

Mobile IoT-RoadBot: An AI-powered Mobile IoT Solution for Real-Time Roadside Asset Management

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Motivations

- Timely detection of roadside assets (e.g., damaged road signs, rubbish dumped on the roadside) that require maintenance is essential for improving citizen satisfaction and appearance of local government areas (LGAs).
- The current process of identifying such maintenance issues is typically performed manually (e.g., citizens reporting issues), which is time consuming, expensive, and slow to respond.
- Requests received via crowd-sourced reports are often unclear and inaccurate.
- The manual approach is not feasible in larger areas as it only covers very small geographical areas and is reliant on the number of citizens participating, making it unscalable and impractical.

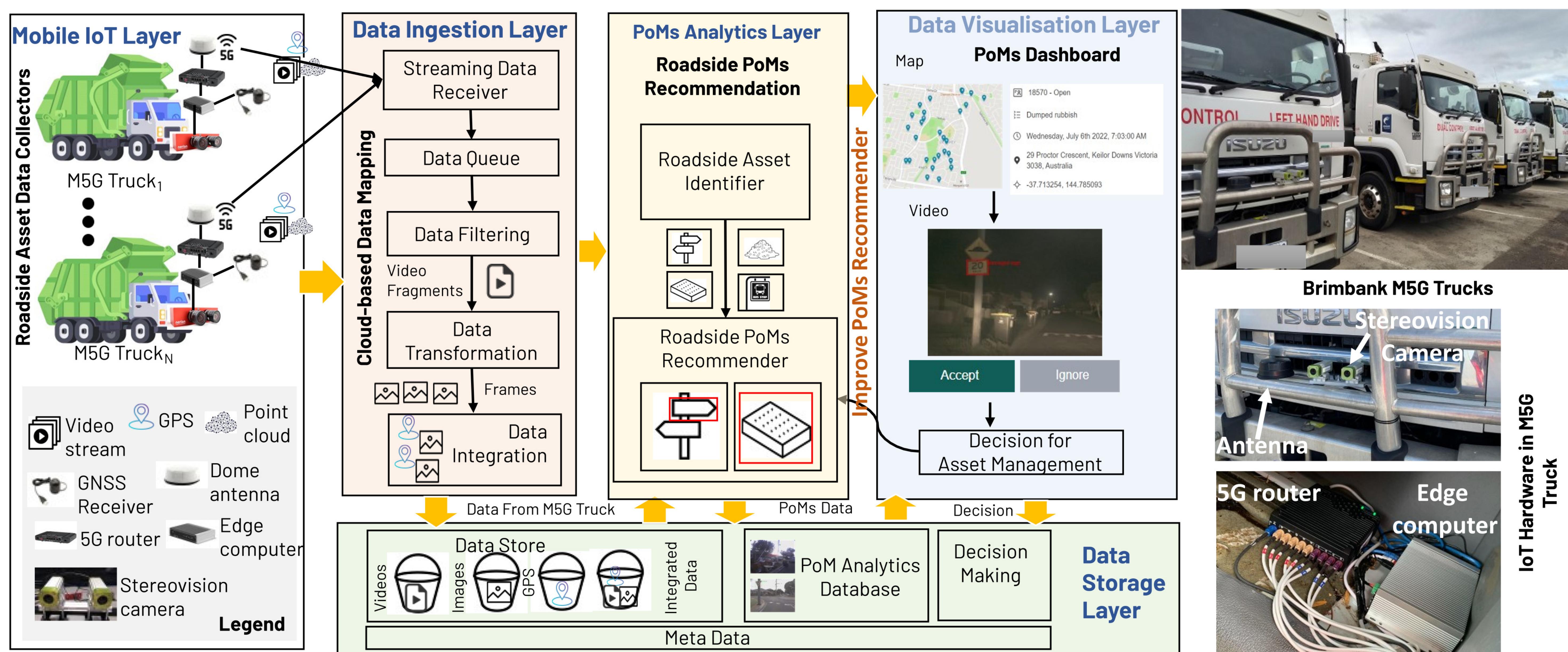
Contributions

We present Mobile IoT-RoadBot, a mobile 5G-based Internet of Things (IoT) solution, powered by Artificial Intelligence (AI) techniques to enable opportunistic real-time identification and detection of maintenance issues with roadside assets.

- The first research solution that combines advanced technologies such as IoT, 5G, and AI to automate PoMs management in real-time in a real-world setting.
- Mobile IoT-RoadBot comprises of IoT devices, stereo-vision cameras, 5G routers, and GNSS sensors
- The solution is deployed on 11 waste collection service trucks in the western suburbs of Melbourne, Australia.
- Mobile IoT-RoadBot transmits captured data by waste collection service trucks via 5G to the cloud for processing, and uses Deep Learning models to automatically monitor and detect roadside asset maintenance issues
- We developed a map-based dashboard to present Points of Maintenance (PoMs) map (along with a short video clip for verification).

The overview of our developed Mobile IoT-RoadBot solution

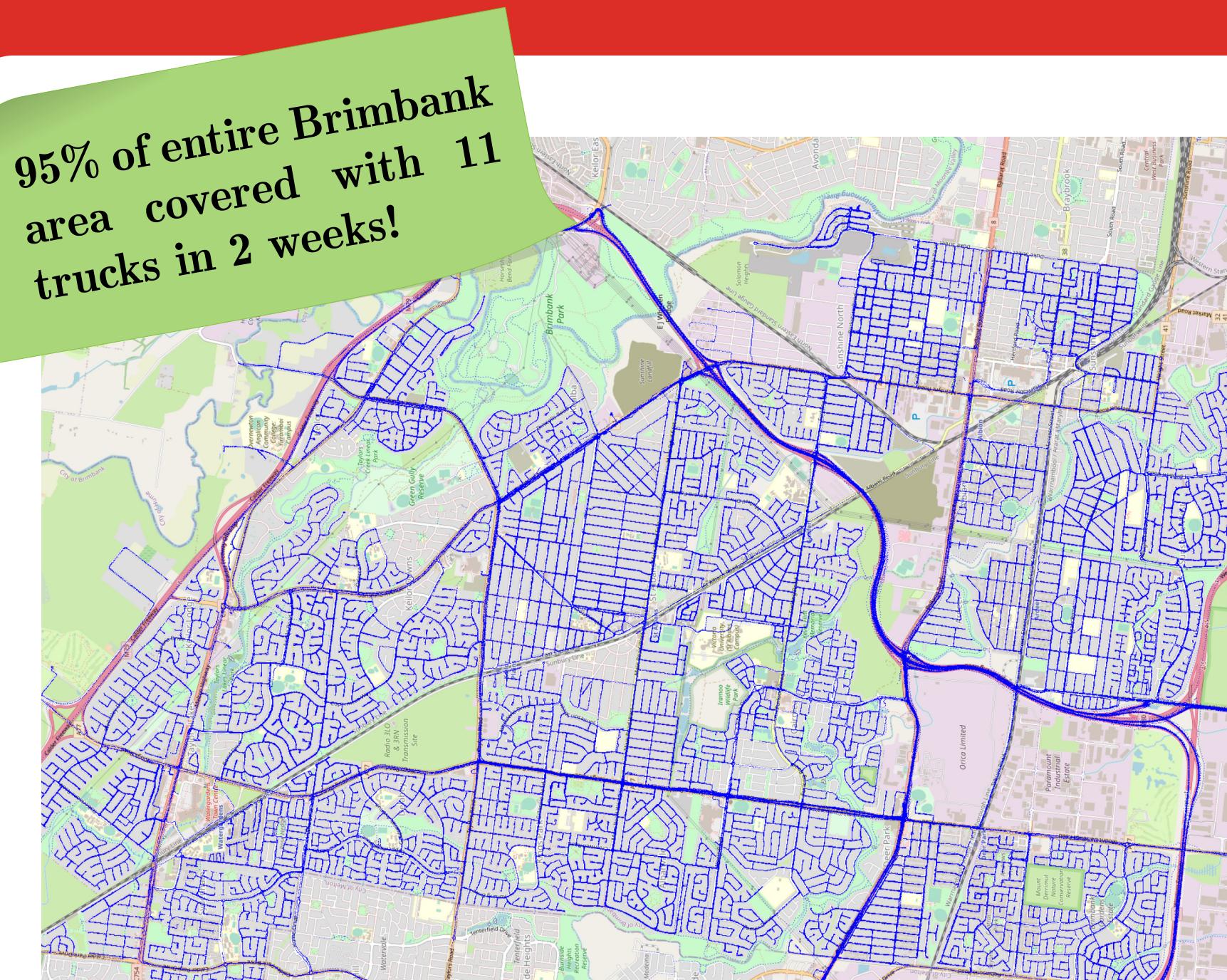
The solution has been deployed and in operation since June 2022!



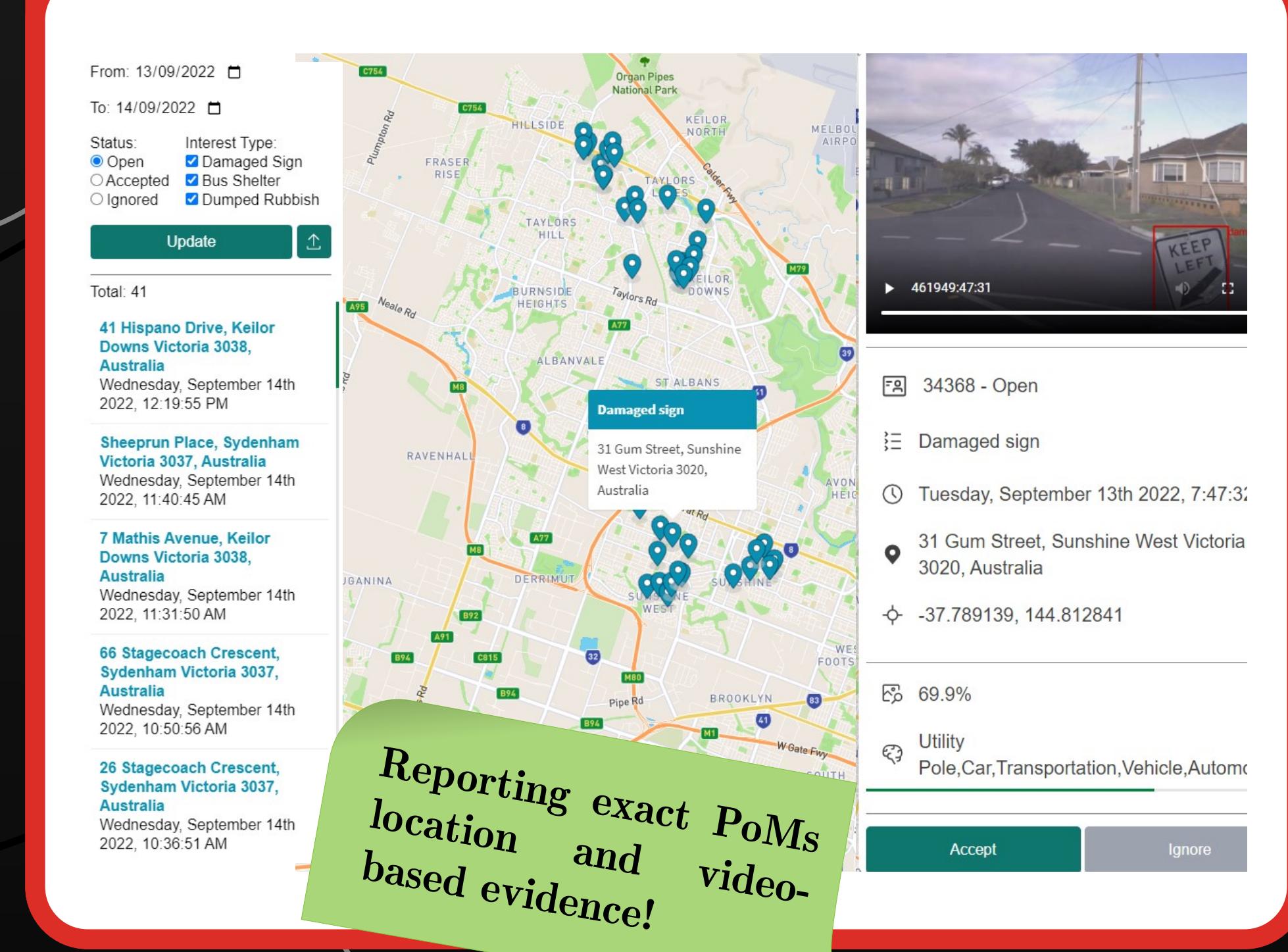
Identified Points of Maintenance



GNSS coverage by trucks



Points of Maintenance dashboard



Outcomes

- An innovative first of its kind mobile 5G-based IoT solution deployed on bin service trucks and uses Deep Learning models to automatically detect and report issues with road assets in LGAs.
- The solution uses Nerial's Stereo-vision camera, Sierra Wireless's 5G router, Optus's 5G antenna and Amazon Web Service (AWS) as a backbone for developing the cloud-based pipeline.
- Each truck streams approximately 5GB data/day with an average of 2.5 MBps (max: 4.24MBps) transmission rate.
- The PoMs Analytics Layer processes around 35,000 frames/day on average and can detect damaged road signs (e.g., bent, cracked), dumped rubbish on the street, and graffiti on bus shelters.

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