

*Networking Your
Wallet, Credit Cards,
and Keys*

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Imagine a world where library books tell you they are on the wrong shelf and fruit reports it has gone bad to grocers. It is a universe where you can always find your keys or remote control.

This world is under construction in Associate Professor Dan Rubenstein's laboratories. His team is working with small tag-like devices that attach securely to everything from books to baseball bats. "They will let you track all the things you want to track without being tracked by entities you don't want to track you," Rubenstein said.

The devices are called EnHANTs, which stands for energy-harvesting active network tags. "They're designed to soak up energy from the environment to form a network with the tags around them. The networked tags then keep track of one another." Unlike similar radio frequency identification (RFID) tags, which turn on only when activated by powerful radio transmitters, EnHANTs would generate their own power by harvesting energy from ambient light, tiny vibrations, or temperature changes.

Unfortunately, this is not enough power to stay turned on all the time, communicate more than 10 feet, or send lots of information at a time. To get around those limitations, EnHANTs must network with other nearby EnHANTs and devices.

"Existing network protocols waste too much power to work with devices of EnHANTs' size. We have to be more efficient," Rubenstein said.

He imagines a room with 10 tagged possessions. The devices sleep to conserve energy, but turn on periodically to see what devices are nearby. Over time, the EnHANTs identify the other devices in the room.

A more powerful device, such as a home wireless network or smartphone, would query the EnHANTs and ask them what they see. Over a period of time, the network would build a map of the room's contents and any sensor data the EnHANTs had to communicate.

"If you start to leave your house and your wallet knows it should be with your belt, coat, and keys, it could tell the network to text a reminder to your cell phone," Rubenstein said.

Meanwhile, Rubenstein's group continues to work on shrinking prototypes to postage-stamp size. "We are really scaling back the components that go into a tag to see how small we can make it," he said. If he succeeds, we may never forget our wallet, keys, or bank cards again.

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