Enjoy!

THE ETSI MAG

THE INTERVIEW
Julian Stafford
EUTC General Secretary. p.4-5

TECH HIGHLIGHTS
How healthcare can benefit from new digital technologies. p.18-19

IN THE SPOTLIGHT
Asset tracking: the satellite solution. p.13-16

THE DIGITAL
TRANSFORMATION
OF INDUSTRY

ETSI

Editorial

Let me wish you a very Happy New Year, which will hopefully give us an opportunity to meet face to face again.

As we start 2022, more than 30 years after the creation of the Institute, we wanted this edition to address the digital transformation of industry. Many sectors have evolved and are now digitized, bringing innovations to the whole of society at a very fast pace. ETSI members contribute to this rich standardization ecosystem both at ETSI and 3GPP, as this January edition of Enjoy! highlights.

As Julian Stafford from the European Utilities Telecoms Council states in his *Interview*, we should consider the extent to which our daily lives are highly dependent upon a reliable energy supply and telecoms infrastructure with the emergence of smart grids.

In our interview with a *new member*, AUTOCRYPT's CEO tells us why security is more necessary than ever in the automotive industry, as autonomous vehicles make headway in terms of technological development. The *Spotlight* article highlights other areas of transportation, with asset tracking and satellite communications, while the *use case* addresses the factory of the future with 5G and time-sensitive networking. One of our groups explains how is supporting the European maritime safety and security strategy and the development of the *"EU Blue economy"*.
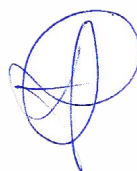
Our *Tech Highlights* feature addresses two topical matters: one article discusses why digital technologies are key for the *healthcare sector* and another looks at how *quality of communication* has developed since the first standards. In *Working Together*, the ZVEI association underlines the importance of standards in the electro and digital industry.

In *New in the Library*, don't miss the second edition of the *Education about Standards* textbook and its set of slides, which will help train the new generation of The Standards People. If you want to refresh your knowledge of ETSI, you can also listen to the short webinar modules of the *ETSI Seminar*, available on our website.

And of course, let me wish you a very Happy New Year, which will hopefully give us an opportunity to meet face to face again.

Enjoy reading!

Luis Jorge Romero,
Director-General ETSI

Event: Digital technologies
for a smart
and sustainable city

This seminar is the first in a European roadshow organized by the NGO "e.green for users" (eG4U), ETSI and Eurocities in several major European capital cities.

The municipality of Montrouge, in the heart of Greater Paris, is hosting this seminar at the Palais des Congrès the "Beffroi". The event will include presentations and an exhibition with booths dedicated to showcase products and services of sustainable smart cities, over two half-days from 13 to 14 January 2022. The main themes addressed by more than 17 speakers will show how digital innovation to the benefit of the smart city can become efficient, effective and environmentally responsible.

Free registration: *https://forms.gle/6bhvCQo6rabaQox27*

ETSI Augmented Reality
group stays busy

The *ETSI Augmented Reality Framework ISG* has been granted a third extension until 2023. This will enable the group to cover the activity of a Specialist Task Force (STF), to complete its set of deliverables and to promote an ecosystem around ARF interoperability framework. The STF was created to accelerate the development of the API specification for the World Storage function. The World Storage function is responsible for storing information that is required to track elements in the real world and to determine the actual position of an AR system in the real world. This implementation-driven standardization approach will use open source software development to support the API development and ensure that the APIs are complete and validated with several implementations at the time of their publication.

The ISG has already released a standards landscape for AR, use cases for AR with a focus on industry 4.0 and a functional reference architecture, and developed a set of interoperability requirements for AR components, systems and services.

ETSI DECT-2020 NR
now part of 5G standards
marker

ETSI DECT-2020 NR, the world's first non-cellular 5G technology standard, has been recognized by the WP5D of the International Telecommunication Union's Radiocommunication Sector (ITU-R) and included as part of the 5G standards in the IMT-2020 technology recommendation. Released last year, the ETSI standard sets an example of future connectivity: the infrastructure-less and autonomous, decentralized technology is designed for massive IoT networks for enterprises. It brings 5G within everyone's reach as it allows any enterprise to set up and manage its own network autonomously. It also enables companies to operate without intermediaries or subscription fees as well as store and consume the data generated in the way they see most suitable for them (on premises, in public cloud or anything in between). The ETSI DECT-2020 NR standard is suited for businesses such as smart meters, Industry 4.0, building management systems, logistics and smart cities. It will assist in the urbanization, building, and energy consumption in the construction of these smart cities.

In this exclusive interview to Enjoy! Julian Stafford points out interactions between utilities and telecoms and the role of government agencies, regulators and standards bodies to support the smart grid future.

The utilities landscape has dramatically evolved within 30 years, what are the technical challenges you face today?

The utility infrastructure has long been dominated by relatively narrow band and proprietary technology solutions, especially for the wide area networks. That was an adequate solution when we only had a relatively small number of assets which we needed to connect to. If you had a million homes, you only had to have visibility and control of devices at the high voltage end of the network.

Julian Stafford
European Utility Telecoms Council (EUTC) General Secretary

Julian Stafford has been working as a professional in mission critical and utility telecoms for 30 years. After studying electrical and electronic engineering at the University of Sheffield he initially worked in the UK Electricity Industry – utilising new software tools for power flow analysis and fault level calculations. He joined the internal telecommunications team of what is today 'Electricity North West' working in senior design roles in charge of PMR, SCADA, microwave systems and the introduction of rural automation schemes. In the commercial telecommunications sector, Julian held several senior architect posts with responsibility for new technology introduction in the wireless and optical domains.

As General Secretary of the European Utilities Telecoms Council, Julian works with the whole European Utility sector and vendor community developing standards-based solutions in the rapidly evolving field of smart grids and energy digitalisation – especially focussed on LTE based wireless solutions for field area connectivity. He has worked extensively in the EU and globally on the issue of dedicated utilities spectrum access. He represents *EUTC* in the EU smart grids task force and is also CTO of the Joint Radio Company (JRC) in the UK.

What happened at the middle and periphery of the network could be estimated on an aggregated statistical basis.

The transition to decarbonised energy means that we now see a massive increase in the number of active devices at the edges and in the center of the networks (windfarms, battery storage, smart metering etc.). A vast amount of data should now be delivered via highly reliable, cybersecure connectivity to hundreds of millions of devices throughout the EU. The narrow band proprietary solutions we've used in the past won't scale either technically or economically to the dimensions that we will soon need.

The recent COP 26 summit reaffirmed the need to tackle climate change, does the utility sector have a role to play there?

Absolutely. Globally, the utility sector has one of the largest roles to play in meeting 'net-zero'. A huge amount of CO_2 is produced as a result of electricity generation from fossil fuels. This generation will increasingly come from renewable (less predictable sources). In parallel, the need to electrify heating and transportation to move away from hydrocarbon use will require an increase in the amount of energy transported through our electricity grids. Added to this we need to increase monitoring and control of gas networks (injection of clean hydrogen) and water infrastructure. Historically, the utility sector moves very slowly, the infrastructure will have a lifetime of 40 to 60 years and government regulation and policy is aligned to the way we used to do things in the past. The pace of change within the utility sector is now demanding a more nimble and dynamic approach. To move away from embedded coal fired, oil fired, gas fired power generation towards distributed renewable energies requires a massive change to the way we monitor and control those huge networks. The utility sector throughout Europe and throughout the globe is an instrumental one for society and particularly in the decarbonisation, evolved human activity on the planet whether it is industrial activity, the electrification of transport or the electrification of heat. This all feeds into the objectives from the United Nations to reduce our carbon emissions.

> ## "All the European states need to align on one or two standardized frequency bands."

And can standards help to achieve these goals?

Yes, we need to get the most cost-effective standardized solutions within our toolkit to meet the increase in devices in the future smart grid, with requirements of high data throughput and high reliability. So EUTC, in connection with ITU and the Radio Spectrum Policy Group (RSPG) within the EU, is looking at standardized wireless-based solutions. As fibreoptic cables would be too expensive to install for the huge number of additional devices, a large chunk of connectivity will need to rely on wireless technology. The challenge is to bring together all the European states to align on one or two standardized frequency bands to avoid a fragmented market, no interoperability, expensive equipment and not having a very healthy ecosystem.

Many people including those in governments do not fully appreciate that the promise of 5G to satisfy connectivity from railways to the automotive sector, maritime and utilities will only happen if those sectors get involved in the standardization process and, for mission critical applications gain access to dedicated radio spectrum allocations. This is why EUTC joined 3GPP and ETSI.

We also need to think of the chicken and egg scenario where utilities depend on telecoms networks for their operational function and the public telecom networks depend on the power utility for them to function. Governments and policy makers need to consider the extent to which our daily life is reliant upon a reliable energy supply and telecoms infrastructure.

Obviously, policy makers can be a catalyst to the necessary changes

We're working with RSPG and others to help them recognize the connection between access to radio spectrum and the facilitation of smart grids to reach the goal to net zero energy. Policy makers and politicians do not deliberately make poor decisions around critical national infrastructure – such decisions are almost always the result of having been presented with inaccurate or incomplete background material. The operation of the energy grid is complex to understand - a big part of EUTC' work is advocacy and education. It is relatively easy to understand why police officers, firemen, and an ambulance service would need dedicated radio networks. But to understand the connection between control and monitoring of something as complicated as the 50Hz EU wide electricity grid network is not easy. We need to ensure that MEPs are fully appraised of the needs of the evolving smart grid so that they can make policy and regulatory decisions from an informed position. It is interesting to note that in most countries around the world, the telecom regulator and the energy regulator don't work together - it's essential they start to do so.

Another important technology change for utilities is broadband connectivity, a topic addressed through the Broadband Cost Reduction Directive. This Directive deals with how society can get more cost-effective broadband connectivity to the public via shared infrastructure. Of course, the utility sector along with railways and other sectors have vast amounts of infrastructure in terms of power poles, fiber optic cables and lamp posts. With better broadband comes a reduced need to commute, improvements in general propriety and enhanced quality of life. Another of EUTC's roles is to work with governments to understand what is realistic and what is achievable. This doesn't come without its own challenges - particularly around the operational health and safety aspects of getting access to utility infrastructure.

Utilities have a large role to play to bring a carbon neutral future for today and future generations.

Without smart grids, facilitated to a great extent by access to dedicated, harmonised radio spectrum, a total move away from fossil fuels to distributed renewable energy and storage will be impaired and the desire for a low cost, reliable, zero carbon energy sector will not be realised.

> ## "Utilities have a large role to play to bring a carbon neutral future for today and future generations."

Welcome to our NEW members

🇰🇷 *AUTOCRYPT*, Republic of Korea

AUTOCRYPT is an industry-leading automotive and mobility cybersecurity company. It secures the rapidly evolving framework of smart mobility from start to finish.

Backed by decades of industry experience, AUTOCRYPT'S solutions can be customized to fit any mobility service, application, or vehicle environment.

AUTOCRYPT is represented internationally through its branch network in 5 different locations, developing and cooperating with OEMs and partners to provide the best all-in-one security solutions.

Read Autocrypt's CEO interview on page 8 of this edition.

🇳🇱 *Cleverbase* ID B.V., Netherlands

Cleverbase is a Qualified Trust Service Provider (QTSP). It is the organization behind the brand Vidua. Cleverbase develops digital services for secure e-signatures, login, identification, encrypted information exchange and archiving.

As QTSP, they issue personal qualified certificates within the PKIoverheid infrastructure. They comply with the strictest security requirements and their team has a lot of knowledge and experience with highly reliable information systems. They always do their best to keep their Vidua services user-friendly and future-proof. This is how they make sure that online business is safe and accessible.

🇺🇸 *Ford*, United States

Ford is a family automobile manufacturer, one that spans the globe and has shared ideals. Ford is the second-largest U.S.-based automaker and the fifth largest in the world.

The company's Ford+ plan for growth and value creation combines existing strengths, new capabilities and always-on relationships with customers to enrich experiences for and deepen the loyalty of those customers.

Ford designs, manufactures, markets and services a full line of connected, increasingly electrified passenger and commercial vehicles: Ford trucks, utility vehicles, vans and cars, and Lincoln luxury vehicles.

The company is pursuing leadership positions in electrification, connected vehicle services and mobility solutions, including self-driving technology, and provides financial services through Ford Motor Credit Company. Ford employs about 184,000 people worldwide.

🇪🇸 *Fundacion Vicomtech*, Spain

Fundacion Vicomtech is an applied research centre specializing in digital technologies. They are a Technological centre set up as a private non-profit Foundation. Their main mission is to respond to the Applied Research, Development and Innovation needs of businesses and institutions in our environment, enabling them to confront new financial and social challenges, thus improving their competitiveness in the global marketplace.

Vicomtech carries out applied R&D&I and bridges the gap between basic research and industry. They research and develop technologies, always responding to market demand and contributing real solutions to businesses.

Vicomtech specializes in digital technologies related to Artificial Intelligence and Visual Computing and Interaction. They transfer technologies to enable businesses to be more competitive and to have a positive impact on society, in line with their social commitment.

🇩🇪 JK Consulting and Projects, Germany

JK Consulting and Projects is a consulting firm that supports companies in the area of Machine-to-Machine (M2M) and Internet of Things (IoT) technologies.

🇬🇧 *Ocean Signal Limited*, United Kingdom

Ocean Signal is a worldwide leader in the design and manufacture of Satellite and Terrestrial Emergency Rescue Beacons based upon VHF/UHF, Iridium, DSC, AIS, GNSS and battery technologies, supplying products throughout the world to four main markets: Commercial Marine, Leisure Marine, Governmental/Military and Land/Recreational.

Through more than 10 years of continued innovative design, development and testing, Ocean Signal has developed and delivered a world-class portfolio of products onto the market.

The portfolio of Ocean Signal products are designed to meet or exceed the technical requirements of the International Maritime Organization (SOLAS), International Electrotechnical Commission standards, European Directives and Decisions and United States Coastguard standards, as well as many other applicable national and international regulations

🇩🇪 *SWR*, Germany

SWR is a public broadcasting corporation, offering content on all platforms in Southwest Germany. They represent regional focus and currency, and supply high-quality and independent programming for Baden-Württemberg and Rhineland-Palatinate.

As a multi-state broadcasting corporation, they are the second largest station within the ARD, the working group of public broadcasting corporations in the Federal Republic of Germany. SWR is a public-law media enterprise supporting the free and democratic formation of opinions with their content.

Their financing is borne jointly by everyone through the payment of the broadcasting licence fees, a key factor for independence. With the digital age, they design new offers specifically for web-based use. They develop media offers specifically for children, parents, and seniors.

🇨🇳 *Tonscend*, China

Tonscend is a national high-tech enterprise specializing in the development of electromagnetic compatibility and microwave radio frequency automatic detection system solutions. The company professionally provides customers with RF&EMC automated testing software and hardware solutions for multiple industries and types of products such as information and communication technology, automotive electronics, consumer electronics, smart homes, lamps, military industry, medical treatment, electric power, and rail transit.

Tonscend focuses on technological innovation and on customer demands and challenges, commits to providing first-class detection system solutions for microwave radio frequency and electromagnetic compatibility industry laboratories, supports customers in all aspects to build information intelligent LAB, and strives to create "Industry 4.0" in the field of detection.

Daniel Kim, CEO of AUTOCRYPT, highlighted in the Forbes Asia Inaugural 100 to Watch List, tells us why security is more necessary than ever as autonomous vehicles are making headway in terms of technological development.

AUTOCRYPT has received several awards for its automotive cybersecurity solution. Are you anticipating the next generation of vehicles?

Indeed, the industry is currently in a transition phase towards the next generation of vehicles. This transition is mainly driven by two forces: climate change and automation. To meet zero emission targets, more and more OEMs have announced their ambitious plans to completely phase out Internal Combustion Engines (ICE) vehicles by switching to EVs and fuel cell EVs in the coming decade. The recent exponential growth in EV sales, despite decreasing government subsidies, signals that the EV market is here to stay.

Daniel ES Kim

AUTOCRYPT's CEO and Co-Founder

Daniel ES Kim is the CEO and Co-Founder of the mobility security solutions company, *AUTOCRYPT*. An esteemed cybersecurity professional with experience spanning decades, he spent nearly 20 years at Penta Security Systems, a leading IT security firm in APAC. Taking on the roles of Chief Research and Development Officer as well as Chief Security Architect, he led the company in developing several security solutions, including AUTOCRYPT. In 2019, Daniel began AUTOCRYPT as an independent spinoff venture of Penta Security and currently leads the company as CEO in the development and implementation of security solutions for connected, autonomous, and electric vehicles. A member of the Charging Interface Initiative (CharIn) and the CCC Digital Key Working Group, Daniel has a comprehensive knowledge of automotive cybersecurity regulations and compliance standards such as ISO 15118, ISO 21434, and the new WP.29 regulations. He speaks regularly on the need for security implementation into smart roadways and leads AUTOCRYPT in providing security for all ITS projects in South Korea.

> **"The increased connectivity between the vehicle and the outside world is why cybersecurity must be pre-embedded."**

The same pattern can be observed in the growth of autonomous features. Very soon, sensor-enabled autonomous driving experience will be enhanced by V2X (vehicle-to-everything) communications technology, allowing cars to make decisions based on the real-time basic safety messages (BSM) transmitted between cars, traffic infrastructure, and pedestrians, as well as to make automated transactions. Such increased connectivity between the vehicle and the outside world is why cybersecurity must be pre-embedded. We need to ensure that the messages transmitted are not exposed, manipulated, or forged, in order to establish a trusted environment for autonomous driving, infotainment, and automated payment for EV charging.

That means that you want to bring the entire mobility ecosystem to the forefront?

Inevitably, yes. Looking back on history, prior to the Internet, computers were literally computing devices and cybersecurity did not exist. Intruders had to be physically present to insert "bugs"

> **"As cars and infrastructure receive Internet access, cars will no longer be a simple transportation tool, but the core of a mobility ecosystem that shapes our lives on-the-go."**

into a computer. But this changed when computers began utilizing Internet access, gradually forming an IT ecosystem that facilitates virtually everything we do today, from work and study to entertainment and shopping. In fact, this ecosystem,

if left unprotected, can allow hackers to infect computers remotely, and we envision that a similar pattern of change is impending in the automotive industry. As cars and infrastructure receive Internet access, cars will no longer be a simple transportation tool, but the core of a mobility ecosystem that shapes our lives on the go. We will enjoy entertainment and shopping in the car, pay for electric charging and road services with a touch, reserve and pay for personalized rides on our smartphones, and receive parcels from automated delivery vehicles. This vision drives AUTOCRYPT forward to take on a vital role in securing these services by ensuring encrypted communications and trusted access.

What are the challenges of cybersecurity in the automotive industry?

The vehicle system consists of over a hundred microcomputers called electronic control units (ECU), distributed throughout the vehicle. As such, we cannot simply

> **"In the automotive industry, cybersecurity must be built side by side with the vehicle."**

make an aftermarket antivirus program or firewall that can be readily installed. Vehicular cybersecurity begins at the pre-production stage, where the specific security needs of the model must be pre-assessed. As security software gets embedded during production, a series of interoperability tests need to be conducted to eliminate development errors and flaws before the vehicle enters the market. The most challenging aspect lies in the post-production stage, where misbehaviours or malfunctions of tens of millions of active vehicles must be continuously monitored and examined so that the OEM can work with suppliers to prioritize updates. If we were to compare this to the IT industry, we can see that IT cybersecurity is mostly adopted post-production by the consumers using aftermarket cybersecurity tools, whereas, in the automotive industry, cybersecurity must be built side by side with the vehicle, managed by the OEMs and suppliers at all three stages: pre-production, production, and post-production.

You recently demonstrated C-V2X interoperability in China; what was the use case?

The C-V2X Cross-Industry Pilot Plugfest is China's largest C-V2X application testing event. The "Four Layers" demonstration is a testament to how well the four layers of the V2X ecosystem function together. These are the physical layer, which is the vehicle; the network layer, which contains the on-board units (OBU); the message layer, which consists of the communication modules; and lastly, the security layer, where the messages are secured by V2X modules and verified by the PKI. In this year's demonstration, AutoCrypt V2X, a secure V2X communication SDK, was embedded in the OBUs of a major chipmaker, whereas AutoCrypt PKI, a Security Credential Management System (SCMS) used to authenticate V2X participants, was paired with one of the eight participating root certificate authorities (CA). Adopting the correct PKI standard is especially important; while cars in the US follow the SCMS, cars in the EU must carry the CCMS (C-ITS Credential Management System), and cars in China must comply with C-SCMS (China SCMS). In practice, AUTOCRYPT works closely with OEMs to ensure that vehicles are built in accordance with the respective standard.

You said that Europe sets itself apart as an essential market for the development of mobility and security solutions—why?

Europe is one of the three largest automotive markets along with North America and China. It is a very dynamic market not only because it is home to many of the world's largest OEMs and Tier 1 suppliers, but also because it has a massive, interconnected road network that crosses countless borders, making it the perfect place for pioneering C-ITS developments. Its evenly spread population centres make it cost-efficient to build smart infrastructure. Europe is also home to most organizations and working parties that establish essential industry regulations and facilitate smart mobility developments. Europe is the second largest EV market after China, and a pioneer in Plug&Charge (PnC), an advanced EV charging technology that enables one-step identification and automated transaction. This vibrant environment creates a welcoming atmosphere for us to work with OEMs and suppliers on establishing mobility and security solutions.

What happened to "voice quality" in telecommunications?

About "voice quality"

Living in a border region of Germany, regularly faced with dropped calls, distorted voices, and other difficulties in communication, I ask myself "How has quality of communication developed?"

In the last 30 plus years, we have seen an unbelievable change in technology. We have moved from TDM to packet-based transmission, from narrowband to wideband, and even full-band communication. But what about the user experience? The answer is that it ranges from very poor to excellent. To understand this considerable bandwidth perceived by the user, we need to understand what is needed for superior quality from the perceptional point of view, and we need to understand the impact of technical implementations on the quality of communication.

Quality of communication from a perceptional point of view

Ideally, a communication system should provide the same user experience as two people talking to each other at a distance of 1 meter. Communication between humans has many aspects, ranging from the psychological to the perceptional. We focus on aspects of speech quality that can usually be perceived subjectively, but that should be measurable by objective procedures. We need to consider the listening situation, the talking situation, and the conversational situation to cover all the dimensions of speech quality.

The major factors impacting the perceived quality of communication:

- **Delays** impact the communicational flow seriously if they are too long. A one-way delay of 150 ms is a good "ballpark number". In modern communication systems this value is often exceeded significantly. Longer delays lead to unstructured and impaired communication, unintended **double talk** and increased **echo**, which may be very annoying. High echo leads to increased **talker effort**, which may result in a completely impossible conversation.

- **Speech intelligibility and listening effort** can be impaired by various factors, such as distorted speech signals, interruption of the speech signal (missing syllables or words) or high background noise.

- **Speech sound quality** focuses on the quality of the transmitted speech and may be impaired by similar factors as intelligibility. With the introduction of wideband, super-wideband and even full-band communication, sensitivity to speech sound quality has increased.

- **Loudness** is the fundamental parameter of any communication system. The correct level of the transmitted speech is of high importance. Users suffer from loudness that is either too low or too high.

Technical implications

High quality of communication can only be achieved if all the components in a communication link offer a high level of quality: terminals, networks and devices connected to a terminal such as headsets, in-car hands-free devices, plus others. Neither the best possible terminal nor the best possible network connection will lead to a superior quality of communication.

A variety of terminals and interconnected devices must be considered, ranging from handsets through headsets to hands-free and conference systems. Modern terminals provide an incredible amount of signal processing capabilities that can help to optimize quality of communication in various ways:

- The quality of the acoustic components mainly determines the basic quality of the transmitted speech signal. If not properly designed, it is impossible to improve the quality of communication at a later stage.

- Advanced speech signal processing can be used to reduce the impact of the environment e.g., by noise- and echo-cancellation. These need to be adapted to the specific use case. Optimizing noise cancellation for a conference phone and for an in-car hands-free system are two different tasks. Other enhancement techniques are available to compensate for user behavior and user movements, e.g., individually adjusting the loudness of the transmitted speech that is sent and received.

- Speech-coding is essential to achieving a high quality of speech sound. With advanced speech-coding, we can even transmit fullband speech rather than just a narrowband speech signals, as in the past. Speech-coding must be adapted to the network transmission, and the speech codec chosen has a significant influence on the quality of the transmitted speech.

- If packet-based transmission is used, terminals need to provide de-jitter buffering and packet loss concealment for seamless playout of packets, in the event of network errors.

Ideally, networks are transparent. But jitter and loss may occur, e.g., under different network load conditions, and may lead to packet delay variation (jitter) and even packet loss. When interconnecting with different networks, including short-range wireless such as Bluetooth®, no transcoding should be made. In today's connections, this is unfortunately not the case.

All the components in a connection are to be optimized for low delay, the best possible quality of speech sound and the best possible interoperation. It is always the task of the endpoints in a connection - the terminals – to adapt to user behavior and the environmental conditions.

Testing and optimization procedures with ETSI standards

The optimization of the quality of communication requires testing and optimization at many stages. A significant contribution is made by the optimization of terminals and connected devices, such as headsets or in-car hands-free devices. In *ETSI TC STQ*, various standards have been developed that concern handsets, headsets, and conference devices that are interconnected with any network (packet-based, mobile, etc.).

When targeting network optimization, standards are available for different types of gateways. A series of standards for drive testing complements ETSI standards for voice quality testing.

Most standards reflect the user's point of view. Following these standards allows manufacturers and providers to optimize the quality of their devices, so that seamless interaction in conjunction with superior quality of communication can be achieved.

The superior quality of any component is key for high quality of communication. The combination of excellent terminal quality with reliably high network quality alone will meet the customer's needs.

Manufacturers of terminals, accessories, and any interconnected devices need to optimize the acoustic components. And they need to adhere to the same high standards in their speech signal processing for all conversational situations. ETSI's terminal standards provide excellent guidance.

For network operators, it is not sufficient to be the winner in a (drive-) test competition. It is much more important to provide good coverage, transparency, seamless handover and consistent quality during a call without any interruptions and narrowband fallback.

Maybe it is time for all parties to rethink their priorities, development, and price strategies to finally deliver "HD voice" services that really deserve the name "HD voice". The technologies and standards are available, so why wait?

■ *Hans W. Gierlich, HEAD acoustics GmbH, vice-chair of the ETSI technical committee for Speech and multimedia Transmission Quality (ETSI TC STQ), ETSI Fellow.*

Supporting the EU Blue Economy with the CISE

What is the CISE?

The Common Information Sharing Environment (CISE) for the Maritime Domain is a pillar of the Action Plan for the EU Maritime Safety and Security Strategy that enables Member State authorities and EU Agencies to share maritime information by means of a distributed standardized information exchange node (CISE node), using their existing institutional or sectoral information systems (legacy systems), without the need for any major modifications to those systems. The CISE is designed to enhance overall European maritime situational awareness and to contribute to safer, more secure and cleaner seas.

The ISG "Common Information Sharing Environment Service and Data Model".

In 2019, the "European Common Information Sharing Environment Service and Data Model" Industry Specification Group (*ISG CDM*) was established at ETSI to provide specifications for the CISE data and service models that will enable multiple organizations to develop interoperable software for exchanging information through CISE nodes, thus constituting a reference for cross-sectoral and cross-border information sharing.

Achievements

The ISG CDM set itself the task of specifying new technical standards for the components of the CISE, its infrastructure and application services. The specifications are based on use cases reflecting operational scenarios where the CISE provides added value:

- Monitoring of events at sea to create conditions for decision-making;

- Requests for information, confirming the identification, position, cargo and activity of a vessel of interest;

- Knowledge of capabilities of partner authorities to react to tactical situations (e.g., search and rescue);

- Investigation of anti-pollution situations;

In the first 2 years, the ISG CDM successfully developed specifications of the description of the target applications, the technical and non-functional specifications and the *node-and system-level architecture*, resulting in the *Service and Data Models*. The ISG has also identified the need for a *testing environment*, which shall allow industry to test and validate individual CISE components (e.g., legacy system adaptors) against the CDM specifications.

A look into the future...

In addition to the improvements introduced in the current EU project on the CISE roadmap, we are convinced that the CISE service and data models should not be restricted to the maritime domain, but have the potential to be equally valid and useful to connect existing legacy systems of EU public authorities acting in other domains (e.g., border control). The ISG CDM has therefore been extended to 2 years to cover these aspects.

The members and participants of the ISG CDM are noticing a growing interest in their activities, both from industry and public institutions. The ETSI standards will be instrumental in providing Europe with a universal tool to improve cross-sector and cross-border information sharing.

■ *Bernhard Wehner, Chair, ETSI Technical Committee CDM.*

THE DIGITAL
TRANSFORMATION
OF INDUSTRY

In the **spotlight** article, we address the interesting services of asset tracking and monitoring, a major use case for LPWAN technologies today. Satellites play a key role in meeting the challenges of the growing demand for the digital transformation of this service. The billions of assets transported across the globe everyday are now at the heart of the digital supply chain and need to be tracked in real time. But asset tracking also applies to critical infrastructures which can be damaged in case of natural events and accidents and therefore need to be closely monitored. The show case of this section focuses on the factory of the future with 5G and time-sensitive networking and the concrete example of the Bosch 8,000 sqm semiconductor factory in Reutlingen, Germany.

Asset tracking: the satellite solution

The initial focus of a massive IoT was smart metering. Today the most important use case in terms of value and volume for the emergence of LPWAN technologies is asset tracking. Satellites play a key role in meeting the challenges of the growing demand for the digital transformation of this service.

Assets on the move

Every organization owns assets (machines, medical devices, containers, pallets, trolleys, etc.) and an asset can be extremely valuable. These assets are continuously on the move, carried all over the word by various modes of transport. They must be tracked to let the organization know their location in real time. Companies also need to monitor their status, depending on the asset and its content (the condition of the asset, environmental factors – temperature, shock detection, events, etc.), in order to maintain an efficient supply chain and logistics. Asset tracking can prevent disasters or theft, identify potential issues, inform or alert and basically ensure end-to-end traceability.

Billions of units are moving everywhere across the globe and asset tracking represents a huge market, as it is now at the heart of the digital supply chain.

Asset tracking and monitoring apply to fixed assets as well as critical infrastructures. For example, natural events such as landslides, floods and weather, as well as man-made events, such as bridge strikes, can have serious

> **Billions of units are moving everywhere across the globe and asset tracking represents a huge market as it is now at the heart of the digital supply chain.**

impacts on critical infrastructures, such as railways, electricity grids or pipelines, leading sometimes to accidents such as rail derailments or power cuts. It is vitally important to monitor these infrastructures and obtain real-time information and knowledge both on the infrastructure assets, as well as their surroundings, to prevent or identify any issues.

Challenges

The main challenges are similar for asset tracking and asset monitoring. Both need a low-cost IoT solution, whose two paramount requirements are coverage and efficient battery consumption (designed to have a lifetime of several years without changing the battery or the device).

Coverage in particular is important. Moving assets have to be tracked everywhere in the world and they are often transported across areas where there is no obvious connectivity (at sea for example). For critical infrastructures, the main issue is often the monitoring of these infrastructures in remote or inaccessible areas, which are not usually covered by mobile operators.

In addition, they need a continuity of connectivity along their journey, with a solution that will work everywhere and that will be supported by an acceptable business model. For example, implementing all existing connectivity solutions for asset tracking would not be cost-effective. This is typically what is preventing the emergence of tracking solutions for automotive pallets. Pallets need to be tracked across several countries where technologies lacking interoperability or roaming (Sigfox, LoRa, NB-IoT, LTE-M, etc) may be used. It would

> **Asset tracking needs a continuity of connectivity everywhere with an acceptable business model.**

obviously be too expensive to implement solutions supporting all those protocols. Today, the container industry is using 2G and non-IoT optimised 4G for containers. These are the only cellular technologies that are widely available across the globe and in all the countries that the containers cross. Indeed, more optimized solutions, such as NB-IoT or LTE-M, are far from being deployed everywhere.

Asset tracking by satellite: paving the road towards a cellula

Private Network + Satellite

Port Terminal

© ETSI
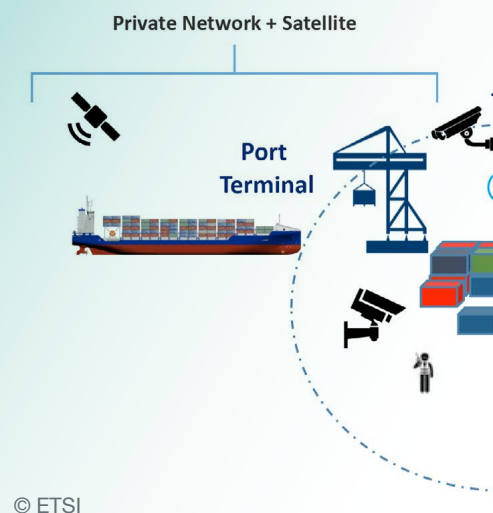
The emergence of a satellite solution

Satellites, combined with some existing terrestrial solutions, seem to be the obvious candidate to address the coverage and continuity of connectivity issues. However, until now, satellite solutions have been proprietary and costly.

The emergence of low-cost and low-orbit cubesat constellations has paved the way for a new era. They enable cost-effective deployments, especially for IoT.

But which IoT by satellite connectivity would be the most suitable for these use cases, and would at the same time be interoperable with terrestrial solutions? It cannot be a satellite-only solution, as there are many instances where the terrestrial

> **The emergence of low-cost and low-orbit cubesat constellation has paved the way for a new era.**

> **It is critical for industry that solutions for asset tracking work everywhere and are standardized to allow for scalability and sustainability.**

solution is better adapted. It is also more cost-effective to have IoT devices that are not specialised, i.e., the devices work in all circumstances and use the connectivity that they have where they are (terrestrial, when available, and satellite, when there is nothing else available).

It is critical for industry that solutions for asset tracking work everywhere and are standardized to allow for scalability and sustainability.

A standardization answer

The 3GPP recognized that there are benefits in improving existing mobile IoT 3GPP solutions (NB-IoT, LTE-M), in particular to support asset tracking use cases. A study on "IoT over NTN"

(Non-Terrestrial Network) started in RAN Release 17 and was recently turned into a normative activity when 3GPP realized it was possible to deliver a first IoT by satellite solution to the market, with the completion of the standard by March 2022. As a result, it will enable cellular IoT devices to work, from 2023, with the same technology (NB-IoT or LTE-M), using terrestrial or satellite connectivity, without making any changes to the existing protocols. Such a device will be similar to existing devices using only terrestrial connectivity (same cost, similar size, optimized battery consumption, no lock-in, large ecosystem, etc.). This is a huge benefit that only 3GPP can offer. Once combined with cost-effective satellite solutions such as cubesat, it will allow for the rapid deployment of asset tracking and monitoring solutions and will support many other use cases.
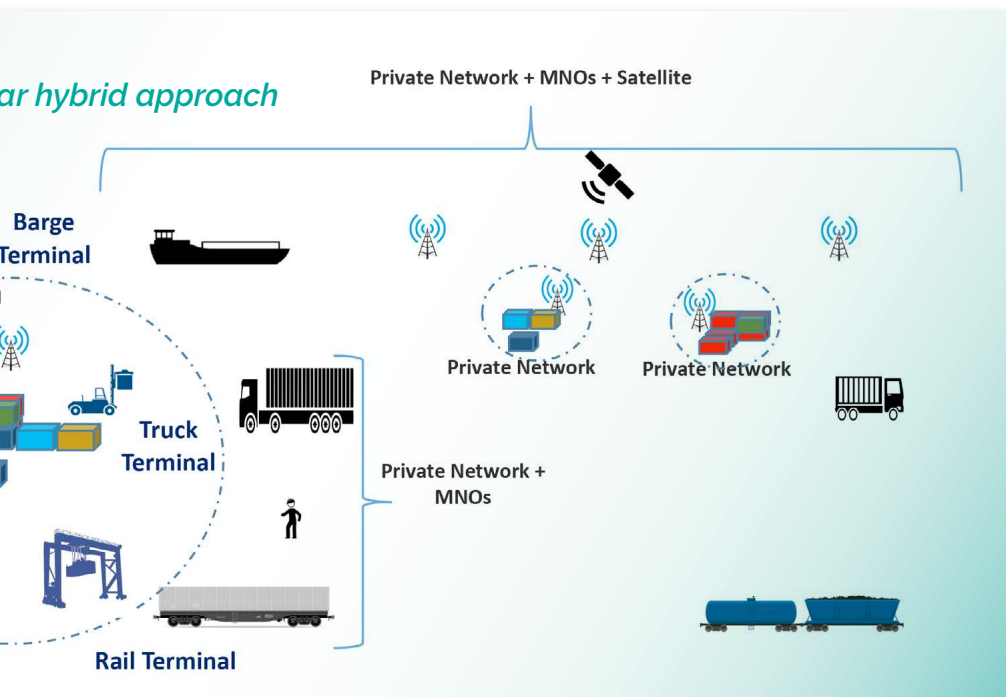
The future lies ahead

Like texting at the time, the future of IoT lies in its ability to be a universal and interoperable solution. In fact, the text message, standardized by ETSI, only took off after interconnection could be made with all networks. Likewise, the IoT will take off when there will be a universal and interoperable solution available and IoT by satellite will contribute to it.

The use case of asset tracking is exemplary and is already revealing future opportunities. Thanks to a common technology, it is also the first step towards a hybrid approach, in which all the services will work all the time, everywhere and will benefit from the best connectivity adapted to the situation (public network, satellite and private networks).

■ *Thierry BERISOT, rapporteur 3GPP SA1 asset tracking, NOVAMINT.*

> **The IoT will take off when there will be a universal and interoperable solution available and IoT by satellite will contribute to it.**

ar hybrid approach

Private Network + MNOs + Satellite

Barge Terminal

Private Network

Private Network

Truck Terminal

Private Network + MNOs

Rail Terminal

Enabling the factory of the future with 5G
and time-sensitive networking

Industry is commonly considered to be one of the most promising new areas of application of 5G. In fact, 5G will offer unprecedented levels of flexibility, productivity, efficiency, and ease-of-use in manufacturing, thus raising Industry 4.0 up to the next level.

Main use cases

Concrete use cases include the reliable connection of automated guided vehicles, autonomous mobile robots, smart tools, wireless sensors or AR/VR headsets and supporting workers on the shopfloor during monitoring and maintenance tasks. In combination with other key technologies, such as edge computing, 5G may help offload more and more application intelligence from end devices to a local cloud by closing control-loops over the air. This requires high reliability, low latency and a high level of dependability that no other wireless technology can offer today.

Picture : Bosch

A major milestone in standardization

A major milestone on the way to Industrial 5G is the support of time-sensitive networking (TSN) by the 5G system, starting with 3GPP Release 16. TSN, as specified by IEEE 802.1, represents the basis for next-generation real-time Ethernet and will replace many of the proprietary flavors of Industrial Ethernet in use today. The 5G system will implement many TSN features that are relevant for industrial applications, for example for time synchronization, priority handling or redundancy. In addition, it will offer the same interfaces to the outside world like a standard TSN bridge, which allows for a very smooth integration of 5G into existing connectivity infrastructures.

Leading to a real-world production environment

The standardization of features supporting industrial use cases and applications is one thing, but the validation in real-world production environments another. To this end, the 5G Alliance for Connected Industries and Automation (5G-ACIA), the leading global organization for driving and shaping Industrial 5G, has established a testbed framework, which allows different 5G-ACIA members to jointly set up and operate corresponding testbeds.

One example is the 5G-SMART testbed in the Bosch semiconductor factory in Reutlingen, Germany, developed with Ericsson. The testbed features a standalone, non-public, indoor 5G network deployment covering a 8,000 sqm industrial manufacturing hall. The plant is made up of one main room and several side floors, with many walls and large items of production equipment. Therefore, reflections as well as signal shadows must be taken into account in the deployment of 5G infrastructure. The 5G network is an isolated 5G non-public network, meaning that all the functionality, including the 5G core, is located on premises, so neither data nor control traffic leave the plant. The objective of the testbed is to demonstrate how 5G empowers factory automation and intralogistics in a real production environment. This will be achieved by developing and trialing use cases, such as 5G-enabled cloud-controlled automated guided vehicles (AGVs) and industrial Ethernet over 5G on the factory floor.

■ *Dr. Andreas Müller, General Chair 5G-ACIA, Bosch.*

The importance of standards
for the electro- and digital industry

Global standards are important to the electro- and digital industry as they ensure an international level playing field and reciprocal market access to all market players.

Standards generate markets. Those who engage in the standardization process, have a chance of leveraging market access. Standardization will play a crucial role in supporting the EU's ambitions for the digital decade and the European green transition. For this to happen successfully, policymakers, industry, European Standardization Organizations and other stakeholders need to cooperate and rely upon a solid standardization system in order to assert European leadership and the strong combined voices of the relevant players from Europe (including Member States via the national delegation principle) in international standardization bodies.

The electro- and digital industries represented by ZVEI are a global industry. Most of our companies are active on all major markets around the world. With their technologies and solutions, they create leading markets in the areas of industry (industry 4.0 / digital manufacturing), energy, mobility, health, buildings and consumer. The main drivers of the development of technological innovations are the ongoing electrification, digitization, sustainability – and globalization. Global standards are of the utmost importance to our industry, as they provide an international level playing field and reciprocal market access to all market players. For the future, we need a system based upon the rule "One standard – one test – accepted everywhere". The European Commission outlined a standardization roadmap in the summer and is preparing a new strategy to be presented very soon. Europe needs to reach out to its international partners and watch developments in global standards very carefully. This includes a better understanding of the changes in China – and new impetus for a dialogue

with the United States, for instance via the recently launched EU-US Trade and Technology Council.

Within the European standardization system, we need to align on priorities, speed up the standards-setting procedures and create a better understanding between the parties engaged of their specific roles and relevant contributions.

ZVEI contributes intensively to the discussions on standardization. First, we have raised awareness of standards from the level of some work done by technical experts to the decision-makers in our industry. Now CEOs

and upper management participate in the discussion. Second, we have started a constructive and forward-looking dialogue with EU policymakers and national / EU standardization organizations. Third, we have brought the relevant parties together for exchanges on possible solutions – for instance with the first conference organized by ZVEI and ETSI in June 2021 on "Globally competitive European standardization for the digital decade". And lastly, ZVEI has drafted *a position paper* with six main recommendations for the successful standardization of the future.

■ *Dr. Oliver Blank, Director of European and Chinese Affairs ZVEI.*

How healthcare can benefit
from new digital technologies

From artificial intelligence to augmented reality, digital technologies are key for the healthcare sector. b<>com, a private research and technology institute that explores, designs, and delivers innovations using digital technologies, tells us why.

From healthcare to eHealth

The healthcare sector is one of particular interest, as it can greatly benefit from the use of the latest advances in digital technologies; from the use of artificial intelligence to assist a doctor in making a diagnosis, to the use of augmented reality (AR) to provide contextual information, at the right time, in the right place.

Clinicians are increasingly using digital technologies to help them perform safer and less invasive procedures during surgery. AR applications can enrich live images captured from the operating room (OR) by adding information as an overlay. The augmentation can be a 3D display of the patient anatomy, reconstructed from pre-operative MRI or CT scans, or projections of real-time intra-operative medical imaging (typically ultrasound). This raises the importance of providing best-in-class assistance to the surgical team, with smart video systems and perfect synchronization between video sources in the OR. This type of application emphasizes the need for standards that facilitate the management and transmission of medical images and related data between equipment supplied by different manufacturers.

Digital Imaging and Communications

Digital Imaging and Communications in Medicine (DICOM) is an international standard used to transmit, store, retrieve,

World first real-live demonstration of DICOM-RTV in an OR by the CHU Rennes (France) and b<>com
©b<>com

print, process and display medical imaging information. It is considered to be the backbone of image displays in modern medicine, and is currently the driving force behind the imaging workflow in hospitals around the world. Its main objective is to provide standards to manage the complete chain end to end, and to make medical imaging information interoperable.

The DICOM Real-Time Video (DICOM-RTV) supplement was specifically developed to address the numerous challenges related to the handling of the real-time transmission and display of multimedia flows and the associated medical metadata of a patient undergoing an operation in the OR. Indeed, with the generalization of image-guided procedures, hybrid rooms are used increasingly, combining video-based images (e.g., endoscopy) with

radiology (e.g., C-Arms), using solutions supplied by different vendors, each having their own way of managing video. The DICOM-RTV supplement defines a new IP-based DICOM service for broadcasting real-time video, together with the corresponding metadata, in a synchronized way to subscribers (e.g., display monitors), with a quality of service comparable to that obtained with video cables. The interoperability issue can therefore be overcome by enabling different devices inside the operating room to communicate using the standardized mechanism defined by DICOM-RTV. It also enables the upgrade of the SDI-based (video cables) system in the operating room to an IP-based one.

b<>com was a key contributor to the development of DICOM-RTV and played a key part in the first live demonstration of the use of the DICOM-RTV standard

worldwide by a medical team in the CHU (Centre Hospitalier Universitaire - University Hospital) in Rennes, France, as far back as in 2019. DICOM-RTV converter enabled the display of two synchronized videos, one from a camera recording the hand gestures of the surgeon, and another one from an endoscope.

3D Localization

Besides synchronization, which allows the relevant information to be displayed at the right time, accuracy is also of paramount importance in medical applications. The digital augmentation needs to be placed in the physical scene in the right place with a high degree of accuracy. Indeed, current surgical navigation systems offer sub-millimetric real-time localization, but they require the use of invasive markers attached to the patient, often adding extra operating time and high costs. As an alternative, b<>com has been working on an affordable navigation approach based on mid-range depth sensors and small-scale 3D-printed shape markers, to meet the needs of

medical applications in terms of accuracy and robustness. A new algorithm called Fast Volumetric Reconstruction (FaVoR) implements a compute-efficient approach for real-time 3D model registration-based tracking, allowing computed 3D poses to be used for video scene augmentation. This affordable and efficient model-based 3D localization and tracking framework is called 3D Localization.

It was first developed for an orthopedic use case for knee replacement surgery: b<>com's goal was to track the surgical tools (cutting guides) and visible bone parts using off-the-shelf depth sensors. A patented design of an easily 3D-printable textureless shape marker has also been validated to cope with heavy occlusions and low-visibility situations (imaging probe mostly occluded by hand). This technology has shown promising results, targeting 1 millimeter and 1 degree 3D pose accuracy.

DICOM-RTV converter and 3D Localization technologies are being associated to develop an AR application merging fluoroscopy and ultrasound (US) images in the context of a cardiac intervention. The

US probe is tracked using 3D Localization and all the fluoroscopy, US video and US probe 3D pose streams are transported and synchronized with b<>com's implementation of DICOM-RTV. This work is being done as part of the EU-funded *5GTours project.*

The digital transformation of the healthcare system is well underway, with the use of digital technologies and dedicated standards. One hurdle remains however: wires! AR applications will be much easier to deploy in the operating room, when all the wires connecting the equipment are no longer required. This is one of the great benefits that 5G connectivity will bring. b<>com is already on the case, studying the transmission of streams over 5G and next-generation telecommunication standards. More opportunities to innovate!

■ *Muriel Deschanel, Chair of ETSI ISG Augmented Reality Framework, director b<>com, Albert Murienne, R&I manager b<>com, Guillaume Pasquier, R&I manager b<>com.*
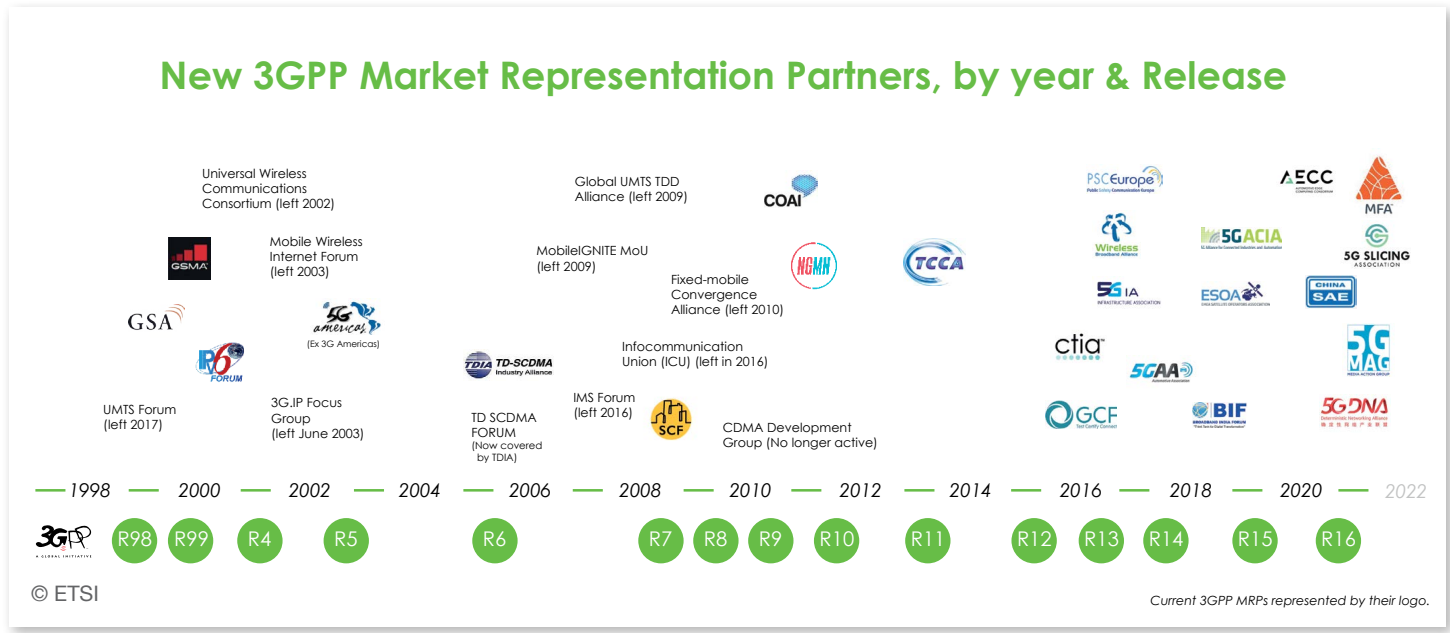

Augmented Reality view based on external video camera and probe handled by the cardiologist

©b<>com

3GPP partners evolve with 5G

New 3GPP Market Representation Partners, by year & Release

© ETSI

Current 3GPP MRPs represented by their logo.

In 1998, when 3GPP was created, the internet of things was a far-off place. The first specifications for the 3rd Generation of mobile were instead firmly focused on a body of work that would allow for global roaming and provide a system that could support the needs of future smartphones.

3GPP was set up with three constituent parts, based on the community that had successfully delivered the early cellular systems and technologies.

An expanding set of industry members came together via their international SDO Organizational Partner (OP), joined by market representation partners (MRPs) - who would bring a coordinated view of their members' needs as well as helping to promote the 3GPP work within their sector.

A cluster of market representation partners came in, during those early years, to help with the challenge of the transition of both voice and broadband services to All-IP Networks. The 3G.IP Focus Group, Universal Wireless Communications Consortium, the Mobile Wireless Internet Forum, the IMS Forum, the Fixed Mobile Convergence Alliance and the MobileIGNITE MoU all worked with the 3GPP community to create a path for their technologies to benefit from the 3GPP system.

All of those pioneers have since left the 3GPP work (See graphic above), as new partners have arrived - bringing with them fresh perspectives of how LTE and 5G systems can work for the benefit of a new set of users.

Since 2013, new industrial sectors have joined the work through direct membership or through 3GPP MRPs, such as the TETRA and Critical Communications Association, Public Safety Communication Europe Forum, the 5G Automotive Association, Automotive Edge Computing Consortium, China Society of Automotive Engineers, 5G-ACIA for the industrial domain, the 5G Deterministic Networking Alliance, 5G Infra-structure Association, 5G Slicing Association, 5G Media Action Group, EMEA Satellite Operators Association and the MulteFire Alliance.

The challenge for the newcomers, as for 3GPP itself, is how to effectively capture and fulfil the requirements from these diverse communities. The 3GPP leadership are working with the satellite, broadcast, critical communications, Industry 4.0 and automotive members and MRPs to find as many points of a converged need as possible. By the identification of common features and parameters the working group and TSG Chairs can help to ensure that the most pressing collective needs are prioritized and that the wheel isn't reinvented for each new use case.

■ *Kevin Flynn, Communication Professional 3GPP.*

IoT Information Sharing
in Industrial Sectors

In this article, oneM2M looks at information models for different industry sectors as a means of sharing IoT data.

In the Internet of Things (IoT) context, an information model is an organizational framework that defines the capabilities, actions and events associated with a connected thing. For standardization purposes, oneM2M defines a Smart Device Template (SDT) to structure this framework. The SDT contains several attributes such as the *Domain* which classifies a device as belonging to a home, city, industry, or product category. Others are the *Product Class*, to record the properties of a device, and *DeviceClass* to indicate an actuator, sensor, or other type of device. The *ModuleClass* attribute defines reusable basic functions, such as on/off switching, data readings and event triggers.

This framework acts as an abstraction layer. It frees IoT developers to source IoT data and to manage devices via a standardized API. This process masks the complexity of native language formats and technology specificities for different IoT endpoints.

Rail Sector Information Models

A current work item in oneM2M catalogues information models for the rail sector. A safety-related use cases involves capturing data from different kinds of barriers at railroad crossings to alert train drivers in emergencies.

An extension of the information model applies to smart gates for passenger flow control. Some of the model's attributes handle barcode and e-ticket scanning. Others deal with passenger-information that might be sent to digital displays and commands to control the operational status of each gate.

The proliferation of use cases and information models in the rail sector is mirrored in cities, office buildings and factories. The purpose of oneM2M standardization is to analyse use cases in different industry sectors and then to map information models to the oneM2M system as a basis for cross-silo and cross-vendor data interoperability.

Legacy Industrial Systems

OPC-UA is a widely used industrial automation protocol for switches and programmable logic controllers (PLCs). In order to leverage legacy investments in new IoT systems, there are benefits from being able to understand the profile and interact with already-deployed industrial domain objects.

oneM2M members defined an Interworking Proxy Entity (IPE), which provides interoperability at the syntactic level. It lays the foundation to support interworking between the OPC-UA information model and the oneM2M information model. The next progression, from syntactic to semantic interoperability, makes it possible to apply oneM2M's Semantic Reasoning functionality to interact with legacy devices. This is an example of oneM2M adding a layer of value on top of OPC-UA's data exchange functionality.

A longer-term benefit of mapping legacy-to-oneM2M information models is the ability to enable new, cross-domain services. It becomes possible, for example, to form direct links between smart-home and retail or manufacturing domains. To support this goal, *Release 3* of the oneM2M standard established a library of 84 model classes for home domain devices. Additions to *Release 4* go beyond the home domain to other sectors with 119 module classes and 19 common device models spanning home, health, city, vehicular and railway domains, as well as 2 sub-device models.

■ *Shane He, Nokia and Chair of oneM2M Requirements & Domain Models Working Group.*

The 5G-VINNI Project
Network Slice as a Service for 5G Industry Experimentation

The main objective of *5G-VINNI* is to provide a long-term full end-to-end (E2E) 5G facility accessible to non-telco industries to set up trials, and to further validate core 5G KPIs. 5G-VINNI adopts the Network Slice as a Service (NSaaS) delivery model to offer a customized service experience to non-telco sectors, basing its architecture on guidelines from telecom industry organizations and the normative specifications from standardization bodies. The ecosystem of 5G-VINNI facility sites is modular. This modularity guarantees the highest degrees of freedom for both site configurations and interworking. The conceptual E2E facility architecture is organized in three layers, as defined in the 5G-PPP Architecture white paper: the Service layer, the Network layer and the Resources and Functional layer.

The Resources and Functional Layer provides the physical resources to host the Service Layer and Network Layer elements (e.g., VNFs). These elements are interconnected to build dedicated logical networks, customized to the respective services. Any Service Layer or Network Layer VNF from any 5G-VINNI facility can be included in the logical network of a use case driven from another facility, allowing use cases to be validated using the consolidated shared capabilities of all the facilities, rather than limiting experiments to individual sites. More information about the project, access to technical documents, details about the project releases and information about the facility sites can be found on the website.

The major achievement of 5G-VINNI is a 5G service model based on a consolidated slice concept, which is measurable, reproducible and repeatable. 5G-VINNI has a common schema, that is flexible and verifiable, based on two structures:

• The 5G-VINNI Service Blueprint (5G-VINNI-SB).

• The 5G-VINNI Service Catalogue (5G-VINNI-SC).

The Service Catalogue contains pre-defined 5G-VINNI-SBs, which have either been pre-configured in the 5G-VINNI-SC or have been defined previously by other sectors for their experiments. Over time, the number of 5G-VINNI-SBs in the 5G-VINNI-SCs will increase, as more non-telco industries validate their use cases on 5G-VINNI facilities.

A 5G-VINNI-SB is a baseline, model-based service template describing a given network slice to be provisioned using NSaaS. This service template is a structured document that provides a complete description of a given network slice, including information on service topology, and expected behaviour.

A number of demonstrations with different industrial sectors and experiments have been performed or are in progress, such as remote robotic control with 360° VR-based tele-presence, as well as processes for onboarding vertical applications on the Greece facility site. Further demonstrations of 5G-VINNI capabilities include automated Testing as a Service (TaaS), E2E service orchestration, autonomous edge and network telemetry, among others.

The 5G-VINNI Service Blueprint (SB) structure to be used   *Source: 5G VINNI Consortium*
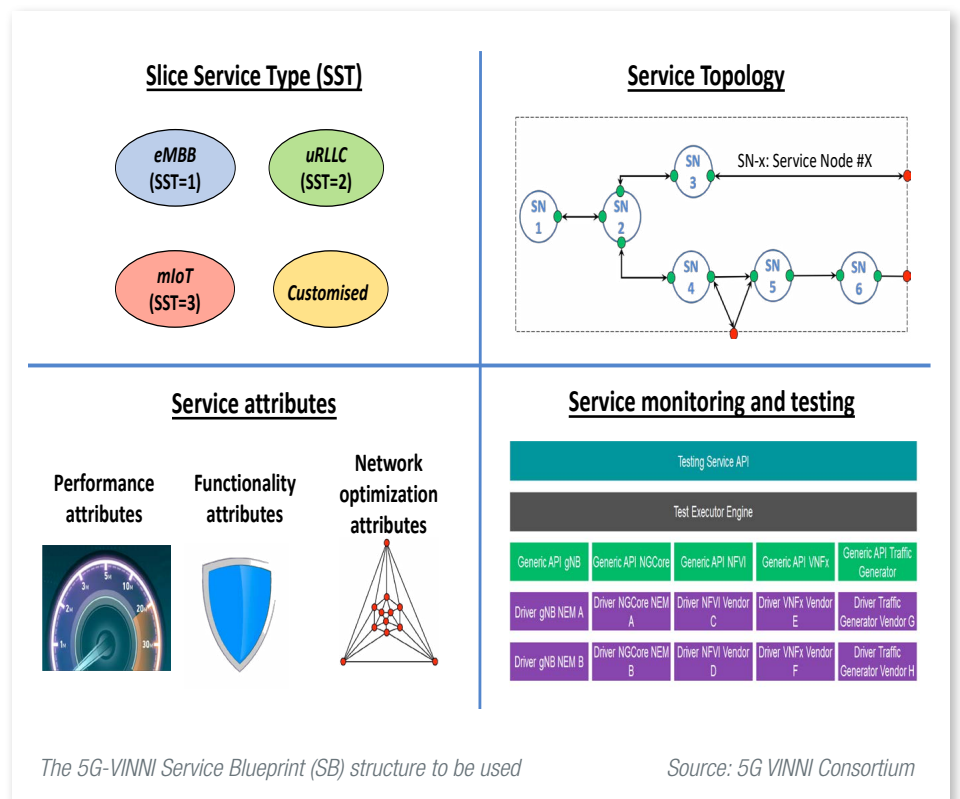
Enriched and revised version
of the Education about Standards book

Imagine if time measurement or the track width of trains were not standardized, or imagine if we were not able to use our mobile devices once we are out of the reach of our operators' networks, for instance abroad.

With technological progress, the need for standardization grows. The rapid progress in information and communication technology (ICT) could not be achieved without the advances in standardization. Standardization and standards boost progress and create a common basis, upon which technology can evolve. Though important, ICT standardization and its methods remain a topic that is not easily accessible.

To try to remedy this situation and prepare a new generation of standards professionals, ETSI has commissioned the development of teaching materials for a comprehensive education on ICT standardization. The first textbook was published in 2018 with the support of the European Commission and the EFTA Secretariat. We are now launching a revised and enriched edition of these teaching materials.

If standardization principles are the same, independent of the fields of application, be it mechanical engineering, ICT, nanotechnology, on any other area of interest, ICT, however, exhibits some discipline-specific features.

The present textbook deals with these specifics and explains them in a way that is as simple as possible without compromising rigour and depth. Due to the rapid technological advances in ICT, ICT standardization seems to become increasingly restrained to the expert, while remaining mysterious to the non-expert.

So far, there is a fair body of research published in the area, but there is no textbook that makes the topic easy to digest by the interested student and the practitioner that requires a reference that contains the most important concepts in ICT standardization. We believe that ICT standardization deserves more attention, especially in relationship with education.

The principles of ICT standardization should be taught in class to convey essential knowledge to students about such an important field. A good understanding of the concepts provided in this book will enable students and practicing professionals to get a good overview of the field, so that they are able to put this knowledge in practice or advance it through their own research.

Thus, this textbook is an attempt to remove the accessibility barriers related to the understanding of ICT standardization. Our aim is to cover the essentials of the field of standardization by large and the ICT-specific aspects, while additionally conveying our passion to the topic. The book is organized in chapters that are related to each other. Therefore, readers are encouraged to read the book from cover to cover.

The *textbook* is complemented by a comprehensive *set of slides*, and available from the ETSI website free of charge.

MY ETSI: new form to apply for ETSI membership

As part of the overhaul of the "Directory Service" application and the upgrade of our Enterprise Resource Planning software, we are developing the "MY ETSI" application, which aims to improve the exchange and management of information between members and the secretariat.

The first exchange is often done when applying for membership. To do this, organizations that want to join ETSI fill in a form available on the website.

We have reworked the membership form and the way it is handled by the secretariat.

Starting in January 2022, the completion, submission, and validation of this form can now be done in a collaborative way between the applicant and the membership administration team.

Once the contract is signed, the information is transferred to the membership directory.

In the near future, the official contacts will be able to manage this information themselves as done during the membership request (update of their address, phone number etc.).

■ *Vincent Depagne, ETSI, Chief Information Officer.*

New staff member

Magali Fitzgibbon

Senior Legal Advisor.

Magali, who was born and has lived most of her life on the Côte d'Azur, received her Master's degree in Intellectual Property Law with a focus on new technologies at both University of Aix-Marseille, France and University College Dublin, Ireland.

She started her career as Legal Advisor at an IP consulting firm where she was in charge of customers in various industries, such as sea freight and agrifood. In 2007, she joined INRIA, the renowned French National Institute for Research in Digital Science and Technology, where she held several positions. In her first role as IP Legal Manager, she co-developed a software IP tracking methodology to assess compliance with licensing strategy. She was later promoted to Project Director for a consortium between INRIA, CNRS, CEA and Mines Telecoms, where she led the creation of an IP software-related training programme.

In 2017, she worked as a project manager on the governance, legal, administrative, and fundraising aspects of the Software Heritage project. This fascinating project, supported by UNESCO, was created to collect, preserve and share all software that is publicly available in source code form. Data are stored on mirrored servers throughout Europe to make sure that this software library will not meet the same tragic outcome as the ancient Great Library of Alexandria, Egypt. In 2018, Magali became the General Secretary of the INRIA foundation, reporting to the President, before becoming a project manager of digital transformation back at INRIA.

Fellowship award: deadline 31 January

Remember to nominate our next ETSI Fellows! The awarded fellows will be announced at our next General Assembly in March 2022.

For more information, please visit our website at: *https://www.etsi.org/membership/fellows*

Getting greener: IPR e-sign

In alignment with ETSI's current efforts to reduce paper-based processes and embrace greener approaches, the ETSI Secretariat has evolved the IPR application. A new feature is available for IPR declarants to sign their declarations electronically.

The IPR e-sign project, which aimed to enable the e-sign process in the IPR database application (*ipr.etsi.org*), was published on 14 October 2021. This new release comprises an optional e-sign mechanism embedded directly into the IPR declaration submission process.

The new feature uses the Adobe Sign service to deliver the e-sign possibility to all IPR declarants seamlessly. Furthermore, it is compatible with General Declarations (GDs) and Information Statement and Licensing Declarations (ISLDs). The e-sign feature can be found by following the original declaration submission flow in the application. All declarants are actively encouraged to use it in order to have their signed and submitted declarations reach the ETSI Secretariat in a timely and paper-free fashion.

■ *Cátia Borges Ormonde, ETSI, IT Project Manager.*

New format for the ETSI seminar

In May 2021, we held our *ETSI Seminar* online. We were happy to welcome 70 attendees, the highest number of attendees ever for this event. In order to improve the onboarding programme for our new members and if health (Covid) conditions allow, we are planning to hold a Face-to-Face ETSI Seminar with a new format in 2022. It will allow people to become more familiar with the ETSI environment, to meet and exchange with key and relevant staff members and to get an improved "onboarding" feeling.

This Seminar will be combined with the new online *ETSI Seminar modules* containing a comprehensive set of 10 minute video presentations which are freely available on our website. New members will have the keys to understand the ETSI organization as a whole as well as the Secretariat work and tools. These online videos are also a good way to refresh your knowledge of ETSI for those of you who need an update on specific topics. They can be viewed at any time at: *https://www.etsi.org/events/etsi-seminar.*

First comprehensive global standard
for securing smart phones
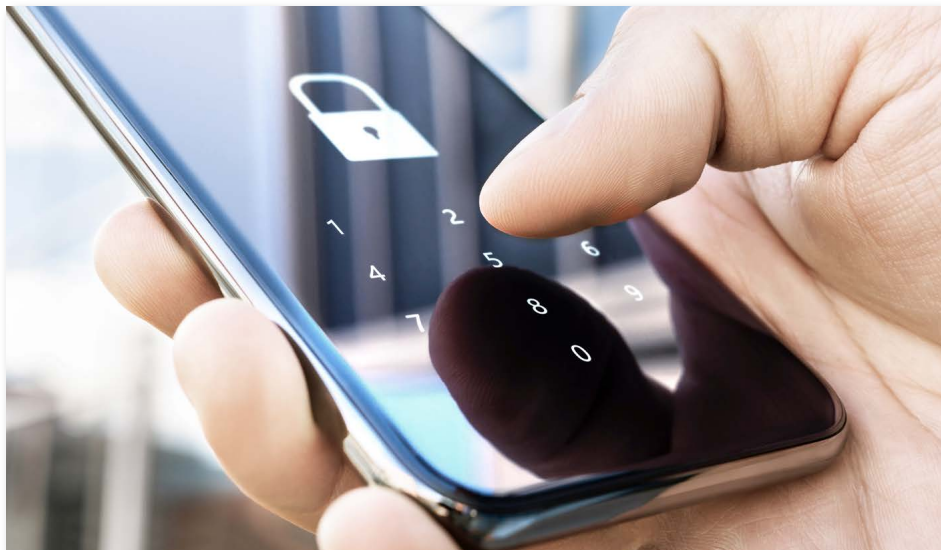
Today our smartphones and tablets are fundamental for citizens and hold a wide range of user data and apps. At the same time, security attacks have increased with malicious applications and network eavesdropping. To define security and assurance requirements for smart phones and tablets, mitigate potential risks and protect users, ETSI has released a world class standard called Consumer Mobile Device Protection Profile, *ETSI TS 103 732*. The specification identifies key security and privacy risks for user data and provides appropriate protection.

The new ETSI standard specifies security requirements for consumer mobile devices. It ensures the protection of key user data such as photos, videos, user location, emails, SMS, calls, passwords for web services, and fitness related data.

The ETSI specification has a broad coverage of security features including cryptographic support, user data protection, identification and authentication, security management, privacy protection, resistance to physical attack, secure boot, and trusted communication channels.

IPv6 Enhanced Innovation
First Report

The ETSI IPv6 Enhanced Innovation (IPE) Industry Specification Group (ISG) has released its first report *ETSI GR IPE 001* "IPv6 Enhanced Innovation: Gap Analysis". This report presents industry trends and comprehensively analyzes gaps based on the requirements created by new use cases and services, like 5G and the cloud, to accelerate IPv6 deployment and innovations. In addition, the ETSI GR IPE 001 report outlines the differences between IPv6 and IPv4, as well as the advantages and gaps of IPv6 in IP link, multicast, security, operation and maintenance solutions, and IPv6-only networks. It also identifies recommendations of new features of the IPv6 enhanced innovations, including deterministic quality, ubiquitous connectivity, low latency, ultra-high bandwidth, security, and automation.

OSM Release ELEVEN out

ETSI OSM community has recently launched a new release of its management and orchestration framework, *OSM Release ELEVEN.*

Committed to the alignment with ETSI standardization work since its foundation, this new OSM release completes the adoption of two new ETSI NFV specs, SOL004 and SOL007 for package formats. In addition, Release ELEVEN includes significant functional extensions in areas such as the extended interoperability with public clouds, now also supporting deployments over Google Cloud; advanced interaction with cloud-native environments, with fine-grained operations over CNFs via Kubernetes operators, and cluster monitoring, and seamless coordination between network functions, via inter-application relations.

Join us at upcoming events
organized or supported by ETSI.

Find more information and register on our website at: www.etsi.org/events

January 2022

OSM 12 Hackfest - 24-28 January, Virtual
Organized by ETSI's Centre for Testing and Interoperability, the OSM#12 Hackfest will enable OSM developers and users to share, test and demonstrate the latest features delivered with OSM Release ELEVEN. The event will also allow new OSM community members to acquire hands-on experience with OSM.

February 2022

6th World eSIM Summit - 17-18 February, hybrid, Berlin, DE
This hybrid edition will focus on exploring key industry trends, surging the adoption of eSIM technology, aligning the emerging eSIM ecosystem and overcoming security and interoperability issues. Hear from Dario Sabella of Intel, Chairman of ETSI's Industry Specification Group Multi-access Edge Computing (ISG MEC) about the latest trends and developments.

Mobile World Congress - 28 February-3 March, Barcelona, ES
MWC, the world's most influential event for the connectivity industry, where world-leading companies share the latest thought leadership about the progression and future of connectivity, is attended by global mobile operators, device manufacturers, technology providers, vendors, and content owners. Take the opportunity to (re-)connect and exchange with ETSI management! *Due to the ongoing pandemic, we will not be hosting the well-established annual ETSI Networking Cocktail in 2022 but hope to resume the tradition in 2023.*

March 2022

IoT India Expo 2022 – 23-25 March, New Delhi, IN
ETSI is pleased to endorse the IoT India Expo 2022, co-located with 29th Convergence India expo 2022 the leading enterprise event across IoT, Blockchain, AI, Big Data, Cyber Security and Cloud. This event is a great platform for IT Professionals to meet and discuss the future of technology. Hear from ETSI's seconded expert, Mr Dinesh Chand Sharma about the latest IoT and oneM2M standardization activities.

ENISA-ESO CyberSecurity Standardization Conference 2022 – 15 March 2022, Virtual Event
The European Standards Organizations CEN, CENELEC and ETSI, have once again joined forces with ENISA, the European Union Agency for Cybersecurity, to bring you the annual Cybersecurity Standardization Conference. The event will run virtually. The conference aims to foster the dialogue among those involved in the development of the ICT certification framework in Europe, in view of an effective implementation of the Cybersecurity Act.

3rd C-V2X Plugtests - 28 March-1 April, Klettwitz, DE
The 3rd C-V2X Plugtests event, lab and outdoor-based, will enable vendors to run interoperability test sessions to assess the level of interoperability of their implementation, and validate ETSI ITS standards.

930
members

27%
SMEs

+130
technical groups

363
standards
Sept-Nov 2021

678
standards
under development

4.538 M
standards' downloads
Sept-Nov 2021

ETSI SNAPSHOT

15.275
online participants
Sept-Nov 2021

556
eMeetings
Sept-Nov 2021

20
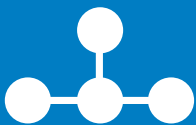conferences
& Plugtests
Sept-Nov 2021
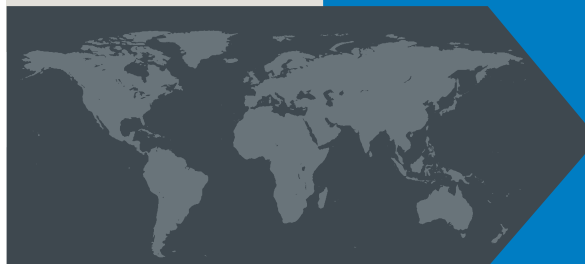
@ETSI
Secretariat

127
people

16
nationalities

ETSI
650 Route des Lucioles
06560 Valbonne France
Tel: +33 (0)4 92 94 42 00

83
partnerships

**Members
from
63
countries**

About ETSI

ETSI provides members with an open and inclusive environment to support the development, ratification and testing of globally applicable standards for ICT systems and services across all sectors of industry and society. We are a not-for-profit body with more than 900 member organizations worldwide, drawn from over 60 countries and five continents. Members comprise a diversified pool of large and small private companies, research entities, academia, government and public organizations. ETSI is officially recognized by the EU as a European Standards Organization (ESO).

For any information, to contribute on Enjoy!, to be removed from the list of hard copies or subscribe to it, contact us at: enjoy@etsi.org

For more information please visit: *www.etsi.org*

ETSI
The Standards People

Follow us on: