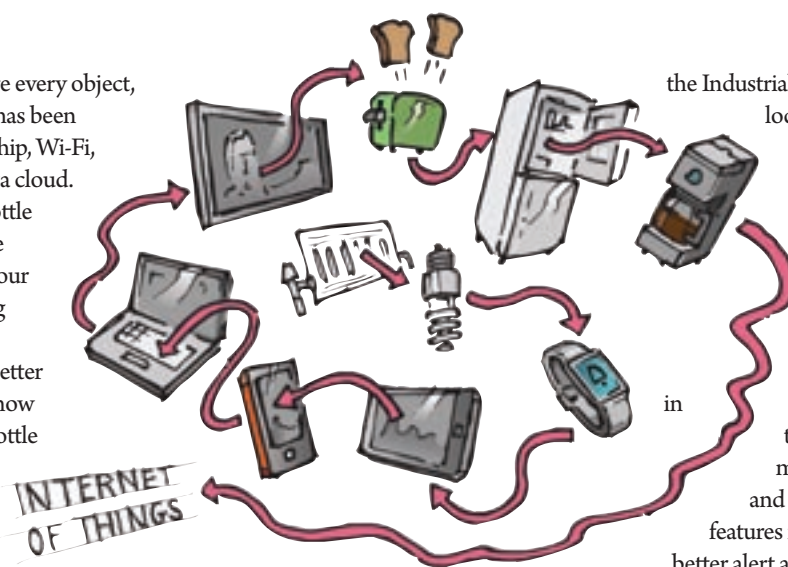## By David King

The Internet of Things

The tech sector is engaged in a remarkable burst of innovation as it accelerates the connection of objects with humans and with other objects via the Internet. Every industry will be changed. It's only a matter of when.

PICTURE A WORLD where every object, every electronic appliance, has been outfitted with a computer chip, Wi-Fi, and synched to a shared data cloud. Then imagine finishing a bottle of milk, swiping the barcode on the bottle over a scanner installed on your refrigerator and the fridge accessing the local grocery store's website to order another gallon for delivery. Better yet, over time, software will gauge how long it takes you to get through a bottle and time a delivery for the same day you run out. Envision a treadmill that's synched with your thermostat so that, when you're working up a sweat, the room will automatically cool down to accommodate you. Your car could be synched with your home so that, by accessing your odometer, your oven could switch on at just the right moment, so dinner's almost done when you get home. DVRs could know you're running late and record the big playoff game for you.

The possibilities are endless and, though mostly speculative at the moment, not that far from implementation. The Internet of Things (IoT)—a connected network of data-swapping sensors and software—is the hottest topic in the tech world at the moment, with numerous companies committed to making it a reality. In theory, the Internet of Things would result in increased efficiency, less dependence on manpower, and lower costs in almost every field. Its biggest cheerleaders see it as the basis for a new industrial revolution. To its detractors, the IoT is a harbinger of a Terminator-style Judgment Day. Though it is still a ways off from either grand scenario, it's already clear that the IoT is going to be a game changer.

At a conference in 2012, GE CEO Jeff Immelt coined the phrase "Industrial Internet" to characterize his company's plans for the future. Two years later, the company has gone all-in on applying the principles of the Internet of Things to their industrial products. A new Global Software Center has gone up in San Ramon, California and the company has committed $1 billion over a three-year period to deliver its vision for the Industrial Internet. GE is now building a locomotive, called the Evolution, equipped with an array of sensors and data-collecting devices. The new locomotive will be equipped with features such as GE's Trip Optimizer, a type of cruise control that combs through piles of data and synthesizes them for the driver in a way that allows him to control the locomotive to maintain the most efficient speed at all times and reduce fuel burn. Additional features include remote diagnostics to better alert analysts of impending maintenance needs, and a movement planner to track every train's position in order to decrease rail congestion and increase average velocity. The Evolution is just the tip of the iceberg. GE is developing a software platform, called Predix, that optimizes assets and operations by providing a standard way to run industrial-scale analytics and link machines, data, and people. The software will help GE's customers increase productivity and reduce costs in countless areas, from power plants to jet engines.

The Industrial Internet

Cisco Systems Inc., a multinational manufacturer of networking equipment, has pegged the Internet of Things as a $19 trillion market. With a number like that, it's no surprise that even an old giant like GE would be diving into an untested and still largely hypothetical market. The Industrial Internet is an important sub-segment of the IoT. The Industrial Internet of Things (IIoT) refers to industrial objects (the "things") that automatically connect over a network, without human-to-human or human-to-computer interaction, to share information and take action. Digital oilfields, advanced manufacturing, grid automation, smart cities, are all part of the IIoT. The IIoT faces some unique challenges because of the unforgiving environments in which these industrial devices exist, including harsh physical conditions and mission critical processes. IIoT solutions must meet the requirements of industrial-strength reliability,

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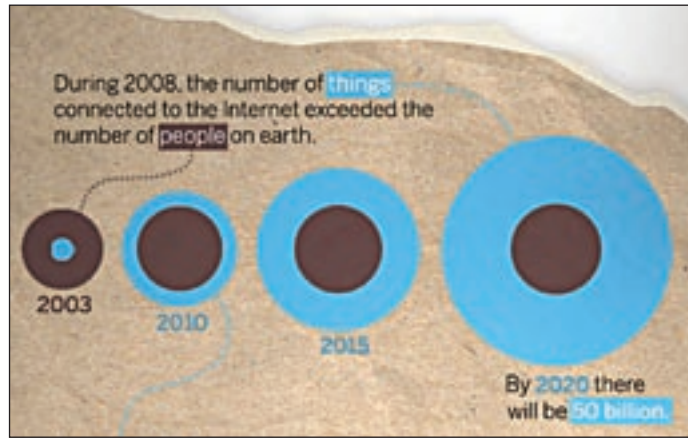18 New Hempstead Road
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security, wired and wireless connectivity, and compatibility with large installations of older devices.

Emerging software technology for manufacturers includes programs, such as RtDuet, that allow real-time monitoring of the performance of on-site resources. Developer RtTech posits that understanding the factors preventing 100 percent availability of assets gives manufacturers the ability to make smart decisions to boost productivity. For example, knowing when critical equipment needs servicing, before it fails, saves time and money, while mapping and managing energy consumption as it is being consumed allows decision-makers to take steps to drive down energy costs.

Frank Falatyn, President of engineering and manufacturing services company FALA Technologies in Kingston, NY, compares the development of the IoT to the development of IBM's microprocessor a generation ago. "That was our generation's contribution to the world of technology. The next generation will be the one to invent the next big thing, which is the Internet of Things," says Falatyn.

New York companies are on board

New York State is getting involved by investing in the infrastructure needed to develop this next-generation technology. "One of the biggest investments being made by New York State today is in the expansion of

During 2008, the number of things connected to the Internet exceeded the number of people on earth.

2003   2010   2015   By 2020 there will be 50 billion.

the cutting edge nanotechnology work being done at Albany Nanotech to the new technology park located at SUNY IT in Utica," Falatyn says. "The goal of this new technology park will be to help New York companies apply the microprocessor technologies that my generation invented to the new IoT technologies waiting to be invented." He stresses the importance of education to the realization of the IoT, encouraging engineering students to study in emerging fields such as mechatronics, a combination of mechanical, electrical and software controls engineering.

Daniel Freedman, Dean of the School of Science and Engineering at SUNY New Paltz, affirms the importance of fields such as coding, embedded systems and wireless communication, which he describes as the "core technologies" involved in developing the IoT. He notes that some of his students have started implementing these technologies in their senior projects, "actually helping to create the Internet of Things."

While the Internet of Things is the hot topic in tech circles right now, it is still a ways off from the sophistication its champions envision: Technology has rarely been developed as quickly as it is dreamed up. Nevertheless, the world is experiencing a remarkble burst of innovation as it accelerates the connection of objects with humans and with other objects via the Internet. Every industry will be changed. It's only a matter of when.