

Trusted CI Success Story

Chicago Array of Things

Trusted CI aids Chicago Array of Things with public engagement and privacy policy

Chicago community leaders and Array of Things (AoT) science partners had a long list of questions they wanted to explore by measuring the environment and urban activities. What is the air quality, temperature, or noise level in a neighborhood at a specific time of day, and how do those measurements vary depending on whether they were taken near water, concrete, a park, a factory, or a congested intersection? How long are vehicles delayed at railroad crossings? Which Chicago parks get the most usage?

To explore the potential for a new type of urban/environmental measurement instrument that would provide data related to these questions and more, the National Science Foundation (NSF) funded the Chicago AoT project to develop a prototype using both traditional sensors and “software-defined sensors.” No company sold such devices, so the next step was to create a prototype for the sensor “nodes,” which enabled artificial intelligence capabilities and measurement without human observers, but required cameras.

Since one of the goals was to stimulate youth interest in science and technology, the AoT team partnered with the School of the Art Institute of Chicago to design the

devices to be conspicuous, inviting curiosity or even engagement, resulting in a bright, inviting, and friendly design. Project leaders also wanted stakeholder involvement in what to measure and where to place the nodes. Above all, they wanted to address privacy in a transparent fashion.

In 2016, two years before the first nodes would be installed, the AoT team began a series of community open house meetings. That’s when AoT reached out to [Trusted CI](#), the NSF Cybersecurity Center of Excellence. “The community meetings underscored the value of transparency in the development of policy and privacy practices,” said Charlie Catlett, principal investigator of the project and a senior research scientist with the Discovery Partners Institute of the University of Illinois. “We felt that AoT would only succeed if the residents of Chicago were not just tolerant of the project but actually felt ownership.”

“Having an external group walk through our rationales was extremely helpful,” Catlett said. “Trusted CI provided a valuable third-party review of our approach to cybersecurity threats and our initial privacy policies, and they were particularly helpful observing and reviewing the concerns voiced in public meetings and online forums.”

During the public workshops, AoT leaders and city partners emphasized a commitment to privacy, explaining that images would be temporarily stored in cameras for analysis in place,



Figure 1: An Array of Things node. In the blue enclosure: edge computers, upward-facing camera, and light sensors; in the white enclosure: a cellular modem, street-facing camera, and environmental and air quality sensors. (Image © University of Chicago, used with permission)

then deleted, and stressing that no image processing would identify individuals (faces, license plates).

Early on, said Catlett, some news opinion pieces were critical, but for the most part, once AoT’s goals and policies were explained, these critiques became rare, and privacy and ethics were a non-issue with the public. “We worked really hard to be transparent. We published an exhaustive list of what we were doing with the images and data, rather than a list of prohibited uses, which implied an infinite number of potential uses,” explained Catlett.

Over the next four years, more than 200 AoT nodes were installed, and the experiments began. Basic capabilities for software-defined measurements were developed. As the NSF project concluded, the team obtained a larger NSF grant, called “[SAGE: A Software-Defined Sensor Network](#).”