IEEE and Wi-Fi Alliance: Synergy Driving Wi-Fi Success

By Edgar Figueroa, President & CEO, Wi-Fi Alliance

Wi-Fi® is among the greatest success stories of the high-tech era. For more than 20 years [1] our industry, guided by standards created by IEEE, brought Wi-Fi to the world. IEEE members, Wi-Fi Alliance® [2] members, and Wi-Fi users are participants in a virtuous cycle that steadily solidified Wi-Fi in daily life. This cycle inspires the creation of new businesses, products, and applications that change how we live. It is hard to overstate the success Wi-Fi enjoys.

The IEEE role in this cycle is clear: IEEE members, which include the world's most brilliant inventors and technologists, develop core standards for Wi-Fi. Wi-Fi users play the important role in the cycle of voicing preferences through their purchases, amounting to more than 33 billion total products shipped, and 3.8 billion shipments in 2020 alone [3]. So, what is Wi-Fi Alliance's role in this virtuous Wi-Fi cycle?

Wi-Fi Alliance sits between the IEEE world and end users' real-life experience with Wi-Fi. Comprised of companies spanning a rich, global Wi-Fi ecosystem, Wi-Fi Alliance provides a forum for stakeholders with commercial Wi-Fi interests to discuss and determine use cases, market requirements, and standards-based solutions for those requirements. Wi-Fi Alliance also creates testing for broad interoperability. Such interoperability work has been ongoing since IEEE 802.11b [4]. The Wi-Fi name, the benefits of cross-vendor interoperability, and the Wi-Fi CERTIFIED™ [5] product designation and logo contribute to the mass market adoption and affordability that differentiate Wi-Fi from other technologies.

Over time, Wi-Fi Alliance has evolved along with the industry. While continuing to deliver interoperability certification, Wi-Fi Alliance also addresses possible obstacles to market growth. For example, Wi-Fi Alliance and IEEE 802.11 first addressed Wi-Fi security in the early 2000s, and that work continues through today with WPA3™ [6]. In addition to promoting global Wi-Fi adoption, Wi-Fi Alliance is heavily involved in advocating for spectrum access and harmonization [7], ensuring Wi-Fi and cellular radios coexist within products, addressing fairness in 5 GHz, and helping governments recognize the economic value that Wi-Fi delivers [8].

Wi-Fi Alliance and IEEE have a synergistic relationship. Lessons, questions, and feedback are shared between common Wi-Fi Alliance and IEEE 802.11 delegates, which ensures industry alignment. Our relationship underpins the virtuous Wi-Fi cycle, which bodes well for our shared, connected future with Wi-Fi.

References

[1] https://www.wi-fi.org/discover-wi-fi/20-years-of-wi-fi
[2] https://www.wi-fi.org/
[3] IDC, September 2020
[4] https://www.wi-fi.org/news-events/newsroom/wireless-ethernet-compatibility-alliance-weca-awards-first-wi-fi, April 17, 2000
[5] https://www.wi-fi.org/certification
[6] https://www.wi-fi.org/discover-wi-fi/security
[7] https://www.wi-fi.org/discover-wi-fi/unlicensed-spectrum
[8] https://www.wi-fi.org/value-of-wi-fi

IEEE P802.11be: Extremely High Throughput and Low Latency Wireless LANs

Alfred Asterjadhi (Qualcomm Technologies, Inc.), IEEE 802.11be Task Group Chair

Use of wireless LANs (WLANs) continues to grow for important data services in many environments, such as the home, enterprise and public-venue hotspots. Video traffic needs on these networks have expanded due to the emergence of 4k and 8k video formats (e.g., uncompressed rates of 20 Gbps). In addition, new applications, such as virtual reality, augmented reality, wireless gaming, remote office, and cloud computing require high throughputs simultaneously with low latency. For example, successful gaming requires less than 5 ms wireless latency, which is a challenge given current WLAN networks. Finally, it is expected that future users of WLAN will expect improved integration with Time Sensitive Networks (TSN) to support applications over heterogeneous networks comprised of both Ethernet and wireless LANs.

To tackle these challenges, the IEEE 802.11 Working Group has created a new Task Group (TG) that is working on a major standard amendment, namely IEEE 802.11be. This TG is developing and standardizing protocols which will improve aggregate network throughput and latency. The focus of IEEE 802.11be is on WLAN indoor and outdoor operation with stationary and pedestrian speeds in the 2.4, 5 and 6 GHz frequency bands.

The amendment is defining modifications to both the IEEE Std 802.11 Physical Layers (PHY) and the Medium Access Control Layer (MAC) that enable at least one mode of operation capable of supporting a maximum throughput of at least 30 Gbps and at least one mode of operation capable of improved worst-case latency and jitter.

The TG is discussing technical contributions on a wide range of topics and has adopted a release-based (Release 1 and Release 2) inclusion of features in the specification draft.

Candidate features that are expected to be part of Release 1 include (not exhaustive):

- 320 MHz bandwidth and more efficient utilization of non-contiguous spectrum
- 4086-Quadrature Amplitude Modulation (4K-QAM)
- Multi-link aggregation and operation
- Priority access for National Security (NS)/Emergency Preparedness (EP) services
- Adaptation to regulatory rules specific to the 6 GHz band (if needed)

Candidate features that are expected to be part of Release 2 include (not exhaustive):

- Multi-Access Point (AP) coordination
- Enhanced link adaptation and retransmission protocol
- 16 spatial streams and MIMO protocols enhancements

Because of the COVID-19 pandemic, the TG is currently conducting its business via teleconferences. The TG delivered IEEE802.11be D0.1 in September 2020 and the current TG schedule projects that the IEEE 802.11be Draft 1.0 specification will be produced by May 2021 with a RevCom approval of May 2024. Stakeholders that are interested in learning more, or who are interested in contributing, can obtain more information by visiting the IEEE P802.11be TG home page at:
http://www.ieee802.org/11/Reports/tgbe_update.htm

Overview of IEEE P802.11bf for WLAN Sensing

Tony Xiao Han (Huawei Technologies Co., Ltd.), Chair of IEEE 802.11bf Task Group

The IEEE project P802.11bf, established in September 2020, is developing an amendment to the IEEE 802.11 standard to enable sensing for IEEE 802.11 networks. It has been attracting broad participation from academic groups, research labs, and industry.

Definition: WLAN (wireless local area network) sensing is the use of received WLAN signals to detect feature(s) of an intended target(s) in a given environment. There are three keywords in the definition, namely features, targets, and environment. Features include range, velocity, angular, motion, presence or proximity, gesture, etc. Targets include object, human, animal, etc. Environment includes room, house, vehicles, enterprise, etc.

Use cases: The typical use cases and applications include: home security (e.g., use WLAN signal changes to detect an intruder); energy management (e.g., use WLAN signal changes to control HVAC, light, etc., in order to save power); home elderly care and assisted living (e.g., fall detection); gesture recognition; vital signs monitoring (e.g., breathing rate, heart rate); facial and liveness recognition; and sneeze detection and recognition (e.g., detect and recognize when and where the sneeze happened in a public place, which is useful information related to COVID-19).

Goals (derived from Project Authorization Request (PAR)): Task Group bf is expected to develop an amendment that defines modifications to the IEEE 802.11 medium access control layer (MAC) and to the Directional Multi Gigabit (DMG) and enhanced DMG (EDMG) PHYs to enhance Wireless Local Area Network (WLAN) sensing (SENS) operation in license-exempt frequency bands between 1 GHz and 7.125 GHz and above 45 GHz. The amendment enables stations to inform other stations of their WLAN sensing capabilities; request and setup transmissions that enable WLAN sensing measurements to be performed; and exchange of WLAN sensing feedback and information.

For more details, please see the P802.11bf project page at: https://www.ieee802.org/11/Reports/tgbf_update.htm

Moving Forward in V2X Standards

Jim Lansford (Qualcomm Technologies, Inc.) Chair, IEEE 802.11 Wireless Next Generation Standing Committee and Editor, SAE J3161/1

Standards for Vehicle to Everything (V2X) communications are developed across numerous organizations, which address different aspects of the ISO OSI model. This report summarizes recent activities in several relevant standards groups.

The IEEE 1609 (Wireless Access in Vehicular Environments -WAVE) family of standards define middle layers of the OSI model for V2X communications. The subgroups of note that have been active recently are:

- IEEE 1609.2 (Security Services for Applications and Management Messages) – Revision is underway and being coordinated with ETSI. The changes are intended to make this standard, which is the baseline global standard for V2X security, more stable, flexible, and future-proof. The group's schedule calls for the standard to be technically stable by the end of 2021.
- IEEE 1609.2.1 (Certificate Management for End Entities) – This has completed all parts of IEEE approval and is in the publication process. Target date for publication is the end of 2020.
- IEEE 1609.3 (Network Services) – The recent update to 1609.3 has completed Standards Association ballot and has been submitted to IEEE RevCom for consideration in its December meeting.
- IEEE 1609.13 (Reliable Data Transport Mechanisms for Multiple Receivers) – This document has reached D2 and includes a set of user needs. Target date for a technically stable draft is June 2021.

The SAE Cellular-V2X Technical Committee is developing standards and recommended practices for use of C-V2X (also known as LTE-V2X). Current activities are:

- J3161/1 (On-Board System Requirements for LTE-V2X V2V Safety Communications) – The standard has passed the TC approval threshold and will go to the Motor Vehicle Council for final approval late this year.
- J3161/0 (C-V2X Deployment Profiles) - This standard, which focuses mostly on I2V/V2I, passed its initial ballot on November 9 and will proceed toward comment resolution and final approval.
- J3161/1A (Vehicle-Level Validation Test Procedures for LTE-V2X V2V Safety Communications) – This recommended practice has been posted to the members for review and initial ballot as of this writing.

IEEE 802.11bd (Next Generation V2X): This Task Group is developing a new PHY/MAC for V2X that is an evolution to the original IEEE 802.11p, which comprises the lower layers of Dedicated Short Range Communication (DSRC). As of this writing, the D1.0 version of the standard is out for initial Working Group Letter Ballot.

3GPP standards (Cellular-V2X): 3GPP standardized V2X in Release 14 based on LTE Device to Device communication as standardized in Release 12. The standard supported broadcast communication for basic safety services. The standard was expanded in Release 15 to reduce latency, and improve reliability and data rate. 5G NR based V2X was introduced in Release 16 of 3GPP. This standardized broadcast, distance based connectionless multicast, connection-oriented multicast and unicast for advanced V2X services such as sensor sharing. Currently Release 17 is enhancing 5G NR V2X to improve the reliability and lower power consumption.

3GPP RAN2 - Embarking on the 3rd Release of 5G NR Specifications

Richard Burbidge (Intel), 3GPP RAN2 Chairman 2015 to 2019

Within 3GPP, RAN Working Group 2 (RAN2) is responsible for specifying the radio interface architecture and protocols for 4G LTE and 5G NR. More specifically, the key protocols under its responsibility are MAC, RLC, PDCP, SDAP, RRC and LPP. The first version (Release 15) of the 5G NR specification was completed in 2018 and this is now being deployed by cellular operators around the globe. More recently, during 2020, RAN2 completed its work on the next version of 5G NR (Release 16) and it is now embarking on Release 17.

The impact of coronavirus and the necessity to move its work from face to face meetings to electronic meetings has clearly had an impact into the work of 3GPP. While not yet as efficient as face to face meetings, RAN2 has quickly adapted to remote working methods and further improvement over time can be expected. There was relatively little impact to the completion of Release 16, and indeed RAN2's milestone to freeze the RRC ASN.1 was achieved in June 2020 as per the original schedule. However, RAN2's start of Release-17 was delayed and a corresponding delay to the completion date can be expected, with the target completion date due to be agreed in the RAN plenary meeting to be held in December 2020.

The makeup of the Release 17 RAN work items includes a balance of items that are aimed at expanding the market reach of 3GPP's technology, as well as delivering enhancements to mobile broadband and to the verticals for which support was greatly expanded in Release 16. Of the items that aim to expand the market reach, those of particular relevance to RAN2 include introducing support for Non Terrestrial Networks (i.e., 5G NR for satellite communication), support for 5G Broadcast and Multicast services, support for Reduced Capability (RedCap) devices to more optimally address uses cases such as industrial sensors and wearables, and expanding NR Sidelink (direct device to device communication), which originally targeted 5G V2X, to address other uses cases such as public safety as well as to study how to introduce Sidelink relaying support. Other work items containing a significant RAN2 scope will provide enhancements to Industrial IoT functionality, NR positioning, dual connectivity and carrier aggregation operation, private network support and network slicing, optimize support for small data transmission from the inactive state, and introduce support for multi-SIM devices.

ETSI and its Role in the Path to the European Market

Dr. Guido R. Hiertz (Ericsson GmbH), ETSI TC BRAN Chair

The success of IEEE 802.11 (Wi-Fi) is closely related to its focus on license-exempt spectrum. License-exempt spectrum allows users to deploy wireless networks without the need to explicitly apply for permission. However, the use of license-exempt spectrum is subject to several rules. These rules are subject to international treaties as well as region-specific and country-specific regulations. In Europe, Harmonized Standards (HSs) set the rules for the 2.4 GHz, 5 GHz, and soon the 6 GHz that Wi-Fi mainly operates or will be operating in. The related HSs are EN 300 328, EN 301 893, and EN 303 687. These HSs are of special importance because, unlike in the US, the European Union does not require type approval. Regarding HSs, the European Commission (EC) explains: "Manufacturers, other economic operators, or conformity assessment bodies can use harmonized standards to demonstrate that products, services, or processes comply with relevant EU legislation." [1] Alternatively to a self-assessment, vendors may approach a notified body to evaluate a product on their behalf. Based on their technical expertise and guided by HSs, these test labs assess a product to determine whether it may be put on the European market.

Tasked by the EC, HSs are developed by recognized European Standards Organizations. Among them are the European Committee for Standardization (CEN), European Committee for Electrotechnical Standardization (CENELEC), and the European Telecommunications Standards Institute (ETSI). As the name indicates, ETSI is responsible for telecommunication standards with Global System for Mobile Communications (GSM), the Universal Mobile Telecommunications System (UMTS), and the Digital Enhanced Cordless Telecommunications (DECT) being well known examples. Besides these technical standards, ETSI also develops HSs that specify general principles for the use of license-exempt spectrum. At ETSI, Task Group (TG) 11 of the EMC (Electromagnetic Compatibility) and Radio Spectrum Matters (ERM) Technical Committee (TC) is responsible for EN 300 328 and ETSI TC Broadband Radio Access Networks (BRAN) is responsible for EN 301 893 and EN 303 687.

Since EN 300 328 targets the 2.4 GHz ISM (Industrial, Scientific and Medical) band, this HS defines rules applicable for a wide variety of technical concepts. Low power and high power, fast and slow data rate technologies (Wi-Fi, Bluetooth, Zigbee etc.) are in scope. In contrast, HSs EN 301 893 (5 GHz) and EN 303 687 (6 GHz) focus on high speed Radio Local Area Network (RLAN) technologies with Wi-Fi being the prime example.

References

[1] European Commission, "Harmonised Standards," [online]. Available: https://ec.europa.eu/growth/single-market/european-standards/harmonised-standards_en

A Glance at ETSI MEC (Multi-access Edge Computing)

Dario Sabella (Intel), Vice-chair ETSI ISG MEC, Miltiadis Filippou (Intel), Rapporteur of MEC 017 & MEC 030 WIs

Multi-access Edge Computing (MEC) offers application developers and content providers cloud-computing capabilities and an IT service environment at the edge of the network. ETSI Industry Specification Group (ISG) MEC is the leading international group in the area of edge computing standardization. Currently, the group is about to complete its second three-year phase, having published its MEC reference architecture and a complete set of specifications on: (i) Infrastructure-as-a-Service (IaaS) Management Application Programming Interfaces (APIs) focusing on Platform and Application management, device-triggered Lifecycle Management (LCM) operations; (ii) Platform-as-a-Service (PaaS) Service Exposure APIs, i.e., an Application Enablement Framework, and a number of Service APIs. After a study on the MEC deployment in Network Function Virtualization (NVF) environments (MEC 017) and on Container Support (MEC 027), ETSI ISG MEC worked on the MEC integration in 5G networks (MEC 031), and recently published, jointly with 3GPP officials, a white paper [1] entitled: "Harmonizing standards for edge computing: A synergized architecture leveraging ETSI ISG MEC and 3GPP specifications". MEC does not only focus on 5G networks, as it supports "Multi-access" deployments, like Wi-Fi (MEC 028) and Fixed Access (MEC 029). Moreover, MEC is addressing key Industry Segments, like automotive (through MEC 030, on V2X service API), IoT (MEC 033), Industrial Automation, VR/AR, along with key use-cases and new requirements related to Network Slicing (MEC 024). In particular, the group collaborates with the MEC4AUTO WI of the 5G Automotive Association (5GAA), since MEC is a key technology for V2X services, especially in multiple Mobile Network Operator (multi-MNO), multiple Original Equipment Manufacturer (multi-OEM) and multi-vendor environments. In this perspective, the group is currently studying inter-MEC systems and MEC-Cloud systems coordination (MEC 035) also in alignment with requirements coming from the GSMA Operator Platform Group (OPG).

The long list of published MEC service APIs is also accompanied by OpenAPI representations, published in the ETSI Forge site (https://forge.etsi.org), to help application developers using the functionalities introduced by MEC standards. The group is also continuously working on Testing and Compliance (MEC 025, MEC 032) and developing a "MEC Ecosystem" web-portal with a set of useful resources for developers (e.g., MEC Sandbox). Additionally, ETSI ISG MEC, with the WG DECODE, is continuously committed to supporting edge deployments and developer community engagement activities by promoting Proof-of-concepts, MEC Deployment Trials (MDT) and MEC Hackathons. As a recent example, the Droidcon MEC Hackathon 2020 (https://it.droidcon.com/2020/hackathon/) is organized as a fully virtual event, to allow online participation to the MEC Hackathon including remote edge server access to developers, especially to those facing COVID-19-related travel restrictions.

For the upcoming phase 3 (starting in 2021), the group plans to work on MEC enterprise deployment scenarios (MEC 038) along with MEC infrastructure deployed in the form of heterogeneous clouds, expanding traditional cloud and NFV LCM approaches and involving mobile or intermittently connected components and consumer-owned cloud resources (MEC 036). An important focus will be on Inter-MEC systems and MEC-Cloud systems coordination (MEC 035), also in the collaboration with 5GAA and GSMA, and on standardizing service enablers meeting industry requirements. The group will continue working toward application developer community engagement through API serialization (also by maintaining the completed APIs), Sandbox development, testing and compliance activities.

References

[1] https://www.etsi.org/images/files/ETSIWhitePapers/ETSI_wp36_Harmonizing-standards-for-edge-computing.pdf

The IETF Reliable and Available Wireless (RAW) Working Group

Eve M. Schooler (Intel) and Rick Taylor (Airbus), Co-chairs of the IETF RAW Working Group

With the increasing maturity of Time Sensitive Networking (TSN) in Ethernet networks, there is growing interest in supporting TSN-like capabilities in other Layer 2 technologies and to

coordinate their seamless interoperation at Layer 3. To address this, the Internet Engineering Task Force (IETF) hosts a couple of working groups focused on these challenges in IP networks: the Deterministic Networking (DetNet) working group, chartered to enable deterministic data paths operating over Layer 2 bridged and Layer 3 routed network segments; and its new companion, the Reliable and Available Wireless (RAW) working group.

Whereas the DetNet working group has concentrated on support for Layer 3 determinism across wired networks, the RAW working group focuses on identifying areas where those capabilities may require additional mechanisms to operate effectively across networks featuring wireless segments. The combined vision is to enable end-to-end deterministic IP networking within a single administrative domain of control, across heterogeneous Layer 2 technologies, be they wired or wireless. To ensure a common architecture for both Layer 2 and Layer 3, both IETF working groups actively collaborate with the IEEE 802.1 TSN Task Group, which is responsible for TSN operation in Layer 2.

Chartered at the start of 2020, the RAW working group is looking to address the significant challenges faced by wireless media to achieve high reliability and availability, i.e., low packet error rate, bounded consecutive losses, packet delay variation (jitter), and bounded latency. An analysis is underway of several wireless technologies that offer improved determinism through scheduled wireless, including: IEEE 802.11ax/be (Wi-Fi), IEEE 802.15.4 time slotted channel hopping (TSCH), 3GPP 5G ultra-reliable low latency communications (URLLC), and L-band Digital Aeronautical Communications System (LDACS). At the same time, RAW is studying Layer 3 aspects needed by use cases requiring deterministic networks, with an emphasis on those at the wireless network edge. Examples include professional and home audio/video, gaming, multimedia in transportation, engine control systems, edge robotics, aeronautical data communications systems, and other industrial and vehicular applications being considered by IEEE 802.1 TSN. By combining this analysis with an audit of the Layer 3 mechanisms already defined by the IETF, the goal of the working group is to "plug the gaps" by standardizing new protocols, as well as clarifying deployment plans and operating practices.

The RAW timeline over the next 12 months includes the publication of several informational documents to supplement recently published foundational DetNet RFCs: RAW Use cases and their requirements, assessment of scheduled-wireless Technologies capabilities, RAW Architecture/Framework considerations, and an Evaluation of Existing IETF Technologies and Gap Analysis. The RAW working group welcomes partnership with other standards bodies and in fact, to get the layering right, solicits collaboration with experts in Layer 2 technologies.

One Global Wi-Fi Network with OpenRoaming™

Tiago Rodrigues (Wireless Broadband Alliance), CEO

The Wireless Broadband Alliance (WBA) has a vision to drive a seamless, interoperable service experience via Wi-Fi within the global wireless ecosystem, and in 2020 we made a giant leap forward to achieve that with OpenRoaming (www.openroaming.org).

WBA was founded in 2003 and undertakes programs and activities to address business and technical issues, as well as business opportunities, for member companies. WBA work includes industry guidelines, standards development, trials, certification, and advocacy. Its key programs include NextGen Wi-Fi, 5G, IoT, Testing and Interoperability, Wi-Fi Roaming and Policy and Regulatory Affairs, with member-led Work Groups dedicated to enable interoperability, resolving standards and technical issues to promote end-to-end services and accelerate business opportunities. WBA's membership is comprised of more than 120 companies including major operators and leading technology companies. The Board of the Alliance consists of AT&T, Boingo Wireless, Broadcom, BT, Cisco Systems, Comcast, Deutsche Telekom, GlobalReach, Google, Intel Corporation, Korea Telecom and Reliance Jio.

In May 2020 we launched WBA OpenRoaming to provide a new global standards-led approach to roaming, removing public-guest Wi-Fi connectivity barriers and bringing greater convenience and security to the wireless ecosystem. The OpenRoaming Federation removes the need to search for Wi-Fi networks, to repeatedly enter or create login credentials, or to constantly reconnect or re-register to public Wi-Fi.

At the same time, WBA has been instrumental to their members to accelerate Wi-Fi 6 and Wi-Fi 6E adoption by developing a successful trials program that demonstrates the significant improvements in reliability, efficiency and performance even in challenging environments for wireless signals, like Manufacturing, Smart Cities or Education Campus. In addition, we have been interacting with regulators around the world to release the 6 GHz spectrum for use by unlicensed (Wi-Fi) technology.

All these recent developments on Wi-Fi (including OpenRoaming, Wi-Fi 6, Wi-Fi 6E, Mesh Wi-Fi) position Wi-Fi alongside 5G as the future of connectivity. WBA has been a strong advocate of a heterogeneous network approach where Wi-Fi alongside 5G NR plays a crucial role in delivering better connectivity to all. This is especially true in the current environment with Covid-19 that has changed our lives, the way we work, study, socialize and entertain, and Wi-Fi has been fundamental to keep the world connected today and tomorrow.

The FiRa Consortium: Making UWB Fine Ranging a Reality

Jianzhong Charlie Zhang (Samsung Research America), FiRa Consortium Board Chair

Launched in August 2019, the FiRa™ Consortium is dedicated to the development and widespread adoption of seamless user experiences using the secured fine ranging and positioning capabilities of interoperable Ultra-Wideband (UWB) technologies.

UWB has found new relevance in its present form as a secure fine ranging technology. UWB's unique combination of precision and protection is likely to become the basis for secure access and location services of all kinds. UWB shows promise for the evolution of secure transactions in mobile devices, by driving the convergence of hands-free access, location-based services, payments, identification, and device-to-device interactions.

Having quickly grown to 50+ members, all of whom are leaders in their respective fields, FiRa™ Consortium members have a shared vision on how UWB technology can enhance future connectivity to support new and better user experiences across a variety of mobility use cases.

As a member driven organization with a high degree of diversity, we approach the use of UWB from a variety of perspectives. The FiRa Working Groups are highly focused on creating technical specifications and developing a certification specification with an associated FiRa Certified™ program. The singular goal of this work is to ensure a widespread, interoperable ecosystem among chipsets, devices, and solutions.

Technically, FiRa develops profiles on top of the IEEE defined PHY and MAC lower protocol layers. The PHY 1.0 Requirements Specification identifies hardware and RF communication configurations based on IEEE 802.15.4z standards to ensure interoperability between FiRa Certified UWB-enabled devices, while the FiRa MAC 1.0 Technical Requirements prescribe UWB ranging

protocols and the associated behaviour of devices performing ranging.

As a technology, UWB is poised for its next stage of rapid growth. At present, UWB is the leading wireless technology commercially available that delivers highly accurate and highly precise location and fine ranging measurements, while also supporting high-level security to protect access credentials and data communications. The FiRa Consortium is committed to harnessing the power of UWB to deliver on the promise of exceptional user experiences for daily interactions in an increasingly mobile world.

Exploring the Emerging Requirements for AI and ML in IoT Systems

Ken Figueredo (Consultant for Chordant Inc.), oneM2M Contributing Member

Across the business and technology sectors, there is huge anticipation for Artificial Intelligence (AI) and Machine Learning (ML) solutions. Early uses in health data and self-driving vehicles demonstrate how easy it is to digest enormous quantities of data for diagnostic and decision-making purposes. At the same time, there is currently apprehension about the challenges AI and ML pose to black-box decision making that entrenches designer biases.

Architectural Issues Raised by AI/ML for IoT

The Internet of Things (IoT) vastly expands the scale of available data and will affect both the benefits and concerns of AI and ML. As a result, organizations that are interested in standardizing IoT systems through oneM2M's architectural framework are exploring the implications of AI and ML on IoT. This is taking place under the auspices of an ETSI Special Task Force (STF-584).

An initial use-case assessment highlights two architectural issues. One relates to the concept of AI 'as a service'. This is where a common feature detection or classification algorithm, for example, might be invoked by an IoT system, subject to being configured for application-specific conditions. From a standardization perspective, this arrangement would support an ever-growing library of AI and ML functions that developers could call 'as-a-service' from different IoT systems via a standardized Application Program Interface (API) model.

The other architectural implication of AI and ML for IoT relates to the design and deployment of systems. Dependability has many dimensions, including the capabilities to build trustworthy and explainable AI and ML systems. An example of enabling trustworthy AI and ML systems is to maintain a history of the security and software-update parameters for an IoT device. Any application could then check the device's credentials before relying on the data it supplies. In the case of explainable AI, a technician would want insights into the reasoning of an AI and ML system that predicts the failure of a component on a manufacturing line. That insight will determine whether to shut the line immediately or not. In large and multi-vendor IoT systems, the ability to query and automate a failure-mode analysis requires a standardized architectural framework and family of common query functions.

Proof of Concept Experiments

In addition to exploring the emerging requirements for AI and ML in IoT systems, current work in STF-584 involves three proof of concept implementations using open-source IoT platforms based on oneM2M standards. These deal with fault-management and isolation of IoT field devices, pattern detection in smart city video streams, and language-based pattern recognition in social media and crowdsourced data.

Setting the Standard for Digital Transformation with SMEs

Massimo Vanetti, Small Medium Enterprise (SME) Expert at oneM2M

Representing 99 percent of all businesses in the European Union (EU) and providing two thirds of the total private sector employment, SMEs are well placed to participate in delivering IoT systems and are the backbone of Europe's economy.

Alongside this, the global IoT market is forecasted to be worth $1.1 trillion in revenue by 2025, according to new data from GSMA Intelligence. If SME innovations and solutions are to become an integral part of a wider, interoperable IoT ecosystem, they will need to act now. As a result, standardization will be key to ensure digital success, and will make it much easier and cheaper for SMEs to partake in the new digital economy.

The Digital Agenda

Launched in 2007, the European DIGITAL SME Alliance received the support of the European Commission to put digital SMEs at the center of the EU agenda and to promote SME participation in standardization. Members of an Italian branch included a group of lift-service providers who service equipment from several different lift manufacturers, and these SMEs saw value in standardizing the collection of lift data. This led to a platform that brings together different manufacturers' data, as well as help them offer a better quality of service to building managers and tenants.

An open standard to record IoT data will provide investment confidence and enable providers to develop new services for lift equipment from different vendors. The combination of sensor data with historical records about check-ups and repairs, for example, will help improve the quality of servicing and optimize preventive repair schedules. An initial group of participants began their standardization journey through a Special Interest Group within ETSI.

With that in mind, oneM2M is the natural home for IoT standardization activities. The group consolidated its findings in a oneM2M Technical Report. This initiative is progressing through oneM2M as work item (WI-0098) on the topic of IoT for Smart Lifts. It will include information about use cases, requirements for smart lifts, and the inclusion of appropriate solutions in oneM2M.

A New Era of Innovation

SME lift service providers recognized the importance of innovation to evolve their business models and drive productivity. In oneM2M, they have a standardization environment that is open to contributions from small, medium, and large organizations alike. Here, a standards-based approach will help in creating a common vocabulary for lift assets, making it easier to share data across boundaries and capture new sources of value from cross-silo applications. This takes us one step closer to achieving a more streamlined ecosystem that will stimulate the IoT market.