Enjoy!

THE ETSI MAG

THE INTERVIEW
Mikko Uusitalo, Nokia Bell Labs. P.4/5

IN THE SPOTLIGHT
TeraHz: a candidate for 6G. P.13/16

ZOOM ON EUROPE
EC Code of Practice. P.22

FROM RESEARCH TO STANDARDS

ETSI

Editorial

Wishing you a Happy and Well-Connected New Year 2023!

You cannot design tomorrow's world without innovation. Research leads to standards which in turn underpin future ICT technologies that will impact our daily lives. This edition of Enjoy! will show you how and why researchers play a key role in ETSI.

*The newly launched group on terahertz (THz), featured in our **spotlight** pages, is one example. THz is indeed a candidate technology for 6G, still at the research stage. From a different angle, our **showcase** shows how INRIA, the France-based National Institute for Research in Digital Science and Technology, has been instrumental in building an ETSI standard that offers a reliable solution to detect pathogens.*

*In our main **interview**, Mikko Uusitalo, from Nokia Labs and lead of the 6G Hexa-X EU funded project, outlines its three pillars: sustainability, trustworthiness, and digital inclusion. At the same time, Dr.-Ing. Michael Buchholz, Head of research groups at Ulm University (Germany), one of our new members, tells us why joining ETSI makes research results become part of tomorrow's everyday life. Then, with SystemX, a Research and Technology Organization, we can see how **Working together** helps ETSI develop cooperative, connected and automated mobility.*

*Our **Tech Highlights** this time go back to one of ETSI's success stories, the Industry Specification Group on Network Functions Virtualization technology created 10 years ago. In contrast, it highlights a recently created Industry Specification Group on Reconfigurable Intelligent Surfaces, launched one year ago.*

*Policy Officer Gergely Tardos **zooms** on the European Commission new code of practice for researchers, to be published soon. Last but not least, our new GA Chair, Bettina Funk, from ITS (the Swedish NSO), shares her thoughts with us on her new role.*

Before moving on to the next pages, let me wish you a happy and well-connected New Year 2023!

Enjoy reading!

*Luis Jorge Romero,
Director-General ETSI*

9th ETSI/IQC **Quantum Safe Cryptography** workshop

The 9th ETSI/IQC *Quantum Safe Cryptography workshop* will return to face-to face format at ETSI Headquarters in Sophia Antipolis from 13-15 February 2023.

As we increasingly rely on cyber technologies, we are ever more vulnerable to cyber-attacks.

Therefore, preparing is critical and a new suite of tools resilient to quantum computers must be standardized and deployed. These will help maintain the availability and reliability of cyber systems and protect the confidentiality and integrity of our business functions, connected devices and information assets.

This event will bring together diverse participants in the quantum-safe cybersecurity community to facilitate the knowledge exchange and collaboration required to transition cyber infrastructures and business practices, in an era with quantum computers.

More information at *https://www.etsi.org/events*

ETSI event: the value of education

On 6 October, ETSI organized its first workshop dedicated to *"Forming the Next Generation of ICT Standards People: A Day of Teaching Standardization"* where authors presented their chapters of the ETSI textbook (Understanding ICT Standardization – Principles and Practice) and also proposed best practices and teaching methods. The participants included national standards organizations, university professors and Intellectual Property experts. They actively participated and there was a strong two-way interaction. More educational events related to ICT standardization are planned in the future to maintain ETSI education on the standardization programme started in 2016. Presentations are available on our *website*.

Upcoming **ETSI Research Conference**

The ETSI Research Conference, Maximizing the Impact of European 6G Research through *Standardization*, will take place from 6 to 8 February 2023 in ETSI Headquarters, Sophia Antipolis.

This face-to-face event is an exceptional opportunity for the research community to learn about the latest European research projects and plans for future activities as well as receive guidance on how to get involved in standardization. For the standards community, it is a great opportunity to learn about the latest innovative technology research areas that may have an impact on their future work.

The ETSI Research Conference will also provide the perfect platform for the first phase of 5G/6G research projects of the Smart Networks and Services Joint Undertaking (SNS JU), many of which will play a crucial role in the definition of next generation networks.

Call for Nominations for **ETSI Fellowship Awards**

Nominations for new ETSI fellows are open until 31 January 2023. This award recognizes an outstanding contribution to ETSI and is given to an individual whose dedication to ETSI is well known.

ETSI members must submit their nominations in writing and justify clearly why the nominated candidate should be granted an ETSI Fellowship.

ETSI Fellowship awards will be announced at the spring General Assembly. More information at https://www.etsi.org/membership/fellows

100,000!

ETSI has just granted its 100,000th ETSI-On-Line account! This means that since the creation of its electronic tools, 100,000 people around the world have worked with or for ETSI.

6G research Hexa-X connects the human, physical and digital worlds.

What is the Hexa-X vision?

In the Hexa-X we have the vision to connect the human, physical and digital worlds with 6G key technology enablers.

With efficient interfaces we can remotely or locally control the physical world. An example is Augmented Reality in the industrial sector. Operators can control any number of devices independently from their location. It makes it feel as though humans are next to the machine, even if located in a remote location – like extremely realistic telepresence.

People could connect to other people and machines using all the senses and also connect with objects that exist only in the digital world – to test them before they are produced.

Mikko Uusitalo

Head of Research Department Radio Systems Research Finland, Nokia Bell Labs, Hexa-X-II lead

Mikko Uusitalo is Head of Research Department Radio Systems Research Finland at Nokia Bell Labs Finland and leads the European 6G Flagship project Hexa-X. He obtained an M.Sc. (Eng.) and Dr.Tech. in 1993 and 1997 and a B.Sc. (Economics) in 2003, all from predecessors of Aalto University. Mikko has been at Nokia since 2000 in various roles, including Principal Researcher and Head of International Cooperation at Nokia Research. Mikko is a founding member of the CELTIC EUREKA and WWRF.

Do you have any research on the topic?

Yes, the whole Hexa-X project and many other activities in the world are pointing in this direction and here is an example. We did a *demonstration (PoC)* on the empowerment of manufacturing with cooperative robots (cobots) and resilience through 6G. Three cobots collaborate in the context of automated industrial processes, i.e. automated

> **"We did a PoC on the empowerment of manufacturing with cooperative robots (cobots) and resilience through 6G."**

product quality check, as well as robotic device impairment repair. It's a digital twin application. Digital twins and virtual reality represent key technologies to design, simulate and optimize industrial production systems and interact with them remotely. Using 3D graphics and stereoscopic sounds to recreate realistic virtual industrial environments in Unity 3D game engine, we can create an immersive virtual workstation for our customers. We gave AR glasses to visitors who could control robots into the digital world and in the physical world. In the digital world you had a model of the robot environment and in the physical world the real robot in a real environment.

Sustainability is one of the challenges of 6G; how do you address it?

The demand for the wireless traffic is increasing at quite some pace. So even though we are decreasing the energy consumption per bit, the overall energy consumption is increasing, and this is something we need to pay strong attention to. In the end the technology needs to be fully sustainable.

Another important aspect is to help other sectors of society be more sustainable. For example, the Nokia CEO has said there is no green without digital. Industry, buildings and transport are responsible

> **"We need to help other sectors of society be more sustainable."**

for a major share of the greenhouse gas emissions. With digital ICT and networks, we can help these other sectors to reduce these emissions. We need efficient connectivity between the digital and physical worlds to maintain accurate models of the physical world to operate it better. Therefore, we can help with preventive maintenance and detect problems before they occur.

What about trustworthiness and digital inclusion, two other pillars of Hexa-X and 6G?

More and more aspects of life are going digital and wireless. In this connection between humans and the digital world, we need to guarantee data privacy, operation resilience and security. We share some very sensitive and private

> **"There is no room to have any lacks or compromises in eHealth."**

information for health for example. So it's even more important that the next generation is designed right from the beginning with this trustworthiness in mind. There is no room to have any lacks or compromises here.

The UN Sustainability Development Goals, which we strongly support, include many other things than just energy efficiency or greenhouse emissions. For example, they address digital inclusion. For humanity, it is important to be able to serve a greater amount of people but also from a commercial perspective, it needs to be done in an economical way.

Talking about digital inclusion, do we have all the technologies to address this topic?

In remote areas, satellites can provide the connectivity no matter where you are on

Earth, but not always with very affordable solutions. Another question is how we can improve joint operations of satellite parts, non-terrestrial networks, and other flying things helping with connectivity. In Hexa-X we are looking at this global service coverage, with extreme use cases and with integration of sub-networks. We have already worked on an architecture optimizing the mix of these technologies.

What is the role of standardization for research results?

We have already had quite a bit of interaction with ETSI, and contributed to creating new activities, and we are creating material that hopefully will be used as well in 3GPP. In ETSI we have been contributing to the new

> **"With ETSI, there is a possibility to make a real impact with our results."**

THz Industry Specification Group. It's important that research has an impact. With standardization, we're moving from research to getting the technology and solution to real life. Also, for academics the measurement of impacts is increasing in relevance when it comes to getting funding. With standardization activity and with ETSI, there is a possibility to make a real impact with our results.

The second phase of the project is starting this month, in January; what are the main characteristics of Hexa-X-II?

Hexa-X has been ramping up the first strong consortium with industry and academia together with a global impact, working on vision and use cases and studying the opportunities offered by different technologies. Hexa-X-II will continue on from this with an update on use cases and requirements with an even wider participant and interaction base, improving the technologies and then moving also towards setting the foundation for system view and initial validation.

Welcome to our NEW members

Balluff GmbH, Germany

Balluff was founded in 1921 near Stuttgart and has been family-run for four generations. The company opened up to the international market at a very early stage and has grown into a cosmopolitan, leading player present in 68 countries worldwide and one of the most efficient manufacturers of sensor technology. Balluff is a leading supplier of high-quality sensor, identification and image-processing solutions including network technology and software for all automation requirements.

Entirety LLC, U.S.A

Entirety provides certification and regulatory services for module integrators, manufacturers, and operators across the world. The company works directly with regulatory authorities to obtain Type Approvals and homologations in regions like LATAM, EMEA, and APAC in more than 180 countries. Entirety works hand in hand with regulators and close trusted contacts to make the certification process as quick as possible. Entirety's technical knowledge, country-specific regulatory expertise, fully multilingual and cross-cultural capacities ensure fast and efficient results.

Entrust EU, Spain

Created in 1969, Entrust enables trusted experiences for identities, payments, and digital infrastructure. Entrust offers solutions that are critical to enabling trust for multi-cloud deployments, mobile identities, hybrid work, machine identity, electronic signatures, encryption, and more. It enables reliable debit and credit card purchases with its card printing and issuance technologies, protects international travel with its border control solutions, creates secure experiences on the internet with SSL technologies, and safeguards networks and devices with its suite of authentication products.

Eurofins KCTL, South Korea

Eurofins KCTL is an accredited testing lab that provides full testing and certification solutions. With four test sites based in Suwon, Yougin, Hwaseong and Gunpo, the company offers safety testing for electric and electronic devices, EMC conformity assessment testing, Reliability testing, Medical Device testing, Over The Air (OTA) testing for antennas on wireless devices and Automotive Testing for the electromagnetic compatibility of components and electrical units used on motor vehicles.

Leidos SES Inc, U.S.A

The company was founded in 1969 in California by nuclear physicist Dr. J. Robert Beyster as Science Applications Incorporated. In 2013, the company was renamed Leidos. Leidos is a science and technology solutions leader working to address some of the world's toughest challenges in the defence, intelligence, homeland security, civil, and healthcare markets.

Leidos' mission is to make the world safer, healthier, and more efficient through technology, engineering, and science.

NCI Agency, Netherlands

NCI agency was established in July 2012 as part of a NATO reform. It is a team of 3,000 civilian and military staff members located in 29 sites throughout Europe and North America. The Agency helps NATO and its member countries communicate and work together to fulfil their mission of peace and security preservation. NCI Agency's experts are on the frontline against cyber threats in order to help NATO keep the technological edge that is necessary to achieve its core tasks of consultation, collective defence and crisis management.

RAIN Alliance, U.S.A

The RAIN Alliance is the industry organization supporting the universal adoption of RAIN RFID technology, formerly referred to as UHF RFID, a wireless technology that connects billions of everyday items to the Internet of Things, enabling businesses and consumers to identify, locate, authenticate, and engage assets. RAIN Alliance is a global collection of companies and organizations which develop RAIN technology solutions addressing applications across many vertical markets. RAIN uses the GS1 UHF Gen2 protocol which ISO/IEC has standardized as 18000-63.

SDI Squared, U.S.A

SDI Squared is a consulting company providing a wide range of services using proven strategies and tools to speed optimal global outcomes via international fora. Services include tools for research and research services, integrated standards strategy services and integrated planning services & fora procedural guidance.

Teltronic, Spain

Teltronic is a global leader in the design, manufacture and deployment of mission critical radio communications equipment and systems. Teltronic supplies complete wireless communications solutions to important sectors such as public safety and transport, energy, mining, and oil and gas.

Teltronic has a complete range of critical communications products and solutions, including private communications infrastructures in TETRA, LTE and 5G technologies; terminals, including sophisticated on-board equipment for trains, trams and subways; emergency control centres and dispatch; and complementary solutions in spheres such as Video, IoT, Artificial Intelligence, Virtual Reality, and Drones, among others.

Texas A&M University, U.S.A

Texas A&M University Internet 2 Technology Evaluation Centre Operating began in 2004 by working on emergency communications projects but has since evolved into one of the premier emergency communications academic research centres in the world. To advance the deployment of practical technology solutions, Texas A&M ITEC brings together government, industry, practitioners, and academia, creating collaborative teams to identify problems, define solutions, and put technologies in the hands of first responders and other front-line professionals for test and evaluation. The aim of every effort is to advance the practical use of communications technologies to benefit communities, public safety, and national security.

University of Durham, UK

Located in a unique and historic setting, the University of Durham is one of the UK's leading universities and has an outstanding reputation for excellence in teaching and research. Founded in 1832, Durham comprises 17 colleges, offers over 330 courses and has over 11,000 undergraduate students and over 3,500 postgraduate students. The University ranks within the top 10 of all UK university league tables and is a world top 100 university.

Valid8, U.S.A

Valid8.com offers a different approach to testing. Its industry-leading performance, security and conformance solutions for 5G/4G-LTE/3G-UMTS, IMS, VoIP and PSTN telecommunication networks deliver an all-in-one technology with flexible, customizable testing options in a single platform.

Valid8 tests fixed and mobile networks with an upgrade path to support emerging technologies such as 5G and IoT. Its simple, agile, and cost-effective testing solution is used by some of the largest providers in the world.

Joining ETSI makes research results become part of tomorrow's everyday life.

Dr.-Ing. Michael Buchholz

Head of the research groups Electric Mobility and Connected Driving / Connected Infrastructure, Ulm University, Germany.

Dr.-Ing. Michael Buchholz has been a member of the Institute of Measurement, Control and Microtechnology since April 2009. He established and is leading the research groups "Electric Mobility" and "Connected Driving / Connected Infrastructure". He is also an active member of the "Mechatronics" research group.

Can you tell us about the activities of the research groups you are heading?

The electric mobility group works, on the one hand, on modelling and state estimation of batteries for electric power trains. On the other hand, we research

> **"We research on optimal control strategies for energy efficient and safe driving."**

optimal control strategies for energy efficient and safe driving, which in recent years has been especially performed for all-wheel-driven electric motorbikes.

The work of my other research group on connected driving and connected infrastructure is closely related to the work on automated driving and driver assistance systems carried on by the group of Prof. Klaus Dietmayer, our institute's director. We research smart traffic infrastructure and how it can help connected and automated vehicles to handle traffic situations, especially in the complex urban environment.

You have worked on a pilot in Ulm with your connected driving group: what is the goal of this project?

For our research on connected driving, initially within the publicly funded German research project MEC-View, together with our partners, we have installed sensors on street lamp posts at a T-junction in a suburban part of the city of Ulm. When you approach the T-junction on the minor road, a building blocks the view of the main road until you arrive at the give-way lines. This is true for human drivers as well as for an automated vehicle equipped with sensors. To overcome this, we detect road participants with our sensors on the street lamp posts and send them to a MEC server using mobile communication, both provided by our partner Nokia. On this server, our algorithms calculate an environment model (i.e., a digital twin) of the current traffic situation at the junction. This

> **"With MEC, stops at the give-way line are avoided and this can save fuel."**

information is then sent to connected road users either via cellular communication or via an ETSI ITS-G5 roadside unit.

Within MEC-View as well as the EU project ICT4CART, we have been able to show that automated vehicles can gainfully make use of this information on gaps on the main road to adapt their speed to arrive at the intersection accordingly. Since stops at the give-way lines are avoided, this can even save fuel.

As you're using ITS and MEC standards for this project, is this why you joined ETSI? What do you expect from being in our groups?

Exactly. We based our communication between the MEC server and connected vehicles on the then-available draft of the Collective Perception Message (CPM). During the course of the projects, based on the practical experience at our pilot site, we discovered that some improvements and extensions of the CPM would significantly help or even are required to realize such V2X use cases. We want to share our findings and help to improve the standards in this area. This is why we applied for ETSI membership and have contributed to the new draft version, which is currently finalized. I think with our prototype, we are able to provide valuable practical experience.

> **"We joined ETSI to share our findings and help to improve the standards in V2X."**

As a researcher, what would you tell your peers about joining a standardization body such as ETSI?

It is a great opportunity to make research results become part of tomorrow's

everyday life. What better can happen to researchers than that their findings are acknowledged and approved by the experts in ETSI's working groups? Also, being part of these expert groups to evaluate others' ideas is a great opportunity to broaden your own view on the topic.

> **"Joining ETSI is a great opportunity to make research results become part of tomorrow's everyday life."**

How do you foresee the future of mobility? Are there any future research projects you can share with us?

I hope that our work towards ITS will help to make tomorrow's mobility more inclusive and safer. In the German-funded project LUKAS, as well as the European project PoDIUM, we are currently extending the above-mentioned ideas and use cases towards infrastructure-assisted cooperation of connected vehicles in mixed traffic. This includes the integration of manually driven connected vehicles as well as vulnerable road users via mobile devices, e.g. smartphones. Also for this research, our ETSI membership plays an important role, since we have already developed ideas for shaping the future draft of the Manoeuvre Coordination Message and the respective service, which we like to bring into the discussions.

> **"Our ETSI membership plays an important role for the future Manoeuvre Coordination Message."**

Celebrating 10 years
of ETSI NFV!

Today, network function virtualization (NFV) technology is being deployed around the world and its adaptation has accelerated, triggered by the introduction of 5G Standalone (SA) systems. ETSI created the Industry Specification Group NFV 10 years ago, here's the story.

Overview

Network virtualization is being applied not only to mobile networks, but also to fixed-line telecommunications, companies, and various other areas, including the virtualization of radio access networks (vRAN). The application of NFV to

> **ETSI ISG NFV is unanimously recognised as the home of NFV.**

virtualizing radio base stations is being considered for the immediate future. NFV is becoming an increasingly important technology in telecommunications.

The ETSI ISG NFV held its first meeting in 2013 to standardize the key elements of network virtualization, achieving greater flexibility and operability for the large networks and delivering a vision for the future network. Since then, the ISG has published more than 400 deliverables and is working on a further 99 deliverables while promoting the adoption of network virtualization in the telecommunications industry.

ETSI ISG NFV is unanimously recognised as the home of NFV and is celebrating its 10th anniversary in January 2023. This article tells the story about how the ETSI ISG NFV connected, and continues to connect, with global telecommunication and IT R&D initiatives to promote network transformation with NFV and standardization.

Dawn of NFV

Until the late 2000s, telecommunications equipment was designed and implemented with specific-purpose applications running on specially designed processors, hardware, and operating systems to achieve the high performance and high availability needed to meet telecommunications requirements. Meanwhile, the IT industry was increasingly focusing on server virtualization and cloud infrastructure to utilize large groups of infrastructure elements flexibly and efficiently. In the late 2000s, advances in high-performance general-purpose hardware and software packet processing technology made it possible to achieve the required conditions for using general-purpose hardware in telecommunications applications.

Many R&D divisions of telecommunications operators around the world had been working to reduce the total cost of ownership (TCO) of telecommunications equipment, speed up service delivery, and improve operational flexibility. The goal was to accelerate telecommunication services innovation and reduce costs by utilizing infrastructure virtualization and cloud computing principles. They developed proofs of concept (PoC) with partner vendors to confirm that the high performance and high availability required for telecommunications services could be achieved, even when using virtualization software technologies and general-purpose hardware with comparatively low reliability. The successful results of these PoC were presented at international technical events.

The concept of NFV was taking shape; however, it was limited to each telecommunications operator's own R&D efforts, and the impact of the results on the industry was limited.

Expanding the Telco Collaboration and the Birth of "ETSI ISG NFV"

Informal discussions amongst researchers in the leading telcos convinced them of the importance of global collaboration to influence the telecommunications industry. Coincidently, ETSI had recently created a new type of entity in its organizational structure called an "Industry Specification Group (ISG)" to enable non-ETSI member companies to work within ETSI on new

> **ETSI ISG NFV has developed an extensive education programme.**

standards addressing a specific technology area. The ISG method can also enable academic and research organizations to participate and continue promoting their research. The need to involve new members from various industries was also recognised among the telcos, and a consensus was reached to use an ISG to collaborate on network virtualization.

At the Layer123 SDN & OpenFlow World Congress in 2012, thirteen telecommunications operators from

around the world published a white paper introducing network virtualization and inviting the industry to join a global collaboration under the umbrella of the newly formed ETSI ISG NFV. This white paper was recognised as heralding a significant new technology direction and network transformation for the industry and attracted worldwide attention.

The first ETSI ISG NFV plenary meeting was held in January 2013. The organizational structure included a Network Operator Council (NOC), as an advisory group intended to facilitate, for users of the new technology, the expression of their needs and views on its evolution.

10 years activity of ETSI ISG NFV

After this 10-year intensive effort, ETSI ISG NFV has made a very significant contribution to the industry, including sponsoring

ETSI ISG NFV has made a very significant contribution to the industry.

An active open-source ecosystem has emerged.

over 40 NFV PoC and publication of the specifications underpinning the latest developments in telecommunications networks. The 5G system architected by 3GPP takes advantage of network virtualization and SDN principles, directly referencing ETSI ISG NFV specifications. The success of ETSI ISG NFV is also due to the close R&D collaboration amongst the telecommunications operators, their partners, academic researchers and open-source communities to explore and validate future networking concepts based on NFV principles. NFV has been a major research topic in networking technologies and many academic papers have been published on subjects such as multi-layer orchestration, high-availability design, resource optimization, acceleration offloads, etc. In addition, many collaborative projects including EU projects have NFV on their agenda and their projects have been built on top of ETSI ISG NFV's concept and architecture.

Recognizing the need to educate the industry on the new approach, ETSI ISG NFV has developed an extensive

education programme that includes webinars and hosting tutorial sessions at major conferences, along with outreach to universities to encourage the development of hybrid telecommunication networking/IT courses.

An active open-source ecosystem has emerged to foster the exploration and adoption of draft ETSI ISG NFV specifications by open-source communities. And ETSI itself has adapted and is now hosting open-source communities, such as ETSI OSM and ETSI TFS, with a variant of the Industry Specification Group (ISG) model.

The future

With the rapid growth of cloud and software development technologies - such as "Cloud-Native" - as well as the expanding scope of NFV technologies, NFV will continue to be a pillar for telecommunications industry transformation. ETSI ISG NFV will continue to engage with global R&D initiatives and will further strengthen cross-industry collaboration to enable new use cases and promote standardization to ensure interoperability.

■ *Yoshihiro Nakajima, Chair of ETSI NFV ISG.*
Bruno Chatras, Diego Lopez, former ETSI NFV Chairs.
Joan Triay Marques, former ETSI NFV Vice Chair.

Misbehaviour reporting service to secure C-ITS

Cooperative-Intelligent Transport Systems (C-ITS) leverage the capability of vehicles and other ITS users to communicate with each other and with the infrastructure. Misbehaviour detection in the C-ITS enables to identify misbehaviour and to mitigate its effects. This happens both at the vehicular level, where stations continuously monitor incoming messages to spot inconsistencies; and at the global level, where Misbehaviour Authorities investigate Misbehaviour Reports (MR) received by the stations to identify misbehaving nodes, and eventually interact with the PKI to revoke their certificates. In order to provide interoperability, the format and content of the MR has just been standardized in ETSI Technical Committee ITS as TS 103 759.

Improving the interoperability of AR applications

Augmented Reality (AR) gives the possibility to mix in real-time spatially registered digital content with the real world surrounding the user. The development of a modular architecture allows components from different providers to interoperate through defined interfaces. Transparent and reliable interworking between different AR components is key to the successful roll-out and wide adoption of AR applications and services.

Taking into account the architecture framework that has been developed in ISG ARF, the group started the development of APIs between the several functional blocks specified. One of these APIs supports the collaboration of several authoring tools to commonly work on the creation of an augmented scenario. Such a collaboration makes use of an element called a World Graph. A World Graph defines complex structures and scenarios representing the real world and describes a scene used at runtime by AR systems to spatially register AR assets with the real world.

The newly published *ETSI ARF GS 005* entitled "Augmented Reality Framework (ARF); Open APIs for the Creation and Management of the World Representation" describes use cases and the meaning of a World Graph and specifies APIs for allowing AR developers to commonly work on the creation of one AR scene.

New TETRA algorithms to **secure critical infrastructures**

With the world facing growing challenges including the war in Europe and a global energy crisis, it is essential that the mission- and business-critical communications networks used by the public safety, critical infrastructure and utilities sectors (including transportation, electricity, natural gas and water plants) are secured against third-party attacks, to protect communications and sensitive data. With more than 120 countries using dedicated TETRA (Terrestrial Trunked Radio) networks for these critical services, work has been undertaken to ensure the ETSI TETRA technology standard remains robust in the face of evolving threats.

To adapt to technology innovations and potential cybersecurity attacks, including from quantum computers, the *ETSI technical committee TCCE* has completed work on new algorithms designed to secure TETRA networks for at least the next 20 years. These new specifications, *ETSI TS 100 392-7* and *ETSI TS 100 396-6* have been developed in close collaboration with experts from the ETSI quantum safe cryptography group.

FROM RESEARCH
TO STANDARDS
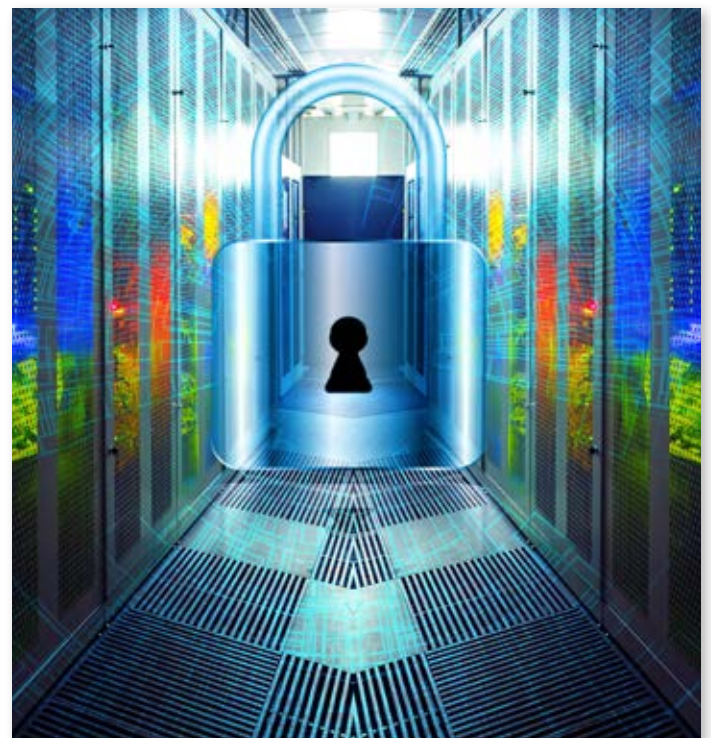
TeraHz: a candidate for 6G

Thomas Kürner, the Chair of the newly created ETSI Industry Specification Group THz, explains why the ability to provide wireless pipelines for ultra-high data rates makes THz communications an attractive candidate for a component of the physical layer in 6G systems.

Why use THz for 6G?

For almost two decades THz communications (0.1 – 10 THz) has been the subject of basic research and has even caught the attention of *standardization bodies* yielding a first wireless standard at a carrier frequency of 300 GHz. In more recent years various *Horizon 2020 projects* have made significant progress towards an implementation of

> **At WRC19, 137 GHz of spectrum was identified to be used for this technology.**

THz communications and at the world radio communications conference 2019 (WRC19) 137 GHz of spectrum was identified to be used for this technology. This large amount of available spectrum enables a path towards *1 Tbps*. While the sub-6GHz band is more suitable for splitting the capacity among a large number of relatively low-rate users, the sub-THz band supports much higher data rates to *fewer users*. This ability to provide wireless pipelines for ultra-high data rates makes THz communications an attractive candidate for a component of the physical layer in 6G systems.

Challenges ahead

In order to make this a reality, a couple of challenges have to be met. One of these challenges is the high path loss in this frequency band, which can be mitigated

> **THz will enable to replace or at least complement the traditional fibre links.**

by high-gain. With a moderate form factor of the antennas, predominantly short-range applications will be enabled. This will provide opportunities for data-hungry short-range applications, like virtual reality or ultra-fast wireless data exchange between devices. On the other side, point-to-point applications like wireless backhaul or wireless connections in data centres, allowing larger form factors of the antenna, will benefit from this technology as well. This will make it possible to replace or at least complement the traditional fibre links. Furthermore, the use of high-gain antennas requires new concepts for device discovery and beam tracking in order to enable applications with mobility involved. Research and development activities to solve open issues for applications with a mobile receiver on at least one end of the link are already under way in various projects in *Horizon Europe*. A basis for the development and standardization of any new radio system is the timely availability of appropriate channels. Whenever a wireless communication system is introduced in either a new

> **ETSI ISG THz will ensure that appropriate channel models are available.**

largely unknown frequency band or is implemented in a certain environment for the first time new channel models have to be developed. Both conditions are fulfilled for THz communications. One of the key missions of ETSI ISG THz is to make sure that appropriate channel models are available from the beginning of the THz standardization process.

Further challenges come from the design and fabrication of RF hardware. While hardware *demonstrations* have already proven the feasibility for point-to-point applications, there is still a need to develop RF circuits, which are low-cost, energy-efficient and can be easily integrated with

Fixed point-to-point applications

Wireless fronthauling & backhauling

Close proximity point-to-point communication

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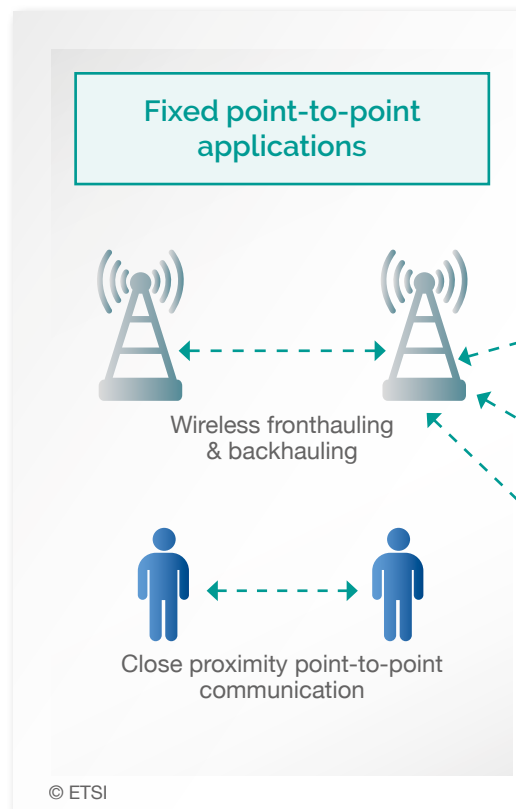
chipsets for the baseband processing and networking interfaces. The latter will be a pre-requisite to paving the way for mass-market applications. Together with the capabilities at THz frequencies to sense the environment, this frequency band also provides obvious opportunities for Joint Communication and Sensing applications.

Working on future developments of THz

A new ETSI Industry Specification Group THz (ISG THZ) was established at the end of September 2022. ETSI ISG THz performs pre-standards work aiming to support the future 3GPP standardization work on THz communications and covers several areas. Firstly ETSI ISG THz will select the most relevant use cases for THz communications, select the target scenarios and identify the concrete frequency bands of interest. Of major interest to the ISG THz is to analyse specific radio propagation aspects for THz communication, such as molecular absorption; the effect of micro-mobility;

> The ETSI THz group will establish a baseline for THz technology fundamentals.

specific considerations for scattering, reflections, and diffractions; and considerations for near-field propagation. This requires the mapping of selected use cases to relevant channel measurement scenarios. As a starting point for channel measurements, data from the numerous earlier measurement campaigns published in relevant literature will be analysed. To complement this and fill the gap of missing data, it is expected that the members of ISG THz will perform channel measurements for the selected scenarios and frequency bands. This will include measurement campaigns in indoor and outdoor environments, with and without mobility, intra/inter device measurements, sounding for integrated sensing and communication (ISAC) and channel sounding including reconfigurable intelligent surfaces (RIS).
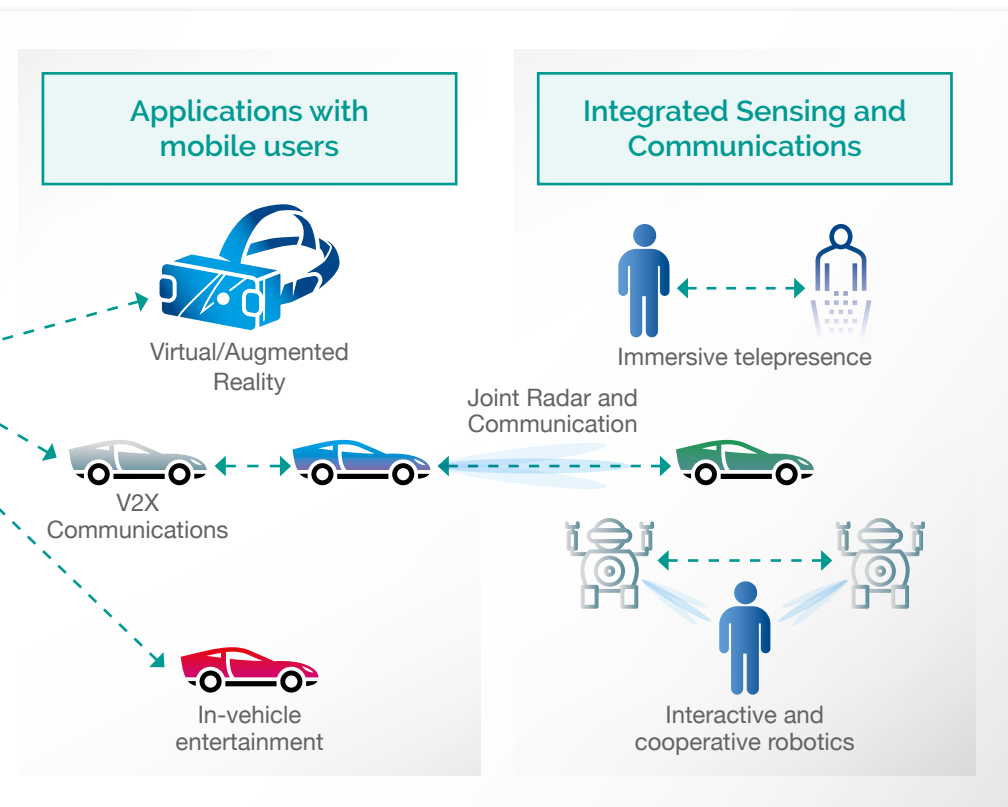
Furthermore, machine learning (ML) methods to generate and analyse radio channels will be applied. All this will enable the group to develop channel models for the selected scenarios and frequency bands and finally establish a baseline for THz technology fundamentals, including antenna assumptions, simulation assumptions, and deployment strategies. ETSI ISG THz thus prepare systematic output on channel models, system parameters, and evaluation assumptions for the evaluation of THz communication systems. ISG THz encourages a continual exchange with relevant standardization groups (either inside or outside ETSI) to ensure they are informed and consider the work of ISG THz in their further relevant technology specifications developments.

To a certain extent THz communications has similarities and shared challenges with millimetre wave technology. Due to the need for line-of-sight or at least obstructed line-of-sight to make use of one reflection or scattering process, Reconfigurable Intelligent Surfaces (RIS) are seen as a booster for THz

> THz communications has similarities and shared challenges with millimetre wave technology.

communications. This will provide ample opportunities for collaboration and joint undertakings with the ETSI ISG mWT and ETSI ISG RIS. The start of ETSI ISG THz coincides with the start of various *projects* on THz communications within the framework of the Horizon Smart Networks and Services Joint Undertaking providing further excellent opportunities for collaboration and exchange. Similar opportunities exist with the already running large 6G projects in various European countries, for example in *Germany* or *Finland* via some of the founding members of ETSI ISG THz.

■ *Thomas Kürner, Chair of ETSI ISG THz.*

Applications with mobile users

Virtual/Augmented Reality

V2X Communications

In-vehicle entertainment

Integrated Sensing and Communications

Immersive telepresence

Joint Radar and Communication

Interactive and cooperative robotics

How Research Meets Standardization: the ETSI *Asynchronous Contact Tracing* Standard and the PANDESYS Research Activity
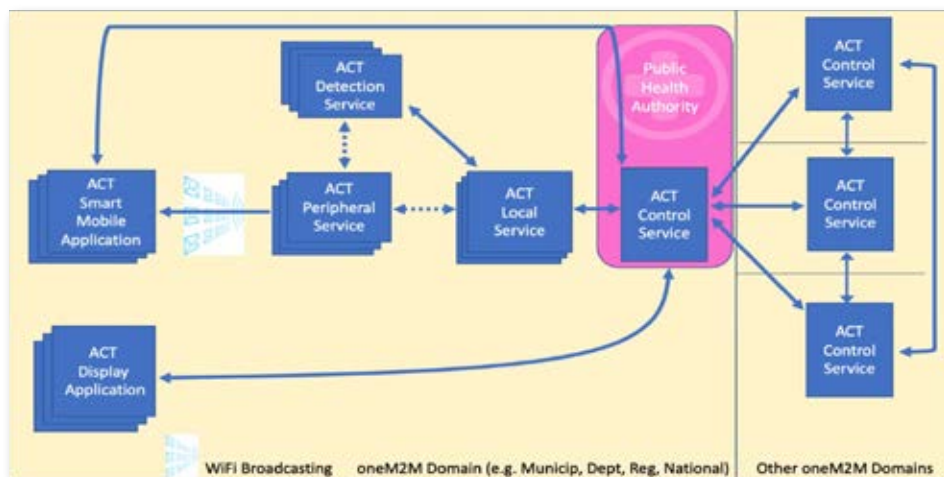
The Covid-19 pandemic has shown how the mutation of a common virus can topple the world economy in a few weeks and how public policies must react quickly to limit and even avoid such a collapse. The existing 'In Vitro Diagnostic' (IVD) ICT technology has not always been reliable. Asynchronous Contact Tracing (ACT), standardized in ETSI SmartM2M Technical Committee, offers a reliable solution to detect pathogens.

State of the art

ICT technologies to detect potential exposure to the SARS-CoV-2 virus did not always have a *measurable reliability*. Indeed the 'Synchronous Contact Tracing' technology is based on getting a notification of a potential virus exposure when being close to an infected person 'at the same time and in the same space', without knowing the real level of mutual exposure and without addressing the strong potentiality of combining advanced IoT technologies with innovative 'In Vitro Diagnostic' virus detection technologies.

The technology breakthrough

PANDESYS (**PA**thoge**N DE**tection **SYS**tem) research activity on Advanced Surveillance, detecting pathogens on delimited areas on the territory (on surfaces, air-conditioning filters, waste water, etc.) and correlating this to the individual presence of humans in the same areas, is directly inspired by the ETSI ACT standard. Asynchronous means that time and space synchronicity of two individuals are not needed anymore. More matches can be made between one person and their proximity to a precise location, where the presence of pathogens has been formally established by a Detection Platform. PANDESYS focuses on Covid-19, but it can be extended to other pathogens such as viruses, bacteria, fungi, or even chemical contaminants. IoT, Wi-Fi™, 5G, and AI will be the tech PANDESYS ingredients; they will work with new pathogen detection technologies to provide a fast and automated diffusive test result, correlating it with the specific area of contamination and informing people in that area without tracing their movements. AI will support humans in data analysis by empowering a kind of pandemic forecast.

PANDESYS aims to build a diffusive deployment of Pathogen Platform(s), (nearly) automatic, each one associated with a small area (e.g., a supermarket, an underground/train station, a hospital), all covered by a beacon based on available Wi-Fi™ technology, so people in that zone, with the help of their smartphones, can collect the list of the areas they have visited with associated timestamps. The information from the Detection Services is collected on a cloud and integrated with the other pathogen diffusion information, made available to the Public Authorities, and to the general public via the Internet. The oneM2M Control Services, under the control of the Public Health Authorities, are all connected in a Pan-European system managed via *ETSI oneM2M* standard tools.

■ *Luigi Liquori, Research Director, Inria Centre at Université Côte d'Azur.*

SYSTEM-X research project instrumental in ETSI C-ITS specification

Cooperative-Intelligent Transport Systems (C-ITS) leverage the capability of vehicles and other ITS users to communicate with each other and with the infrastructure, providing mobility services and increasing road safety. The C-ITS will be an enabler of Cooperative, Connected and Automated Mobility (CCAM).

Securing communications in the C-ITS

Safety C-ITS applications require vehicles to communicate directly, without a network infrastructure. Stations broadcast kinematic data about themselves or other entities on the road, which are exploited by the driving functions of the receiving nodes nearby. Today, this may trigger an emergency braking alert on the vehicle; in the future, it will enable applications for, e.g., cooperative automated manoeuvring.

The first step in securing C-ITS communications is to rely on cryptographic signatures of the messages. The key pairs are attributed to legitimate C-ITS users by a Public Key Infrastructure (PKI). The C-ITS PKI is composed by a few authorities, organized in a hierarchical fashion and ultimately based on common trust policies established at the European level. This mechanism allows receiving stations to verify the integrity and the attribution of each message, thus protecting against outsider attacks from non-legitimate stations.

Misbehaviour detection

Legitimate C-ITS stations transmitting false or inappropriate data, either purposefully or by malfunction, are said to be misbehaving. Misbehaviour cannot be prevented by the PKI and can be very detrimental, especially for increasing levels of automation. Misbehaviour detection is the set of functions in the C-ITS aimed to identify misbehaviour and to mitigate its effects. This happens both at the vehicular level, where stations continuously monitor incoming messages to spot inconsistencies; and at the global level, where Misbehaviour Authorities (MAs) investigate Misbehaviour Reports (MRs) received by the stations to identify misbehaving nodes, and eventually interact with the PKI to revoke their certificates. In order to provide interoperability, the format and content of the MR has just been standardized in ETSI Technical Committee ITS as TS 103 759.

SystemX comes in

Misbehaviour detection is one core topic of the Trusted Automated Mobility (TAM) project at SystemX.

SystemX is a Research and Technology Organization (RTO – Institut de Recherche Technologique – IRT) dedicated to the digital engineering of systems. SystemX coordinates partnership-based research projects, bringing together academics and industrials in a multidisciplinary and cross-cutting perspective. In TAM, Atos, Navya, Renault, Stellantis, Oppida, Trialog, Yogoko, Inria and Institut Mines-Télécom are involved in the consortium of partners. Thanks to this richness and diversity, TAM proposes scientific and technical solutions for the whole misbehaviour detection management system (local, reporting, global), and tests them with in-the-lab and on-the-road experimentations. Aware of the concrete impact that the standardization activity brings to the development of more secure C-ITS, SystemX is an active contributor to the ETSI TC ITS Working Group 5 on security.

■ *Francesca BASSI, Senior Researcher at SystemX.*

ISG RIS 2022 Progress

Exploration and gap analysis for Reconfigurable Intelligent Surface as a potential future wireless technology.

RIS basics

RIS (Reconfigurable Intelligent Surface) is a new type of network node that leverages smart radio surfaces with many unit-cells to dynamically control the electromagnetic waves, for example through signal reflections, refractions, focusing, collimation, modulation, and any combination of these.

RIS technology will effectively turn the wireless environment into a service, inspiring a host of new use cases. These include enhancing Key Performance Indicators for various systems such as coverage and capacity, as well as enabling new applications such as localization and sensing. Thanks to its associated characteristics, RIS is considered a key technology in future wireless systems, including 5G-Advanced and 6G.

ETSI group

ETSI's Industry Specification Group on Reconfigurable Intelligent Surfaces (ISG RIS) gives ETSI members the opportunity to coordinate their pre-standardization research efforts into RIS technology across various EU collaborative projects, together with global initiatives, paving the way for future standardization of the technology.

Since the launch of the group in September 2021, the group has focused on identification and description of RIS-related use cases and deployment scenarios. It has also outlined system requirements and technological challenges in several areas including fixed and mobile wireless access, fronthaul and backhaul, sensing and positioning, energy and EMF exposure limits, security and privacy.

Ongoing work

2022 saw further progress made on the group's first three Work Items, all scheduled for publication as informative Group Reports (GRs):

RIS-001 identifies and defines relevant RIS use cases, with corresponding general Key Performance Indicators (KPIs) and deployment scenarios where RIS technology will be applicable. It describes potential requirements for each identified use case, with the aim of promoting interoperability with existing and upcoming wireless technologies and networks.

RIS-002 describes the technological challenges in deploying RIS as a new network node. Analysing potential impacts to network architecture, protocol architecture and a RIS control framework, it offers recommendations for requirements and potential impact to specifications supporting RIS as a new feature.

RIS-003 explores: (i) communication models that offer a trade-off between electromagnetic accuracy and simplicity for performance evaluation and optimization; (ii) channel models that include path-loss and multipath propagation effects, as well as the impact of interference; and (iii) KPIs and the methodology for evaluating the performance of RIS for application to wireless communications – including the coexistence between different network operators – and for comparing transmission techniques, communication protocols and network deployments.

The stable drafts of the GRs from the existing work programme were issued in 2022, and these deliverables will be published in the first half of 2023.

■ *Arman Shojaeifard, Chair of ETSI ISG RIS- Richie Leo and Di Renzo Marco Vice Chairs ETSI ISG RIS.*
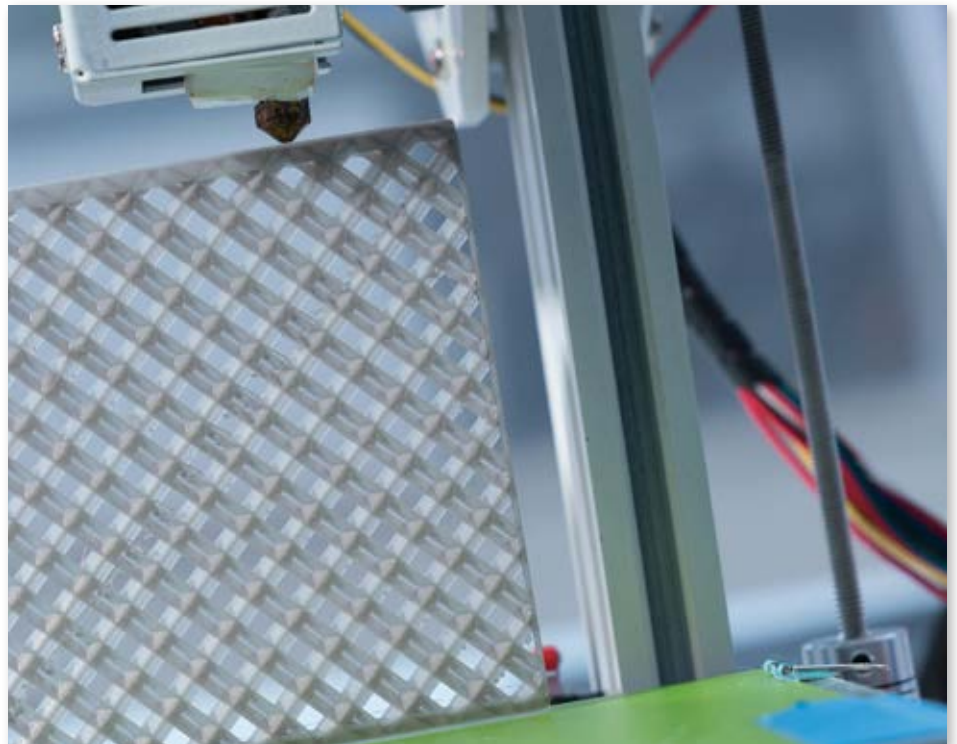
ETSI, listening to the needs
of the R&D community

ETSI's role in the R&D Ecosystem

ETSI is at the forefront of technology standardization and actively engages with the R&D community to take latest technological advances towards market exploitation through standards. The ETSI Board has a strong focus on research and innovation that are coordinated through the Research, Innovation and Standardization Ecosystem (RISE) strategic group. RISE maintains an ongoing dialogue with key European R&D platforms including 6G-IA, NetworldEurope and major European research projects including Hexa-X, Europe's 6G flagship research project and many others. One recent result of our continued dialogue with researchers, projects and all ETSI members, is the creation of the new ETSI Industry Specification Group Terahertz (ISG THz) that was created in October 2022.

Outreach to the R&D Community

ETSI has made available detailed information on how to engage into the standardization ecosystem, specifically targeting the R&D community: *http://www.etsi.org/research*. In ETSI, we felt it was the right time to reach out to the broader R&D community in order to better understand whether the available material was meeting the needs. We also asked ourselves what should be done to further remove barriers and facilitate access to exploitation of research results through standards. For this purpose, a survey was initiated targeting this community. Corresponding results are summarized in Fig. 1.

Figure 1: Research Survey Results. © ETSI
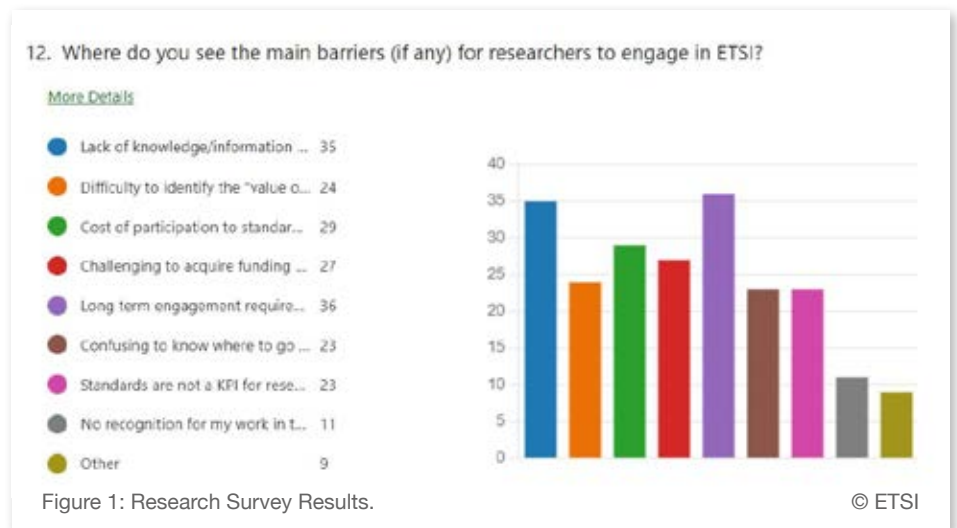
Removing the barriers and facilitating access to standards

ETSI RISE has analyzed the survey results and has identified that further actions are needed to better serve the R&D community. It is proposed to address the identified needs through three specific groups of actions:

Group 1 will be in charge of external communication, to address concerns such as "Lack of knowledge/information" or "Where to go / who to contact?"

Group 2 will take care of the value for researchers, to address comments such as "Difficult to identify the value of standards", "Standards are not a KPI for researchers", "No recognition of the work".

Group 3 will address funding / long-term engagement, to answer concerns such as "Cost of participation" and "Challenging to acquire funding".

Next steps

Please watch out for upcoming ETSI initiatives addressing the three groups of actions above! We are fully committed to creating additional value and support for the R&D community.

To continue the dialogue, ETSI is pleased to invite the R&D community to its headquarters in Sophia Antipolis, France in the framework of the ETSI Research Conference from 6-8 February 2023 on "Maximizing the Impact of European 6G Research through Standardization". The conference will serve as a discussion platform and will include a kick-off event of 25 recently approved research projects under the Smart Networks and Services Joint Undertaking (SNS JU). It will be a unique opportunity for the R&D and ETSI standardization communities to work together and identify promising opportunities for taking novel and disruptive technologies to market exploitation through standards.

■ *Markus Mueck, Chair of ETSI Research, Innovation and Standardization Ecosystem (RISE) strategy group.*

R&D and New Sectors
help drive Standards, but 6G must wait

This issue of Enjoy! is focusing on the impact of Research on standards. In this short article we will consider the growth of R&D and new industry sectors in 3GPP.

By definition, successful research & development paves the way for the commercialization of any product or service. In 3GPP, all of the generations of mobile systems have leant heavily on proposals perfected in the lab or workshop, prior to the start of scrutiny, collaboration and debate in the working groups - as the technology makes its way into the specifications.

With network and equipment launches often starting within two years of the stable specifications being approved, one of the challenges for the membership is to ensure that new R&D led contributions are aligned with the latest release, with several releases from 3GPP contributing to each generational marker (4G, 5G, etc.).

Perhaps due to that release-based culture, where the 3GPP groups are delivering specifications that are market ready, 3GPP would not necessarily be the natural place for discussions on future 6G, with its 2030 'to market' target. The current 3GPP releases are all still 5G centric and will stay focused on that for the next four to five years – prior to 6G specifications becoming the mainstream focus of the working groups. Of course, early visions and requirement gathering for 6G will come much earlier than that, largely within the membership, R&D and the Organizational Partners - Outside 3GPP, but aligned with the standards' direction of travel.

5G trend set to continue

For 6G, when the time is right, we can expect the trend seen during the 5G releases for more direct participation in 3GPP from researchers and 5G projects to continue. This is an important way to ensure that R&D inputs are aligned

The 3GPP Market Representative Partners (MRPs)

with the new work plan and with the priorities of the broader industry member organizations in the project.

This proactive approach by universities, researchers and a growing cluster of 5G market partners in 3GPP (see MRP graphic) has greatly helped the groups to address a broader variety of new use cases. Some specific examples of this diverse involvement are Mission critical, V2X, industrial IoT, private networks, mobile broadcast and video production, drones and UAS, network slicing and the use of satellite for 5G.

The rise of new industry sectors

In addition to the Market Representative Partners, there has been a marked increase in direct participation in 3GPP by new member companies, from a variety of new industry sectors during the 5G work.

To help to ensure that these industries get what they need the 3GPP leadership is encouraging their experts and delegates to find common ground between themselves where possible, to help build the necessary scale of support for new features. This is helping to ensure that many new features for the verticals get a good hearing in the 3GPP-wide prioritization process for the next release.

For both 5G-Advanced and future 6G, the role of both mature R&D and well organized new sectors will play a major part in driving 3GPP networks into the next decade.

■ *Kevin Flynn, 3GPP Marketing and Communications.*

Research and Innovation
in IoT Standardization

The earliest internet of things (IoT) innovations focused on remote connectivity and application of sensor data. This allowed organizations to monitor remote assets and supervise roving machinery. At the same time, the IoT roadmap continues to evolve, exposing new frontiers for innovation and research.

Current Dynamics in IoT Innovation

Relative to IoT's beginning association with RFID tags, affordable wide-area connectivity exploded the addressable market opportunity. Lessons from early deployments and an active supply-side industry have combined to make IoT a mature and generally accepted technology.

Nowadays, the collection of IoT data from connected devices and sensors is almost taken for granted. Reliable access to time-series data provides the foundation for many innovative applications. Real-time location tracking has transformed trip planning allowing the traveling public to manage their time more effectively. Multi-modal journey planning highlights the value of several organizations cooperating across organizational and operational boundaries. This is the basis of promising *new service concepts and business models around IoT data licensing and monetization.*

The IoT sector is also affected by innovation in neighboring sectors. Advances in machine learning and artificial intelligence amplify the power of IoT data by increasing the scope of application opportunities.

IoT Research Roadmap Implications

To capitalize on these opportunities, IoT practitioners must evolve the technology roadmap beyond connectivity. In so doing, IoT's integrative role quickly becomes evident. At the connectivity level, innovation takes the form of interoperability and interworking techniques. These make it possible for designers to build multi-vendor IoT systems and to support the *interoperable exchange of information across disparate systems.*

Simulation of complex systems and immersive experiences are two other developments that depend inextricably on IoT systems and data. Simulation builds on digital twin techniques such as the resource tree and entity-relationship models of IoT systems. Immersive experiences allow maintenance teams to practice repairs in safety. They can also superimpose augmented reality instructions on machines under repair. Both sets of innovations depend on research and technical standardization for interoperability and market scale.

oneM2M Research and Innovation Initiatives

oneM2M's international footprint means that several academic and applied research communities are actively involved in furthering the IoT technology roadmap. In Europe, ETSI's Specialist Task Forces continue to address *cross-domain usability of IoT devices.* Elsewhere, researchers are tackling *semantic interoperability for sharing IoT data* and *energy consumption patterns to enhance sustainable IoT.* In India, the International Institute of Information Technology (Hyderabad) is one of several bodies researching oneM2M's use for *smart city and data sharing systems.*

Taking a longer-term perspective, S. Korea's Hansung University and Sejong University recently launched a new work item on *"Enablement of IoT in the metaverse"* to study the use of oneM2M.

■ *Ken Figueredo, oneM2M MARCOMs Advisor.*

Commission Plans to Adopt Code of Practice on Standardization

for Researchers to Create Bigger Impact

Standards are a vital part of innovation and help bridge the gap between research and global market impact by building customer trust in new solutions.

The benefits of standards

Standards and standardization have been increasingly recognized as an important channel for the successful transfer, commercialization and valorization of research results. They are hence a vital part of innovation. Standards ensure compatibility and interoperability between different products, or minimum quality, performance and safety levels. They are also important in creating economies of scale and increasing efficiency in supply chains. There are many benefits of engaging in standards development for new and emerging technologies. Standards help bridge the innovation

gap between research and global market impact by building customer trust in new innovative solutions – such that early standards development enables faster mass-market adoption of new technologies, products and services. Standards have the power to strengthen the economic, social and environmental value and impact of R&I projects.

Research and SDOs working together

Research and innovation and formal standardization processes are different in nature and can be challenging to synchronize. Standardization within a research project typically requires wider stakeholder management. Researchers, Standard Development Organizations and the technical committees developing standards therefore have to work closely together.

The Code of Practice on standardization for researchers aims to contribute to the successful synchronization and systematic integration of R&I and standardization. It will guide researchers and innovators by, for example, identifying elements of good practice. It will guide R&I activities without any technology boundaries and a proof for its inclusive approach is that it will target projects within a wide range of technology readiness levels from terminologies and

concepts to testing, interoperability and performance. The new instrument, foreseen in the first quarter of 2023, will support the implementation of the Council Recommendation on the guiding principles for knowledge valorization adopted by Member States in December 2022. The new valorization guidelines will bring a much-needed comprehensive approach into this dynamic ecosystem.

The Code of Practice's three sections

The Code of Practice will be hands-on guidance that will provide a set of recommendations grouped under three sections. The first helps higher education institutions and research and innovation organizations to build relevant capacities. The second targets beneficiaries of EU, national and local R&I programmes and offers best practices. Finally, in the third section recommendations are formulated at policy level including European, national and local authorities and standards development organizations. The recommendations will help everyone to use standardization as an effective tool to harness results from R&I projects.

■ *Gergely TARDOS, Policy Officer, DG Research & Innovation*

Disclaimer: The information and views set out in this article are those of the author and do not necessarily reflect the official opinion of the European Commission.

White Paper:
MEC security

The White Paper revises and updates the status from standards and industry groups on "MEC security; Status of standards support and future evolutions".

It includes a brief description of some selected MEC security aspects not previously contained in the first Edition, e.g. MEC Security requirements from GSMA OPG (requirements on security for MEC federation based on the PRD V2.0 published in April 2022), Infrastructure security and physical protection, Data protection, User security and Data security, Network Security Layer and Application Security Layer.

It is required by MEC stakeholders to meet customer demands and is a step forward for the alignment of the edge ecosystem and to further encourage the adoption of MEC technologies.

This MEC Security White Paper is a must-read for all ecosystem stakeholders.

ETSI White Paper No. #46

**MEC security;
Status of standards support
and future evolutions**

2nd edition – September 2022
ISBN No. 979109262041

Authors:
Dario Sabella, Alex Reznik, Kamal Ranjan Nayak, Diego Lopez, Fei Li, Ulrich Kleber, Alex Leadbeater, Kishen Maloor, Sheeba Backia Mary Baskaran, Luca Cominardi, Cristina Costa, Fabrizio Granelli, Vangelis Gazis, Francois Ennesser, Xi Gu, Faraz Naim, Dan Druta

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White Paper:
F5G Advanced and Beyond

One of the overarching goals of the ETSI Industry Specification Group (ISG) F5G on Fifth Generation Fixed Network is to establish a regular rhythm of evolution for the fixed telecommunications network.

This new white paper describes the drivers, dimensions, and technologies of the F5G advanced and beyond. It encourages debate on F5G advanced and future networks with the ideas feeding the F5G work programme and resulting in new specifications to further enhance F5G networks. The document considers the development of "F5G Advanced and Beyond", identifying nine key applications or industry trends considered as key drivers for F5G Advanced, but also scenarios, use cases and the various new technologies that will be necessary.

The White Paper considers all the factors and helps build consensus on the technical content and direction of the new phase.

ETSI White Paper No. #50

**Fixed 5ᵗʰ Generation
Advanced and Beyond**

1st edition – September 2022
ISBN No. 979108262071

Author:
Dr. F.J. Effenberger, Futurewei (rapporteur) with contributions from Beijing University of Post and Telecommunication (BUPT), Bouygues Telecom, CAICT, China Telecom, China Unicom, CICT, CTTC, Global Telecom, Frauenhofer HHI, Huawei, MTN, OI, Orange, POST Luxembourg, TIM, TNO, Turk Telecom, University of Patras

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New 3GPP video

Discover the new 3GPP introductory video, featuring some prominent delegates and some general scenes captured during the summer meeting of the RAN1 working group.

The video is on the 3GPP website and the Vimeo site and will also be made available to the various 3GPP partners, to be used as an introduction to the project and our role in 5G technologies.

In Toulouse in August 2022, several RAN1 delegates kindly took the time to record their part, speaking on camera about 'Why 3GPP is important to me'. The video also demonstrates the broadening of 3GPP's areas of work to include the new verticals as well as the traditional mobile operators, manufacturers and service providers. The clips used are intended to demonstrate the diversity of the people and companies engaged in the 3GPP specifications work.

New GA Officials

Bettina Funk
ETSI GA Chair

Bettina joined the German Federal Network Agency in 2007, where she worked in the standardization unit. She represented Germany as a radio expert in CEPT, ITU-R and ETSI before moving to Sweden in 2015 to join PTS, becoming Chair of the Committee on Radio Protection. She represented Sweden in ETSI, 3GPP and the IEC. In 2018 she joined the Swedish National Committee in IEC and became director general for ITS, the Swedish National Standardization Organization in ETSI. She is currently the Swedish member of the IEC group responsible for the management of the International Standards work in IEC. She has been a member of the ETSI Board since 2020.

> **"As GA Chair, I see my role as a kind of mediator."**

How can ETSI and its membership benefit from the new standardization strategy?

It is very positive that the European Commission acknowledges the importance of standardization with their new standardization strategy. I hope that this recognition will have a positive effect for our experts that sometimes have difficulties to defend their time and efforts in ETSI to their management, since their engagement cannot directly be translated into monetary benefits for the organization. I also think that it is positive that ETSI is called to investigate its processes and to engage more with its national outposts, since improvements and reach-out are always beneficial to the whole membership.

In the context of the new standardization strategy, can ETSI keep its major role as a renown global standards body?

That is entirely up to the ETSI membership, ETSI's leadership and the European Commission. Members need to adapt to a changing environment; the leadership needs to communicate the benefits of having ETSI both as a strong ESO and a producer of globally relevant standards. It also depends on the European Commission's willingness to discuss suggested changes to the ETSI Directives to see if these solve the perceived issues and to finally agree them together with the ETSI Membership.

How do you see your role as GA Chair?

As GA Chair, I see my role as a kind of mediator. I want to facilitate necessary changes without losing the ETSI spirit.

Magnus Madfors
GA Vice-Chair.

Magnus Madfors is the Head of Standardization and Industry for Europe at Ericsson.

He has more than 30 years of experience in industry-driven pre-competitive research and standardization. Magnus leads the ETSI Board's work on strategy and is a member of the ETSI Finance Committee.

Massimo Vanetti
GA Vice-Chair.

Massimo, elected for a second term, is a Senior consultant for digital transformation. Active in Industry 4.0 projects where interoperability and adoption of standards are paramount, he has been a shareholder of three ICT SMEs. He serves as chairman of the DIGITAL SME WG on Standards. He is a member of joint scientific/technical committees, of oneM2M, appointed by SBS and of the ETSI task force STF547.

ETSI Fellowship Ceremony

The Fellowship Award Ceremony 2022 was hosted on 29 November 2022 at the prestigious Hotel Negresco, on Nice's famous Baie des Anges, during the dinner of the 80th General Assembly. The awards celebration honoured the ETSI Fellows of 2022 but also the Fellows of 2020 and 2021 who had not been awarded in person due to the health situation for the past three years. The ETSI community was proud and delighted to be able to honour its Fellows for their outstanding personal contributions in such an exceptional environment

ETSI Fellows 2022: Dr. Diego Lopez, Dr. Günter Kleindl, Larry Taylor and Lindsay Cornell

ETSI Fellows 2021: Anthony Wiles, Dr. Gabrielle Owen, Charles Brookson, Nurit Sprecher, Dr. Hans Wilhelm Gierlich and Dr. Jamshid Khun-Jush

ETSI Fellows 2020: Edgard Vangeel, Kirit Lathia, Brian Copsey, Ian Doig (deceased)

Welcome to our new staff members

Maria Choque
Finance Administrator.

Maria is from Córdoba in Argentina. She has a bachelor's degree in accountancy and a master's degree in finance.

In 2014, Maria moved from South America to Europe. She first spent a year in Dublin in Ireland, where she worked as an accountant for Meridian Global Services and The Royal College of Surgeons before heading to France.

From 2015 to 2018, she was both an accountant and an operational manager for a luxury yacht charter company in Monaco. In parallel, Maria completed her education with a Master's in Business Administration at the IAE school in Nice. Prior to joining ETSI, Maria was an accountant in a company selling diving equipment in Sophia Antipolis.

Antoine Burckard
Technical Officer.

Antoine is originally from the Paris region. He has an engineer's degree in Automation, Electronics and Technical software from Telecom Physique in Strasbourg, later completed by an Advanced Master in Strategy and Management of International Business (SMIB) at ESSEC Paris. Antoine started his career as a software engineer in different software services companies. In the 2000s, he held different technical positions, including Standards officer, first at CANAL+ Technologies, the digital TV solutions provider, then at NAGRA, the world leader in security solutions for digital TV. Prior to working in ETSI, Antoine was a System Architect at Thales.

Bruno Camolez
Graphic Design and Web Professional.

Bruno was born and raised in Rio de Janeiro, Brazil.

He has worked for many years as an art and creative director for renowned advertising agencies in different countries, such as Publicis, Leo Burnett, JWT and TBWA. He moved from Lausanne (CH) to Nice (FR) in 2013.

Bruno then pursued his career as a graphic designer for various companies while being a self-employed professional photographer specialized in culinary photography.

Prior to joining ETSI, Bruno was also a lead designer for a high-tech start-up in Monaco.

Join us at upcoming events
organized or supported by ETSI.

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

Meet ETSI at Mobile World Congress 2023!

#ETSIMagic
Come and join us for some 'ETSI Magic' in Barcelona.

Mobile World Congress 2023 sees the return of the well-established and highly anticipated ETSI Networking Cocktail, taking place on Tuesday, 28 February 2023 from 7pm.

In a new, bigger venue, offering the same convenient journey from the Fira as the previous one, guests may look forward to mingling with ETSI and 3GPP representatives, partners and peers, enjoying Spanish tapas, listening to good music and experiencing some special ETSI magic on that night.

Invitations are being sent out in January. Should you wish to attend, feel free to reach out proactively to secure your place: *ETSI_Magic@etsi.org*

January 2023

5th NG112 Emergency Communications Plugtests™,
23 January-3 February 2023, online.

The event is organized in cooperation with the European Emergency Number Association (EENA) and with the support of ETSI TC EMTEL. The concept of "Next Generation 112" (NG112) has been identified as a potential answer to the increasing requirements and demands of content-rich emergency calling. This Plugtests event will consist of remote lab testing based on the use cases developed by ETSI and EENA.

February 2023

Cybersecurity Standardization Conference 2023,
7 February, Renaissance Brussels Hotel and Online.

The European Standardization Organizations CEN, CENELEC and ETSI, are pleased to join forces with ENISA, the EU Agency for Cybersecurity, to organize this event. The 2023 programme will have dedicated sessions on standardization activities in the areas related to the emerging EU legislation.

9th ETSI/IQC Quantum Safe Cryptography workshop,
13-15 February, ETSI, Sophia Antipolis.

As we increasingly rely on cyber technologies, we are ever more vulnerable to cyber-attacks.
As standards emerge, solutions become commercially available, best-practices are developed and shared. This event brings together diverse participants in the quantum-safe cybersecurity community to facilitate the knowledge exchange and collaboration required to transition cyber.

4th mWT Plugtests™,
20-24 February, ETSI, Sophia Antipolis.

This edition of the mWT (millimetre Wave Transmission) SDN (Software Defined Network) Plugtests™ will focus on proving the ability of Software Defined Network (SDN) to operate from an end to end service point of view. Building upon the previous editions which focused on a standard Northbound Interface (NBI), this event will now look at the Southbound Interface (SBI). It will consist of lab tests conducted in ETSI premises.

March 2023

10th Anniversary of ETSI NFV,
6-7 March, ETSI, Sophia Antipolis.

Founded in November 2012 by seven of the world's leading telecoms network operators, ETSI ISG NFV has established itself as the home of Network Functions Virtualization. We are pleased to announce an exclusive, face-to-face, free of charge conference to celebrate ETSI NFV 10th Anniversary and exchange on the evolution of NFV towards the next decade.

ETSI Summit: sustainable ICT,
30 March, ETSI, Sophia Antipolis.

This face-to- face event will provide an opportunity for the ICT community to discuss the status of various sustainability topics relating to both the communications domain, and those domains where digitization may help reduce CO_2 emissions and improve efficiency. The presentations and discussions will touch upon technologies enabling energy efficiency, CO_2 reduction, circular economies, eco-design and other related topics. By attending the event participants will better understand the work done in ETSI in support of sustainability.

ETSI SNAPSHOT

895 members

27% SMEs

+130 technical groups

527 standards
Sept.-Nov. 2022

711 standards under development

4.1 M standards' downloads
Sept.-Nov. 2022

629 Meetings
Sept.-Nov. 2022

4583 Unique participants
Sept.-Nov. 2022

111 partnerships

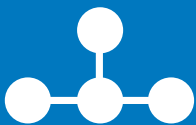Members from **63** countries

20 conferences & Plugtests
Sept.-Nov. 2022

@ETSI Secretariat
127 people
16 nationalities

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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 about 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).

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

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