

The system, developed by a company named Zerofootprint, places passive high-frequency RFID tags into the electric plugs of appliances and other devices.

By Mary Catherine O'Connor

Nov. 17, 2009—[Zerofootprint](#), a Toronto-based company whose initial product is a software-as-a-service-based enterprise carbon management solution for corporations, has developed an RFID-enabled system for monitoring and managing home electricity usage, called the TalkingPlug. This system is based on an RFID-enabled electrical outlet and plug system that can track energy usage at the device or appliance level.

Ron Dembo, Zerofootprint's CEO and founder, says his company will make the system available this coming spring.

TalkingPlug Uses RFID-Enabled Power Outlets for Energy Management

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A TalkingPlug outlet contains built-in RFID interrogators to identify the devices that plug into it.

Zerofootprint developed the TalkingPlug system through a joint venture with [2D2C](#), a manufacturer of electrical outlet systems designed to improve safety. The TalkingPlug outlet, which plugs into a wall power outlet, contains two ISO 14443-compliant 13.56 MHz RFID interrogators—one for each of its two plug receptacles. Users place a passive 13.56 MHz RFID tag onto the plug of each of their appliances or electronic devices. The tag slides over the plug's prongs, and is set in place with adhesive. To protect it from the physical force of a plug being inserted into an electrical socket, the tag is covered with an epoxy coating.

The tag, made available through an industry group known as the [RightPlug Alliance](#), contains an RFID chip compliant with the ISO 14443 standard. Encoded to the tag's memory is a unique identification number. The outlets contain radios compliant with the IEEE 802.15.4 mesh network communication system, and communicate with each other and to a central gateway. The gateway could take the form of a standalone 802.15.4-compliant device, such as a network router, a thumb-drive attached to a PC, or an IEEE 802.15.4-compliant thermostat or smart meter.

A consumer will be able to use TalkingPlug's Internet-based Velo software to access data the gateway collects from the outlets. Each time a new device or appliance is plugged into a TalkingPlug, the consumer will utilize the Velo software to enter the unique ID number encoded to the RFID tag attached to that device's plug. Thus, the tag ID is always associated with the device or appliance, even if it is later unplugged from one TalkingPlug power outlet and replugged into another, anywhere in the United States.

As the appliance or device is used, the TalkingPlug outlet measures the amount of time the plug draws energy. The consumer can employ the Velo software to program specific appliances or devices to power off during specific times of the day when they are generally not in use, thereby saving energy. If a

consumer's electricity utility provider offers variable pricing, the Velo software can access this information via the Internet, and show the consumer what he is paying per kilowatt-hour for the energy being consumed.

If the utility has a demand-response program, the consumer can program Velo to provide power to certain devices or appliances, through communications with the TalkingPlugs, only when demand on the electrical grid is low and, thus, the electrical rates are low as well. What's more, being able to see the amount of energy an appliance or device uses can help consumers determine whether upgrading to newer, more efficient models will lead to energy and cost savings. Finally, the software can be utilized to benchmark consumption in order to help a household set and stick to energy-efficiency goals.

The RFID reader embedded in the TalkingPlug outlet can be set to provide power only when a plug, equipped with a RightPlug tag, is inserted. This is a safety feature that 2D2C designed into its flagship product, the SafePlug, upon which the TalkingPlug is based. The SafePlug is designed to help prevent electrical fire and shock, and uses overload fault circuit interrupter (OFCI) technology to detect dangerously high resistance connections, high line voltages and appliance overloads. A TalkingPlug outlet is the same as a SafePlug outlet, but with the addition of an ISO 802.15.4 (the same standard on which ZigBee is based) radio, used for networking the outlets and the gateway.

While the RightPlug tag contains a passive 13.56 MHz RFID inlay compliant with the ISO 14443 standard, it is customized in several ways, explains Steve Montgomery, 2D2C's executive VP. The tag's read range is stepped down to just three-eighths of an inch, so that the interrogator in each receptacle in the outlet reads only the tag in the plug inserted into it, and not the plug inserted into the adjacent receptacle. Furthermore, the air-interface protocol used for tag-to-reader communication uses special algorithms designed to authenticate the RightPlug tag, so that appliance and electrical device manufacturers could integrate the tags into their products, and the TalkingPlug outlet could verify that the products were not counterfeit.

The RightPlug Alliance and 2D2C have been developing the SafePlug and RightPlug devices for the past five years, Montgomery says, and are just now starting to bring the devices to market. The system is being marketed for safety and product authentication purposes, and now—through the TalkingPlug—as an energy-management device.

The use of RFID differentiates the TalkingPlug system from other home-energy-management systems currently on the market. Some of these non-RFID systems monitor individual outlets, Montgomery says, but are not designed to uniquely identify the appliance or devices plugged into the outlets—nor can they track the appliances or devices as they are moved from one outlet to another in the user's home, or elsewhere.

But the TalkingPlug system also comes with a higher price tag than a similar energy-management system—initially, it will likely cost \$50 per two-plug outlet. Dembo told reporters at a Monday press conference that his company hopes it will be able to lower costs to approximately \$35 per outlet,

through partnerships with utilities or manufacturers of appliances and other products powered by house current. The tags will cost very little—about 10 cents per plug cover, Dembo says—and the gateway may run in the \$20 to \$30 range. But consumers with smart meters installed at their homes could use them as a gateway for the TalkingPlug data as well, then utilize the Velo software to access the usage information through the local utility's site.

The TalkingPlug system would enable ratepayers to participate in demand-response programs, even if they do not yet have a smart meter in their homes. The more that response programs draw demand from participants, the better a utility can lighten demand for power during times when demand generally spikes.

"We are looking for technology partnerships to bring the cost [of the TalkingPlug] down," Dembo says, "and we are in discussions with consumer electronics manufacturers and utilities that are looking to be early adopters [of the system]." Electronics manufacturers could access their products' TalkingPlug data via the Internet, he adds, and use it as a means of improving customer management, by mining consumers' usage data for clues as to why a particular device or appliance is malfunctioning. If it were not drawing the proper current for that type of device or appliance, for instance, the TalkingPlug data would reveal that fact.

For consumers, the return on investment into the plugs would come, theoretically, through lower monthly energy bills, as well as through participation in a demand-response program, if their utility offers one.

The system is currently designed only for U.S. power systems, for 110-volt outlets. According to Dembo, Zerofootprint also plans to make outlets for 220 volts available to consumers in the United States and other countries.