Utility IoT

IoTility

DataSense

Online Cellular Sensor Monitoring

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Introduction

Nowadays, water utilities strive to improve customer services and increase operational efficiencies. A major effort is invested in NRW reduction, as well as in smart metering. The wide deployment of LTE NB-IOT cellular technologies, opens significant opportunities for applying this technology for various utility applications. This document presents several novel IOT solutions that have been developed specifically for water utilities. The document describes how these technologies can support the utility's effort to improve its service level and its operational efficiencies in water supply.

Background

Miltel Communications, an Israeli company, develops, manufactures and markets IOT solutions for water utility companies. For many years, data collection was limited by the capabilities of traditional SCADA systems. Mitel, a leading developer of wireless AMR/AMI systems, has extended its expertise in metering solutions and developed a suite of utility IOT products and solutions, including data acquisition endpoints, connectivity management software as well as a portal for data analytics. Miltel's battery-operated *CellPoint*™ offer a unique solution for water utilities, complementing the SCADA system, while enhancing the smart metering venture. The *CellPoint* supports data logging capabilities and event monitoring for consumption, flow, pressure, and other operational parameters. Mitel's solutions are based on RF wireless communications, or 4G cellular technology. Miltel's data acquisition solutions are complemented by *DataSense*™, a comprehensive data management software portal that offers reporting, trend analysis, threshold alerts, displays history of events, and data analytics capabilities.

Pressure Monitoring

Monitoring water pressure in the distribution system is an essential component of managing the water supply. Tracking pressure values over time provides critical operational information for detection of problems as they develop. Most utilities monitor the pressure at the pump stations, water tanks, reservoirs, and other production sites. Pressure monitoring at remote locations has been a challenge due to the lack of power supply and communication lines. Modern IOT cellular technology opens new opportunities for collecting pressure data at remote sites. Miltel's **Pressure Monitoring CellPoint** is an IOT device that operates on a built-in battery and collects pressure data 24-7, at intervals of at least 15 minutes.

The ability to monitor pressure peaks and pressure drops, provides the utility companies with the means to monitor and study the change of pressure over time, as well as react in real time when sudden events occur. Pressure loss can cause contamination of the groundwater system. Pressure fluctuations can also affect the physical integrity of the pipes. Pressure increases can lead to leaks, major breaks and further reduce the life of the infrastructure. Gradual pressure decrease can be an early indication of a development of a crack/leak that will eventually lead to a burst pipe.

Furthermore, a sudden loss of pressure provides an indication of either a pump malfunction, hydraulic resistance due to a problematic valve or as a result of a sudden pipe rupture. Exact pressure data enables system operators to reduce leakage volumes, energy costs, system maintenance costs, customer complaints, as well as mitigate problems with water quality.

The **Pressure Monitoring CellPoint** measures the momentary pressure every 5 minutes. The device saves the data log every 15 minutes (96 readings per day). Once the device detects a pressure drop, or a pressure peak that is below/above the predefined threshold, the device dynamically starts measuring the pressure at higher intervals. If the high/low pressure event endures, the device sends an alert message to the management platform, which reports the event by SMS or email to a predefined list of utility operators/technicians. On a regular basis (when no abnormalities are identified), the device sends the 96 readings once a day to Miltel's *DataSense* management system (communications interval can be programmed to send the data at more/less frequent intervals).

By the deployment of pressure monitoring devices along its distribution network, the utility company can gain valuable operational data that will allow for detection of equipment malfunctions and infrastructure deterioration. Additionally, the Pressure Monitoring CellPoint provides an immediate alert when a critical event occurs. The deployment of this solution does not require any local communications infrastructure and it complements broadband SCADA solutions. Due to its low cost of ownership (installation and operation), this solution can be implemented in the short-term, and as data is gradually gathered from more and more locations, the utility company will gain multiple benefits, including:

- Optimization of pipe replacement schedule
- Identification of equipment malfunction, allowing scheduled maintenance before breakdown
- Improve customer service level (SLA) as pressure values are monitored at supply locations
- Early response to pipe bursts, minimizing environmental damages and reducing service downtime

The advantage of this solution is that it can be deployed gradually, so that it does not have a significant impact on annual budgets and does not require high capital expenditure.

Asset Management

Most water utilities face a logistical challenge of assets being spread over wide areas with many unmanned remote sites. In many cases, such sites include equipment such as generators, pumps, electric cabinets and other assets. Miltel's *Cellpoint* has been designed to provide an easy remote monitoring tool that can provide a simple and reliable solution for event detection. Many of our customers find new use cases that solve various logistical problems, such as:

- **Outage Monitoring** – the *Cellpoint* can interface via a relay that is hooked up to a pump, or any other equipment that needs to be monitored. Once there is a power outage, the device can send out an alert. The alert response time can be programmed via the installer's Android application. Since the *Cellpoint* is battery operated, the device is easy to install, and it is not dependent on any external connection.

- **Cabinet Monitoring** – the *Cellpoint* can interface with a standard magnetic door switch that is hooked up to a power cabinet, or any other entrance to a critical unmanned facility. Once the door is opened, the switch will trigger the device and an alert will be transmitted. The device can be concealed, and as the alert is silent, the intruder will not notice any outstanding occurrence.

- **Independent Panic Button** – the *Cellpoint* can interface with a panic button. The device can be installed at any location without a need for power or any kind of communication line. Once the panic button is depressed, the device will transmit an alert. Since the *Cellpoint* is battery operated, the device is easy to install and requires no infrastructure.

- **Tank Level Monitoring** – the *Cellpoint* can interface with a simple float switch. Once the float reaches a predefined level, the deice will send an alert. This solution can be implemented in water tanks, sewage pits, and even in fuel tanks (for generators or for equipment refueling). The device does not require any external power, or any communication line. The alert response time can be programmed via the installer's Android application, so that the alert is triggered after X minutes that the float is constantly above/below a predefined height (this delay avoids false alarms).

These use cases are just a few examples of the many applications that the ***Cellpoint*** has been used for by utility customers. The alerts can be programmed to be sent via SMS, emails, or linked to any existing IT system.

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Cellular IoT

In the world of Utility IoT the typical configuration for data acquisition requires the deployment of an industrial controller connected to a power supply and a communications line (for backhaul). Miltel's new cellular product line provides a unique out-of-the-box solution for remote data collection from sensors. The device is self-powered and designed for installation in harsh environmental conditions, whether indoor or outdoor. There are numerous applications for this technology, for utilities, asset management, or any type of industrial application. The device serves as a stand-alone integrated endpoint that:

- Collects the data
- Stores the data (log)
- Detects events (thresholds and significant changes)
- Communicates data to server over LTE network
- Sends alerts when critical events are identified

The device offers a solution for any general-purpose discrete sensor monitoring application. The solution is based on a set of software tools utilizing Miltel's DataSense™ application management platform.

The cellular IIoT endpoints can interface with:

- Dry contact (pulse)
- Analog sensors 4-20mA
- Analog voltage reading 0-5V / 0-10V
- Digital interface (RS232)

The cellular endpoint can supply power to activate the sensor (might impact the battery life).

FEATURES

- Wide range of monitoring applications
- User defined alerts and reports
- Long life of 10 years (replaceable battery)
- IP68 rating
- Integrated (embedded) antenna
- External antenna for improved coverage (software selectable)
- Easy to install using an Android application
- Device and data management using web application

Parameter	Specification
Dimensions	
L 10" x H 3" x W 3.5"	
Technical	
Operating voltage	3.65 VDC - internal battery (replaceable)
GSM Bands	LTE 4G (CAT-M / NB-IoT)
Antenna	Printed Internal / Optional - external extension kit
Environmental	
IP Rating	IP68
Storage temperature range	-40°F to +140°F (-40°C to +60°C)
Operating temperature range	- 4°F to +140°F (-20°C to +60°C)

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Dry Contact and Pulse

Model IoT-GP-LTE

THE PRODUCT

The **IoT-GP-LTE** device is part of Miltel's series of cellular **Utility IoT** endpoints. This device is intended for general purpose applications and is designed to monitor events such as a switch closure or a Reed switch pulse.

Like all Miltel cellular LTE endpoint products, this device operates on the cellular LTE network (Cat-M or NB-IoT). The device is designed to meet extreme outdoor ambient conditions and may be also used indoors, in basements or in underground pit applications.

The sensor output is sampled so the device can detect change of status, alert on a switch closure, or accumulate the switch closures where pulse output counting is required. Any critical event can be transmitted to the web server immediately, while hourly pulse counts are stored and transmitted once per day.

APPLICATION

The device offers a solution for any general-purpose discrete sensor monitoring application.

The solution is based on a set of software tools available using Miltel's DataSense^{TM} application management platform.

FEATURES

- Wide range of monitoring applications
- User defined alerts and reports
- Long life of 10 years (replaceable battery)
- IP68 rating
- Integrated (embedded) antenna
- External antenna for manhole installations
- Easy to install using an Android application
- Device and data management using utility web application

Parameter	Specification
Dimensions	
L 10" x H 3" x W 3.5"	
Technical	
Operating voltage	3.65 VDC - internal battery (replaceable)
GSM Bands	LTE 4G (CAT-M / NB-IoT)
Antenna	Printed Internal / Optional - external extension kit
Environmental	
IP Rating	IP68
Storage temperature range	-40°F to +140°F (-40°C to +60°C)
Operating temperature range	- 4°F to +140°F (-20°C to +60°C)

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Pressure Monitoring

Model IoT-PM-LTE

THE PRODUCT

The **IoT-PM-LTE** device, is part of Miltel's series of cellular **Utility IoT** endpoints. This device is designed for pressure monitoring and includes a pressure transducer and a state-of-the-art LTE cellular communication device.

The device was designed to meet extreme outdoor ambient conditions and may be also used indoors, in basements and in under the ground applications.

The sensor output is read hourly by the communication device (or at other programable sampling intervals, as required by the user). The data (pressure readings) is transmitted to the web server for analysis and archiving (typically once a day).

The device provides pre-defined threshold alerts for over-, or under-pressure events. The hi- and low-pressure thresholds are monitored at 5-minute intervals. Any events are sent as notifications to the user via the Web server.

APPLICATION

The system offers a solution for monitoring fluid pipelines or pressure vessels to determine the probability of a break, leak or rupture.

The system includes an analytics algorithm procedure in which two or more different sets of pressure measurements, containing a different number of readings, are compared statistically at the same time, to detect a trend in the readings that would be indicative of a flow event.

FEATURES

- Wide range of pressure sensors support

- User defined alerts and reports

- Long life of 3-5 years (replaceable battery)

- IP68 rating

- Integrated (embedded) antenna

- External antenna for manhole installations

- Easy to install using an Android application

- Device and data management using utility web application

Parameter	Specification
Dimensions	
L 10" x H 3" x W 3.5"	
Technical	
Operating voltage	3.65 VDC - internal battery (replaceable)
GSM Bands	LTE 4G (CAT-M / NB-IoT)
Antenna	Printed Internal / Optional - external extension kit
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Storage temperature range	-40°F to +140°F (-40°C to +60°C)
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