

The Standards and Interoperability PlugFest at IECON 2020

The Standards and Interoperability (INTEROP) PlugFest 2020, originally planned in conjunction with the 46th Annual Conference of the IEEE Industrial Electronics Society (IECON 2020) for 19–20 October 2020 at the Marina Bay Sands Convention Center in Singapore, was instead held as a virtual event due to the worldwide COVID-19 pandemic.

Sponsored by the IEEE Industrial Electronics Society (IES) Standards Technical Committee (TC), this annual three-day event, in its third year, planned to introduce two new features, in addition to interoperability activities, among the standards groups and the face-to-face standards working group sessions. One such feature was presentation sessions of the demos, and another was the availability of an INTEROP PlugFest brochure chronicling the onsite demonstrations and interoperability capabilities (Figure 1). This brochure was included in the IECON 2020 conference proceedings package.

With flagship IES conference IECON 2020 changed to a virtual setting, INTEROP PlugFest met the challenge of being produced in a virtual environment. With credit to the ingenuity, hard work, and determination of participants, INTEROP 2020 was successfully held virtually, with remote demonstrations via video streaming and real-time access.

INTEROP PlugFest was reconfigured to a two-day, four-session presentation format, taking advantage of the newly planned feature of online presentation sessions. Working with the conference organizers and the video streaming team (IEEE.tv), a virtual INTEROP PlugFest was achieved and successfully carried out with remote presentations and demonstration test platforms. For the four sessions, INTEROP PlugFest averaged a live attendance of 55 viewers per session, with

lively question-and-answer periods per presentation.

There were 12 demonstrations for INTEROP PlugFest, with three demonstrations per session and two sessions per day, along with participants from eight different countries around the world (the United States, Austria, Portugal, China, Argentina, Hong Kong, Japan, and India). As the virtual IECON 2020 was fully conducted via IEEE.tv, full recordings of all the sessions are available on the website.

The demonstrations were grouped in three clusters: the IEEE 1451 Sensor Networks Standards Cluster, the Industrial Automation Cluster, and the Industrial Electronics Cluster.

- 1) *IEEE 1451 Sensor Networks Standards*—This cluster consisted of the following standards working groups (WGs): 1) P1451.0 1451 Family Standards, 2) P1451.1.6 MQTT Services, 3) P1451.5 NB-IoT, 4) P1451.002 Low Power Transducer Interface, 5) P1451.99 IoT Harmonization, 6) IEEE 1451.001—2017 Signal Treatment, and 7) P1451.1.5 SNMP Services. These WG platforms were presented live from the United States, Japan, Hong Kong, Portugal, India, Argentina, and China, respectively.
- 2) *Industrial Automation Standards*—This cluster included the following standards WGs: 1) IEEE P2668 Standard for the Maturity Index of Internet-of-Things: Evaluation, Grading, Ranking (IDEX) and 2) IEEE P2805 Standards for Protocols for Edge Computing Nodes. These two platform presentations were live-streamed from Hong Kong and China, respectively.
- 3) *Prestandards Demonstration Platforms*—This cluster featured the following demonstrations: 1) Miniaturized Solar Powered Sensors,



FIGURE 1 – The INTEROP PlugFest 2020 brochure.

- 2) Smart Battery Gauge, and 3) IEEE 1451 and IEC 61499 Interoperability. These presentations were from Austria and the United States, respectively.

The Sensor Networks Standards Cluster was, by far, the largest cluster, consisting of seven testbeds, each representing a member of the IEEE 1451 standards family. The IEEE 1451.0 standards WG presentation emphasized the IEEE 1451's ongoing goal of interoperability of the standards family, pointing out the four platforms that demonstrate interoperability among each other over geographical distances, with two platforms showing interoperability with each other within the cluster and with another cluster. These two demonstrations presented remote interoperability over the three countries (China, Portugal, and Austria) live-streamed during the presentations.

One demonstration presentation displayed live interoperation between two platforms in different geographical locations (China and Portugal) within the IEEE 1451 standards family

Industry Partner Highlights

Another highlight of INTEROP PlugFest was the collaborative cooperation of our participating members working with industry in their demonstrative platforms, which was also demonstrated during the presentation streaming sessions. As with past PlugFests, our long-time partner from industry or government was once again the National Institute of Standards and Technology (NIST), which has been with our program since the beginning, leading interoperability development among the IEEE 1451 standards family members. Silicon Austria Labs is another one of our regular contributors to INTEROP PlugFest.

This year's PlugFest included collaborative partners such as Huawei Technologies in the P2805 Edge Computing Standards WG (Figure 4); and Hong Kong Telecoms, Dekra, and China Mobile with the P2668 IDEX WG and P1451.5 WG test platforms (Figure 5).

The IEEE P2805 Edge Computing Standards WG presented its Industrial Edge Computing testbed shown in Figure 4, where connections to the edge node and cloud computing platform were in cooperation with Huawei Technologies.

The standards testbeds on the narrow-band IoT connectivity with China Mobile Hong Kong (CMHK) showed a harmonization between the IEEE P2668 IoT Maturity Index standards and IEEE P1451.5. The trial demonstrated successful access to CMHK's OneNET Cloud, with test locations in Hong Kong Science Park and connections to China (Figure 5). P1451.5 and P2668 project cooperation were endorsed by the management of CMHK and Dekra (a test-certification company) [see Figure 5(a) and (b)].

The Smart Battery Gauge project has been developed and deployed with industry partners Duke Energy and North Carolina Electric Cooperatives, both based in North Carolina, the United States. Additionally, our P1451.1.6 MQTT services standards platform has cooperative partners in the National Agriculture Research Organization of Japan, with applications in smart agriculture.

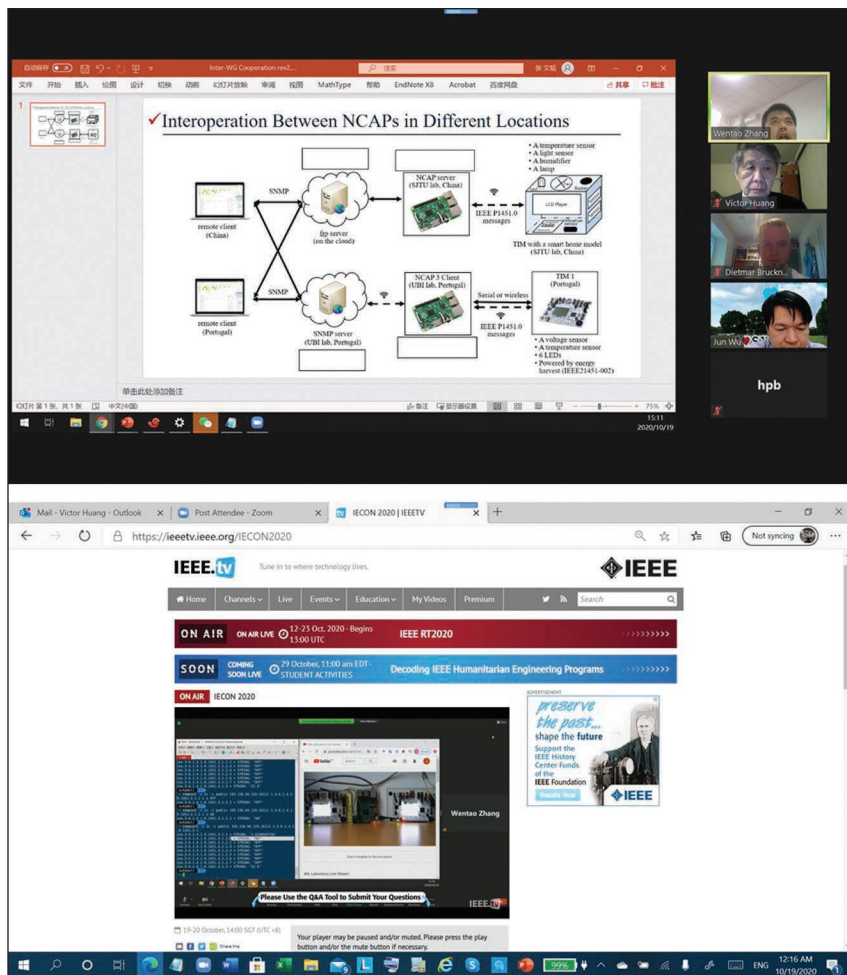


FIGURE 2 — Interoperability testing between the P1451.1.5 SNMP Services demo (China) and the P1451.002 Low Power Energy Harvesting Sensors demo (Portugal).

(Figure 2). A second demonstration presented live interoperation between two platforms from different clusters in a dashboard application, also over remote locations (Portugal and Austria) (Figure 3).

Expanding on the spirit of INTEROP PlugFest, three other presentations further exhibited interoperability projects within the IES standards community. One presentation exhibited a dashboard application between P1451.002 and P1451.1.6 MQTT Services standards, with interoperation between Portugal and Japan. For the first time at PlugFest, there were two projects involving interstandards harmonization between the IEEE 1451 standards and other standards families.

One project demonstrated the interoperability between the IEEE 1451 standard and the IEC 61499 standard

platforms. This working demonstration was accomplished remotely using the IEC standards platform, located in the United States, with the IEEE 1451 platform in Portugal. It is interesting to note that the test platform from Portugal is the same testbed interoperating with the test platforms from China, Austria, and Japan.

The IEEE 1451.99 presentation discussed an experimental testbed that harmonizes the IEEE 1451 standards family with Internet of Things (IoT) devices and systems connected to other standards and protocols, such as the Open Platform Communications Unified Architecture and ModBus. This project is located in India. The other members of the standards family will be working toward the same interoperability objectives as these aforementioned projects.

Detailed information on the 2020 INTEROP PlugFest and the IES Standards TC is available at <https://sites.google.com/view/iesstandardstc/>.

Goals

The IES Standards Committee would like to reiterate that the goal for INTEROP PlugFest remains the same: to continue to serve the technical interests of the IES community in the standards and interoperability of IES fields-of-interest (FoI) areas. In particular, the standards and platforms

- provide the IES standards community with verification and validation platforms for individual standards and for families of standards so that the community can test its applications to these benchmarks, ensuring compliance and interoperability to their systems
- provide compliance and interoperability to industrial applications in IES FoI
- encourage industry partners to participate in IEEE standards by providing verification and validation platforms for standards compliance and interoperability in the industry context
- benefit the conference, which is in conjunction with the INTEROP PlugFest event, in its publicity and attendance, and the IES, in enhancing its influence on and connections with industry.

The IES Standards Committee looks forward to presenting the 2021 editions of INTEROP PlugFest at the 30th IEEE International Symposium on Industrial Electronics in Kyoto, Japan, in June 2021 and IECON 2021 in Toronto, Canada, in October 2021. The Committee also looks forward to welcoming back the following 2020 INTEROP PlugFest participating members to its future events: NIST (United States); North Carolina State University (United States); City University of Hong Kong (China); Shanghai Jiao Tong University (China); IEEE P1451.99 WG India (India); Universidad Tecnológica Nacional (Argentina); the University of Miami, Ohio (United States); Keio University (Japan); the University of Beira Interior (Portugal); and Silicon Austria Labs (Austria).

The IES Standards Committee gratefully acknowledges support and advice from the following program advisors: Dr. Kiang Wee Lim (honorary general

chair, IECON 2020; executive director, Campus for Research Excellence and Technological Enterprise, Singapore), Prof. Roberto Oboe (IES vice president of

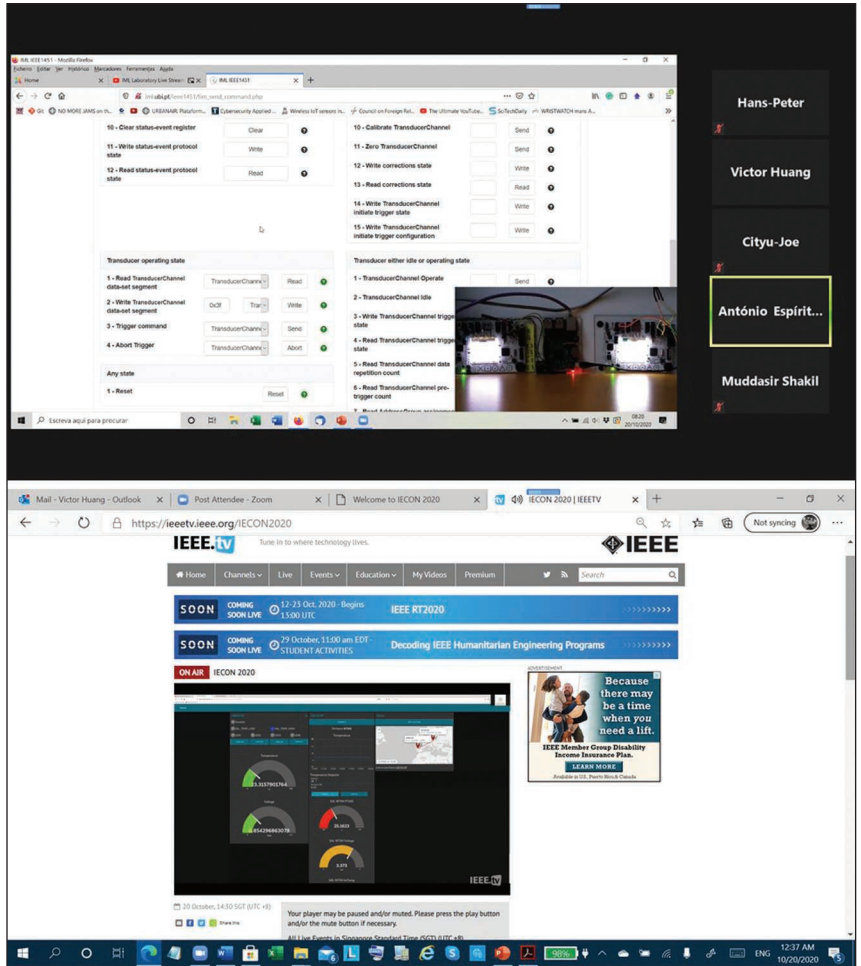


FIGURE 3 – (a) The P1451.002 Low Power Energy Harvesting Sensors (Portugal) in remote connectivity with (b) the Miniaturized Solar Powered Sensors test platform (Austria).

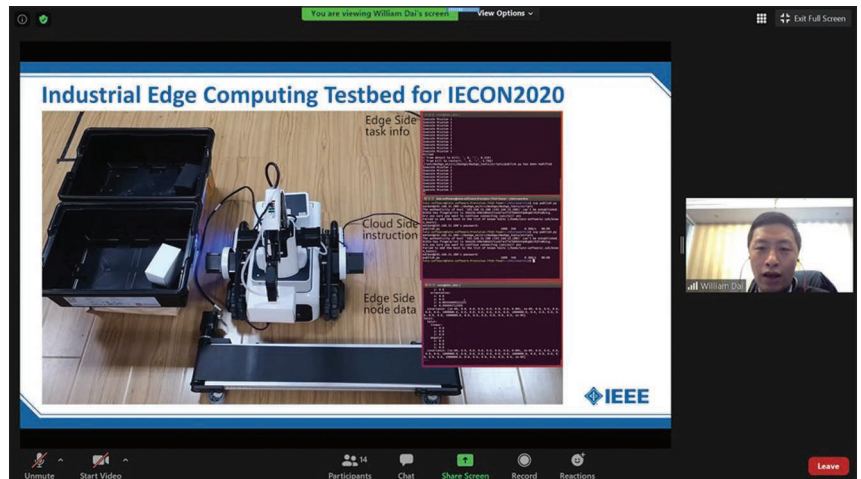


FIGURE 4 – The IEEE P2805 Edge Computing Standards Industrial Edge Computing testbed connected to the Huawei Edge cloud computing platform.

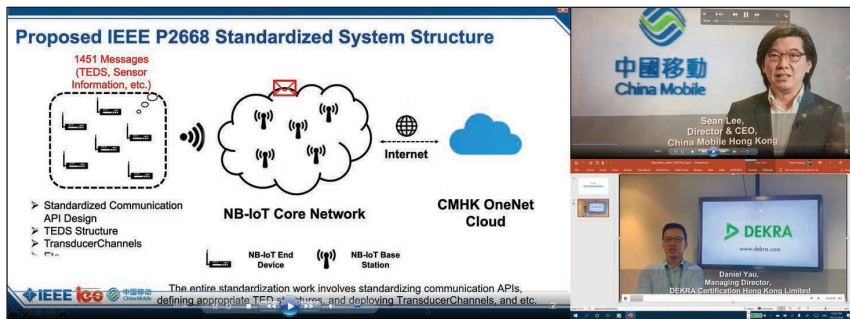


FIGURE 5 – IEEE P2668 Standards testing using the P1451.5 NB-IoT testbed with China Mobile Hong Kong (China) at Hong Kong Science Park.

technical activities), Kang Lee (IMS TC-9 technical chair for IEEE 1451 standards), and IECON 2020 organizers and IEEE.tv.

—Victor Huang, IEEE Industrial Electronics Magazine associate editor; vice chair, IES Standards Committee
Allen Chen, chair, IES Standards Committee
Dietmar Bruckner, secretary, IES Standards Committee

Fumio Harashima Selected as a Bunka kōrō-sha (Person of Cultural Merit)

The Japanese government recently announced the names of the recipients of Person of Cultural Merit for 2020. Among them is Emeritus Professor Fumio Harashima, a prominent Member of IEEE and the IEEE Industrial Electronics Society (IES). Harashima was selected as a Bunka kōrō-sha (Person of Cultural Merit) for his outstanding achievements in the field of mechatronics. *Mechatronics* is a Japanese-English word created in the early 1970s and since then has been synonymous with ceaseless worldwide economic growth. Industrial robotics is a good way to describe mechatronics.

Harashima developed a pioneering theory conjointly based on electrical and mechanical engineering for artificial machines to acquire the flexible adaptability of humans. In the citation, mechatronics appears in the same way as does mathematics, physics, electronics, or any other scientific or technological field. This means that, thanks to prominent scientists like Harashima, mechatronics is now accepted as an important and established discipline. Please refer to [1] for more information about Harashima's main achievements in the field of mechatronics.

The award ceremony took place in Tokyo on 4 November 2020 (Figure 1).



FIGURE 1 – Harashima with his wife, Teruko, at the ceremony selecting him as a Person of Cultural Merit.

For more details, please visit https://www.mext.go.jp/b_menu/activity/detail/2020/20201104.html

Biography of Fumio Harashima

Harashima was born in Tokyo in 1940. He earned his B.S., M.S., and Ph.D. degrees, all in electrical engineering, from the University of Tokyo in 1962, 1964, and 1967, respectively. He was employed as an associate professor at the Institute of Industrial Science, the University of Tokyo, in 1967, and had been a professor from 1980 to 1998. He was the director of the institute from 1992 to 1995. He was president of the Tokyo Metropolitan Institute of Technology from April 1998 to March 2002. He was also a visiting professor at the Korea Advanced Institute of Science and Technology from 2002 to 2003. Harashima served as the president of Tokyo Denki University from June 2004

to June 2008. He was the president of Tokyo Metropolitan University from 2009 to 2015. Harashima has been professor emeritus of the University of Tokyo since May 2000.

Harashima served as president of the IES in 1986–1987 and secretary of IEEE in 1990. He was also a member of the IEEE Nominations and Appointments Committee in 1991–1992 and the IEEE Fellow Committee in 1991–1993. He initiated several mechatronics/robotics conferences, such as the IEEE/RSJ International Conference on Intelligent Robots and Systems, the IEEE/ASME International Conference on Advanced Intelligent Mechatronics, and so on and served as the founding editor-in-chief of *IEEE/ASME Transactions on Mechatronics* in 1995. He was the editor-in-chief of *IEEE Transactions on Industrial Electronics* in 2000–2003.

During his illustrious career, Harashima has received numerous awards, including the 1984 IEEE/IES Anthony J. Hornfeck Award, 1988 IEEE/IES Eugene Mittelmann Award, IEEE Third Millennium Medal, and 2015 IEEE Haraden Pratt Award.

Reference

- [1] F. Harashima and S. Suzuki, "State-of-the-art intelligent mechatronics in human-machine interaction [guest introduction]," *IEEE Ind. Electron. Mag.*, vol. 4, no. 2, pp. 9–13, 2010. doi: 10.1109/MIE.2010.936765.

