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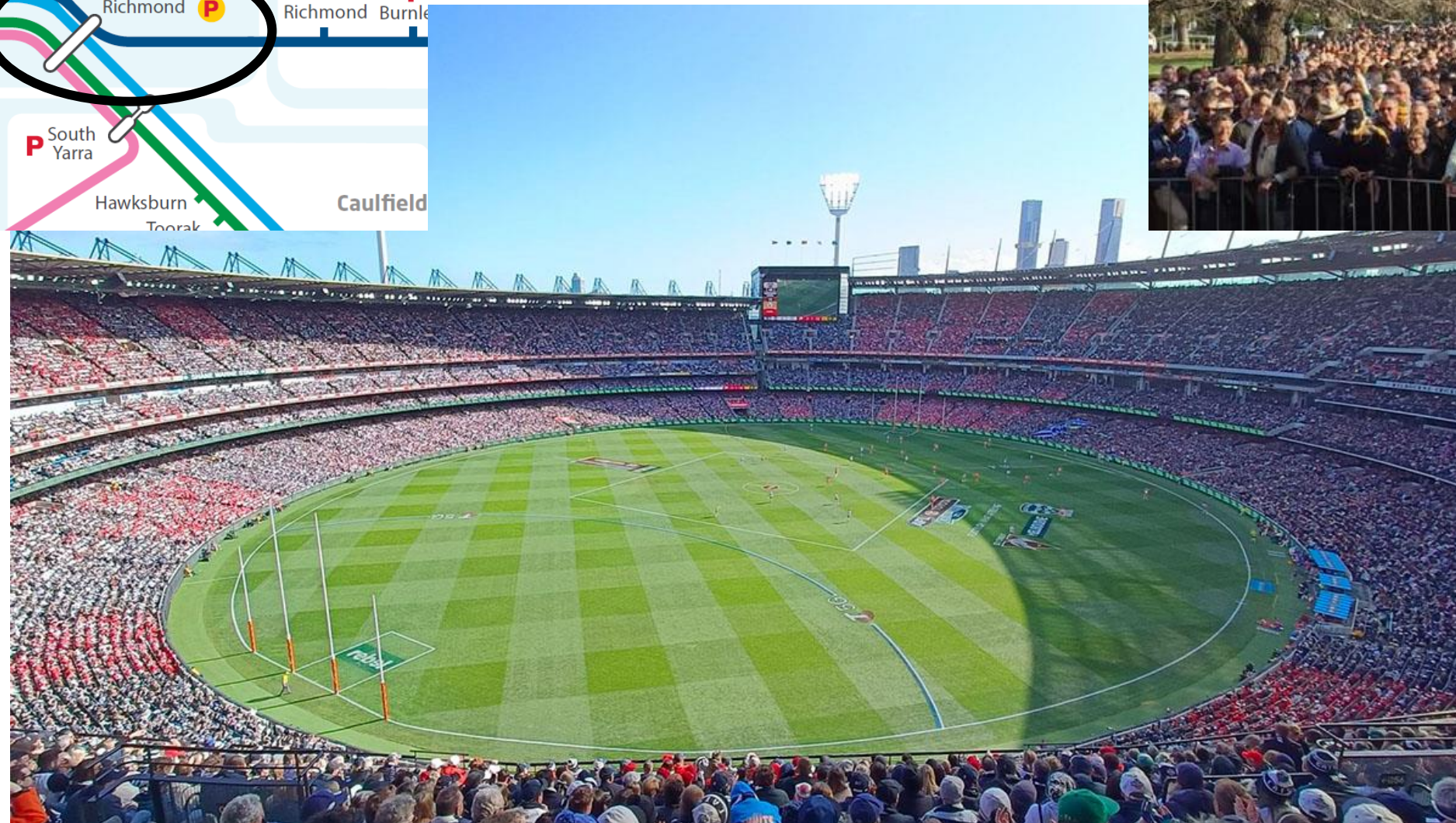
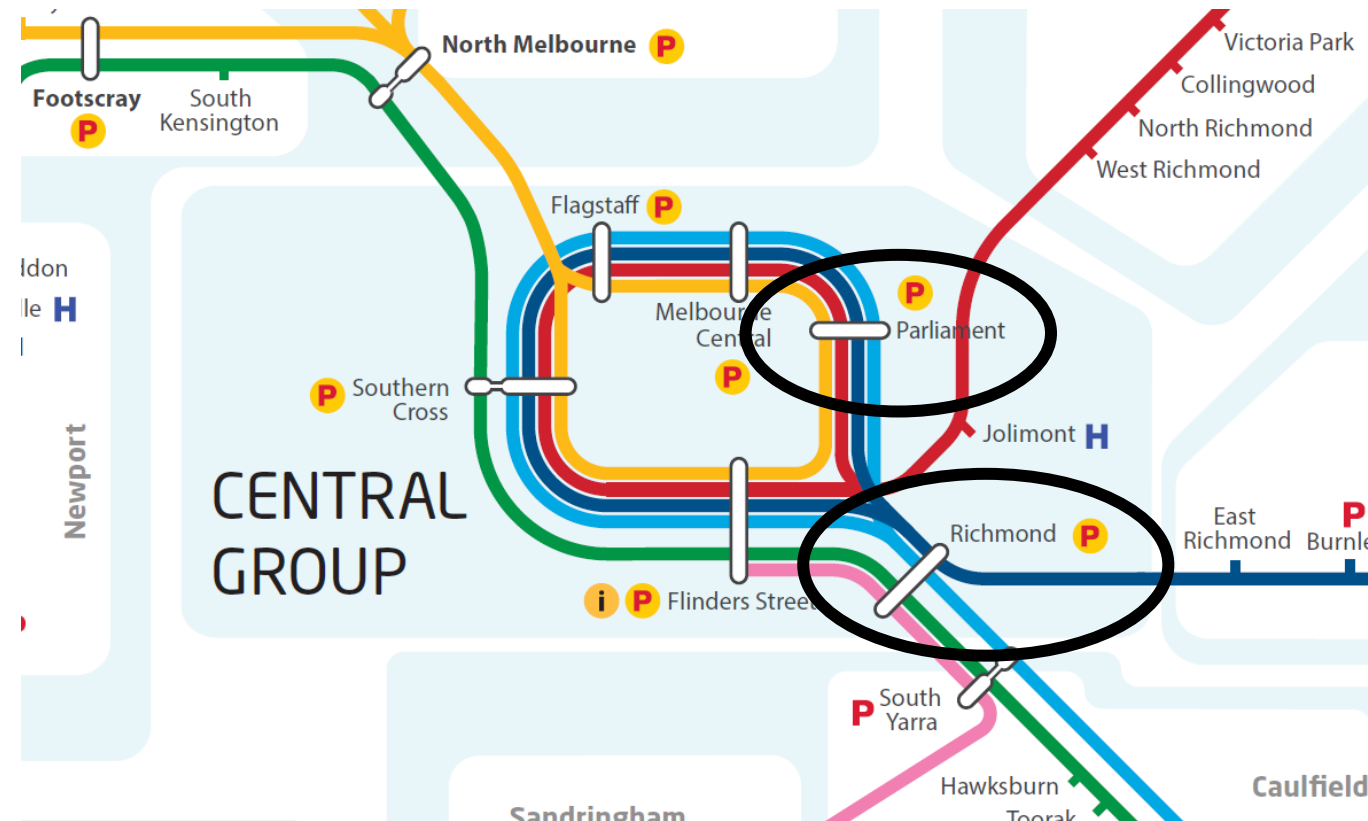
IRSC 2025

***Advancing Railway Safety through
Innovations and Collaborations***

Hong Kong, China 25th - 30th November 2025

People Movement Analytics

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Why People Movement Analytics?

Crowd Management

Passenger movements on platforms can impact **overcrowding** and **trespasser** incidents.



Current crowd levels are estimated by sight, this can be **inaccurate** and **varies** between people.



Overcrowding may cause passengers to unintentionally fall into the rail pit which can result in **serious injuries and fatalities**.

Trespasser Management

Trespassers can **enter the network** from the platforms and remain **undetected** until seen by a driver where early intervention is no longer possible. Without early intervention, these can lead to fatalities.



This results in the need to **stop** all trains in the vicinity of the incident location



Causing mass **disruption**, especially in the inner-city, high service frequency areas.

Impacting our Passengers and Our People

1. Support operational staff in managing platform crowding during peak times and special events

2. Support our Strategic Trespasser Program by developing solutions that can be applied at hotspot platforms



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Objective

Deliver real-time accurate information to MTM operations staff to Inform and support decision making about passenger safety, crowd management and early detection of trespassers.



LiDAR Technology

People Movement Analytics uses Light Detection and Ranging (LiDAR) technology at key stations connected to an edge-based server located on the platform. Specially-installed sensors capture passenger density on platforms, monitor crowd levels and trespasser events.

The LiDAR technology is undergoing a 12-month trial to validate its ability to support a shift towards a more proactive approach.

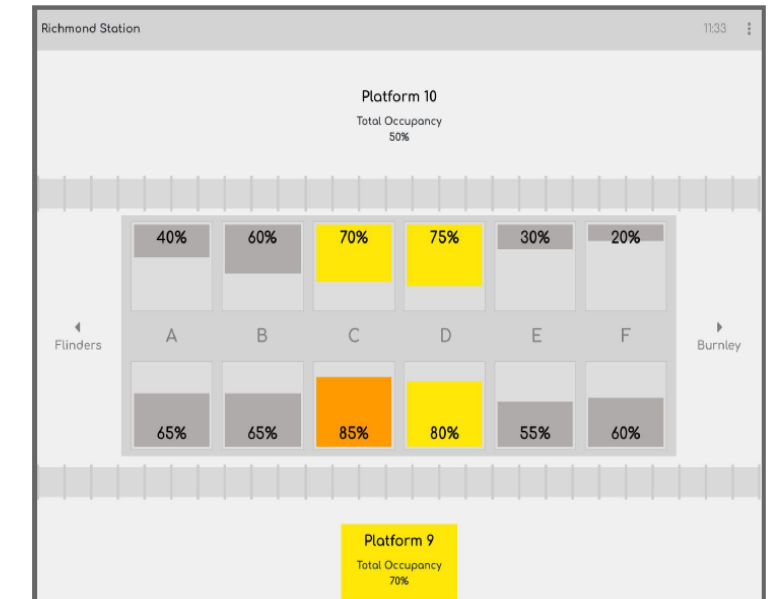
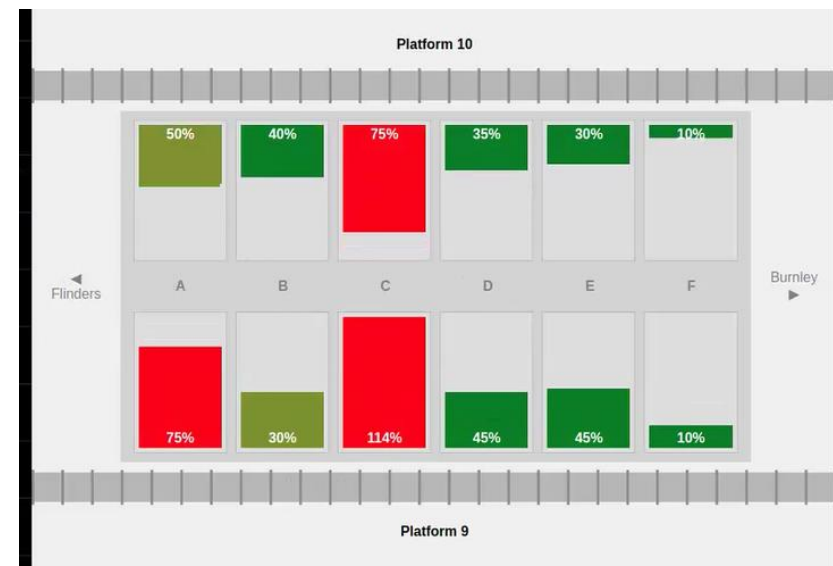
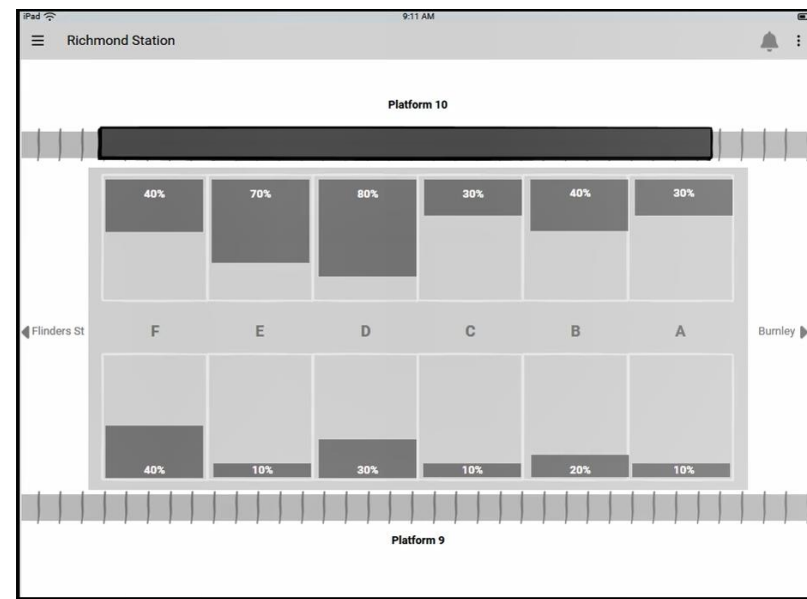
Installed at Parliament Station platform 4 and Richmond Station platforms 9 and 10

Human Factors Inputs

How did HF drive the success of the system?

Iterative Design

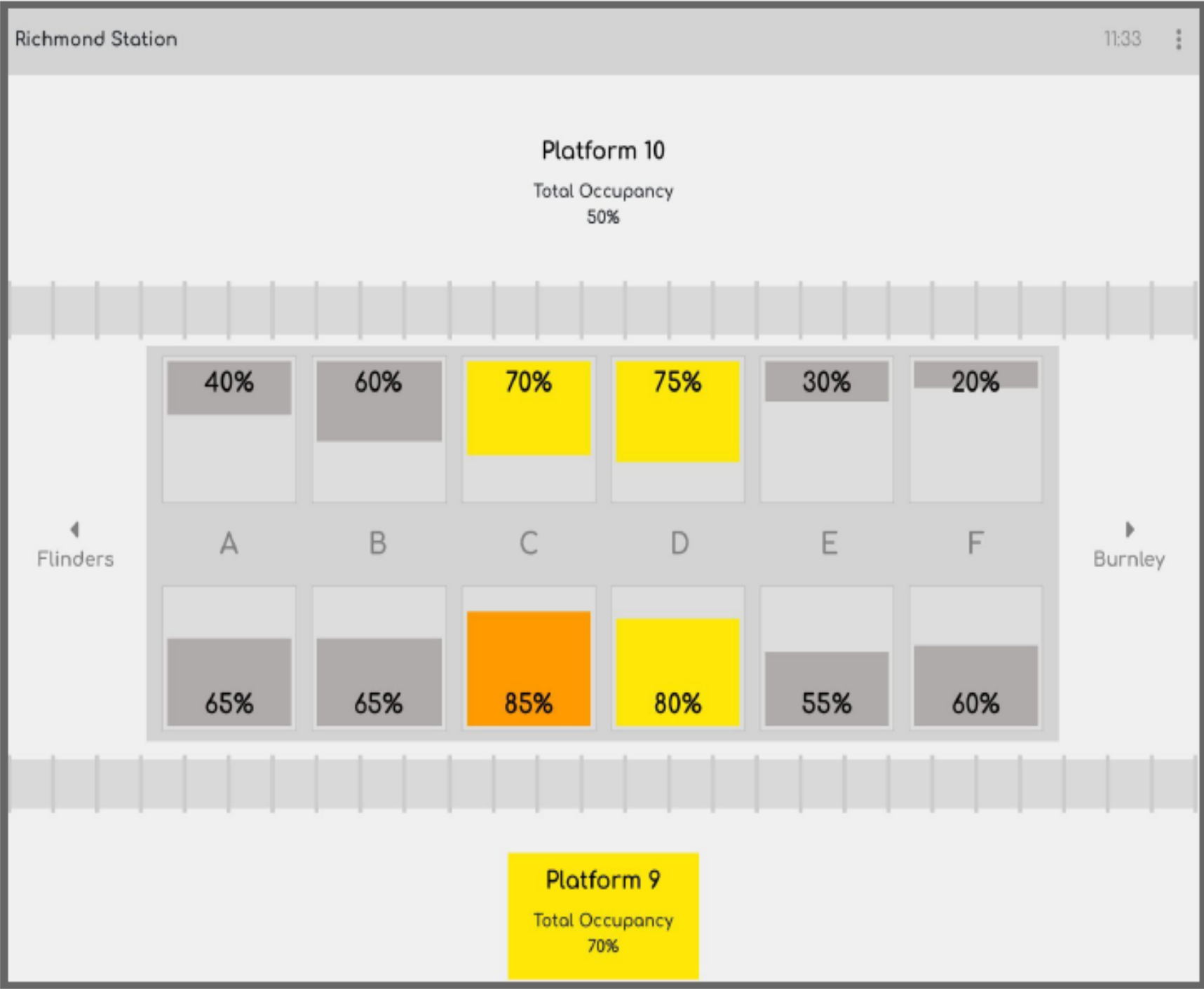
- An in-house HMI expert created a mock-up based on the requirements from the Early Human Factors Analysis (EHFA)
- I worked with the vendor to refine the user interface and ensure that the HMI was in line with the EHFA and HF standards/best practices
- Once the HMI was in a good place, I used the User Reference Group (URG) to further refine the HMI and ensure that it met user needs
 - E.g., set the color-coding thresholds for crowding level based on action that users take



Procedures

- We leveraged the URG to help us understand the ways of working between the user groups, ensuring any procedure updates to ensure that the way the trespasser feature aligned with existing similar processes
- Attended site to record user observations of the Authorized Officers (AO) and Station Staff
- We used our findings to inform procedures updates and training videos

System Overview



Staff have been supplied with iPads in the Station Control Room and the platform. An additional wireless mini-iPad is used on the platform during Special Events by the AOs.

Training modules have been developed: Crowd Management and Trespasser Detection. Training modules are available in person and via the Metro online portal.

Methodology to Trialing the Technology

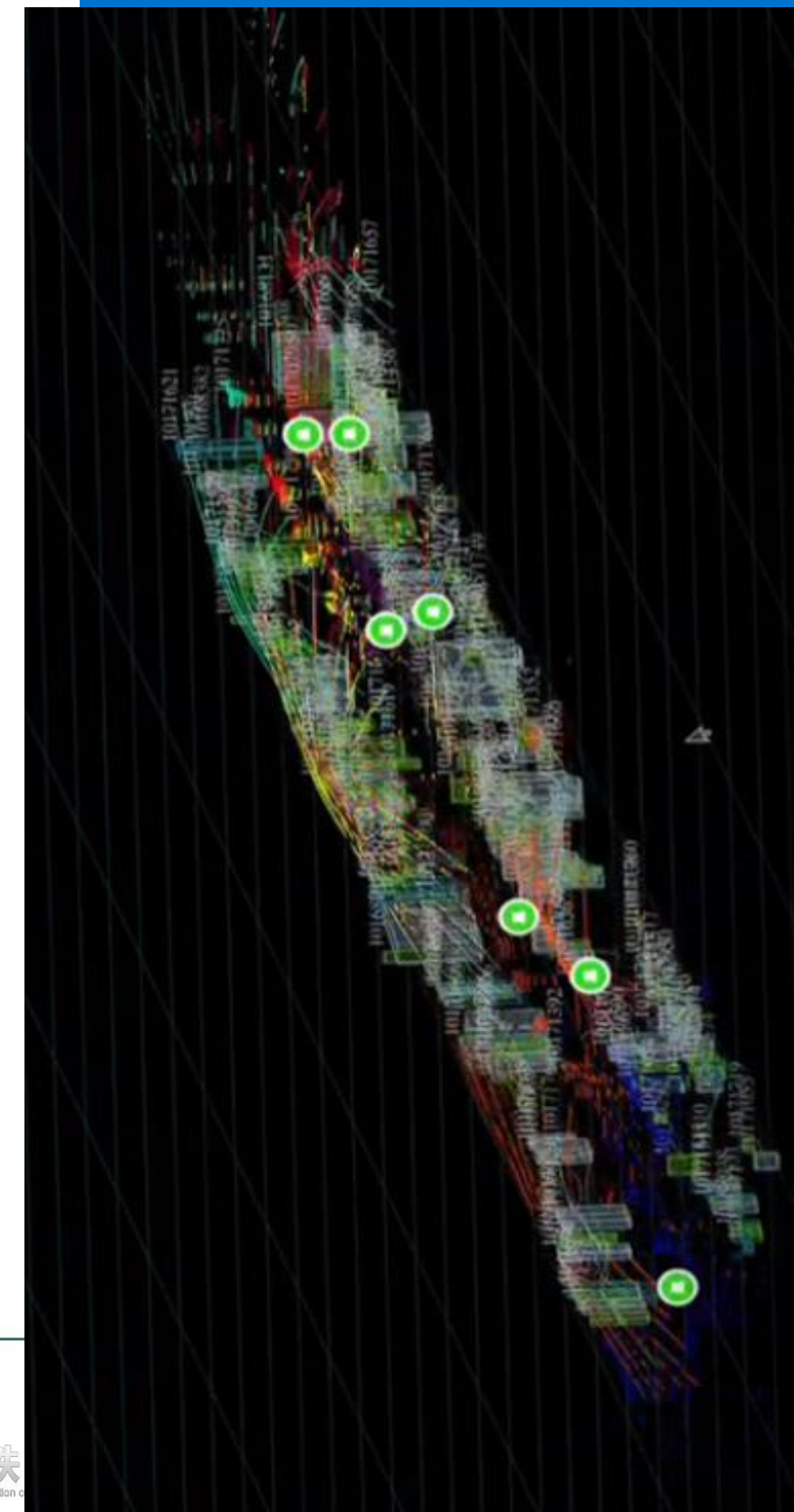
Crowd Management solution deployed in Sep-24.

- Trespasser pit entry feature went LIVE at Parliament station in Feb-25 and at Richmond station in Mar-25.

Validation approach includes:

- on-site observations during operational trial.
 - independent testing and comparison between reported and system generated events as well as CCTV vision.
- The success criteria was determined with key stakeholders as follows

Crowd Management	Trespasser pit entry
• Improved On-platform Safety (for special events) • Optimised train capacity utilisation (for special events) • Improved Block and Hold implementation (for special events) • Improved platform occupancy distribution	• Improved incident response time • More efficient response time to trespass events • Pattern / trend detection based off data • Accurate real time alerts with trespass location, time, and CCTV information



Results – Crowd Management

Case Study – AFL Finals

- Special Event, Fri 21st Sep-24, AFL Qualifiers Western Bulldogs vs Hawthorn:
 - I attended the site to collect feedback from the users and collect observations.
 - AO Team members provided positive feedback, noting the user interface is intuitive and helpful in understanding the situation on the platform
 - Great collaboration with Station staff and Rail Incident Commander

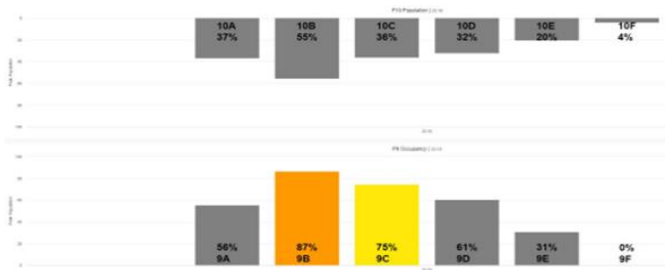


Crowd Management Outcomes

- Effective use of the Block & Hold approach to manage crowds during Special Events
- Achieved a **9.1% improvement** in the “line clearance-to-crowd attendance” ratio during Major special events.
- The HF Post Implementation Review (PIR) discovered that the accuracy of the crowding percentages at Richmond Station was not and should be refined. However, this was still accurate enough to inform decision making



Informed decision-making enabled staff to bring platform zones to a safe population level in less than 1 minute



From this...



To this...



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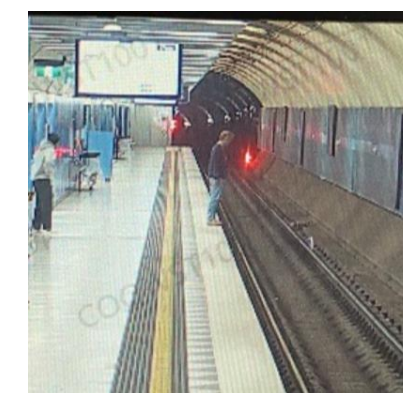
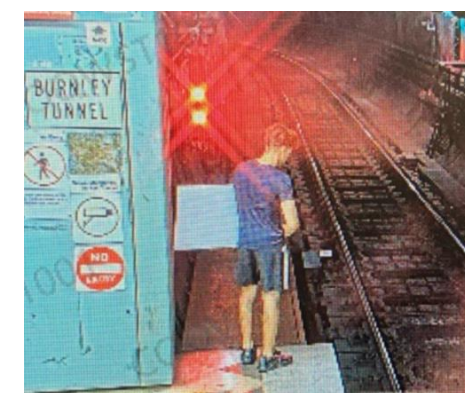


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Results – Trespasser pit entry

- Identified and categorised several types of trespassing behaviours.
- Identified areas of concern; for instance, at the end of the platform.
- During the validation process, the team came across several challenges such as reflections, size and speed of objects, birds, etc.
- System designed to alert station staff on trespassing detection (visual and audio).
- The HF PIR found a difference in **work as done versus work as imagined**
 - In many cases, Station Staff would not contact control operations (METROL).
 - At Parliament Station, staff noted that the alarm would trigger if someone stuck their head out at the end of the platform, prompting them to make an announcement.

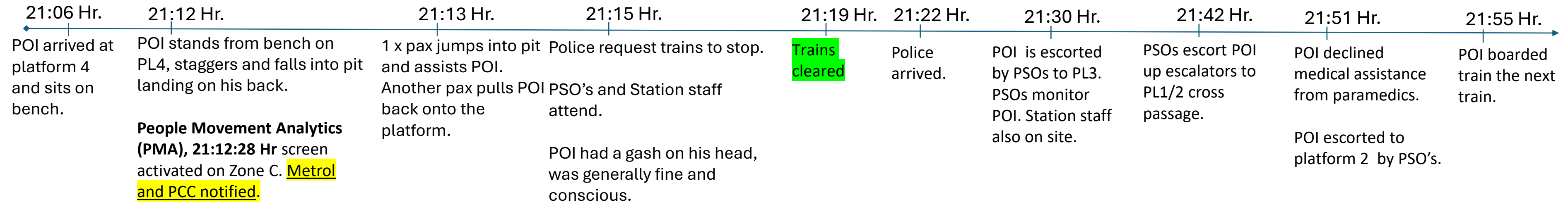


System in action

Parliament Station, platform 4: Trespasser fall in pit



26th Sep-25 Trespasser fall in pit



21:12 – Person of interest staggers on platform and falls into pit off platform 4 at Parliament and remains lying on the track



21:13 – Passenger enters the pit to assist the POI out, then struggles to get back onto the platform himself



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One Team. One Metro

Conclusions

The LiDAR technology has proven effective in **supporting data-driven decision-making** for operations staff, particularly in crowd management and early trespasser detection.

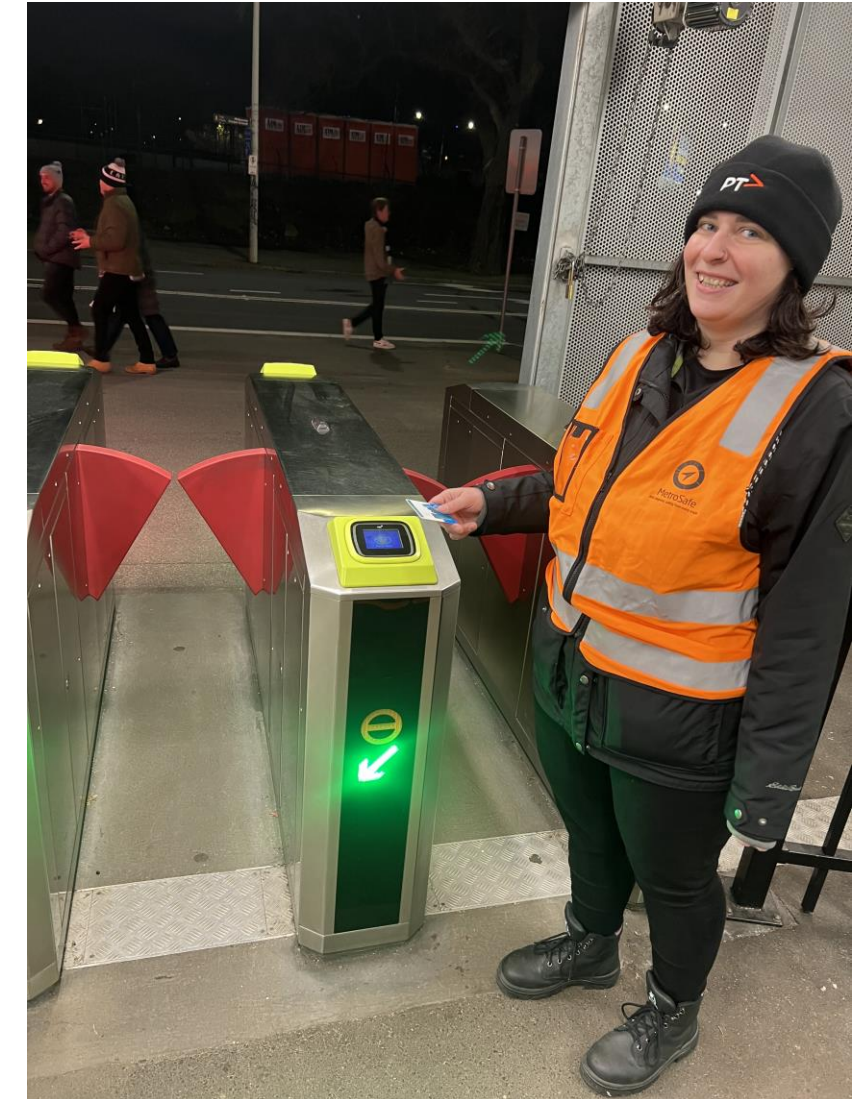
- People-counting accuracy is more than 90% at trial locations.
- Pit entry trespasser detection is 97% accurate.

Key HF PIR Findings

- The system was well received by users, and they found it intuitive.
- The trespasser detection feature was the most valuable
- Misaligned in procedures, work as imagined vs work performed
- Ongoing refinement of the platform crowding feature
- The system has not significantly impacted block and holds

Further Technology Considerations

- CCVT and LiDAR





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