HOW TO SOLVE THE 6 BIGGEST CHALLENGES IN MICROMOBILITY WITH THE INTERNET OF THINGS

As more and more companies enter the micromobility space, they are facing unparalleled challenges when building and deploying electric scooter and bike fleets. Nowadays, a typical player in the space not only has to build, deploy, and scale their micromobility operation rapidly, but they also have to navigate complex governmental regulations that change city-by-city.

These new governmental regulations have forced many micromobility companies to take a closer look at their business and the systems that power it. While rapid deployment is still important, the most successful micromobility companies are now building flexible mobility ecosystems that are able to adapt to future business challenges. One of the biggest ways operators are creating these flexible mobility ecosystems is through the Internet of Things.

Companies that take their time and implement comprehensive IoT solutions are able to overcome some of the biggest challenges in the micromobility industry. Although, many companies often overlook the many ways IoT solutions can solve real business challenges. In this guide, we'll explore how IoT is transforming the micromobility industry, and how the right IoT partner can help you build a flexible mobility ecosystem.

Section 1: Addressing city regulations

Governmental regulations change city-by-city. With the right IoT solution in place, micromobility companies can wirelessly update scooters to follow new city laws.

Section 2: Ensuring data compliance

IoT cloud platforms can help companies segment data and send it directly to municipalities.

Section 3: Preventing software bugs and security vulnerabilities

To combat firmware and security vulnerabilities, many operators have started using OTA (over-the-air) firmware updates to reliably fix bugs and product behavior.

Section 4: Designing a safe micromobility service

The best scooter and bike-sharing companies share a responsibility to keep their riders safe, and the right IoT hardware can help protect riders.

Section 5: Preventing and reporting vandalism

As scooter vandalism rises, many operators have started to use mechanisms enabled by connected IoT sensors to counteract damage and theft.

Section 6: Scaling a scooter or bike sharing service

A single IoT platform can provide you all the services you need to scale your services reliably.

1. Addressing city regulations

One of the main challenges for micromobility operators is that governmental regulations (like speed limits, parking rules, vehicle caps, and other laws) change city-by-city. This means operators need the ability to change the underlying product behaviors of their scooters to adapt to city regulations. For example, when deploying a fleet of scooters, operators need to be able to enforce that their scooters are parked in the right areas and follow speed limits that have been mandated by the city.

This can be accomplished with a scooter's internal IoT device. With the right IoT solution in place, operators can wirelessly program a sensor to slow down a scooter when needed. An IoT device could even warn a rider that they need to park their scooter at a docking station before they can get off. The same IoT device can send information to the user's phone to let them know where the nearest docking or parking station is located.

2. Ensuring data compliance

Operators are often required to give mobility data (like traffic patterns and environmental conditions) to cities as part of their license to operate. This can be a complex networking challenge because companies must give cities access to the device data that they need, without giving them access to all their data. As more and more data-sharing regulations are put in place, many micromobility operators are partnering with IoT companies to build services that make it easy to share data.

**Cloud
(Data-Broker)**

Dockless Bike Fleet

Municipalities
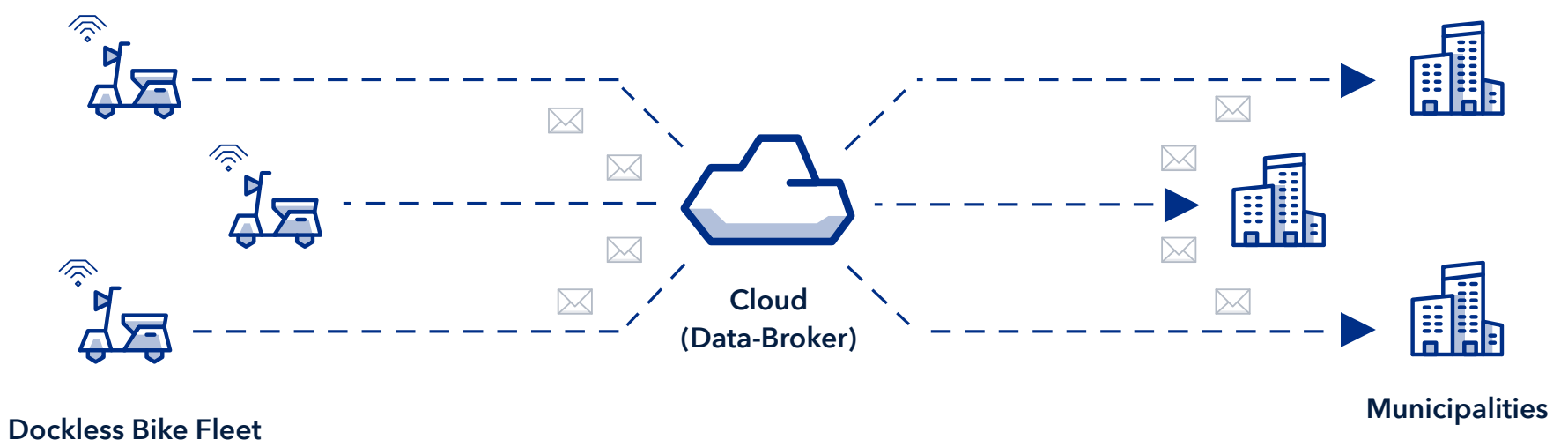
When looking for an IoT partner, you want to find a service that can act as a data-broker between your scooters and the city. For instance, the Particle platform is designed to let you send your data where you want. The Particle Device Cloud supports integrations so you can seamlessly connect device data with the services your business relies on.

3. Preventing software bugs and security vulnerabilities

New software bugs and security vulnerabilities are discovered all the time in electric scooters and e-bikes. In February 2019, a major scooter company issued a warning to their riders about a firmware bug in the company's system that could cause a scooter to unexpectedly brake mid-ride. In the same month, a security research firm also discovered that hackers could make bikes suddenly accelerate or brake mid-ride thanks to a flaw in bluetooth modules.

To combat these firmware and security vulnerabilities, many operators have started using OTA firmware updates to reliably fix product behavior. OTA firmware updates refers to the practice of remotely updating the code on a remote embedded device. With OTA firmware updates, bugs and product behavior can be continuously improved even after a product has been deployed in the field.
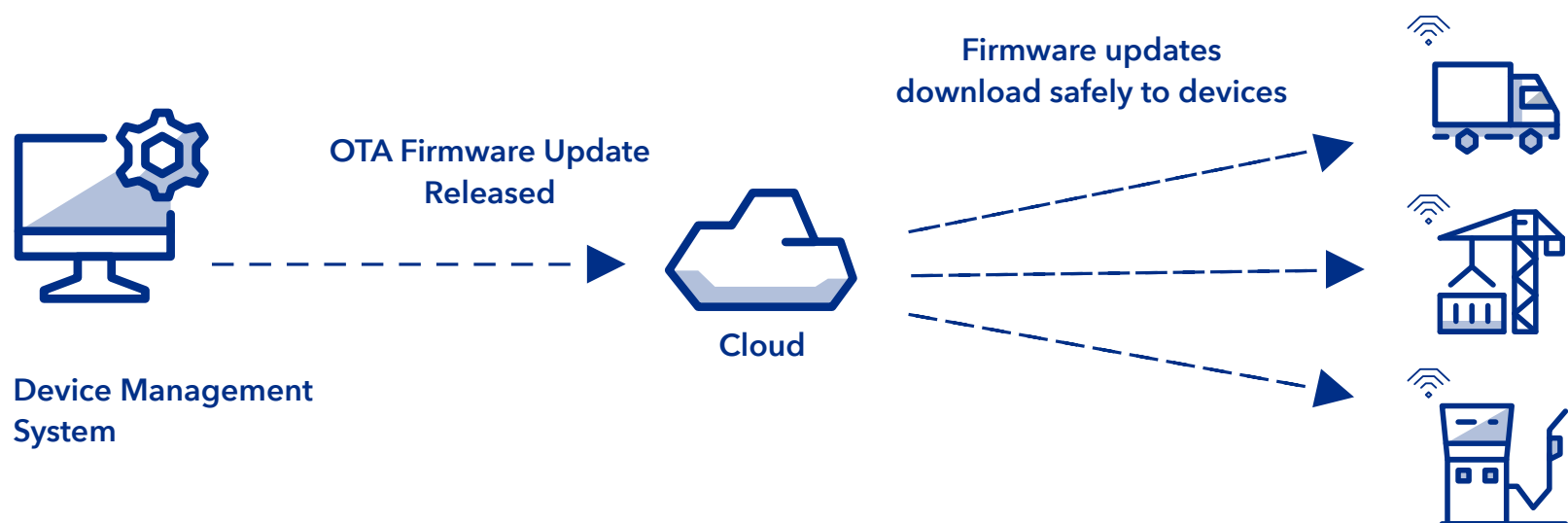
To send out OTA firmware updates, you need a device management system that can interface with microprocessors and local software on IoT devices. This is complicated to build because few companies have an IoT software and hardware ecosystem that can process OTA firmware updates and manage remote devices. At Particle, we have worked hard to integrate our infrastructure so you can seamlessly deliver OTA updates to devices at any scale. Some of the benefits of our system are:

- **Developers can rapidly respond to bugs** and security vulnerabilities without the need for physical recalls of devices or truck rolls.
- **Engineers can deploy frequently and reliably**, knowing that the products will stay functional as updates are released.
- **Companies can add new software features** to a product after a device has been deployed in the field to improve functionality over time.

4. Designing a safe micromobility service

The best scooter and bike-sharing companies share a responsibility to keep their riders safe, and the right IoT sensors can help protect riders. For example, many scooter companies are starting to use IoT sensors to determine if a rider is driving in a straight line or wobbling. If a sensor detects a rider is wobbling, it can be programmed to warn the rider or slow down the bike. A feature like this is especially important for counteracting drunk riders who are not in the right state of mind to drive.

However, if you don't have the right IoT hardware or sensors, building and implementing safety features like these can be a challenging task. When comparing IoT hardware for your scooter or bike fleets, you should look for connectivity hardware that can be updated wirelessly (i.e. OTA firmware updates). This advanced functionality allows you to continuously add new product features as you scale your scooter or bike fleets. This is important if you want to avoid having to retrieve old devices to install new product and safety features. While there are many connectivity hardware modules on the market that come with OTA functionality, they are not all built alike. When comparing vendors, build a prototype with their hardware and OTA firmware to make sure they work together seamlessly.

5. Preventing and reporting vandalism

As scooter vandalism rises, many operators have started to use mechanisms enabled by connected IoT sensors to counteract damage and theft:

- **Locating stolen vehicles** – Companies can locate and retrieve stolen scooters by tracking units through sensors attached to the scooter.
- **Preventing theft** – Connected sensors can disable wheel movement and trigger an alarm if it detects a possible theft attempt.
- **Power monitoring** – Sensors can active an automatic kill-switch to a scooter if it is disconnected or detects any other component have lost power, deterring vandals from stealing components.
- **Remote monitoring** – When not in use, sensors on an electric scooter can map their environment, reporting vandalism when it happens and sending that data back to the company and municipalities. This data would not only help build relationships with the city, but help operators learn where the scooter vandalism happens the most.

Of course, you need the right IoT hardware and device management system to build features like these in your scooter or bike fleets. When looking at IoT providers, you want to choose a platform that provides you connectivity hardware that allow you to change product behaviors out in the field.

6. Scaling a scooter or bike sharing service

Every project faces scalability issues, but imagine scaling up from 100 to 10,000 or a million scooter or bikes. If you don't scale correctly, your costs will skyrocket and your system will fail. When scaling IoT, you are not scaling a single technology or product, you are scaling an entire process. You have to scale business operations, data processes, product infrastructure, manufacturing infrastructure.

It's difficult to adapt to customer and market needs, and even more difficult to add new IoT device feature offerings. Even when creating a self-hosted solution, network architects need to depend on a number of vendors for sensor hardware, radio technologies, and cloud platforms. If you choose the wrong vendor, you might find yourself stuck with an incompatible piece of hardware or software.

That's why many scooter and bike-sharing companies choose to build with a single IoT partner who can provide all the hardware, software, and connectivity needed for deploying an IoT product. When scaling rapidly, you also want to find business partners who are equally invested in helping you grow your enterprise. When looking for an IoT partner, you should look for someone who can can provide the tools and help you build your connected product every step of the way. You should look for a IoT platform that offers the following services:
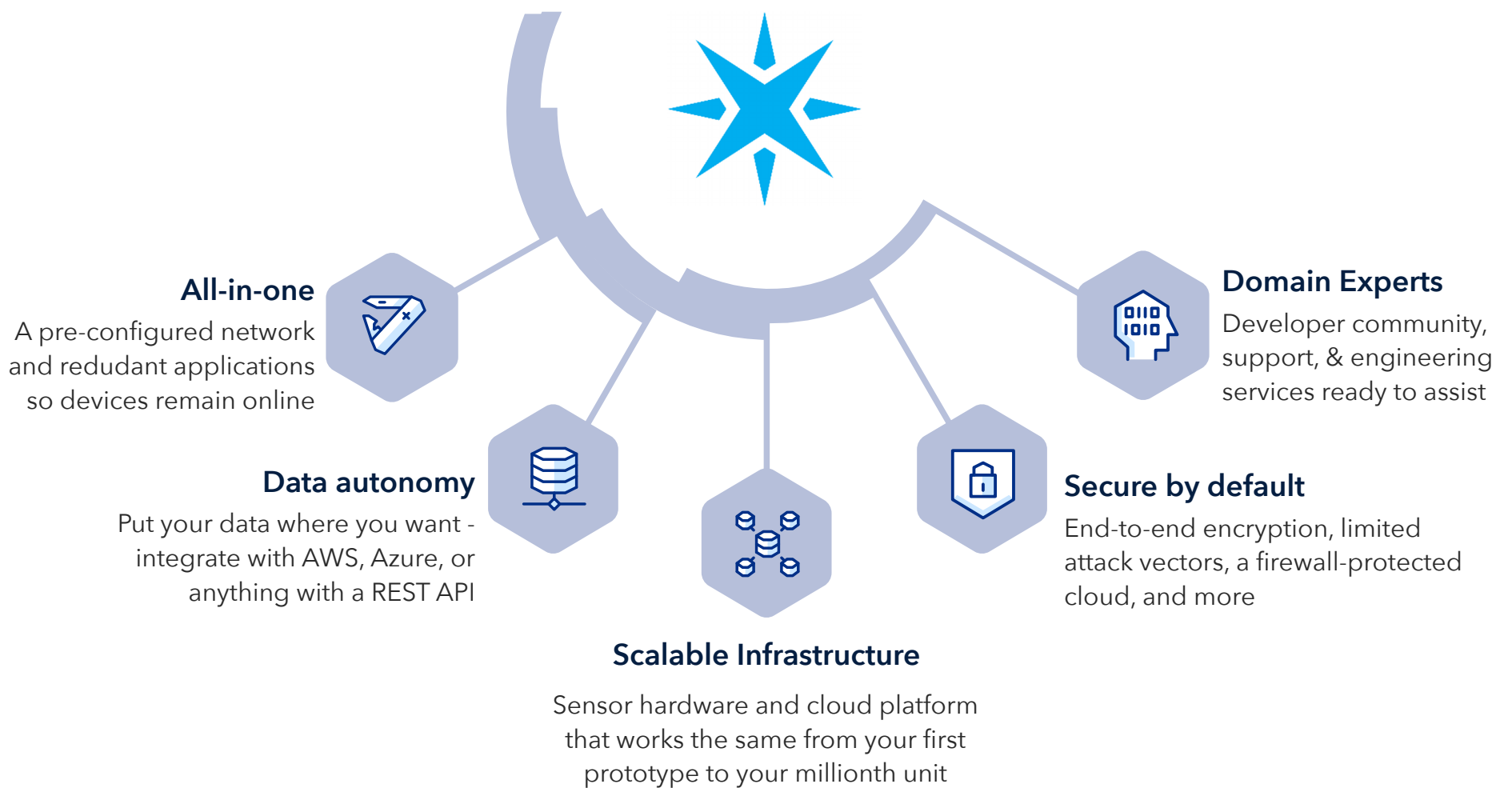
- **Engineering services** – A team of experts who can help you build your product from prototype to production.
- **Manufacturing services** – A team of IoT experts who can help you acquire certifications and manufacture your connected product at scale.
- **Support services** – A support team who can answer questions if you are having any difficulties with your connected device.

Getting started with Particle

As a trusted enabler of IoT, Particle can help you power, manage, and scale your micromobility fleets. Particle has helped many companies (like Jacuzzi, Logical Advantage, and Opti) build smart solutions that cut operational costs and help grow new revenue streams.

> Particle provides your business with the **hardware, software, and network infrastructure** it needs to overcome the innumerable challenges of IoT.

Particle differentiators

All-in-one
A pre-configured network and redudant applications so devices remain online

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

Scalable Infrastructure
Sensor hardware and cloud platform that works the same from your first prototype to your millionth unit

Domain Experts
Developer community, support, & engineering services ready to assist

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

How to start your IoT journey

Starting your own IoT project may seem challenging or near impossible (as a matter of fact, nearly three-fourths of self-initiated IoT projects are considered a failure, while a third of all projects were not seen as a success). The two biggest contributors to the failure rate are: lack of internal IoT expertise and platform (hardware/software) reliability. With Particle, you have full access to IoT experts, a large community of IoT enthusiasts, support services, and professional engineering services (Particle Studios) to help you get your IoT projects off the ground. Additionally, you will be building on top of an enterprise-grade, production-tested IoT platform used across the industry.

Check out the Particle store

Start your IoT journey by checking out our industrial hardware on the Particle Store.

Contact our experts

Contact our team of experts at Particle.io/sales to get a personal demo of the platform.