



Monitor - Locate - Report

Case Study: Personnel Tracking

Client: CPB Contractors and Ghella



Case Study - Underground Personnel Tracking

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Project: Western Sydney Airport Metro Rail (2023- Ongoing)

1. Introduction

Iottag's next generation tracking system assists companies operating within underground spaces by providing a comprehensive personnel activity tracking overview encompassing total site visibility, granular occupancy, automation, traceability, safety management, operational efficiency and compliance across sites.

2. Client Background

CPB Contractors, in partnership with Ghella, were chosen by the NSW Government to undertake the Sydney Metro - Western Sydney Airport, Station Boxes, and Tunnelling Works (WSA-SBT) starting operations in 2023.

This project includes designing and constructing 9.8 kilometres of twin tunnels, connecting greater Western Sydney to the new Western Sydney International Airport. During the project's lifecycle, a workforce in excess 2000 personnel comprising company employed personnel and subcontractors will be operating on multiple sites.

3. Problem Statement

Across the WSMT project CPB and Ghella aim to accurately track personnel above and below the ground, helping to ensure occupancy and safety protocols are correctly managed. In emergencies, prompt identification of individuals operating in specific underground zones in real time is crucial for effective response and safety measures.

Previous solutions involved both manual scan and semi-automated 900mhz broadcasting systems, both produced unreliable location information, resulting in low

trust in accrued data. Further limitations included short Tag battery lifespan, which created regular maintenance events and high manual labour.

	Detection Reliability	Reporting Frequency	Detection Range	System Maintenance	Room for human error	Two-way Communication
Iottag	High	High	High	Low	Low	Available
Previous Solutions	Medium	Low	Low	Medium	High	N/A

4. Solution Overview

4.1 Hardware and Software Solution

Hardware: Gateways are strategically positioned both above and below ground throughout the project area. These Gateways were installed at intervals of 50 to 100 metres, establishing blanket coverage and distinct functional geozones with location accuracy of sub 25m.

Upon entering the site, personnel wear the Vector Tag, securely clipped into their safety helmet cradle or Minsup clip. The Vector Tag has two way communication features, including a duress button and remote activated emergency alarm. Utilising enterprise Bluetooth connectivity, these tags continuously transmit location data to the nearest Gateway with millisecond precision.

Software: The Gateway then relays tracking information to the Iottag Atlas Portal, where data is recorded, processed, and transformed into actionable insight, behavioural analytics reports and real-time alerts.

4.2 Addressing the Problem Statement

The real-time tracking of personnel provides on-demand transparency with current and historic location information for individual personnel across site.

The Atlas platform offers tailored, real-time on demand and daily reports, meeting CPB & Ghella's specific needs. Raw and smooth data is also delivered via API to their existing business systems. This feature significantly enhances the reliability and efficiency of their reporting system, overcoming the limitations of the previous solution's inconsistent data.

The tracking and reporting functionalities cater to a broad spectrum of stakeholders, including top management, Health & Safety teams, and servicing teams. This access to crucial and collaborative information enables informed decision-making across the organisation, enhanced safety measures and operational efficiency at all levels.

4.3 Tracking Technology Features and Functionality



Vector Tag

Suitable for assets & personnel

Features:

- Millisecond Reporting
- 5-7 year battery life
- Audible Alarm to locate lost tag
- Two-way communication
- Ultra long range detection

Dimensions: 53 × 35 x 8 mm

Battery: CR2450 (replaceable)

IP Rating: IP65 / UV Resistant



IS1 Gateway

Features:

- Scans for tags 10x per second
- Plug-n-play installation (PoE/WiFi/4G)
- Encrypted protocol to secure data in transit

Size and weight

Diameter: 3.3 in (8.4 cm)

Weight: 180g

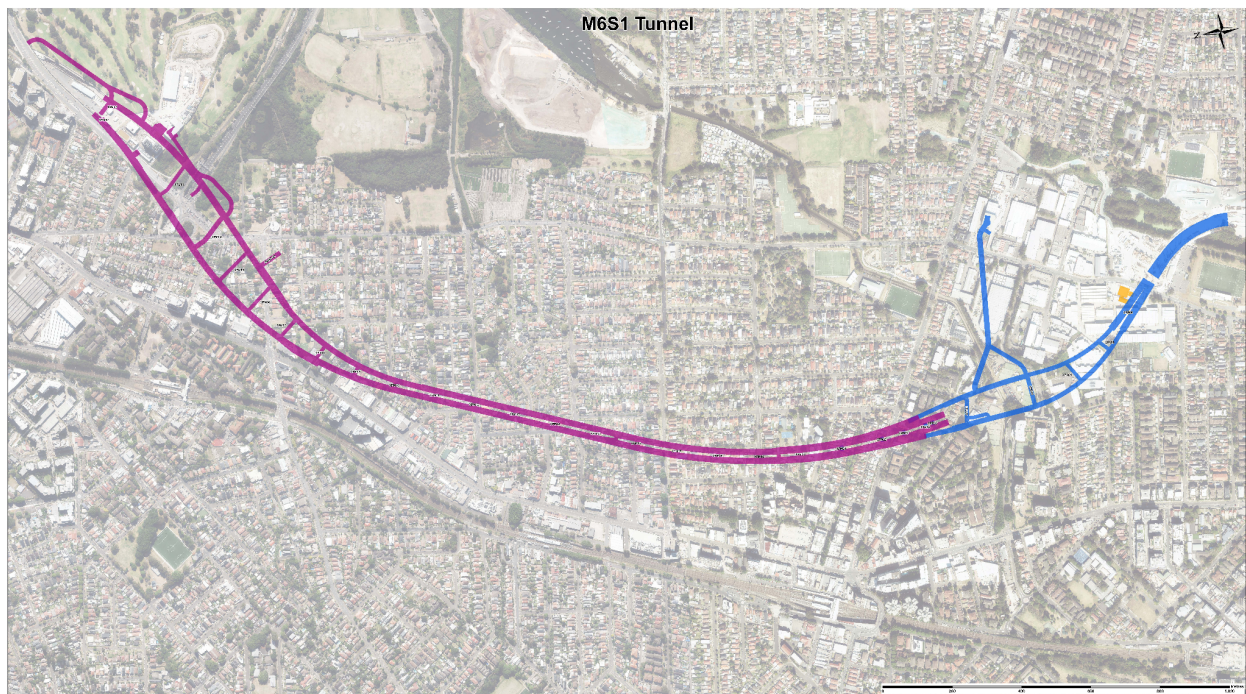
Power supply: 5V 1A DC power adapter

5. Implementation Process

5.1 Phase 1: Strategy, Design and Planning

Timeline: 2 weeks

Image 1: Western Sydney Airport Metro Tunnel - Site Map



The iottag Solutions Architecture team worked with the project's Electrical Engineering team to design the system layout. A crucial phase to ensure seamless integration within the existing tunnelling infrastructure. Involving consideration of native and third party hardware specifications, compatibility, and long term scalability.

They analysed workflows, identified potential weaknesses, and proposed solutions to ensure optimal strategy. Coordination with various departments enabled a cohesive integration and minimal disruption to ongoing operations.

Gateways were strategically installed throughout the tunnel designed to optimise communication and data transmission, considering factors like signal strength,

obstructions and coverage, adequate services supply and redundancy measures to sustain continuous operations.

5.2 Phase 2 - Commissioning and Testing

Timeline: 3 days

The Electrical Superintendent, serving as the Captain of the install team coordinated the fixed hardware installation process, overseeing the electrical aspects of the system's setup. Confirmation of installation success was provided by iottag's deployment support team, who were able to confirm online status of each Gateway and assist with any troubleshooting throughout the process.

Images 2 & 3: CPB Electrical Superintendent Underground & Gateway located On Wall



5.3 Phase 3 - Training Staff And Assigning Tags

Timeline - 2 days

Images 3 & 4: Hardhat with Vector Tag In Cradle



The Project Management team played a pivotal role in educating and training the staff about the implementation of the new personnel safety system. They led comprehensive in person training sessions aimed at familiarising personnel with the system's functionalities, emphasising its role in enhancing safety, benefits and suitable methods for attaching the wearable device.

Their training sessions covered various aspects, including the operation and utilisation of the Vector Tag and best practice procedures. Additionally, this team oversaw the assigning of tracking Tags to individual personnel.

6. Software Data And Analytics

Core system features utilised by Project Management, Health and Safety, high level management and Stakeholders.

Listed below operation activity data visualisations for cross departmental teams to draw necessary operational information to support their roles.

Image 6: Gateways and demarcated zones

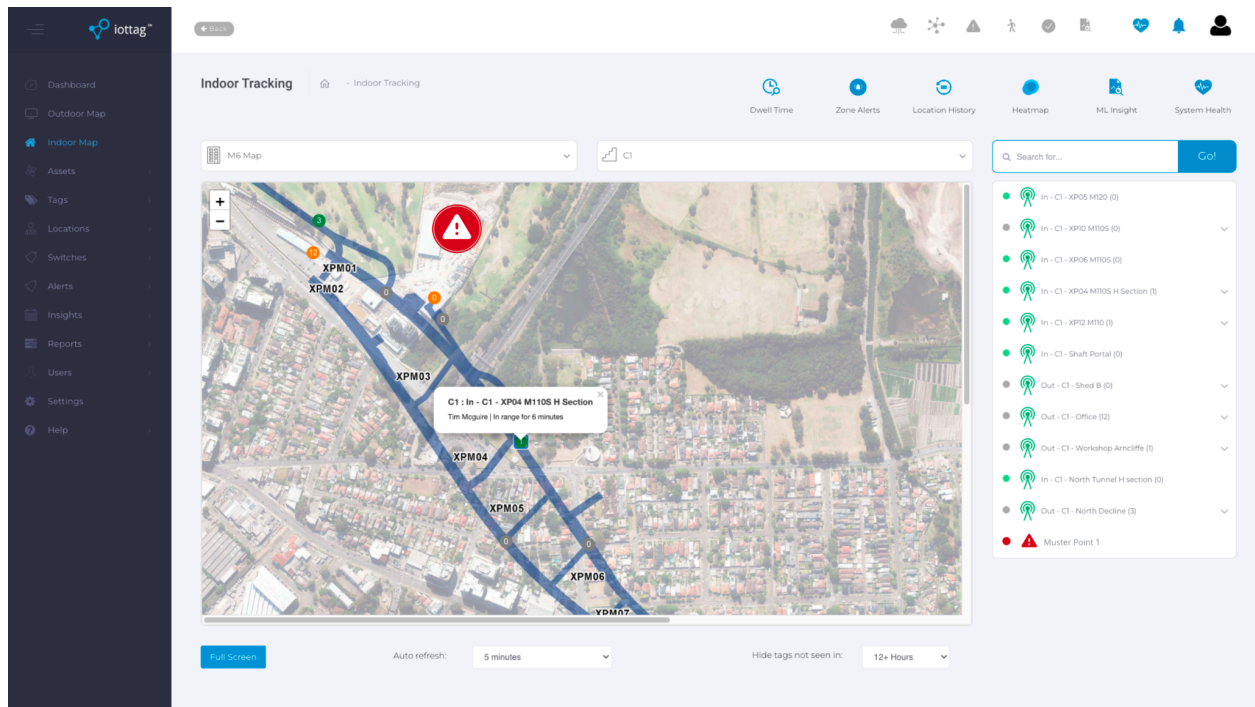


Image 7: Zones denote places of performance underground

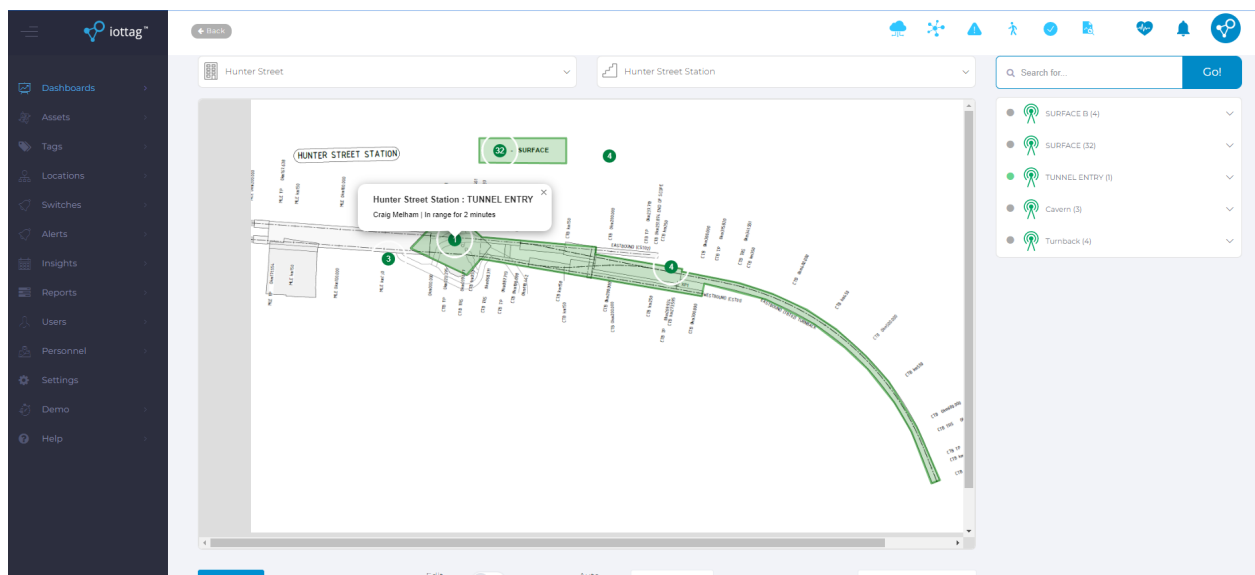


Image 8: Manage and edit view of entire workforce operating across site

The screenshot shows the 'Asset Management' page in the IotTag application. The interface includes a sidebar with navigation options like Dashboard, Outdoor Map, Indoor Map, Assets, Tags, Locations, Switches, Alerts, Insights, Reports, Users, Settings, and Help. The main content area displays a table of assets with the following columns: Asset Name, Category, Linked Tag, Linked Gps, Note, Status, Updated by, Location, Updated Time, History, Last data, and Action. A summary box at the top right indicates 87 assets, updated in the past 24 hours. The table lists assets such as Candy Stainton, New Tag - doocxl, Taylor Savage, Gina Osborne, Brad Graham, Conor Mellon - Rocktown, and Jayden Mika, each with associated category, tag, location, and status information.

Image 9: Site activity, occupancy by customisable zone and location spread

The screenshot shows the 'Site Activity' page in the IotTag application. The interface includes a sidebar with navigation options. The main content area displays a table of site activity with the following columns: ASSET NAME, LOCATION, TIME LAST DETECTED, and DATE. A summary box at the top right indicates 37 total items. The table lists activities such as Brad Graham, Conor Mellon - Rocktown, Jayden Mika, Angelica Cuernero, Candy Stainton, New Tag - offert, Hayden Moore, Jeremy Rowlings, Richard Brandis, Donnie Griffin - ewtldc, Gina Osborne, Mark Pringle, Chris Wall, New Tag - jmhllk, New Tag - doocxl, Scott Bathorne, Matt McCulloch - k2fkw, New Tag - vassax, Tim McGuire, Rick, Clayton, New Tag - rhykix, Maurice Raleigh - tcefy, New Tag - 4btuad, Ryan Hayes, and James McCarthy - qjzaf. A pie chart titled 'Location Spread' is also displayed, showing the distribution of activity across different locations: In - C1 - XP04 M105 H Section: 1, Out - C1 - Office: 12, In - C2 - Bottom of Shaft: 17, Out - C1 - North Decline: 3, Out - C1 - Workshop Armcliff: 1, and In - C1 - XP08 M110 S: 3.

6.3 Testimonial

"We have found the IoT Tag team extremely willing to implement their system to suit our requirement. The hardware holds up well to our underground environment, while the cloud system enables, easy and high speed deployment to our across our projects. We continue to look at other innovations we can implement together, to continually improve site safety and efficiency."

Ben Richards (CPB Ghella JV)

Senior ICT Analyst

Sydney Metro Western Sydney Airport
Station Boxes and Tunnelling Works



Ben Richards is the most highly regarded source for tunnelling technology in Australia. He is available to provide a reference regarding the many iottag systems installed across their sites, please see contact details below.

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8. Conclusion

The iottag system was found to be easily installed and quickly scaled up which suited the progressive tunnel construction process.

Plug and play Gateways were seamlessly integrated into the existing network and communications infrastructure. The tags were quickly assigned and adopted by personnel and the long life battery relieved management teams of maintenance duties.

Various departments from project management through to administration utilised the platform to draw pertinent data on demand and analytical reports throughout the project lifecycle. An unexpected benefit which provided great value was the ability to track and trace subcontractor activities, in particular auditing historical attendance records which provided confidence in addressing payroll uncertainties.

This case study represents information pertaining to enterprise Personnel Tracking solutions by iottag. For more information on additional IoT automation and asset tracking services please contact - sales@iottag.com.au

Further case studies available on request:

- *Vehicle tracking and performance analytics (GPS / RTLS)*
- *Proximity and safety detection*
- *Smart interactive lighting*
- *Equipment tracking and utilisation monitoring*