

tsdsi celebrating **10** Years of developing ICT Standards
India's Telecom SDO

TECH DEEP DIVE

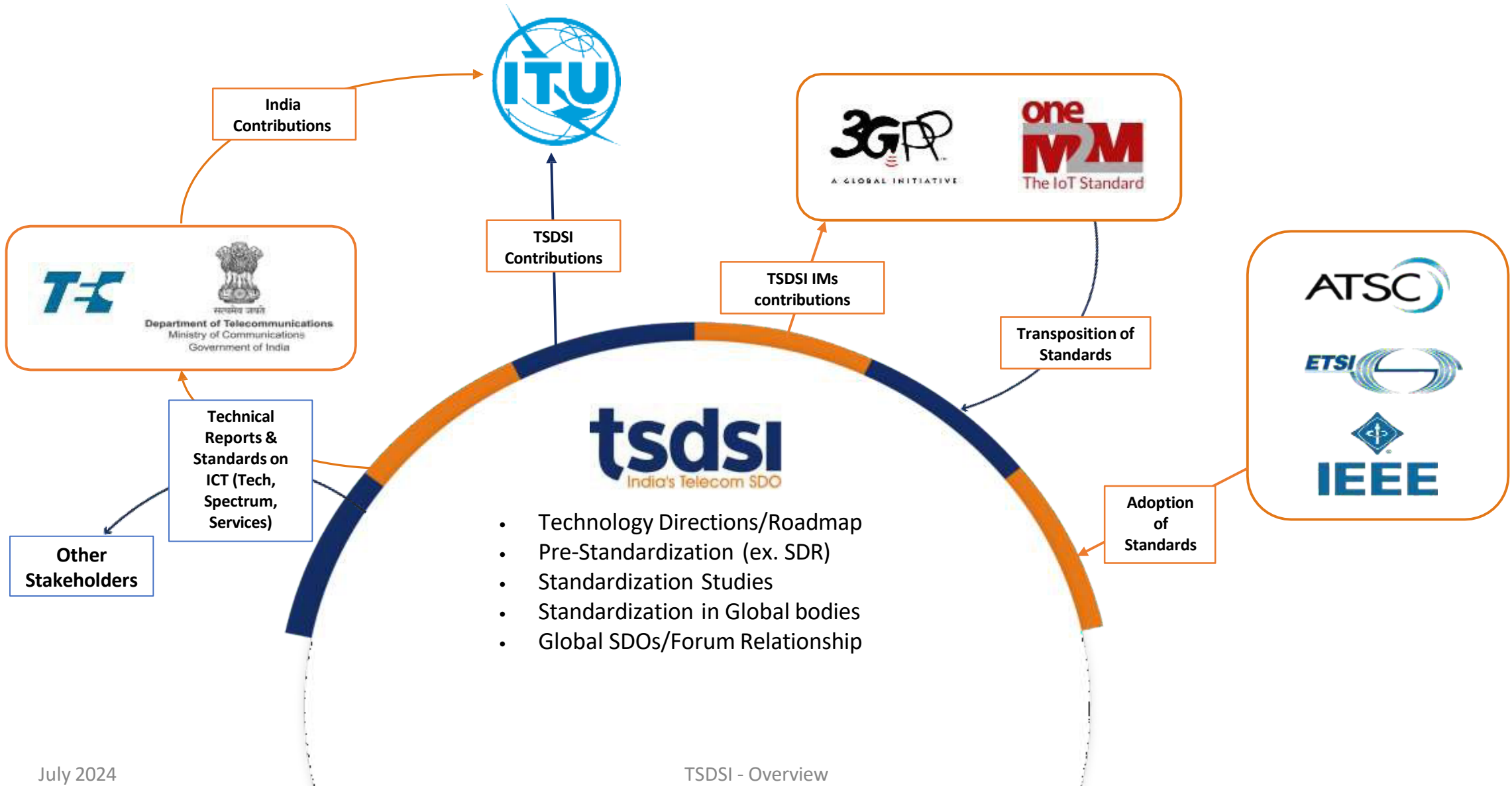
TTDD 2024 CONFERENCE (7th EDITION)

REALIZING THE 6G VISION :
SOCIETAL NEEDS, USAGE SCENARIOS & TECHNOLOGIES

 **Date:** 16-19 July 2024

TSDSI – Overview Session

Pioneering Telecom and ICT Standards for India's Digital Transformation



Our Vision



“To ensure that Digital Communication Standards increasingly drive domestic, economic and policy activities and enhance India’s competitiveness for ICT goods and services in global markets. It aims to do this by creating a leadership position through India’s participation and contribution to emerging Digital Communication Standards in global SDOs”

About Us

We are an autonomous, membership based, standards development organization (SDO) for Telecom/ICT products and services in India.

We develop standards for access, core, back-haul, core telecom networks, ICT solutions & services that best meet India specific Telecom/ICT needs, based on research and innovation in India.

We work closely with global standards’ bodies to reflect Indian requirements into International Telecom/ICT standards.

We play an important role in incorporation of Indian IP into Global Telecom standards.

We are recognised by DoT as India’s Telecom SDO

We are registered as a not for profit Society, under the Indian Societies Registration Act XXI of 1860

Our Objectives

Developing, promoting and standardizing India-specific Telecom/ICT requirements and solutions

Taking Indian requirements to Global Standards organizations

Adhere to the principles of Openness, Transparency, Fairness, Consensus and due Process in conducting its activities

Maintain technology neutrality and provide a uniform playing field for its members.



Alliances



TSDSI is the Organizational Partner of 3GPP. This entitles TSDSI members to become Individual Members of 3GPP through TSDSI and contribute to 3GPP Specifications, taking their IPR into the global arena.



TSDSI is Partner Type I of oneM2M project a leading forum driving M2M service layer standards. It entitles TSDSI member organizations to become Individual Members of oneM2M and contribute to standards development in M2M space.

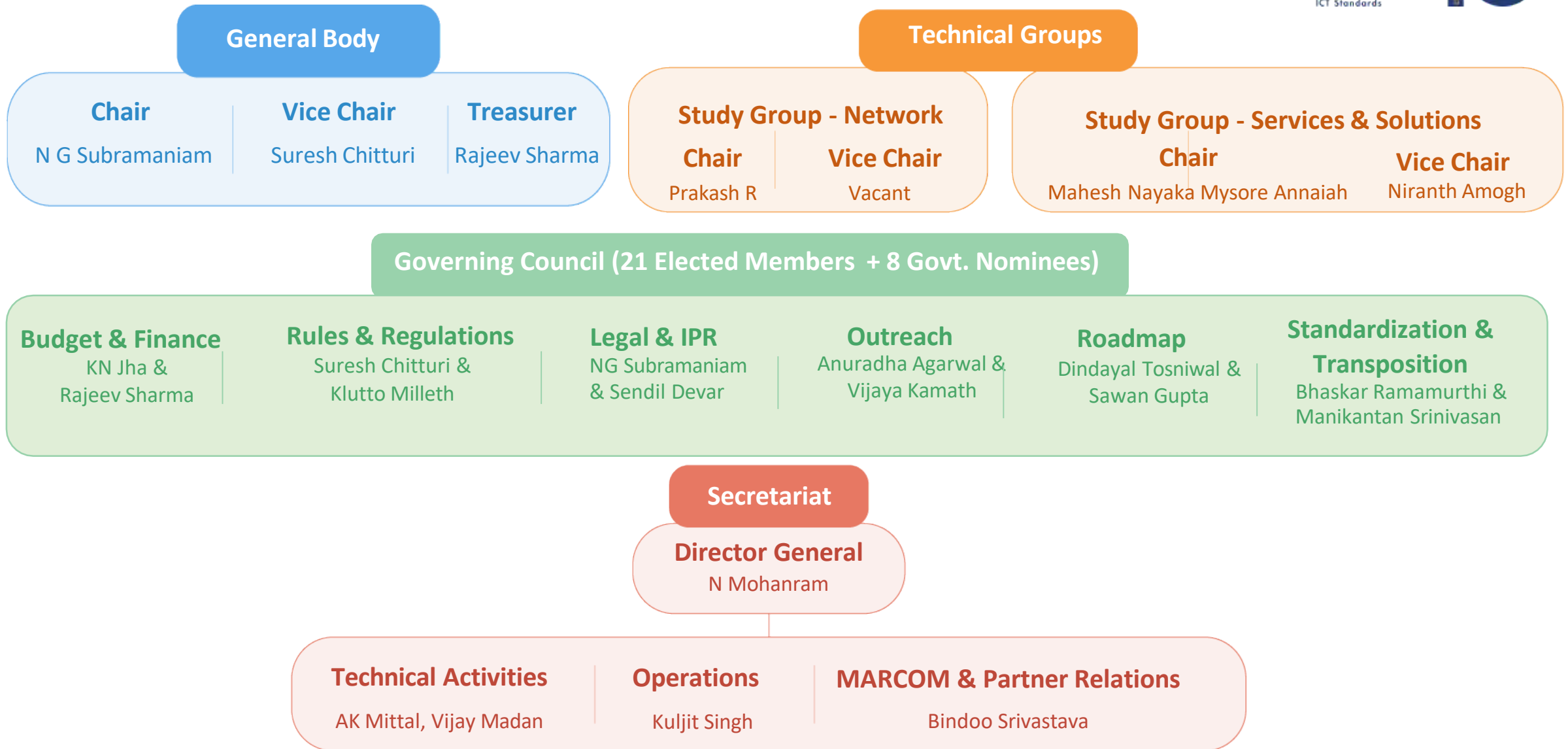


TSDSI is a constituent SDO of Global Standards Collaboration (GSC) – a voluntary forum of the world’s leading information and communication technologies standards organizations (SDOs).

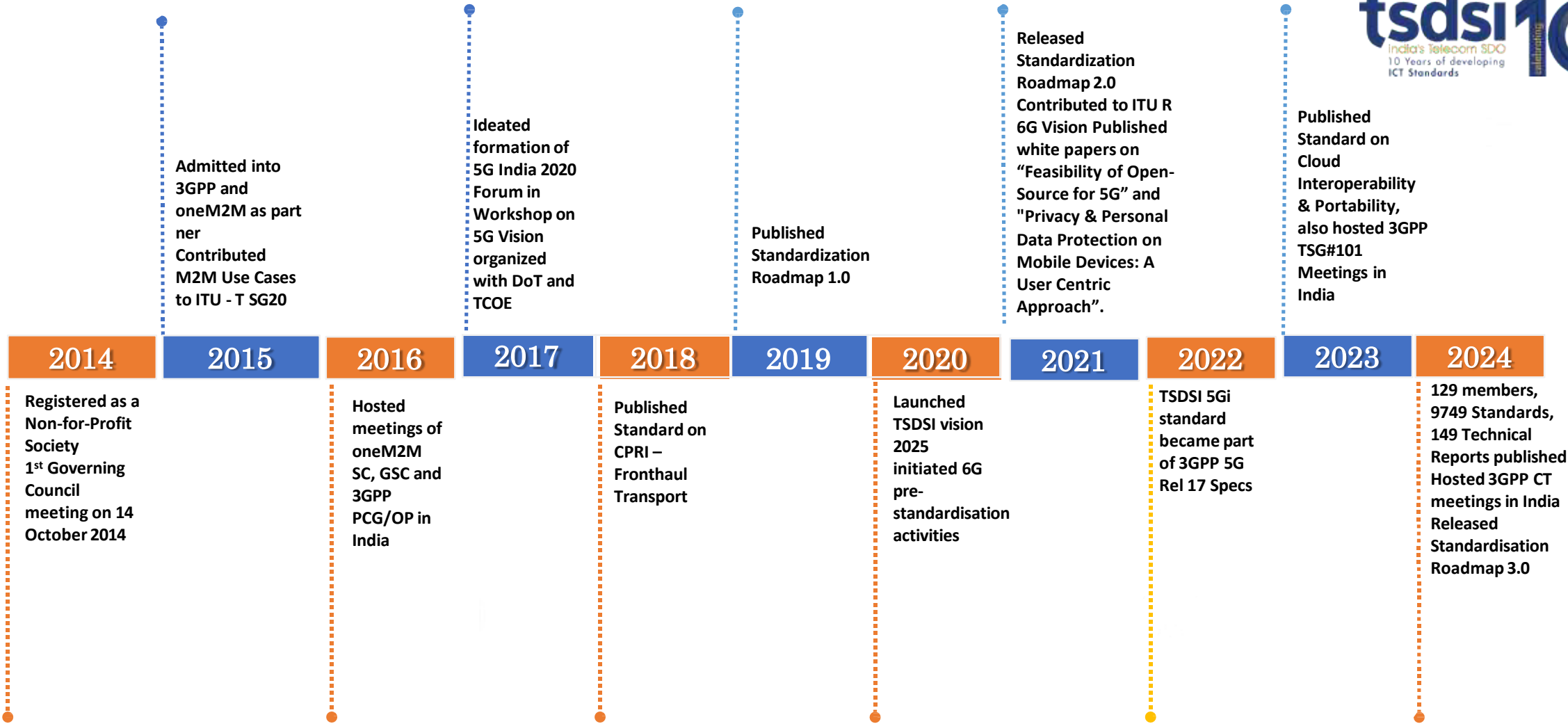


TSDSI is a member of the Multilateral MoU for conducting Global 5G Events (other members being 6GIA, 6GMF, 6G Forum, 6G Americas, IMT2030 PG, 5G Brazil)

Organizational Structure



Journey so Far



Our Activities



Technical Groups

Study Group - Networks

- 6G
- 5G Enhancements
- Broadcast offload
- Spectrum Studies
- Open Systems
- Wireless Backhaul
- Visible Light Communications
- Quantum Communications

Study Group- Services & Solutions

- Security - Security and Privacy aspects in the end-to-end Telecom/IoT networks & related standards, and Multilayer user plane security Post Quantum Cryptography, AI/ML model and delivery of services, enablers for 6G.
- Application layer - Localization, Metaverse, and UAV Drones, Telerobotics, Sustainable 6G networks, V2X applications in 6G Networks, integrated sensing at application level, common payload.
- Services Architecture and Framework – Edge solutions, Critical Communications, Tactile Applications, RAN Slice Services, Cloud Interoperability, Rural Broadband services and marketplace, cost modelling data services, Smart Agriculture, AI operation splitting context in 6G.

Strategic Initiatives

- Technology Roadmap Item Proposal Forums
- Global Standards Coordination, Engagement with Startups & Industry, Standards Driven Research, Test & Certification

- ITU Sector Member
- Contributions to 3GPP, oneM2M and ITU
- Agreements with ATSC, ETSI and IEEE-SA for adopting their standards

- TSDSI Tech Deep Dive Conference
- Workshops to promote SDR, and contributions to 3GPP, ITU (including WTSA)

Our Accomplishments



Group	Technical Reports Published	Technical Standards Published
Study Group- Networks	13	9749
Study Group- Services & Solutions	136	223

Technical Standards Published

- Cloud Interoperability & Portability Standard
- 5Gi (merged with 3GPP Rel 17 in 2022)
- CPRI Fronthaul
- A Generic Relay Architecture for 5G and Beyond

Standards Adopted

- Adoption of ETSI IoT and NFV Standards as TSDSI Standards
- 19 Specifications of ATSC 3.0 Standards
- Transposed 3GPP and oneM2M Specifications into TSDSI Standards

TSDSI transposed standards mandated as National Standards by TEC

- 3GPP Specifications for 3G, 4G and 5G
- 3GPP Specifications for Indian Telecom Security Assurance Requirements
- oneM2M Rel 2 & Rel 3 Standards

Technical Reports Published



6G / 5G Enhancements

- 5G Extensions for Broadcast Offload
- Slice Identification in 5G RAN for End-to-End Secure Services
- 6G: Use Cases, Requirements and Enabling Technologies
- Visible Light Communication/Li-Fi
- Enhancements of flexible UL/DL Resource Utilization

Spectrum Studies

- Characterization of E-band for 4G/5G Backhaul & Rural Broadband
- 6 GHz spectrum for IMT services in India

Broadcast Convergence

- Broadcast Offload
- 5G Broadcast based Service Delivery for TV, Radio, IPTV and File-casting

Open Systems

- Open Disaggregated RAN

Wireless Backhaul

- Channel Characteristics of 60GHz for 4G/5G Backhaul

Applications / Verticals

- Communication Requirements & Recommendations for Energy Sector
- Enablement of Common Ontology for Adaptive traffic control system and other Intelligent transportation system products
- Drone Communication Services
- Public Protection Disaster Recovery (PPDR)
- Indian Languages in Mobile Transactions
- Information Centric Networking
- Data Pruning in Smart IoT Applications
- M2M Use Cases in Various Verticals - India Context
- NB IoT capabilities for Energy Metering

Services Architecture

- Unified Network Slicing Model
- Edge Intelligence for haptics IoT use cases
- Performance Measurements for Dual SIM Devices
- Cloud Interoperability and Portability Standards

Security

- Study of Post-Quantum Cryptography for Future 5G Networks and Application
- Digital Process for Know Your Machine Custodian
- Smartphone User Data & Privacy Protection
- Reducing Threats to the National Critical Infrastructure using DNS



<https://tsdsi.in/tr/>

Published White Papers



[Status of Telecom Startup Ecosystem in India](#)



[6G Use Cases and Enabling Technologies](#)



[Privacy & Personal Data Protection on Mobile Devices](#)



[Feasibility of Open Source for 5G](#)

Engagement with Global Forums



TSDSI@ITU

Contributed to IMT2030 Framework

5Gi standard (recognized as one of the ITU-R Recommendation M.2150, and now merged into 3GPP 5G)

LMLC requirement to address requirements of Rural & Remote areas mandatory in IMT.2020

TSDSI obtained A.5 Certification from ITU-T

@ 3GPP

Hosted 3GPP CT WG Meetings in Hyderabad from 27 - 31st May, 2024

53 TSDSI Members to 3GPP as Individual Members

NavIC (Satellite based Indian Navigation System) incorporated in 3GPP Rel 16 based on proposal introduced by TSDSI IM

TSDSI hosted 3GPP TSG#101 meetings in Bengaluru on 11-15 September 2023

Workshops on 3GPP Releases

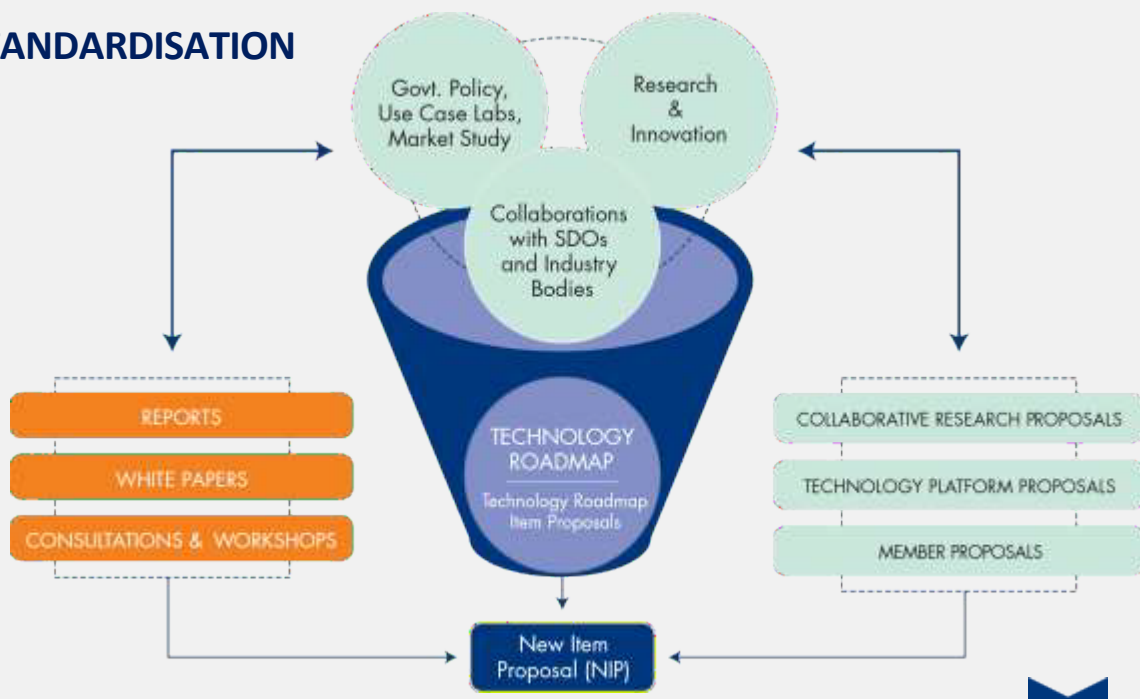
@ oneM2M

63 TSDSI Members to oneM2M as Individual Members

oneM2M Centres of Excellence @ IIIT Hyderabad and UIET Chandigarh

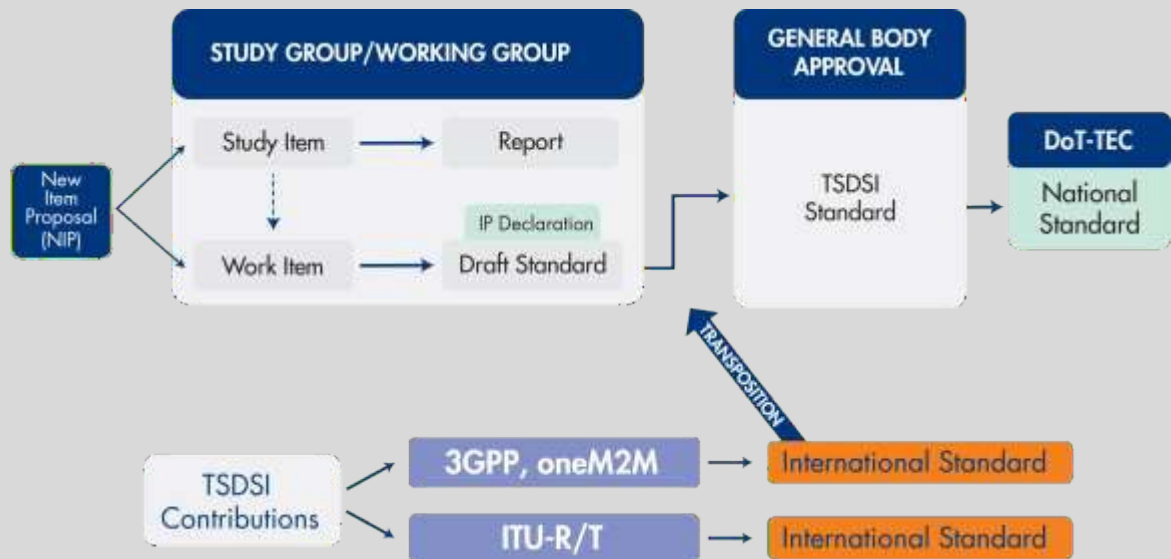
Hosted oneM2M TP58 meeting in New Delhi in February 2023

PRE-STANDARDISATION

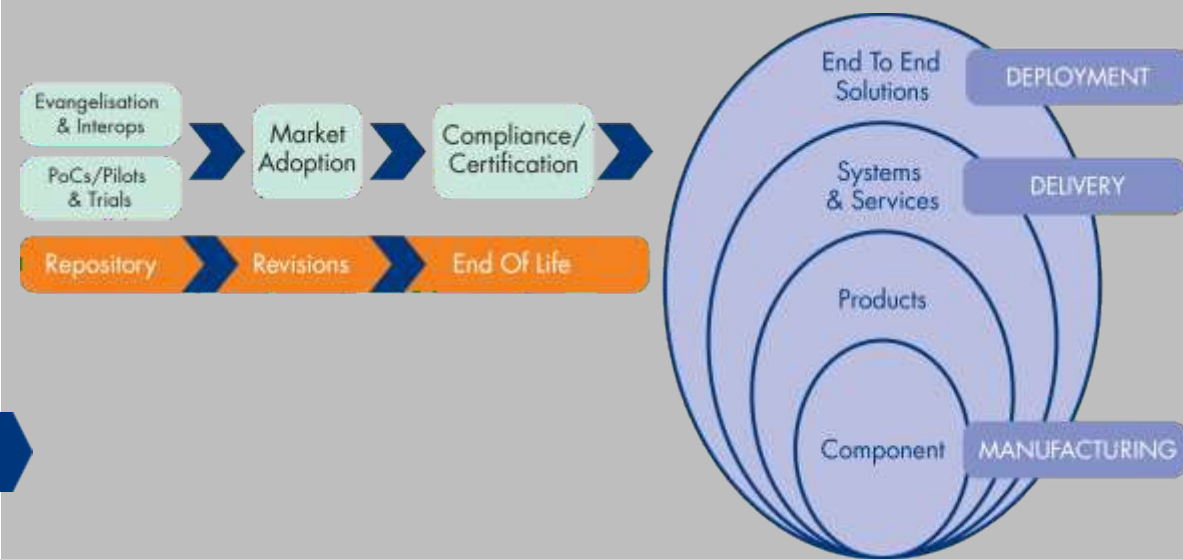


Standardization Lifecycle

STANDARDISATION



POST-STANDARDISATION



6G @ TSDSI



Adopted a two-pronged strategy:

1. Steer research in India to serve its goals
2. Continue engagement with global standard bodies for harmonization of efforts including ITU WP 5D.

TSDSI began 6G work with an introductory workshop “[Telecom Technologies for the next Decade](#)” in Jan’2020

Published Technical Report on [6G: Use Cases, Requirements and Enabling Technologies](#) in Jul’2022

[TSDSI white paper](#) based on TSDSI Technical Report released in Sep’2022

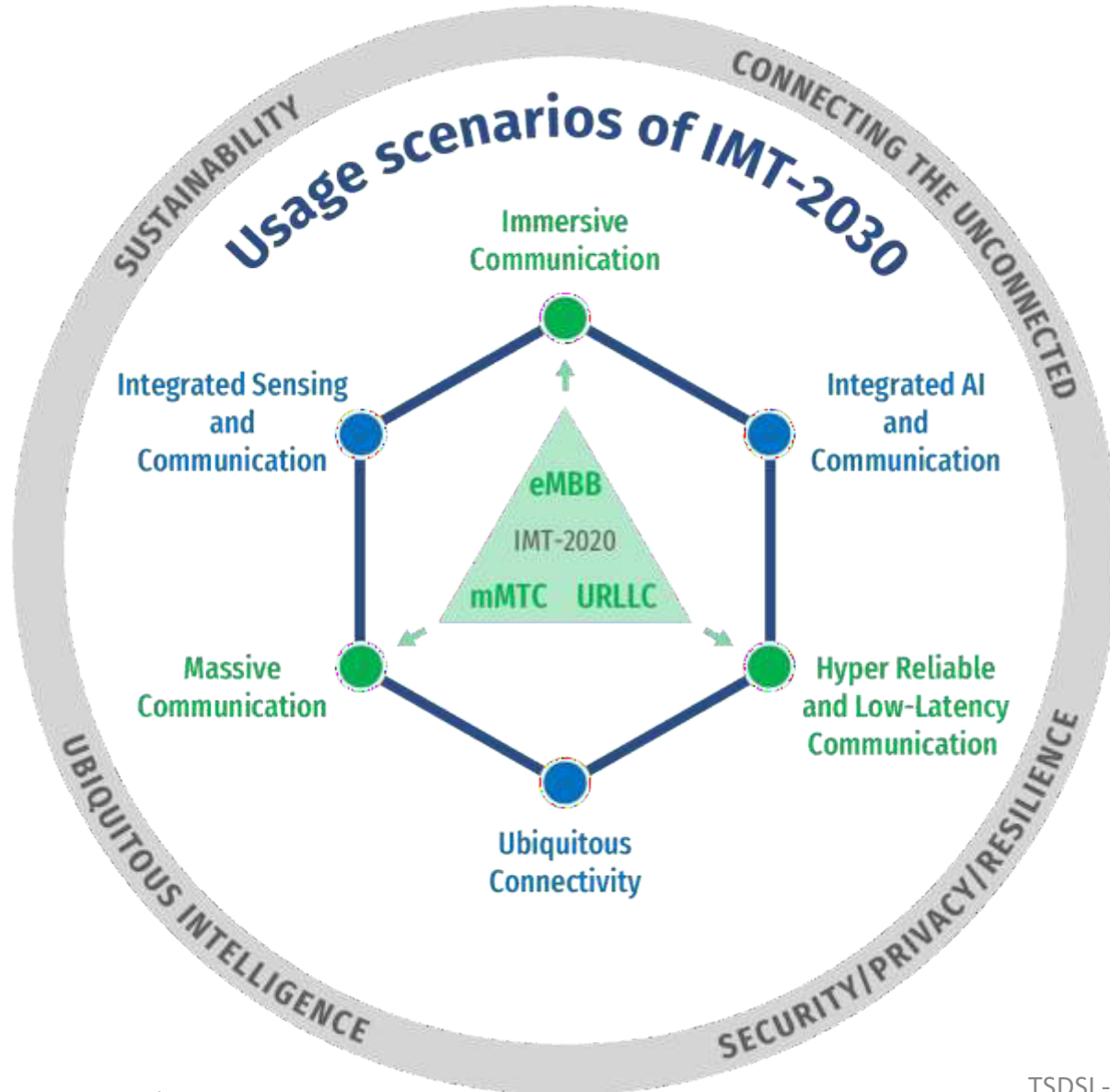
Use Cases & Enabling Technologies



Key Technology Enablers



ITU-R FRAMEWORK for IMT-2030 & TSDSI Role



TSDSI contributed to ITU-R Framework document and Future Technology Trends document in 2021-22 and 2022-23

Current Standards Development Activities



6G / 5G Enhancements

- Architecture for 6G Communication Systems
- Coreless RAN
- AI Architecture for RAN
- Tactile applications edge intelligence- 5GS
- B5G - Multilevel E-to-E User Plane Security
- Fronthaul Interface in FBS Driven C-RAN
- Methods and Interface design for RIS-assisted communication

Broadcast Convergence

- Extension of Broadcast Offload

Services Architecture

- Rural Broadband Services Architecture
- Cloud Interoperability & Portability

Wireless Backhaul

- Characterization of E-band for 4G/5G Backhaul & Rural Broadband (TR Published)
- Evaluation of the existing IAB architecture in 5G Networks (TR Published)

Applications / Verticals

- Integrated Communication and Sensing
- Local Language for financial workflows
- Standardization of common data payload for adaptive traffic control system and ITS interoperability

Current Technical Studies



6G / 5G Enhancements

- Waveforms for B5G
- Channel Modeling, PHY Layer Req. for NFC in 6G
- Joint Communication & Sensing in B5G
- Qualitative Metrics for 6G KPIs
- Dynamic Joint SDN Controllers and Hypervisors
- Security Aspects of AI/ML model transfers in 5Gs
- Privacy Preserve - Detection False Base Stations
- Network Energy Saving functionality of the 5G-Advanced system and its Evolution
- Minimum Performance Specs for the Communication Edge
- Minimum Performance Spec for Mobile Devices
- Suggested recommendations for sustainable 6G networks
- Recommendations for use of Dynamic AI/ML models for self-sustainable V2X applications in 6G Networks
- Framework for AI/ML operation splitting in 6G context
- Handling of Diverse Services in Future Mobile Networks
- System Requirements for NR based Future Railways Mobile Communication System
- Functional Split Selection & Transition for FBS-assisted C-RAN Operation in 5G and Beyond
- Multiple Access for 6G communication
- Unified network slicing model

Security

- Security Enablers for 6G
- Security and privacy of the user identity
- 5G and Beyond Network Security Architecture to support Multilevel End-to-End User Plane Security
- A Technical Exploration of the Significance and Implementation of Central Equipment Identity Register (CEIR)
- Network Security
- AI/ML-based Security Implementation in Wireless Communication Systems

Wireless Backhaul

- Characterization of E-band for point-to-multipoint backhaul

Spectrum Studies

- Sub-THz Channel Modeling
- Study of the channel model for integrated sensing and communication network in FR3 and THz band

Applications / Verticals

- Study on semi-autonomous collaborative telerobotics
- Metaverse use cases in mobile network
- Enablement of common payload for Smart Agriculture
- Intelligent Transport Systems Communication
- Slice Identification in 5G RAN and Core for End-to-End Secure and Resilient Slice Services

Services Architecture

- Common Edge Connectivity for Public Utility Services
- Cost model considering network assets and utilization
- Smart Agriculture end-to-end monitoring use case in Indian context
- Carrier Grade Linux Specification

Others

- Profile for Smart Meters

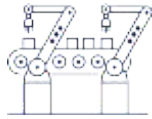
VLC

- Solar Panel Based Optical Wireless Communication
- Enhancement to media access control (MAC) protocols for visible light communication (VLC) in indoor scenarios

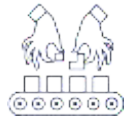
TSDSI Membership



TSDSI attracts members from all sections of Telecom/ICT Ecosystem



Manufacturers with Indian IP



Domestic Manufacturers



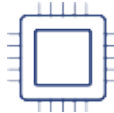
Telecom Service Providers



Other Services



R&D Organizations



Semiconductor components designer/ manufacturer



Manufacturer of Mobile Device/CPE End User Devices



Government Department/ Autonomous Bodies



Developers of Application solution/ Service Platform



Academic Institutions

An organization can join TSDSI as a Corporate/Associate/Guest member. Corporate Members can join 3GPP and oneM2M.

Membership Type	Description	Privileges
Corporate	Entities registered in India and engaged in Telecom related activities	Contribute to technical activities Participate in Decision Making and Voting Hold Office bearer positions
Associate	Industry Associations, Foreign Entities, Foreign Industry Associations	Contribute to Technical Activities
Guest/ Observer	Professional Experts, Researchers in their individual capacity as observers. Companies wishing to explore before becoming full members are granted Guest Membership for six months.	Participate in Technical Activities and contribute on invitation



Join Us



Member List



THANK YOU



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