



IEEE APSCON 2026

Title: Sensor/IoT Standardisation

Agenda

- About Project SESEI
- Why Standards are important
 - World of Standardisation
- IoT standardization
 - OneM2M, ETSI & 3GPP
- EU-INDIA Partnership Instruments
- Conclusion



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EU Project SESEI



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Project is a local presence in India

SESEI (Seconded European Standardization Expert in India) is a local face for the European standardization community in India: Dinesh Chand Sharma



Why SESEI: India is a major trade partners for EU/EFTA, Increasing role of standards to gain market access, evolving & complex nature of regulatory and standardization landscapes, sharing best practices, and work together as partners

Priority Sectors/topics: Aligned with EU-INDIA TTC, Connectivity Partnership

- **Digitization: Strategic technologies, digital governance, and digital connectivity** - Smart Cities/Urban Development, ITS, Quantum Technologies, Smart Grid/Meter, **Artificial Intelligence**, 5G/6G, Open RAN, M2M/IoT (Cyber-Physical Systems), DECT, Data Privacy, Satellite Communication, Blockchain, Digital Signature, Smart Manufacturing, e-Accessibility, cybersecurity, digital skills, digital platforms including Research and Innovation etc.
- **Green & Clean technologies** : Clean Energy, Energy Efficiency (Green ICT), Environment, Circular Economy including Resource Efficiency, Waste Management, Energy storage technologies, Electric mobility, Green Hydrogen, Advanced biofuels including R&I etc.
- **Other topics** of mutual interests such as Rail, Ropeways, Machinery Safety etc.

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Standardizing the IoT/M2M



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Standardizing the IoT

- Why Standards Matter for IoT
 - Smart objects generate massive volumes of data that must be managed, processed, transmitted, and stored securely.
 - Standardization is essential to enable globally accepted specifications and ensure true interoperability across devices and applications.
- Benefits of Using Standards
 - Enables interoperable and cost-effective solutions
 - Creates new market opportunities and supports innovation
 - Helps the IoT ecosystem scale and reach full market potential
- Security Imperative
 - As connectivity increases, security risks grow significantly.
 - Security standards are critical to protect individuals, businesses, and governments using IoT systems.

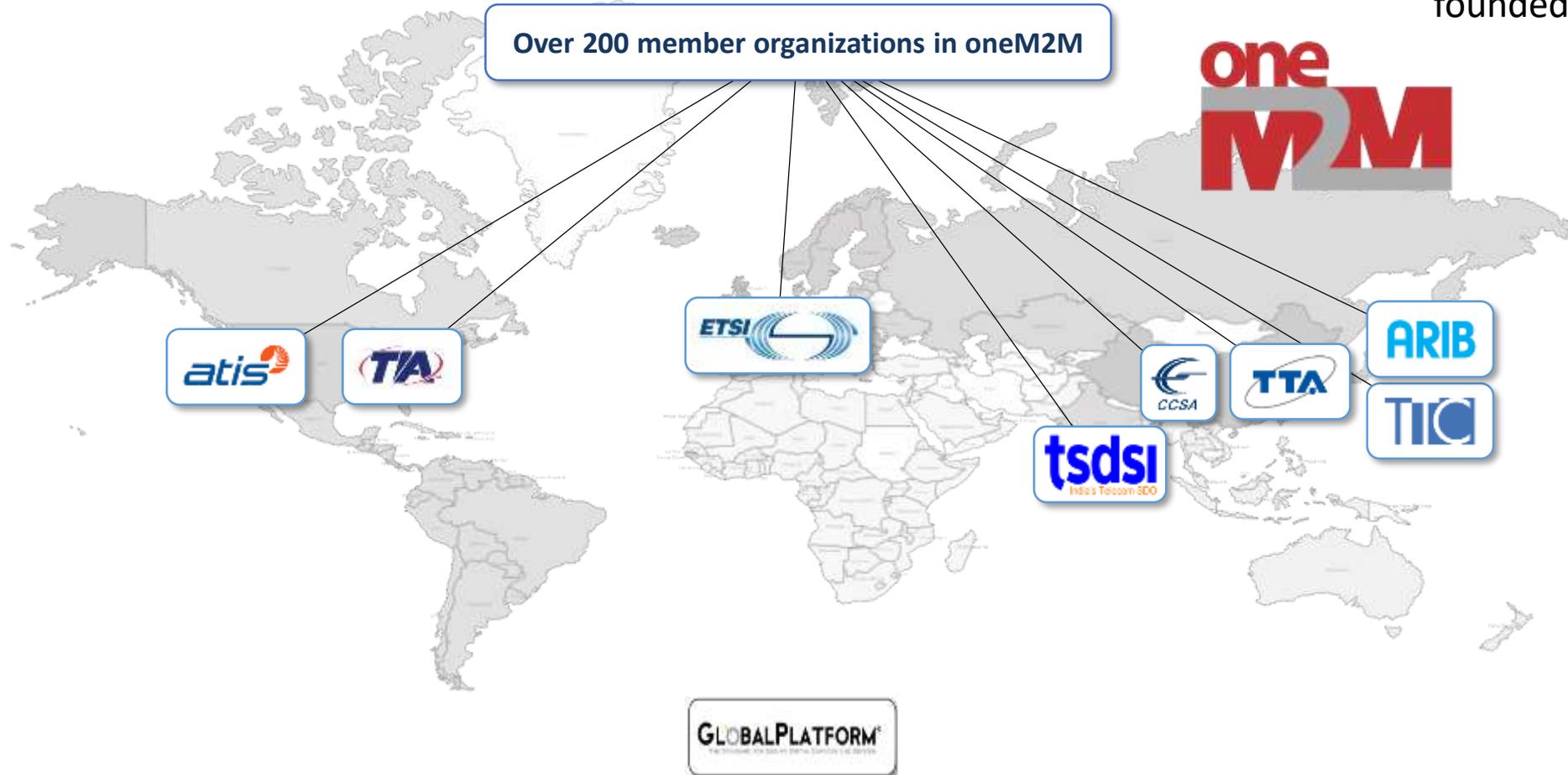


oneM2M & IoT



oneM2M Partnership Project

founded July 24th, 2012



www.oneM2M.org

Source: oneM2M

All documents are publicly available

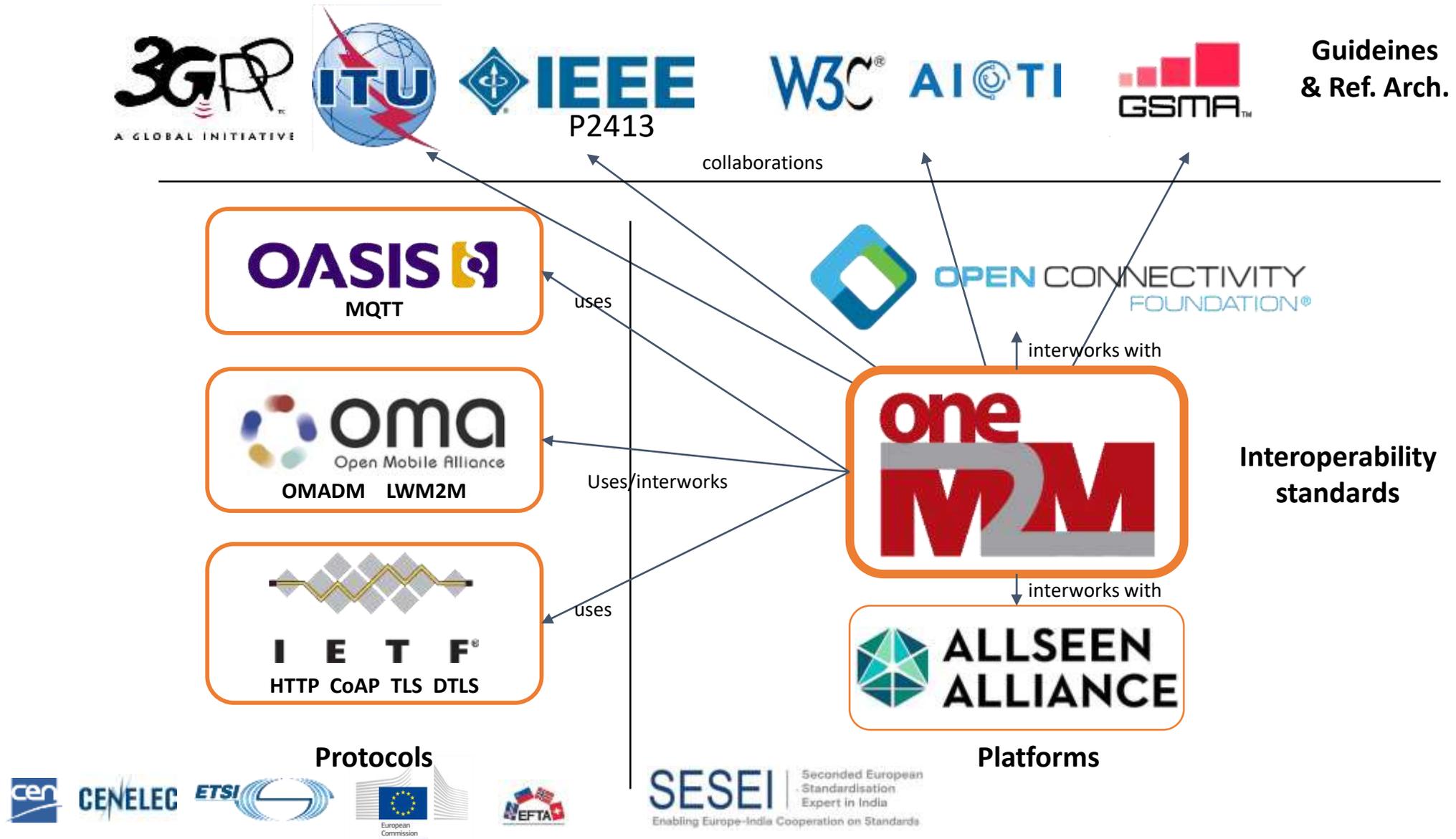


200+ members organizations

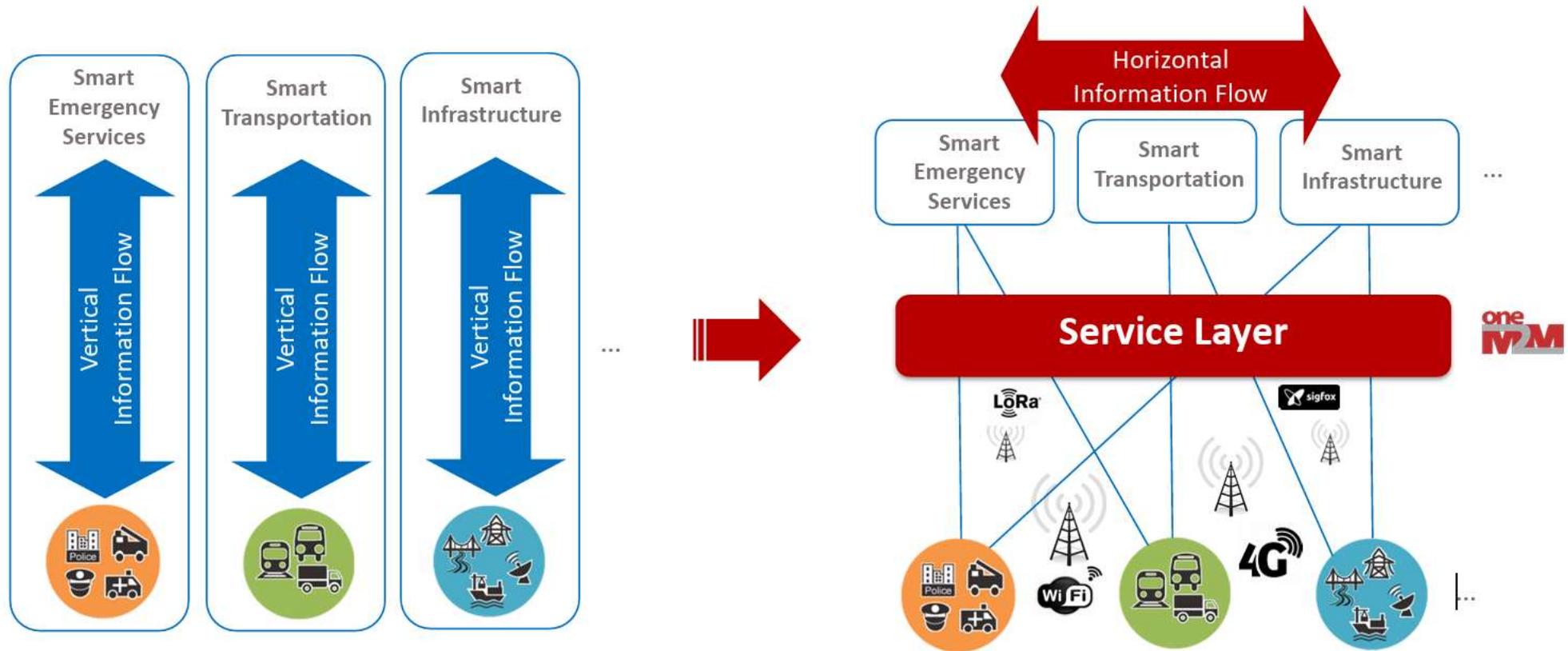
Some of the 200+ active members of oneM2M



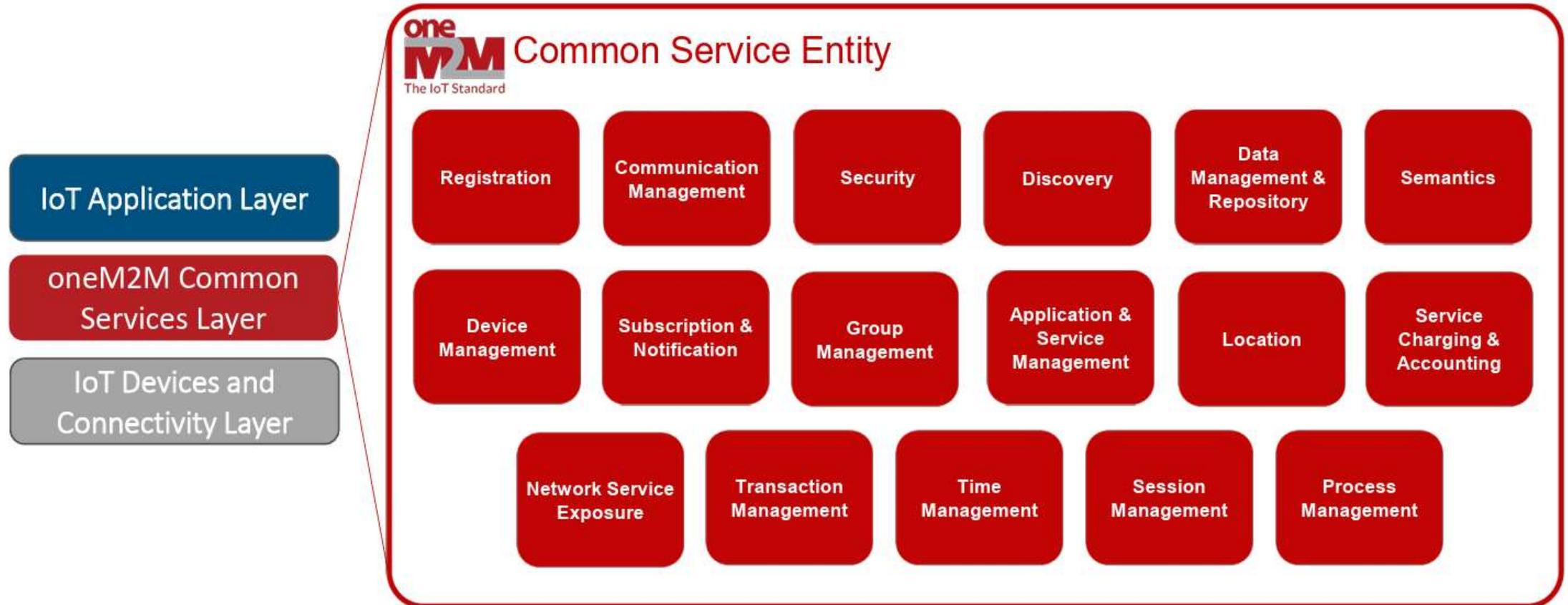
Ongoing oneM2M collaborations



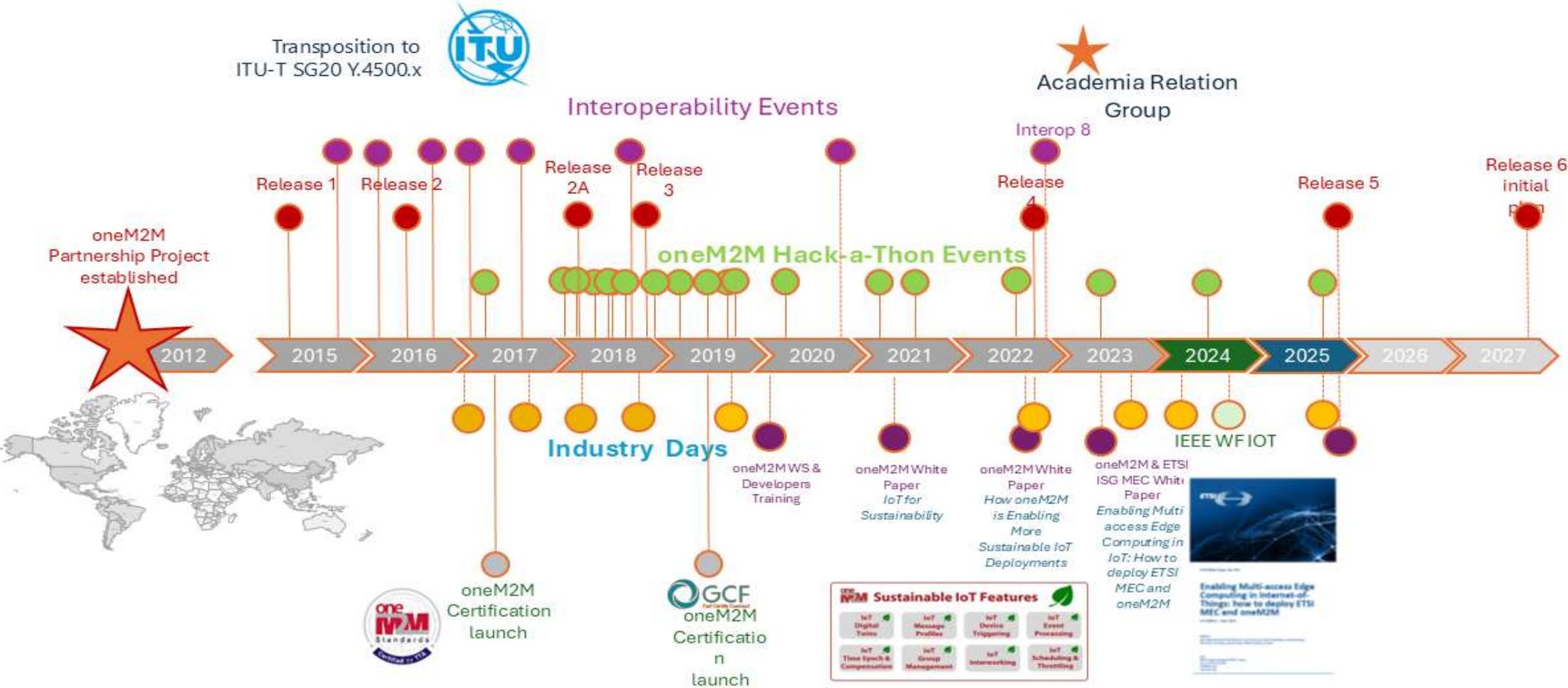
oneM2M Breaks Down the Silos



oneM2M Common Services “Toolkit”



oneM2M Key-events Timeline



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oneM2M Published Specifications

Release 1

- Registration
- Discovery
- Security
- Group Mgmt.
- Data Mgmt. & Repository
- Subscription & Notification
- Device Management
- Communication Mgmt.
- Service Charging
- Network Service Exposure | App & Service Mgmt.
- HTTP/CoAP/MQTT Bindings

Release 2

- Time Series Data
- Flexible resources that can be customized by app developers
- Semantics Description & Discovery
- Security Enhancements: Dynamic Authorization / Content Security / E2E Security
- WebSocket Binding
- Ontology for Home Area Information Model
- oneM2M App-ID Registry
- oneM2M Interworking: LWM2M / AllJoyn / 3GPP Triggering

Release 3

- Semantic Querying/Mashups
- 3GPP SCEF Interworking: Non-IP Data Delivery / UE Reachability Monitoring / Device Triggering / Etc.
- Transaction Management
- Service Layer Routing
- Common oneM2M Interworking Framework: OCF, OPC UA, OSGi, Modbus
- oneM2M Conformance Tests and Profiles
- Security Enhancements: Distributed Authorization, etc.
- Ontology-based Interworking

Release 4

- Fog/Edge Computing: Service Provisioning / Service Pooling, etc.
- 3GPP Interworking: Session QoS / V2X / NIDD Enhancements / Charging
- Vehicular Centric Features: Mobility, low latency, ...
- Semantic Reasoning & Ontology Mapping | Service/User Subscription
- Security Enhancements: User/Data Privacy, etc.
- W3C WoT Interworking
- SDT4.0 and the information models for multiple domains 2
- Streamlining oneM2M protocol
- oneM2M Conformance Tests

<https://www.onem2m.org/technical/published-specifications>



oneM2M Future Feature development

Release 5

TECHNICAL REPORTS

REQUIREMENTS TS-0002

TECHNICAL SPECS

- AI enablement
- Support of Data Protection Regulations
- Support of Data License Management
- Advanced Semantic Discovery
- Enablement of IoT in the metaverse
- Digital Twins Enablement in oneM2M
- Integrating NGSI-LD API in oneM2M
- Additional Interworking (e.g. OGC's Sensor Thing API)
- Enhanced Filter and Queries
- Enhanced Public Warning Service Enabler
- Effective IoT Communication to Protect 3GPP Networks (cont'd)

ETSI & IoT



ETSI in a nutshell

- Standards setting organization
- ICT and « ICT inside » e.g. **IoT**, **M2M**, intelligent transport, security, e-ID, etc
- Formally recognized by the EU
- Global membership with direct participation.
- All you can eat
- Free availability of deliverables
- Focus on Interoperability (CTI)
- Collaborative working and partnerships

European & Global SDO

- ETSI is a brainchild of European industrial policy
- It produces standards in support of European Union policies and legislation, e.g.
 - Radio, e-ID, e signatures, Security, Accessibility
- It contributes to ICT radio frequency requirements to the European co-ordination process
- ETSI works in close cooperation with CEN and CENELEC, the other two ESOs
- Work closely with National Standards Organizations (NSOs) in the European countries.
- EC and EFTA are Counsellors of ETSI
- Global footprint of standards implementation (incl. HENs)
- Global membership
- Operates in partnership with peers worldwide (US, India, China, Japan, Korea)



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Committees, Projects & other groups

- **ATM:** Access, Terminals, Transmission and Multiplexing
- **BRAN:** Broadband Radio Access Networks
- **BROADCAST:** EBU/CENELEC/ETSI on Broadcasting
- **CABLE:** Integrated broadband cable telecommunication networks
- **CYBER:** Cyber Security
- **DATA:** Data Solutions
- **DECT:** Digital Enhanced Cordless Telecommunications (DECT)
- **EE:** Environmental Engineering
- **eHEALTH:** eHEALTH
- **EMTEL:** Emergency Communications
- **ERM:** EMC and Radio Spectrum Matters
- **ESI:** Electronic Signatures and Trust Infrastructures
- **HF:** Human Factors
- **INT:** Core Network and Interoperability Testing
- **ITS:** Intelligent Transport Systems
- **LI:** Lawful Interception
- **MSG:** Mobile Standards Group
- **MTS:** Methods for Testing & Specification
- **QT:** Quantum Technologies
- **RRS:** Reconfigurable Radio Systems
- **RT:** Railway telecommunications
- **SAFETY:** Safety
- **SAL:** Securing Artificial Intelligence
- **SES:** Satellite Earth Stations & Systems
- **SET:** Secure Element Technologies
- **SmartBAN:** Smart Body Area Network
- **STQ:** Speech and multimedia Transmission Quality
- **TCCE:** TETRA and Critical Communications Evolution
- **USER:** User Group

ETSI PARTNERSHIP PROJECTS



Industry Specification Groups

- **ARF:** Augmented Reality Framework
- **CIM:** cross-cutting Context Information Management
- **ENI:** Experiential Networked Intelligence
- **F5G:** Fifth Generation Fixed Network
- **ISAC:** Integrated Sensing And Communications
- **MAT:** Multiple Access Techniques
- **MEC:** Multi-access Edge Computing
- **NFV:** Network Functions Virtualisation
- **DEU:** Operational energy Efficiency for Users
- **QKD:** Quantum Key Distribution
- **RIS:** Reconfigurable Intelligent Surfaces
- **THz:** TeraHertz technology
- **ZSM:** Zero Touch Network and Service Management

Software Development Groups

- **DCF:** OpenCAPIF
- **ODP:** OpenOP
- **OSL:** OpenSlice
- **OSM:** Open Source MAND
- **TFS:** TeraFlowSDN

ETSI Technical Committee SmartM2M

- **ETSI Technical Committee SmartM2M** responsible for developing standards to enable M2M services and applications and certain aspects of IoT.
- **ETSI** is one of funding partners in **oneM2M** and help to produce the specifications to enable users to build platforms by which devices and services can be connected, regardless of the underlying technology used.
- ETSI TC SmartM2M enables connected devices to exchange information through SAREF,
 - SAREF (Smart Applications REFerence ontology) runs with oneM2M-compliant communication platforms.
 - With SAREF, SmartM2M is promoting oneM2M Base Ontology with extensions in many IoT domains.
- ETSI TC SmartM2M is also supporting the ETSI role in AIOTI (www.aioti.eu) WG03 (IoT Standardization) in collaboration with the H2020 IoT Large Scape Pilot and IoT Platforms.
 - It also collaborate with TC CYBER to achieve the move towards better IoT Cybersecurity, Safety and Privacy protection.
 - ETSI has published [EN 303 645](#), the first globally applicable, harmonized standard for consumer Internet of Things (IoT) security
- Standards:
 - ETSI GR ZSM 020 V.1.1.1 (2026-01): Zero-touch network and Service Management (ZSM); Study on the Utilization of Agents in Autonomous Networks
 - ETSI GR ZSM 019 V.1.1.1 (2026-01): Zero-touch network and Service Management (ZSM); ZSM Framework for NaaS
 - ETSI GS ZSM 018 V.1.1.1 (2024-12): Zero-touch network and Service Management (ZSM); Network Digital Twin for enhanced zero-touch network and service management

ETSI Technical Committee SmartBAN

- **ETSI Technical Committee SmartBAN** responsible for standardization to support the development and implementation of **Smart Body Area Network (BAN) technologies** (Wireless BAN, Personal BAN, Personal Networks, etc.) in health, wellness, leisure, sport and other relevant domains.
- **Key objectives include:**
 - Ultra-low-power radio communication
 - Low-complexity MAC protocols for extended autonomy
 - Robust performance under interference
 - High security, privacy and trust
 - Interoperability across heterogeneous **IoT networks**
- **Scope of work covers:**
 - Physical, network and security layers
 - Data interoperability and formats
 - QoS requirements
 - Generic applications and services
- **Standards:**
 - **ETSI TS 103 378 V1.2.1 (2026-01):** Unified data representation formats, semantic open data model and corresponding ontology; Associate service model/ontology/enablers extensions for SmartBAN semantic interoperability
 - **ETSI TS 103 805 V1.1.1 (2024-01):** Relay Functionality for SmartBAN Medium Access Control (MAC)

ETSI Technical Committee eHEALTH

- **ETSI Technical Committee eHEALTH**

- Coordinates ETSI's standardization activities in the eHealth domain, identifies gaps, and addresses areas not covered by other ETSI bodies.

- **Key Focus Areas:**

- Security of systems and data
- Quality of services
- Interoperability & testing/validation
- Usability

- **Key Collaborations within ETSI:**

- **TC SmartM2M & oneM2M:** SAREF for eHealth and Ageing Well (data definition)
- **TC CYBER & ISG PDL:** tools for contact tracing during health emergencies
- **TC SAI & OCG AI:** AI applications in eHealth
- **TC SmartBAN:** wearables for eHealth
- Other ETSI groups ensuring ICT standards are eHealth-ready

- **Standards:**

- ETSI TR 103 477 V1.3.1 (2023-01): eHEALTH; Standardization use cases for eHealth
- ETSI SR 003 809 V1.1.2 (2021-12): eHEALTH; The role of ICT to enable Health crisis management and recovery; Responding to the 2019 SARS-CoV-2 Pandemic



3GPP & IoT



3GPP standards eco-system



3GPP: NB-IoT

- In 2016, 3GPP standardized Narrowband Internet of Things (NB-IoT) in Release 13 first time
 - enables a wide range of new cellular-connected IoT devices and services.
 - offers a dedicated wireless pathway optimized for IoT
 - operates within licensed spectrum bands owned by mobile carriers.
 - Communication between NB-IoT devices and the network occurs within a designated narrow band of 200kHz, compared to much wider bands used by standard cellular connectivity.
- 2018: Rel-14 – Improvements of the Mission Critical (MCx) aspects, Vehicle-to-Everything (V2X), **improvements for Cellular IoT**, eLAA, 4 band & inter-band Carrier Aggregation.
- 2022: Rel-17 - Reduced capability NR (Redap), NR to 71GHz, Non terrestrial Networks (NTN), **IoT over NTN**, RF reqs for NR FR2, Support for uncrewed aerial systems, Support for edge computing in 5GC, Proximity-based services in 5GS, Access traffic steering, switch and splitting (ATSSS), **Support for the Industrial IoT**, Advanced V2X... See a summary of Rel-17 Work Items in TR 21.917

Ambient IoT (A-IoT) in 3GPP Release 19

- 3GPP is standardizing a new ultra-low-power IoT technology for battery-less or energy-harvesting devices, offering orders-of-magnitude lower complexity and power consumption compared to LPWA technologies like NB-IoT and eMTC.
- Rel-19 focuses on A-IoT Device 1 with $\sim 1 \mu\text{W}$ peak power consumption, no active RF components, and backscatter-based uplink transmission using an external carrier wave—enabling extremely low-cost, small-form-factor devices.
- The Work Item addresses indoor inventory (rUC1) and indoor command (rUC4) use cases, with direct bidirectional communication between device and base station reader in licensed FR1 FDD spectrum (D1T1 topology).
- Devices harvest energy from ambient RF, thermal sources, or dedicated supply nodes and use simple envelope detectors for reception. Only device-terminated (DT) and triggered device-originated (DO-DTT) traffic are supported (no autonomous active uplink).
- [Release 19 Ambient IoT](#)

EU-India Partnership Instruments



ETSI cooperation with INDIAN SDOs

- **MoU signed with Bureau of Indian Standards (BIS)**
 - to perform & promote international standardization, which will benefit both by adopting a complimentary approach to the standardization, fostering closer cooperation, and further strengthening their relationship.
- **TEC, an associate member of ETSI as other government body**
 - Participates in the ETSI meetings, submit contributions for the meetings, work with technical bodies work programme etc.
 - National Standards by TEC based on OneM2M Release 2 Specifications
 - WTO-TBT for Telecom/ICT Products
- **Telecommunications Standards Development Society, India (TSDSI) signed a cooperation agreement with ETSI**
 - TSDSI has also signed agreements with 3GPP and oneM2M partnership projects, of which ETSI is a founding member.

ETSI is supported in India by the Seconded European Standardization Expert for India (SESEI) project, established by ESOs i.e. CEN, CENELEC and ETSI and the European Commission and the European Free Trade Association (EFTA). A seconded standardization expert, Mr. Dinesh Chand Sharma, has been appointed in India to increase the visibility of European standardization and to promote EU/EFTA-India cooperation on standards and related policies and legislations.



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EU-India TTC – What's in it

WG1: Strategic technologies, digital governance and digital connectivity

Areas to be explored:

- Digital connectivity (MoU in Nov'23)
- Artificial Intelligence
- 5G/6G (MoU b/w B6GA and 6G-IA)
- High performance and Quantum computing
- Semiconductors (EU-Ind signed)
- Cloud systems
- Cybersecurity
- Digital skills
- Digital platforms

WG 2: Green & clean technologies

The group focuses on **standards**, emphasis on research and innovation.

Areas to be explored :

- Research and Innovation
- Wastewater treatment
- Recyclable Plastics
- Waste to Energy
- E-mobility and battery performance and recycling
- Green hydrogen and green ammonia
- Liquid fertilizers

WG 3: Trade, investment and resilient value chains

- ▶ The resilience of supply chains and access to critical components, energy, and raw materials.
- ▶ To resolve identified trade barriers and global trade challenges by promoting cooperation in multilateral fora.
- ▶ Towards **promotion of international standards** and cooperation on addressing global geopolitical challenges.

EU-India: New Strategic Agenda

- On September 17, 2025, European Union (EU) unveiled a new "[Strategic EU-India Agenda](#)" to significantly deepen and broaden cooperation with India across multiple sectors.
 - This builds on Strategic Partnership established in 2004 and is underpinned by shared interests and complementary strengths.

Five Pillars

PROSPERITY AND SUSTAINABILITY

- Boosting trade and investment; strengthening supply chains and economic security; and advancing the clean transition and resilience.

TECHNOLOGY AND INNOVATION

- **Supporting critical emerging technologies**; advancing a conducive digital environment; and promoting research cooperation.

SECURITY AND DEFENCE

- Deepening engagement on regional security; countering traditional and hybrid threats; and boosting defence industrial cooperation.

CONNECTIVITY AND GLOBAL ISSUES

- Strengthening regional connectivity; promoting cooperation in third countries; and shaping effective global governance.

ENABLERS ACROSS PILLARS

- Expanding skills mobility; promoting mutual understanding; involving business communities; and reinforcing institutional architecture.

Other Partnership Projects/instruments

EU-India Global Gateway

- Strategic partnership under **EU's Digital & Connectivity Strategy with** Priorities around **Emerging tech, Cybersecurity, DPI, Trusted digital infra, Online platforms**
- Initiatives:
 - **EU-India Global Gateway Conference for Connectivity Investments in North-Eastern India (Shillong Conference-2023)** – Digital, Energy & Transport sectors
 - **Trilateral cooperation** in Africa, Indo-Pacific, Central Asia
 - **India-Middle East-Europe Economic Corridor (IMEC)** → Transport, energy & **digital connectivity**

SESEI Project (Phase VI: 2024-2027)

- Managed by **CEN, CENELEC, ETSI, EC-DG INTPA, EFTA**
- Enhances visibility of **European Standardization System (ESS)** in India
- Supports EU-India alignment in **standards, regulations, policies**
- Priority Areas are aligned with EU-India TTC topics:
 - **Digitization:** AI, 5G/6G, **IoT**, Quantum, Smart Manufacturing, e-Signature, e-accessibility etc.
 - **Green & Clean Tech:** Clean Energy, EVs, Green Hydrogen, Circular Economy etc.

InDiCo-Global (2024-2027)

- Consortium: ETSI, CEN, CENELEC, Trust-IT, Martel, COMMpla
- Promotes EU **digital policies & ICT standards** globally
- Focus: **AI, 5G/6G, IoT, Cybersecurity, Quantum, Smart Cities, Circular Economy** etc.
- Outreach: **India, China, South-east Asia, African Union, Western Balkans, Eastern Partnership and Latin America and Caribbean (LAC).**



Conclusion

- **IoT** is a key enabler of digital transformation, supporting smart cities, industry, mobility, energy, healthcare and public services.
- **ETSI, oneM2M & 3GPP** are driving global IoT standardization, ensuring interoperability, scalable architectures, and secure IoT deployments across sectors.
- **Standards-based IoT ecosystems** reduce fragmentation, enable cross-border compatibility, and accelerate innovation and market adoption.
- **Security and trust remain central priorities**, as increased connectivity also increases cyber risks—making cybersecurity standards essential for resilient IoT infrastructure.
- **EU–India cooperation** provides a strong platform for IoT collaboration, supported by strategic instruments such as the EU–India TTC, Global Gateway, Horizon Europe, etc.
- Strengthening **Global alignment on IoT standards and policy frameworks** will boost industrial competitiveness, enable sustainable development, and support future-ready digital infrastructure.



Thank you!

Dinesh Chand Sharma

(Seconded European Standardization Expert in India)

Director – Standardization & Public Policy

Address: AIF, 2ND Floor, 101

Ishwar Nagar, Okhla, New Delhi 110044

Mobile: +91 9810079461, dinesh.chand.sharma@sesei.eu

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