

HOW 5G CAN PLAY A CRUCIAL ROLE IN AGRICULTURE, HEALTHCARE, SMART CITIES AND OTHER INDUSTRIES GROWTH IN INDIA?

Application Layer Standards & USE CASE LABS for 5G & beyond

PAMELA KUMAR

JUNE 27, 2019

AGENDA

- Riding the wave of 5G – LEAD THE CHANGE
- Global Landscape
- Indian initiatives and proposed roadmap

LEAD – WHAT IS CHANGING? WHAT IS TECHNOLOGY DISRUPTING?

Life is changing

Enabled by
Technology,

Applications of
Technology

Different ways

Live, work, play
and go to war

Future X Network at work



New Technology stack

**FinTech, Edutech, Agritech,
Smart Cities, Villages,
Industry 4.0;
Joint warfare ; Smart
Warfare**



Vehicle-to-vehicle

Farm automation?



THE TELECOM ANALOGY

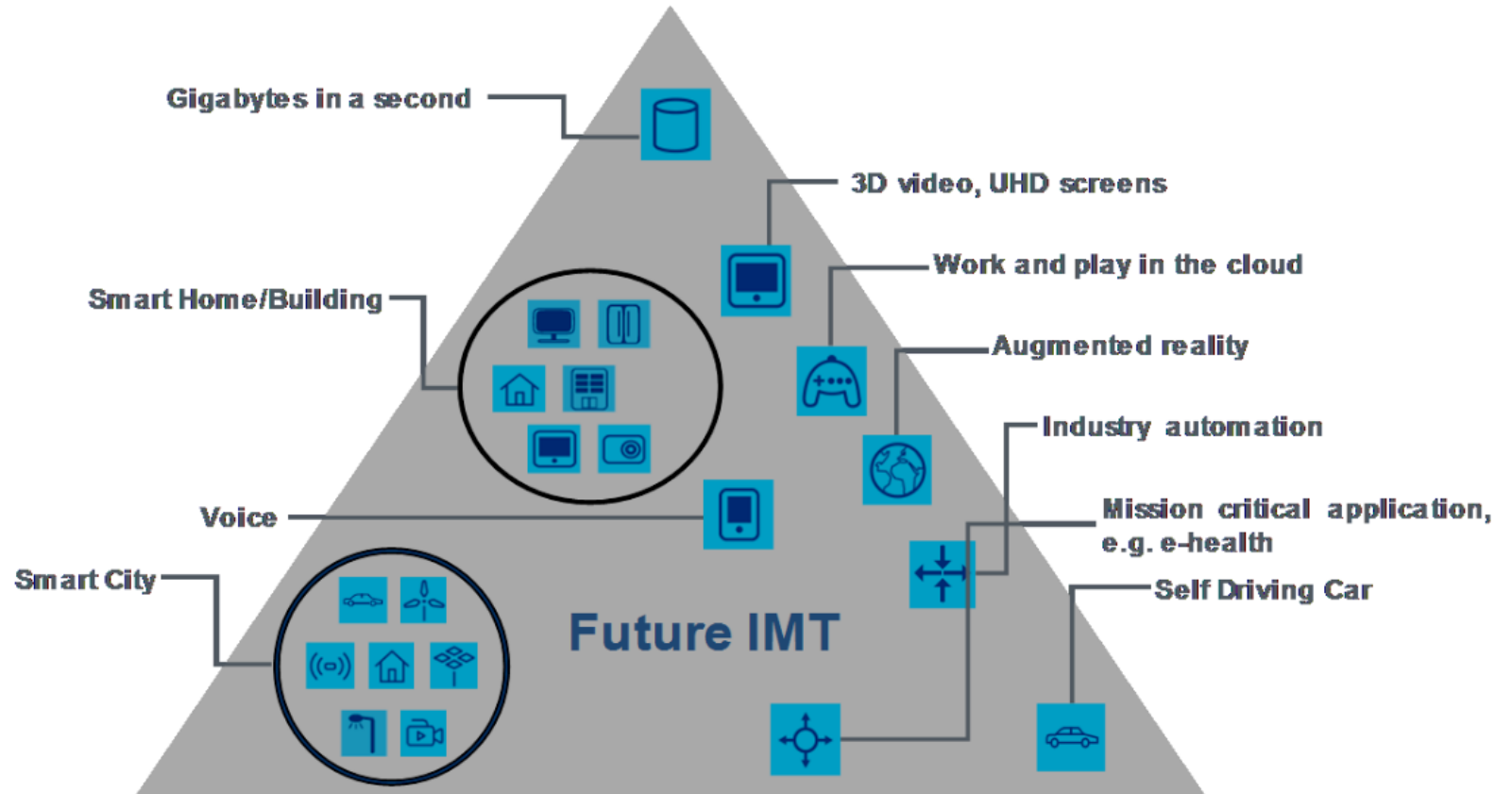
Telecom Revolution
PHASE 1

Hockey Stick of
Indian Telecom

Engineering
the future

5G Usage scenarios

Enhanced Mobile Broadband

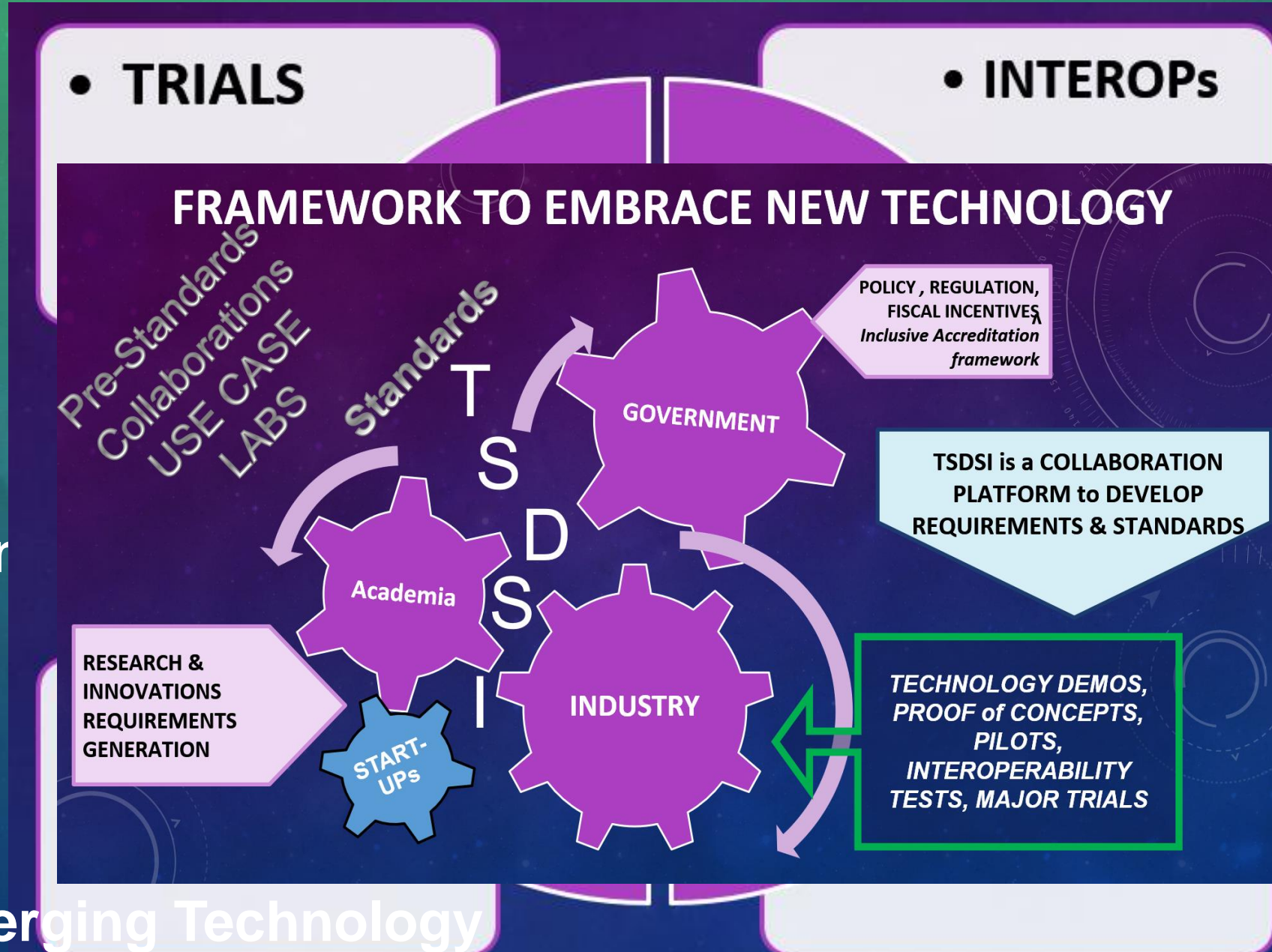


Massive Machine Type
Communications

Ultra-reliable and Low Latency
Communications

CHANGE – WHAT NEEDS TO CHANGE ?

Collaboration &
Hardening of
technology before
Acquisition
influence direction
of Technology,
Generational
LEAPFROG by
Embracing emerging Technology



AGENDA

- Riding the wave of 5G – LEAD THE CHANGE
- Global Landscape
- Indian initiatives and proposed roadmap

The 22nd meeting of the Global Standards Collaboration (GSC), a high-level gathering of the world's leading information and communication technologies (ICT) standards organizations,

GSC | 22
MONTREUX, SWITZERLAND

GSC 22 : Smart Sustainable Cities & Artificial Intelligence
GSC 21 : Smart Cities, Autonomous Systems; Intelligent Transport Systems



7/1/2019

7

Application Layer Standards @ITU

ITU-T Study Groups

- [SG2 - Operational aspects](#)
- [SG3 - Economic and policy issues](#)
- [SG5 - Environment and circular economy](#)
- [SG9 - Broadband cable and TV](#)
- [SG11 - Protocols and test specifications](#)
- [SG12 - Performance, QoS and QoE](#)
- [SG13 - Future networks \(& cloud\)](#)
- [SG15 - Transport, access and home](#)
- [SG16 - Multimedia](#)
- [SG17 - Security](#)
- [SG20 - IoT, smart cities & communities](#)

ITU-T Focus Groups

- [ITU-T Focus Group on Technologies for Network 2030 \(FG NET-2030\)](#)
- [ITU-T Focus Group on Machine Learning for Future Networks including 5G \(FG ML5G\)](#)
- [ITU-T Focus Group on Application of Distributed Ledger Technology \(FG DLT\)](#)
- [ITU-T Focus Group on Digital Currency including Digital Fiat Currency \(FG DFC\)](#)
- [ITU-T Focus Group on Data Processing and Management to support IoT and Smart Cities & Communities \(FG-DPM\)](#)

ITU-R Study Groups

- SG 1 Spectrum Management
- SG 3 Radio wave propagation
- SG 4 Satellite services
- SG 5 Terrestrial services
- SG 6 Broadcasting service
- SG 7 Science services

- www.itu.int/ITU-R/go/rsg1
- www.itu.int/ITU-R/go/rsg3
- www.itu.int/ITU-R/go/rsg4
- www.itu.int/ITU-R/go/rsg5
- www.itu.int/ITU-R/go/rsg6
- www.itu.int/ITU-R/go/rsg7

ITU-R WP5D – IMT. Specific Industry Applications

New members at ITU

Insurance



Space



Fintech



Quantum



OTTs



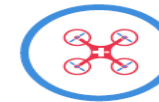
Automotive



IoT



MVNOs/
MVNEs

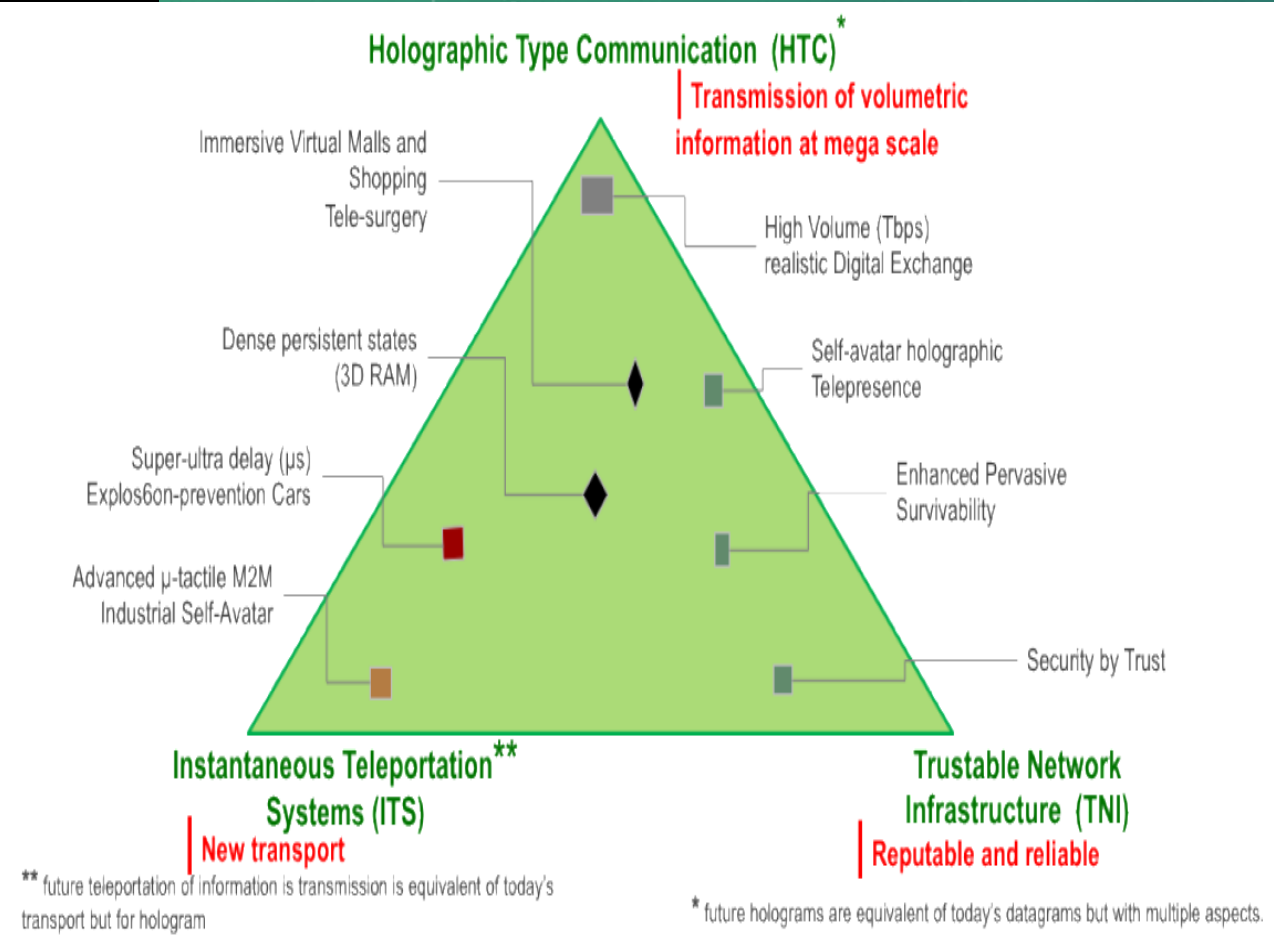
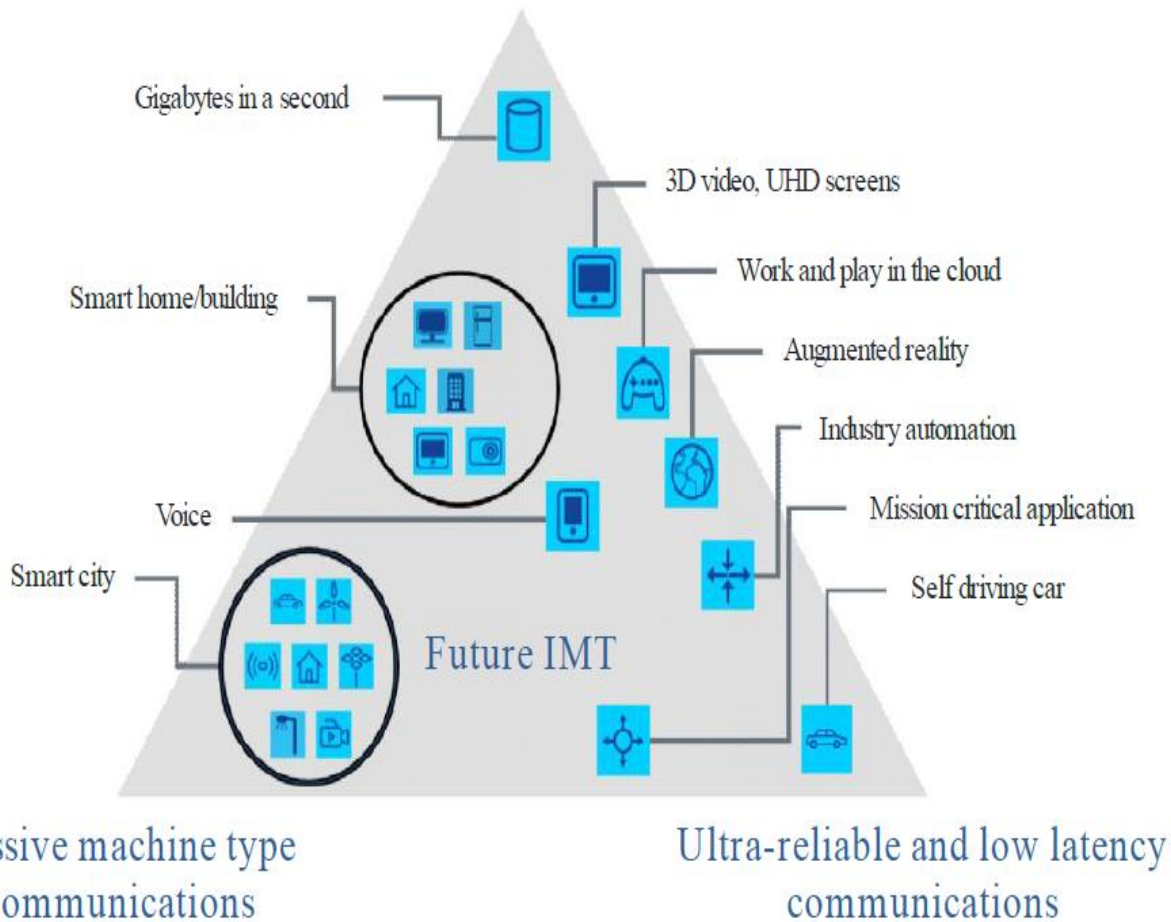


UAVs



Utilities

IMT 2020



and in 2030....

IEEE STANDARDS ASSOCIATION APPLICATION LAYER

Technology Frontiers

Sustainable and clean electrical energy (decarbonizing the grid)
IoT and infrastructure
Telecommunications and connectivity

Healthcare and data governance
Mobility and transportation
Life sciences and technology

Beyond Functional Design @ the IEEE-SA

Digital Identity & Inclusion Through Trust & Agency

Ethically Aligned Design in Autonomous & Intelligent Systems

Some examples of 5G Application Layer related standards

- IEEE 802.11p/1609 to enable vehicle-to-everything (V2X) communication for the automotive sector.
- IEEE 2030 series on the Smart Grid, including electric vehicle infrastructure
 - IEEE 2030-2011, IEEE Guide for Smart Grid Interoperability of Energy Technology and Information Technology Operation with the Electric Power System (EPS), and End-Use Applications and Loads
- Other Standards and Standards Projects under Development
 - IEEE 1931.1, Architectural Framework for Real-time Onsite Operations Facilitation (ROOF) for the Internet of Things
 - IEEE P1589, Augmented Reality Learning Experience Modes
 - IEEE P2301/2302 – Cloud Portability & Interoperability; InterCloud Interoperability & Federation

ISO/IEC - APPLICATION LAYER STANDARDS

Smart Cities & Internet of Things	Artificial Intelligence	Cybersecurity
<p>30165 Real-time IoT framework</p> <p>30164 Edge Computing</p> <p>30163 System requirements of IoT/SN technology-based integrated platform for chattel asset monitoring supporting financial services</p> <p>30162 Compatibility requirements and model for devices within industrial IoT systems</p> <p>30161 Requirements of IoT data exchange platform for IoT services</p> <p>30149 Trustworthiness framework</p> <p>30147 Methodology for trustworthiness of system/service</p> <p>30144 Sensor network system architecture for power Substations</p>	<p>22989 Concepts and terminology</p> <p>23053 Framework for Artificial Intelligence (AI) Systems Using Machine Learning (ML)</p> <p>23894 Risk Management</p> <p>24027 Bias in AI systems and AI aided decision making</p> <p>24028 Overview of trustworthiness in Artificial Intelligence</p> <p>24029-1 Assessment of the robustness of neural networks -Part 1: Overview</p> <p>24030 Use cases</p> <p>38507 Governance implications of the use of artificial intelligence by organizations</p> <p>20547 Big data reference architecture -- Part 1: Framework & application process Part 3: Reference architecture</p> <p>20546 Big data -- Overview & vocabulary</p>	<p>15408 Evaluation criteria for IT security</p> <p>24036 Secure management and preservation of documents through digital systems -- Certified mail</p> <p>27002 Code of practice for information security controls</p> <p>27032 Guidelines for Internet Security</p> <p>27071 Security recommendations for establishing trusted connection between device and service</p> <p>27100 Overview and concepts</p> <p>27101 Framework development guidelines</p> <p>27102 Information security management guidelines for cyber insurance</p> <p>27570 Privacy guidelines for Smart Cities</p> <p>30111 Vulnerability handling processes</p>

IEC Work groups	SEG 8 Communication Technologies	SEG 9 Smart Homes & Buildings	SEG 10 Ethics & Artificial Intelligence	SEG 11 Future Sustainable Transportation
	SC 41 IoT & Related Technologies	SC 42 Artificial Intelligence	Open Source Software Data Usage	Quantum Computing Autonomous & Data Rich Vehicles

Application Layer Standards @ 3GPP

Release 17 Features

TSG RAN Radio Access Network	TSG SA Service & Systems Aspects	TSG CT Core Network & Terminals
<u>RAN WG1</u> Radio Layer 1 spec	<u>SA WG1</u> Services	<u>CT WG1</u> MM/CC/SM
<u>RAN WG2</u> Radio Layer 2 spec Radio Layer 3 RR spec	<u>SA WG2</u> Architecture	<u>CT WG3</u> Interworking with external networks
<u>RAN WG3</u> UTRAN O&M requirements	<u>SA WG3</u> Security	<u>CT WG4</u> MAP/GTP/BCH/SS
<u>RAN WG4</u> Radio Performance Protocol aspects	<u>SA WG4</u> Codec	
<u>RAN WG5</u> Mobile Terminal Conformance Testing	<u>SA WG5</u> Telecom Management	
<u>RAN WG6</u> Legacy RAN radio and protocol	<u>SA WG6</u> Mission-critical applications	

Study on Audio-Visual Service Production

Study on Network Controlled Interactive Service in 5GS

Study on Mission Critical services support over 5G System

Study on Communication Services for Critical Medical Applications

Study on Asset Tracking Use Cases

Study on enhanced Relays for Energy efficiency and Extensive Coverage

Study on enhancement for Unmanned Aerial Vehicles (UAVs)

Support of Immersive Teleconferencing and Telepresence for Remote Terminals

Study on authentication enhancements in 5GS

Study on supporting Unmanned Aerial Systems Connectivity, Identification, and Tracking

Study on system enablers for multi-SIM devices

Study on application layer support for Factories of the Future in 5G network

Study on application layer support for Unmanned Aerial System (UAS)

VERTICALS @ 3GPP

Automotive and other transport (trains, maritime communications)

Transport, logistics, IoT

Discrete automation

Electricity distribution

Public Safety

Health and wellness

Smart cities

Media and entertainment

eV2X and Railways

oneM2M: the Common Services Platform

Common Services Platform
Wide Scale Deployment

TECHNICAL PLENARY

WG1-REQ Use Cases & Requirements
WG2- ARC Architecture
WG3- PRO Protocols
WG4-SEC Security
WG5-MAS Management, Abstraction and Semantics
WG6-TST Testing



Semantics and Abstraction
Security Framework



Interworking Framework
Interoperability

Market Adoption Collateral

- Developer Guides
- oneM2M Conformance Test
- Feature Catalogues
- Product Profiles
- Smart Cities

Application Enablement
Big Data Enablement

RELEASE 4

WI-0046 – Vehicular domain enablement	WI-0053 - Enhancements on Semantic Support
WI-0064 - Adaptation for Smart City	WI-0070 - Disaster Alert Service Enabler
WI-0076 - Lightweight Services	WI-0081 - Smart Device Template 4.0
WI-0080 - Edge and Fog Computing	WI-0092 - Railway Domain Enablement
WI-0082 - 3GPP V2X Interworking	WI-0084 – SDT based Information Model and Mapping for Vertical Industries
WI-0065 - Trust Management	WI-0088 - M2M/IoT Application and Component Configuration
WI-0068 – Global Platform Interworking	

Application driven 5G Trials @ ARIB

	Responsible Organization	Main Partners	Trial Overview
I	NTT DOCOMO	<ul style="list-style-type: none"> •TOBU TOWER SKYTREE •ALSOK •Wakayama Pref. 	<ul style="list-style-type: none"> •Sightseeing •Smart Cities •Medical Services
II	NTT Communications	<ul style="list-style-type: none"> •Tobu Railways •Infocity 	<ul style="list-style-type: none"> •Transport
III	KDDI	<ul style="list-style-type: none"> •Obayashi Corp. •NEC 	<ul style="list-style-type: none"> •Construction
IV	ATR	<ul style="list-style-type: none"> •Naha City •Keikyu Railways 	<ul style="list-style-type: none"> •Entertainment
V	Softbank	<ul style="list-style-type: none"> •Advanced Smart Mobility Co., Ltd. •SB Drive Corp. 	<ul style="list-style-type: none"> •Transport
VI	NICT	<ul style="list-style-type: none"> •Comm. Carriers •Local Government •Office System, suppliers 	<ul style="list-style-type: none"> •Logistics •Smart office

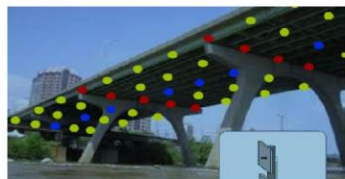
5G TRIALS in 2017 and 2018

	Responsible Organization	Main Partners	Trial Overview
I	NTT DOCOMO	<ul style="list-style-type: none"> ● TOBU TOWER SKYTREE ● ALSOK ● Fukui Pref. ● Wakayama Pref. ● Aizu-Wakamatsu City 	<ul style="list-style-type: none"> ● AR+VR content ● Monitoring and Security ● Medical Services
II	NTT Communications	<ul style="list-style-type: none"> ● Tobu Railways ● West Japan Railway Company ● Infocity 	<ul style="list-style-type: none"> ● Transport (High speed railway)
III	ATR	<ul style="list-style-type: none"> ● Kyushu Institute of Tech. ● Keikyu Railways ● Waseda Univ. ● Maehara elementary school 	<ul style="list-style-type: none"> ● Smart factory ● Station ● School education
IV	Softbank	<ul style="list-style-type: none"> ● Advanced Smart Mobility Corp. 	<ul style="list-style-type: none"> ● Transport ● Car remote control
V	KDDI	<ul style="list-style-type: none"> ● Obayashi Corp. ● NEC ● The Univ. of Tokyo. 	<ul style="list-style-type: none"> ● Remote Construction ● Drone surveillance
VI	Wireless City Planning	<ul style="list-style-type: none"> ● Pacific Consultants ● NICT ● Higashihiroshima City 	<ul style="list-style-type: none"> ● Smart highway ● Smart office

massive Machine Type Communications (mMTC)



(stock management)

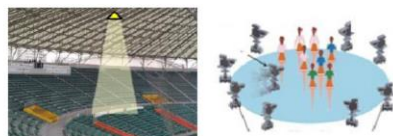


(bridge inspection)

enhanced Mobile BroadBand (eMBB)



(multi-transmission of 8K video)



(sports)



(transmission to car/train@over 60mph)

Ultra-Reliable Low Latency Communications (URLLC)



(remote machinery control)



(telemedicine)



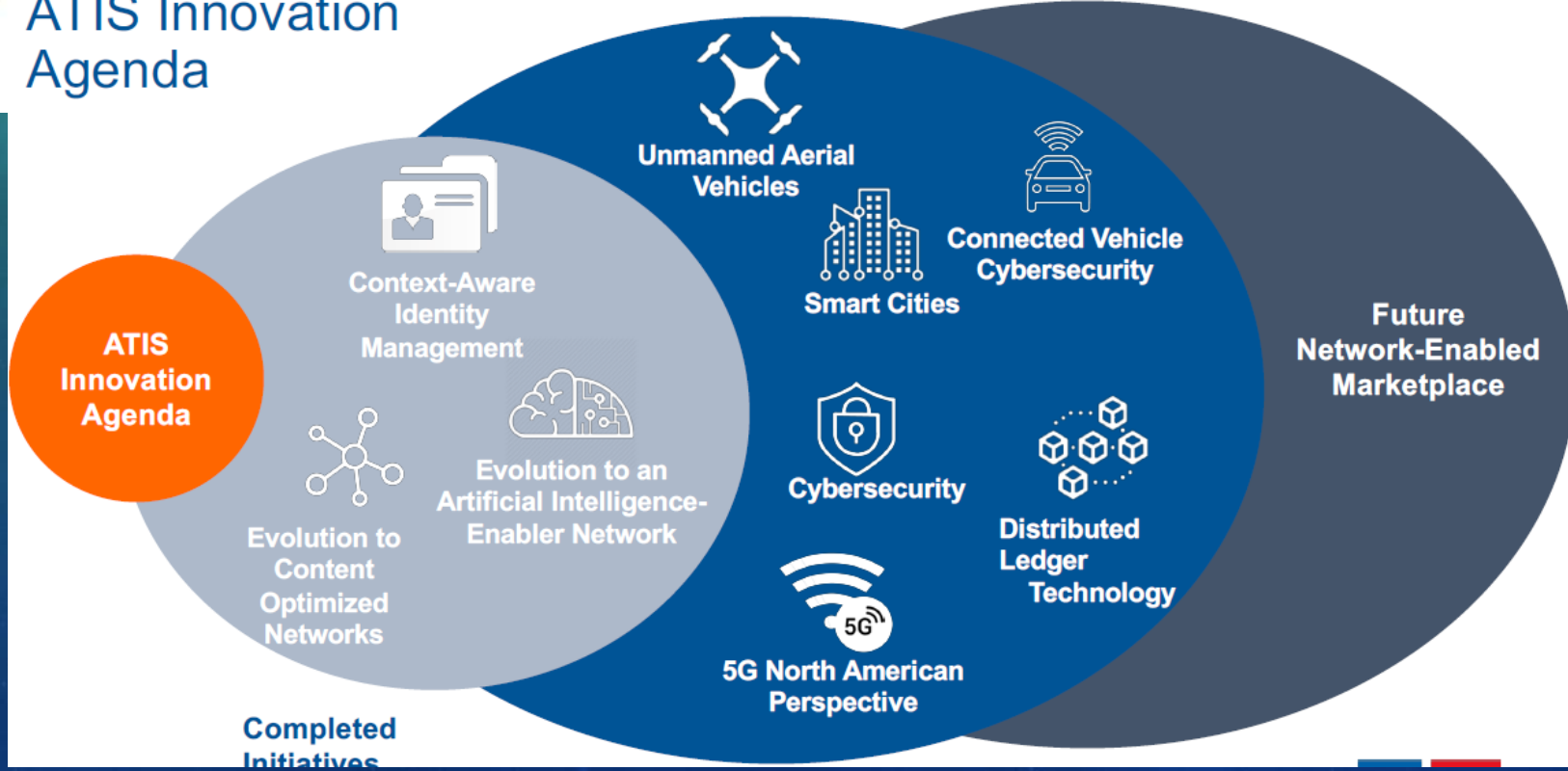
(truck platooning)

Focus Areas and Innovation Agenda @ ATIS



TECHNOLOGY FOCUS Areas

ATIS Innovation Agenda



Working Groups, Application Focus @ CCSA

Technical Committees

- TC1: Internet and Application Technology
- TC3: Network and Service Capability
- TC4: Communication Power & Station Working Environment
- TC5: Wireless Communication
- TC6: Transport Network and Access Network
- TC7: Network Management and Operation Support
- TC8: Network and Information Security
- TC9: Electromagnetic Environment and Safety Protection
- TC10: Internet of things
- TC11: Mobile Internet Application and Terminal
- ST2: Energy Conservation and integrated Utilization for Communication Devices
- ST3: Emergency Communication
- ST7: Quantum Communication and Information Technology
- ST8: Industrial Internet
- ST9: Navigation and Location Service

1. AIoT era
2. 5G Technology R&D Trials
3. 5G Vertical Industries Requirement Study
4. 5G Applications Contest
5. LTE-V2X Standards in collaboration with other Industry bodies
6. Industrial Internet
7. Internet of vehicles
8. End user driven Home Appliance STDs
9. AI
10. Information Security

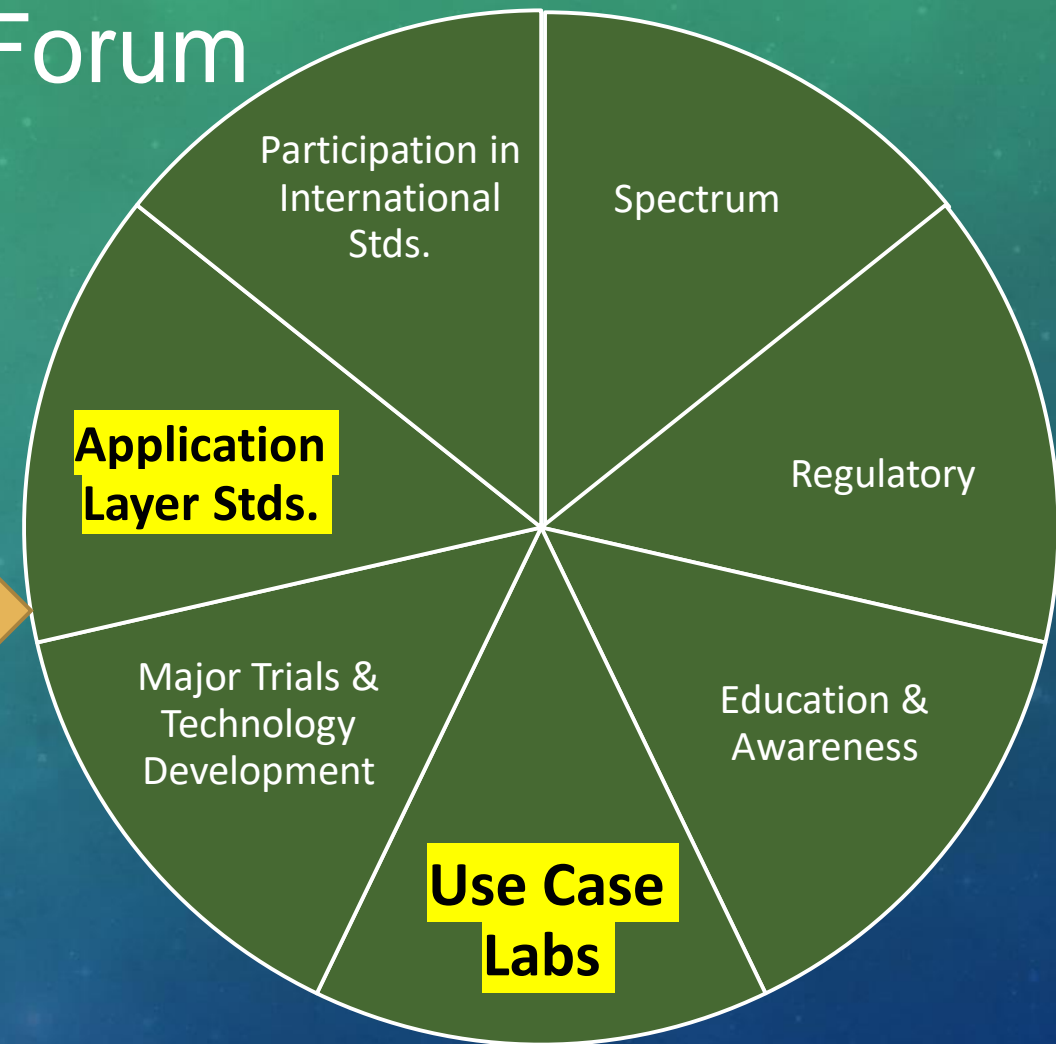
Promoting Committees

- TC601: Big Data Technologies and Standard
- TC602: Network & Data Technologies Standards
- TC603: Trusted Blockchain Technologies and Standardization
- TC604: Financial Technologies Standards
- TC605: Chronic Disease Control and Prevention Information Technologies Standards
- TC606: Open Data Center and standard
- TC607: The Green Grid (China) and standard
- TC608: Cloud Computing Standards and Open Source
- TC609: Internet Health Care and standard
- TC610: SDN/NFV Technologies and Industry
- TC611: Wireless Informatization Standard
- TC612: Future Mobile Communication Technology Standards and Industrial Development
- TC613: Interactive Media Technologies and Standard
- TC614: Web 5.0 Technologies and standard
- TC801: 3GPP Standards

AGENDA

- Riding the wave of 5G – LEAD THE CHANGE
- Global Landscape
- Indian initiatives and proposed roadmap

5G India 2020 High Level Forum

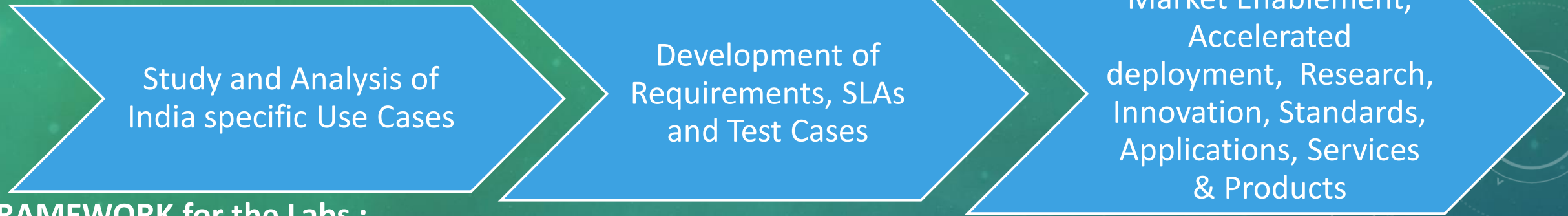


5G technology has the potential of ushering a major societal transformation in India by enabling a rapid expansion of the role of information technology across manufacturing, educational, healthcare, agricultural, financial & social sectors.

India must embrace this opportunity by deploying 5G networks early, efficiently, and pervasively, as well as emerge as a significant innovator and technology supplier at the global level.

Emphasis should be placed on 5G touching the lives of rural and weaker economic segments so as to make it a truly inclusive technology.

USE CASE LABS OBJECTIVES & OUTCOMES



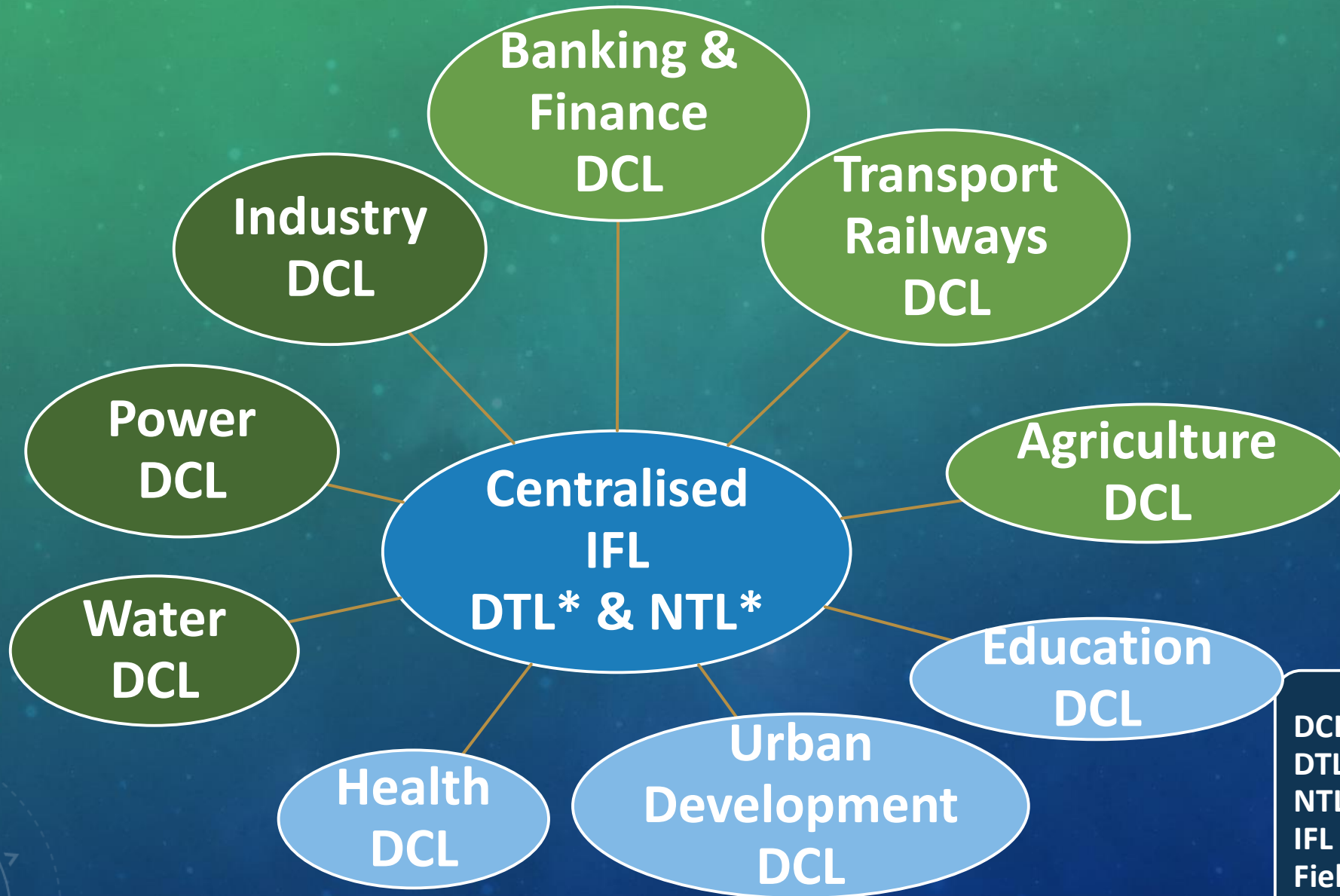
FRAMEWORK for the Labs :

USER GROUP	TECHNOLOGY GROUP	FACILITATORS	ACTIVITIES
End User Ministries	Technology Ministries	Govt. Agencies	DEMOS & Simulations : Hands-on experience for USER Group
TSPs/ ISPs	Vendors, OEMs; Start-ups	Global Partners	Study, analysis and modelling of India Specific Usage Scenarios, challenges & Use Cases
Domain/Mngt Institutes; Use Case Experts	Technology Institutes; Researchers & Innovators	Professional Bodies	Proof of concept testing, Interoperability and pilot testing

SCOPE - In line with national initiatives like Digital India, Smart Cities etc. and the focus areas in 5G :

SMART COMMERCE /BANKING : Department of financial services, LAB @ IDRBT	INTELLIGENT TRANSPORT : Ministry of Railways Ministry of Road Transport & Highways	SMART AGRICULTURE : Department of Agriculture & Farmers Welfare
SMART CITIES : Ministry of Housing & Urban Affairs	SMART GRID : Ministry of Power	SMART WATER : Ministry of Water Resources, River Development & Ganga Rejuvenation
INDUSTRY 4.0 Department of Industrial Policy and Promotion	SMART EDUCATION : Department of Higher Education Department of School Education	SMART HEALTH : Department of Health & Family Welfare

NETWORK OF LABS



- First Set of LABS
- Second Set of LABS
- Third Set of LABS

DCL - Demo and concept Lab
DTL - Device Testing Lab
NTL - Network Testing Lab
IFL - Interoperability and Field Scenario Test Lab

Application Layer Standards – How should we organise ?

USE CASE LABS

DOMAIN Working Groups

MAJOR TRIALS

Smart Cities

Finance

PPDR

Health

Agriculture

Education

Utilities

Transport

Industry

Immersive experience AR/VR

Artificial Intelligence/ Machine Learning

Autonomous Systems

Web Technologies

Integrated Data Exchange

Security and Privacy

IoT /M2M Common Services Layer

Cloud Computing

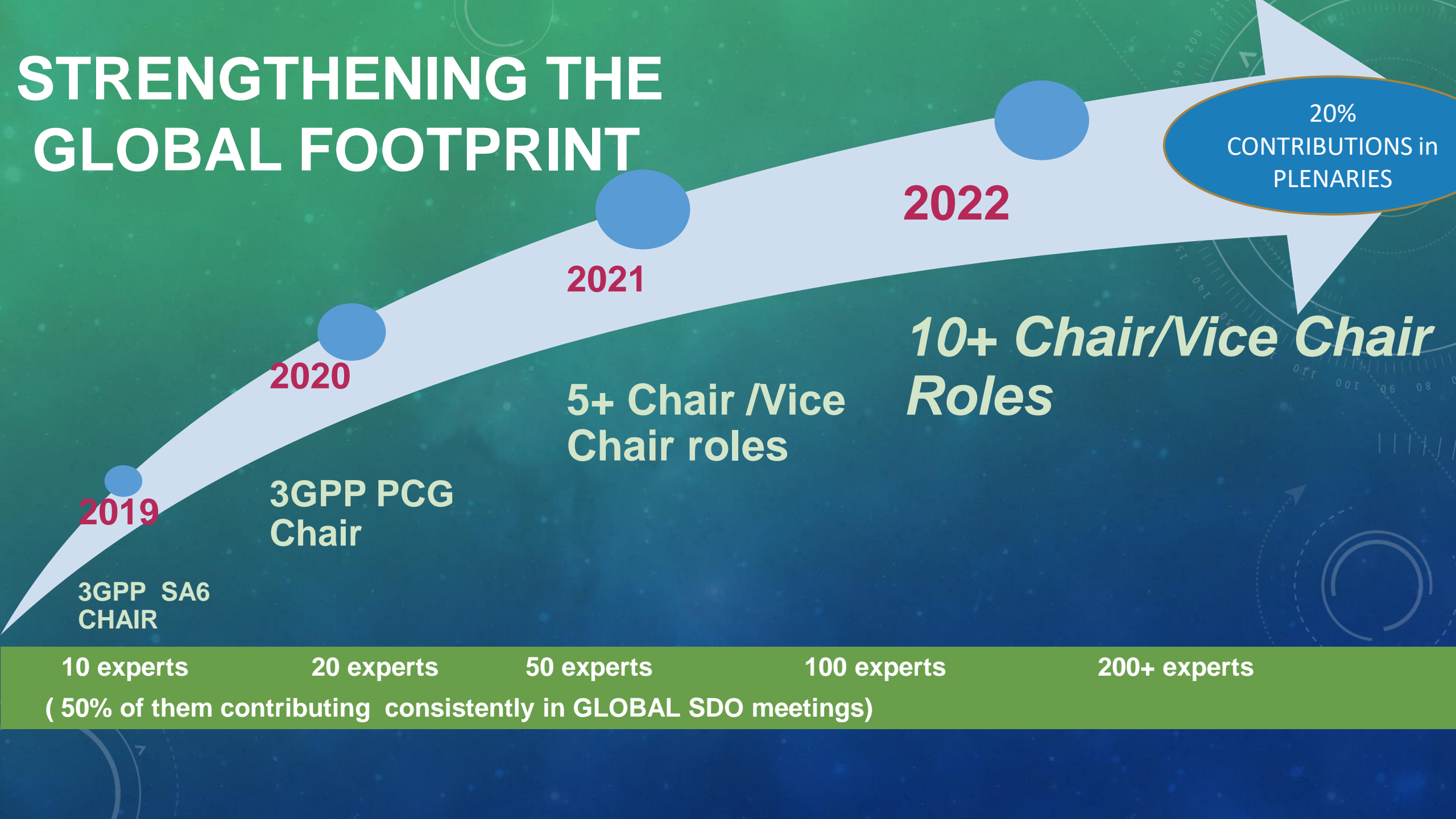
Global SDOs



OPEN ++

Technology Study Groups

STRENGTHENING THE GLOBAL FOOTPRINT



2019

3GPP SA6 CHAIR

10 experts

(50% of them contributing consistently in GLOBAL SDO meetings)

2020

3GPP PCG Chair

20 experts

2021

5+ Chair /Vice Chair roles

50 experts

2022

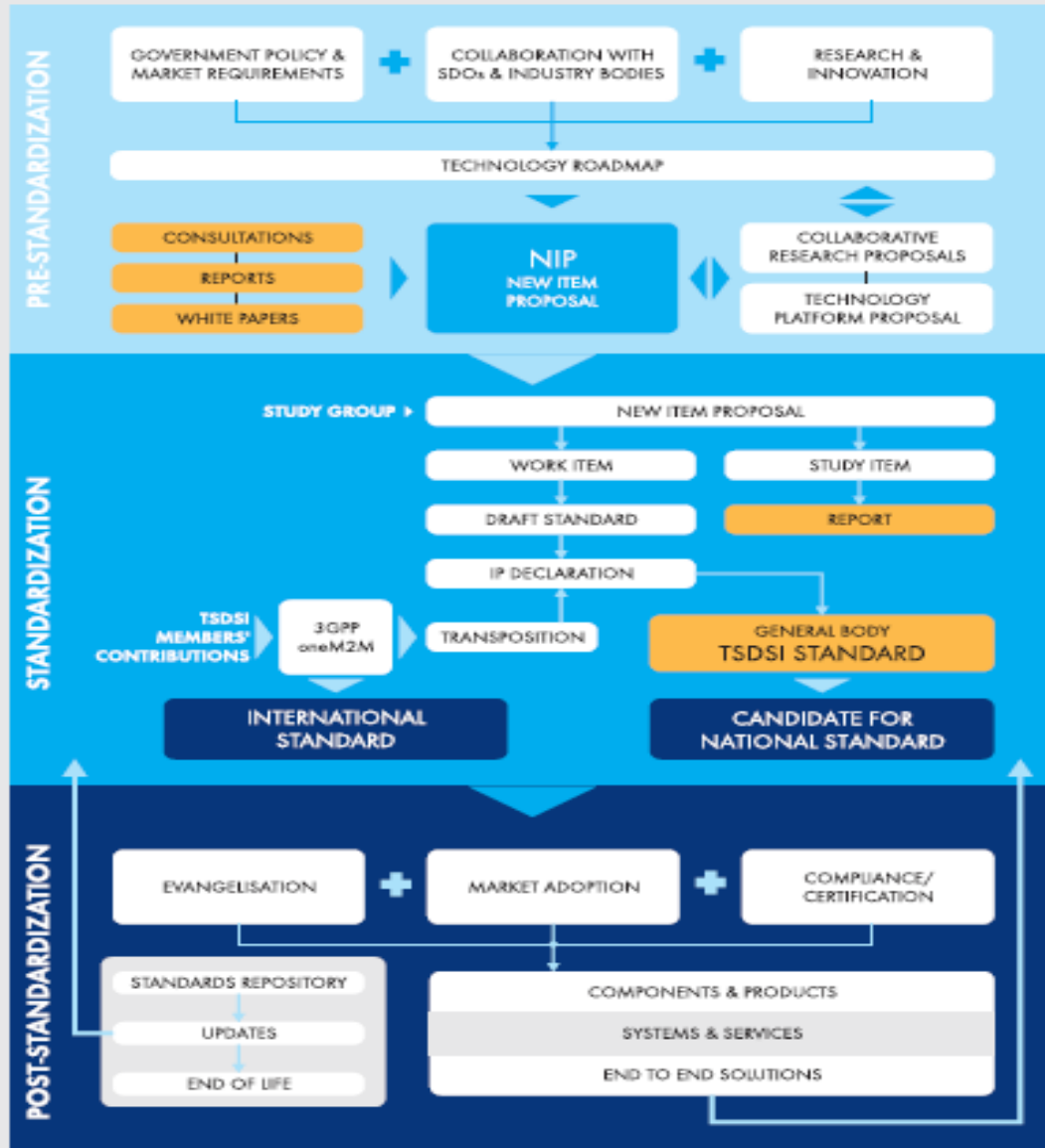
10+ Chair/Vice Chair Roles

100 experts

20% CONTRIBUTIONS in PLENARIES

200+ experts

Standards Life Cycle



SG Networks

CPRI Fronthaul Specifications
Contributions for Futuristic Technologies –
IMT 2020 & beyond (RIT/SRIT for IMT 2020)
60Ghz for Backhaul
NB-IoT Specifications
Enabling Private Networks
5G related Spectrum Studies
Broadcast Broadband Convergence

SG Systems & Solutions

Cloud Interoperability and Portability
Public Protection & Disaster Recovery (PPDR)
Information Centric Networking (ICN)
UAV/Drone communications and services
Indian Language Support
Security and Privacy
M2M/IoT

What it means to participate effectively ?

Local /Global SDO meetings	Events	Pre Standardisation	Post standardisation
4 to 10 local meetings per expert per year	Hosted Events	Use Case Labs	Evangelisation Workshops/ Hackathons
5- 8 Global meetings per expert per year	Workshops (5 lakhs per event)	Major Trials	Approval as National Standards
10 to 200 experts	SG meetings (2 lakhs per event)	Standards Driven Research/ Testbeds	Test and Certification

THANKS

and

Looking forward to working with all of you

Acknowledgements

1. TSDSI GC and Members
2. TSDSI Secretariat
3. 5G INDIA2020 HLF Task Forces
4. GSC 22 Presenters
5. IEEE 5G FORUM

PRESENTED in MY PERSONAL CAPACITY