Case Study

Pull Forward: Monitoring Drive-Thru Service Efficiency in McDonald's Restaurants

Industry

Fast Food Restaurants

Organizations

- United Atlantic Systems (UAS)
- McDonald's

Hardware

Each participating restaurant location is equipped with a Tibbo Project System (TPS) controller, which has the following hardware connected to it: an ultrasonic range finder (distance meter), an infrared motion detector, a door open sensor(s), a visual annunciator, and an AC power relay.

United Atlantic Systems (UAS)

Since its founding in 1972, UAS and its employees have helped redefine the meaning of integrated security services in the industry. UAS is a national provider of integrated security services protecting over $15 billion in commercial assets for a diverse client base, including: Food Service Providers, Convenience Stores and Retailers. UAS provides various services to its clients, including: Comprehensive Security Analyses, Intrusion Alarm Systems, UL Certified Fire Alarm Systems, Closed Circuit Television Systems, Monitored Access Control Systems, Environmental Monitoring Systems, and Raven-Remote Audio Video Event Notification.

McDonald's

The McDonald's Corporation is the world's largest chain of hamburger fast food restaurants, serving around 68 million customers daily in 119 countries across 35,000 outlets.
A McDonald's restaurant is operated by either a franchisee, an affiliate, or the actual corporation itself. In 2012, the company had annual revenues of $27.5 billion and profits of $5.5 billion. According to a 2012 BBC report, McDonald's is the world's second largest private employer—behind Walmart—with 1.9 million employees, 1.5 million of whom work for franchises.

Challenges and Objectives

Being an exclusive authorized provider of video surveillance systems to McDonalds in the US, UAS maintains close relationship with hundreds of McDonalds' franchisees. At the forefront of the ongoing dialogue with people who own and operate McDonald's fast food restaurants across America is Stuart Bercun, the Product Manager working for UAS.

It is through this dialogue that Stuart learned about one area of operations that was causing a continuous headache to restaurant owners: difficulty of monitoring the speed of the

drive-thru (a.k.a. "McAuto") service, especially at night. The problem was especially pronounced for the owners of multiple locations, as they were unable to spend significant time at any particular location.

Although not able to substantiate their suspicions with hard facts, these franchisees felt that a lot of slacking off was going on, especially during the night hours. Many owners suspected that their employees "failed to notice" the cars pulling to the menu board. Some openly spoke of employees sleeping in the manager's office, taking turns to work when everyone should have been working, and so on. Although each restaurant had a video surveillance system installed by UAS, no one had time or inclination to sift through endless hours of boring video with the purpose of proving their suspicions. When Stuart asked if anyone would be willing to invest in an automated system for vehicle counting and service time tracking, a large number of franchisees immediately expressed their interest. Problem was, no such system existed at the time!

More conversations followed, and the rough specification for the would-be tracking system has emerged. Since no competing solutions existed, the spec looked more like a set of goals. The system would have to be able to:

- Count the number of drive-thru customers;
- Record the time it took to service each vehicle;
- Generate SMS alerts whenever a pre-defined wait time was exceeded;
- Generate weekly performance reports and email them to the restaurant owners.

Armed with this list of objectives, Stuart went to work.

The Solution

After analyzing a dozen of possible ways to detect and monitor the vehicle's progress as it goes about ordering a McDonald's meal, Stuart has settled on an inexpensive and effective ultrasonic distance sensors from MaxBotix. These tiny devices measure the distance to an object in front of them and report this distance in centimeters via RS232 interface. Stuart envisioned the sensors to be installed close to the ground and facing the drive-thru.

The sensing part of the equation solved, Stuart then turned to planning the rest of the system. The output of ultrasonic sensors had to be received, processed, sent into the cloud, combined with other data, and offered to franchisees in the form of simple-to-comprehend weekly performance reports. This is when Stuart discovered Tibbo Technology, its Tibbo Project System (TPS) controllers, and the AggreGate Device Management Platform. The TPS devices were selected to act as system "nodes" tasked with collecting ultrasonic sensor data and sending it into the cloud. "Up there", the AggreGate server would receive the data, store it as events, generate reports, raise alerts, manage TPS devices, and perform other management duties. The "platform" edition of the AggreGate product was deemed to be sufficient for carrying out all required tasks.

As the pieces of the project were falling into place, UAS Marketing Department came up with the product name: **Pull Forward**. The product was to be offered as a subscription service with a flat monthly fee.

UAS customers, meanwhile, were starting to get their own ideas regarding the use of TPS and AggreGate. Many of these ideas came to fruition because of the TPS modular nature and nearly infinite flexibility of AggreGate.
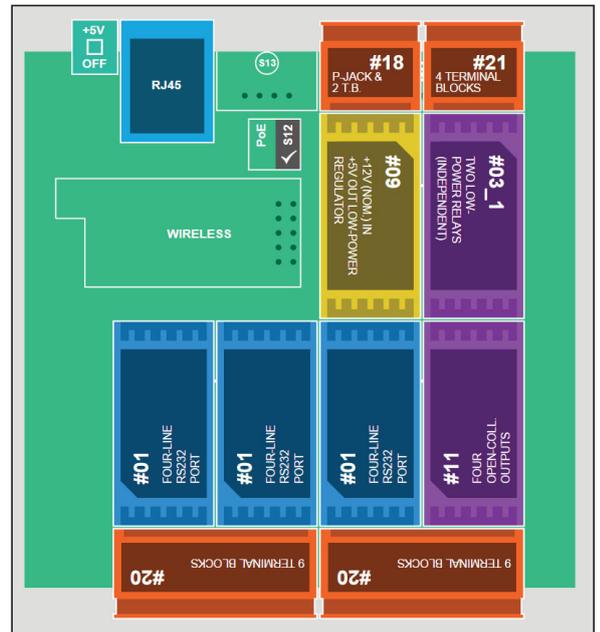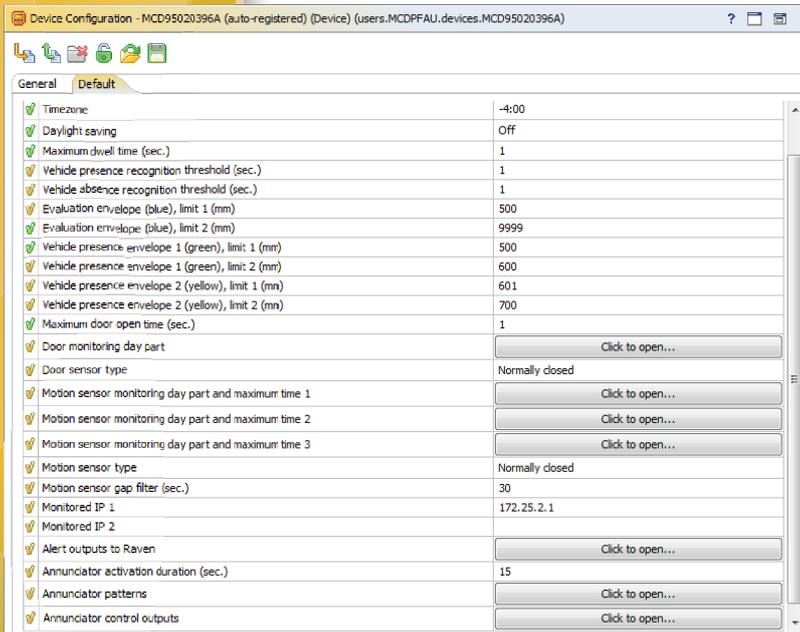
A Tibbo Project System device comprises a main board enclosed in a stylish plastic nclosure. The mainboard carries the CPU, memory, Ethernet port, and a number of installation sockets for I/O modules called Tibbits®. Each Tibbit implements a specialized I/O function. A TPS user picks the Tibbits he requires and plugs them into the board. There are no predefined configurations and no paying for I/O that's not needed.

The UAS configuration started off simple: one RS232 Tibbit for receiving the distance measurementdata, and one power supply Tibbit. This left enough free space for four more I/O functions, and future **Pull Forward** customers didn't take long to tell UAS what else they needed.

Follows is the list of features that were added as the project was gaining traction:

- An input to connect an infrared motion detector. Now it was possible to catch people dozing off in the office.

- An input to connect door sensors. As many restaurants only provide drive-thru service at night, security policies of such locations require doors to be locked at night. Keeping the door opened may void the insurance. Now the TPS was making sure the doors were securely locked.

- An output to control a "visual annunciator" – a sort of a signal light installed in the kitchen. The light would turn green whenever a vehicle pulled up, start blinking red when the time was almost up, and turn solid red on the "dwell time violation", as going over the pre-defined time limit has come to be known.

- Several outputs going into the DVR. Whenever an event of interest occurred, one of the inputs would be activated, thus marking (tagging) that moment on the recorded video. This dramatically simplified the video search process.

- Finally, the TPS was tasked with the role of the "IP watchdog", i.e. pinging a list of IP addresses and rebooting the misbehaving network equipment.

Needless to say, all Tibbit slots on the TPS are occupied by now! This constant expansion and rearrangement of the TPS configuration would not be possible without the AggreGate management capabilities. The server is capable of pushing new firmware into the field, as well as automatically learning about new device settings and capabilities brought over by new firmware releases.

The AggreGate server part of the system is hosted in the Amazon Web Services infrastructure, thus providing a very high system uptime. Since TPS controllers installed in the field don't have public IP addresses, they are configured for operating in the M2M mode and establishing outgoing connections to the AggreGate server. SMS messages are sent through the Clickatell gateway, and the AggreGate server is set up to only send them within certain hours of the day, taking into account franchisees' instructions and the timezone in which he/she lives.

The entire system is effectively operated by the UAS personnel, while the restaurant owners receive their SMS alerts and weekly reports.

Custom data processing and visualization tools designed specifically for the **Pull Forward** project include reports and alerts for dwell time violations, back door violations, office occupancy violations, network equipment failures, etc. The entire project was implemented with standard AggreGate modules and Tibbo Project System libraries.

The **Pull Forward** system is now being gradually rolled out to a larger number of locations. In the meantime, Tibbo is working on the next project phase that envisions replacing SMS messaging with iOS and Android apps.

Benefits

The initial rollout of the **Pull Forward** offering garnered an overall positive feedback from the customers. As franchisees started to receive objective data about their drive-thru traffic and service times, they were able to implement positive changes aimed at improving operational efficiency and quality of service at their restaurants.

In addition, the overall flexibility and extensibility of the TPS + AggreGate solution opened up new possibilities for additional efficiency, safety, fraud, and compliance monitoring at fast food restaurants across America.

Conclusion

The initial stage of the **Pull Forward** project was completed in less than a year. The majority of this time was spent on field-testing sensors and other hardware, designing vehicle tracking algorithm, and monitoring the system operation at pilot locations. The actual cumulative development time for the TPS firmware and custom AggreGate reports is estimated to not have exceeded two months.

About Tibbo

Located in Taipei, Taiwan, Tibbo Technology Inc. brings simplicity to the automation world defined by enormous complexity of operating systems, programming languages, and design tools. Tibbo's programmable hardware and the AggreGate Platform offer a complete solution for delivering robust, distributed automation and monitoring systems.