WORLD SENSING

Worldsensing Remote Monitoring Solution

Hong Kong Convention and Exhibition Centre

October 2024

CHALLENGES

HOW TO MAKE MONITORING SOLUTIONS MORE COST EFFECTIVE & EASY TO OPERATE?

Monitoring solutions have become the cornerstone of any risk management, business continuity or smart maintenance strategy. In this sense, wireless technologies have helped significantly to make monitoring cost-effective and easy to operate. But as the availability of technologies grow, different problems start to arise- and engineers face now issues such as:

Access to high quality data

Network flexibility and reliability

Open and scalable technology

SOLUTION

WORLDSENSING
IoT REMOTE MONITORING SOLUTION

The end-to-end, open, interoperable and reliable wireless system for your infrastructure monitoring needs

MOST TRUSTED

3000 deployed networks across 70 countries, monitoring more than 170k sensors and instrumentation

MOST SCALABLE

A system that lets you expand, change or reconfigure depending on the project needs

MOST COMPLETE

Broadband and narrowband capabilities. Instrumentation and the most complete catalog of sensor integrations in the industry.

ISO 9001:2015
27001:2013
14001:2015

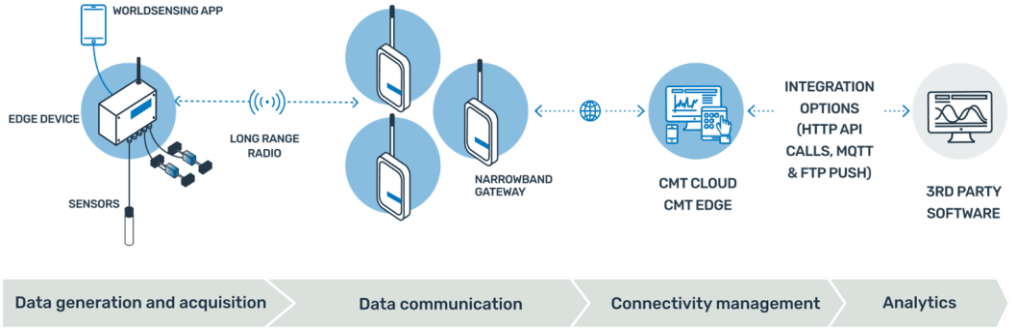
POWERED BY WORLDSENSING

Enabling data-driven decisions through secure and robust connectivity tools

NARROWBAND COMMUNICATIONS

For long-range, unattended, low-packet-rate projects.

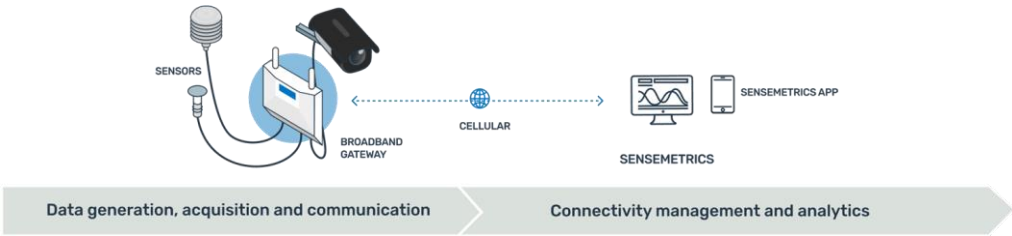
Take advantage of our main communication system based on LoRa/LoRaWAN technology to cover vast distances with low-power devices.



BROADBAND COMMUNICATIONS

Data-intensive, high-power monitoring projects.

Leverage the power of advanced broadband IoT data acquisition and communication technology to connect data-intensive sensors to your software using 4G networks.



MONITORING SOLUTION

1.
EDGE DEVICES

EDGE DEVICES

WIRELESSLY COLLECT AND TRANSMIT DATA FROM ALL YOUR GEOTECHNICAL AND INDUSTRIAL SENSORS

With Loadsensing, leverage the power of IoT

Loadsensing

+10 YEARS OF OPERATION
The data loggers and sensors are battery-powered and can last up to 10 years with little or no maintenance.

SIMPLE CONNECT AND COLLECT
Connect-and-collect technology with customizable data acquisition rates adapted to customers' risk management needs.

VERSATILITY
Integration with all leading geotechnical and structural instrumentation and monitoring sensors and systems .

EDGE DEVICES

WIRELESS DATA LOGGERS

LS-G6-VW-1M LS-G6-VW LS-G6-VW-RCR

VIBRATING WIRE

Automate data collection by wirelessly connecting instruments like piezometers and load cells to your monitoring systems.

With an internal barometer, they also transmit barometric pressure data.

The VW-RCR, a 5-channel device, measures stress and strain in concrete segments.

LS-G6-PICO LS-G6-ANALOG-4

ANALOG

Connect analog sensors like load cells and thermometers easily to your monitoring systems.

The 4-channel version supports inputs from most analog sensors, accommodating voltage, current, and resistive transducers.

The Piconode, a 3-channel wireless logger, features configurable analog, thermistor, and pulse counter channels for cost-effective data capture.

LS-G6-DIG-2

DIGITAL

The optimal choice for wirelessly streaming data from sensors with RS485 communications and other proprietary protocols to your information systems.

Utilize its autonomy and long-range communication capabilities to connect digital in-place inclinometers (IPIs) and multipoint borehole extensometers (MPBX) in areas with limited connectivity or power sources.

Additionally, the digital logger seamlessly integrates other digital sensors used in geotechnical, structural, process control, and environmental monitoring

EDGE DEVICES

WIRELESS SENSORS

LS-G6-TIL90-X

LS-G6-TIL90-I

TILTMETER

The Worldsensing Tiltmeter, a 3-axis wireless sensor, measures inclination changes in both fixed structures and ground movements.

These sensors are crucial for monitoring ground stability, structural integrity, and slope settlements, as well as railway tracks where minimizing external parts is essential.

LS-G6-TIL90-XE

LS-G6-TIL90-IE

EVENT DETECTION TILTMETER

The Tiltmeter Event Detection is a smart, 3-axis wireless tiltmeter designed for early detection of ground movements. Its embedded edge algorithm increases data frequency when predefined thresholds are reached, providing timely insights.

Monitor land stability in real time and make swift, data-driven decisions to protect people and the environment.

LS-G6-LAS-TIL90

LASER TILTMETER

The Worldsensing Laser Tiltmeter combines a laser distance meter and tiltmeter into one device. The laser measures relative distance to reference points, while the tiltmeter detects changes from vertical level in ground or structures.

This wireless sensor provides robust data for monitoring inclinations, movements, and slope or infrastructure settlements.

LSG7ACL-BILH-VIB

VIBRATION METER

The Worldsensing Vibration Meter is a wireless sensor for automated, continuous vibration monitoring. It includes a tri-axial accelerometer and an edge algorithm for threshold breach detection of vibration parameters like LAW/PPV and frequency.

Comply with vibration regulations for building integrity (e.g., DIN 4150-3, BS7385-2) and human effects (e.g., ISO2631-2).

LOADSENSING LONG-RANGE NETWORK CONFIGURATION

Loadsensing Connectivity benefits

LoRa
LoRaWAN

LONG RANGE

LOW POWER

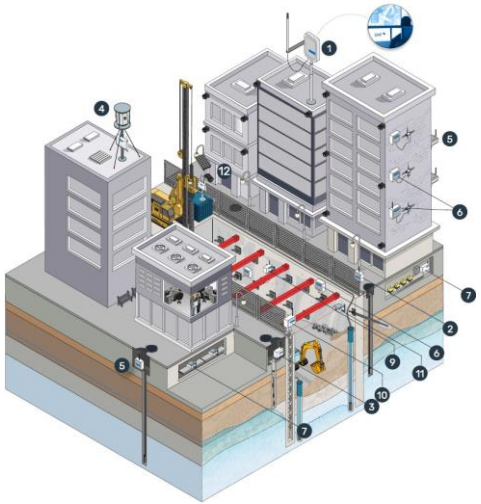
LICENCE FREE SPECTRUM

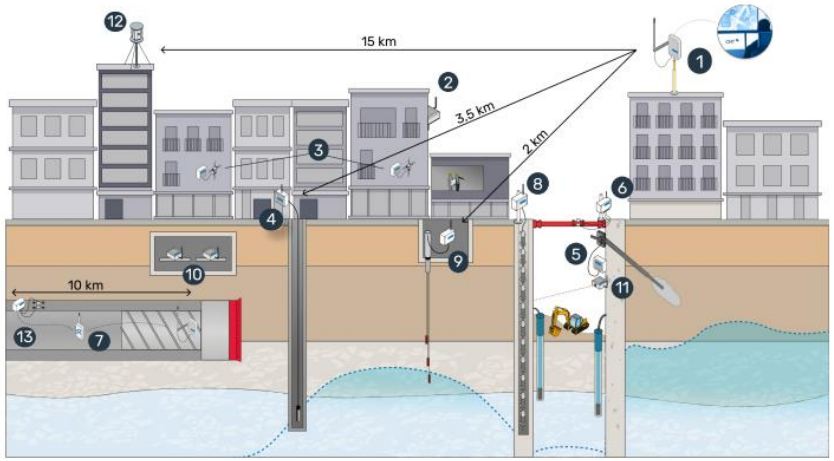
HIGH CAPACITY

END-TO-END SECURITY

OPERATIONAL ROBUSTNESS

LOADSENSING in CONSTRUCTION PROJECT





MONITORING SOLUTION

2.
CONNECTIVITY
ENABLERS

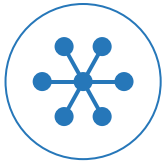
4G Rugged Gateway
Simple and reliable

Worldsensing's 4G Rugged Gateway guarantees wireless connectivity to the deployed narrowband networks. It is an industrial gateway used to connect LoRa and LoRaWAN projects with high performance relying on an optimized hardware system:

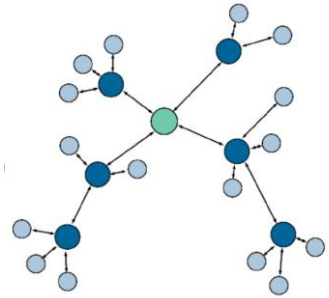
- **Backhaul connectivity**: 4G Worldwide module with 3G fallback, and Ethernet (RJ45)
- Fully integrated and **internal/external antennas GPS, 4G, LoRa/LoRaWAN**
- Carrier grade - **IP67 casing** for industrial use
- Mounting kit allowing **simple and quick installation** without opening the casing
- Built-in **high-rejection filters** for co-location with other radio devices and enabling strong interference resistance
- PoE injector powered

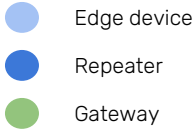
Edge Repeater
Extend LoRa network

From Star topology…



…to Tree network





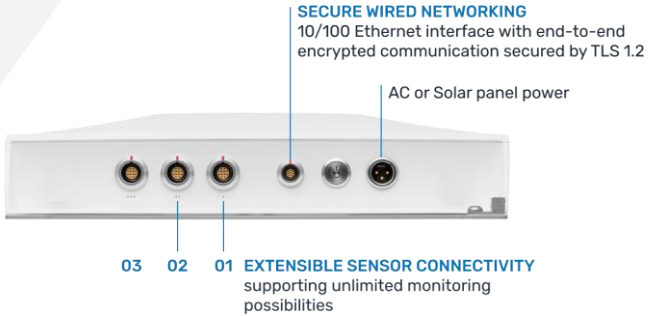
Ideal for Underground Environments

Leverage Worldsensing's LoRa Tree network topology to extend the radio range of your network up to 10 km in monitoring projects that include intricate topologies, radio signal obstacles or poor internet connectivity: long urban tunnels with several turns widespread areas with tall vegetation, galleries, ventilation shafts and other underground infrastructures

The key component of this network topology is the CMT Edge Repeater software version. The repeater is able to receive a signal from a node and retransmit it to the gateway. You can install repeaters strategically to overcome radio signal obstacles such as walls, ramps and curves to transmit data up to 10 km underground. LoRa Tree runs in a single-gateway configuration through CMT Edge.

Thread

Data-logger & Gateway
High Data-rate networks



- **2 in 1 - IoT Data-Logger & Gateway**
  As a wireless gateway, the Thread X3 enables efficient connection with compatible low-power devices and smart sensors
- **Intelligent Wireless Networking**
  Automatic network role detection Gateway, Repeater, or Endpoint
- **Adaptive and Resilient**
  Self-forming medium-range wireless mesh networking
- **Globally Compliant Cellular**
  Operate on 600+ cellular networks across 190 countries. No provisioning or carrier management required

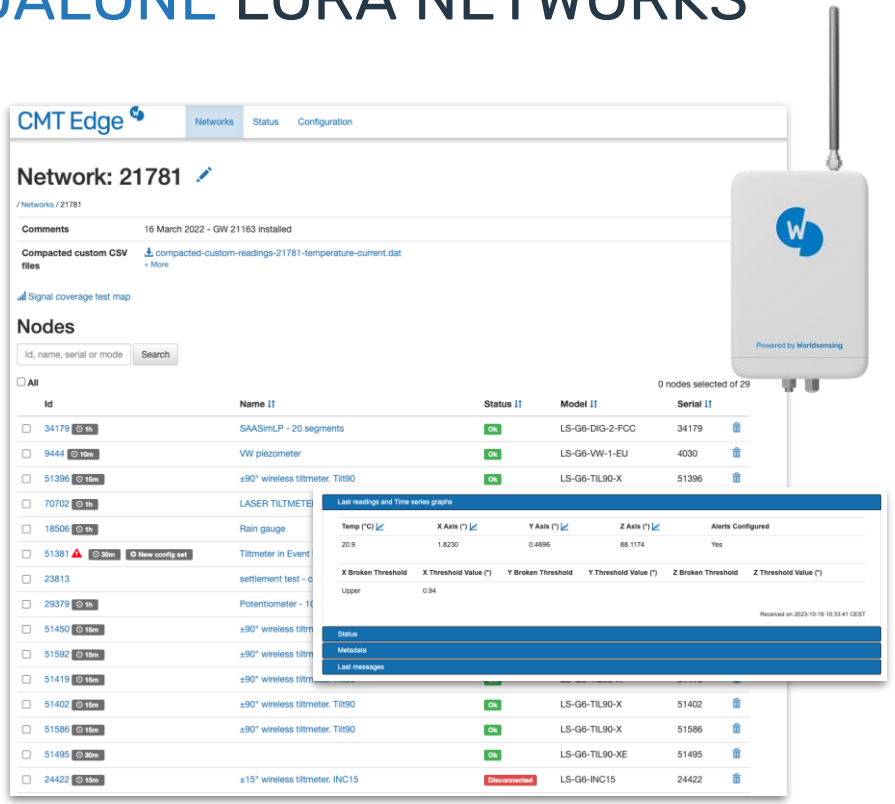
MONITORING SOLUTION

3.
MANAGEMENT SOFTWARE
WORLDSENSING

THE SOLUTION FOR STANDALONE LORA NETWORKS

Choose CMT Edge to manage an individual and private network for your IoT monitoring project. All the collected data will be contained in the gateway to ensure simplicity and full independence.

- ➔ Single site, single gateway management for controlled environments
- ➔ Setup and configure your devices and network with a very simple plug-and-play process
- ➔ Locally export csv and configure file transfers in Modbus TCP, FTP/FTPS and MQTT
- ➔ Limited management and network size due to HW capabilities
- ➔ **Optional**: Leverage the capabilities of extended radio communications with LoRa Tree networks



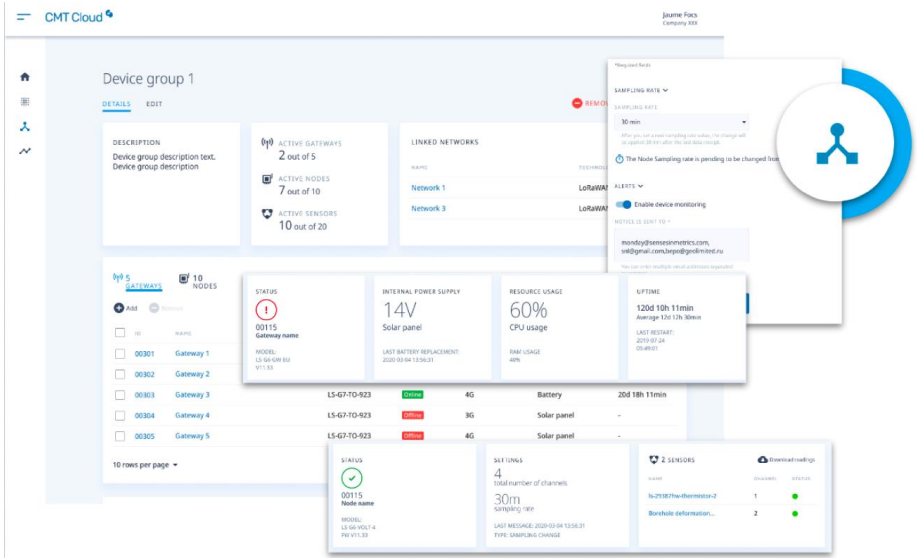
CMTCloud

LoRaWAN

MULTI-PROJECT, MULTI-TENANT, MULTI-NETWORK PLATFORM FOR ALL YOUR DEPLOYMENTS

Manage all your networks and assets across all your monitoring projects from a single platform, regardless of where they are deployed around the world:

- ➔ Multi-site, multi-project. Full visibility of network performance 24/7 online
- ➔ Full scalability and redundancy with networks that can manage multiple projects and devices simultaneously.
- ➔ Generate sub-groups from the connected devices to simplify the management process of technology and data
- ➔ Advanced features, such as Business Rules generator and User Management engine to further automate complex processes
- ➔ No limitation in terms of network size and data storage. Historical data available
- ➔ Export csv and configure file transfers in TCP, FTP/FTPS and MQTT (client/broker)



MONITORING SOLUTION

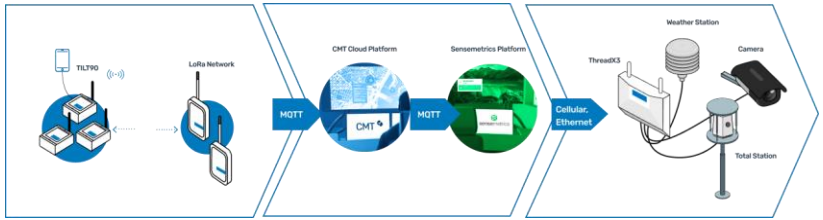
4. APPLICATIONS

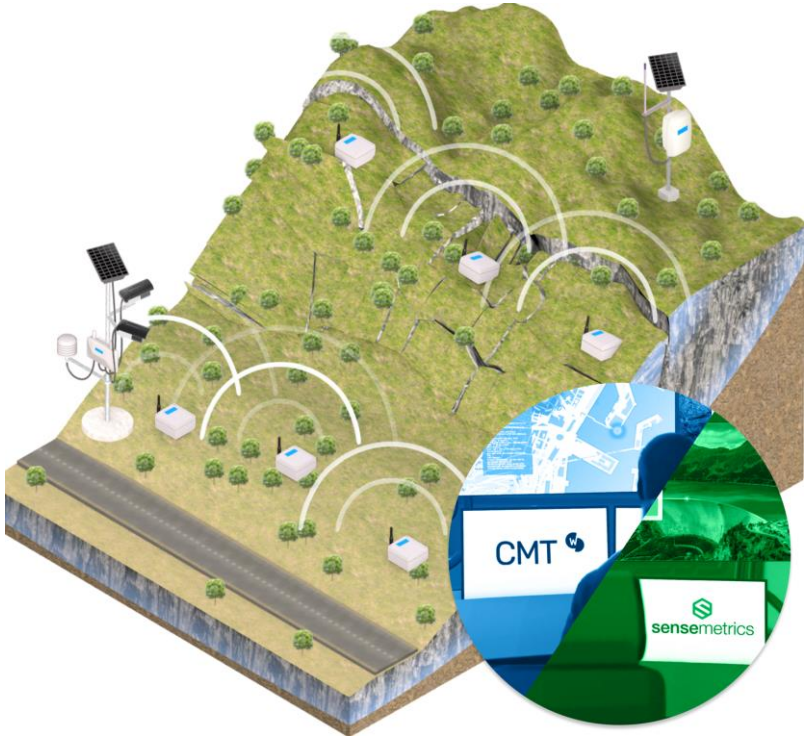
Early Warning System

Landslide Monitoring

Introducing Early Warning Systems for Ground Movement, a complete end-to-end solution that allows you to detect real-time deviations and trigger automatic events to prevent or minimize risks of ground movements.

Using Worldsensing wireless sensors and the readily real-time connectivity with the leading data visualization software Sensemetrics, you can focus on delivering a valuable Early Warning System relying on an easy to deploy solution for ground movements monitoring.





Pearl’s Hill, Singapore

Pearl’s Hill, Singapore

Pearl’s Hill, Singapore

ENVIRONMENTAL MONITORING

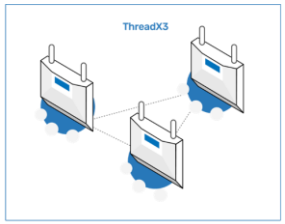
FLOOD MONITORING SYSTEM

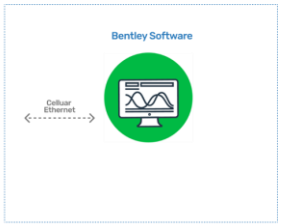
Take advantage of an all-in-one system for flood monitoring.

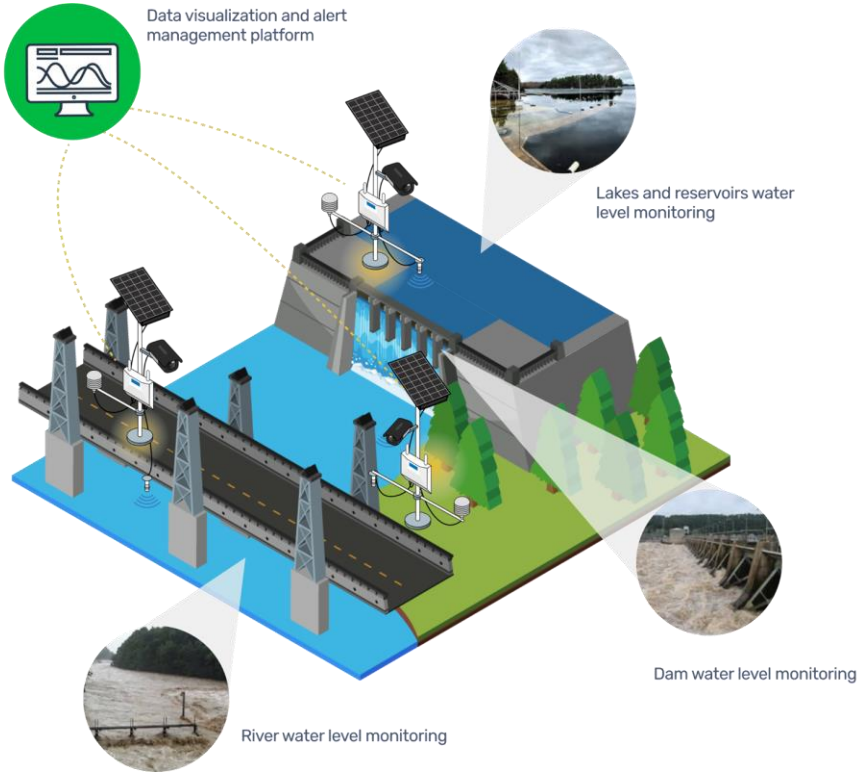
Using a single **ThreadX3** station, you can monitor water levels, weather parameters, and have visual aids through a camera to have real time data on the evolution of water bodies.

Sensor integrations allow an easy connect-and-collect deployment to have systems running with minimum installation costs.

Bentley's data visualization tool closes the gap for full system convergence, allowing you to have all data in a single place for fast data-driven decision making for flood monitoring.







Rio Grande Reservoir, Colorado, U.S.

Los Angeles Reservoir, U.S.

IoT Remote Monitoring Solution

Bridges

WORLD SENSING

1. Remotely manage and monitor your network and all deployed devices, either on-premise or through the cloud, using a **gateway** that sends data to the **Connectivity Management Tool (CMT)**. Integrate your data analytics software in CMT to create complete monitoring reports.

STRUCTURAL MONITORING

2. Monitor static deflections of the structure with the **Tilt90-X**, 2-in-1 inclinometers and data loggers,
3. Check the relative distance variation between piers with the **LaserTilt90** wireless sensor, a 3-in-1 laser distance meter, inclinometer and data logger.
4. Monitor pressure, force and temperature using strain gauges and thermistors under the deck or embedded on the armor connected to a **Vibrating Wire 5-channel data logger.**
5. Assess joint displacements and/or cracks evolution with crack meters connected to a **Vibrating Wire 5-channel or Piconode**.
6. Measure tension force with a load cell connected to a **Piconode** on stay cables.

GEOTECHNICAL MONITORING

7. Monitor wind velocity, wind direction, ambient temperature, rain, etc. with a Meteorological Station connected to a **digital logger.**

ENVIRONMENTAL MONITORING

8. Connect a water level meter to an **Analog 4-channel data logger.**
9. Measure vertical deformation at various depths with a multi-point borehole extensometer (MPBX) connected to a **Vibrating Wire 5-channel data logger**.

Forest City Bridge, Malaysia

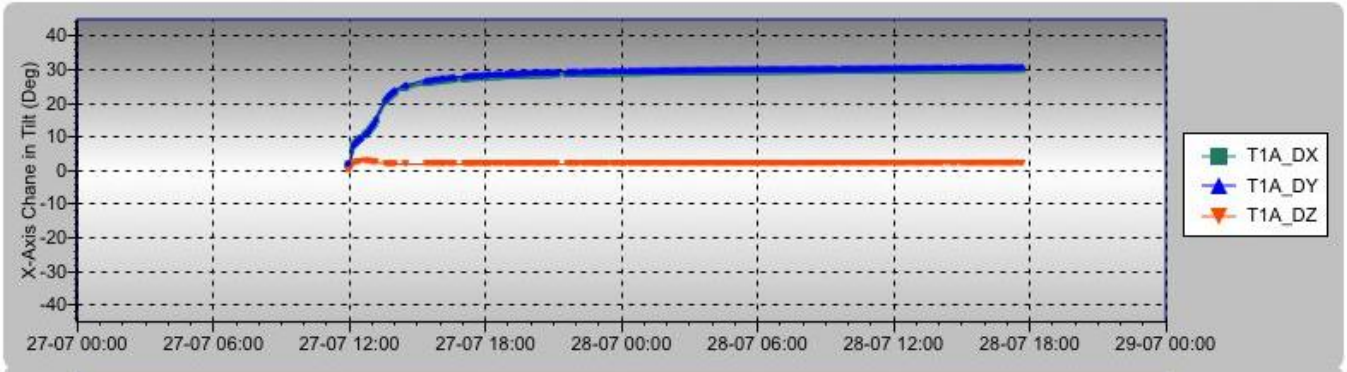
Forest City Bridge, Malaysia

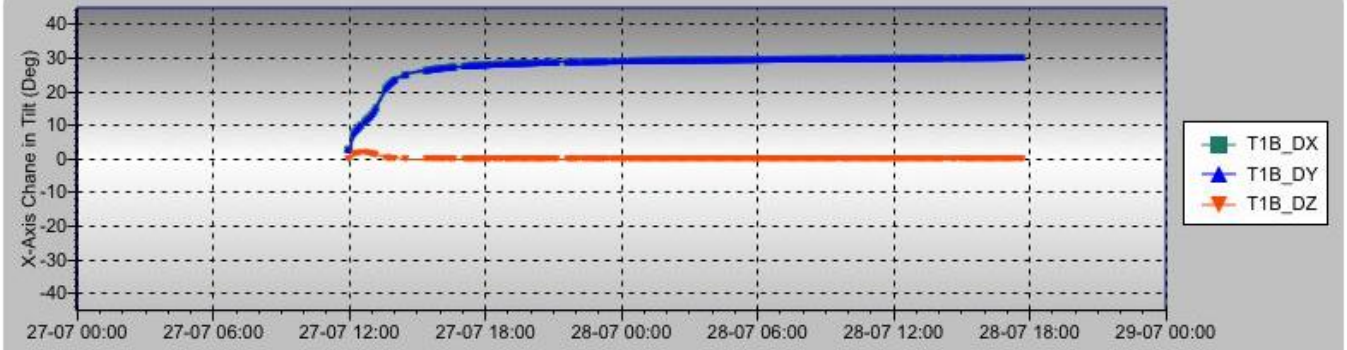
Forest City Bridge, Malaysia

T1A & T1B Chart & Data | Back to Dash Board

T1D & T1F Chart & Data | T2A & T2D Chart & Data

Current Time, Malaysia 28-07-23 05:47:01 PM





Data Range: 27-07-2023 00:00 - 29-07-2023 00:00

Select Range | Step Size | LIVE

Tiltmeter T1A & T1B

Tiltmeter ID :	T1A
Model :	LS-G6-TIL90-X
Serial Number :	91339
Install Height :	~ 1.5m abve Ground
Installation Date :	26-07-23
Commission Date :	26-07-23
Initial Reading Date :	26-07-23 14:05

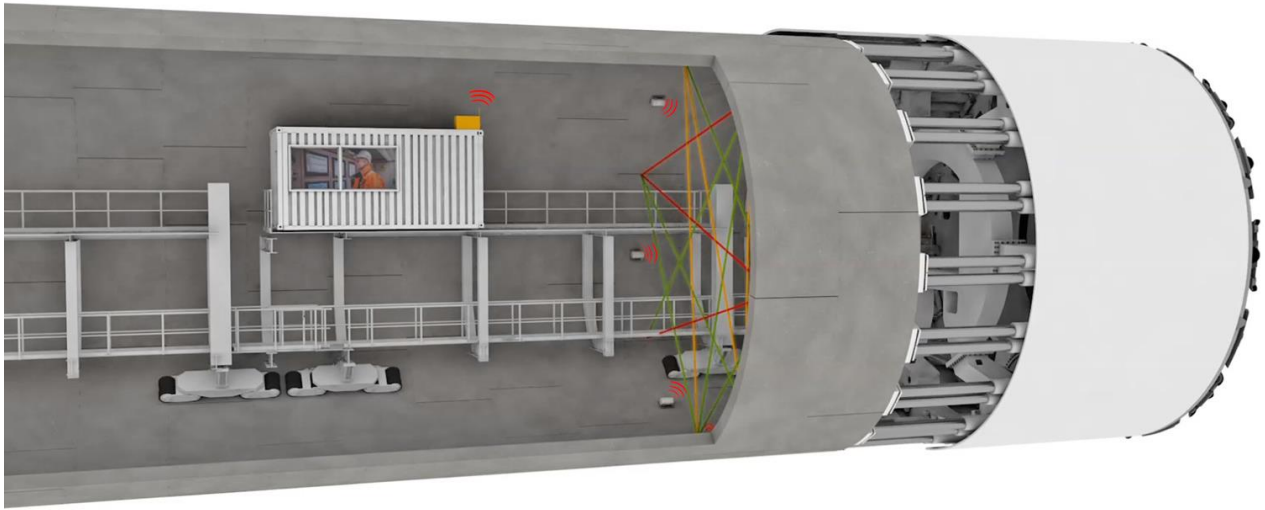
Tiltmeter ID :	T1B
Model :	LS-G6-TIL90-X
Serial Number :	91332
Install Height :	~ 1.5m abve Ground
Installation Date :	26-07-23
Commission Date :	26-07-23
Initial Reading Date :	26-07-23 14:05

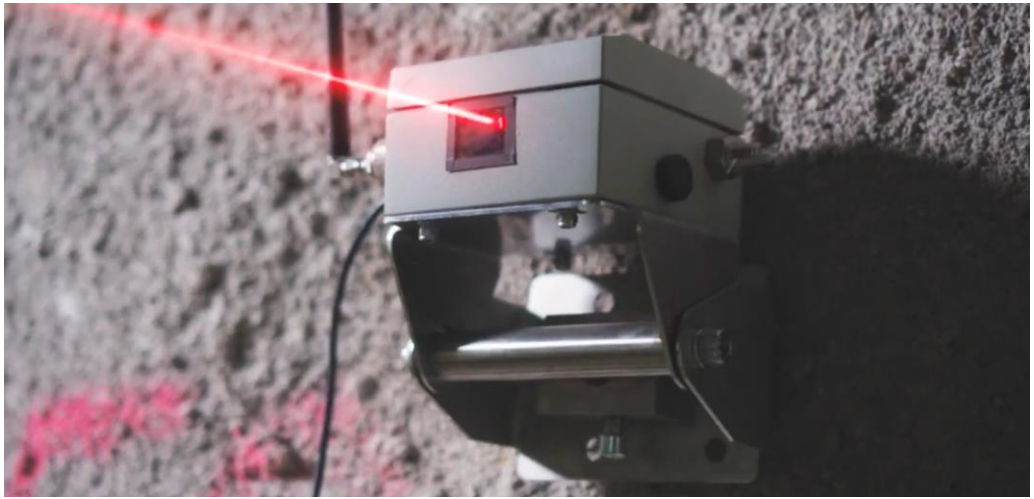
Timestamp	T1A_Delta_X	T1A_Delta_Y	T1A_Delta_Z	T1B_Delta_X	T1B_Delta_Y	T1B_Delta_Z
28-07-23 17:41	30.1	-30.9	2.2	30.2	-30.2	0.0

Application in TBM Tunnelling

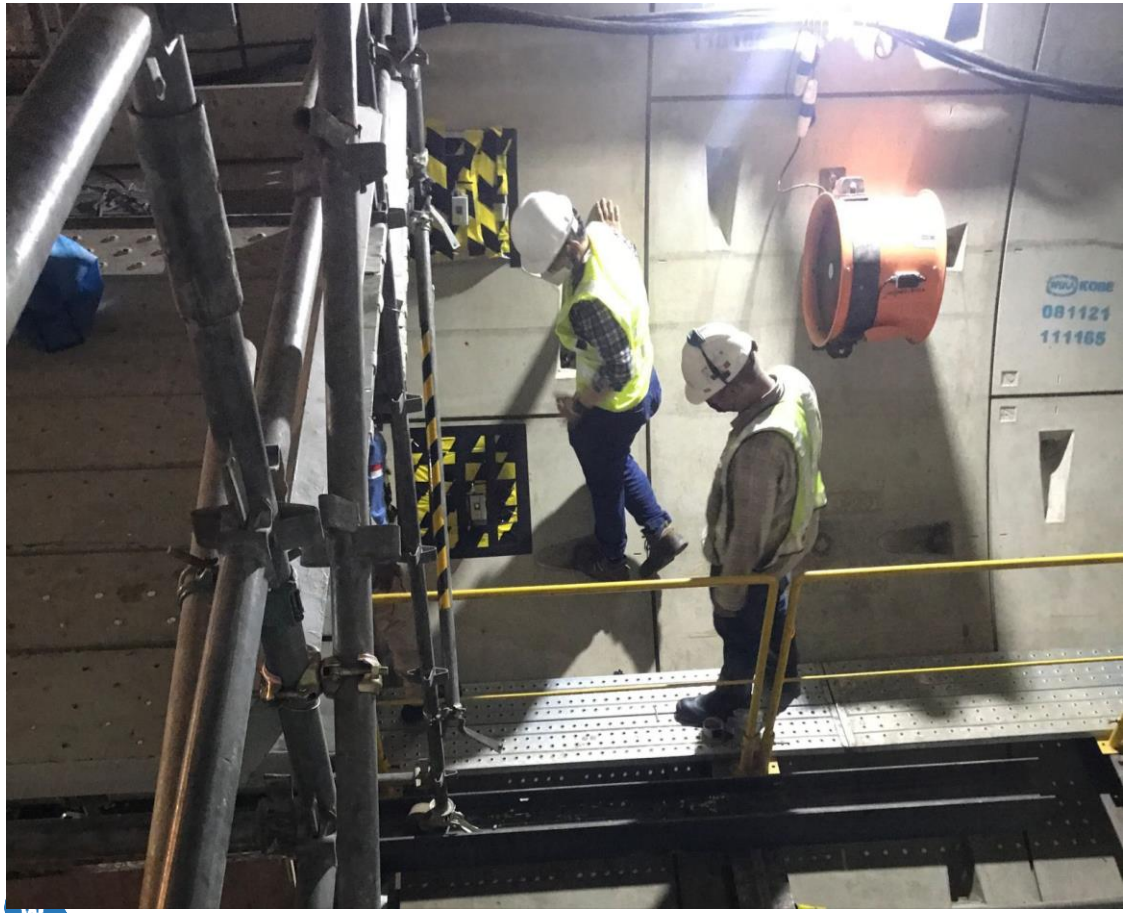
Tiltmeters are embedded in each segment

Automatic convergence measurement immediately after ring completion





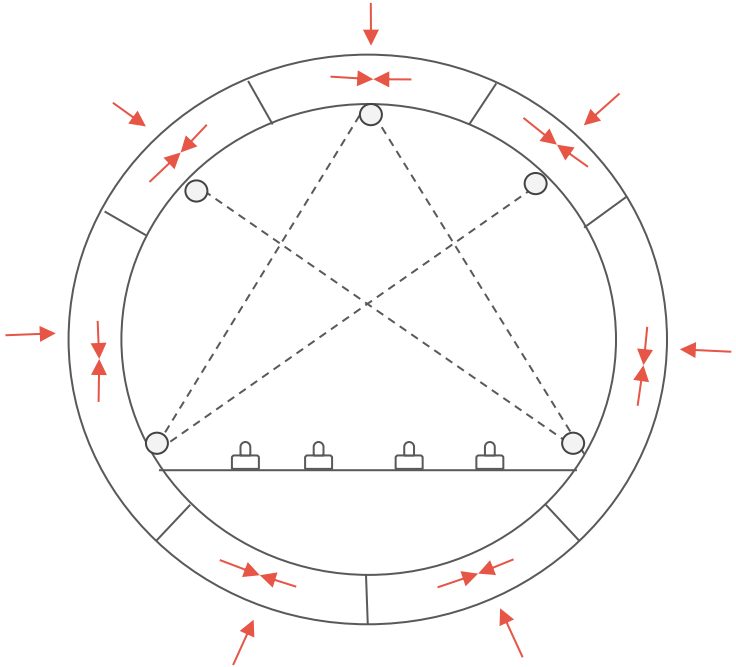
Jakarta MRT, Indonesia



Jakarta MRT, Indonesia

TBM Tunnel monitoring

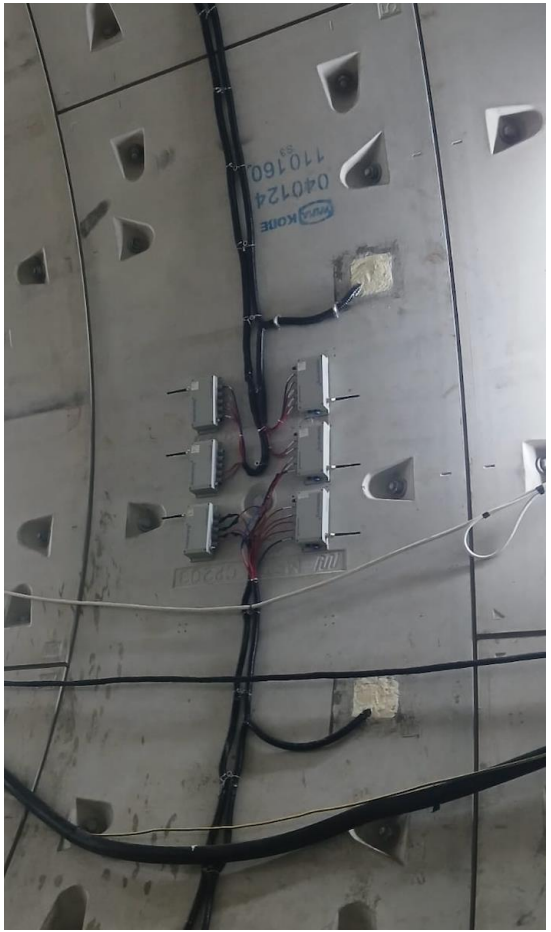
Instruments inside a tunnel structure (TBM Tunnel section)



Pressure Cells

Strain Gauges

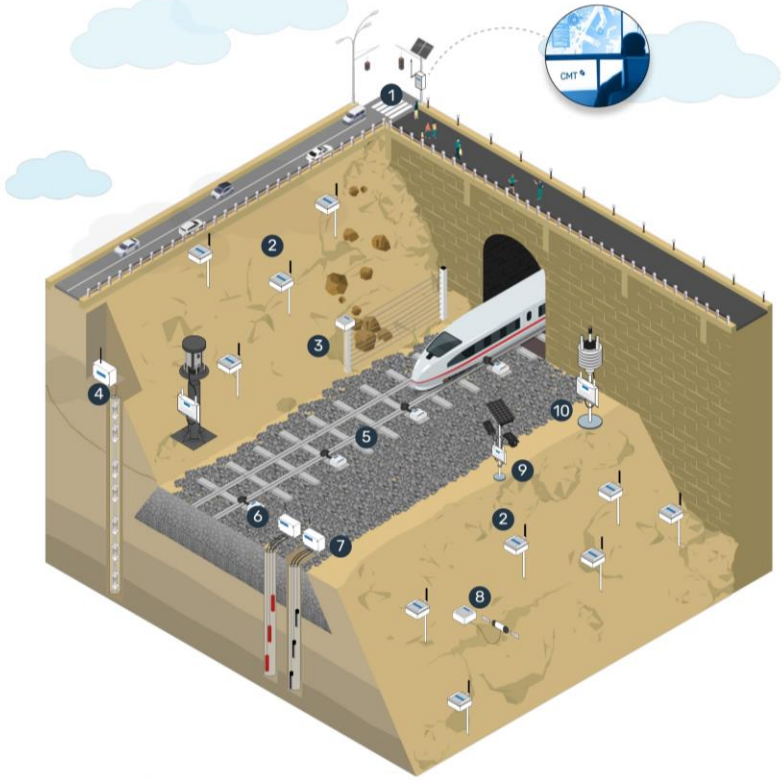
Prisms/LASTIL90



Jakarta MRT, Indonesia

IoT Remote Monitoring Solution

IoT Remote Monitoring in the Rail Industry



1. Remotely manage and monitor your network and all deployed devices, either on-premise or through the cloud, using a **gateway** that sends data to the **Connectivity Management Tool (CMT)**. Integrate your data analytics software in CMT to create complete monitoring reports.

GEOTECHNICAL | GEOSPATIAL MONITORING

2. Monitor lateral displacement due to slope instability with the **Tilt90-X, Wireless Tiltmeter with external antenna,** mounted on a pole and installed on a slope.

3. Connect a rock detection system to a **Piconode**.

4. Monitor in-depth lateral displacements of the subsoil due to instability and/or presense of discontinuities using a string of in-place inclinometers connected to a **digital logger** or a **ThreadX3** for longer chains.

5. Measure track conditions (cant, twist and height variation) with a **Tilt90-i, Wireless Tiltmeter with an internal antenna**.

6. Measure pore water pressure and water level variations associated with vertical displacement and bearing capacity of the soil with vibrating wire multipoint piezometers connected to a **Vibrating Wire 5-channel data logger**.

7. Monitor vertical displacements linked to soil settlement with a multipoint borehole extensometer (MPBX) connected to a **Vibrating Wire 5-channel data logger.**

STRUCTURAL MONITORING

8. Analyze soil cracks that can lead to soil failure with a crack meter connected to a **Piconode**.

9. Integrate automated remote visual observations to your condition monitoring program with a field camera connected to a **Thread X3.**

ENVIRONMENTAL MONITORING

10. Monitor wind velocity, wind direction, ambient temperature, rain, etc. with a Meteorological Station connected to a **ThreadX3.**

Rail monitoring parameters

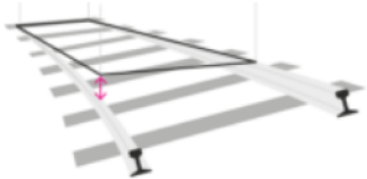
Monitoring can help avoid critical faults in three areas: the track, the subsurface and the railway surroundings, including embankments, retaining walls and so on.

Track geometry

The safety of the railway depends not just on the vertical alignment of the track but also the extent of twist or cant gradient. This is how the difference in elevation between the outer and inner rail varies over a given length of track. Monitoring systems can detect changes in these parameters and make sure track irregularities do not reach dangerous levels.

Cant

The measurement of the difference in elevation between the outer rail and the inner rail is called cant in most countries.



Twist or Cant gradient

Track twist may be used to describe cant gradient which may be expressed in percentage of cant change per length unit.

Vertical alignment

It is the surface uniformity in the vertical plane.

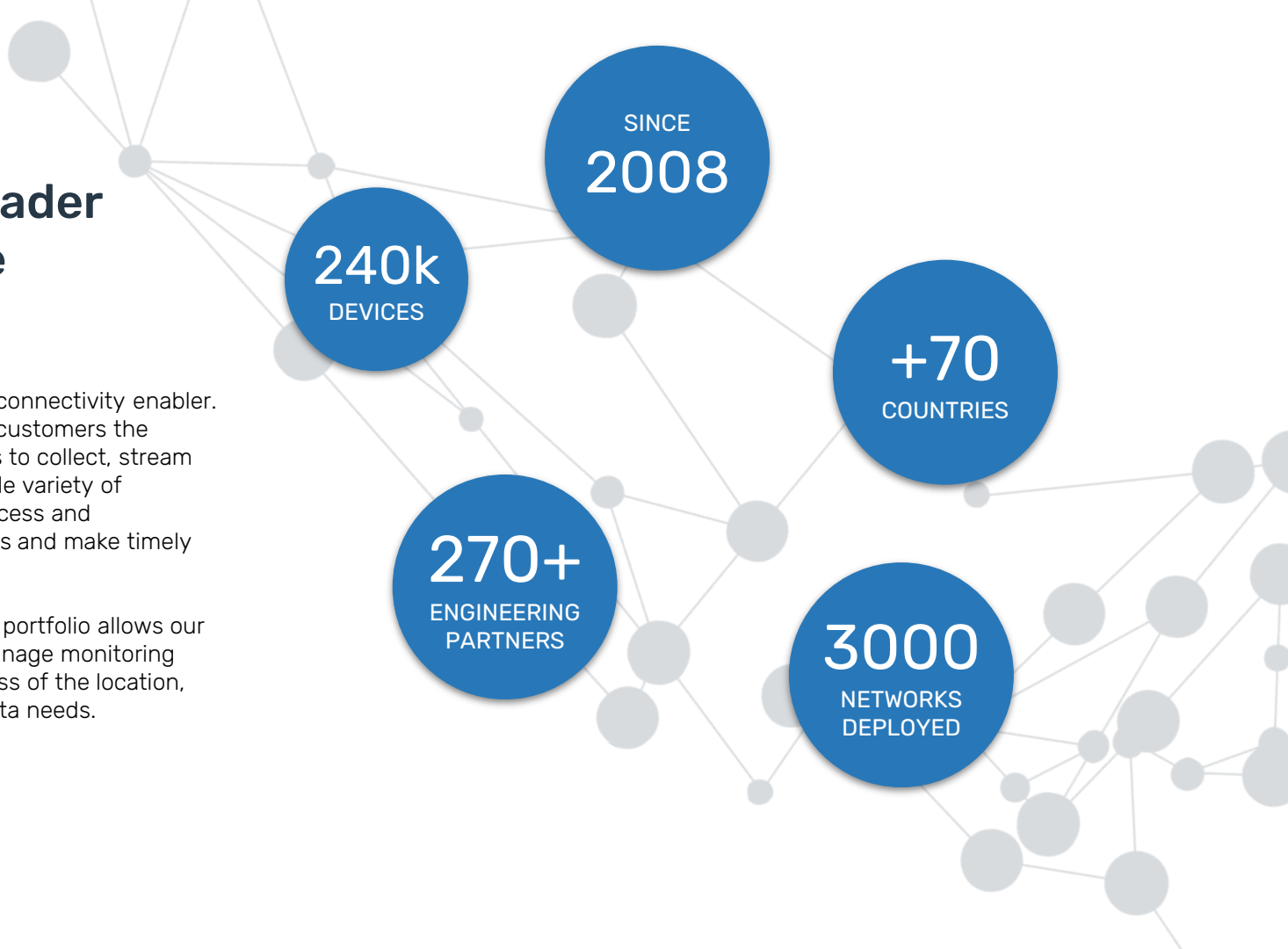
Shuttleworth Road, London, UK

7.
ABOUT WORLDSENSING

The Global Leader in IoT Remote Monitoring

Worldsensing is a global IoT connectivity enabler. We provide our engineering customers the necessary connectivity tools to collect, stream and manage data from a wide variety of geotechnical, structural, process and environmental to assess risks and make timely decisions.

Our comprehensive solution portfolio allows our customers to deploy and manage monitoring systems anywhere, regardless of the location, energy requirements and data needs.



Your trusted partner for monitoring large-scale civil infrastructure through IoT technology.

MINING

We contribute to safer operations at 130+ mines and tailings dams.

CONSTRUCTION

We support geotechnical monitoring across 200+ major construction sites to check structures are sound.

TRANSPORT

Leading the wireless monitorization of ground stability and structural health of transport-related infrastructure worldwide.

ENERGY GENERATION INFRASTRUCTURE

Leading the wireless monitorization of ground stability and structural health and environmental compliance in hydro dams maintenance projects with the highest quality and safety standards.

CERTIFIED PARTNER

Helping you comply with quality standards.

Meeting high quality standards of demanding industries

- Customer value our ability to respond to their industry's required quality standards.
- Worldsensing's Quality Management System is certified to ISO 9001, ISO 27001 and ISO 14001 by an Accredited Certification Body.
- Our quality system has been developed around one of our core values: excellence.

ISO 27001:2022
INFORMATION SECURITY

ISO 9001:2015
QUALITY MANAGEMENT

ISO 14001:2015
QUALITY MANAGEMENT

THANK YOU

STAY IN CONTACT WITH US:

ppang@worldsensing.com

Patrick Pang (+65) 8131 2948

worldsensing.com

WORLD SENSING