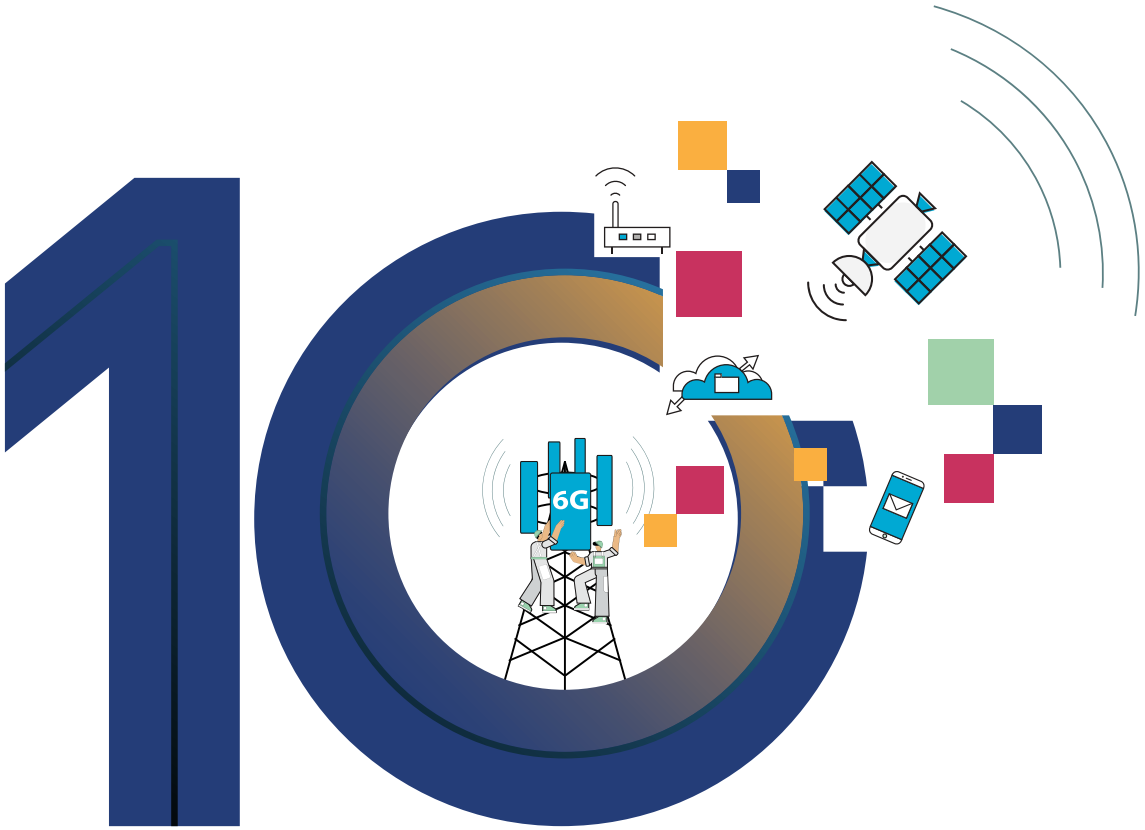
tsdsi
India's Telecom SDO

Telecommunications Standards Development Society, India



Years of developing ICT Standards

Standardization Process & Study Group-Networks

Induction Program on TSDSI

20.6.2024

AK Mittal
Advisor- Networks, Systems & Technologies
TSDSI

Types of Standardization in TSDSI

- TSDSI develops its own organic standards through contribution of members

- TSDSI also develops standards through transposition
  -by converting the specifications of partner organizations into own standards
  -having the copy right and distribution rights on the transposed specifications

- Other type of standardization is through adoption of standards under agreement with third party developers
  - by converting the specifications of partner organizations into own standards
  - generally having limited copy right and distribution right as per the terms of agreement

IPR Policy

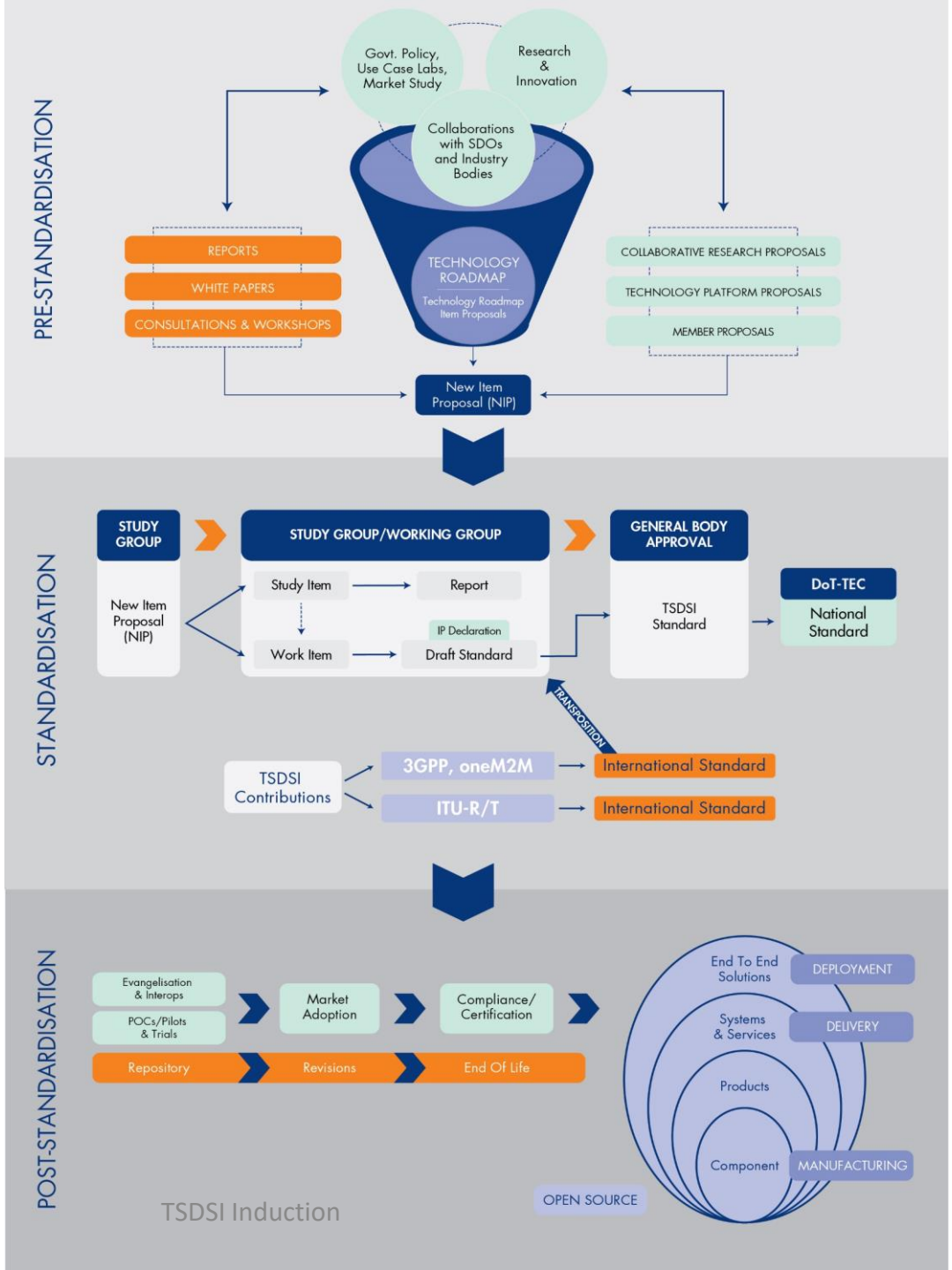
- Development of standards invariably leads to creation of patents on the innovative solutions from the members included in the standard.

- For the users of standards, it is essential the licenses for the patents are made available in a timely manner

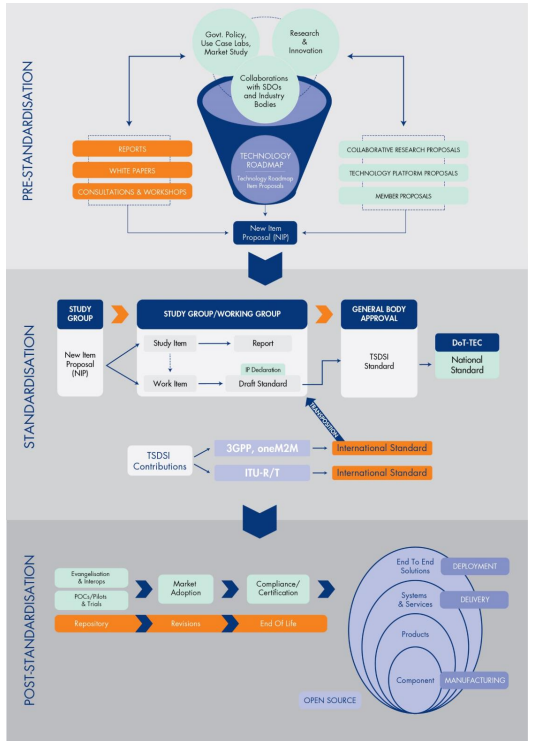
- Every SDO has a patent licensing policy or IPR policy which requires members to disclose their patents and provide undertaking to the SDO that licenses will be granted on Fair, Reasonable and Non-Discriminatory terms

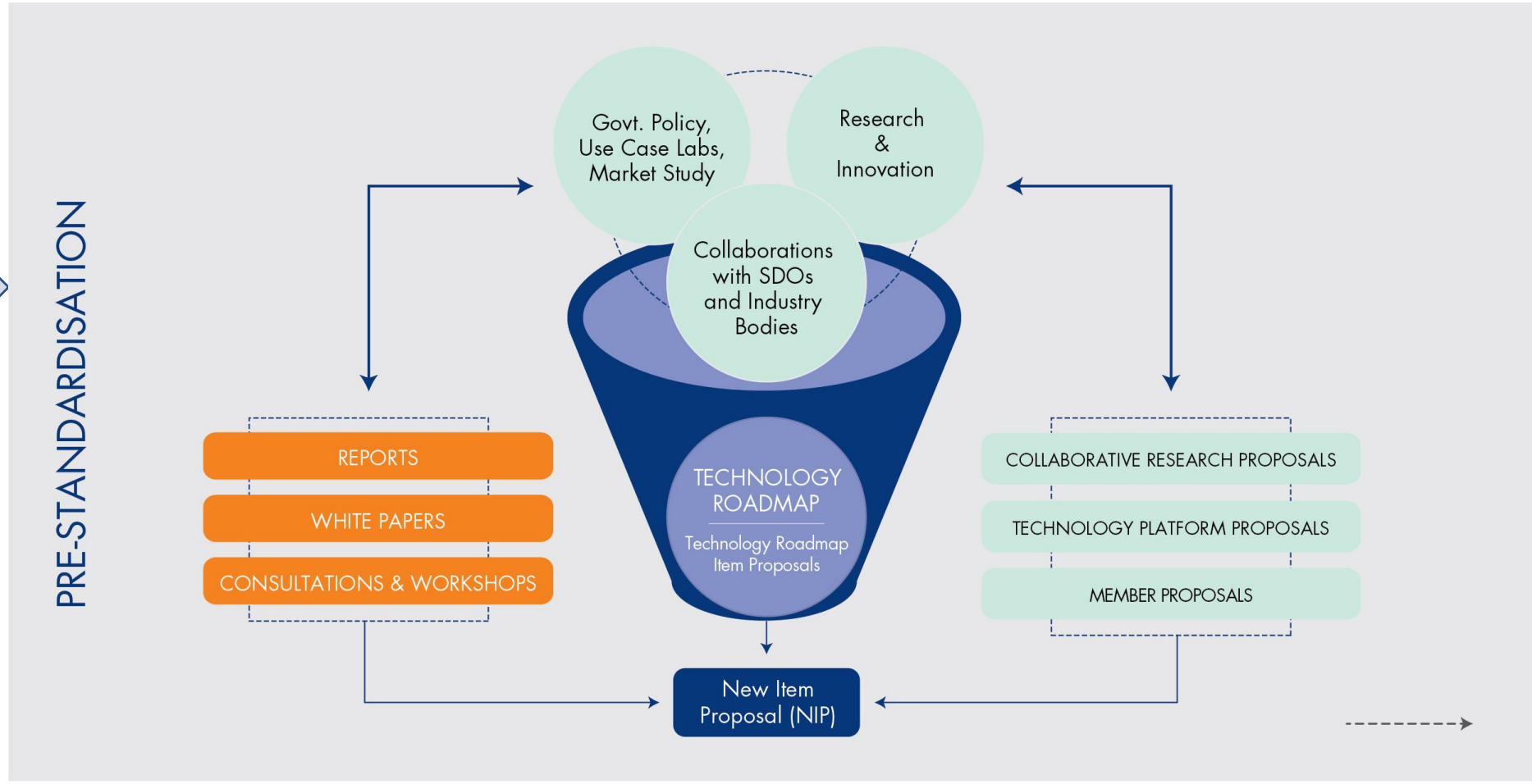
- TSDSI has its IPR policy which also aligned with many of the other SDOs globally, especially the member SDOs of 3GPP and oneM2M. Key provisions on licensing are also compliant to ITU IPR policy
- TSDSI members to declare their patents in TSDSI, 3GPP and oneM2M standards to TSDSI

STANDARDIZATION PROCESS @TSDSI

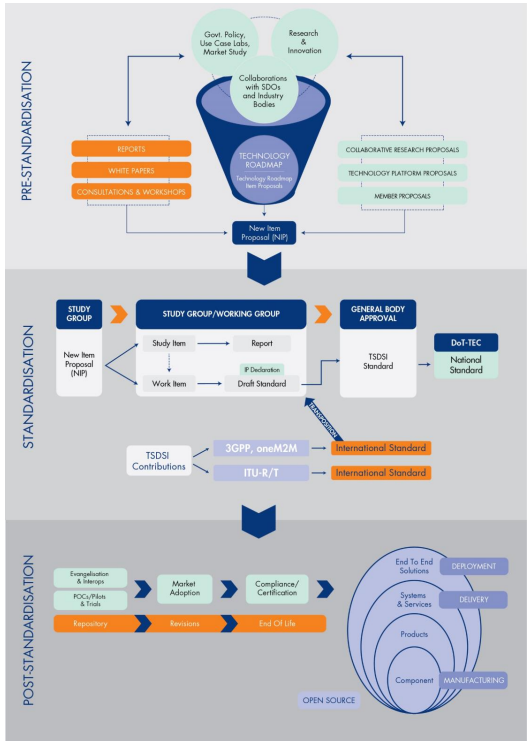


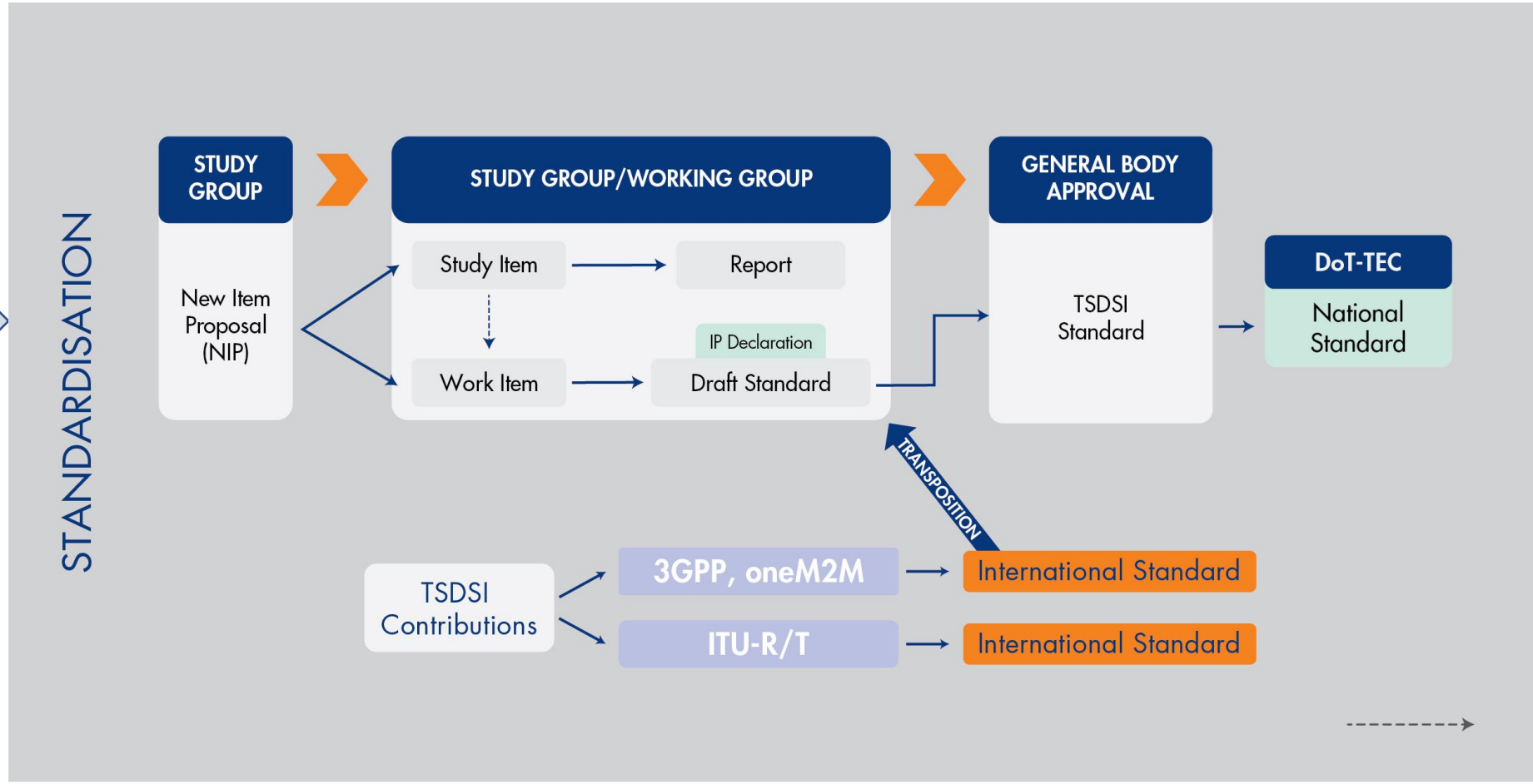
PRE-STANDARDIZATION STAGE



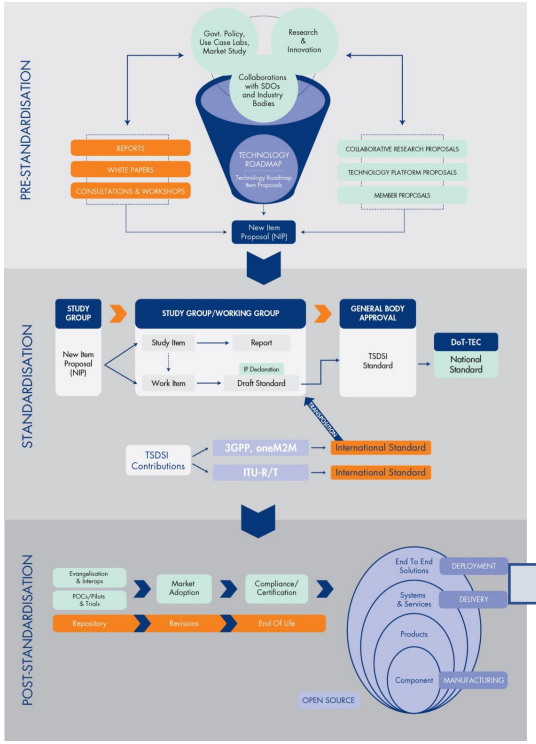


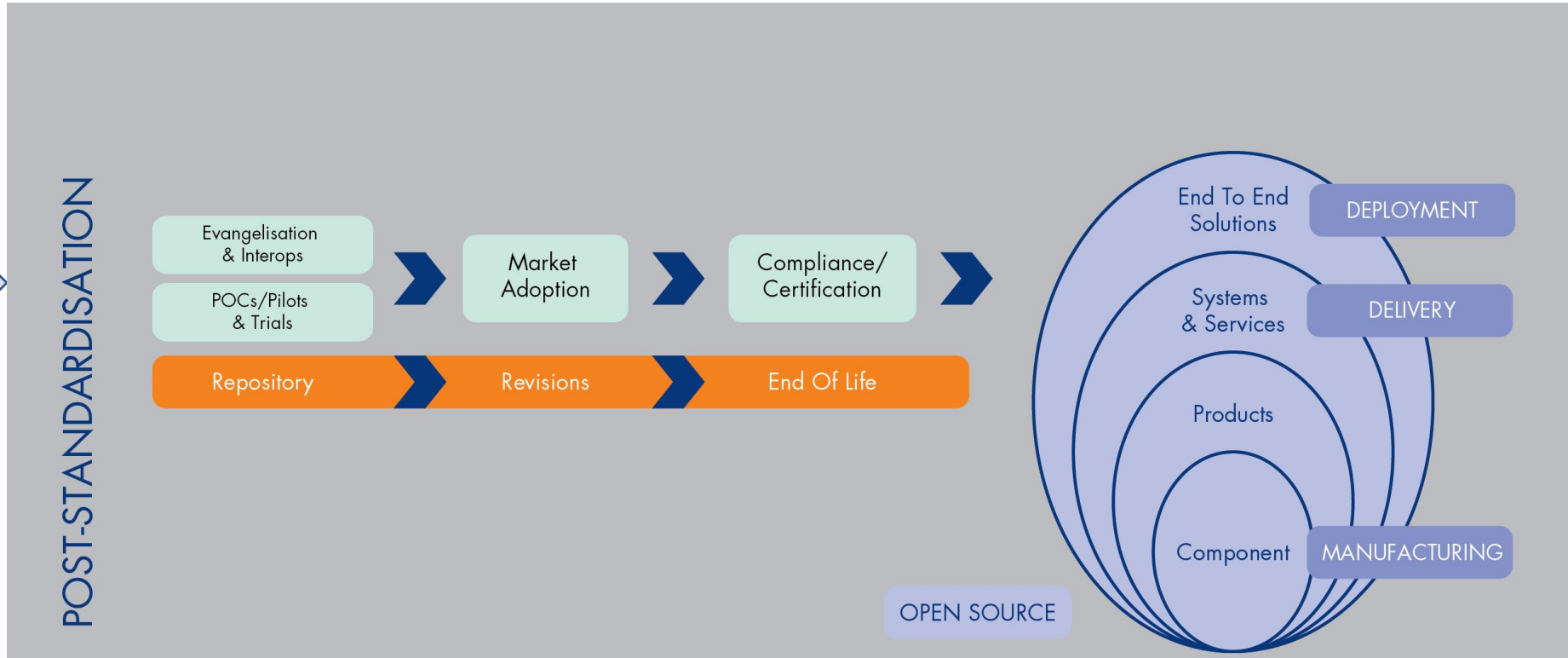
STANDARDIZATION STAGE



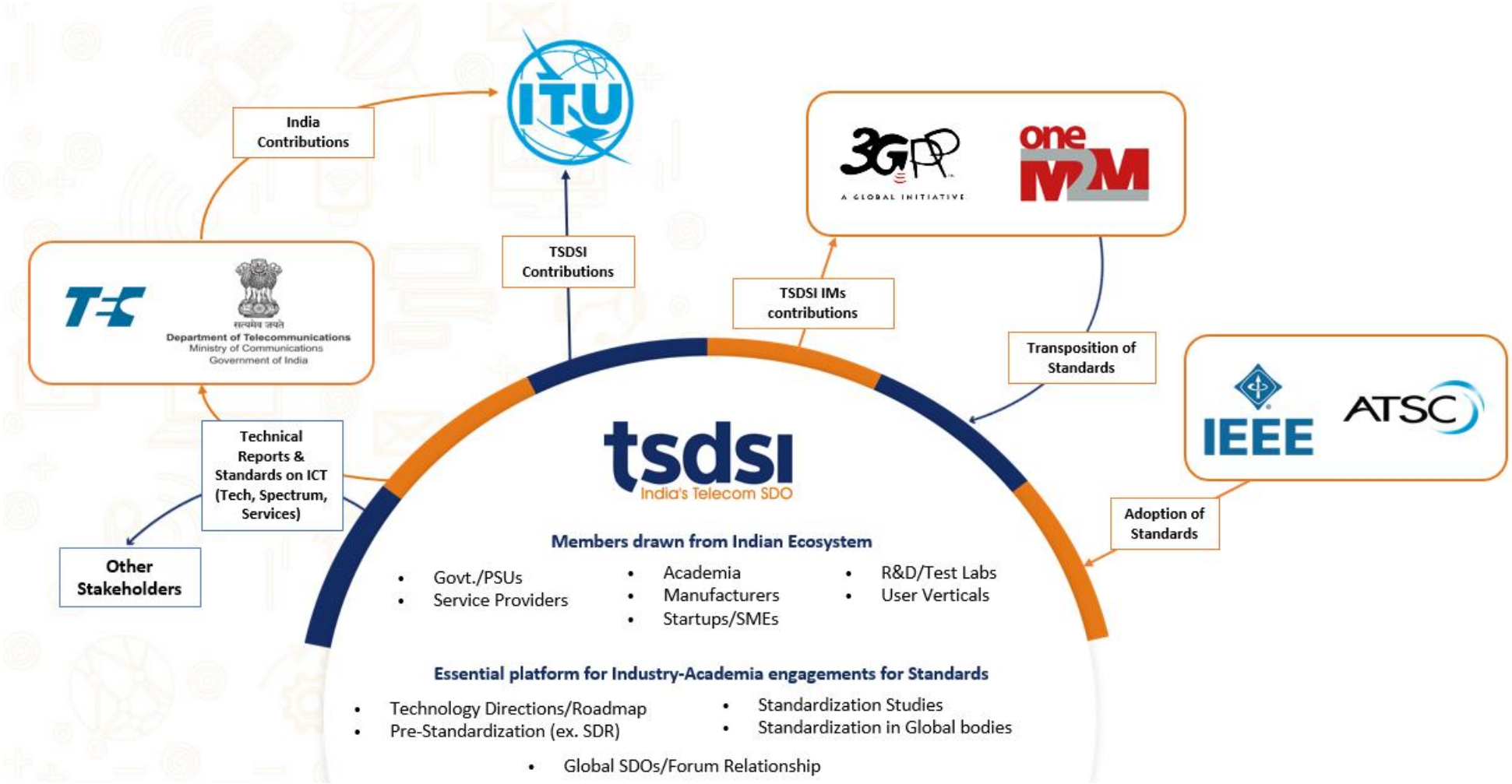


POST-STANDARDIZATION STAGE

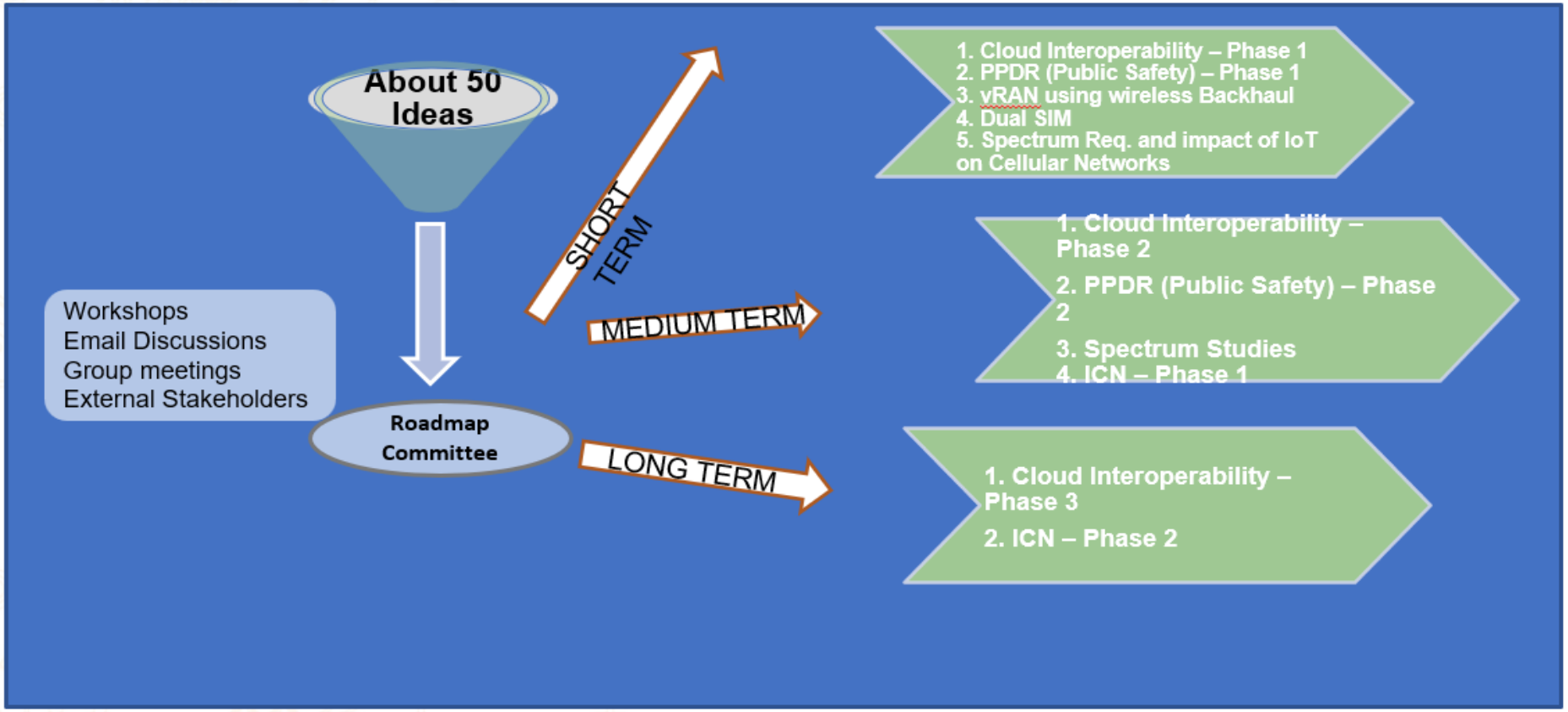




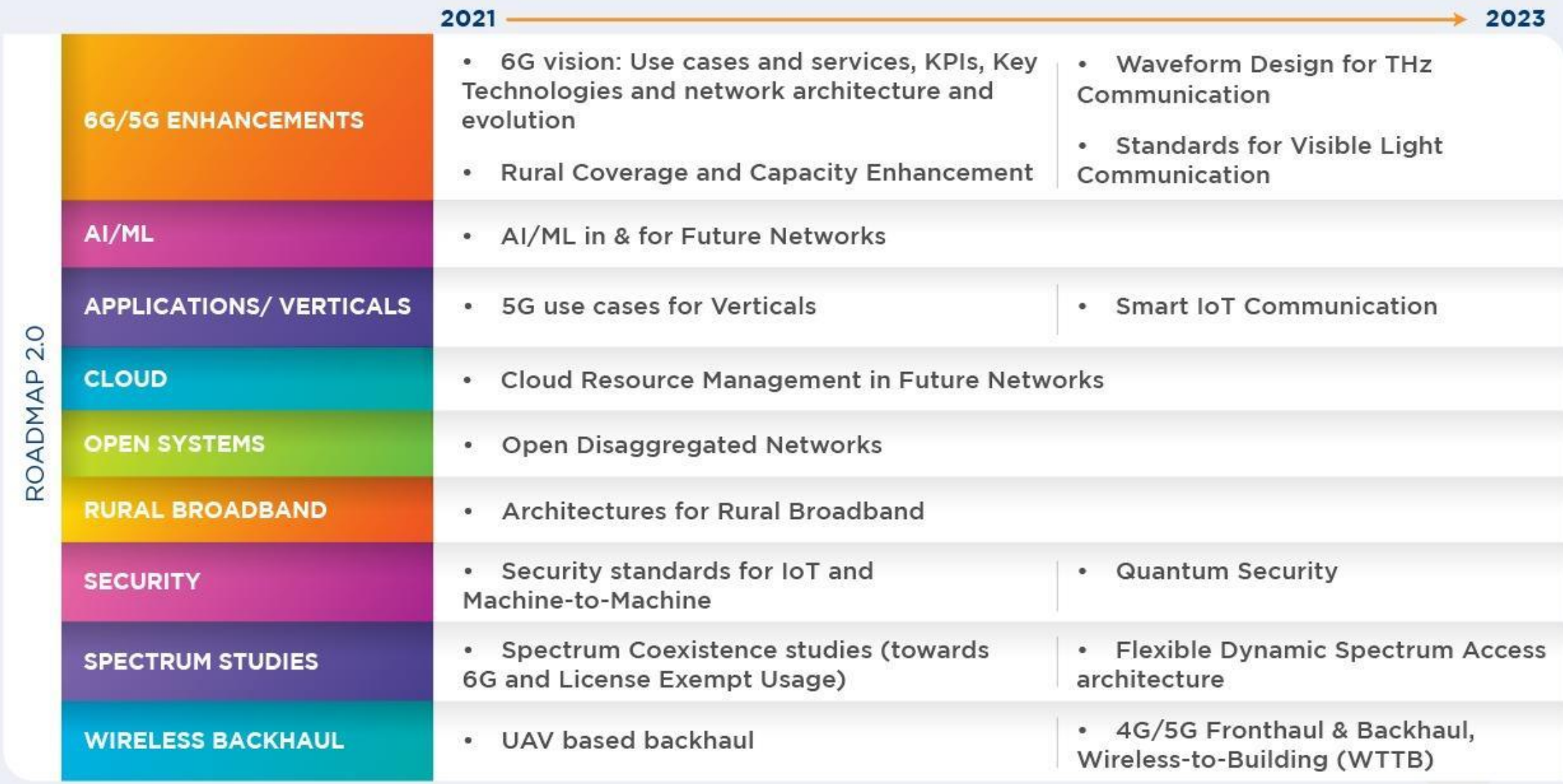
TSDSI – ESSENTIAL ENABLER FOR GLOBAL STANDARDS



TSDSI Roadmap 1.0 (2018-20)



TSDSI ROADMAP 2.0



Roadmap Workshop

Vision: to evolve Roadmap 3.0 for period 2024-26

29th Nov, 2023	16th Jan, 2024	14th Feb, 2024	3.0
Call for Proposal	Roadmap Workshop	RC Review & next steps	

TSDSI members, Academia, Industry, Start-ups, Eqt manufacturers, R&D org, Govt Dept & SMEs

159 Participants
26 Proposals

- ✓ Strong participation in this Roadmap Workshop with 26 proposals.
- ✓ Online poll conducted during the workshop for gathering interest and support for the proposals from the members
- ✓ From the poll result, it was noted that each proposal has sufficient support; filtering/dropping of proposals not necessary
- ✓ Some topics have been carried forward from Roadmap 2.0

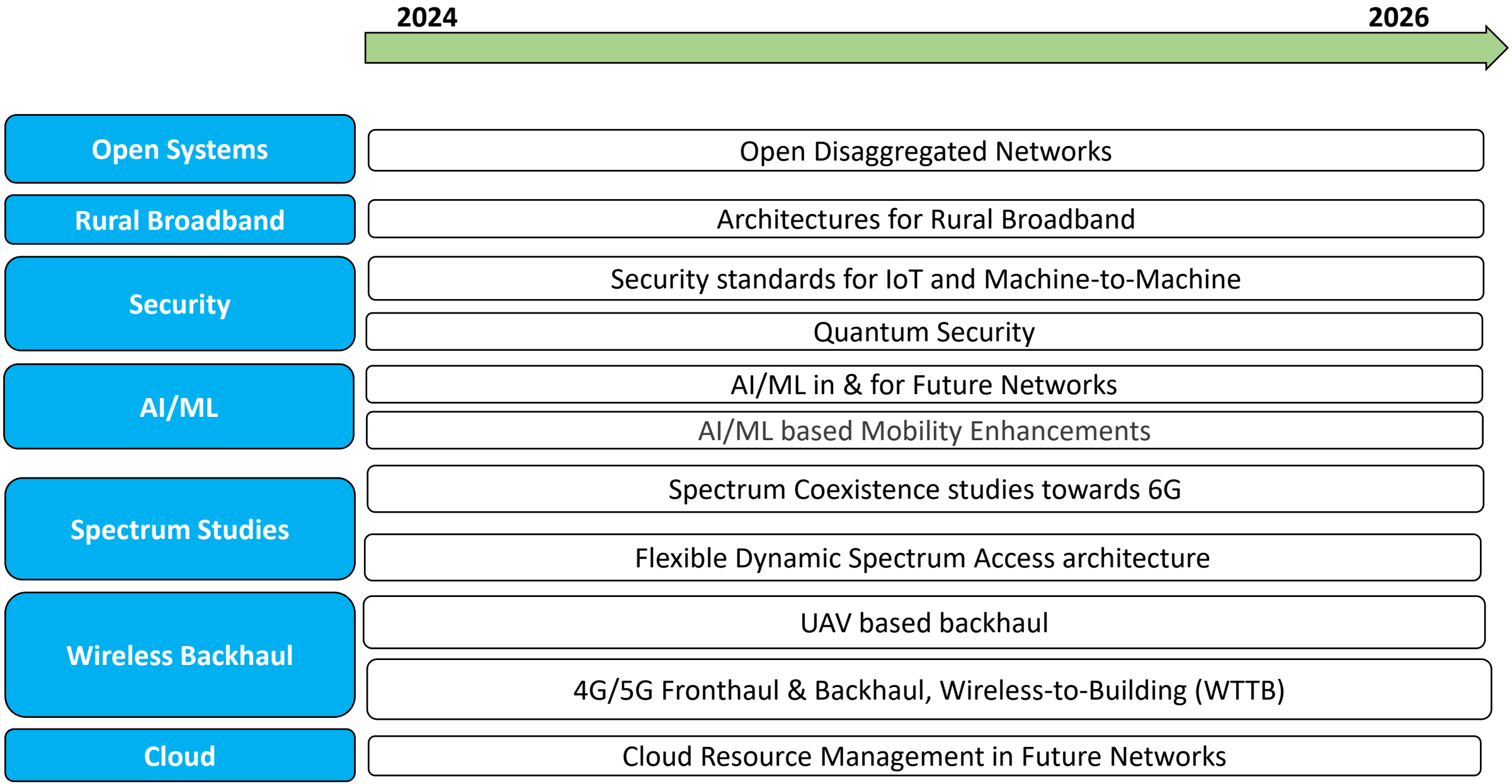
- ✓ Proposals to be taken up in **study groups in a phased manner**
- ✓ Plan to **develop a visualization for monitoring the status of progress** of various topics of Roadmap 3.0
- ✓ **Some areas like "Cloud and Core networks" are under-represented. GC may recommend ways to increase participation in these areas**

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


2024
2026
Open Systems
Open Disaggregated Networks
Rural Broadband
Architectures for Rural Broadband
Security
Security standards for IoT and Machine-to-Machine
Quantum Security
AI/ML
AI/ML in & for Future Networks
AI/ML based Mobility Enhancements
Spectrum Studies
Spectrum Coexistence studies towards 6G
Flexible Dynamic Spectrum Access architecture
Wireless Backhaul
UAV based backhaul
4G/5G Fronthaul & Backhaul, Wireless-to-Building (WTTB)
Cloud
Cloud Resource Management in Future Networks

Visible Light Communication	Standards for Visible Light Communication
	Standardization of FSO systems for broadband communication
NTN	Positioning in 6G Communication networks using Multi GNSS including NavIC
	Multi dimensional mutihop non terrestrial networks with BS functionality onboard
ITS	Standard and regulations for Autonomous driving System
	Reference Architecture for Automated Electric Road Transportation
	Connected Multi-Modal Transportation
Quantum Communications	Next generation secure, adaptable and cost-effective solutions for Quantum security
	Quantum communication, security and modelling
	Trusted node testing
	Under water QKD
	PQC in embedded systems and Device Biometrics

Relation of Roadmap topics and Study Groups work

- Topics included in the Roadmap are based on willingness of TSDSI members to drive technical work in study groups in the time horizon of the Roadmap
- Members are free to choose the time and scope of work for the topic for introducing a NIP in the relevant study group
- Roadmap is indicative of a broad direction of work in TSDSI for information of its members and other stakeholders
- Study Groups can entertain proposals on other topics as well though not part of the Roadmap

ToR for SGN

SG-Networks is responsible for standardization activities for the following:

•1) Wireless communication systems including Radio-based access and Mobile core networks, the functional elements constituting these networks and the interfaces between these networks.

•2) Overall system architecture as well as the protocol interface between various user equipment or customer premises equipment and the elements in the access network e.g. base stations, relay stations, etc.

•3) Software defined networking (SDN) aspects and Network function virtualization (NFV) of the access and core networks.

•4) Backhaul using wireless & wireline, microwave, optical and/or packet based transport networks and related SDN & NFV aspects, systems, equipments, optical fiber cables, along with the related control plane, network management, performance monitoring & reporting, synchronization, interfaces, multi-layer optimization techniques and testing aspects.

•5) Spectrum studies related to the above areas, and technical recommendations.

•6) Interference studies including co-channel, adjacent channel, and inter-system interference.

•7) SG-Networks is also responsible for liaison for regulatory aspects between TSDSI and external govt. agencies on the above topics as required, in coordination with TSDSI secretariat

•SG-Networks works closely with SG-Services&Solutions for service-level requirements

Update on Ongoing Study / Work Items (1/4)

Study Items in SGN

S No.	Active Study Items	Category	% status	Proponent name
1.	Profile for Smart Meters (SI131)	Others	10%	Airtel (Saurabh Mittal)
2.	Handling of Diverse Services in Future Mobile Networks (SI130)	5G Enhancements	10%	IIT Bombay(Rashmi Kamran Bhatia)/ IIT Kanpur (Rashmi Yadav)
3.	System Requirements for NR based Future Railways Mobile Communication System (FRMCS) (SI129)	5G Enhancements	10%	Nokia (Siddharth Das)
4.	Study of the channel model for integrated sensing and communication network in FR3 and THz band (SI128)	Spectrum Studies	10%	HFCL (Sonali)
5.	Functional Split Selection & Transition for FBS-assisted C-RAN Operation in 5G and Beyond (SI127)	5G Enhancements	10%	Debarati Sen (IIT Kharagpur)
6.	Minimum Performance Spec for Mobile Devices (SI122)	5G Enhancements	25%	Qualcomm (Vinosh James)
7.	Minimum Performance Spec for the Communication Edge (SI121)	5G Enhancements	10%	Qualcomm (Vinosh James)
8.	Solar Panel Based Optical Wireless Communication (SI120)	VLC	10%	IIIT Delhi Vivek Ashok Bohara

Update on Ongoing Study / Work Items (2/4)

Study Items in SGN

S No.	Active Study Items	Category	% status	Proponent name
9.	Technical Report on Network Energy Saving functionality of the 5G-Advanced system and its Evolution (SI119)	5G Enhancements	25%	Nokia (Srinivasan Selvaganapathy)
10.	Enhancement to media access control (MAC) protocols for visible light communication (VLC) in indoor scenarios (SI118)	VLC	25%	IIT Delhi (Abhishek Dixit)
11.	Characterization of E-band for point-to-multipoint backhaul (SI117)	Wireless Backhaul	25%	Astrome Technologies (Phalguni Mathur)
12.	Study of Multiple Access for 6G communication(NIP322-SI110)	6G	25%	IIT Kharagpur (Dr. Suvra Sekhar Das)
13.	Unified network slicing model (NIP316-SI109)	5G Enhancements	10%	IIT Delhi (Prof Brejesh Lall)
14.	Joint communication & sensing in 5G networks & beyond (NIP308-SI108)	6G	25%	Reliance Jio(Vinay Shrivastava)
15.	Study on channel modeling and physical layer requirements for near-field communication in 6G networks (NIP312-SI107)	6G	30%	CEWiT (Mohammed Ershadh)
16.	A Case Study for Sub-THz Channel Modeling(NIP 294-SI100)	Spectrum Studies	10%	IIT Kharagpur (Debarati Sen)

Update on Ongoing Study / Work Items (3/4)

Study Items in SGN

S No.	Active Study Items	Category	% status	Proponent name
17.	Defining qualitative metrics for 6G KPI definitions (NIP 295 -SI97)	6G	10%	Reliance Jio (Satish Jamadagni)
18.	Study of waveforms for B5G communication systems(NIP 288- SI96)	6G	25%	Reliance Jio (Vinay Shrivastava)
19.	Dynamic joint deployment of SDN Controllers and Hypervisors (NIP 251-SI 80)	5G Enhancements	10%	IIT-KGP(Deborsi Basu and Prof. Raja Datta)

Update on Ongoing Study / Work Items (4/4)

Work Items in SGN

S No.	Active Work Items	Category	% status	Proponent name
1	Coreless RAN (WI1-NIP291)	6G	25%	Reliance Jio Infocomm Ltd (Pradeep Hirisave)
2	New Architecture for 6G Communication Systems (WI1-NIP290)	6G	25%	Reliance Jio(Satish Jamadagni)
3	AI Architecture for RAN (SON / RRM) (WI1-NIP292)	6G	25%	Reliance Jio(Satish Jamadagni)
4	Methods and Interface Design for RIS-assisted Communications Systems(WI-NIP284 v3.0.0)	6G	100% (TS under approval)	IIT Bhilai (Dr. Arzad Alam)
5	Extension of Broadcast Offload (WI1-NIP226)	Broadcast Offload	50% (TR Released)	Saankhya Labs/Tejas Networks (Anindya Saha)
6	Evaluation of the existing IAB architecture in 5G Networks (WI1-NIP248)	Wireless Backhaul	100% (TS Published)	IIT-Bombay (Pranav Jha)
7	Characterization of E-band for 4G/5G Backhaul & Rural Broadband (WI1-NIP258)	Wireless Backhaul	50% (TR Released)	Astrome (Phalguni)
8	Functional Split and Fronthaul Interface in FBS Driven C-RAN for 5G and Beyond (WI1-NIP270)	5G Enhancements	50% (TR Released)	IIT Kharagpur(Debarati Sen)

Technical Reports released by SGN

S No.	Reports released by SGN	Publish Date
1	5G Extensions for Broadcast Offload	March 2024
2	Functional Split and Fronthaul Interface in FBS Driven C-RAN for 5G and Beyond	September 2023
3	Characterization of E-band for 4G/5G Backhaul & Rural Broadband	August 2023
4	Limitations of the Existing Relay (IAB) Architecture in 3GPP 4G LTE & 5G Networks(TSDSI TR 6022 V1.0.0)[WI1-NIP248]	May 2023
5	Study of 6 GHz spectrum for IMT services in India(TSDSI TR 6020 V1.0.0)[SI73]	September 2022
6	6G: Use cases, Requirements and Enabling Technologies(TSDSI TR 6017 V1.0.0)[SI70]	July 2022
7	Visible Light Communication/Li-Fi(TSDSI TR 6016 V1.0.0)[SI89]	June 2022
8	Open Disaggregated RAN(TSDSI TR 6011 V1.0.0)[SI81]	September 2021
9	Study on enhancements of flexible UL/DL resource utilization(TSDSI TR 6010 V1.0.0)[SI66]	May 2021
10	NB-IoT capabilities for Energy Metering (TSDSI TR 6009 V1.0.0) [SI 79]	May 2021
11	Performance Requirement Measurements for Dual SIM (TSDSI TR 6003 V1.0.0) [SI65]	September 2019
12	Channel Characteristics of 60GHz for 4G/5G Backhaul (TSDSI TR 6004 V1.0.0) [SI 59]	September 2019
13	Broadcast offload (TSDSI TR 6002 V1.0.0) [SI 63]	September 2019

Technical Standards developed in SGN

S No.	Standards released by SGN	Publish Date
1	Methods and Interface Design for RIS-assisted Communications Systems(WI-NIP284 v3.0.0)	**TS under GBM approval**
2	A Generic Relay Architecture for 5G and Beyond	June 2024
3	5Gi Standard	October 2020
4	CPRI Fronthaul Standard	July 2018

ACCOMPLISHMENTS

Group	Technical Reports Published	Technical Standards Published
Study Group-Networks	13	9749
Study Group-Services & Solutions	133	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 ATSC3.0 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

RESOURCES

- Visit **https://tsdsi.in/about/** for more information on TSDSI
- Introductory Video on TSDSI **@ https://tsdsi.in/introductory-video-of-tsdsi/**
- TSDSI Standards **https://tsdsi.in/published-standards/**
- TSDSI Transposed Standards at **https://tsdsi.in/3gpp/** and **https://tsdsi.in/onem2m/**
- TSDSI Technical Reports from **https://tsdsi.in/tr/**
- TSDSI White Papers:
  - 6G at **link here**
  - Status of Telecom Startup Ecosystem in India at **link here**
  - Focus on Open-Source for 5G at **link here**
  - Privacy and Personal Data Protection on Mobile Devices at **link here**
- Download our monthly bulletins from **https://tsdsi.in/tsdsi-monthly-bulletin/ and newsletters from https://tsdsi.in/newsletter/**

Thank You