Exploring the Impact of the Internet of Things

A new IEEE group is taking on the quest to connect everything

By KATHY PRETZ 7 October 2013

Image: iStockphoto

The “next big thing” is the Internet of Things, a world of networked devices equipped with sensors and radio-frequency identification aimed at interconnecting all things electronic to make them more intelligent and programmable. About 50 billion machines and devices could be linked by 2020, according to Cisco Systems, a leader in the IoT movement. Such smart devices are already being used, for example, to check soil moisture in vineyards, control the carbon emission of factories, alert drivers to traffic jams, and monitor patients’ blood pressure—all without human intervention. But people will have a major role to play as they generate and use the data coming from these myriad devices.

While the IoT offers plenty of business opportunities, it also, naturally, presents challenges for engineers, who must build ever more complex systems, deal with a lack of standards, and figure out ways to analyze the deluge of data. Societal issues also intrude, such as the need to keep personal information private while regulating who uses it and for what purpose. These and other issues are why the IEEE Future Directions Committee, the organization’s R&D arm, recently launched its IoT initiative.

“IoT offers the possibility for IEEE members and its societies to integrate their knowledge and skills to create value and impact industry,” says IEEE Member Roberto Minerva, chair of the initiative’s working group. “Applications of IoT are wide-ranging; specialists are needed to develop and improve specific technologies while others work with a more general system view. In addition, the interdisciplinary challenges posed by IoT could be a means to creating larger synergies within IEEE, especially in the areas of education, conferences, and publications.” Minerva is head of innovative architectures in the strategy department of *Telecom Italia,* in Turin, Italy.

“The idea behind the initiative is to develop ‘thought leadership’ in the marketplace,” adds Harold Tepper, senior program manager for IEEE Future Directions, in Piscataway, N.J. “Then, when people want to know more about IoT, they think of IEEE as *the* place to go for information, whether it’s papers in the **IEEE Xplore Digital Library (http://ieeexplore.ieee.org/Xplore/home.jsp)** or its videos and conferences.”

To that end, the group has developed a **website (http://iot.ieee.org)**, organized a **conference (http://sites.ieee.org/wf-iot/)**, and is about to launch a **journal (http://iot-journal.weebly.com/)**.

TO BE CONNECTED

IoT will appear to move objects from the physical world to a virtual one, according to Minerva. “IoT’s features create a sort of virtual continuum among physical objects, their environment, and their representation on the Internet,” he explains. “By-products of this virtual continuum will be new services and functionality.”

For example, say you are strolling along a street in Venice and come across an artifact such as a Renaissance facade you want to know more about. With your mobile device and IoT technologies, you can learn details about the architect, how the facade was designed, the best time of day to shoot a photo, and a map of other artifacts related to the same period—information customized to your preferences.

But to get to that point will require large, complex systems that will not be managed in traditional ways, according to Minerva.

“Complexity will be an important factor to study and control: The behavior of every single node will need to be considered to determine its potential impact on the whole system,” he says. “This will be a challenge for the entire scientific and industrial community.”

He points out, too, that standards do not yet exist for the basic sensing and actuation technologies that will have to be integrated in an open-communications environment.

“A wealth of data will be generated, aggregated, analyzed, and transformed into information and distributed to users, which will require widely distributed processing capabilities and seamless connectivity,” he continues. “All these features point to an industry-wide standardization effort.”

Then there are concerns about the privacy of the information gathering. Users will be contributing to these smart environments by allowing companies to access their information to better understand and predict behavior.

“A significantly different approach towards the ownership and use of data will be needed to guarantee privacy,” Minerva says. “An organization-centric approach [in which a company is using personal data without the control of users] needs to be balanced with policies that allow users to determine how their personal data can be used and shared.”

IEEE’S ROLE

To help IEEE members and others keep abreast of the issues surrounding this disruptive technology, the working group recently launched an IoT **website (http://iot.ieee.org)** to showcase new developments, news articles, upcoming conferences, and publications. And as mentioned, a conference and journal are also in the works.

The **IEEE World Forum on Internet of Things (http://sites.ieee.org/wf-iot/)** will be held from 6 to 8 March 2014, in Seoul, South Korea. Several IEEE societies and councils are sponsors, in addition to the Korea Institute of Communications and Information Sciences. The meeting will cover technologies such as body sensor networks, routing and control protocols, data mining, and identity management. Applications to be addressed include ambient intelligence, smart cities, building automation, energy management, and e-health systems. In addition, the conference will explore how IoT will affect such topics as the security of information, human-device interactions, and sustainable design.

The inaugural issue of the online-only ***IEEE Internet of Things Journal*** (http://iot-journal.weebly.com/) is due out in the January-February timeframe. (The deadline for submitting a paper is 31 October.) Six issues published annually will include articles on such topics as system architecture, enabling technologies, communication and networking protocols, system security and manageability, standards, and test beds. Articles will be posted in the IEEE Xplore Digital Library as soon as they are accepted.

“The disruptive potential of IoT has to be evaluated, but it’s clear that many industries will no longer be the same,” Minerva says.

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