



# Ofo Bicycle Internet of Things Case Study

## Introduction

Ofo bikes was founded in China in 2014 and currently operates over 10 million dockless hire bikes in over 180 cities around the world. In China, Ofo operates in all major cities including Beijing, Shanghai and Guangzhou. They have partners with China Telecom in China to improve their operations and make their hire bikes easier to use and lower the cost of managing them.

Ofo promotes the sharing economy, with their bicycles available to be hired at any time by any user who has installed the Ofo app. As such, Ofo needs to deploy network technologies which are simple to implement, offer a good quality of service, and do not affect the users experience of hiring or using Ofo bikes.

Ofo have to date been using a 2G GPRS modem in their bikes to allow for the bicycles' locks to be opened when a user requests to use them via the app. This has created a few issues for Ofo, such as having to adapt their bikes to recharge the modem's battery whilst the user cycles, forcing users to have to wait up to 25 seconds for the lock to open, and lack of coverage leading to failure to open the locks, all of which adds cost and complexity to their operation.





### **NB-IoT Dockless Bicycle Deployment**

Ofo has signed an agreement with China Telecom and Huawei to implement NB-IoT in their dockless hire bikes to solve some of the issues that they have been experiencing and improve the user experience. China Telecom are providing the NB-IoT network and Huawei are providing the NB-IoT chips and platform.

The aim of this agreement is to demonstrate that NB-IoT is a beneficial technology for Ofo bikes. This was demonstrated by showing that NB-IoT makes it easier for users to find a hire bike through the Ofo app, the time taken to unlock the bike and lock it again at the end of the hire period is reduced, coverage is improved so that no failures of bicycle unlocking occur, and finally to prove that Ofo are able to bill the customer accurately with the usage information that they receive from the NB-IoT connection in the bicycle.

### **Benefits to Ofo**

NB-IoT has delivered some significant benefits to Ofo bicycles compared to their existing 2G communications solution.

**Battery Life** – NB-IoT is designed for power optimisation, meaning that it can operate from battery power and maximise battery life span for up to 10 years. The current 2G solution has to be charged by a charging unit built into each bicycle and operated as the user pushes the pedals around. This adds cost to each bicycle that Ofo produce.

**Coverage** – NB-IoT is based on LTE, but is designed to offer improved coverage of up to -20dB over existing LTE networks. This means that bikes which currently do not receive coverage are likely to be able to connect to the network with NB-IoT,

even if the bicycles are located indoors or in underground parking garages.

**Scalability** – NB-IoT is based on LTE, and is designed purely for IoT connectivity. It is therefore well suited to Ofo's requirements as it can scale to connect millions of bicycles in a city, and offer enough bandwidth to successfully operate each bicycle individually. Users of the Ofo app should see no degradation of service no matter how many users or bikes Ofo deploy in a city.

### **Outcomes**

The initial deployment of NB-IoT connected Ofo bikes has been a success, and has significantly improved the experience for Ofo and their users.

**Response times** – The NB-IoT connection significantly shortens the time delay for opening and securing the smart lock on the bicycle. Compared to the 2G lock, NB-IoT has improved the time delay from the previous 25 seconds to 5 seconds or less. This means that Ofo users can more quickly get onto their bikes and head off to their destinations.

**Battery Life** – The new NB-IoT modem batteries have shown that they do not need regular recharges or replacements. The new system has shown battery life of more than 2 years without any recharging needed, reducing both the cost of operation and maintenance of the bicycles.

**Coverage** – Improved coverage available from the China Telecom NB-IoT network means that the Ofo bikes are able to connect and run smoothly in all areas of the city, and Ofo can actually now deploy their bikes into areas that they previously would have been unable to offer a service in.

### Conclusion

This NB-IoT deployment for Ofo from China Telecom and Huawei has shown that there are significant benefits for Ofo. They are able to both improve the customer experience and reduce their operational and maintenance costs. NB-IoT is a clear contender to connect the many millions of dockless hire bikes that Ofo is deploying around the world. Its global

footprint means that Ofo can build a single version of their bicycle which will be able to connect to a local Nb-IoT network anywhere that they want to operate.

NB-IoT gives Ofo the opportunity to focus on improving their service and offering new, innovate services to their users that are powered by NB-IoT.





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