

# RFID ON THE MOVE

## A GUIDE TO USER AUTHENTICATION AND ACCESS CONTROL FOR THE BIKE SHARING ECONOMY



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#### USER AUTHENTICATION AND ACCESS CONTROL FOR THE BIKE SHARING ECONOMY

The bike share market is exploding around the world—and it's easy to see why. What better way to navigate a busy city or large campus? Bikes and scooters are perfect for traveling distances a bit too far to walk but too short to justify a bus or a cab. Bike sharing (and scooter sharing) give people access to these transportation resources when and where they need them, without the expense of ownership or the inconvenience of lugging their own equipment from home.

In many communities, bike sharing has become an important part of the transportation ecosystem.

- + For regular commuters, bikes can provide "last mile" transportation between bus or subway lines and job sites or residential communities.
- + For visitors to a city center or tourist area, bike sharing provides an easy way to get around the local area.
- + On large university or corporate campuses, shared bikes and scooters allow students, faculty or staff to move quickly between buildings for classes or meetings.
- + For city residents, bikes are a more affordable option for short trips than cabs or ride share services and allow people to get to places that aren't reached by bus and subway lines.

To make the bike sharing economy work, the companies and organizations managing the assets need a reliable way to identify who is using the bikes and ensure that only riders who have paid for the privilege are able to operate them. For bike and scooter sharing, user authentication and access control systems can:

- + Ensure that only authorized riders/subscribers are able to unlock and use the bikes and scooters.
- + Enable tracking of ridership and usage data.
- + Connect to payment and subscription systems.

**User authentication** is the ability to correctly identify an individual user and match their information to the equipment or systems they are using.

Access control is the ability to ensure that only authorized users are able to gain access to an asset or system.

User authentication and access control can help bike share companies protect valuable physical assets and streamline access and payment for riders. To be effective, these systems must:

- + be fast and easy for riders to use;
- + be easy to physically integrate into the dock or into the vehicle itself (depending on the business model);
- + integrate seamlessly with back-end software or apps used to run the system;
- + have the flexibility to evolve with rapidly changing technologies and business models.

#### THE BIKE SHARE MARKET

- + **Station-based or docked**: Bikes are borrowed from and must be returned to automated stations, often located at transportation hubs or other high-traffic areas. The locking and access control mechanism may be part of the physical station or integrated into the bike.
- + Dockless: Bikes can be left anywhere within a defined range. An integrated geolocation system lets users locate available bikes using an app, which may also be used for membership and payment.
- + **Hybrid systems**: These systems combine elements from both station-based and dockless models. "Virtual stations" require bikes to be returned to a specific location but do not have physical docking infrastructure, while smart locks can ensure that bikes are locked to something (or simply to themselves) for physical security.

# USER AUTHENTICATION, ACCESS CONTROL AND THE BIKE SHARE ECONOMY

Bike sharing technologies and business models are evolving rapidly—and so are user authentication and access control systems for bike share equipment. Companies and cities promoting bike sharing need systems in place to deter theft and vandalism while ensuring that legitimate riders have easy access to equipment.

Radio-frequency identification (RFID) provides a simple solution for many bike share applications. RFID cards are a familiar technology for nearly anyone who uses a corporate ID to gain entry into their workplace. The same technology is now frequently used by large metropolitan transportation systems. A "metro card" linked to the user's payment account may be a gateway to multiple modes of transportation, including bus and subway systems operated by the city. Bike sharing systems can leverage these same cards to provide access to bikes.

#### HOW RFID WORKS

RFID cards have two main components:

- + an integrated circuit that can store and process information
- + an antenna to transmit or receive a signal

Each RFID card stores a unique data set—such as a number—that serves to identify the card and, by extension, the person carrying it. When a card with an embedded RFID tag is in close proximity with an RFID reader, the reader transmits a radio signal to interrogate the tag. The radio signal activates the tag, which then uses the power in the radio signal to respond to the reader with its unique ID. RFID has a number of benefits for today's bike share market, particularly for campus systems or in commuter markets where bike share systems are integrated with other public transit options.

- + It allows commuters to use the same transit cards they already use for bus or subway systems to unlock and use bikes docked at nearby stations.
- + For campus systems, riders can use a student or employee ID card to utilize the bike share system.
- + RFID enables rapid, contactless identification using readers that are integrated into docking stations or into the bike itself.
- + RFID readers can be easily integrated into back-end systems for user management and payment for both subscription-based and per-use models.
- RFID cards are simple to issue, easy to manage and highly cost effective, making them a great solution to serve low-income communities where smartphone access may not be universal.
- + It's a simple, secure and flexible solution that is ready for deployment now.

In dockless models that are not integrated with a city transit system or located on a defined campus, bikes are more frequently found and unlocked using a smartphone app. These may be enabled by smart locks that use Bluetooth Low Energy (BLE) or Near Field Communication (NFC) technologies to communicate with the user's smartphone before unlocking the bike. An RFID reader that also can be configured for BLE or NFC provides a flexible solution that can be adapted for both RFID card and smartphone authentication.

### CHALLENGES IN IMPLEMENTING RFID FOR BIKE SHARING

While RFID is a practical solution for most user authentication and access control applications, implementing RFID is not without challenges. There are a number of different RFID reader technologies on the market, but they do not all provide the same capabilities. Cities and companies wishing to integrate RFID reader technology into their bike share solutions need to understand the differences and select a reader technology that will maximize their market opportunities. In particular, they should ask:

- + Will the reader work with the card or smartphone technologies potential riders are using?
- + Does the reader support the functionality and security requirements needed by my application?
- + How easily can the reader be reconfigured or updated as requirements and market conditions change?

#### A Highly Diverse RFID Market

There are dozens of RFID card technologies in use around the world, each with their own data formats, communication frequencies and security capabilities. Cards can be broadly separated into high frequency (HF) and low frequency (LF), depending on the radio frequency band range they use to communicate. However, within these categories cards by different manufacturers have their own unique formats.

Bike share companies wishing to get their systems adopted into a diverse global market may need to be able to accommodate 60 or more unique card technologies. Cities that use RFID for transit system access use a multitude of card types, as do campuses using RFID for staff and student identification. These card technologies are generally well entrenched into the transportation or campus ecosystem; bike share companies wishing to be part of these ecosystems will have to adapt to the cards already in use at each location.

Many RFID readers can only read a few different card technologies, and some are created by card manufacturers to read only their own technologies. This means that bike share companies and equipment providers wishing to expand their market opportunities may have to stock different readers for different customers. This creates both sales and inventory management challenges. Sales people or planners must discover the card types being used within the transportation ecosystem to determine which part to use or whether the card technology in use can be accommodated at all. This is especially problematic when trying to reach a global market, since most RFID readers are only certified for use in a few countries or regions.

### SOLUTION: ELATEC UNIVERSAL RFID READERS

ELATEC RFID readers are "universal"; some can read more than 60 card technologies, including HF and LF RFID as well as NFC and BLE technologies increasingly used with mobile devices. They are also certified for use in as many as 110 countries. This means they can accommodate virtually any card technology in use within a city or campus, providing a virtual single part number solution that simplifies sales and inventory management. Sales staff or system planners can simply scan an example card from the end user to identify the technologies they are using. Final configuration can be completed on installed readers, so equipment manufacturers essentially only have to stock one version of their system for all potential customers. They can also be adapted to integrate with app-based systems that use BLE or NFC technologies for user identification using a smartphone.

#### A Rapidly Changing Market

The ecosystem for bike sharing is young and changing rapidly. Business models are still evolving, with dockless, station-based and hybrid systems vying for market dominance. It is likely that different cities and campuses will lean towards different solutions depending on the existing transportation infrastructure, community needs, regulatory environment and other local factors. In some cities, multiple bike share companies and models may compete within the same geographic area.

As companies and communities learn from early ventures into bike sharing, needs, expectations and regulations around user authentication and access control are likely to evolve as well. Companies providing bike share equipment and infrastructure need flexible solutions that can be easily adapted to support these emerging functionality and security requirements.

Most readers are limited in both their current functionality and potential upgradability. Equipment providers may find themselves "locked in" to current functionality and security capabilities around user identification and access control by their RFID reader solution. Addressing emerging market opportunities or challenges in this case could require physically replacing the RFID readers in their systems. This limits the long-term usability of their equipment and their ability to respond to changing user and community needs.

#### SOLUTION: ELATEC READERS ARE "FUTURE PROOF"

ELATEC readers have a robust open application programming interface (API) that makes them highly adaptable and practically "future proof." The readers can be programmed to enable unique functionality for sophisticated bike share solutions and support mobile access control technologies such as BLE and NFC. The API is powerful and flexible, so bike share systems will be able to update their existing readers to address new opportunities and requirements in the future that have not yet been imagined. This vastly increases the lifespan of both installed systems and inventory. And since they can be easily reconfigured after installation, equipment providers will be able to respond to new requirements and maintain customer loyalty.

#### Widely Dispersed Assets

Companies operating bike share systems may have dozens, hundreds or even thousands of readers installed in assets located across the country or around the world. For station-based models where the reader is integrated into the station, updates may involve sending a technician to multiple far-flung locations to visit each station in each city. If readers are integrated into the bikes, the problem is even harder—how do you collect and update readers on hundreds of highly mobile assets that are in frequent use? These challenges make it extremely difficult to update or reconfigure standard RFID readers installed in stations or bikes.

There are several reasons why RFID readers may need to be updated or reconfigured. Cities or campuses may adopt a new card technology. Emerging security threats may prompt bike share companies or the communities they operate in to enable advanced encryption or other security features for identity management and theft reduction. Bike share operators may make changes in their software systems that require reconfiguration of the reader or may want to add new functionality to their user identification and access control solutions.

Field reconfiguration of most RFID readers is time consuming and expensive. Technicians must physically access each reader, in some cases removing it from the system in which it has been installed. If the installed reader cannot be configured to meet the new requirements, it must be removed and replaced. If the reader is located on the bike rather than on station infrastructure, this means that each bike has to be returned to a central hub and taken out of circulation while the readers are reconfigured or replaced—an expensive and unsatisfactory solution. Equipment manufacturers may also face significant expenses if they have unsold inventory in stock that must be replaced or reconfigured.

#### SOLUTION: REMOTE CONFIGURATION WITH ELATEC READERS

ELATEC readers support remote configuration for fast, easy updates. Manufacturers and bike share operators can push updates out to a distributed fleet, allowing all installed readers to be updated at once without pulling bikes out of circulation or requiring extensive technician time. This increases customer satisfaction and provides a significant competitive advantage for bike share operators and equipment providers.

## THE ELATEC ADVANTAGE FOR BIKE SHARING

ELATEC's powerful, flexible reader technology gives bike share operators and equipment manufacturers a real competitive advantage, both now and in the future. ELATEC can help companies creating bike sharing equipment and software solutions:

- + Expand internationally: ELATEC readers are certified for sale in as many as 110 countries globally.
- + Maximize market opportunities: ELATEC readers support all major card technology available, including both HF and LF, as well as emerging smartphone mobile access control solutions via BLE and NFC.
- + **Reduce total lifecycle costs:** ELATEC readers simplify inventory management with a virtual single part number solution and can be easily updated or reconfigured without replacing inventory.
- + **Deliver customer advantage:** ELATEC readers reduce configuration expenses, extend product life, and support advanced functionality and security requirements, providing meaningful product differentiation for equipment manufacturers.
- + Prepare for the future: With ELATEC, you'll be ready for whatever comes next. Our readers can be reconfigured to address emerging opportunities and customer requirements.

#### CASE STUDY: SMOOVE

Smoove was chosen by the city of Paris to provide equipment for their urban bike share program. The bikes are equipped with an innovative handlebar-mounted system called the Smoove Box. The electronic control box is charged by a hub dynamo that is powered by the bike's motion. An integrated RFID reader allows subscribers to the bike share program to present a membership card for quick and direct access to the bikes without keys or totems. Smoove chose the ELATECTWN4 MultiTech Reader, a compact multi-protocol RFID reader. Its compact size and low energy consumption make it ideal for integration into the Smoove Box or parking posts. Because it supports nearly all RFID protocols, it will allow Smoove to expand into other markets internationally

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