System Integration for Real-Time Environmental Monitoring

The Client: Western Australia's Department of Environment and Conservation, Western Australia

The Department of Environment and Conservation (DEC) is responsible for the environmental protection and nature conservation in Western Australia for future generations. Pollution control is an integral component of this responsibility, and the DEC has created a Pollution Response Unit to provide:

- Prevention of pollution including blitz and pre-emptive strike strategies
- Identifying polluters and mounting cases for legal prosecution
- 24/7 first response to pollution-related incidents and emergencies
- Identification, sampling and monitoring of hazardous materials during these incidents
- On-site containment and clean up advice during incidents
- Environmental advice to other government departments on pollution issues

The Challenge

DEC adopts a tough stance when investigating pollution and regards prevention as better than a cure. At times, unless the offender is caught in the act, it can be difficult to prove that it was the accused who committed the offense. Without adequate evidence (hard data) offenders often escape prosecution. Problem areas include:

- Location of gross polluters
- Industrial pollution which includes air, ocean and groundwater damage
- Illegal dumping by individuals and industry

To obtain hard data, DEC sought out new and innovative means to outsmart polluters and secure evidence to support positive identification. DEC officers use hand-held air quality sensors, and handheld video to capture footage of polluters, but they wanted to improve their effectiveness by deploying car mounted Digital Video Recorders (DVRs). While the Pollution Response Unit owned a virtual treasure trove of different analog and digital sensors from different vendors, it had no simple, uncomplicated manner of integrating them.

The Smart Connect Solution

A solution that could integrate, reconfigure and access these devices remotely, extend the coverage and incorporate video would be an ideal solution. An in-vehicle video with integrated sensor monitoring was the first step to realizing this goal of environmental information system integration.

After five years of exploring suitable technologies to view incidents and obtain chemical data in real time, Dr. Jimmy Seow, Manager of the Pollution Control Unit, DEC, discovered Smart Connect Technologies, Inc. and raised the possibility of integrating live video and sensor automation into a general purpose airborne particle monitoring unit. Realizing the potential benefits for his operation, Dr. Seow introduced S
mart Connect to another instrument company to combine this technology with internet 3G communication and gas detection, and immediately requested the design of a prototype in- system.

Simple Implementation

Smart Connect's gateway solution easily integrates and controls these specialized devices in addition to providing real-time data and video online from any internet-enabled computer. Within weeks, a compact innovative solution was delivered and retrofitted to the Pollution Control Vehicles.

Step 1. Antennas fitted

Step 2. Camera fitted to dashboard

Step. 3 Control fitted to transmission hump

Step 4. SmartConnect Gateway fitted to wiring harness

The in-vehicle SmartConnect Gateway™ system features:
- Brower access to the vehicle from any PC or mobile device
- Open standards/vendor neutral operating platform
- Rugged compact Car PC and wireless 3G Modem
- High resolution Day/Night IP Axis camera to provide real time video
- Sensor data in real time over the internet
- Siren with manual override
- Secure logins & data audit trails

- Automatic data quality and compliance checks
- SMS for critical data alarms
- Simultaneous management of up to 20 different analog or digital sensors
- Scalability to quickly and easily expand the system

Effective Results

Dr. Seow explains how the system is working operationally: "We have now deployed on the vehicles, a one switch button whereby we can not only record incidents but also view them on the internet anywhere, anytime. Additionally, we can control the vehicle cameras, alarms, and sensors from any browser which is critical to our ability to view the incident and retrieve the important chemical data for decision making anywhere anytime.

The Smart Connect system installed also allows us to retrieve data, set trigger alarms from our gas monitors and detectors via the internet and the new 3G mobile phone system. Lately, we have installed LEL, VOC, CO, NH4, H2S, Cl, SO2 and HCN detectors on top of our vehicles. Wireless internet connection to the SmartConnect Gateway™ in the vehicle, means that as we drive through a chemical plume, we receive data in real time and see exactly what is happening as the events unfold. Next is to set triggers on the detector readings so that the system can alert the operators in the vehicle via an enunciator as to the levels of any given chemical.

Sensor box assembly

Sensor box installation on vehicle

We also commissioned Smart Connect to integrate their system into a particulate monitoring unit which means we can now receive particulate data and see what causes the rise in say PM10 anywhere, anytime via the internet. The combined particulate/ SmartConnect Gateway™ can also send us (or anyone we choose), an alert each time

a value is exceeded and automatically directs the webcam to where the alarm originates from.

The SmartConnect Gateway™ has given us so much flexibility and greater capabilities. We are now working towards installing a WiFi network around these vehicles to collect data from webcams fitted to our safety helmets. This will enable us to see exactly what our officers are seeing during an emergency response anywhere, anytime. If I am not mistaken, I think we will be the first to use this technology for environmental monitoring."

The SmartConnect Gateway™ solution proved to be a fast, reliable and cost-effective solution to the DECs problem. The return on this investment will be realized by all West Australians as the newly equipped vehicles enable staff to increase the detection and prosecution of polluters, for a safer, cleaner environment.

Smart Connect's technical team designed an interface to allow DEC personnel to browse vehicle cameras and data via their hand-held PDAs and phones. Although not part of the initial requirements specification, this feature was greatly appreciated by management who need to stay informed, particularly during emergencies.