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Hardware, Software & Technology



HVAC Ducts Extend RFID Coverage

October 5, 2010

HVAC (heating, ventilating and air-conditioning) ducts might seem an unlikely choice for a communications medium, but a team of North Carolina State University researchers believe that hidden building infrastructure could be cost effectively used to transfer signals reflected by radio frequency identification (RFID) tags. The researchers say their finding promises to lead to significant time and cost savings for building owners and tenants, since remote sensor deployments could be made without the expense and effort of running wires.

RFID systems use centralized readers to collect data from small, lightweight tags that are equipped with radio antennas. An electronic interrogator transmits a signal at a specific frequency. When a tag receives the transmission, it absorbs the energy and responds by reflecting the wave.

The new technology could create new RFID applications for both building management and health and safety monitoring, says Prof. Dan Stancil, head of NC State's electrical and Computer Engineering department. "This would work with anything you can create an electronic sensor for," he says. He notes that the research opens the door to cheaper deployments of RFID-enabled smoke detectors, carbon-monoxide monitors and sensors that can detect chemical, biological or radiological agents.

The researchers focused their efforts on UHF RFID systems. When placed in open spaces, UHF RFID tags typically need to be within 16 to feet 33 feet (5 to 10 meters) of the interrogator in order to respond to a transmission. However, the researchers found that by using a building's HVAC system, UHF RFID tags can effectively operate when located within at least 98 feet (30 meters) of an interrogator.

"Because you can tap into existing infrastructure, I think this technology is immediately economically viable," Stancil says. "Avoiding the labor involved with installing traditional sensors and the related wiring would likely more than compensate for the cost of the RFID tags and readers."

Existing climate-control technology, for example, uses thermometers that are placed throughout a building, each of which is connected to a central climate-control monitor via extensive wiring. Using the new approach, management could distribute RFID tags with temperature sensors around the building, connecting them to the building's HVAC ductwork via short antennas. The tags could then send temperature data wirelessly to interrogators via the ductwork.

HVAC ductwork is an excellent conduit for radio transmissions, the researchers say, because the ducts typically consist of hollow metal pipes. The ducts guide the radio waves, keeping the signals from dispersing and helping them maintain their strength over a greater distance. While the researchers performed their experiments in a duct that was 98 feet (30 meters) long, they note that even longer transmission distances may be possible.

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