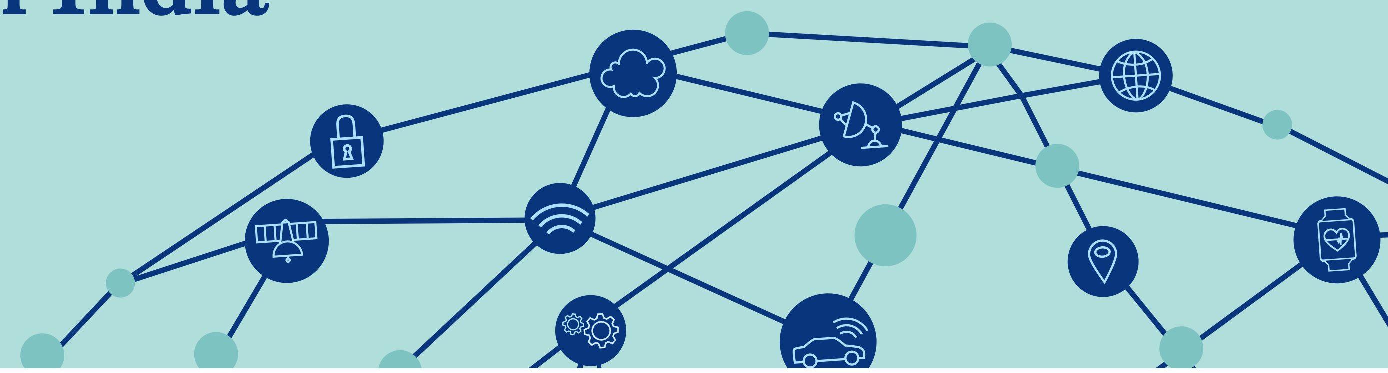
tsdsi
India's Telecom SDO

Telecommunications
Standards Development
Society, India

The Growth Story of **Telecommunications In India**



Telecommunications in India have come a long way in past 4 decades. From a teledensity (defined as phones per 100 persons) of less than 1 in eighties, we now have an overall teledensity of 91.82 as in January 2019. While urban teledensity is 161.34, the rural lags behind at 59.38. An overwhelming percentage of users access the services wirelessly, be it voice telephony or internet / data services. The rapid advances in digital technology have made such an explosive growth possible by reducing the per line capital cost dramatically. Telecom operators have also played a very important role by introducing innovative ways to acquire and service subscribers, creating and maintaining a nation-wide network against all odds of accessibility and poor infrastructure and offering services at tariffs which are the lowest in the world. Such has been the proliferation of mobile telecom services that a vast majority of first time users made their first voice call or opened their first webpage on a mobile device. A vast majority continues to access internet services on mobile devices.

The telecom proliferation dovetails well with Government's vision of Digital India, of delivery of an ever increasing number of citizen services in online mode to increase efficiencies and bring transparency. Setting up NOFN, National Optical Fibre Network, a nationwide project of reaching quality internet access to 250,000 Gram Panchayats (village level local government and community centres) across the country is a step forward in the direction of digital empowerment of the citizens. With so much hanging on digital communications, the government has a stake in the future of telecom technologies as they get developed. The 5G technology standards, which are currently under development at ITU, 3GPP and other Standard Development Organisations (SDOs), are a case in point. The 5G technology promises an order of magnitude improvement in mobile broadband. It is also going to be the vehicle for IoT revolution. It is imperative that 5G standards should incorporate India specific requirements and special use cases obtaining here. India has no desire of becoming an island and creating exclusive technology standards for itself but wants to work with global standards development organizations to help create global technology standards that incorporate India specific requirements. This will ensure that the equipment / products conforming to such global standards gets deployed, not only in India but in the larger developing world, with minimum glitches and offer best efficiencies.

It is with this national mandate that TSDSI (Telecommunications Standards Development Society, India), India's telecom SDO founded in 2014, started participating in WP5D meetings of ITU-R, an international telecom standards body of United Nations, working on IMT-2020 or 5G technology standards. Simultaneously, TSDSI also works with 3GPP as a partner organization. 3GPP is a Global Core Specification (GCS) partner of ITU-R in that the 3GPP standards are made a part of ITU standards by reference.

LOW MOBILITY LARGE CELL (LMLC)

TSDSI members noted that one test specification proposed for eMBB (enhanced Mobile Broad Band) services of IMT-2020 did not address Indian scenario of usage. The rural eMBB test case is one of vehicular access at 120 kmph and the inter-site distance (ISD) defined was 1.732 km. Now these conditions may be adequate for developed world, but not so for India and other developing countries. While the rural areas in the West and North America are characterized by very sparse population spread over large areas (large farms interspersed with houses at great distance from each other), the Indian villages are population clusters of a few hundred or thousand people every few km. Smaller ISD, i.e. smaller cells, will increase the capital and recurring costs of installation and maintenance to such level so as to be economically unviable for the telcos. Not only that, the low paying capacity of the rural population will mean that tariffs will have to be kept low for achieving any reasonable level of subscription. This will add to the economic unaviability of providing service. Hence large cells are a must if we want our rural users to get 5G services at affordable tariffs. Further, the high speed vehicular access is not that important in Indian context. Hence, TSDSI decided to propose Low Mobility Large Cell (LMLC) test configuration for IMT 2020 in WP5D of ITU-R. In the Indian delegation to WP5D's meeting of 26th meeting 14 – 22 February 2017 at Geneva, led by Department of Telecommunications, proposed LMLC as part of mandatory test configuration for Rural eMBB with an ISD of 8 km and pedestrian mobility of up to 10 kmph. The contribution was accepted in the face of much opposition from some established players. The support of many country delegations made it possible. A decision on ISD was taken in the next meeting of WP5D held in Canada in June 2017, where value of ISD was agreed as 6 km.

SUBMISSION OF CANDIDATE RADIO INTERFACE TECHNOLOGY / SET OF RADIO INTERFACE TECHNOLOGY (RIT / SRIT) TO ITU-R FOR IMT-2020

ITU invited GCS proponents and other technical organizations to propose candidate Radio Interface Technology or Set of Radio Interface Technologies (RIT / SRIT) for development of IMT2020 specifications. The proposed RIT / SRIT are then evaluated for suitability by an Independent Evaluation Group (IEG), a group of volunteering technical organization from all over the world who offer their services to ITU-R for the purpose. TSDSI proposed an RIT, developed by TSDSI members, in the 32nd meeting of WP5D, held on 9-17 July 2019, at Búzios, Brazil . Further information/clarification has been provided to ITU-R on 10th September 2019.

The contribution has wide ranging implications. It will support developing countries in deploying cost effective broadband 5G networks as cell sites with larger coverage, leading to reduced infrastructure costs, enabling affordable 5G services in rural areas. Improved spectral efficiency will also lead to higher traffic handling capacities at the no extra cost.

SALIENT FEATURES OF CANDIDATE RIT SUBMITTED BY TSDSI

1. pi/2 BPSK with spectrum shaping in uplink

- A 3dB lower PAPR waveform
- UE can transmit up to 26 dBm with pi/2 BPSK compared to 23 dBm with QPSK, thus increasing the uplink range
- Signalling changes are proposed

2. pi/2 BPSK for NB-IOT

- Improved urban penetration and increased rural coverage
- No cost impact on the device

3. Intelligent BWP configurations

- Additional granularity in the UE frequency scheduling
- Better utilization of available resources

4. Low latency precoded SRS transmission

- Enhancements to SRS precoder updation with channel dependent delay between an SRS transmission and the last received aperiodic CSI-RS
- Performance gains with mobility

5. Optimizing PTRS density through intelligent threshold parameters

- Adaptive density of the PTRS reference signals
- Useful for high frequency (mm wave) communications.

6. pi/2 BPSK with spectrum shaping enables 5G NR large cell 12-Km ISD rural deployment at 3.5GHz TDD

7. For the same data rate and ISD

- Approx. 2X increase in UE throughput over QPSK using 2-rx antennas. For 60MHz BW, 10 UEs per sector, each UE get >1 Mbps due to pi/2 BPSK while
- QPSK requires twice the number of receiver antennas to maintain same cell edge performance as pi/2 BPSK resulting in higher BTS costs

8. For the same data rate requirement, pi/2 BPSK offers higher cell range since QPSK modulation results in very low data rates for some cell edge UE

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Telecommunications Standards Development Society, India

REGISTERED OFFICE: 2nd Floor, C-DoT Campus, Mandi Road, Mehrauli, New Delhi 110030, INDIA

www.tsdsi.in secretariat@tsdsi.in +91 11 26597254 company/tsdsi @TSDSI_India