

Essential Standards



WE ARE STANDARDS

At ETSI we produce globally applicable technical standards for ICT-enabled systems, applications and services that are widely deployed across all sectors of industry and society.

Officially recognized by the European Union as a European Standards Organization (ESO), our outputs include globally applicable standards for Information and Communications Technologies, including fixed, mobile, radio, transportation, broadcast, and Internet technologies.

Established in 1988 as a not-for-profit organization, ETSI has 946 members drawn from 64 countries (end 2023). These include world-leading companies from the manufacturing and service sectors, regulatory authorities, and government ministries, as well as small/medium-sized enterprises and innovative start-ups, alongside universities, R&D organizations, and societal interest groups.

Our standards help ensure the free movement of goods within the European single market, allowing enterprises in the European Union to be more competitive. Building on this heritage, the excellence of our work and our open approach sees ETSI's influence extend beyond Europe to the whole world.

This Annual Report highlights just some of our many achievements during 2023. Full details about the work of our Technical Committees, Industry Specification Groups and other technical bodies can be found online at etsi.org/technologies, and on the ETSI Portal at portal.etsi.org.

You'll discover more about our current and planned activities in the ETSI Work Programme 2024-2025.

DESIGNING TOMORROW'S WORLD

'Designing tomorrow's world' is ETSI's strategy that recognizes the global importance of ICT for society's sustainable digital transformation. Our vision is to be at the forefront of Information and Communication Technology, and to lead development of standards that enable a sustainable, securely connected society. To deliver this vision ETSI follows a path marked by five Key Strategic Directions that express the journey to achieve our ambitions:

Being at the Heart of Digital

As the preferred point of call for ICT related standardization, ETSI enables comprehensive end-to-end ICT architectures and technologies including devices, network, and cloud.

Being an Enabler of Standards

ETSI provides support and tools to enable the identification of the needs and requirements for standards and their production and adoption. We are the enabler of standards in response to regulatory, legislative, policy and market needs.

Being Global

ETSI creates standards intended for global use, with a membership from across the world and partnerships covering all regions and relevant sectors for ICT. We tailor our processes to influence worldwide standards and builds on our ESO status to contribute to the European economy.

Being Versatile

ETSI innovates in its working methods, creating room for wide participation, rapid deployment and global acceptance of its standards. We work with developer communities and supports the creation and maintenance of test suites and tools plus additional standards-related software material.

Being Inclusive

ETSI's membership represents real market and societal needs, from local to global, leveraging the digitization of business and industry, circular economy, and the sustainable development of modern society. ETSI comprises large and small companies and research organizations, as well as other business, consumer, societal and environmental stakeholders.

Learn more at etsi.org/about/our-strategy

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2023 in brief

JANUARY

- 5th NG112 Emergency Communications Plugtests™

MARCH

- Summit on Sustainability: ICT Standards for a Greener World
- 2023 ETSI Fellows announced
- Report on enabling more transparent security techniques

MAY

- Release of first use cases for Reconfigurable Intelligent Surfaces
- oneM2M specifications approved as ITU standard

FEBRUARY

- ETSI Research Conference: Maximizing the Impact of European 6G Research through Standardization
- 9th ETSI-IQC Quantum-Safe Cryptography workshop
- ENISA/CEN/CENELEC/ETSI Cybersecurity Standardization Conference supporting EU legislative framework, Brussels
- Announcement of Software Development Groups

APRIL

- 23rd Global Standards Collaboration meeting hosted by ETSI in London
- World's first Protection Profile for Quantum Key Distribution (QKD)
- Webinar on User-Centric Approach of Smart Digital Identity

JUNE

- ETSI celebrates 30 years of standards for European single market
- New 'DIY' declaration feature in ETSI IPR database application
- OSM#15 Hackfest and Ecosystem Day
- ETSI NFV and O-RAN Alliance workshop, Osaka

ETSI Members:

946 from
64 countries, including
23% SME/micro-enterprises and
15% universities / researchers

**Publications
to date:
58 550**

**Technical
groups:
100+**

**Publications
issued in 2023:
1 812**

JULY

- ETSI 35th anniversary celebrated
- Launch of OpenSlice, first ETSI Software Development Group
- 3rd FRMCS Plugtests held at UIC headquarters, Paris
- OSM Release FOURTEEN announced
- ETSI IoT Conference focuses on green and digital transformation

OCTOBER

- ETSI Security Conference
- 8th MCX Plugtests, University of Malaga
- LTA Signature Augmentation and Validation Plugtests
- Agreement to release TETRA air interface algorithms to public domain
- Industry Standards Group on Securing AI becomes Technical Committee

DECEMBER

- Publication of revised edition of ETSI Technology Radar
- OSM Release FIFTEEN announced
- 3GPP celebrates 25th anniversary and commits to develop 6G specifications

SEPTEMBER

- Extension of collaboration with Linux Foundation
- Standard to comply with EU regulation on electronic signatures in email messages
- World first report on mitigating AI-generated deepfakes

NOVEMBER

- Launch of ISG ISAC (Integrated Sensing and Communications)
- Election of new ETSI Board Chair and Board Members
- Software Development Group OpenCAPIF announced
- Signature of pledge to future standardization professionals

**Standards
downloads
in 2023:
19 975 000**

**Plugtests
interoperability
events:
8**

**Partnerships:
108**

**ETSI Secretariat:
127 people from
25 nationalities**

In review



Bettina Funk Chair of the General Assembly

Following 2023's enforcement of amended Regulation (EU) 2022/2480, the National Standardisation Bodies of the EEA are now wholly responsible for the consideration and acceptance of Standardisation Requests received by ETSI. This responsibility extends to managing Work Items created by ETSI in response to requests, and ultimately the validation and adoption of the European and Harmonized standardization deliverables that we produce.

I am pleased to note that through the tremendous efforts of the ETSI membership, together with the ETSI Secretariat during 2023 we were successful in becoming fully compliant with these new requirements.

Implementing these significant changes to our Directives within the required timeframe has not been without its challenges. But these efforts have been more than rewarded in ensuring that ETSI's outputs are fully aligned with European policymaking and the interests of its citizens.



Markus Mueck Chair of the Board

While many of the thousands of technology standards we write annually have global relevancy, we are mindful that ETSI also serves the interests of the EU and the European Single Market.

The European Commission, European Parliament and European Council collectively prepare key regulations that have far-reaching implications for all stakeholders. As an example, preparations for the forthcoming Cyber Resilience Act and European Artificial Intelligence Act provide a clear framework on requirements for accessing the European Single Market. And in a rapidly changing world, we must ensure that ETSI's deep technical competence can be offered appropriately to support the implementation of upcoming legislation.

Following publication in February 2022 of the EU's new Standardisation Strategy, the spotlight has been turned firmly on European Standardisation Organisations (ESOs) and their role in supporting EC policymaking objectives. Measures put forward by the Commission included a proposed amendment to Regulation EU No 1025/2012, mandating ESOs to meet key criteria in handling standardization requests. This was accompanied by a call for ESOs to modernize their own governance.

Adopted in December 2022 as Regulation (EU) 2022/2480 and subsequently enforced in July 2023, this amendment has necessitated new processes in ETSI to ensure that as an ESO we meet the EU's demand for greater representation of societal stakeholders.

Staunchly European in its obligations but with a wider global outlook, I am confident that ETSI is in better shape than ever to demonstrate the added value that it provides to the European Standardisation system.



Luis Jorge Romero Director General

In 2023 ETSI celebrated its 35th anniversary. Since our foundation in 1988 at the instruction of the European Commission and CEPT, we have published over 58 000 standards, specifications, reports and other deliverables. Complementing the work of our European Standardisation Organisation (ESO) peers, these deliverables have been instrumental in helping foster a thriving harmonized single market for more energy efficient, interoperable, safer and better value products and systems.

‘Digital transformation’ is a term that’s liberally applied across many industries, and it’s one that is equally applicable to the world of standardization. As technology evolves – characterized by developments including 6G, AI and quantum computing – ETSI remains agile in adapting its structure and working methods to serve the needs of citizens in Europe and the wider world.

Some organizational changes in 2023 have sharpened the focus of our activities as ETSI’s workload grows ever greater. These allow us to be even more responsive in serving the core standardization activities of our members. Our Operations division continues to support the work of 100+ technical bodies, while performing a parallel function for 3GPP. Meanwhile a new Standardization Services division ensures that our officers and committees are equipped with the best tools, resources and methodologies to do the job, from drafting standards to interoperability testing and document processing.

These changes are essential in a fast-moving world where the very nature of standardization is itself evolving. ETSI’s commitment to continuous improvement is further reflected in the establishment in 2023 of our first Software Development Groups. Drawing inspiration from other open source communities in the ICT world, they support the development of code to support our members’ standardization requirements in an agile, collaborative environment.

We’ve also conducted a fundamental review of our own governance. This is to ensure that all ETSI members – including global brands, small businesses and research institutions – benefit equitably from the services we offer. This is reflected in root-and-branch reforms in areas such as voting rules, membership fees and the structure of our Board.

By maintaining an unwavering focus on the future – as we have done for the last three and a half decades – ETSI will maintain its continuing relevancy as an effective participant in the European standards-making ecosystem.



A bridge to a new generation

5G Advances as 6G vision emerges

As a founding partner of 3GPP (The Third Generation Partnership Project), our standardization activities cover a full range of advanced cellular communication technologies. These include radio access, core network and service capabilities that together offer a complete system description for mobile network operators, vendors and service providers. 3GPP specifications also provide hooks for non-radio access to the core network, and for interworking with other networks. Established in 1998, 3GPP brings ETSI together with six other regional standardization organizations in Asia and North America, plus market representation partners (associations) and several hundred individual companies.

Enabling an exciting constellation of advanced applications tailored to vertical industries and sectors, Release 18 represents the first set of 3GPP specifications to be characterized by the mid-generational '5G-Advanced' marker. Delivering on the full potential of 5G, this also lays the foundations for future work on 6G technologies.

Intense work during 2023 culminated in the effective completion of Release 18 Stage-2 by the end of the year. This has preceded an anticipated Stage-3 functional freeze in March 2024, ahead of protocol stability by June 2024 to signify delivery of implementable Release 18 specifications.

Release 18 in brief: core topics

- Satellite (5GSAT), non-terrestrial networks (NTN)
- Internet of Things (IoT), including MTC, energy, complexity saving
- Uncrewed Aerial Vehicles (UAV), UAS, UAM
- Sidelink, proximity, location, and positioning
- Verticals, industries, factories, northbound API
- Mission critical and emergency calling
- Artificial Intelligence (AI) / Machine Learning (ML)
- Multicast and Broadcast Services (MBS)
- Network Slice
- eXtended, Augmented and Virtual Reality (XR, AR, VR)
- Transportation (Railways, V2X)
- User plane traffic and services
- Edge computing
- Non-Public Networks
- User plane improvements
- Network automation
- Data interoperability, as well as AI and regulatory impacts and opportunities.





A GLOBAL INITIATIVE

The 100th Plenaries of the Technical Specification Groups in 3GPP were celebrated in Taipei during June 2023, where the first workshops were held to discuss the content of Release 19. Following good progress on Release 19 Stage-1 priorities at the December 2023 Plenaries, this process is ongoing.

Confirming a shared commitment

Since its inception, 3GPP has successfully delivered on the promise of cellular communications. The original scope of project in 1998 was to produce specifications for a 3G mobile system based on evolved GSM core networks and the radio access technologies that they supported. Since then, 3GPP's consensus-based process has delivered the critical technical specifications that provide a comprehensive system description for the mobile networks that billions of users depend on. Building on twenty-five years of work to create specifications for 3G, 4G and 5G, 3GPP is now uniquely poised to standardize the next generation of mobile systems. Coinciding with the 25th anniversary of signing the original project agreement, in December 2023 all current 3GPP

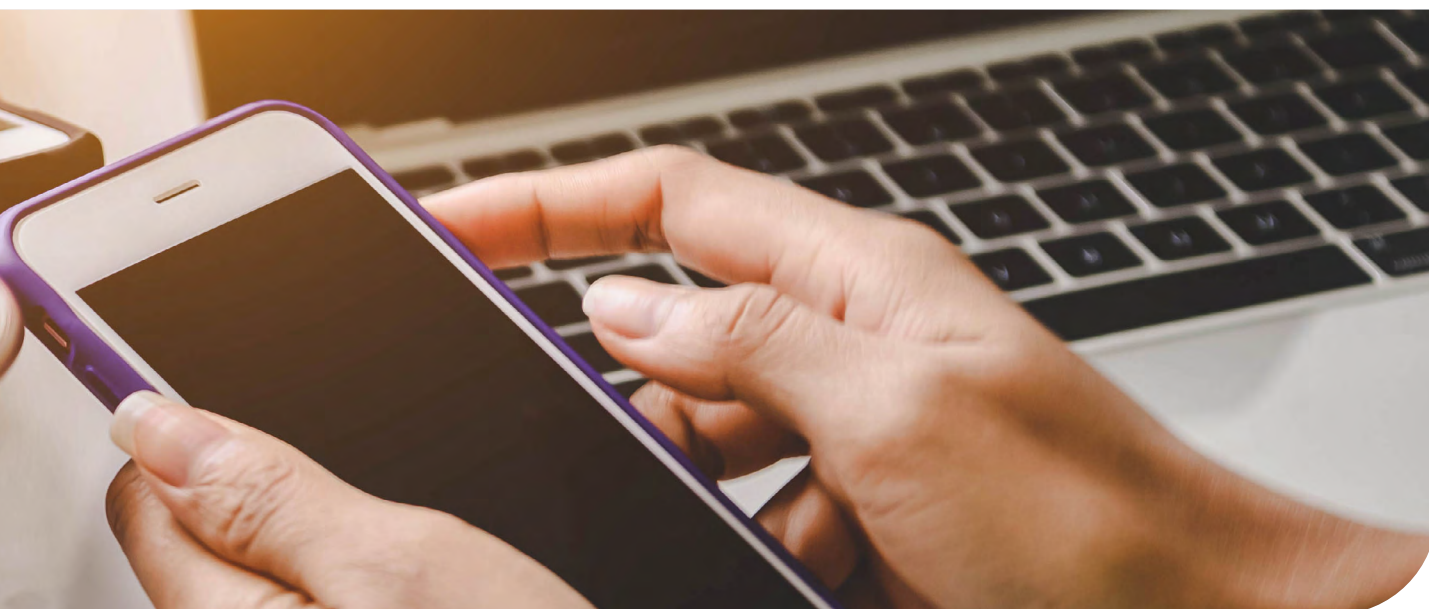
Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA and TTC) announced their shared commitment to develop 6G global communications specifications within 3GPP.

"Success is something that we must work to maintain. Our future success is best served by the partners' commitment to making 3GPP fit for purpose for the next phase of the system's development. Our early commitment to this cause is a strong marker for the exciting road ahead – towards 6G."

Luis Jorge Romero, ETSI Director General

At the end of 2023, of the 865 member organizations of 3GPP, 477 (55%) were via their membership of ETSI.

View the complete 3GPP work plan at 3gpp.org/specifications/work-plan



All together

Connecting devices, data and experiences

Connections between billions of devices are driving exciting new applications and fresh sources of business value. The Internet of Things (IoT) brings together technologies including Machine-to-Machine (M2M) service platforms and wireless sensor networks. IoT use cases span smart cities, connected vehicles, eHealth, home automation, energy management, public safety, logistics and more.

oneM2M

oneM2M is the global standards initiative that considers requirements, architecture, security solutions and interoperability for Machine-to-Machine and IoT technologies. As a oneM2M founding partner, ETSI helps produce standards and specifications that simplify connection between devices and services, regardless of the underlying technology.

oneM2M is an open set of specifications that define a common set of horizontal IoT service functions, enabling secure data exchange and information interoperability across different vertical sectors, service providers and use cases, including smart cities, energy and grid, smart agriculture, lift & buildings, and maritime services. The IoT ecosystem is futureproofed by standardized APIs that reduce costs and enable interworking with existing technologies.

In May 2023 more than 190 ITU-T member countries approved oneM2M specifications as an ITU standard, simplifying the IoT ecosystem lifecycle by minimizing development, deployment, and maintenance costs.

In July oneM2M and ETSI's MEC Industry Specification Group (ISG MEC) jointly published a White Paper 'Enabling Multi-access Edge Computing in Internet of Things: how to deploy ETSI MEC and oneM2M'. Reflecting collaboration across 3GPP and oneM2M communities, the paper discusses deployment of ETSI MEC and oneM2M components in environments such as smart factories, automotive scenarios and edge deployments involving constrained devices.

ETSI IoT Conference

Held over three days in July 2023 at our Sophia Antipolis headquarters and online, the ETSI IoT Conference (previously 'ETSI IoT Week') offered attendees the opportunity to share experiences related to IoT technologies, services, activities and requirements in the context of present and future standardization work. With the theme of 'Green and Digital Transformation', the event offered a mix of keynote speeches, presentations, interactive panels and IoT demonstrations. Topics addressed spanned semantic interoperability, multi-access edge computing, digital twins, cybersecurity, environmental engineering and IoT data interoperability, as well as AI and regulatory impacts and opportunities.

Smart Machine-to-Machine Communications

In coordination with oneM2M, our SmartM2M Technical Committee (TC SmartM2M) produces specifications to simplify the connection of devices and services via the exchange of information through SAREF, our Smart Applications REference ontology that specifies core concepts in the smart applications domain and the relationships between them.

Topics addressed in a series of Technical Reports published during 2023 variously addressed: smart grids, industrial IoT use cases, deployment scenarios, standardization opportunities for digital twins, and performance assessment of oneM2M-based IoT platforms. In addition to issuing a new SAREF extension for the smart grid domain, we also revised an existing extension for the energy domain. In July TC SmartM2M (with oneM2M) organized the successful ETSI IoT Conference, providing the opportunity to promote awareness of SAREF among a broader community.



Context Information Management

From digitizing industrial processes to creating smart services for citizens, it's essential to record data with its context information (space, time, relations) and to transfer these unambiguously to other systems. ETSI's Industry Specification Group on cross-cutting Context Information Management (ISG CIM) is making it easier for end-users, data spaces, IoT platforms and third party applications to exchange information – with proper formal definitions, between vertical applications – while retaining the original meaning. The group develops and maintains specifications that enable the development of interoperable software implementations of a cross-cutting CIM Layer, using the NGSI-LD Application Programming Interface (API). In 2023 ISG CIM published a Group Report that provides test technique and examples of use for testing NGSI-LD-based interface and data model conformance. The report also describes how the NGSI-LD test platform can be used for data interoperability in smart cities. Meanwhile the committee issued revisions to the NGSI-LD API and its supporting assets.

Smart Body Area Networks

As the use of wearables and connected in- and on-body sensor devices grows in the Internet of Things (IoT), Wireless Body Area Networks (BAN) facilitate the sharing of data in environments such as smart homes, living environments, automotive and aerospace. ETSI's Smart BAN committee (TC SmartBAN) addresses the need for global standards to support the market roll-out of BAN technology. 2023 saw the publication of a Technical Specification that extends the SmartBAN MAC (Medium Access Control) with hub-to-hub communications capability. We also published a Technical Report detailing a Smart Coordinator for SmartBAN Networks that can be used as a 'bridge' between a SmartBAN and the surrounding infrastructure.

eHealth

eHealth considers the use of ICT across a range of functions that affect the health sector. Applications include health information networks, electronic health records, telemedicine services, personal wearable and portable communicable systems including those for medical implants, health portals, and other ICT-based tools assisting disease prevention, diagnosis, treatment, health monitoring and lifestyle management. In 2023 our eHEALTH Technical Committee issued a revision of its report that analyses eHealth use cases in order to drive future standardization efforts. Its scope includes examples from EU Research projects, and from current health industry practices.

Digital Inclusion and Accessibility

Understanding human capacities and limitations to make products and services easy for all to use is key to success of the digital networked economy. In ETSI we are helping to realize these objectives through the work of our Technical Committee on Human Factors. Co-operating with other ETSI groups to support the production of standards in accordance with good Human Factors practice, the committee's work addresses all users including children, seniors, and people with special accessibility needs. Published in 2023, a Technical Report on video game usability identifies the role of standards-based solutions in ensuring consistent design practice. The report considers the specific accessibility needs of users with hearing, vision, touch, cognitive and motor control types of disabilities.

Taking care to protect

Staying safe in a hyper-connected world

The Internet is critical to our everyday lives, and so too is its security. With growing dependence on networked digital systems comes an inevitable increase in the variety, scale and sophistication of threats and cyber-attacks targeting businesses, organizations and private individuals. Standards have a central role in strengthening our cybersecurity, protecting the Internet and everyone who relies on it.

Cybersecurity

A trusted centre of expertise, ETSI's Cybersecurity Technical Committee (TC CYBER) develops market-driven standardization solutions to meet strategic high-level needs, as well as offering guidance to regulators, users, manufacturers and network operators.

The security of consumer IoT devices has been a focus of TC CYBER activities for several years. In 2023, the committee revised its existing standard 'Cyber Security for Consumer Internet of Things: Baseline Requirements' that was subsequently published in early 2024 as a Technical Specification, progressing to an anticipated update of the EN version.

Anticipating the proposed European Cyber Resilience Act (CRA), TC CYBER – in collaboration with other ETSI groups – continued its analysis of the proposed legislation, providing comments to the European Commission on the draft Standardisation Request, and developing a mapping to assess existing standards and identify further work required in support of the Act.

During the year the committee published a Technical Specification 'Mapping specific requirements of the delegated act and Standardisation Request for RED articles 3(3)(d), 3(3)(e) and 3(3)(f) to IEC 62443-4-2 requirements and to EN 303 645 provisions'. A similar detailed mapping is under development, to be published in response to the anticipated CRA Standardisation Request.

Meanwhile the committee published a Technical Report presenting a comprehensive methodology for risk assessment based on products' properties

to support their placement on the internal market, which is one of the central requirements of the proposed regulation.

Originally published in 2021, ETSI's Protection Profile for Consumer Mobile Devices was revised and expanded in 2023 as a multi-part specification. As well as addressing basic requirements it now spans the increasing use of biometric authentication in consumer mobile devices. A further Technical Specification complements this Protection Profile, defining the evaluation configuration and merging the requirements of the two other documents to allow the product can be evaluated as a whole. This ETSI Base Protection Profile for securing smartphones gained world-first certification from the French Cybersecurity Agency at the end of 2023.

Reflecting societal concerns around the dangers of technology-enabled coercive control, a new report (published in early January 2024) provides emerging design practices through examples and explanatory text for organizations involved in the development and manufacturing of consumer IoT devices and associated services.

In the context of consumer devices, sensor hubs are microcontroller units or digital signal processors that help to integrate data from different sensors or other chips (e.g. Wi-Fi, Bluetooth, GPS). They are thus key components used for the management, pre-processing and presentation of user data to the device's operating system. In 2023 we published a Technical Specification detailing security threats and corresponding common security requirements of sensor hubs implemented in consumer devices.

In September 2023 ETSI announced publicly that it had been the subject of a cyber-attack on its IT systems. Working closely with the French National Cybersecurity Agency (ANSSI), the vulnerability on which the attack was based was rapidly identified and fixed. Additional security actions were also taken to significantly strengthen IT security procedures.

Cybersecurity Standardization Conference

Organized in February 2023 by ENISA (the European Union Agency for Cybersecurity), CEN, CENELEC and ETSI, the 7th Cybersecurity Standardisation Conference in Brussels focused on the theme of 'European Standardisation in support of the EU legislation'. Sessions included the proposed Cyber Resilience Act, eIDAS Regulation, the RED Directive, proposed European Chips Act, Data Act and the forthcoming AI Act.

Quantum Safe Cryptography

Quantum computers pose a major challenge to conventional cryptographic techniques, where information such as bank account details become subject to potential discovery and misuse.

The focus of our CYBER QSC Working Group is on the practical implementation of quantum-safe primitives, including performance considerations, implementation capabilities, protocols, benchmarking and practical architectural considerations for specific applications. During the year CYBER QSC published a Technical Report that offers recommendations on a QSC migration strategy for Intelligent Transport Systems and C-ITS use cases.

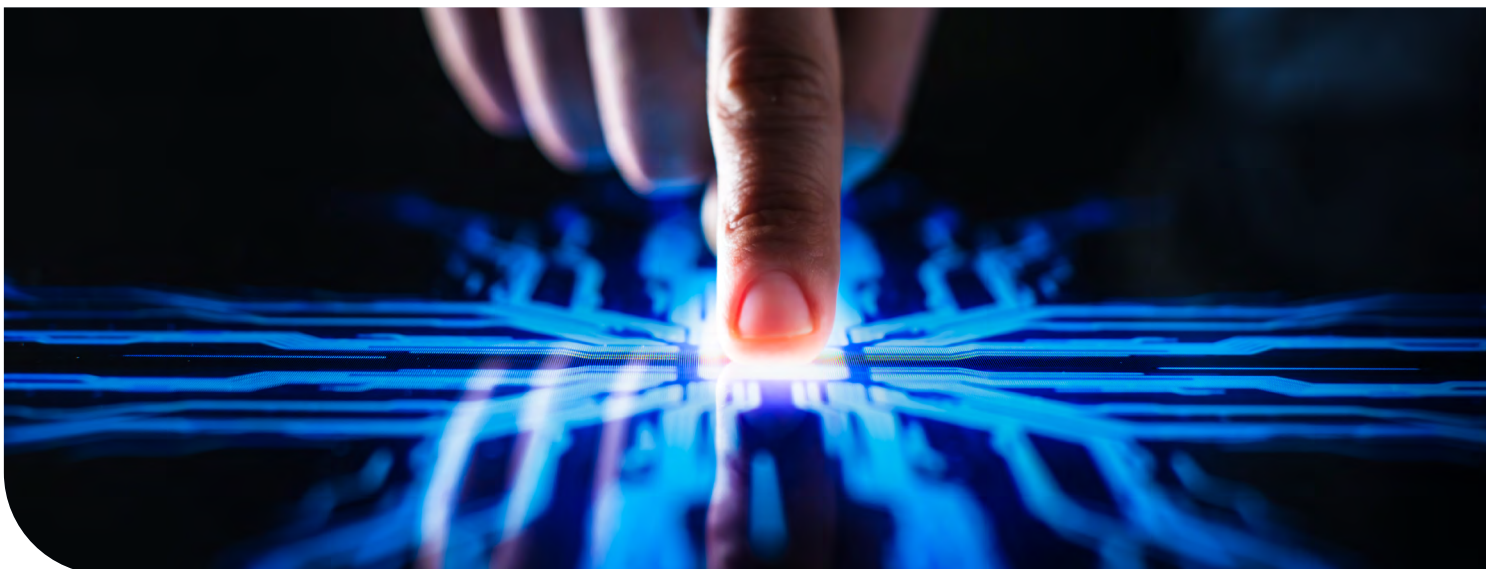
Held in February 2023, the 9th face-to-face ETSI-IQC Quantum-Safe Cryptography event attracted a large audience representing industry, academia and government. The Executive Track included keynote addresses on EU activities and direction in quantum-safe cryptography from ENISA and from colleagues in the telecom and aerospace industries who also lead EuroQCI (European Quantum Communication Infrastructure) initiatives. Expert panels shared advances in government actions and policies, while industry sessions discussed challenges faced by technology providers and leaders in finance and telecommunications as they prepare to migrate to quantum safe cryptography.

Available on YouTube, our short video 'Building a Quantum Safe Future!' offers a friendly introduction to ETSI's work on creating standards for Quantum Safe Cryptography and Quantum Key Distribution to help keep encrypted data secure.

Quantum Key Distribution

Quantum Key Distribution (QKD) enables keys to be established securely over optical links, via the transfer of quantum states. Unlike conventional methods, quantum cryptographic protocols should be resilient to all advances in computing and mathematics. The first applications of quantum cryptography are likely to be those requiring long term secrecy, such as encryption of sensitive government or corporate data or the health records of individuals.

In 2023 our Industry Specification Group (ISG) on QKD released the world's first Protection Profile (PP) for Quantum Key Distribution that will help manufacturers to submit pairs of 'prepare and measure' QKD modules for evaluation under a security certification process. Such modules can be used by telecom operators and enterprises in securing their networks with the knowledge that certified products have been subjected to the scrutiny of a formal security evaluation process. The Protection Profile specifies high-level requirements for the physical implementation of prepare and measure QKD protocols through to the output of final secret keys.



Securing Artificial Intelligence

AI is becoming increasingly endemic, featuring in many current and future software applications. It has been the responsibility of ETSI's Industry Specification Group on Securing Artificial Intelligence (ISG SAI) to develop technical reports and specifications that mitigate against threats arising from the deployment of AI – and threats to AI systems – from both other AIs and from conventional sources. In 2023 ISG SAI published four Group Reports: three collectively address explicability and transparency of AI processing and provide an AI computing platform security framework, while a fourth explores the threats posed by so-called 'deepfakes' and strategies to minimize them. In order to contribute directly to standardization requests – which may potentially include the future AI Act, Cybersecurity Resilience Act and NIS2 – it was decided to transfer the Industry Specification Group into a Technical Committee. The new TC SAI held its kick-off meeting in December 2023.

Permission Distributed Ledger

Our Industry Specification Group on Permissioned Distributed Ledgers (ISG PDL) is exploring the challenges presented by the operation of permissioned distributed ledgers. The group also addresses application scenarios, functional architecture and solutions for the operation of permissioned distributed ledgers, including interfaces/APIs/protocols and information/data models. In 2023 ISG PDL released a further suite of deliverables to support industry's and government institutions' rapidly expanding need for PDL solutions. These variously address: the use and applicability of reputation management in a PDL; potential security and privacy benefits of decentralized identification that can benefit public and private services; a description of wireless consensus network architecture; and an overview of use cases/scenarios of PDL specific to mobile networks. We also published revised versions of our PDL reference architecture, and an updated report on Redactable Distributed Ledgers.

Electronic Signatures

Our committee on Electronic Signatures and Trust Infrastructures (TC ESI) addresses the requirements of digital signatures, including formats, procedures and policies for creation and validation, as well as trust service supporting the authenticity of transactions. In 2023 the committee published two further parts of its Technical Report on policy and security requirements for Trust Service Providers issuing certificates. These were complemented by two further reports, one on analysis of selective disclosure and zero-knowledge proofs applied to Electronic Attestation of Attributes, and one on NIS2 and its impact on eIDAS standards. Conducted remotely from October to December 2023, ETSI's first LTA Signature Augmentation and Validation Plugtests saw 190 participants from 38 countries exchange over 35 000 digital signature validation reports. The event's aim was to test interoperability of digital signatures conforming to LTA (Long-Term Archive) level, as well as validation capacities of participants' LTA-level signatures.

Lawful Interception and Lawful Disclosure

Bringing together the interests of governments and law enforcement agencies as well as mobile network operators and equipment vendors, ETSI's committee on Lawful Interception (TC LI) develops standards supporting common international requirements for LEAs, including the interception of content and disclosure of electronic communications related data with supporting standards for warrantry and internal interfaces. During 2023 the committee continued to revise its suite of deliverables, notably including further updates to its multipart specification on Handover Interface and Service-Specific Details (SSD) for IP delivery. This ongoing work represents the substantial effort of leading experts to ensure that ETSI continues to publish world-class LI and LD standards. In addition, several other specifications and reports continue to be revised as necessary on an ongoing basis, based on proposals by TC LI Members approved by the group.

Smart Cards and the Secure Element

ETSI's Technical Committee on Secure Element Technologies (TC SET) is responsible for developing and maintaining specifications for the Secure Element (SE) used in communication systems including the Internet of Things (IoT) and Machine-to-Machine (M2M) applications. The committee creates 'agnostic' specifications that can find their way into other applications such as ID management, ticketing and cards with contactless interfaces used in financial services.

TC SET curates the UICC, the most widely deployed Secure Element whose specifications are evolving with support for multiple logical SEs inside one physical UICC. Support for the new I3C interface brings faster communication to the UICC as well as easier integration. The committee is also home of the newer Smart Secure Platform (SSP). Designed to cover needs from diverse industries, SSP offers a flexible platform that maintains common features and several characteristics of the UICC. In 2023 TC SET issued updates to a number of Technical Specifications and test specifications. Meanwhile the

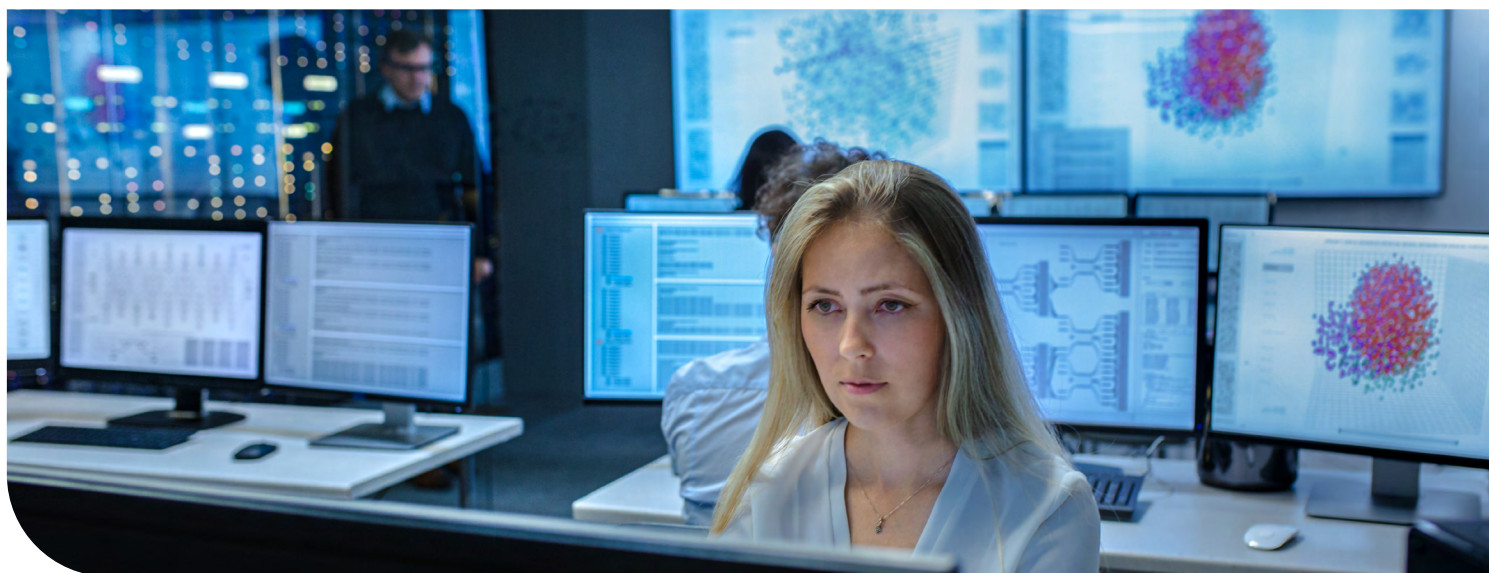
committee's TEC Working Group completed technical realization of requirements for the CAT-Runtime environment for the support of logical Terminal-UICC interfaces and logical SEs.

Encrypted Traffic Integration

An 'encrypted by default' paradigm adopted by many network and service providers may not take due account of threats to network resilience and security. ETSI's Industry Specification Group on Encrypted Traffic Integration (ISG ETI) aims to develop insights on the evolutionary path of this paradigm, as well as its impact where attackers may take advantage of encryption to spread malicious code or exfiltrate sensitive data through networks. Published in 2023, a Group Report on requirements definition aims to make networks more transparent in the way security techniques are deployed. An enabler for more transparent security techniques, it focuses on widespread adoption of the Zero Trust model, closely tied to explicit declarations of which specific security functions are being provided. The report adopts ongoing work on identity management and discovery for IoT, as well as work on the middlebox security protocols of ETSI's cybersecurity committee.

ETSI Security Conference 2023

Hosted in October at our Sophia Antipolis headquarters, the annual ETSI Security Conference attracted over 250 onsite attendees from 29 countries. Aligned with European Cybersecurity Month, the event focused on research and global security standards, considering aspects such as attracting the next generation of cybersecurity standardization professionals, and supporting SMEs. The four-day programme gathered speakers from government agencies, other standards bodies, academia and various industry sectors. Featured topics included global security and regulatory matters, zero trust, IoT certification, 5G-related security, quantum safe cryptography and quantum key distribution.



A new wave

Standards for wireless devices and systems

ETSI creates standards that define many radio technologies and systems, including those used for mobile phones, broadcast radio and television, broadband networks, satellite communications, smart grids, short-range devices and cordless technology. We also develop standards used by regulatory authorities to ensure safe co-existence of systems competing for use of limited spectrum resources.

Harmonised Standards and the Radio Equipment Directive

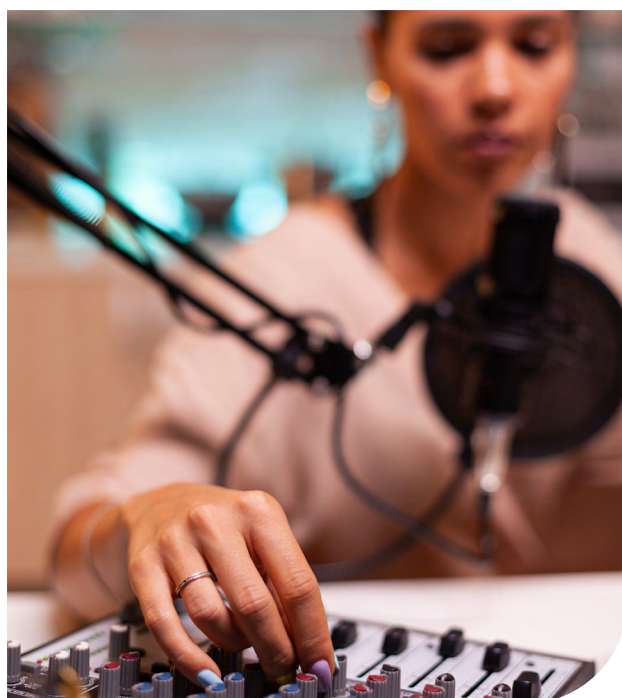
ETSI is responsible for a wide range of radio product and electromagnetic compatibility (EMC) standards and the overall co-ordination of radio spectrum matters, with much of this work being conducted in our Committee for Electromagnetic compatibility and Radio spectrum Matters (TC ERM) that develops Harmonised Standards and other deliverables in response to Standardisation Requests received from EC/EFTA. The committee's work accommodates the requirements of a broad range of industries and applications. These include standards for wide band and ultra-wide band data systems, Short Range Devices (SRDs), wireless medical devices, RFID devices, Intelligent Transport Systems, digital mobile radio, aeronautics, maritime, PMSE, TV/radio broadcast systems and more.

During 2023 the committee has continued to develop and revise various Harmonised Standards, European Standards, Technical Specifications, Technical Reports and System Reference documents. Here much of the work of TC ERM's Working Groups and Task Groups continues to be in response to the Radio Equipment Directive 2014/53/EU (RED), underscored by a strong cooperation between ERM with CEPT/ECC groups. During the year the committee has meanwhile worked closely with the EC to optimize the efficiency of Harmonised Standards drafting process, as exemplified by participation in several bi-lateral events.

Reconfigurable Radio Systems

Reconfigurable Radio Systems (RRS) are smart radio entities or functions that can react to their environment and/or have their radio parameters updated via software. This offers an opportunity to support the needs of our connected world – including the Internet of Things (IoT) – by sharing spectrum among multiple services and radio networks. Spectrum sharing will also play a key role in the further development of 5G, and subsequently 6G.

In 2023 our Technical Committee on RRS issued a feasibility study on existing spectrum sharing frameworks for temporary and flexible spectrum access. Leveraging ETSI's interactions with the WInnForum (Wireless Innovation Forum) community, the report evaluates existing dynamic spectrum access frameworks and their suitability for potential on-demand use cases. It also explores further improvements in the definition of requirements, system architectures and functionalities for spectrum access. An accompanying White Paper jointly published by ETSI and WInnForum was presented in June at the 18th European Spectrum Management Conference in Brussels.



Reconfigurable Intelligent Surfaces

Anticipated to be a key technology in future wireless systems including 5G-Advanced and 6G, RIS (Reconfigurable Intelligent Surfaces) describes a new type of network node that leverages smart radio surfaces – with thousands of small antennas or metamaterial elements – to dynamically shape and control radio signals in the electromagnetic domain. RIS technology will effectively turn the wireless environment into a service, inspiring a host of new use cases with enhancements to capacity, coverage, positioning, security, and sustainability, as well as the support of further sensing, wireless power transfer, and ambient backscattering capabilities.

Our Industry Specification Group on Reconfigurable Intelligent Surfaces (ISG RIS) gives ETSI members the opportunity to coordinate their pre-standardization research efforts on RIS technology, paving the way for future standardization of the technology. 2023 saw publication of the group's first phase of deliverables as a suite of three Group Reports. These variously address key RIS use cases and deployment scenarios; technological challenges, architecture and impact on standardization when deploying RIS as a new network entity; and an exploration of communication models, channel models, channel estimation and evaluation methodology.

Integrated Sensing and Communications

The use of radio signals to detect and estimate characteristics of target objects in the environment can be integrated into the communications network, with the network using its own radio signals to sense and comprehend the physical world it operates in, collecting data on the range, velocity, position, orientation, size, shape, image, materials of objects and devices. Integrated sensing thus enables innovative use cases in transport, urban environments, homes, factories and more. These range from object and intruder detection in secure areas around critical infrastructures to fall detection and rain/pollution monitoring.

In November 2023 ETSI announced the launch of its Industry Specification Group for Integrated Sensing and Communications (ISG ISAC). Establishing the technical foundations for ISAC technology development and standardization in 6G, the group will coordinate ETSI members' 6G pre-standardization research efforts on ISAC, particularly across various funded projects.



Broadband Radio Access Networks

Our Broadband Radio Access Networks committee (TC BRAN) produces and maintains standards and specifications for current and future Wireless Access System (WAS) and Radio Local Area Network (RLAN) technologies in different frequency ranges. Publications in 2023 included a Harmonised Standard for access to radio spectrum for 6 GHz WAS/RLAN, and a feasibility assessment of applying mitigation techniques to WAS/RLAN to enable coexistence in the 5 725 MHz to 5 850 MHz band.

During the year the committee contributed to a Liaison Statement from ETSI on Receiver Recommendations (managed by TC ERM) directed to the ECC's Working Group on Spectrum Engineering. The European Commission attended ETSI TC BRAN's first plenary meeting in 2023, presenting the EC's Joint Research Centre report on the coexistence of Meteorological Radars and WAS/RLAN in the license-exempt 5 GHz band.

DECT™

ETSI's Digital Enhanced Cordless Telecommunications (DECT) specification is the leading standard around the world for digital cordless telecommunications. Originally developed by ETSI in the early 1990s, DECT™ (Digital Enhanced Cordless Telecommunications) is implemented in more than a billion short-range communication devices around the world. The DECT-2020 New Radio (NR) component is now officially recognized as an IMT-2020 technology, with ITU-R confirming that DECT-2020 fulfils requirements for Ultra-Reliable Low Latency Communications (URLLC) and massive Machine Type Communications (mMTC). During 2023 the work of our DECT Technical Committee continued on maintenance updates to the first Release of DECT-2020 NR specifications. The publication of Release 2 specifications – to be used for the next revision of IMT-2020 Recommendation ITU-R M.2150 – is expected in 2024. A demonstration of DECT NR+ Network and Mesh Implementation was presented at the ETSI IoT Conference in July.

Millimetre Wave Transmission

4G/5G deployments – and the needs of massive machine-type communications in the IoT – are making unprecedented demands on radio access networks and backhauling. Under-utilized frequencies in the microwave and millimetre-wave ranges provide more spectrum for radio transmissions with a wider channel bandwidth and fibre-like capacity.

In 2023 our Industry Specification Group on millimetre Wave Transmission (ISG mWT) published a revised version of its Group Specification that defines a Wireless Transport Profile for Standard SDN Northbound Interfaces. It was accompanied by a new Group Report that defines new KPIs for planning microwave and millimetre wave backhaul network. During the year ISG mWT members contributed to ETSI White Paper #58 *'Worldwide analysis and proposals to promote and facilitate the wireless transport network as the key enabler for fast mobile backhaul network modernization.'*





Satellite Communications

The applications of satellite communications technology range from direct-to-home TV, location services and high-speed Internet access to fixed and mobile user equipment, especially for rural and outlying regions or onboard aircraft, ships or land transportation.

Throughout 2023 ETSI's Satellite Earth Stations and Systems committee (TC SES) continued to update our Harmonised Standards (ENs) for compliance with the Radio Equipment Directive, as part of the ongoing consultation process with the EC. The committee's work accordingly saw regular interaction with the HAS consultant on several ENs to clarify the standards' requirements and their compliance with RED requirements, and addressing them to ensure our Harmonised Standards meet the conditions to pass the ENAP procedure and achieve listing in the Official Journal of the EU.

During the year revised versions of two Harmonised Standards for access to radio spectrum – originally published in 2022 – achieved citation in the OJ. These address fixed and in-motion Wide Band Earth Stations communicating with non-geostationary satellite systems in the 11-14 GHz frequency bands (Ku-band). Work was meanwhile launched on Satellite-Quantum Key Distribution (S-QKD) Satellite Systems & Associated Optical Earth Stations (OES), and on a new Technical Report regarding small transmit-only IoT satellite terminals operating in the C-band and Ku-band.

Mobile Standards

Our Mobile Standards Group (TC MSG) works alongside MSG TFES, our joint Task Force with TC ERM responsible for identifying European regulatory requirements and creating harmonized standards supporting the deployment of IMT family networks in Europe.

In 2023 the committee published an updated version of its Technical Specification on Next Generation eCall High Level Application Protocol (HLAP) Interoperability Testing. This revision incorporates an enhancement of NG eCall interoperability test specification, covering updated and new test descriptions produced from the latest ETSI/3GPP base specifications.

Concerning the Radio Equipment Directive – and to align with different 3GPP releases, including support for 5G – TC MSG has continued to update the multi-part Harmonised European Standard on access to radio spectrum for IMT cellular networks.

A further focus of work during the year has been the review of specifications submitted by the O-RAN Alliance within the scope of the PAS process. Seven PAS Work Items were subsequently published as ETSI Technical Specifications in January 2024.

Terahertz Communications

THz communications offer an attractive candidate for a component of the physical layer in 6G systems. A huge amount of bandwidth is available in THz bands (identified by ITU as 137 GHz of spectrum between 275 and 450 GHz), where it's possible to achieve extremely high data rates while easing spectrum scarcity problems. ETSI's Industry Specification Group (ISG) THz provides the opportunity for ETSI members to share their pre-standardization efforts on THz technology resulting from various collaborative research projects and being extended with relevant global initiatives, paving the way towards future standardization.

ISG THz held its first 'post kick-off' plenary in February 2023. During the year progress was made on the Group's initial suite of deliverables. Four Group Reports variously address: identification of use cases for THz communication systems; identification of frequency bands of interest; channel measurements and modelling in THz bands; and RF hardware modelling. During the year the group presented its activities at the ETSI Research Conference '*Maximizing the Impact of European 6G Research through Standardization*', and at several 6G-focused industry events.

Tomorrow's destination

Transforming travel by land, sea and air

At ETSI we're driven to make transport networks safer and more reliable while reducing energy consumption. We develop standards to accelerate the introduction of Intelligent Transport Systems (ITS) services and applications, based on experience gained from market deployments. We also address rail, aeronautical and maritime transportation, and the use of satellite communications standards for high speed Internet access on board aircraft, ships or in vehicles.

Road Transport

IntelligentTransportationSystems(ITS)enables smarter, more coordinated and efficient use of transport networks with the potential to increase safety for travellers and the public, minimize environmental impact and improve traffic management. ETSI's ITS Technical Committee (TC ITS) develops standards and specifications to support the implementation of ITS service provision across the network, for transport networks, vehicles and transport users – including interface aspects and multiple modes of transport and interoperability between systems.

During 2023 the committee progressed development of the ITS Release 2 framework. This intends to specify structure of the Release 2 package, the principles for referencing between the ITS standards as well as general/common aspects of Release 2 ITS standards such as context and ecosystem.

TC ITS continued to work in cooperation with ETSI TC RT on Road ITS and Urban Rail applications in the 5,9 GHz frequency band. The purpose of this work is to specify a solution applied in the ITS band (5 875-5 925 MHz) to meet Urban Rail ITS and road ITS applications requirements. These activities are linked to Commission Implementing Decision (EU) 2020/1426 on the harmonized use of radio spectrum in the 5 875-5 935 MHz frequency band for safety-related applications of ITS and repealing Decision 2008/671/EC.

Railway Communications

In 2020 the European Commission requested ETSI to draft new European Standardization deliverables – and revise existing standards – for the Future Railway Mobile Communication System (FRMCS), the successor to the GSM-R (GSM™ for railways) standard. This has driven an intensive Work Programme that sees our Rail Telecommunications technical committee (TC RT) liaising with 3GPP and the International Union of Railways (UIC) in the development of an extensive suite of new specifications for FRMCS. Numerous standards, specifications and reports in development address areas including system architecture, transport and service strata, on-board and trackside functions and interfaces, radio characteristics, user equipment capabilities and FRMCS/GSM-R interworking.

ETSI's 3rd FRMCS Plugtests event was organized in July 2023 with support of the European Commission, the European Free Trade Association (EFTA), the Critical Communications Association (TCCA) and UIC. Held at UIC headquarters in Paris, the event saw independent and joint testing of FRMCS components using a 5G test network. Sessions validated interoperability of a variety of implementations using scenarios based on the 3GPP Mission Critical Services framework. Based on 3GPP Release-17, over 300 tests addressed capabilities including Mission Critical Push-to-Talk (MCPTT), Mission Critical Data (MCData) and Mission Critical Video (MCVideo).

In the domain of spectrum sharing for Urban Rail ITS and Road ITS applications, JTFIR continued to make progress during the year on a Technical Specification and accompanying report on shared use of spectrum in the 5 855 – 5 925 MHz band. Conducted under the scope of an EC-funded STF, this activity is linked to the Commission Implementing Decision (EU) 2020/1426 on the harmonized use of radio spectrum in the band. Completion of this work is anticipated in summer 2024.

In cooperation with ETSI TC ERM TG37, the committee is also developing a new Harmonised Standard for access to radio spectrum in relation to radio equipment for applications such as Communications-Based Train Control (CBTC) operating in the 5 875 MHz- 5 935 MHz band.

Aviation

The activities of our Aeronautics group (ERM TG AERO) are focused on three principal areas: the development and revision of Harmonised Standards under the Radio Equipment Directive – notably relating to communications, navigation and surveillance equipment; the development of European Standards in support of Regulation (EU) 2018/1139 (the EASA Regulation); and the evolution of DataLink – a key pillar in the SESAR (Single European Sky ATM Research) project and a crucial aspect of the Single European Sky.

In 2023 we continued to develop or update various standards relating to use of radio spectrum for aeronautical applications. These address: Advanced Surface Movement Guidance and Control System (A-SMGCS); Primary and Secondary Surveillance Radar for Air Traffic Control; Wide-area Multilateration Systems; Advanced Surface Movement Guidance and Control System (A-SMGCS); Data Link Services (DLS); Airport Surface Data Link (AeroMACS); and VHF air-ground Digital Link (VDL). The second part of our Harmonised European Standard on access to radio spectrum for Secondary Surveillance Radar (SSR) – covering Far Field Monitor (FFM) – achieved citation in the OJ. We also published a further part of our European Standard for A-SMGCS, providing a Community Specification for A-SMGCS guidance service.

Maritime

Our Marine group develops standards for all aspects of communications and radiolocation equipment and systems for maritime and inland waterways. Along with ‘person overboard’ devices, the group covers other safety related equipment such as survival craft radios, transceivers for use in distress situations and signalling/homing beacons.

In 2023 we published a Technical Specification relating to radio transmitters and receivers for maritime mobile broadband communication links operating in the 5-8 GHz frequency range employing integrated beamforming phased array antennas. Originally published in 2022, a revision of our Harmonised European Standard on access to radio spectrum for maritime VHF survivor locating devices using DSC Class M achieved citation in the OJ in October 2023.

Cross-border Information Exchange

The Common Information Sharing Environment (CISE) is an EU initiative towards an Integrated Maritime Surveillance, aiming to make EU/EEA Member States surveillance systems interoperable and to give all concerned authorities from different sectors access to information they need to conduct missions at sea. Its primary objective is to generate a situational awareness of activities at sea, impacting on the seven maritime sectors – Maritime Safety & Security, Border Control, Maritime Pollution & Marine Environment Protection, Fisheries Control, Customs, General Law Enforcement and Defence – as well as on the economic interests of the EU.

ETSI’s Industry Specification Group on European Common Information Sharing Environment Service and Data Model (ISG CDM) is developing a consistent set of technical specifications that allow data exchange among different legacy systems within the European CISE framework.

In 2023 we published a revision of a Group Specification on Release 2 System Requirements definition, with requirements based on operational use cases (including land borders). We also issued a new Group Report that describes the implementation of the ETSI CDM Testing Platform for conformance and interoperability testing of the IUTs (Implementations Under Test).



Enriching connections

Embedding intelligence in our networked world

Consumers and business users expect communications services to be easily accessible and available everywhere, on the device of their choosing. To meet this need networks are rapidly becoming smarter and more agile. At ETSI we provide a comprehensive set of standards to increase the utility and efficiency of today's convergent access networks – and for tomorrow.

Network Functions Virtualization

An enabler for the success of 5G – and relevant to other telecoms network architectures – Network Functions Virtualisation (NFV) consolidates heterogeneous network equipment types onto standard IT servers, switches and storage. NFV is an essential aspect of modern network design, simplifying roll-out of new services while reducing deployment and operational costs. In the decade since its inception, NFV has expanded its application environments, acting as a facilitator for network transformation and as a key enabler for technology evolution. These include 5G consolidation and further evolution, the use and integration of non-public networks, and edge environments. With the support of dozens of organizations worldwide, the goal of ETSI's Industry Specification Group (ISG) on NFV is to create specifications that can accommodate today's and tomorrow's network requirements.

NFV Release 3 was formally closed by the end of November 2023, with the group continuing to maintain core specifications. Development of Release 4 specifications was also effectively concluded during the year, with deliverables addressing technological advances such as 5G, containerization, cloud-native design, service-based architectures and data analytics.

Release 5 embraces broader industry considerations, including extension of the NFV framework to the RAN domain. The release considers faults and alarms modelling, as well as studies on VNF configuration, energy efficiency aspects, enhanced container networking, flexible VNF deployment, support for RAN virtualisation and reliability evaluation for cloud native VNFs. During 2023 this work accordingly included studies on enhanced container

networking, network connectivity integration and operationalization, multi-tenancy enhancement for NFV-MANO, service-based architecture for NFV-MANO and VNF generic management functions. The collection of proposals for Release 6 technical features meanwhile continued. This acceleration of activities was reflected in the adoption of a large number of new Work Items, with first published deliverables anticipated in 2024.

In May 2023 the Group published a report that profiles the NFV framework against O-RAN use cases and solutions, exploring key issues which are analyzed considering an NFV-MANO-based vRAN orchestration and management. Findings of the Group Report were presented at a joint workshop hosted by ETSI NFV and O-RAN Alliance, held in Osaka in June.

The occasion of the group's 10th anniversary saw the issue of two ETSI White Papers: *'In the Light of Ten Years from the NFV Introductory Whitepaper'* and *'Evolving NFV towards the next decade'*. ISG NFV participants also contributed to a further White Paper *'Unlocking Digital Transformation with Autonomous Networks: ETSI perspectives and major achievements'*.

Celebrating a decade of NFV

Marking the 10th anniversary of ETSI NFV, the *'Evolution of NFV towards the next decade'* conference at our Sophia Antipolis headquarters in March 2023 saw the NFV community – including carriers, vendors, SDO representatives and other stakeholders across the ecosystem – reflecting on achievements in the past ten years while examining new challenges and opportunities. Global telecom operators shared their experience on NFV deployments for 4G and 5G, while sessions discussed topics including security in cloud-based deployments, the need to solve interoperability issues between various standards and open-source solutions, and NFV's crucial role as a pillar for telecoms industry and network transformation.

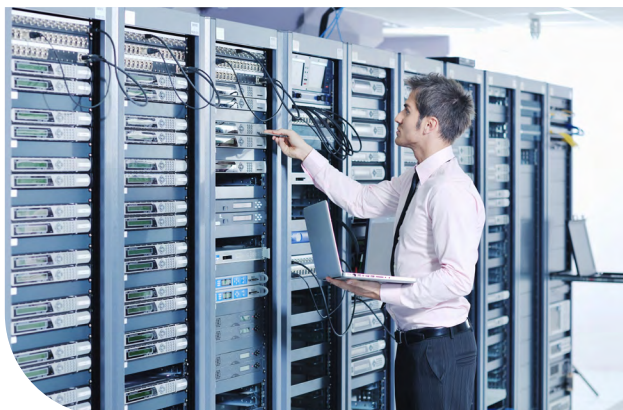
Open Source MANO

ETSI is actively exploring synergies between the worlds of open source and standardization in its work on NFV. Two key components of the ETSI NFV architectural framework are the NFV Orchestrator and the Virtualized Network Function (VNF) manager, referred to collectively as NFV Management and Orchestration, or MANO. ETSI OSG (Open Source Group) OSM (Open Source MANO) has primary responsibility to develop an open source implementation of ETSI NFV MANO. As a community-led project, the output of OSM is a production-quality MANO stack aligned with ETSI NFV Information Models that meets operators' requirements for commercial NFV deployments.

Delivered in July 2023, OSM Release FOURTEEN is a Long-Term-Support (LTS) release delivering significant improvements in many key areas. It offers a new scalable architecture for service assurance based on Apache Airflow and Prometheus, and includes closed loops for auto-scaling and the handling of alerts coming from the Network Functions. It also enables scheduled monitoring and service-assurance workflows, as well as alarm-based on-demand workflows – capabilities that will be key to supporting new telco cloud use cases in future Releases.

OSM Release FIFTEEN was announced in December 2023 as a regular release that includes significant improvements in many key areas. These notably include: Network Service instantiation and lifecycle management; Support for new Kubernetes features; VNF Management interface; Closed-loop life cycle in public clouds; OSM installation; and end-to-end testing.

The OSM community works in close cooperation with the TeraFlowSDN community, with a new plugin being developed in 2023 to enable smooth interworking between the two components. Meanwhile several cross-community efforts have been launched, including an initiative to build an end-to-end cross-project test bed based on shared ETSI infrastructure.



TeraFlowSDN

OSG TeraFlowSDN (TFS) is an ETSI-hosted Open Source Group supporting the development of autonomous networks and cybersecurity use cases. Drawing on results of the European Union-funded TeraFlow 5G PPP research project, the group provides a toolbox for rapid prototyping and experimentation with innovative network technologies.

Modelled on the success of ETSI's OSM (Open Source MANO) initiative which has already been adopted by over 30 EU-funded research projects, TFS is developing an open-source, cloud-native SDN controller for high-capacity IP and optical networks. Supporting use cases such as autonomous networks and cybersecurity, it will help service providers and telecommunication operators to meet the challenges of future networks. Software developed by the group will also be a valuable tool for other ETSI groups working on network transformation, enabling the alignment of goals and helping to accelerate standardization cycles.

TeraFlowSDN Release 2 was delivered in February 2023, offering improved scalability and resilience of the controller and new workflows for network automation. Delivered in July 2023, TeraFlowSDN Release 2.1 incorporates substantial improvements to increase alignment with operators' requirements concerning network controllability, management and support. It also features a number of bug fixes and security enhancements.

In September 2023 ETSI and The Linux Foundation, the nonprofit organization focused on fostering innovation through open source, announced an expansion of their long-standing collaboration. Formal links between both communities support initiatives spanning Multi-access Edge Computing (MEC), Network Function Virtualization (NFV) / Cloud-native Network Functions (CNF), Artificial Intelligence, Software Defined Networking, Autonomous Networks, and 5G/6G. An updated Memorandum of Understanding now includes broader mapping of common areas of interest. New areas of potential collaboration identified by ETSI include zero touch network management and ETSI Open Source groups such as OSM and TeraFlowSDN. Further extending ETSI's cooperation with the Linux Foundation, establishment of our own Software Development Groups anticipates the greater use of software that's anticipated in standardization of future technologies such as 6G.

Multi-Access Edge Computing

A central building block in the evolution of mobile broadband networks, MEC (Multi-access Edge Computing) complements NFV and SDN as a key enabler for vertical solutions. As one of the foundational architectural concepts and technologies for 5G it is also expected to be pivotal to 6G.

ETSI's ISG (Industry Specification Group) MEC is standardizing an open environment to enable the integration of applications from infrastructure and edge service providers across MEC platforms and systems. This activity focuses on developing a standardized solution that enables seamless integration of applications from vendors, service providers and third parties across multi-vendor MEC platforms in a distributed cloud environment. Crucial to this is the creation of a consistent set of Application Programming Interfaces (APIs) for edge developers to build services and applications.

In 2023 The Group consolidated its Phase 3 work with the publication of a number of MEC APIs and associated deliverables. These notably include a Group Specification on MEC Federation Enablement APIs. Critical for supporting requirements identified by GSMA OPG (Operator Platform Group) to enable inter-MEC system communication, it allows 5G operators to collaborate among themselves, with service cloud providers and with other stakeholders. Its publication was accompanied by a webinar held in February. This Phase 3 consolidation work anticipates the Group's progressive transition to the next MEC Phase 4 from 2024 through to 2026.

In June ETSI hosted the first in a series of Multi-access Edge Computing live panels. Held as a hybrid event, the panel explored the drone business from a MEC perspective, giving an opportunity to share insights from experts on regulation, technology and business, and to understand how various drones use cases (e.g. private sky/network and public U-spaces) can benefit from MEC.

2023 also saw publication of three ETSI White Papers developed with the contribution of ISG MEC members.

Zero Touch Network and Service Management

Maximizing the efficiency of end-to-end network operations requires increased automation of functions that are currently administered with direct human intervention, such as configuration and capacity management. The goal of our Industry Specification Group on Zero Touch Network and Service Management (ISG ZSM) is to provide a complete solution where all operational processes and tasks – including delivery, deployment, configuration, assurance, and optimization – are executed automatically, without manual supervision.

In 2023 ISG ZSM issued two new Group Reports. One investigates the potential use of intents as key enabler for enhancing autonomous network and service management within a ZSM framework, with use cases to provide examples of management domains where intents are applicable and capabilities that may be needed. It's complemented by the third part of a multi-part report on 'closed loop' automation. This investigates advanced topics related to closed-loop operations such as learning and cognitive capabilities, ways to set and evaluate levels of oversight, autonomy, and operational confidence in the behaviour of closed loops.





Augmented Reality

Augmented Reality (AR) blends real-time spatially registered digital content with our experience of the real world. Transparent and reliable interworking between different AR components is key to the successful roll-out and wide adoption of AR technologies and services. Our Industry Specification Group on Augmented Reality Framework (ISG ARF) is defining a framework for the interoperability of Augmented Reality components, systems and services. Allowing components from different providers to interoperate through defined interfaces, this framework avoids vertical silos and reduce market fragmentation – and thus enables players in the ecosystem to offer parts of an overall AR solution.

In 2023 the group published the fourth part of its multi-part Group Specification on interoperability requirements for AR components, systems and services that considers world analysis, world storage and scene management functions. This was complemented by revision to the overview of a corresponding Group Report on interoperability requirements.

During the year ISG ARF maintained close collaboration with external bodies including The AREA, Khronos Group and the Open AR Cloud Association (OARC) to support the development of a thriving technology ecosystem. It also continued its active liaison exchange with other ETSI groups (including ISG CIM, ISG MEC) and with 3GPP SA WG4.

Non-IP Networks

Nearly a decade ago mobile operators identified problems with the inefficiency of TCP/IP-based networking technology used in 4G, resulting from the addition of mobility, security, quality-of-service and other features. In today's world of 5G, fibre-optic and satellite networks – and beyond – operators and service providers are exploring new technologies that can serve their needs. ETSI's Industry Specification Group on Non-IP Networking (ISG NIN) is standardizing protocols that will provide better support for 21st century use cases than that provided by today's TCP/IP-based solutions.

In 2023 progress continued on a new Group Specification that details procedures and packet formats for the carriage of Flexilink flows (both basic service and guaranteed service) over the DECT-2020 New Radio interface. Work was meanwhile launched on a Group Report that outlines options for replacing IP in the satellite access network stack with non-IP networking, using Flexilink as an example. A paper titled '*Flexilink: A Low Latency Solution for Packet Based Media*' was presented to the 4th EAI International Conference on Technology, Innovation, Entrepreneurship and Education in September.

Experiential Networked Intelligence

While technologies such as Software Defined Networking (SDN), Network Functions Virtualization (NFV) and network slicing are making networks more flexible and powerful, these innovations are also making networks harder to manage efficiently. The use of Artificial Intelligence (AI) techniques in the network supervisory and management system can help address some of the challenges of future network deployment and operation. Our Industry Specification Group on Experiential Networked Intelligence (ISG ENI) develops standards that use AI mechanisms to assist in the management and orchestration of the network.

During 2023 the focus of the group's technical work was on ENI Releases 3 and 4. Publications included a Group Report that defines network autonomicity features and levels for IP networks, including the intelligent characteristics at each layer and closed-loop management process. By the end of 2023, a number of further Release 4 deliverables were declared 'stable' – or approaching stability – in anticipation of publication in early 2024.

Group members contributed to an ETSI White Paper that describes the design of a novel cognitive network. *'ENI Vision: Understanding the Operator Experience Using Cognitive Management'* explains how ETSI's ENI system architecture intelligently manages, predicts, adjusts and optimizes network behaviour using cognition management to enhance the operator experience.

Fixed Network Evolution

The evolution of fixed networks will also play a vital role in the success of 5G and future mobile systems. This 'fifth generation' aims to deliver full-fibre connection, enhanced fixed broadband and a reliable user experience in industrial and consumer applications through secure, low-latency connections. F5G Advanced enhances this further with reductions in energy and carbon emissions, improved low latency and reliability for industrial applications, and the addition of optical network sensing.

Our Industry Specification Group on the fifth generation of Fixed Network (ISG F5G) is studying this evolution to support new services and applications, matching and enhancing the benefits 5G has already brought to mobile communications.

2023 marked completion of F5G Release 2 specifications, based on an updated set of use cases including virtual presence, home broadband connectivity to multiple clouds, virtual music and next generation digital twins. Publications variously address F5G Technology Landscape, Network Architecture, Industrial PON, Security Countermeasure Framework Specification, Residential Services Quality Evaluation, Data Models of Telemetry for Access Network, and F5G Advanced Generation Definition. Published with contributions from ISG F5G members, the White Paper *'All-optical network facilitates the Carbon Shift'* highlights the role of fibre networks as a key ICT enabler to meet UN sustainability goals.

Cable

Our Integrated Broadband Cable Telecommunication Networks committee (TC CABLE) develops standards addressing the evolution of the capabilities of broadband cable networks. It also serves as the point of contact within ETSI for expertise in hybrid-fibre coax (HFC) network technology and systems.

In 2023 TC CABLE made progress on a number of deliverables that will provide valuable tools for operators and manufacturers of cable technology. These include: a standard on standalone routers that defines core features enabling multiple subscriber devices to gain access to high-speed data service independently of the access network; the revision of global KPIs for energy management in operational infrastructures; a new specification on network performance measurement methods for broadband data services; a report on mapping of cable equipment and standards to support assessment of conformity with the European Commission's Radio Equipment Directive (RED), the Electromagnetic Compatibility (EMC) Directive, and the Low Voltage Directive (LVD); and a specification on performance characteristics of coaxial cables used for RF signal transmission in hybrid fibre-coax (HFC) telecommunication networks.

Generating efficiencies

Standards for a greener, safer planet

Technology has given us powerful new opportunities to stay connected in ways we could have scarcely envisioned a generation ago. While reaping the benefits, however, we must minimize its negative impact on individuals, society and our planet. Part of our work involves making products and services simpler to use, safer and more efficient. We are also committed to identifying energy efficiency solutions that mitigate the impact on climate change of the growing use of Information and Communications Technologies (ICT).

Energy Efficient Product Deployment

Our Environmental Engineering Committee (TC EE) manages various engineering aspects of telecommunication equipment in different types of installation. These include climatic, thermal and other environmental conditions; physical requirements of equipment racks and cabinets; power supplies and grounding; Circular Economy (including lifecycle analysis) and energy performance measurement and assessment methods for different parts of radio access networks including data centres. The

committee's work also embraces innovative energy storage technologies for ICT equipment – for example to provide resilience in sustainable smart cities.

During 2023 TC EE's activities continued to address four key areas: revision of environmental classes to consider climate change adaptation aspects, measurement methods for the energy efficiency of ICT equipment; standardization on eco-design aspects of servers and storage products; and requirements for power supply interfaces of ICT equipment.

Working Group EE 01 started its revision of environmental classes in line with latest IEC classification. Progress was also made on revision of environmental test standards to clarify expected performance criteria. Working Group EE 02 continued to develop or revise various standards, technical specifications and reports relating to power supply, bonding and related topics. Our EEPs Working Group published a standard on assessment of material efficiency aspects of ICT network infrastructure goods in the context of circular economy. Work was also concluded on a Technical Specification (published in early 2024) on requirements for a global digital sustainable 'product passport'.



Sustainable Networks

Our Access, Terminals, Transmission and Multiplexing committee (TC ATTM) addresses the operational and physical parts of Information and Communications Technologies, including broadband transmission networks, equipment and sites. The committee's work aligns closely with ETSI's European SDO peers CEN and CENELEC in areas of shared interest, including the operational sustainability and energy efficiency of smart cities and communities. TC ATTM also works closely with ETSI's Industry Specification Group on Operational energy Efficiency for Users (ISG OEU), with the shared aim of increasing sustainability efficiency in operational networks and devices.

ATTM Working Group AT2 is responsible for the creation, development and maintenance of standards and specifications covering cabling, installations, communications systems and network services implementation. During 2023 development continued on various reports and specifications.

ATTM Working Group TM4 develops specifications for point-to-point and multipoint radio systems in the fixed service, used in core and access networks, including mobile service backhauling. During the year the group updated various European Standards and accompanying Harmonised European Standards, including deliverables in response to the M/536 under the Radio Equipment Directive (2014/53/EU).

Organized by TC ATTM's Working Group on SDMC (Sustainable Digital Multiservice Communities), a symposium on digital technologies for smart and sustainable cities was held in February in Montrouge with the collaboration of EC DG Connect, EURO CITIES network, and the Greater Paris Metropolis. Focusing on digital, efficient and eco-responsible innovations in the service of local authorities, the event explored how technologies can help combine innovation and sustainable development within our cities and the challenge of reducing environmental impact of digital technologies.

Towards Efficient ICT

Working with ETSI's ATTM, EE, eHEALTH and Smart M2M committees, our Industry Specification Group on Operational energy Efficiency for Users (ISG OEU) develops standards to minimize power consumption and greenhouse gas emissions of infrastructure, utilities, equipment and software within ICT networks and sites such as data centres and central offices. This includes the measurement of energy usage by servers, storage units, broadband fixed access and mobile access with a view to developing global Key Performance Indicators. Our work also embraces the management of end-of-life ICT equipment.

In 2023 the group neared completion of a new report that considers data interoperability with applications for connected buildings, describing opportunities to produce a 'digital twin' applied in the context of the operation of connected buildings.

User Perspectives

Our User Group Special Committee (SC USER) works with other ETSI committees to ensure that our standardization work reflects the needs of all users of ICT products and services, including consumers and businesses, network operators, service providers and individuals with special needs.

New technologies, notably AI/ML, are essential today for profiling users, in order to cope with their expectations to communicate 'anywhere, anytime, on any device, for every service, with everyone'.

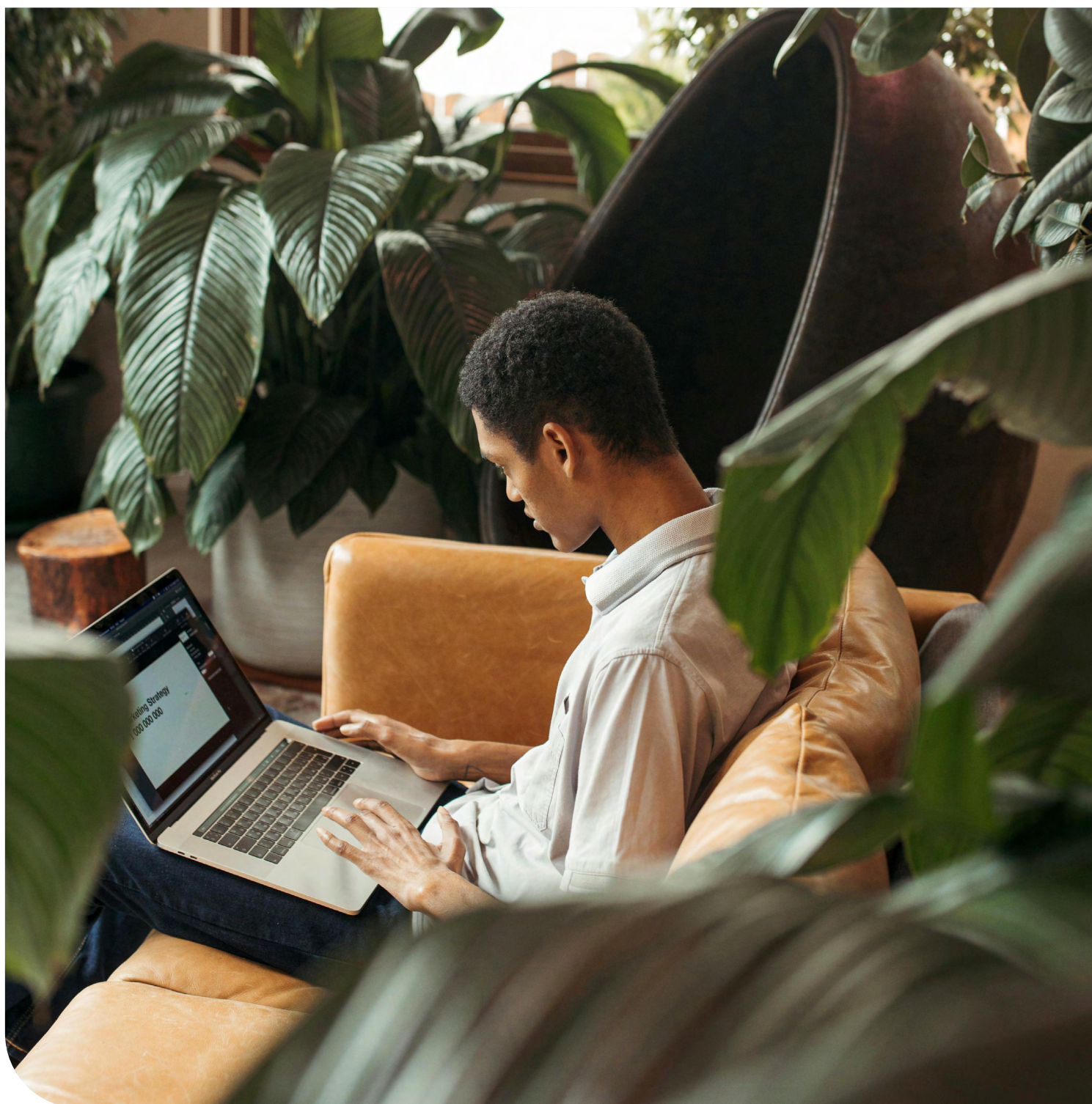
It is important however to keep the user at the centre of the data system. To achieve this, SC USER has developed a Proof of Concept (PoC) that demonstrates the possibility of digitizing personal information, by delivering the active user profile at any time.

Following an earlier description of the model of smart ID (Smart Identity) as a user's 'digital clone', in 2023 the group accordingly published the second of two new reports that consider a user-centric approach in today's digital ecosystem. This work was presented at a webinar held in April.

Sustainability in the spotlight

Organized in March as a hybrid event at our Sophia Antipolis premises, the ETSI Summit on Sustainability focused on how ICT developments and standards can enable sustainability and have a positive impact on society, and the key role of the ICT industry and related standardization activities to support green initiatives. The event attracted a global audience of over 220 stakeholders including operators, solution providers, policy makers, industry fora and standards bodies.

Sustainability was also a primary focus of the 23rd meeting of the Global Standards Collaboration (GSC), hosted in April by ETSI in London. Sessions addressed the value of global standards in a geopolitical context, the role of ICT standards in supporting the metaverse and extended reality, and global standards as key enablers for the convergence of ICT and vertical industries to enable the UN's Sustainable Development Goals (SDGs).



Perfect pictures and sound

Bringing quality content to every audience

Mobile communications, the Internet and broadcasting are already inextricably interlinked. But the standardization of these different areas has traditionally followed different paths, so they do not always interoperate smoothly. We are addressing the need to align the diverse specifications for content delivery in a converged environment supporting IPTV, mobile TV and broadcast TV to benefit industry and end users.

Broadcasting

We play a leading role in the development of specifications for technologies that are used globally for radio, television, and data broadcasting. The specifications cover services delivered via cable, satellite, and terrestrial transmitters, as well as by the Internet and mobile communication systems. Related topics such as Ultra High Definition (UHD) TV and interactive television are also included. Within ETSI standardization of broadcast systems, programme transmission and reception equipment is managed by JTC Broadcast – the Joint Technical Committee that brings us together with the European Broadcasting Union (EBU) and the European Committee for Electrotechnical Standardization (CENELEC).

During 2023 JTC Broadcast issued a revision to its Technical Specification ‘5G Broadcast System for linear TV and radio services; LTE-based 5G terrestrial broadcast system’. Other publications included a report on DVB-I service delivery over 5G Systems Deployment Guidelines, and a specification on DASH-IF forensic A/B watermarking, produced under the PAS agreement between ETSI and DASH-IF.

Media Quality

ETSI’s Technical Committee on Speech and multimedia Transmission Quality (TC STQ) creates and maintains standards relating to speech and end-to-end media quality performance for terminals and networks. With our Working Group STQ Mobile we liaise with 3GPP, ITU-T and other organizations to support development of specifications for test methods, equipment and performance requirements for use in fixed and mobile telecommunications services.

New publications in 2023 included: a Technical Specification that presents an objective test method for the evaluation of echo impairments, based on the related specification for subjective test procedures; a Technical Report on gender-related aspects of listening quality and effort in speech communication systems; a Technical Report on QoS evaluation of cloud gaming services over 5G networks; and a Technical Report that considers a generic approach to test network performance for OTT voice applications.

Following the successful TC STQ Workshop held in Bratislava in November 2022, planning progressed on the next workshop that is anticipated to take place during 2025, with the provisional title ‘Communications for all - Supporting diversity and accessibility in speech and audio transmissions and human-machine communication’.



Stay safe

Communications to depend on



At ETSI our standardization work supports public safety via secure, resilient public networks or platforms such as Professional Mobile Radio, as well as the ubiquitous smartphone. Our activities also embrace standards for maritime safety equipment, Personal Locator Beacons to alert emergency rescue services and mechanisms for road safety through the use of Intelligent Transport Systems.

TETRA

Developed to meet the needs of Professional Mobile Radio (PMR) users in public safety, security, transportation, military, governmental, commercial and utilities applications, TETRA (Terrestrial Trunked Radio) addresses requirements including group calling, PTT (Push-To-Talk), and direct communications in natural disasters and emergencies when a supporting network is unavailable.

Our TETRA and Critical Communications Evolution committee (TC TCCE) has continued to develop and maintain user-driven specifications for secure, highly reliable voice and data services over broadband and narrowband air interfaces.

In response to feedback from 3GPP, the committee's ongoing work includes further development of

specifications covering the detailed interfaces between mission-critical broadband systems and TETRA, as well as the required security between the two systems. To optimize this standardization activity, existing standards for technologies such as LTE (and later 5G) will be enhanced by interfaces and applications that make them suitable for mission-critical applications.

During the year, work progressed on development of specifications for additional encryption algorithms to complement the existing set relating to TETRA. This reflects the needs of users to keep TETRA up to date throughout the 2030s.

In October TCCE reached full consensus to make primitives of all TETRA Air Interface cryptographic algorithms available to the public domain. This decision followed reports by security researchers – publicised in August 2023 – that potential vulnerabilities had been found in the original TETRA air interface security design. Public domain algorithms are now widely used to protect government and critical infrastructure networks, for example AES – the Advanced Encryption Standard standardized by the US government. Effective scrutiny of public-domain algorithms allows for any flaws to be uncovered and mitigated before widespread deployment occurs.



Emergency Calling and Alerting

Our Emergency Communications Technical Committee (TC EMTEL) is focused on the access to emergency services through different media, data transmission to public safety answering points, networks and IoT (Internet of Things) devices in the provision of emergency situations and in the context of the European Public Warning System. The scope of its work includes emergency communications between individuals and authorities/organisations; between authorities/organisations; and between individuals.

Much of the committee's activity is centred on IP-based emergency communications services, involving communications between IoT devices in emergency situations. This work includes the architecture (known as Next Generation 112 by the community), core elements and technical interfaces for network-independent access to emergency services.

In 2023 we published a revised version of our specification defining next generation core services (NGCS) that will enable users to utilize multimedia communications (voice, photo, video, text) to contact a relevant emergency call centre. The revision includes a technical basis for national packet switched infrastructures, giving access to emergency services communications for all citizens.

We published a new specification on requirements, protocol elements and procedures for a multi-party audio-video capability for PEMEA (Pan-European Mobile Emergency Application).

We also revised our Technical Specification that describes the content and transport methods used for AML (Advanced Mobile Location) messages with handset-derived location information and associated data.

MCX Plugtests

ETSI's eighth MCX (mission-critical) Plugtests event was held in October 2023 at the University of Malaga, attracting vendors as well as representatives from European and American governments, operators, and emergency bodies. Over the course of the week, individuals evaluated more than 360 different MCX (Mission-Critical) and FRMCS (Future Railway Mobile Communication System) test scenarios. The goal of the event was to assess mission-critical services defined by 3GPP that are crucial for emergency responders such as fire departments, police, civil protection services, and ambulances. Various entities use equipment like 'walkie-talkies' with technologies such as ETSI TETRA, DMR (Digital Mobile Radio), TETRAPOL, and P25, which now incorporate the capability to transmit data and video. The event aimed to test devices on 4G and 5G networks, and in direct mode, enabling communication even without network coverage.

Public Safety

Working with appropriate ITU groups, ETSI's Safety Committee (TC SAFETY) monitors developments in electromagnetic fields (EMF), electrical safety and safety in cable television systems, as these impact the interests of ETSI members. The role of TC SAFETY is quite distinct from other ETSI Technical Committees. While it does not normally write standards, the primary role of the committee is as an information exchange, collecting information from other bodies including CENELEC, IEC, ITU and WHO, as well as the EC for any work on directives related to safety in order to provide information for ETSI members.

During 2023 the committee has continued to monitor work in CLC/TC106X, the group within CENELEC addressing various aspects of human exposure to electromagnetic fields at frequencies up to 300 GHz. We also continued our participation in the EC Low Voltage Directive (2014/35/EC) Working Party to distribute relevant EC notifications, as well as in ITU-WHO groups dealing with safety, distributing information when appropriate.

An insistence on quality

Supporting best practice in standardization

Technical excellence lies at the heart of ETSI and is central to our members' aspirations. Interoperability is driven by market demand. It is crucial in a multi-vendor, multi-network and multiservice environment, and is one of the reasons why we develop standards. It gives users much greater choice of products and allows manufacturers to benefit from the economies of scale of a wider market. Interoperability is therefore a crucial factor in the success of modern technologies – especially in the introduction of new technologies.

Testing and Interoperability

ETSI's Centre for Testing and Interoperability (CTI) supports our standardization groups in the use of best practices for the specification and validation of standards, the development of conformance and interoperability test specifications and the organization of developer events. Technologies that CTI covers include 5G mobile, safety and mission-critical communications, intelligent transport, electronic signatures, network virtualization, and the Internet of Things.

Continuing our ongoing support for the development of conformance test specifications for 3GPP – and following 3GPP's own release schedule – in 2023 we have delivered new conformance test cases implementing 5G features from 3GPP Release 17 for user equipment including smartphones and IoT devices.

The CTI's work meanwhile continued on developing conformance test specifications, providing support to oneM2M and our technical groups including TC ITS, ISG MEC, TC EMTel and ISG NFV.

CTI oversees ETSI's Testing Task Force process, developing a multi-annual roadmap of testing activities requiring ETSI funding. We support the use of the Forge, our GitLab™ repository for managing code used for development of various APIs, standards and test specifications in ETSI committees and 3GPP.

In 2023, CTI supported the establishment of ETSI's two new Software Development Groups (SDG), OpenSlice and OpenCAPIF. Support for SDG was moved to a new dedicated ETSI unit SNS ('Software N' Standards') at the end of the year.

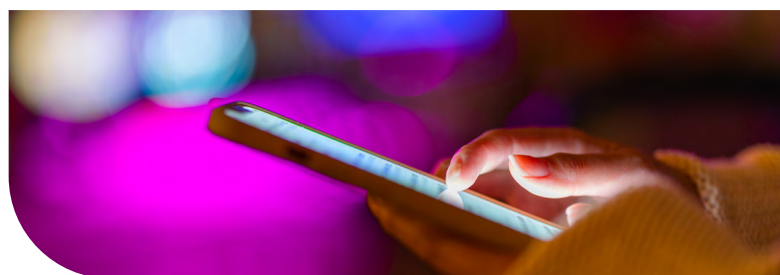
Methods for Testing and Specification

Working with the Centre for Testing and Interoperability, ETSI's Technical Committee on Methods for Testing and Specification (TC MTS) creates standards and guides for testing and specification languages. Providing frameworks and methodologies that enable other ETSI committees to produce documents which are easy to understand and use, our work is critical to the market success of many technologies.

During 2023 TC MTS continued to evolve and maintain ETSI's highly successful testing language, TTCN-3 (Testing and Test Control Notation version 3), along with its tool conformance test suites. This work has been complemented by further updates to our Test Description Language (TDL) that fills the gap between the simple expression of 'what needs to be tested' and the concrete coding of executable tests with existing test specification languages such as TTCN-3.

Within TC MTS, our Testing working group (TST) addresses conformance, interoperability, security and performance testing for specific ICT technologies. In 2023 this resulted in the publication of a Technical Specification on testing of IoT security functional modules, and a Technical Report that details case studies related to the security validation and assurance for integration and conformity of IoT applications with an existing IoT architecture.

Reflecting the growing importance of Artificial Intelligence in related work items, work was launched during the year on a new Technical Specification on the Continuous Auditing Based Conformity Assessment (CABCA) process for AI-enabled systems.



UCAAT 2023

Organized by TC MTS and the ETSI Events team, the 10th User Conference on Advanced Automated Testing (UCAAT) took place in November, hosted by Nokia in the Polytechnic Timisoara University, Romania. Featuring tutorials, keynotes and presentations, this well-established annual event addresses the practical challenges of testing and test automation faced by industry today.

Core Network and Interoperability Testing

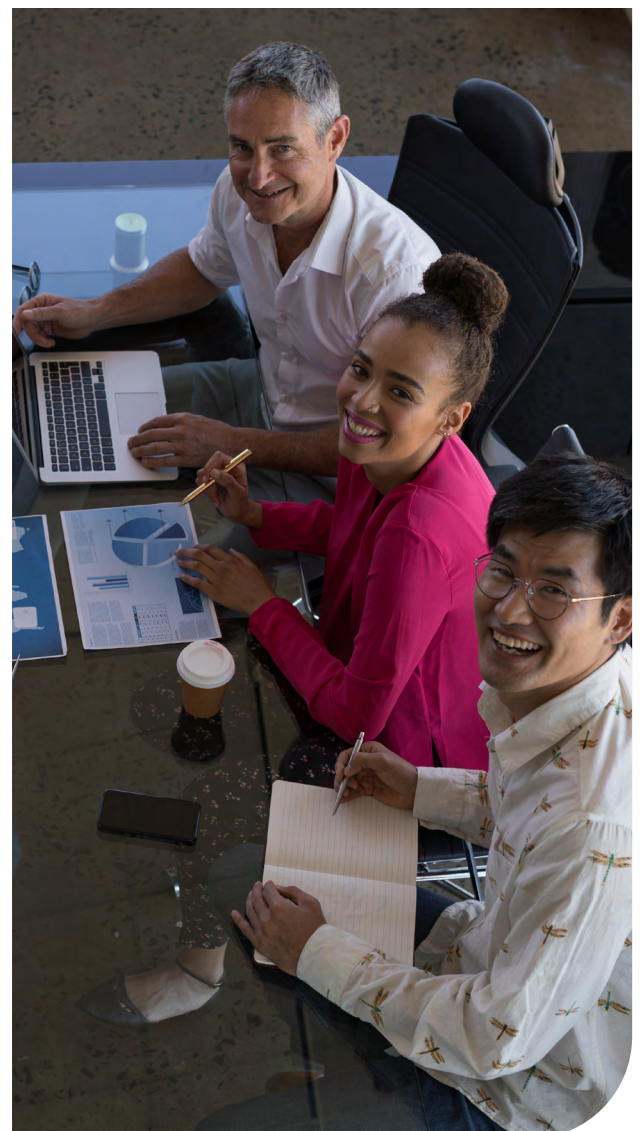
Interoperability is crucial to ensuring Quality of Service and Quality of Experience in complex end-to-end systems such as Voice over LTE (VoLTE) that bring together Internet Protocol (IP) Multimedia Subsystem (IMS™), packet and circuit switched networks. ETSI's Technical Committee on Core Network and Interoperability Testing (TC INT) develops core network test specifications for interoperability, conformance, performance and security. These are based on – but not limited to – 3GPP specifications (including Virtual, Layered and Autonomic Networks).

Alongside development of various specifications and reports, we published a new Technical Specification 'Closed User Group (CUG) using IP Multimedia (IM) Core Network (CN) subsystem at the AGCF connecting legacy access; Conformance Test Specification (3GPP™ Release 17); Test Suite Structure and Test Purposes'. Meanwhile our Working Group on the evolution of management toward Autonomic Future Internet (AFI) – part of TC INT – made progress on various Technical Reports relating to Generic Autonomic Network Architecture (GANA). This was reflected in the publication of the first part of Technical Report on business drivers for autonomic networking.

Plugtests™

Our industry leading Plugtests events allow organizations to connect standards-based equipment – from prototypes to production implementations – to test for mutual interoperability. Plugtests provide a practical, cost-effective means of identifying inconsistencies in either an implementation or the standard itself. Some Plugtests events are co-financed by the European Union (EU) and the European Free Trade Association (EFTA).

Eight interoperability events were held in 2023, attracting a total of around 650 participants. Some events were physical, some hybrid or even fully remote, depending on the technical scope or expected participants. Notable events in 2023 included the 8th MCX Plugtests gathering with 180 participants in Malaga, and the LTA (Long-Term Archive) Signature Augmentation and Validation Remote Plugtests that attracted 190 participants.



Inspiring developments

New opportunities for innovation and collaboration

With the continuous evolution of communication systems from hardware-based to software-defined, there is a greater need for collaboratively developed software to accompany traditional standards. This serves as an accelerator for the standardization process, providing faster feedback loops and improving the quality of the standards we create. Building on the success of open-source projects hosted at ETSI, Software Development Groups operate alongside our technical committees, with each SDG utilizing tools and processes that are already familiar to the developer community. Various software copyright licences are available, including open-source licences.

OpenSlice NEW



ETSI has positioned itself as a focal point for development and experimentation in network slicing technologies with the launch in July 2023 of OpenSlice, its first Software Development Group (SDG).

SDG OpenSlice offers an open-source, service-based Operations Support System (OSS) to deliver Network Slice as a Service (NSaaS) in alignment with specifications from leading Standards Development Organizations. As part of ETSI's broader efforts in Future Networks, OpenSlice aligns with Open Source MANO and TeraFlowSDN initiatives to enrich the suite of ETSI open source components. Designed to facilitate experimentation, proofs-of-concept, integration, and testing, this comprehensive framework provides early and regular feedback to the standardization process. Building on code seeds developed by European Research, OpenSlice is developed using ETSI Zero touch Service and Network Management (ZSM) principles, implementing the ETSI NFV data model and APIs. The group's launch marks a significant milestone for the wider telecommunications industry, where collaboration among software development and standardization groups will foster validation of new technologies and accelerate time for market of next-generation networks. The group's kick-off meeting was held in Castelldefels, Barcelona in October 2023.

OpenCAPIF NEW



The use of Application Programming Interfaces (APIs) to enable programming and service provisioning is growing exponentially in converged telecom and IT networks. This trend has accentuated the need for a standardized framework that supports interoperability, security, and discoverability of APIs and services. Originally specified in 3GPP Release 15, the Common API Framework (CAPIF) has evolved to support a wide range of use cases, with the main goal of providing a unified northbound API management framework across different 3GPP functions. CAPIF is thus considered a cornerstone in the realization of multi-vendor 5G, 6G and future networks, allowing the secure exposure of core network APIs to third party domains and enabling third parties to define and expose their own APIs in a unified way. In November 2023 ETSI announced its OpenCAPIF Software Development Group, with the goal of developing an open-source Common API Framework defined by 3GPP to allow for secure and consistent exposure and use of APIs. The group will collaborate with other ETSI software and open-source projects – such as Open Source MANO, TeraFlowSDN and OpenSlice – to share best practices and opportunities for component reuse. It will also enable developers to test their applications using CAPIF, accelerating time-to-market for deployment of applications in 5G networks.

"Through the adoption of Software Development Groups, ETSI is capitalizing on its experience in linking software and standards to prepare for future standardization needs in the age of 6G and pervasive AI."

Luis Jorge Romero, ETSI Director General

Research and innovation through standards

Strengthening dialogue with R&D communities

The implementation of published standards is the output of a process that often starts with grass-roots technological research, conducted in university campuses and research facilities funded by governments, the private sector or the European Commission.

Today, universities and public/private research institutes represent around 15% of our 946 strong membership. A central pillar in the ETSI Strategy is the focus on strengthening our close links with academic and research communities. In turn, this provides a continuous path for innovative ideas and research output to be taken through our own pre-standardization activities and onward into standards work in both ETSI and 3GPP. This continuous exchange ensures exciting cutting-edge innovation is captured in tomorrow's standards – notably for the technologies that may constitute building blocks of 6G – allowing industry to meet the challenging performance requirements that private and business customers can expect from future networks and services.

At ETSI our work has always been enriched by close links with the R&D and academic communities. Accordingly, we offer a range of tools and resources to make researchers aware of our activities and to meet their specific needs.

2023 saw the continuation of our ongoing initiatives to forge connections with innovation communities in Europe and worldwide. We are currently extending our outreach programme to engage with universities and research projects, highlighting the value of standardization and encouraging their participation in our work. During the year we embarked on updates to the ETSI Technology Radar (ETR). This document tracks emergent trends in the tech innovation space that are potentially relevant to ETSI's goal to be at the forefront of ICT standardization – either through our existing committees and Industry Specification Groups – or, if needed, through the creation of new activities in ETSI.

With the first edition already shared with several global SDOs and associations as well as our own technical groups, we published the revised edition of the ETR in December 2023.

The ETSI Research Conference was held in February 2023 at our headquarters in Sophia Antipolis. Titled 'Maximizing the Impact of European 6G Research through Standardization', this face-to-face event provided an exceptional opportunity for the research community to come together with industry representatives and standardization experts to discuss future technology research and links to standardization developments.

In June ETSI participated in a research session at the 2023 EuCNC (European Conference on Networks and Communications) and 6G Summit in Gothenburg, Sweden. Hosted by ETSI and the 6G-IA Pre-Standardization Working Group, the session offered a demonstration of ETSI's value as a vehicle to bridge the research/innovation 'standardization gap' for projects that may be selected for SNS-JU (Smart Networks and Services Joint Undertaking) funded activities.



Actionable information

Education about Standardization

We have continued to build upon our achievements and consolidate our role as the leading standards organization for education and awareness in ICT standardization. The second edition of our textbook and teaching material 'Understanding ICT Standardization' (etsi.org/education/teaching-material) is proving highly popular with increased requests for slide set licences. The textbook and accompanying slide sets are not only used by universities but also by NSOs and member organizations for training purposes.

ETSI General Assembly #82 created a complementary project 'Training in Standardization' that will run for several years. The project will initially concentrate on leveraging and enhancing the education resources developed over the past few years.

We also provided educational sessions for the TUDOR project in the UK, lectured to students at TU Berlin, and continued working with the University of Luxembourg for their master's course. We also presented our approach to education about standardization to the ETSI Security Conference to attract next-generation engineers as well as emerging talent in law and business.

In November we signed the pledge launched by the European Commission's High-Level Forum on European Standardisation, where the signing parties aim to contribute to the broader EU standardization strategy. As a key participant in this commitment, ETSI pledged to undertake a series of actions falling into distinct categories, demonstrating its dedication to shaping a skilled and knowledgeable workforce for the future. We have taken roles in both the EC HLF and the EU research project EDU4Standards.

White Papers

Offering an informal overview of the work of ETSI and other organizations, our White Papers also highlight broader issues related to the successful deployment of various technologies and services related to our own standardization activities. Complementing our other published deliverables, White Papers express the viewpoint of the authors, and do not constitute an official position of ETSI or its members. In 2023 we published twelve White Papers, including updated editions of three previously-published papers, and a joint publication with the Wireless Innovation Forum. All are available for download from our website.

- #51 - ENI Vision: Understanding the Operator Experience Using Cognitive Management
- #52 - ETSI Activities in the field of Artificial Intelligence: Preparing the Implementation of the European AI Act (second edition)
- #53 - In the Light of Ten Years from the NFV Introductory Whitepaper
- #54 - Evolving NFV towards the Next Decade
- #55 - MEC support towards Edge Native Design
- #56 - Unlocking Digital Transformation with Autonomous Networks
- #57 - Software Radio Reconfiguration: A modular Software Reconfiguration approach for Radio Equipment in general (second edition)
- #58 - Worldwide Analysis and Proposals to Promote and Facilitate the Wireless Transport Network as the Key Enabler for Fast Mobile Backhaul Network Modernization
- #59 - Enabling Multi-access Edge Computing in Internet of Things: how to deploy ETSI MEC and oneM2M
- #60 - All-optical network facilitates the carbon shift
- #61 - ETSI Technology Radar (second edition)
- Joint publication with WInnForum - Spectrum sharing frameworks for temporary, dynamic, and flexible spectrum access for local private networks

ETSI Events

Conducted face-to-face or online, our own workshops, seminars, summits, conferences and fora are designed to bring communities together, present an overview of our work and invite input for future activities. These popular events also provide a platform for researchers to share latest results and identify next steps for standardization. In 2023 we continued to engage in a wide range of external events addressing relevant topics, typically via speaker participation and/or endorsements. See details on events organized, attended and supported by ETSI during 2023 at etsi.org/events/past-events

Webinars

Our successful programme of interactive webinars highlights various aspects of ETSI's work, with high-level overviews complemented by more in-depth exploration of individual technologies. During 2023 we conducted nine webinars:

- OSM Release THIRTEEN Overview
- OSM release FOURTEEN Overview
- TeraFlowSDN Release 2 Overview
- MEC Federation Enablement APIs: Overview and Instructions for use
- A user-centric Approach of Smart Digital Identity in ETSI
- Series of four ZSM webinars:
 - The ZSM Approach for E2E Service Orchestration: Standards and Proofs of Concept
 - Enabling AI and Providing Intent to Empower the Zero-Touch Automation Solutions
 - Closed-Loop Automation: Unleashing the Full Potential of Zero-Touch Management
 - Mitigating Potential Security Threats to Zero-Touch Network & Service Automation

Recordings of all webinars can be accessed free of charge via our ETSI BrightTalk channel that has more than 18 500 registered followers. If you're not already registered, creating a new account takes just a few moments. See more at etsi.org/events/webinars.



Enjoy!

Issued four times yearly, *Enjoy!* is the official ETSI magazine. Available electronically or in print to members and non-members alike, it features news, interviews and opinion from ETSI members, our officials and invited contributors.

Videos

New video uploads to the Media Library area of our website in 2023 included 'Building a Quantum Safe Future!', an animated guide to quantum computing, its impact on our technological landscape and the need for standardized solutions to safeguard our most sensitive data in a quantum-powered age. See latest video added to our dedicated YouTube channel youtube.com/@EtsiOrgstandards.

ETSI Seminar

Held in June, the annual ETSI Seminar provided an intensive course on ETSI's organization, structure, ways of working and related subjects. Seminar content is readily accessible as a series of video modules that also serve as a helpful 'refresher' on a range of ETSI topics. See etsi.org/events/etsi-seminar.

Success through cooperation

Partnership Agreements

Co-operation and collaboration are the best way to overcome the growing challenges of fragmentation and establish global interoperability. Such collaboration avoids duplication of effort and helps ensure that ETSI's deliverables are widely accepted and implemented. By the end of 2023 our partnership portfolio numbered over 100 agreements.

In 2023 ETSI renewed co-operation agreements with the Cloud Signature Consortium (CSC), Telecommunications Standards Development Society, India (TSDSI), SAE International, and DASH Industry Forum (DASH-IF).

Memoranda of Understanding were renewed with the MIPI Alliance (MIPI), Open AR Cloud Association (OARC), Institute of Electrical and Electronics Engineers (IEEE), Khronos Group (Khronos), Cellular Operators Association of India (COAI), European Telecommunications Network Operators' Association (ETNO), and Trusted Connectivity Alliance (TCA).



Working with the European Commission and EFTA

As a European Standardization Organization (ESO), we provide world class ICT standards and specifications to support EU legislation and public policies. We also participate and contribute to a series of policy driven initiatives:

Committee on Standards

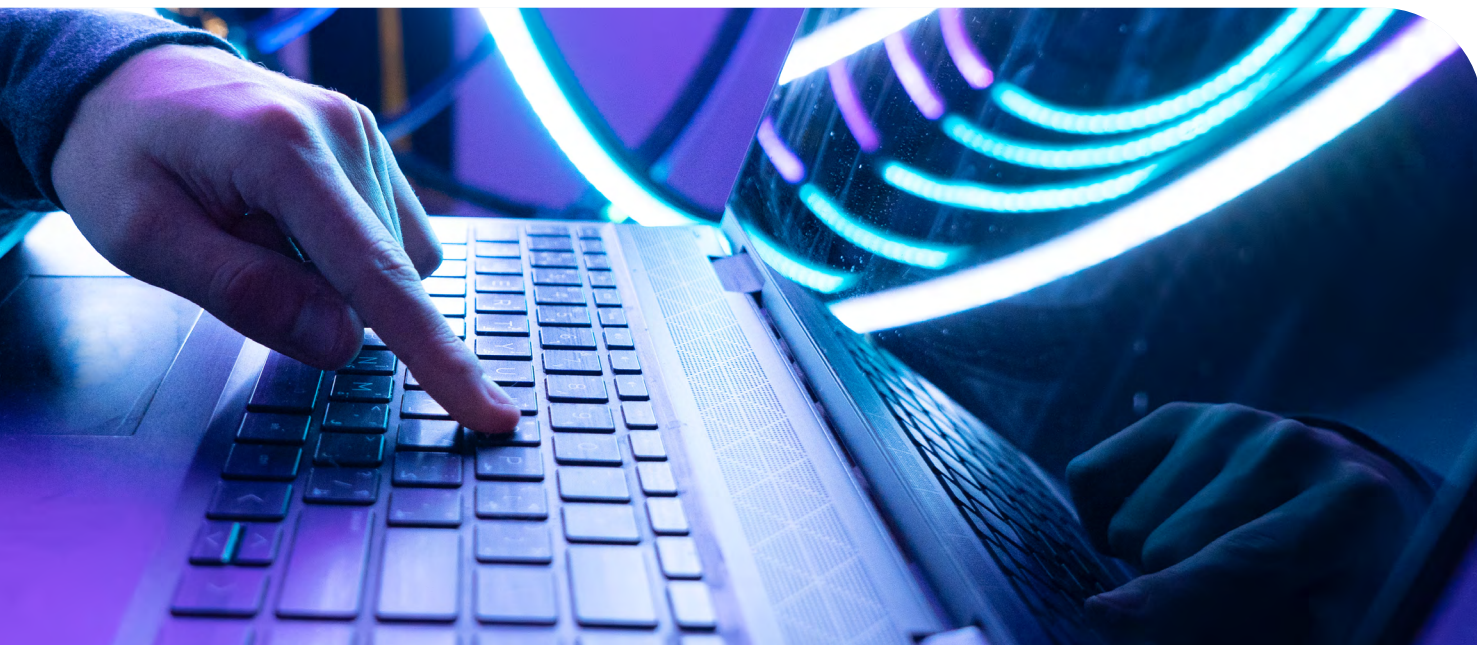
ETSI participates as an observer in meetings of the Committee on Standards (CoS): in 2023 two meetings of the Committee took place. The agenda is usually comprised of a policy-oriented session and a Standardisation Requests session. The ETSI Secretariat prepares the meetings with a cross-departmental team (EU Affairs and Technical Organization). ETSI members may contribute by subscribing to the CoS briefing list, and participate in calls organized prior to the Committee meetings.

ICT Multi-Stakeholder Platform

The European Commission's ICT Multi-Stakeholder Platform (ICT-MSP) renewed itself in 2023, with a new mandate period and more importantly, the articulation with the newly created High Level Forum. Prior to MSP meetings, the ETSI Secretariat holds a preparatory call for ETSI members to input their views on agenda items. Members wishing to join are welcome to register via ICT_MSP_BRIEFING@list.etsi.org.

Rolling Plan on ICT Standardization

This is the most tangible output of the ICT-MSP, with ETSI coordinating inputs from its Technical organizations into the Rolling Plan Task Force. This involves circulating the base version of the plan with the technical group officials, requesting input and updates to the existing text. ETSI inputs are consolidated into a joint contribution to each chapter of the Rolling Plan.



High-Level Forum on European Standardisation

The High-Level Forum is an expert group of the European Commission launched in January 2023 as foreseen in the EU Strategy on Standardization of February 2022. The purpose of the Forum is to identify standardization priorities in support of EU policies and legislation, and to discuss horizontal issues such as international leadership and education and skills, in a multi-stakeholder setting. A 'Sherpa' sub-group supports the Forum as the main operational body dealing with the technical preparatory work undertaken which is later endorsed by the Forum. ETSI is a member of both the High-Level Forum and the Sherpa group.

3SI Programme

The 3SI (Societal Stakeholders and SMEs Inclusiveness) Programme has been complemented by the creation of a Board sub-group on inclusiveness (ETSI Board_INCLU) in late 2022, chaired by the 3SI Advocate. Board_INCLU, like the 3SI, discussed the enhancement of ETSI tools for usage by societal stakeholders and SMEs.

Seconded Experts

ETSI is actively involved in two cooperation projects that have established a presence in China and India with the help of seconded standards experts, in cooperation with the EC, EFTA, CEN and CENELEC.

SESEC (Seconded European Standardization Expert in China)

The fifth phase of the SESEC project was launched in 2022 at a time when the geopolitical context was largely different from previous phases of the project. Yet, the project is running smoothly, supported by the partners and their members. Consultation meetings have been organized by the partners to ensure that the project remains in line with their strategies and expectations.

SESEC newsletters and subject specific reports are available from the ETSI Secretariat, or directly at sesec.eu or sesec.eu/resources.

SESEI (Seconded European Standardization Expert in India)

The SESEI project was financed for only one year at the closure of SESEI 4th phase in 2023.

The SESEI team and partners has nonetheless remained active, in particular with the organization of the 4th EU-India conference on Emerging Technologies in December 2023. In parallel, ETSI and the project partners and the EU Delegation in India have devoted considerable efforts to identifying potential sources of financing for continuation of the project.

InDiCo Global

Between 2018 and 2022, ETSI managed a project on International Digital Cooperation for ICT standards under a grant from the European Commission as part of its Foreign Policy Instrument. Covering Brazil, China, India, Japan, South Korea and the United States, the InDiCo project focused on building bridges between technical communities and policy makers on topics relating to the Digital Single Market and related ICT standardization priorities.

In 2023 the European Commission instigated a follow-on to InDiCo with two new projects under the Horizon Europe research programme. ETSI was selected for one of these two projects, with the aim of commencing work in January 2024. Building on the experience of previous funded projects (notably SESEI, SESEC, InDiCo and the EU-India project on ICT standardisation) the new 36-month initiative – titled InDiCo Global – aims to further establish and strengthen cooperation between EU and key partners/markets.

ETSI is serving as InDiCo Global project coordinator, as part of a consortium that includes SDO peers CEN and CENELEC, together with Martel Innovate, Trust-IT Services and COMMpla. Geographical scope of InDiCo Global spans India, China, Southeast Asia, the African Union, Latin America and Caribbean (LAC), the Western Balkans and the Eastern Partnership. Technical areas addressed include: AI, 5G and beyond, IoT and security aspects, Internet, cybersecurity, data, eID, quantum, digital ledger technologies, circular economy and smart cities.

India-EU Cooperation on ICT-Related Standardization, Policy and Legislation

Overall objectives of the EU-funded efforts on ‘India-EU Cooperation on ICT-Related Standardisation, Policy and Legislation’ (established in 2015) have been to promote closer alignment between India and Europe with regard to the production and use of ICT standards, and to harmonise the exchange of statistical data, thereby facilitating trade, increasing interoperability and the ease of doing business for companies, as well as adding further weight to European and Indian ICT standardization efforts at a global level. The main cooperation partners are the Telecommunications Standards Development Society, India (TSDSI) and its members, and the Central Statistics Office of India (CSO); and on the European side ETSI and Eurostat. Formal closure of the project took place in February 2023.



Specialist Task Forces and other Funded Projects

Specialist Task Forces and Testing Task Forces

Specialist Task Forces (STFs) are expert teams established under the direction of an ETSI committee to work together for limited periods on specific technical work. Therefore, STFs can accelerate the development of urgently needed standards or support strategic activities required by our members or by the European Commission (EC) and the European Free Trade Association (EFTA).

A similar mechanism has been adopted to support 'Funded Projects' for the Third Generation Partnership Project (3GPP™) and oneM2M partners.

Some resources are also allocated from ETSI budget to fund projects aiming at reviewing and streamlining internal processes.

Altogether (EU, ETSI or Partners), 28 STFs (interoperability events not included) and other funded projects were active in 2023, involving more than 80 service providers for a total expenditure of about 2 M€. 3GPP Members provided voluntary contributions equivalent to 0,34 M€.

STF Technical areas in which funded resources were spent in 2023:

Technical Areas	Financial Investment (k€)	%
3GPP Partners	641	32%
Centre for Testing and Interoperability	108	5%
European Common information sharing environment service and Data Model (CDM)	233	12%
Smart M2M	207	10%
Railway Telecommunication (RT)	127	6%
Human Factors (HF)	108	5%
Emergency Communications (EMTEL)	54	3%
Electronic Signatures and Trust Infrastructures	53	3%
Multi-access Edge Computing (MEC)	45	2%
Cyber Security (CYBER)	23	1%
Network Functions Virtualization (NFV)	22	1%
Quantum Key Distribution (QKD)	17	1%
Augmented Reality Framework (ARF)	7	0%
User Group (USER)	2	0%
Voluntary	338	17%
TOTAL	1 987	

Figures are rounded to the nearest k€.

Testing Task Forces (TTF) are teams established to support the Reference Bodies and accelerate the production of testing and methodology standards. TTFs give ETSI a competitive advantage by making readily available the technical competences necessary to quickly develop testing and methodology standards needed by the market.

TTFs are established and managed by the ETSI Secretariat under the authority of the Director General, based on a technical roadmap and a multi-annual plan developed and maintained by ETSI's Centre for Testing and Interoperability (CTI), in consultation with the ETSI Board and OCG.

Testing Task Forces are 100% funded via ETSI budget.

TTF Technical areas in which funded resources were spent in 2023:

Technical Areas	Financial Investment (k€)	%
Methods for Testing and Specification (MTS)	169	24%
Core Network and Interoperability Testing (INT)	114	16%
Intelligent Transport Systems (ITS)	90	13%
TCCE	71	10%
Multi-access Edge Computing (MEC)	64	9%
Cross-cutting Context Information Management (CIM)	60	9%
Speech and multimedia Transmission Quality (STQ)	48	7%
Smart M2M	37	5%
Network Functions Virtualization (NFV)	13	2%
Millimetre Wave Transmission (mWT)	13	2%
Digital Enhanced Cordless Telecommunications (DECT)	7	1%
Mobile Standards Group (MSG)	5	1%
TOTAL	690	

Figures are rounded to the nearest k€.

Funding sources in 2023:

ETSI	42%
3GPP Partners	24%
EC/EFTA	21%
3GPP Members	13%
Other ETSI Partners	1%

EC/EFTA Funding

2023 has been a year of consolidation with regards to processes and working methods to be put in place in the context of the tri-partite relations between DG GROW, the European Innovation Council and SMEs Executive Agency and ETSI. The exclusive use of the 'Funding and Tenders' Portal, to exchange information and submit proposals, also required internal adaptations and to gain knowledge and extensive practice all along 2023.

The action grants signed between EISMEA and ETSI are operated under the 'actual cost' model, except for staff travel costs which are reimbursed on the basis of unit costs.

In 2023 ETSI received from EISMEA three invitations to submit technical proposals on dedicated topics, and to be funded out of the 2023 EU budget allocated to standardisation. None of the three proposals sent by ETSI in response to the first call were positively assessed by EISMEA.

In reply to the second call, ETSI addressed by the deadline three out of the five proposed topics requesting a total funding of 0,8 M€. The outcome of the evaluation of these technical proposals was received in December. Only one proposal was approved for a total funding of 0,07 M€.

A third invitation to submit technical proposals by February 2024 was received in December. This latest 2023 call included only one topic addressed to ETSI, offering 1,2 M€ dedicated to NSBs for 'Running specific activities in support of Regulation 2022/2480 and the Single Market Programme'.

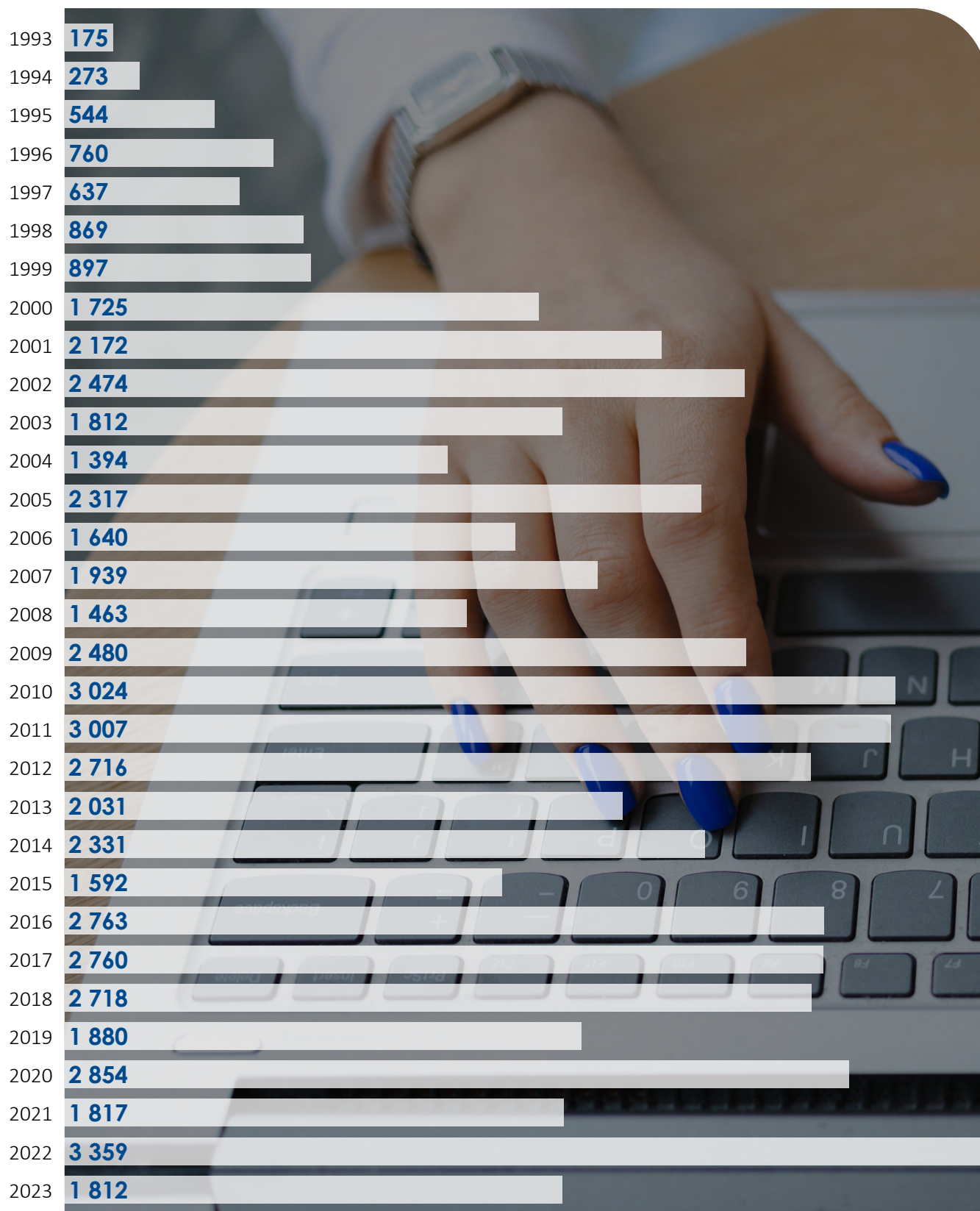
The Operating Grant destined to finance part of ETSI operations in its role of ESO and standardisation platform is ruled by the Framework Partnership Agreement signed in June 2021 for a four-year duration.

After the EC extended deadlines for submission and evaluation, ETSI was able to formally submit its Work Programme for a 2023 Operating Grant. Following its positive assessment by the EC/EFTA, the acceptance of the eligible costs and the funding rate, ETSI was granted a maximum of 0,21 M€ subsidy in 2023, with EFTA share included.

ETSI reported and achieved 100% payment of the 2022 Operating Grant.

Standards Production

Number of deliverables published,
for each of the years 1993 – 2023



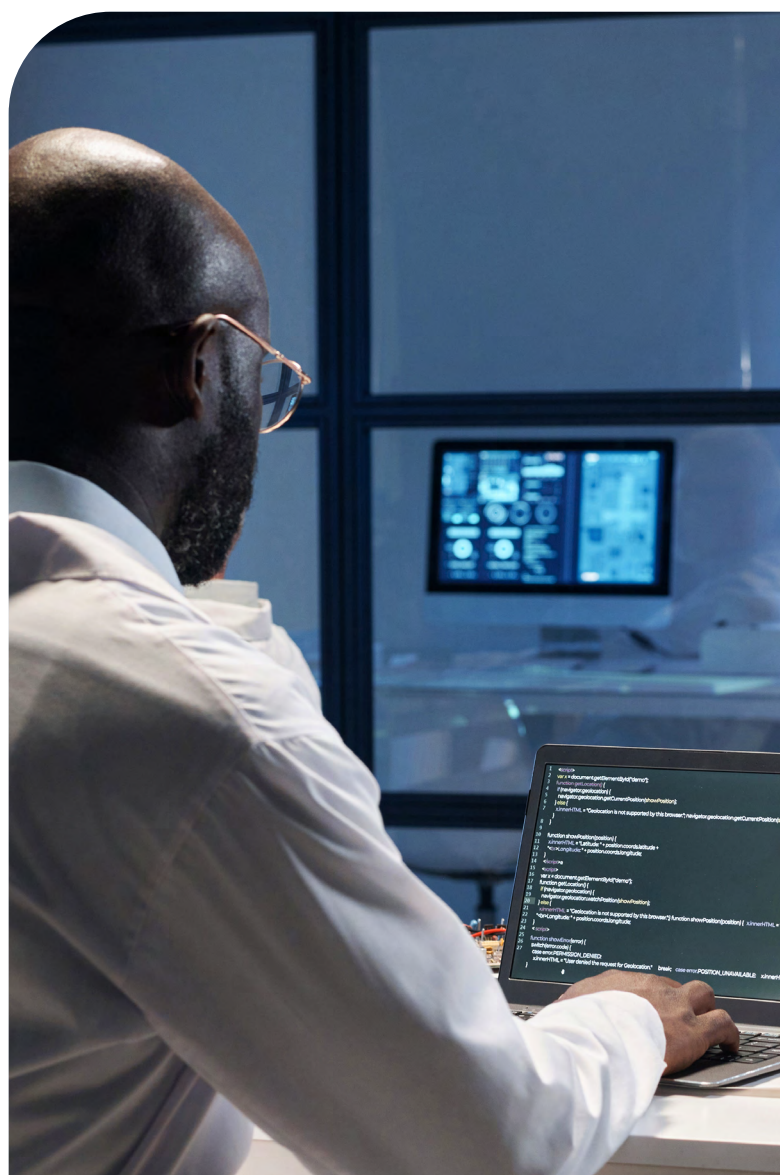
Distribution by type of published document

	In 2023	Total since 1988
Technical Specification (TS) ¹	1 566	46 539
Technical Report (TR) ²	83	4 559
ETSI Standard (ES)	8	908
European Standard (telecommunications series) (EN) ³	23	5 289
ETSI Guide (EG)	0	259
Special Report (SR)	2	117
Group Specification (GS)	88	652
Group Report (GR)	42	227
TOTAL	1 812	58 550

Intellectual Property Rights

ETSI's Intellectual Property Rights (IPR) Policy continues to be widely referenced in the international standardization landscape. We maintain a public database of patents as well as patent applications. These are disclosed by their owners in the belief that they may be or may become essential to an ETSI standard. Recognized as a unique source of information, this IPR database is one of the most complete in the ICT sector.

A focus of the Secretariat's activity has been on new solutions to ensure better accuracy regarding unpublished and provisional patent declarations that may create uncertainty regarding the possibility of being licensed. So-called 'un-normalized' patent numbers are temporarily attributed when declarants submit their IPR declarations to ETSI before patent authorities have validated the corresponding patent publication numbers. Once the respective patents have been reviewed and approved, they are attributed a number that's distinct from that used in the earlier submitted declaration. Until recently, updating a declaration directly in the ETSI IPR database with the final patent number was not allowed for declarants, with updates being processed by the ETSI Secretariat upon written request. In October 2023, we introduced a new 'do it yourself' (DIY) feature in our IPR database application. This allows the submitter – or any other authorized user – to access their ISLD (Information Statement and Licensing Declaration) and update the formerly unpublished patents, either to normalize or abandon them.



1 Includes GSM™ Technical Specification (GTS)

2 Includes old deliverable types: Technical Committee Reference Technical Report (TCR-TR), Technical Committee Technical Report (TC-TR) and ETSI Technical Report (ETR)

3 Includes amendments and old deliverable types: European Telecommunication Standard (ETS), Interim ETS (I-ETS) and Technical Basis for Regulation (TBR)

Financial Situation

The management of the finances of ETSI is described by:

- the budget report
- the financial statements (balance sheet and income and expenditure statement), which are established according to French laws and regulations.

Mr. Anis Nassif, CONCERTAE, whose auditor's mandate was renewed at General Assembly 80, has audited the 2023 ETSI accounts and certified that the annual financial statements are true, sincere and give a fair view of the activities carried out during the past financial year.

Budget Maintenance

In total, compared with 2022, income increased by 6,5% (1 630 k€) while expenditure increased by roughly 7,1% (1 772 k€). After having made provision of roughly 42 k€ for Income Tax to be paid, the net result of the year is 113 k€. This compares with a net result of 255 k€ in 2022.

The key points of the budget management are the following:

Income

Members' contributions (19,2 M€) were 3,9% over budget and increased by 2,9% compared with 2022. They funded roughly 72% of the budget. European Commission (EC)/European Free Trade Association (EFTA) funding amounted to roughly 1,5 M€ to cover expenses related to the operation of the European standardization platform, standardization projects including at international level, plus specific projects dedicated to Secretariat operations.

3GPP Partners contributed 2,5 M€ corresponding to their share to the project according to the funding formula in force and also taking into account the impact of the 2022 carry-forward and the decision to reserve 50% of this carry-forward in a long-term reserve fund.

Expenditure

Secretariat costs were 4,6% under budget and higher by 7,1% compared with 2022. The activities have resumed as before the pandemic, many meetings and events took place all over the world and the travel costs have increased accordingly.

Following GA#82 approval to commit funds for engaging in a Standardisation Training project, the Secretariat started working on this project already in Q4 and the approved funding had been carried over to 2024 to continue deploying the action plan.

Staff resources were reorganized in September 2023 to ensure a better adaptation to the organizational needs and activities instilling more agility. The headcount remained stable.

IT developments accelerated in 2023 to ensure the tools and applications could be timely adapted to the significant changes introduced to the ETSI Directives after the revision of its Governance and the implementation of the Regulation 2022/2480 amending the Regulation 1025/2012.

3,4 M€ were spent acquiring expertise for Specialist Task Forces and other standardization-related technical expertise.



2023 Budget Statements

INCOME	(k€)	EXPENDITURE	(k€)
Members' contributions and Observer fees net of credit notes	19 249	Secretariat staff costs	14 784
EC/EFTA contracts	1 449	Other Secretariat costs	5 377
3GPP™ Partners	2 479	Special Projects	889
Voluntary contributions	355	3GPP Meetings Fees (incl. European Friends of 3GPP)	2 003
3GPP Meetings Fees (incl. European Friends of 3GPP)	2 647	Provision and losses	196
Sales	112	Experts costs	3 382
Financial income	365		
Other income	86		
TOTAL INCOME	26 743	TOTAL EXPENDITURE	26 630

In 2023, there was a net result of 113 k€.

Financial Statements for the Year 2023

The final accounts and the balance sheet are summarized below.

The fiscal accounting period is 1 January 2023 – 31 December 2023.

Statement of Income and Expenditure Year 2023

	Income (€)	Expenditure (€)
Income	27 255 711	
Purchases		10 523 099
Expenses		16 872 480
Financial income and expenses	365 494	20 063
Extraordinary income & expenses	1 026	51 653
Income Tax		41 617
TOTAL	27 622 231	27 508 912

There was a net result of 113 319 € in 2023.

Summary of the Balance Sheet

Assets

Net amounts at:	31 Dec 2022 (€)	31 Dec 2023 (€)
Fixed assets	5 220 056	5 386 638
Debtors	14 864 577	16 172 441
Securities/cash	16 555 781	16 922 717
Prepaid expenses	329 272	350 579
TOTAL ASSETS	36 969 685	38 832 375

Liabilities

Net amounts at:	31 Dec 2022 (€)	31 Dec 2023 (€)
Equity	9 124 155	9 206 804
Provisions	286 517	1 364 291
Balance carried forward	82 648	255 797
Result of the year	255 797	113 319
Creditors	10 488 654	7 498 710
Deferred revenue	16 731 913	20 393 454
TOTAL LIABILITIES	36 969 685	38 832 375

Figures are rounded to the nearest €.

In honour

Recognizing an outstanding personal contribution

Established in 2015, the ETSI Fellowship Programme rewards those individuals who have made an outstanding personal contribution to ETSI, to building our work, or raising our reputation in specific sectors of standardization. Any individual representing an ETSI member organization may nominate a candidate for an ETSI Fellowship. Candidates for an ETSI Fellowship must have been nominated by at least four individuals representing different ETSI members. Fellowships are awarded each year by an Award Committee composed of the ETSI General Assembly Chair and Vice-Chairs, the ETSI Board Chair, and the ETSI Director General.

In 2023 we honoured Scott Cadzow, Hans Johansson and Robert Sarfati as ETSI Fellows for their outstanding personal contributions.



Scott Cadzow

Director, Engineer, Cadzow
Communications Consulting Ltd., UK

Scott Cadzow has been an active member of ETSI's community since 1995 and over that period has contributed to developments across a vast swathe of ETSI's technical work.

From TETRA (as RES.6, then TETRA and TCCE) to TIPHON/TISPAN, including HF, MTS, eHealth and NFV, Scott has consistently pushed for the acceptance of security as a horizontal domain through the special SEC group until adoption as TC CYBER.

Scott is a recognized expert in cybersecurity and its application across a number of technologies addressing core aspects of risk analysis, methods, and applications, in many cases breaking new ground for ETSI in domains such as AI, virtualized environments, and quantum migration.





Hans Johansson

Radio Expert, Kapsch TrafficCom, Sweden

Since 2002 Hans has been a key contributor in ETSI for standards on road vehicle radio communication. His work started with developing harmonized standards for 5,8 GHz CEN/DSRC used in road toll equipment and similar applications.

Later in TC ITS, Hans contributed to standards for 5,9 GHz ITS safety road applications, and after some years became chair of the two physical layer groups. For TG37 it was complicated to develop and obtain EU acceptance of the harmonized standards for the new EU RED directive, including six years of negotiations.

Hans coordinated the development of coexistence methods for completely different road ITS technologies. Due to increased interest in using the 5,8 and 5,9 GHz band, he participated in other ETSI groups developing coexistence standards and participated in ten different ECC groups, contributing to 17 CEPT/ECC reports.



Robert Sarfati

Retired, Former Director Technologies and Services for Mobility, SYSTRA Consulting Services, France

Robert has been the Chair of ETSI's Telecommunications Committee for Railway Communications for the last 21 years. From 2001 the committee oversaw development of ETSI standards in support of GSM-R and FRMCS. This work later expanded to the investigation and development of a common technical solution applicable to Urban Rail and its coexistence with ITS in 2014.

Robert initiated a key evolution of the rail sector from analogue telecommunications to the digital telecommunications world. He introduced and maintained complementarity between the GSM-R railway community (represented by the Union Internationale des Chemins de Fer (UIC)) system requirements and ETSI standards which provide detailed standardized solutions.

Robert was also one of the initiators of FRMCS, the 3GPP MCX-based system for which ETSI TC RT is currently developing standards as part of a European Commission standardization request. FRMCS will be the successor to GSM-R, and Robert was instrumental in obtaining additional frequency for this system.

Membership

Overall ETSI membership increased by roughly 1% in 2023. At the end of the year, we had a total of 946 members, drawn from 64 countries and provinces across five continents. Membership was made up of 779 full members drawn from 41 European countries, 163 associate members drawn from 23 non-European countries and 4 observer members from both European and non-European countries. 137 of our members are small and medium-sized enterprises (SMEs) and 81 are micro-enterprises. Small organization members represent 23% of the overall membership. 139 members are universities and research bodies; this represents roughly 15% of the overall membership.

76 resignations were received during the year and are effective 1st January 2024. This unusual increase stems from the review of ETSI governance and voting weight in 2023, and limiting the voting power of corporate and public groups to rebalance representation in the different members categories. This is also related to upcoming changes related to limiting the number of members per corporate group that will be implemented in 3GPP, starting in 2024.

Collection of contribution invoices in 2023 was performed with a recovery rate of 99,85%.

One of the utmost priorities is the development of the ETSI Membership base, gathering a diverse, vast and innovative community for the development of world-class ICT standards by reaching out to different vertical sectors, which ETSI can pride itself for achieving when listing the names of the organizations being ETSI Members.

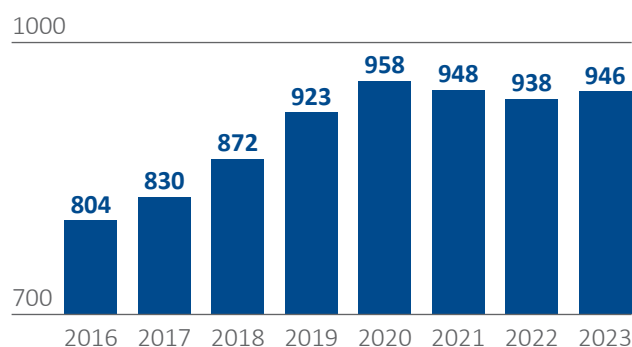
ETSI not only promotes inclusiveness but realizes it by having a high percentage of eminently innovative small organizations but also by the number of universities and research bodies.

An onboarding programme is available to ensure that members enjoy a quick start when joining ETSI. This aims to enhance new members' experience by providing information on our tools and working methods, facilitating their smooth integration into the community of The Standards People. Our onboarding programme is complemented by an online seminar and various guides and documentation specifically produced to assist members in successfully navigating the ETSI environment.

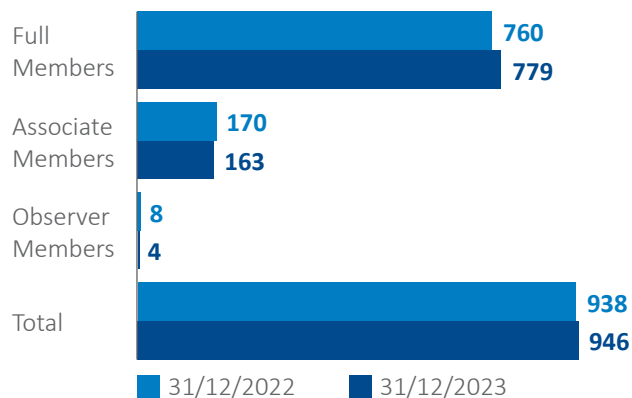
See www.etsi.org/media-library/ and www.etsi.org/events/etsi-seminar.

In the role of Counsellors, The European Commission and the European Free Trade Association Secretariat attend the ETSI General Assembly and Board, and continue to play an active part in our work.

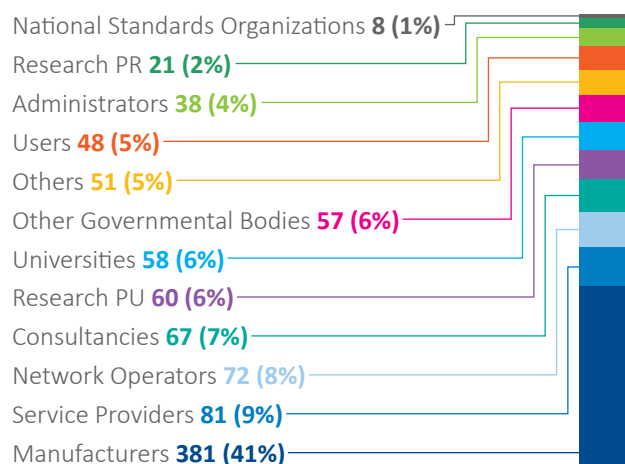
Evolution of ETSI Membership (Full, Associate & Observer members)



Membership per status



Full and Associate Membership by category



Take full advantage

ETSI offers an open and inclusive environment to support the development and testing of globally applicable standards for ICT-enabled systems, applications and services across all sectors of industry and society.

ETSI provides the opportunities, resources and platforms for organizations to understand, shape, drive and collaborate on globally applicable standards. These standards facilitate interoperability, security, and competitive advantage across all sectors of industry and society. Our international membership includes universities, research bodies, associations and public authorities, as well as industrial companies of all sizes: almost a quarter of members are small or medium-sized enterprises (SMEs).

We're a world-renowned organization with a longstanding reputation for technical excellence. Our standards are produced by our members, through active participation, co-operation and consensus in an atmosphere of openness and transparency, where all contribute as equals. We work in partnership with all relevant worldwide Standards Developing

Organizations, particularly the other ESOs, as well as communities, fora and consortia. This ensures that our standards are aligned with those produced elsewhere and avoids the duplication of effort.

By joining ETSI, you can become part of one of the leading communities for the development of world-class ICT standards – and have your say in shaping the future of our industry.

Find out more about the benefits of ETSI membership at etsi.org/membership

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