



Collaboration, Innovation and Resilience: Championing a Digital Generation

Brisbane, Australia 6-10 April

Using Wi-Fi HaLow Technology for IoT GNSS Monitoring Systems

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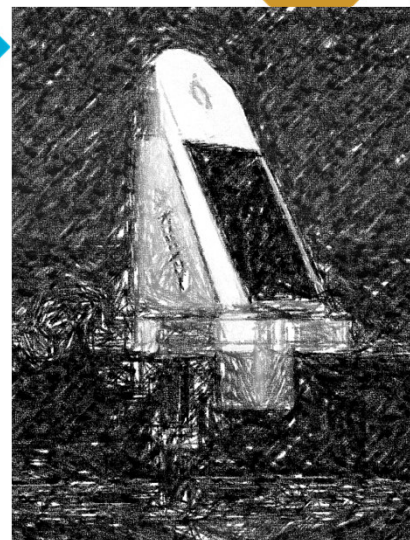
What's in a name?

Why kurloo?

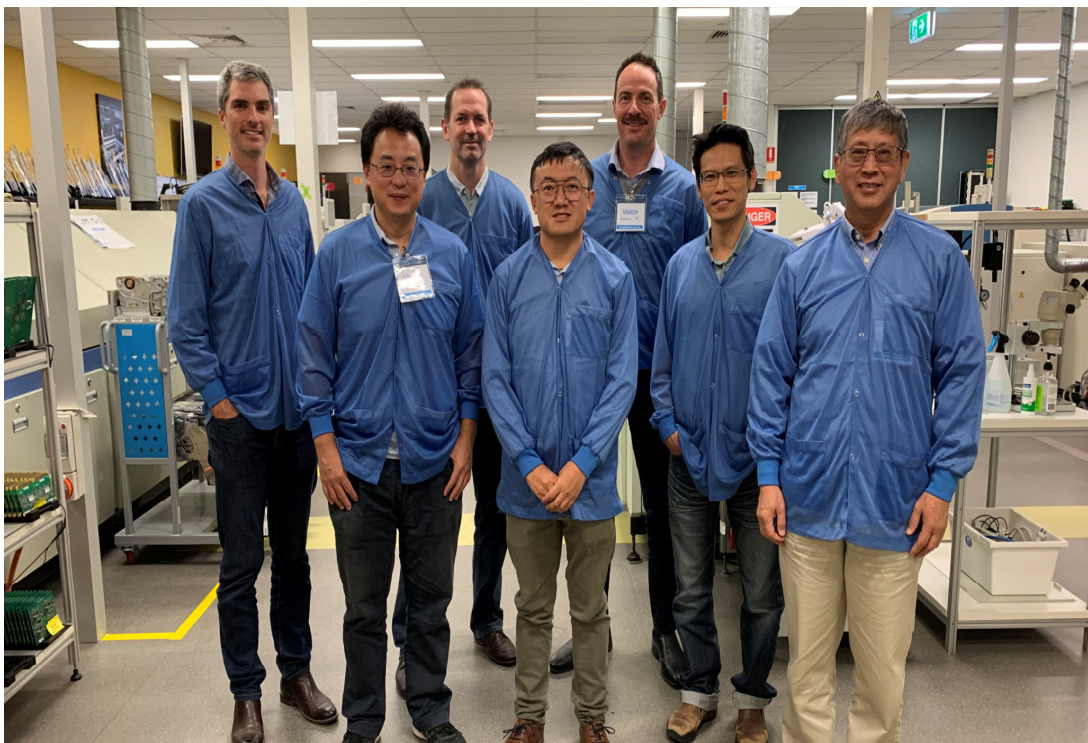
Definition: Curlews are a group of nine bird species well known for their loud screaming that announces sundown.

The English name is imitative of the Eurasian curlew's call, but may have been influenced by the Old French corliu, "messenger", from courir, "to run".

The Kurloo acts as the first warning of ground movement to engineers and projects managers across Australia.



Research Innovation Commercialisation



Kurloo Application and Project

Mining

- Tailing dams
- Site stability

Roads

- Slope stability
- Embankments
- Bridge abutments
- Erosion

Dams

- Displacement monitoring
- Slope stability
- Critical infrastructure

Rail

- Slope & track stability
- Bridge abutments

New constructions

- Risk management
- Slope stability – during & post construction

Ports and airports









- Settlement monitoring
- Land reclamation
- Sea walls and infrastructure



Kurloo Data Journey



Practical Challenges in Our Expanding Projects

- **Solar Charging Efficiency**  
 - Varies with **seasonal changes** (summer vs. winter).
 - Cloud cover and **shorter daylight hours** affect performance.
- **Battery Performance & Longevity**  
 - Cold temperatures in **winter reduce capacity**.
 - High-power demand in **summer increases degradation**.
- **High Multipath Effects**  
 - Urban and **waterbody reflections** impacting GNSS accuracy.
 - Strategies needed for **better antenna placement** and filtering.
- **LTE Coverage & Connectivity Issues**  
 - LTE **does not cover** every remote site.
 - Exploring **alternative communication methods** (LoRa, satellite, Wi-Fi HaLow).





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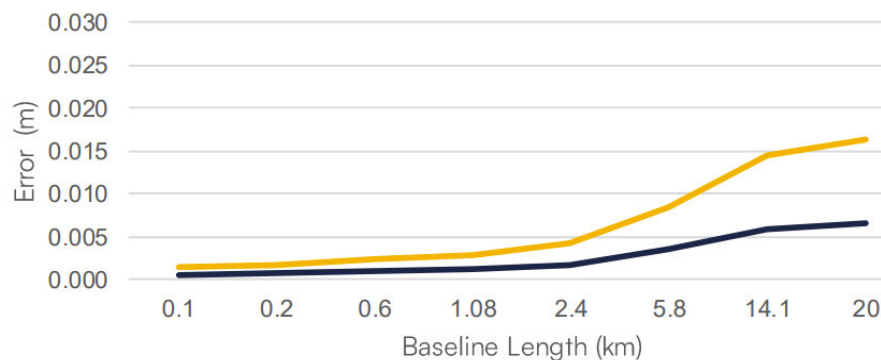
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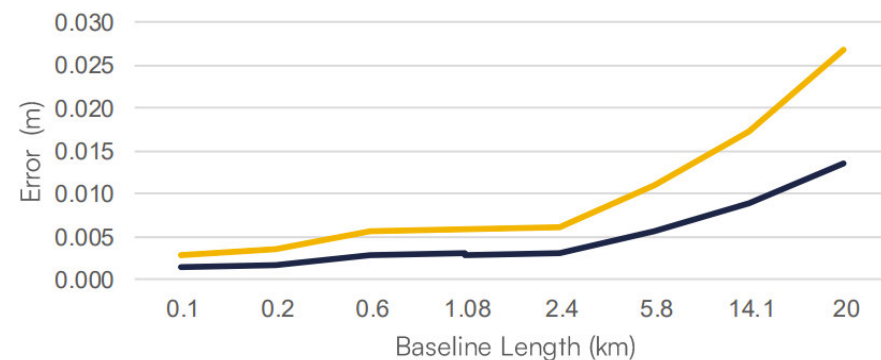
Wireless communication techniques comparison

	LTE/4G	Bluetooth	LoRa	Wi-Fi	Wi-Fi HaLow
Frequency	600-2600 MHz	2.4 GHz	868/900 MHz	5-60 GHz	Sub-1 GHz
Data rate	1 Mb/s	1-24 Mb/s	0.3-50 Kb/s	1-6.75 Gb/s	150k – 86.7Mb/s
Range	1 – 10 km	8-10 m	<30 km	20 -100 m	<1500m
Energy	Medium	Medium	Very low	High	Low

* Based on 6hr Duration / Low & Medium Multipath



* Based on 6hr Duration / Low & Medium Multipath



— σ_{2D} — Position Uncertainty

— σ_H — Height Uncertainty

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Upgrading Kurloo Data Communication



Kurloo communication hub options



CommHub 01

- WiFi HaLow
- Requires:
 - onsite power
 - Onsite internet access via passive PoE



CommHub 02

- 4G modem
- WiFi HaLow
- Requires:
 - 4G coverage
 - Onsite power



Commhub 03:

- 4G modem
- WiFi HaLow
- Solar and Battery
- Requires:
 - 4G coverage



Commhub 04:

- Starlink internet (mini dish 1/3 of power usage)
- Wireless router
- WiFi HaLow
- Solar and battery



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Experiment testing



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Experiment testing



Experiment testing





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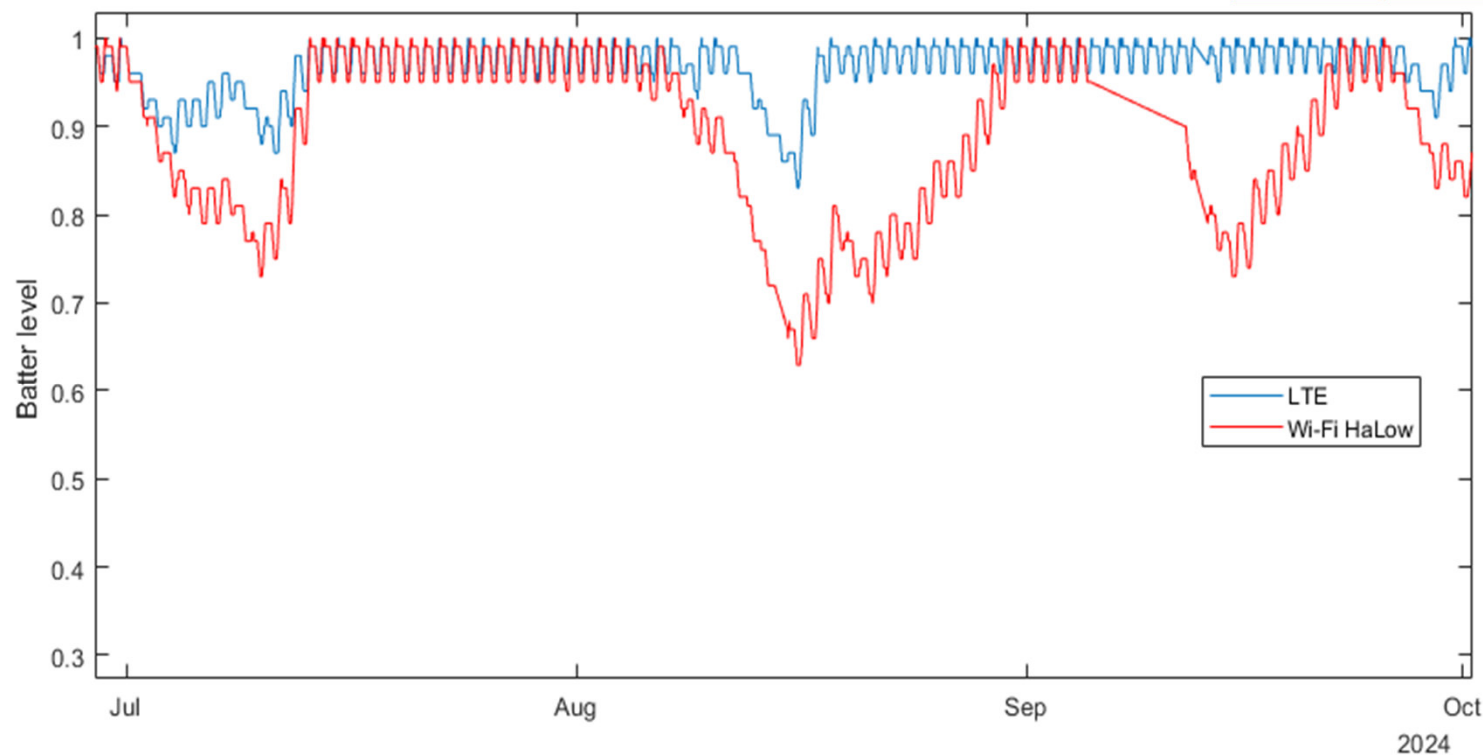
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Power Consumption



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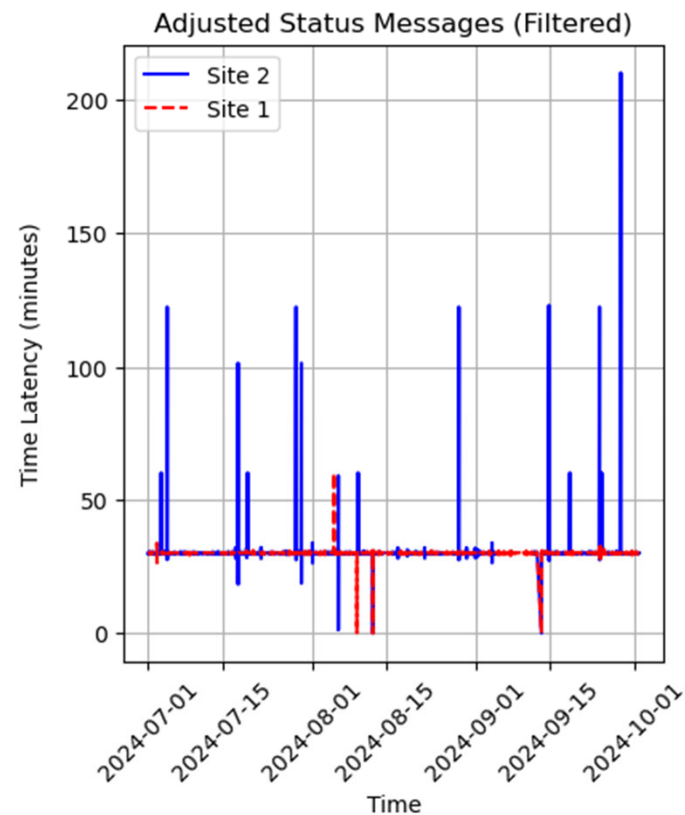
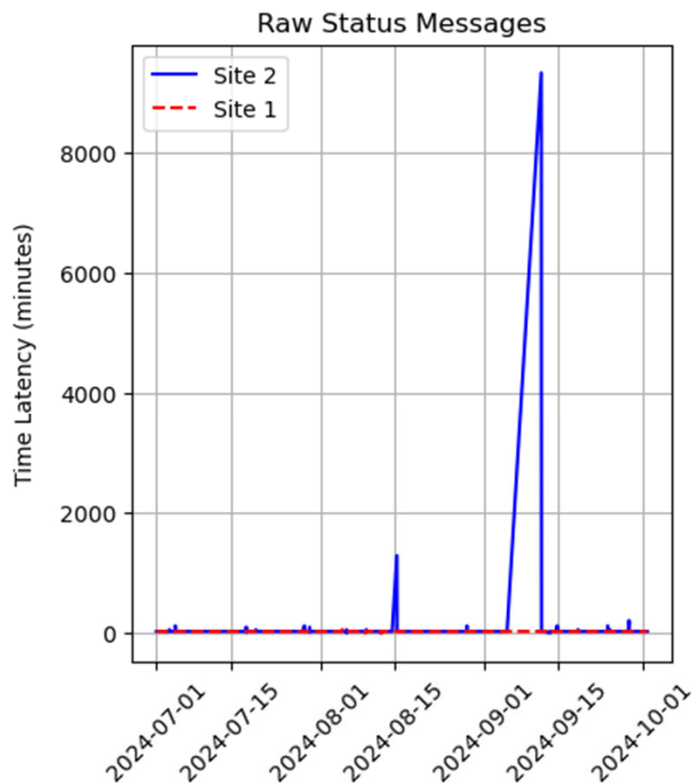
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Time Latency





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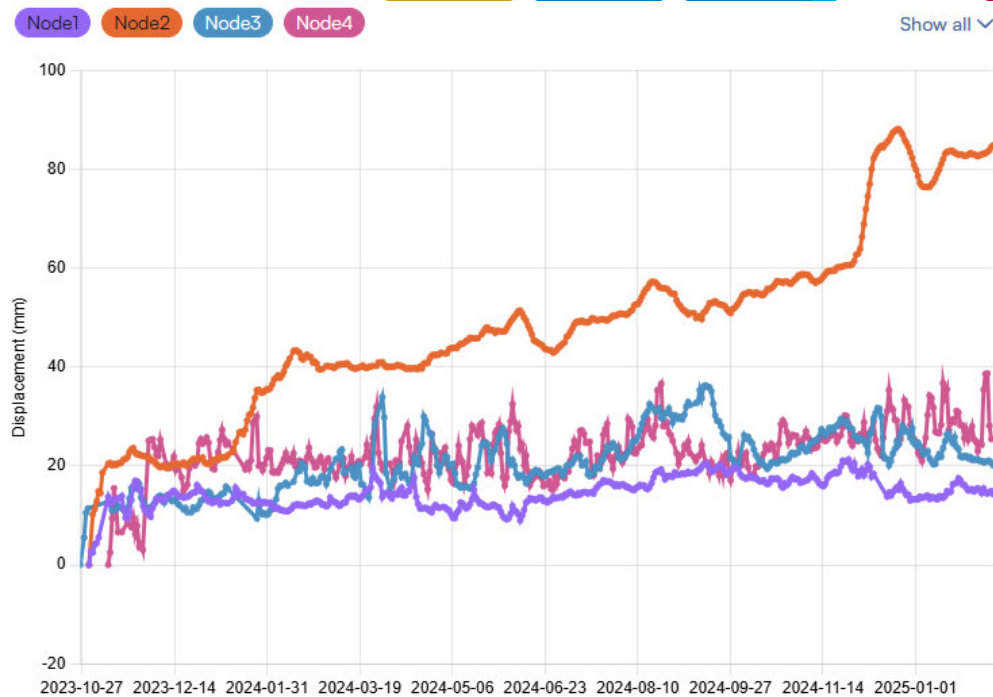
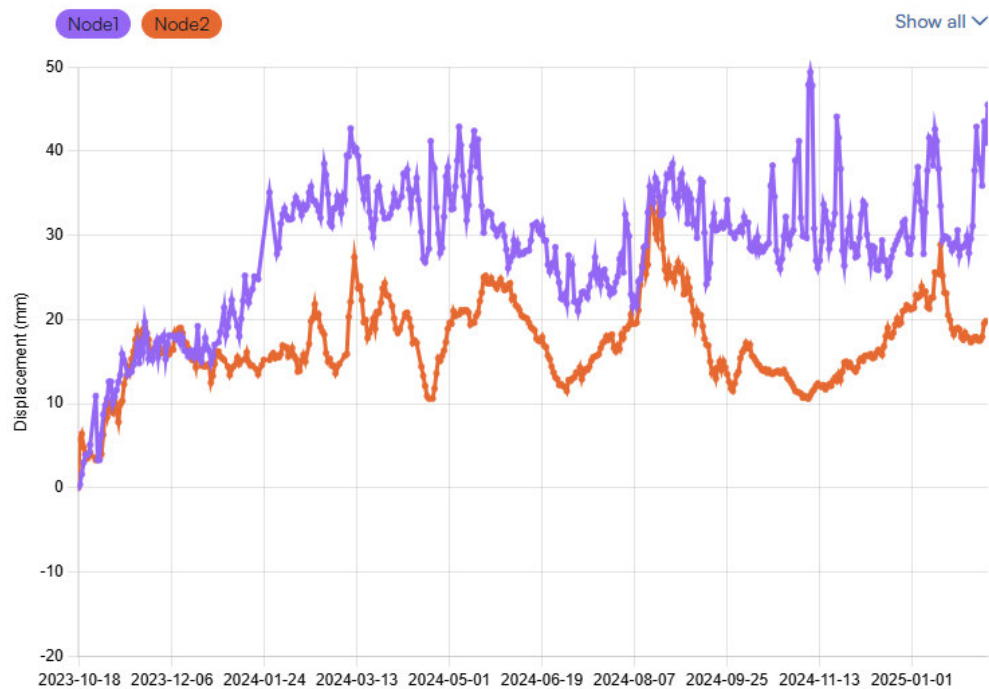
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Monitoring Results



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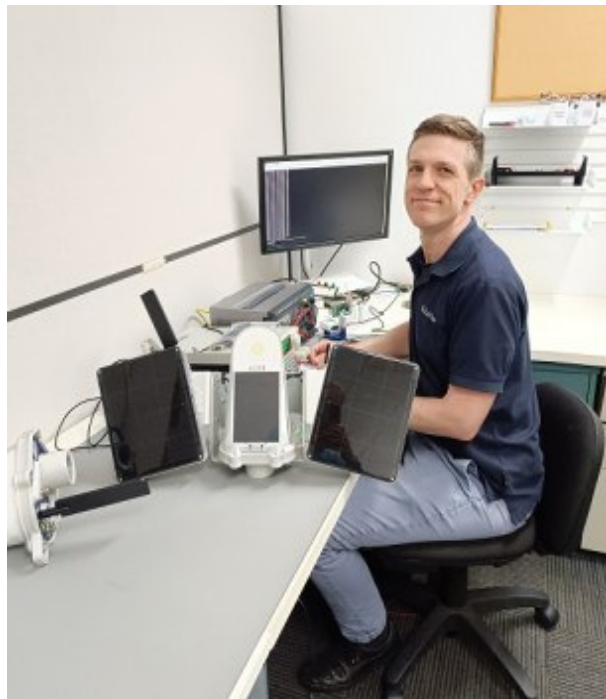


iMETER



Surveyors
Australia

Soaring to new heights with the Kurloo Wing



The most relevant SDGs related to the presentation and theme of this session



**SUSTAINABLE
DEVELOPMENT GOALS**

International Federation of Surveyors supports the
Sustainable Development Goals



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