Talk to Me, One Machine Said to the Other

BERLIN — Ocado, an online grocery store in England, prides itself on its delivery of refrigerated foods: When the company says the goods will arrive at a certain temperature, they mean it.

The promise is more than a marketing boast. Aided by microchip transmitters, heat sensors and a fast-growing form of wireless communication, the boast is a measurable fact.

Inside each Ocado delivery van is a SIM-card module the size of a postage stamp that monitors the air temperature. The sensor sends data to a computer used by fleet managers back at headquarters near London every few minutes.

Ocado says incidents of spoilage of goods have declined since the transmitters were installed last year.

"It has saved us time and given us more confidence in our real-time monitoring, as well as being a safety check for the driver," said Paul Clarke, Ocado's director of technology, who oversees a 300-person department that develops software and hardware for the retailer.

The drone of low-density conversation between Ocado's trucks and headquarters in Hatfield is one example of machine-to-machine communication, a stream of consciousness based on semiconductors that is poised to reinvigorate the mobile industry.

Berg Insight, a research firm in Goteborg, Sweden, says the number of machine-to-machine devices using the world's wireless networks reached 108 million in 2011 and will at least triple that by 2017. Ericsson, the leading maker of wireless network equipment, sees as many as 50 billion machines connected by 2020. Only 10 billion or so are likely to be cellphones and tablet computers. The rest will be machines, talking not to us, but to each other.

The combined level of robotic chatter on the world's wireless networks — measured in the digital data load they exert on networks — is likely soon to exceed that generated by the sum of all human voice conversations taking place on wireless grids.

"I would say that is definitely possible within 10 years," said Miguel Blockstrand, the director of Ericsson's machine-to-machine division in Stockholm. "This is a 'What if?' kind of technology. People start to consider the potential, and the possibilities are endless."

Machine-to-machine communications has been around for more than two decades, initially run on landline connections and used for controlling industrial processes remotely. With advances in mobile broadband speeds and smartphone computing, the same robotic conversations are now rapidly shifting to wireless networks.

When the total amount of data traffic generated by machines overtakes that created by human voice conversations — or possibly before — mobile operators will have to choose who waits in line to make a call or receive an e-mail — the machine or the human.

"It really does raise some quandaries for the operators," said Tobias Ryberg, an analyst at Berg Insight. "Most mobile networks are set up for human communication, not for machines. So there will have to be a whole revamping of the system to make this possible."

Currently, about a third of all machine-to-machine communication involves so-called smart utility meters, which perform duties like sending data on household electric and gas consumption to utilities; the utilities use the information to tailor production to actual demand. In Europe, all households in Sweden and Italy are equipped with smart meters, many of them running wirelessly. In Austria, a law will require five million homes to be equipped with smart electric meters by 2019.

Another third is taking place in the auto industry, through car and truck fleet management systems, which allow transport companies or corporate car managers to track their vehicles in real time, or that are used by emergency accident, repair and location services like General Motors' OnStar system, now installed on a quarter of new GM vehicles. In Europe, similar technology is beginning to appear in preparation for 2015, when the eCall initiative, an E.U. law requiring all new cars to be equipped with wireless transmitters will take effect. The transmitters would automatically report accident data, as well as airbag deployment and location, to emergency responders

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But it is variations on consumer applications like Ocado's that are expected to provide the biggest growth over the next decade, said Yiru Zhong, an analyst at Frost & Sullivan, a research firm in London that tracks the sector.

In Japan, the government is considering installing a bigger system of seismic sensors to detect earthquakes, Ms. Zhong said. In Calitri, a town in southern Italy, wireless sensors are helping produce caciocavallo, a type of Pecorino cheese made by Caseificio di Cecca e di Roma. The cheese ages in cellars shielded from the searing heat, and sensors regularly send data on humidity to a monitoring station at a local agricultural extension center.

European mobile operators have begun exploiting the financial potential of machine-to-machine communication, and have set up independent units to develop the business. Telefónica, Deutsche Telekom, Vodafone and France Télécom have all established separate business entities or internal centers to develop new products catering to machines.

"Right now, this is a nice contribution to our company's bottom line," said Bernd Liebscher, the managing director of Telekom Austria's machine-to- machine division, which was set up last September. The operator does not break out machine-to-machine sales. "But over time, should we assume services for an entire vertical industry, like utility smart metering, we are talking about a significant business," he said.

Telekom Austria's mobile networks wirelessly connected 500,000 machines in eight countries at the end of 2011, a figure Mr. Liebscher said would grow 50 percent this year to 750,000. The tiny transmitter modules provide traffic and weather updates to 1.3 million users of TomTom navigation systems, link Otis elevators in Slovenia to emergency breakdown centers and connect 900 automatic teller machines of Priorbank in Belarus, among other uses. The two biggest applications are electronic payment terminals and fleet management.

Ms. Zhong, the Frost & Sullivan analyst, estimated that machine-to- machine conversations made up less on average than 10 percent of an operator's total revenue, but the growth potential is considered large.

For wireless machine communication to become ubiquitous — imagine every home or office window opening and closing automatically to control temperature and humidity — the makers of the modules, SIM cards and associated network equipment

will have to agree on broad series of technical standards to enable seamless communication between various devices.

Those megastandards do not exist now, and the biggest makers of devices, industry groups and mobile operators have split into different standards- setting groups, which is likely to delay adoption of uniform communications across industries, networks and module makers.

A 2011 research paper produced by researchers at Intel, the leading chip maker, concluded that the lack of broad, overarching standards and technologies that enable mobile networks to keep up with the explosion in robotic communication, are needed to bring about an Internet "embedded" in everyday life.

"I think there will be an effort to work to convergence, but the reality is not there yet," Ms. Zhong said.

Jim Morrish, an analyst with Machina Research, a London firm that focuses on the sector, said he had no doubts that engineers would come up with the requisite advances to bring about that kind of future.

"I think by the time we reach 50 billion connected devices, we will be in such a different technological stage that those won't be issues anymore," he said.