TrenTrace

TrenTrace Infrastructure Monitoring

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About TrenTrace

What is TrenTrace?

TrenTrace is a unique remote monitoring tool that allows you to measure weather and other environmental data anywhere in the world in real time. TrenTrace comes with its connectivity and security pre-configured: all of the complex mobile network access and security is seamlessly and invisibly managed in the background so you don't need to worry.

THE WORLD LEADING REMOTE DATA SOLUTION

Measurement Capabilities

The TrenTrace base unit has four separate measurement parameters:

- A Weather Station
- A Wireless Rail Track Temperature Sensor
- A Water Level Sensor
- An Embankment Stability Sensor

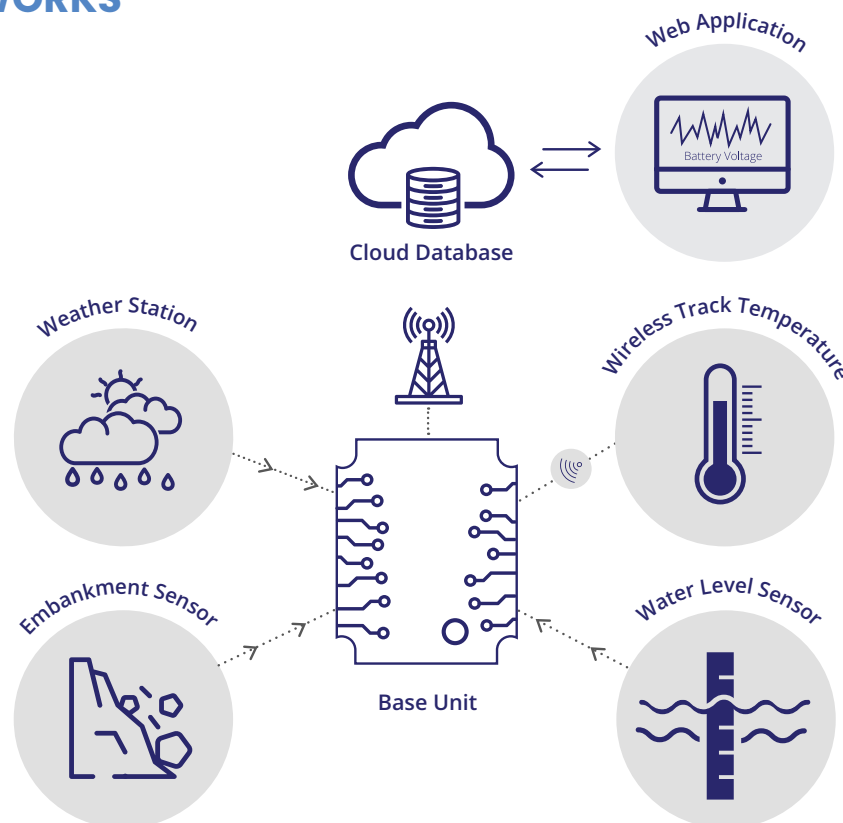Each unit is supplied with onboard voltage and humidity sensors and a Global Positioning (GPS) chip.

Each unit can simultaneously accept

1 x Weather Station,

4 x Wireless RailTrack Temperature Sensors,

1 x Water Level Sensor,

1 X Embankment Stability Sensor

You can pick and choose which sensors you'd like to connect.

Using the same base unit for more than one sensor reduces capital costs and annual data costs.

HOW IT WORKS

Web Application

Battery Voltage

Cloud Database

Weather Station

Wireless Track Temperature

Embankment Sensor

Water Level Sensor

Base Unit

Wireless Rail Track Temperature

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The Temperature Sensor is a self-contained unit that is simply clipped onto the underside of the rail. The brass plug (ASTM B16 H02) containing the digital sensor is pressed against the foot of the rail maintaining a contact force of between 10 and 20N.

There is no requirement to alter the rail geometry or drill holes etc. thus ensuring no change to the integrity and strength of the rail. Because no damage is caused to the rail either during installation or operation, the units can be easily moved to another location if required.

The wireless range of the temperature sensor is up to 20m, allowing the base unit to be installed at a safe distance from the tracks. The temperature data is sent to the cloud database once every 30 minutes. Up to four Temperature Sensors can be installed and connected to the same base unit at the side of the track.
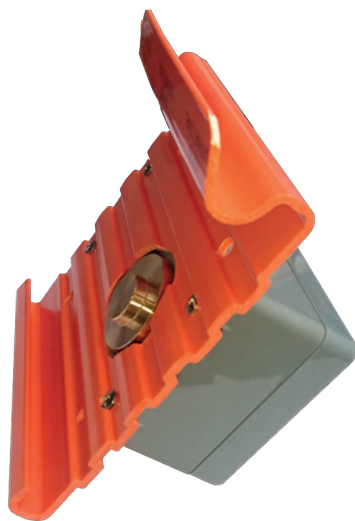
Weather Station

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The Weather Station measures Windspeed & Direction, Rainfall Amount & Intensity, Air Temperature and Humidity. There are no moving parts so it is virtually maintenance free. Measurement of precipitation is carried out using a small 24GHz Doppler radar. The precipitation type (rain/snow/hail) is also determined by radar. Data is sent to the cloud database every 10 minutes.

Water Level

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The water level sensor can measure the water level of a lake or a water course such as a river or stream. It is very effective in providing an early warning for possible flooding occurring in an area. The sensor uses a vented diaphragm to compensate for atmospheric pressure changes. It is supplied with a 20m lead giving ample distance for mounting the base unit safely away from the water course/ lake etc. Data from the water level sensor is sent to the cloud database every 10 minutes.

Embankment Stability
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Embankment Monitoring is carried out using either a cable or mesh pinned to the embankment surface. The cable is fixed at one end and connected to the movement sensor at the other end. Movement in the Embankment is detected via changes in tension in the cable/mesh. The data is sampled every 15 seconds and checked against the Alarm Settings. If the values are in Alarm, the data is immediately sent as Alarm data to the cloud database for processing and to allow alerts to be sent to the appropriate personnel. While not in Alarm, the data is sent to the cloud database once every 10 minutes.

Power Supply
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TrenTrace harnesses the power of the sun to provide energy to the base unit and the connected instrumentation. The unit is supplied with a solar panel, deep-cycle AGM battery and MPPT Charge Controller which supplies the base unit power and the instrument power to ensure that your unit remains operational at all times. The battery life is expected to exceed 700 cycles[1].

[1.] weather dependent on the depth of discharge

Connectivity & Security

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Immediate access to data is usually the driving force behind an IoT installation. People want access to data in real-time rather than waiting for batch uploads or costly visits to the instrument in the field. That is why connectivity is so important: a reliable connection is vital. We target >99% uptime. Using cellular connectivity gives the lowest total cost of ownership, the lowest risk, and highest uptime for your remote instrumentation.

We use the Eseye AnyNet™ Sim to power our connections. The Sim cards are embedded in the PCB so that they cannot be removed/tampered with. The unit picks up the strongest network signal in the installation area and

uses that for its connection. It can also swap networks if connectivity issues are detected, boosting connectivity uptime. We have access to over 700 networks in 190 countries via the Eseye Global APN.

The data from the field is managed using Amazon Web Services, or AWS. When a new unit is provisioned, the AWS service delivers a unique Security Certificate which is then installed and all communication between the Cloud and the field is in encrypted format. The SSL/TLS Security Certificates management process is completely automated in the background so you don't need to worry about their ongoing management.
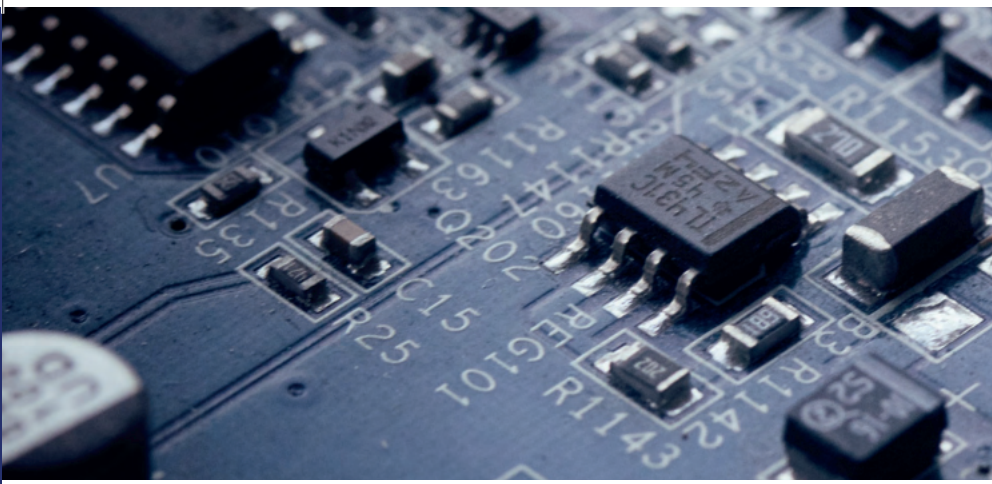
Data

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Fully hosted Cloud Database & Web Application

This requires the least management and infrastructure from your perspective. We supply and manage the Cloud Database to collect the data. We supply, host and manage the Web Application to view and manage your data. Your full system will be up and running as soon as the first instrument is installed and switched on.
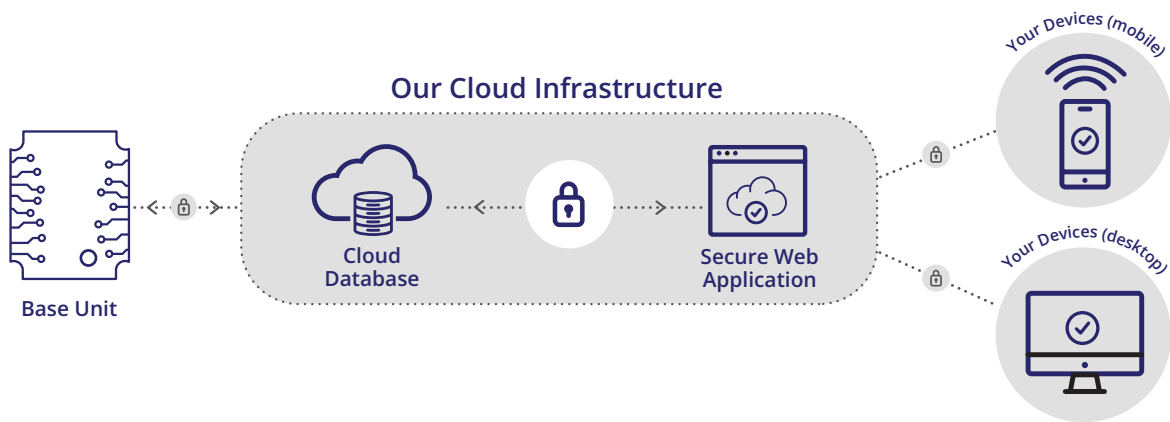
API

We can supply your data via API. Using this approach, you can use your infrastructure to integrate the data via API delivering it directly to your existing system for further processing/viewing etc.
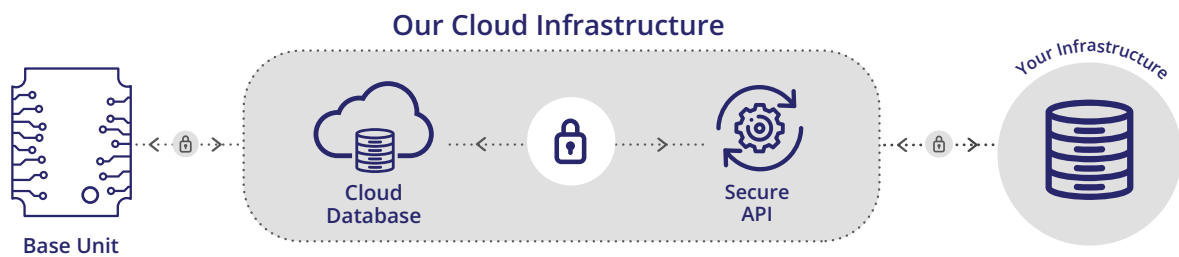
HOW IT WORKS

Fully Hosted Cloud Database & Web Application

Our Cloud Infrastructure

Base Unit

Cloud Database

Secure Web Application

Your Devices (mobile)

Your Devices (desktop)

API

Our Cloud Infrastructure

Base Unit

Cloud Database

Secure API

Your Infrastructure

Diagnostics

Each Base Unit contains sensors built into the board that measure its health. This allows for early preventive maintenance intervention before an issue causes a malfunction. Specifically, we measure:

- Battery Voltage: to ensure that the charging process is operating correctly.

- Board Humidity: to ensure that there are no issues with water ingress to the enclosure.

- Board Temperature: to ensure the board is operating correctly.

Each unit is also equipped with a GPS chip. The GPS coordinates are sent to the cloud once every hour enabling you to see the real position of your unit. This is very useful for detecting mix-ups during installation or theft.

RAIL TRACK TEMPERATURE
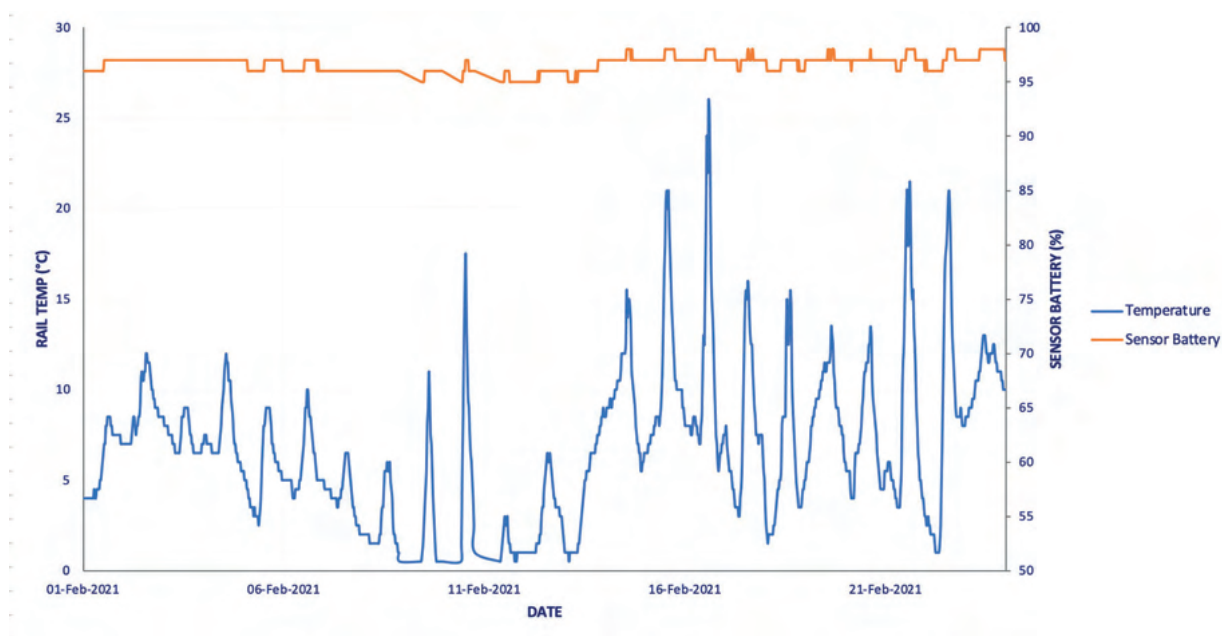
Specification

DESCRIPTION	RANGE/ ACCURACY	DATA FREQUENCY
Base Unit (board temperature, board pressure, board humidity, battery voltage)	—	10 minutes
GPS Position	2 metres	60 minutes
Wireless Temperature	-55°C to 125°C ± 0.5°C	30 minutes
Water Level	0 – 10m H20 ± 0.5% FSD	10 minutes
Embankment Stability Monitoring	1mm/10m	10 minutes or 15 seconds if Alarm Detected
Weather Station:		
Air Temperature	± 0.5°C	10 minutes
Atmospheric Pressure	300 - 1100mBar ± 0.1mBar	10 minutes
Windspeed	0-40m/s ± 3%	10 minutes
Wind Direction	± 3°	10 minutes
Humidity	0-100% ± 5%	10 minutes
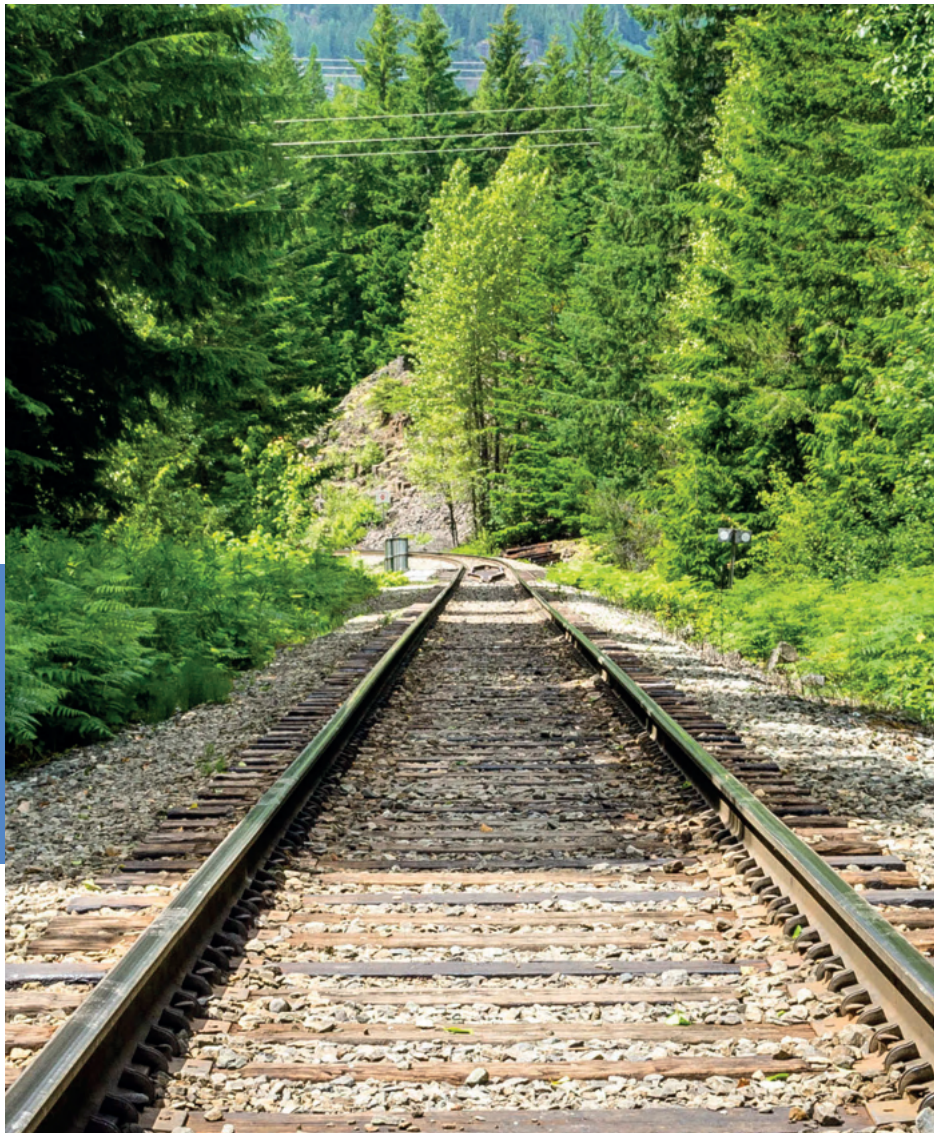
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