PARTICLE fracsun

How Fracsun Deployed Solar Soiling Measurement Around the World With Particle

Case Study

particle.io

Executive Summary

Problem

Fracsun needed to deploy devices that would measure solar panel soiling in remote locations. The team struggled to find a solution that would give them reliable connectivity. As a startup, Fracsun was also eager to avoid hiring firmware, hardware, and cellular engineers just to get to market.

Solution

Particle was compelling to Fracsun because it handled software, cellular connectivity, and hardware all in one solution. The ease of development on the Particle platform-as-a-service would also allow Fracsun to build without hiring a team of engineers or design partners. This would speed up Fracsun's time to market and keep the total cost of ownership of the product low.

Results

Fracsun was able to get to market months sooner than if they had built their own IoT capabilities using Arduino or a similar solution. The team was able to use Particle to not only prototype, but go to production without adding headcount, worrying about hardware quality control, or handling device management themselves.

The Company: Fracsun

Fracsun optimizes solar asset performance by providing both the hardware to measure photovoltaic soiling and the software to determine the financially optimal days to clean a solar plant. With the exception of physically cleaning panels, Fracsun offers a full solution for solar plant owners and operators to understand more about how soiling is affecting solar production.

Fracusun serves customers in the commercial, distributed, and utility-scale solar markets, offering solutions to solar builders, owners, operators, Engineering, Procurement and Construction (EPC) firms, asset managers, and OEMs.

Problem

Fracsun's customers often struggle to determine exactly how much energy production is lost due to soiling in dry regions. Soiling (which involves the buildup of dirt, dust, and other particles on panel surfaces) can cause an energy loss of 30% to 40% compared to soil-free panels. Depending on the size of a solar project, this could mean a financial loss of tens to hundreds of thousands of dollars per year.

Cleaning solar panels can be extremely expensive, as determining whether remotely installed panels need to be cleaned is often a manual process that involves sending a technician to measure soiling or using outdated SCADA systems that make gathering and interpreting soiling data a long and disjointed process. Additionally, panels cannot produce energy while they're being cleaned, so waiting until periods of low production is critical to ensuring energy loss is minimized during maintenance.

Fracsun aims to solve this problem by giving its customers real-time soiling data without relying on existing onsite equipment. As Fracsun COO Bryan Fisher explained, his team's solution would make use of Internet of Things technology to easily deploy custom sensors on customers' solar panels, connect the sensors to the Internet, and open a data stream between the solar panels and the cloud.

However, building this solution was proving difficult. In addition to deploying and monitoring a high volume of devices across a geographically dispersed customer base, Bryan and his team wanted to maintain consistent and reliable cellular connectivity across the devices—which was both challenging for a team without deep cellular expertise and critical to facilitate real-time monitoring and over-the-air updates.

Without a dedicated hardware and firmware expert on the team, Bryan began searching for a solution that would provide the ability to quickly scale sensor deployment without the need to hire a whole fleet of engineers. That's when he discovered Particle.

Solution

Particle offered Fracsun a compelling solution for its hardware, connectivity, and software needs.

“For the hardware, we wanted something that worked off the shelf, but still gave us the flexibility to customize our solution,” Bryan said. “As a startup, we have limited resources and money to develop fully custom solutions. The fact that Particle had a ready-to-go module helped us build our solution faster and at a lower cost.”

Bryan noted that Particle’s off-the-shelf yet customizable hardware not only reduced costs and sped up Fracsun’s time to market, but made it much easier to maintain quality at scale.

“As you produce more units and get them out in the field, quality control tends to become an issue,” Bryan noted. “We liked that Particle would basically handle all the hardware quality control for us.”

On the connectivity side, Bryan’s team appreciated that Particle would oversee managing cellular connectivity across a distributed fleet.

“We are not experts in cellular protocols,” Bryan acknowledged. “Particle does all that work for us. The Particle Device OS firmware manages all the cellular functions so we can connect and publish data easily.”

The software offerings via Particle Cloud also make managing a distributed fleet across multiple customer deployments much easier than comparable solutions.

“We wanted a solution that would allow us to see the health of all of our devices in the field, no matter where they were in the world,” Bryan said. “Particle’s console made it easy to see the health of our fleet and hone in on specific subsets of it to gauge device health.”

Moreover, Particle’s software offered ease of development for Bryan, who picked up Particle’s coding language quickly.

“I'm personally familiar with the Arduino development background and C++, but the Particle software is even more powerful than Arduino, in my opinion,” Bryan said. “That was a big reason why we felt Particle was the right solution.”

The combination of the console overview, device and SIM card management, simple OTA firmware updates, and in-depth documentation made the software ideal for Fracsun’s goals.

“Particle makes it very simple for a company like Fracsun to quickly bring an idea to market,” Bryan concluded. “They offer all the tools you need to not only prototype but build a production-ready solution.”

Results

Provable, Fast ROI for Customers

According to Bryan, customers with large solar deployments can be ROI-positive with Fracsun in under a year—and for smaller solar plant owners, ROI can be realized anywhere from one to two years.

"The ROI depends a lot on whether the customers were washing too much or not enough," Bryan explained. "In either scenario, the customer can be ROI-positive very quickly."

Fracsun is able to use the data its product generates to compare energy efficiency—and, thus, revenue—to prove that using soiling data to make maintenance decisions can significantly improve system efficiency and avoid downtime during peak generation. The ability to back up such claims with reliable data, as Fracsun did with this case study, makes the offering even more compelling.

Getting to Market While Staying Lean

Although Bryan and his team were originally evaluating Arduino-based solutions, they came to understand that additional hiring would be required to fill the gaps in expertise across the entire IoT stack. When Bryan evaluated Particle, he realized his Arduino expertise would translate perfectly while giving him a full stack of technology right out of the box.

"Particle seemed similar to Arduino in a way that you could program it and you could make it do whatever you want to based on the code that you put in there," Bryan said. "But I found that Particle was just so much more powerful. It gave you so much more that made scaling your project easy compared to Arduino."

In addition to full-fleet visibility, Particle's solution also solved difficult firmware challenges that would otherwise have required Bryan to increase his team's headcount.

"Particle took care of all the device firmware that runs in the background for us," Bryan explained. "From there, I was able to create a program on top of the Particle Device OS relatively quickly."

Using Cellular IoT to Deliver a Step Change for Customers

Bryan sees the solar monitoring industry moving away from older, more rudimentary technologies like Modbus toward IoT-based sensors, and he wants Fracsun to lead the charge.

With Modbus-based solutions, you have to run a conduit line to a data box, which limits where you can deploy the system. By contrast, a cellular-based IoT solution allows Fracsun's customers to get reliable connectivity and place the sensors wherever they want. Consequently, they can measure more widely and get more accurate results than ever before.

Reliable cellular connectivity allows solutions providers like Fracsun to lead their industries with the new wave of IoT solutions—even in rural areas where Wi-Fi isn't an option.

"Having a technology partner like Particle that has cellular connectivity just built right into it makes it easy to deploy our sensors and actually control them remotely," Bryan said. "Thanks to Particle, we're able to sell into any market where there's cellular service. It gives us all the tools we need to scale on a global level."

Work with Particle

Particle has helped market leaders and innovative new companies alike bring IoT projects to life for over a decade. What makes our platform different?

Secure and reliable

End-to-end encryption from hardware to connectivity to cloud, with SOC II and GDPR certifications, public/private key authentication, open event logging framework, encryption at REST, encrypted API messages, and firewall protection.

Scalable

We've helped connect and launch hundreds of thousands of devices, with a fully managed cloud infrastructure processing billions of messages a month and zero planned downtime.

Upgradable

Wirelessly reprogram your fleet of vehicles in the field with our over-the-air (OTA) software updates without any hardware or software scalability issues, and add product features, improve bugs, and avoid vehicle disruption with the push of a button.

Open

Use our APIs and open, referenceable system architecture to access and share vehicle data to multiple different stakeholders of your choosing or integrate seamlessly into existing software architecture without any security hassles.

Global Connectivity

Our IoT-specific SIM card is built into our hardware and is powered by over 350 carriers around the world that automatically connect to the best networks across 2G, 3G, and LTE technologies, designed to make IoT cellular management simple and unified.

All-in-one

A pre-configured network and applications so devices remain online

Secure by Default

End-to-end encryption, limited attack vectors, a firewall-protected cloud, and more

Scalable Infrastructure

Sensor hardware are cloud platform that works the same from your first prototype to your millionth unit

Domain Experts

Developer community, support, & engineering services ready to assist

Data Autonomy

Put your data where you want - integrate with AWS, Azure or anything with a REST API

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About Particle

We love helping game-changing energy solutions providers get connected products to market faster and at a lower cost of ownership. Learn how we can help.

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