SMART Geotechnical Monitoring & Structural Health Solutions

The Challenge

With many 1000's of kilometres of transport infrastructure routes traversing diverse topography and geotechnical conditions it is not always possible to avoid unfavourable conditions which present risks to the structural integrity of the infrastructure and in extreme situations can pose a risk to public safety.

Weather events, seismic loading, elevated water pressures, erosion, hill-side creep, settlement and time dependant deterioration can lead to landslides, rockfalls and structural damage.

Monitoring is often the go-to solution of risk management adopted by asset owners and managers to provide early warning of deteriorating conditions or confirmation that remedial works are functioning to design.

Geotechnical monitoring systems are installed to assist in managing identified risks associate with unplanned ground movement or movement of structures. These systems can vary from in-ground instruments, such as piezometers and borehole inclinometers, surface survey prisms, and/or satellite/drone photogrammetric surveys.

Many asset managers are still reliant on manual systems such as traditional surveying techniques and manually read instruments. Operationally these monitoring systems are demanding more management time and maintenance effort. Manual inspection/measurement methods may require implementing extensive lane closures with attendant traffic management.

The work health and safety (WHS) risks associated with sending personnel into the field, working often in steep terrain adjacent to active transport corridors is becoming difficult to justify as societal expectations of what is an acceptable WHS risk has changed. The recent situation with COVID-19 has highlighted the future challenges of maintaining field based manual geotechnical and structural health monitoring systems.

The Liability Gap

With periodic measurement systems requiring manual field measurements or manual data processing, there can be a significant liability gap created between the instance of ground movements, or other leading risk indicators, and the reporting of the field measurements in an actional format to asset managers. This liability gap can become more significant where an asset owner has out-sourced maintenance to a third party yet retains statutory accountability for the provision of safe infrastructure to the public.

Gaining greater insight into the status of infrastructure is crucial to improving maintenance management, but traditional manual and siloed processes are unable to provide the detail necessary to enable this on a regional network level in a timely manner.

Real-time monitoring and data aggregation platforms that provide region or state-wide reporting on conditions of transport infrastructure are increasingly being viewed as a requirement to meet oversight requirements under tightening maintenance standards and increased stakeholder focus.

Critical to the effective maintenance and management of infrastructure exposed to a geotechnical hazard is ready access to real-time information such as:

- Location, Time, date
- Weather conditions
- Ground movements
- Deformation of structures Groundwater levels
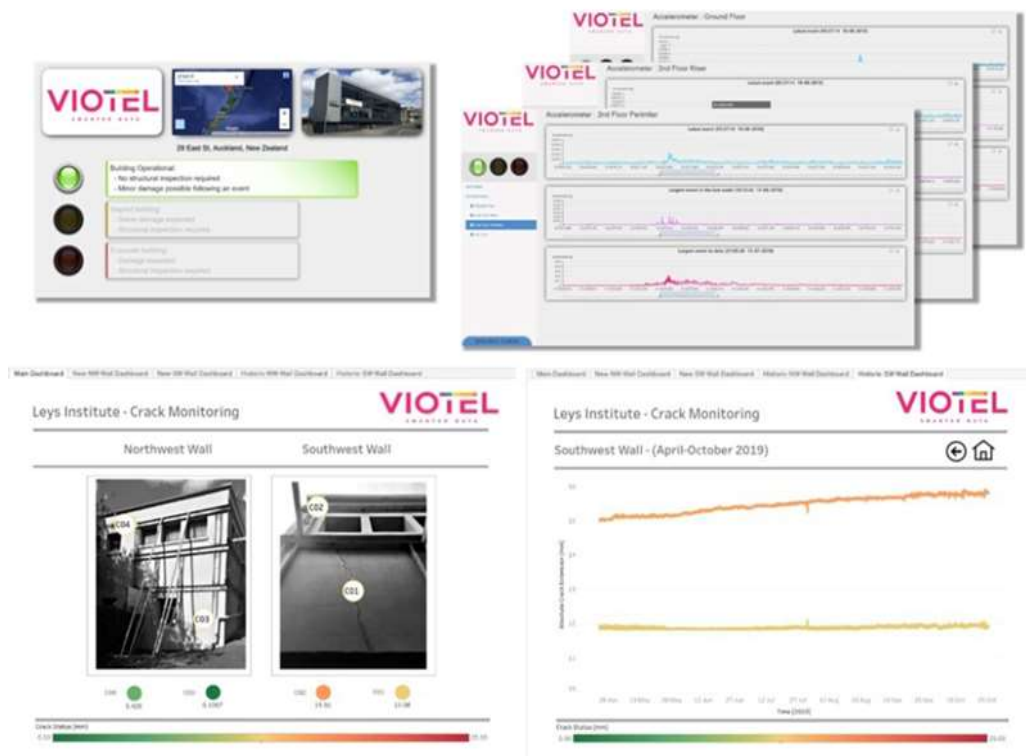- Seismicity

Our Solution

Incorporating Internet of Things (IoT) technology, a Viotel SMART Geotechnical network can reduce the reliance on manual inspections, improve triaging and scheduling of maintenance, reduce delay time from hazard alert to risk mitigation action, minimise disruption and safety risks to workers and the public.

SMART sensors provide real-time monitoring and advise network operators when leading indicators reach key thresholds associated with geotechnical hazards to warrant safety actions, inspections or maintenance. Our systems are configurable record action response rates and help provide auditable records.

Our proprietary SMART sensors include:
- IoT Piezometer – ground water levels
- IoT Tilt meter – ground / structure movement
- IoT Strong ground motion – seismic response
- SMART Box – IoT datalogger compatible with most types of geotechnical sensors

The Viotel SMART units are safe, self-contained IoT sensor packs which are discrete, simple to install and calibrate, powered with mains / battery &/or solar power and with analysis power deployed in Cloud / Edge computing. An app accessing internet-based data, transforms a sensor from a disconnected unintelligent asset to a networked live data device.

Benefits

1. Real-time monitoring, reporting and automated alerting functionality that can facilitate reduce emergency response times and improved asset management through timely maintenance.
2. Cloud data hosting with configurable interrogation dashboards
3. Reduce manual inspections and thereby reduce lane closures and traffic management costs.
4. Analytics capability for assessment of key leading indicators
5. The Viotel SMART system can be integrated with existing asset management systems and IoT platforms.
6. Subscription based SAS type model with reduced up-front deployment cost.

Features

Viotel's SMART geotechnical & structural health monitoring system harnesses 'Internet of Things (IoT)' technology and features sensors and telemetry device, which streams real-time data to the Cloud hosted via Amazon Web Services (AWS). The SMART sensor units are self-contained with each unit able to operate as IoT device.
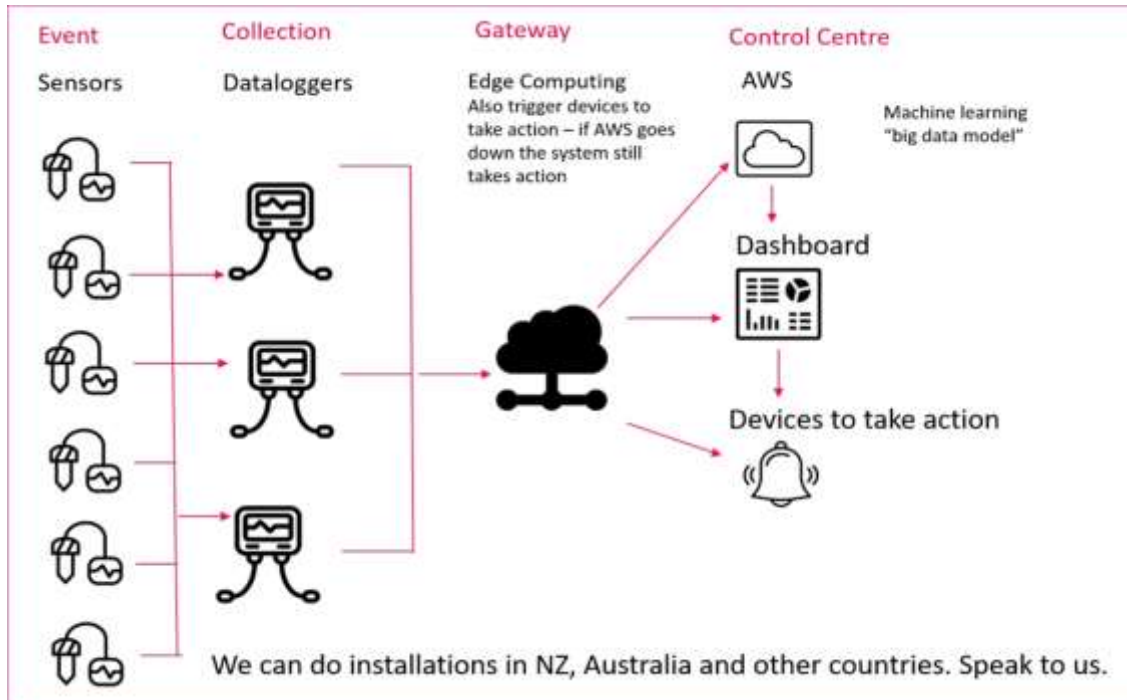

Viotel SMART System

- Built in GPS location.
- Provides real-time feed of information to operators via a smartphone app (as part of IoT), alerts associated with key leading indicator thresholds or programmed algorithms.
- Installed and calibrated quickly on-site 'plug & play'.
- Cloud hosting / Edge computing
- Control capability – not just monitoring

Our SMART Barrier system provides data reporting and interrogation dashboards and data analytics via AWS. The Viotel SMART Barrier system is configurable to other IoT platforms and dashboard reporting systems.

Viotel's key advantage lies in the flexibility of our data management system. Clients are NOT tied into monolithic silos requiring multiple applications to look at different datasets - Viotel understands that your data is YOUR data, and we will help you to integrate our data sources into your management systems. Or, we can customize a dashboard for you, or even give you one of our pre-prepared dashboards - it's your choice. And, because our systems are IoT-based, our dashboards can give you control over field-based equipment such as to switch warning lights, turn on pumps etc. For mission-critical applications where telemetry systems add another layer of risk, we offer edge-computing, so that critical decisions are made and alarms triggered locally, without the data having to leave the site.

We can do installations in NZ, Australia and other countries. Speak to us.

Data are stored within the station and also streamed to the cloud using either mobile phone/data (low-power CatM1), LoRa or satellite networks. Viotel's cloud platform has been built in partnership with Amazon Web Services, using high security certificate exchange to validate connections and encrypted data flows.

About Viotel

Our mission is to empower businesses with better data for better decisions. At Viotel we believe knowledge is power and understand the critical role data plays in managing risks, identifying opportunities and protecting business assets. Using 'plug and play' Smart Box technology, coupled with the power of Amazon Web Services, Viotel has created a data ecosystem. We believe in making smart technology smarter.

By continually investing in new technology and collecting and analysing data in real time, our cutting- edge solutions empower businesses to identify cost savings, increase productivity, streamline maintenance, increase OHS, monitor assets from any location and respond faster to emergencies.

Viotel currently have operations support in Australia and New Zealand.

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