World Class Standards

work programme

2016 - 2017

building the future

ETSI's Vision of a Connected World

ETSI is a producer of technical standards intended for global use for digital technologies, products and services. The high quality of our work and our open approach to standardisation has seen our reach extend from European roots to the entire world.

ETSI is officially recognised by the European Union as a European Standards Organisation (ESO). Our activities are driven by time to market and our standards help ensure the free movement of goods within the single European market, allowing enterprises in the EU to be more competitive.

ETSI is a not-for-profit organisation created in 1988. We have over 800 member organisations worldwide, drawn from 66 countries and five continents. Our diverse membership includes 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, working alongside universities, R&D organisations and societal interest groups.

ETSI is a world-renowned organisation with a solid reputation for technical excellence. Our standards are produced by our members, through active participation, co-operation and consensus in an atmosphere of openness and transparency, where all contribute as equals. We work in partnership with all relevant worldwide Standards Developing Organisations, particularly our sister 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.

ETSI is at the forefront of emerging technologies. We have close relationships with research communities and other innovative organisations, addressing the technical issues that will drive the economy of the future and improve life for the next generation.

Our 'clusters' (above) provide a simplified, yet comprehensive, way of identifying our different areas of expertise based on business relevance or application domain rather than our committee structure.

Each cluster represents a major component of the global Information and Communications Technologies (ICT) architecture and brings together the work of those Technical Committees and other groups which share a common technological scope and vision.

It is this joint scope and vision that gives each cluster its own identity; collectively the clusters represent the totality of ETSI's work, and demonstrate the way that technologies are converging into a connected world.

The standards we produce truly respond to the needs of the ICT industry, as represented by our members. Join us – and have your say in the future shape of our industry.

Building the Future

Work Programme 2016-2017

Throughout our history, ETSI has stood at the forefront of evolving technology, adapting to new environments and responding to the changing needs of our members. In doing this, we help to support the commercialisation of new technologies and to shape our industry. Our Long Term Strategy highlights some of the emerging technology trends that will influence our standards-making over the next five years.

One such trend is the shift from hardware to software, virtualisation and the Cloud. Of course we will always use hardware in Information and Communications Technologies (ICT), and we will continue to develop the standards necessary to do so. But in 2016 many of our activities support software-based products. Our Industry Specification Group (ISG) on Network Functions Virtualisation (NFV), for example, is developing an open NFV ecosystem, which will enable rapid service innovation for network operators and service providers. We have also begun to address the interplay between standards and Open Source software. ISG NFV is liaising with Open Source projects and we are looking into ways to allow Open Source developments inside ETSI.

Our ISGs bring together key stakeholders to kick-start new technologies and in 2016 we have a dozen active ISGs. These include our new ISG on Mobile and Broadcast Convergence (ISG MBC) which will look for solutions to enable media delivery over converged networks – a recognition of the way that broadcasting technology has evolved and the different ways in which we now watch television. Also in the broadcasting area, we are working on intelligent compound content management, digital broadcasting, especially Ultra High Definition TV, protection and rights mechanisms and the transportation of video over powerlines.

In 2016 we will continue to play a key role in the development of the Internet of Things (IoT). As a founding partner of oneM2M, the global standards initiative for Machine-to-Machine communications and the IoT, we are helping to develop a global standardised platform by which devices and services can be connected, regardless of existing sector or industry solutions. We cities, wireless industrial automation, Body Area Networks and Co-operative Intelligent Transport Systems.

As our world becomes ever more connected, the difficulties in maintaining security multiply. So, as well as our ongoing work on electronic signatures, smart cards and smart secure elements, for example, which is designed to extend opportunities in the modern world and make life richer or easier, increasingly we are involved in protecting the use of ICT and the Internet by both individuals and business. We are therefore addressing Cyber Security, Lawful Interception, issues such as security by default, privacy and data protection, as well as the impact on quantum-safe cryptography of the emergence of the quantum computer.

As a partner in the Third Generation Partnership Project (3GPP™), we will continue to develop 3G and 4G mobile communications in 2016, and work is now beginning on 5G. Anticipating the introduction of 5G, we are developing standards in fields such as Software-Defined Networking, NFV and autonomic network management, and we are involved in preparatory standardisation in areas such as Millimetre Wave Transmission and Mobile-Edge Computing.

We are also looking at the spectrum needs of both existing radio systems and 5G, including increasing efficiency by sharing spectrum, and we will examine the future requirements for Internet Protocols to ensure that developments in the technology of local access networks (including LTE™-Advanced Pro and 5G) are able to deliver their full potential.

Other work in 2016 includes standards for telecommunication quality, and widening access to ICT devices and services for the young, the old and those with cognitive and learning disabilities. We continue to standardise Terrestrial Trunked Radio (TETRA) and we are addressing public safety issues such as emergency calling and alerting. We are tackling the eco-environmental impact of ICT equipment and developing tools to improve the energy management of networks.

The quality of our standards is a high priority so we will continue to be rigorous in testing and validation. In 2016 we will explore different ways to introduce standardisation into the early development of new technologies through our collaboration with the R&D community and academia. And we expect to complete the enormous task of updating our Harmonised Standards and creating the new ones required by the introduction of the Radio Equipment Directive.

This Work Programme describes the activities we have planned for 2016 which will both consolidate traditional technologies and facilitate the new. Full details of all upcoming standards and specifications can be found at: http://webapp.etsi.org/workprogram.

Dirk Weiler

Chairman of the Board

New Beginnings

We are constantly looking for new ways to extend our activities and to keep up to date with the latest developments in Information and Communications Technologies (ICT). In this way we are able to provide our members with the standards they need to develop their businesses with innovative services and equipment.

In Touch with the Research Community

Standards can help bridge the gap between research and the industrial development of products and services by facilitating the commercialisation of research results. Research, in turn, contributes to our ongoing standards-making and it can trigger new standardisation activities.

For example, following our successful workshop in May, "From Research to Standardisation", we have identified specific fields for follow-up activities. These include fog computing as an extension of our current work on Mobile-Edge Computing (MEC), cross-domain orchestration for commercial and technical domains related to Network Functions Virtualisation (NFV) and x-hauling (combining front-haul and backhaul in future mobile networks), and tactile networking which offers ultra-low latency, high availability and security.

In 2016 we will continue to cultivate close relationships with academic institutions, to exchange information with researchers and to take part in relevant conferences and other events where the results of R&D projects are presented.

We will maintain contact with European Technology Platforms, Public Private Partnerships and Joint Technology Initiatives, as appropriate. We will continue to monitor the EU research funding programme, seeking to identify opportunities where we have something to add. In some cases we may participate in European Commission (EC) funded projects.

In 2016 we will work as a partner in two EC Co-ordination and Support Action projects: ESPRESSO (systEmic Standardisation apPRoach to Empower Smart citieS and cOmmunities) and UNIFY-IoT, which fosters innovation ecosystems for the Internet of Things (IoT). We will maintain informal liaison with other relevant EC projects.

Workshops

In 2016 we will offer another varied programme of workshops, many of them free of charge. These events serve as a platform for disseminating the results of our work and a means of identifying next steps for standardisation. They can also facilitate early consensus-building, stimulate new standardisation activities and fertilise our ongoing technical work.

Events this year include highly regarded annual events such as our Intelligent Transport Systems workshop, our Security Week and, in September, a workshop organised jointly with the European Conference of Postal and Telecommunications Administrations Electronic Communications Committee (CEPT/ECC) on regulatory changes and new opportunities for broadband Public Protection and Disaster Relief. In co-operation with the Institute for Quantum Computing of the University of Waterloo in Canada, we are organising the fourth Quantum-Safe Cryptography workshop, in Toronto, Canada. This event is being extended from two to three days to incorporate an executive briefing which will address the impact of quantum computing on next-generation cryptographic and security solutions.

In November, we will be holding our IoT/Machine-to-Machine Workshop 2016, which will be preceded by a tutorial for developers. Among other things, this year we will turn the spotlight on oneM2M Release 2, which will be published shortly before the workshop.

Many of our regular workshops are also focusing on the IoT this year. For example, the ETSI International User Conference on Advanced Automated Testing (UCAAT) in October in Budapest, Hungary, will take as its theme "How can advanced test automation face the challenges of fast product development in the age of IoT?".

Supporting the Commercialisation of New Technologies

Setting standards in ICT is crucial for the commercial success of new technologies. However, there is a narrow window of opportunity to set a standard. We are therefore involved in several major standards-related initiatives through which we can identify new areas for standardisation at an early stage and ensure that standards are in place when they are needed.

In 2016 we will continue to offer support and advice to researchers in bringing their work to the standardisation community and to provide an easy route for the introduction of new standardisation activities.

Industry Specification Groups

For example, our Industry Specification Groups (ISGs) were established to offer standardisation in specific innovative areas. By their nature, ISGs can produce specifications quickly and easily to encourage innovation. They have proved to be a flexible platform to bring together key stakeholders, including non-members of ETSI, to shape the industry. We have already nurtured a number of innovations in our ISGs and the output of some of our earliest groups is now being built upon in our other committees. We will have over a dozen ISGs operating in 2016.

New for 2016 is our ISG on Mobile and Broadcast Convergence (ISG MBC), which held its kick-off meeting in June. TV delivery has traditionally been dependent on broadcasting (i.e. on one-way, one-to-many delivery networks to fixed TV sets). But, as more consumers watch linear or non-linear content on their traditional home screens as well as on their smartphones and tablets, the load on mobile networks is increasing. New solutions may therefore be needed. ISG MBC will develop the requirements for media delivery over converged networks.

A number of our ISGs are working on key technological components which will form some of the building blocks on which 5G will be based. For example, 5G networks will make significant use of virtualisation – which we are addressing in our ISG NFV. To achieve very high performance and high availability, we will need much more spectrum. Our ISG on Millimetre Wave Transmission (ISG mWT) is conducting studies into millimetre wave bands (30 - 300 GHz), where spectrum is more readily available than in currently popular bands below 6 GHz. Our ISG MEC is looking to achieve very low latency by placing computational functionality as near as possible to the end-users, and our ISG on Next Generation Protocols (ISG NGP) will examine the future requirements for Internet Protocols to ensure that developments in the technology of local access networks (such as LTE™-Advanced Pro, G.Fast, DOCSIS 3.1 and 5G) are able to deliver their full potential.

Open Source

In a world where virtualisation and cloud technology are beginning to shape the next generation of network systems, Open Source software offers significant potential and we recognise the important role it will play in future standards activities.

We have begun to capitalise on the synergies between the worlds of standards and Open Source in our work on NFV. Two of the key components of the ETSI NFV architectural framework are the NFV Orchestrator and the Virtualised Network Function (VNF) Manager, known collectively as NFV Management and Orchestration, or MANO. Following our Summit on Open Source, held in November 2015, we set up a new group, ETSI OSM, for the development of Open Source software for the NFV MANO.

ETSI OSM is developing a software reference implementation (code) for the ETSI NFV MANO, according to accepted Open Source working procedures and using a software development platform hosted and managed by ETSI. We plan to release regular versions of the code approximately every six months. ETSI OSM complements the work of ISG NFV and its activity is closely aligned with the evolution of our work on NFV.

Open Source software can facilitate the implementation of an ETSI-aligned NFV architecture, provide practical and essential feedback to ISG NFV and increase the likelihood of interoperability between NFV implementations. This approach maximises innovation, efficiency and time to market and enables NFV solution vendors to meet the needs of their users rapidly and cost-effectively.

ETSI OSM has already attracted significant interest from the industry. Following the launch of Release 0, which integrates the seed code supplied by some of the founding members of the group into a documented package of running code, we expect to launch Release 1 by the end of 2016.

Education about Standardisation

We are working with our members, partners and other stakeholders interested in Education about Standardisation (EaS) to develop teaching materials, aimed mainly at engineering students, and to test them in guest lectures and seminars.

We have begun work on an EC-funded project to develop various modules as part of an educational programme comprising an academic textbook, exercises and case studies. The project will also include a workshop, a conference and an engagement programme for academic staff. The aim is to make these modules available as potential building blocks for university curricula.

Integrating Objects to Create New Networked Services

An ever increasing number of everyday machines and objects are now embedded with sensors or actuators and have the ability to communicate over the Internet. Collectively they make up the Internet of Things (IoT). The IoT draws together various technologies including Radio Frequency Identification (RFID), Machine-to-Machine (M2M) service platforms and Wireless Sensor Networks. Potential applications and services include smart devices, smart cities, smart grids, the connected car, eHealth, home automation and energy management, public safety and remote industrial process control.

M2M and the IoT

ETSI is one of the founding partners in oneM2M, the global standards initiative for M2M and the IoT. oneM2M brings together 14 partners including eight of the world's leading Information and Communications Technologies Standards Development Organisations, as well as representatives of different industry sectors.

Further information at www.oneM2M.org

The key to the success of the IoT is enabling interoperability, with a global standardised platform through which devices and services can be connected, regardless of existing sector or industry solutions. oneM2M is developing specifications that will enable users to build such platforms and will provide a standardised interface, without changing the underlying network. oneM2M's specifications will work with current industry-specific standards, extending their reach by widening integration and cross-sector connectivity. This will increase the scalability of IoT applications and services and thus their commercial viability. In this way, oneM2M will offer a means to realise the huge potential for sharing data and services across and between multiple organisations in different sectors and different geographical locations.

Having published an updated first release of specifications early in 2016, oneM2M expects to produce its second release of specifications in mid-2016. Release 2 will include fourteen new specifications, which will add new functionality and drive the deployment of various features.

Key features in Release 2 include enhanced security, features for home and industrial deployment, together with interworking with three IoT device ecosystems: AllSeen Alliance's AllJoyn, Open Connectivity Foundation's IoTivity (formerly Open Interconnect Consortium) and the Open Mobile Alliance's Lightweight M2M (LWM2M). A new protocol binding for Websockets is being added. Most significantly, oneM2M will now include full support for semantic interoperability. These features will present a unique value proposition – one common core interworking platform technology for the IoT.

Interoperability in the IoT is not just a matter of connecting devices. It is also about understanding the data being collected and distributed by different devices, and reusing it in a secure manner. This is known as semantic interoperability. oneM2M's support for semantic interoperability builds upon work by the W3C for the semantic web. oneM2M has based its master ontology on the ontology developed by ETSI's SmartM2M Communications committee (TC SmartM2M) as part of a European Commission project on smart appliances.

Work has started already on oneM2M Release 3, and will intensify once Release 2 is delivered. Release 3 will focus on two main tracks: industrial IoT, and efforts to improve market adoption. The activity on industrial IoT will include support for the Object Management Group's Data Distribution Service (DDS) for Real Time Systems and for the Open Services Gateway Initiative (OSGi), while work to support market adoption will include developing guidelines and support documentation for application developers, as well as further developing the test specification documentation begun in Release 2. In addition, improvements and technical corrections will be integrated, based on feedback from implementers, and from the oneM2M interoperability event held in May 2016 in Korea. Further interoperability events are expected in 2017. Release 3 is due to be completed by mid-2017.

Smart appliances

In 2016, TC SmartM2M will focus primarily on smart appliances, specifically the use of an application-independent 'horizontal' service platform to interface with smart appliances, allowing the interoperability of applications and 'plug and play' connectivity. We are addressing the need for all the connected domestic and industrial appliances in the IoT to be able to communicate among themselves and with the service platforms. Open interfaces will therefore be a key factor in creating an IoT ecosystem, and the availability of a standardised solution, along with related test suites, will be the essential enabler of the IoT.

In 2016 we will revise our specification for SAREF, our smart appliances reference ontology that runs with oneM2M-compliant communication platforms. Designed for use by devices in the home, SAREF will allow them to exchange information with any energy management system, whether located in the home itself or in the Cloud. We are also investigating the possible evolution of SAREF, potentially to include non-energy aspects, and expanding it in response to feedback received from the industry.

We are developing a complete set of testing specifications for smart appliances and in 2016 plan to complete conformance tests for the testing of SAREF mapping onto the oneM2M base ontology. This will enable the widespread adoption of SAREF within the European Union.

The seventh annual ETSI IoT/M2M workshop will be held in November 2016 and will focus on oneM2M Release 2, which is scheduled for publication shortly before the workshop. This three-day event will be preceded by a two-day developers' tutorial and will include a oneM2M Showcase demonstration, now a regular feature of the workshop.

Other aspects of M2M
With the closure of the Home Gateway Initiative (HGI), we plan to complete three Technical Specifications (TSs) on the requirements specifications for linking Smart M2M devices with the Home Gateways, publishing relevant HGI requirements as ETSI specifications developed within our Publicly Available Specification (PAS) process.

We are undertaking a gap analysis of the IoT standards landscape and European Large Scale Pilots. Two Technical Reports (TRs) are scheduled for publication in 2016, one on use cases and standards gaps and the other looking at the IoT standards landscape, which will include requirements, architecture, protocols, tests and related Open Source projects.

We are also working on the environmental aspects and the human factors implications of smart cities.

eHealth

Our eHealth Project (EP eHEALTH) is developing use cases for eHealth standards with a view to identifying gaps in standardisation. We are looking at eHealth in relation to the IoT and M2M, and we are addressing wider societal issues including security and privacy. We are also compiling a glossary of terms to clarify the vocabulary used for eHealth.

Our Electromagnetic Compatibility and Radio Spectrum Matters committee (TC ERM) continues to develop standards for wireless medical devices including ultra low power active implants and medical body area network systems.

Smart Body Area Networks

Body Area Network (BAN) technology involves using small, low power devices for applications such as health and wellness monitoring, sports training, personalised medicine (e.g. heart monitors) and personal safety, such as fall detection.

Our Smart BAN committee (TC SmartBAN) is addressing the pressing need for a dedicated technology, optimised for BAN, with ultra-low power radio, a lower complexity Medium Access Control (MAC) protocol for extended autonomy, enhanced robustness in the presence of interference, and interoperability when communicating over heterogeneous networks in the IoT.

Having defined the PHY layer and MAC layer protocols, we are verifying the performance of the Smart BAN communication system using simulations and real-life demonstrations. In this way we will test our published specifications and also increase the market potential of the Smart BAN communication system. In 2016 we will build a simulation model to evaluate performance and co-existence, with the results feeding back to improve the next version of the standard.

We expect to complete a TR on measurements and modelling of the Smart BAN RF environment and we are developing a TR which will provide a system description for Smart BANs, including an overview and use cases.

We are working on a TR on Smart BAN data representation and transfer, service and application. We are also extending the TS which enables semantic interoperability by defining Smart BAN unified data representation formats, a semantic open data model and a corresponding ontology.

Wireless Industrial Automation

TC ERM expects to complete a new Harmonised Standard for radio equipment to be used in the 5,8 GHz band (5 725 - 5 875 MHz) for Wireless Industrial Automation (WIA). A new TS on the methods and concepts for a WIA system approach is expected to be published in mid-2016.

We plan to produce a new version of our European Standard (EN) for 2,4 GHz wideband transmission systems by the end of 2016. This will include requirements such as receiver parameters, to improve the politeness of existing adaptive and non-adaptive mechanisms and/or to consider the inclusion of alternative automatic and polite adaptive mechanisms. This work is being performed mainly in response to the use of short range devices in factories, for example in robotic arms, where high reliability and accurate response times are required.

Supporting these New Networked Services

Many of the connecting objects in M2M and the IoT need only low throughput connectivity. TC ERM is working on Low Throughput Networks (LTN), developing a TR on use cases and system requirements and two TSs which will specify respectively the LTN architecture and the protocols for LTN interfaces.

We are also addressing the wireless technologies which will support the IoT, including the development of 5G mobile services and the use of Ultra Low Energy DECT™.

Towards a Fully Connected Wireless World

Radio technology is an integral part of our daily lives. We use it for mobile phones, for broadcast radio and television, in Wireless Local Area Network (WLAN) and cordless technology, Global Navigation Satellite Systems (GNSS), Radio Frequency Identification (RFID) and short range devices. ETSI creates the standards which define many of these radio technologies and systems.

We also provide the standards which the regulatory authorities in Europe – and elsewhere – use to manage the radio spectrum environment and to ensure safe co-existence between all the systems which compete for use of limited spectrum resources.

Harmonised Standards and the Radio Equipment Directive

We provide a wide range of Harmonised Standards by which manufacturers are able to demonstrate that their products comply with a European Commission (EC) Directive, allowing them to be placed on the market or put into service within the 32 European Union (EU) and European Free Trade Association countries. In this way, we play an important part in helping to create a large, unified European market.

The new Radio Equipment Directive (RED), which replaces the Radio and Telecommunications Terminal Equipment (R&TTE) Directive, covers all products that deliberately use radio waves for communication or for determining their position, regardless of primary function. The RED puts specific requirements on the performance of radio receivers that they do not use more of the spectrum than is necessary. Broadcast receivers, which had been specifically excluded from previous legislation, are covered by the RED. For the first time equipment operating at frequencies below 9 kHz and radio determination equipment (including GNSS) are also included. New Harmonised Standards are required in all these areas. As a result, we are heavily engaged in standardisation to take account of the RED's requirements.

For example, our Electromagnetic Compatibility and Radio Spectrum Matters committee (TC ERM) is revising the Harmonised Standards for cordless audio devices in the 25 - 2 000 MHz band, wireless microphones, audio Programme Making and Special Events in the 25 MHz - 3 GHz band, inductive loops in the 10 Hz - 9 kHz band for peope with a hearing impairment and wireless video links in the 1,3 - 50 GHz frequency bands, as well as many other types of equipment. In addition, we expect to complete new Harmonised Standards for broadcasting equipment, for radio and TV broadcast receivers and amplifiers for broadcast reception on domestic premises, as well as transmitting equipment for Digital Radio Mondiale, Terrestrial - Digital Audio Broadcasting and FM and AM sound broadcasting. We are also developing many standards in the transport sector: automotive, rail, maritime and aeronautical.

We are developing nearly 200 new Harmonised Standards as a result of the introduction of the RED; by June 2017, when manufacturers are required to comply with the Directive, we expect to have completed about 90 more of them to add to the 60 plus already published. This work will continue throughout the life of the RED. We are co-operating with the European Committee for Electrotechnical Standardisation (CENELEC) to avoid any overlaps or gaps between our respective European Standards (ENs) on Electromagnetic Compatibility (EMC).

Building on our guide to 'smart' or 'connected' electrical equipment operating in domestic and industrial EMC environments, we are developing two new Harmonised Standards by which manufacturers will be able to demonstrate their compliance with the RED.

Managing Radio Spectrum

We will continue to work with the EC and the European Conference of Postal and Telecommunications Administrations (CEPT) to harmonise the use of spectrum throughout the EU and beyond (usually by producing System Reference documents). We will also continue to support the Radio Spectrum Policy Group, which has launched a number of new initiatives in 2016.

In 2016 we will make our regular update of our Technical Report (TR) which includes detailed information on spectrum usage and an overview of our standards, reports and specifications, together with their applications and relevant frequency bands.

ETSI plays an important role in ensuring compatibility between the different uses which may occupy adjacent spectrum. This includes developing the standards to enable Wireless Access Systems (WAS) and Intelligent Transport Systems (ITS) on WLAN-type and LTE™-type technology to share spectrum equitably.

Reconfigurable Radio Systems (RRS)

We are looking for ways to improve spectral efficiency by using the latest methodology and advanced techniques for sharing spectrum to help meet increasing demands on network resources. Our RRS committee is supporting EC Mandate M/512 by developing new ways to increase the efficiency of spectrum usage, including Licensed Shared Access (LSA) and mobile device reconfiguration and related certification.

LSA is a new technology which allows for the co-existence of the original incumbent with a new cellular operator in the same frequency band, creating opportunities for spectrum sharing. We are defining the information elements and protocols for the LSA1 interface and expect to publish a Technical Specification (TS) by the end of 2016.

We are developing a multipart EN on mobile device information models and protocols and plan to publish the final part, on the Radio Programming Interface, at the end of 2016 or early in 2017.

We will continue to address the security of RRS, particularly the security challenges of specific wireless systems. We expect to publish a TR on security use cases and threats for RRS, and a TS recommending countermeasures to security threats and defining requirements. We will then begin updating the RRS requirements and RRS architecture in line with these recommendations.

The new RED includes new features such as the use of RRS that affect device certification which were not addressed by the R&TTE Directive. In 2016 we plan to complete a TS defining the requirements related to the introduction of dynamic re-certification mechanisms for reconfigurable radio equipment which support reconfiguration after its initial certification and deployment. We are developing a TS on RRS use cases for configurable equipment management to address software reconfiguration issues in the context of the RED.

We are also undertaking a feasibility study into the Radio Interface Engine, with the aim of defining a radio support ecosystem with information such as radio environment measurements and location information to enable the optimum selection of operational parameters of a system.

Broadband Radio Access Networks

As part of our work in support of the development of the use of the 5 GHz band, our Broadband Radio Access Networks committee (TC BRAN) is revising our Harmonised Standard for Radio Local Area Networks (RLANs) operating in the 5 GHz frequency band to take account of the RED. At the same time we are including a fair access mechanism to ensure co-existence between current and new RLAN technologies. We are also updating our Harmonised Standard on WAS/RLAN equipment operating in the 60 GHz band, and including a Listen Before Talk mechanism to help ensure co-existence with other WAS/RLAN equipment operating in the same band.

By the end of 2016, we expect to have completed three new TRs to support the possible extension of the current 5 GHz frequency allocation for RLANs. These reports will describe the mitigation techniques required to enable sharing between RLANs and different types of incumbent services: road tolling and ITS, Radio Location Systems and Earth Exploration Satellite Services.

We also expect to complete a Harmonised Standard for direct air-to-ground communication systems using beam forming antennas.

Satellite Communications

Satellite technology is an important delivery platform for diverse services such as direct-to-home TV and mobile, high-speed Internet access and location services. Satellite services are particularly useful for rural and outlying regions, where it is difficult to deploy other systems on a commercial basis. They therefore play a key role in ensuring that all European citizens are able to access high quality information services.

In 2016 our Satellite Earth Stations and Systems committee (TC SES) will continue to develop standards to enable high speed Internet access to fixed terminals or terminals on the move, be it in an aircraft, on board a ship or in a vehicle. Developing standards for location systems based on GNSS is also a priority topic.

Work will continue on a new Harmonised Standard (EN) on GNSS receivers.

We plan to publish a full life cycle assessment of the environmental impact of satellite broadband networks and an analysis of their energy efficiency.

In anticipation of 5G requirements, we are developing a TR on the seamless integration of satellite and/or High Altitude Platform Station systems into 5G systems.

We will produce a TR on protocol for resource management in high throughput satellite systems between the service provider and the satellite operator.

A new version of our Harmonised Standard on radio frequency and modulation for the telemetry, command and ranging of geostationary communications satellites is being produced.

We are also developing a Harmonised Standard for fixed and in-motion earth stations communicating with non-geostationary orbiting systems in the 11 - 14 GHz frequency bands.

Mobile and Broadcast Convergence

Our new Industry Specification Group (ISG) on Mobile and Broadcast Convergence (ISG MBC) held its kick-off meeting in June. Traditionally TV delivery has been dependent on broadcasting (i.e. on one-way, one-to-many delivery networks to fixed TV sets). Nowadays, an increasing number of consumers watch linear or non-linear content on their conventional home screens, as well as on smartphones and tablets. Although much of this content is currently delivered via Wi-Fi networks, these new forms of media consumption dramatically increase the load on mobile networks. New solutions, such as the leveraging of a one-to-many broadcasting approach, may therefore be needed. There is increasing interest in exploring the potential for developing future mobile and broadcasting standards in a converged way. ISG MBC will develop the requirements for media delivery over converged networks.

Advanced Mobile Communications Technologies – 3GPP™

ETSI and 3GPP

ETSI is one of the founding partners of the Third Generation Partnership Project (3GPP), in which we come together with six other regional standardisation organisations worldwide, plus market associations and several hundred individual companies, to develop specifications for advanced mobile communications technologies. Based on the evolution of GSM™, which was defined by ETSI, 3GPP has developed the Universal Mobile Telecommunications System (UMTS™), LTE and LTE-Advanced/ LTE-Advanced Pro technologies.

3GPP is supported by ETSI's Mobile Competence Centre (MCC).

Further information at: www.3gpp.org

3GPP expects to complete a new Internet of Things (IoT) protocol based on GSM EDGE Radio Access Network (GERAN) technology, as well as the alternative narrow-band IoT technology based on LTE.

Whilst LTE, now in its 'LTE-Advanced Pro' guise, continues to receive further enrichment, more and more attention is being given to fifth generation systems, with a number of studies being conducted into potential new radio technologies (including much higher frequency bands). These offer either lower latency and greater throughput or the high latency or low throughput and extremely long battery life which makes them ideal for smart meters, remote monitoring etc.

Work on the development of 5G will intensify in 2016 and will be influenced by activities in the oneM2M project and ETSI's work on Mobile-Edge Computing (MEC), Network Functions Virtualisation (NFV) and Millimetre Wave Technology (mWT).

3GPP is also now looking into the use of technologies derived from the General Packet Radio Service (GPRS) for the exchange of non-Internet Protocol data, which will become increasingly important for Machine-to-Machine communications in the IoT.

In the not too distant future, society will be fully mobile and connected. It will be characterised by tremendous growth in connectivity, traffic volume and a much broader range of usage scenarios. To meet these increasing demands, sustainable development of the eco-system is now required to improve spectrum efficiency, energy use, ease of operation and to reduce capital and operational expenditure.

Future mobile communications systems will have to be ultra-secure and ultra-reliable. 3GPP is looking into the range of potential applications of 5G and assessing the appropriateness of 5G cellular technology. These studies are currently in the early stages of development but will be mature by mid-2016. It is only then that detailed technical specification can start on 5G. This work will take place in the framework of Release 15, which is due to be finished by mid-2018, though there is pressure from some countries to have implementable specifications early in 2017.

Meanwhile, Release 14, due to be functionally frozen in March 2017, will see LTE mission-critical services extended from voice-only to video and data.

With ever greater numbers of channels and the advent of 4k resolution inciting interest, 3GPP will look again at mechanisms for delivering television programming over cellular networks, with a view to providing better spectral efficiency and improving the consumer's quality of experience. Work in this area will encompass facets of charging, of radio access network sharing, and improved flexibility as perceived by both broadcaster and consumer.

Other work in 2016 will include an examination of the operations and maintenance aspects of virtualised networks, and the modification of a number of network management specifications. Increasing security concerns will result in new encryption algorithms.

Further work will be undertaken to bring closer together the concepts of cellular telecommunications and Wi-Fi, with spare capacity in the 5 GHz Wi-Fi band being used on demand for aggregating with cellular licensed bands to increase overall available bandwidth. 3GPP is co-operating with the Institute of Electrical and Electronics Engineers (IEEE) and the Wi-Fi Forum on this service. This work is in addition to the expansion of 'traditional' channel aggregation using licensed spectrum alone.

Many interesting studies are planned for completion in 2016 including work on server and network assisted Dynamic Adaptive Streaming over HTTP (DASH) in the 3GPP network; virtual reality: improved characteristics for and performance of video services; enhanced Voice over LTE; High Speed Packet Access and LTE joint operation; context-aware service delivery; and relays for the IoT and device-to-device functionality.

Harmonised Standards for IMT

Our Mobile Standards Group (TC MSG) provides the regulatory standards needed to support the deployment of GSM, UMTS and LTE networks in Europe. In 2016, we will begin updating our standards to include additional features (beyond 3GPP Release 11), specifically new band combinations and new features corresponding to 3GPP Release 13.

We will complete the conformance and interoperability testing for eCall, the in-vehicle emergency call service which automatically relays data about an accident from the vehicle involved to the emergency services, providing faster and more effective emergency responses. We plan to publish test descriptions for High Level Application Protocols in mid-2016.

We also expect to publish new versions of our European Standards (ENs) and our TS on mobile communication on aircraft, which will then include UMTS and LTE as well as the original GSM.

Mobile-Edge Computing

A key development in the convergence of IT and telecommunications networking is the ability to run IT servers at the network edge, applying the concepts of Cloud computing. MEC will enable operators to open their Radio Access Networks to authorised third parties, allowing them rapidly and easily to deploy innovative applications and services for use by mobile subscribers, enterprises and vertical segments, creating a new value chain. MEC will be a key component in the transformation of the mobile broadband network into a programmable world and an important enabler for the IoT, mission-critical vertical applications and 5G. It will help to satisfy the demanding requirements for the 5G era in terms of expected throughput, latency, scalability and automation.

A standardised, open environment is needed to allow the efficient and seamless integration of applications across multi-vendor MEC platforms. This would also ensure that the majority of the customers of a mobile operator can be served.

Our ISG MEC is developing specifications that will allow the hosting of third-party applications in a multi-vendor MEC environment. In 2016, we will develop specifications for the MEC application programming interfaces (APIs) and other interfaces, beginning with radio network information, MEC location, user equipment identity and bandwidth management. These APIs will be application-agnostic and will allow the smooth porting of value-creating applications on every mobile-edge server with guaranteed service level agreements. By the end of 2016 we also expect to have defined the general principles and design guidelines for developing mobile-edge service APIs.

We will also specify the user equipment application interface, mobile-edge platform application enablement, the management of mobile-edge applications, such as application lifecycle and application-related policies, and the management of the mobile-edge system, hosts and platforms.

In addition, we are addressing mobility support provided by MEC, which will form the basis of a standardisation gap analysis, and the deployment of MEC in an NFV environment.

To increase MEC market acceleration, we are addressing appropriate metrics (e.g. latency, energy efficiency) that can potentially be improved by the use of MEC in both LTE-based and future mobile networks. We are also working on the business drivers for the MEC value chain and MEC market requirements for multi-vendor eco-systems, including the methodologies, tools and facilities to achieve interoperability.

Millimetre Wave Transmission

Interest in millimetre wave bands (30 - 300 GHz) has risen in recent years due to the enormous amount of under-utilised bandwidth that lies in this part of the electromagnetic spectrum and the significant advantages offered in terms of frequency re-usability and large channel bandwidths. As regards backhaul and more general transmission, millimetre wave offers more spectrum for radio transmission than lower bands, and larger channel bandwidths, delivering fibre-like capacity. The spectrum can be made available readily and can be reused easily, and lower licensing costs mean services can be provided more economically. Millimetre wave technologies are therefore expected to be a major enabler of future mobile communications.

However regulations for millimetre wave radio differ greatly from country to country, making it difficult for operators to devise deployment strategies across different countries.

Our ISG mWT is working to facilitate the use of the V-band (57 - 66 GHz), the E-band (71 - 76 and 81 - 86 GHz) and, in the future, higher frequency bands (from 50 GHz up to 300 GHz) for large volume backhaul and front-haul applications. This will support mobile network implementation, wireless local loop and other services which benefit from high speed wireless transmission, and enable large-scale usage of this – as yet largely untapped – spectrum resource.

In 2016 we will focus on licensing aspects, more innovative and holistic use of the spectrum (band and carrier aggregation), standardisation of new bands above 90 GHz (W-band and D-band) and the co-existence of different services in the V-band, with the aim of giving operators the confidence to deploy in an interference-safe environment. We plan to analyse the co-existence of fixed services and short range devices in the V-band, with the ultimate aim of identifying a new reference standard for the backhaul of small cells.

We expect to publish a specification on the channelisation of W-band (92 - 114,5 GHz) and D-band (130 - 174,8 GHz), aimed at facilitating the deployment of both future high capacity backhaul systems and innovative solutions for fixed broadband access.

We have begun new work on applications and use cases of Software-Defined Networking as related to microwave and millimetre wave transmission.

Other Wireless Work

Our Access, Terminals, Transmission and Multiplexing committee (TC ATTM) is developing a new TR on small cells microwave backhauling.

TC ERM has begun new Harmonised Standards for robotic mowers and metal sensors below 148,5 kHz. We are updating our Harmonised Standards for Digital Mobile Radio (DMR) and digital PMR (dPMR) to take account of technical developments in PMR. We expect to complete a new System Reference document on amended mitigation techniques for Ultra Wideband to provide alternatives to existing techniques. We will produce a new TR on the use and effect of mathematical operations on relative measurement uncertainties and we are updating our TR on the definitions of radio parameters in ETSI standards, specifications and reports, harmonising the definitions.

Bringing the Power of ICT to People on the Move

Information and Communication Technologies are revolutionising the transport sector, increasing efficiency, reliability and safety and reducing energy consumption. ETSI supports road, railways, aviation and maritime transportation with activities which are carried out by key industry players and therefore reflect true market demand.

Intelligent Transport Systems (ITS)

Our Intelligent Transport Systems committee (TC ITS) is playing a leading role at the global level, accelerating the introduction of ITS services and applications. The key focus of 2016 and beyond will be on Co-operative ITS (C-ITS), which enable vehicles made by different manufacturers to communicate with each other and with road infrastructure systems to help prevent traffic accidents.

In 2016 we will continue to fine-tune our Release 1 C-ITS standards, taking account of feedback received.

At the same time we are conducting initial studies for Release 2 of the C-ITS standards and in preparation for automated driving. Release 2 will address new features and functionalities anticipated in future C-ITS to deal with more complex use cases and the interests of a larger group of stakeholders. Work will continue on pre-standardisation studies into Co-operative Adaptive Cruise Control and the use of C-ITS to protect vulnerable road users such as cyclists and motor cycle riders. We expect to begin an investigation into platooning. These activities are being co-ordinated with the Institute of Electrical and Electronics Engineers (IEEE) and SAE International to achieve the harmonisation of ITS deployment in different regions.

By the end of 2016 we plan to complete a Technical Specification (TS) on the Co-operative Observation Service, whereby sensor information is shared between road users.

Development of conformance tests, which are crucial for the commercial deployment of C-ITS, will continue.

We are studying the feasibility of operating C-ITS and Communication Based Train Control systems in the same frequency bands.

We expect to introduce additional standardisation activities in the second half of 2016, following the publication of the European Commission (EC) 'Master Plan' for C-ITS deployment in Europe.

In response to EC Mandate M/453, our Electromagnetic Compatibility and Radio Spectrum Matters committee (TC ERM) is addressing the spectrum requirements to support Release 2.

We will work with the Car Connectivity Consortium, creators of MirrorLink®, the leading industry standard for car-smartphone connectivity, to adopt the technology as an ETSI standard.

Aviation

In the area of air traffic management equipment, we are developing a new part for the Harmonised Standard on the Advanced Surface Movement Guidance and Control System, on multilateration equipment, covering receivers and interrogators, and reference and vehicle transmitters. We are also updating the Harmonised Standards for VHF Digital Link Modes 2 and 4. Publication is expected early in 2017.

We are working on three new Harmonised Standards required under the scope of the Radio Equipment Directive, addressing primary surveillance radar (PSR) in three operational bands, secondary surveillance radar and multi-static PSR.

By the end of 2016 we expect to complete a new Technical Report (TR) on the use of professional unmanned aerial systems in Europe for civil use such as by film crews, for aerial surveys and by the police.

Railways

Our Railway Telecommunications committee (TC RT) maintains the GSM-R (GSM™ for railways) standard. In 2016 we will update it with an additional section on optional features in railway operation. We will also continue to work to resolve interference issues with public systems, and to ensure the interoperability of the trans-European rail system.

By the end of 2016 we expect to complete a feasibility study into the use of GSM-R radio performance enhancements and resource optimisation as a means of improving system capacity, spectrum efficiency and the robustness of the radio link.

We plan to complete a TS on the commands necessary for the operation of mobile radio systems on railways. A new TS on Short Message Service using Functional Addressing in a roaming environment is scheduled for completion by the end of 2016.

We will start work on the standards necessary for the future Next Generation Radio for Rail for voice, data services and other applications over broadband and narrowband air interfaces. We will begin by collecting the requirements for Professional Mobile Radio Access systems from relevant stakeholders in different rail transportation domains.

We are organising a workshop on future radio for rail transport to be held in November 2016.

Other aspects

TC ERM continues to develop standards for Digital Selective Calling, maritime broadband radio links for ships and off-shore installations and man overboard devices.

By the end of 2016 we plan to complete a new European Standard (EN) on measurement techniques for automotive and surveillance Short Range Radar equipment using 24,05 - 24,5 GHz or 76 - 81 GHz. Publication of a new EN for heli-borne obstacle detection radar equipment in the 76 - 79 GHz band is scheduled for the end of 2016.

We are developing a new Harmonised Standard on wireless power transmission systems, including for the charging of electric vehicles.

Technologies for a Better Life

While technological progress has improved the way we communicate for both social and business purposes and opened up exciting new opportunities, we are careful to minimise any adverse social consequences. Part of our work involves making products and services simpler to use, safer and more efficient. We are also committed to identifying energy efficiency solutions that mitigate the impact on climate change of the growing use of Information and Communications Technologies (ICT). The ultimate goal is to ensure that ICT improve the quality of life for all.

Access for All

The study of human factors can help ensure that products, systems and processes are designed to take proper account of the interaction between ICT and the people who use them. Much research and development in human factors today is aimed at finding innovative approaches to extend digital inclusion. Increasing the uptake and use of new technologies can improve the quality of our lives and the competitive position of businesses in global markets. Both society and industry therefore profit from a greater focus on end-user aspects and the user's experience of ICT.

Our Human Factors committee (TC HF) continues to focus on accessibility issues and 'Design for All', an approach aimed at ensuring that everyone has the same access to devices, systems and services. We are working to include Design for All in all our relevant standardisation initiatives, in line with European Commission (EC) Mandate M/473, and work continues on the implementation of TC HF's guidelines on identifying Design for All aspects in ETSI's standards.

We are developing a Technical Report (TR) on the functional needs of people with cognitive and learning disabilities (including dyslexia, dementia and other cognitive impairments). We have also started work on an ETSI Guide (EG) which will provide recommendations for the design and development of applications, services and devices (mobile phones, smartphones, touchpads, tablets etc.) to enable users with learning disabilities and the elderly to exploit the potential of mobile technologies. This work is expected to be completed by the end of 2016.

We are revising our European Standard (EN) on accessibility requirements for the public procurement of ICT products and services, particularly in relation to real-time texting and to increase its global relevance. This will be followed by updates of the associated TRs and the procurement toolkit.

In the area of smart cities, we are undertaking an analysis of standards documents and standardisation activities related to human factors. We are also looking into questions of privacy, data integrity and trust in smart cities environments.

Our User Group works with our other committees to ensure the needs of users are considered. Work has begun on a TR on reference values for various telecommunication services and service level agreements, with the aim of helping the user make a properly informed choice of supplier. The group is also preparing a Special Report on the Internet of Things and users' needs with regard to issues such as Quality of Service (QoS), security, usability, flexibility and service level objectives.

Our Emergency Telecommunications committee (SC EMTEL) is addressing alerting and emergency communications for users with special needs such as the elderly, the very young or those with disabilities.

Media Quality and the User Experience

Our Speech and Multimedia Transmission Quality committee (TC STQ) is addressing the growing demand for wideband and 'super-wideband' (bandwidth up to 14 kHz) speech communication and multimedia in hands-free and video phone applications. In 2016 we will update our Technical Specifications (TSs) on the transmission requirements for super-wideband handheld, headset and hands-free terminals, to optimise the end-to-end quality perceived by users.

We work closely with the Third Generation Partnership Project (3GPP™), regularly revising our multi-part TS on the QoS aspects of popular mobile services to reflect the latest developments in GSM™, 3G and LTE™. In 2016 we will publish a new part 8 on the definition of QoS parameters and their computation, and updated versions of our standards related to background noise.

We plan to complete TRs on the maximum levels of acoustic output from the headphones used by call centre agents, and on the handling of measurement uncertainties in the field of electro-acoustics. We also expect to publish the last part of a new four-part TS on benchmarking methods and background traffic load profiles, on high speed Internet.

We are developing a new TS on transmission quality and speech intelligibility for users with impaired hearing.

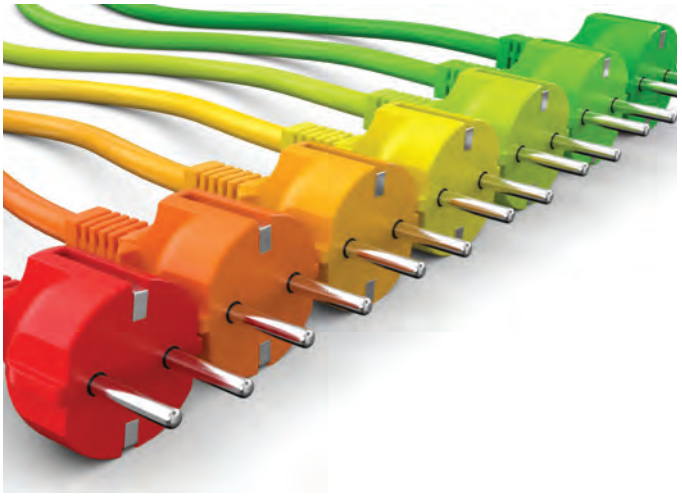
Work will continue on net neutrality, and on methodologies and the testing of speech communication when using wearable devices. To improve subjective testing, we are addressing the possibility of detecting emotions in the measurement of telecommunication applications.

Safety

Our Safety committee (TC SAFETY) will continue to monitor electrical safety, safety in cable television systems and developments in electromagnetic fields (EMF), particularly in the light of the introduction of the Radio Equipment Directive.

Energy Efficiency for ICT

We are working with the European Committee for Standardisation (CEN) and the European Committee for Electrotechnical Standardisation (CENELEC) in support of EC Mandates M/462 on energy efficiency in fixed and mobile information and communication networks, M/543 on material efficiency and M/544 on networked standby. M/543 and M/544 support the implementation of the EU's Ecodesign Directive.



Our contribution to the work programme agreed with the EC under M/462 includes ENs on measurement methods for energy efficiency Key Performance Indicators (KPIs) for servers, for radio access network equipment and for Network Function Virtualisation (NFV) applications in ICT networks. These ENs are expected to be published by June 2017.

For M/544, our Environmental Engineering committee (TC EE) plans to complete a new EN on networked standby mode for household and office equipment by the end of 2016. We will also define the standardisation programme on material efficiency in support of M/543, with the aim of publishing all the required standards by 2018.

In addition, we are updating our ETSI Standard (ES) for the assessment of mobile network energy efficiency to take account of the evolution of the network. In parallel, we are developing a TR on the possible metrics and measurement methods for the energy efficiency of future 5G systems, and we are improving our ES on the energy efficiency of radio base stations to take account of dynamic traffic load. We are also developing a TR on best practice for the assessment of the energy performance of future radio access network deployment.

We are developing an ES to define appropriate measurement methods for the energy efficiency of NFV, and updating our ES on the Green Abstraction Layer to cover the NFV application.

We are producing a new ES defining standardisation terms and trends in energy efficiency, and a TR on approaches, concepts and metrics for the circular economy.

We will continue our discussions with the Alliance for Telecommunications Industry Solutions (ATIS) on the alignment of our respective methodologies for the measurement of energy efficiency in ICT products and networks.

We have begun new work on a TS for liquid cooling systems for ICT equipment.

We will continue to develop standards on the alternating current interface for ICT equipment connected to a 400V DC source, and will update our EN on the reverse power feeding of fixed access network equipment to introduce requirements for 400V DC remote powering. We are revising our standards for equipment powered by 48V DC.

A new ES on the colour and marking of DC cables and connecting devices – the first international standard on this subject – is due to be completed in 2016. This will simplify the installation of equipment, improving both safety and efficiency.

We plan to publish a TS on the evolution of battery technology and super-capacitors for use with stationary ICT and telecommunication equipment. This will have implications for smart cities and other applications which rely on batteries used in conjunction with alternative power sources.

In response to M/462, our Access, Terminals, Transmission and Multiplexing committee (TC ATTM) is developing global KPIs to support the deployment of eco-efficient networks and sites and to enable users to monitor the energy management of deployed broadband. Outlined in a series of ESs based on our existing KPIs and TSs for energy efficiency in broadband deployment, these KPIs will describe the best practices, most efficient equipment and solutions for the building of sustainable operational networks, sites and data centres. We have begun upgrading these ESs and TSs, with the aim of publishing them as ENs by 2018, in time to support potential new European legislation related to the development of efficient ICT products and components.

In addition, our Integrated Broadband Cable Telecommunication Networks committee (TC CABLE) is developing an EN defining the energy consumption of cable access networks which will be used as a global KPI and a baseline for measuring the energy management of operational infrastructures.

We are addressing regional metropolitan networks, broadband deployment and lifecycle resource management for the end of life of ICT equipment. Other work includes a new TS on digital multiservice cities and a TR which will recommend realistic limits for the energy consumption of ICT equipment in the context of current technology.

Our Industry Specification Group on Operational energy Efficiency for Users (ISG OEU) expects to complete a position paper on the deployment of fire extinguishing and alarm systems in ICT sites.

A global KPI for monitoring green data centres is scheduled for publication by early 2017 and, in collaboration with Eurocities (the European forum of smart cities), we will produce a specification defining global KPI modelling for green smart cities. We will begin new work on ICT services for the management of sustainable intelligent cities, relevant KPIs for smart cities, and KPIs for ICT energy levels in different industrial sectors. We will also address operational sustainability management and the monitoring of the ICT carbon footprint. Work will continue on the measurement of energy consumption in memory units and information technology servers.

Standards for Secure, Reliable Communications

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 the user and creating a more secure and profitable environment for the industrial sector.

Cyber Security

The Internet has become a critical infrastructure for both businesses and individual users and its security is therefore of paramount importance. Security is also central to the modern connected world and a crucial factor in inspiring the consumer confidence necessary to achieve the commercial success of the new technologies emerging in the Internet of Things (IoT). Growing dependence on networked digital systems, products and services has brought with it an increase in both the variety and quantity of cyber-threats which now infiltrate the daily lives of individuals and threaten the stability of the economy.

By the end of 2016 our Cyber Security committee (TC CYBER) plans to complete a Technical Report (TR) on gateway cyber defence, an ETSI Guide (EG) on the impact of the anticipated emergence of the quantum computer, and a TR on describing and exchanging cyber-threat information.

We also expect to complete a TR on the protection and retention of personally identifiable information (PII) as well as two related Technical Specifications (TSs): one on the technical means to enable the assurance of privacy and the verification of that assurance and the other on identity management and naming schema protection mechanisms, which will identify means to prevent identity theft and resultant crime.

Recognising growing concerns about protecting the privacy of individuals and their data, we are working in co-operation with the European Committee for Standardisation (CEN) and the European Committee for Electrotechnical Standardisation (CENELEC) in response to European Commission (EC) Mandate M/530 on Privacy by Design. Following the EC's acceptance of our proposals for the production of a set of standards to manage privacy and personal data protection from the earliest stages in the design and development of security technologies and services, as well as during production and provision, we plan to complete a practical introductory guide to privacy by the end of 2016.

The timing of the standardisation of new technologies, products and services is important, and work is also underway to ensure that Information and Communications Technologies (ICT) are secure from the start. We expect to complete a TR outlining a high-level structured ecosystem of security design requirements for communication and IT networks and attached devices.

Other work will address Lawful Interception (LI) and Retained Data (RD) interfaces and the role of global, trusted-third-party or virtualised components of law enforcement equipment. Additional work is expected to arise in 2016 as a result of the new Network and Information Security Directive, particularly in the area of Critical Infrastructure Protection.

Smart Cards

Our Smart Card Platform committee (TC SCP) is responsible for developing and maintaining the specification of the UICC, a specific type of secure element mainly (but not only) targeted at telecoms and used in various environments to secure service-related credentials such as ticketing and payment services. Its most notable use is as a platform for the Third Generation Partnership Project (3GPP™) (U)SIM application, as well as for 3GPP2.

Our main areas of work in 2016 will be the embedded UICC (eUICC) and the definition of test cases related to the support of multiple secure elements for mobile contactless communication over the Near Field Communication interface.

In addition, we will consider the future of the secure element and plan to publish a specification early in 2017. We will consider improving the existing physical/electrical interface and/or logical interface or defining new ones for removable and non-removable secure elements. We will look at new flexible ETSI form factors for a secure element and new data structures capable of handling large amounts of data securely.

We will also continue to enhance the requirements specification for the embedded UICC with the addition of a set of requirements related to device-assisted download and installation as well as specific requirements for the testing of the embedded UICC as its integration changes the testing environment.

Our specifications are widely used by the industry and certification bodies, so we will continue to maintain our existing specifications and to update our test specifications, particularly to cover new features and functions.

Future work will take into account the ecosystem of applications and further development of the use of the UICC. This will enable us to cover interfaces between servers involved in the management of the UICC. We will expand our focus to new form factors to address the requirements of, for instance, IoT applications.

Electronic Signatures

Our Electronic Signatures and Infrastructures committee (TC ESI) expects to complete its work in response to the EC mandate on Electronic Signature Standardisation, M/460, publishing all the outstanding specifications required by mid-2016.

M/460 aims to achieve mutual recognition and the cross-border interoperability of electronic signatures throughout Europe by providing a rationalised framework for electronic signature standardisation. Our standards, specifications and reports will provide guidance on the use of standards related to digital signatures, the creation and validation of signatures, Trust Service Providers (TSPs), cryptographic algorithms and trust application service providers. We are co-operating with CEN in this work, and harmonising our standards and specifications with the new 'eIDAS Regulation' on electronic identification and trust services for electronic transactions in the internal market.

In addition, by the end of 2016 we expect to complete a preliminary study on long term preservation, and we are enhancing the CAdES and XAdES signature formats to support the Evidence Record (ERS and XMLERS).

Further work will be undertaken on TSPs to support electronic identification and to profile the certificate revocation status in line with the eIDAS Regulation. We will begin new work on digital signature creation and validation services.

We will continue to collaborate with the CAB Forum on certification authorities issuing public key certificates.

Lawful Interception and Data Retention

In 2016 our Lawful Interception committee (TC LI) will continue to update its LI and RD standards, specifications and reports by adding new services, as required. This will include the maintenance of the seven-part TS on the handover interface and service-specific details for Internet Protocol (IP) delivery.

We plan to finalise a new TS on the dynamic triggering of interception, which is required as a result of the diversification of service and network architectures, and we are preparing a new specification for an internal network interface for LI, covering connections between LI systems and several network elements from different vendors.

We are developing a specification on security for LI and RD systems, a fundamental requirement which is becoming ever more challenging as networks become increasingly IP service-centric, globally distributed and, frequently, software-based. Our work on Network Functions Virtualisation, which is a key element in this area, is intensifying.

We will update our specification for an LI interface for Terrestrial Trunked Radio (TETRA).

We will develop two new Special Reports: a guide to LI and RD standards and concepts (including an evolutionary overview), and guidance on LI for LTE™.

Other possible future topics include the media stream handover for encrypted data, for handling intercepted data from communications which have been encrypted by operators.

Security Algorithms

Our Security Algorithms Group of Experts (SAGE) will continue to develop cryptographic algorithms as needed to support our standardisation activities. In 2016 we plan to complete specifications for new algorithms for the General Packet Radio Service (GPRS): a new 128-bit encryption algorithm (GEA5) and new 128-bit integrity algorithms (GIA4 and GIA5). These are being developed primarily for EC-GSM-IoT, a radio interface solution being specified by 3GPP for use in the IoT.

Quantum-Safe Cryptography

With the advent of the quantum computer, some of the most widely-deployed public key cryptosystems in security products today will be broken, and previously secure encrypted information (including bank account numbers, identity information and items relating to military security) will become subject to discovery and misuse.

New ‘quantum-safe’ techniques have emerged in recent years that do provide protection against quantum threats and our Industry Specification Group (ISG) on Quantum-Safe Cryptography (QSC) is developing specifications for the transition to quantum-safe ICT applications.

By the end of 2016 or early 2017, we expect to complete six Group Specifications (GSs) including a quantum-safe algorithmic framework and a threat and risk assessment for real-world use cases. Two other GSs are concerned with the characterisation of cryptographic primitives, benchmarking their performance and their suitability to a variety of applications. We have introduced new work aimed at explaining the upper limits of quantum computing power in the context of cryptography, and we will assess the current state of quantum-safe standardisation, identifying where new standards and security architectures are needed.

Quantum Key Distribution

Quantum Key Distribution (QKD) enables digital keys to be shared privately without relying on computational complexity. Keys are shared over optical fibre or free space links encoded on single photons or weak pulses of light. Standards are now urgently needed to enable adoption of these new security technologies.

In 2016 our ISG QKD will address best practice security guidance and complete a specification on protection against Trojan horse attacks. We will begin work on a specification for the characterisation of QKD transmitter modules underpinned by measurement procedures developed and validated by several national metrology institutes. Work will continue on deployment parameters and on the properties of the components and internal interfaces of QKD systems.

Information Security Indicators

After producing six specifications which together provide a reference model for the measurement of information security risks, in 2016 our ISG on Information Security Indicators (ISG ISI) is embarking on a second phase of work. This will include a description of a security information and event management approach involving the whole information security ecosystem (national Computer Emergency Response Teams (CERTs) and security operations centres (SOCs)). We will develop an ISI-compliant measurement architecture for cyber security to enable communication between diversified detection tools, and guidelines for building and operating a secure SOC. At the same time, we are updating our Key Performance Security Indicators for the evaluation of the maturity of security event detection, with the addition of application examples.

Facilitating Content Consumption Whatever the Platform

The Internet, mobile communications and broadcasting are converging. But the standardisation of these different areas has traditionally followed different paths, so they do not interoperate across the same platforms. We are addressing the urgent need to align the diverse specifications for content delivery in a converged environment supporting Internet Protocol Television (IPTV), Mobile TV and broadcast TV – for the benefit of both the industry and the consumer.

Broadcasting

Our standardisation of broadcast systems, programme transmission and receiving equipment is dealt with in a Joint Technical Committee which brings us together with the European Broadcasting Union (EBU) and the European Committee for Electrotechnical Standardisation (CENELEC) – JTC Broadcast.

In 2016 JTC Broadcast will continue to address digital broadcasting, particularly Ultra High Definition TV (UHDTV) and related areas. The committee will focus on Digital Video Broadcasting (DVB) UHD Phase 2 covering High Dynamic Range (HDR), Wider Colour Gamut (WCG) and Next Generation Audio. Higher Frame Rates will also be addressed, once chip set technology supports this feature.

HDR is a key topic and will also be addressed, especially its backwards compatibility, in another JTC Broadcast specification, for a Standard Dynamic Range (SDR) compatible HDR system for use in consumer electronic devices.

The JTC is developing a new DVB Subtitle Specification based on Extensible Markup Language (XML), which will decrease the data rate required for subtitle delivery. The current bitmap-based Subtitle Specification will also be updated to include UHD resolutions.

The committee will also provide a new version of the CI Plus Specification which will include a new, smaller USB-based form factor in place of the original memory card (PCMCIA), which will produce higher data rates.

The latest version of the 'DVB-SI (Service Specification)', which enables all the various components of a video service to work together, is scheduled for publication in 2016. It will provide the necessary updates for companion screens and streams and UHDTV, as well as updates for the C2 delivery descriptor.

The JTC will standardise the requirements and test methods for Digital Audio Broadcasting (DAB)/DAB+ radios. It will also revise the DAB system specification to take account of feedback received following roll-out and to prepare for the further take-up of digital radio.

The committee will define extensions to the Enhanced AC-3 codec to carry object audio in a manner that is backwards compatible with existing channel-based operation. A new specification will be developed to define a consumer object-based audio renderer for use with the AC-4 codec, and the object audio metadata specified therein.

Still in the audio area, the DTS specification will be updated with additional details for the technical descriptions and improved language consistency to increase readability.

Work on hybrid TV will include a revision of the MHEG-5 Broadcast profile. A revised Hybrid broadband broadcast TV (HbbTV) specification, corresponding to HbbTV v2.0.1, will also be produced. This will primarily address gaps relative to the MHEG-5 Broadcast profile as used in the UK and DVB-MHP as used in Italy. A new standard will extend this specification with broadband discovery, addressing situations in which broadcast signalling does not reach the HbbTV terminal.

Protection and Rights Mechanisms

Our Industry Specification Group (ISG) on the Embedded Common Interface (ECI) for exchangeable Conditional Access (CA)/Digital Rights Management (DRM) solutions is specifying a framework for software-based, easy-to-change protection and rights mechanisms for the delivery and consumption of media content on several types of user equipment.

The core of the concept is the ECI software interface to which CA/DRM clients can be attached after being downloaded to the device. This will improve interoperability between services and devices, allowing consumers to continue using equipment and content they have previously paid for, after a move or a change of network provider, or to access content from multiple service providers from the same device. Greater flexibility and scalability is also anticipated, leading eventually to cost reductions for both the service provider and the consumer.

In 2016 we will finalise Part 3 of the core specification of the ECI, which covers the CA/DRM container, loader, interfaces and revocation mechanisms. In addition, we expect to complete specifications dealing with security and the virtual machine (which will allow multiple clients to run in parallel on the same device). We have begun work on the trust environment and other new work this year will include extended requirements, system validation and test cases.

Compound Content Management

New production techniques including HDR, which can produce darker and brighter, more life-like images, and WCG, which extends the colour range displayed, are expected to lead to mass market sales of next generation UHD displays and equipment. However legacy receivers will comprise the majority of installed receivers for many years to come. In 2016 our ISG on intelligent Compound Content Management (ISG CCM) expects to complete a specification for a new Compound Content system for consumer electronic devices which will allow backwards compatibility with today's television, while also providing full quality for the next generation – without compromising the quality of either.

Fulfilling the Promise of Unlimited Bandwidth

Today's consumers expect communications services to be easily accessible and available everywhere, on whatever devices they are using. Technically, this means networks must converge. We provide a comprehensive set of standards for access network technologies.

Network Technologies

Our Network Technologies committee (TC NTECH) is standardising current and future network technologies and their application to managed networks. In 2016 we will finalise the specification of the protocols required on the interfaces of the functional architecture for emergency caller location determination and transport, in support of European Commission Mandate M/493.

In the area of autonomic management, we plan to publish a Technical Specification (TS), outlining the Generic Autonomic Network Architecture (GANA) reference model. We will finalise a report on the application of the GANA reference model to Third Generation Partnership Project (3GPP™) backhaul and core network architectures, and will begin work on the application of the model to fixed broadband access and aggregation networks. We will also continue to work on the evolution of the model to take into account emerging technologies such as Software-Defined Networking (SDN) and Network Functions Virtualisation (NFV).

In the area of naming, numbering and addressing, we have begun new work on the impact of alphanumeric user identifiers on interconnection scenarios. Publication of a Technical Report (TR) is scheduled for June 2017.

We will continue to maintain our Next Generation Network specifications, in particular for business communications and location services, and to provide guidelines on naming, numbering and addressing in managed networks.

Network Access

In the area of fixed radio systems, our Access, Terminals, Transmission and Multiplexing committee (TC ATTM) will continue to revise our Harmonised Standards for point-to-point equipment and the TR on definitions and terminology. Work continues on a new TR on small cells microwave backhauling.

ETSI is leading work at the global level on the standardisation of reverse power feeding. In 2016 we plan to publish a new version of our TS on the reverse powering of remote access equipment, which will specify additional requirements and add further detail.

We are revising our TS on single mode optical fibre systems for home cabling in response to feedback following implementation.

Cable Networks

By mid-2016 our Integrated Broadband Cable Telecommunication Networks committee (TC CABLE) plans to complete a TS on measurement methods for the network performance of broadband data services. This will enable consumers to compare the performance of different service providers. We are taking into account recent developments in Internet Protocol technology.

We plan to produce a TS defining the technical requirements for cable equipment with radio interfaces.

We have started work on a new TS on the performance characteristics of coaxial cables used for RF signal transmission in hybrid fibre-coaxial telecommunication networks.

Network Functions Virtualisation

As innovation cycles continue to accelerate, hardware-based appliances quickly reach the end of their life. Network design must be agile and able to respond on demand to the dynamic needs of the traffic and the continuously evolving services running over it. The vision of our NFV Industry Specification Group (ISG) is of an open ecosystem for NFV, enabling rapid service innovation for network operators and service providers.

With NFV, standard IT virtualisation technology is adopted to consolidate many network equipment types onto industry standard high volume servers, switches and storage. This involves implementing network functions in software which can run on a range of industry-standard server hardware. This software can then be moved to, or introduced in, various locations in the network as required. This will simplify the roll-out of network services, reduce deployment and operational costs and encourage innovation.

Having defined the requirements and architectural framework for the virtualisation of network functions and identified the technical challenges involved, our second release of NFV standards (NFV Release 2) will be published by mid-2016. This release will specify the functional requirements and information models which will provide a basis to facilitate the deployment and operationalisation of Virtual Network Functions (VNF) in an interoperable NFV framework. Release 2 contains specifications about NFV Management and Orchestration (NFV-MANO) interfaces, acceleration interfaces, VNF Packaging (plus the VNF Descriptor) and the Network Service Descriptor. Work on related specifications of protocols, Application Programming Interfaces and data models will extend into 2017.

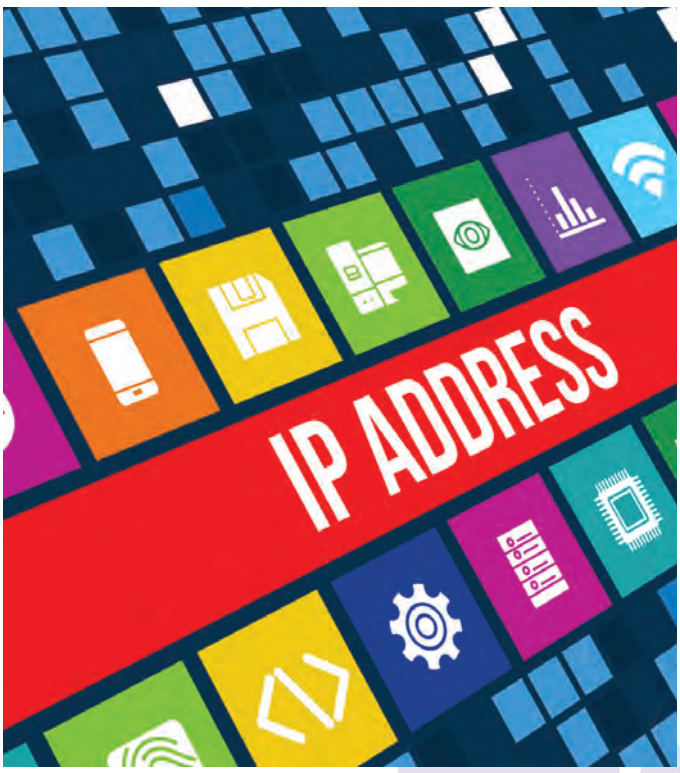
At the same time, we have begun work on NFV Release 3. Release 3 will consolidate specified capabilities and add new features. We will work on diverse topics including charging, billing and accounting; policy framework and general policy descriptions; the automated deployment of element management and specific functions of operating support systems, and the management of NFV-MANO functions; Wide Area Network infrastructure managers and multi-site network services; composition/decomposition of NFV orchestration functions; software updates and upgrades; and snapshotting of the VNF. We will also address interoperability, security and testing.

We have pioneered the use of Proof of Concept (PoC) demonstrations to validate key concepts. In 2016, we look forward to receiving new PoC proposals, in particular in fields that have not been sufficiently explored, or related to hot topics such as Lawful Interception, end-to-end fault correlation and test methodology. A Plugtests™ interoperability event will also be used to help validate the completeness and consistency of our specifications.

Our Open Source MANO (ETSI OSM) initiative is beginning work on the development of Open Source software for the NFV-MANO. This will capitalise on the synergies between the worlds of standards and Open Source, using accepted Open Source working procedures to produce regular versions of a software reference implementation (code) of the ETSI MANO. This approach will maximise innovation, efficiency and time to market, and enable NFV solution vendors to meet users' needs rapidly and cost-effectively. Following the launch of Release 0, which integrates the seed code supplied by some of the founding members of the group into a documented package of running code, we plan to launch Release 1 by the end of 2016. Release 1 will extend current multi-VIM (Virtualised Infrastructure Manager) and multi-site support, and include further additions to service modelling and Enhanced Platform Aware resource allocation.

Transition to IPv6

The public Internet Protocol version 4 (IPv4) address space managed by the Internet Assigned Numbers Authority (IANA) was completely depleted back in February 2011. IPv6 was developed as a replacement for IPv4 and, if current trends continue, worldwide penetration of IPv6 should reach 50% by 2017. IPv6 solves the problem of IPv4 address exhaustion, allowing new entrants to join the Internet and preventing a digital divide and market distortion which would affect the openness of the Internet. IPv6 also provides enhanced features and caters for the new technologies that will adopt it such as the Internet of Things (IoT), Cloud computing and 4/5G mobile communications.



Our ISG on IPv6 Integration (ISG IP6) is addressing the transition from IPv4 to IPv6. Our work includes selecting and defining scenarios where IPv6 could have real critical impact. We are working on 18 Group Specifications (GSs) including those outlining the motivation for the deployment of IPv6 in various areas – enterprise, telecommunications and Internet service providers, public safety and the emergency sector, academia and education, Cloud computing and government. Each specification will also include the respective objectives, technology guidelines and an addressing plan, and will identify benefits, risks, challenges and milestones. A key GS will describe IPv6, as well as the challenges arising from transition from IPv4 to IPv6 and their co-existence, and then identify best current practices and develop guidelines for mitigating any issues identified.

We will also address the use of IPv6 in new technologies, in particular the IoT and Machine-to-Machine communications, SDN and NFV, 5G mobile Internet, Cloud computing and the industrial Internet, as well as IPv6 over Time-Slotted Channel Hopping (6TiSCH) technology, privacy and security.

All except the GSs on 5G, Fog Computing and privacy, which need more investigation, are expected to be completed by the end of 2016. We then plan to introduce new topics in 2017 such as IPv6-based Internet of Vehicles and Vehicles of Internet and IPv6 on robotics.

Five different IPv6 transition technologies (NAT64, MAP-E, DS-Lite, 464XLAT and 6RD) have been defined. In 2016 TC CABLE expects to publish Test Descriptions for each of them, providing interoperability and test cases that go beyond compliance and protocol conformance testing to enable the deployment of IPv6 transition technology. We also plan to publish a series of specifications outlining a strategy to provide network operators with specific and realistic approaches to deploying each of the five transition technologies in operational networks.

Next Generation Protocols

Many existing communications systems have adopted the TCP/IP protocol suite for networking and inter-networking, but increasingly find these protocols do not meet their demands as well as expected. Over time, there have been incremental improvements, often targeted at specific issues which were not always adequately resolved. In short, these protocols no longer meet the needs of today's connected society.

Our ISG on Next Generation Protocols (ISG NGP) is reviewing the future landscape of Internet Protocols, identifying and documenting requirements. The aim is to trigger new activities to create a more efficient Internet that is responsive to the user – whether this means an individual person or millions of devices in the IoT.

ISG NGP is formulating a series of GSs which will include a summary of relevant technologies, architectures and protocols under research, together with an assessment of their maturity and practicality for implementation to begin by 2020. By September 2016 we expect to complete a definition of key scenarios that are required to support existing next generation use cases. This will enable us to identify issues that may require improvements leading to next generation network protocols.

We also plan to introduce work on NGP self-organising control and management planes, with the aim of making the network able to adapt to unpredictable changes while hiding intrinsic complexity from operators and users.

Connecting Devices in the Home and Office

The variety of devices that need to be interconnected is growing rapidly and most require broadband. The new services being developed are creating a 'Connected Home' and a 'Connected Office'. Our standardisation for home and office focuses on three aspects: home and office wireless, home and office interconnection, and home and office requirements, including Quality of Service (QoS) and security.

Cordless Voice and Broadband Communication

Our Digital Enhanced Cordless Telecommunications (DECT™) specification is the leading standard around the world for digital cordless telecommunications with over 1 billion devices installed worldwide in over 110 countries and more than 100 million new devices sold every year. DECT products now account for more than 90% of the world cordless market.

Our DECT committee (TC DECT) continues to maintain the DECT base standard with the addition of new features. In particular in 2016 we will implement security architecture enhancements in the core technology to better protect end-user privacy and the confidentiality of communications.

We will also update the New Generation DECT specifications for Internet Protocol-based networks and services as necessary.

In addition, DECT is being enhanced to include Ultra Low Energy (ULE) products. DECT ULE is the new networking technology for residential and building applications that is primarily driven by the need for low power for battery-operated devices. It enjoys all the advantages of the DECT spectrum and technology as well as adhering to the technical parameters for the Internet of Things. In addition to low power consumption, DECT ULE offers good QoS and wider coverage than competing technologies.

DECT ULE is not a minor adaptation of DECT but has been developed specifically for Machine-to-Machine (M2M) communications. It reuses the DECT physical layer, DECT spectrum and DECT channel structure, but there are significant differences in the MAC layer, security algorithms and channel selection. DECT ULE operates over license-exempt 'high-quality' spectrum (1 880 - 1 900 MHz) which provides a more reliable service than the Industrial, Scientific and Medical band.

Although specifically designed for optimal coverage of homes and industrial premises, DECT ULE can also be used in Personal Area Networks due to its low power consumption. In the first phase of its development, target applications included smart home and smart living applications such as home automation and energy control, remote switches, the control of smart appliances, smart metering and temperature controls, security, alarms and eHealth applications. Phase 2 includes regional variants of ULE for the US and Japan and additional features suitable for a broader range of application scenarios such as support for hybrid devices which use ULE and non-ULE services (e.g. voice), Software Update Over The Air (SUOTA), a compatibility mode for base stations that also support No-Emissions Mode (NEMo) and a connectionless downlink (the capability to transmit ULE messages to multiple devices), and repeater compatibility support for base stations and mobile stations to extend the range of the DECT system. Possible applications that can be built with ULE Part 2 include simple medical pendant alarms (for instance to monitor heart rate or movement and including an alarm button and additional voice capability), lighting controls, residential hubs and gateways, and intercoms, entry-phones and other M2M devices with an audio capability.

In response to feedback received after implementation of the Phase 2 specifications, in 2016 we will update the specifications to include NEMo and to add more functionality for operation with repeaters.

We are now making plans for the future of DECT, collecting requirements for its evolution and studying implementation possibilities, such as for example for low latency or higher bit rates, possibly using Orthogonal Frequency-Division Multiplexing and multiple-input multiple-output (MIMO). A Technical Report (TR) is due for publication in mid-2017.

In addition, we are working to ensure adequate spectrum resources for wireless technologies. The standard frequency band for DECT in Europe is 1 880 - 1 900 MHz. We are participating in work to update CEPT Recommendation 70-03 to include the 1 900 - 1 920 MHz band. When completed in 2016, this extension will provide additional capacity for various M2M applications, smart appliances and streaming audio.

Liaison with the International Telecommunication Union (ITU) continues, to maintain existing standards and to build New Generation DECT and DECT ULE into the ITU's Recommendations.

Powerline Communications

Our Powerline Telecommunications committee (TC PLT) focuses primarily on the transportation of video over wireline at home. In particular we are responding to demand from TV broadcasters and over-the-top (OTT) programmers seeking to embrace the advent of Ultra High Definition (UHD) video streaming and Video on Demand services for UHD television and new video compression technology such as High Efficiency Video Coding (HEVC), which rely on high performance powerline telecommunication (PLT) MIMO modems.

The high throughputs provided by MIMO-PLT modems combined with advanced HEVC encoded video are facilitating today's UHD video services such as Video on Demand and OTT. They are also enabling the evolution of UHD (Phase 2) with features such as High Dynamic Range, High Frame Rate and Wider Colour Gamut to enhance the user experience on smart TVs and the new generation of set-top-boxes. In response to these developments, we are preparing a new Technical Specification (TS) on the transcoding of HD and UHD video over powerline networks, to improve wireline or wireless gigabit home network coverage for new premium services.

To preserve the high throughputs of Digital Subscriber Line (DSL) technologies, we are collaborating with Study Group 15 of the ITU's Telecommunications Standardisation sector (ITU-T) on the co-existence of DSL modems and PLT at customers' premises. In 2016 we plan to publish a test specification on the measurement of interference between PLT (single-input single-output (SISO) and MIMO) on Very-high-bit-rate DSL 2 (VDSL2) and the ITU-T's G.Fast Recommendation. This will then be used at a Plugtests™ event in late 2016 or early 2017 which will help us refine our specification on the co-existence of VDSL2 and PLT modems.

Mission-critical Communications to Rely on

Communication is a key factor in an emergency situation, both small incidents such as a man overboard as well as major natural disasters.

Terrestrial Trunked Radio

Terrestrial Trunked Radio (TETRA) is still the leading technology choice for critical communications users. Looking to the future, it is expected to evolve into a fully integrated and seamless Information and Communications Technologies solution, providing narrowband/wideband/broadband wireless communications for mission-critical and business-critical Professional Mobile Radio applications. Broadband will be central to this, enabling the high data speeds needed for key applications such as streaming video from the scene of an incident. In 2016, our TETRA and Critical Communications Evolution committee (TC TCCE) will therefore continue to focus on standardising a broadband extension to TETRA.

To minimise the work required, we are enhancing existing standards for technologies, such as LTE™ and 5G, by the development of interfaces and applications, to make them suitable for mission-critical applications. We are revising our Technical Report (TR) on user requirements for mission-critical broadband communications to add more detail on interworking between the Critical Communications Application and TETRA and on the migration of services from TETRA to LTE. We are collaborating with the Alliance for Telecommunications Industry Solutions (ATIS) in the US to ensure our specifications are aligned.

We are revising our original Inter-System Interface (ISI) European Standard (EN) to take account of the introduction of Internet Protocol (IP)-based networks, dividing the content into several new parts to produce a family of specifications for IP, circuit switched and transport layer-independent networks. By late 2016, we expect to have completed a revision of our series of specifications on interworking at the ISI between two TETRA systems, which will add the transport of TETRA speech over IP.

We have begun work on a Technical Specification (TS) for an interworking interface architecture between TETRA and critical communications applications running on broadband networks.

Work will continue on a set of TSs defining the mobile to network interface architecture of a critical communications application operating over a broadband IP interface. We will update part 2, on the network architecture, and we will complete a new part 3, on the network interface specification. These specifications will provide input for the work of the Third Generation Partnership Project (3GPP™) critical communications group, SA6.

Security is also a priority topic. We are studying security mechanisms for mission-critical broadband systems for an underlying broadband system (such as LTE) as well as for applications providing mission-critical services, including group call and Direct Mode services. We have also started a new TR on security issues and mechanisms for interworking between TETRA and critical communications applications running on broadband networks.

At the same time we continue to maintain the existing TETRA standards and by mid-2016 we plan to publish a TR on the addition of voice services to the TETRA Enhanced Data Service (TEDS) channels to improve spectral efficiency.

Emergency Calling and Alerting

In 2016 our Emergency Telecommunications committee (SC EMTEL) will continue to focus particularly on caller location, alerting and emergency communications for users with special needs.

We are developing a TR defining dictionaries which will enable alerting messages to be encoded from keywords, or even generated automatically, and then decoded in the receiver into the user's preferred language.

We are preparing guidelines on the best means of presenting alerting messages to users with special needs such as the elderly, the very young or those with disabilities. This might include, for example, the use of vibrations for those with hearing impairments and colour coding for users who cannot read. A TR is scheduled for publication in 2017.

We plan to re-publish our TS for EU-Alert, the European Public Warning System which uses the Cell Broadcast Service, adding rich media alerts in addition to text messages. This could enable pictures of missing children, for example, to be broadcast to smartphones.

We have begun work on a new TR outlining guidelines for emergency smartphone apps by defining the interface with 112 emergency centres and specifying the type of information that is sent to the public safety answering point (PSAP). The report will consider end-users' varying needs for communication modalities and languages. The report is expected to be completed early in 2017.

Other new work for 2016 will include next generation emergency calling, exploring new ways to contact the emergency services via, for example, social media, texting or sending video clips.

We expect to complete our work on conformance and interoperability testing for eCall, the in-vehicle emergency call service.

Other Aspects of Public Safety Standardisation

Other work includes acoustic safety limits, standards for maritime safety equipment and various mechanisms for road safety through the use of Intelligent Transport Systems.

Interconnecting in a Multi-polar World

Interoperability is driven by market demand and is crucial in a multi-vendor, multi-network and multi-service environment. It gives users greater choice of products and allows manufacturers to benefit from the economies of scale of a wider market. Interoperability is therefore a crucial factor in the success of modern technologies – especially in the introduction of new technologies.

An Innovative Approach to Technical Quality and Interoperability

Our technical committees apply best working practices to ensure that our standards are well-specified and testable and thus provide a solid basis for the implementation of robust and interoperable products. Our Centre for Testing and Interoperability (CTI) supports our committees with hands-on expertise in standards validation.

The CTI employs a software development approach to the production of test specifications, encouraging feedback from a broad base of users. In 2016 we will continue to make use of tools commonly used by Open Source projects for our test suite repositories, bug tracking and quality control. This, together with a tighter cycle-time in our technical committees, will allow us to move towards an even more agile testing approach. We will also continue to develop the use of hackathons.

Proofs of Concept (PoCs) facilitate early standardisation activity and feedback. We have developed a generic framework for running PoCs which can be adapted to suit the needs of individual technical committees. Our Industry Specification Group (ISG) on Network Functions Virtualisation (NFV) already has over 40 PoCs registered, with more expected to be announced during 2016, and our ISG on Mobile-Edge Computing (ISG MEC) has begun its own PoC programme.

Plugtests™ Events

Our Plugtests events provide an opportunity for companies to interconnect prototype or production implementations of standards to test for interoperability and, where necessary, conformance to requirements. These events provide a highly cost-effective and practical way of identifying inconsistencies in either an implementation or the standard itself. We plan to run around 12 Plugtests events in 2016, with varying formats to meet the specific needs of our members and the industries we serve.

This year we will branch into new technical areas with Plugtests events on next generation emergency call 112, NFV interoperability and Vehicle-to-Grid charging systems.

As we continue to support the development of the Internet of Things (IoT), in July we will hold the first joint 6TiSCH/6lo event (IPv6 over the Time slotted Channel Hopping mode of IEEE 802.15.4e/IPv6 over Networks of Resource-constrained Nodes) in Berlin, Germany. The ETSI IoT/Machine-to-Machine (M2M) Workshop in November will include a comprehensive interoperability event with demonstrations, a developers' tutorial and an M2M hackathon.

To support the deployment of Intelligent Transport Systems (ITS), we are organising the fifth Plugtests event on Co-operative Mobile Systems in November, in Livorno, Italy.

Test Specifications and Frameworks

In 2016 we will continue to develop conformance test specifications, including for our ITS and Smart M2M communications (TC SmartM2M) committees, oneM2M and the Third Generation Partnership Project (3GPP™).

Our Core Network and Interoperability Testing committee (TC INT) develops core network test specifications for interoperability, conformance, performance and security, based on 3GPP specifications and the needs of industry. In 2016 we will develop test specifications for Diameter conformance testing for the Rf/Ro interface, which will help accelerate the rollout of LTE™. Other work will include conformance testing for the S1AP and the S1-MME interface and the testing and quality assessment of Voice over LTE (VoLTE) interconnection and roaming. We are also collaborating with the Telecommunication Standardisation sector of the International Telecommunication Union (ITU-T) on the development of a methodology for measuring Internet speed on fixed and mobile networks.

We continue to maintain Testing and Test Control Notation version 3 (TTCN-3), and will develop further conformance test suites for TTCN-3 tools and the application of Test Description Language (TDL).

We will also address security testing and plan to complete an ETSI Guide on the security assurance lifecycle.

We will hold the fourth ETSI User Conference on Advanced Automated Testing (UCAAT) in Budapest, Hungary, in October. The event will consider how advanced test automation can meet the challenges of fast product development in the age of the IoT.

Test Description Language

Our Methods for Testing and Specification committee (TC MTS) creates standards for testing and specification languages and provides frameworks and methodologies to enable our other committees to produce documents that are easy to understand and easy to use.

The main focus for TC MTS in 2016 will be TDL, our new language which exploits the benefits of model-based software engineering. We have commissioned an Open Source reference implementation of a TDL editor, viewer and UML profile implementation to make it easier for industry users and tool vendors to start using TDL. These tools will be made publicly available in the first half of 2016. We will then disseminate TDL to industry and gather feedback on its use.

World Class Standards

- 2G, 3G, 4G, 5G Mobile Communications
- Air Traffic Management
- Automotive Radar
- Autonomic Systems
- Body Area Networks
- Broadband Wireless Access
- Broadcasting
- Cable Networks
- Cloud Technology
- Cognitive Radio
- Content Delivery
- Cyber Security
- DECT™
- Digital Mobile Radio
- Digital Rights Management
- eHealth
- Electromagnetic Compatibility
- Electronic Signatures
- Emergency Communications
- Energy Saving
- Environmental Aspects
- Fixed-line Access
- Fixed Radio Links
- Human Factors
- IMS Network Testing
- Intelligent Transport
- Internet of Things
- Interoperability
- Lawful Interception
- Low Power Radio
- Machine-to-Machine Communications
- Maritime Communications
- Media Content Distribution
- Millimetre Wave Transmission
- Mobile-Edge Computing
- Network Functions Virtualisation
- Next Generation Networks
- Open Source Software
- Powerline Communications
- Protocols
- Public Safety Systems
- Quality of Service
- Quantum Key Distribution
- Quantum-Safe Cryptography
- Radio Regulations
- Radio Systems
- Railway Communications
- Safety
- Satellite Communications
- Security Algorithms
- Short-range Radio
- Smart Appliances
- Smart Cards
- Software Defined Radio
- Telemedicine
- Testing
- Terrestrial Trunked Radio (TETRA)
- Wireless Medical Devices

Published in July 2016
Produced by Kingston Public Relations Ltd, UK (+44 1482 844612) www.kingstonpr.com

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