

Sandia National Laboratories Laboratory Directed Research and Development

We welcome your questions, comments, and ideas for future LDRD projects to feature! Email your feedback to Marie Arrowsmith, mdarrow@sandia.gov

SECANT: Sandia Enabled Communications and Authentication Network using Quantum Key Distribution

SECANT team lead by PI Ryan Camacho

LDRD-developed portable system, developed using chip-scale quantum transceivers, will ultimately make sending, receiving, and processing secure signals in the field possible.

Securing communication networks against increasingly sophisticated cyber attacks depends on robust and reliable authentication methods. SECANT uses the laws of quantum mechanics (i.e., quantum key distribution) to enable secure communications in the field. Using advanced microfabrication techniques and innovative microdesign, the SECANT team has produced photonic microchips capable of sending, receiving, and processing quantum signals for applications in cyber and physical security. Made using nano-fabricated lasers, waveguides, modulators, frequency shifters, and detectors, each device is 3 mm x 5 mm, and weighs less than an ounce. The scalable manufacturing method of the quantum transceiver dramatically reduces the cost relative to existing technologies and, for the first time, makes quantum-secured data processing possible for hand-held devices.

Putting a table-top full of advanced quantum photonics technologies on a chip yields over 20 improvements in device functionality, system performance, and security. Functionally, the sub-micron feature sizes of the optical processors enable increased device speeds, with lower power requirements. At the system level, micro-integration of the quantum photonic elements allows for compact and scalable circuits. Thousands of devices can be printed at the same time and can be incorporated

directly into existing consumer electronics, such as laptops and cell phones. From a security standpoint, integrating optical elements into a microchip makes it exponentially more difficult for a potential adversary to access, analyze, or modify the system. Altogether, this first-ever chip-scale quantum communications circuit dramatically improves performance, form factor, and ease of use while driving down cost by orders of magnitude.

PANTHER: Pattern Analytics to Support High-Performance Exploitation and Reasoning

PANTHER team lead by PI Kristina Czuchlewski

Sandia's PANTHER team has developed solutions that will enable national security analysts to work smarter, faster, and more effectively when looking at huge, complex amounts of data in real-time.

PANTHER seeks to support high-consequence decision-making by unifying and advancing science across three key technical domains: sensor extraction, big data analytics, and human analytics. The project results will enable analysts to examine mountains of historical and current remote sensing data that would otherwise go untouched, while also gaining meaningful, measurable, and defensible insights into overlooked geospatial-temporal relationships and patterns.

PANTHER's accomplishments include rethinking how to compare motion and trajectories; developing software that can represent remote sensor images, couple them with additional information and present them in a searchable form; and conducting fundamental research on visual cognition. Capabilities developed by the PANTHER LDRD team are being used for specific applications in new projects sponsored by the Army, NA-22, TSA, and other US government agencies.

Read More: <http://tiny.sandia.gov/oje8v>

LDRD Participants Recognized

Ali Pinar and **Cindy Phillips** have been selected as distinguished members of the Association for Computing Machinery.

David Osborn has been elected a fellow of the American Physical Society's (APS) Division of Chemical Physics.

Jeff Brinker is among 168 distinguished innovators from around the world announced as 2015 Fellows by the National Academy of Inventors.

Jeff Koplw has been selected as the inaugural recipient of the Innovator in Residence Fellowship by the SunShot Initiative, a DOE enterprise to make solar energy fully cost-competitive with traditional energy sources by 2020.

LDRD PROJECTED BUDGET AND STATUS

FY16 Q2 \$155 MILLION 335 PROJECTS FUNDED AT \$144.7 MILLION

Upcoming Events

- Feb 25 - FY17 Call for Ideas closes at 6 pm. Get your ideas in!
- Feb 29 - Mar 1 Hostile GC EAB
- Mar 2 - Mar 3 Born Qualified EAB
- Mar 1 - Apr 6 - Investment Area review of Ideas



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