



TfNSW Leverages the Edge to Improve the Travel Experience on Public Transport

TfNSW trials IoT edge computing to provide new insights into public transport performance leading to improved service for customers and operators.

Figure 1. Sydney Light Rail @ The Edge



The customer summary

Customer name

Transport for New South Wales (TfNSW)

Industry

Transportation

Location

Sydney, Australia

Number of employees

25,000



Business challenge

- Provide new real-time insights into asset performance to enable targeted maintenance regimes
- Reduce customer impact and potential congestion due to service failure
- Reduce overall mobile broadband data costs when scaling out across a large fleet of vehicles
- Build a scalable solution that can be easy to deploy, manage, and replicate across multiple transport modes



Network solution

- Deployed an IoT Gateway with edge computing on a variety of TfNSW public transport vehicles: busses, ferries, and light rail vehicles
- Installed Cisco Meraki™ Smart Cameras to process video streams locally, reduce mobile backhaul data costs, and address privacy concerns while counting people
- Leveraged Cohda Wireless LocatelQ WiFi solution to detect customer on-board WiFi devices to determine people counts



Business results

- Reduced overall mobile broadband data costs by filtering non-interesting data at the edge and using condition-based monitoring to trigger events
- Discovered new insights into asset performance and customer behaviour through sensor fusion
- Improved total cost of ownership and application agility through a single hardware development platform that can be utilized across all modes

Technology Partners

Cohda Wireless; Innovation Central (a joint partnership between Data61, UNSW and Cisco)

“Cisco has been instrumental, sitting with us helping us understand differences between cloud computing and edge computing and what applications work for which scenario. And what we’re seeing is with the huge amount of data being produced by the sensor network – edge is where we need to be investing”

Chris Bennetts

Head of Innovation and Technology
Transport for NSW

Figure 2. Newcastle Ferries @ The Edge



Business challenge

With a population of just over 5.312 million in Sydney and rising, an efficient transportation system is essential to move people safely across the city. In order to ensure

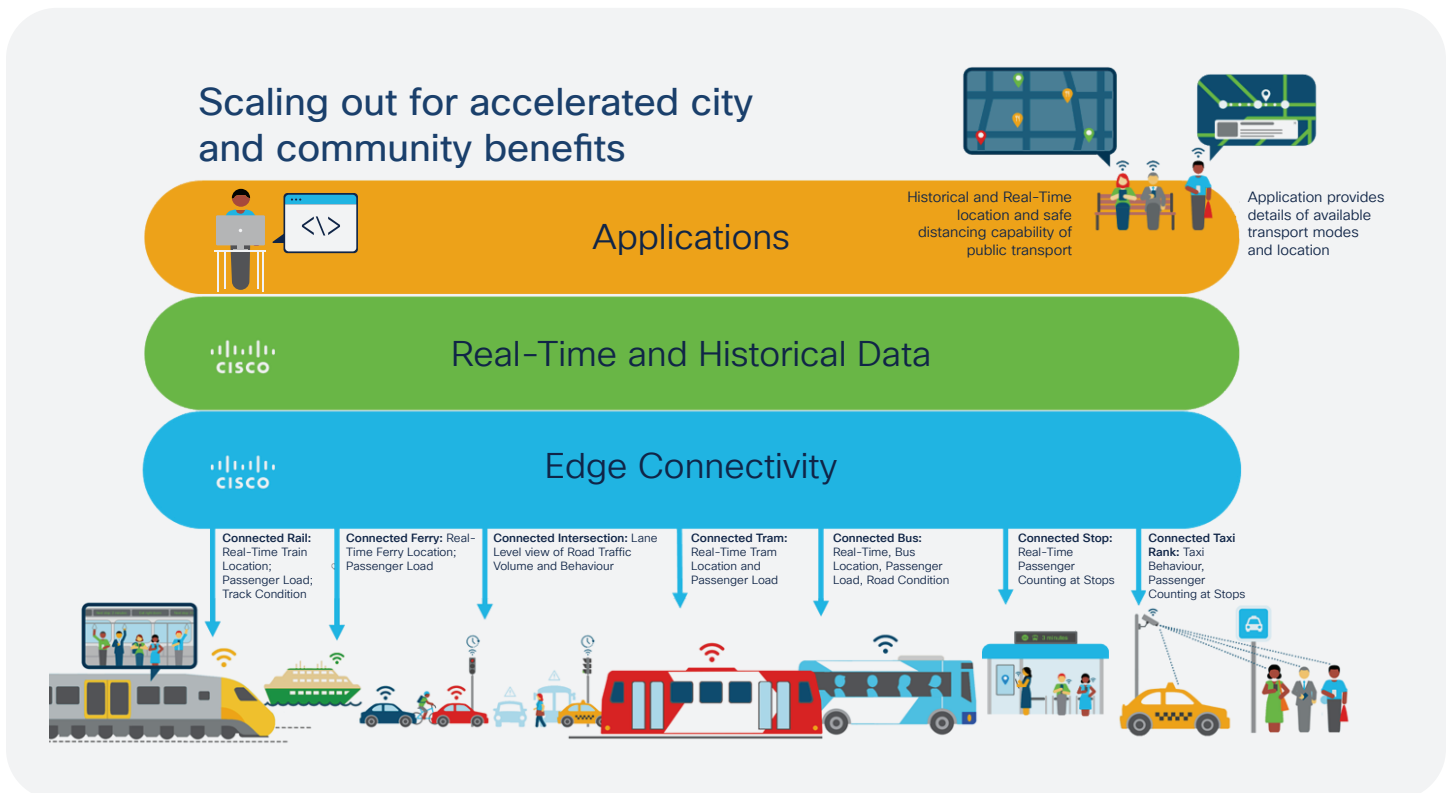
as little commuter disruption as possible, TfNSW were looking for a way to gain real-time data into how their assets were performing. Performance data would enable the early identification of issues and facilitate targeted maintenance regimes, reducing impact to customers and potential congestion events due to service failure.

However, streaming data back to the cloud to be processed across the entire vehicle fleet and all data sets is expensive. To test the ability to capture events while remaining cost effective, another method was necessary.

Finally, ease of deployment was essential. How could a solution be easily deployed and replicated across an entire fleet **without** requiring the vehicles to be pulled off service every time a change was required?

Network solution

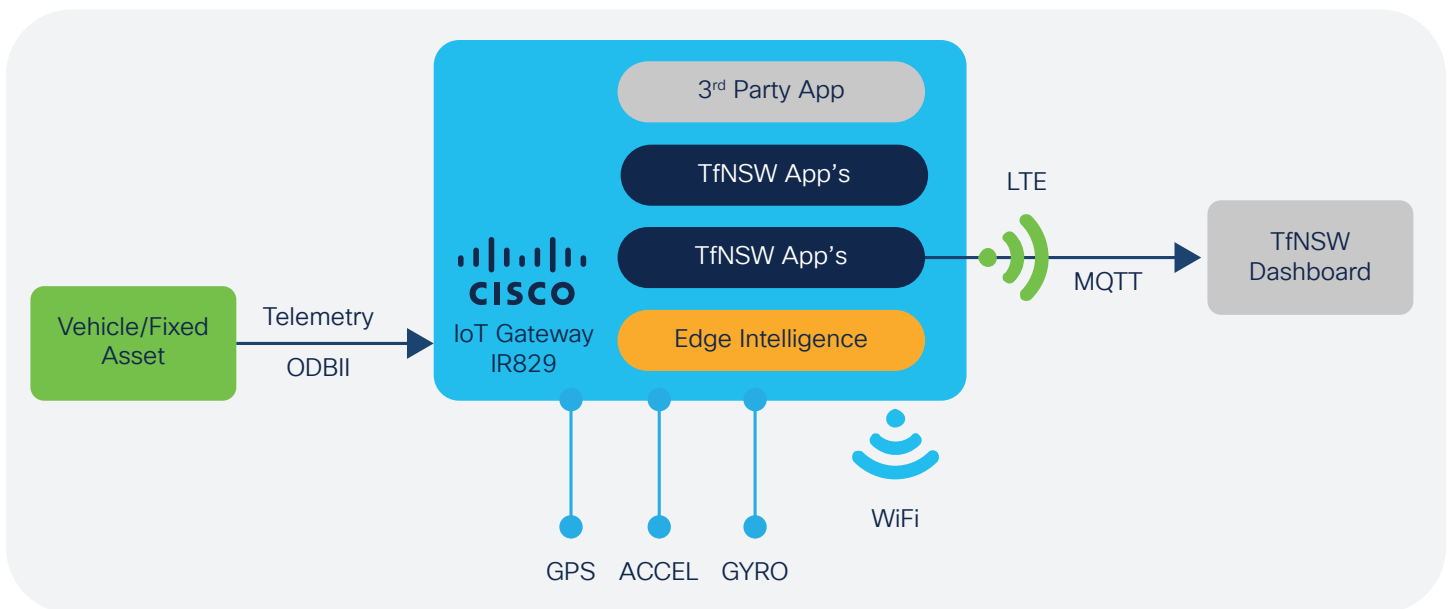
Internet of Things (IoT) solutions begin with intelligent sensors to “connect” people, places, and things to the network. The Cisco® IR829 IoT Gateway was used to connect and unlock data from the telemetry OBDII port of the vehicle, as well as to provide additional sensor functions including GPS location and accelerometer and gyroscope data. The edge computing capabilities of the IR829 came into effect where data management was required. Instead of sending data directly to the cloud, an application and ruleset were written on the IR829 so that only triggered threshold events caused an action. This effectively reduced the amount of data sent to the cloud.



In addition, an application was written to collate the data message and send via a Message Queuing Telemetry Transport (MQTT) broker on the IR829 to the TfNSW dashboard system to be displayed to the operators.

In order to understand the number of people on the bus and the load, several solutions were deployed. First, a Cisco Meraki Smart Camera was used to provide analysis of the visual counts of people. Leveraging edge computing, the video and images remained on the camera while the processed counts of people were sent to the IR829 to be forwarded via the MQTT broker. This enabled a number of privacy issues to be overcome by ensuring that customers' privacy was not breached through recording any images that left the vehicles.

An additional solution was used from partner Cohda Wireless, which used WiFi to detect devices on board the bus. The information was used to correlate the number of devices with people and formed an innovative way in which to understand load on the vehicle without impacting customer privacy. Processing of the data occurred on the IR829, which again reduced the amount of mobile broadband data required to support the solution. By leveraging sensor fusion on the IR829, the edge platform could take the data from Cohda Wireless, and the door open-and-close events, and use this information to understand when to start counting once the vehicle moved between stops.

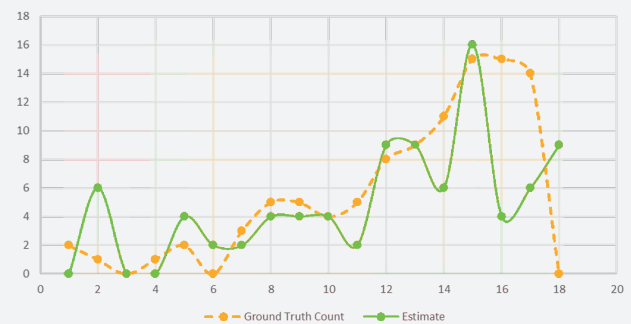


Business results

The trial successfully demonstrated overcoming a key number of challenges that TfNSW are facing managing their public transport fleet while improving the overall customer experience. With IoT edge computing, data costs may be reduced significantly by ensuring that data is filtered and decisions made locally on the vehicle, rather than all data being sent to the cloud or data center to be processed.

The solution also demonstrated the power to provide new insights into asset performance and customer behavior through sensor fusion, leveraging the data management capabilities on the IoT Gateway data from multiple sensors such as people counting and door open-and-close events. Thus, new insights into asset performance were provided at a level of granularity that would have been either non-existent or lost if aggregated.

Cohda Wireless WiFi people/device counting results:



Finally, the trial highlighted how application agility may lead to improved total cost of ownership. Using a single hardware platform enables changes to be made through software, eliminating the need for vehicles to be taken out of service when changes must be

made. In addition, the same solution can be built across modes with a standards-based interface north bound, and common applications rollout and results can be achieved more quickly.

Going forward

This trial demonstrates the feasibility of using IoT and edge computing solutions to enable a real-time insight into customer behavior and asset performance. While initially developed to monitor public transport, the solution has the potential to play a larger role in understanding supply and demand across the entire transport system. This analysis could be used to provide information on train platform behavior or even number of people waiting at a bus stop. This type of insight from intelligent sensors can then drive intelligent decision making, which ultimately leads to an integrated and elastic transport system and a whole new customer experience for the community.

Learn more

https://www.cisco.com/c/en_au/solutions/industries/transportation/new-south-wales.html

https://www.cisco.com/c/m/en_au/cda.html

https://www.cisco.com/c/en_au/solutions/industries/transportation.html

<https://www.cisco.com/c/en/us/solutions/industries.html>

Product list

IoT Routing and Switching

Cisco IR829 Router

Cisco IOx

Meraki Smart Cameras

Meraki MV32 Camera

Meraki Vision