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Infrastructure Monitoring through Ackcio & tailored:systems' technologies

November 16, 2021, Tuesday,

SGT 4.30pm – 5.30pm,

CET 9.30am – 10.30am

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Your Hosts

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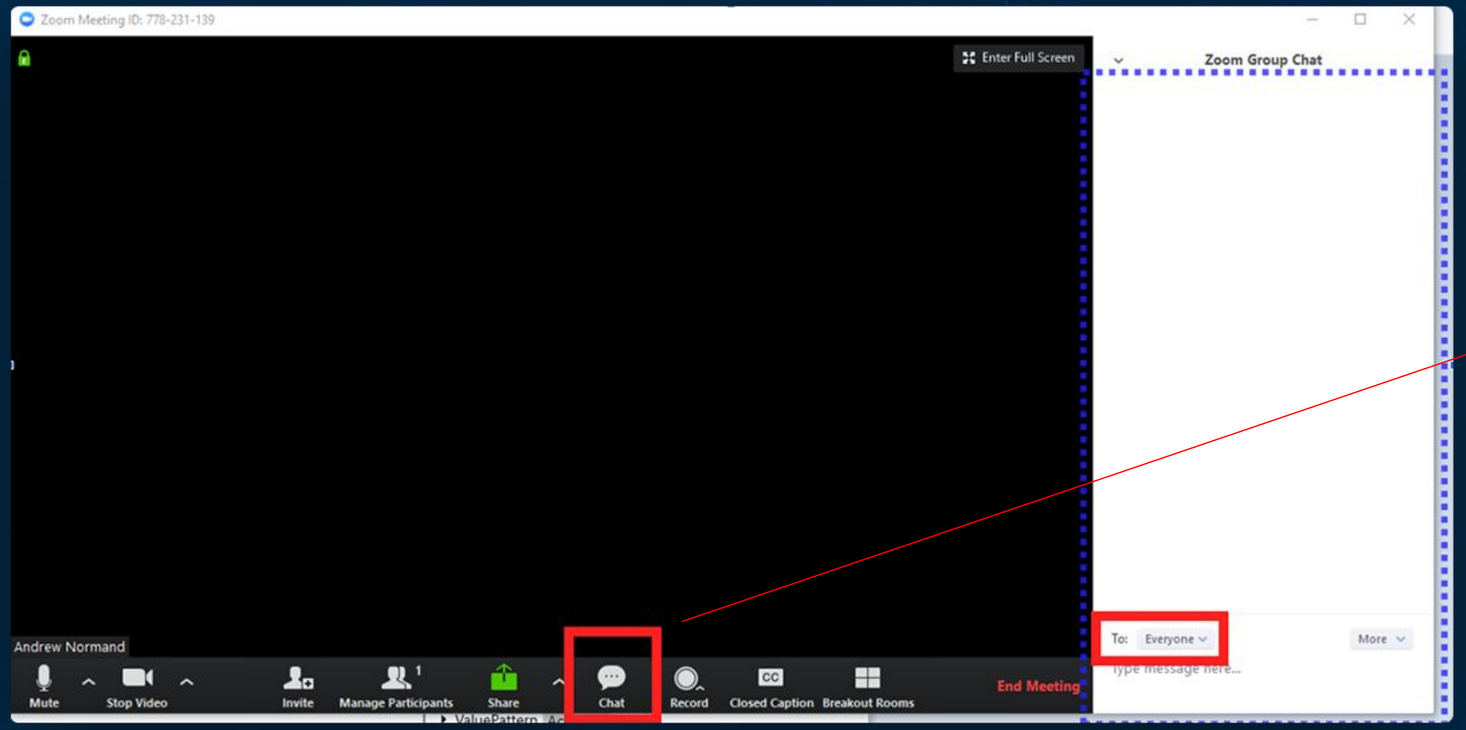
Housekeeping Rules



We are live! Please mute your mic.

Pose questions to the speakers here. We'll get to these at the end.

Recording of the webinar will be sent out within 1 week after the webinar.

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Agenda

1. Importance of digitize infrastructure projects to help protect assets, reduce costs and keep people safe
2. Common infrastructure monitoring challenges
3. Key facts about wireless monitoring solutions vs legacy solutions
4. Comparison of LPWAN - What makes Ackcio Beam reliable?
5. Live demonstration of Ackcio Beam and IoTailor platform
6. Sharing of real deployment cases
7. Q&A session
8. Closing

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Importance of digitizing infrastructure projects

Infrastructure is a key global industry

But we are not getting all the value out of it

How can we change this?

$13 Trillion
est. global output in 2022 *(Global Data)*

180 Million
people work in construction *(Weigo)*

1%
increase in annual productivity in the last 20 years *(MGI)*

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Importance of digitizing infrastructure projects

Infrastructure is a key global industry

But we are not getting all the value out of it

How can we change this?

4-6%

Cost reduction

by implementing technology *(MGI)*

71%

Owners

data capture during construction reduces operation costs *(MGI)*

25-40%

of fatal accidents

out of 6-10% of total workforce in developed countries (ILO)

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Importance of digitizing infrastructure projects

Infrastructure is a key global industry

But we are not getting all the value out of it

How can we change this?

Culture & Mindset

Training, collaboration,..

Processes

Optimize processes, off-site construction,...

Technology

- Flexible and Reliable
- Cost efficient
- Focus on helping solve real problems

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Importance of digitizing infrastructure projects

Infrastructure is a key global industry

But we are not getting all the value out of it

How can we change this?

End to end solutions that are easy to deploy, cost efficient, and provide periodically real-time information

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Use Case

Monitoring and Management of Small Machinery

PROBLEMS

- Loss of working hours looking for lost machinery
- Increased rental costs and machinery yard to keep up with production goals
- Poor management of all existing assets due to under usage

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Use Case

Monitoring and Management of Small Machinery

SOLUTION

- Geo-location of small machinery
- Machinery assignment to teams
- Management of shared machinery
- Return excess of rental machinery

PRODUCTION DASHBOARD  ANALYTICS  LOGISTICS DASHBOARD

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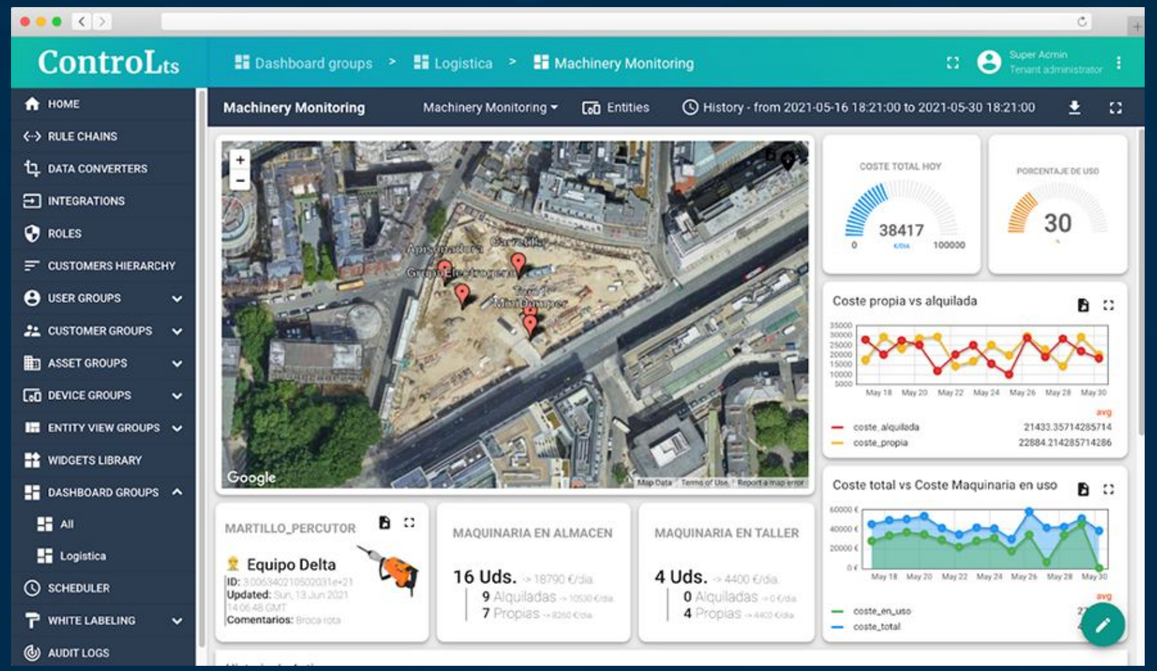
Use Case

Monitoring and Management of Small Machinery

BENEFITS

- No more lost hours looking for machinery
- Reduce rental costs
- Optimize management and control, linking teams and machines



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Use Case

Rail Track Monitoring

PROBLEMS

- Monitoring of rail tracks movements are needed for safety and maintenance
- Auscultation trains are expensive and do not provide timely information
- Automatic surveying is expensive and requires maintenance

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Use Case

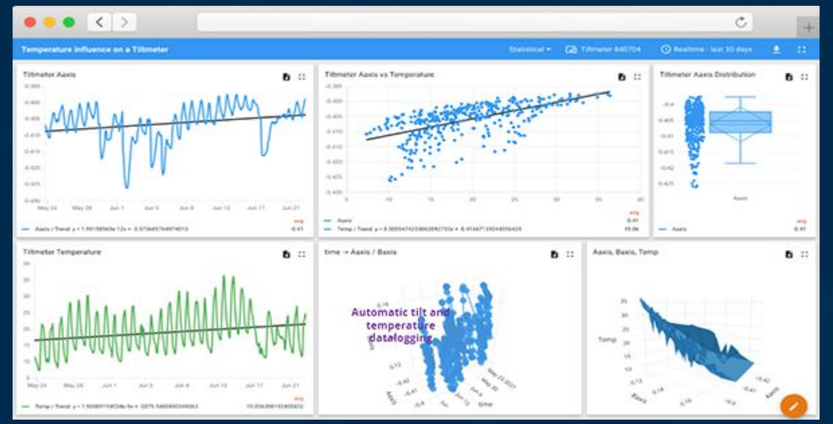
Rail Track Monitoring

SOLUTION

Automatic Monitoring with IoT wireless tiltmeters and temperature sensors

- ✓ Register biaxial tilt in every sleeper and temperature in rail
- ✓ Upload to the cloud where data is processed and visualized
- ✓ Alarm and report to warn issues to the operator

Automatic tilt and temperature datalogging



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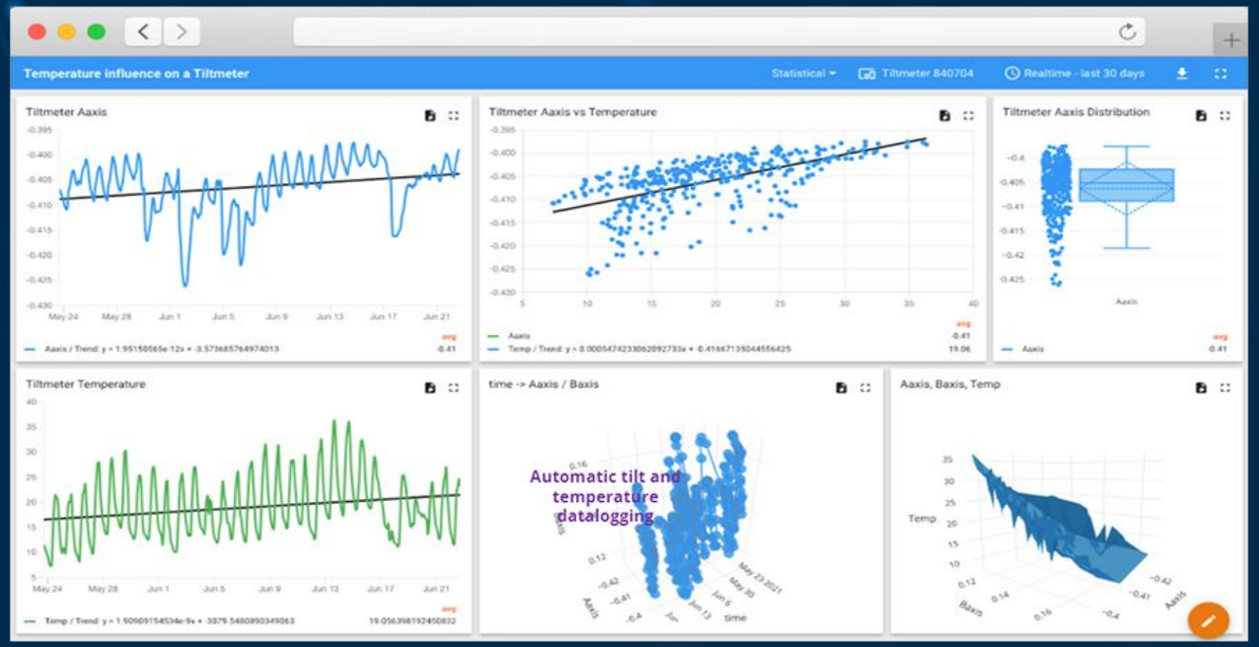
Use Case

Rail Track Monitoring

iotailor by tailored:systems

BENEFITS

- Allow near real-time problem detection
- Easy to maintain, almost free
- Better informed decision making



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Use Case

Geotechnical and Infrastructure Monitoring

PROBLEMS

Safety First !!!

- Land slides
- Dam failures
- Bridge collapses
- Tunnel collapses
- Facades and structures stability

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Use Case

Geotechnical and Infrastructure Monitoring

PROBLEMS

Safety First !!!

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Use Case

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Use Case

Geotechnical and Infrastructure Monitoring

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Use Case

Geotechnical and Infrastructure Monitoring

PROBLEMS

Safety First !!!

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Use Case

Geotechnical and Infrastructure Monitoring

WHAT CAN WE DO?

- Use technology to monitor aging and critical infrastructure
- Know as soon as possible where maintenance is required
- Avoid incidents that could affect the operation of the infrastructure

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Use Case

Geotechnical and Infrastructure Monitoring

BENEFITS

- ✓ Optimize maintenance programs
- ✓ Operation reliability
- ✓ PREVENT ACCIDENTS !!!

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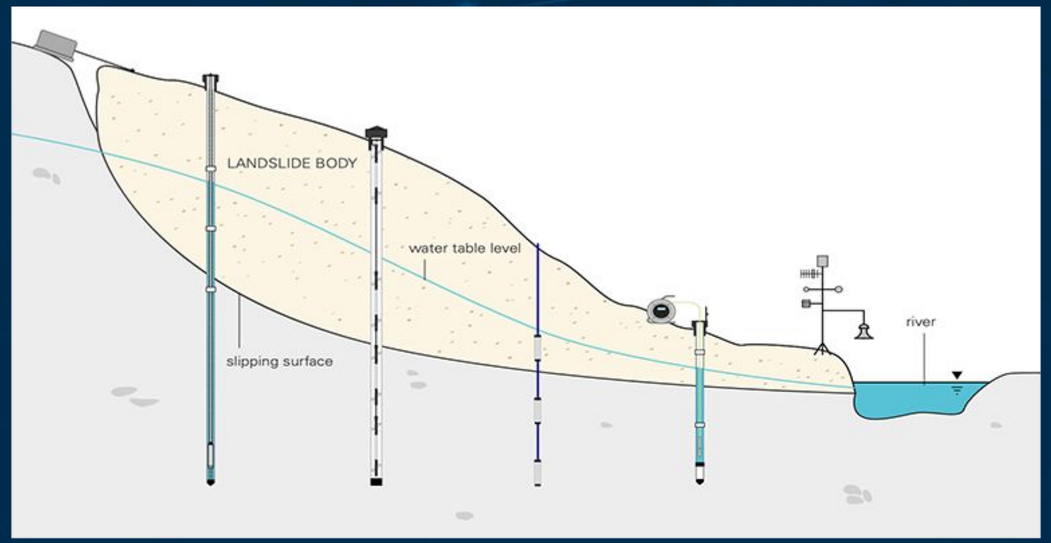
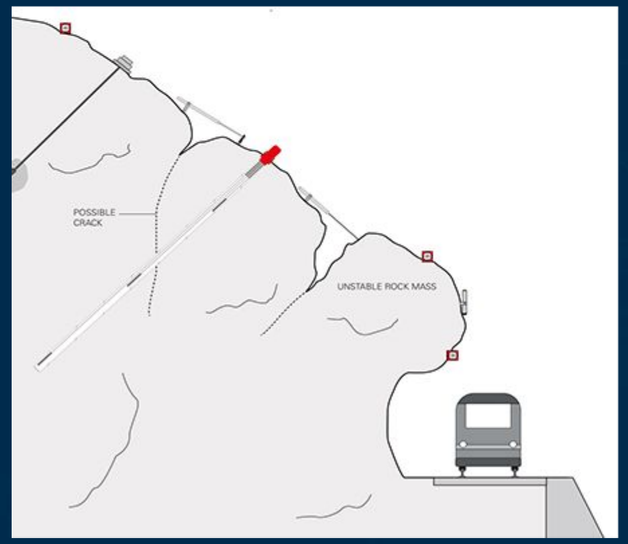
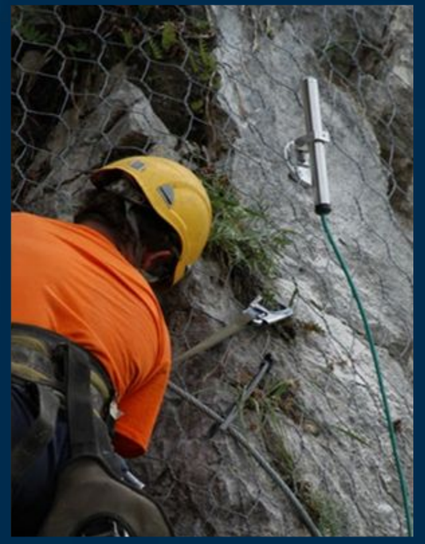
Geotechnical Monitoring







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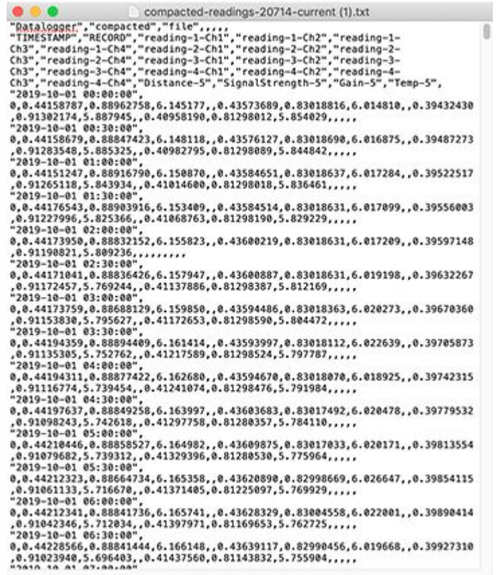
Data

- Manual Collection
  - Sensors
  - Connectivity
  - Device Control
- Data Management
- Reporting
- Analysis
- Applications
- Forecast

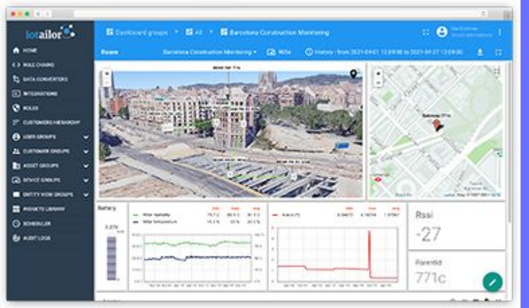
Sensors

Dataloggers

Data



Visualization & Analysis



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Evolution of Geotechnical Data Gathering and Management

1900 — Manual Monitoring

1970 — Automatic Datalogging (Cable, AMTS)

1990 — Wireless Datalogging (GSM)

2010 — IoT wireless

2015 — Cloud

Future — AI + ML

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GEOTECHNICAL MONITORING

Periodic monitoring of various geotechnical sensors to manage risks and increase safety.

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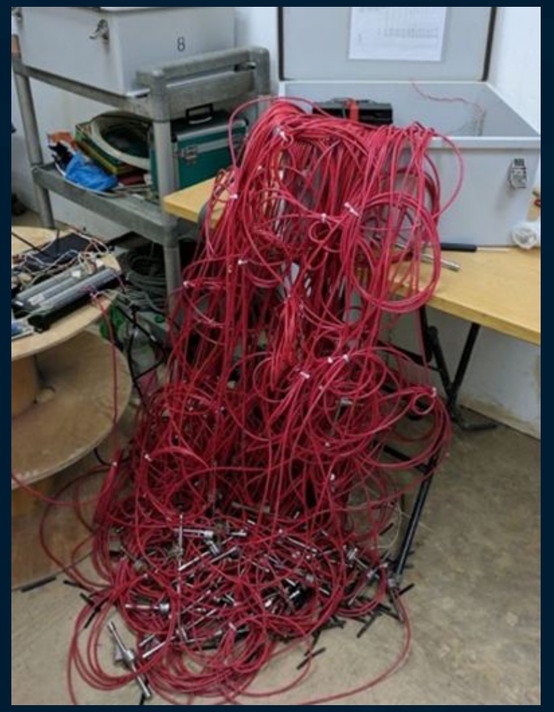
Traditional Monitoring Practices?

MANPOWER-BASED SOLUTIONS

- Costly
- Accuracy might suffer
- Infrequent readings

CABLE-BASED SOLUTIONS



- Deployment takes time
- Maintenance is costly
- Prone to effects like EMI

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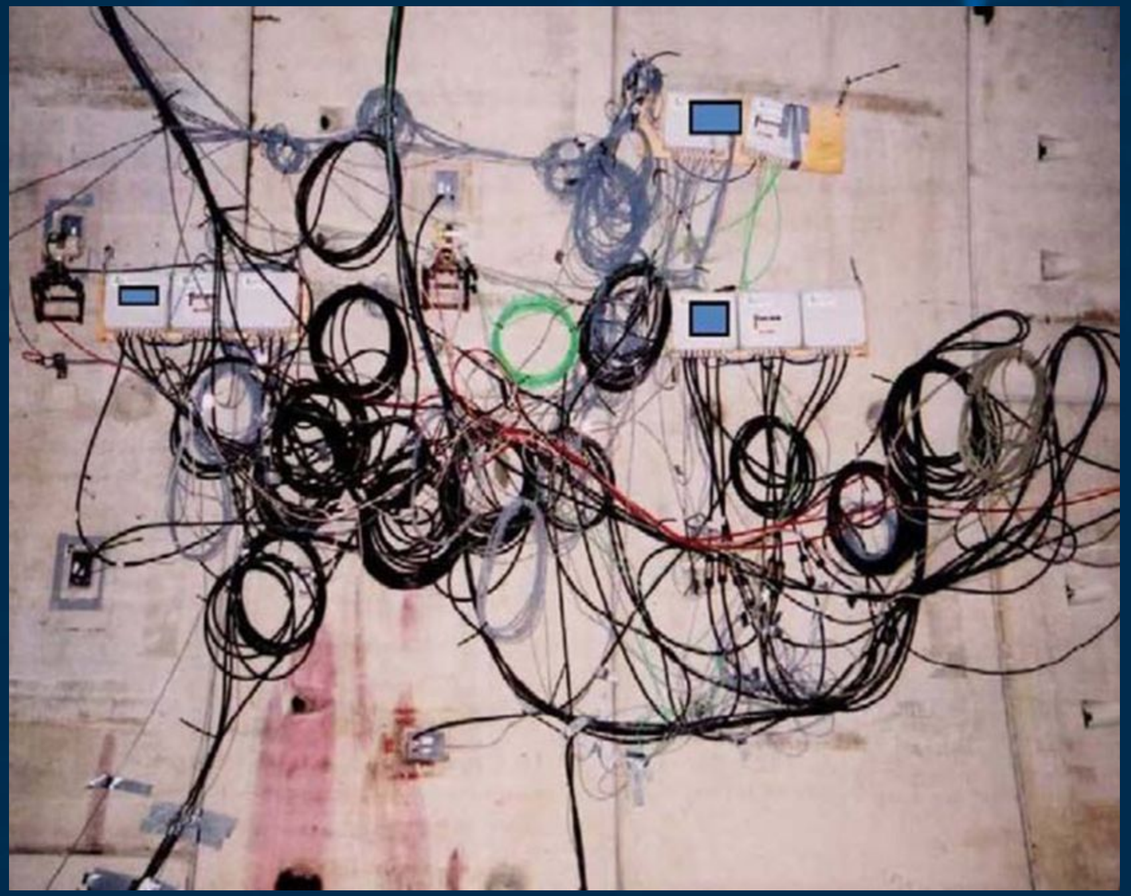
Traditional Monitoring Practices?



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Traditional Monitoring Practices?

Expensive | Error Prone | Inefficient

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Wireless is the way forward

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Wireless is the way forward

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Wireless is the way forward

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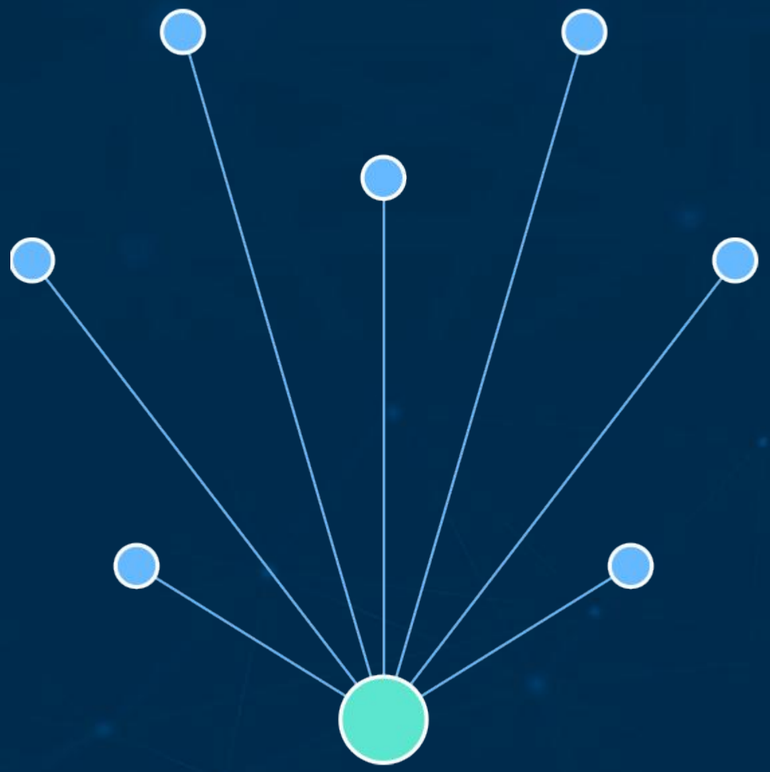
Star Topology



Star

LoRa

ADVANTAGES

- Easy to implement
- Low power consumption

DISADVANTAGES

- Network not scalable
  - Obstruction
  - Interference
- Downlink limitations
  - Changing device parameters
- Not suitable for deployments
  - Underground (e.g. Mines)
  - Linear (e.g. Tunnels)

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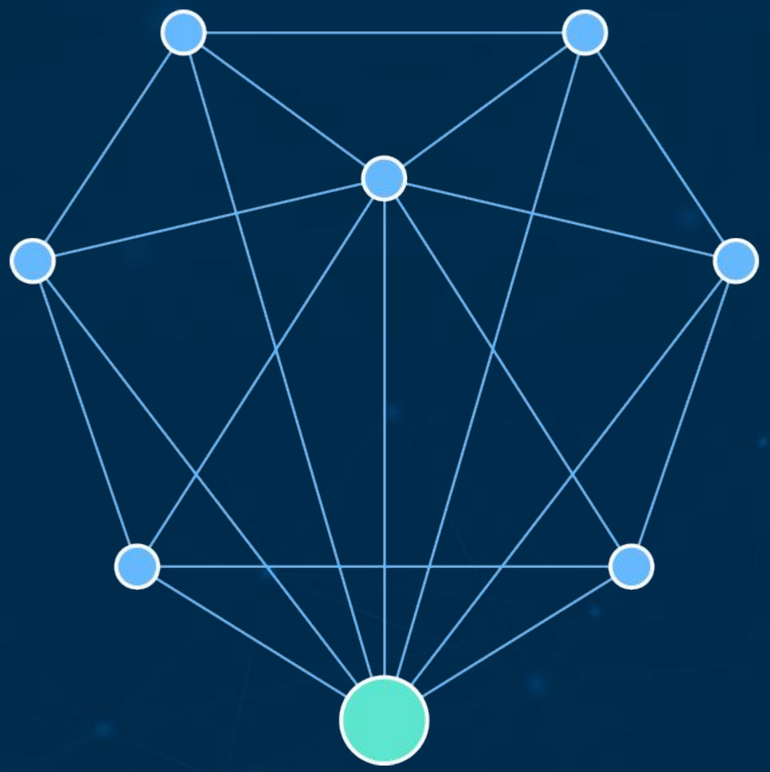
Mesh Topology



Mesh

ACKCIO based on Wi SUN

ADVANTAGES

- Improved reliability
  - Obstruction / Interference
- Dedicated downlink
  - Over-the-air configuration
- Tight time synchronization
  - Improved data correlations
- End-to-end data encryption
  - Industrial grade AES128
- Suitable for challenging deployments
  - Underground (e.g. Mines)
  - Linear (e.g. Tunnels)

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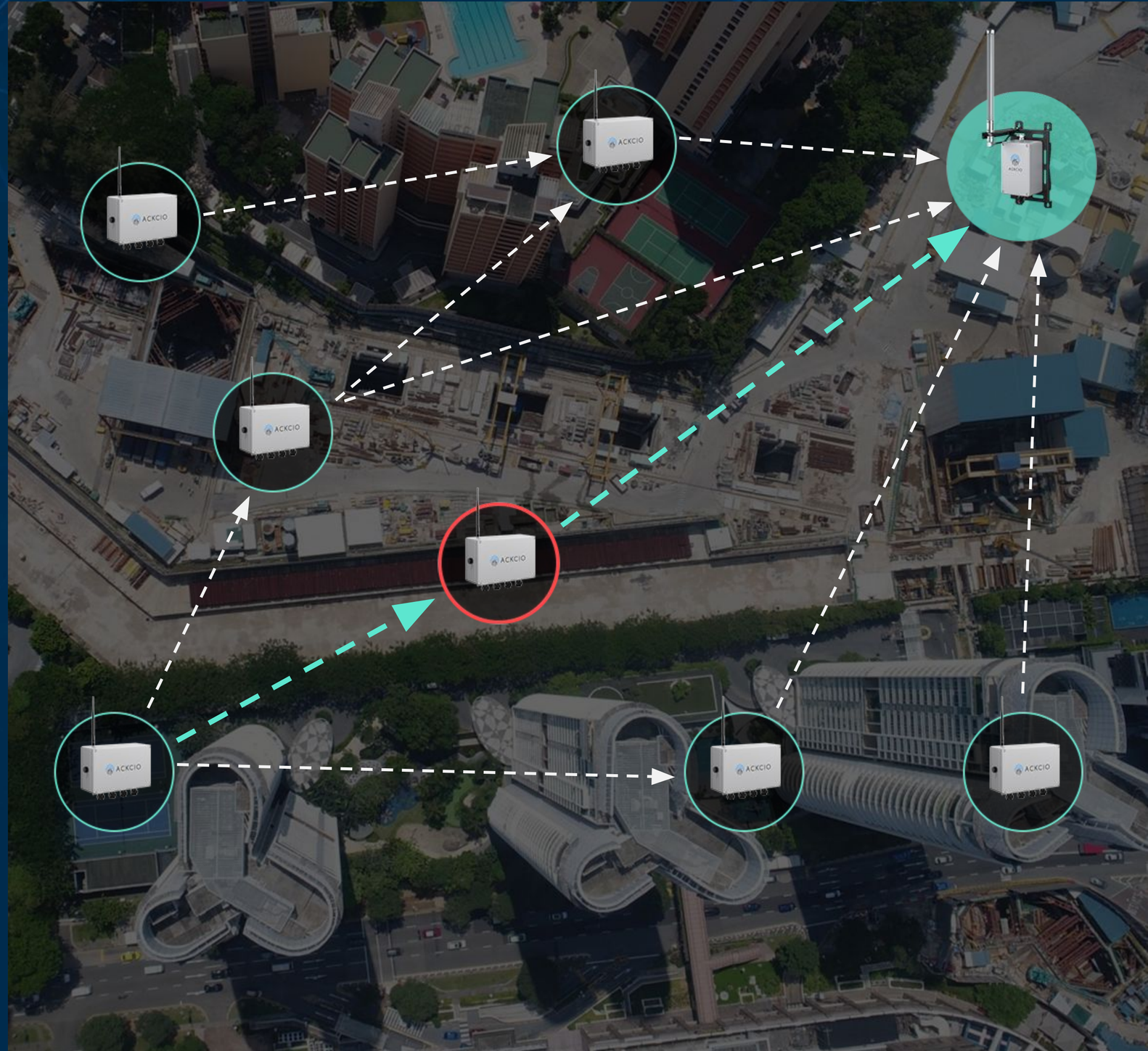
MESH Benefits

1 Self healing



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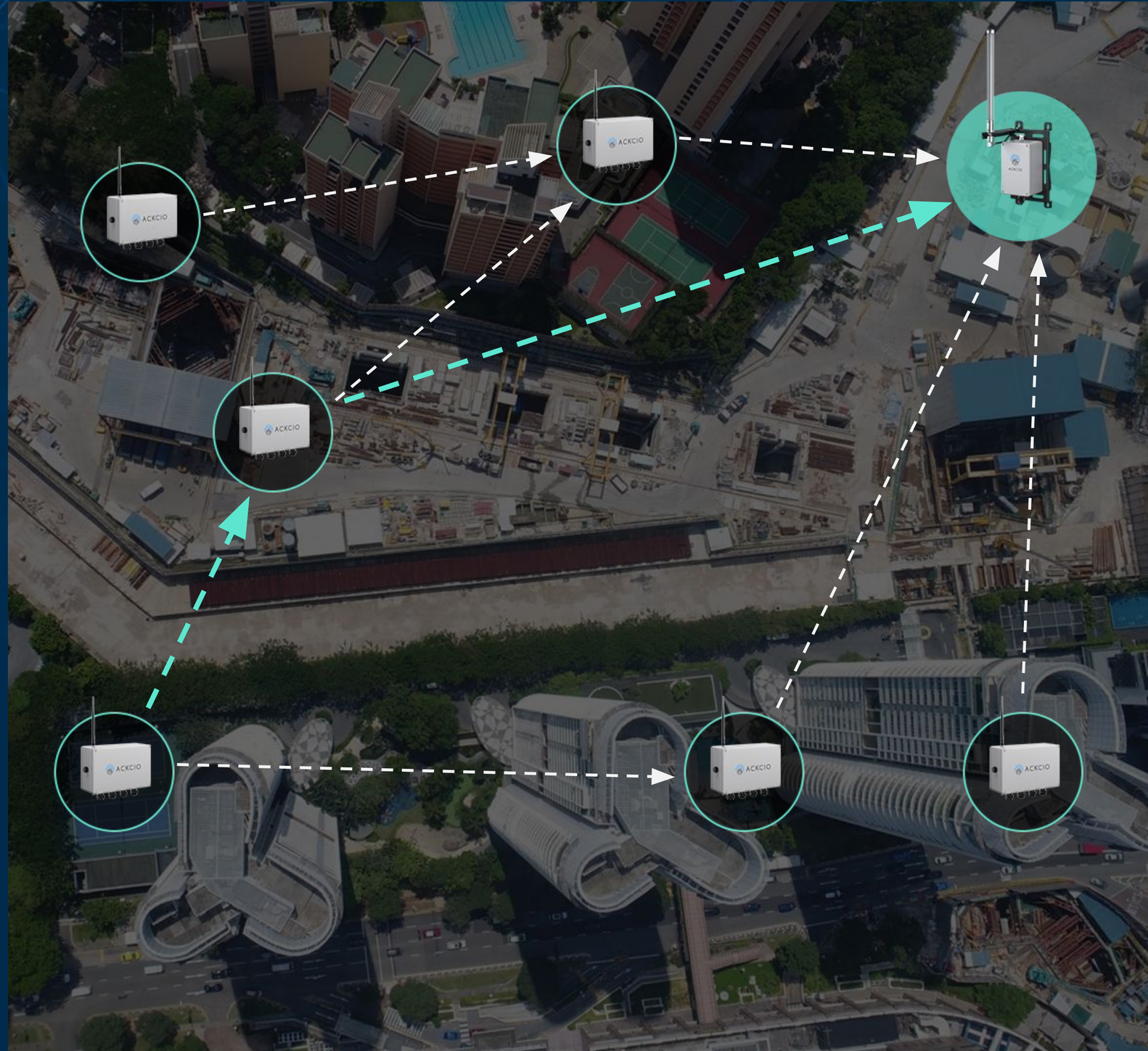
MESH Benefits

1 Self healing

Long-range links avoid critical paths since Nodes have multiple paths to choose from.



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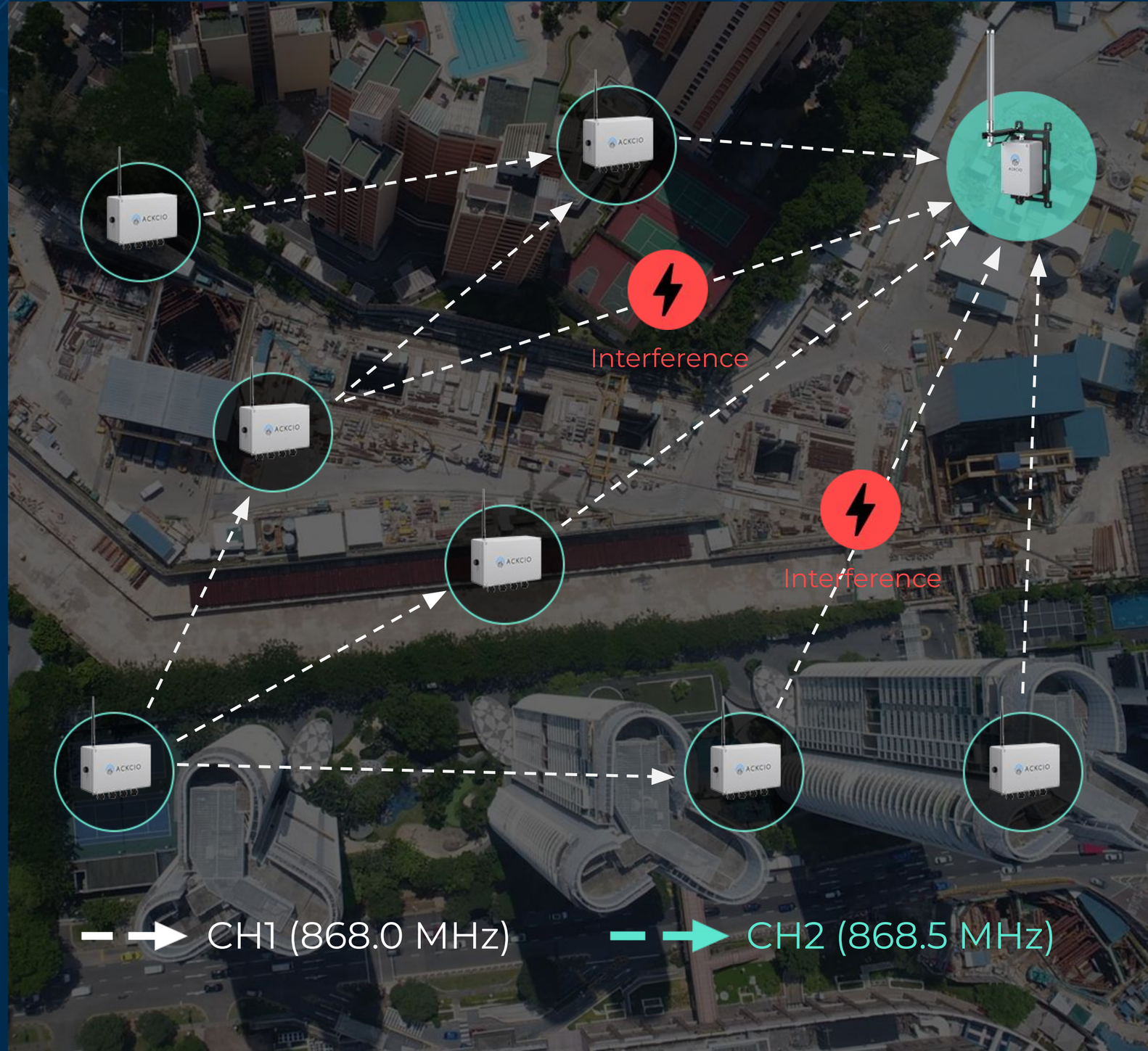
MESH Benefits

2 Superior reliability



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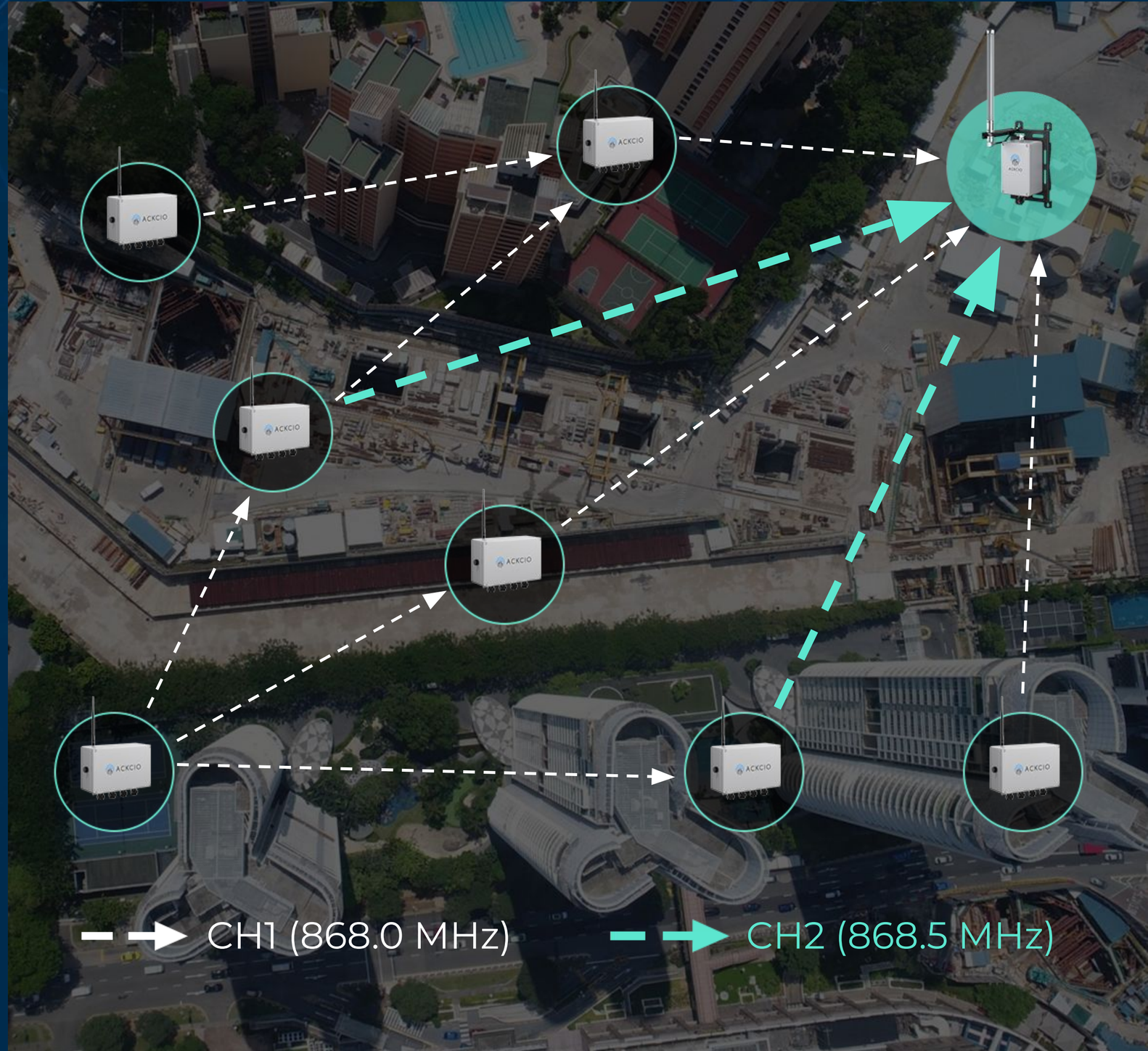
MESH Benefits

2 Superior reliability

By using non-interfered channels automatically, the reliability of mesh networks can be as high as 99%.



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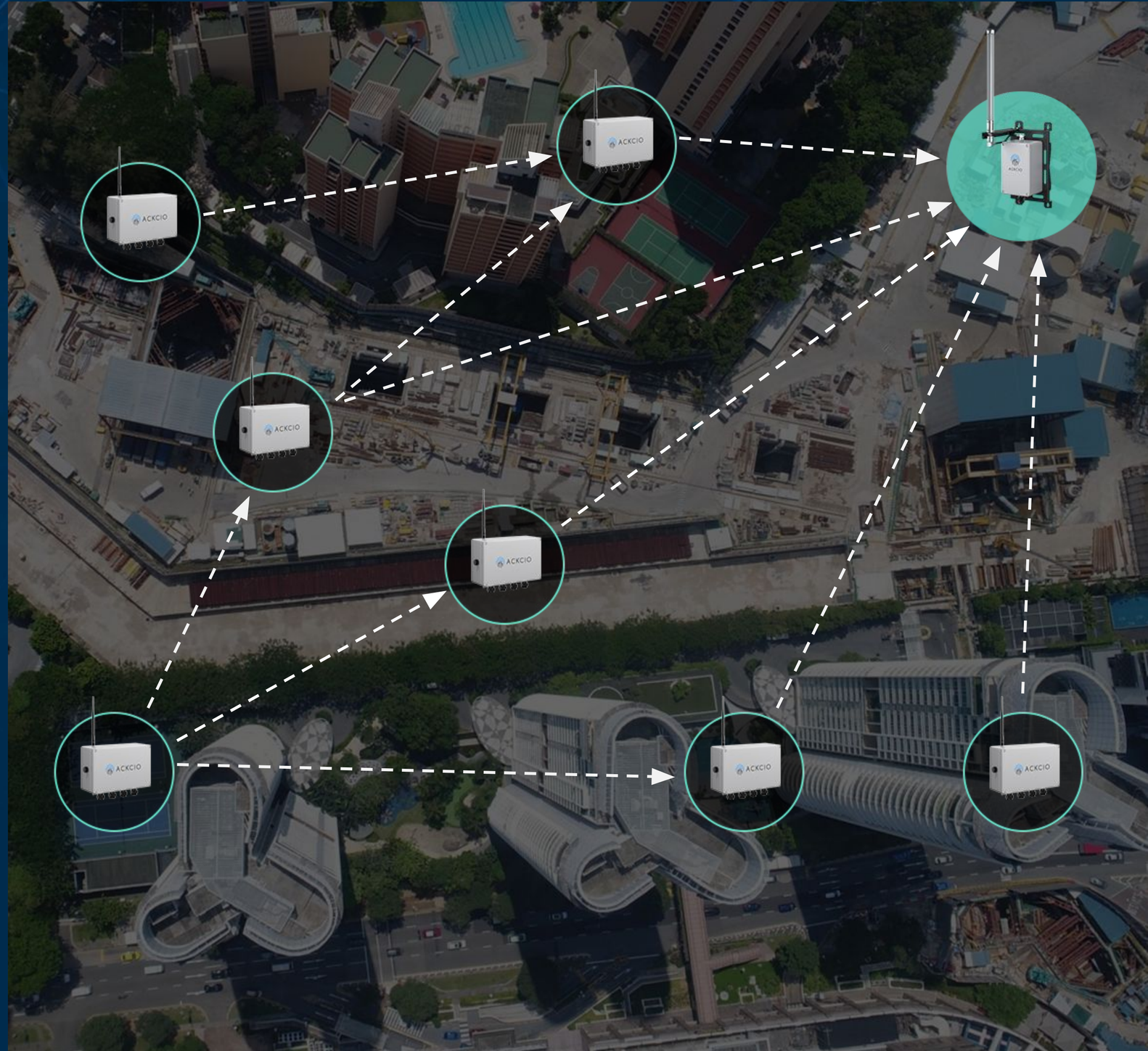
MESH Benefits

3 On-demand downlink



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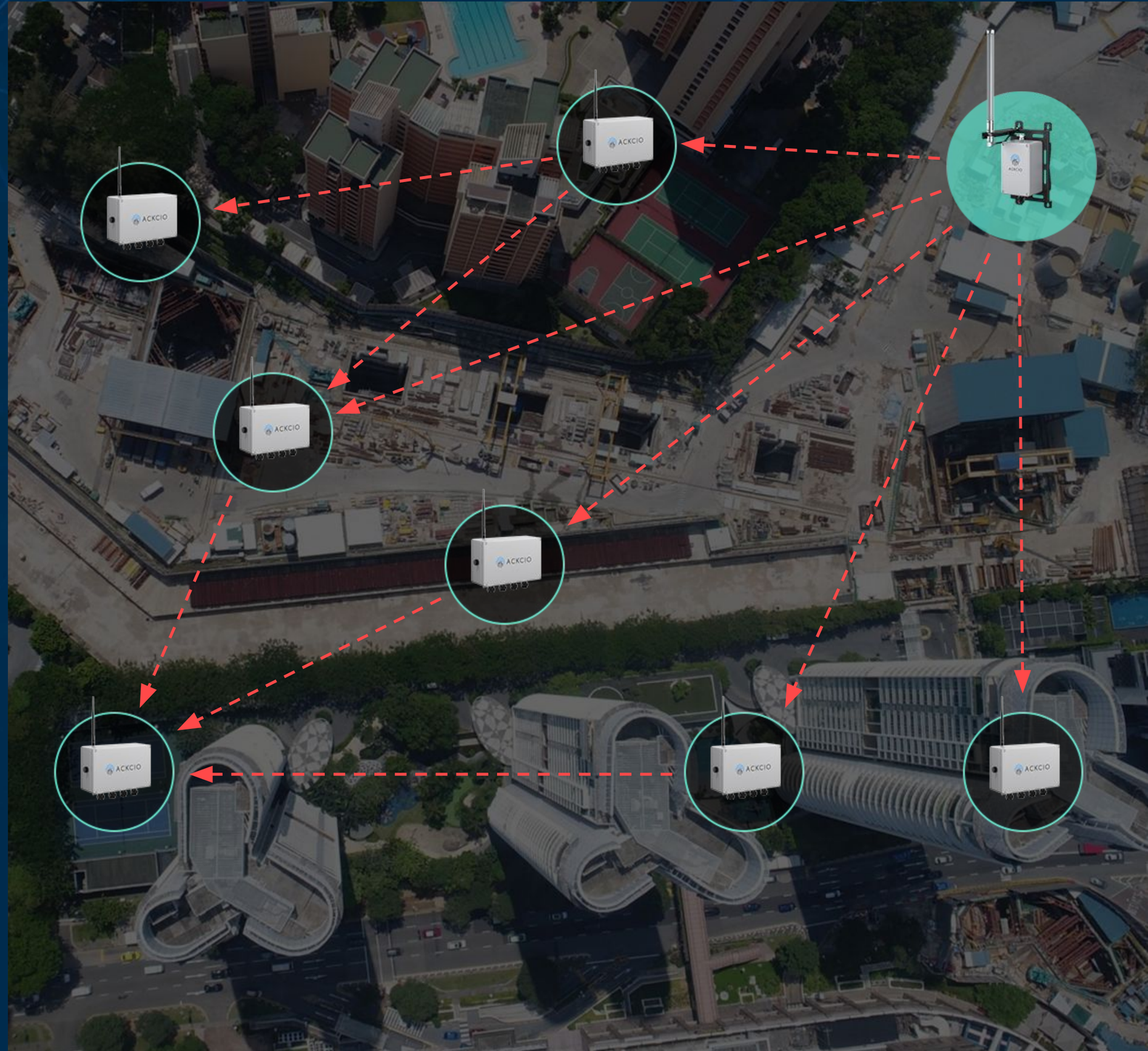
MESH Benefits

3 On-demand downlink

The Gateway can send messages to the Nodes on-demand. This is important to send updates (e.g., reading frequency) to the Nodes at any time.



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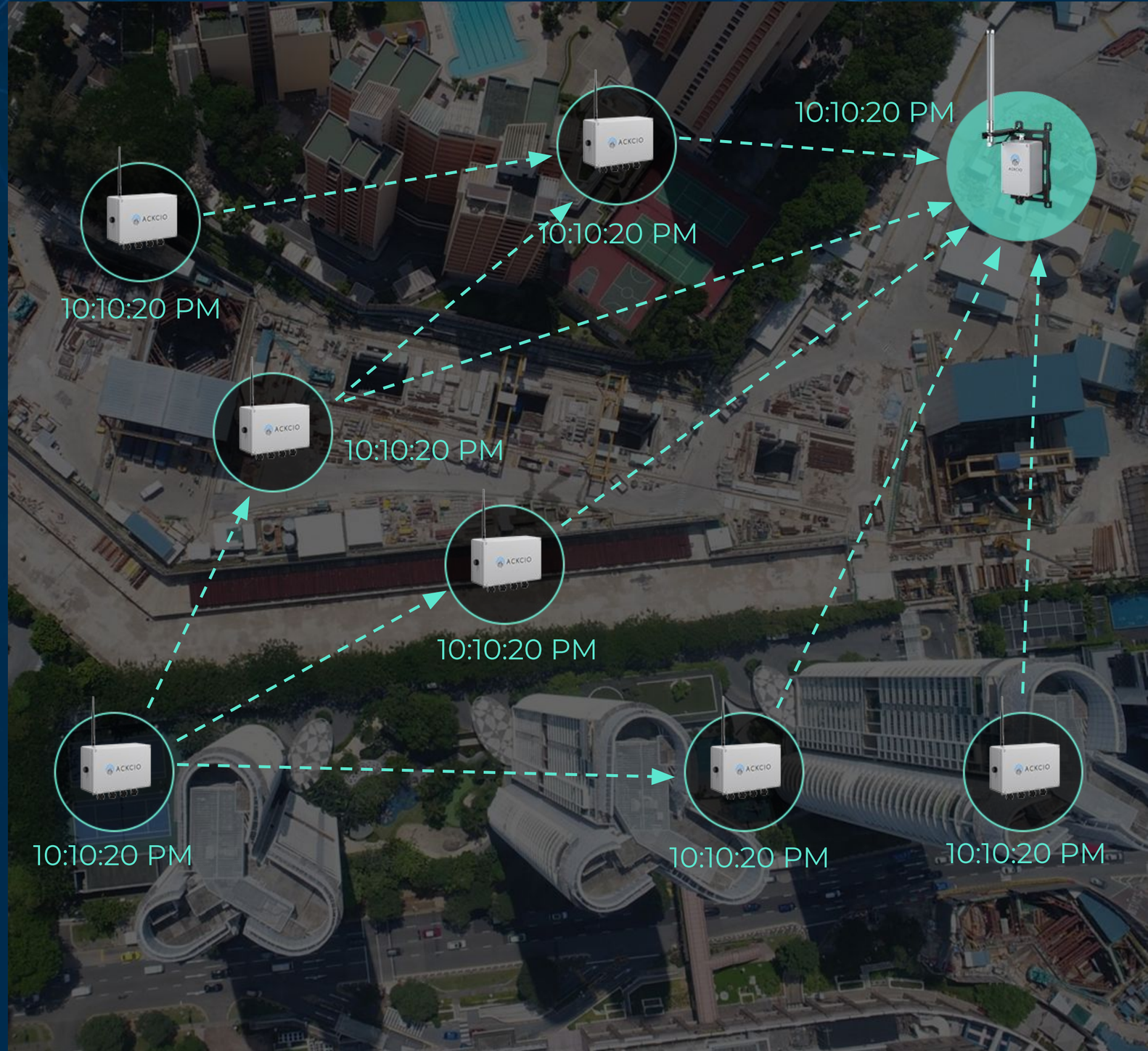
MESH Benefits

4 Tight time synchronization

Mesh networks maintain millisecond-level time synchronization that allows for all sensors to be read at almost the exact same time.



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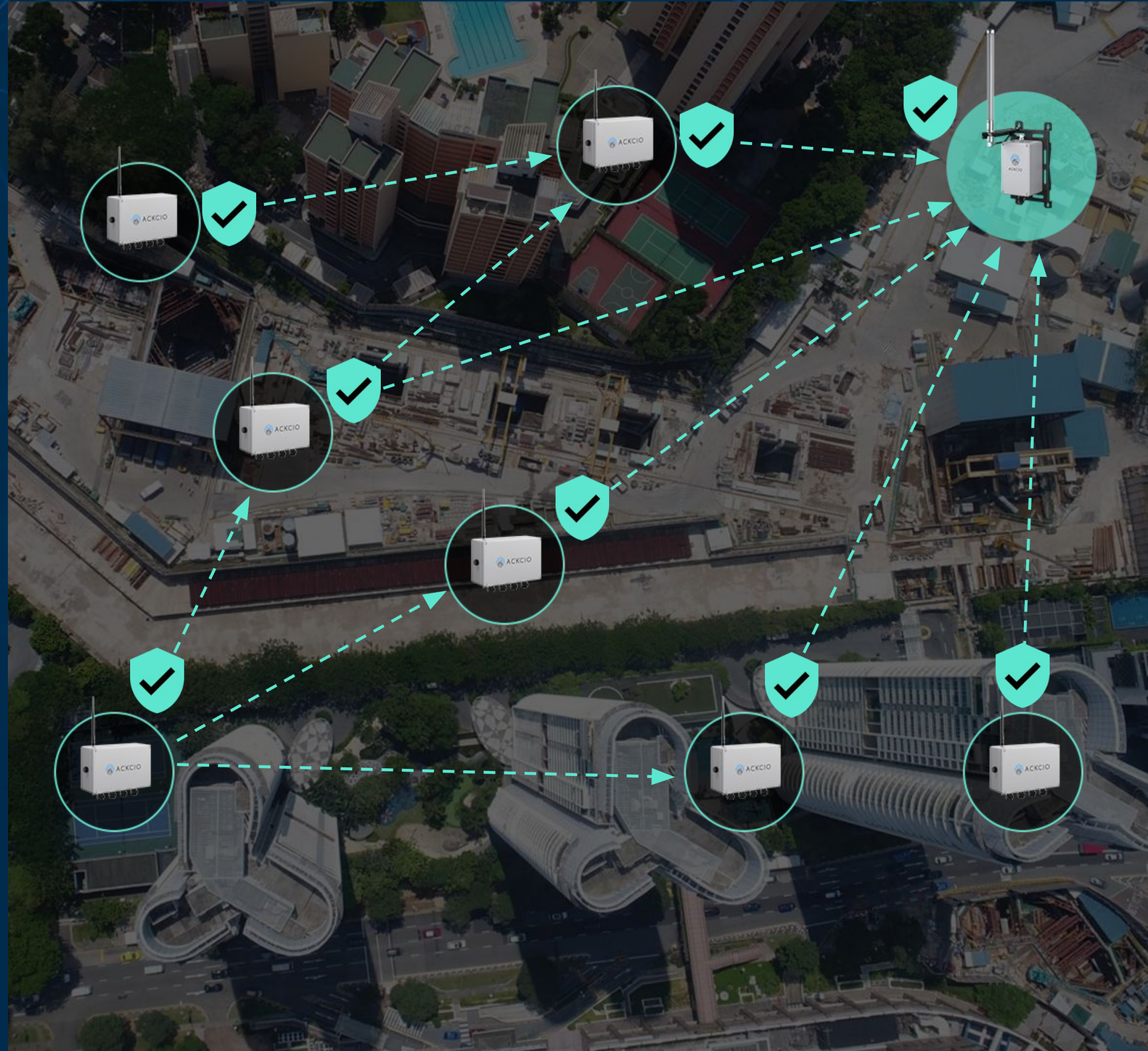
MESH Benefits

5 Secure Communication

AES 128 encryption algorithms make mesh networks secure.



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ACKCIO BEAM

WIRELESS MONITORING SOLUTION

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ACKCIO BEAM

Ackcio Analogue Nodes

BEAM-AN-S1: Supports 1 sensor (2 analogue channels and 1 thermistor channel)

BEAM-AN-S4: Supports 4 sensors (8 analogue channels and 4 thermistor channels)

Ackcio Vibrating Wire Nodes

BEAM-VW-S1: Supports 1 sensor (1 vibrating wire channel, 1 pulse counter, and 1 thermistor channel)

BEAM-VW-S8: Supports 8 sensors (8 vibrating wire channels and 8 thermistor channels)

Ackcio Digital Node

BEAM-DG: Supports digital sensors using RS232, RS485 or SDI-12 communication protocols. Supports digital sensors like in-place inclinometers, digital tiltmeters, borehole extensometers, water level sensors, ShapeArrays etc.

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ACKCIO BEAM

Supported Digital Sensor Brands

CAMPBELL SCIENTIFIC
WHEN MEASUREMENTS MATTER

GEOSENSE

MEASUREND

rst INSTRUMENTS
Monitor with Confidence

ENCARDIO RITE

In-Situ

GEOKON

Mine Design technologies

SISGEO

DTC
Monitoring • Since2005

METER

YieldPoint

ZC

& more

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ACKCIO BEAM

Ackcio Tiltmeter Node

BEAM-TM: Wireless Tiltmeter Node. BEAM-TM uses MEMS bi-axial tilt sensor modules built, installed, and calibrated by Sisgeo Asia Pacific, thus providing highly accurate and reliable tilt readings.

Ackcio Repeater Node

BEAM-RN: Repeater Node that helps to expand the network coverage.

Ackcio Gateway

BEAM-GW: Beam Gateway with Snape, Ackcio's on-Gateway data and device management software.

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DEMO: Solution Architecture

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Use Case

Façade Monitoring - Madrid

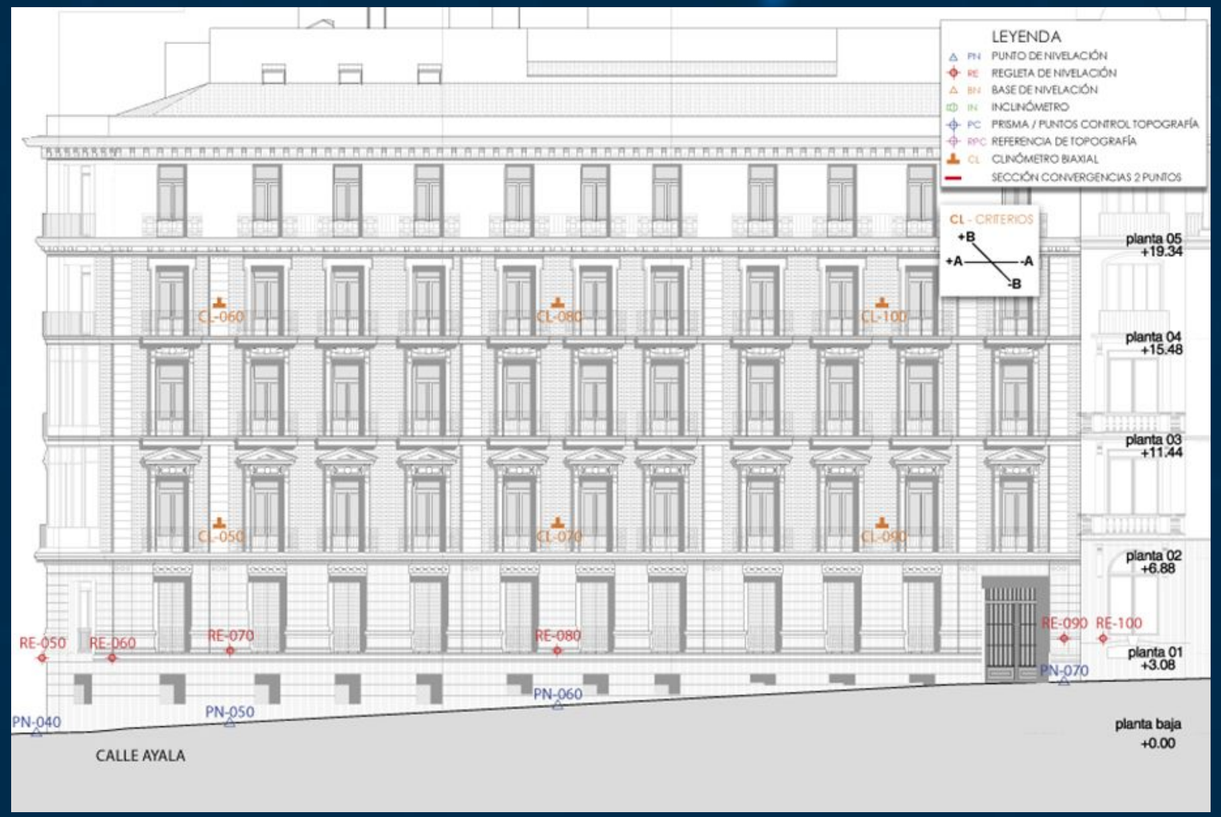
Renovation of historical building requires precise control of the facade which will remain unaltered.

A building in the relevant Castellana Street in Madrid is going to be demolished while preserving the façade, so the construction company wants continuous control of it as the works progress. Especially when they will excavate inside an area between deep piles at -16m, with 20m piles.

I&M contractor Ofiteco installed 1 Ackcio Gateway and 18 tiltmeters across the façade reading every 6 hours (4 times a day).

As a challenge, the site losses power frequently but thanks to the Ackcio Gateway back-up battery, the data is not lost and received by the GW, which sends the completed CSV files to Ofiteco FTP server, once power and cellular connectivity is restored.

Data is automatically transferred to the Ofiteco monitoring software Tunneldata.



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Use Case

Façade Monitoring - Madrid

ACKCIO tailored:systems OFITECO Metro

Use Case

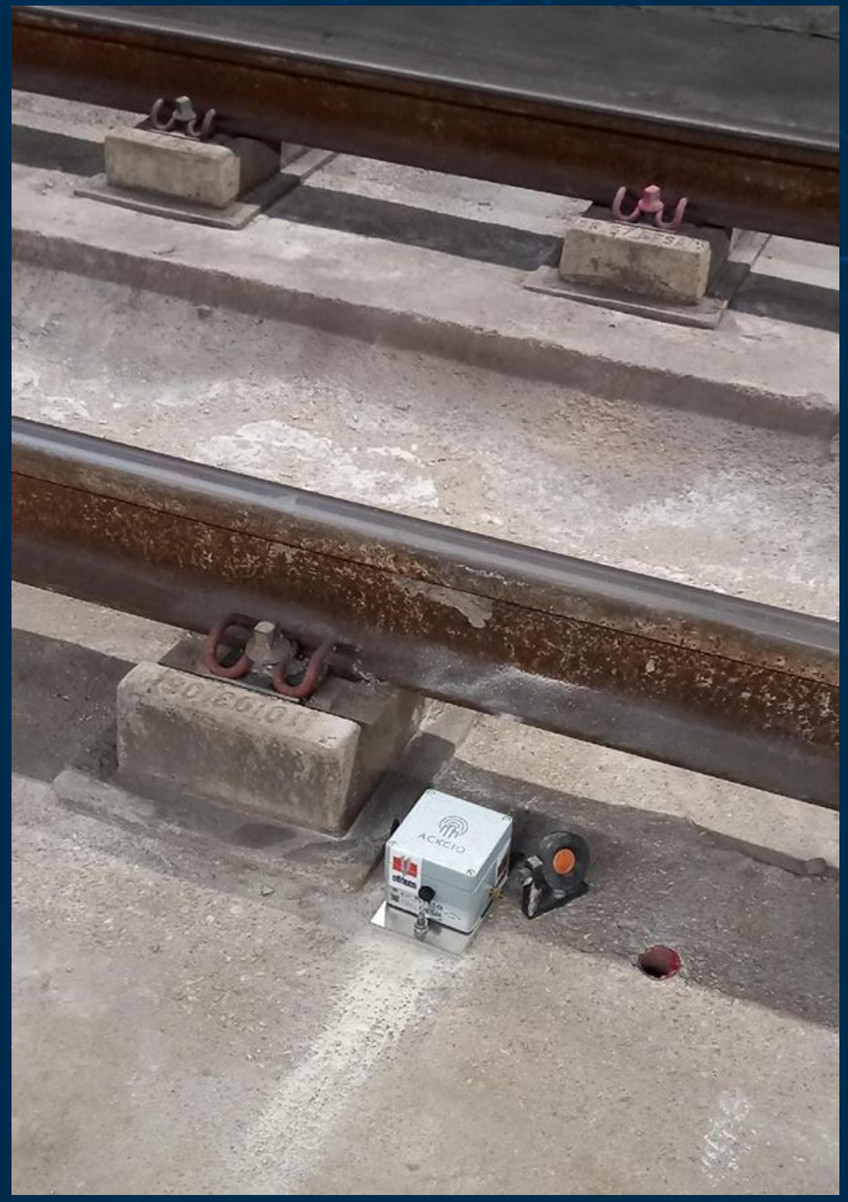
Rail Track and Metro Station Monitoring - Madrid

To control the stability of the rail track and the walls of the station, there are a set of tiltmeters installed:

- 3 biaxial tiltmeters on the rail platform, to control longitudinal and perpendicular twists
- 2 biaxial tiltmeters on the side walls, installed behind the aesthetical steel walls (vitrex)

The GW is installed in an indoor room on the platform, with no direct line of sight to the nodes.

Data is automatically transferred to the Ofiteco monitoring software Tunneldata.



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Use Case

Rail Track and Metro Station Monitoring - Madrid

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Case Study

Great World MRT Construction

CHALLENGES

- Large site area (over 1 km)
- Sparse deployment of sensors
- Dense urban environment
- High noise environment
- Instrumentation above and below ground

SENSORS MONITORED

- Strain gauges - BEAM-VW-S8
- Piezometers - BEAM-VW-S8
- Digital Tiltmeters - BEAM-DG
- MEMS Tiltmeters - BEAM-AN-S4
- BEAM-RN
- BEAM-GW

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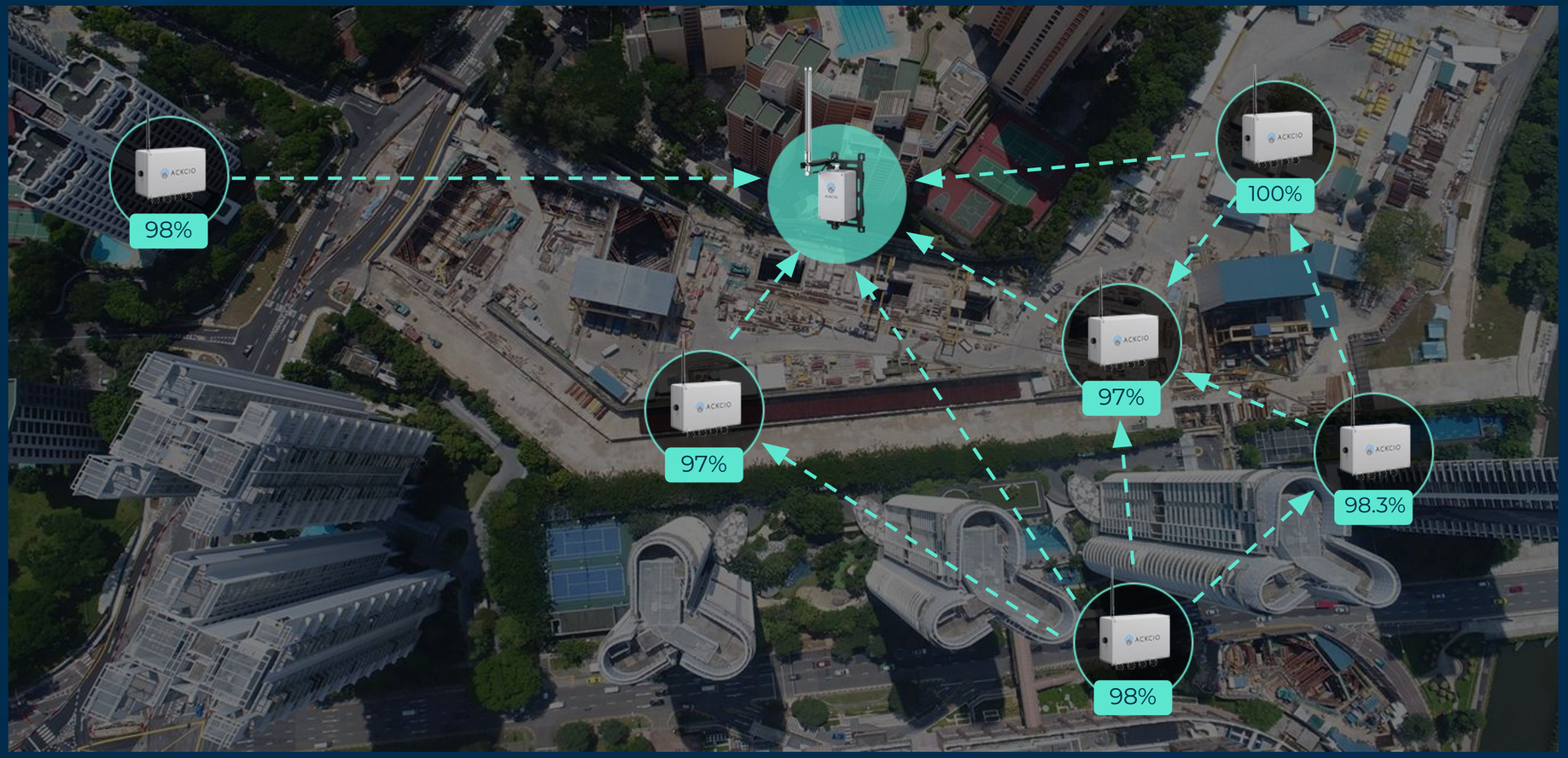
Case Study

Great World MRT Construction



Proven
greater than

98%

reliability

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ACKCIO BEAM

System Benefits

- Patented long-range wireless mesh system
- Supports many sensors
- Suited for underground environments
- Designed for harsh environments (-45 to +80 °C temperature)
- IP67-rated enclosures
- FCC and CE certifications (915 | 868 MHz radio)
- Battery-powered installation
- Cost effective
- Easy to set up, use, and maintain

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ACKCIO BEAM

Business Benefits

- Increased safety
- Monitoring cost reductions by up to 70%
- Increase productivity
- Implement state-of-the-art risk management processes
- Predictive maintenance
- Comply with regulations that are getting stricter

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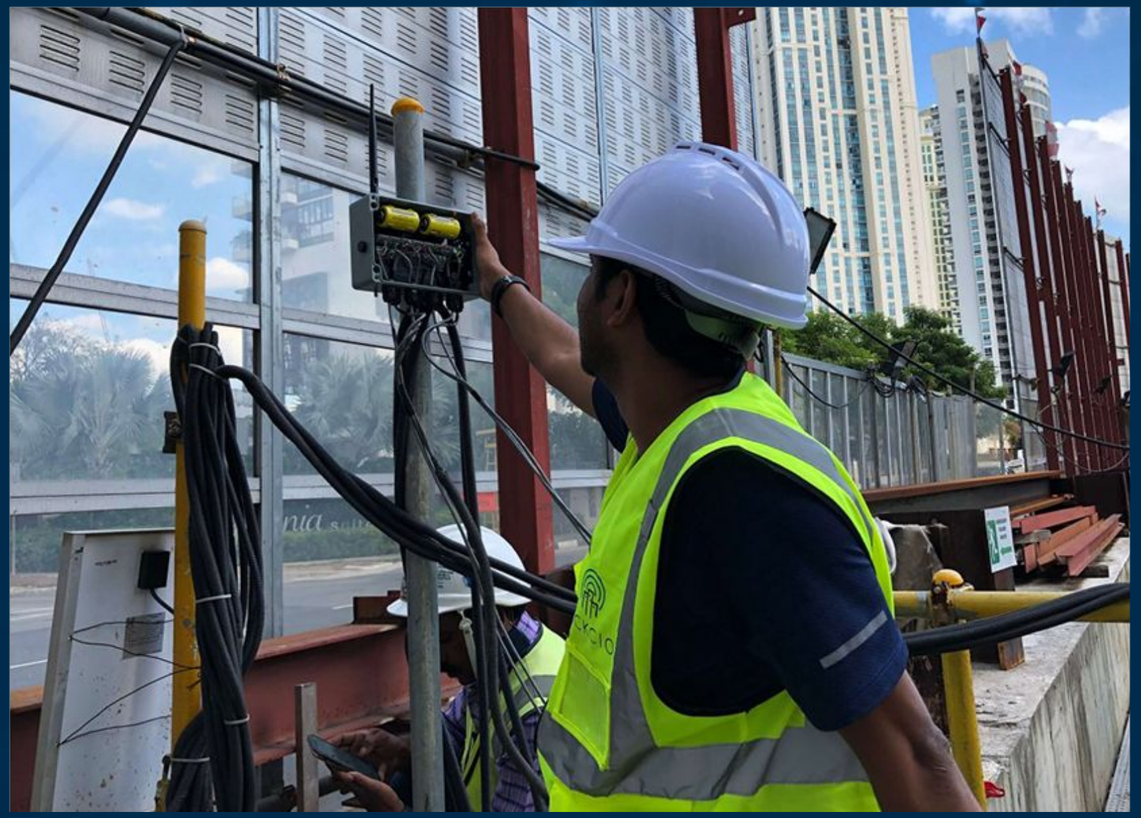
ACKCIO BEAM



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Q&A

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Oscar Guevara
Chief Business Officer
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