Case Studies: Connected Solutions & Internet of Things (IoT)

February 21, 2016

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1 Introduction

Experion Technologies is a diversified technology company focusing on web & mobile solutions and services. The company has its headquarters and development center in Trivandrum, India with offices in US, Switzerland, Germany, Netherlands, Denmark and Australia. Experion was founded by a team of senior executives in the IT domain with strong technology and international business background. Experion is an ISO 9001 certified company from Bureau Veritas and has a client base which includes recognizable names such as Bacardi, Johnson & Johnson, Alexion Pharmaceuticals, etc. We have also served over 80 startups and Small and Medium Businesses across US, Asia, Australia and Europe.

Experion has experience in building software solutions for a wide variety of devices, expertise in emerging internet as well as mobile technologies and R&D capabilities in embedded systems. From an industrial/ enterprise automation standpoint, Experion has developed solutions where devices track, monitor and capture real time information from various devices such as remote sensors, scanners, QR codes, printers, energy meters, wearable devices and mobile devices with the goal to provide actionable intelligence to users and decision makers.

Given below are a few examples of connected solutions that Experion has developed for its enterprise customers worldwide:

2 Game Management & Analytics (US)

The client a leading leisure sports company based in the United States, offering gaming and entertainment facilities to customers across North America and Europe. Each facility offers gaming bays with patented RFID based gaming equipment (balls, clubs, etc.) and proprietary game management systems. Experion worked with the client to roll out multiple solutions for connecting playing equipments with games management systems and user information systems.

Golf like games offered by the client features RFID chips in each golf ball that tracks a shot's accuracy and distance while awarding points by hitting targets ranging from 20 to 250 yards away. End users purchase playing cards or get membership cards with magnetic stripes, occupy a bay and start playing (games are played on specialized bays).

Users initiate a game by swiping the card and selecting options on weather proof, daylight viewable, touch screen devices. Each bay is also equipped with an overhead bay board (a wide screen display panel), which displays relevant information as the users play games. It can also display the digital sign-age and ads in the same screen.

Based on the selected option, balls are dispensed automatically from a ball dispenser. Golf balls struck by the user are scanned by an antenna at the target area and the data is read by a reader. The information about the antenna and the ball (distance, point, etc.) is sent back to a server for processing. Scores are calculated automatically based on the game type and zones in which the balls lands while playing. RFID sensor clusters installed in the ground (as marked zones) are wired to a server in each facility where all readings are aggregated. The data from multiple such facilities are sent to a central management centre, where the information is used for generating analytics related to player behavior, demand management, marketing campaigns, etc.

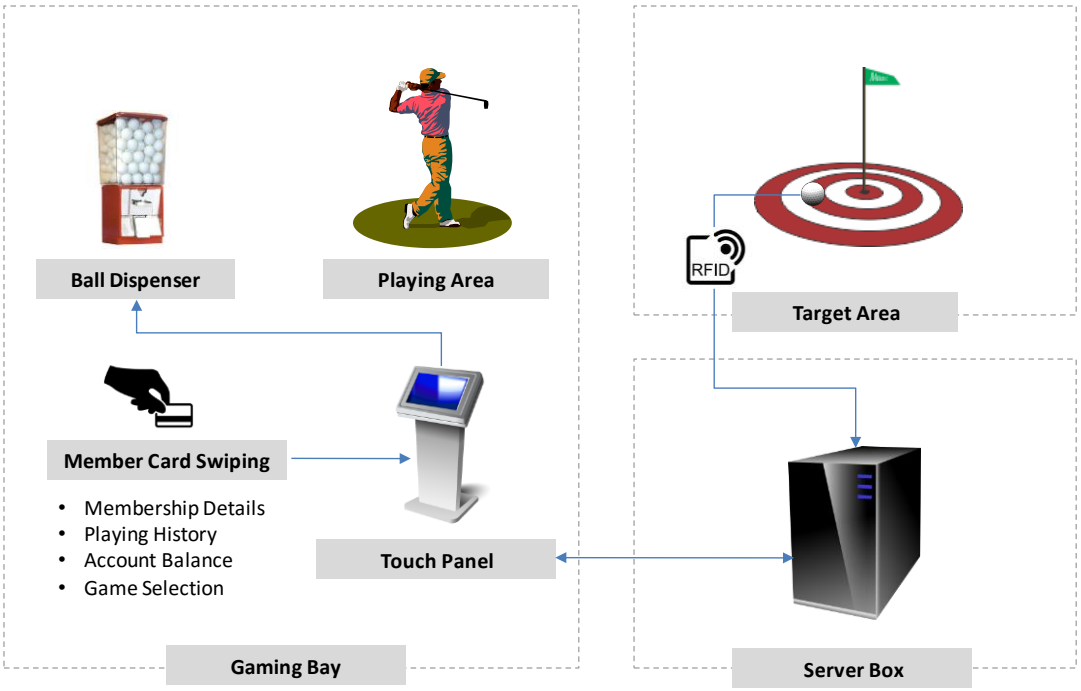

Figure 1: Schematic overview of games information system

Technologies used: PHP, node.js, MySQL, Linux, RFID, RS232, TCP/IP, UDP, HTTPS

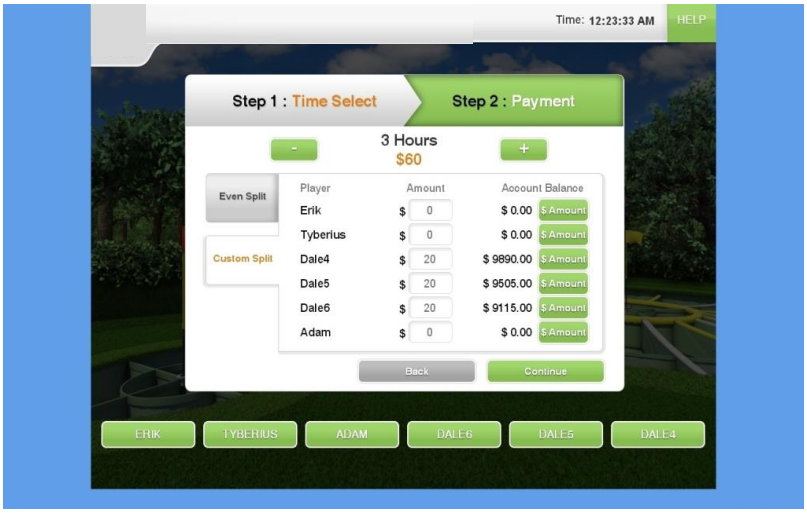

Figure 2: End user display panel

3 Smart Sensor based Monitoring Solution (Europe)

Based in the Scandinavian region, the client is a leading provider of solutions such as data loggers, wireless modules and modems, SMS alarm senders, and CO2 sensors and controllers. Data logger solutions have applications for diverse business cases - from simple temperature and humidity, pulse and water level logging, to fully automated cold room and warehouse monitoring systems.

Experion is currently working with the client to reengineer/ re-architect its data logger/ sensor management dashboard, add new features and improve data visualization capabilities. The solution captures data from different loggers/ sensors and displays it to end users for real time monitoring and management. The solution also provides alerts to the user (based on preset threshold values) to handle deviations and exceptions.

Technologies used: Java, Struts, Java RMI, Spring, Bootstrap, jQuery, GSM, TCP/IP

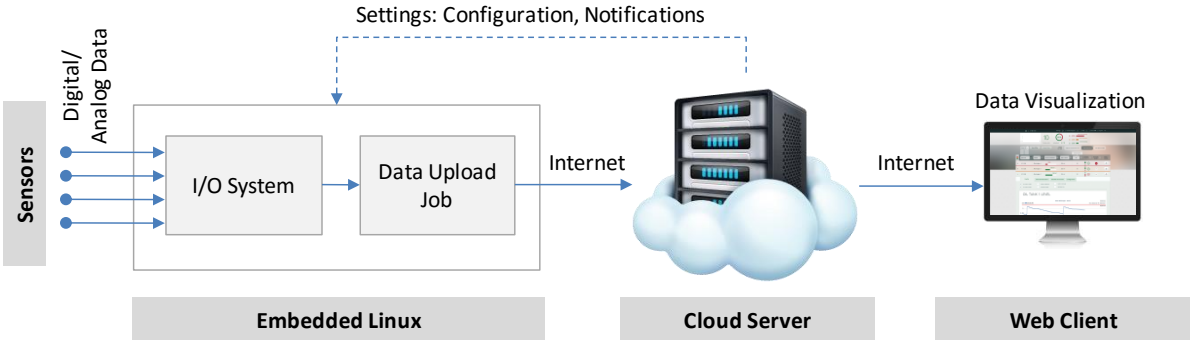

Figure 3: Overview of smart sensor based monitoring system

Figure 4: Smart Sensors for data acquisition & wireless data transfer

Figure 5: Sensor Management Dashboard

4 Sensor Data Aggregation & Analytics Solution (Australia)

The client is a supplier of a wide range of electrical, data, gas, telecommunication and water testing and monitoring products in Australia. The client serves the needs of customers in diverse domains such as Telecommunications, Electricity, Gas, Water and Occupational Health & Safety.

The project involved development of a web based application to consolidate and visually present sensor data currently logged in FTP servers. The application is multi-tenant and responsive in nature to be accessible from PCs, tablets and mobile phones.

The application developed by Experion is designed to automatically collate sensor data using ETL process. Once cleaned up data is saved against each end client, the data is visualized using rich UIs and intuitive user dashboards. The solution also triggers alarms and alerts to notify users when sensor data crosses set threshold values. The web platform provides multi-client support and has client/ user management features. The solution is architecturally scalable to support big data analytics with growth in data volumes.

Technologies used: AngularJS, NodeJS, Cassandra

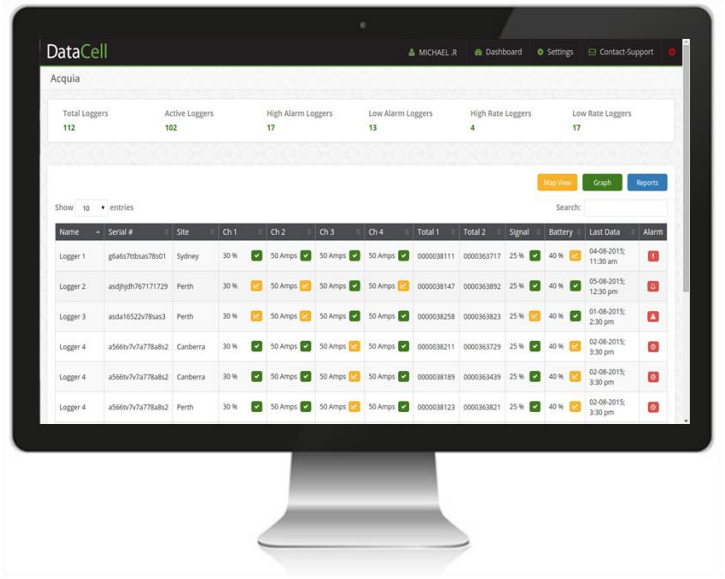

Figure 6: Data Visualization Dashboard

5 Event Networking Solution with Wearable Device (US)

The client is a technology start up in the United States and develops innovative products for different industry verticals.

Experion worked with the client to develop a connected solution for business networking. The Near Field Communication (NFC) based solution is aimed at business users to network at events, using a specialized wearable device (wrist band). The solution also includes a mobile application, which is integrated with LinkedIn business networking platform.

Business users exchange contact details easily with the tap of a button in the wearable device. This information is synced with the mobile application over Bluetooth Low Energy (BLE) or NFC. Based on this, the mobile application retrieves detailed information about the contact from LinkedIn and the users can further get connected and interact using the LinkedIn platform.

Technologies used: Android, PHP, BLE/ NFC

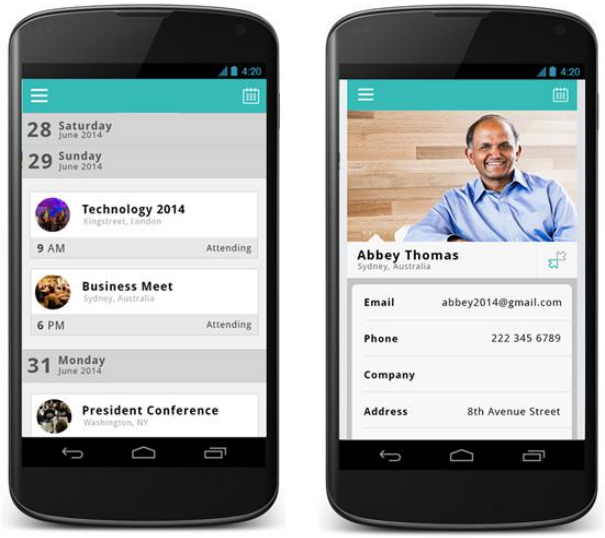

Figure 7: Event Networking Application

6 Aqua Farm Monitoring System (Australia)

The client is a specialized provider in aqua farming, with 20+ years of expertise in creating high yield fish farms throughout the world. The client has successfully created and deployed fish farms for various breeds of fish in both saline and fresh water. They also focus on exporting quality pet foods throughout the world and have made their presence felt in countries such as Australia, China, Middle East and United Kingdom.

Experion has partnered with the client to help create a connected solution that helps fish farmers to create a feeding pattern/ plan as well as schedule tasks for the entire farm. The application is accessible over an iPad for field staff to get reports on their daily activities such as fish feeding, fish movement, cleaning, etc. In addition to this, there is a fully functional web application which helps subject matter experts and management users to view the status of the farm such as reports, aqua culture, maintenance alerts, feed alerts etc. The solution is designed to provide real time information using smart sensors and alerts and notifications to take proactive decisions.

The web application is connected to access controls within the fish farm that provide inputs to the system related to employee attendance and smartly manage the rescheduling of various fish tasks based on availability. The application is also connected to sensors attached to different infrastructure within the farm such as bio-filters, fish tanks, etc. that can provide various environmental parameters which the application could closely analyze and alert in case of emergencies. The solution provides an intelligent mechanism that can revolutionize fish farming in terms of fish feeding, staff scheduling and inventory management.

Technologies Used: iOS, ASP.NET, REST/ JSON, SQL Server 2012

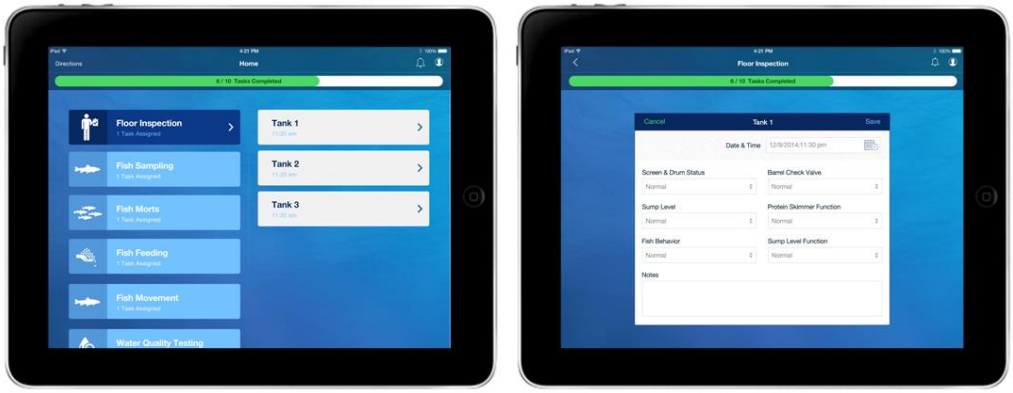

Figure 8: Aqua-culture Management Application

7 Retail Kiosk Management System (US)

The client is a pioneer in the restaurant industry in United States, and sells unique varieties of premium burgers and milk shakes across its 500+ branded stores in 27 states.

Experion is currently working with the client on an innovative project to develop the software for deploying Milk Shake Machines (MSM)/ specialized kiosks at its own stores as well as third party locations. The solution enables the client to remotely manage, distribute and display content through a high quality display provided in the MSM.

The initial version of the solution, which will be deployed at select locations, has a limited set of functionality and is aimed as a proof–of-concept before going ahead with full fledged development and nationwide roll out. The system provides the ability to collect data from the existing individual store installations and send to a centralized backend server. The backend system provides the ability for an administrative user to remotely update the application/ configuration files and maintain configuration records. The solution also includes a simple content distribution engine which displays predefined content in the MSM, fetched from the server.

Technologies used: Timesys embedded Linux, C, Shell scripting, Splunk Enterprise, PHP, REST/ JSON

8 Lab Monitoring System (Asia)

The client is a premier research institute in India, exclusively devoted to research in Molecular Biology and Biotechnology. Apart from academic and research work, the client also provides laboratory and infrastructure services to other academic and research institutions.

The client has over 100 remote freezers to store biological samples and chemicals in precisely controlled temperatures as low as -80°C. Any failure in freezer equipment can potentially result in spoilage of biological samples and chemicals, resulting in monetary losses and high opportunity costs. Manual monitoring of these freezers were not practical.

To monitor temperature variations in such freezers, Experion designed and developed custom solution hardware, firmware and web based monitoring dashboard for the client. Temperature logging was done using a smart temperature meter which captures the reading in individual freezer units, a transmitter device which send inputs to the application server using Zigbee wireless protocol and the web based monitoring console through which readings are displayed using rich user interface/ dashboard. The application also provides alerts for the user to indicate temperature variations beyond permissible levels. Abnormal events are also reported through SMS and e-mail directly to the responsible scientist in charge of the lab operations. Thus, any freezer mal operation is tackled early on, before it causes any losses.

Technologies used: ASP.NET, SQL Server 2005, Zigbee protocol

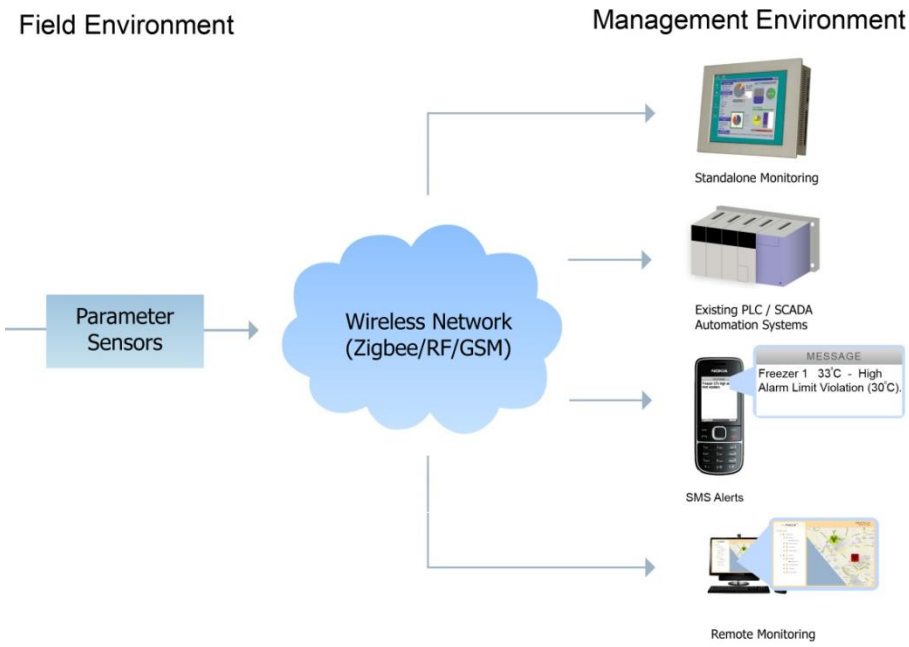

Figure 9: Overview of lab monitoring system

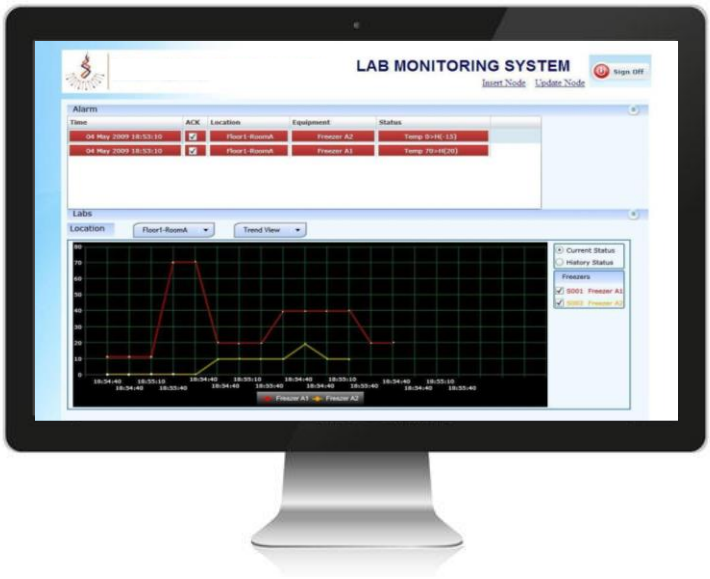

Figure 10: Parameter Monitoring Dashboard

9 Remote Parameter Monitoring (Asia)

The client is a $250 million publicly listed company, engaged in manufacturing basic chemicals such as caustic soda, synthetic rutile and soda ash among other chemicals.

The manufacturing process of one of the key product manufactured by the client includes treatment of base chemicals using super heated steam in a rotary digester. The inside temperature of the digester varies from 400°C to 1300°C and maintenance and monitoring of temperature at each stage of the process is critical due to two key reasons:

1. The quality of the end product has a direct correlation with stage temperature
2. Unchecked temperature has safety hazards due to the nature of chemicals involved

The client wanted to overcome the above business challenge by implementation of a real time temperature monitoring system. Since the digester was not stationary, conventional wired temperature monitoring systems were not practical in this scenario.

Experion helped the client design, develop and implement a wireless smart sensor integrated with the client's SCADA system to monitor and manage the temperature in rotary digesters. The communication from the smart sensor (called X-Track) is sent wirelessly over Zigbee protocol for continuous monitoring and tracking.

Technologies used: RS485, MODBUS, 802.15.4/ ZigBee

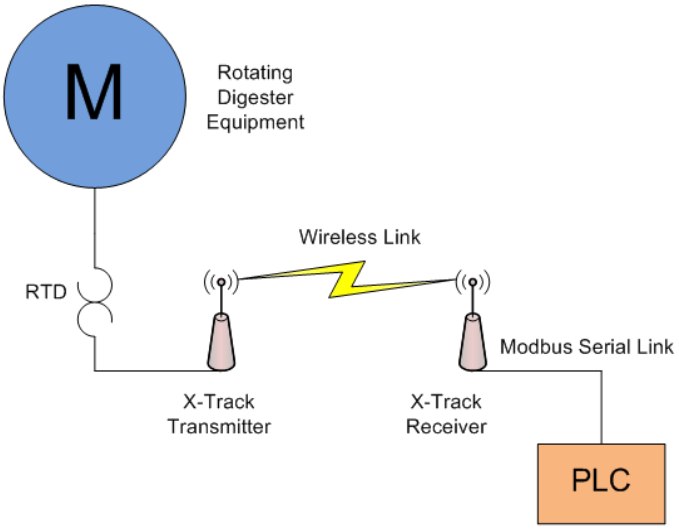

Figure 11: Overview of temperature monitoring solution