

ANNUAL REPORT



Standards in a transformed world

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 over 950 members drawn from 64 countries and five continents. These include some of the world's leading companies from the manufacturing and service sectors, regulatory authorities and government ministries, as well as small and 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 single European market, allowing enterprises in the European Union to be more competitive. Building on this heritage, the consistent excellence of our work and our open approach sees ETSI's influence extend beyond our European roots to the entire world.

This Annual Report highlights just some of our achievements during 2020. 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 also find more information about current and planned activities in the ETSI Work Programme 2020-2021 and future updates.

World Standards Day

In October 2020 ETSI joined CEN and CENELEC as the three official European Standardization Organizations to celebrate World Standards Day. Under the banner 'Protecting the planet with standards', the event celebrated the potential of standards to help our world become more sustainable by enabling businesses provide better goods and services while respecting planetary boundaries.

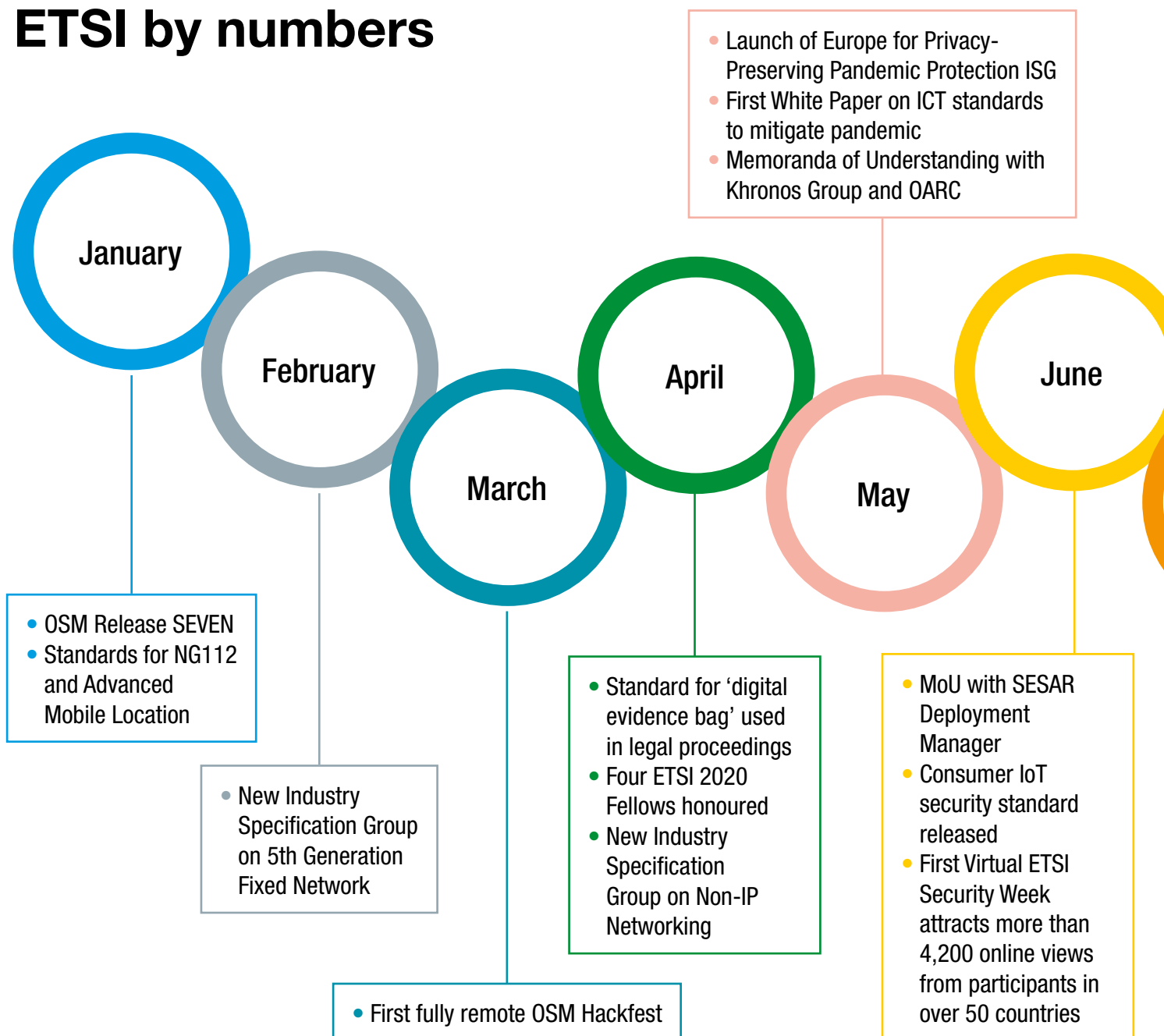
"By enabling global interoperability, current and future ICT standards help us better communicate, which is key for sustainability" commented Luis Jorge Romero, ETSI Director General. "As the world enters a new phase where communication through 5G and the generations to follow will be prominent, ICT networks, devices and components will need to be more environment friendly and energy efficient. Over the last few years ETSI members and partners have been actively working on making Green become a reality in Europe and beyond."

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01 THE YEAR IN SUMMARY

ETSI by numbers



958
ETSI members
(27% SMEs)

64
countries

2009
E-meetings

2854
Publications

92
Partnerships

23 737
Standards
downloads

100+
Technical
groups

ETSI Secretariat:
128 people
15 nationalities

45 448
Online participants

- OSM Release EIGHT
- DECT-2020 New Radio interface published
- 2nd C-V2X Plugtests™ events

- India selects OneM2M as national standard
- World Standards Day

- New ETSI Strategy announced
- First report from Industry Specification Group on Securing Artificial Intelligence
- OSM Release NINE
- MEC Hackathon 2020

July

August

September

October

November

December

- IPv6 White Paper published and webinar
- I5th MCX Plugtests™ validates 3GPP Mission Critical Services

- First cloud native VNF management specification
- Report on citizens' requirements for smart cities
- ETSI virtual event on R&D innovation ecosystem

02 FROM OUR OFFICERS

A year in perspective

Neviana Nikoloski,
Chair of the General Assembly



In ETSI we exist to standardize new technologies. Today, the pace of technological change is even more rapid than it was just a decade ago. Industry now typically looks for new standards to be developed in a couple of years, or even less. While we are nominally a European organization, our standards are cited for regulatory purposes in

jurisdictions including the USA and Asia Pacific. In ETSI our own challenge is meeting this accelerated demand from our members to write robust, timely, high quality standards that serve a global ICT market.

Standardization plays a fundamental role in the digitalization of our society, where technologies such as broadband connectivity, the Internet of Things, AI and data analytics are enablers for greater industrial efficiency and sustainability. And as 2020's global pandemic starkly illustrated, standards are also vital to enabling the rapid roll-out of technologies that can support the implementation of public health measures.

As an organization ETSI has always placed great value on its open dialogue with the European Commission. In June the Commission asked the three European Standardization Organizations – ETSI, CEN and CENELEC – how our collective standardization activities could help strengthen the region's priorities for post-Covid economic recovery, while supporting the 'twin' transitions of green and digital transformation.

In our consolidated response to the Commission in August, we reiterated the importance of standardization in enabling a resilient, fully functioning Single Market. In particular, we noted the reliance of EU legislation on industry expertise and technological innovation from the private sector – fuelled by harmonized standards – to address current challenges and enable Europe to fully unleash its digital growth potential, today and tomorrow.

As I discovered during the year, chairing an electronic General Assembly during the pandemic has its own challenges. Pre-Covid, a glance round the room was enough to take the temperature of the debate, see raised hands and decide who has the next turn to speak. It's harder when fifty virtual participants are clamouring to speak with no easy way of reading everyone's body language. Respecting schedules is tricky without the incentive of a coffee break to give protracted discussions the chance for a natural pause.

Early in 2020 many companies had already imposed travel bans, presenting ETSI with an immediate challenge for the hosting of its March General Assembly. Drafted over thirty years ago, our constitution demanded the physical presence of sufficient members to approve mandatory items and make crucial decisions. For first time in our history, we amended our directives to allow these meetings to be hosted electronically.

A speedy and successful transformation of our meeting procedures has also given an opportunity to rethink other aspects of the way we work. As ETSI's GA Chair I am delighted that we are taking positive steps to better address inclusiveness and the use of gender-neutral language in our drafting rules and directives.



Dirk Weiler, Chair of the Board



Under direction of the Board, 2020 saw the finalization and approval of the new ETSI Strategy. Building on our preceding Long Term Strategy 2016-2021, this update sharpens ETSI's vision and mission while reconfirming the importance of our work in enabling the successful development and commercialization

of genuinely world class technologies – 5G is an unarguable demonstration of this.

A central pillar of this new strategy is an even stronger emphasis on dialogue and collaboration with research and academic communities. ETSI exists to develop, publish, maintain and promote technical standards that directly benefit citizens, industry and society as a whole. We are not a research organisation, an academic institution or a technology company. Equally, many of our members – including commercial companies as well as universities and dedicated research organizations – are intimately involved in the earliest phases of developing new technologies. A goal of our refocused strategy is to ensure a seamless linkage between the research community and the interests of our members in creating standards based on this research, thanks to our innovation friendly IPR policy.

The revision of our Strategy has evaluated and identified the major global trends perceived in the

context where ETSI is active, and addresses the digital transition, sustainability, energy efficiency, circular economy and open innovation among others, in a very positive alignment between ETSI aims and the policy and priorities identified by the European Union. This includes the perspective of the recovery of Europe in the light of the crisis caused by the Covid-19 pandemic.

During a challenging year it was pleasing to see continuing positive interactions between ETSI and the EC. In 2020 we saw ongoing publication of a steady stream of our Harmonised Standards, with a number of these being cited in the Official Journal of the EU. There is still much work to be done to create a mutual understanding how standards are helping the EU to reach its ambitious goals, and several actions have been proposed in the Task Force Bildt Report to achieve this.

The completion of 3GPP Release 16, and its successful submission to the ITU as part of the IMT-2020 process, was a remarkable milestone in itself, not least due to the huge organizational challenges posed by Covid-19. Representing 'phase 2' of 5G standardization, this latest iteration of 3GPP standards dramatically expands the appeal of 5G to meet the needs of new use cases and industries such as rail and automotive that demand secure, ultra-reliable machine-to-machine wireless communications.

Luis Jorge Romero, Director General



The development and maintenance of technical standards can normally be characterized as a process of structured, highly ordered change. During the global coronavirus pandemic in 2020, however, abrupt and unplanned change was imposed on virtually every aspect of society.

In parallel with ensuring the safety of our own staff, an immediate priority in ETSI was to enable our members to keep working with us. We rolled up our sleeves, took the technological systems we already had at our disposal and explored new processes and procedures to go hand in hand with these tools.

An immediate challenge was the hosting of our General Assembly meetings. Hitherto these meetings have required the physical presence of our members to vote for the election of officials and determine dozens more critical actions by direct consensus. During my time with ETSI I have often heard the assertion that 'physical meetings will never be replaced'. Thanks to the commitment and determination of our Secretariat and IT teams, however, we were able to re-engineer our GA process to enable decision making by electronic means – a shift that would have been frankly unthinkable to many of our members just two years ago. One consequence of this shift to e-participation meant our last GA meeting at the end of 2020 attracted participation by the highest number of members ever in ETSI's history. Similarly, 3GPP and oneM2M saw their regular plenaries transformed into electronic meetings, taking part during times of the day that allowed participation from members in different time zones.

Widespread restrictions on international travel were also of incidental benefit to some of our membership. This notably included SMEs and other smaller organizations, who were able to participate actively in electronic meetings without the costs and inconvenience of travelling overseas. I am pleased to report that our hundred-plus technical bodies and committees have been equally agile in adapting to this 'new normal' to ensure the pace and quality of their activities has been maintained.

Another achievement of the year was a dramatic increase in online workshops and webinars as well as our increasingly popular Hackathons and Plugtests™ interoperability events that – for now – are exclusively virtual meetings. Again, this transformation has encouraged visibility from smaller organizations who can participate in our work without the need to travel.

Despite the year's daunting challenges our membership continued to grow steadily in 2020. Much of this growth has come from smaller companies and entrepreneurial start-ups, including organizations who are interested in our work in areas such as cybersecurity, blockchain, AI, quantum computing, network virtualization and the Internet of Things. It has also seen widened representation from vertical market sectors. Accordingly, the focus of our activities continues to evolve in reflection of our members' own interests. This progression was illustrated in 2020 by the establishment of new Industry Specification Groups.

The majority of us are fortunate to have access to fast, reliable fixed and mobile broadband in our homes, as well as a wide range of readily accessible conferencing tools. Many of these technologies that we take for granted today have of course been made possible through the existence of open standards. One can only wonder how ETSI – and the world at large – would have struggled to cope with the challenges of the pandemic if it had occurred twenty years ago.



Designing tomorrow's world Restating our mission, vision and values

Our Long Term Strategy 2016-2021 has guided ETSI's direction of travel while supporting our position within the global digital landscape. As a forward-looking organization, however, we must constantly examine how we can anticipate and serve our members' future needs.

ETSI's brand-new strategy was formally adopted by our General Assembly in December 2020. Titled Designing tomorrow's world, it reflects the global context in which we operate as an organization. In turn, it articulates our values, mission and vision while indicating our future direction as a world-leading Standards Developing Organization. It also recognizes the global importance of ICT in sustainable development, and the role of standards to support society's digital transformation.

Developing this new strategy started with a high-level analysis of socioeconomic, policy and technology trends characterizing the ecosystem that impact on our activities. We accordingly explored factors including climate change, the circular economy and the UN's Sustainable Development Goals, the role of SMEs and the EC's industrial strategy. From a technology perspective, we also considered latest ICT trends including developments in AI, cloud, photonics and quantum computing.

This development process also re-examined the changing role of ICT, manifested through digital transformation, the increasing roles of virtualization and cloud computing as well as issues related to security and privacy. Furthermore, it explored the roles of main players in the ICT ecosystem, the importance of standardization in different industry sectors, and the importance of education and skills.

ETSI's Mission is 'to provide platforms where interested parties come together and collaborate on the development and promotion of standards for Information and Communication Technology systems and services, used globally for the benefit of all'. Consolidated on our

Mission, ETSI envisions 'to design tomorrow's world; be at the forefront of new Information and Communication Technology; and to lead the development of standards that enable a sustainable and securely connected society'. To deliver this vision, we will follow a path marked by five Key Strategic Directions:

- Being at the Heart of Digital
- Being an Enabler of Standards
- Being Global
- Being Versatile
- Being Inclusive

Reflecting our deep roots in European standardization, our new strategy is a dynamic entity that will evolve over time, being revised in response to a continually changing global context. Rather than attaching a short-term, detailed implementation plan to it, ETSI's strategy represents a guiding framework that will shape ETSI's activities at all levels over the years.

“ Developing this new strategy for ETSI has proved fruitful for all our stakeholders, and is positive confirmation of the success of our operational methods over the last years. The excellent spirit of cooperation from all our members reflects how realistic and engaged we are in supporting the evolution of ETSI to achieve its challenging ambitions. Operating in a fast-changing industrial and socioeconomic landscape, ETSI is a key player in an ecosystem that has enabled huge advances in technology over the past decades – a role that I am certain our new strategy will consolidate further. ”

Luis Jorge Romero, ETSI Director General

04 ADAPTING OUR WORKING METHODS

Staying connected Meeting challenges of the pandemic

Electronic meetings are not new to ETSI. Our Technical Committees and Industry Standardization Groups, as well as our Board and Secretariat, have been successfully using virtual methods such as videoconferencing to complement face-to-face meetings for many years. In 2020, however, e meetings became the primary means of interaction for members and ETSI staff to conduct our core standardization activities, host interoperability and educational events as well as facilitating the daily work of our Secretariat.

In the earliest stages of the global pandemic, ETSI's IT department rapidly executed its long-established business continuity plan to accommodate a huge scaling up in demand for online meetings across all our technical bodies, including the work of 3GPP and oneM2M. By March over 200 e-meetings of ETSI and 3GPP technical groups had been conducted, attended remotely by up to 300 participants per meeting.

With ETSI staff working remotely from March, our IT department worked tirelessly to ensure that our standardization activities were able to continue as smoothly as possible during the Covid-19 lockdown.

Great efforts were made to guarantee network resilience, data security and privacy across ETSI sites and communities. Real-time synchronization and data back-ups between buildings at our Sophia Antipolis campus ensured that if one centre went down another site could accommodate the load. All our production servers were also synchronized to a remote data centre, backing up information stored on ETSI drives, web sites and email servers.

The ETSI Secretariat also shifted its operations to all-

remote working, with home-based staff able to access emails, shared calendars and virtual meetings across multiple devices, either via direct access or with the additional privacy of a VPN connection. Storage and management of all employees' personal data is naturally General Data Protection Regulation (GDPR) compliant.

Additional round-the-clock resilience for our systems was assured by the establishment of on-call expertise from our IT team, able to rapidly address issues and ensure seamless business continuity in the event of outages or major incident outside working hours.

Rapid implementation of these robust measures allowed ETSI members, partners and staff to conduct online meetings throughout the year and keep our standardization activities – including the work of oneM2M, 3GPP and our own technical bodies – on track.

While many face-to-face meetings postponed or cancelled, we were nevertheless able to continue our busy schedule of Plugtests™ interoperability events and Hackfests, together with 35 webinars on technical topics.

05 RESPONSE TO THE CORONAVIRUS PANDEMIC

Joining forces to protect lives Leveraging ICT to manage a global crisis

The devastating impact of the Covid-19 pandemic in the first weeks of 2020 placed the health systems of many countries under unprecedented strain. An immediate challenge was the reliable tracing and identification of individuals affected – or potentially affected – by the coronavirus to ensure their isolation. Traditional methods of contact tracing have relied on interviews with identified or suspected patients. As previous pandemics had shown, these methods were frequently hampered by interviewees' imperfect recall of whom they had recently been in contact with, or the absence of contact information for other individuals with whom there may have been in proximity to.

From the first days of the pandemic, numerous initiatives emerged in attempt to tackle the spread of the virus with the help of the most varied technological solutions. In terms of apps alone, the Inter-American Development Bank surveyed more than 600 available applications related to Covid-19. Of these, today there are more than 100 oriented to digital contact tracing, giving an idea of a true universe of applications.

ETSI's unified response to the global coronavirus pandemic was rapid and decisive, involving the concerted efforts of numerous technical groups and committees including 3GPP, SmartM2M, HF, ATTM, EMTEL, CYBER, OEU, CIM, SmartBAN, ITS, SCP, ERM and USER. We also exchanged information with external groups including Bluetooth SIG, CEN/CENELEC JTC 13, GSMA, IEEE and W3C.

In May ETSI launched the ISG E4P (Europe for Privacy-Preserving Pandemic Protection), with the immediate goal of providing a standardization framework that enables developers to build interoperable mobile

applications for automatic proximity detection and anonymous identification. Complementing manual tracing methods, this framework must preserve users' privacy and comply with relevant Data Protection regulation. The group's first meeting attracted record participation from government and EC representatives, vendors, operators, research bodies, ethics, legal and cybersecurity players. By the end of the year E4P membership stood at 40 organizations plus seven participants and one counsellor (the EC).

Scheduled for publication in early 2021, the group's first focus is a comparison of existing pandemic contact tracing systems. This Group Report reviews existing pandemic proximity detection methods, applications and other aspects of a pandemic contact tracing system.



eHealth

Standards have a key role in supporting the development of eHealth products and services. The coronavirus pandemic has highlighted the need for global ICT standards to be 'eHealth-ready', capable of supporting rapid, secure data exchange to support governments and epidemiologists in the event of possible future outbreaks. Individuals are also turning to ICT devices to enable home working and protect their families at a time of unprecedented change.

Published in May 2020, a White Paper authored by officials of our ETSI Project on eHealth highlighted the importance of developing ICT standards to mitigate the impact of the Covid-19 pandemic. The paper issues a 'call to arms' to standards bodies and their constituent members to ensure greater harmonization of the ICT supply chain.

In August the eHealth team revised its Technical Report on standardization use cases. With the original study covering aspects of network interconnectivity, semantic and syntactic interoperability and security, the update includes privacy issues related to proximity-based contact tracing.

During the year, eHealth cooperated with the newly formed ISG E4P and other ETSI Technical Committees, including TC ATTW WG SDMC, ISG OEU, TC SmartBAN, TC Smart M2M, TC ERM TG30, ISG CIM and SC USER. The worsening pandemic and the intense interest generated by the medical issues led to the formation of a 'Hub for Health' – a forum for all ETSI groups with health-related interests to address issues raised by the crisis.

The chair of EP eHEALTH together with members of the OCG AI group co-authored the first ETSI White Paper exploring the potential use of Artificial Intelligence in eHealth applications. The group also considered applications and data recording requirements for eHealth.



06 3GPP AND 5G

Achieving milestones Contribution for IMT-2020 finalized

As a founding partner of The Third Generation Partnership Project, our standardization activities in ETSI 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 non-3GPP networks. Established in 1998, 3GPP brings ETSI together with six other regional standardization organizations in Asia and North America, plus market associations and several hundred individual companies. At the end of 2020, of the 717 member organizations of 3GPP, 449 (62%) were via their membership of ETSI

Since 2014, 3GPP has been a leading participant in preparing the way for terrestrial radio interface specifications for IMT-2020 - the latest member of the family of radio interface standards for mobile systems as defined by the International Telecommunication Union. Building on previous technology iterations, IMT-2020 calls for support for enhanced mobile broadband (eMBB) and for new use cases that require massive machine-type communications (mMTC) and ultra-reliable low latency communications (URLLC).

A major milestone was achieved in June 2020, with final submission of the 3GPP set of specification material for inclusion in the ITU-R Recommendation 'Detailed specifications of the terrestrial radio interfaces of International Mobile Telecommunications-2020 (IMT-2020)'. Comprising Releases 15 and 16, the final 3GPP proposal submitted for inclusion in IMT-2020 has included two separate and independent proposals, defined as the single Radio Interface Technology (RIT) and the combined Sets of Radio Interface Technologies (SRIT). Both these submissions – one based on 'pure' 3GPP NR Stand Alone (SA) specifications, and the other that is non-SA, using LTE for basic access plus

'islands' of NR – are collectively supported by the seven 3GPP Organizational Partners including ETSI.

While Release 15 has already given over 100 operators all the essential radio and core network elements needed to commercially deploy 5G mobile broadband networks, Release 16 adds further significant capabilities, including ultra-low latency communications and very large-scale machine-to-machine connectivity, that will enable the next wave of M2M/IoT/II.0 applications.





Meanwhile Release 17 activity also increased during the year. New studies were launched or progressed on autonomous network levels, energy efficiency enhancements for 5G, management of non-public networks, enhanced closed loop SLS assurance, intent driven management service, Quality of Experience (QoE) measurement collection, IP Multimedia Subsystem (IMS) charging in 5G, and additional network resource model features. These were complemented by ongoing work on management and orchestration aspects with integrated satellite components in a 5G network, management data analytics service, and charging aspects of Edge computing. Completion of all SA5 Release 17 work is anticipated in Autumn 2021.

At the end of 2020 several Release 18 studies were already underway in SA1, addressing areas including tactile and multi-modality communication services, 5G access to localized services, enhanced access to and support of network slice, 5G timing resiliency system, 5G smart energy and infrastructure, ranging-based services, residential 5G, personal IoT networks, performance requirements for AI/ML model transfer in 5G systems and guidelines for extra-territorial 5G systems.

Despite the year's immense challenges, 3GPP membership continued to grow steadily, exceeding 700 organizations with a significant presence of players from vertical industries such as automotive manufacturers. The global coronavirus pandemic necessitated a rapid transformation in 3GPP's working procedures that had hitherto depended heavily on members' participation at physical meetings.

Throughout 2020 the bi-monthly Working Group meetings and quarterly Plenaries shifted exclusively to e-meetings, with delegates processing thousands of contributions via email and holding live discussions over audio calls. Replacing manual voting via paper and ballot boxes, the introduction of a new online voting app will enable the first electronic election of 3GPP officers taking place in March 2021.

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

“ Thanks to an amazing effort in the first half of 2020, we successfully delivered the protocol specifications expected for Release 16, providing phase 2 of the 5G system that includes key features for Industry 4.0 and factory automation, ultra-reliable and low latency communications, enhanced vehicle to everything (V2X) and wireless/wireline convergent networks. While maintenance of Release 16 specifications and earlier releases was an important part of our work in the second half of 2020, we have officially launched activities on protocol enhancements for Release 17 – our main focus in 2021. ”

Lionel Morand, TSG CT Chair

07 MACHINE-TO-MACHINE COMMUNICATIONS AND THE INTERNET OF THINGS

Intelligently connected

Linking devices, data and experiences

Billions of machines and objects are now embedded with sensors or actuators, giving them the ability to communicate over the Internet to drive new applications and new sources of business value. The Internet of Things (IoT) brings together a number of technologies, including Machine-to-Machine (M2M) service platforms and wireless sensor networks. IoT use cases span smart cities, devices and grids, connected vehicles, eHealth, home automation and energy management, public safety, logistics, process control and more.

oneM2M

The number of connected devices in the IoT already exceeds the world's population. With this number anticipated to outstrip 70 billion by 2025, the IoT will have a transformative influence on the way we live and work. As a founding partner in oneM2M, ETSI helps produce standards and specifications that simplify connection between devices and services, regardless of the underlying technology.

Reflecting the great challenges of 2020, finalization of oneM2M Release 4 was postponed in order to retain its intended features. Building on previous iterations of the global IoT standard, the latest release (to be published in Q2 2021) provides significant enhancements for security, semantics and 3GPP interworking, and adds support for emergent trends such as Fog/Edge computing. Release 4 specifies common services for provisioning and service pooling functions, discovery-based operations and features ontologies for smart city and public warning services, railway and vehicular applications as well as support for industrial domains. It also addresses semantic enhancement, user security and data privacy, system optimization and testing.

During the year work meanwhile commenced on Release 5. This considers advanced semantic discovery, enhancements to support data protection

“ We are very pleased that the oneM2M standard has been selected as a national standard in India as national governments across the globe continue to realise the immense importance of IoT. This announcement highlights the crucial role that oneM2M plays in helping to connect IoT applications and in enabling mass deployment across industries by limiting complexity and scalability issues. ”

*Enrico Scarrone,
Steering Committee Chair, oneM2M*

regulations and effective IoT communication to protect 3GPP networks.

As an active and evolving standard, oneM2M has maintained its programme of developer hackathons and interoperability testing events. Hosted virtually during the pandemic, these events have served to provide feedback contributing to the robustness of the oneM2M standard. In November, ETSI and TTA – two of the oneM2M founding partners – together with the EU-funded InDiCo project hosted the seventh in a series of successful oneM2M interoperability events. Over eleven days, participants had the opportunity to test

their products' interoperability and check end-to-end functionality via oneM2M interfaces in a range of test scenarios.

In a significant step towards global adoption, it was confirmed in September 2020 that oneM2M specifications had been formally adopted by the Indian government as part of its 100 Smart Cities plan.

Smart Machine-to-Machine Communications (SmartM2M)

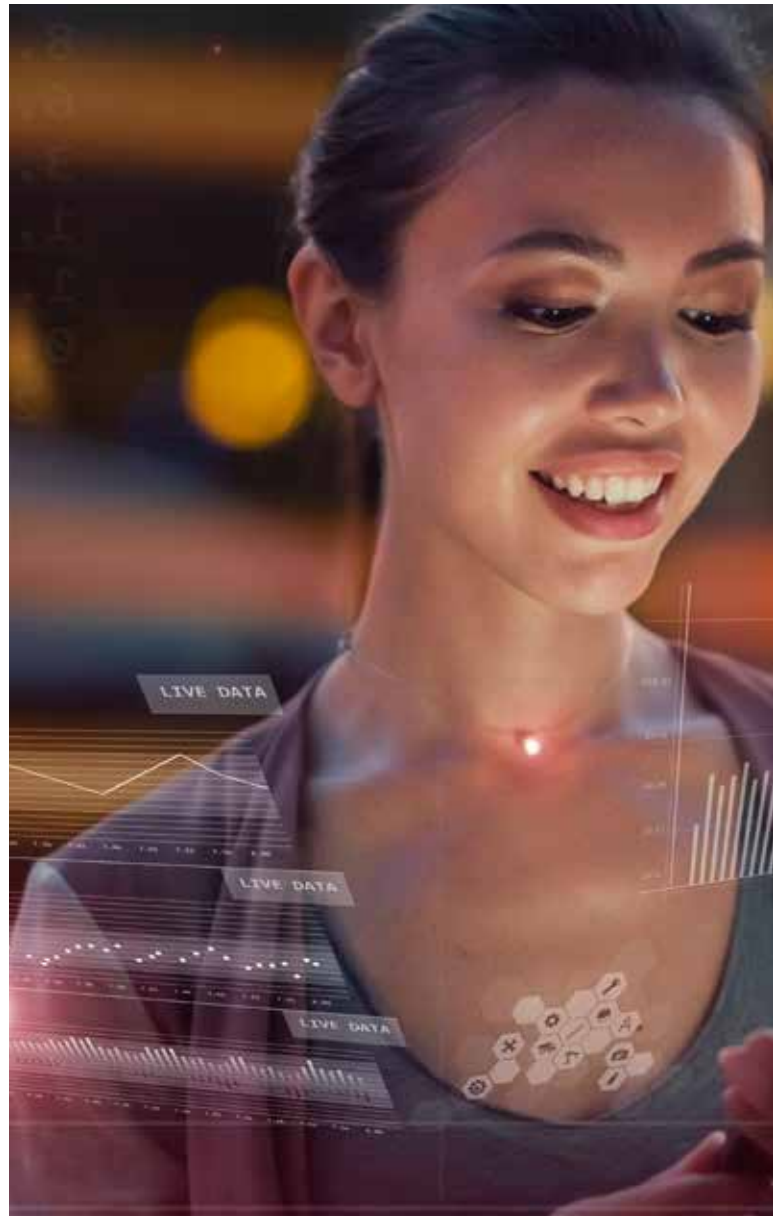
ETSI's Smart M2M Communications technical committee creates reports and specifications for M2M services and applications, with much of its work focusing on the IoT and smart cities. In coordination with oneM2M, TC SmartM2M helps produce specifications that enable users to build platforms that allows devices and services to be connected, regardless of the underlying technology used. Our work enables connected devices to exchange information through SAREF, our Smart Applications REFERENCE ontology that runs with oneM2M-compliant communication platforms. Providing building blocks that allow separation and recombination of different parts of the ontology depending on specific needs, SAREF specifies recurring core concepts in the smart applications domain and the main relationships between them.

The wide scope of SmartM2M's interests sees it interacting with several other ETSI technical bodies and projects, including oneM2M, ITS, CIM, SmartBAN, eHEALTH, EMTEL, CYBER and E4P. Despite the challenges of the year – and a shift to online meetings – the committee published 17 deliverables during 2020, including revisions to our SAREF V3 and SAREF Core Framework V2. We also published new guidelines for security, privacy and interoperability.

A new Technical Report explored the requirements for collecting and exchanging data between smart lifts, their management applications and their interaction with other IoT devices in a building environment. We published a further Technical Report, examining the potential of Artificial Intelligence (AI) and Machine Learning (ML) solutions within various IoT systems and applications.

About oneM2M

ETSI is a founding partner of oneM2M, the global standards initiative that covers requirements, architecture, API specifications, security solutions and interoperability for Machine-to-Machine and IoT technologies. Formed in 2012, it includes eight of the world's preeminent standards development organizations: ARIB, ATIS, CCSA, ETSI, TTA, TSDSI, TTA and TTC, together with industry fora, consortia and over 200 member organizations. Learn more at onem2m.org



SAREF ontology was enhanced with four further extensions (Automotive, eHealth/Ageing-well, Wearables and Water domains). Complementing these, we revised six existing SAREF extensions (Energy, Environment, Building, Smart Cities, Industry & Manufacturing, and Smart Agriculture and Food Chain domains).

During the year we continued to participate in joint CEN/CENELEC/ETSI coordination groups on smart meters, smart energy grids and smart manufacturing.

The latest SAREF core, extensions, specifications and documentation can be found at our portal: saref.etsi.org

Context Information Management

Digital transformation – from smart cities to smart manufacturing machine learning and AI – requires interoperable and reliable sharing of information, together with its provenance, accuracy information and unambiguous definitions of its content.



Our Industry Specification Group on cross-cutting Context Information Management (ISG CIM) has developed specifications for publishing, accessing and updating contextual information, integrating information from IoT, legacy databases and third party applications. An update of the NGSI-LD API was released as a Group Specification in 2020, together with a primer for developers. A further major initiative was our NGSI-LD Testing Framework with associated ETSI Forge coding areas.

Smart Body Area Networks

Our technical committee on Smart Body Area Networks (SmartBAN) develops standards to support the development and implementation of technologies including Wireless BAN, Personal BAN and Personal Networks in a wide range of domains including eHealth/telemedicine, wellness, leisure, sport and personal safety. These applications typically feature the use of small, low power sensors, wearables or embedded devices to collect, monitor and securely exchange data about an individual and their environment.

In 2020 SmartBAN officers and committee members contributed to the paper 'ETSI SmartBAN Architecture: The Global Vision for Smart Body Area Networks' published in the IEEE Access journal. The paper presents a condensed review of European standardization work in ETSI. It also outlines a SmartBAN semantic reference model and ontology, and introduces a SmartBAN IoT reference architecture plus a description of SmartBAN MAC, physical and network layers.

During the year we published a Technical Report examining the application of the reference SmartBAN MAC for various use cases, and their QoS requirements in terms of data rates, latency and other parameters. Work meanwhile progressed on other deliverables including a system level description; a report on trust, privacy and security aspects; and a comparison between SmartBAN and other short-range standards.

Members participated in a number of virtual events, including EAI BODYNETS 2020. TC SmartBAN also continued to liaise with other bodies including AIOTI, IEC, and H2020 ACTIVAGE.

Digital Inclusion and Accessibility

The study of Human Factors applies scientific knowledge about the capacities and limitations of users to make products and services safe, efficient and easy to use. In ETSI we are helping to achieve this objective through the work of our Technical Committee on Human Factors (TC HF). The committee's primary responsibility is the production of standards, guidelines and reports that set the criteria necessary to embed optimum usability in the digital networked economy.

Local communities are essentially users of standards, rather than active participants in the process of standardization. As a result, standards can be confusing for them, and the needs of the citizen must be addressed in standards processes. With the support of the European Commission and EFTA Secretariat, in November 2020 our Human Factors committee accordingly issued a Technical Report assessing different citizen-related issues that smart city-related standardization in the ICT domain needs to address. These include fundamental aspects such as accessibility, usability, interoperability, personal data protection and security, and how services to citizens are to be designed to maximize benefits to the community. Providing an overview of existing ETSI and other SDO standards in the field, the study aligns with the UN Sustainable Development Goal 11 – 'Make cities inclusive, safe, resilient and sustainable'.

08 CYBERSECURITY AND PRIVACY

Addressing unknown threats

Ensuring a safer digital

Our world has never been more connected. 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 key role to play in strengthening our cyber security, protecting the Internet and everyone who relies on it.

Cybersecurity

Security and privacy are inescapable aspects of our digital lives, and standardization plays a key role in protecting the communications and business we depend on. A trusted centre of expertise, our Cybersecurity Technical Committee (TC CYBER) offers market-driven standardization solutions as well as guidance to regulators, users, manufacturers and network operators.

As more devices in the home connect to the internet, the cybersecurity of the Internet of Things (IoT) has become a growing concern. Developed in conjunction with CEN/CENELEC and drawing on expertise from industry, academia and government, our standard for cybersecurity in the Internet of Things was published in June 2020, establishing a security baseline for Internet-connected consumer products while providing a basis for future IoT certification schemes.

Compliance with the standard – that specifies provisions for the security of Internet-connected consumer devices and their associated services – will restrict attackers' ability to launch DDoS attacks, mine cryptocurrency and spy on users in their own homes. IoT products in scope include connected children's toys and baby monitors, connected safety-relevant products such as

smoke detectors and door locks, smart cameras, TVs and speakers, wearable health trackers, connected home automation and alarm systems, connected appliances (such as washing machines and fridges) and smart home assistants. Work also continued on the development of a complementary test specification and implementation guide for the new standard.

In December the committee published the first part of a new multi-part specification defining the security properties of a Middlebox Security Protocol (MSP). A vital component of modern networks, middleboxes provide strengthened protection against sophisticated new cyberattacks; however their deployment can raise complex questions around issues of security, privacy and trust. MSP Part 1 addresses this gap with a new security framework that allows middleboxes to perform vital functions whilst keeping up with the rapid pace of technical development. Further parts of this series will create a complete set of protocols to enable secure functional operation of next generation middleboxes.

Other publications during the year variously considered: external encodings for the Advanced Encryption Standard; mechanisms for privacy assurance and verification; security guidelines for smart meters; and techniques for the assurance of digital material used in legal proceedings. We also revised our report on the global cybersecurity ecosystem.

In June ETSI joined the newly formed Stakeholder Cybersecurity Certification Group (SCCG). Representing a broad range of interests and include representatives of trade associations, companies, academic institutions, consumer organizations, conformity assessment bodies, SDOs and other membership organizations, the group offers advice to the EC on strategic issues regarding the European cybersecurity certification framework. It also assists the Commission in preparation of the Union rolling work programme, which sets priorities for the definition of schemes within the EU cybersecurity certification framework.

Quantum computers pose a major challenge to conventional cryptographic techniques, where information such as bank account details become subject to potential discovery and misuse. In July our QSC working group within TC CYBER released a Technical Report defining migration strategies and recommendations for Quantum-Safe schemes, as well as enhancing cryptography awareness across all business sectors. The report defines a framework of actions that organizations should take to enable smooth migration to a fully Quantum-Safe cryptographic state.

In December the group published its first Technical Specification on hybrid key exchange. This defines methods and architectures for combining a quantum-safe key encapsulation method with a classical key exchange method, ensuring that the resulting negotiated keys are as secure as the strongest of the individual schemes being combined.

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Quantum Key Distribution

Quantum Key Distribution (QKD) enables digital keys to be shared privately without relying on computational complexity, resisting advances in brute-force computational power or quantum computers. In 2020 our Industry Specification Group on QKD revised its Group Specification for a QKD Application Interface in response to new developments in networks. Updates include the introduction of additional parameters to adapt to new network architectures.

Securing Artificial Intelligence

In 2020 our Industry Specification Group on Securing Artificial Intelligence released its first Group Report, detailing the problem statement regarding the securing of AI. The report describes the problem of securing AI-based systems and solutions, and the challenges relating to confidentiality, integrity and availability at each stage of the machine learning lifecycle. Outlining several cases of real-world use and attacks, it also highlights some of the broader challenges of AI systems including bias and ethics.

“ There are a lot of discussions around AI ethics, but none on standards around securing AI – yet they are becoming critical to ensure security of AI-based automated networks. This first report is meant to come up with a comprehensive definition of the challenges faced when securing AI. ”

Alex Leadbeater, Chair of ISG SAI.

Permission Distributed Ledger

A foundation of today's decentralized ledger technologies, 'blockchains' use cryptographic techniques to link a growing list of data within and between organizations in an open system that's immune to modification. Our ISG on Permissioned Distributed Ledger (PDL) is exploring application scenarios, functional architecture, interfaces/APIs and data models.

The group issued its first set of Group Reports in 2020, beginning with a landscaping study to explore current research and standardization activities relating



to PDL. Two further reports considered essential data processing requirements in terms of trust, security and conformity assessment; and a description of potential application scenarios for the operation of PDLs including infrastructure governance aspects. These three reports were complemented by a Group Specification offering a Proof of Concept (PoC) framework to validate key technical components.

Electronic Signatures

Our committee on Electronic Signatures and Infrastructures (TC ESI) develops standards for electronic signatures and trust services to protect electronic transactions and ensure trust with business partners. Our activities address the requirements of digital signatures, including formats and procedures and policies for creation and validation, as well as trust service supporting the authenticity of transactions. The committee's scope covers policy, security and technical requirements for trust service providers (TSP) such as certification authorities, time-stamping authorities, TSP providing remote signature creation or validation functions, registered e-delivery providers, and long-term data preservation providers. Our work supports the eIDAS (electronic ID, authentication and signature) regulation as well as general requirements of the international community to provide confidence in electronic transactions.

In 2020 we published a new specification on protocols for providers of long-term data preservation services. We also revised the first part of our standard on Trust Service Provider Conformity Assessment, addressing requirements for conformity assessment bodies assessing TSPs.

Our Technical Report on Global Acceptance of EU Trust Services examined services operating in different regions of the world, and their possible mutual recognition/global acceptance. Focusing on existing PKI-based trust services, the study identifies steps which could be taken to facilitate cross-recognition between services based on ETSI standards and other non-EU schemes. Building on this survey we liaised with representatives from Japan, ASIA PKI and the Arab ICT organization about future harmonization of their trust services with EU standards.

We also revised our multi-part standard on certificate profiles. Enhancements included the specification of how eIDAS minimum data set for electronic identities can be included in signing certificates issued to legal or natural persons. In addition we agreed updates to clarify requirements for trust services issuing certificate, anticipating publication in 2021.

The committee surveyed identity proofing solutions in Europe and around the world. This was used of the basis of a draft Technical Specification for identity proofing to verify claimed identities at registration on trusted services such as signing certificates, electronic identities and, potentially, banking services which is currently under public review. We also launched work with Open Banking Europe on internationalization of the current EU-centred standard for payment services.

Lawful Interception and Retained Data

The work of our Lawful Interception committee (TC LI) supports common international requirements for law enforcement agencies (LEAs). The committee interacts with a number of ETSI-related and external bodies to ensure that LI and Retained Data (RD) requirements are taken into account in their own work. These include 3GPP SA, 3GPP CT, GSMA, ITU-T Future Networks/ Cloud and Security groups, as well as oneM2M/ SmartM2M, ETSI's CYBER, ITS and TCCE Technical Committees, and our NFV, MEC, ENI, NIN Industry Specification Groups.

In 2020 we completed work to standardize LI/ DR functionality in OTT (Over-The-Top) messaging services delivered over HTTP/XML. Published as a Technical Specification (TS), this collaborative project included significant contributions from 'traditional' TC LI committee members as well as several providers of OTT services.

We published a Technical Report on high bandwidth delivery, assessing the problems associated with interception and secure onward delivery of high-bandwidth user traffic using TCP or TLS as defined in current ETSI specifications.

A Technical Report on LI network function security examines LI and Lawful Disclosure (LD) network function security with a focus on virtualization. The

report focuses on threats and risks, identifying areas where other standards present recommendations which are relevant to the threats identified. Published with input from ETSI's ITS (Intelligent Transport Systems) committee, a further report provides a high-level description of a process for interfacing between law enforcement and providers of vehicle information. The study highlights the benefits of using an automated, secure, efficient interface and investigates how existing TC LI specifications can be used for such an interface. During the year we continued to update our suite of existing standards, notably our seven-part specification on Handover Interface and Service-Specific Details (SSD) for IP delivery.

Smart Cards and the Secure Element

ETSI's Smart Card Platform committee (TC SCP) develops and maintains specifications for the Secure Element (SE) used in telecommunication systems including the Internet of Things (IoT) and Machine-to-Machine (M2M) applications. TC SCP is the home of the UICC – the most widely deployed Secure Element with more than five billion pieces entering the market every year just as SIM cards, a share of well over 50% of the Secure Elements market (source: EUROSMA).

In 2020 the focus of TC SCP activity stayed on the advancement and maintenance of the next generation secure platform, the Smart Secure Platform (SSP). During the year we approved two new SSP specifications for publication. The committee also continued to upgrade and maintain specifications to the latest Release. The newly launched ETSI Testing Task Force (TTF) successfully submitted the first of its SSP test specifications for approval.

A new function for the UICC will be the use of the contactless interface of the UICC to support Ultra-Wide Band (UWB) technologies for secure applications hosted on the UICC. Requirements were finalized and technical realization started in mid-2020. TC SCP led two sessions at ETSI's virtual Security Week 2020.

ETSI Security Week 2020

The first all-virtual ETSI Security Week in June attracted a record audience of more than 4,200 unique online views from participants in over 50 countries. Speakers and moderators included global telco operators, vendors, academia, security organizations ENISA and the UK National Cyber Security Centre, and other bodies including 3GPP and GSMA.

Webinars focused on four key cybersecurity topics: how to deploy 5G securely in different market sectors; the Cybersecurity Act and the future European Standard developed by ETSI on security for IoT consumer devices; advanced cryptography; and the new Smart Secure Platform.

The first offered a high-level introduction to the SSP ecosystem. The second dealt in detail with technical concepts of the SSP and our System on Chip (SoC) solution as described in ETSI specifications.

NEW Encrypted Traffic Integration

A paradigm of 'encrypted by default' has been adopted by many network and service providers, without taking due account of any threats to network resilience and security. Launched in June 2020, our Industry Specification Group on Encrypted Traffic Integration aims to develop insights on the evolutionary path of this paradigm, as well as its impact on network resilience and on security where attackers may take advantage of encryption to spread malicious code or exfiltrate protected customer or sensitive data through networks. A goal of the new group is to better describe the issues and to establish essential requirements to allow for retention of network controls, thus giving guarantees of security and resilience in spite of the growth of such a paradigm.

Work embarked in 2020 on the group's initial set of deliverables that include a Group Specification and three Group Reports. The first of these presents a problem statement of when traffic is encrypted, and an examination of how it impacts various stakeholders. The second identifies requirements for allowing integration of encrypted traffic across an abstracted network architecture. The third specifies techniques allowing a network manager to access encrypted traffic for lawful purposes; and the fourth develops ontology extensions that allow encrypted traffic to be integrated into existing knowledge bases. A survey of the ETI ecosystem – including traffic concepts, techniques, and capabilities – is also in preparation.



09 RADIO AND WIRELESS SYSTEMS

Spectral efficiency

Standards for wireless devices, services and radio spectrum

Radio technology is an integral part of our daily lives. We use it for mobile phones, for broadcast radio and television, in Wireless Local Area Network and cordless technology, Global Navigation Satellite Systems (GNSS), Radio Frequency Identification (RFID) and short range devices (SRDs). 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 provide standards used by regulatory authorities in Europe and elsewhere to manage the use of radio spectrum, and to ensure safe co-existence of systems competing for use of limited spectrum resources.

Harmonised Standards and the Radio Equipment Directive

ETSI's Harmonised European Standards are developed by our technical committees. Much of this work is conducted in our committee for Electromagnetic compatibility and Radio spectrum Matters, whose fifteen Working and Task Groups deal with electromagnetic compatibility and radio equipment for a broad range of industries and applications. The scope of this work covers drafting and updating standards for wide band and ultra wide band data systems, various types of Short Range Devices (SRDs), wireless medical devices, RFID devices, Intelligent Transport Systems, wireless industrial applications, digital mobile radio, aeronautics, maritime and TV/radio broadcast systems.

We develop Harmonised Standards – along with other deliverables including Community Specifications, Technical Specifications and Technical Reports as required – in response to Standardization Requests received from EC/EFTA. In 2020 we accepted two

new requests and accordingly launched a number of associated work items: one relating to ecodesign requirements for servers and data storage products, and the other relating to the Future Rail Mobile Communication System (FRMCS).

We also published a number of deliverables in response to previous requests. These variously covered European Air Traffic Management Network, Smart Meters, Intelligent Transport Systems, Electronic Signatures, Energy Efficiency, Space, Privacy and Personal Data Protection.

In 2020 much of our work was in response to the Radio Equipment Directive (RED). Establishing a regulatory framework for placing radio equipment on the market, the RED has necessitated revision or replacement of ETSI's existing related Harmonised Standards and the development of new ones. During the year we maintained our constructive dialogue with the EC and its technical consultants to optimize the efficiency of this process. Despite the challenges of the pandemic we published fourteen Harmonised Standards, with five of these – addressing Ultra Low Power (ULP) wireless medical capsule devices, Primary Surveillance Radar,

DRM/AM broadcast sound receivers and equipment for Wireless Industrial Applications – being cited in the Official Journal of the EU. We also published revisions to the ETSI Guide for the selection of technical parameters for Harmonised Standards.

Reconfigurable Radio Systems

Reconfigurable Radio Systems (RRS) are smart radio devices 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. Sharing will also play a key role in the further development of 5G. In ETSI our Technical Committee on RRS is responsible for the standardization of these systems, including reconfigurable equipment architecture and cognitive radio.

During the year TC RRS continued its active participation in the Radio Equipment Directive (RED) EC Expert group that addresses implementation of RED Article 3(3)(i) and Article 4 in relation to a combination of hardware and software, as typically featured in many electronic devices currently on the market.

Completing a series of Technical Specifications (TS) on evolved Licensed Shared Access (eLSA), we published the second part on system architecture and high-level procedures, and finalized the third part on information elements and protocols for the interface between eLSA Controller (eLC) and eLSA Repository (eLR). We also finalized the second part of the TS on the Radio Interface Engine (RIE) which specifies the Architecture.

Building on previously published specifications, we revised our multi-part standard on Radio Equipment (RE) information models and protocols for generalized

software reconfiguration architecture. We also revised our standards on RE reconfiguration architecture and reconfiguration requirements.

Moving from today's hardware design principles to software reconfiguration solutions will require an incremental approach suited to the requirements of 5G and subsequent systems – for example to enable automotive communication platforms to remain relevant over the lifetime of a vehicle. This approach was discussed in the September publication of a White Paper titled 'Software Radio Reconfiguration: A Modular Software Reconfiguration Approach for Radio Equipment in General'.

Broadband Radio Access Networks

Our Broadband Radio Access Networks committee continued to produce and maintain specifications for current and future Broadband Wireless Access technologies operating in different frequency ranges. In 2020 ongoing work focused on standards concerning 5,8 GHz Fixed Wireless Access Systems, 60 GHz Multiple-Gigabit/s equipment, 5 GHz and 6 GHz RLANs, TV White Space devices in the UHF band, Wideband Data Transmission Systems for Fixed Radio in the 57-71 GHz band, WAS/RLAN mitigation techniques in the 5725 - 5850 MHz band and MAP (Multiple Access Points) performance testing.





DECT™

Originally developed by ETSI as a European standard in the early 1990s, DECT™ (Digital Enhanced Cordless Telecommunications) is implemented in more than a billion short-range communication devices around the world.

The capabilities of DECT have evolved over the last three decades, with improvements to security and voice quality plus the addition of video telephony and broadband data streaming. In 2011 our specification of DECT ULE (Ultra Low Energy) broadened the technology's appeal to M2M markets such as smart metering and home automation. In parallel with these initiatives, DECT Evolution is an ongoing programme that includes new audio codecs and coding enhancements.

While it shares several attributes with its DECT predecessor – and the same widely recognised brand name – DECT-2020 reinvents this ubiquitous technology to support small- and large-scale industrial (and consumer) IoT and M2M use cases. In this respect the new standard presents a complement to other cellular 5G systems standardized by 3GPP.

“ETSI's new standard is a great response to industry's digitalization needs. It brings mMTC and URLLC performance to a new level, providing flexibility to address large-scale and high-density applications in logistics and building automation, and low-latency applications in industry automation. In terms of bit rates, communication range and reliability, DECT-2020 NR offers new opportunities for local and private networks as industrial companies, solution providers and other players can independently develop their own solutions and services.”

Jussi Numminen, Vice Chair, TC DECT.

Released in October 2020 as part of ETSI's proposal to ITU-R for a new 5G IMT-2020 radio interface technology, DECT-2020 New Radio (NR) enables wireless IoT applications supporting both massive machine type and ultra-reliable low-latency communications, while support for mesh communication obviates the need for dedicated infrastructure investments. The technology also facilitates professional wireless audio applications with point-to-point or multicast communications. This work was reflected in a suite of Technical Specifications, variously addressing radio reception and transmission requirements as well as MAC and physical layers. These specifications were complemented by a Technical Report describing a security architecture for the radio interface.

Millimetre Wave Transmission

Spectrum in the under-utilized 30 - 300 GHz range is an enabler for 5G and machine-type communications that will make unprecedented demands on radio access networks and backhauling.

In 2020 our Industry Specification Group on millimetre Wave Transmission (ISG mWT) published a Group Report detailing the metrics and necessary equipment implementation to describe error performance related aspects in radio equipment used for fixed services. Work also neared completion on a report examining fixed service RF frequency ranges above 174,8 GHz, addressing current standardization activities, potential applications and industry trends.

Conducted remotely due to Covid-19, ETSI's second and third mWT SDN (Software Defined Network) Plugtests™ events focused on the benefits of using a standard Northbound Interface (NBI) to minimize interoperability issues and simplify multi-vendor/multi-technology operation. Achieving a 92% success rate across all test executions, the events attracted participation from seven vendors and four operators, representing a majority share of the market.

Satellite Communications

The applications of satellite communications technology range from direct-to-home TV to location services and high-speed Internet access in outlying regions or onboard aircraft and ships. During 2020 our Satellite Earth Stations and Systems technical committee (TC SES) continued its work on the development and revision of Harmonised Standards covering all aspects of satellite earth station fixed terminals or terminals on the move, whether in an aircraft, on board a ship or in a vehicle.

The committee published a Technical Report detailing the seamless integration of satellite and/or HAPS (High

Altitude Platform Station) systems into 5G. We also updated our multi-part Technical Specification relating to GNSS (Global Navigation Satellite System) based location systems. These revisions variously address reference architecture and functional requirements, performance and test specifications, and requirements for location data exchange protocols.

During 2020, TC SES interfaced with the EC to have various RED compliant ENs listed in the Official Journal of the European Union.

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 (GSM, UMTS, LTE, NB-IoT and 5G NR) networks in Europe.

In line with requirements of the Radio Equipment Directive and to align with 3GPP different releases,

ongoing revisions in 2020 to our multi-part Harmonised Standards on access to radio spectrum for IMT cellular networks addressed base stations, repeaters and user equipment, adding support for 5G.

Reflecting the evolution of eCall standards, new interoperability tests have been required to support industry in its deployment of next-generation technology to enable eCall over LTE. During the year we published two specifications: one covering Pan-European eCall end-to-end and in-band modem conformance testing, and the other addressing NG eCall interoperability test specifications.

TFES also published a Technical Report capturing the process, discussions and negotiations for arriving at the final agreement on LTE OTA (Over The Air) performance requirements to be included in our Harmonised Standard for access to radio spectrum in IMT networks.



10 TRANSPORTATION SYSTEMS

Fresh destinations

Transforming every journey

At ETSI we're driving 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 early 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

Intelligent Transportation Systems (ITS) enable 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. Our ITS Technical Committee (TC ITS) is leading the drive to develop global standards for Co-operative ITS (C-ITS), where vehicles exchange information with other road users and the surrounding infrastructure. Applications include road safety, traffic control, fleet management and location-based services, driver assistance, hazard warnings, support for emergency services – and ultimately the realization of fully autonomous driving.

Our standards relate to the overall communication architecture, management and security aspects of C-ITS. As such they provide support for a wide range of services and applications. These include Cooperative Adaptive Cruise Control; Congestion Control; Cooperative Awareness, Perception and Manoeuvre Coordination; and Decentralized Environmental Notification (DEN) to alert road users. In addition we develop conformance test specifications which are crucial for the commercial deployment of the technology, and are closely involved in radio spectrum requirements for ITS.

In 2020 we continued to develop specifications to support multiple access layers such as LTE-V2X PC5 and ETSI ITS-G5. We also updated security standards to support ongoing establishment by the EC of a Public Key Infrastructure (PKI) for C-ITS deployment.

In C-ITS the exchange of position, motion and other information among road users, pedestrians and roadside infrastructure is critical to road safety and traffic efficiency applications. November saw completion of our suite of standards related to the protection of Vulnerable Road Users (VRU) including pedestrians, cyclists, motorcyclists and animals whose movements may be less predictable than other vehicles. Developed with contributions from stakeholders around the world, the standards define service interfaces and protocols including the VRU awareness message (VAM) format – a continuous signal transmitted by vulnerable users.

Cooperation continued with our Rail Telecommunications committee (TC RT) on Road ITS and Urban Rail applications in the 5,9 GHz frequency band, with revisions to our Technical Report on extension of the band for safety related ITS.

The committee maintained interaction with bodies including IEEE, ISO, CEN/CENELEC and the EC's CONNECT, GROW and MOVE initiatives.

Organized remotely in partnership with the 5GAA, our second C-V2X Plugtests™ event in July tested interoperability between devices to support the deployment of C-ITS in Europe.

Railway Communications

Our Rail Telecommunications committee (TC RT) continues to maintain the GSM-R (GSM™ for railways) standard, enhancing it with new features specific to the railway environment. Working closely with the rail industry in Europe and worldwide, we also liaise with 3GPP to standardize the Future Railway Mobile Communication System (FRMCS), the successor to GSM-R. Among other aspects, this work considers train speeds up to 500 km/h and the integration of 3GPP radio technologies with a main focus on 5G NR.



In October 2020 ETSI received a fresh mandate M/570 from the European Commission, requesting the drafting of new European Standardization deliverables and revision of existing standards in support of Directive (EU) 2016/797 for FRMCS. This request has led to the adoption of an intensive Work Programme that will lead to the development of new Technical Specifications for FRMCS.

During the year the committee continued its close coordination with 3GPP (SA1 and SA6) to define FRMCS use cases and requirements. We published a revision to our report on the FRMCS functional and system architecture, addressing topics including positioning, migration and security. The study explores realization of the FRMCS architecture based on UIC requirements, including consideration of support of multiple onboard/handheld radios and/or multiple trackside transport domains, and the support of border crossing scenarios.

We updated our report on radio performance simulation and evaluation of 3GPP Long Term Evolution (LTE) as a radio access technology candidate for FRMCS to include simulations at 1900 MHz. We also completed work on simulations of 5G New Radio (NR) in 900 MHz FDD and 1900 MHz TDD. These studies will assist with understanding evaluating the expected QoS suitable for FRMCS, taking into account user needs as well as the available bandwidth.

We published a new Technical Specification on the use of Session Initiation Protocol with ISUP encapsulation (SIP-I) and other IP based protocols for interconnection of GSM-R networks. We also revised two further specifications: one addressing use of Session Initiation Protocol (SIP) on the Network Switching Subsystem (NSS) to Fixed Terminal Subsystem (FTS) interface for GSM-R; and the other on GPRS/EGPRS requirements for European Train Control System (ETCS).

Aviation

The activities of our Aeronautics group are focused on three principal areas: the development and revision of Harmonised Standards – notably relating to communications, navigation and surveillance equipment – under the Radio Equipment Directive; the development of Community Specifications under Regulation (EU) 2018/1139 of the European Parliament; 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 2020 part of our Harmonised Standard on access to radio spectrum for Air Traffic Control (ATC) Primary Surveillance Radar (PSR) sensors operating in the X-band achieved citation in the Official Journal of the EU, together with parts of our Harmonised Standard on spectrum access for deployed surface movement radar sensors and multilateration (MLAT) equipment for Advanced Surface Movement Guidance and Control System (A-SMGCS). We also published and revised various parts of our Community Specification for A-SMGCS.

The world of air traffic management is evolving, requiring a ‘bridge’ between existing technologies and new solutions – such as Data Link Services (DLS) and Automatic Dependent Surveillance - Broadcast (ADS-B) – standardized by ETSI. In July ETSI signed a Memorandum of Understanding with SESAR Deployment Manager (SDM) to link their activities with our aeronautics work. SDM synchronizes and coordinates the deployment of common projects, translating regulatory requirements to the industry.

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 2020 three of our Harmonised Standards – covering access for spectrum for low power personal locating devices employing AIS; radio telephone equipment operating in the VHF band for inland waterways; and Coastal Surveillance, Vessel Traffic Services and Harbour Radars – were delivered to the EC for citation in the Official Journal. We updated our standard for radiotelephone transmitters and receivers for the maritime mobile service operating in VHF bands. We also published and updated specifications for interoperability testing of Digital Selective Calling (DSC) marine radios.

Our Industry Specification Group (ISG) on European Common Information Sharing Environment Service and Data Model (CDM) is developing standards to allow data exchange among legacy systems in the European Common Information Sharing Environment (CISE). In 2020 work neared completion on the group’s first deliverables, including system requirements, use cases, architecture, data models and test specifications for CDM.



11 NETWORKS

Connecting with intelligence Unleashing the power of tomorrow's networks

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 tomorrow's.

“ ETSI should rightly be proud of its outstanding global reputation as an SDO, especially when you look at the sheer magnitude of what it produces: 3GPP is a great example of that. It is also illustrated by what it has achieved, for example with NFV and MEC – this is something that comes from the quality of the process that ETSI provides. ”

Dr Ulrich Dropmann, Head of Standardization at Bell Labs CTO, Nokia.

Network Functions Virtualization

A key enabler for the success of 5G – and equally relevant to other telecoms network architectures – Network Functions Virtualization (NFV) consolidates heterogeneous hardware-based IT infrastructures onto standard servers, switches and storage, simplifying roll-out of new services while reducing deployment and operational costs.

With NFV Releases 2 and 3 in maintenance mode, during 2020 our Industry Specification Group on NFV focused its efforts on Release 4. This latest iteration enhances the NFV framework by considering recent technological advances (including Service Based

Architecture, cloud-native VNFs, NFV architecture PaaS support), as well as ways to simplify network deployment (container-based) and operations aligned with the current trends in the industry towards network transformation. In October 2020 progress was consolidated in a first 'drop' of Release 4 interfaces and information model level specifications, including aspects concerning Cloud-native VNFs and container infrastructure management.

ETSI's first joint NFV and MEC Plugtests™ event took place remotely in June 2020, offering solution providers and open source communities an opportunity to tackle interoperability challenges while validating their implementation of NFV and MEC specifications and APIs. More than 40 organizations and over 170 engineers were involved in test sessions that covered a wide range of configurations. Participants were able to interact remotely through the ETSI HIVE (Hub for Interoperability and Validation at ETSI).

“ ETSI Plugtests events continue to provide a unique opportunity to foster and accelerate NFV adoption and to get essential industry feedback to help us improve our specifications. Congratulations to the participating organizations and individuals who took on a twofold challenge this year: address a wider scope than previous events and run the event in a fully remote mode. ”

Bruno Chatras, ETSI ISG NFV Chair.

Open Source MANO

Two key components of ETSI's NFV architectural framework are the NFV orchestrator and the virtualized network function manager, known collectively as the NFV Management and Orchestration, or MANO. ETSI OSM is an operator-led ETSI community, delivering a production-quality open source MANO stack aligned with ETSI NFV Information Models and meeting the requirements of production NFV networks. Find out more at osm.etsi.org

Unveiled in July 2020, OSM Release EIGHT added ultra-scalable service assurance capabilities and support for new resilience schemes. It also facilitated visual operation for large-scale network deployments from Cloud to Edge. For this Release, OSM's VNF Configuration and Abstraction layer (VCA) introduced a new scheme for high-availability setups that greatly improves its resiliency to potential outage events. It also extended the support and flexibility of configuration tasks for the various components within a Network Service or a Network Slice.

Launched in December, OSM Release NINE completed the alignment process with ETSI NFV specifications, culminating in native adoption of ETSI's Group Specification for network functions and service modelling. Significant new features included: next-generation resource orchestration; extended VNF and CNF lifecycle management; smooth integration with external systems; and further user interface improvements. Standardizing the onboarding process for VNFs into OSM fosters interoperability and boosts the growth of OSM's VNF ecosystem. Release NINE coincided with the announcement of a new production deployment, confirming OSM as the most comprehensive open-source NFV orchestrator and a key enabler for zero-touch end-to-end network and service automation.

Originally scheduled as physical events, four OSM Hackfests were run virtually, while still allowing participants to complete hands-on sessions remotely in a shared lab environment provided by ETSI through the Hub for Validation and Interoperability (HIVE).

“ Standards alignment is at the heart of the OSM project vision, as the means to foster and develop a wide ecosystem in which network operators can accelerate the development of NFV solutions. OSM Release NINE goes a step further in supporting carrier-grade requirements and production readiness by adopting ETSI NFV standards and software maturity. ”

Antonio Marsico,
Chair of OSM End User Advisory Group and
OSM Liaison Officer, ISG NFV.



Find out more about our OSM Hackfest presentations, demonstrations and Ecosystem Day talks on the dedicated Open Source MANO YouTube channel.

Multi-Access Edge Computing

A key enabler for 5G, Multi-Access Edge Computing (MEC) shifts processing away from remote data centres and closer to end users at the 'edge' of the network. MEC enables a wide range of IoT and mission-critical vertical solutions, from gaming and Virtual Reality to Intelligent Transportation Systems and the industrial Internet. Supporting increasing QoS requirements for these applications and use cases, it also offers improved privacy and security.

ETSI's MEC Industry Specification Group is developing a fully 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 developers to build services and applications meeting industry demand.

Anticipating widescale industry adoption of MEC solutions, the group's focus in 2020 shifted to 'Phase 3' activities. Emphasizing market needs, this considers a more complex heterogeneous cloud ecosystem while providing a developer-friendly environment for continued innovation.

We published a new Group Report documenting the key issues and solutions for MEC integration in 5G networks. We also expanded our suite of increasingly popular MEC APIs available via the ETSI Forge web page – see forge.etsi.org. New APIs covered Traffic Management, WLAN information, Application Mobility Service and a Vehicular-to-Everything (V2X) information service.

We are continuously evolving existing Group Specifications. These included our MEC Framework and Reference Architecture; Edge Platform Application Enablement; and a survey of general principles, patterns and common aspects of MEC Service APIs.

A successful webinar on ‘Multi-access Edge Computing in Action for Application Developers’ was held in March 2020. Our NFV & MEC Plugtests™ was held successfully in June. In October the MEC Chair participated in an ETSI/3GPP webinar titled ‘Boost innovation and create business opportunities with mobile edge computing’. In July MEC members authored a White Paper titled ‘Harmonizing standards for edge computing - a synergized architecture leveraging ETSI ISG MEC and 3GPP specifications’.

Hosted as an all-virtual event, November’s MEC Hackathon invited developers to test their applications with ETSI MEC APIs in a variety of use cases ranging from Augmented Reality for the construction sector to automotive, consumer, media and entertainment applications. Teams remotely accessed MEC servers and software platforms to develop mobile applications for advanced services in a simulated MEC-enabled 5G network.

“**These MEC Hackathons revealed talented teams who have experienced the benefits gained from using real MEC platforms and MEC APIs in their edge computing applications. It’s exciting to note how this community keeps on creating interoperable systems that will bring the full benefits of MEC to emerging 5G services.**”

Dario Sabella, Chair of ISG MEC.

In October we revised the Group Specification on general principles for MEC Service APIs. This was accompanied in December with publication by MEC’s DECODE group of our multi-part Conformance Test Specification, covering Service APIs as well as the MEC Application Enablement API.

Launched in December and hosted virtually by ETSI, our MEC Sandbox provides an environment for developers to experience and interact with MEC service APIs via a detailed simulation of a 4G/5G/Wi-Fi network. Developers are invited to find out more at try-mec.etsi.org.

Zero Touch Network and Service Management

Tomorrow’s 5G operators will be faced with increasing complexity, new services and support for more devices. Maximizing the efficiency of end-to-end network operations will require increased automation of functions such as configuration and capacity management that are currently administered with direct human intervention. The goal of our Industry Specification Group on Zero Touch Network and Service Management is to provide an end-to-end solution

where all operational processes and tasks – including delivery, deployment, configuration, assurance, and optimization – are executed automatically, without manual supervision.

We issued two Group Reports in 2020. The first is a landscape document, assessing activities in other bodies including SDOs, open source communities and industry associations. The second explores different means or approaches to achieving network automation.

Augmented Reality

Augmented Reality blends real-time spatially registered digital content with our experience of the real world. Our Industry Specification Group on Augmented Reality Framework (ISG ARF) is creating a framework for the interoperability of Augmented Reality components, systems, and services that will define an overall functional architecture. Transparent and reliable interworking between different AR components is key to the successful roll-out and wide adoption of AR applications and services. Allowing components from different providers to interoperate through defined interfaces, this framework will avoid vertical silos and reduce market fragmentation, enabling players in the eco-system to offer parts of an overall AR solution.

Building on previous deliverables, the group’s first Group Specification presents a modular reference architecture, forming the basis of an interoperability framework for industrial AR technologies and services. Identifying key components and interfaces required by an AR solution, the architecture allows components from different providers to interoperate via the defined interfaces.

Replacing a planned physical event, our successful AREA-ETSI-XR4ALL virtual workshop ‘Engineering XR for the Future: Frameworks, Requirements and Future Research’ attracted a wide international viewing audience.

During the year ETSI signed two Memoranda of Understanding (MoUs) with the Khronos Group and OARC (Open AR Cloud Association). Allowing the exchange of views and expertise, the MoUs enable ETSI and both organizations to develop interoperability of AR components, systems and services with a wide range of technology providers while avoiding duplication of effort.





IP version 6

The capacity, efficiency and security of IPv6 are key enablers for the upgrading of legacy IP broadband networks, and for the cloud and industrial IoT (Internet of Things), with wireless links replacing thousands or millions of cabled connections in a factory or industrial facility. The adoption of IPv6 is outstripping IPv4 in all metrics including user numbers, traffic levels and share of content. Today over 1,2 billion Internet citizens are using IPv6 without even knowing it.

In 2020 our Industry Specification Group in IPv6 integration (ISG IP6) published two Group Reports. The first explores the integration of IPv6-based 5G in Vehicular Networking (V2X) systems. The second examines cybersecurity issues in relation to IPv6, including use of blockchain/distributed ledger technologies.

In August we issued a White Paper titled 'IPv6 Best Practices, Benefits, Transition Challenges and the Way Forward'. Offering recommendations to ease the adoption of IPv6 and to motivate industry for the imminent large-scale deployment of IoT and 4G/5G, the paper illustrates how cloud service providers and operators have successfully deployed IPv6, with practical guidelines and use cases. It also argues that applications such as autonomous vehicles, smart grid, industrial factory automation, process control and building automation will greatly benefit from IPv6-enabled M2M communications.

An ETSI webinar in September explored global IPv6 status with discussions on deployment, industrial applications, transition solutions and progress on

standardization. The online event attracted over 160 participants from SDOs, operators, vendors, governments, universities and research institutions.

ISG IP6 activities closed at the end of 2020. To address rising market needs, we subsequently launched a new Industry Specification Group on IPv6 Enhanced innovation (ISG IPE). The group aims to drive full connectivity of IPv6 on everything and facilitate the business success of this technology.

NEW Non-IP Networks

Mobile operators are increasingly challenged by the limitations of decades-old TCP/IP networking protocols. Security, quality of service and other aspects have triggered fixes and workarounds that have themselves incurred penalties in terms of greater cost, latency and power consumption.

In today's 5G world, network owners and service providers are exploring new technologies to serve their needs better than the ageing TCP/IP stack. Launched in March 2020, our Industry Specification Group on Non-IP Networking is dedicated to the specification of alternative networking protocols to support 5G applications, as well as being more efficient and easier to manage with lower capex/opex in current applications. The group's work will be initially applicable to private mobile networks such as factory automation. It is anticipated this will expand to embrace public systems, both in the core network and eventually radio elements.

Work progressed in 2020 on the new group's first three reports. The first is a problem statement, detailing the limitations of TCP/IP for mobile networks, and how an alternative system could overcome those shortcomings. The second offers guidelines for testing and implementing non-IP networking on 3GPP cellular access networks, specifically LTE and 5G. The third illustrates how the technology initially identified by our previous Next Generation Protocols Industry Specification Group (ISG NGP) can form the basis of a system that will support both new and existing protocols.

“ *When you are on IPv4, you're flying in economy class. If you are on IPv6 you are in business class...and on IPv6 Enhanced Innovation with new functions such as SRv6 (Segment Routing over the IPv6 data plane) you upgrade to first class.* **”**

Latif Ladid, Chair of ISG IP6

Experiential Networked Intelligence

Software Defined Networking (SDN) and NFV technologies are making networks more flexible, more powerful – and harder to manage. The use of Artificial Intelligence (AI) techniques can address some of the challenges of future network deployment. Our Industry Specification Group on Experiential Networked Intelligence (ISG ENI) accordingly develops standards that use AI mechanisms to assist in management and orchestration of networks.

In 2020 we published revisions to existing Group Specifications covering ENI use cases, requirements and a proof of concept framework.

In April our webinar on ‘Artificial Intelligence for networks: understanding it through ETSI ENI use cases’ attracted more than 150 online attendees including operators, vendors, research institutions, and SDOs. It was followed in May by a second webinar exploring AI for robust and manageable systems and applications.

ISG ENI is working closely with the technologies defined by other ETSI groups including Fifth Generation Fixed Network (F5G), IPv6 integration (IP6), Multi-access Edge Computing (MEC), Network Function Virtualization (NFV), Secure AI (SAI) and Zero touch network and Service Management (ZSM).

NEW Fixed Network Evolution

We are entering a new era of communications where the evolution of fixed networks will play a vital role in the success of 5G and future mobile systems. Building on previous technology iterations, this ‘fifth generation’ of fixed networks will address three main use cases: full-fibre connection, enhanced fixed broadband and a secure, low-latency, reliable experience in both industrial and consumer applications.

In February 2020 we announced the launch of our Industry Specification Group dedicated to specifying the fifth generation of Fixed Network (ISG F5G). The group aims to study the fixed-network evolution required to match and enhance the benefits that 5G has brought to mobile networks and communications. It will define improvements with respect to previous solutions, opening up new opportunities by applying fibre technology to various scenarios and turning the ‘Fibre to the Home’ paradigm into ‘Fibre to Everything Everywhere’.

Issued in September, a White Paper authored by ETSI members sets the scene for the evolution of on-premise, fixed access, and aggregation networks. Presenting the current status of on-premise, fixed access and aggregation networks, the paper offers

a general description of the main features and characteristics of ISG F5G, plus benefits in terms of network simplification, cost-efficient ODN buildout and end-to-end management,

Published in December, the group’s first Group Report examines the history of fixed networks and summarizes their development paths and driving forces, analyzing the factors influencing the definition of fixed, cable and mobile network generations. Other work items in development include: a survey of use cases for F5G, ranging from industrial M2M applications to end-user services; a technology landscaping document and gap analysis; network architecture and end-to-end management; and Quality of Service aspects for demanding services such as 8K video, interactive gaming and VR/AR.

Cable

Our Integrated Broadband Cable Telecommunication Networks committee (TC CABLE) continued its work on standards addressing the evolution of broadband cable telecommunications network infrastructure and devices.

In 2020 we made progress on developing our multi-part Harmonised Standard on global KPIs for energy management in operational infrastructures. Other work items in progress included a new specification on network performance measurement methods for broadband data services; revisions to our existing Technical 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 revision of our specification on performance characteristics of coaxial cables used for RF signal transmission in hybrid fibre-coax (HFC) telecommunication networks.



12 SUSTAINABILITY, SAFETY AND USER NEEDS

In everyone's interests

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. However while reaping its benefits 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.

Cooperating with ETSI's Access, Terminals, Transmission and Multiplexing (TC ATTM) and Cable (TC CABLE) Committees, TC EE develops standards to support EC Mandate M/462 on efficient energy use in fixed and mobile information and communication networks. Much of our work supports European Commission (EC) policies, regulation and legislation on eco-design aspects, where we liaise with the European Committee for Electrotechnical Standardization (CENELEC) to develop relevant standards.

In January 2020 ETSI received a draft standardization request (M/573) on ecodesign requirements for servers and data storage products, with progress being made during the year on a number of related deliverables.

Network Function Virtualization will present new issues and opportunities in respect to energy consumption of telecommunication networks. We published a standard describing an enhanced Green Abstraction Layer (GAL) interface for dynamic power management in NFV environments.

We continued to enhance our environmental efficiency standards for radio access networks to embrace 5G systems. This included publication of a new Technical Specification on dynamic energy performance measurement methods for 5G base stations.

The work of TC EE also considers innovative energy storage technologies for ICT equipment – for example to provide resilience in smart sustainable cities. We published a Technical Specification offering an evaluation, roadmap and recommendations on various available ‘supercapacitor’ solutions.

During the year we meanwhile revised parts of our environmental test standard for telecommunications equipment at underground and weatherproof locations.

Sustainable Networks

Our Access, Terminals, Transmission and Multiplexing committee (TC ATTM) addresses operational and physical aspects of Information and Communications Technologies (ICT), spanning broadband transmission networks, equipment and sites.

In the area of fixed radio systems we revised two parts of our standard on point-to-point equipment and antennas. The second part – addressing harmonized spectrum requirements for systems in the 1 - 86 GHz range – subsequently achieved Citation in the Official Journal of the EU. Also relating to fixed radio systems, we published a Technical Report exploring the role of PtMP (point-to-multipoint) solutions in addressing 5G network backhaul challenges.

We revised parts of our Technical Specification on broadband deployment and lifecycle resource management, relating to customer network infrastructures (single tenant homes) and ICT sites.

We revised part of our specification describing Key Performance Indicators (KPIs) for sustainable digital multiservice areas. We also revised the first part of our specification on European requirements for reverse powering of remote access equipment, relating to twisted pair networks.

We published two new Technical Reports: one presents a benefit analysis of Ethernet and Power over Coaxial cables in IP video surveillance case studies; the other compares sustainability parameters between internal/external and cloud-based ICT hosting solutions.



Towards Efficient ICT

Working with ETSI’s ATTM and EE committees, our Industry Specification Group on Operational energy Efficiency for Users 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 2020 we published a Group Specification detailing KPIs on carbon equivalent intensity measurement for operational infrastructures. Meanwhile we continued to develop guidelines for the study of green smart transportation in cities. Worked neared completion on a new specification defining carbon equivalent emission level for ICT sites to support carbon footprint monitoring.

In response to the Covid-19 crisis, we embarked on a new report providing guidelines on sustainable and efficient pandemic monitoring technologies. We also launched new studies on recommendations for sustainable and effective ICT networks and services in order to support reuse and full efficiency of ICT networks.

User Perspectives

Our User Group special committee 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. It also liaises with external organizations such as the International Telecommunications Users Group (INTUG).

The Covid-19 pandemic demonstrated society’s reliance on digital platforms and services to support universal requirements for teleworking, online shopping, sharing vital information and simply keeping in touch. It also accentuated how users have become increasingly aware of the importance of quality of service (QoS) and the many factors contributing to it.

In 2020 we published a Technical Report examining users’ experience of the digital ecosystem, their expectations and their relationship with services from different providers. Titled ‘Quality of ICT services; New QoS approach in a digital ecosystem’, the report explores service provision perspectives from both the user and supplier side. This report is one of the building blocks to define the Smart Interface, completing work on the user-centric approach in the digital ecosystem.

13 BROADCAST, MEDIA AND CONTENT DELIVERY

Engaging audiences everywhere Immersive audiovisual experiences

The worlds of 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 across. We are addressing the need to align the diverse specifications for content delivery in a converged environment supporting Internet Protocol Television (IPTV), Mobile TV and broadcast TV – to the benefit of both the industry and end users.



Broadcasting

Within ETSI our 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). As well as assessing work performed within other organizations, the committee considers broadcast systems (emission and reception) for television, radio, data and other services via satellite, cable and terrestrial transmitters.

In an era of fragmented content consumption, TV and radio industries are looking beyond the limitations of traditional distribution models to satisfy today's audiences. To maximize audiences, broadcasters are focused on providing the best quality content and service experience to users without being tied to a specific technology. Published in December 2020, our specification '5G Broadcast System for linear TV and radio services; LTE based 5G terrestrial broadcast system', is intended to help broadcasters harness the fast-evolving capabilities of 5G radio and core network technologies to engage with their audiences. Leveraging existing 3GPP standards to enable the deployment of linear media services, the specification also offers implementation guidelines to support broadcasters, vendors and infrastructure providers.

We also published several other new Technical Specifications during the year. These notably covered DVB targeted advertising and hybrid broadcast broadband TV targeted advertising; DVB-Multicast Adaptive Bit Rate (ABR): adaptive media streaming over IP multicast; DVB service discovery and programme metadata for DVB-I; and DRM regional profiles. Meanwhile we revised existing deliverables covering topics including DVB, DAB, Hybrid Broadcast Broadband TV and High Dynamic Range (HDR) systems for use in consumer electronics devices.

Media Quality

Our Speech and Multimedia Transmission Quality committee 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 and other standards organizations to support development of equipment for use in existing and future network telecommunications services, both fixed and mobile.

New Technical Specifications published in 2020 covered subjective test methods for evaluating echo control systems; methods for assessing Quality of Experience for noise cancelling headsets; and methods for evaluating the performance of voice assistant devices and functions.

We published revisions to ETSI standards for wideband and narrowband speech transmission requirements from a user's QoS perspective, variously covering handsfree, handset and headset VoIP terminals. We also updated our standard for transmission requirements for IP-based home and other network media gateways.

We revised specifications on methods for the objective assessment of listening effort, and for simulating reverberation conditions for communication device measurements. We also revised our specification of a sound field reproduction technique to allow the physical reproduction of real, pre-recorded sound fields in a laboratory type environment.

Our STQ Mobile group issued a new Technical Report, detailing QoS parameters and test scenarios for assessing network capabilities in 5G performance measurements.



14 PUBLIC SAFETY AND MISSION CRITICAL COMMUNICATIONS

Decisive action

Communications for public safety and security

Effective real-time communication is critical in co-ordinating the response to emergency situations, from minor road traffic accidents to large-scale public incidents and natural disasters. At ETSI our standardization work supports public safety via secure, resilient public networks or platforms such as Professional Mobile Radio, as well as via 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

TETRA (Terrestrial Trunked Radio) is a digital trunked mobile radio standard developed to meet the needs of Professional Mobile Radio (PMR) users in public safety, security, transportation, military, governmental, commercial and utilities applications. It is the world's leading choice for critical communications, with a base of 4,5 million TETRA users predicted to exceed 5 million in 2023.

During 2020 our TETRA and Critical Communications Evolution committee (TC TCCE) continued to maintain and further develop TETRA, publishing several updates to multi-part standard for voice and data communications.

The committee worked closely with 3GPP Working Group SA6 MCPTT (Mission Critical Push to Talk) and TCCA (The Critical Communications Association). Within this cooperation framework we published a test specification that was used during the 4th Mission Critical Plugtests™ event.

Hosted on the BrightTALK platform, our webinar on 'TETRA to 2035 and beyond' presented a market overview and standards development update, plus a review of latest packet data enhancements, security aspects and interworking with critical communications broadband systems.

Emergency Calling and Alerting

Our Emergency Communications Special Committee is focused on applications for smartphones, networks and IoT devices in the provision of emergency situations and in the context of the European Public Warning System (EU-ALERT).

Much of our work is centred on Next Generation 112 (NG 112) services, involving communications between IoT devices in emergency situations. The scope of this work includes the architecture, core elements and technical interfaces for network-independent access to emergency services.

We published our Technical Specification on the Lightweight Messaging Protocol for Emergency Service Accessibility (LMPE). This defines a SIP SIMPLE based Instant Messaging for Emergency Service accessibility using NG112 core services.

We revised our specification on the Pan-European Mobile Emergency Application (PEMEA). Reflecting recent technology developments in the IoT, we updated two existing specifications on requirements for communications from and between authorities/organizations to individuals, groups or the general public during emergencies. We also published two parts of our NG112 conformance test specifications.

15 TESTING AND INTEROPERABILITY

Maintaining quality

New testing methods in a changed world

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 currently covers include 5G mobile, safety and mission critical communications, intelligent transport, electronic signatures, network virtualization and the Internet of Things.

During 2020 we provided ongoing support for the development of conformance test specifications for 3GPP and oneM2M. Keeping pace with 3GPP's own release schedule, this work included test specifications for 5G user equipment including smartphones and IoT devices.

The CTI team also led ETSI's 'New Working Methods' (NWM) project. Inspired by working practices and tools used in open source software projects – and driven by needs of ETSI and 3GPP standards development processes – the project is developing an innovative

framework for the collaborative drafting of documents. As well as helping ETSI technical groups to work as efficiently as possible, NWM will help ensure the highest editorial and technical quality of our deliverables; it will also facilitate closer integration with ETSI member working practices while enabling increased throughput by the ETSI Secretariat. Limitations on travel faced by all standardization committees in 2020 further demonstrated the need for the service proposed by NWM. The project has thus been focused on providing near-term solutions to assist the operation of 3GPP's online meetings.

CTI continued to oversee ETSI's Testing Task Force process that supports enhanced planning for future test activities, developing a multi-annual roadmap of planned testing activities requiring ETSI funding. We also continued the rollout of Forge, our open source repository for managing code used for developments of various APIs, standards and test specifications in ETSI committees. We have introduced a Forge repository dedicated to use in 3GPP standardization.

See forge.etsi.org

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.

In 2020 all our Plugtests™ events were successfully held remotely, building on past experience. We extended our HIVE service (ETSI's Hub for Interoperability and Validation), introducing the HIVE Test Automation Platform (TAP) in two Plugtests™ events.

While we maintained almost all our planned Plugtests™ in 2020, the technical scope of some events was necessarily reduced where participants could not travel, notably for events where all equipment needed to be on the same site. However, by holding events remotely we reduced some barriers to participation. This was reflected in an increased participation level and a broader geographic spread of delegates. We anticipate continuing to feature remote events in the ETSI Plugtests™ programme alongside our physical events.

To accommodate the time zone differences between participants we extended the duration of our usual one-week face-to-face events to two or three weeks. Networking was maintained via daily wrap-up sessions where participants had the opportunity to communicate using online chat tools.

Originally planned face-to-face, ten interoperability events were conducted remotely in 2020, attracting a total of around 1,000 participants.



Launched in February, our MCX permanent remote testing lab offers an ‘any-time’ interoperability testing facility for member companies of our MCX Plugtests™ programme.

Core Network and Interoperability Testing

Our Technical Committee on Core Network and Interoperability Testing 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.

In 2020 we issued a Technical Report providing a mapping of architectural components – developed in the European Commission (EC) WISHFUL and ORCA Projects using our Generic Autonomic Networking Architecture (GANA) model – for autonomic networking, cognitive networking and self-management. We revised our existing suite of test specifications with a report on autonomic network engineering for the self-managing Future Internet (AFI), providing an instantiation and implementation of the GANA model onto heterogeneous wireless access technologies using cognitive algorithms. We also published a multipart specification detailing VoLTE/ViLTE interoperability test descriptions over 4G/early 5G (3GPP Release 15) in physical/virtual environments.

Methods for Testing and Specification

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

During 2020 we continued to evolve and maintain our enormously successful testing language, TTCN 3, along with its tool conformance test suites. This was complemented by 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. We also continue to evolve the associated TDL Open source Project (TOP). This provides a platform for exploring new language features and application domains, ensuring the consistency of TDL standards and accelerating the adoption of TDL.

With the support of CTI we published an ETSI Guide that provides guidance for RESTful API specification and testing, based on an analysis of methods, languages and best practices used in industry and in ETSI bodies.

During the year TC MTS also progressed joint work with TC INT on a new Technical Report exploring the benefits and trustworthiness of Artificial Intelligence (AI) in test systems used for standardization.

16 R&D AND INNOVATION

The genesis of standards

Fostering links with Research and Development communities

The implementation of published standards to create new solutions 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 EU.

Today, universities and research institutes represent 13% of our 900-strong membership, the highest proportion in ETSI's 30-year history. A central pillar in our New Strategy is a focus on strengthening our close links that already exist with the academic and research communities. In turn, this provides a continuous pathway from innovative ideas and pure research all the way through to our own pre-standardization activities. It is this continuous exchange and dialogue that ensures the most exciting cutting-edge innovations will be captured in tomorrow's standards – notably for technologies such as 6G – allowing the industry to continuously meet the challenging performance requirements that today's and tomorrow's customers can expect from future networks and services.

At ETSI, our own 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 in support, tools and services.

2020 saw an expansion of our initiatives to deepen 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. To support this ETSI is building a 'technical radar' document describing emerging technology trends which can also identify technologies where we can support the innovation community – either through our existing committees and Industry Specification Groups or, if

needed, through the creation of new activities in ETSI. In parallel with this we are closely monitoring the status of EU funding projects such as Horizon Europe.

Held in November, our two-day virtual conference co-organized with TelecomTV focused on the innovation standards ecosystem and research opportunities in standards. Attracting speakers from the most significant actors involved in the ICT research, innovation and standards ecosystem, the successful event explored the evolution of research and standards as we move from 5G deployments, addressing innovative research for new technologies and use cases in the 6G era. Other topics covered the status of EU research, future research plans and programmes, 3GPP status, research roadmaps and ETSI's tools for researchers. Speakers included representatives from the European Commission, 5G-IA, NGMN, 3GPP, Networld2020, leading universities and Horizon project leaders as well as ETSI technical experts.

“ Much of the current research activities on candidate technologies for evolved 5G and 6G networks will be relevant to the future work in 3GPP. ETSI serves as a valuable forum where R&D focused organizations, academics and innovative companies – especially in industry sectors and markets that aren't so familiar with the European standardization process – can exchange and mature their pre-standards work and provide direct benefit to future developments in 3GPP. ”

*David Boswarthick,
ETSI Director of New Technologies.*

17 PUBLICATIONS, EVENTS AND EDUCATION

Knowledge Sharing

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. Completing our other published deliverables, White Papers express the viewpoint of the authors, and do not constitute an official or agreed position of ETSI or its members. In 2020 we published nine White Papers: all are available for download from our website.

OCTOBER

#40 Autonomous Networks, Supporting Tomorrow's ICT Business

SEPTEMBER

#41 The Fifth Generation Fixed Network (F5G): Bringing Fibre to Everywhere and Everything

#38 Software Radio Reconfiguration: A Modular Software Reconfiguration Approach for Radio Equipment in General

#37 E-Band: Survey on Status of Worldwide Regulation

#39 Enhanced DNS Support towards Distributed MEC Environment

AUGUST

#35 IPv6 Best Practices, Benefits, Transition Challenges and the Way Forward

JULY

#36 Harmonizing Standards for Edge Computing – A Synergized Architecture Leveraging ETSI ISG MEC and 3GPP Specifications

JUNE

#34 Artificial Intelligence and Future Directions for ETSI

MAY

#33 The Role of SDOs in Developing Standards for ICT to Mitigate the Impact of the Pandemic

ETSI Events

Our own ETSI-branded 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 2020 the Covid-19 pandemic and related restrictions saw many ETSI events being either cancelled or postponed to 2021. However, we were able to successfully 'pivot' four major events for an online audience:

ETSI Security Week Goes Virtual! - 8-16 June
Engineering XR for the Future: Frameworks, Requirements and Future Research - September-October

ETSI / IQC Quantum Safe Cryptography Virtual Event - 27-28 October

Boosting the Impact of Research & Innovation through Standardization - 24-25 November

Recorded content for all events can be viewed on demand at etsi.org/events/past-events

Webinars

Our successful webinar programme expanded in 2020, reflecting the effective cessation of face-to-face seminars and tutorials. Highlighting particular aspects of ETSI's work and featuring experts from our 900+ ETSI members and over 100 technical bodies, interactive sessions included high-level overviews as well as more detailed exploration of individual technologies including AI, non-IP networking and Augmented Reality. ETSI Security Week in June itself provided a platform for twelve webinars out of a total of 35 hosted during the year, a fivefold increase over 2019.

Our 'Top Ten' webinars during the year were:

- 5G Deployment
- Recent Developments in RED & EMCD: How to make the best use of ETSI
- 5G Security for Verticals
- Insight into the First Steps of the Cybersecurity Act Reality
- 5G Security Evolution
- 5G Network Certification
- Consumer IoT Security Standards
- Consumer IoT Security - Certification Schemes
- SSP: The New Smart Secure Platform – A High Level Introduction
- Artificial Intelligence for networks: understanding it through ETSI ENI use case

Recordings of all webinars are available free of charge via our ETSI BrightTalk channel that has already attracted over 14 000 subscribers. If you're not already registered, creating a new account takes just a few moments.

Enjoy!

Published four times annually, Enjoy! is the official ETSI magazine. Available free of charge to members and non-members alike, it features news, interviews and opinion from ETSI members, our officials and invited contributors.

Partnership with TelecomTV

In September we announced a new partnership with TelecomTV to launch the ETSI Channel - a dedicated media platform to access content where ETSI officials and staff are speaking, or where ETSI activities are being discussed.

See telecomtv.com/content/etsi-channel/

Videos

We continued to expand our series of promotional videos that offer a fresh, visually appealing perspective on ETSI and its activities. Three new videos were released in 2020, addressing NFV, our work with SMEs and the new Smart Secure Platform. They're easily accessible in the Media Library area of the ETSI website and on our dedicated YouTube channel, along with our Corporate Video that has attracted over 20,000 views.

Education about standardization

Education about standardization has an important role in raising awareness of our activities and providing stronger support for standardization. The ETSI set of teaching materials is available in PDF format from the ETSI website (etsi.org/standardization-education). The materials are targeted at undergraduate and post-graduate degree level and are also structured in a modular form so that components can be used in business or law courses, or the whole can be used as a course on standardization in engineering degrees. This promotes the ICT standardization process, where it is important to increase the understanding and attractiveness of standards with lecturers and students alike. Strong teaching materials provide a major tool that can be used to convey the value of standardization.

ETSI is seeking to update the textbook and slides and has commenced an activity to consider comments being received. A new edition will be available online in 2021. We are looking to involve as many stakeholders as possible and to enable this held a first webinar was held on 24 September. The recorded webinar is available here: etsi.org/events/1820-2020-09-education-about-ict-standardization. This webinar presented the material published as well as providing views from a University professor who is currently using it for the teaching of a Masters course.

United in our goals

Working with the European Commission and EFTA

We highly value our partnership with the European Commission (EC) and the European Free Trade Association (EFTA). As a European Standardization Organization (ESO), we provide world class standards and specifications to support European Union (EU) legislation and public policies.

The major mandated activity in 2020 was the continuation of the development and production of candidate Harmonized Standards under M/536 in support of the Radio Equipment Directive. It continues to be a challenging task. To overcome the difficulties encountered over the past five years in the assessment process, a new mechanism has been put in place with the EC since the second half of 2018 with a view to improving the collaboration and efficiency of the overall process.

Work also continued on a number of existing EC Standardization Requests such as M/552 for Harmonized European Standards (ENs) in support of the new Electro Magnetic Compatibility (EMC) Directive, and M/554 in support of the Directive on the accessibility of the websites and mobile applications of public sector bodies.

In 2020 two standardization requests were accepted: M/570 in support of Directive (EU) 2016/797 for the Future Rail Mobile Communication System (FRMCS); and M/573 relating to ecodesign requirements for servers and data storage products.

A further request - M/568 in support of Article 3(3)(g) of Directive 2014/53/EU, in conjunction with Article 1 of Delegated Regulation (EU) 2019/320, for hand-held mobile phones with features similar to those of a computer in terms of capability to treat and store data ('smartphones') – was refused in its current form.

The Annual Union Work Programme for European Standardization is used as a planning tool to prepare for possible future standardization requests and actions. The 2020 issue was released in October 2019 and ETSI has considered in its 2020 work programme the areas where support to Union policies and legislation could be provided.

We participated in all of the meetings of the EC's Committee on Standards which took place in 2020, as well as all the meetings of the Information and Communications Technologies (ICT) Multi-Stakeholder Platform. During 2020 ETSI continued to provide inputs to the Task Force on the ICT Rolling Plan that drafts the EU programme of ICT standardization in correlation with/in support of policy objectives. At the Task Force's last meeting in 2020, ETSI Board Chair and official representative Dirk Weiler presented the outcome of the Task Force Bildt Report. We also continued to attend as an observer at various Member State committees and their working groups.

In 2020 ETSI pursued extensive negotiations with the EC/EFTA for signing a new FPA (Framework Partnership Agreement) which is a pre-requisite for being eligible to receive European funding directly. The one in force expired on December 31st 2020 and because of delays in providing the final templates, the signature could not be achieved at the end of 2020, and it is now expected to take place in early 2021.

At the date of this Annual Report it is clear that two different FPAs will be signed, one related to Operating grant funding and a separate one for Action Grants financing. For Action Grants the new process foresees a complete electronic handling via an entrusted Agency and a portal that will not be ready until mid-2021.

3SI Programme

ETSI has maintained its engagement with the Annex III organisations, with a view to ensure that their participation and visibility within ETSI is addressed in compliance with EU regulation 1025/2012. The 3SI programme is however not only targeted at Annex III organizations, but aims to address overall inclusiveness matters in ETSI.

At two 3SI roundtables held in 2020, Annex III organizations and the ETSI leadership worked towards implementation of improved identification of the topics relevant for SMEs and societal stakeholders. The changes and related guidance were finalized with a view to publication in early 2021.



Seconded Experts

ETSI is party to two cooperation projects that have established a presence in China and India, thanks to a seconded standards expert in cooperation with the European Commission and EFTA.

SESEC (Seconded European Standardization Expert in China)

In 2020 SESEC continued its active documentation of the Chinese standardization landscape. Despite interactions being affected by the absence of physical meetings, the year was busy for teams in both China and the EU. On the policy side, SESEC continued to monitor:

- China's domestic and international activities in standardization;
- Increasing adoption of IEC/ISO standards in China and its growing role in international standardization;
- R&D and implementation of new technologies and digitalization;
- Certification, market access and WTO/TBT (World Trade Organization Technical Barriers to Trade) issues.

The technology focus throughout SESEC IV – the project's fourth phase – has been on cybersecurity and data protection, 5G and the industrial Internet, artificial intelligence, smart transportation, medical devices and energy efficiency. Anticipating completion of the fourth phase of the project in 2021, the SESEC team had already started discussions on SESEC V with partners in their respective networks.

SESEC newsletters are available at:
sesec.eu/Archive/sesec-newsletter/

SESEI (Seconded European Standardization Expert in India)

As project manager for SESEI, ETSI continued to oversee the project and the related action grant throughout 2020, including provision of the secretariat function for the SESEI Steering Committee meetings.

The benefits of the SESEI project range from raising awareness in India of the European standardization system to the delivery of structured information in Europe on Indian standardization, regulatory initiatives and on the chosen priority sectors. Under the lead of Mr. Dinesh Chand Sharma the team continued to support all project partners (EC, EFTA, CEN, CENELEC and ETSI) remotely from India, as Covid-19 has disrupted travel to Europe. It also impacted new plans for Phase IV of SESEI, where one Steering Committee is anticipated to be held in India each year, serving as an anchor for interactions between stakeholders, including the Delegation of the European Union in Delhi.

SESEI newsletters are available at:
sesei.eu/news-events/newsletter/

International outreach projects

International Digital Cooperation on ICT Standardization (InDiCo)

The InDiCo project targets six geographies (Brazil/LATAM, China, India, Japan, South Korea and the United States) with a view to foster understanding and alignment on ICT policies, regulations and standards. Its main areas of interest include technical areas of the IoT, 5G, cloud computing, big data and cybersecurity as well as other priority topics such as Intelligent Transport Systems and Distributed Ledger Technologies.

The start of 200 saw high levels of activity to support the action of the EC in the partner countries, as well as the promotion of global standards developed by 3GPP and oneM2M. The project focused on fostering exchanges

with the partner countries in order to share information on respective frameworks for ICT security certification, with a view to facilitate work towards mutual recognition and reduce barriers to market access for the industry.

The coronavirus pandemic however necessitated a significant effort to enable fully digital delivery of a restructured work programme. Due to this disruption, and to allow for proper implementation of the work programme, the project was extended beyond its original completion date at end December 2020 until the end of July 2021.

Information on the project's activities, outcomes and upcoming events is available at indico.ictstandards.eu/

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

ETSI is a partner in this initiative together with its Indian counterpart TSDSI and the European Commission. The project has engaged in active promotion of oneM2M in India, organizing a series of tutorials and hackathons with partners in India as well as enabling the creation of Centres of Excellence on oneM2M. A major milestone in this area was the announcement of the adoption of oneM2M as national standard by India. The project, together with SESEI and InDiCo, made major efforts in supporting local players and India's Telecom Engineering Center towards achieving this goal.

The project also organized a series of webinars in 2020, covering a number of topics of interest to Indian and European stakeholders.

National Standards Organizations (NSOs)

The NSOs and ETSI use the NSO meetings to review common procedures and documentation. The NSOs and ETSI had reached consensus on a revised agreement governing the role and responsibilities of NSOs in ETSI, the signature of which was delayed until 2021.





The NSO meetings provide the opportunity to review the production of ENs by ETSI and the related transposition effort by the NSOs. In 2020, suggestions were made by the NSOs to enhance the ETSI applications supporting the collection of national positions regarding the adoption of European Standards.

Last, in 2020, the ETSI Secretariat initiated an exchange with the NSOs with a view to review and potentially adapt the EN Approval Procedure (ENAP), aiming at shortening the overall duration of the procedure. The goal would be to exhibit increased agility, notably towards requests for corrections of ENs.

Partnership Agreements

To overcome the ever-growing challenges of fragmentation and establish global interoperability, co-operation and collaboration are the best way to ensure alignment between ETSI's own standards and those of other global players. Such collaboration contributes to avoiding duplication of effort and helps ensuring that ETSI's deliverables are widely accepted and implemented. The establishment of partnership agreements with fora, consortia and international and regional Standards Developing Organizations around the world is one of the key mechanisms we have adopted in working with others. By the end of 2020, our partnership portfolio numbered over 100 agreements.

In 2020 ETSI renewed its agreement with the 5G Infrastructure Association (5G-IA) with a view to strengthen links between the two organizations and create a more organic link between research taking place under the umbrella of 5G-IA and the

standardization work hosted in ETSI. This in turn contributes to an enhanced path for research results into market products. Renewals of the agreements with the Trusted Computing Group, the Trusted Connectivity Alliance (formerly SIMalliance), Eurosmart, the Office of the Assistant Secretary for Research and Technology at the US Department of Transport, GlobalPlatform and the NFC Forum also took place.

Beyond renewing and nurturing existing partnership, ETSI also established new relationships with relevant actors of the ICT market and of the industry sectors leveraging ICT as part of their own digital transformation. An example is the establishment of a partnership with the Agricultural Industry Electronics Foundation (AEF) as the topics of connected farming equipment and both on and off-road intelligent transport systems are increasingly needed for agriculture. Augmented and virtual reality was also a focus area, with partnership on the matter signed with the Open AR Cloud Association and with Khronos. Following-up on 2019's partnership with the Linux Foundation, ETSI further strengthened its connection with open source communities by entering an agreement with the OpenStack Foundation. In the area of digital signature and trusted services, an MoU was established with the Arab ICT Organization, potentially leading to work on other topics in the future.

Last, the option of offering existing specifications published by a third party for ETSI adoption (the Publicly Available Specification (PAS) process in ETSI) sparked interest of a number of partners, with the DASH Industry Forum initiating a request to make use of the PAS, and Secure Chorus approaching ETSI with the specific intent to use the PAS. In the latter case, a co-operation agreement was signed between ETSI and Secure Chorus end of 2020, as it is a requirement for using the PAS.

19 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. In this way, STFs are therefore able to 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). ETSI is also involved in one Horizon 2020 (H2020) EU Research and Innovation project.

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

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

Altogether, 50 STFs and other funded projects were active in 2020, involving 130 service providers for a total spend of about 2,73 M€. Voluntary contributions equivalent to 0,31 M€ were provided by 3GPP Members.

Technical areas in which funded resources were spent in 2020

Technical Areas	Financial Investment (k€)	%
3GPP Partners	848	31,08%
Centre for Testing and Interoperability	325	11,90%
Smart M2M	246	9,01%
Intelligent Transport Systems (ITS)	237	8,67%
Methods for Testing & Specification (MTS)	165	6,04%
Network Functions Virtualization (NFV)	121	4,43%
Core Network and Interoperability Testing (INT)	97	3,54%
Speech and multimedia Transmission Quality (STQ)	73	2,66%
Multi-access Edge Computing (MEC)	66	2,43%
Access, Terminals, Transmission and Multiplexing (ATTM)	52	1,92%
Others (ESI, HF, H2020, DECT, MSG, ERM)	117	4,29%
Voluntary	383	14,04%
TOTAL	2 730	

Figures are rounded to the nearest k€.

Funding sources in 2020

ETSI	41,43%
3GPP Partners	31,08%
EC/EFTA	12,77%
3GPP Members	11,43%
oneM2M	2,61%
H2020	0,69%



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.

EC/EFTA Funding

In 2020, the EC decided to reappropriate the budget granted to ETSI between Operating and Action Grants, to the benefit of the latter.

All standardization action grants are operated under a lump sum financing system. The lump sum unit value is updated every year based on an index agreed with the EC and 2020 has seen this value increased compared to 2019.

In 2020, the actions signed at the end of the year (0.75M€) aimed at covering activities related to Railways Telecommunication (RT JTFIR), Intelligent Transport System (ITS) and Human Factors (HF). Given the EC standardization budget for ICT (which is shared

Technical areas in which funded resources were spent in 2020		
Technical Areas	Financial Investment (k€)	%
Smart Card Platform (SCP)	262	33,32
Intelligent Transport Systems (ITS)	120	15,26
Cross-cutting Context Information Management (CIM)	119	15,13
Methods for Testing and Specification (MTS)	99	12,58
Core Network and Interoperability Testing (INT)	94	11,96
Speech and multimedia Transmission Quality (STQ)	92	11,75
TOTAL	786	

Figures are rounded to the nearest k€.

among the three ESOs) was exhausted, the evaluation of one of the proposals submitted in 2020 was deferred to 2021.

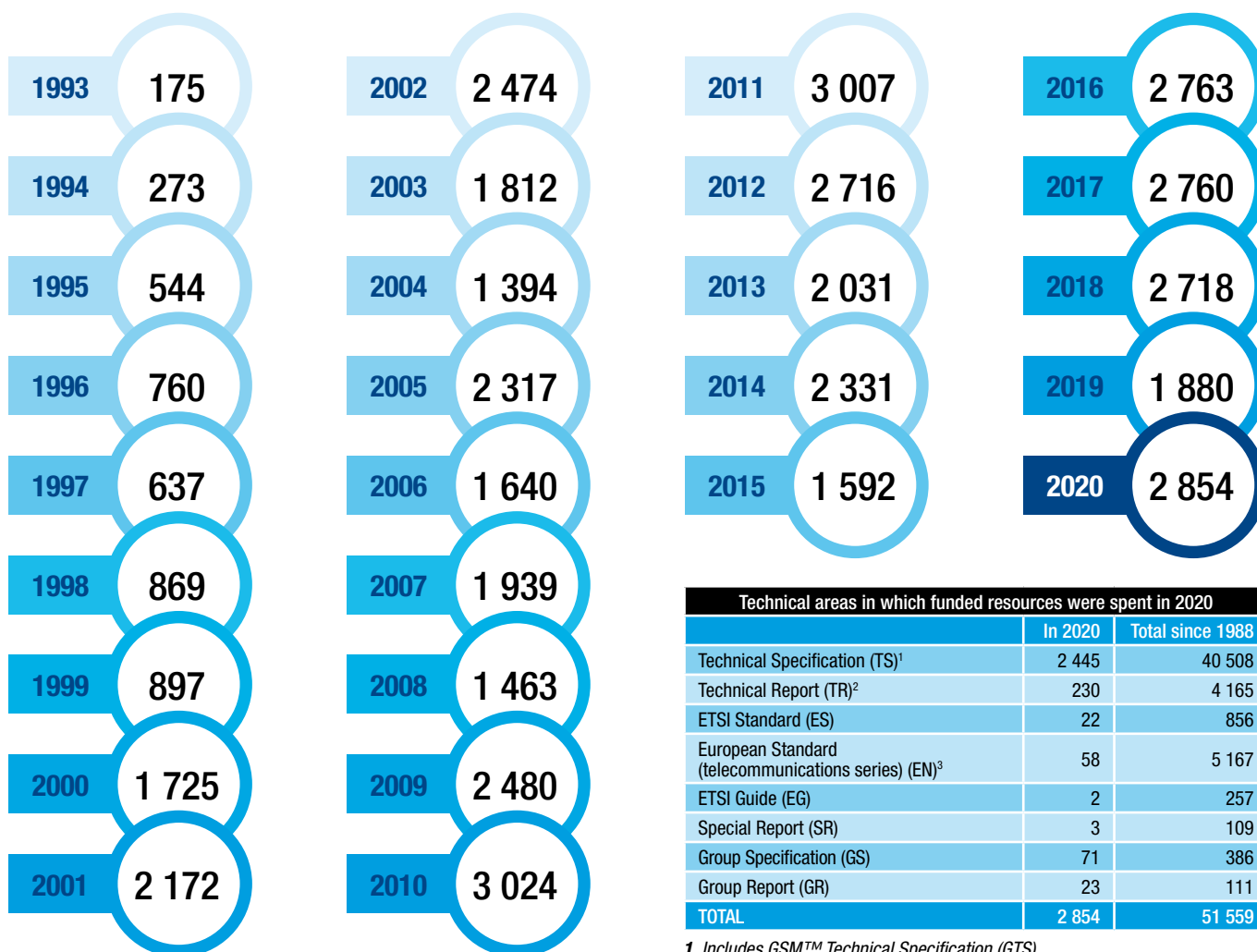
In September, ETSI also submitted a proposal issued by TC ERM. The EC then informed ETSI at the end of 2020 that this proposal would not be evaluated. However, as it was an important piece of work to be started for the new RED articles, ETSI funded this activity from its own FWP (Funded Work programme).

We were able to successfully report and achieve a 95% payment of the 2019 Operating Grant initially allocated.

20 STANDARDS PRODUCTION AND IPR

Standards Production

In 2020 we published 2 854 standards, specifications, reports and guides, bringing the total published since our establishment in 1988 to over 51 000.



Technical areas in which funded resources were spent in 2020		
	In 2020	Total since 1988
Technical Specification (TS) ¹	2 445	40 508
Technical Report (TR) ²	230	4 165
ETSI Standard (ES)	22	856
European Standard (telecommunications series) (EN) ³	58	5 167
ETSI Guide (EG)	2	257
Special Report (SR)	3	109
Group Specification (GS)	71	386
Group Report (GR)	23	111
TOTAL	2 854	51 559

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)

Intellectual Property Rights

Our ETSI Intellectual Property Rights (IPR) Policy continues to be widely referenced in the international standardization environment.

ETSI maintains a public database of patents as well as patent applications that are disclosed by their owners in the belief that these patents or applications may be or may become essential to an ETSI standard. This IPR database is recognized as unique, and one of the most complete in the ICT sector.

Ongoing discussions with different stakeholders, including close dialogue with the European Patent Office, are constantly taking place for the improvement of providing accurate information to the public.

The bulk upload of SEP (Standard Essential Patents) in the database is in place, and is widely used worldwide by the declarants, easing the declaration process.

Since the last Special Report refinement conducted, it now includes all the reflected declarations/disclosures information in a single file. Additionally, it features reports and graphs giving a status overview of the IPR database, together with other information including aggregate numbers for declarations/disclosures, standards, patents and patent families.



21 BUDGET REPORT AND FINANCIAL STATEMENTS

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 approved at General Assembly 68, has audited the 2020 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 2019, income decreased by 10,25% or roughly 2 472 k€ while expenditure diminished by 10,4% or 2 507 k€. After having made provision of roughly 37 k€ for Income Tax to be paid and of 2 550 k€ in credit notes to be issued to Members to offset the excess of income over expenditure, the net surplus of the year is 86 k€. This compares with a net surplus of 50 k€ in 2019.

2020 Budget Statements

2020 Budget Statements INCOME	
Income	k€
Members' contributions and Observer fees net of credit notes	15 597
EC/EFTA contracts	3 879
3GPP™ Partners	2 380
Voluntary contributions	312
European Friends of 3GPP	538
Sales	104
Financial income	61
Other income/carry forward	- / 1 227
TOTAL INCOME	21 643

In 2020, there was a net surplus of 86 k€.

The key points of the budget management are the following:

Income

Members' contributions (18,15 M€ before credit notes) were 2,24% over budget and increased by 3% compared with 2019. They funded roughly 72% of the budget. European Commission (EC)/European Free Trade Association (EFTA) funding amounted to 3,9 M€ to cover expenses related to the operation of the European standardization platform, and standardization projects including International Digital Cooperation.

3GPP Partners contributed their share to the project according to the funding formula in force, representing 2,4 M€. Member companies of EF3GPP granted 0,54 M€ in 2020 to fund their activities.

Expenditure

Secretariat costs were 22,07% under budget and lower by 10,4% compared with 2019. The significance of this cost reduction mostly stems from the Covid-19 pandemic that prevented from holding any activity

2020 Budget Statements EXPENDITURE	
Expenditure	k€
Secretariat staff costs	13 196
Other Secretariat costs	3 961
Special projects	715
European Friends of 3GPP	76
Provision and losses	167
Experts' costs	3 443
TOTAL EXPENDITURE	21 558

In 2020, there was a net surplus of 86 k€.

requiring physical presence. Since March, events and meetings were all held virtually at a much lower cost. Almost no travel costs were borne in 2020. In addition, the French Authorities imposed two lockdown periods that resulted in buildings being closed for almost five months, generating significant underspend.

Staff resources were reinforced by a net addition of six headcount, of which two were formerly contractors for 3GPP activities. In 2020 three staff members left the Institute to go on retirement and the associated legal indemnities have been accounted for in the 2020 accounts.

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

Financial Statements for the Year 2020

The final accounts and the balance sheet are summarized below.

The fiscal accounting period is 1 January 2020 – 31 December 2020.

Statement of Income and Expenditure Year 2020		
	Income (€)	Expenditure (€)
Income	21 671 464	
Purchases		7 334 367
Expenses		14 266 967
Financial income and expenses	61 201	7 592
Extraordinary income & expenses	2 720	3 612
Income Tax		37 234
TOTAL	21 735 385	21 649 772

There was a net surplus of 85 613 € in 2020.

Summary of the Balance Sheet

ASSETS		
Net amounts at:	31 Dec 2019 (€)	31 Dec 2020 (€)
Fixed assets	4 891 889	4 928 683
Debtors	17 257 705	15 408 567
Securities/cash	12 364 920	16 878 031
Prepaid expenses	245 360	359 216
TOTAL ASSETS	34 759 875	37 574 496

LIABILITIES		
Net amounts at:	31 Dec 2019 (€)	31 Dec 2020 (€)
Equity	8 895 696	8 988 164
Provisions	303 296	303 296
Balance carried forward	92 468	50 378
Surplus of the year	50 378	85 613
Creditors	7 030 287	7 865 978
Deferred revenue	18 387 750	20 281 067
TOTAL LIABILITIES	34 759 875	37 574 496

Figures are rounded to the nearest €.



22 ETSI FELLOWSHIP PROGRAMME

Distinguished service

Recognizing an outstanding personal contribution

Our Fellowship Programme recognizes individuals who have made an outstanding personal contribution to ETSI, either by building on our own work, or by raising ETSI's reputation in specific sectors of standardization.

Any individual representative of a member organization may propose a candidate for an ETSI Fellowship. Candidates must have been proposed by representatives

of at least two 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 2020 we honoured Brian Copsey, Ian Doig, Kiritkumar P Lathia and Edgard Vangeel for their outstanding personal contributions.



Brian Copsey

Director at Copsey Communications, Brian has been the Chair of ERM TG 17, our group in charge of broadcast related activities since 1996. Brian developed the first Assistive Listening Devices (ALD) Standard, and was instrumental in creating the first multi country radio microphone standard. He is also an active contributor to testing radio interference of ALDs.



Kiritkumar P. Lathia

Kiritkumar P. Lathia, B.Sc. C. Eng. and Fellow IET, United Kingdom, was a member of the ETSI Board and Chair of the Finance Committee from 1997 to 2008. He was instrumental in replacing the ETSI Technical Assembly with the ETSI Board and OCG. He has been a key player in the creation of 3GPP, and a major contributor to reduce membership fees for SMEs and academia categories.



Ian Doig

Ian Doig joined ETSI in 1993 as a Technical Editor, where he was responsible for coordinating the output of Technical Committee Special Mobile Group (SMG) and its working groups, the predecessor to 3GPP. In 2000 he took his skills back into industry, with Motorola and later as a lead BlackBerry delegate until his retirement in 2019. He also contributed greatly to ITU and CEPT groups. Ian passed away in February 2020. He is missed by colleagues and his many friends.



Edgard Vangeel

Manager Engineering at Cisco Systems Belgium, Edgard was the Chair of ETSI TC BRAN from 2009 to 2019. He has also been Chair of ERM TG11, our group in charge of in charge of 2.4 GHz Wireless LANs, since 1999. In addition, he has been the ETSI Liaison Officer to CEPT WGFM since 2001. Edgard has been a major contributor to the harmonized standard for 5 GHz RLANS, a key actor in radio matters standards and instrumental in building DFS Requirements to protect civil and military radars.

23 MEMBERSHIP

Overall ETSI membership increased by roughly 3,8% in 2020. At the end of the year, we had a total of 958 members, drawn from 64 different countries and provinces across five continents. This was made up of 781 full members drawn from 43 European countries, 166 associate members drawn from 21 non-European countries and 11 observers. 144 of our members are Small and Medium-sized Enterprises (SMEs) and 92 are Micro-Enterprises. Small organization members now represent roughly 27% of the overall membership. 50 resignations were received during the year and are effective 1st January 2021.

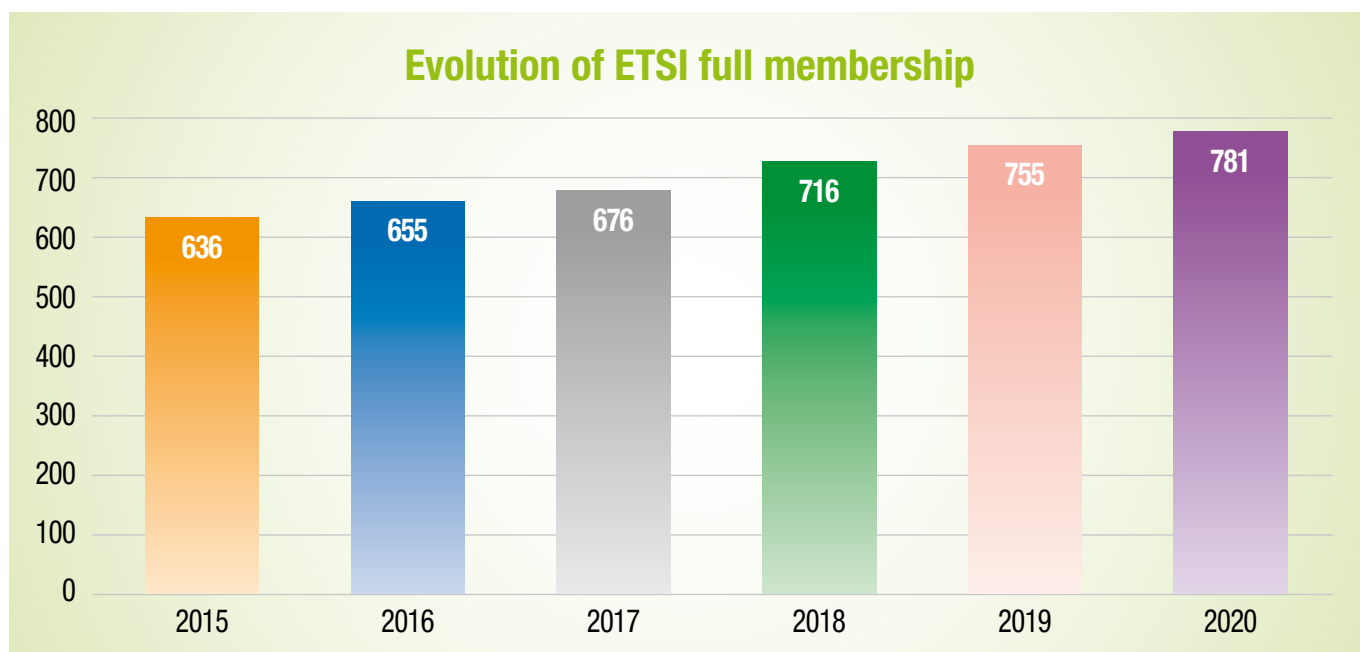
The European Commission and the European Free Trade Association Secretariat, which hold the role of Counsellors, attend the General Assembly and the ETSI Board and continue to play an active part in our work.

Collection of contribution invoices in 2020 was performed with a rate of 99,54% of recovery.

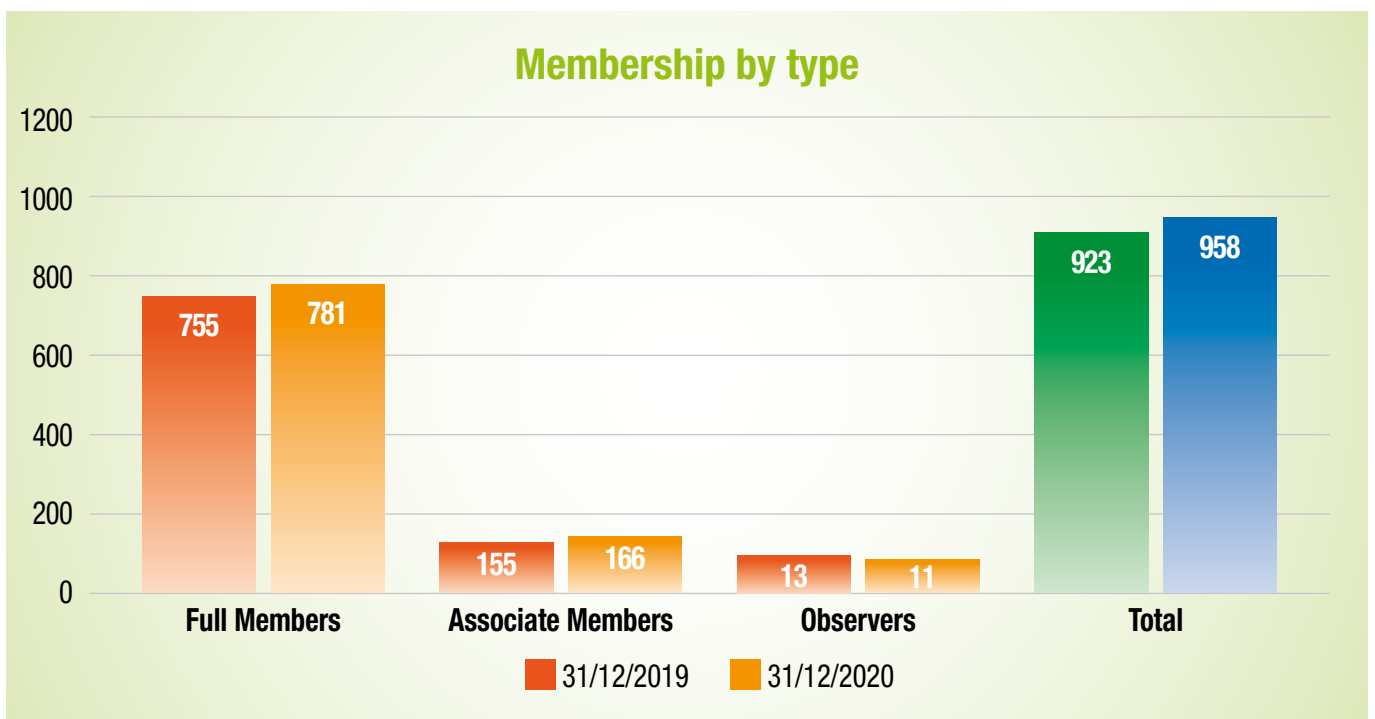
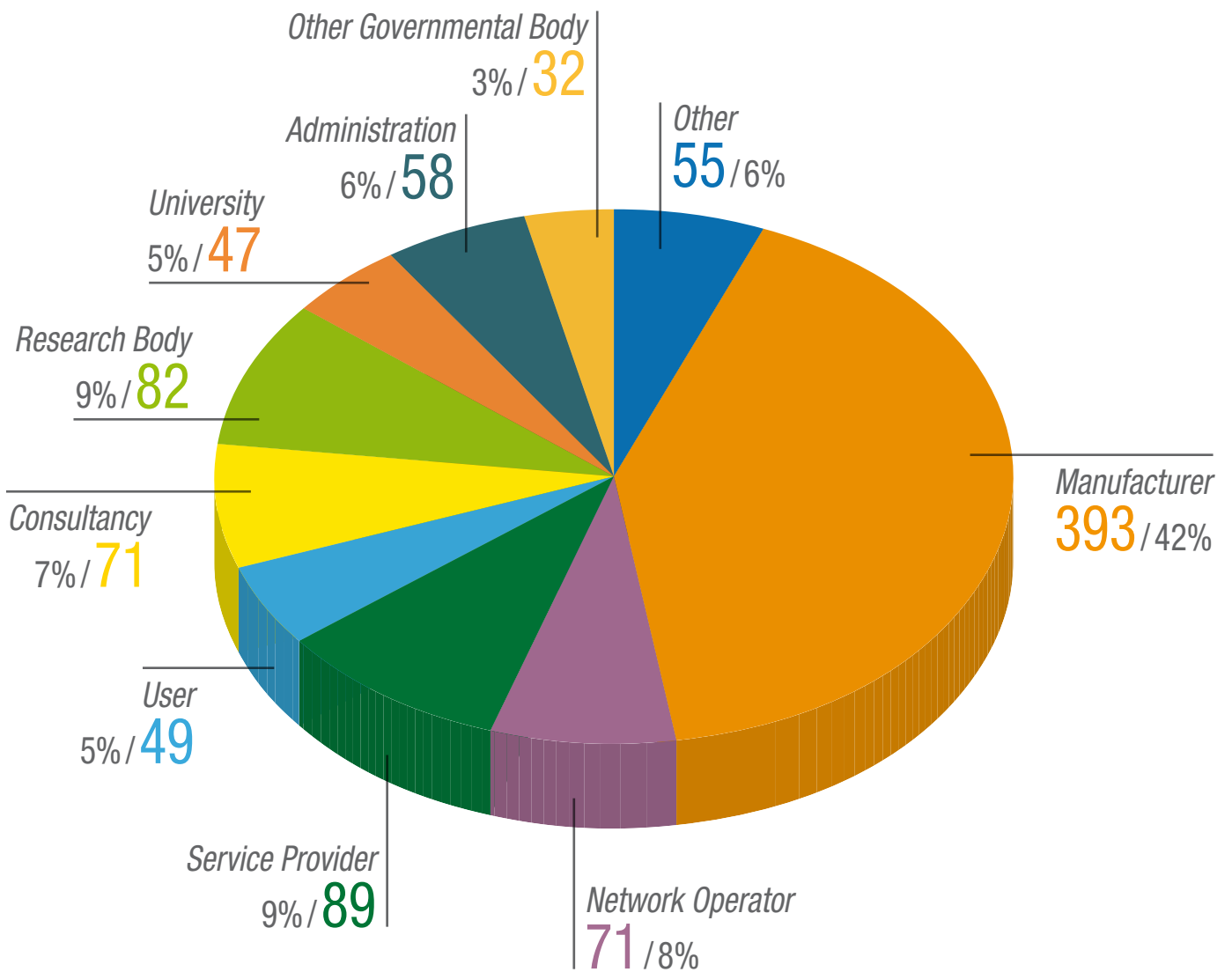
One of the utmost priorities is the development of the ETSI Membership base, gathering a diverse, vast and innovative community for the development of world-class ICT standards by reaching out to different vertical sectors.

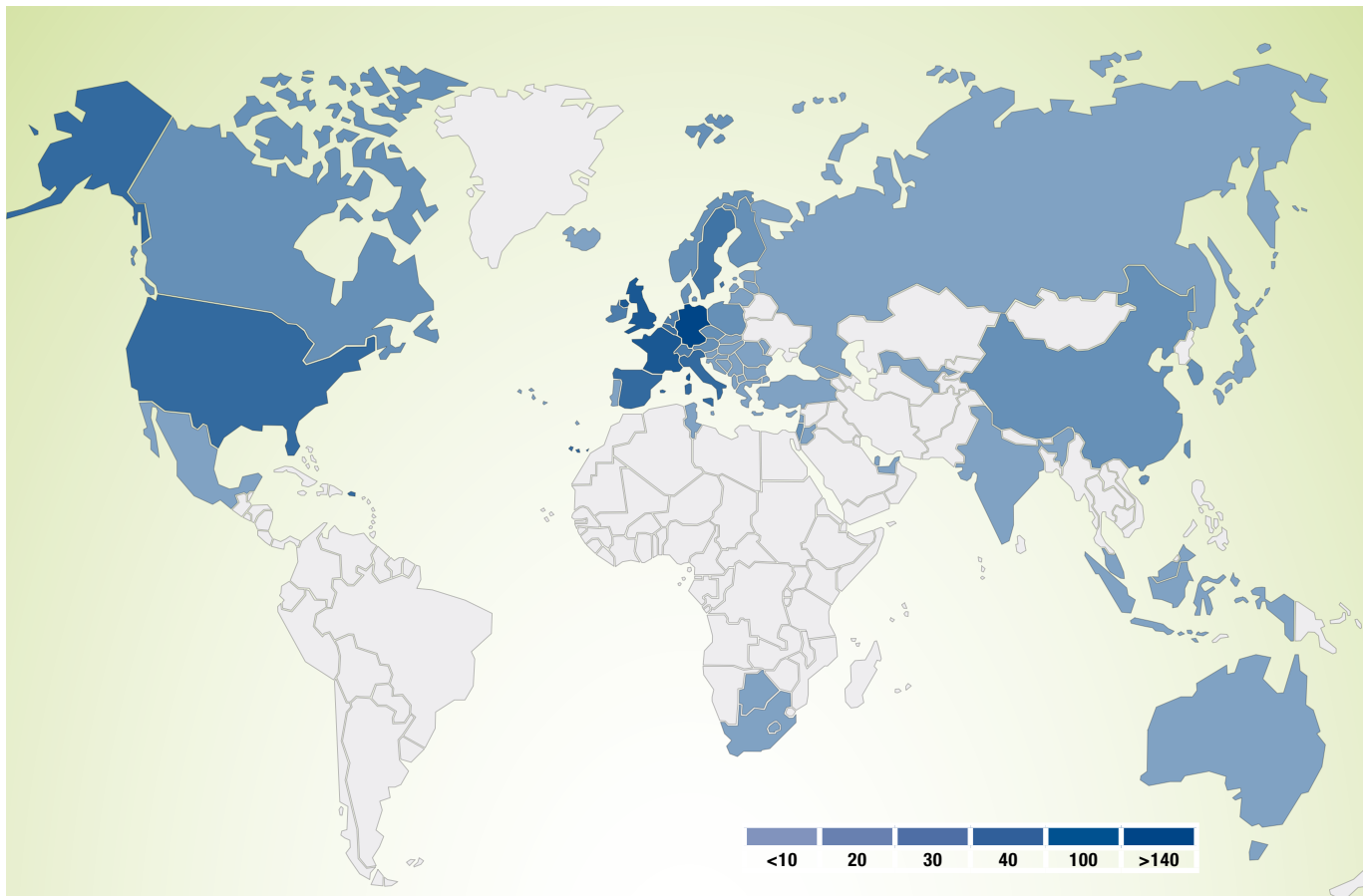
It is also in the DNA of ETSI to respect the broad diversity of the ICT players and offer as much inclusiveness as possible. In 2020, a video containing testimonials and information regarding the benefits for SMEs and MEs was created and can be viewed at etsi.org/membership/sme.

To facilitate the application for ETSI membership a new video tutorial has been made available to assist organizations complete the online application form at etsi.org/membership.



Membership by category





958 total membership
 from **64** countries or provinces

Albania	1	India	4	Poland	13
Andorra	1	Indonesia	1	Portugal	3
Australia	6	Ireland	27	Qatar	1
Austria	19	Israel	13	Republic of North Macedonia	1
Belgium	41	Italy	39	Romania	5
Bosnia Herzegovina	2	Japan	8	Russian Federation	9
Botswana	1	Jordan	1	Serbia	1
Bulgaria	2	Korea	6	Slovakia	2
Canada	14	Kosovo	1	Slovenia	3
China	15	Latvia	1	South Africa	3
Croatia	3	Lebanon	1	Spain	40
Cyprus	1	Lesotho	1	Sweden	35
Czech Republic	5	Lichtenstein	1	Switzerland	27
Denmark	19	Lithuania	1	Taiwan (Province of China)	14
Estonia	4	Luxembourg	13	Turkey	10
Finland	19	Malaysia	1	Ukraine	1
France	109	Malta	2	United Arab Emirates	5
Germany	152	Mexico	1	United Kingdom	112
Georgia	1	Moldova	1	United States of America	73
Greece	6	Montenegro	1	Uzbekistan	1
Hungary	8	Netherlands	31		
Iceland	1	Norway	14		

24 JOIN OUR COMMUNITY

Realize the benefits

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.

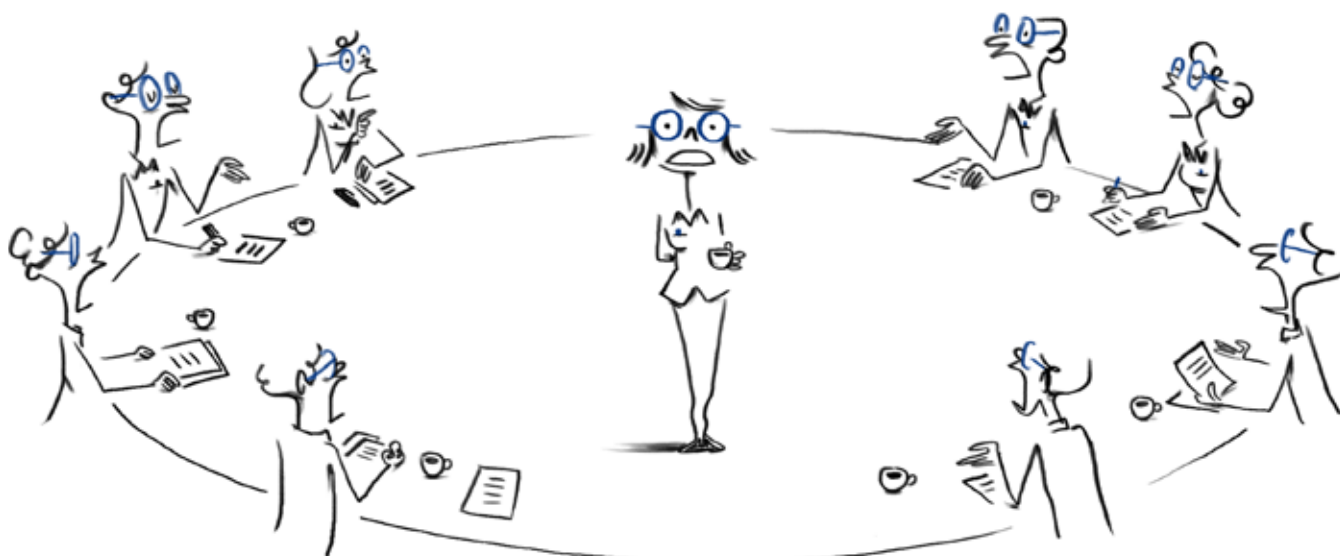
ETSI provides the opportunities, resources and platforms for organizations to understand, shape, drive and collaborate on globally applicable standards. ETSI standards facilitate interoperability, security, and competitive advantage across all sectors of industry and society. Our international membership includes universities, research bodies, associations and public authorities, as well as industrial companies of all sizes: a quarter of ETSI's 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.

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