

EDITORIAL AND INTRODUCTION TO THE ISSUE: RISK AND REWARDS OF THE INTERNET OF THINGS

Welcome to the inaugural issue of *IEEE Internet of Things Magazine* (IoTM)! IoTM is sponsored by the IEEE Internet of Things (IoT) Initiative, a multi-disciplinary initiative with 19 member societies/councils. The mission of the IEEE IoT Initiative is to “serve as the gathering place for the global technical community working on the Internet of Things; to provide the platform where professionals learn, share knowledge, and collaborate on this sweeping convergence of technologies, markets, applications, and the Internet, and together change the world.”

The IoT is one of the most important, exciting, and transformational technology developments today. IoT is global in impact, multi-disciplinary in nature, and spans virtually all industry segments. The IoT is a topic that is growing in interest, yet no concise definition of IoT is universally accepted within the community of practitioners. A document produced by the IEEE IoT Initiative states that “Despite the diversity of research on IoT, its definition remains fuzzy.” The document attempts to address this issue, but concludes with three pages that define IoT with a list of characteristics of IoT systems.¹ Very generally, the IoT refers to collections of things, such as devices, vehicles, sensors, and actuators, for example, that interconnect and communicate over a network to perform some application. IoT integrates the physical and the digital, providing unique solutions that exploit sensing, aggregation of data from multiple sources, common infrastructure such as communications, computing and storage, to remotely monitor and control physical systems. IoT applications range from chemical plant control to personal health monitoring, from automobile engines to transportation systems, from electrical generators to smart grids, and more.

Some example IoT applications, which are representative topics for IoTM articles, include:

- In the transportation domain, a railroad company uses IoT technology to instrument thousands of miles of track, as well as every locomotive and railcar. Customized sensor packages placed at various locations along the track measure various externally observable properties of every car as the train passes by. Communication between sensor stations enables observations of trends in the data so that proactive maintenance can be scheduled in advance and performed when the train reaches a location with a maintenance yard. Similarly, customized sensors on board each car monitor various parameters that indicate the stability

of the car and cargo, and inspect the state of the rails and roadbed.

- In the agricultural domain, many growers have installed distributed networks of sensors that provide real-time data and historical trends for multiple parameters such as soil moisture, local temperature, humidity, and others. Growers use the data to optimize watering, fertilizer application, and more. Some agribusinesses now employ networked autonomous systems to observe crop status and apply treatments.
- In the industrial domain, miniaturized sensors integrated into critical equipment monitor performance parameters to proactively diagnose maintenance issues, enable trend analysis of equipment performance, and optimize overall system operations. The cost of sensors and sensor integration is more than offset by the savings in maintenance costs and increase in equipment up-time.

The growth in IoT has been nothing less than astounding, and is forecast to continue. For example, Cisco projects over 10 billion machine-to-machine IoT devices will be connected in 2019.² Intel predicts 200 billion connected devices in 2020.³ McKinsey Global Institute estimates the economic impact of IoT to be as much as \$11.1 trillion per year by 2025.⁴ Many corporations now have IoT divisions led by corporate vice-presidents.

IoTM was proposed to meet the needs of industry, government, and academic practitioners, who are working to design and deploy IoT applications every day. Through a mix of articles and regular columns, IoTM will present IoT solutions, report on IoT experiences throughout the community, analyze IoT deployments from a business perspective, and point readers to relevant literature, events, and activities. The objective is for IoTM to be a forum for practitioners to share experiences, develop best practices, and establish guiding principles for technical, operational, and business success.

The articles in our inaugural issue present examples of successful IoT deployments, as well as recommendations for industry growth, and some perspectives on the future of IoT.

IoT is growing rapidly, and more and more organizations are appreciating the financial benefits of investing in IoT. However, rapid growth is bringing challenges to the IoT community. The article “Why Industry Needs to Accelerate IoT Standards” discusses two key issues, security and standards, in the context of representative IoT deployments and makes some recommendations for the IoT community to follow.

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SUBMISSIONS: The magazine welcomes high-quality articles on IoT technology and end-to-end IoT solutions. Submissions will normally be approximately 4500 words, accompanied by up to six figures and/or tables, with up to fifteen carefully selected references. Electronic submissions are preferred and should be submitted through Manuscript Central: <https://mc.manuscriptcentral.com/iotmag>. All submissions will be peer reviewed.

The pace of technological change is driving the rise and fall of companies and even entire industries. IoT is proving to be one of those transformational technologies that may determine the winners and losers in many sectors. The article “Drilling Deep into Digital Industrial Transformation Will Determine Who Survives and Thrives” uses case studies to present the argument that one type of transformation in particular is required for any organization that wants to thrive in the 21st century.

IoT provides a mechanism for organizations to do more with less, while providing agility and responsiveness to customer needs. The article “Connecting the Dots on IoT for the Industrial World” presents some examples of the application of dense sensing and near-real-time data analytics to aircraft system maintenance and operations.

Our closing article “The Future of IoT” presents a panel discussion among three experts in IoT regarding the risks and rewards of IoT. Additionally, the panel discusses the real and potential impact to IoT of some of today’s most anticipated technologies.

In closing, the Editorial Board would like to thank the authors that contributed to this inaugural issue. We hope that the community of IoT practitioners will find the articles and columns to be interesting and useful, and provide support for *Internet of Things Magazine* in the form of articles, columns, references, and, of course, subscriptions.



Keith Gremban (kdgremban@gmail.com) is the Director of the Institute for Telecommunication Sciences (ITS), which is the research and engineering laboratory for the National Telecommunications and Information Administration (NTIA). Keith has been involved in systems engineering and advanced technology development for over thirty years. Prior to arriving at ITS, he was a Program Manager at the Defense Advanced Research Projects Agency (DARPA) where he managed a portfolio of programs in the areas of wireless communications and electronic warfare. Prior to DARPA, He worked at a variety of companies and research institutes, managing and leading research and systems engineering projects, including a diverse collection of unmanned systems and command-and-control applications. He received his Ph.D. and M.S. in Computer Science from Carnegie Mellon University, and his M.S. in Applied Mathematics and B.S. in Mathematics from Michigan State University.

FOOTNOTES

- ¹ [IEEE_IoT_Towards_Definition_Internet_of_Things_Revision1_27MAY15.pdf](https://iot.ieee.org/images/files/pdf/IEEE_IoT_Towards_Definition_Internet_of_Things_Revision1_27MAY15.pdf), https://iot.ieee.org/images/files/pdf/IEEE_IoT_Towards_Definition_Internet_of_Things_Revision1_27MAY15.pdf
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