From the CHAIR'S DESK

Dear Readers,

I would like to compliment TSDSI members on taking up 6G standards development – in the form of a technical study on use cases, requirements and technologies within TSDSI, and by contributing to the ITU IMT 2030 Vision.

The increased engagement levels by members and the diversity of technical activities spanning 5G enhancements, VLC, convergence, spectrum studies, application verticals, security and privacy, cloud interoperability, support for Indian languages, non-terrestrial networks, quantum and open systems etc is very encouraging. It will surely help TSDSI to contribute as the voice of India’s technology and research community and the user segments from various verticals, in the global standards dialogue.

I look forward to the recommendations of the task forces on Global SDO Strategy and Application and Services Layer Standards to foster an ecosystem of globally harmonized standards and promote interworking across verticals. I am also hopeful that our discussions with BIS, TEC, Academia and other research organizations in order to synergise our efforts should start yielding results in the coming future.

As we go towards electing the next slate of leaders of the technical groups in end of August, I would like to acknowledge the contributions of Mr Satish Jamadagni, Mr Akhilesh Srivastava, Mr R Prakash and Mr Sharad Arora, in growing the study groups and related technical activities in terms of engagement levels and outcomes.

Regards

N G Subramaniam
DG SPEAK

Dear Members,

Hope you and your families are doing well!!

Inspite of the very difficult and challenging period due to the second wave, the first half of 2021 has been a very productive period at TSDSI - releasing 4 Technical Reports by initiating 10 new proposals; and contributing to IMT-2030@ITU, Release 4&5&OneM2M and Release 18@3GPP. Study Group Services and Solutions is creating 3 Working Groups to manage the diverse range of topics. The strong engagement of our members in the above activities is a testimony to the importance of standardization to their businesses. Hats off to the Secretariat team for keeping the momentum on all fronts despite several personal challenges!!

The Governing Council has also been very active, following are some highlights:

1. Start-up Strategy Task Force led by Balaji Rangaswamy tabled a set of recommendations which are being executed by the Secretariat and GC Standing Committees, a Start-up corner is also being created.
2. Open-Source Strategy Task Force led by Prof Indeep Goyal and Manish Gangey has completed its feasibility report for review by GC and to initiate new proposals in the Study Groups.
3. The Global SDO Strategy Task force led by Prof Bhaskar and Puneet Jain is in the final stages of completing its report.
4. The Applications and Services Layer Standards Task Force led by Kamesh Chelluri and Rajeev Shorey has been kicked off and is looking for additional participants.
5. An Executive Administration Committee has been formed to advise Chair and Vice Chair on strategic matters.

TSDSI Performance for FY’21 is given overleaf. The revised goals for FY’22 are as follows:

<table>
<thead>
<tr>
<th>Goal</th>
<th>Study Groups</th>
<th>Secretariat</th>
<th>Governing Council</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enhance Technical Activities</td>
<td>SGN Focus: 5G/6G, Broadcast Offload, Spectrum, NSGM, Open Systems</td>
<td>Dashboard of Metrics; XIPs, Attendance &amp; Feedback, TS/TR, National Standards</td>
<td>Roadmap V2; 8+NP/5G/year Focus - MDPP, CTPD, VLC, Quantum</td>
</tr>
<tr>
<td>Higher Impact in Global Forums</td>
<td>10+ delegates/meeting; 10+ contributions / SDO 10+ high profile Global Events</td>
<td>Global SDO Strategy; Dashboard of Metrics; Streamline Transpositions &amp; Adoptions; Delegations, leadership roles, deputations @ Global SDOs</td>
<td></td>
</tr>
<tr>
<td>TSDSI as World Class SDO</td>
<td>Secretariat, Accreditations; SoPs [for GC, GBMA and Standing Committee], Compliance, IT Support for world Class Virtual working / events, Administer SME Category, Streamline Contracts process for Legal, Finance etc.</td>
<td>TSDSI - India’s Digital Communication SDO, Strategy for Application Layer Standards, Focus on - Standing Committees; Global (SDO) Initiatives; GC members engagement</td>
<td></td>
</tr>
<tr>
<td>Membership Development</td>
<td>25 New members; Focus on - Startups + Academia/R&amp;D + Govt/PSUs + Vertical Industry + Developing Countries, 90% members active; Mobilise SME Category</td>
<td>TSDSI Vision 2.0 Initiatives: New Strategies: IPR and Patents; Research &amp; Academia; Spectrum; Vertical Markets Ongoing: Outreach/Capacity Building; Affiliations; Secretariat</td>
<td></td>
</tr>
</tbody>
</table>

Our MARCOM team has conducted 26 events, averaging 1 event per week!!!. Thank you very much for the overwhelming response to TSDSI Workshops and Outreaches. Thank you also for appreciating your colleagues by nominating them for the TSDSI Technical Contributions Award for FY 2021. These are being evaluated by the Jury Panel and results will be announced soon.

New Partnerships have been formalised with ORAN and OCF. 18+ project proposals were received for the Phase 2 of Indo-EU Partnership Project with ETSI. A 2-day workshop was conducted with TIA.

Membership Development team has enabled addition of 8 new members and conducted an induction program attended by 85 participants. Initial focus is on Startups and Academia to be extended to government and vertical industries segments.

Elections for the 4th slate of Technical Group Chairs will be held on 31 August 2021. I would like to place on record the great contributions made by the current Chairs - Satish, Akhil, Prakash and Sharad in maturing the SGN and SGSS groups — in terms of participation, intensity of activities and more importantly — streamlining and structuring the activities of the groups.

Last but not the least, we are introducing a new section in the Newsletter — Invited Article — that will have an article on an evolving or futuristic topic. The first such article is on Electric Mobility Ecosystem by Dr Prasant Misra, from TCS Research. We look forward to your feedback on this initiative.

Thanks for your enthusiastic engagement at TSDSI. We plan to continue in the virtual mode for the rest of the year.

Our best wishes for the safety and well-being of you and your families.

Regards,
Pamela Kumar
Pamela Kumar, Director General
Performance Dashboard

Enhancing Technical Activities

**Study Group metrics (per meeting):**
- Average 11 NIPs/SWIPs (Goal 8 XIPs)
- 80% jump in participation. Average 32 members (Goal 30)
- 52 unique members attended TP this year
- Average 75+ attendees per meeting

**Outcomes:**
- 4TR’s Published (Cloud Interoperability & Portability, DNS Security, Drone Communication & Smart IoT Communication)
- Transpositions: 3GPP Rel 15 & 16, oneM2M Rel 3 261 TS (Goal 8 TS/1TR)
- Adoption as National Standard: oneM2M Rel2, IMT Advanced M.2012 – 428 TS (Goal 20 TS)
- 5GN workshop on 6G conducted 190 attendees

**Focus Areas:**

**Key Focus Areas**
- 2 Roadmap workshops average 2.5 NIPs per 3G (goal 8 NIPs/3G)
- Roadmap 2.0 being developed - Topic Clusters with champions identified
- Inter Study Group Coordination

Higher Impact in Global Forums

**Global SDO outcomes:**
- ITUR: TSDSI RT/SG11 approved for INT-2020
- oneM2M: 370+ cumulative contributions by CDT; CDT conferred Technical Excellence Award; Total 55 members registered as oneM2M IMs
- ITUT: 3 Proposals for WTSA

**Leadership Roles:**
- 3GPP PCG Vice Chair, oneM2M SC Vice Chair, oneM2M SDS WG VC
- 3GPP S4A Chair, 3GPP S4A SC Vice Chair, ITU-T SG9 Rapporteur, ITU-T WP5D Drafting Group Chair
- 3 year reappointment at 3GPP-MCC
- 36 Mandates contribution for oneM2M

**Affiliations:**
- Adoption Agreements signed with ATSC and IEEE-SA
- Agreement with OCF
- 5G Multilateral MoU signed
- Indo-EU Partnership Project extended till 2023 supports 3 CoE
- 10 Global Partner Events [Goal 10]
- 18 International Speakers @ TDD 2020
- Partner Webinar Series with 3GPP

**Global SDO metrics:**
- Average delegates/meeting ~ 68ITU, 70@3GPP, 11@oneM2M (goal 10)
- Contributions/meeting ~ 48@3GPP, 18@ITU, 36@ITU, 30@oneM2M (goal 10 / SDO)
- Number of IMs ~ 208@3GPP, 56@oneM2M

**Affiliations:**
- Agreements with IEEE-SA, OCF, ATSC, ORAN under discussion

Establishing TSDSI as a World Class SDO

**Pre-Standardisation:**
- TRIP Forums in action
- Task Forces: - WTSA Strategy - Open-Source Strategy

**MARCOM:**
- TSDSI Tech Deep Dive 2020: 3 days online 8 Sessions, 64 Speakers & 500+ unique delegates
- TSDSI Partnership Webinars
- TSDSI Expert Talk Webinar Series
- “Standards driven Research” Outreach workshop in partnership with academic institutes

**Organisational:**
- 4th Governing Council elected
- Standing committees formed with “one GC member one Committee” guideline
- Global SDO Strategy Task Force formed

**Membership Development:**
- 79 Members (Goal 90)
- Startup Ecosystem White Paper
- Startup Strategy Task Force

**Global Engagements:**
- Global SDO Strategy Task Force being formed
- ITU RDF Webinar Series to be launched
- Affiliations Management process to be streamlined

**Organisational:**
- Legal and IPR Framework
- GC members engagement in MARCOM, membership development & technical contributions
- Strengthening the Secretariat
Standardization Activities

Study Group - Networks

Technical Reports Released:

Enhancement of Flexible UL/DL Resource Utilization (TSDSI-TR 6010 V1.0.0) [https://bit.ly/365ij3d]: It discusses limitations in realizing flexible use of UL/DL resources in networks based on 3GPP Rel 15 and 16 and analyses role of cross link interference (CLI) and in-band full duplexing (IBFD) mechanisms for improvements.

Narrow Band IoT Capabilities for Energy Metering (TSDSI TR 6009 V1.0.0) [https://bit.ly/3BvACcn]: This report assesses suitability of NB-IoT technology for Smart Metering from India context — with detailed analysis of Power Outage and Restoration management (ORM) use cases.

Following reports are under preparation:

Virtualization for Open-Disaggregated RAN (S181): Study ORAN architecture for assessing gaps with respect to India specific requirements.

Dynamic Joint Deployment of SDN Controllers and Hypervisors for Frugal 5G and Beyond (S180): Study of adaptive load balancing by properly positioning the controller and hypervisor entities at H-C planes according to their potential positions.

Evaluation of the existing IAB architecture in 5G Networks (W1248): Evaluation of existing Relay/IAB architecture in 3GPP 4G LTE/5G NR Networks in order to standardize a new generic and flexible Relay/IAB Architecture along with the associated protocols.

Extension of Broadcast offload (W11-NIP226): Study utilization of UHF DTT spectrum to provide supplementary download services, closely coupled with a cellular network.

The group is working on following technical activities:

Spectrum Matters:
The group is conducting following studies related to spectrum matters:
- 6 GHz spectrum for license-exempt wireless applications in India (S174)
- 6 GHz band usage for IMT applications in India (S173)

Bandwidth aggregation for 5G TV Broadcast from co-located UEs from a physical layer perspective with FeMBMS and downlink broadcast control channel (S182): The study aims to assess fitness of SRT architecture with respect to 5G TV transmission with FeMBMS, algorithms at video and PHY layer and explore UE to TV simultaneous data transmission etc.

Characterization of E-band for 4G/5G Backhaul & Rural Broadband (W1 258): The study aims to characterize E-Band with parameters like ideal channel size, transmission characteristics, range, throughput etc based on study of effectiveness of E-band solutions under different topologies.

UAV Assisted C-RAN for 5G and beyond (S183): UAV assisted C-RAN can meet the requirement for a quickly deployable network for managing disasters and improving QoS for one-off public events (like concerts, festivals, sporting events etc). The study focuses on finding solutions for challenges like demand for low latency and high bitrate at the fronthaul transport.

Proposal for study on use cases, requirements and technologies towards 6G (S170): This study will establish KPIs for requirements; identify technology trends including candidate technologies to address these KPIs; corresponding spectrum requirements and related aspects; and study network evolution and the respective performance parameters.

VLC/LiFi (S189): The study will focus on the current status of VLC/LiFi standards status, identify gap areas and suggest possible areas where standardization activities can be taken up. The areas may include developing PHY and MAC layer standards for VLC, LiFi Co-existence standards, developing Co-existence systems for LiFi and VLC enabled IoTs etc.
**Activities**

**Study Group - Services and Solutions**

Technical Reports Released:

*Drone Communication Services Support in Cellular Network [TSDSI TR 6007 V1.0.0]* [https://bit.ly/3Xz2D36]: The report highlights current developments and support for Drone Communication available in cellular standards. It concludes that based on the enhanced support and features provided by 3GPP EPC & LTE for Drones, LTE Rel 15 specifications can meet the connectivity requirements necessary for the DCS flight operations regulated by DGCA.

*Context Specific Data Pruning in Smart IoT Applications [TSDSI TR 6008 V1.0.0]* [https://bit.ly/3EWPMq]: The report recommends new software architecture to make end IoT devices capable of data compression. This work has the potential of being used in different domains such as Power Sector and other verticals using Wide Area Monitoring Systems.

Following reports are under preparation:

*IoT Identifier (S175)*: The report assesses the numbering and addressing requirements for IoT devices and applications, various numbering mechanisms, understanding evolving status of standards to make recommendations towards globally unique IoT identifiers.

*Know Your Machine Custodian-KYMC (S177)*: Trust framework for verification and transfer of custodian and machine relationship for the massive M2M domain.

*Study of Post-Quantum-Cryptography for 5G Networks (S178)*: The report aims to study the need for Post-Quantum-Cryptography in 5G Networks and evolve a migration path of 5G Networks towards Post-Quantum-Cryptography.

*User Device Data Protection (S188)*: The report will provide recommendations for data privacy in various devices and applications and secured data collection.

*Indian Languages for Financial Transactions & Applications (S167)*: The report will recommend a uniform & standardized environment for use of Indian Languages in financial applications offered by government and non-government agencies that are consumed by a vast majority of Indian population.

*Communication Requirement for Energy Sector (S187)*: Analysis of Key nodes of Advanced Metering Infrastructure topologies with respect to packet types, flow direction, volumes and transmission frequency of data and of quality of services.

The group is working on following technical activities:

*Public Protection & Disaster Recovery Use Cases & Architecture (S186)*: Study of technical aspects for deployment of a Pan-India Broadband PPDR network based on PS-LTE and 5G technology. The project also includes study of components and architecture for pilot followed by Pan India deployment. This is a collaborative work between the user agency and TSDSI.

*Rural Broadband Services & Architecture (S185)*: Study of architecture & technology choices in providing broadband services to GP and villages, apps & services to be deployed to increase utilization of underlying BharatNet and security implications. A draft outline of the report was presented and approved in the June plenary and work on the same is in progress.

*Edge Intelligence (S190)*: A new study on creation of Edge Intelligence standards for latency and privacy management (S190) has been approved. It aims to develop a framework for supporting critical haptics-based applications and services keeping in mind features like latency and privacy.

*Service Delivery using 5G Broadcast for TV, Radio, IPTV and File-casting (S191)*: This study aims to create a single overview document to capture 5G solutions for India specific deployment conditions: Broadcasters’ needs including free - to - air and receive - only - mode; dedicated network for mobile and fixed broadcast/multicast and radio services; enabling content/data offloading scenarios for Mobile Operators using existing resources; content transport mechanisms for applications beyond linear TV (e.g. IPTV, scheduled file-casting); UE and network implementation guidelines to deploy fixed and mobile TV, radio and additional services, as necessary.

*Cloud Interoperability and Portability (W11-NIP 197)*: A Report on standards applicable to various use cases of Cloud Interoperability and Portability (CIP) was published. It recommended creation of normative standards for CIP. Work in this area has been started.

*Use Cases and Trials for Automotive (NIP 260)*: A study to compile findings from trials of remote patient monitoring system in vehicles (Next Generation Ambulance) and C-V2X use cases using 5Gi technology has been initiated, with support from several facilitating members. This use case is expected to pave the way for other applications in future.

### Snapshot of Technical Activities:

<table>
<thead>
<tr>
<th>Study Group</th>
<th>Technical Reports</th>
<th>Technical Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Published</td>
<td>In Draft</td>
</tr>
<tr>
<td>Networks</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Services &amp; Solutions</td>
<td>84</td>
<td>5</td>
</tr>
</tbody>
</table>
List of Technical Meetings held in this period is given below:

<table>
<thead>
<tr>
<th>Group</th>
<th>Date</th>
<th>Attendees (Member Organizations)</th>
<th>Contributions NHs &amp; SWPs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Networks TP</td>
<td>28-29 Jan’21</td>
<td>32</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>30-31 Mar’21</td>
<td>25</td>
<td>09</td>
</tr>
<tr>
<td></td>
<td>24-25 May’21</td>
<td>38</td>
<td>15</td>
</tr>
<tr>
<td>Services &amp; Solutions TP</td>
<td>15-16 Mar’21</td>
<td>26</td>
<td>07</td>
</tr>
<tr>
<td></td>
<td>3-4 Jun’21</td>
<td>39</td>
<td>10</td>
</tr>
</tbody>
</table>

* All meetings were held online

TSDSI welcomes volunteering offers from members and organizations to organise discussion workshops and knowledge sharing webinars on any active study or work items listed on our website. Please contact outreach@tbsdsl.in for the same.

Liaison Statements

Incoming LS:
TSDSI received 7 Liaison Statements (LS) including the following:

- ITU-R WP 5A has invited contributions for revision of its recommendations ITU-R M.1801-2 on Broadband wireless access in the mobile service.
- TEC LS providing information on co-existence and compatibility studies for 6GHz Band.

Outgoing LS:
TSDSI sent 10 LS as listed below:

- For carrying out Co-existence & Compatibility Studies, LS have been sent to DoT, TEC, WPC and Ministry of Information and Broadcasting respectively, requesting for information on existing FSS, FS Services in 6GHz Band.
- LS was sent to WPC in response to the questionnaire received from WPC regarding a 10 year Roadmap for use of Radio frequency spectrum in India.
- LS have been sent to Ministry of Power, NSGM, Central Electricity Authority, DOT, TRAI and TEC respectively, sharing the Technical Report on NB-IoT Capabilities for Energy Metering.

Liaisons Statements can be viewed at https://tbsdsl.in/laison-statements/

Strategic Initiatives

Global SDO Strategy Task Force: A Global SDO Strategy Task Force has been formed under the Standardization Committee to come out with a strategy for strengthening TSDSI’s footprint in the Global Standards ecosystem. It will also formulate the process to be followed for Global SDO contributions by members. The Task Force is Co-chaired by Prof Bhaskar Ramamurthi, IIT Madras and Mr Puneet Jain, Intel. It conducted 4 meetings in the reporting period and is in the process of submitting its initial recommendations to the Governing Council. Based on these, a debriefing session for “updates from Global SDOs” has been incorporated in TSDSI technical meetings.

The IEEESA Strategy Task Force has been merged as a sub team within the Global SDO Task Force.

Task Force on Application/Services Layer Standards (ASLS): An Application/Services Layer Standards (ASLS) Task Force has been formed under the Standardization Committee to focus on India specific use cases and requirements in various verticals including Smart Cities, smart banking and other critical domains. It will formulate a strategic action plan for identification, specification and adoption of application layer standards and develop a strategy for interoperability testing of application/services and enabling technologies across verticals. It will also recommend strategies for synergizing and coordinating efforts of TSDSI, TEC, BIS and other forums. The Task force is Co-chaired by Mr Kamesh Chelluri, TCS and Dr Rajeev Shorey, IIT Delhi.

Executive-Administration Committee (EAC): An Executive-Administration Committee has been constituted as a Standing Committee of the Governing Council to facilitate decision making and provide oversight on the operational aspects of TSDSI. It comprises: Mr N G Subramaniam- Chair, Mr Satish Jamadagni- Vice Chair, Dr Kumar Sivarajan (Tejas Networks), Dr Klutto Millet (CEWiT) and Mr A K Mittal (Advisor Networks).

Domain / Vertical Engagement: 5G and beyond technologies are going to be driven to a large extent by verticals. A regular interaction of TSDSI technical leaders and member champions with “expert” representatives from different verticals has been initiated. Broadcast, Utilities, Fintech, Satellite and Public Safety segments have been taken up as the focus verticals to begin with.

TSDSI Outstanding Technical Contribution Award: Standards development is generally a multi-stage process spanning ideation - scoping - formal inception - contributions - drafting - approval, requiring persistent efforts over a long period of time. Each stage in the development is important and requires specialisation. TSDSI has instituted a “TSDSI Recognition Awards for Outstanding Technical Contribution” to recognise efforts of its members a technical activity within TSDSI during the year. Nominations for the award have been received and are currently under consideration of the Jury.
**Pre-standardization Activities**

**6G Initiatives:**

The Study Group Networks organized an online Technical Workshop on “6G (Beyond 5G)” on 18 February 2021. The workshop, attended by over 190+ participants, had presentations from experts representing the entire telecom ecosystem - Operators, Industry, Research bodies, as well as academia like Reliance Jio, Nokia, Intel, Saankhya Labs, Sameer, Huawei, Lekha Wireless, IITs and IISc.

**Special Session on “Digital Innovation” at the ITU WTDC Regional Preparatory Meeting:**
ITU WTDC RPM meeting conducted a special session on Digital Innovation on 10 March 2021. TSDSI presented a proposal for conducting a webinar series to showcase India’s Innovation centric ICT Projects to ITU members in the Asia Pacific Region. The proposal has since been accepted and details of the webinar series are being worked out.

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**Post-Standardisation Activities**

**Following TSDSI Standards have been notified for public comments by Telecom Engineering Centre for adoption as National Standards:**

<table>
<thead>
<tr>
<th>Standard</th>
<th>Notification</th>
<th>Last date for Public Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSDSI 5G Standard</td>
<td>Notification is hosted on the TSDSI website at the link below: <a href="https://tdsdi.in/extension-of-date-for-inviting-public-comment-for-adoption-of-5g-as-natioanal-standard/">https://tdsdi.in/extension-of-date-for-inviting-public-comment-for-adoption-of-5g-as-natioanal-standard/</a></td>
<td>16 July 2021 extended till 31 July 2021</td>
</tr>
<tr>
<td>TSDSI transposed onem2m Rel 3 standards</td>
<td>Notification is hosted on the TSDSI website at the link below: <a href="https://tdsdi.in/extension-of-date-for-inviting-public-comment-for-adoption-of-onem2m-release3-standard-as-national-standard/">https://tdsdi.in/extension-of-date-for-inviting-public-comment-for-adoption-of-onem2m-release3-standard-as-national-standard/</a></td>
<td>16 July 2021 extended till 31 July 2021</td>
</tr>
</tbody>
</table>

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**1G**
- AMDS
- CDPD
- C-Netz
- NMT
- TACS

**2G**
- GSM
- IS-95A
- IS-136
- PDC

**3G**
- EDGE
- CDMA 2000
- TD-CDMA
- WCDMA
- IEEE 802.016e

**4G**
- LTE
- Rel 10
- IEEE 802.16m

**5G**
- 5G-NR
- 5Gi

**6G**
GLOBAL STANDARDS ROUNDUP

ITU-R

TSDDI members delegation attended meetings of ITU-R WP5D#37 held on 1-12 March 2021 and Meeting #38e on 7-16 June 2021.

TSDDI is required to submit 3GPP transposed standards for M.2012-5 (IMT Advanced) technologies by 1 September 2021, in its role as GCS proponent. The transposition activity has been taken up.

The following two contributions were made by TSDDI as developed in Study Group-Networks in the 38th meeting of ITU-R WP5D:


2. Working document towards a preliminary draft new Report ITU-R M.1538.FUTURE TECHNOLOGY TRENDS OF TERRESTRIAL IMT SYSTEMS TOWARDS 2030 AND BEYOND [Document No. 5D/694]: This report will cover the broader view of future technical aspects of terrestrial IMT systems considering the time-frame of 2030 and beyond. It will include information on technical and operational characteristics of terrestrial IMT systems, as well as the evolution of IMT through advances in technology and spectrally efficient techniques, and their deployment. TSDDI contribution covers the overview of emerging services and applications and emerging technology trends and enablers.

3. Contributions made at the WP5D 37: TSDDI made a contribution in the 37th e-meeting of ITU-R WP5D suggesting a few amendments to the working document IMT-2020/WWW [5D/502].

ITU-T

A Cross-SDO test-bed workshop on the topic of “Test-beds Federations for 5G and Beyond: Interoperability, Standardization, Reference Model and APIs” was held in March 2021 (https://bit.ly/3hZAeSL). This discussion continued in the joint Q16/11 and ETSI TC INT RGM (e-meeting, 22 April 2021). Considering the Cloud Interoperability and Portability (CIP) standards development activity led by TSDDI, and the interoperability test-bed proposal in this area, TSDDI is closely tracking this discussion based on the work being carried out in the 5G Use Case Lab for this domain at IDRB.

3rd Virtual meeting of ITU-T Focus Group on Autonomous Networks was conducted between 15-17 June 2021. Dr Abhishek Thakur, IDRB, India, acted as “mentor” for the use cases on Inter-Domain Service Automation (IDSA): for microfinance and Autonomous Vertical-Driven Edge Service and Middle-Mile Connectivity for Rural Financial Inclusion (Fi). These use cases arose out of discussions regarding Cloud Interoperability in 5G use case lab of IDRB and are aligned with presentations of Dr Thakur during TSDDI SGSS Technical Plenary held on 3-4 June 2021.
3GPP

3GPP TSG RAN Meeting #91e approved a study item (RP-210910) to study and potentially specify "pi/2 BPSK with spectrum shaping" waveform enhancements within Rel-17 of 5G NR specs.

3GPP PCG-OP meetings were held online on 27-28 April 2021. Final submission of LTE Advanced specifications towards Revision 5 of ITU-R M.2012 was approved. Timelines for submission to ITU in respect of IMT Advanced (M.2012-6) and 5G (M.2150) were also approved. All meetings of 3GPP for calendar year 2021 have been made virtual.

A workshop on Rel 18 features was organised by 3GPP RAN from 28 June to 2 July 2021. A workshop of SA group on Rel 18 is scheduled on 9 - 10 September 2021. TSDSI will host the 3GPP RAN Meetings in India in October 2022. Please reach out to secretariat@tdsdi.in with expression of interest to support hosting these meetings.

Participation and contributions by representatives from TSDSI member organisations in 3GPP technical meetings in the reporting period is as follows:

<table>
<thead>
<tr>
<th>Group</th>
<th>No. of Meetings</th>
<th>No. of Participants</th>
<th>No. of Contributions</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAN</td>
<td>19</td>
<td>318</td>
<td>50</td>
</tr>
<tr>
<td>CT</td>
<td>15</td>
<td>56</td>
<td>29</td>
</tr>
<tr>
<td>SA</td>
<td>21</td>
<td>117</td>
<td>16</td>
</tr>
</tbody>
</table>

oneM2M

58 TSDSI members, spanning small to medium sized entities, operators, service providers, equipment manufacturers, system integrators, academic institutes etc, have joined oneM2M as IMs in calendar year 2021. This membership is being extended to the members at no cost as a one time benefit. The Digital India, Smart Cities, and fast-growing vertical applications such as Automotive, Healthcare, Agriculture, Energy Segments, stand to benefit from adoption of the national M2M standard. Participation by the large and diversified membership base of TSDSI in oneM2M is expected to accelerate adoption and further maturing of the framework through collaborative work.

Ms Poornima Shandilya, Team Leader C-DOT, has been elected as the SDS Group Vice Chair.

23 experts from 13 organizations participated in 2 Technical Plenary meetings of the project and submitted 25 contributions.

oneM2M has launched a Sustainability Sub-Committee (SSC) to promote the beneficial impact of IoT systems, the importance of open-standards based solutions and the significant role that the oneM2M standard has in improving the sustainability of IoT deployments. The committee will provide opportunities for members to promote their use of IoT systems in delivering climate, energy, and sustainable citizen services, in parallel with related oneM2M capabilities. oneM2M also expects to involve other industry bodies that share a common interest in these issues. Mr Girish Ramachandran, President, TCS Asia Pacific has joined the committee on behalf of TSDSI. Please visit https://bit.ly/3rou12 (oneM2M Executive Viewpoints) to read his views on Sustainability.
TSDSI, has signed adoption agreements with IEEE-SA and ATSC, to enable it to directly adopt their standards for its use.

TSDSI and Open Connectivity Foundation (OCF) signed a Liaison Agreement to collaborate in the areas of developing a bi-directional bridge interworking specification between OCF and oneM2M standards in India; development of India-specific use cases, and corresponding test cases to validate interworking between OCF & oneM2M; collaborate and facilitate the promotion and use of Open Source implementation for the developed interworking specification between OCF and oneM2M, by providing seamless access to developers including emerging IoT startups, to easily build interoperable IoT products addressing both proximal and distal network scenarios.

India-EU Partnership Project (PP) on Cooperation for ICT Standardization

The India-EU Partnership Project which was initially for 3 years was extended till February 2021 and now has been further extended for another two years till February 2023. An online workshop on India-EU ICT Standards Collaboration for “Stocktaking of Phase I of the project” was organized on 23 February 2021. This workshop discussed the accomplishments of the phase I and suggestions for phase II. The detailed scope and activities for this phase are being worked. TSDSI sought proposals from its members for activities to be taken up under the project. The proposals received are under evaluation.

The project organized the following webinars in the reporting period:

<table>
<thead>
<tr>
<th>Webinar Topic</th>
<th>28th Knowledge Sharing Webinar on “5G and Internet of Radio Light”</th>
<th>29th Knowledge Sharing Webinar on “OpenAirInterface: Democratizing innovation in the 5G Era”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td>17 February 2021</td>
<td>30 June 2021</td>
</tr>
<tr>
<td>Speakers</td>
<td>John Cosmas, Anand Srivastava, Ajay Kumar Mittal (Moderator)</td>
<td>FlorianKaltenberger, Prakash R (Moderator)</td>
</tr>
</tbody>
</table>

The project also supported IIIT Delhi in organizing a workshop on “Visible Light for Broadband Communications: Current Research & Standardization” on 25-26 March 2021 with active participation from TSDSI. Visible Light Communication technology will be most useful in indoor environments as it will be able to provide large bandwidths. This will also be very useful for providing high bandwidth last mile connectivity in remote and rural areas. The workshop, attended by 443 participants, focussed on the requirements and challenges of deployment in such scenarios and need for further development of standards.
Ms Kavita Singh (DoT) has joined as the Co-chair of the Standing Committee on Budget & Finance.

The Secretariat provided in-kind support for MARCOM as well as Finance & Accounts activities of oneM2M. This was passed on as a subsidy of INR 2.6 Lakhs to the TSDSI IMs of oneM2M for the year 2020.

In order to reduce the barrier to enter TSDSI, a new membership category for Subject Matter Experts is being introduced. This will enable individual experts to formally contribute to TSDSI Technical Activities.

**Finances**

TSDSI Membership fees for FY 2021-22 will remain same as that for previous year.

A grant from DoT for 3GPP membership has enabled subsidy of Rs. 35 Lakhs to 3GPP IMs for the year 2020.

Budget for FY 2021-22 was approved in the AGM held on 20 January 2021.

**Operational Matters**

The Annual Report for FY 2019-20 was approved in the AGM held on 20 January 2021.

Elections for the 4th slate of Technical Group Chairs will be held on 31 August 2021.

Col PK Jaswal has joined the Secretariat as a Consultant in the Operations Team and Mr Guna Bala Shekhar has joined the Secretariat as a Consultant in the Study Group Networks Team.

**Outreach**

TSDSI Member experts represented TSDSI in a total of 26 events in the reporting period. A few representative events are listed below:

**TSDSI® Convergence India 2021**: Mr NG Subramaniam, Chair TSDSI shared his views in the Inaugural Session of the “5G and Beyond Leadership Summit” on “Future Roadmap for 5G” in the 28th Convergence India 2021 Conference. TSDSI also conducted a session on “Looking Beyond 5G — Path to 6G” in the “5G and Beyond Leadership Summit” in the Conference.

**Roundtable on “5G for Smart Utilities and Smart Cities”**: TSDSI organized a session on “5G for Smart Utilities and Smart Cities” @ India Smart Utility Week 2021 on 3 March 2021.

TSDSI participated in a three part webinar series of “UK India Joint Consultations” to deliberate on opportunities for collaboration on digital technologies.

TSDSI made a presentation in the Meeting of the India-EU JWG on Cooperation in ICT on “Expanding Digital Trade & Co-operation on Standards (5G and Beyond 5G)” held on 19 April 2021. Following areas were recommended for strengthening collaboration — oneM2M Roll Outs, 5G/IoT-based Roll outs for verticals, Cloud AI Blockchain for Future Networks and Beyond 5G-6G Technologies.

GENERAL UPDATES

TSNDS® Open RAN India 2021 Virtual Conference: TSDSI organized a session on “Role of Open Source in 5G Deployments” in the Open RAN India 2021 Virtual Conference. The session was chaired by Dr Inder Gopal, Co-Chair of the TSDSI Open Initiatives Task Force. It discussed current and emerging trends in adopting open source in various segments of the telecom ecosystem from India perspective. Mr Satish Jamadagni, Vice Chair TSDSI Co-chaired the Technical Session on “Open RAN Infrastructure & Future Business Model” with Ms Deepa Tyagi, Sr DDG & Head TEC and shared his views along with other distinguished industry leaders.

Prof Kiran Kuchi delivered a keynote on “Introduction to 5Gi - Description of Low Mobility Large Cell (LMLC)” at the Plenary Session of the Wireless Russia & CIS Forum 2021 on 27 May 2021.

Capacity Building:

TSDSI members and Secretariat experts delivered training modules on TSDSI, 3GPP, ITU & oneM2M on 23 March 2021 to:

- Junior Telecom Officers of 2018 (RL) and 2019 batch, organised by National Telecom Institute for Policy Research, Innovation and Training (NTIPRIT).
- IPBAFS Officer Trainees of 2019 batch, organised by National Institute of Communication Finance (NICF).

Dr MH Kori, Consultant TSDSI delivered a talk in an online workshop on “Recent Advances in 5G & mm-Wave Technologies Networks” from organized by Institute of Computer Technology, Ganpat University on 1-3 April 2021.


Induction Session on TSDSI: TSDSI conducted an Online Induction Session for new joinees on 22 May 2021. It covered Standardization life cycle, Engagement with Global SDOs (3GPP, ITU, oneM2M), technical focus areas and resources of TSDSI. The webinar was attended by 85 participants. Presentations can be viewed at the link: https://bit.ly/3Bkl1Cg8

Other Events:

- COMSNETS January 2021
- Panel discussion on “Getting Telecom Infrastructure Ready For 5G – Post Budget Feedback from the Telecom Industry”, organised by CNBC Awaz on 26 February 2021
- Panel discussion on “Making 5G Use Cases Right & Relevant”, in the ET Telecom’s 5G Congress 2021 on 26 February 2021.
- Online Regional Workshop on “5G Test-Bed Initiative at IIT Delhi” on 13 April 2021.
- “Standards driven Research – The most efficient way to achieve ATMA NIRBHAR BHARAT” in the ACM India Industry Webinar held on 17 April 2021.

If you are interested in getting an outreach workshop conducted for your organization or your industry segment, please contact outreach@tsdsi.in
TSDSI MEMBERSHIP UPDATE

TSDSI welcomes following members who have joined us in the reporting period:

Corporate Members:

Keysight Technologies, https://www.keysight.com, is the world’s leading electronic measurement company, transforming today’s measurement experience through innovations in wireless, modular & software solutions. It proposes to contribute in the areas of 5G & 6G Standards and Use cases in this Domain.

Ganpat University, https://www.ganpatuniversity.ac.in, a high-tech education campus is a joint initiative by a large number of industrialists and technocrats, noble farmers and affluent businessmen for the mission of “Social Upliftment through Education”. It intends to contribute in the areas of 5G Use case Laboratories, EdTech applications development for future technology, 6G and beyond network infrastructure development, Wireless Backhaul system set-up, 5G and beyond testbed set-up.

Indraprastha Institute of Information Technology, Delhi (IIIT Delhi), https://www.iiitd.ac.in, is on the path to become one of the leading comprehensive research-led teaching institutes in India. It intends to engage with TSDSI in the areas of Radio based access and mobile core networks, protocol interfaces, SDN/NFV, backhaul, interference studies etc.

Associate Members:

Fraunhofer IIS, https://www.iis.fraunhofer.de/audio, is a leading innovator of technologies for cutting-edge audio and multimedia systems. They offer solutions for CE-devices, Broadcast systems and telecommunications. Engagement with TSDSI is in the areas of mobile-broadcast-convergence; 5G development and deployment; multimedia services in mobile networks and IPR related topics.

Observer:

Sirab Technologies, https://www.sirabtech.com, with its deep understanding of safety-critical and security-critical systems for aerospace and railways is focussing on development of automated vehicle guidance systems — Automated Driving, Vehicle Platooning etc based on wireless links for vehicular control.

InterDigital, Inc., https://www.interdigital.com, is a research and development company that licenses its innovations to the global wireless and consumer electronics industries. It designs and develops advanced technologies that enable connected, immersive experiences in a broad range of communications and entertainment products and services.


MCLabs, https://www.mclabs.co.in, develops and deploys feature rich mission-critical communication services using state-of-the-art broadband technologies complying to world class standards. It provides solutions for enabling communication during mission critical and/or disaster relief events specially when public networks become unavailable/unreliable for communication. It is keen to engage with TSDSI in the areas of Public Protection and Disaster Relief (PPDR).

TSDSI member list can be viewed here https://tsdsi.in/present_members/
To apply for TSDSI membership, please visit https://tsdsi.in/membership/
The Electric Mobility Ecosystem: A Greenfield for Standards Development

Prasant Misra, TCS Research

1. Introduction

The year 2020 was an important landmark for Electric Vehicles (EV). The global electric car numbers hit the 10 million vehicle mark. Despite the socio-economic impact of the Covid-19 pandemic, the global electric car sales rose by 70% last year [1]. India is at an interesting crossroad with regards to EV adoption. While there are multiple drivers that strongly favor transport electrification, gathering the right ecosystem momentum is turning out to be a challenge [2]. Amidst this push-pull, the electric three-wheeler market is reported to be growing at a better pace than the electric two-wheeler and economy class passenger vehicle segments; primarily due to favorable operational economics for first and last-mile connectivity [3]. While all these facts and figures are encouraging, how well do EVs integrate with the broader mobility ecosystem? Where is the opportunity space? Where is the role of technology standardization, and what are the latest developments?

These questions are at the core of the transport debate in the country. The following sections highlight some of these aspects.

2. Mobility Ecosystem and Electric Vehicles: The Opportunity Space?

- Parking vs Charging: Since EV charging is a time-consuming process, parking is an essential pre-requisite. However, in case of EVs, what is a better policy? In principle, a charging point is a parking spot with a charger, and so, how does an operator co-design parking and charging policies that not only serve the customer (searching for either a parking spot or a charging point), but also maximizes the overall service revenue?

- Translating charging behavior into new service opportunities: EV users can either charge at “home or place-of-work” or “on-the-go” to the destination at public charging stations (that are not widespread yet). In the later approach, users need to compensate for the charging wait time by engaging in other ancillary activities (such as shopping, dining, etc.). Will this lead to a different mobility dynamics with localized service hotspots emerging around charging points? Is there a way to mine this context, and predict various interdependent service demands?

- Navigation complexity: Navigation systems are the lifeline of day-to-day journey planning and decision making, with real-time information about city traffic conditions and other related mobility resources. Are they EV ready yet? Navigational support system for EVs will have to perform advanced routing and real-time planning by not only considering the source, destination, and intermediate stoppage locations; but also, the battery’s state-of-charge, proximity to charging points and their charging demands, road topography, etc.

- Accessibility to chargers: Unlike the refueling operation of gasoline vehicles, charging an EV takes time. How does one discover available charging points and find the correct schedule that aligns with the mobility needs of the user? Should there be a mechanism to pre-empt on-going charging sessions, and if so, what should the arbitration model be? If public charging points are exhausted during any time of the day, is there a way to find and book private chargers?

- Bridging the charging demand-to-supply gap: Real-time spatio-temporal mismatches are expected in dynamic systems, and the EV charging ecosystem is no different. Is demand-shaping (i.e. controlling the charging requests) the best way to perform demand management? Is it possible to augment the supply-side with additional chargers to manage peak demand [4]?

- Engaging in ancillary services: EVs have an added value proposition of selling power stored in their batteries back to the grid during peak demand and refilling them back when grid energy prices drop, resulting in cost savings and additional revenue. EV (fleets) with lower utilization levels and reliable usage/charging patterns would be more suitable to engage in such a service. In this case, how would a charging management system plan and operate the vehicle-to-grid interaction at scale?

- Navigating the service silos in EV charging: Can EVs interact with a range of different chargers; can those chargers interact with each other and with other charging management systems; can the payment be managed with charging service providers operating different charging networks? The present charging ecosystem is siloed and fragmented with proprietary networks; public and/or workplace networks owned by charging network operators; non-networked charging stations owned by private entities. The existing operational arrangement makes it difficult for users to move seamlessly across different EV charging networks.

3. Standards and Readiness Level

While infrastructure readiness is essential for booting up the EV ecosystem in India; data, connectivity and analytics across the entire value chain is crucial to sustain this development by allowing it to co-exist with existing as well as newer mobility services and operators. Standardization is important to manage the scale and complexity of electric mobility, and especially, its integration with the fast-changing mobility ecosystem [5].

There is need for immediate standardization efforts in the areas of: (i) Vehicle to charger communication, for authentication and authorization of users, and billing for the charging service; (ii) Charger to charging network communication, for management of chargers and their charging activities; (iii) Intra charging network communication, for coordinating and data sharing among charging providers (that would facilitate network roaming). The following standardization activities and open protocols have provided a head start [6]: ISO 15118, communication protocol between EV and charging station; Open Charge Point Protocol (OCPP), an application protocol for communication between EV charging stations and the charging station network; Open Charge Point Interface (OCPI), network communication standard to form peer-to-peer agreements for enabling network roaming; Open Inter Charge Protocol (OICP), network communication standard to form agreements with central hubs for enabling network roaming and billing; OpenADR 2.0, demand response interface for communication between utilities and operators.
National and International Standards Developing Organizations (SDO) such as the Bureau of Indian Standards (BIS); International Telecommunication Union (ITU); 3rd Generation Partnership Project (3GPP); oneM2M, etc; have been working on multiple Information and Communications Technology (ICT) standard development projects that cover various aspects of the EV ecosystem. The following is a list of few of the ongoing activities:

- **BIS ETD S1** [7], technical committee on electrotechnology in mobility that is currently working on vehicle to grid communication interface with specific focus on physical and data link layer requirements for wireless communication; communication protocol for light EV battery swap; EV conductive charging systems with specific focus on digital communication for control of EV charging and plugs/socket outlets/vehicle connectors and inlet etc;

- **ITU-T G.1099m** [8], which defines a narrowband orthogonal frequency division multiplexing power line communication technology using IPv6 as the main networking protocol for targeting multiple smart grid applications such as smart metering; distributed automation; in-home energy management; generic home automation; car charging etc;

- **ITU-R SM.2110-1** [9], which recommends frequency ranges for operation of non-beam wireless power transmission for EVs;

- **ITU-T L.1220** [10], which recommends energy storage technology for stationary use;

- **3GPP TR 22.886** [11], which provides a study on enhancement of 3GPP support for 5G vehicle-to-everything (V2X) services;

- **oneM2M TR-0001-V3.1.1** [12], which provides a study of various M2M use cases; and one of them is on plug-in electrical charging vehicles and power feed in home scenario.

The larger standardization play, however, lies at the intersection of electric vehicles and the larger mobility ecosystem, where ICT standards would be game-changing. Examples include EV-ready navigation systems; resource discovery e.g. parking/charging stations; booking and reservation services; resource brokering and arbitration; preemptive charging and settlement; privacy; etc [refer to Section 2].

### 4. Concluding Remarks

The electric mobility ecosystem has immense growth potential with transformative societal and business outcomes. The opportunity space is very broad, and the Indian market is quite unique. Hence, correctly identifying the wants versus the needs is going to be important. This article discusses some of the technology and service gaps that may impede the smooth transition of EVs into the complex mobility ecosystem. Standards have the potential to remove those barriers, and open markets to competitive electromobility solutions that are affordable and sustainable.

### References

7. BIS ETD S1 [https://www.services.bis.gov.in:8071/php/BIS/UndertDevDocs/under_dev/standards?commitid=Mtc5]
8. ITU-T G.1099m
9. ITU-R SM.2110-1 [https://www.itu.int/dms_pub/itu-t/REC/SM-REC-SM.2110-1-201910-!!!PDE-PDF]
12. oneM2M TR-0001-V3.1.1 [https://www.onem2m.org/images/files/deliverables/Release3/TR-0001Use_Cases_Collection_V3_1_1.pdf]

Prasant Misra ([prasant.misra@tcs.com](mailto:prasant.misra@tcs.com)) is a scientist with TCS Research, where he works on intelligent cyber-physical systems for smart mobility. He received his PhD in Computer Science and Engineering from the University of New South Wales, Sydney in 2012; and completed his postdoc from the Swedish Institute of Computer Science, Stockholm in 2013. He has worked in different roles and capabilities for Keane Inc. (now a unit of NTT Data Corporation), CSIRO (Australia), and Robert Bosch Centre for Cyber Physical Systems at the Indian Institute of Science, Bangalore. He has received several recognitions for his work, of which it is noteworthy to mention MIT TR35 India (2017), the ERCIM Alain Bensoussan and Marie Curie Fellowship (2012) and the Australian Government’s AusAID Australian Leadership Awards (2008). He serves on the Editorial board of the IEEE Communications Magazine as Series Editor of Internet of Things, and the Elsevier Ad Hoc Networks journal as Area Editor. He is the Founding Chair of the IMOBILE ACM Chapter (the India chapter of ACM SIGMOBILE), and is a member of the Executive committees of IEEE Bangalore Section and COMSNETS Association. He is a senior member of the IEEE and ACM.

URL: [https://sites.google.com/site/prasantmisra/](https://sites.google.com/site/prasantmisra/)
### Upcoming Meetings

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<thead>
<tr>
<th>Meeting</th>
<th>Date/s</th>
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<tbody>
<tr>
<td>TSDSI SGN Technical Plenary</td>
<td>10-11 August 2021</td>
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<tr>
<td>TSDSI G8M</td>
<td>18 August 2021</td>
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<tr>
<td>ITU-R WP 5D e-Meeting</td>
<td>23-27 August 2021</td>
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<tr>
<td>oneM2M TP 51</td>
<td>30 August – 17 September 2021</td>
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<tr>
<td>TSDSI SGSS Technical Plenary</td>
<td>7-8 September 2021</td>
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<tr>
<td>3GPP SA Workshop</td>
<td>9-10 September 2021</td>
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<td>3GPP RAN/SA/CT#93e</td>
<td>13-20 September 2021</td>
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<td>oneM2M SC 58*</td>
<td>28 September 2021</td>
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<tr>
<td>ITU-R WP 5D Meeting</td>
<td>4-15 October 2021</td>
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<td>3GPP PCG/OP Meeting</td>
<td>19-20 October 2021</td>
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<td>oneM2M TP 52</td>
<td>29 November – 3 December 2021</td>
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<tr>
<td>ITU-R SG-5 Meeting</td>
<td>29 November 2021</td>
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<tr>
<td>TSDSI Technical Plenary Meetings*</td>
<td>6-10 December 2021</td>
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<tr>
<td>3GPP RAN/SA/CT#94</td>
<td>13-17 December 2021</td>
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*Tentative

### Upcoming Events

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<tr>
<th>Events</th>
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<tbody>
<tr>
<td>C-DOT TSDSI Webinar Series: The National Standards for IoT – Smart Cities Perspective</td>
<td>5 - 8 July 2021</td>
</tr>
<tr>
<td>IIT Bombay-TSDSI Webinar on End-to-End 5G Test-bed: An Overview</td>
<td>9 July 2021</td>
</tr>
<tr>
<td>TSDSI Workshop on &quot;Standards Driven Research&quot; @ NCC 2021</td>
<td>29 July 2021</td>
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<tr>
<td>TSDSI-IIT Delhi Webinar on Indigenous Li-Fi 5G test-bed</td>
<td>5 August 2021</td>
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<tr>
<td>TSDSI-IITU Webinar#1 on &quot;Digital Technology Innovations - Case Studies from India and Asia-Pacific&quot; featuring talk by Dr Vivek Raghavan, UIDAI</td>
<td>2 September 2021</td>
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<tr>
<td>TSDSI-5GIA webinar on 5G Trials &amp; Pilots</td>
<td>22 September 2021</td>
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<tr>
<td>IEEE 5G World Forum 2021</td>
<td>13 - 15 October 2021</td>
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<td>TSDSI Hall of Fame Awards Ceremony, Virtual</td>
<td>14 October 2021</td>
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<tr>
<td>8th Global 5G Event</td>
<td>14-15 October 2021</td>
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<tr>
<td>TSDSI Tech Deep Dive 2021 (ITD2021)</td>
<td>25-28 October 2021</td>
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<tr>
<td>TSDSI Workshop @ IEEE ANTS 2021</td>
<td>13-16 December 2021</td>
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</table>

### ABOUT TSDSI

Telecommunications Standards Development Society, India (TSDSI), aims at developing and promoting India-specific requirements, standardizing solutions for meeting these requirements and contributing these to international standards, contributing to global standardization in the field of telecommunications, maintaining the technical standards and other deliverables of the organization, safeguarding the related IPR, helping create manufacturing expertise in the country, providing leadership to the developing countries (such as in South Asia, South East Asia, Africa, Middle East, etc) in terms of their telecommunications-related standardization needs.

TSDSI is recognised by Department of Telecommunications as India’s Telecom Standards Development Organisation (SDO).

TSDSI is registered as a Society under the Societies Registration Act (Act XXI of 1860).