



# Melaka Sentral - Transportation Hub Roof Monitoring

CLIENT: MELAKA STATE DEVELOPMENT CORPORATION

Safeguarding a major transportation hub in Melaka, Malaysia



## Challenge

Melaka Sentral, the largest public transportation hub in Melaka, Malaysia, is a major centre for countrywide bus travel. The terminal, built in 2004, was designed with a high ceiling and open lattice roof structure to allow natural light to penetrate. Observable differential settlement had occurred between adjacent column supports along several bays. This could have led to closure without a more complete understanding of the long-term impact of the movement on the integrity of the structure.

To determine the extent of continuing differential settlement, high resolution measurements were needed to make an informed decision on the stability and safety of the roof. The height of the building added to the complexity of monitoring, requiring the use of a scissor lift for access. Due to the operational sensitivity of a live and busy transport hub, the client required an unobtrusive system.

## Solution

A decision was made to monitor five of the portal frames to check for continuing movement - both in tilt and/or change in distance between adjacent columns.

**Meridian 2000**, the Malaysia authorised distributor for Senceive technology, proposed a remote wireless monitoring solution comprising 15 high precision triaxial tilt sensors and 5 combined optical displacement/tilt sensors. Due to the close spacing of sensor nodes, the FlatMesh™ platform was used with a mains-powered cellular gateway. Data was transmitted to a secure cloud-based server and data management platform - WebMonitor™.

Two-part magnetic mountings were used to easily attach the sensors onto the steel portal frames, which also allowed for ease of removal and re-positioning if necessary.

## Outcome

As the triaxial tilt sensor nodes comprise three orthogonally orientated MEMS tilt sensors, it was possible to mount the nodes in any orientation and still allow for rotation to be measured along the two closest-to-horizontal perpendicular axes.

With the FlatMesh™ platform, each node communicates with neighbouring nodes to identify the most efficient path to the gateway and self-heal when necessary. As there is no hierarchy, the system is not reliant on any one node. In the event of a node failing, for example due to vandalism, then the mesh network would identify the next most efficient route to the gateway.

The system was configured to upload automatically every 30 minutes via the gateway. Authorised users can access the data by logging-in to WebMonitor™ on any web portal (computer, tablet or phone). In addition, SMS text alerts and emails can be automatically received.



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to keep people and infrastructure safe

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