CASE STUDY
Smart Manholes Case Study - DFA
SMART MANHOLE CASE STUDY

The Challenge

The underground network of services that keeps our city running is often taken for granted. However, access points to these networks can become a liability if not properly managed. In South Africa, one person dies every four days by falling into an open manhole.

A manhole cover is a removable plate forming the lid over the opening of a manhole, to prevent anyone or anything from falling in. It also serves to keep out unauthorized persons and material. These covers are often stolen, or go missing, creating a public hazard. The impact of loss or injury is often severe causing network downtime or in the worst case, death.

Client background

DFA are the premier open access fibre optic company in South Africa. Since 2007 they have been assisting their clients with solutions for their dark-fibre needs, and thus connecting South Africans to the Internet and one another for the last ten years. DFA has laid 10 000km of fibre optics in the country.

They lease their backbone fibre and secure transmission infrastructure while also maintaining, building, installing, managing and financing these dark fibre networks. DFA has a state-of-the-art network monitoring centre in Rivonia, Johannesburg, which provides round-the-clock monitoring and maintenance to ensure that the network remains up and running 24/7.

DFA owns over 35 000 manholes which are an integral part of terrestrial telecommunication infrastructure. They provide protection for critical network junctions, as well as an access point for maintenance teams. With the pending arrival of high-bandwidth 5G infrastructure, the density of fibre networks is expected to sharply increase, together with the number of manholes, and the need to monitor them.
Current Solution

Many of DFA’s manhole covers are fitted with state-of-the-art electronic access systems, but these systems only detect when a manhole cover is opened by an authorised person through the cellular-based application. An additional solution is required to alert if a regular manhole cover is opened, or to detect if an electronically locked manhole has been forcefully breached. Currently, the detection of unauthorized openings of manholes is largely a manual process, performed by field technicians tasked with inspecting and maintaining infrastructure.

Industry trends

The Internet of Things (IoT) is disrupting traditional business in all major industries, providing them with the opportunity to be much more efficient. As objects come alive, assets themselves can autonomously report on changes to their condition or their environment, based on a multitude of sensors.

Manhole covers can be managed much more efficiently through IoT technology. The covers can send intelligence back to the control centre to help management make informed decisions. The number of sensors would vary greatly depending on the events that are affecting the smooth operation of the business. An example of a simple, but useful sensor would be for the cover to send an alert when opened, or if flooding is detected. This information can be integrated into the systems operational tool to further detect if the opening of the cover was due to scheduled maintenance, or if it was unauthorized – indicating a potential theft. IoT also provides the ability to trace and track the movement of the manhole cover, allowing for seamless recovery.
Our Solution

SqwidnNet’s smart manhole tamper detection solution is an end-to-end offering that can assist businesses to combat common challenges related to the management of manhole covers. These are:

- Loss of life due to missing manhole covers
- Personal injury due to falling into an open manhole
- Vehicle damage due to driving over an open manhole
- Legal liability and reputation damage
- Overflowing sewers mainly due to foreign objects being thrown into open manholes
- Unnecessary expenditure to replace stolen manhole covers
- Detecting unauthorised access that could result in theft of other utility service infrastructure e.g. cables
- Network downtime affecting business transactions

SqwidnNet packaged an end-to-end IoT solution to assist DFA to automatically monitor the movement of manhole covers from the NOC itself. The end user is alerted when a manhole cover is opened via a simple dashboard.

<table>
<thead>
<tr>
<th>Manhole ID</th>
<th>Message Date</th>
<th>Message Description</th>
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<tbody>
<tr>
<td>GH003708</td>
<td>Jul 4, 2018 2:43:30 PM</td>
<td>Manhole cover was moved</td>
</tr>
<tr>
<td>GH025026</td>
<td>Jul 4, 2018 2:23:39 PM</td>
<td>Manhole cover was moved</td>
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<tr>
<td>GH003661 C6</td>
<td>Jul 4, 2018 2:18:48 PM</td>
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<td>EMM-MSHH-01</td>
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<td>EMM-R17-HH02</td>
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</tr>
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</table>
The project kicked off with a ten day POC to determine the feasibility of the solution. Devices were tested at both steel and plastic covered manholes to ensure client satisfaction. After the success of the POC, the client confirmed the roll-out to all 20,000 of their manholes.

The VisioTamper device was used for this solution. The device sends a SigFox message whenever it is tilted over 45 degrees from the horizontal. Using a double-sided tape, the device is stuck onto the manhole cover. The installation process was designed to be as easy as possible. A QR scanner is used to link the device ID to the manhole. With this simple process, installation teams are able to rollout these devices very quickly and easily.

**Benefits**

- Real-time notification of manhole access
- Ability to easily detect theft/vandalism
- Visibility of open or damaged manhole covers
- Optional SMS and email alerts
- Mobile application for linking device
- Robust and waterproof (IP67)
- Easy installation
- Up to 10 year battery life
- Daily battery level messages