# GE Sensing, Dust Networks to Develop Wireless Sensors

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By Beth Bacheldor

May 15, 2007—GE Sensing has teamed up with Dust Networks to develop wireless sensors based on mesh network technology for a variety of industries.

The networks will leverage the Time Synchronized Mesh Protocol (TSMP) from Dust Networks. The Hayward, Calif., company provides wireless sensor networking products to GE Sensing and other original equipment manufacturers. GE Sensing manufactures a variety of sensing elements, devices, instruments and systems designed to help companies perform such functions as ultrasonic and gas-flow measurement, control-circuit protection and liquid-level detection.

TSMP, a proprietary networking protocol designed by Dust, is the foundation of the company's ultra-low-power wireless sensor networking technology. TSMP-based sensors contain RF transceivers utilizing mesh routing to create redundant and self-healing networks. This allows for continuous connections and reconfiguration around blocked paths by hopping from sensor to sensor (node to node) until it communicates with an RF receiver functioning as a gateway to a computer network. The wireless sensors form a self-organizing, multi-hop network for monitoring and control processes, physical attributes such as temperature and so forth. According to the company, current TSMP implementations operate at 2.4 GHz on IEEE 802.15.4 radios, and at 900 MHz on proprietary radios.

GE Sensing has opted to use mesh networking in a variety of current and upcoming products, says Tim Wortley, the firm's senior global product manager, because it provides networks with greater speed, confidence and reliability, minimizing the potential for data loss. The company plans to build products using TSMP for a range of industries, including pharmaceutical, biotechnology, automotive, industrial, commercial, petrochemical and power generation.

"Pharmaceutical environments, while not the harshest of RF environments, can be difficult to form a reliable wireless network with the amount of stainless steel process equipment," says Wortley. "Mesh networks provide the level of redundancy and self-corrective infrastructure to work a potentially dynamic RF environment."

The first GE Sensing product to take advantage of Dust's TSMP will be the RF ValProbe, available next month. The RF ValProbe is designed to help pharmaceutical and life sciences companies monitor and validate environments—such as freezers and sterilization processes—for regulatory- and quality-compliance purposes. The product will include loggers (wireless sensor nodes with built-in memory storage) to monitor temperature and moisture conditions. For example, RF ValProbe sensors could be placed in a walk-in cooler for storing

vaccines, and collect and report data at intervals ranging from every 10 seconds to once per minute. Each wireless sensor would pass on its temperature and humidity data, along with any information it receives from other wireless sensors in the network, to an adjacent wireless sensor up to about 300 feet away.

All this data will travel from node to node until it reaches a gateway connected to a computer network. However, the RF Mesh network is designed to prefer a logger connection directly to the gateway/base station, and will try to maintain such an optimized connection. Each node will also connect to another sensor node as a backup/redundant connection, which can be viewed as each sensor node with two or more parents, one of which is preferably the gateway. If the gateway is not in range, however, the two parent nodes can be other sensor nodes, which in turn can forward data back to the gateway.

Companies can view the data collected in real-time. If an event occurs, such as a freezer door not closing properly, then corrective action can be taken immediately.

Monitoring the temperature and moisture conditions in such precise detail, Wortley says, is required for companies to meet regulations set forth by the U.S. Food and Drug Administration (FDA). In fact, the FDA requires a cooler storing vaccines be checked for maximum and minimum temperature and humidity, and that cold and hot spots be identified and compared with previous tests. To validate the tests, companies must have redundant, reliable networks to collect and communicate the sensor data. "Losing a single data point," says Wortley, "could potentially require a re-run of the 12- to 72-hour process."

Redundancy is very important. As such, GE Sensing added storage to its loggers to ensure that if a logger fails, the data is always stored within it for later retrieval via the RF network. The information in the sensor node is stored in non-volatile memory, so if the logger's battery dies, the user can replace it, and the sensor node will then rejoin the mesh network, and any data stored in the node can be retrieved by the network, up to the point of failure.

"In the highly regulated pharmaceutical industry," Wortley says, "data is critical to the validation process and cannot be lost. Even the extremely reliable RF mesh network technology cannot absolutely guarantee 100 percent data delivery, so GE Sensing added the additional redundancy layer of data storage in both the node and the gateway. We can achieve true 100 percent data reliability using this scheme."

RELATED_ARTICLES The partnership with GE Sensing is not Dust Networks' first. Last year, the company announced that Emerson Process Management would employ TSMP in its Smart Wireless products, designed for use with wireless networks at manufacturing plants.

GE Sensing's decision to use TSMP will help further boost Dust Networks' mesh networking technology, says Rob Conant, Dust's cofounder and VP of business development. GE Sensing's customers, he adds, also stand to gain from using TSMP-based sensors. "Wireless sensor networking technology will allow customers to measure and control more for less, resulting in lower costs, better energy efficiency and better productivity," says Conant. "Dust and GE Sensing's partnership will accelerate these benefits for GE Sensing's customers."