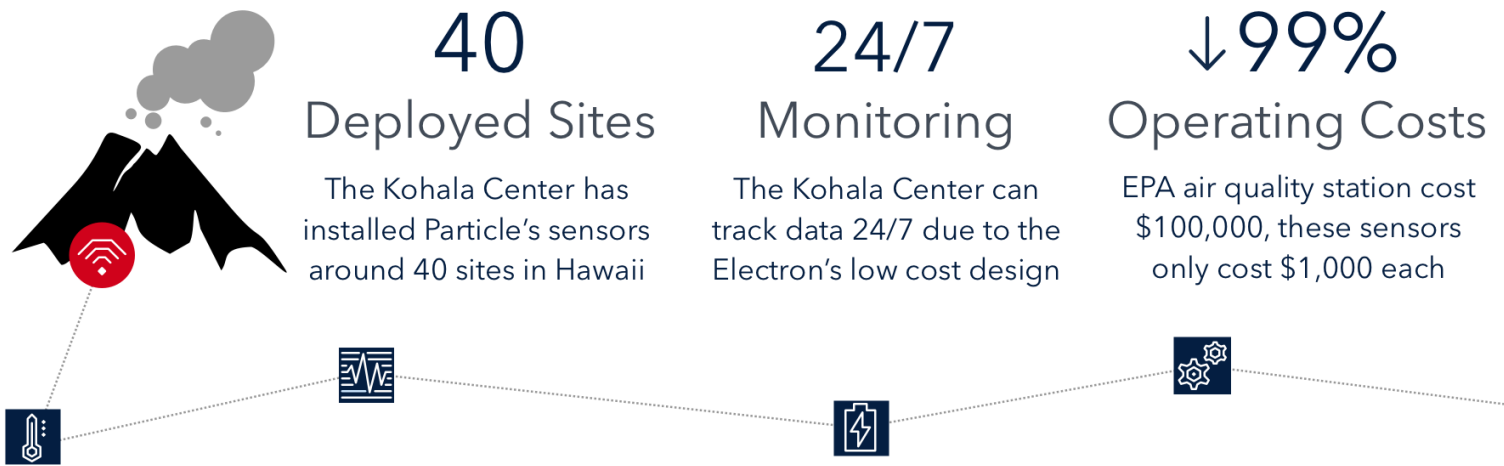# SCIENTISTS DEPLOY AN IOT NETWORK TO BATTLE KILAUEA'S DEADLY FUMES

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TECHNICAL CONTENT WRITER

Tracking volcanic pollutants with the Hawai'i Island Vog Network

Scientists at MIT and the Kohala Center have created a **Hawai'i Island Vog Network** that provides real-time measurements of hazardous fumes like sulfur dioxide and particulate matter in Hawaii. The network collects data using low-powered sensors that are stationed near eruption zones and are connected to the Internet with **Particle's Electron**.

40
Deployed Sites
The Kohala Center has installed Particle's sensors around 40 sites in Hawaii

24/7
Monitoring
The Kohala Center can track data 24/7 due to the Electron's low cost design

↓99%
Operating Costs
EPA air quality station cost $100,000, these sensors only cost $1,000 each

Kilauea's ongoing eruptions

The MIT scientists and the Kohala Center hope to learn more about pollutants in Hawaii's atmosphere and provide this information to the public through accessible means. The need for this network could not be more timely as the most active volcano on Hawaii, Kilauea, erupted early May. In a month's time, Kilauea destroyed around 700 homes, caused at least 21 fissures to emerge, and exposed residents to high levels of sulfur dioxide gas. Even today, these hazardous fumes are seething from the volcano with geologists warning that these eruptions could last for months or years to come.

> "We're one of **the main groups really using IoT sensors for science** and improving them from the engineering side to make them usable for other scientific pursuits"
>
> David Hagan
> Physics PhD Candidate, Massachusetts Instuitue of Technology

Particle jumpstarts the path to production

At first, these MIT Scientists developed prototypes using Arduinos and Raspberry Pis. However, after some tinkering, they concluded that these developer boards wouldn't work at a commercial level. They needed boards that could easily connect to the cellular network without the hassle of trying to buy their own SIM cards. The Particle Electron comes with an sim card pre-installed, which allowed them to focus on their product and less on connectivity constraints.


Particle's Electron Kit

The Electron is a tiny development kit for creating cellular-connected products.
It comes with a Particle SIM card with service in more than 100 countries worldwide.

Particle's Electron reduces the cost of monitoring volcanic emissions

The Environmental Protection Agency typically creates air quality stations to monitor for toxins and air pollutants. Unfortunately, these type of stations can cost around $100,000 to setup. However, with Particle, these scientists were able to create air quality monitoring sensors for just $1,000 each.
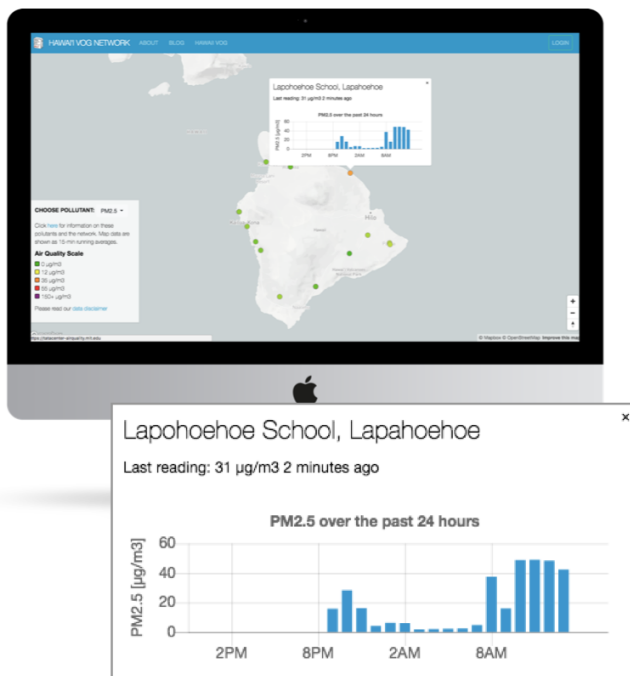
The Electron's small size and low-cost allowed the two groups to deploy their sensors more widely than typical air quality monitors, which means they could capture highly localized air quality data. With the Particle Electron's cellular SIM card, these sensors were able to transmit data to the Hawai'i Island Vog Network remotely, without the need of human intervention.

The Electron was also extremely easy to setup, they just had turn it on and it would find a cellular network automatically. This was an important factor for the Kohala Center because they wanted something that was easy to reset or troubleshoot if any issues occurred.

Measuring Urban Air Quality in Delhi, India

David Hagan, one of the MIT scientists, has found great applications for these expensive sensors in Delhi, India. According to the World Health Organization, India contains 14 of the world's most polluted cities. Most of these cities only have a couple of air quality sites to monitor these air pollutants, but these sites are unable to provide specific data that is needed for monitoring exposure.

However, these Electron-powered sensors are providing the granularity that is needed to better understand the pollutants that arise in an urban environment. The Particle Electron is designed to make the most of every byte. A fully encrypted message can use as little as 50 bytes, or approximately 60x less data than a typical HTTPS request, which allows David to focus on gathering data for his project and less on data costs.

Particle's Electron works with Particle's Cellular IoT SIMs to provide 2G/3G/LTE connectivity at affordable prices for IoT devices around the world.

For Science and the community

With Particle, these researchers and MIT and Kohala Center are providing reliable, accurate, and real time information on air pollutants in Hawaii and megacities. Not only are the devices cheaper to deploy and easy-to-use, they are increasing the accessibility of data for those who need it. They've already partnered with local schools on the big island to weave in environmental science and data analysis to the curriculum. The Hawai'i Island Vog Network website is now online at voginfo.com! While more sites will be added in September, the site currently offers air quality information for many Hawai'i Island communities regularly and/or significantly impacted by vog.

Start building your IoT product by checking out the Electron on the Particle Store or contact our team of experts at Particle.io/sales to discuss solution development.