IEEE SSCS Switzerland Chapter Hosts Webinar on the Role of 5G in Industry 4.0

The IEEE Solid-State Circuits Society (SSCS) Switzerland Chapter organized a webinar with ties to local industry. The speaker, Ludger Boeggering, is responsible for developing key industrial segments within energy, automation, and Industry 4.0 applications for u-blox, a Swiss leader in wireless and positioning semiconductors and modules. Boeggering joined u-blox in 2015, with the idea that industrial communication would significantly impact businesses and services whose products would be in demand for Internet of Things (IoT) and Industry 4.0 applications. Thirty IEEE members from the section attended the talk, and topics included the 5G debate going on in Switzerland and worldwide [1].

The Chapter has initiated several meetings along these lines, including the first in October 2019, when Korea Telecom Chief Executive Officer Chang-Gyu Hwang gave a talk at ETH Zurich. Hwang [2] is famous for Hwang's law, published in *Proceedings of the IEEE*, in 2003 [3], which dictates that the density of top-of-the-line memory chips will double every 12 months. There was a follow-up presentation about communication circuits building the bridge between artificial intelligence (AI) and 5G communication networks, demonstrating circuit techniques leveraging AI for the safe and energy-efficient use of millimeter-wave beamforming [4]. This was followed by a Distinguished Lecture describing the evolution of circuit techniques in radio-frequency ICs for cellular communication. This address, given by Venumadhav Bhagavatula, a senior manager at Samsung Semiconductor [5], provided a thorough understanding of how circuit techniques are evolving toward 5G cellular transceivers.

> ***The presentation introduced some of the main building blocks of 5G and certain major challenges in information and communications technology.***

The webinar was held in an applicative context and focused on the rollout of circuit techniques in the field. Industry 4.0 delivers seamless vertical and horizontal integration by significantly improving flexibility and efficiency across the entire value chain and all layers of the automation process. Wireless communication and, in particular, 5G are key to implementing Industry 4.0 and providing powerful and pervasive communication among machines, people, and objects. A BBC report [6] described how automation has enabled Taiwan to maintain industrial production during the COVID-19 pandemic.

Boeggering's webinar was divided into five parts: u-blox's core activity, 5G, Industry 4.0 use cases, possible network implementations, and research. The event started with a few words about u-blox,

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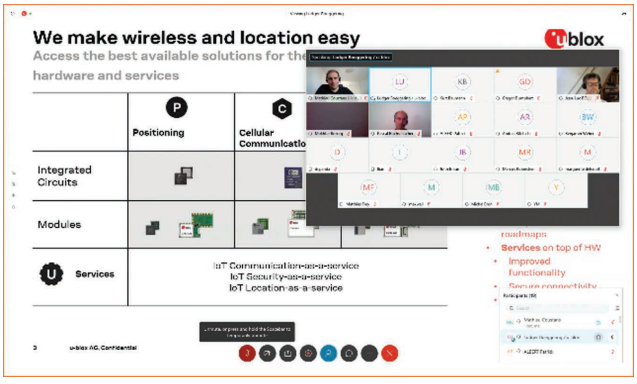
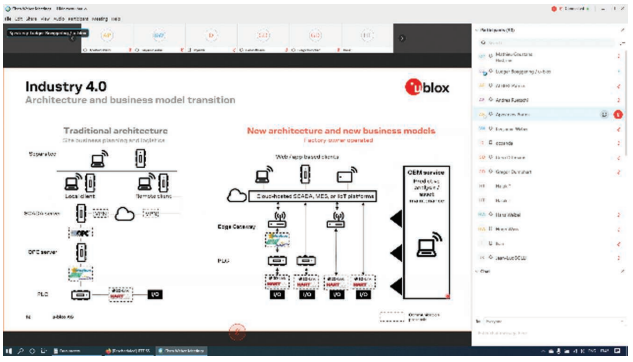
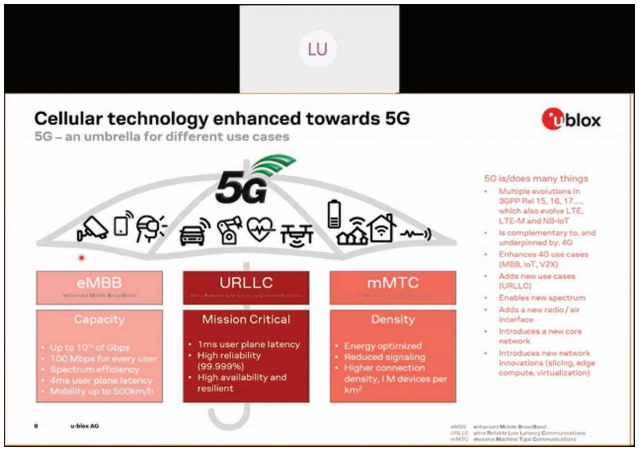


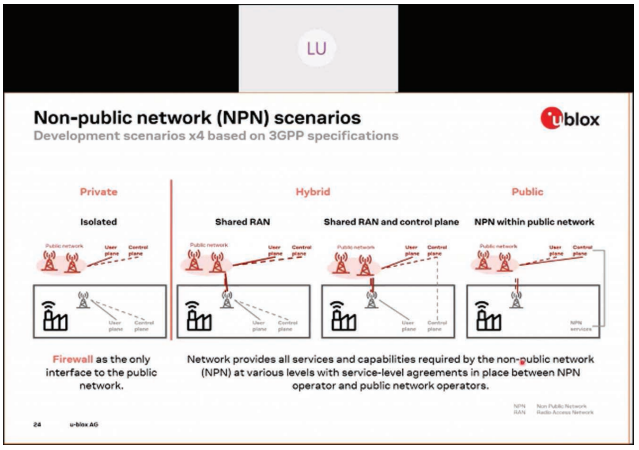
Boeggering introduces his lecture.



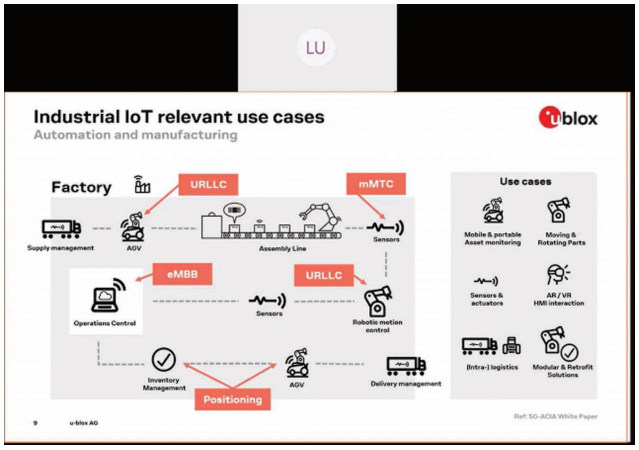
Positioning the Industry 4.0 architecture and business model for 5G services.



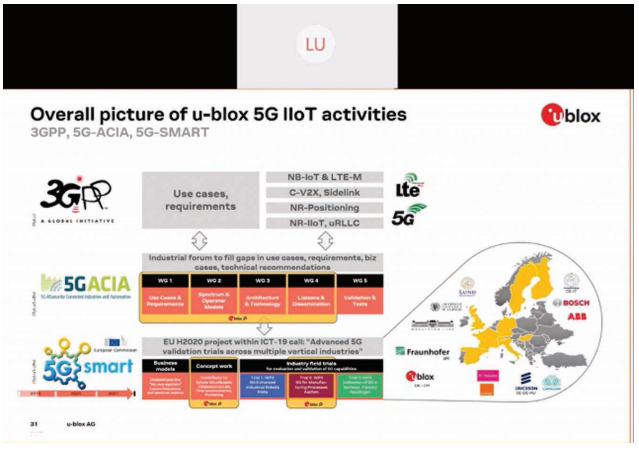
The 5G umbrella of use cases.



NPN scenarios, from fully private to public.



5G use cases in industry 4.0.



The u-blox collaborative research project to support the 5G rollout.

which has headquarters in Thalwil, Switzerland, and a presence at 29 worldwide sites. Its business includes chipsets, modules, and services enabling short-range cellular and positioning activities. One of the main differences between 5G and previous generations of cellular networks lies in the technology's advanced capabilities, i.e., unprecedented reliability and very low latencies. 5G networks will achieve manufacturing flexibility on the factory floor, supporting a wide variety of sensors, devices, machines, robots, actuators, and terminals, with potential in connected industries, in particular, the manufacturing and process sectors.

The presentation introduced some of the main building blocks of 5G and certain major challenges in information and communications technology and operational technology that industry is working to resolve with the next 3rd Generation Partnership Project (3GPP) release. One interesting aspect of 5G is the coverage of various uses cases, from the simplest set of features for edge sensors, using massive machine-type communications, to enhanced mobile broadband. Processes such as robotic motion control will employ ultrareliable, low-latency communication to avoid faults during operation.

Domenico Pepe, the new SSCS Switzerland Chapter industrial relations coordination officer.

In contrast to offering mobile communication to the general public, a 5G nonpublic network (NPN), also called a *private network* or a *campus network*, provides services to a clearly defined user organization. Its implementations are based on 3GPP specifications and range from self-contained NPNs that have no connection to the public network to NPNs that are hosted entirely by public network operators. NPNs offer advantages in terms of coverage, capacity, control and security, and end-to-end traceability. Boeggering concluded with some

remarks about European projects and research activities. The event was made available on the IEEE Volunteer Tools system [7]. Attendees could participate in a 30-min Q&A session focusing on use cases and rollouts of stand-alone NPNs.

Along the lines of getting closer to industry, the SSCS Switzerland Chapter held an adhoc vote approving Domenico Pepe as industrial relations coordination officer. Reach out to Domenico with Chapter queries.

—Mathieu Coustans, Taekwang Jang, Michel Bron, and Domenico Pepe, SSCS Switzerland Chapter

References

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[7] L. Boeggering. "IEEE SSCs Switzerland webinar: The role of 5G in Industry 4.0." IEEE vTOOLs. https://events.vtools.ieee.org/m/225924

IEEE SSCS Israel Chapter Hosts Online Distinguished Lecture

On 9 September 2020, IEEE Solid-State Circuits Society (SSCS) Distinguished Lecturer Dr. Venumadhav Bhagavatula, a senior staff engineer at Samsung, San Jose, California, gave the online seminar "Evolution of Cellular Radio-Frequency ICs (2G to 5G)" for the SSCS Israel Chapter. In his lecture, Bhagavatula discussed circuit and architecture-level techniques that enable reconfigurable cellular transceivers supporting multiple modes (2G, 3G, and 4G). Every generation has brought a unique set of hardware design challenges. Bhagavatula introduced a couple of difficulties associated with each standard—for example, the phase noise requirement in 2G, coexistence in 3G, and counter intermodulation products in 4G—and then reviewed radio-frequency IC techniques to tackle these problems. The final segment of the talk provided an overview of the challenges in upcoming 5G millimeter-wave systems.

Bhagavatula introduced a couple of difficulties associated with each standard and then reviewed radio-frequency IC techniques to tackle these problems.

The seminar was hosted and coorganized by the Advanced Circuits Research Center (ACRC), Technion–Israel Institute of Technology, Haifa. More than 160 participants from the semiconductor industry and academia attended the lecture. Bhagavatula's expertise and in-depth knowledge of the topic made this conversation interesting and informative. The presentation was followed by a Q&A session and a vibrant and thoughtful discussion.

—Solon Spiegel, SSCS Israel Chapter

—Shahar Kvatinsky, associate professor of electrical engineering, Technion–Israel Institute of Technology; IEEE Circuits and Systems Society Israel Chapter

—Masha Schuster, associate director, ACRC, Technion–Israel Institute of Technology

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