Researchers invent 'magic wand' to improve healthcare, cybersecurity

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Dartmouth College Professor David Kotz demonstrates a commercial prototype of 'Wanda' imparting information such as the network name and password of a WiFi access point onto a blood pressure monitor. Credit: Dartmouth College

Dartmouth College researchers have developed a digital "magic wand" to improve home healthcare and to prevent hackers from stealing your personal data.

The system, called "Wanda," will be presented at the IEEE International Conference on Computer Communications in April.

"Wanda" is part of a National Science Foundation-funded project led by Dartmouth called "Trustworthy Health and Wellness". THaW aims to protect patients and their confidentiality as medical records move from paper to electronic form and as health care increasingly moves out of doctors' offices and hospitals and into the home.

David Kotz, a professor of computer science at Dartmouth, says wireless and mobile health technologies have great potential to improve quality and access to care, reduce costs and improve health. "But these new technologies, whether in the form of software for smartphones or specialized devices to be worn, carried or applied as needed, also pose risks if they're not designed or configured with security and privacy in mind."

One of the main challenges is that most people don't know how to set up and maintain a secure network in their home, which can lead to compromised or stolen data or potentially allow hackers access to critical devices such as heart rate monitors or dialysis machines. There are three fundamental operations when bringing a new mobile device into the home, workplace or clinic: to configure the device to join the wireless local-area network; to partner the device with other nearby devices so they can work together; and to configure the device so it connects to the relevant individual or organizational account in the cloud.

In the new Dartmouth-based project, doctoral student Tim Pierson developed "Wanda," a small hardware device that has two antennas

separated by one-half wavelength and uses radio strength as a communication channel. The clever solution makes it easy for people to add a new device to their home (or clinic) Wi-Fi network: they simply pull the wand from a USB port on the Wi-Fi access point, carry it close to the new device and point it at the device. Within a few seconds, the wand securely beams the secret Wi-Fi network information to the device. The same method can be used to transfer any information from the wand to the new device without anyone nearby capturing the secrets or tampering with the information.

"People love this new approach to connecting devices to Wi-Fi," says Pierson. "Many of our volunteer testers remarked on the frustration they've encountered when configuring wireless devices at home and ask when they can take our wand home."

Kotz adds: "We anticipate our `Wanda' technology being useful in a wide variety of applications, not just healthcare, and for a wide range of device management tasks, not just Wi-Fi network configuration."

The THaW team conducts research related to mobile and cloud technology for health and wellness applications, including authentication and privacy tools to protect health records, methods to secure small-scale clinical networks and efforts to reduce malicious activity in hospitals. Supported by a $10-million, five-year grant from the NSF's Secure and Trustworthy Cyberspace program, the Frontier-scale project includes experts in computer science, business, behavioral health, health policy and healthcare information technology at Dartmouth College, Johns Hopkins University, the University of Illinois Urbana-Champaign (UIUC), the University of Michigan and Vanderbilt University.

Provided by Dartmouth College