Opening architecture to make air travel safer and easier

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A Pacific Northwest National Laboratory staffer stands in a traditional millimeter wave body scanner. “Screening has largely been unchanged for the last 20 years, and this project provides an opportunity to really transform how this technology is leveraged for national security and safety,” Sandia optical engineer Ed Jimenez said. Credit: Andrea Starr, Pacific Northwest National Laborator

Air travelers may see faster, safer security checkpoints—no need to open bags or remove liquids or shoes—thanks to the award-winning work of Sandia and their partners who have developed an open architecture for airport screening systems.

The Open Threat Assessment Platform, developed with Pacific Northwest National Laboratory, NASA and industry partners for the Department of Homeland Security's Science and Technology Directorate and the Transportation Security Administration, will allow officials to respond more quickly and easily to rapidly changing threats to air travel safety.

The TSA's current screening systems, such as X-ray machines and body scanners, are proprietary systems that scan, annotate and report in different ways, without communicating with each other. "Only existing vendors can develop ways to address new threats, which have limited the TSA's flexibility to innovate," said project lead Andrew Cox, a Sandia research and development systems analyst previously at the TSA.

"When we wanted to change how we screen in response to new threats, the technology was too rigid. The TSA compensated by adding procedures. There's a shoe bomber and you have to take your shoes off; liquid explosives arrived, and the TSA had to limit liquids and gels," Andrew said.

Sandia partnered with Pacific Northwest National Laboratory, which developed a new high-definition body scanner, and industry partners like Stratovan to create the Open Platform Software Library, which will allow the TSA to work with any vendor for a needed algorithm.

Austin Silva, a Sandia cognitive scientist who oversees development of the library, said the open architecture will provide a common set of interfaces to develop against.

A wider variety of vendors will more quickly and reliably be able to create security upgrades with new algorithms that integrate into existing screening—seamlessly for travelers. "Like LEGOs, you'll be able to rapidly introduce new pieces," Austin said. The system may also be able to use different algorithms at different times based on threat level.

Better data collection means safer, more seamless travel

Faster innovation in detection will make air travel safer, said Ed Jimenez, an optical engineer at Sandia. The TSA will be able to collect data continuously and improve algorithms every few months. Standardizing and modularizing design with an open architecture should benefit industry. Once the TSA approves them for access, companies will be able to collaborate.

Improved scanners will also improve passenger experience. "When you put an object in your bag that's mistakenly flagged as a threat, the enhanced algorithm has the potential to not ring as a false positive alarm," Ed said. "You won't have to open the bag and slow down the line."

Now in its seventh year, the Open Threat Assessment Platform project has involved almost a dozen industry partners, including algorithm developers, X-ray vendors and software specialists. It's part of a worldwide push to open software architecture. Once deployed in the field, the platform will "change the safety profile of airports rapidly," Austin said. "We'll be able to say, we've seen this emerging threat; can anyone in the community develop this algorithm? From there, we'll be able to manage updates across the aviation security infrastructure."

While the Open Threat Assessment Platform is likely to save the TSA

money and provide revenue to industry, Sandia's involvement benefits the project because, Andrew said, "if you're going to develop a standard for one open architecture, you want it to be market-neutral. We're not going to be playing favorites with any vendor. Everything we or our subcontractors develop would be government owned. We were one of few with the technical expertise to oversee it, and we could implement contracts and partnerships to test out these ideas quickly and effectively."

The Open Platform Software Library's main code was primarily developed by Stratovan; Sandia continues to contribute cybersecurity expertise for analysis. "We can be the neutral party to evaluate code, then share our results in ways that are actively changing some of their design principles," Austin said. "We have been able to build cybersecurity into the design process."

Sandia also built a prototype TSA checkpoint at Kirtland Air Force Base to rapidly gather data on detection of live explosives in bags. "These systems are locked down in an airport," Ed said, "but we were able to procure an X-ray machine, stand up a checkpoint at an explosive range and collect data from real explosives scanned in suitcases. It increased our data acquisition; something that would take a full day took only hours."

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