

ANNUAL
REPORT

2018

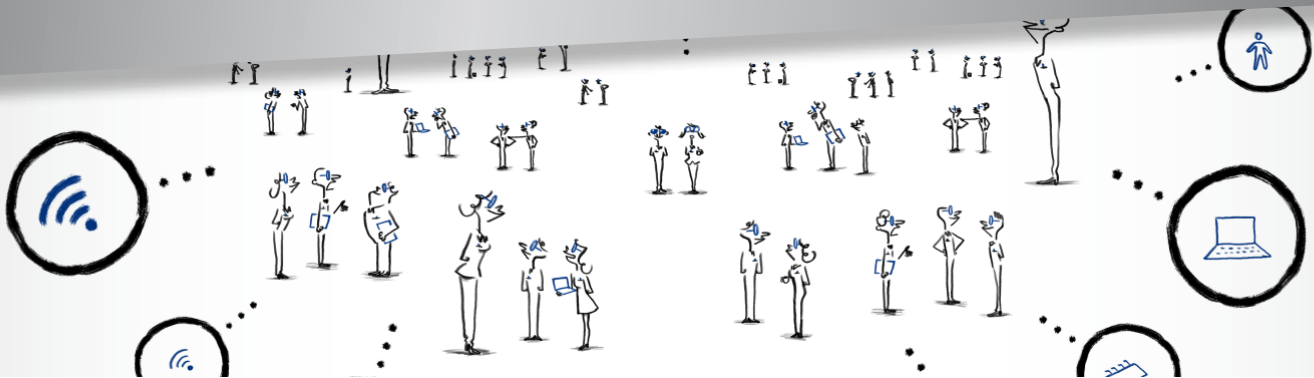


Delivering the future



The Standards People

INTRODUCTION



Meet The Standards People

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.

Recognized by the European Union as a European Standards Organization, our outputs include globally-applicable standards for Information and Communications Technologies (ICT), including fixed, mobile, radio, aeronautical, broadcast and Internet technologies.

Established in 1988 as a not-for-profit organization, ETSI has over 870 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.

ETSI is officially recognized by the European Union as a European Standardization Organization (ESO). 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 documents just some of our achievements during 2018. Full details about the work of our Technical Committees and Industry Specification Groups can be found online at portal.etsi.org. You'll also find more information about our current and planned activities in the ETSI Work Programme 2019-2020.

ETSI Fellowships 2018

The ETSI Fellowship programme recognizes individuals who have made an outstanding personal contribution to ETSI, either through building our work or raising ETSI's reputation in specific sectors of standardization. In 2018 we honoured François Courau, Enrico Tosato, Klaus Vedder and Michael Walker.



François Courau



Enrico Tosato



Klaus Vedder



Michael Walker

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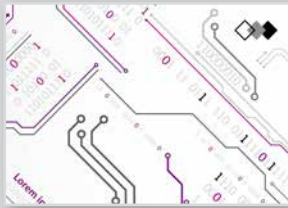
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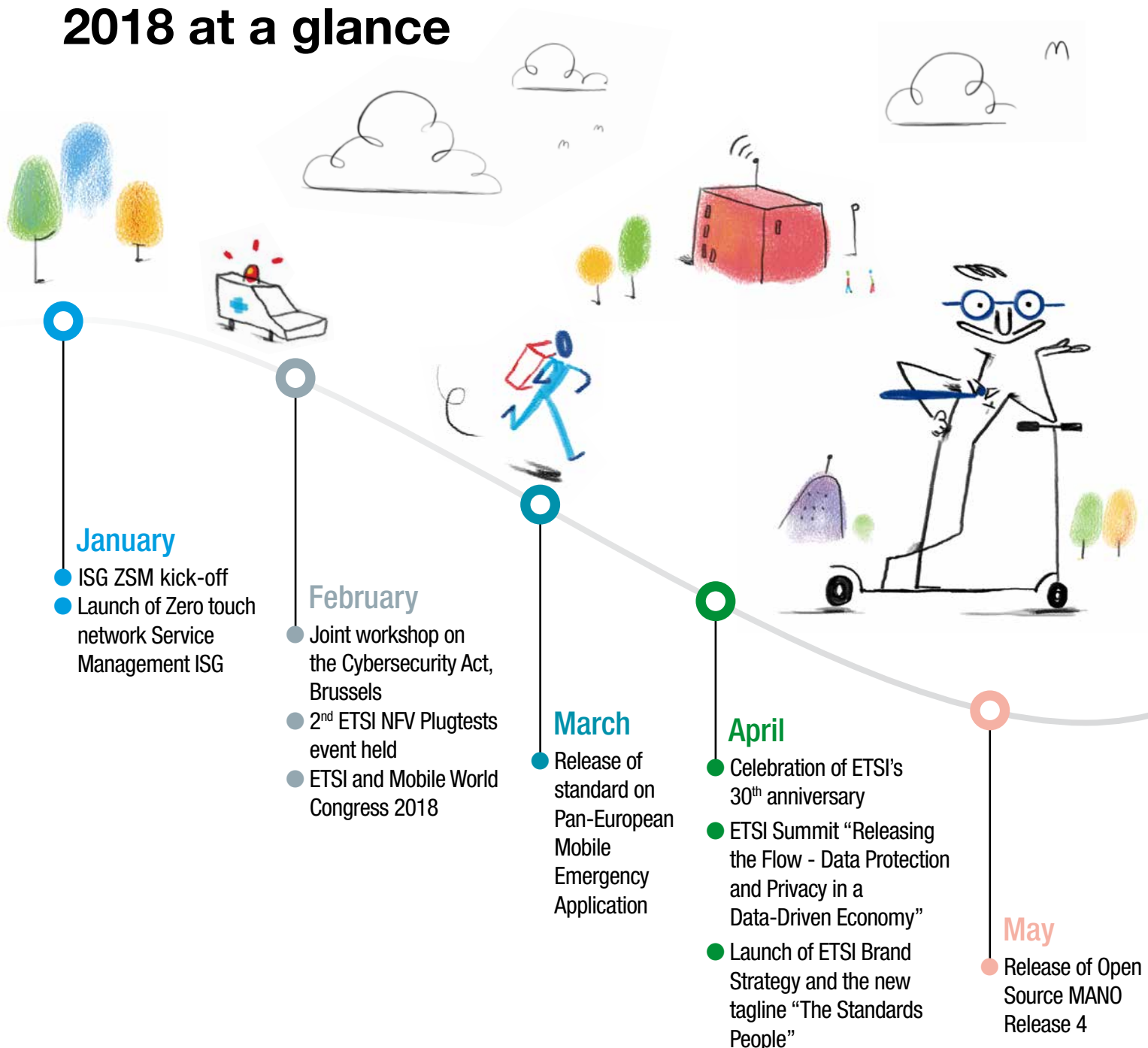


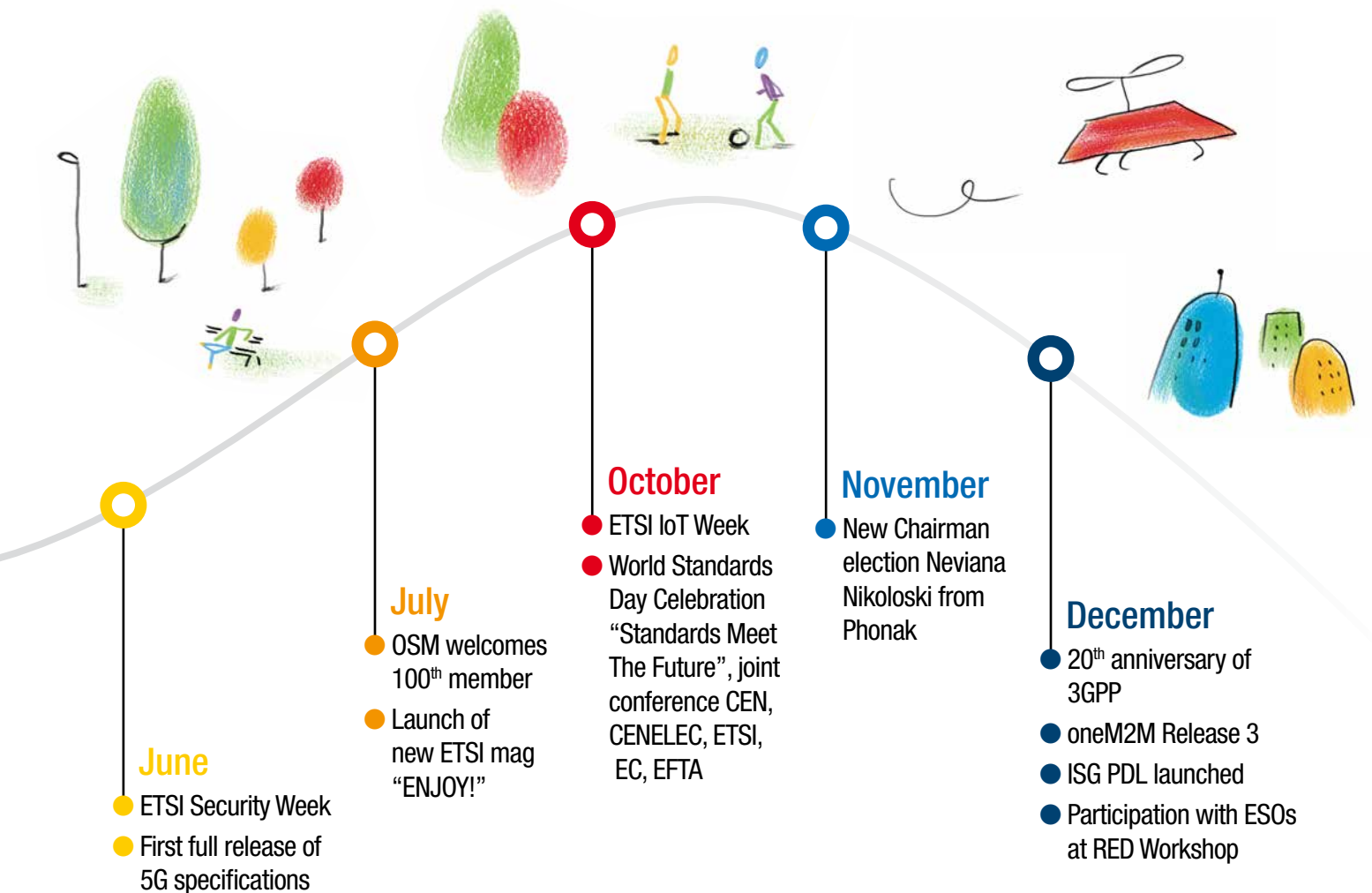
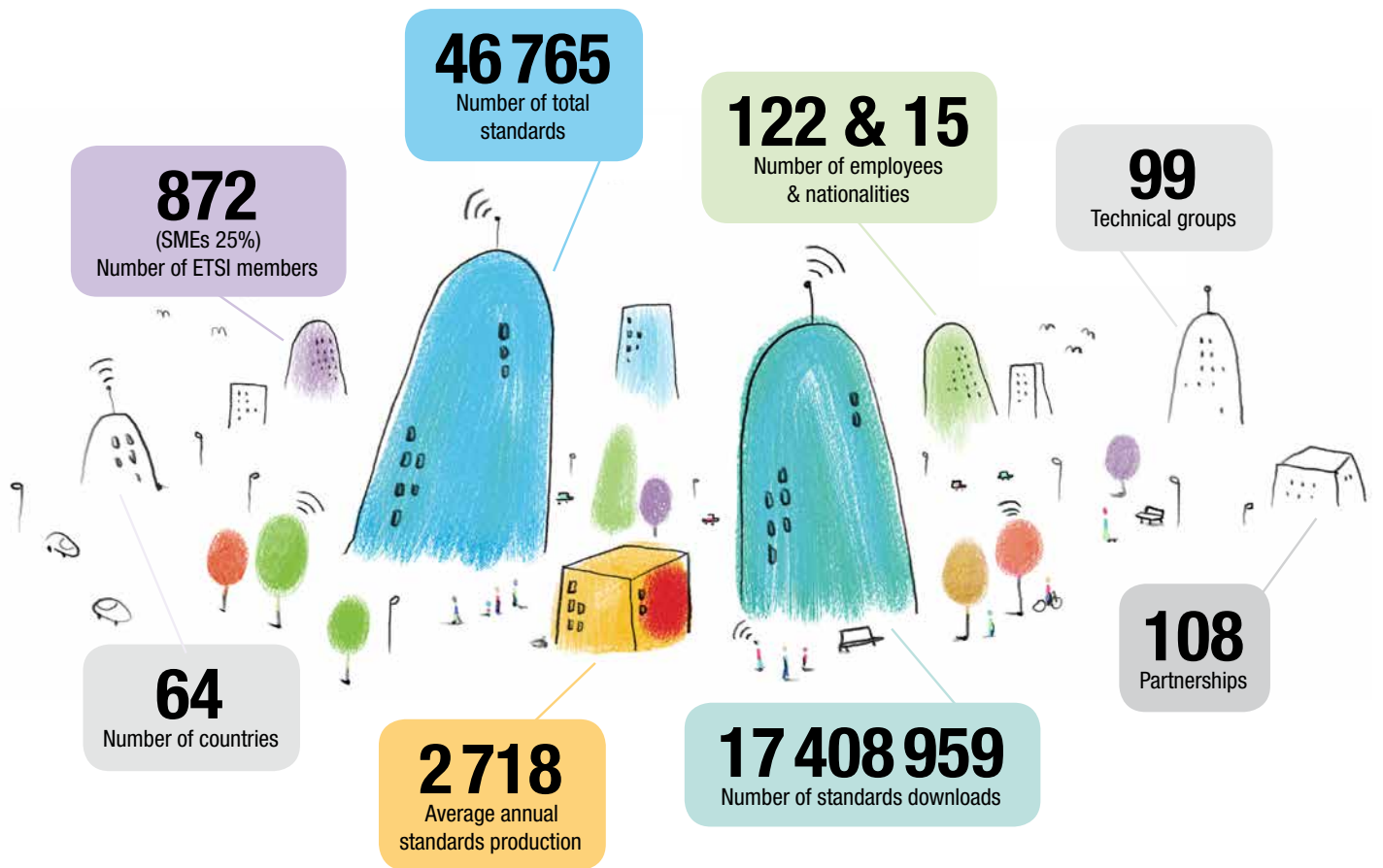
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THE YEAR IN SUMMARY



2018 at a glance







A year in reflection

Simon Hicks, outgoing Chairman of the General Assembly



It is sometimes suggested that there is a tension between the worlds of telecoms and Information Technology, in terms of both their goals and their practical working methods. My own view is that ETSI actively seeks to embrace this contrast, providing a fertile ground for players from both sides to meet in a huge global ICT ecosystem. And while we are a European based organization, the diversity and interests of our membership reflect the much bigger global geopolitical picture.

A prime example of this is The Third Generation Partnership Project. 3GPP was created in 1998 as a mechanism that allows ETSI to work successfully alongside peer standards bodies and other partners to deliver new generations of mobile technology standards to the market. In 2018 – our own thirtieth anniversary year – a standout achievement of this thriving initiative was of course

3GPP Release 15. This is the first real set of technical standards that allows vendors to commit to silicon and build systems that will be used for the first commercial 5G deployments.

5G differs markedly from previous-generation mobile systems. Rather than just an add-on service, it will – much like the Internet itself – be a fundamental enabler for many new industries and market opportunities that simply would not exist without it. In turn, 5G has created the need for ETSI and other SDOs to find new ways to interface with a much larger and more diverse ‘extended family’, including non-traditional players that we’ve had little dialogue with in the past.

5G is a powerful reminder that our world-class standardization efforts do not exist in a vacuum: they are a direct consequence of the commercial environment they inhabit. And it also underlines the reality that standardization is vital to both technical and commercial success as we develop ICT systems of unprecedented complexity, richness and scale.

2018 marked the end of my term as Chairman of the General Assembly, and I warmly welcome my successor, Dr Neviana Nikoloski, who was elected in November as the new GA Chair for a two-year period. Looking back over the last seventeen years of my own involvement with ETSI, I note how profoundly the world has changed. On a day-to-day level I have seen virtual meetings replace a large number of physical meetings,

with their non-stop air travel and conference rooms piled high with paper documents. One of the most exciting initiatives I have welcomed in ETSI is the introduction of our Industry Specification Groups. ISGs offer an agile and cost-effective conduit for non-members to access and contribute to our working methods. In their decade of existence, they have made a significant contribution to the way we work and the variety of our outputs as an organization.

Dirk Weiler, Chairman of the Board



Timing is everything. And I’m delighted that successful delivery in 2018 of the first set of real 5G standards – 3GPP Release 15 – was on schedule. It’s a feat that is all the more remarkable considering the collective effort in 2018 of more than 3500 people, embodied in over 31000 separate change requests in the Release and some 140 meetings. Release

16 development has started and plans for Release 17 are already underway.

In comparison with 3G and 4G, the applications for 5G are far wider, and the commercial expectations are correspondingly higher. Accordingly we have seen the growing presence of other players in the 5G ecosystem over the last year. An illustration of this is the acceptance of the 5G Alliance for Connected Industries and Automation (5G-ACIA) as a 3GPP Market Representation Partner (MRP) in November, as well as a significant increase of 3GPP individual members from 587 in January 2018 to 632 in December.

With all sectors becoming 'digital' the ICT world is of increasing relevance for many vertical industries. This digitization in areas like industrial automation and e-Health is driving a greater focus on topics such as cyber security and Artificial Intelligence (AI). Rather than just defining protocols, in ETSI our own interest is very much from a holistic systems perspective. With an eye firmly on the future, we always ask how our best-in-class standardization work can directly benefit concrete use cases. An example of this is our Industry Specification Group on ZSM that draws on exciting advances in AI to streamline network management with smart new tools, techniques and services to replace cumbersome manual intervention.

While many of our activities are global, we are a recognised European standards organization, helping Europe to reach its policy goals and enabling market access by means of Harmonized Standards (HEN). In the past years we have seen challenges with the acceptance of HEN under the Radio Equipment Directive (RED). During 2018 ETSI and the European Commission have successfully worked together on all levels to improve the situation. An example of this was December's expert workshop held in Brussels with DG GROW and European Standardization Organizations to address barriers in implementation of the RED.

ETSI continues to value the willingness of our members to contribute front-running innovation into our standards by keeping a balanced Intellectual Property

Rights policy. Over the last year our IPR Special Committee agreed several additional features that allow more transparent reporting of IPR declarations: this work has further increased the quality of information we provide to members and the public. In December 2018 I stepped down after chairing this committee for the last ten years, and I warmly welcome Steve Faraji from Audi as my successor.

Luis Jorge Romero, Director General



The world is becoming more deeply connected. Machine to Machine communications and the Internet of Things (IoT) have remained central pillars of ETSI's work over the last year. With the successful delivery in December 2018 of oneM2M Release 3 – and work on Release 4 well underway – developers now have a solid platform to create applications and services based on stable real-world specifications.

In parallel we are engaging with a growing community of vertical industry interests through events and hands-on sessions. One of our brightest highlights was October's ETSI IoT Week that gave over 200 participants an overview of ETSI's standardization activities conducted via oneM2M, 3GPP and our SmartM2M committee. A key driver for applications of machine-to-machine communications is the domain of smart cities. Building on existing standards and specifications – including the work of oneM2M and SmartM2M – our Industry Specification Group on City Digital Profile has explored concrete use cases and challenges that will support the deployment of smart city infrastructures.

Brought a step closer with the timely delivery of 3GPP Release 15, the imminent arrival of 5G mobile is often described as a 'radio revolution'. Equally fundamental to its market success, however, is the increasing virtualization and automation of core network functions to streamline efficient operation and enable new service possibilities. This has been demonstrated by our pioneering work on Network Functions Virtualization, together with the newly created group on 'Zero Touch' service and network management. In addition, we are starting to witness the development of standards that leverage Artificial Intelligence (AI) mechanisms to assist in the management and orchestration of the network. Similarly, our Industry Specification Group on Multi-access Edge Computing is exploring how the placement of computational functionality closer to the end user will improve that user's experience in a range of emergent 5G applications.

5G and the Internet of Things will demand secure end-to-end communications between people, devices and data centres. This has been underlined by our work on the cyber security aspects of middleboxes – already a ubiquitous feature of telecommunication and ICT networks today. ETSI also is one of the few standards organizations actively focused on standardization aspects of Quantum Safe Cryptography, providing protection against a new generation of threats to conventional cryptographic techniques by quantum computers.

During the year we have continued to progressively explore the benefits of Open Source working methods that complement our standardization activities without compromising the integrity of ETSI's current Intellectual Property policy. Our Open Source MANO (OSM) group continues to gain industry respect as an example of best practice in this area, with our ETSI Forge offering a package of online tools used by open source communities to assist our committees in their work.





A New Generation Delivering the 5G promise

Fifth generation systems are almost a commercial reality. Accordingly, much of our activity in 2018 was focused on enabling the timely technical and market success of 5G. As a founding partner of the Third Generation Partnership Project (3GPP™), we come together with six other regional standardization organizations worldwide, plus market associations and several hundred individual companies, to develop specifications for advanced mobile communications technologies.

3GPP™ - an enduring Partnership

After initial delivery in late 2017 of 'Non-Stand-Alone' (NSA) NR new radio specifications for 5G, much effort focused in 2018 on timely completion of 3GPP Release 15 – the first full set of 5G standards – and on work to pass the first milestones for the 3GPP submission towards IMT-2020.

While initial specifications enabled non-standalone 5G radio systems integrated in previous-generation LTE networks, the scope of Release 15 expands to cover 'standalone' 5G, with a new radio system complemented by a next-generation core network. It also embraces enhancements to LTE and, implicitly, the Evolved Packet Core (EPC). This crucial way-point enables vendors to progress rapidly with chip design and initial network implementation during 2019.

As the Release 15 work has matured and drawn close to completion, the group's focus is now shifting on to the first stage of Release 16, often referred to informally as '5G Phase 2'.

By the end of the year, 83 studies relating to Release 16 plus a further thirteen relating to Release 17 were in progress, covering topics as diverse as Multimedia Priority Service, Vehicle-to-everything (V2X) application layer services, 5G satellite access, Local Area Network support in 5G, wireless and wireline convergence for 5G, terminal positioning and location, communications in vertical domains and network automation and novel radio techniques. Further studies were launched or progressed on security, codecs and streaming services, LAN interworking, network slicing and the IoT.

Other activities focused on broadening the applicability of 3GPP technology to non-terrestrial radio access systems – from satellites and airborne base stations to maritime applications including ship-to-shore and ship-to-ship communications. Work also progressed on new Professional Mobile Radio (PMR) functionality for LTE, enhancing railway-oriented services originally developed using GSM radio technology which is now nearing its end of life.

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

About 3GPP

Established in 1998, The Third Generation Partnership Project (3gpp.org) brings ETSI together with six other regional standardization organizations in Asia and North America, plus market associations and several hundred individual companies. As one of the founding partners of 3GPP, ETSI plays a prominent role in the development of mobile communications. At the end of 2018, of the 632 member organizations of 3GPP, 403 (64%) were via their membership of ETSI.

MACHINE-TO-MACHINE COMMUNICATIONS AND THE INTERNET OF THINGS



Deep Connections

Linking objects to create new experiences

Billions of machines and objects are already embedded with sensors or actuators with the ability to communicate over the Internet. This is the Internet of Things (IoT), drawing together technologies including Radio Frequency Identification (RFID), Machine-to-Machine (M2M) service platforms and wireless sensor networks. Applications include smart cities, devices and grids, connected vehicles, eHealth, home automation and energy management, public safety and industrial process control.

oneM2M

It's estimated that the number of connected devices in the Internet of Things (IoT) already exceeds the world's population. And with this number anticipated to outstrip 20 billion by 2020, the IoT will have a transformative influence on the way we live and work.

The IoT draws together several technologies including Machine-to-Machine (M2M) service platforms, Radio Frequency Identification (RFID) and Wireless Sensor Networks, reflected collectively in our work at ETSI. Together, they enable a vast range of potential IoT applications and services – from smart devices, smart

cities, smart grids and connected vehicles to eHealth, home automation and energy management, public safety and remote industrial process control.



As IoT devices permeate society, standardization is key to achieving universally accepted specifications for true interoperability between devices and applications. As a founding partner in oneM2M, ETSI helps produce specifications to enable platforms that simplify connection between devices and services, regardless of the underlying technology used.

oneM2M is an end-to-end IoT technology with flexible deployment options (IoT Cloud/Enterprise, IoT Gateway, IoT Edge Device, IoT User Devices). Finalized in December 2018, oneM2M Release 3 focused accordingly on interworking between industrial technologies, together with improved support for mobile IoT technologies standardized by 3GPP. In addition, it incorporates a common oneM2M interworking framework, transaction management, security enhancements, new conformance tests and tools for developers. It also introduces semantic interworking between proprietary technological 'islands'. This is important in cross-domain use cases such as smart cities, where interoperability is typically required between several systems.

Within ETSI our Smart M2M Communications committee (TC SmartM2M) produces specifications that enable users to build IoT platforms connecting devices and services regardless of the underlying technology used. Central to this is SAREF – our smart applications reference ontology running with oneM2M-compliant communication platforms that

“The European Commission wanted to improve road safety between farm vehicles and other vehicles. John Deere responded to this demand by equipping its tractors with modems. More importantly, the different road-going vehicles and their means of communication had to be interoperable. So it was only natural for us to join ETSI, the only European standardization organization with the necessary experience in these areas.”

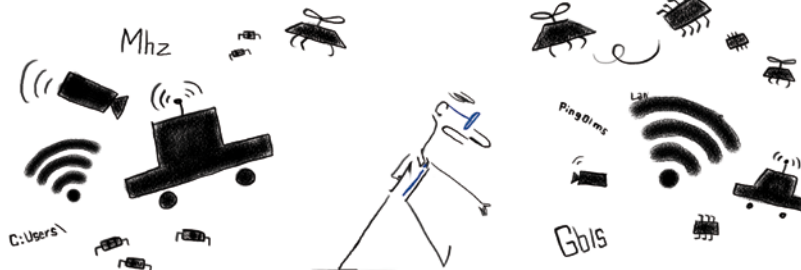
Christophe Gossard, Head of European Regulatory Affairs, John Deere



enables connected devices to exchange information. During 2018, we extended the applicability of SAREF to new sectors including smart cities, industrial and manufacturing, smart agriculture and automotive. We continued to investigate the needs of smart cities, wireless industrial automation and Context Information Management. Other IoT enablers we have explored include new specifications for Digital Enhanced Cordless Telecommunications (DECT™) Ultra Low Energy and Low Throughput Networks.

In parallel with the delivery of oneM2M Release 3, a positive message was delivered to the market with the establishment of a oneM2M Global Certification Programme that was scheduled for formal launch in early 2019. By the end of 2018, more than fifteen products had already been awarded certification, spanning software components and platforms from a variety of vendors.

During the year we maintained partnerships with the CREATE-IoT and F-Interop projects. Other ongoing activities included a landscaping study to explore privacy aspects of the IoT and an investigation into virtualized IoT architectures.



Everyone together: ETSI IoT Week

Our ongoing standardization work is augmented by interoperability events, industry days and hackathons that invite developers to demonstrate working oneM2M solutions. A highlight of our calendar is ETSI IoT Week. Held in October and attracting 200 visitors, 2018's successful event featured discussions on agriculture, sport, health and space, reflecting increased interest in ETSI's work from a growing range of industries and market segments.

Star of the show was a John Deere tractor parked in front of our headquarters in Sophia Antipolis, connected to a car to mitigate the risk of collisions on the road and reduce the 400 fatal yearly accidents caused by farm vehicles that are not clearly visible on roads. Using ETSI's ITS-G5 standard and the oneM2M gateway, this eye-catching illustration highlighted how standards can enable interoperability between traditionally disparate sectors such as agriculture and automotive.

Other demonstrations addressed domains including smart home, smart living, testing, aquiculture and eHealth. Visitors also had the chance to test interoperability with interworking platforms and emerging technologies such as blockchain and AI.

Smart Cities were addressed through use cases, standardization challenges and examples of first implementations in Europe and Asia. The use of wearables and body sensor devices is a rapidly growing use case in the Internet of Things (IoT), with smart body area networks – as explored by our SmartBAN committee – gaining much attention at the event.

CYBER SECURITY AND PRIVACY



A Sense of Security

Making everyone's digital world safer

Information security standards are essential to ensure interoperability among systems and networks, compliance with legislation and adequate levels of security. They provide a means for protecting individual users while creating a more secure industrial and commercial environment.

Cyber Security

Security and privacy are inescapable aspects of all our digital lives. Security standardization – sometimes in support of legislative actions – has a key role to play in protecting the communications and business we all depend on. Our Cyber Security Technical Committee (TC CYBER) is a trusted centre of expertise that offers market-driven standardization solutions, guidance to users, manufacturers, network, infrastructure and service operators and regulators.

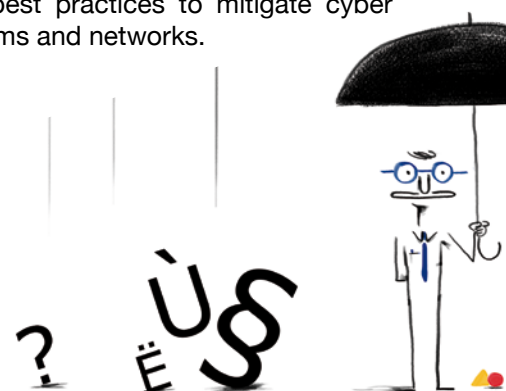
Held in Brussels in February 2018, a joint workshop with ETSI, CEN, CENELEC and ENISA on the European Cybersecurity Act brought together more than 200 policy makers, industry representatives, standardization organizations, consumer associations and certification bodies. Providing an overview of the current legislative and standardization landscape, the event focused on key challenges that need to be addressed to implement

the Act efficiently and increase trust in ICT products and services placed on the European market.

Enforced in May, the GDPR is Europe's legislative machinery to deal with data protection. ETSI's role as a forum to exchange views impacting enterprises and citizens was highlighted in April at our Summit 'Releasing the Flow: Data Protection and Privacy in a Data-Driven Economy'.

In August, we issued two specifications on Attribute-Based Encryption (ABE), a key technology that bundles access control with data encryption to protect personal data securely in highly distributed systems such as 5G and the Internet of Things. Enforcing access control at a cryptographic level, ABE provides better security assurance than software-based solutions.

In October, we updated our international compendium of Technical Reports titled 'Critical Security Controls for Effective Cyber Defence'. Collectively, these describe a prioritized set of best practices to mitigate cyber attacks against systems and networks.



Enterprise Security

A focus area of our CYBER Technical Committee is so-called ‘middleboxes’ that are implemented in the boundaries between networks to enable secure communication between end-points.

November 2018 marked the release of our first Middlebox Security Protocol specification. Driven directly by industry needs, this supports vital data centre operations including compliance and detection of external attacks on encrypted networks. Helping data centres and enterprise networks to meet their service obligations and legal mandates, the new specification also offers visibility over access to users’ data.

Blockchain

An intrinsic feature of today’s secure decentralized cryptocurrencies, a blockchain uses cryptographic techniques to link a growing list of ‘blocks’ or records in an open distributed ledger that’s immune to modification. Aside from their financial application, these ledgers can also be used for digital identity attributes, object tracking or verification of service level agreements.

Launched in December 2018, our Industry Specification Group on Permissioned Distributed Ledger (ISG PDL) is exploring the challenges presented by the operation of permissioned (managed) distributed ledgers, business use cases, functional architecture and solutions for the operation of permissioned distributed ledgers, including interfaces/APIs/protocols and information/data models.

Quantum Safe Cryptography

Quantum computers already pose a major challenge to conventional cryptographic techniques. Previously secure encrypted information – such as bank account details, identity information and military security – will become potentially subject to discovery and misuse. Thus new ‘quantum safe’ cryptographic techniques have emerged in recent years to provide protection against these threats.

Now formally incorporated into TC CYBER, our Working Group on Quantum Safe Cryptography (QSC) has maintained its interest in practical implementation of

quantum safe cryptography, publishing several reports spanning performance considerations, protocols, benchmarking and architectural considerations for specific applications. The group’s work also feeds into other organizations such as the International Telecommunications Union (ITU) and Internet Engineering Task Force (IETF).

Virtual Private Networks (VPNs) allow governments and corporate enterprises to communicate securely between sites or to connect employees remotely with offices. However the future integrity of VPNs is threatened by the prospect of quantum computers circumventing current cryptographic techniques. In October 2018 we issued a Technical Report exploring the requirements to add quantum resistance to VPN technologies, including client, server and architectural considerations.

In November we held our sixth Quantum Safe Cryptography workshop in Beijing, co-organized with the University of Waterloo’s Institute of Quantum Computing and Chongqing University.

Quantum Key Distribution

Quantum Key Distribution (QKD) offers a method of distributing keys securely without relying upon computational security. During 2018 our ISG on QKD finalised API specifications to enable applications to request keys from QKD systems, and developed management interfaces to integrate QKD into Software Defined Networks. We updated our specification on the properties of the components and internal interfaces of QKD systems, and looked towards a certification process by developing work on implementation security and optical characterisation of QKD transmitter modules. Many ISG members were involved in publishing an ETSI White Paper on Implementation Security of Quantum Cryptography. To aid discussions about QKD deployments the group issued a document on device and communication channel parameters, and published a vocabulary for QKD.

Electronic Signatures

Our Electronic Signatures and Infrastructures committee (TC ESI) is responsible for the standardization of digital signatures and related trust infrastructures.

2018 highlights included the publication of specific policy requirements for trust service providers issuing qualified certificates for securing communications between payment services under Directive 2015/2366/EU (called PSD2).

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We also released standards for new types of Trust Services: Electronic Registered Delivery Services (ERDS) and Registered Email (REM) services, Remote Signature Validation services and Remote Signature Creation services.

Further work was launched on the global recognition and trust of EU PKI Trust Services. This will enable EU Trust services to operate within internal European and global markets for online services such as website authentication, electronic signatures and seals, code signing and secure email

“ETSI’s expertise on security is a well-known asset among cybersecurity stakeholders. TC CYBER recognizes the benefits brought by the Critical Security Controls to enhance the cybersecurity posture of industry, administrations and end users.”

Alex Leadbeater, Chairman, TC CYBER



Security Indicators

The threat from cyber attacks represents significant risks to industry, including potentially huge financial losses as well as direct threats to intellectual property or reputation.

Our Industry Specification Group on Information Security Indicators (ISG ISI) produces specifications which together form a reliable and commonly-recognized reference model for the measurement of information security risks. Considered as unique in the standardization world, they have been adopted officially by some Information Security Government Agencies.

In 2018 we published a new Group Specification, describing an overall organization-wide security information and event management (SIEM) approach that spans the monitoring, response, investigation, management and reporting of security events.

We also published a Group Specification, addressing Key Performance Security Indicators to evaluate the maturity of an organization’s security event detection tools and processes.

Work concluded on a Group Specification considering an ISI-driven measurement and event management architecture (IMA) and CSlang, a common ISI semantics specification language. 2018 marked the end of ISG ISI activities, with maintenance of group specifications passing to TC CYBER.

Lawful Interception and Retained Data

Bringing together the interests of governments and Law Enforcement Agencies (LEAs) as well as mobile network operators and equipment vendors, our Lawful Interception committee (TC LI) develops standards supporting common international requirements for LEAs, including the interception of content and retention/disclosure of electronic communications related data with supporting standards for warrantry and internal interfaces.

In 2018 we continued to update our Lawful Interception (LI) and Retained Data (RD) standards, specifications and reports. This included maintenance of the seven-part Technical Specification on the handover interface and service-specific details for Internet Protocol (IP) delivery. We completed specification of an interface for communication between authorized Law Enforcement Monitoring Facilities (LEMFs) to support European Investigation Orders related to LI and/or RD. Comprising an exchange protocol together with an associated data schema, this specification is focused on the secure handling of real-time and stored data transfer between LEMFs.

Work continued on defining an electronic interface for the exchange of information between systems relating to the establishment and management of LI. Following previous publication of a specification for an internal network interface X1 for LI-related messages over Handover Interface 1 (HI1), work neared completion on another specification for both interfaces X2 and X3, supporting other related work in 3GPP.

Service and network architectures are becoming increasingly non-monolithic, with multiple operators involved in supplying a service to a single user. Updates progressed to a TS on the dynamic triggering of interception required as a result of this diversification of architectures.

Security Algorithms

ETSI’s Security Algorithms Group of Experts (SAGE) specifies authentication, encryption and key agreement mechanisms for a range of standardized technologies. In response to a liaison statement from 3GPP SA3, the group began work on the development of new 256-bit algorithms that will offer greater resistance to possible future Quantum Computing attacks in 5G systems. These same 256-bit algorithms could also be potentially retrofitted to previous-generation mobile systems if required.



ETSI at European Cyber Security Month

European Cyber Security Month (ECSM) is an annual EU-organized awareness campaign promoting cyber security among citizens and organizations about the importance of information security and highlighting the simple steps that can be taken to protect their personal, financial and professional data. Coinciding with ECSM in October 2018, our CYBER committee hosted a series of webinars addressing key topics including Middlebox Security Protocol (MSP) standards, Attribute-Based Encryption (ABE) for personal data protection and Quantum-Safe Cryptography.

Smart Cards and the Secure Element

Our Smart Card Platform committee (TC SCP) develops and maintains specifications for the Secure Element (SE) for its use in telecommunication systems including the Internet of Things (IoT). We develop 'agnostic' specifications that can find their way into other applications such as ID management, ticketing and ID cards with contactless interfaces used in financial services. TC SCP is the home of the UICC – the most widely deployed Secure Element with more than 5 billion pieces entering the market every year just as SIM cards.

Trust and privacy in IoT and mobile applications are crucial market drivers. As such, our next-generation platform, the Smart Secure Platform (SSP) will contribute significantly to achieving these goals. In high-end deployments, the SSP will be faster and more flexible than what can be achieved with the UICC, while continuing to support the existing features such as toolkit and the contactless interface.

To advance this new platform TC SCP was supported in 2018 by an STF for the technical realization of the SSP. As a first step, we launched work on two specifications: one containing the general characteristics and one describing the specific case of the SSP integrated into a System on Chip solution. This is of particular interest for IoT applications as it vastly reduces the complexity and costs of deployment of a Secure Element.

Part of our work in 2018 went into the development and maintenance of more than 50 specifications on the UICC and, in particular, the update of test specifications.



ETSI Security Week

Held annually in June, the ETSI Security Week explores different aspects of cybersecurity underpinning our digital world. Attracting over 300 delegates, this year's event showcased presentations from national security agencies, IT leaders, cybersecurity experts, standards organizations, developers, academics and policy makers. Sessions covered future-proof IoT security and privacy, middlebox security, eIDAS remote signature creation services, 5G security and privacy, ICT standards for the European Digital Single Market and distributed ledger technologies.

SMART CITIES AND COMMUNITIES



Living for the Future

Building tomorrow's connected communities

Tomorrow's smart cities and communities will be characterized by standardized services that enhance the appeal of these connected urban environments to residents, businesses, investors and tourists. Totally new and evolved applications will embrace health and social care, building management and connected homes, energy efficiency, waste management, transportation, mobility and environmental issues.

Smart Cities infrastructure and services

Our City Digital Profile Industry Specification Group (ISG CDP) is developing standards to support the deployment and roll-out of smart city infrastructures, building on existing standards and specifications including the work of oneM2M and our own SmartM2M committee.

Focus areas in 2018 included a high-level architecture, together with a survey of smart city reports and deliverables by other Information and Communication Technology (ICT) standardization bodies and research

organizations. We continued to capture city needs and service scenarios for their citizens and infrastructure, including concrete examples that reflect the importance of environmental factors and sustainability objectives. Meanwhile our Human Factors committee (TC HF) explored consumers' and citizens' needs that must be addressed by smart city standardization, including accessibility, personalization and data protection.

Standards to support the roll-out of smart city infrastructures were considered by our Access, Terminals, Transmission and Multiplexing committee (TC ATTM). During the year this work included the specification of measures to ease the deployment of smart new services and their multiservice street furniture within the IP network of a single city or cluster of cities. Related to spectrum usage in smart cities, we finalized a System Reference document on critical infrastructure utility operations, covering smart grid and smart metering systems.

In October, ETSI Director General Luis Jorge Romero welcomed delegates to the second 'Making Smart Cities Sustainable' Eurocities event, organized by eG4U and Bordeaux Metropole in partnership with ETSI and the Smart Building Alliance.





Available on our YouTube channel, we created a 'Smart Cities Made Simple' video that offers viewers a fun, accessible introduction to tomorrow's connected communities

In parallel with this activity, ISG CIM continued during the year to examine use cases relating to context information, while increasing contact with other groups where knowledge management is under development, such as SmartM2M (including SAREF), oneM2M, ITU-T FG DPM and W3C.

"Smart cities will be the first areas to benefit directly from our work on cross-cutting Context Information Management. As the NGSI-LD API is used to 'glue together' existing databases across the many city services for citizens. The NGSI-LD has already been referenced by many EC research and innovation programmes, such as EIP-SCC-01 Lighthouse and the SynchroniCity project. New use cases in Smart Agriculture and Smart Industry are under development."

Dr. Lindsay Frost, Chairman, ISG CIM



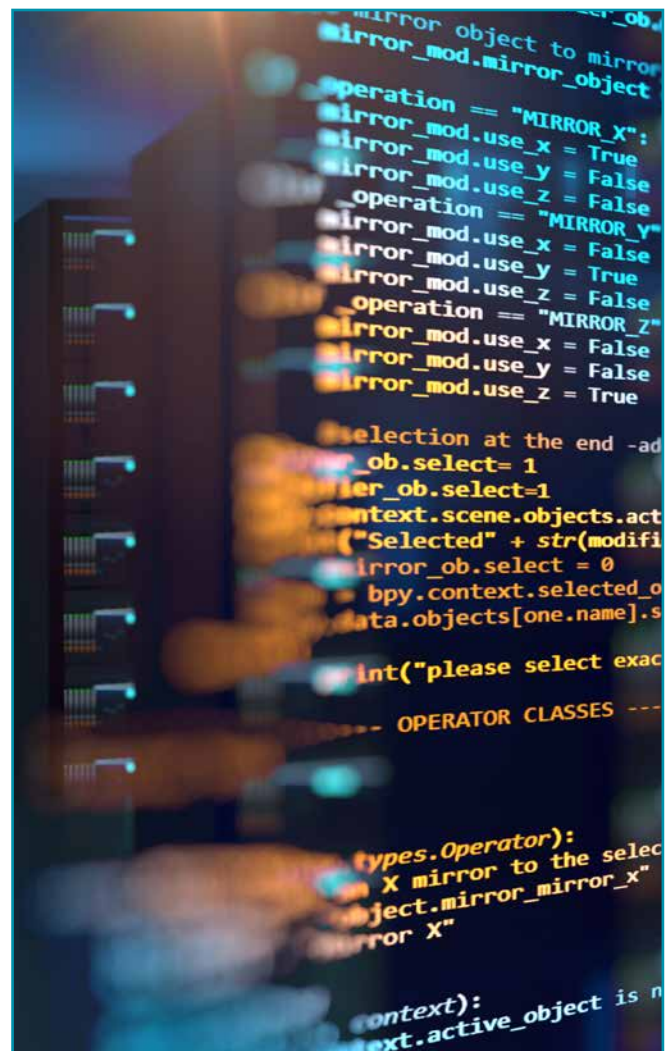
Context Information Management

From digitizing industrial processes to creating smart services for citizens, it is essential to record data accurately together with its source, meaning and accuracy – its context information or metadata – and to transfer these without misinterpretation to other systems.

Addressing this need, ETSI's ISG on cross-cutting Context Information Management (ISG CIM) is developing specifications for applications to publish, discover, update and access context information in a broad range of environments including smart cities.

The end of 2018 saw completion of a Group Specification for NGSI-LD - a name that references early work of the Open Mobile Alliance in defining high-level NGSI interfaces, as well as advances from the Linked Data community. The culmination of two years' work – including industry feedback on a preliminary release in April – the specification defines an Application Programming Interface (API), allowing developers to write software to provide, consume and subscribe to context information in multiple scenarios and with multiple stakeholders.

Of particular relevance to smart city applications, this enables near real-time access to information from many different sources, including but not limited to the IoT. Challenges in interpreting data models and API standards across platforms mean that much collected data is seldom leveraged in typical Smart City applications. NGSI-LD addresses this, building on widespread property graph data models so that all kinds of 'things' – including people, city boundaries, buildings, rooms, cars and equipment – can be readily referenced and described, together with their relationships.





Wireless World

Radio devices, services and spectrum

Radio technology is an integral part of our daily lives, used for mobile phones, broadcast radio and television, Wireless Local Area Network and cordless technology, Global Navigation Satellite Systems (GNSS), Radio Frequency Identification (RFID) and Short Range Devices (SRDs). ETSI creates the standards that define many of these radio technologies and systems. We also provide the standards used by regulatory authorities in Europe and elsewhere to manage the radio spectrum environment and ensure safe co-existence of systems competing for use of limited spectrum resources.

Harmonised Standards and the Radio Equipment Directive

Compliance with the Radio Equipment Directive (RED) became mandatory throughout the EU in June 2017, necessitating the revision or replacement of all our existing Harmonised Standards and the development of new ones. At the start of 2018, we had published more than 200 Harmonised Standards in support of the RED, of which more than 150 were cited in the Official Journal of the European Union (OJEU).

The EC's creation of a new approval procedure for our Harmonised Standards during the year also necessitated a change in our working methods to ensure compliance with legislative requirements. We thus co-operated closely with the EC to optimize the efficiency of this new process, as exemplified by our participation with other ESOs and DG GROW at a successful RED standardization workshop in Brussels plus other bi-lateral events.

Much of the work of our EMC and Radio Spectrum Matters committee (TC ERM) was accordingly dedicated to defining receiver parameters: these were not mandatory under the previous Radio and Telecommunications Terminal Equipment (R&TTE) Directive that the RED replaces.

Positive progress was made in creating new Harmonised Standards or making updates to existing publications. In the area of Short Range Devices (SRDs) we published new standards covering Ultra Low Power wireless medical capsule devices operating in the 430 - 440 MHz band, metal and object sensing devices operating in the 1 - 148,5 kHz band. We also amended standards relating to access to radio spectrum for SRDs operating in the 25 MHz - 1 GHz and 1 - 40 GHz ranges. Also on the topic of Short Range Devices we issued Technical Specifications on an architecture and interface protocols for Low Throughput Networks (LTN).

We updated a standard covering access to radio spectrum and features for telephone transmitter/receivers used on inland waterways using the VHF band.

We updated spectrum standards for radiosonde telemetry instruments used in meteorological applications. Updates were also made to both parts of a Harmonised Standard covering transmitter/receiver spectrum access for avalanche beacons used by the emergency services.

TC ERM also published a number of new System Reference documents (SRdocs). These considered High-Definition Ground Based Synthetic Aperture Radars (HD-GBSAR) operating in 1 GHz band; smart tachograph applications in commercial vehicles, Nuclear Magnetic Resonance (NMR) equipment, Low Power Wide Area Networks Chirp Spread Spectrum (LPWAN-CSS) operating in the UHF band below 1 GHz, and Wireless Access Systems/Radio Local Area Networks (WAS/RLANs) in the 5 925 - 6 725 MHz band.

In the area of digital audio, we revised radio spectrum access standards for Digital Audio Broadcasting (DAB) transmission equipment and the Digital Radio Mondiale (DRM) sound broadcasting service. We also addressed Digital Mobile Radio systems design.

Reconfigurable Radio Systems

The telecommunications industry faces a major challenge – a lack of spectrum to meet growing demand, particularly from the Internet and mobile communications. However, a significant amount of spectrum is allocated exclusively to organizations that do not take full advantage of it.

For example, much is used only across certain areas or at specific times. If this under-used spectrum could be shared, it could free up spectrum resources to support the needs of our connected world, including the Internet of Things (IoT). Sharing will also play a key role in the development of 5G.

Reconfigurable Radio Systems (RRS) – intelligent radio devices which can characterize and act upon their environment – offer an opportunity for the sharing of unused spectrum among multiple services and radio networks. In ETSI our Technical Committee on RRS is responsible for the standardization of these systems, including reconfigurable equipment architecture and Cognitive Radio.

In 2018, the committee published an EN describing a radio reconfiguration related architecture for mobile devices.

Study continued into a Radio Interface Engine that will address the efficient acquisition and management of context information and suitable equipment configuration in a heterogeneous radio environment which might include satellite, mobile broadband and the IoT.

To meet the spectrum access demand and the needs of local high-quality wireless networks, evolved Licensed Shared Access (eLSA) offers a technical means to facilitate the spectrum allocation procedure, including automatic local area licensing and leasing agreements between incumbents and other players. We thus developed the first part of a multipart TS on eLSA that aims to support spectrum access to networks operated by vertical sector operators.

We published two parts of a multipart EN on Mobile Device (MD) information models and protocols for RRS, covering the Multiradio Interface (MURI) and Unified Radio Application Interface (URAI).

We published a TS on security requirements for reconfigurable radios, including aspects such as signature creation and validation, secure storage, trusted timestamps and ‘attestation’ to prove to a remote system the authenticity and integrity of an RRS’s hardware and software configuration.

We also published a Technical Report, presenting a feasibility study on temporary spectrum access for local high-quality wireless networks. A further TR considered radio equipment reconfiguration use cases for RRS.

Broadband Radio Access Networks

In 2018 our Broadband Radio Access Networks committee (TC BRAN) continued to produce and maintain standards and specifications for present and future Broadband Wireless Access technologies in different frequency ranges.

We continued work on the next version of the Harmonised Standard for 5 GHz RLAN, with a focus on achieving coexistence between different technologies within the scope of the standard. The 5.8 GHz band is being added to the standard as this band has been opened up by some member states. Work on the revision of the Harmonised Standard for Broadband Fixed Wireless Access (BFWA) in 5.8 GHz was completed.

Work started on the revision of the Harmonised Standard on White Space Devices (WSD) operating in the 470 - 790 MHz TV broadcast band.

We completed a Technical Report studying central coordination of WAS/RLANs operating in the 5 GHz band.

During the year work also progressed on two System Reference documents (SRdocs) which contain a spectrum request to the CEPT. The first one describes the technical characteristics of multiple gigabit wireless systems in radio spectrum between 57 and 71 GHz and a second one was on Wireless Access Systems including Radio Local Area Networks (WAS/RLANs) in the band 5 925 - 6 725 MHz.

In addition to these SRdocs, the group started working on a Technical Report describing Wireless Access Systems including Radio Local Area Networks (WAS/RLANs) operating in the band 6 725 - 7 125 MHz.

DECT™

ETSI is responsible for the development and maintenance of specifications for Digital Enhanced Cordless Telecommunications (DECT™) – the leading standard around the world for digital cordless telecommunications. Over 1 billion DECT devices have been installed worldwide: the system has been adopted in over 110 countries and more than 100 million new devices are sold every year.

DECT is now being enhanced to include Ultra Low Energy (ULE) – the new networking technology for residential and building applications driven primarily by low power requirements for battery-operated devices. With around 80% of data traffic generated by indoor systems, low-latency DECT ULE systems have the potential to be key contributors to the success of 5G and the Internet of Things – both in smart homes and in a range of vertical markets.

In 2018 our DECT Technical Committee made significant inputs to a DECT-5G Industry White Paper published by the DECT Forum, the international association of the wireless home and enterprise communication industry. Making use of license exempt radio spectrum, DECT-5G will seamlessly interface with 3GPP 5G systems in a complementary role. The paper discusses the potential of DECT-5G as a Radio Interface Technology to address specific needs of various vertical markets including industrial, media/entertainment, smart home and healthcare.

In 2018 we also updated the first part of the DECT test specification, covering radio frequency parameters, security elements and DECT protocols facilitating RF tests and efficient use of spectrum.

We issued a new Technical Report evaluating vertical industry use cases for DECT evolution – targeting lower end-to-end latency, higher data rates and higher reliability based on the current DECT physical layer – as well as DECT-2020, a New Radio (NR) interface supporting URLLC and Machine Type Communications (MTC). Also relating to DECT's longer-term evolution, we published a Technical Report on NR for DECT-2020, focusing on the physical layer.

A further TR studied technical updates to the DECT standard to enable super wideband (SWB) audio calls in existing DECT slot formats as well as technical improvements to narrowband (NB) and wideband (WB) calls. A new EN defined the DECT Wireless Relay Station (WRS) – an additional building block for DECT fixed networks. We also issued a Technical Specification for DECT in the 1 920 - 1 930 MHz Unlicensed Personal Communications Services (UPCS) frequency band.

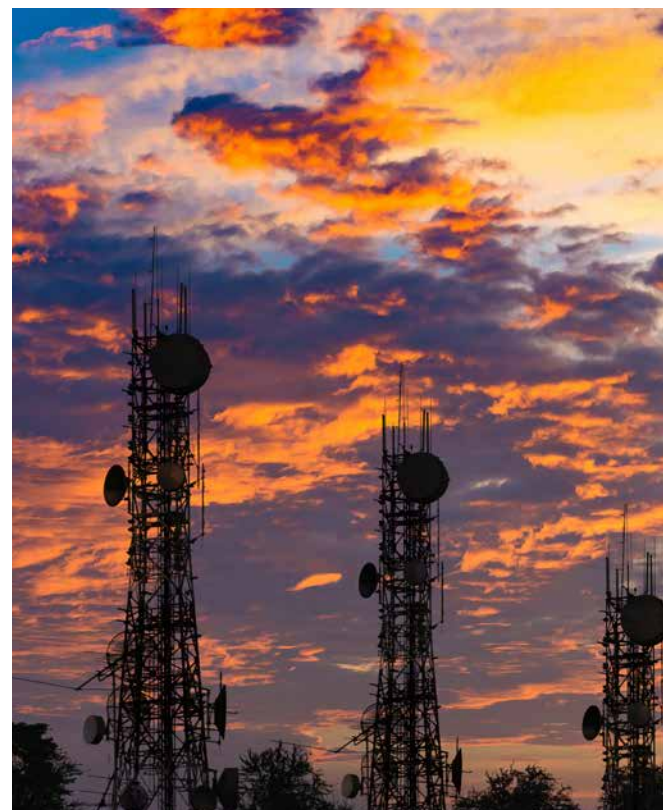
Millimetre Wave Transmission

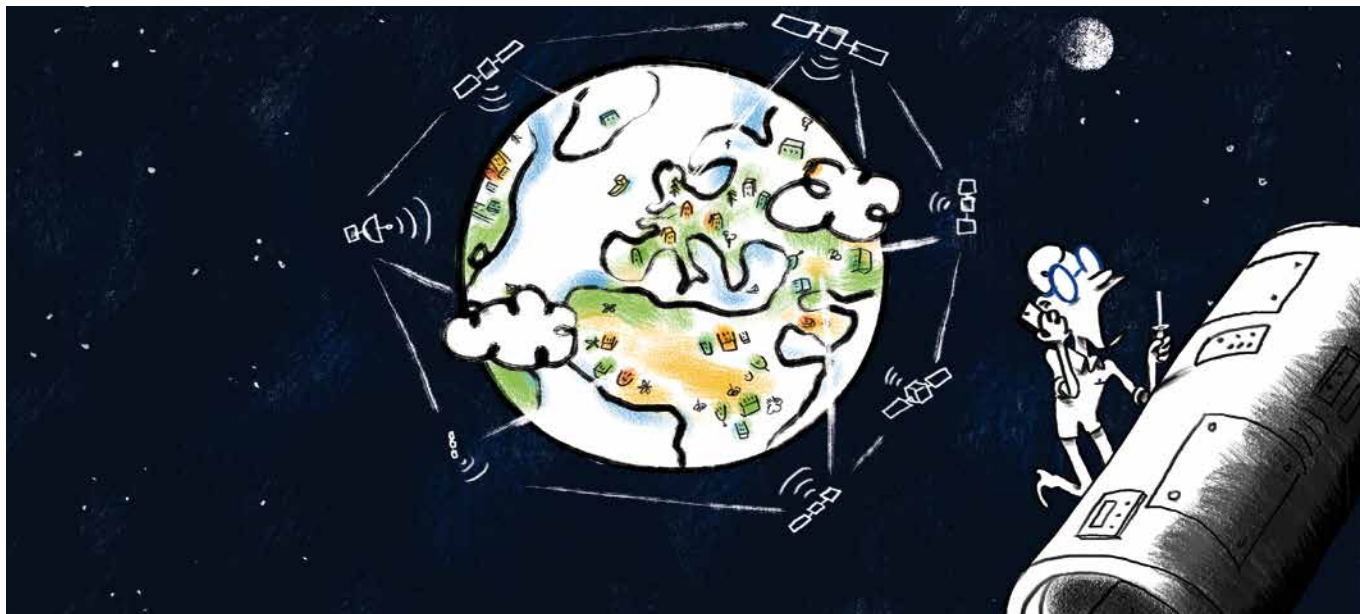
4G, the future needs of 5G and the Internet of Things together pose unprecedented demands on radio access networks and backhauling. As a means of addressing this, millimetre wave bands in the 30 - 300 GHz range offer large amounts of under-utilized bandwidth – as well as more spectrum for radio transmission than lower bands, and wider channel bandwidth, with fibre-like capacity. As a source of largely untapped spectrum resource, millimetre wave technologies are expected to be a major enabler for future mobile communications.

In 2018 our Industry Specification Group (ISG) on millimetre Wave Transmission (mWT) published a Group Report analysing spectrum, license schemes and network scenarios in the D-band to facilitate deployment of high capacity backhaul systems and decongest heavily-loaded networks.

Much of the group's attention focused on exploring how microwave and millimetre-wave backhaul could meet the requirements of 5G deployment. Building on a previous white paper, our Group Report on 5G Wireless Backhaul/X-Haul gained extensive industry and media interest.

It is anticipated that communication links in the V-Band will be used for access and transport applications, including street level connectivity, urban/suburban fixed broadband residential access and business connectivity. We thus published a Group Report presenting a 3D ray-tracing interference analysis based on an urban scenario.





Satellite Communications

Satellite technology plays a key role in delivering services such as direct-to-home TV and mobile, high-speed Internet access and location services. It is particularly useful for rural and outlying regions, where it is difficult to deploy other systems on a commercial basis.

Our Satellite Earth Stations and Systems committee (TC SES) continued its work on the development and revision of Harmonised Standards for satellite earth station fixed terminals or terminals on the move, whether in an aircraft, on board a ship or in a vehicle. Throughout the year we actively pursued compliance of our Harmonised Standards with the Radio Equipment Directive.

In 2018 we published a technical analysis on the Radio Frequency, Modulation and Coding for Telemetry Command and Ranging (TCR) of Communications Satellites.

Work progressed in other areas, including revisions to existing standards and specifications on performance and test specification requirements for GNSS location systems; radio spectrum access for indoor and outdoor satellite receivers; Mobile Earth Stations (MES) narrowband user equipment; and a study on Vehicle-Mounted Earth Stations (VMES) operating in the 14/12 GHz bands; Tracking Earth Stations operating in the 11/12/14 GHz bands; Satellite Earth Stations on board vessels; and Low Bit Rate Data Communications (LBRDC) below 1 GHz using Low Earth Orbiting satellites.

Work Progressed on the integration scenarios for satellite in 5G and the associated architectures. We also initiated a new technical analysis of configuring satellite networks to integrate edge delivery in 5G systems.

Mobile Standards

Our Mobile Standards Group (TC MSG) provides the regulatory standards needed to support the deployment of GSM, UMTS, LTE, NB-IoT and NR networks in Europe.

In 2018 we aligned our ENs on International Mobile Telecommunications (IMT) cellular networks with 3GPP Release 13, adding major new features such as Narrowband IoT, Licensed Assisted Access, Machine-Type Communications and new bands for carrier aggregation. This will enable operators to introduce these new features in mobile networks, paving the way for the future development of 5G technologies. We progressed our work on the three parts on base stations in this multi-part Harmonised Standard and made significant progress on the two other parts related to User Equipment, while initiating new work to add support for the Active Antenna System Base Station type. We have also created work items on new parts to cover 3GPP NR Base Stations (BS) and User Equipment (UE), up to and including 3GPP Release 15.

Work continued on a new technical report exploring the possibility of sharing the 6 425 - 7 125 MHz band between incumbent services and Mobile/Fixed Communication Network (MFCN) services.

In addition MSG produced two testing standards for eCall. One is dedicated to prose test specification of end-to-end and in-band modem conformance testing updating conformance requirements for different codec and radio conditions. The other provides guidelines for assessing conformity of eCall IVS devices with regards to essential performance requirements. The resulting test reference are provided as a guidance for device suppliers and integrators to carry out conformity and essential performance requirement.



Unlimited Access

Powering tomorrow's networks

Today's consumers demand communications services that are easily accessible and available everywhere, on whatever device they are using. Technically, this means networks must converge while becoming smarter and more sophisticated. At ETSI we provide a comprehensive set of standards for access network technologies.

Network Functions Virtualization

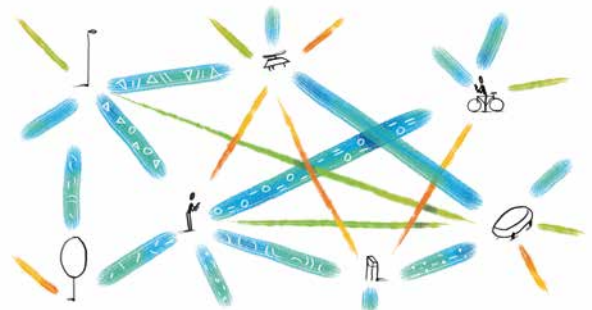
A key enabler for the success of 5G – and of equal application with other telecoms network architectures – Network Functions Virtualization (NFV) mirrors common IT industry practices by consolidating heterogenous, hardware-based infrastructures onto standard servers, switches and storage. Simplifying roll-out of new services while reducing both deployment and operational costs, NFV has become an essential element of modern network design.

With the support of over 300 organizations, the goal of our Industry Specification Group (ISG) on NFV is to create flexible specifications that can accommodate today's and tomorrow's network requirements. During 2018 the group continued work on NFV Release 3 that builds on previous iterations in several significant areas.

Structured around a continuous delivery process with successive “drops”, it addresses information modelling, end-to-end multi-site services management, network slicing, cloud native, acceleration technologies, charging and billing, security, licensing, reliability, testing and policy management.

Collaborating with our Centre for Testing and Interoperability (CTI) team, ISG NFV continued to build on the success of previous well-attended Plugtests™ events with the organization of the 3rd NFV Plugtests event, co-located with the OPNFV Plugfest, in our headquarters.

Open collaboration with other standardization bodies and with Open Source projects remained a priority. We continued close co-operation with other ETSI groups including ISG MEC and ISG ZSM). We also maintained close links with the Open Source NFV Management and Orchestration (OSM) and Open Platform for NFV (OPNFV) Open Source projects. Our participation continued in other Open Source projects including OpenStack and the Open Networking Automation Platform (ONAP).



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. To accelerate standardization, our Open Source MANO group (ETSI OSM) is developing a software implementation example for the ETSI NFV MANO.

OSM is a community-driven initiative that aims to deliver a production-quality open source MANO stack aligned with ETSI NFV Information Models. In July 2018, OSM welcomed its hundredth participating organization,

“OSM Release FIVE delivers new features which are vital to realizing the 5G vision. Enhanced features – such as information model extensions to support network slicing, powerful inter-datacentre connections and extensive improvements to monitoring and policy modules – will further enable service assurance and closed loop automation.”

Pål Grønsund, OSM Vice Chair



with this figure passing 110 by the end of the year. Published in December, OSM Release FIVE – available at osm.etsi.org – marked a significant step towards 5G network deployments. Release FIVE extends OSM's capabilities beyond virtual domains, expanding them across transport networks; as well as physical and hybrid network elements. It also embraces a new micro-service architecture, making it ideal choice for 5G scenarios, distributed/Edge deployments and a wide range of Network as a Service (NaaS) offerings. Other 5G-friendly features include support for network slicing; dynamic creation of inter-datacentre connections across heterogeneous Wide Area Networks and extended monitoring capabilities.

Open Source collaboration is also a hallmark of our popular Hackathons and Hackfest events that provide a platform for the IT development community to validate ETSI specifications through a series of live demonstrations and practical challenges. Following previous sessions for oneM2M, OSM and middlebox security, our first successful ETSI MEC Hackathon was held Berlin in September.

Collaboration with other projects and bodies remains a key aspect of our work. During the year we maintained close links between our NFV ISG and our Multi-Access Edge Computing (MEC) and Zero Touch Network and

Service Management (ZSM) ISGs and other bodies dealing with 5G technologies. We also collaborated with the Open Source NFV Management and Orchestration (OSM) and Open Platform for NFV (OPNFV) Open Source projects. This approach is illustrated by our agreement to organize joint interoperability events with OPNFV during 2018. We have also been involved with other Open Source projects including OpenStack – the reference open source implementation for cloud management – and the Open Networking Automation Platform (ONAP)

Multi-Access Edge Computing

A key enabler for 5G, Multi-Access Edge Computing (MEC) offers application developers and content providers cloud computing capabilities at the edge of the network. This environment is characterized by ultra-low latency and high bandwidth, as well as real-time access to radio network information that can be leveraged by applications.

MEC lets operators open their Radio Access Network (RAN) edge to authorized third-parties, allowing them to deploy innovative applications and services towards mobile subscribers, enterprises and vertical segments. Our Multi-access Edge Computing Industry



“Our first MEC Hackathons have revealed a wealth of talented teams who have shown the benefits that can be gained today from utilising the MEC platforms and MEC APIs in edge computing applications. This provides a valuable snapshot, but the most encouraging news is that these teams and others are continuing to create interoperable systems that will bring the full benefits of MEC to emerging 5G services.”

Dario Sabella, Secretary, ISG MEC



Specification Group (ISG MEC) creates a standardized environment that allows seamless integration of applications from vendors, service providers and third-parties across multi-vendor MEC platforms.

During 2018 we continued our use of Proofs of Concept to demonstrate the viability of MEC implementations, channelling results of this work back into ETSI's specification activities. The group's increased emphasis on implementation issues was reflected in further work on testing and compliance. Another focus was interoperability, with the group's first MEC Hackathons series in October gathering developers in Beijing, Berlin and Turin to test applications with ETSI's MEC APIs. Planned integration with ETSI's Network Functions Virtualization activities was demonstrated by active collaboration with ISG NFV during the year.

Zero Touch Networks

Tomorrow's 5G operators will face the challenges of dealing with increasing complexity, new services and support for a far greater number of devices. Maximizing the efficiency of end-to-end network operations will require increased automation of functions from configuration and capacity management to fault management that are currently administered with direct human intervention.

Our ISG on Zero Touch Network and Service Management (ZSM) is examining requirements for tomorrow's 'zero touch' networks, with the ultimate goal of achieving 100% automation of all operational processes and tasks, from delivery and deployment to configuration, assurance and optimization. 30 companies attended the group's kick-off meeting in January 2018, with membership growing to 65 participants during the year.



Initial activities centred on development of a ZSM architectural framework to enable zero-touch automated network and service management in a multi-vendor environment. Work also focused on end-to-end network slicing management and orchestration, as well as on the ZSM landscape report surveys taking place in other organizations.

We made progress on the means of achieving automation and zero-touch network management, while analyzing implications on design of the ZSM framework architecture and their utilization as a basis for future ZSM compliant solutions. We also developed an initial review of areas with the highest impact for automation, highlighting the vital role of several key means, such as intent-based modelling and orchestration, network governance and network coordination.

Augmented Reality

Our Industry Specification Group on Augmented Reality Framework (ISG ARF) is defining an interoperability framework for Augmented Reality (AR) applications and services, enabling players in the chain to offer part of an overall AR solution and thus avoid market fragmentation.

The group's membership grew rapidly during 2018, increasing from four to eighteen members by the end of the year. Activity was structured around three work items. The first analyzes the standards landscape, identifying the role of existing standards relevant to augmented reality from various standards setting organizations. The second seeks a deeper understanding of typical AR use cases with an initial focus on industry 4.0. This was supported during the spring with an online survey to collect insights into the planned uses for – and challenges faced by – this emerging technology. Full findings of the survey will form the basis of a report due to be published in 2019.

Our third work item considers a modular reference architecture that will form the basis of the interoperability framework. Two well-attended workshops were organized in Berlin and Paris to collect requirements from industry and gain initial feedback on the proposed interoperability framework.

Future Networks

Our Network Technologies committee (TC NTECH) is responsible for the standardization of detailed architecture and protocol specifications for use in networks, spanning service interconnection and network interconnection as well as future network technologies.

In 2018 we revised a Technical Report examining options – with actual use cases – other than telephone number mapping (ENUM) for number portability.



As part of our activities on the maintenance of network specifications, we performed essential corrections to a published ETSI Standard on the use of the Diameter protocol to access location information in access networks.

Another area of activity was autonomic management, developed by our Working Group on the Evolution of Management towards Autonomic Future Internet. We published a Technical Specification defining the Generic Autonomic Network Architecture (GANA) as an architectural reference model for autonomic networking, cognitive networking and self-management. In addition, our ETSI Specialist Task Force working under TC NTECH finalized its report on the application of the GANA reference model onto the Broadband Forum architecture.

We were involved development of a Technical Report (TR) outlining the business drivers for autonomic networking, together with another TR providing guidelines to instantiating the GANA reference model onto target implementation-oriented reference architectures.

We also studied autonomy and self-management in the IP Multimedia Subsystem (IMS) architecture, developing a TR on instantiation of the GANA reference model onto the IMS architecture. Working with the EC-funded WISHFUL Project, WG NTECH AFI continued work on a TR that will provide a mapping to the GANA model of the architectural components.

During the year, WG NTECH AFI activities migrated to TC INT, our Core Network and Interoperability Testing committee that produces specifications to facilitate the implementation of Internet Protocol (IP) based

networks that can carry both fixed and mobile services simultaneously.

Also in the area of future networks, our ISG on IPv6 Integration (ISG IP6) published a Group Report on IPv6-Based 5G Mobile Wireless Internet, outlining technology guidelines, benefits and challenges of implementing IPv6 in 5G.

Next Generation Protocols

The TCP/IP (Transmission Control Protocol/Internet Protocol) suite can no longer provide the scale, security, mobility and ease of deployment required for the connected society of the 21st century. Developments

“Current IP protocols for core and access networks need to evolve and offer a much better service to mobile traffic than the current TCP/IP-based technology. Our specifications offer solutions that are compatible with both IPv4 and IPv6, providing an upgrade path to the more efficient and responsive system that’s needed to support 5G.”

John Grant, Chairman, ISG NGP



in the technology of local access networks will not deliver their full potential unless, in parallel, the communications and networking protocols evolve.

Our Next Generation Protocols Industry Specification Group (ISG NGP) is exploring a future landscape of more efficient networks that are truly responsive to the user – whether that’s an individual person or millions of connected devices in the Internet of Things (IoT). Offering a forum to share research and results from trials, the group also provides a platform for the 5G and Internet communities to engage in a complementary and synchronized modernization effort.

In 2018 we developed a number of Group Specifications and Group Reports. These included identity-oriented networks, intelligence defined networks, mobile deterministic networking, new transport technologies and KPIs to enable objective evaluation of the new protocols against operators’ requirements. We also published a specification of new packet forwarding for the user plane. This separates the process of path set-up from that of packet forwarding, allowing better communication between applications and the network regarding the level of service needed plus stronger security.

Experiential Networked Intelligence

The introduction of technologies such as Software Defined Networking (SDN), NFV and network slicing means that networks are becoming more flexible and powerful. The use of Artificial Intelligence (AI) techniques in the network supervisory and management system can help solve some of the problems of future network deployment and operation.

Our Industry Specification Group on Experiential Networked Intelligence (ISG ENI) develops standards that use AI mechanisms to assist in the management and orchestration of the network. ENI focuses on improving the operator experience, by adding closed-loop AI mechanisms based on context-aware, metadata-driven policies to more quickly recognize and incorporate new and changed knowledge, and hence, to make actionable decisions.

In 2018, the group completed the first phase of its work. Notably this included publication of Group Reports describing ENI use cases, capabilities and policies together with a definition of features, as well as Group Specifications regarding ENI requirements and Proof of Concept framework. During the year we also explored the development of an ENI architecture using AI techniques.

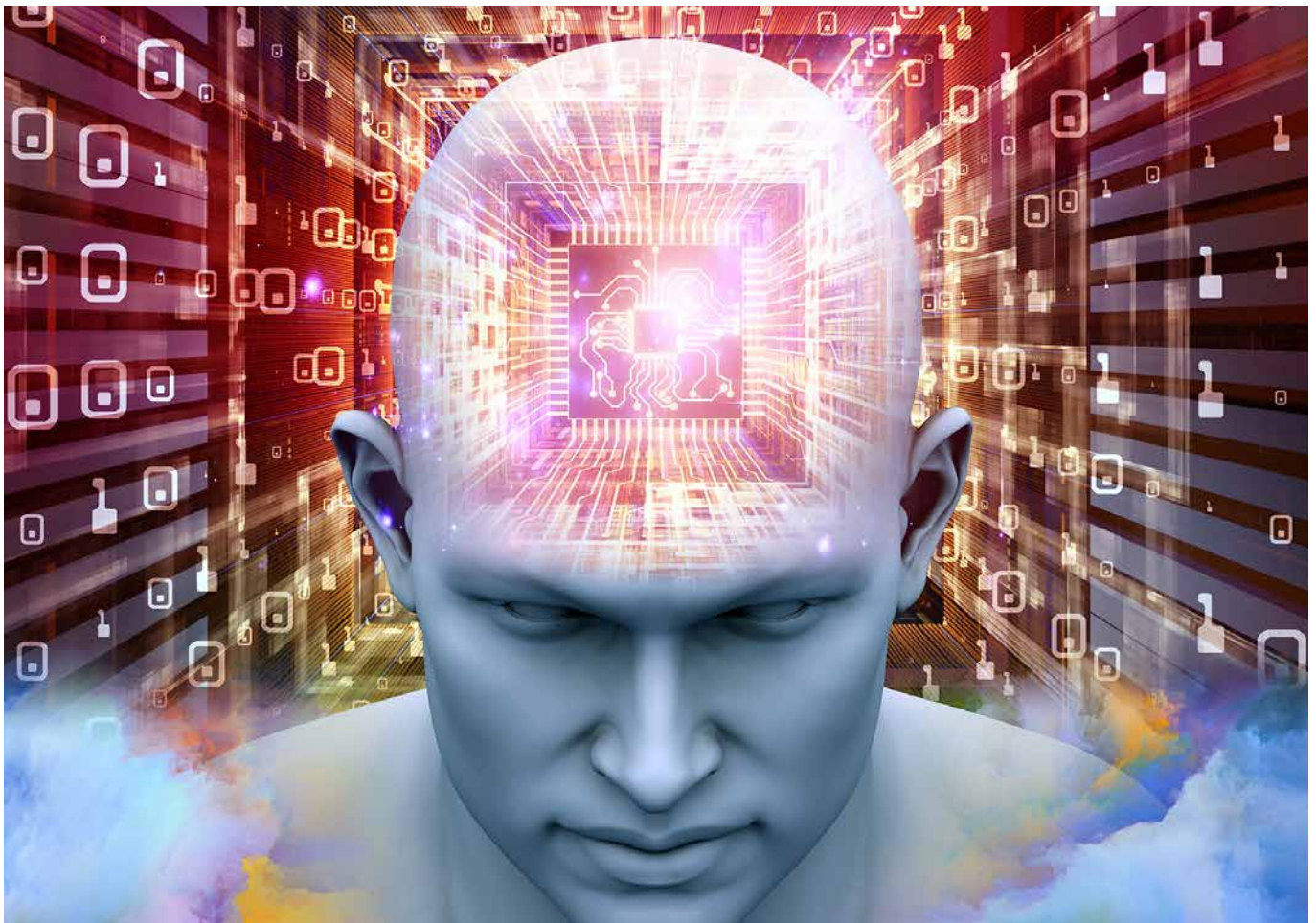
ISG ENI cooperates closely with H2020 (including 5G-PPP), including SliceNet, 5G-MoNArch and SHIELD projects. This work has resulted in proofs of concepts to demonstrate the network elasticity mechanisms with a special attention to AI/ML aspects; and how an AI-based network security management framework reacts to different types of threats.

The group communicated its achievements through participation at several events during the year. These included the first Zero Touch Automation Congress in Madrid (March 2018), the Open Networking Summit in Los Angeles (March); the Network Intelligence Forum in Beijing (September) and the SDN NFV World Congress in The Hague (October).

Cable

Our Integrated Broadband Cable Telecommunication Networks committee (TC CABLE) continued to work on standards addressing the evolution of broadband cable network capabilities.

In 2018, we focused on energy efficiency matters. Among other activities, we developed a European Standard defining global KPIs for the assessment of efficient energy use in broadband cable networks in response to mandate M/462. This was published in the first quarter of the year, with help of joint STF 516 (with TC EE and TC ATTM) that was established to address M/462 Phase 2.





Greater Wellbeing Encouraging healthy, independent lifestyles

eHealth has the potential to improve the quality of healthcare, reduce operational costs and foster independent living. However its implementation relies on giving citizens wider access to services such as telecare and telemonitoring. Standards thus have a key role in enabling interoperability to assist the development of new eHealth products and the growth of telemedicine.

eHealth

In 2018 our eHEALTH project strengthened cooperation with other ETSI committees – notably TC CYBER, TC SmartBAN and TC SmartM2M – in mapping latest eHealth developments to areas including security, privacy, safety and SAREF, our Smart Applications REFerence ontology.

A notable output of this activity was a White Paper to raise awareness of eHealth and demonstrate the need for standards to support the rapid development of technology-driven medical services.

eHEALTH also focused its attention on the EHR (Electronic Health Records) requirements as described in the European Commission's 2018 Rolling Plan for ICT Standardization Action Plan that was published in March. This led to the creation of a new work item on eHEALTH data recording requirements, where activity is ongoing.

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).

Working with CEN and CENELEC, in 2018 we published a new version of the European standard on accessibility requirements for ICT products and services that now includes the design of websites and mobile applications. This addresses people with limited cognition, vision issues, hearing or vocal disabilities as well as those with limited manipulation, strength or reach capabilities.

The updated standard aligns European requirements with W3C's Web Content Accessibility Guidelines. It serves as the primary document to show conformance with essential requirements of the European Web Accessibility Directive (WAD) which applies to public sector websites from September 2019. The standard summarizes technology-neutral requirements that device and service designers must fulfil to make their products accessible to the widest possible range of users.

Work neared completion on user-centred terminology for existing and upcoming ICT devices, services and applications. An ETSI Guide has been produced to extend the terminology and address languages other than English. We also launched work on a new report to assess the needs of citizens that smart city standardization in the ICT domain must address – including accessibility, usability, personalization, interoperability and personal data protection.

ENERGY EFFICIENCY, SUSTAINABILITY AND EQUIPMENT SAFETY



Living with ICT

Simpler, safer, more sustainable products and services

Technology is transforming the way we communicate – at home, at work and on the move. While it has opened up exciting new opportunities, we must be careful to minimize any adverse social consequences. Our work at ETSI includes 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). The ultimate goal is to ensure that ICT improve the quality of life for all.

Enabling Energy Efficiency

Our Environmental Engineering Committee (TC EE) defines engineering, bonding and grounding, power supply and environmental aspects for telecommunication infrastructures and equipment. Working with CENELEC, our activity supports EC policies and legislation.

During 2018 we completed work in support of EC Mandate M/544, revising the standard on eco-design requirements for the network standby mode of interconnected household and office equipment.

Work progressed with CEN/CENELEC JTC10 in response to Mandate M/543 on material efficiency, including publication of a Technical Report (TR) titled 'Definition of approaches, concepts and metrics for the Circular Economy'.

We continued to develop standards in support of EC Mandate M/462 in collaboration with ETSI's ATTM and Cable committees. We progressed work on energy efficiency KPIs for Radio Access Network equipment, for the application of Network Functions Virtualization (NFV) in ICT networks.

Our Working Group on Eco Environmental Product Standards (EEPS) published three Technical Reports (TR) on the energy efficiency of Radio Access Networks.

These cover a study on metrics to evaluate energy efficiency for future 5G systems; best practice to assess energy performance of future Radio Access Network (RAN) deployment; and an energy estimation method based on a statistical approach of Mobile Networks. Work also progressed on measurement of the energy efficiency of wireless access network equipment, taking into account dynamic traffic loads.

Co-operating with ETSI's NFV Industry Specification Group (ISG NFV), we made good progress on an ETSI Standard to define appropriate methods for NFV energy efficiency, and the extension of the standard on the 'Green Abstraction Layer' to NFV applications.

Our working group on environmental matters associated with mobile Information and Communications Technologies (ICT) devices (WG M-ICT) continued its work on a new TR analysing methods for the assessment of the environmental impact of Smart Phones.

We revised European Standards for environmental classification and tests for telecommunication equipment. In July we published the standard for the test methods for stationary use at non-weather protected locations. Work also progressed on standards for equipment installed in weather-protected locations, plus further standards for underground location and portable use. These revisions clarify the applicability of tests and performance criteria, while taking into account the climate change parameters.

We completed a Technical Specification on liquid cooling for ICT equipment, plus a new Technical Report on the study of test methods and the test severity of mechanical aspects for equipment installed on poles and towers. Both deliverables are to be published.

Work continued on a series of standards addressing requirements for ICT equipment connected to a 400 V DC or AC power source. Two new deliverables were published: an ETSI Standard on interfacing of renewable energy or distributed power sources to 400 V DC distribution systems, and a specification on the impact on ICT equipment architecture of multiple AC, -48 V DC or up to 400 V DC inputs.

Deliverables of our WG EE2 working group were prepared in co-operation with ITU Study Group 5. Another work item initiated with ITU-T SG5 was a new standard on management of the migration of telecommunication site installations from existing -48 V DC power distribution to 400 V DC working. WG EE2 also revised two European Standards for equipment powered by 48V DC and 230 V AC.

With ITU-T SG5, we progressed three new specifications on the evolution of battery technology for use with stationary ICT and telecommunication equipment. This has implications for smart cities and other applications reliant on batteries used in conjunction with alternative power sources.

Sustainable Networks

ETSI's Access, Terminals, Transmission and Multiplexing committee (TC ATTM) addresses the operational and physical parts of Information and Communications Technologies (ICT). The committee works closely with our ISG on Operational energy Efficiency for Users (ISG OEU), sharing the aim of improving efficiency of ICT services and increasing energy efficiency in operational networks and devices, as well as improving the management of ICT waste. We also collaborate with CEN and CENELEC in areas of shared interest via the Installations and Cabling Co-operation Group.

In 2018, the committee maintained its focus on sustainable smart cities and rural areas, as well as the green needs of operational networks and the efficient energy management of broadband transmission. We delivered a set of KPIs – published in five European Standards – supporting the deployment of eco-efficient networks and sites, and to monitor the energy management of deployed broadband. These provide ICT users with tools to check compliance with the Kyoto Protocol on climate change and the reduction of greenhouse gas emissions. These published ENs will be complemented by TS documents that are currently in production.

TC ATTM's work in this area supports European Commission (EC) Mandate M/462 on efficient energy use in fixed and mobile information and communication



networks. With the help of an EC-funded ETSI Specialist Task Force, TC ATTM has begun upgrading these standards and specifications with the aim of publishing them as ENs supporting potential new legislation related to the development of efficient ICT products and components.

We continued to develop a multipart specification on broadband deployment and energy management. At the end of 2018, the committee had issued a first version of a subpart on city individual terminals, outlining processes to improve energy efficiency and common infrastructure and to ease the deployment of smart new services such as IP networks in digital multiservice cities. We also published an update of the part on operator sites and data centres, together with further subparts on multi-tenant premises and single-tenant homes.

In the area of fixed radio systems, TC ATTM concluded its revision of Harmonised Standard (HS) for multipoint equipment in line with the Radio Equipment Directive (RED), aligning an EN on multipoint antennas accordingly. Reflecting the new approval procedure, the draft was submitted to the EU Commission Consultants for technical review.

After the previous year's publication of the Harmonised Standard for Point-to-point for RED in the Official Journal of European Union (OJEU), we made revisions to the HS for introducing new applications in the 80 GHz band.

Work progressed on new millimetric wave bands in the range 92-174,8 GHz, and new channel aggregation systems in preparation for 5G network needs.

We revised our Technical Report on guidelines for EM field evaluation in proximity of parabolic antennas currently used in Point-to-point stations.

At the request of the ITU-T and the Broadband Forum, ETSI is leading work on the standardization of Reverse Power Feeding. The latest version of this Technical Specification was published in June 2018. Following a request from the Broadband Forum, work also began on a sub-part of this specification covering Reverse Power Feeding over coaxial cable.

Work on VDSL2 (Very-high bit-rate Digital Subscriber Line 2) is now at a mature phase in the ITU-T and the Broadband Forum. We have closed our work on this topic, but will maintain liaison with both organizations in relation to xDSL technologies in the twisted pair copper access network.

Based on our standard defining a global KPI for ICT sites, we published a European Standard (EN) on Data processing Communication Energy Management (DCEM). In parallel, we published a series of ENs on global KPIs considering general and specific requirements on ICT sites, fixed and mobile broadband access networks. The same work on broadband



deployment networks resulted in the publication of an EN on generic aspects, ICT sites and customer network infrastructures on homes.

We published an EN on broadband deployment and lifecycle resource management for the end of life of ICT equipment, based on a position paper by ISG OEU.

We developed a new Technical Specification on single mode optical fibre systems for home cabling, aligning the content and the terminology with recently published CENELEC standards.

Towards efficient ICT

Closely co-ordinating its activities with TC ATTM, our Industry Specification Group on Operational energy Efficiency for Users (ISG OEU) addresses a range of eco-efficiency issues, including the power consumption and greenhouse gas emissions related to infrastructure, equipment and software within ICT networks and sites such as data centres and central offices. Supporting EC Mandate M/462 on efficient energy use in fixed and mobile networks, the group brings together a broad cross-section of industry interests including transportation, finance and smart cities.

In 2018 we issued a Group Report on energy efficient IP video surveillance systems. This considers the reuse of existing coaxial cabling for efficient remote powering over the same cable, the extension of coaxial networks



to accommodate additional devices, and the use of long cables over 100m without requiring repeaters.

Work progressed on a new set of Group Specifications for smart cities. One defines global Key Performance Indicator (KPI) modelling for green smart cities, covering both residential and office environments. A second describes guidelines for the study of green smart transportation.

ISG OEU is defining carbon equivalent emission level for ICT sites in order to support monitoring of their carbon footprint. Work also continued on a Group Report supporting implementation of the new European Standard on ICT waste management.

During the year we supported the organisation of ETSI Plugtests™ events on IP video surveillance systems and in-building transmission systems.

Telecommunications Equipment Safety

ETSI's Safety committee (TC SAFETY) monitors developments in electromagnetic fields (EMF), electrical safety and safety in cable television systems.

While the committee does not normally write standards, its primary role is as an information exchange, collecting information from other bodies including CENELEC, IEC and the EU and distributing to ETSI

members. It also works closely with other international standards organizations to establish, where possible, globally-applicable standards for telecommunications equipment safety and to avoid duplication of effort.

In 2018 TC SAFETY's activities focused on implementation of the Radio Equipment Directive, working with CENELEC to review current EMF standards in the light of changes brought about by the RED.

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. The committee also liaises with organizations outside ETSI, such as the International Telecommunications Users Group (INTUG).

In 2018 work progressed on a project on user-centric approach in the digital eco system, a series of Technical Reports and an ETSI Guide taking into account the impact of digital ecosystem evolutions on users.

We published a Technical Specification that provides a reference for operators and service providers to check and improve the quality of their metering and billing processes.



Leading the Journey Smarter ICT on the move

Information and Communications Technologies are revolutionizing the transportation sector, increasing efficiency, reliability and safety while reducing energy consumption.

ETSI supports road, railway, aviation and maritime transportation with activities which are carried out by key industry players and therefore reflect true market demand.

Road Transport

Road vehicles will soon share information and interact directly with each other – and road infrastructures – through Co-operative Intelligent Transport Systems (C-ITS) that will significantly improve road safety, traffic efficiency and driver comfort.

Our ITS Technical Committee (TC ITS) is leading the drive to global standards that will support applications including road safety, traffic control, fleet management and location-based services, driver assistance, hazard warnings and assistance to emergency services. As well as developing standards related to the overall communication architecture, management, security and conformance testing, we are also closely involved in related spectrum requirements for ITS.

In response to M/453 on C-ITS systems and M/546 on Urban ITS, in 2018 we launched work on specifications for the cooperative ITS Vulnerable Road Users (VRU) service.

Interoperability and conformance are key elements in the successful deployment of ITS. Accordingly we published a series of test specifications covering ITS V2X use cases, High Data Rate (HDR) transmission equipment operating in the 5,8 GHz ISM band, and conformance testing for ITS security.

Work progressed on a pre-standardization study, addressing modification of the ITS architecture to accommodate multiple radio access technologies with guaranteed backward compatibility.

We published a suite of Technical Specifications related to C-V2X technologies. These addressed congestion control mechanisms; access layer for ITS using LTE V2X communication in the 5,9 GHz band; and amendments to the Geonetworking ENs.

Progress was also made on topics including Collective Perception Services, Cooperative Adaptive Cruise Control, Platooning and Security Improvements.

In parallel with the work of TC ITS, our ERM committee (TC ERM) develops standards for both Automatic Cruise Control (ACC) radar and anti-collision radar. In 2018 we continued to review receiver technical requirements, parameters and measurement procedures for Automotive and Surveillance Radar Equipment.

The 9th ETSI Workshop on Intelligent Transport Systems (ITS) was hosted in March by the Federal Ministry of Economic Affairs and Energy in Berlin, Germany.

Sessions covered technical, regulatory and testing aspects of deploying standardized technologies; hybrid solutions combining cellular technology with short range C-ITS communication technology; and next steps from initial deployments to higher degrees of automation.

Railway Communications

The international railway community has long used enhanced GSM™ technology. Now there is a need to address the harmonized telecommunication requirements for tomorrow's railway systems.

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, including data and voice communications at very high speeds. Collaborating closely with the rail industry in Europe and throughout the world, we also liaise with 3GPP on defining requirements for the Future Railway Mobile Communication System (FRMCS). TC RT also works in cooperation with TC ITS to investigate sharing the 5GHz frequency for urban rail and Intelligent Transport Systems.

In 2018 work progressed with 3GPP on use cases and requirements for FRMCS. Cooperation continued with TC ITS on developing a Technical Report covering use of the 5 855-5 925 MHz band by ITS and Urban Rail applications. We published a revision of the European Standard related to the requirements for GSM operations on railways, as well as a Technical Report on LTE radio performance simulations and evaluations in the rail environment.

During the year we attended the JPC rail coordination group as well as the Rail Standardization Coordination Platform for Europe (RASCOP). Held in July, our second ETSI Workshop on Developing the Future Radio for Rail Transport attracted more than 100 attendees.

Aviation

Our Aeronautics group (TG AERO) focused its activities on three principal areas: the development of Harmonised Standards under the Radio Equipment Directive; the development of Community Specifications under the Single European Sky Interoperability Regulation; and development of Data Link specifications.

Work was concluded on Harmonised Standards for ground ATM equipment, including meteorological radars, primary surveillance radars (X band), A-SMGCS Multilateration and A-SMGCS X band sensors. Two further HS neared completion, covering Primary (L and S band) and Secondary Surveillance Radars Interrogators and Far Field Monitor.

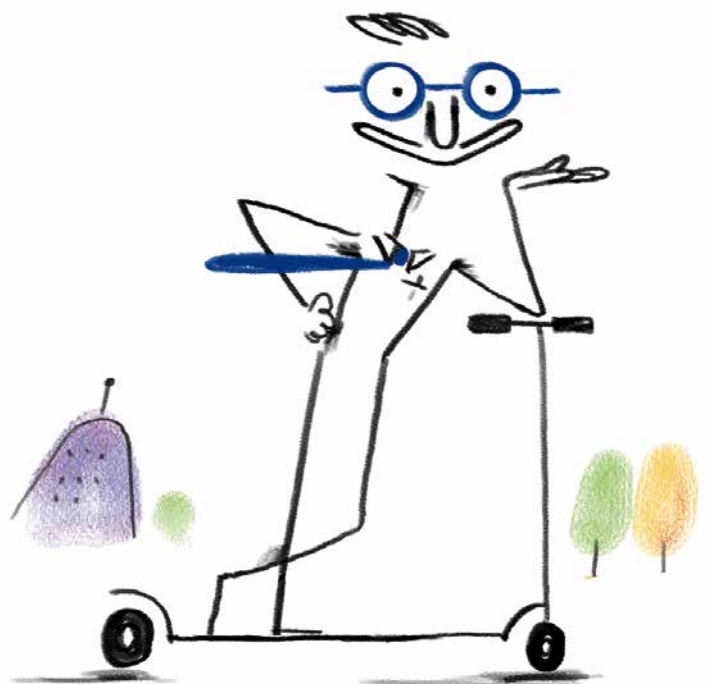
In response to Mandate M/390 and M/524 we worked on Community Specifications related to Advanced-Surface Movement Guidance and Control Systems (A-SMGCS) – a key element of AF2 (Airport Integration and Throughput) and of paramount importance for SESAR deployment.

We published a Technical Report on the evolution of Data Link – a key pillar in the SESAR deployment and a crucial aspect of the Single European Sky. Updates began on the Data Link Community Specification to align with latest developments including the ELSA (Enhanced Large Scale ATN deployment consortium) study.

Maritime

Our maritime group continued to update Digital Selective Calling (DSC) product standards, with work progressing on Bridge Alert Management systems and DSC radio equipment with remote control capabilities.

We published a Harmonised Standard related to Maritime VHF for use on inland waterways, and launched work on two new HS: one covering the radio link for maritime positioning systems and another on New Technology (NT) radars for waterways.



PUBLIC SAFETY & MISSION CRITICAL COMMUNICATIONS



Mission Critical Communications for public safety

Public safety is enhanced by rapid and efficient communications, either via secure, resilient public networks or platforms such as Professional Mobile Radio. The ubiquitous smartphone plays its own important role in public safety, allowing an emergency number such as 112 or 911 to be dialled directly, even when the keypad is locked or no SIM card is present. Much of our work relates to Public Safety and the need for emergency communications in scenarios ranging from minor road traffic accidents to major incidents such a passenger train crash, terrorist incidents or natural disasters such as an earthquake or tsunami. Our work also embraces standards for maritime safety equipment, Personal Locator Beacons (PLBs) to alert emergency rescue services and mechanisms for road safety through the use of Intelligent Transport Systems.



TETRA and Critical Communications

TETRA (Terrestrial Trunked Radio) is the leading technology choice for critical communications users. With a projected 5 million terminals in use by 2020, the use of TETRA in security as well as other business-critical markets such as the transport, military, commercial and utilities sectors is forecast to grow by 15% annually up to 2023.

Much of the work of our TETRA and Critical Communications Evolution committee (TC TCCE) is driven by the requirements of Public Protection, Disaster Relief and other mission-critical services. In 2018 we revised several standards and specifications in response to feedback from manufacturers and users. These included publication of fifteen TS relating to interworking at the inter-system interface (ISI) between two TETRA systems.

Originally a narrowband system, TETRA today cannot support the growing demands of emergency services for additional Mission-Critical capabilities such as streaming high-quality video from the scene of an accident. Reflecting these evolving needs the community of TETRA users asked 3GPP to determine how this functionality can be realized using LTE™ or 5G systems running over both public network operators' licensed spectrum as well as over dedicated private spectrum. We have thus explored 'hybrid' methods to integrate TETRA into current broadband solutions. To optimize the standardization process, existing standards for technologies such as LTE and 5G are being enhanced to make them suitable for Mission-Critical applications.

In response to feedback from 3GPP, we revised specifications covering the mobile-to-network interface architecture of a critical communications application operating over a broadband IP interface. Work also progressed on a specification for the mobile-to-infrastructure interface.

Work meanwhile continued on encapsulating TETRA speech coding, packet format and rate, end-to-end encryption synchronization and secure key management messaging for use in 3GPP Mission-Critical Push-To-Talk (MCPTT) over LTE systems.

Reflecting evolution of the public safety sector, we renamed our Mission Critical Push To Talk (MCPTT) testing programme as the MCX testing programme, embracing Talk, Data and Video.

Emergency Calling and Alerting

The work of our Emergency Telecommunications Special Committee (SC EMTEL) focused on emergency applications for smartphones, networks for emergency services, IoT devices in provision of emergency situations and the European Public Warning System (EU-ALERT).

In March we published a new specification on the requirements, functional architecture and protocols for implementing the Pan-European Mobile Emergency Application (PEMEA) –a major step towards the realization of a pan-European 112 app on your smartphone. Currently there are hundreds of 112 related emergency calling applications in use across Europe, but their utility is restricted to the Public Safety Answering Point (PSAP) they are integrated with. This new specification enables interoperability between emergency apps within Europe and beyond, allowing individuals to continue using their preferred application while accurate location and other information provided by the app will be sent to the most appropriate PSAP.

We also progressed work on technical specifications for future networks dedicated to emergency services

(NG112), describing core elements and corresponding technical interfaces for network independent access to emergency services. We also progressed work on scenarios for interoperability testing of the core elements for independent access networks. These will include location-based and policy-based emergency call routing and network- or handset-derived caller location as well as legacy, enterprise/campus, and IMS-based access networks.

IoT technologies will soon be a major feature of services for emergency support. During the year we established a new Task Force to explore the requirements for communications involving IoT devices in emergency situations, including communications between individuals and authorities/Organizations. This new group commenced work on its first deliverable, a report that draws on work already conducted in other projects such as oneM2M and 3GPP.

In October we hosted the second Joint EMTEL-ECC PT ES Workshop in Sophia Antipolis. The event allowed the two groups to explore complementary work areas, while bringing together stakeholders including regulators, operators, solution providers, emergency services and public safety users.

"We believe that all apps connecting citizens with the emergency services have to work no matter where the citizen is and what app he's using. To achieve this, these apps should be interconnected in a standardized way."

Cristina Lumbreras, Vice Chair, SC EMTEL

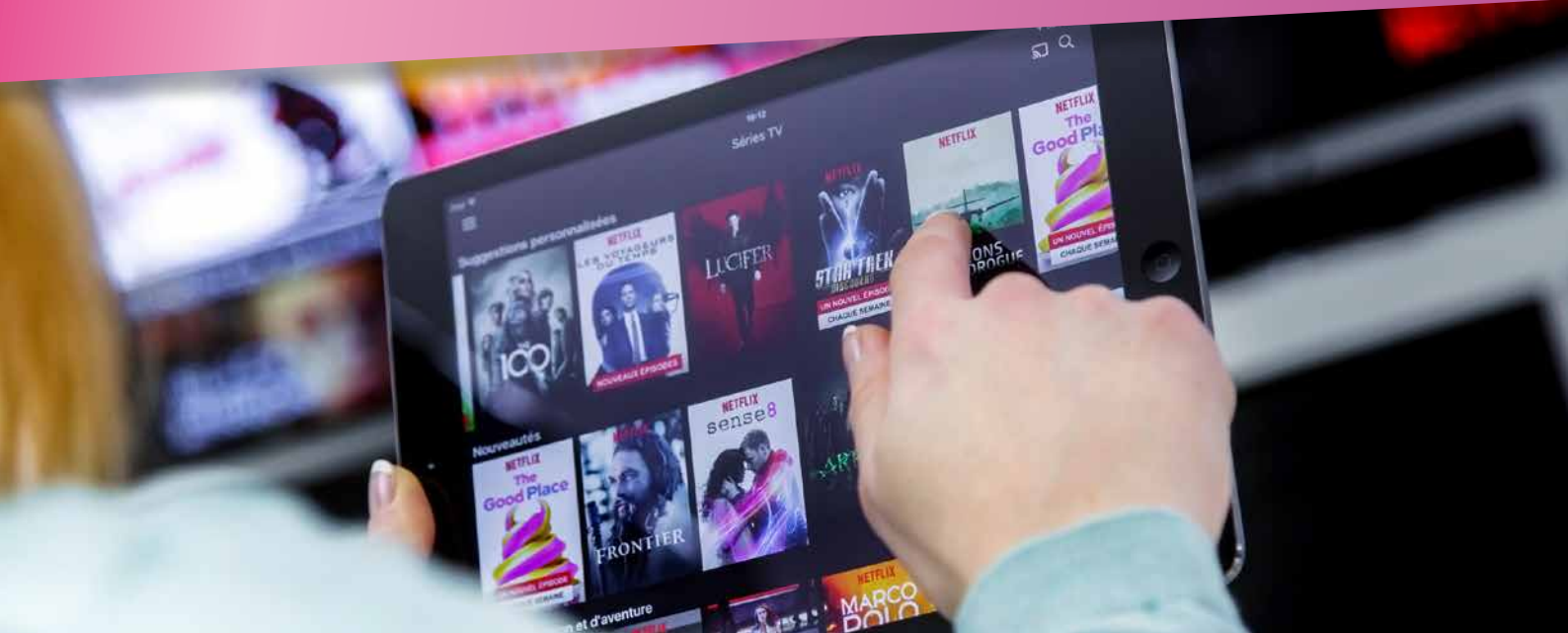


Professional Mobile Radio

Professional Mobile Radio (PMR) allows business users – such as taxi services – to keep in contact over relatively short distances with a central base station. It is also widely used by emergency services and other closed user groups. During 2018 we updated our Technical Report (TR) on Digital Mobile Radio, covering general system design, air interface protocol, data protocol, trunking protocol, and voice and generic services and facilities. We also continued to update our Harmonised Standard for access and sharing of channels for PMR service equipment, as well as updating our Harmonised Standard for Citizens' Band (CB) and a variety of land mobile radio equipment.

In addition, we are developing a Harmonised Standard covering broadband radio equipment for Public Protection and Disaster Relief, operating below 1 GHz.

BROADCASTING AND CONTENT DELIVERY



Sound and Image

Delivering quality content anywhere, any time

ETSI plays a leading role in the delivery of specifications for technologies that are used globally for radio, television and data broadcast. These specifications cover services delivered via cable, satellite and terrestrial transmitters, as well as by the Internet and mobile communication systems. Associated topics such as Ultra High Definition (UHD) TV and interactive television are also included. We collaborate with other partners in the broadcast domain, notably EBU (European Broadcasting Union), DVB (Digital Video Broadcasting), WorldDAB (Digital Audio Broadcasting), DRM (Digital Radio Mondiale), RadioDNS Hybrid Radio, TVAnytime and HbbTV (Hybrid broadcast broadband TV).

Broadcasting

JTC Broadcast is the Joint ETSI/EBU/CENELEC Technical Committee that co-ordinates the drafting of standards for broadcasting and related fields. As well as assessing work performed within other organizations, the committee is responsible for broadcast systems (emission-reception combination) for television, radio, data and other services via satellite, cable and terrestrial transmitters.

In 2018 we delivered several standards and specifications for Digital Video Broadcasting (DVB). Areas addressed included UHD TV, data broadcasting, service information and subtitling systems.

We published a Technical Specification (TS) document specifying the USB form factor for the second-generation Common Interface (DVB-CI Plus 2.0) that allows subscribers to view pay TV services without requiring a set-top-box. Also in the area of DVB, we published a specification for the DVB Single Illumination System (DVB-SIS) that combines direct-to-home distribution and digital terrestrial television contribution in a single satellite beam.

We published two TS on Hybrid Broadcast Broadband Television (HbbTV), covering operator applications and application discovery over broadband.

We completed a multi-part TS describing a high-performance single layer High Dynamic Range (HDR) system with direct backwards compatibility for use in consumer electronics devices.

We published a new TS covering delivery of DVB content services via HTTP adaptive streaming over IP networks using the MPEG-DASH profile. A further TS addressed High Dynamic Range (HDR) signalling and carriage of metadata in DVB compliant systems.

In the area of digital audio, we updated our TS on backwards-compatible object audio carriage using Enhanced AC-3, a widely used transmission format for channel-based audio content. We also published a two-part TS on the AC-4 format, considering coding, immersive and personalized audio.

We published a TS specifying a transport format for Higher Order Ambisonics (HOA) signals; these can deliver a significantly enhanced immersive sound experience compared with conventional stereo or 5.1 channel audio systems. A further TS described a point-source renderer associated with the DTS-UHD audio codec.

As digital radio continues to extend its coverage in Europe and the rest of the world, the JTC continued to maintain the digital radio standards for Digital Audio Broadcasting (DAB) and Digital Radio Mondiale (DRM). We also completed work on an Open Mobile Radio Interface (OMRI) Application Programming Interface (API). This can be used by application developers to gain access to broadcast radio tuners in consumer electronics devices such as smartphones and tablets.

Media Quality

Our Speech and Multimedia Transmission Quality committee (TC STQ) is responsible for standardization relating to terminals and networks for speech and media quality, end-to-end media transmission performance, Quality of Service (QoS) parameters for networks and services and Quality of Experience (QoE) descriptors and methods. With our Working Group STQ Mobile we work closely with 3GPP and collaborate with other standards organizations.

In 2018 we revised four specifications on transmission requirements for narrowband/wideband wireless terminals from a QoS perspective as perceived by the user. We also revised two related specifications on transmission requirements for super-wideband/fullband terminals.

With our Working Group STQ Mobile we published several deliverables, collaborating as needed with 3GPP SA as well as ITU-T Study Groups 12 and 16. Accordingly we published two new Technical Specifications. The first specifies methodologies for simulating reverberation conditions to be used for the measurement of communication devices.

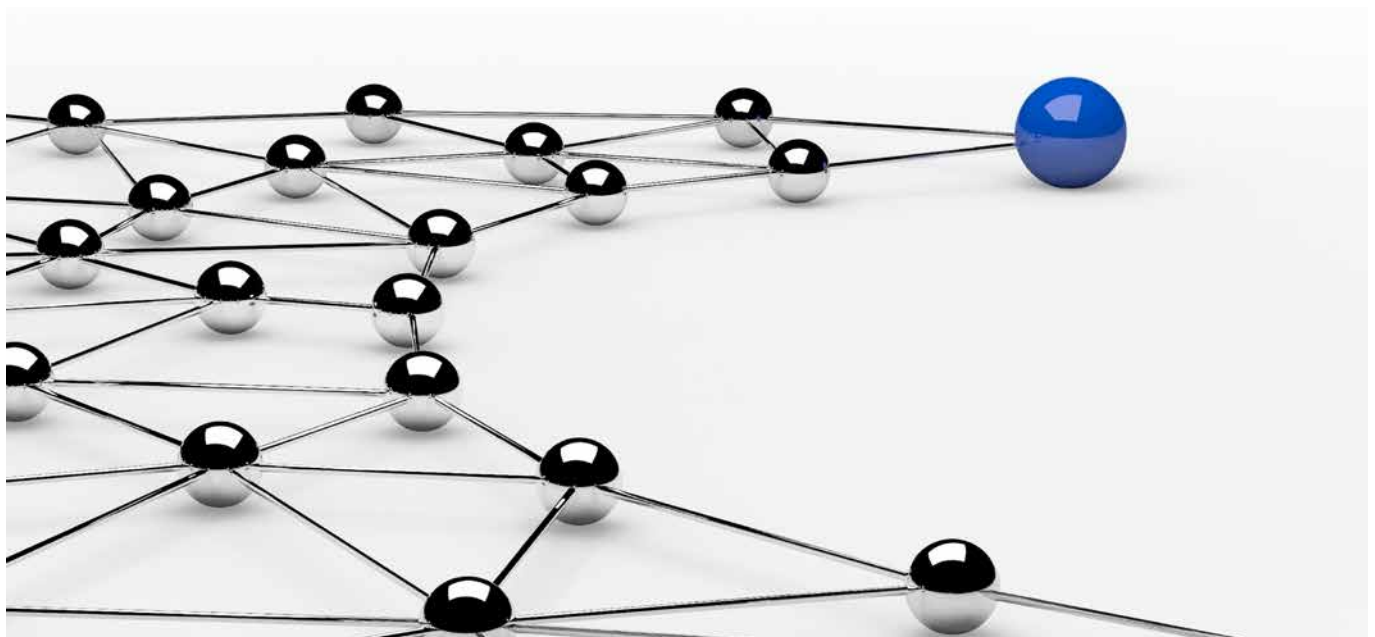
The second considers DTMF (Dual-Tone Multi-Frequency) transmission over VoIP using RTP (Real-time Transport Protocol) Telephony Events. A further Technical Report evaluates multimedia communication performance from the perspective of user under parallel physical and/or mental load.

STQ Mobile also revised several deliverables while publishing one new specification and four new reports. A TS which is an addition to the related multipart: Quality of Service (QoS) aspects for popular services in mobile networks; Part 8: Formalized definition of QoS parameters and their computation; Sub-part 1: General aspects and terminology. This sub-part specifies a consistent terminology for the formalized definition of QoS parameters and their computation.

The first Technical Report (TR) on Mobile Network Throughput Measurements Guidelines provides a holistic view of the measurement process, featuring a selection of methodologies as well as post-processing and data aggregation aspects. The second TR on multi-service testing provides a top-level approach which is also scalable with respect to new services. The third TR discusses QoS aspects of services related to the 5G ecosystem. The fourth discusses QoS aspects of services related to the Internet of Things (IoT) ecosystem from an end-to-end perspective.

TC STQ submitted a successful proposal for an ETSI funded STF (Specialist Task Force) on Methods for Objective assessment of Listening Effort (MOLE) based on subjective test data bases – MOLE Project Step 1. This activity will allow progress in developing the methodology regarding intelligibility for hearing impaired users.

Preparation started for a workshop on Emerging Services for Speech and Audio. Topics include smart home, voice assistant and IoT devices; the impact of super wideband and fullband on design, testing and optimization strategies; signal processing between voice commands and speech recognition; user perspectives on media and acoustic testing; and the impact of new 5G services.



TESTING AND INTEROPERABILITY



Confidence Guaranteed

Technical excellence lies at the heart of ETSI and is central to our members' aspirations. Products and standards evolve in parallel, requiring feedback in both directions. Pre-standardization activities, validation of standards and testing are a first-rate means for generating this feedback. They complement the creation of high-quality standards, enabling industry to produce innovative, interoperable and cost-effective products and services.

Testing and Interoperability

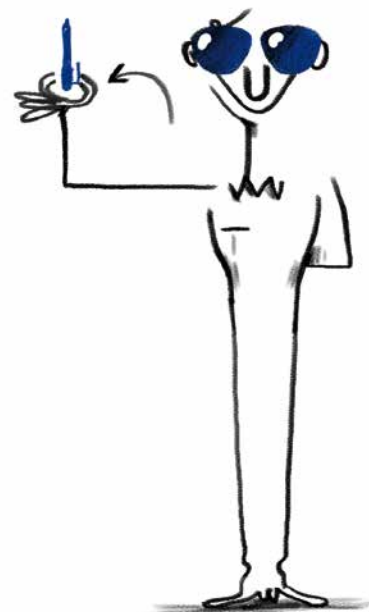
ETSI's Centre for Testing and Interoperability (CTI) supports our standardization groups in the use of best practices for the specification and validation of standards, the development of conformance and interoperability test specifications and the organization of developer events. Technologies that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

We also oversee early standardization Proofs of Concept and coordinate open software development related to the standards. During 2018 this work included the development of test specifications for open APIs developed by our MEC and NVF Industry Specification Groups that are maintained at ETSI's FORGE open source repository.

The year saw a continued focus on development of LTE/5G test specifications, keeping pace with 3GPP's own release schedule. Further highlights included our on-going series of interoperability events and hackathons that allow us to engage with developers who do not participate directly in our core standardization activities. Activities on oneM2M were complemented by events relating to critical and emergency communications. These included our second MCPTT Plugtests event, plus well-attended events for NG112 and eCall.

Find out more about our approach to testing and interoperability at:

www.etsi.org/images/files/Brochures/Intro-achieving-technical-excellence-brochure.pdf



Plugtests™

Our industry-leading Plugtests™ events allow organizations to connect standards-based equipment – ranging 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. To encourage wider participation, we are now rolling out a cloud-based testing platform that allows remote access.

Running for two weeks during May-June 2018, our NFV Plugtests event in Sophia Antipolis attracted over 45 organizations and 200 engineers. NFV implementers were able to interact remotely via the NFV HIVE (Hub for Interoperability and Validation at ETSI). The event was followed in September with the publication of our third ETSI NFV Plugtests™ Report.

The capacities of Mission Critical Push to Talk (MCPTT), Mission Critical Data (MCData) and Mission Critical Video (MCVideo) based on 3GPP Release 14 were tested in August at the second ETSI MCPTT Plugtests event in Texas, with 120 on-site participants plus support from remote labs. Observers witnessed execution of more than 2000 tests, based on a plan with more than 100 test cases.

In December, our third MCX Plugtests event included Mission Critical Push To Talk (MCPTT), MCData and MCVideo tests. Supported by TCCA and the EC, this remote-only event enabled vendors to connect via VPN with the HIVE. A hundred test cases were featured, based on 3GPP Release 14 and specifications developed during the first two Plugtests.



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 for testing and specification languages. Providing frameworks and methodologies that enable other ETSI committees to produce documents that are easy to understand and easy to use, the work of MTS is critical to the market success of numerous technologies.

In 2018 we continued to evolve and maintain our enormously successful testing language, TTCN-3. Object Oriented features were introduced to widen acceptance of the language and also support testing in new areas. The year meanwhile saw ETSI's Test Description Language (TDL) attracting attention from a growing user community within our membership and outside, with the TDL Open Source Project (TOP) serving as a key driver for this upsurge in interest. The mapping of TDL to TTCN-3 was published as an ETSI Standard, serving as a 'bridge' between the different approaches of both languages.

Held in Paris in October, the sixth ETSI UCAAT User Conference on Advanced Automated Testing (UCAAT) was organized with the support of TC MTS and the CTI. Under the banner 'Shaping the landscape of testing', this successful event gave users, service providers and vendors visibility of cutting-edge testing and automation methodologies across a wide variety of application domains including telecommunications, transport, healthcare, finance, broadcasting, smart grids, smart cities and the industrial IoT. Delegates discussed the increasing presence of AI, and the opportunities it brings to the entire testing community. In addition, the event reported on applications of methodologies and test languages standardized in ETSI, such as our own TTCN-3 and TDL.



PARTNERSHIPS

Succeeding Together



The Strength of Partnerships

Working with the European Commission

ETSI highly values its 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 2018 was continued development and production of candidate Harmonized Standards under M/536 in support of the Radio Equipment Directive. This continues to be a challenging task with ambitious targeted time schedules. To overcome difficulties encountered over the past three years in the assessment process, a new mechanism was put in place with the EC in the second half of 2018.

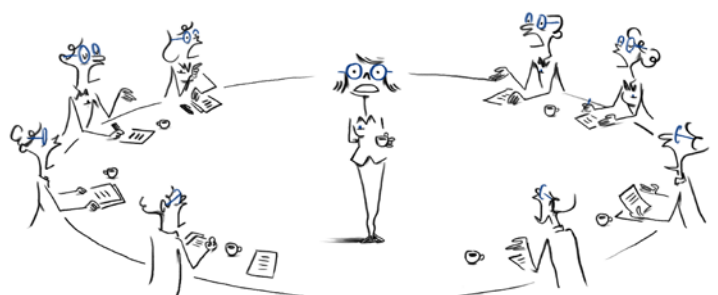
We continued work on a number of existing EC Standardization Requests. These included M/552 for Harmonized European Standards (ENs) in support of the new Electro Magnetic Compatibility (EMC) Directive, and M/554 in support of the Directive on the accessibility of the websites and mobile applications of public sector bodies. No new standardization requests were accepted in 2018.

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

In 2018 we participated in all meetings of the EC's Committee on Standards, as well as meetings of the Information and Communications Technologies (ICT) Multi-Stakeholder Platform. We regularly took part in meetings of the Task Force on the Rolling Plan for ICT Standardization and contributed to the drafts and final outcome for the anticipated ICT Rolling Plan 2019. We continued to attend as an observer at various Member State committees and their working groups.

Seconded Experts

ETSI is party to two cooperation projects in China and India that have established a presence in those two countries thanks to a seconded standards expert in cooperation with the European Commission and EFTA. ETSI acts as project manager for the project in India.



SESEC

(Seconded European Standardization Expert in China)

2018 saw the completion of phase 3 of SESEC, and the start of phase 4, which is scheduled to end in August 2021. CEN is project manager for SESEC and ETSI took part in the final evaluation of SESEC 3, as well as in the selection of the expert for SESEI 4. After careful examination of all candidatures, Ms Betty Xu was reconfirmed in her position.

Ms Xu attended the meeting of the ETSI Board in June 2018, where a brainstorm was held in order to identify further topics of interest and investigation in SESEC 4. Ms Xu provided support to the partners, and specifically to ETSI in ensuring that relevant meetings were organized for the visit of the Legal & Governance and the Strategy Development Directors in China. The work of the SESEC also focused on analyzing still developing impacts of the standardization reform implemented recently.

Lastly SESEC assisted in hosting of the 6th ETSI/IQC Quantum Safe Cryptography Workshop in Beijing, organized by ETSI in partnership with the Institute for Quantum Computing (IQC) and Chongqing University.

policy, regulation and standardization in three main streams (Information & Communication Technologies, Smart Energy, Smart Automotive). This event was also used to issue three study reports on these topics.

Following the common decision to propose a fourth phase of SESEI, ETSI also consulted with the project partners to elaborate a technical proposal for SESEI IV, with the goal of submitting it in Q1 2019 and ultimately enable a seamless transition between phase III and phase IV.



InDiCo

International Digital Cooperation on ICT Standardization

ETSI is managing a far-reaching new initiative to promote the role of the European Union as a global hub for ICT standardization.

In January 2018 the Foreign Policy Instrument (FPI) service of the European Commission, working with the European External Action Service (EEAS), launched an action on International Digital Cooperation to strengthen the EU's position as a world leader in the digital economy.

Through activities in six partner countries (Brazil, China, India, Japan, South Korea, USA), the 36-month project will promote a secure, right-based international digital sphere, encouraging a level playing field in terms of market access and business opportunities. ETSI has been selected to implement a strand of the project focused on ICT Standardization – one of four central 'pillars' of the initiative alongside other activities spanning data protection, cyber security and cross-border access to electronic evidence.

Specific actions will include raising awareness of the EU standardization model; encouraging development of common standardization approaches based on existing best practices; and strengthening cooperation with identified actors regarding the development of open international ICT standards in the area of the IoT, 5G, cloud computing, big data and Cyber Security as well as other priority topics such as Intelligent Transport Systems, and Distributed Ledger Technologies.

SESEI

(Seconded European Standardization Expert in India)

The SESEI project is nearing end of its third iteration 2018 was its third execution year in 2018. ETSI is the project manager for SESEI and continued managing the project and the related action grant throughout 2018. This included chairing and providing the secretariat for the SESEI Steering Committee meetings. The project's benefits are acknowledged by all partners and range from raising awareness in India of the European standardization system to the delivery of structured and focused information in Europe on Indian standardization, regulatory initiatives and on the chosen priority sectors.

In 2018, a major event was organized as part of the SESEI activities: the third Indo-European Dialogue on Standards & Emerging Technology, with a focus on

3SI Programme

ETSI has continued engaging with the Annex III Organizations, with a view to ensure that their participation and visibility within ETSI is addressed in compliance with EU regulation 1025/2012.

In 2018, ETSI completed the establishment of the 3SI programme (for Societal Stakeholders and SMEs Inclusiveness) where ETSI, in addition to its existing practice and policy on societal stakeholders and SME inclusiveness has designed a programme as part of its strategic objective on inclusiveness with a specific focus on Annex III Organizations. 3SI advocate, whose role will be to act as a primary interlocutor for Annex III matters in ETSI, also started its activities in 2018.

During the two 3SI round tables held in 2018, the Annex III Organizations and the ETSI leadership considered proposals and requests made by the Annex III Organizations with a view to ensure improved identification of the topics relevant for SMEs and societal stakeholders as well as to use appropriate channels for comments by Annex III Organizations regarding ENs proposed for approval.

The ETSI Board and the OCG were consulted in relation to the proposals for an updated work item form but the round tables came to the conclusion that the proposal would only encounter support within ETSI's technical Organizations if backed by clear guidance. That guidance was agreed to be developed in early 2019. A way forward was also identified in ensuring that the comments of the Annex III Organizations made during the Public Enquiry are transmitted to ETSI directly. The completion of this specific matter is expected in 2019. The round tables were also an opportunity for ETSI to present the brochure developed to promote inclusiveness in ETSI as well as the dedicated content for the ETSI website, featuring the 3SI programme and providing a link to contact the 3SI Advocate.

Partnership Agreements

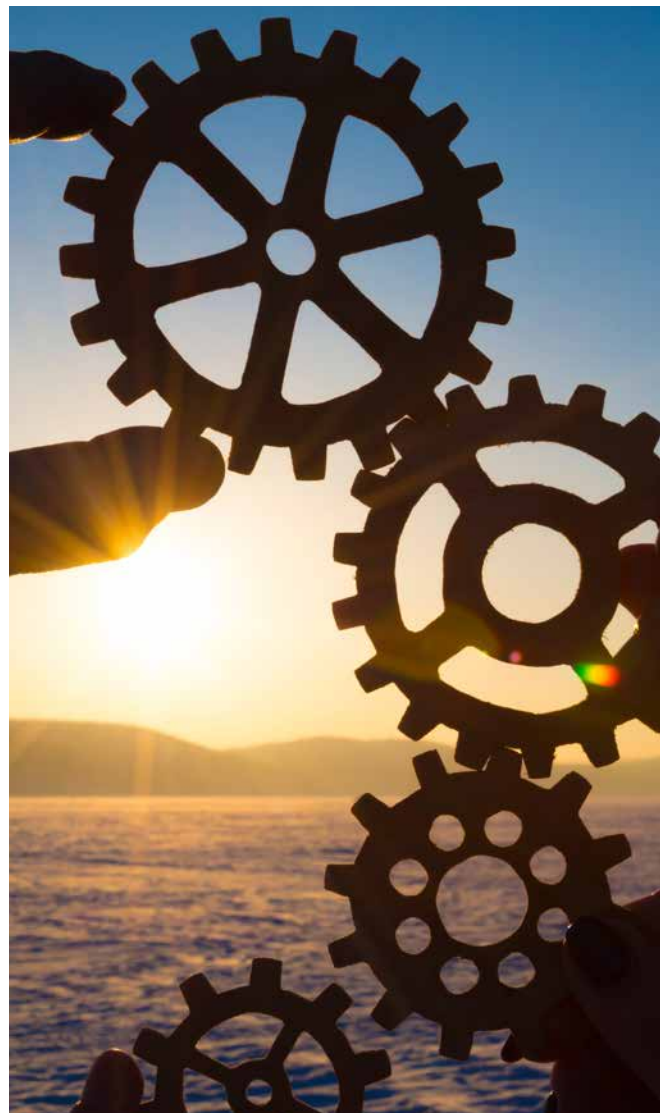
Co-operation and collaboration is the best way to ensure consistency between our own standards and those produced elsewhere, to avoid duplication of effort and to ensure that our work is widely accepted and implemented. Establishing partnership agreements with fora, consortia and international and regional Standards Developing Organizations around the world is one of the key mechanisms we have adopted in working with others. By the end of 2018, our partnership portfolio numbered over 100 active agreements.

In November we renewed our partnership with TCCA – formerly the TETRA Association – that was originally signed in 1997. The development of TETRA has been

a long-term ETSI success story, with TETRA now enjoying global acceptance as a mature standard. The cooperation between the two bodies continues and ensures coordination in evolutions of the TETRA standard as well as in work on critical communications in general. ETSI and TCCA have the common objective of developing, maintaining and promoting standardized solutions for critical mobile communications, including TETRA, LTE and future 5G standards.

Reflecting the evolution of our industry ecosystem, 2018 also marked the signature of further new agreements with other bodies. In the area of transport we entered a new partnership with Shift2Rail, a platform for the key stakeholders of the European rail system. We also partnered with the Augmented Reality for Enterprise Alliance (AREA), an organization in charge of achieving adoption of interoperable AR-assisted enterprise systems.

2018 was also the opportunity for ETSI to start working on the renewal of the cooperation agreement with the IEC, one of the longest standing partnerships in our portfolio, but also one of the most outdated. ETSI also took steps in order to enter into a partnership with the Linux Foundation, with a view to connect open source communities.



PUBLICATIONS AND EVENTS



Thought Leadership

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.

In 2018 we published nine White Papers exploring a range of topics: Microwave and Millimetre wave for 5G Transport; Cloud RAN and MEC; MEC Deployments in 4G and Evolution Towards 5G; ETSI's City Digital Profile; MEC in 5G Networks; Implementation Security of Quantum Cryptography; eHealth standardization; mmWave Semiconductor Industry Technologies; and MEC in an Enterprise Setting.

Webinars

Ranging from high-level overviews to 'deep dives' into individual technologies, our regular webinars highlight particular aspects of ETSI's work. In 2018 we held a total of six webinars covering Quantum-Safe Cryptography; Attribute-Based Encryption for Access Control and Personal Data Protection; Middlebox Security Protocol; Cyber Security Standardization; Multi-access Edge Computing; and MEC in 4G and 5G Deployments.

ETSI Events

Our 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. 2018 programme highlights included:



ETSI Events around the world

January

- **Workshop on eSignature and eSeal validation**, Sophia Antipolis
- **2nd NFV Plugtests**, Sophia Antipolis
- **1st OSM Hackfest**, Sophia Antipolis
- **Smart City Hackathon with oneM2M standard**, Toulouse
- **5th India m2m + iot Forum**, New Delhi

February

- **European 5G Conference**, Brussels
- **Cybersecurity Act – Establishing the link between Standardization and Certification – joint workshop with CEN/CENELEC and ENISA**, Brussels
- **oneM2M tutorials and Hackathon** (various venues)
- **ETSI Networking Cocktail during Mobile World Congress**, Barcelona

March

- **9th ETSI Workshop on Intelligent Transport Systems**, hosted by the Federal Ministry of Economic Affairs and Energy, Berlin
- **oneM2M Hackathon**, Dallas
- **eIDAS meets PSD2 - securing access to financial services with qualified certificates – workshop with Open Banking Europe (OBE)**, Sophia Antipolis
- **Zero Touch & Carrier Automation Summit**, Madrid
- **2nd OSM Hackfest**, Madrid

April

- **20th MPLS, SDN and NFV World Congress**, Paris
- **China SDN/NFV**, Beijing
- **ETSI Summit: Releasing the Flow - Data Protection and Privacy in a Data-Driven Economy**, Sophia Antipolis
- **5G India Congress**, New Delhi
- **NFV and Zero Touch World Congress**, San Jose
- **7th Smart to Future Cities Summit**, London

May

- **Critical Communications World**, Berlin
- **SCWS World**, London
- **Network Virtualization Europe**, London
- **3rd NFV Plugtests**, Sophia Antipolis

June

- **ETSI Security Week**, Sophia Antipolis
- **London Tech Week**, London
- **2nd MCPTT Plugtests**, Texas
- **3rd OSM Hackfest**, Fornebu
- **2nd F-Interop 6TiSCH Interoperability event**, Paris



July/August

- **2nd ETSI Workshop on Developing the Future Radio for Rail Transport**, Sophia Antipolis
- **OneM2M Interop 6**, Washington DC
- **4th National Summit on 100 Smart Cities India**, New Delhi

September

- **7th IoT Innovation Conclave**, Bangalore
- **IBC**, Amsterdam
- **25th ITS World Congress**, Copenhagen
- **Edge Computing Congress and ETSI Hackathon**, Berlin
- **ETSI/Hanyang University Workshop**, Seoul
- **Intelligent Transport Systems of Russia, International Forum and Exhibition**, Moscow

October

- **Education about Standards**, Sophia Antipolis
- **Smart Cities Event**, Bordeaux
- **SDN NFV World Congress**, The Hague
- **World Standards Day**, Brussels
- **ETSI New Internet Forum (co-located with SDN NFV World Congress)**, The Hague
- **ETSI User Conference on Advanced Automated Testing (UCAAT)**, Paris
- **ETSI IoT Week and M2M Showcase**, Sophia Antipolis
- **4th OSM Hackfest**, Palo Alto

November

- **6th Quantum Safe Cryptography Workshop**, Beijing
- **NGMN Industry Conference & Exhibition**, Vancouver
- **Software Defined Operations and Automation**, London
- **#Berlin5GWeek**, Berlin
- **Smart City Expo World Congress** Barcelona
- **5G Future Russia**, Moscow
- **IEEE NFV-SDN Conference**, Verona

December

- **3rd MCX Plugtests**, remote
- **ICT 2018**, Vienna
- **Joint ETSI/OSA Workshop: Open Implementations and Standardization**, Sophia Antipolis
- **AI & IOT India**, New Delhi

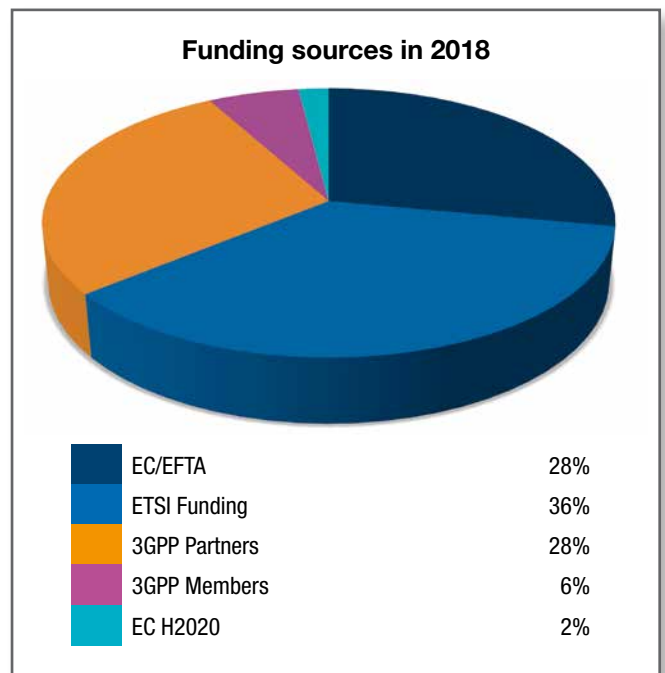
SPECIALIST TASK FORCES AND FUNDED PROJECTS



Specialist Task Forces and other Funded Projects

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 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 two Horizon 2020 (H2020) EU Research and Innovation projects. A similar mechanism has been adopted to support 'Funded Projects' for the Third Generation Partnership Project (3GPP™) partners. In addition, some resources are allocated from ETSI's budget to fund projects aimed at reviewing and streamlining internal processes.

Altogether, 49 STFs and other funded projects were active in 2018, involving 132 service providers for a total spend of about 3,75 MEUR. Voluntary contributions equivalent to 209 k€ were provided by 3GPP Members and Partners.



EC/EFTA Funding

The EC budget line for standardization remained roughly stable for 2018; hence the amount available for the Operating Grants of the European Standardization Organizations (ESOs) did not see any reduction. We were also able to report and achieve a 98,6% payment of the 2017 Operating Grant.

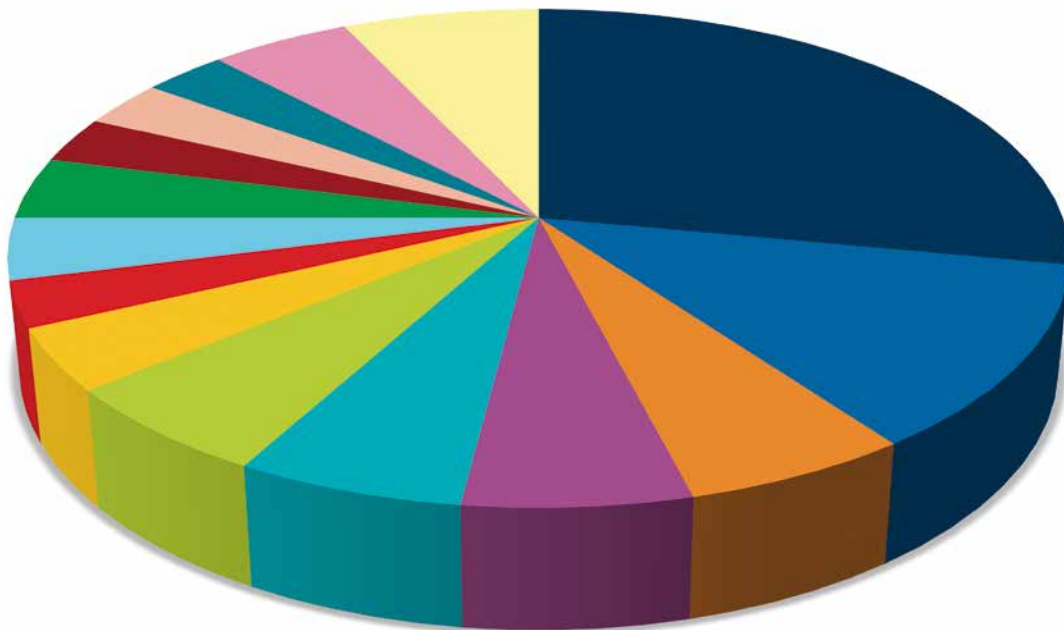
All new standardization action grants are now operated under a lump sum financing system. The lump sum unit value is updated every year based on an index agreed with the EC, and in 2018 this increased compared with 2017.

In 2018, the actions signed (0,6 M€) covered activities related to electronic signatures, human factors, intelligent transport services and SmartM2M. The EC standardization budget for ICT is shared among the three ESOs: proposals related to standardization requests and to the ICT standardization Rolling Plan have the best chance of achieving success.

We also continued to manage the action grants signed prior to 2018, reported efficiently to the EC/EFTA on the progress and closed actions started in 2015 onwards.

The International Digital Co-operation project on ICT Standardization – managed under the Service for Foreign Policy Instrument (FPI) of the European Commission and working with DG CONNECT and the European External Action Service (EEAS) – aims at strengthening the European Union’s position as a world leader in the digital economy. ETSI has been selected to implement one of the four ‘pillars’ on ICT Standardization. Implementation started in 2018 after an action plan was agreed by the Project Steering Committee. This activity will be completed in December 2020.

Technical areas in which funded resources were spent in 2018



Technical area	Financial Investment (k€)	%	Technical area	Financial Investment (k€)	%
3GPP	1 066	28%	Methods for Testing & Specification (MTS)	134	4%
Smart M2M	441	12%	Centre for Testing and Interoperability (CTI)	130	4%
EMC and Radio Spectrum Matters (ERM)	243	6%	Railway Telecommunications (RT)	117	3%
Electronic Signatures and Infrastructures (ESI)	237	6%	Digital Enhanced Cordless Telecommunications (DECT™)	105	3%
Human Factors (HF)	218	6%	Access, Terminals, Transmission and Multiplexing (ATTM)	101	3%
Intelligent Transport Systems (ITS)	217	6%	Others (CYBER, NFV, EMTel, MEC, INT, USER)	180	5%
Smart Card Platform (SCP)	159	4%	Voluntary 3GPP and H2020	280	7%
Education on Standards	125	3%	TOTAL	3 753	

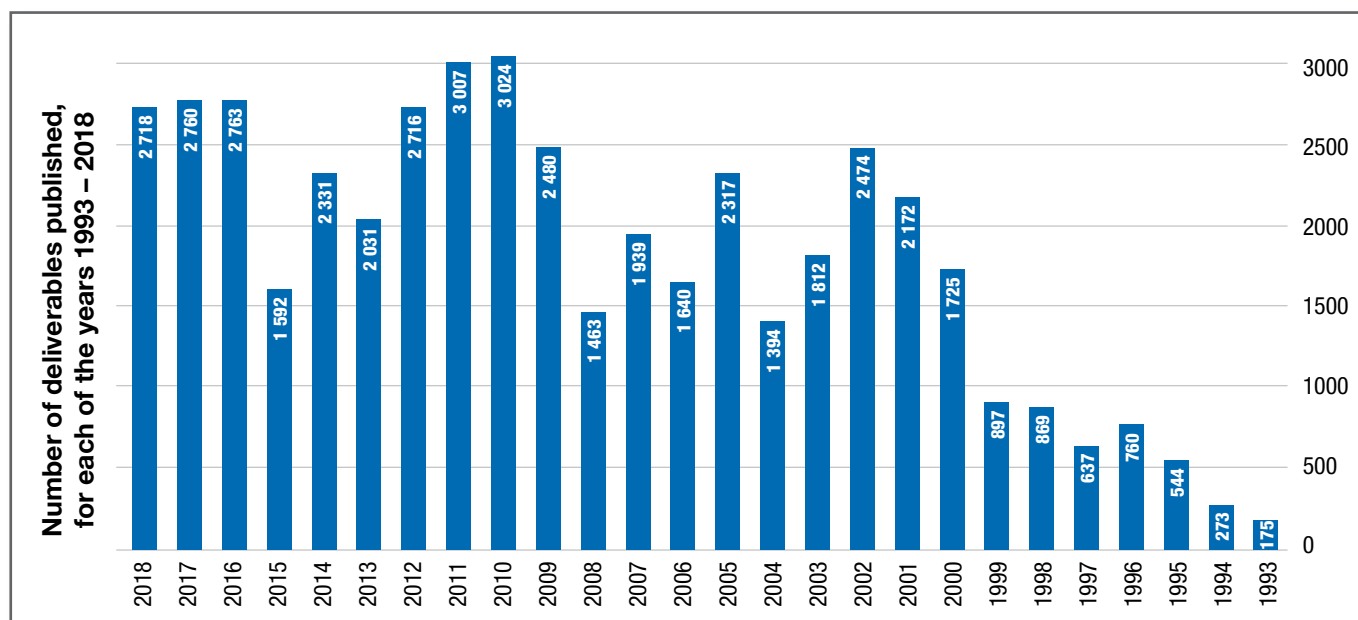
Figures are rounded to the nearest k€.

STANDARDS PRODUCTION AND IPR



Standards Production

In 2018 we published 2 718 standards, specifications, reports and guides, bringing the total published since our establishment in 1988 to over 46 000.



Distribution by type of published document	in 2018	Total since 1988
Technical Specification (TS) ¹	2 307	36 448
Technical Report (TR) ²	240	3 849
ETSI Standard (ES)	19	820
European Standard (telecommunications series) (EN) ³	50	4 987
ETSI Guide (EG)	1	253
Special Report (SR)	3	103
Group Specification (GS)	65	238
Group Report (GR)	33	67
TOTAL	2 718	46 765

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 Intellectual Property Rights (IPR) Policy is highly regarded around the world. To improve it still further, we consult widely with our members, the European Patent Office (EPO), the European Commission, the United States Government and relevant partner organizations, to reflect the needs of our members, public authorities and the ICT community.

In 2018 our IPR Special Committee maintained its focus on increasing the transparency of patent declarations and the information we provide to members and the public. To support this, our legal department continued its review of the ETSI online IPR database, making further enhancements to improve its accuracy.

Throughout the year, we contributed the views and represented the interests of the standardization community on patents, standards and the interplay between them at conferences and workshops worldwide. Work also progressed on identifying and mapping the standardization process to patents activities.

“ETSI does not take any position regarding the correct interpretation of its IPR policy and its IPR Guide. These texts stand as independent documents in their own right. Specific licensing terms and negotiations are commercial matters between the companies and shall not be addressed within ETSI. The basic principle of the ETSI IPR regime remains Fair, Reasonable and Non-Discriminatory (FRAND) with no specific preference for any licensing model. At ETSI we have a tradition of neutrality, and this is one of the reasons industry comes to us. We want to keep it this way for the benefit of all”.

Luis Jorge Romero, Director General



BUDGET REPORT AND FINANCIAL STATEMENTS



Financial Situation

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, Concertaë, whose auditor's mandate was approved at the 68th General Assembly, has audited the 2018 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.

with 2017. They funded roughly 72% of the budget. European Commission (EC)/European Free Trade Association (EFTA) funding amounted to 4,36 M€ to cover expenses related to the operation of the European standardization platform and standardization projects including International Digital Cooperation projects. Termination of some Partners' service contracts in early 2018 accounted for 5 k€ in revenue for the year.

3GPP Partners have contributed their share to the project according to the funding formula in force, and EF3GPP member organizations increased their participation by 11,5% or 65 k€ in 2018.

Budget Maintenance

Compared with 2017, total income increased by 5,7% or roughly 1 348 k€ while expenditure rose by 5,9 % or 1 323 k€. After making provision of roughly 13 k€ for Income Tax to be paid and of 1 450 k€ in credit notes to be issued to members to offset the excess of income over expenditure, the net surplus of the year is 92 k€. This compares with a net surplus of 117 k€ in 2017.

Key points of the year's budget management are as follows:

Income

Members' contributions (17 M€ before credit notes) were 3,9% over budget and increased by 5% compared

Expenditure

Secretariat costs were 0,6 % under budget and higher by 5,9 % compared with 2017. The original 2018 budget did not include the International Digital Cooperation related project, which added to expenditure while being fully compensated by the same amount of income funded by the European Commission. The expenditure budget was closely monitored, and delays in implementing some planned activities and projects contributed to the budget underspend. No payment was made to the Pension Fund to cover ETSI liabilities with regards to 'Indemnités de Fin de Carrière' in 2018, the coverage being already almost at the maximum of the allowed level.

3,8 M€ was spent in acquiring expertise for Specialist Task Forces and other standardization-related technical expertise.

2018 Budget and Financial Statements

INCOME	(k€)	EXPENDITURE	(k€)
Members' contributions and Observer fees net of credit notes	15 526	Secretariat staff costs	12 905
EC/EFTA contracts	4 356	Other Secretariat costs	5 618
3GPP™ Partners	2 431	Special projects	519
Voluntary contributions	209	European Friends of 3GPP	500
Forapolis	5	Provision and losses	175
European Friends of 3GPP	630	Experts' costs	3 844
Sales	126		
Financial income	50		
Other income	320		
TOTAL INCOME	23 653	TOTAL EXPENDITURE	23 561
Surplus	92		

Statement of Income and Expenditure Year 2018

	Income (€)	Expenditure (€)
Income	23 688 472	
Purchases		9 437 698
Expenses		14 180 991
Financial income and expenses	50 504	19 061
Extraordinary income & expenses	19 448	15 219
Income Tax		12 988
TOTAL	23 758 424	23 665 957
Surplus	92 468	

BALANCE SHEET

Assets

Net amounts at:	31 Dec 2017 (€)	31 Dec 2018 (€)
Fixed assets	5 711 991	4 971 992
Debtors	15 492 971	16 555 013
Securities/cash	10 096 690	12 303 770
Prepaid expenses	250 299	222 207
TOTAL ASSETS	31 551 951	34 052 982

Liabilities

Net amounts at:	31 Dec 2017 (€)	31 Dec 2018 (€)
Equity	8 687 393	8 778 326
Provisions	394 571	276 087
Balance carried forward	90 934	117 370
Surplus of the year	117 370	92 468
Creditors	6 703 030	7 504 531
Deferred revenue	15 558 653	17 284 200
TOTAL LIABILITIES	31 551 951	34 052 982

Figures are rounded to the nearest €.



Membership

Overall, ETSI membership increased again during the year. At the end of 2018, we had a total of 872 members, drawn from 64 different countries and provinces across five continents. This was made up of 716 full members drawn from 42 European countries, 144 associate members drawn from 22 non-European countries and 12 observers. 128 of our members are Small and Medium-sized Enterprises (SMEs) and 92 are Micro-Enterprises. Small organizations now represent roughly a quarter of our overall membership. There were 35 resignations, representing a decrease of 16% compared with last year.

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.

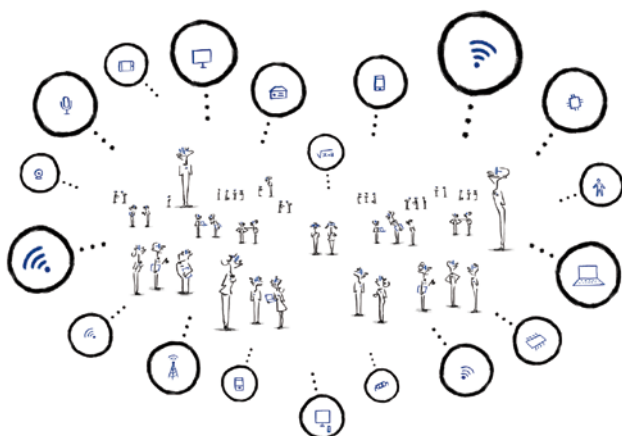
The new mechanism for approving applicant members via an online poll was successfully and efficiently held at each quarter of 2018, allowing new Members to engage more rapidly in ETSI operations.

The membership team maintained and reinforced the close relationship it has with the members by an intensified presence during workshops and events in ETSI premises with a dedicated booth. Membership was also promoted at events organised or endorsed by ETSI throughout the year.

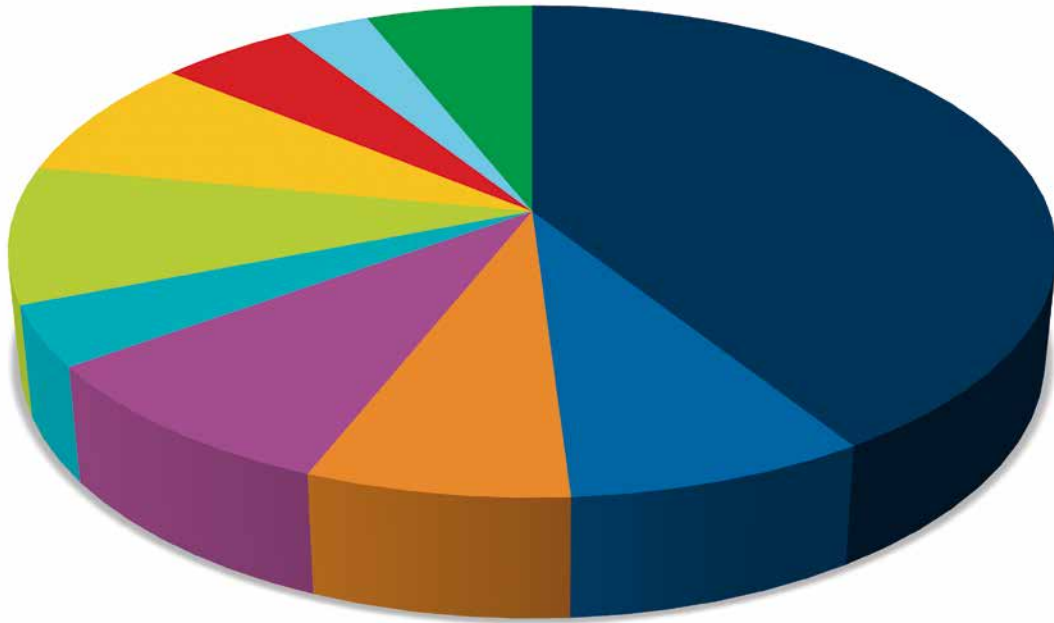
The membership team has also supported the creation of one new Industry Specification Group (ISG) on PDL (Permission Distributed Ledger) in 2018, the extension of four ISGs (MEC, NFV, NGP and mWT) for an additional 24 months of activity and the closure of four ISGs (CCM, ECI, MBC and SMT). The use of e-signature has been widely deployed for the benefit of all parties, resulting in 288 ISGs/OSGs e-signed agreements.

At the beginning of 2018, the ETSI Board approved the creation of a fee credit incentive for ISG participants deciding to become ETSI members. To date this new process has resulted in two ISG participants being converted into ISG members.

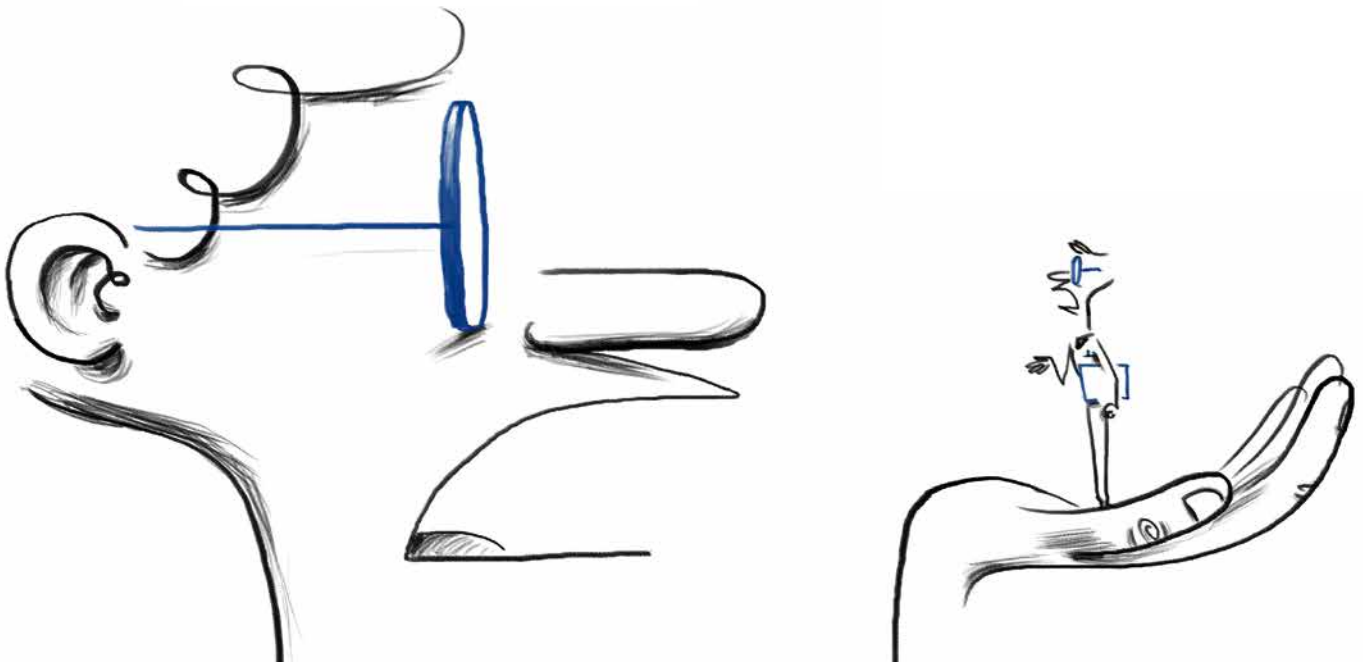
Collection of contribution invoices in 2018 was performed with a rate of 99,56% of recovery.



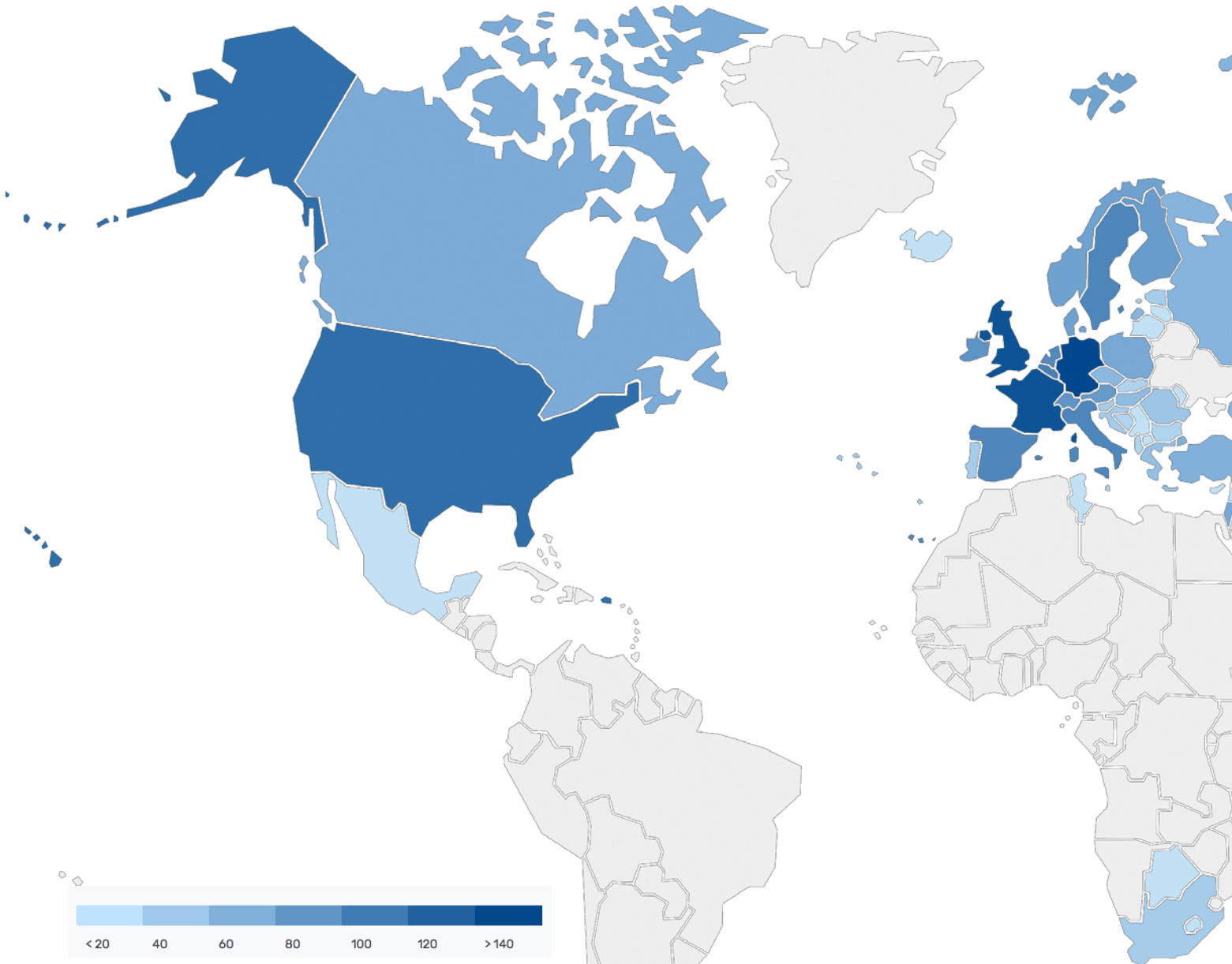
Full and Associate Membership by category



Manufacturer	352	41%	Service provider	74	9%
Network operator	69	8%	Consultancy Company/Partnership	64	8%
Administration	59	7%	User	44	5%
Research body/	81	9%	Other Governmental body	27	3%
University	36	4%	Other	54	6%



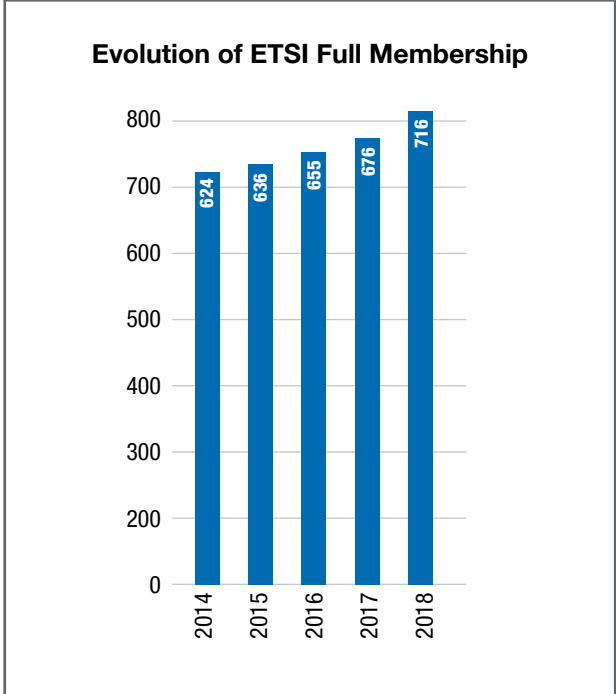
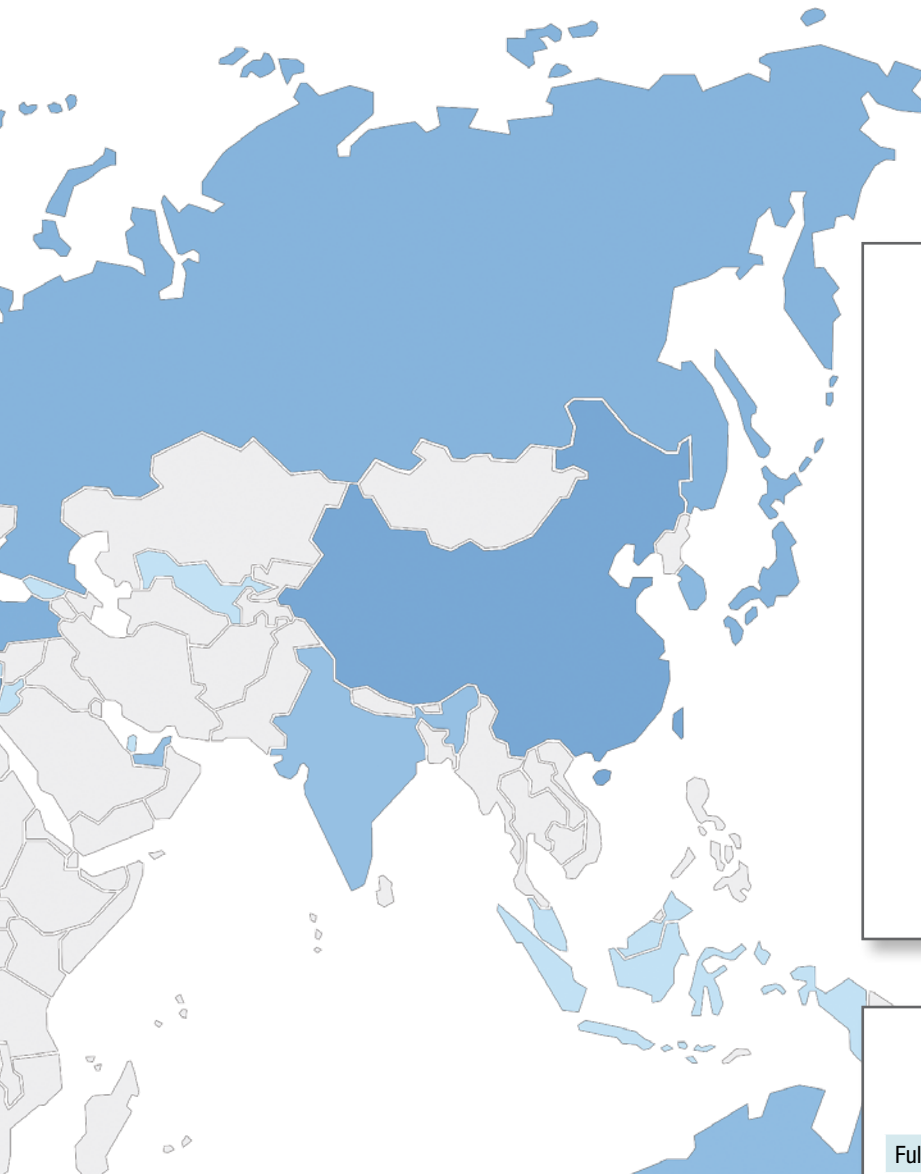
Overall membership



Albania	2
Andorra	1
Australia	6
Austria	19
Belgium	35
Bosnia Herzegovina	2
Botswana	1
Bulgaria	1
Canada	10
China	12
– Taiwan (Province of China)	12
Croatia	3
Cyprus	1
Czech Republic	7
Denmark	15
Estonia	3
Finland	18

Former Yugoslav Republic of Macedonia (FYROM)	1
France	109
Georgia	1
Germany	141
Greece	5
Hungary	6
Iceland	1
India	5
Indonesia	1
Ireland	23
Israel	9
Italy	32
Japan	8
Jordan	1
Korea	7
Kosovo	1
Latvia	1

by country/province



Membership by type

	1-1-2018	31-12-2018
Full Members	676	716
Associate Members	140	144
Observers	14	12
Total	830	872

Lebanon	1
Lesotho	1
Lichtenstein	1
Lithuania	1
Luxembourg	10
Malaysia	1
Malta	2
Mexico	1
Moldova	1
Montenegro	1
Netherlands	29
Norway	14
Poland	10
Portugal	3
Qatar	1
Romania	4
Russian Federation	7

Serbia	1
Slovakia	2
Slovenia	3
South Africa	3
Spain	33
Sweden	32
Switzerland	22
Tunisia	1
Turkey	10
United Arab Emirates	5
United Kingdom	110
United States of America	61
Uzbekistan	1
64 COUNTRIES OR PROVINCES IN TOTAL	872



Join our community

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

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

Find out more about the benefits of ETSI membership at [etsi.org/membership](https://www.etsi.org/membership)

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