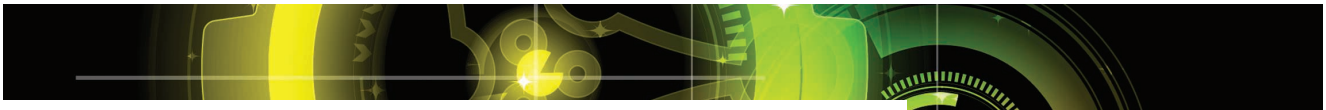

IEEE Computer Society Standards Activities Board: Adapting to a Changing World

Riccardo Mariani, NVIDIA

The IEEE Computer Society's Standards Activities Board (SAB) has adapted to an ever-changing environment. The growth of blockchain, robotics, data compression, autonomous vehicles, and more has driven the SAB to remake itself to be more responsive to the standardization needs of industries.

In tight collaboration with the IEEE Standards Association (SA) and other IEEE Societies, the focus of the IEEE Computer Society Standards Activities Board (SAB) has been updated to promote new standards supporting the growth of emerging technologies. To accomplish that mission, the SAB administration has been restructured into three subcommittees:

- Policies and Procedures, chaired by Edward Au
- Vitality, chaired by Annette Reilly
- Standards, formerly known as SAB Special Projects, chaired by Robby Robson.

Moreover, participation in the SAB has been extended to include additional standards experts from different industries.

In the course of the year, three new standards committees have been established, and their chairs have been appointed:

- Blockchain and Distributed Ledgers
- Smart Manufacturing
- Data Compression.

The IEEE Computer Society (CS) Blockchain and Distributed Ledger Standards Committee manages the development of standards within the area of blockchain and distributed ledgers, including, without limitation, standards for relevant data formats; the development and implementation of blockchains and distributed ledger systems, and the applications of blockchains and distributed

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FROM THE EDITOR

The IEEE Computer Society Standards Activities Board (SAB) is the heart and soul of standardization within the IEEE Computer Society. As a past vice president of standards for the Computer Society, I recognize the importance of the Society keeping in touch with new and emerging technologies as well as ensuring that the SAB remains agile and responsive. The changes that Riccardo describes are important and timely for making sure the SAB remains focused and engaged. *—F. Don Wright*

ledgers to specific sectors, industries, and processes.

The CS Smart Manufacturing Standards Committee is responsible for managing the development of standards within the technical area of smart manufacturing and its associated applications, including, without limitation, requirements, architectures, models, practices, and technologies that support smart manufacturing. In this context, *smart manufacturing* is defined as "Manufacturing that improves its performance aspects with integrated and intelligent use of processes and resources in cyber, physical and human spheres to create and deliver products and services, which also collaborates with other domains within an enterprise's value chains." Performance aspects include agility, efficiency, safety, security, sustainability, or any other performance indicators identified by the enterprise. In addition to manufacturing, other enterprise domains can include engineering, logistics, marketing, procurement, sales, or any other domains identified by the enterprise.

The CS Data Compression Standards Committee is responsible for managing the development of standards within the technical area of data compression and its associated applications, including, without limitation, data compression algorithms, data compression metrics, transmission methods, and cybersecurity issues related to data compression.

These three new committees are in addition to the other existing committees already sponsored by the CS, such as Cloud Computing, Design Automation, Cybersecurity and Privacy Standards, Learning Technology, Local Area Networks/MAN, Microprocessor, Portable Applications, Simulation Interoperability, Software and Systems Engineering, and Test Technology.

In addition, the SAB has successfully promoted and initiated two new project authorization requests (PARs) in the fields of safety and, in particular, autonomous systems, in alignment with the new CS special technical community on reliable, safe, secure, and time-deterministic intelligent systems.

P2846 is a proposal for standardization on formal model for safety considerations in automated vehicle decision making. The CS is sponsoring it in conjunction with the IEEE Vehicular Technology Society.

Government and industry alike need an open, transparent, and technology-neutral standard that formalizes a machine-interpretable definition of safe driving. Industry implementers creating safe-by-design automated vehicles, as well as government and independent assessors, need a metric to assess whether an automated vehicle is, in fact, driving safely according to the agreed-upon balance between safety and usefulness that is at the heart of driving in the real world.

Without a common definition of what it means for an automated vehicle to drive safely, industry will not know how safe is safe enough, and the government will not have a tool to define what safe driving means. Absolute safety in all scenarios at all times is not possible, and so, just like with human drivers, there is a balance between safety and utility in the decision-making capabilities of automated vehicles.

This standard will define a technology-neutral formal model, parameterized so that the balance between safety and the utility of automated vehicle decision making may be adjusted to reflect cultural or other differences about what it means to drive safely. The value of a technology-neutral model is that it will be not only compatible with any kind of planning function (rules based or machine learning) but also flexible enough to be integrated into any automated driving system architecture.

Starting from existing policy models contributed by the different companies participating in P2846, this standard will define a formal rules-based mathematical model for safe decision making for automated vehicles using discrete mathematics and logic. The model will apply to the planning and decision-making functions of an automated vehicle. It will be formally verifiable, technology neutral, and parameterized to allow for regional customization by governments as desired. While it will cover any conceivable driving situation, it is likely that it may first verify a smaller set of scenarios and expand in scope over time. For example, highway driving could be considered first, followed by full urban driving later.

The standard will also define a test methodology and the tools necessary to perform verification of an automated vehicle to assess conformance with the standard. The proposed standard will not address the host vehicle navigation system implementing the logic or anything relating to perception, object detection, recognition, verification

and/or classification, free space detection, and so on. The need for such a standard was further illustrated through the publication of the "Safety First for Automated Driving" white paper. This industry white paper was published by Aptiv, Audi, Baidu, BMW, Continental, Daimler, Fiat Chrysler Automobiles, Here Technologies, Infineon, Intel, and Volkswagen. We expect many of these companies to participate in this new IEEE standards project. Additional information on P2846 can be found at https://sagroups.ieee.org/2846/.

Together with P2846, the SAB is working with the IEEE SA to establish an industry connections activity (ICA) on automated driving safety. The goal of this ICA is to identify, analyze, and assess existing standards and ongoing standardization activities in various standards developing organizations (SDOs); identify standardization gaps; develop and submit PARs to bridge standardization gaps; identify SDOs to partner with and develop recommendations for the level of engagement; set up liaison relationships; and harmonize work programs and joint development efforts.

P2851 is about providing an exchange/interoperability format for safety analysis and safety verification activities to enable intellectual property (IP) core vendors and system-on-chip (SoC) providers to deliver results to safety-critical system integrators in a consistent way while also making possible the interoperability between tools provided by electronic design automation (EDA) vendors. The development of IP cores and SoCs for safety-critical applications is emerging rapidly due to the growth of tasks such as automated driving or robotics. Standards such as ISO 26262 (automotive), International Electrotechnical Commission (IEC) 61508 (industrial), and many others require IP core vendors and SoC providers to execute safety analyses (for instance, failure mode and effects analysis; failure modes, effects, and diagnostic analysis; failure mode, effects, and criticality analysis; and fault tree analysis) and related safety verification activities (such as fault injection) and deliver results to system integrators. EDA vendors are also starting to provide tools to automate those activities.

Currently, however, there is no common language or format in which to provide those results. In the end, system integrators are struggling with many different types of data and spending much effort to reconsolidate, compare, integrate, and combine the data. For that reason, the safety-critical community is demanding a solution to accelerate the safety-engineering process while reducing risks and costs.

This project intends to define a data format to exchange and make available the results of safety analyses and related safety verification activities executed for IP cores, SoCs, and mixed-signal integrated circuits to system integrators. The format will define languages, data fields, and parameters to represent the result of those analyses and verification activities in a technologically independent way. The goal of the standard is to provide a common ground for EDA, SoC, and IP core vendors in need of developing tools and SoC and IP cores for safety critical applications. Additional information on P2851 can be found at https://sagroups.ieee.org/2851/.

Another activity started in 2019 (yet to be completed with a specific PAR) is the contribution to the standardization of new robot applications, such as autonomous mobile robots, collaborative robots (cobots), and delivery robots. Cobots are a fast-developing segment of the robotics market and becoming increasingly popular. More and more, they are being moved out of factories and used in sectors such as agriculture, health care, and retail, where they interact with humans or help them to do jobs that are dirty, dangerous, repetitive, and difficult.

At the same time, e-commerce and package deliveries are growing at a fast pace, and there is an increased demand for same-day deliveries. Established delivery companies and new startups are investing in technologies that reduce delivery times and/or increase driver productivity. In this context, the adoption of sidewalk automated (or autonomous) delivery robots (SADRs) has a growing appeal. SADRs are pedestrian-sized robots that deliver items to customers without the intervention of a delivery person. As of today, cobots and SADRs are ruled by an inconsistent and overlapping set of standards, not fully aligned with the state of the art. The goal of the SAB is to support the IEEE SA and the robotics-related IEEE Societies in clarifying the standardization picture and cover gaps with new standardization initiatives.

In general, the SAB supports 14 standards committees, with 202 working groups (WGs), 70 of which have active projects. The number of active standards is 261, with 140 active PARs and nine pending. There are 103 projects in WG draft development, and 46 projects are approved for the ballot.

The SAB is also quite active in liaisons with other IEEE committees, such as the IEEE Standards Coordinating Committee (SCC) 20, the SCC 42, and the IEEE-SA Registration Authority Committee, and external organizations, such as ISO/IEC JTC1 SC7 Software and Systems Engineering, ISO/IEC/JTC 1/SC27 Computing Security, ISO/IEC JTC 1/SC38, and ISO/IEC JWG16.

With these new standards committees and projects, as well as a new administration organization, the SAB has been reinvigorated to enable it to better support the needs of the Society and the industries it serves.

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