CASE STUDY:
Seismic Dam Monitoring

AT A GLANCE

Viotel's pivotal role in providing real-time seismic monitoring and structural health analysis for a zoned earth and rockfill embankment dam constructed in the 1970s, ensuring safety and reliability.

KEY POINTS:

- Viotel developed robust hardware for monitoring the structural health of a 1970s constructed zoned earth and rockfill embankment dam.
- Viotel's equipment is designed and manufactured in New Zealand & Australia, not merely reselling products.

THE CHALLENGE

The customer's long-term objective was to create a city-wide smart network, incorporating embedded sensors to monitor, measure, transmit, and receive data, improving network reliability and service quality through predictive modeling. As part of this initiative, the goal was to implement seismic monitoring systems at critical infrastructure sites, addressing several key challenges:

- Detecting seismic activity in real-time at critical sites, including dams, water supply, and wastewater networks.
- Establishing a reliable communication system capable of seamless data transmission through secondary methods in case of primary communication failures.
- Deploying weatherproof, lightning-proof, rugged, and tamper-proof equipment to operate in remote sites with limited or no standard network connectivity.
- Integrating IoT data with cloud-based platforms while minimising cabling requirements.

THE SOLUTION

Dam infrastructure equipped with Viotel's advanced SMART monitoring solutions

Viotel was engaged to provide a ground motion monitoring solution. Viotel's expertise in IoT technology and seismic monitoring made them a suitable partner for the ambitious project.

The primary objective of the monitoring system was to track ground motions at the dam to swiftly detect excessive shaking, such as that caused by earthquakes.

Viotel designed a seismic monitoring network to continuously monitor ground accelerations at key points along the dam wall. Four sensors were strategically placed, with three positioned on the dam wall's critical locations and the fourth serving as a reference station to capture far-field ground motion data.
Viotel's accelerometer allowed for the monitoring of the dam wall's resonant frequencies, crucial for assessing structural stability.

VIOTEL
SMARTER DATA

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THE SOLUTION

Seismic Dam Monitoring

Key elements of the approach included:

- Utilising Viotel's accelerometer for strong ground motion monitoring and alarming capabilities.
- Employing a custom enclosure with a multi-communication system that utilised satellite, LTE-M, and Wi-Fi for robust data transmission, ensuring maximum uptime and uninterrupted power supply.
- Integrating Viotel's IoT platform with data management and control dashboards for accessibility from any internet-enabled device.
- Emphasising security through secure software development methodologies to safeguard against malicious activity.
- Deploying weatherproof, lightning-proof, cattle-proof, and rugged equipment with minimal access points and tamper-proof features.

Viotel's accelerometer allowed for the monitoring of the dam wall's resonant frequencies

RESULTS

The implementation of Viotel's seismic monitoring solutions yielded several positive outcomes, including:

- Enhanced safety monitoring at critical sites with real-time and reliable seismic data, enabling timely identification of seismic activity and potential impact mitigation.
- Reduced data collection costs due to minimised high-risk access and fewer site visits.
- Improved safety outcomes, ensuring the safety and reliability of dams and other infrastructure.
- Accessible data from any internet-enabled device facilitating efficient decision-making processes.
- Integration of engineering software suites with regularly updated connected systems for streamlined infrastructure maintenance.
- Advanced analytics providing insights into seismic activity patterns, enabling proactive maintenance measures.

VIOTEL ACCELEROMETER

FEATURES & BENEFITS

- WIRELESS OPERATION IDEAL FOR HIGH FREQUENCY MONITORING OF STRUCTURAL MODES.
- ULTRA LOW NOISE INTEGRATED ACCELEROMETER, DATALOGGER AND COMMUNICATIONS.
- CONTINUOUS MONITORING AND PUSHED ALERTS IN REAL TIME.
- EASY INSTALLATION IN ANY ORIENTATION.
- MULTIPLE MOUNTING OPTIONS - POLE, DIRECT STICK, ANCHOR.
- LTE 4G COMMUNICATIONS IN EACH UNIT.
- INTERNAL TEMPERATURE SENSOR.
- INTERNAL GPS FOR POSITIONING AND TIMING.

LESSONS LEARNED

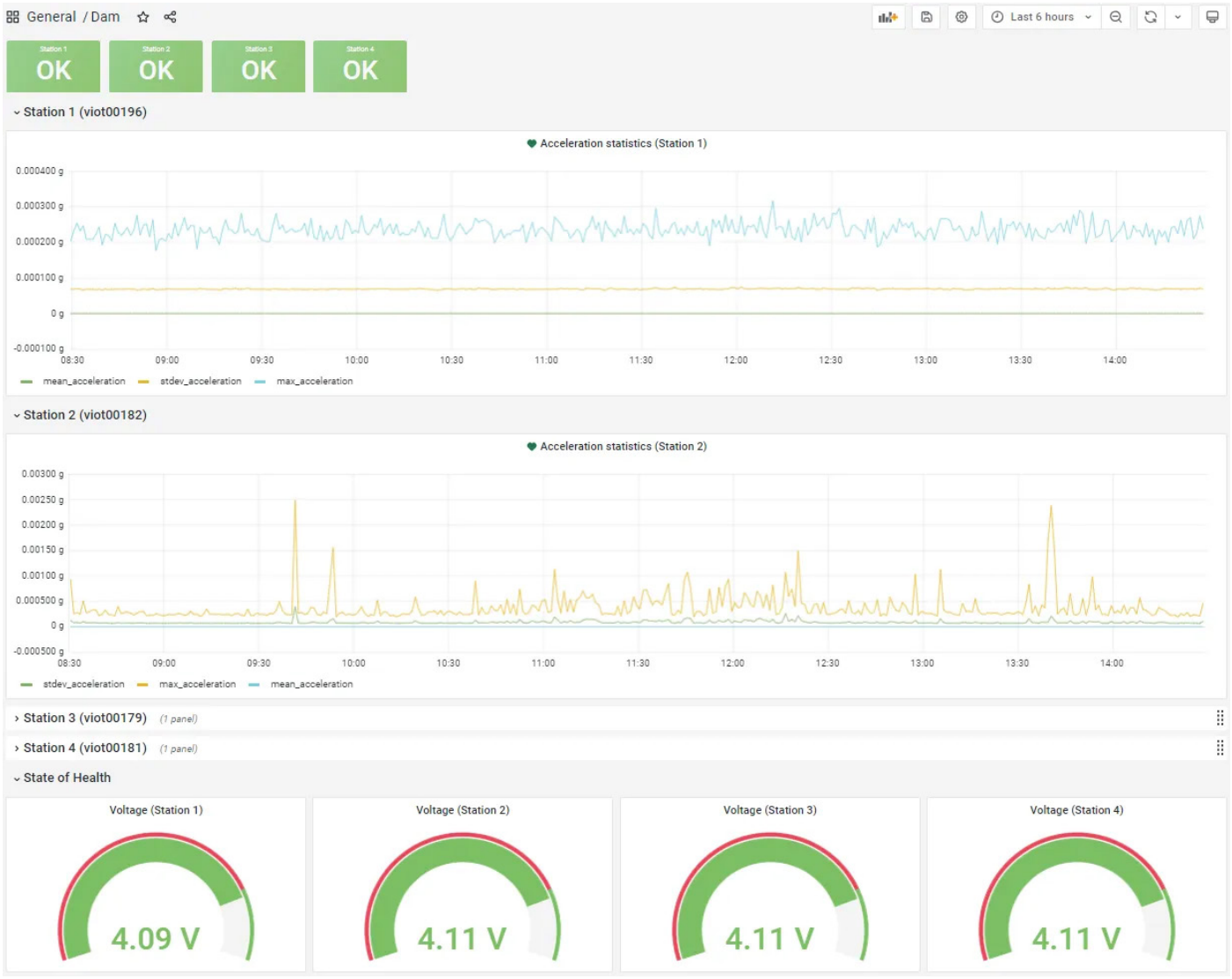
and Future Recommendations

This collaboration highlighted the importance of selecting local partners with domain expertise and ensuring seamless integration between IoT systems and existing secure infrastructure. The case study demonstrates the potential of Viotel's smart technologies in enhancing infrastructure safety and reliability.

Additionally, further automation is possible through the use of Viotel's Vibrating Wire Datalogger, which can be employed to interrogate a variety of vibrating wire sensors, including piezometers, strain gauges, and crack meters.

Viotel's technical team has successfully miniaturized their **accelerometer** while preserving its multi-connectivity options, which include LTE-M, satellite, and Wi-Fi. This advancement enhances the versatility of the **accelerometer**, making it an ideal choice for applications where ease of installation is a consideration while maintaining its connectivity capabilities.

Viotel can also install edge computing - a local alarming device in the control room located at the site office. This would require an additional communication station to be installed at the site office with a line of sight to all the sensors on the dam.



Viotel SMART Dam monitoring system ensures real-time safety and reliability for critical infrastructure through advanced seismic monitoring and data transmission.

Experience proactive risk mitigation and streamlined maintenance with Viotel's cutting-edge technology.