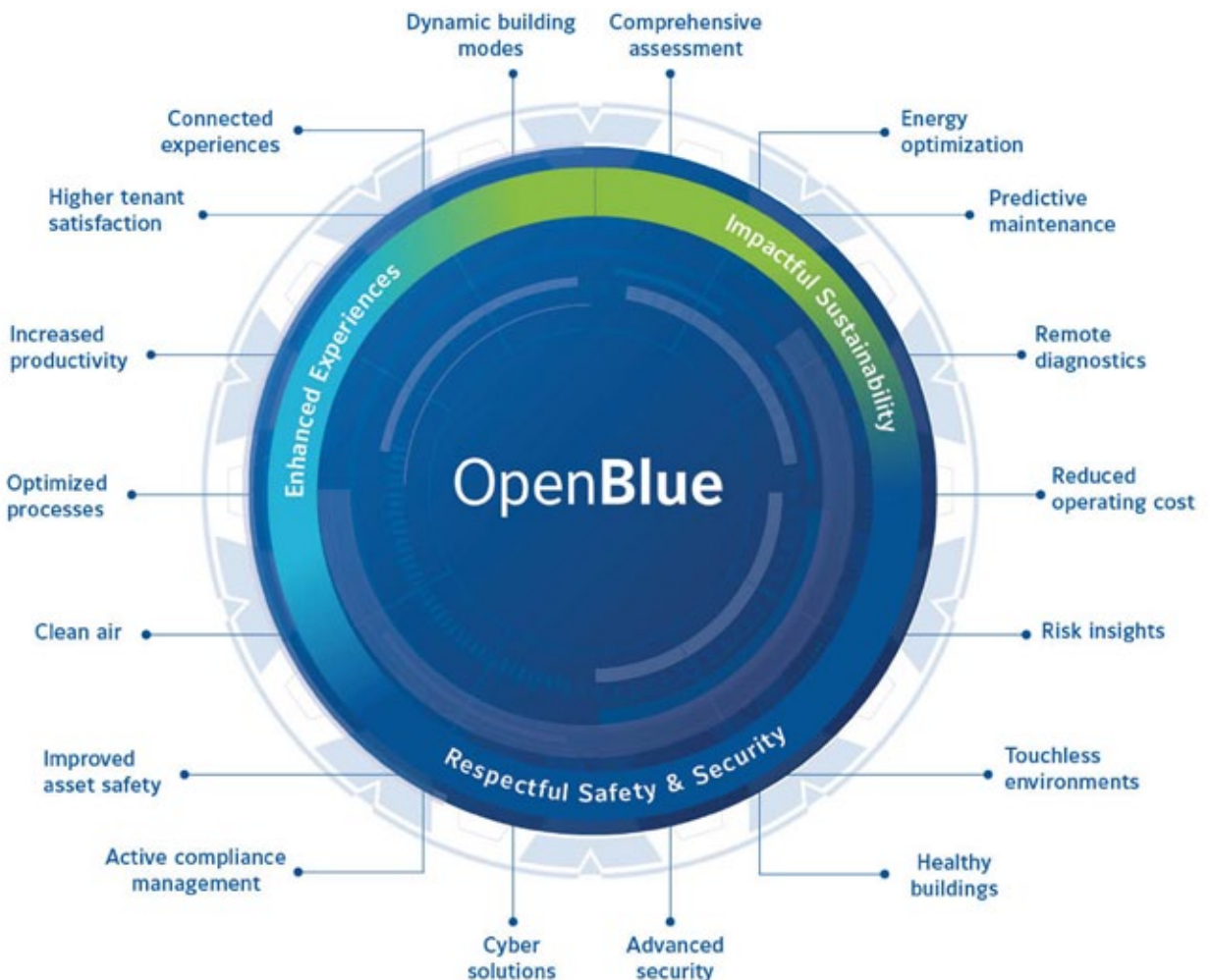


Figure 1. Johnson Controls OpenBlue: A complete suite of connected solutions that delivers impactful sustainability, new healthy occupant experiences, and respectful safety and security.

Johnson Controls has been present in India since 1995 and employs more than 6,000 people, including more than 1,400 engineers at its five Research & Development (R&D) centers.

occupant experiences, and respectful safety and security that combines the company's building expertise with cutting-edge technology. OpenBlue features a suite of tailored, AI-powered service solutions such as remote diagnostics, predictive maintenance, compliance monitoring, advanced risk assessments and more.

The smart system collects data from the building (such as lighting, HVAC, fire detection and access points), applies machine learning at the edge and in the cloud, and compares the data against optimized AI performance models. This approach provides building owners and facilities managers with the information to make data-driven wellness decisions for the benefit of the community, in addition to saving cost and energy. From waste-water reduction, clean air solutions to cloud-based remote monitoring, OpenBlue technology helps create smart, efficient and healthy building infrastructure that impacts environments in ways that ripple throughout the larger community and impact the planet.

For starters, OpenBlue Net Zero Adviser, a real-time, AI-driven tracking and reporting of sustainability metrics, enables companies to understand what factors are contributing to their Scope 1 and Scope 2 emissions. By establishing a baseline, companies can take action to improve their energy efficiency and emissions to reach net zero decarbonization goals.

With concerns over health and wellness in the post-pandemic environment, OpenBlue Healthy Buildings offers a blueprint that transforms indoor built environment into intelligent, resilient spaces that respond to changing external conditions and occupants' needs. The focus is on prioritizing people-centered outcomes, such as improving air quality and enhancing occupant safety, while increasing facility efficiency.

The need and demand for a 360-degree net zero carbon solution is clear. OpenBlue Net Zero Buildings is a full spectrum of sustainability offerings tailored to



Figure 2. OpenBlue Healthy Buildings is a comprehensive suite of connected solutions that powers wellness and community health, while optimizing the performance of buildings & assets.



A smart building becomes more operationally sustainable by adapting more easily to changing conditions. Advanced analytics can help to identify further energy savings and emissions reductions.

schools, campuses, datacenters, healthcare facilities as well as commercial and industry players; providing our customers with guaranteed outcomes and risk management models to ensure and prove the net zero carbon reduction and renewable energy impact of their buildings. The offering includes a broad range of software, products and services to help make net zero leadership easy for customers with a proven path to hit decarbonization goals. It is an unmatched turnkey delivery to assess, benchmark, plan, execute, track and achieve net zero buildings.

The software engineering team in India plays a pivotal role in developing the OpenBlue technology. There are now five research and development centers in India employing more than 1,400 engineers. The centers are located in Bangalore, Delhi, Gurgaon and Pune, with the latest one officially opened in Hyderabad in June this year. The team in India will continue to be the software powerhouse of Johnson Controls, partnering with technology leaders such as Accenture, to advance the OpenBlue digital technology and application development.

Johnson Controls has been present in India since 1995 and is headquartered in Pune. The company employs more than 6,000 people in India, including approximately 850 frontline staff.

There are 16 branch offices, four manufacturing facilities, and five Research & Development (R&D) centers with more than 1,400 engineers.

As a certified Grade 1 Energy Service Company (ESCO), with the widest portfolio of solutions for buildings, Johnson Controls is driving towards improving energy efficiency and achieving net zero for customers in India.

Smart Infrastructure in Action

As part of its environmental sustainability commitments, Johnson Controls aims to cut operational emissions by 55% and reduce enterprise customers' emissions by 16% before 2030. For instance, its new Global Finance Center of Excellence, housed in the Tata Realty Intellion Park in Gurgaon, is equipped with OpenBlue technology and has the latest accessibility, safety, wellness and sustainability features.

Johnson Controls OpenBlue digital technology is helping many Asian companies reap significant improvement in energy efficiency and corresponding carbon emissions. For example, Standard Chartered is using Johnson Controls OpenBlue solution across its Asia Pacific operations, which involves some 100 buildings, to reduce the bank's annual energy costs. This digitalization effort establishes a strong foundation for sustainability management for Standard Chartered Bank, which is committing to net-zero carbon emissions from its own operations by 2030.

Closer to home, a large Indian industrial property developer is using Johnson Controls OpenBlue solution to remotely measure and monitor energy and water usage for all its 44 smart parks across India. The data is integrated with a third-party billing app which enables the smart parks' tenants to view their individual water and energy consumption details.

Digitalization and sustainability are interconnected initiatives in urban city development. If the world takes meaningful action on sustainability today, it can stave off climate catastrophe tomorrow. The real winner is the planet. 🌍

Vijay Sankaran, VP & CTO, Johnson Controls
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Data Gravity Drives Data Center Growth in India and APAC

Mumbai is expected to have 529 MW of data capacity by 2023. Chennai will have 133 MW. These will be the two largest centers in India.

BY RYAN PERERA

Ever since 4G mobile networks were launched in India around 2016, the volume and pace of data consumption has seen unprecedented growth. Data is the new currency of India's digital economy. For example one of the biggest users of mobile data has been the Fintech industry. According to the National Payments Corporation of India (NPCI), the Unified Payment Interface or UPI based payments, recorded over 6.28 billion transactions in July 2022. This is a record since the service was launched in July 2016.

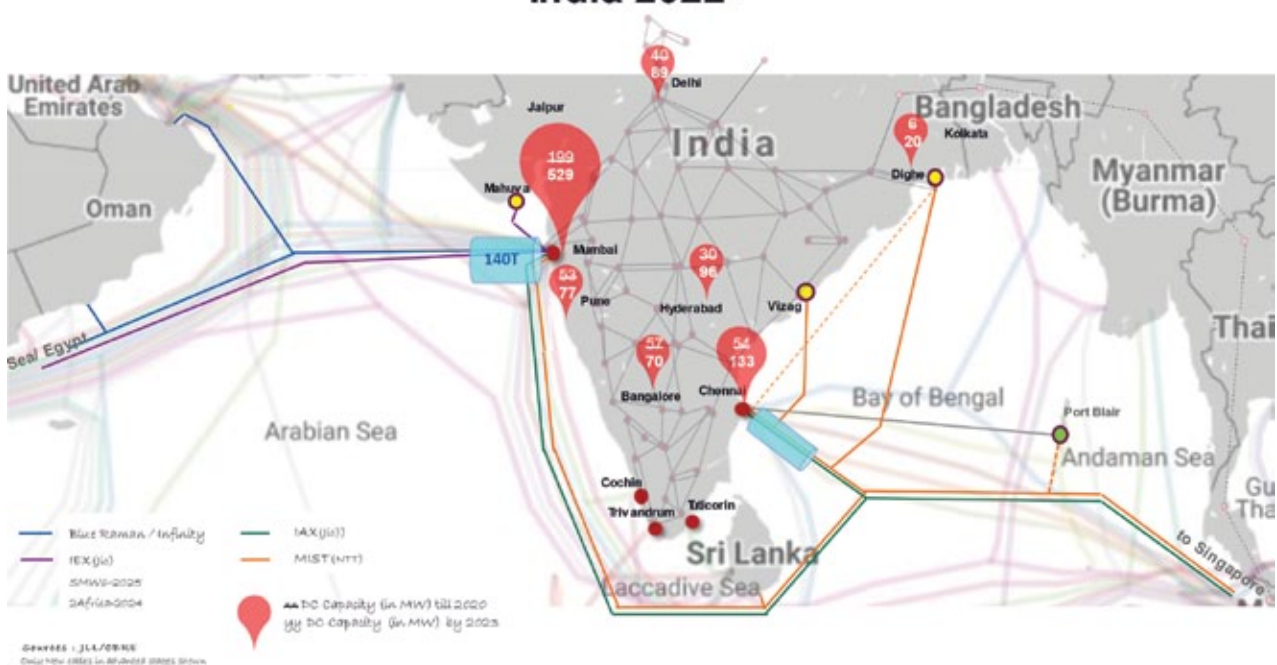
There are many drivers underlying this growth in data use. For example, a major part of India is now watching streaming OTT content – movies, music, web episodes etc – video is one of the largest contributors towards the high data consumption.

And catering to this, we have seen a corresponding growth in data centers (DC) and distributed cloud computing – not just in India but across Asia. The core concept that is driving this is Data Gravity. A clear indicator of this is the increasing capacities of Data Centers across the Asia Pacific region. Typically, data center Capacity is measured in MegaWatts – which essentially indicates the total energy consumed for operating these DCs.

We have measured how the data center capacity has grown since 2019. As can be seen in the chart below, it has grown significantly over these years, primarily as the move to online accelerated with the pandemic.

Currently, the US has the most capacity at 8000 MW and is the largest in the world. China is next with

India 2022+



With huge volumes of data in peta and exabytes arising daily, the growth of Data Center Capacity across the region is also increasing.

approximately 3100 MW – India is lower but has grown from 530 MW in 2019 and expected to reach 1300 MW by 2024.

The major DC hubs for India are Mumbai and Chennai – primarily because of a number of historical reasons, being the centers where early network and applications deployments had happened.

When you build those DCs, with very powerful CPUs and the GPUs – these then start exerting gravitational pull on other data and applications.

So it is pulling other data and applications closer to these centers. These clusters are thus becoming bigger and bigger and bigger. It is a kind of virtuous cycle for the concept of Data Gravity. The industry is building DCs closer to end customers – because of the requirements of the applications, which are both speed and latency sensitive. Though 80% of the Internet is video content, but this is not the super latency sensitive application. The biggest drivers are the latency sensitive applications like

Uber, maps, location based services, and in some places use cases like self driving cars or medical applications.

As can be seen by the above, Mumbai is expected to have 529 MW of data capacity by 2023. Chennai will have 133 MW. These will be the two largest centers.

Hyderabad with 96 MW, Delhi with 89 MW and Pune with 77 MW will be the next rung. Followed by Bangalore 70 MW and Kolkatta, 20 MW.

Further, as the recent 5G auctions in India have unfolded, Enterprises applications will be another big driver. Digital transformation will contribute to more data. Smart Cities and the increasing deployment of sensors, Internet of Things (IoT) along with real time applications in medical sciences and space application, will all contribute to accelerate the DC and cloud computing infrastructure deployment.

All these bodies of data will slowly transform into bigger repositories that enable Data Gravity.



Data Gravity Centers in Asia

When you build those huge DCs in specific locations, with very powerful CPUs and the GPUs — these then start exerting gravitational pull on other data and applications.

They will further attract other data and applications not different from the concept of gravity on objects around a planet.

This will impact the DC locations and storage-oriented 'data lakes' will be closer to customers.

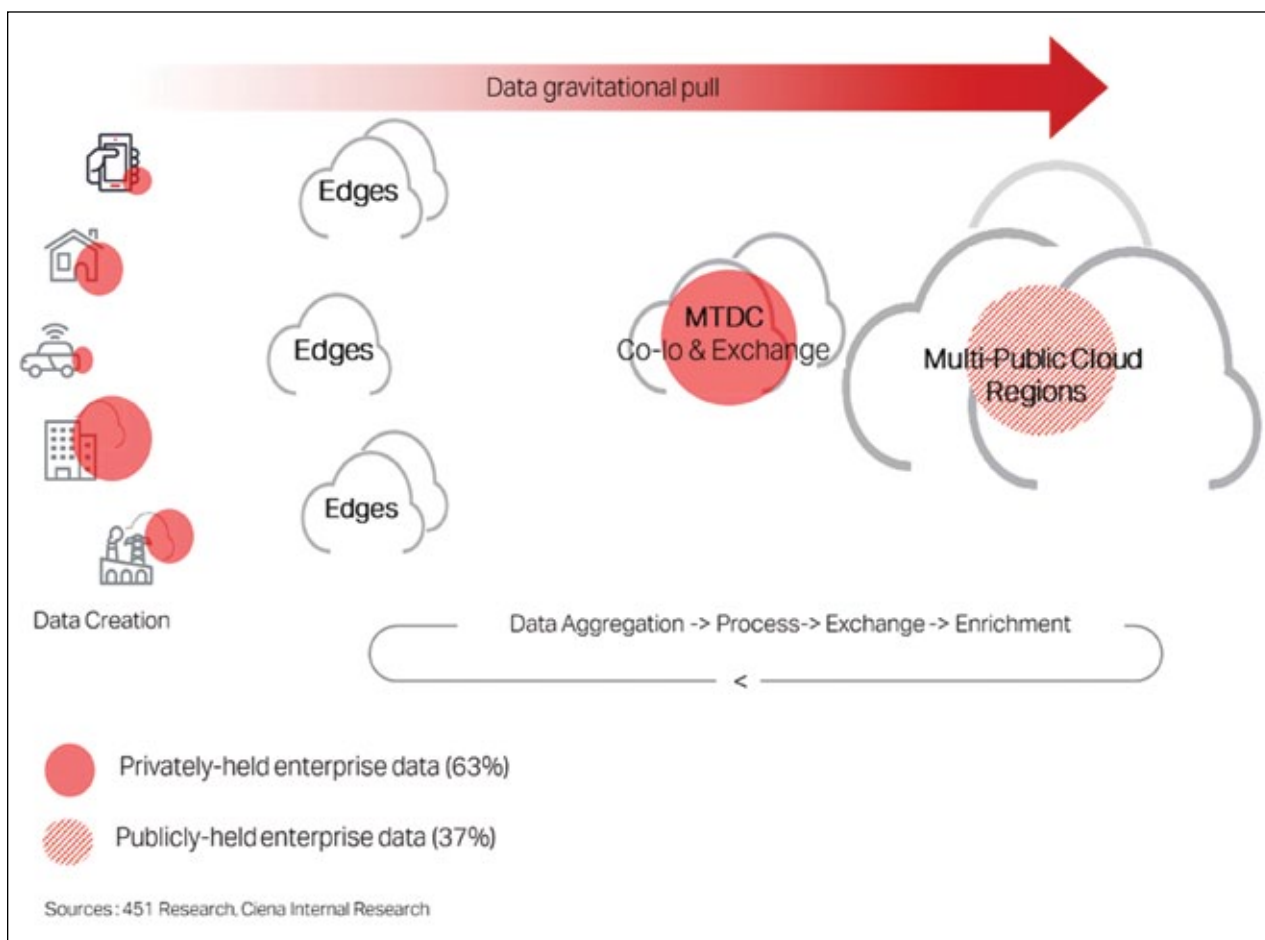
How does Data Gravity

Digital Realty's Data Gravity Index report estimates that by 2024, the G2000 Enterprises across 53 metros are expected to create 1.4 million gigabytes per second, process an additional 30 petaflops and store an additional 622 terabytes per second. This will certainly amplify data

gravity. Data Gravity Intensity, which is determined by data mass, level of data activity, bandwidth and, of course, latency, is expected to see a 153% CAGR in the Asia Pacific region, with certain metros having larger attraction.

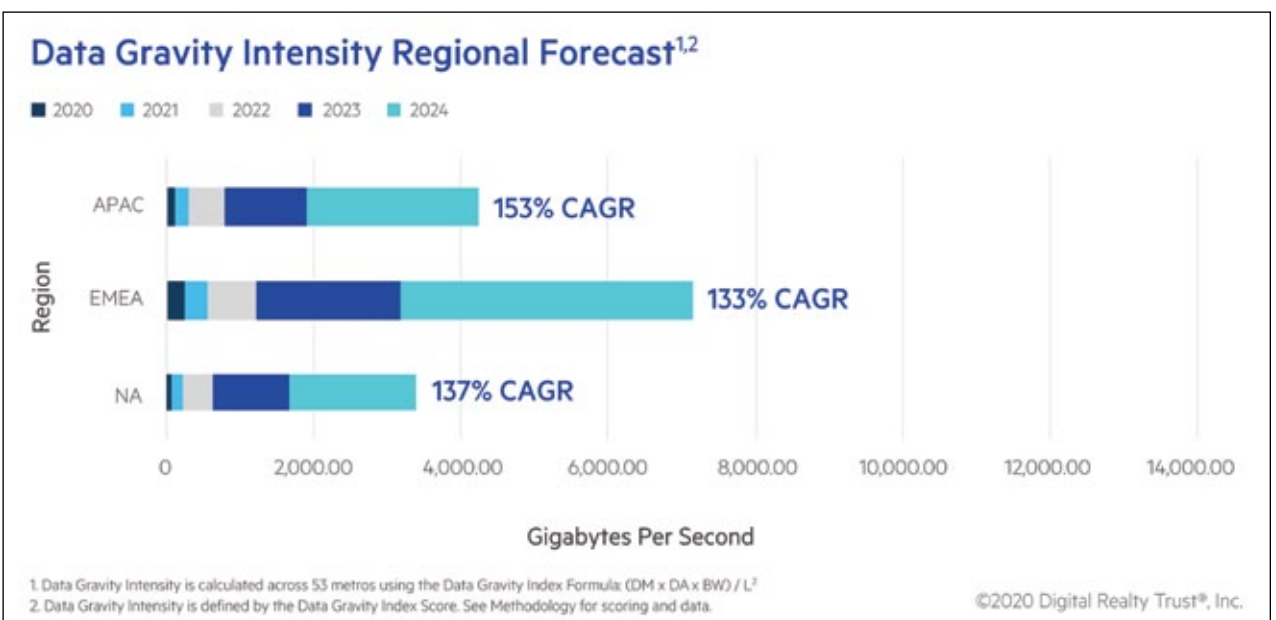
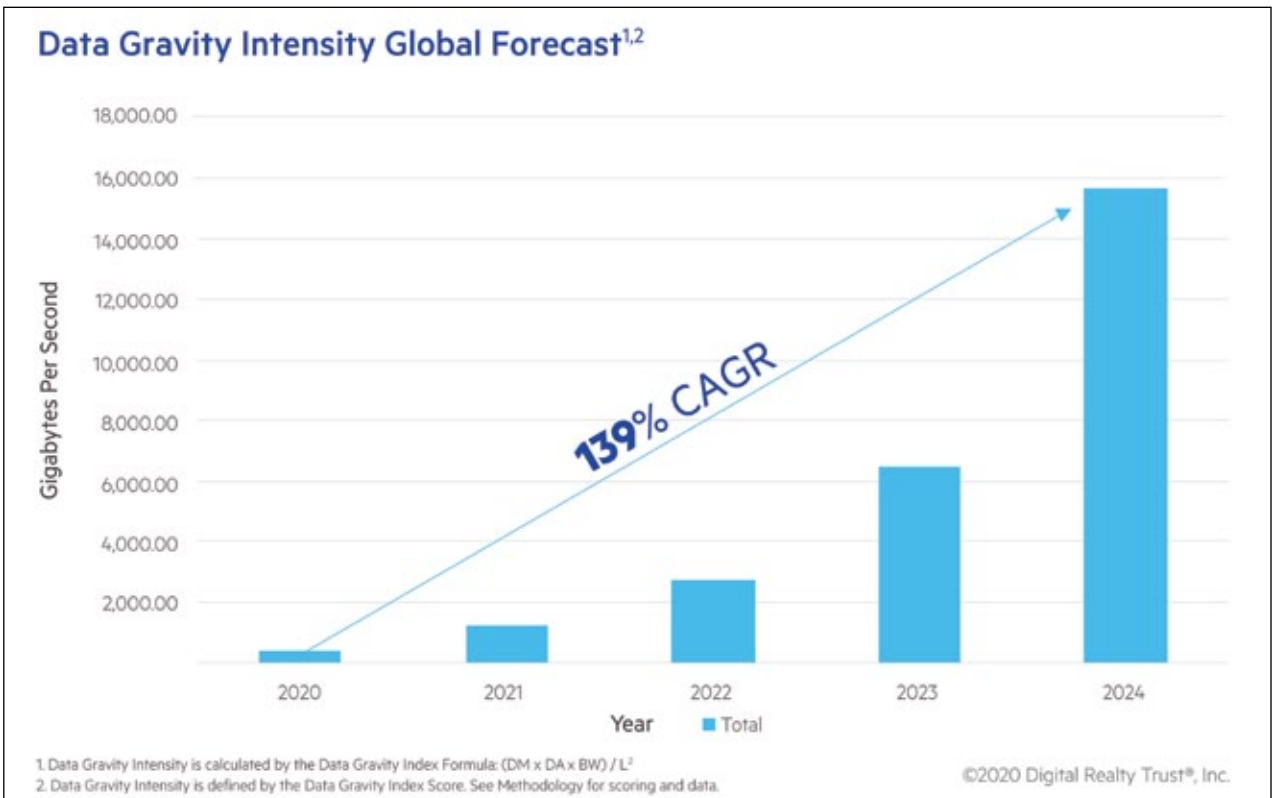
The red bubbles are connected with terrestrial and submarine cables.

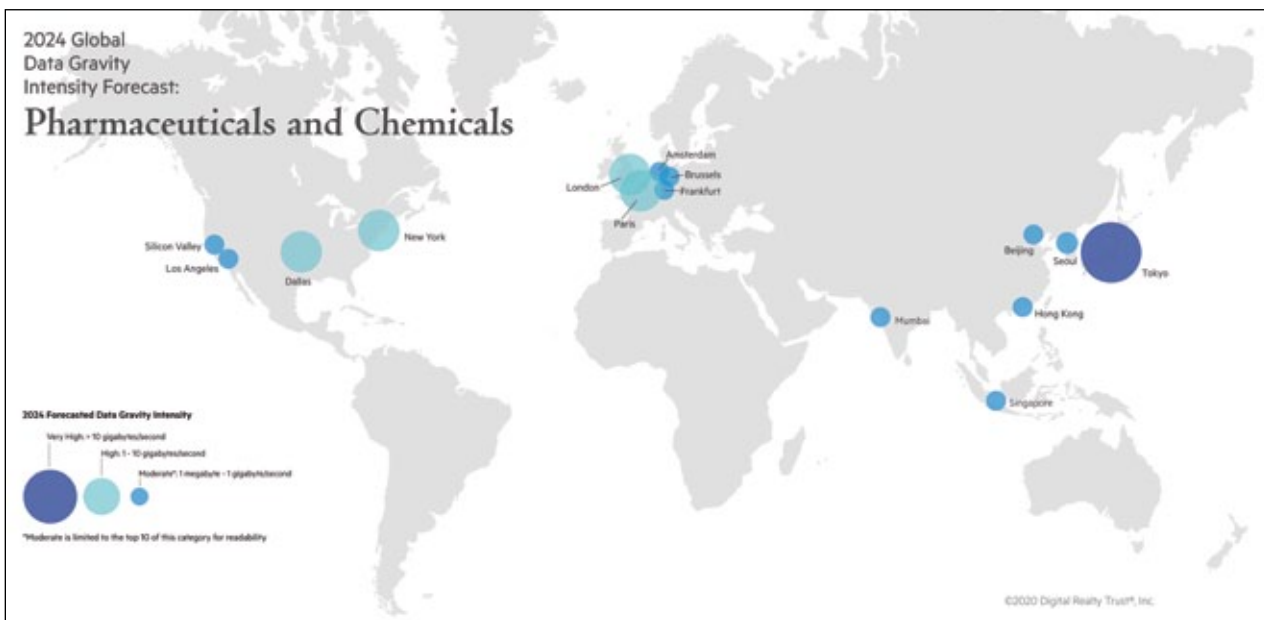
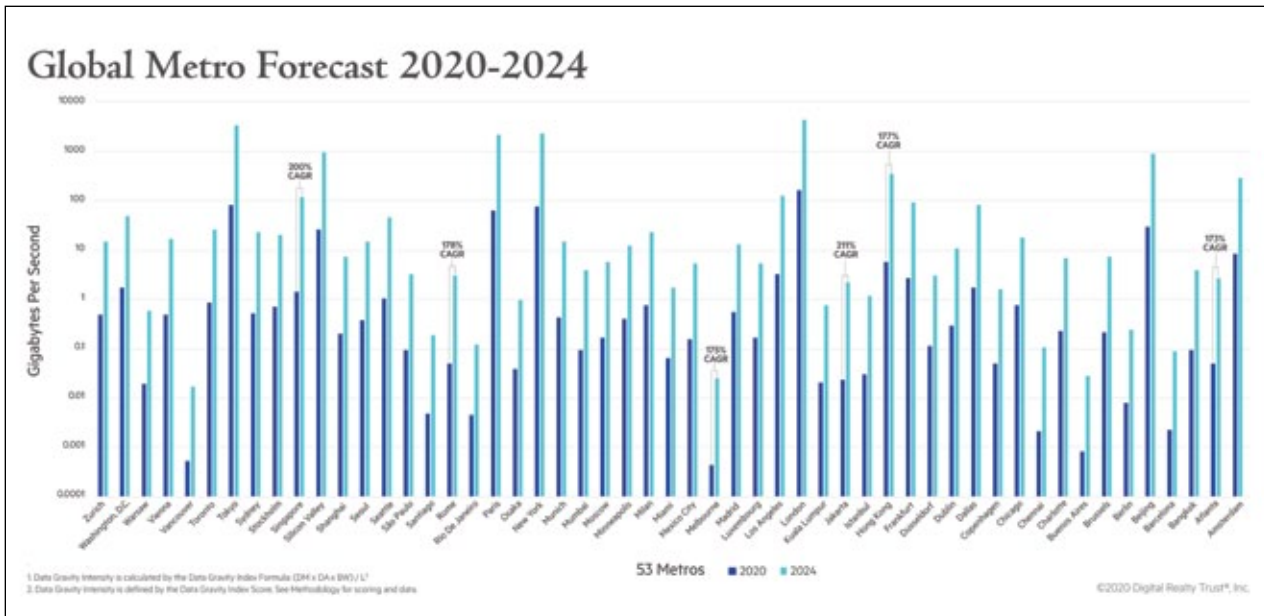
We expect that 17 more submarine cable systems will be commissioned between 2023 and 2025 interconnecting these regions. Telecom Operators and public cloud services (like Google, AWS and Microsoft Azure) are part of these submarine networks.



Data Gravitational Pull

All these bodies of data will slowly transform into bigger repositories that enable Data Gravity. They will further attract other data and applications not different from the concept of gravity on objects around a planet.





With the gravitational pull exerted by these data clusters – increasing exponentially due to the increasing numbers of applications that are deployed, more such agglomerations of DCs, clusters and locations are expected.

Regulatory and operational challenges will arise due to data gravity. There will be unforeseen challenges

on account of consumers, their proximity to the DCs, the amount of bandwidth required to connect all the DCs together to make the available at lower cost. 🍷

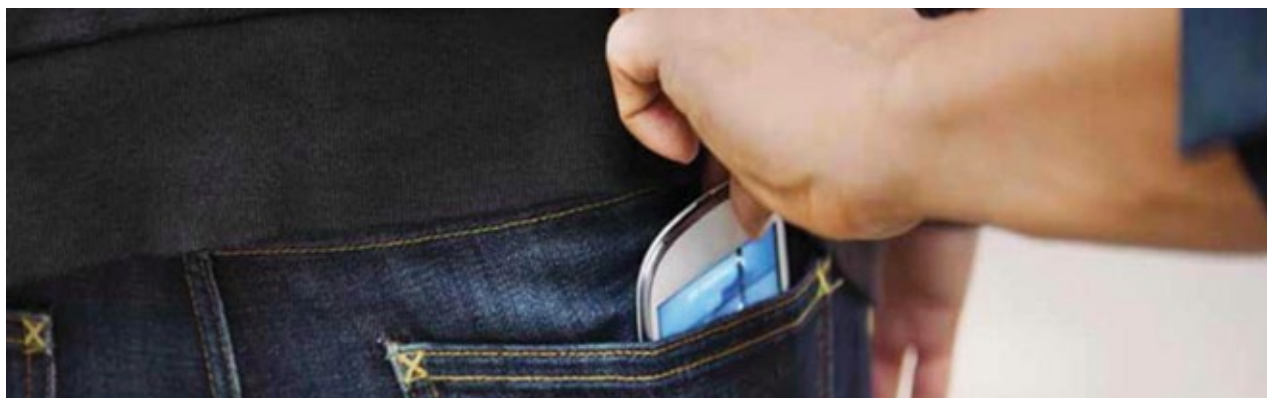
Ryan Perera, Vice President, Asia Content & Subsea Networks, India & the subcontinent, Ciena

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Need for a National level Central Equipment Identity Register (CEIR) System

C-DOT designed CEIR is a nationwide reference databasesystem used to maintain database containing the IMEI (International Mobile Equipment Identity) and IMSI(International Mobile Subscriber Identity) of all the mobile devices used in the nation



BY BIREN KARMAKAR

The mobile phone is now the most critical personal device today – from personal to professional and from banking to entertainment.

Consumers store a lot of personal details like phone contacts, bank account details, passwords, ATM PIN, date of birth etc on their devices. Thus, the mobile device has become an indispensable companion and repository of personal data/information. This brings in its wake a number of serious threats and is one of the primary reasons why there are increasing numbers of theft of mobile devices, cloning of IMEIs, and availability of illegal & non-genuine mobile devices.

According to International Telecommunication Union (ITU), the noticeable growth in the capacity and number of broadband wireless communication devices has introduced a serious security challenge with regard to theft of these devices as well as unauthorised access to personal data and other data security issues.

Global CEIR

The Central EIR (CEIR), hosted by GSMA, maintains information on the eligibility for access to networks by

Mobile Equipment Types. The CEIR interconnects with Equipment Identity Registers (EIR) through out the world so that a common set of data is maintained and available to participating operators.

It is estimated that the total number of mobile users in the world in 2022 would be around 6.6 billion.

And correspondingly the number of mobile devices would be upwards of 16 billion. This is a dramatic increase across the world. All of these smartphones and tablets, provide access to humongous amounts of individual and corporate data and information.

Mobile devices with new technologies such as 3G/4G/5G smart phones with advanced features and applications are expensive. Thus, black market of stolen devices is a lucrative avenue for many.

Stolen mobile devices are re-programmed to change their IMEI numbers so that it cannot be traced.

The IMEI was originally introduced, as a unique terminal identity, for type approval reasons, in order that

All Access Service Providers were directed by DoT on 6th October 2008 to make provision of Equipment Identity Register or EIR in their systems so that calls from mobile handsets without IMEI or that of IMEI with all zeros are rejected.

non-type approved terminals could be prevented from connecting to GSM networks. Nowadays, the IMEI is used to identify mobile station equipment on mobile networks in order to be able to take measures against the use of stolen equipment or equipment whose use can not be tolerated under Article 7 of the R&TTE directive (within Europe), or an appropriate regulatory requirement in other markets. Additionally, the IMEI can be used to allow infrastructure to load appropriate patches and adaptations to avoid inter- working issues.

The availability of mobile handsets with duplicate/ stolen/ unauthorized IMEIs in the Indian Telecom Network is not merely a law and order problem, it is also a security issue. It has implications on lawful interception and monitoring of suspected devices.

In the interest of national security, all Access Service Providers were directed by DoT on 6th October 2008 to make provision of EIR in their systems so that calls from mobile handsets without IMEI or that of IMEI with all zeros are rejected. Subsequent to this direction, all Telecom Service Providers (TSP) have upgraded their network and presently have provisioned EIR in their network. The Equipment Identity Register (EIR) is a database that contains a list of IMEIs of GSM based mobile handsets which are active in a mobile network. EIR maintains a white, grey and black list. The white list is composed of IMEIs of mobiles that are permitted for use. The gray list consists of devices that do not conform to the standards but could be permitted to connect under supervision or triggering an alert. The black list contains IMEIs of devices which have been reported stolen or lost and they are being denied access to the network.

Accordingly TSPs can block these handsets in their networks. Even after this direction, the issues remain – as the black-listed handset / device is blocked only in a particular Licensed Service Area (LSA) of a TSP, but it is allowed in all other TSPs and in different LSA.

To block usage of any mobile device in all networks across country - Centralized Equipment Identity Register (CEIR) is required to be implemented, which provides these consolidated restricted/black list data to all EIRs in

the nation to ensure countrywide blocking of the stolen/ lost mobile devices.

Description of the System

C-DOT designed CEIR is a nationwide reference database system used to maintain database containing the IMEI (International Mobile Equipment Identity) and IMSI (International Mobile Subscriber Identity of all the mobile devices used in the nation for the purpose of detecting clone IMEIs and maintaining black-listed (BL) IMEIs centrally. All TSPs update their local Equipment Identity Register (EIR) black list from the CEIR black list, preventing the use of BL mobile device across all service providers within India. The BL mobile device is traced if its usage is attempted and the corresponding traceability details are presented to the local/regional/state police for recovery. Additionally, CEIR also provide solution to cross-check and restrict import of counterfeited devices to the nation.

Features for the users

Mobile device verification utility to check device validity even before purchase – which will warn the user if the device is black-listed or cloned. If the device is valid – it will show make and model of the device. For these type of functionalities – Know Your Mobile (KYM) mobile App, web portal and SMS to 14422 is made available.

Subscriber has been facilitated with easy and convenient way to report lost/stolen mobile device to blocking pan India and the CEIR system will provide traceability details to the reporting police station for recovery of the mobile device if someone has tried to insert SIM in that device. Although mobile device will not be used – but traceability report will be generated. It will be done through Stolen Device Reporting System (SDRS) module of CEIR.

CEIR will also facilitate users to import mobile device from other countries through ICDR (Indian Counterfeited Device Restriction) portal of CEIR. Thus the system will discourage import of duplicate/cloned mobile devices to the India. 🇮🇳

Biren Karmakar, CDOT

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The C-DoT Story – Recollections of the early days – The Idea, The Vision, The Promise, The Formative Years

At that time, globally, there was an oligopoly of MNC telecom suppliers (esp. for the telephone exchanges) and, as, in the case of IBM, in respect of computers earlier, they needed to be challenged.



BY RAMKI (SRINIVASAN RAMAKRISHNAN)

It was in the 1970s. Those were the sleepy electro-mechanical switching-exchange days.

Strowger - switch <https://www.yourdictionary.com/strowger-switch>, exchanges and a nominal percent of Crossbar exchanges https://en.wikipedia.org/wiki/Crossbar_switch.

Waiting time to get telephone connections ran into years. Indian Telegraph Service (ITS) cadre engineers, functioning under the structure of the department of a ministry (Telecom) of the Government of India, were managing them with technical support staff, often taking criticism despite their best efforts.

The scene had begun to change steadily abroad, initially with electronic exchanges making their foray, soon to be followed by Digital exchanges whose heart was in fact computers, though dedicated to the job of

setting up connections and routes. This reduced noise, cost, made the switches programmable and fast and extended their life, besides increasing their longevity and providing new features.

AT&T was the first, major and pre-eminent telephone service provider in USA, what they called regulated monopoly, much like how we view 'discoms' today in India in Electrical power distribution to residences in metros. They had a fancy name called 'natural monopoly', because underground cable laying in an area was not amenable to competitive offering.

First promise of C-DoT was 36 crores, 36 months, 10,000-line Max exchange - domestic design and domestic manufacture of fully digital exchanges. In the event, it met or exceeded almost all the above near-impossible promises, except for some delay in delivery of 10,000-line exchanges. However, it did build a world-

First promise of C-DoT was 36 crores, 36 months, 10,000 line Max exchanges. They did not fully meet it. But built a world-class institution, created production infra and built core sub-systems for manufacture as PAX and PABX products.

class institution, created a production infrastructure in the country and built core sub-systems for manufacture as PAX, PABX and RAX products, which were taken up for licensed production within that period which would help penetration of telephony and its access nationwide – even in rural areas.

Also, investments took place for component manufacture to enable in-depth manufacture of C-DoT products. Another benefit of one of their most successful and popular 512 lines RAX (Rural Automatic eXchange) was that it got installed in rural areas, no a/c needed, easy to install and maintain (boards were hot-swappable), enabled last mile connection of rural telephones to be shorter and helped telephony reach far and deep into hinterland. Private sector - including the reputed company of Mr. Deodhar who later became Chairman, Electronics Commission, manufactured fancy STD/ISD instruments/ booths. It was a big hit with the people.

Later, Telecom Commission was created on the DoT (the user) side to reform the moribund British time set-up, which was not ready to respond to introduction of modern technologies into the network rapidly and had the potential of acting as a barrier to introduction of C-DoT exchanges and other indigenous products in an efficient and friendly manner. 'Sam' Pitroda (Satyan Gangadharan Pitroda) became the first Telecom Commission Chairman, against all resistance (he surrendered his US citizenship) and took only Rs. 1/- as his salary.

There were 5-6 positions as Members of Telecom Commission (TC) - all created at Secretary level (Gol parance), including that of Chairman, TC. They, the ITS officers - many of whom were also part of the group which initially opposed the efforts of Sam and C-DoT products but became his supporters much later, benefited from the setting up of TC. Other than Sam, other members were mostly ITS officers, except, perhaps, Member, Finance, who was a nominee of Ministry of Finance.

The story dates back to Sam's presentation to the then PM, Mrs. Indira Gandhi, in 1981 that India can build its own telephone exchanges (called Central Offices abroad), that too the most modern, and have them manufactured

cost effectively (because, among other things, the key component, the software, will be indigenously developed) within India itself.

At that time, globally, there was an oligopoly of MNC telecom suppliers (esp. for the telephone exchanges) and, as, in the case of IBM, in respect of computers earlier, they needed to be challenged. The moment Rajiv Gandhi came to power (1984), this was one of the first decisions he took - to set up C-DoT with Sam under the driver's seat with full freedom. Sam had done his homework and put together his initial, founding team – Mr. Meemamsi, Dr. M.V. Pitke, their teams and a few more, much like how a startup founder goes about it.

Meemamsi (who had built a 10,000-line trial electronic exchange at Rajouri garden) was the first one to join CDoT, as he and his team were serious and eager techies and were insiders to the system, though not that influential.

Dr. M.V. Pitke, of TIFR, was the second one to join alongwith his deputy, Chandrasekhar (who was later located at Bengaluru, the focal place for electronics manufacturing even in those days, thanks to PSU majors BEL, ITI and HAL and design labs). They had built AES - Automatic Electronic Switch (an all-digital exchange for Army) for manufacture by ITI. It was a competitive development project for Plan AREN of Army - with the competitor being LRDE (with BEL as the manufacturer).

The TIFR development was funded by DoE/MeitY and I was overseeing it. It was a superior product compared to the other one, but eventually lost out because of preference to LRDE-BEL - being part of the user family itself, namely MoD. That left Pitke and his team free and keen to take up C-DoT mission and merge their team with C-DOT core, initial team.

Same thing happened with Meemamsi's team, who were better versed with DoT specs and were better aligned to MNC competitors' specs. They also had initial intelligence of global competitors.

Sam made use of all these latent talents to stitch together the founding team. So, 'The Team' put together

By the end of the second year the 512 line RAX, was ready and got licensed for the first time. Progressively, these got integrated in the DoT network. These did not need air conditioning and could be placed closer to the rural user. This captured the imagination of people and there were tens of licensees for manufacture.

the initial specs, design, and production blue-print and a time-bound delivery plan and strategy.

The standout cultural transformation brought in by Sam (unbelievable in those days) was openness, transparency, accountability and straight, business-like approach to running institutions and delivering on promises; use of a language everyone can understand - crisp, 1,2,3 way of saying anything, never exceeding five points so that people can use their fingers to remember and recall. He laid emphasis on autonomy with accountability, laying down processes and an atmosphere of openness for everyone to adhere to – which was a big hit with youngsters who joined with idealism writ large on their eyes.

So, instead of making people wait for three years and ask for what (progress) has been made vis-a-vis promised deliverables, he conducted a big function at the end of one year at Vigyan Bhavan main hall inviting the Prime Minister and made 'a presentation to the nation'.

PABX, containing the same set of line cards that were going to be used in the final 10,000-line switch was presented with display of actual product and documentation which potential takers of technology for volume manufacturing can take a look at. Indeed, for sure, these were later licensed for manufacture, for the first time in India.

Similar events were held at the end of second and third years demonstrating 512-line RAX – which again got licensed for the first time, even as the 10,000-line exchanges were getting ready for field trial. Progressively, these got integrated in the DoT network, making waves. These RAX-es did not need a/c and could be placed closer to the rural user, reducing the loss in last mile. This captured the imagination of people and, soon, there were many takers of licenses for manufacture of these products.

That motivated (electronic) component manufacturers, including relays and multi-layer PCBs to obtain license and start manufacturing components that go to service these and other products. The cut-over of 10,000/40,000 exchange at Bangalore was to wait for various reasons, including the very nature of increasing complexity of software, testing and integration to the functioning network. To add to that there was market competition from established foreign players, not too keen to see the success of C-DoT making large exchanges. (ITI had also tied up with CIT-Alcatel for local manufacture of large electronic exchanges at a factory in Gonda, U.P., in 1981-'82 though of an earlier generation of technology).

Though Sam was the brain behind the setting up of C-DoT and the motivator to all, officially he was Advisor, not in an Executive or Operating position in C-DoT, even during that impressionable period of early days of C-DoT from '84 to '89/'90. Mr. Meemamsi, wore the mantle of Executive Director, Dr. Pitke, the second Director and Mr. Mahajan, the third Director looking after Administration and HR.

However, after all the successes of C-DoT, Sam unfortunately had to undergo a major heart bi-pass surgery at Escorts hospital and, on his recovery, his wife urged him to take a break from his hectic schedule in India, and go back to USA to convalesce and recharge his battery.

C-DoT got its first major setback. But it would spring back and move on to make many more successes over the next 40 years. Even by mid to late '80s, it commanded a market share of close to 60% of exchange lines in the Indian network. The foundational days had not gone waste. 🙌

Ramki (Srinivasan Ramakrishnan), Formerly Founder Director, Education & Research Network (ERNET), Group Coordinator, MeitY and DG, C-DAC – worked closely with Sam Pitroda when in the Telecom Division of DOE (Dept. of Electronics).



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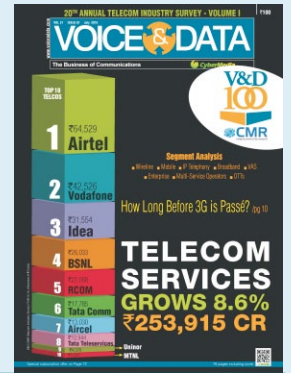
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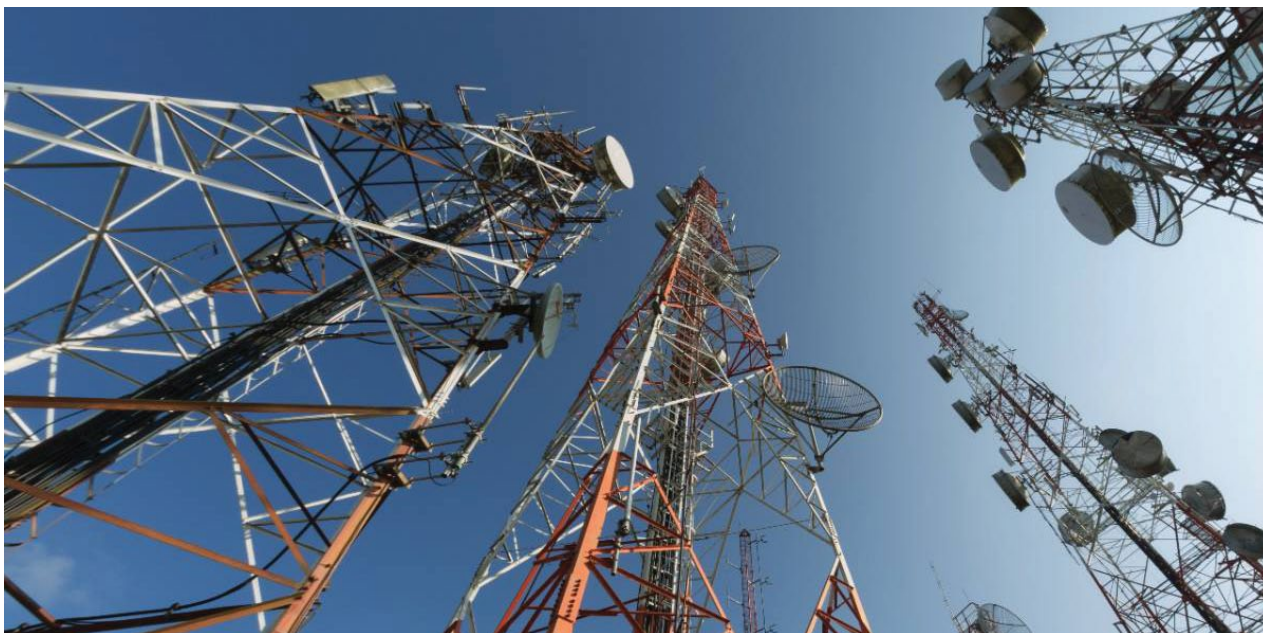
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C-DoT's network management system (NMS) for BharatNet (the largest Fiber network in the world)

The mammoth BharatNet Fibre Network depends on C-DoT's indigenous NMS platform to monitor performance and flag incidents



BY JAI PRAKASH

BharatNet is the world's largest rural broadband project initiated by Govt of India under the Digital India program in order to provide high speed digital connectivity of the internet in rural areas at a very affordable price to common people. It is envisaged to provide broadband connectivity to 2.5 Lakh Gram Panchayats and 6 Lakh villages PAN-India. This high speed digital connectivity will be provided through optical fibre. BharatNet will transform rural India into a digitally empowered society and knowledge economy.

Through BharatNet using Gigabit Passive Optical Network (GPON) access technology, bandwidth is offered to service providers like Telecom Service Providers (TSPs) , Internet Service Providers (ISPs) ,

Local Cable Operators (LCOs) and government agencies so that they can extend their services from block level to gram panchayats and beyond by providing last mile connectivity using technologies like Fibre To The Home (FTTH), WiFi etc. Backhaul connectivity to Prime Minister WiFi Access Network Interface (PM-WANI) network can be provided by BharatNet network.

With the huge size and complexity of BharatNet Network (2.5 Lakh Gps and 6 Lakh Villages), it is very critical to maintain the network Key Performance Indicators (KPIs) and ensure the customer service continuity. C-DOT Network Management Solution (CNMS) is an indigenously designed and developed Network Management Solution based on CSMP (Customizable Service Management Platform) framework by C-DOT to

BharatNet NMS and UNMS (Unified NMS) are the customized products from CNMS to provide end to end solutions to M/s BBNL. It provides a state of the art web interface to monitor multiple network technologies deployed in BharatNet.

monitor, manage and provision TSP's / ISP's network of Multi-Vendor, Multi-Technologies.

BharatNet NMS and UNMS (Unified NMS) are the customized products from CNMS to provide end to end solutions to M/s BBNL. It provides a state of the art web interface to monitor multiple network technologies deployed in BharatNet such as GPON, MPLS, Satellite and Radio covering Multiple vendors / suppliers like ITI, UTL, Alphion, Tejas and TCIL in PAN-India.

BharatNet UNMS keeps monitoring the PAN-India network continuously and presents an unified view of the entire network displaying the live status of the network with a location hierarchy (Zone → State → District → Block → Gram Panchayat → Village) so that the field operators and NOC operators can view and take corrective action as soon as a fault / alarm data is presented in their respective location. CNMS analyses the huge data that is generated by BharatNet network and presents various Root Cause Analyses so that the operator can take proactive actions to reduce the system down time and there by reducing the operational costs (OPEX). C-DOT has implemented a MobileApp through which the BharatNet network status can be viewed live by the managers, operators, maintenance staff from their mobile units. It automatically assigns the Trouble Tickets (Dockets) to respective field operators, indicating network faults, fibre faults, service problems in their respective area so that the operator will take immediate corrective action and there by reducing Mean Time To Repair (MTTR), Operational Expenditure (OPEX) and maintaining the Service Level Agreements (SLAs).

BharatNet NMS Major Features

BharatNet NMS (CNMS) is a fully featured, vendor and technology-agnostic solution suite that supports the complete Service Fulfillment and Service Assurance capability. Standard REST APIs provide integration with the Business Support Systems (BSS) such as the Order Management system, Trouble Ticketing, Billing component etc.

The CNMS Service Assurance Platform provides Fault Management and Performance Management capabilities, playing an important role in ensuring efficient operations. A key component in this is the topology-aware Root Cause

Analysis module, which in tandem with Service Impact Analysis, rapidly identifies services that could be affected as a result of network outages. The Performance Management System along with the Service Quality Management System provides an efficient framework for service quality management and improved customer experience.

The CNMS Trouble Ticketing System is an ITILv3compliant Help Desk solution whereby an Alarm / failure can be tracked from initial reporting till closure driven approach to proactive issue identification and time bound SLA driven problem resolution.

The CNMS Dashboards and Reporting Management module provides different types of hierarchical reports for Inventory, Fault, Performance, Service Provisioning & Activation and Trouble Ticketing. The Web-portal provides a single sign-on for NOC (Network Operations Center) users to access the CNMS applications. CNMS can also be accessed via a Mobile based application on both Android and iOS platforms.

CNMS is developed using an indigenous, award winning CSMP (Customisable Service Management Platform)Framework, which is a readily available core engine from C-DOT to support the development and customization of OSS products to end users.

• Dashboard

Dashboard is a tool presenting the network information of equipment status whether UP or DOWN. The reasons for equipment being Down, tickets being raised and tracking of those tickets in state-of-the-art charts and reports, with time series and trend analysis. (Data represented in the picture is for illustration only)

• Fault Management System

C-DOT Fault Management system is an IT system for managing network failures. This state-of-the-art tool quickly identifies, isolates, diagnoses and helps to resolve all critical network issues that are affecting the network performance. This will ensure that the services are up and running all the time leading to customer satisfaction. C-DOT Fault Management System is based on TMF e-ToM standards and is useful for all telecom technologies like Optical, IP, MPLS, wireless etc.



• **Trouble Ticketing System**

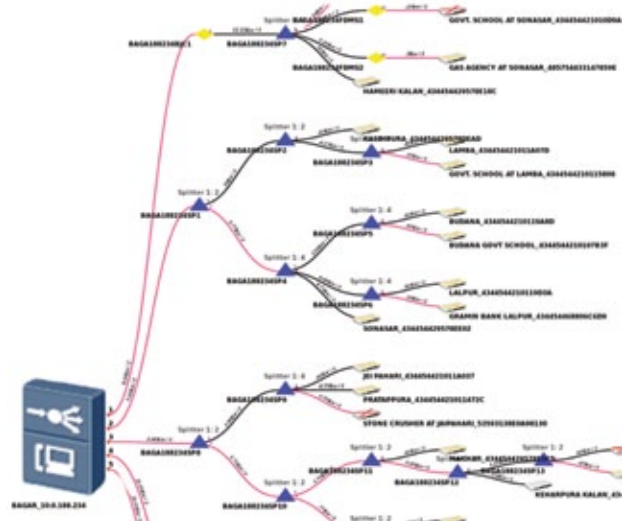
C-DOT Trouble Ticketing System is an ITIL compliant docket management system that provides mechanism for raising tickets on Network Faults, QoS Faults and SLA Violations in the system. The system tracks and manages the life cycle of all the dockets / tickets for faster resolution and restoration of the faulty conditions in the network.

• **Messenger**

Messenger is a product that effectively and instantaneously sends network faults and performance conditions as and when they occur to network operators/ concerned persons via various communication channels (SMS and Email) so that corrective measures can be taken and network effectiveness is restored.

• **Fiber Management**

Fiber Management system is an application to efficiently manage and monitor fiber links, joints, splitters in optical



networks. It has features for configuring, provisioning, fault monitoring and reporting on fibers. It raises tickets on fibre faults/alarms. Fiber Management system is also used to Configure End to End Fibers (OLT to ONT) along with configuration of passive elements and represent them in graphical display for ease of management at operators end. It also does root cause analysis for identifying probable segment's fault. Operator can configure required fiber details using this application.

• **Network Services Management System**

Network Services Management System provides a centralized monitoring and management framework for the telecom network services provided by TSPs to their B2B and B2C customers. It provides a generic framework where in telecom network services can be modelled/ designed and configured for services of access networks, core networks and backbone networks.

• **Performance Management System**

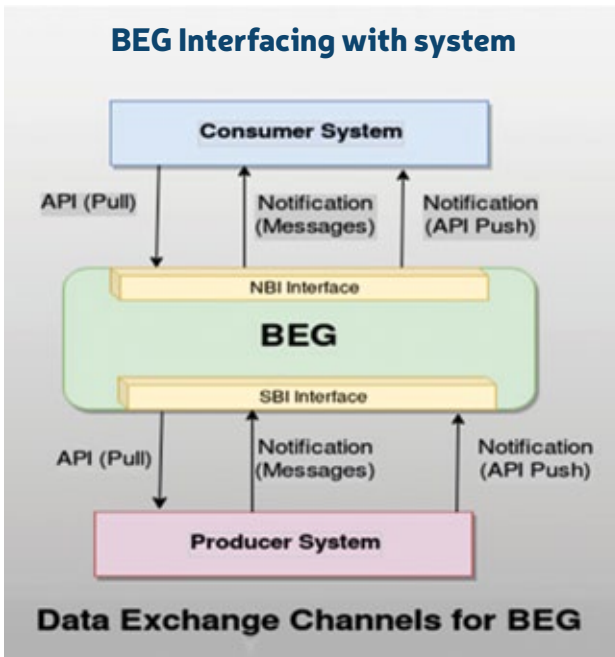
C-DOT Performance Management system is aimed at a wider audience, from small LANs, SMBs (Small to Medium Business) and to large corporations. The software focuses strongly on monitoring the performance of infrastructure and services.

• **Telecom Asset Management System**

C-DOT TAMS (Telecom Asset Management System) is an application to manage any type of telecom equipment life cycle i.e from their purchase to disposal. It manages the end-to-end life cycle management process from procuring physical assets through Purchase Order to installing & commissioning, verification, re-location, Operation & maintenance, AMC, repair/scrap.

• **Business Enterprise Bus**

C-DOT Business Enterprise Bus is an application to



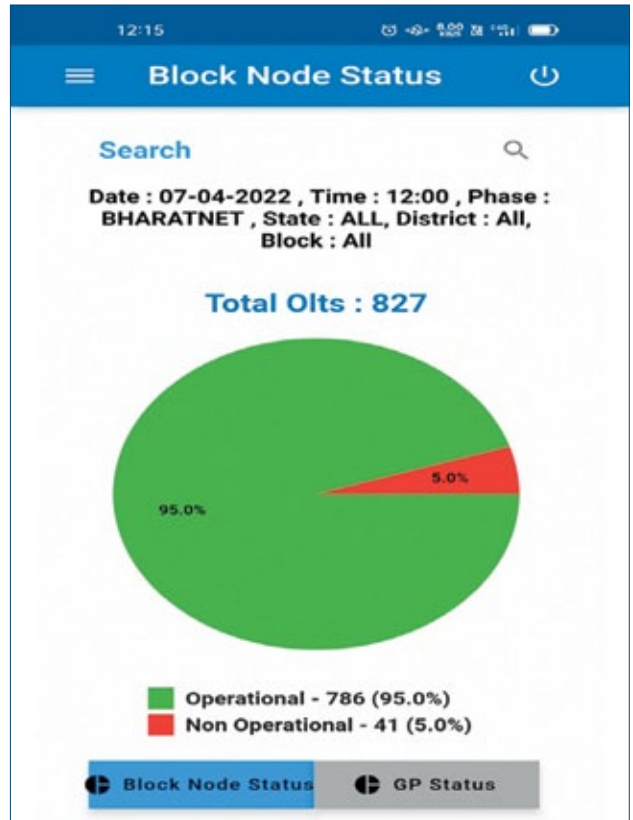
provide a central access point for managing enterprise APIs, providing a mediator between internal and external services, systems and devices. It gives an abstraction layer for the O&M data which simplifies and facilitates interaction and integration of systems for business processes.

Business Exchange Gateway (BEG) is an abstraction layer which simplifies and facilitates interaction and integration of systems for business processes. It absorbs the changes and provides conversion and generic modelling of data exchanged between systems. The data producer can extend available APIs as per its syntax, semantics and processes.

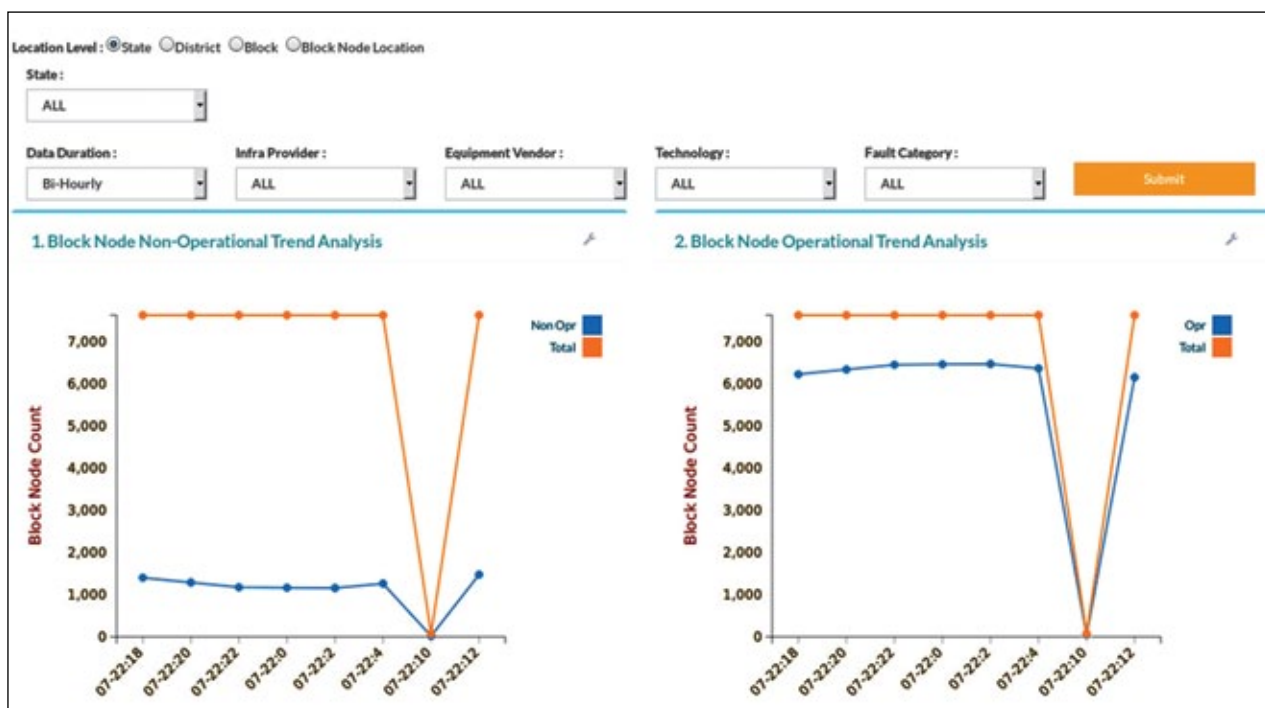
The consumer system gets data as per their requirements of O&M and map it to their own user interface. It can also cater to business logic which an enterprise wants to bring in during data exchange insulating both its NMS and third-party systems from integration issues.

• BharatNet MobileApp

BharatNet Mobile App is a Mobile Application which is a light weight smarter NMS solution to reduce OPEX of the network. The Mobile App helps the field operators to view all the pending tickets for which the operator is responsible, as soon as the ticket is created and enables them to take corrective action at the earliest. This will reduce the Operational delays and help in faster restoration of faults to keep the MTBR lower.



BhartNet UNMS keeps monitoring the PAN-India network continuously and presents an unified view of the entire network displaying the live status of the network.



It provides a bird's eye view of the network status to the higher management with complete drilldown features. The higher management will be able to get the required status faster along with the failure reasons, if any.

• **Time Series graphs**

CNMS provides various intuitive graphs to display the overview of the network. These details are also available in MobileApps.

The robust SOA (Service Oriented Architecture) and the award winning CSMP Framework of CNMS makes it suitable for proactive monitoring of all kinds of networks like smart cities, telecom networks, railways, defence, airports, hospitals etc. CNMS can be used to monitor and manage the ecosystem of smart cities to collect wide range of data that is being provided by the smart devices and manage the assets, resources and services of the smart city more efficiently. CNMS can be used in Railway

networks and Defence Networks to monitor and manage their IP devices, DWDM networks and 4G LTE networks, 5G SMO solutions and 6G networks efficiently.

Big Data Analytics based on Artificial Intelligence (AI) and Machine Learning (ML) techniques provides deeper insights and proactive predictions of the faults that can occur in the networks. Dashboards and hierarchical reports gives summarized information to the higher level managers.

BharatNet NMS is deployed in Main Data Center (Main DC) in Delhi and Disaster Recovery Data Center (DR DC) in Bangalore. BharatNet NMS can switchover or failover between Main DC and DR DC with minimal downtime and zero data loss. 🌟



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