Pioneering Telecom and ICT Standards for India's Digital Transformation

India Contributions

TSDSI Contributions

TSDSI IMs contributions

Transposition of Standards

Adoption of Standards

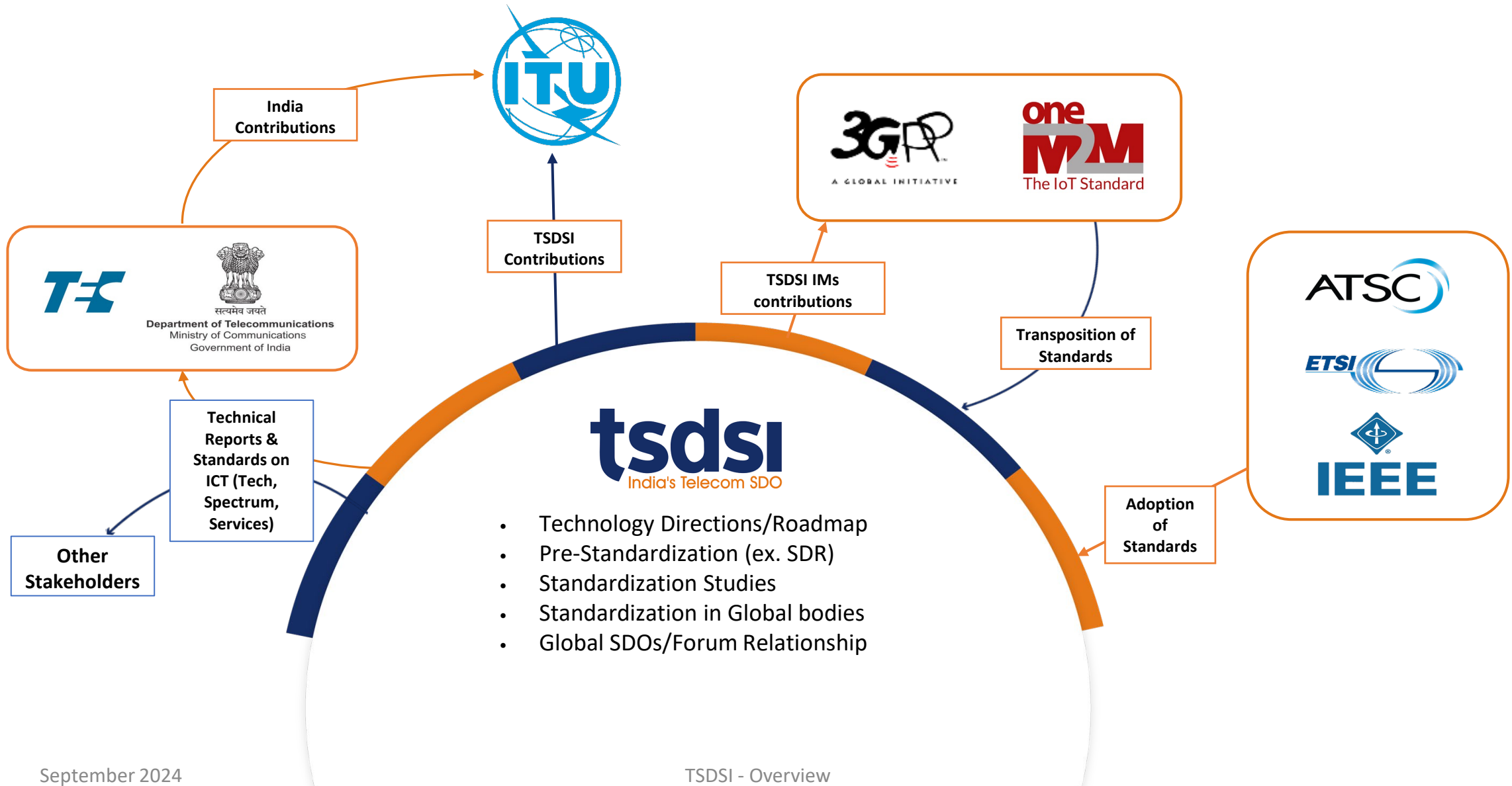Technical Reports & Standards on ICT (Tech, Spectrum, Services)

Other Stakeholders

tsdsi — India's Telecom SDO

- Technology Directions/Roadmap
- Pre-Standardization (ex. SDR)
- Standardization Studies
- Standardization in Global bodies
- Global SDOs/Forum Relationship

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 as 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

Map labels: ORAN Alliance, 6G-IA, GCF, IEEE-SA, WWRF, IMT-2030 PG, TTA, ATSC, ATIS, ETSI, ARIB, TTC, TIA, SIA India, BIF, TAICS, CCICI, MTSFB, 5G Brasil

3GPP — A GLOBAL INITIATIVE

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.

oneM2M — The IoT Standard

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.
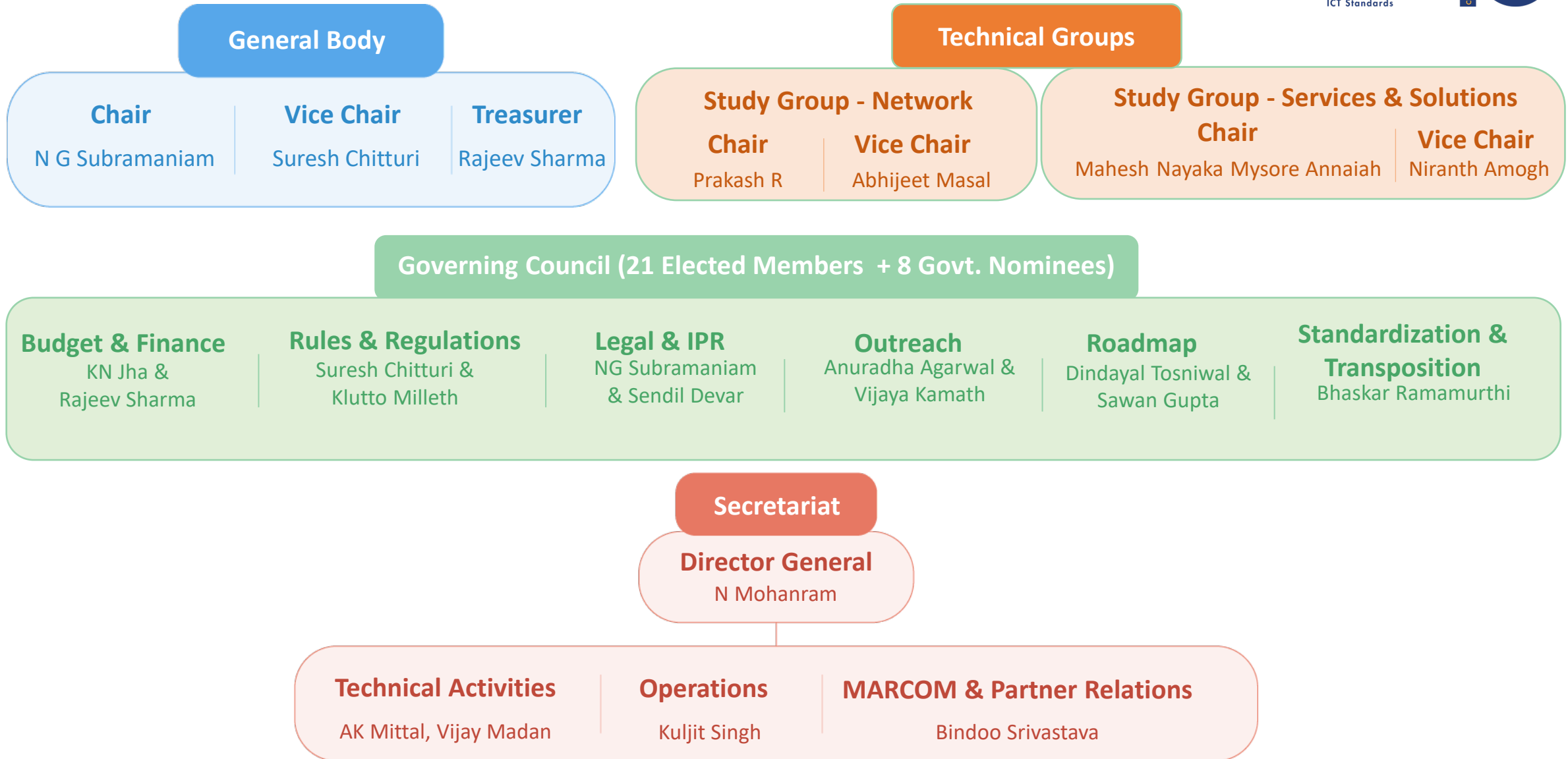
GSC

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).
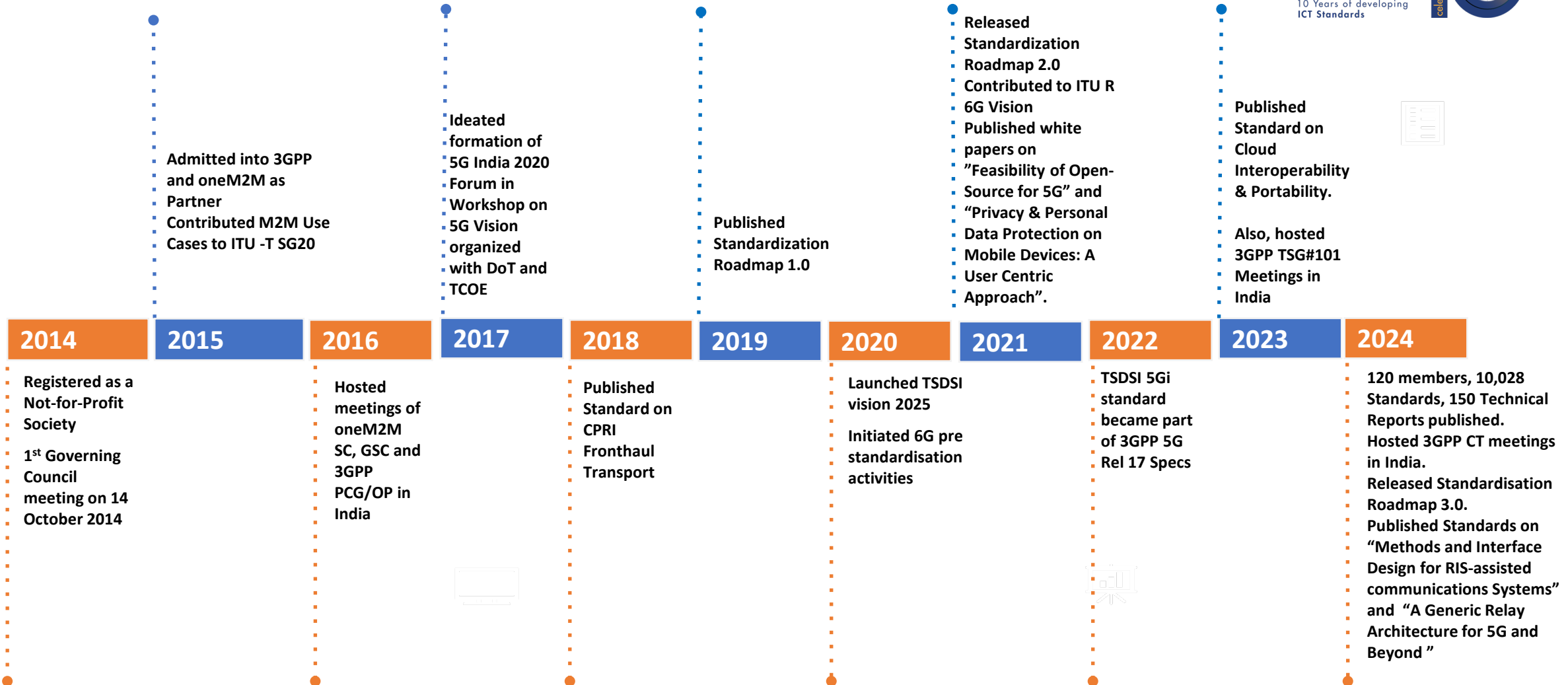
Multilateral MoU

TSDSI is a member of the Multilateral MoU for conducting Global 5G Events (other members being 6G-IA, XGMF, 6G Forum, 5G Americas, IMT-2020 (5G) PG, 6G Brasil)

Organizational Structure

General Body

Chair	Vice Chair	Treasurer
N G Subramaniam	Suresh Chitturi	Rajeev Sharma

Technical Groups

Study Group - Network

Chair	Vice Chair
Prakash R	Abhijeet Masal

Study Group - Services & Solutions

Chair	Vice Chair
Mahesh Nayaka Mysore Annaiah	Niranth Amogh

Governing Council (21 Elected Members + 8 Govt. Nominees)

Budget & Finance	Rules & Regulations	Legal & IPR	Outreach	Roadmap	Standardization & Transposition
KN Jha & Rajeev Sharma	Suresh Chitturi & Klutto Milleth	NG Subramaniam & Sendil Devar	Anuradha Agarwal & Vijaya Kamath	Dindayal Tosniwal & Sawan Gupta	Bhaskar Ramamurthi

Secretariat

Director General
N Mohanram

Technical Activities	Operations	MARCOM & Partner Relations
AK Mittal, Vijay Madan	Kuljit Singh	Bindoo Srivastava

Journey so Far

2014

Registered as a Not-for-Profit Society

1st Governing Council meeting on 14 October 2014

2015

Admitted into 3GPP and oneM2M as Partner
Contributed M2M Use Cases to ITU -T SG20

2016

Hosted meetings of oneM2M SC, GSC and 3GPP PCG/OP in India

2017

Ideated formation of 5G India 2020 Forum in Workshop on 5G Vision organized with DoT and TCOE

2018

Published Standard on CPRI Fronthaul Transport

2019

Published Standardization Roadmap 1.0

2020

Launched TSDSI vision 2025

Initiated 6G pre standardisation activities

2021

Released Standardization Roadmap 2.0
Contributed to ITU R 6G Vision
Published white papers on "Feasibility of Open-Source for 5G" and "Privacy & Personal Data Protection on Mobile Devices: A User Centric Approach".

2022

TSDSI 5Gi standard became part of 3GPP 5G Rel 17 Specs

2023

Published Standard on Cloud Interoperability & Portability.

Also, hosted 3GPP TSG#101 Meetings in India

2024

120 members, 10,028 Standards, 150 Technical Reports published.
Hosted 3GPP CT meetings in India.
Released Standardisation Roadmap 3.0.
Published Standards on "Methods and Interface Design for RIS-assisted communications Systems" and "A Generic Relay Architecture for 5G and Beyond "

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, Multilayer user plane security, Post Quantum Cryptography, AI/ML model and delivery of services, enablers for 6G.
- Application layer - Localization, Metaverse, 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, Split AI in 6G context.

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)

ROADMAP 3.0

6G/5G ENHANCEMENTS

Use cases and services, KPIs, Key Technologies and network architecture and evolution for 6G, Rural Coverage and Capacity Enhancement, Waveform Design for THz Communication, Network Energy Saving in 5G and its Evolution towards 6G Sustainability Requirements, Channel Models for Integrated Sensing and Communication in Beyond 5G Systems, Non GNSS/NTN Positioning, Ambient IoT – A New Paradigm for Resource-Efficient IoT Deployments, Unified Global Communication Infrastructure Reference Architecture, Network Capabilities Exposure, Sustainable Development with Minimal Energy Consumption in 6G

APPLICATIONS/ VERTICALS

5G use cases for Verticals, Study on System Requirements for NR based Future Railways Mobile Communication System (FRMCS), Collation of Satellite Imagery for agriculture using 5G network, Requirement for a Reference Architecture for Solar-powered Unmanned Aerial Vehicle

QUANTUM COMMUNICATIONS

Next generation secure, adaptable and cost effective solutions for Quantum security, Quantum communication, security and modelling, Trusted node testing, Underwater QKD, PQC in embedded systems and Device Biometrics

VISIBLE LIGHT COMMUNICATION

Standards for Visible Light Communication, Standardization of FSO systems for broadband communication

SPECTRUM STUDIES

Spectrum Coexistence studies towards 6G, Flexible Dynamic Spectrum Access architecture

NON-TERRESTRIAL NETWORKS

Positioning in 6G Communication networks using Multi GNSS including NavIC, Multi-dimensional multihop non terrestrial networks with BS functionality onboard

INTELLIGENT TRANSPORT SYSTEMS

Standard and regulations for Autonomous driving System, Reference Architecture for Automated Electric Road Transportation, Connected Multi-Modal Transportation

CLOUD

Cloud Resource Management in Future Networks

WIRELESS BACKHAUL

UAV based backhaul, 4G/5G Fronthaul & Backhaul, Wireless-to-Building (WTTB)

SECURITY

Security standards for IoT and Machine-to-Machine, Quantum Security

AI/ML

AI/ML in & for Future Networks, AI/ML based Mobility Enhancements

OPEN SYSTEMS

Open Disaggregated Networks

RURAL BROADBAND

Architectures for Rural Broadband

Our Accomplishments

Group	Technical Reports Published	Technical Standards Transposed
Study Group- Networks	13	10,028
Study Group- Services & Solutions	138	223

Technical Standards Developed and Published

- Cloud Interoperability & Portability Standard
- 5Gi (merged with 3GPP Rel 17 in 2022)
- CPRI Fronthaul Transport
- A Generic Relay Architecture for 5G and Beyond
- Methods and Interface Design for RIS-assisted Communication Systems

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
- Functional Split and Fronthaul Interface in FBS Driven C-RAN for 5G and Beyond

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
- 5G Extensions for Broadcast Offload

Open Systems

- Open Disaggregated RAN

Wireless Backhaul

- Channel Characteristics of 60GHz for 4G/5G Backhaul
- Evaluation of the existing IAB architecture in 5G Networks

https://tsdsi.in/tr/

Applications / Verticals

- System requirements in Metaverse use cases in mobile network
- Communication Requirements & Recommendations for Energy Sector
- Enablement of Common Ontology for Adaptive traffic control system and other Intelligent transportation system products
- Slice Identification in 5G RAN and Core for End-to-End Secure and Resilient Slice Services
- Study of UAV/Drone 3GPP Standard Applicability to India Use Cases
- 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

- Edge Intelligence for haptics IoT use cases
- Performance Measurements for Dual SIM Devices
- Cloud Interoperability and Portability Standards
- Rural Broadband Services and Architecture
- Service Delivery using 5G Broadcast for TV, Radio, IPTV and File-casting

Security

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

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 (May, 2024) and TSG#101 meetings in Bengaluru (Sep 2023)

Hosting SA WG meetings in Hyderabad in Oct 2024

58 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

Conducted Workshops on 3GPP Releases

@ oneM2M

58 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

STANDARDISATION PROCESS @ TSDSI

6G @ TSDSI

6G VISION
- Composable Open network architectures
- Personalization
- My Data my ownership concerns
- Ultra High reliability
- Ultra High Broadband
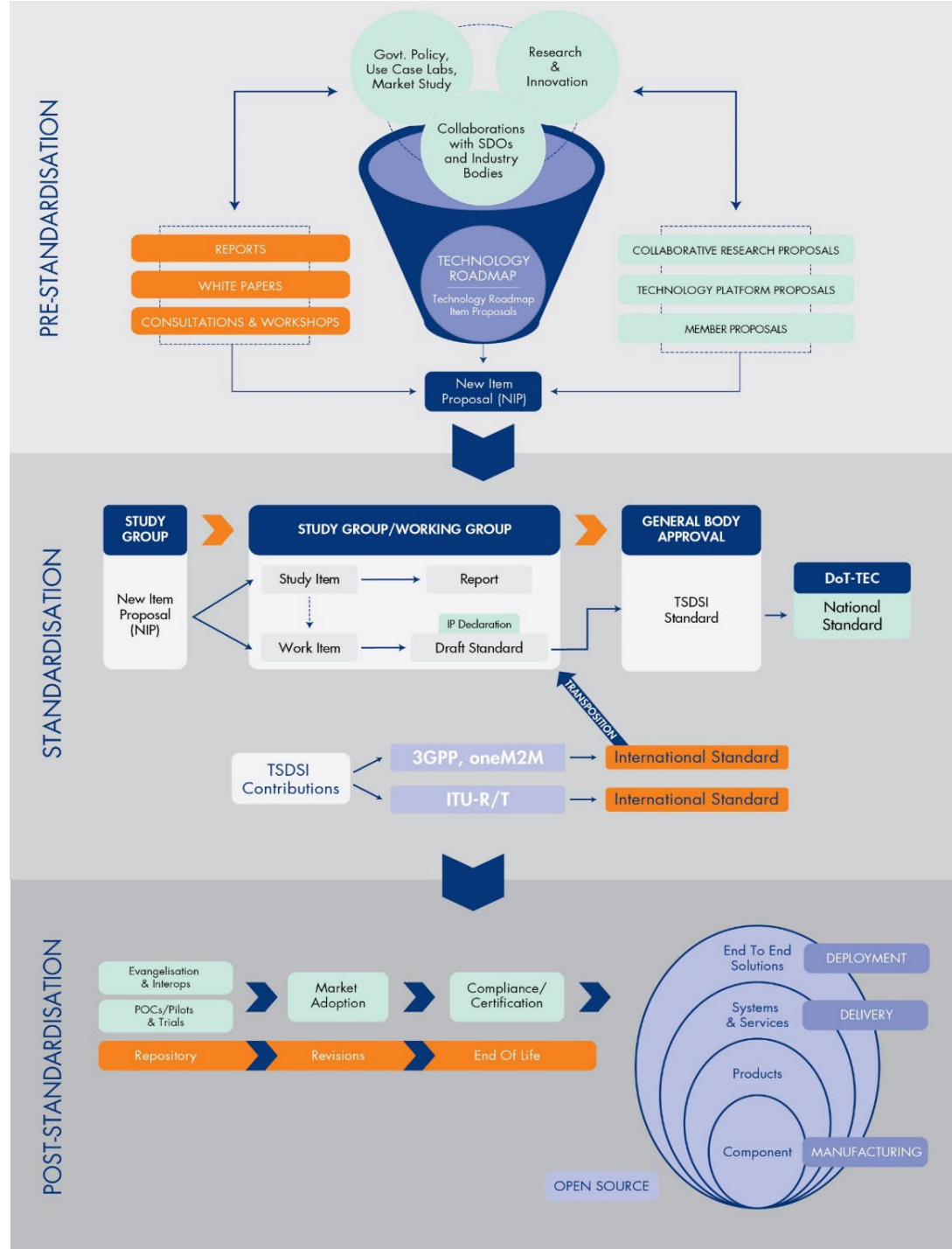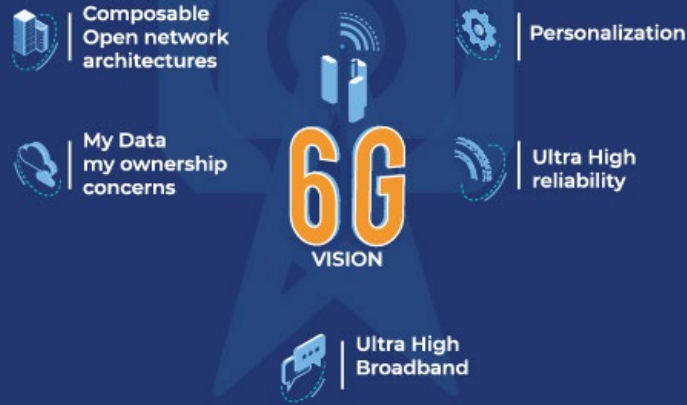
Adopted a two-pronged strategy:

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 Technolgies

- Ubiquitous connectivity / compute Experience
- Immersive Interactive Experience
- Automated Transportation
- Surveillance for industries and civic crime control
- Enabling Smart Villages / remote area accessibility including e-health and education
- Supply chain and logistics
- Industrial Internet / Tactile Internet
- Native AI andML in networks

Key Technology Enablers

- New Radio interfaces
- Combined communications and Sensing technologies
- Enhance privacy and security
- Energy efficiency and sustainability
- Coverage enhancements
  September 2024
- Native AI/ML in radio interface technologies
- Integrated terrestrial and non-terrestrial communications
- Explore new spectrum management mechanisms

TSDSI - Overview

ITU-R FRAMEWORK for IMT-2030 & TSDSI Role
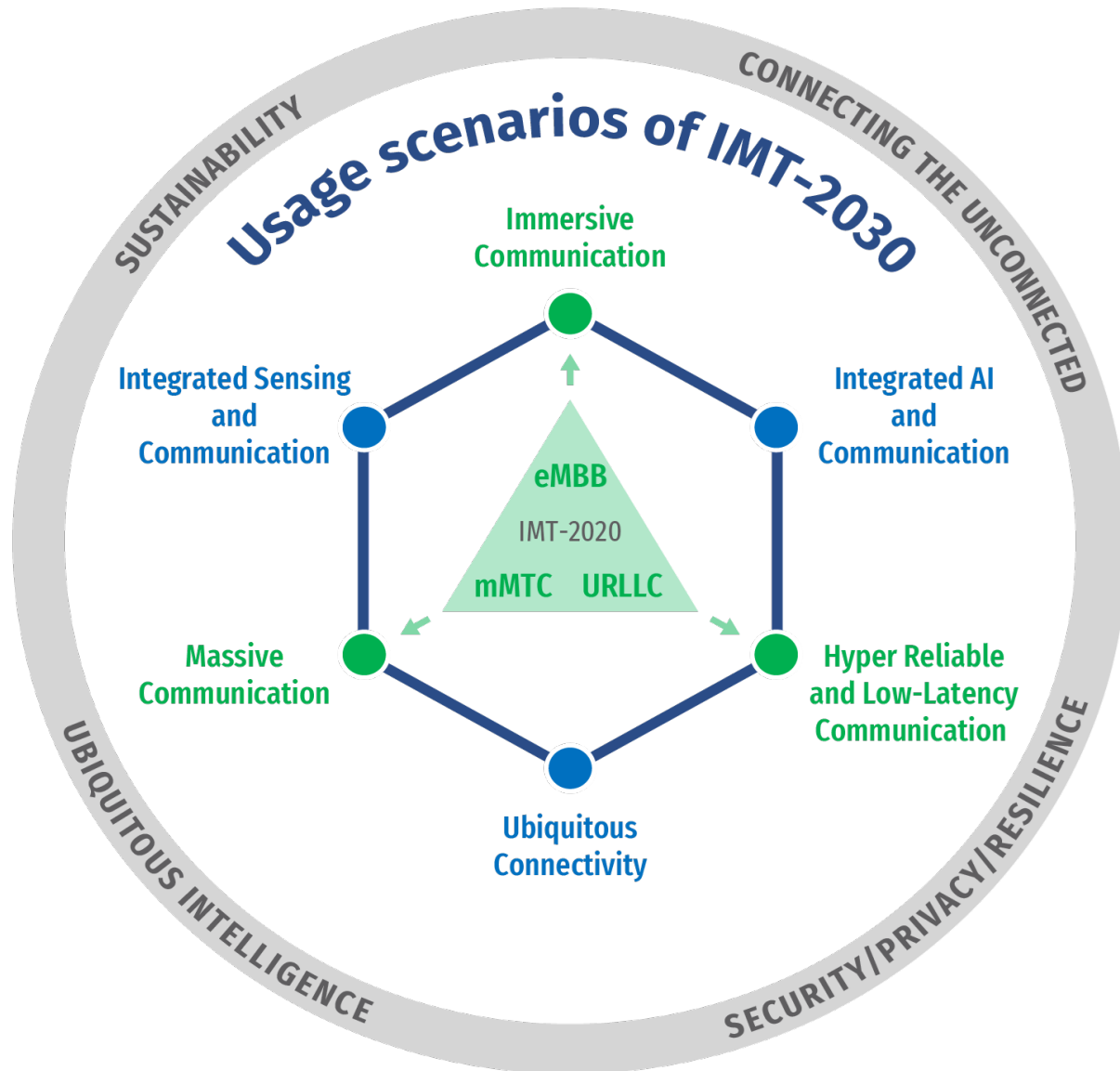
TSDSI contributed to ITU-R Framework document and Future Technology Trends document in 2021-22 and 2022-23

Current Standards Development Activities

6G / 5G Enhancements

- Architecture for 6G Communication Systems
- Coreless RAN
- AI Architecture for RAN (SON / RRM)
- Functional Split and Fronthaul Interface in FBS Driven C-RAN for 5G and Beyond
- Update to TS on Methods and interface design for RIS- assisted communication System

Broadcast Offload

- Extension of Broadcast Offload (TR Published)

Services Architecture

- Rural Broadband Services Architecture
- Cloud Interoperability & Portability
- Architecture to support tactile applications with edge intelligence over 5GS

Wireless Backhaul

- Characterization of E-band for 4G/5G Backhaul & Rural Broadband (TR Published)

Applications / Verticals

- Integrated Communication and Sensing
- Local language repository as an enabler for financial workflows
- Standardization of common data payload for adaptive traffic control system and ITS interoperability

Others

- Profile for Smart Meters

Current Technical Studies: SGN

6G / 5G Enhancements

- Handling of Diverse Services in Future Mobile Networks
- System Requirements for NR based Future Railways Mobile Communication System (FRMCS)
- Minimum Performance Spec for Mobile Devices
- Role of Edge Intelligence in a 6G Communication Network
- Network Energy Saving functionality of the 5G-Advanced system and its Evolution
- Study of Multiple Access for 6G communication
- Joint communication & sensing in 5G networks & beyond
- Study on channel modeling and physical layer requirements for near-field communication in 6G networks
- Defining qualitative metrics for 6G KPI definitions
- Study of waveforms for B5G communication systems
- Functional Split Selection & Transition for FBS-assisted C-RAN Operation in 5G and Beyond
- Dynamic joint deployment of SDN Controllers and Hypervisors

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

VLC

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

Others

- Unified network slicing model

Current Technical Studies: SGSS

Security

- Security aspects of Artificial Intelligence (AI)/Machine Learning (ML) models for 5G applications
- A location privacy-preserving scheme to mitigate the authentication relay attack under False Base Station in 5G
- Security Enablers for 6G
- 5G and Beyond Network Security Architecture to support Multilevel End-to-End User Plane Security
- Network Security
- AI/ML-based Security Implementation in Wireless Communication Systems
- Interoperability of Multi-vendor QKD Hardware using SDN

Applications / Verticals

- Easing Operations using ML/AI solution for 6G and beyond
- Public Safety Use Cases for 6G Networks
- Research directions and Collaboration on Intelligent Transport Systems Communication Standards
- Enablement of common payload for Agricultural Automation Solutions
- Semi-autonomous collaborative telerobotics
- Slice Identification in 5G RAN and Core for End-to-End Secure and Resilient Slice Service
- Suggested recommendations for sustainable 6G networks
- Recommendations for use of Dynamic AI/ML models for self-sustainable V2X applications in 6G Networks

Services Architecture

- Service requirements and reference architecture for Railways Communications using 5G
- Network Capabilities Exposure
- Enablement of common edge connectivity for public utility purposes
- Framework for AI/ML operation splitting in 6G context
- Usage of oneM2M for Smart Agriculture end-to-end monitoring use case in Indian context
- Cost model considering network assets and utilization
- Further enhancements on RBSA
- Use cases for rural connectivity
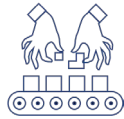- Carrier Grade Linux Specification

TSDSI Membership

TSDSI attracts members from all sections of Telecom/ICT Ecosystem
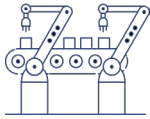
- Manufacturers with Indian IP
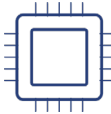- Domestic Manufacturers
- Telecom Service Providers
- Other Services
- R&D Organizations
- Semiconductor components designer/manufacturer
- Manufacturer of Mobile Device/CPE End User Devices
- Government Department/Autonomous Bodies
- Developers of Application solution/Service Platform
- Academic Institutions

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	• Participate in and Contribute to Technical Activities • Participate in Decision making and voting • Eligible to hold office bearer positions
Associate	Industry Associations, Foreign Entities, Foreign Industry Associations	Participate in & Contribute to Technical Activities
Guest	Organizations who wish to explore the need for becoming a member before taking up Corporate or Associate Membership, can be granted, on request Guest Membership for a period of 6 months.	Participate in Technical Activities and contribute on invitation

Join Us

Member List

THANK YOU

✉ secretariat@tsdsi.in