Using Data Science Initiatives to deliver Smart Infrastructure and improve Customer Experience

A Transport for NSW Case Study

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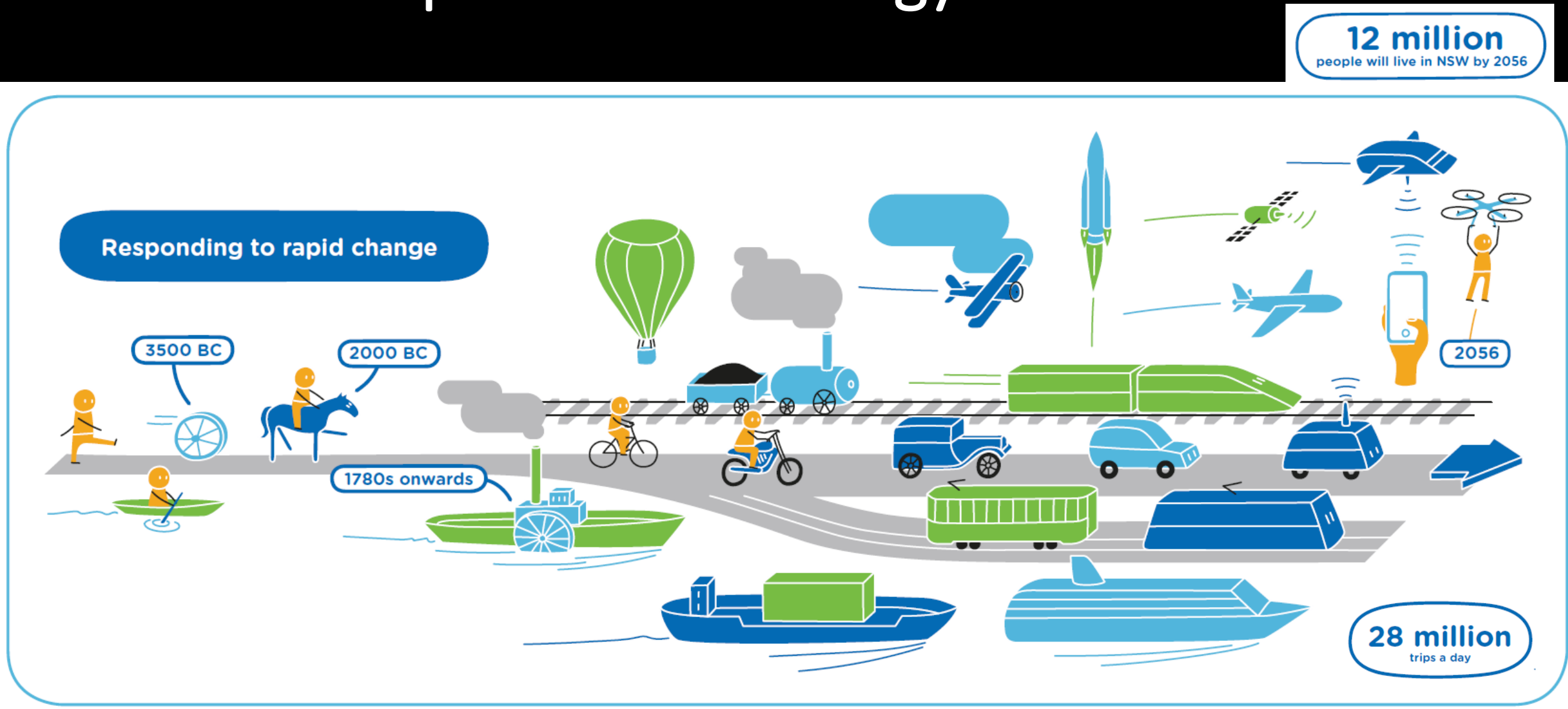
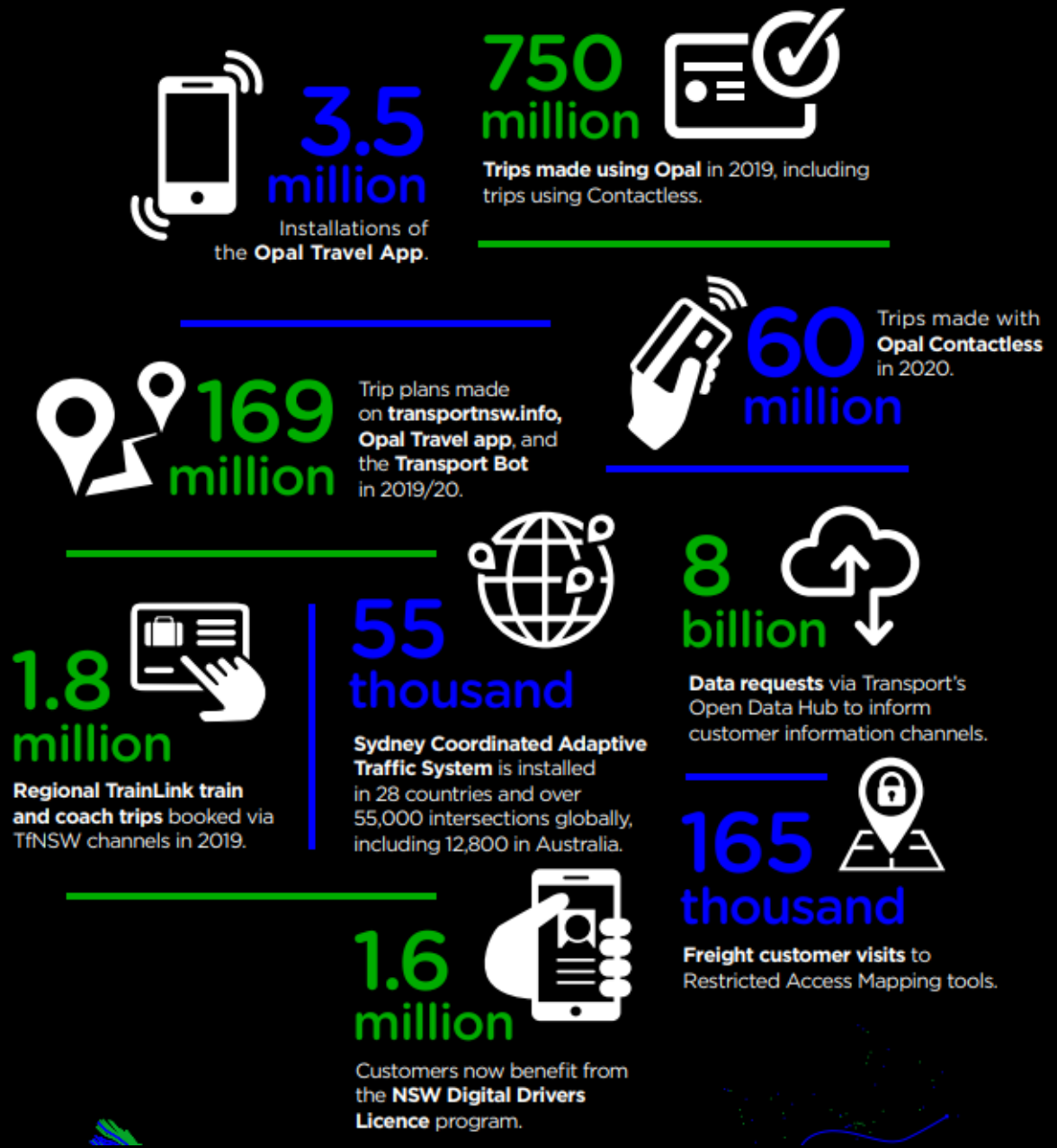
Future Transport 2056 Strategy for NSW



Our customer's use of technology is vast



Transforming Customer Journeys by 2024

Mobility as Service (MaaS) will deliver seamless and personalised journeys across all modes

- Opal Connect will become a single account for travel in all modes across NSW
- More partnerships with on-demand and rideshare providers to expand MaaS offering
- Digital ticketing will expand to regional NSW

NSW will be a world-leading adopter of connected and automated vehicles

- Trials will show how autonomous ride share services can integrate with MaaS
- The Future Mobility Test Centre at Cudal will test integration of vehicles sensors and infrastructure
- Government will apply policies needed for mass adoption of CAVs

Rapid transition to ZEB and EV will help NSW to reach net zero emissions by 2050

- NSW's bus fleet will transition to zero emission buses (ZEBs)
- Industry will be encouraged to adapt and supply EVs
- Our EV charging network will expand across NSW
- We will explore use of hydrogen technology to support zero emissions target

Technology will transform mobility in regional NSW

- Regional NSW will have real-time information and digital ticketing for all public transport services
- Cutting edge technology will be deployed to create smart regional cities
- Digital connectivity will be provided at transport hubs and on major services
- New mobility technologies will be tested and deployed first in Regional areas

More efficient freight through technology

- We will capture and share data to enable a more holistic view of the supply chain
- Automated and sustainable last mile freight vehicles will be trialled and rolled out
- Investigate the development of a Freight Community System to follow the container supply chain from port to intermodal terminals and distribution centres

Sensors and intelligent systems will create smart transport networks

- Smart sensors will be deployed across the network for richer customer information, service performance, and incident response
- Intelligent systems powered by AI will dynamically optimise network and predict events
- New data sources in Open Data and data exchange will enable integrated mobility solutions

Active Transport – Data & Analytics Roadmap

The Roadmap will be delivered in three stages

The action plan focuses on people, process, data & technology

Outcomes are progressively delivered over time

Stage 1 Establish
FY22

Establish Technology Platforms & Data Management/Governance

- **Collaboration & Alignment:** Broader stakeholder engagement, collaboration & communication plan
- **Review & Streamline:** Deployment of Smarty Grants, Jira Align and other data management tools & processes
- **Audit and Review:** review and consolidate TfNSW data, develop data requirements, schema designs and deploy data platforms
- **Investigate & Pilot**: Assess and decide on technology, sensors and platforms to pilot

Stage 2 Operationalise
FY23

Technology Rollout, Bi-Directional Information Flow & Automation

- **Supporting Network Use:** Change management & broad communication plan execution
- **Automation:** Automated data processing to remove manual intervention and improve data quality
- **Bi-Directional Information:** Growth of usage and customer journey data supported by bi-directional network and sensor data sharing with councils and customers via open data platforms
- **Technology Rollout:** based on pilots, progressively rollout select technology across the state in cloud infrastructure

Stage 3 Enhance
FY24++

Advanced Insights, Business System & Digital Twin Integration

- **Advanced Capability Development:** Stakeholder collaboration to support knowledge sharing, innovate and support capability development
- **Advanced Insights:** Expand capabilities and knowledge-sharing in predictive and prescriptive analytics and crowdsource data
- **Digital Twin:** Smart Network solutions serving as the digital counterpart of the physical assets focusing on real-world functional utilisation with human centric capabilities
- **Business System Integration:** seamless integration with the core Enterprise GIS with new insights and using business data to support potential Digital Twin

People Process Data Technology

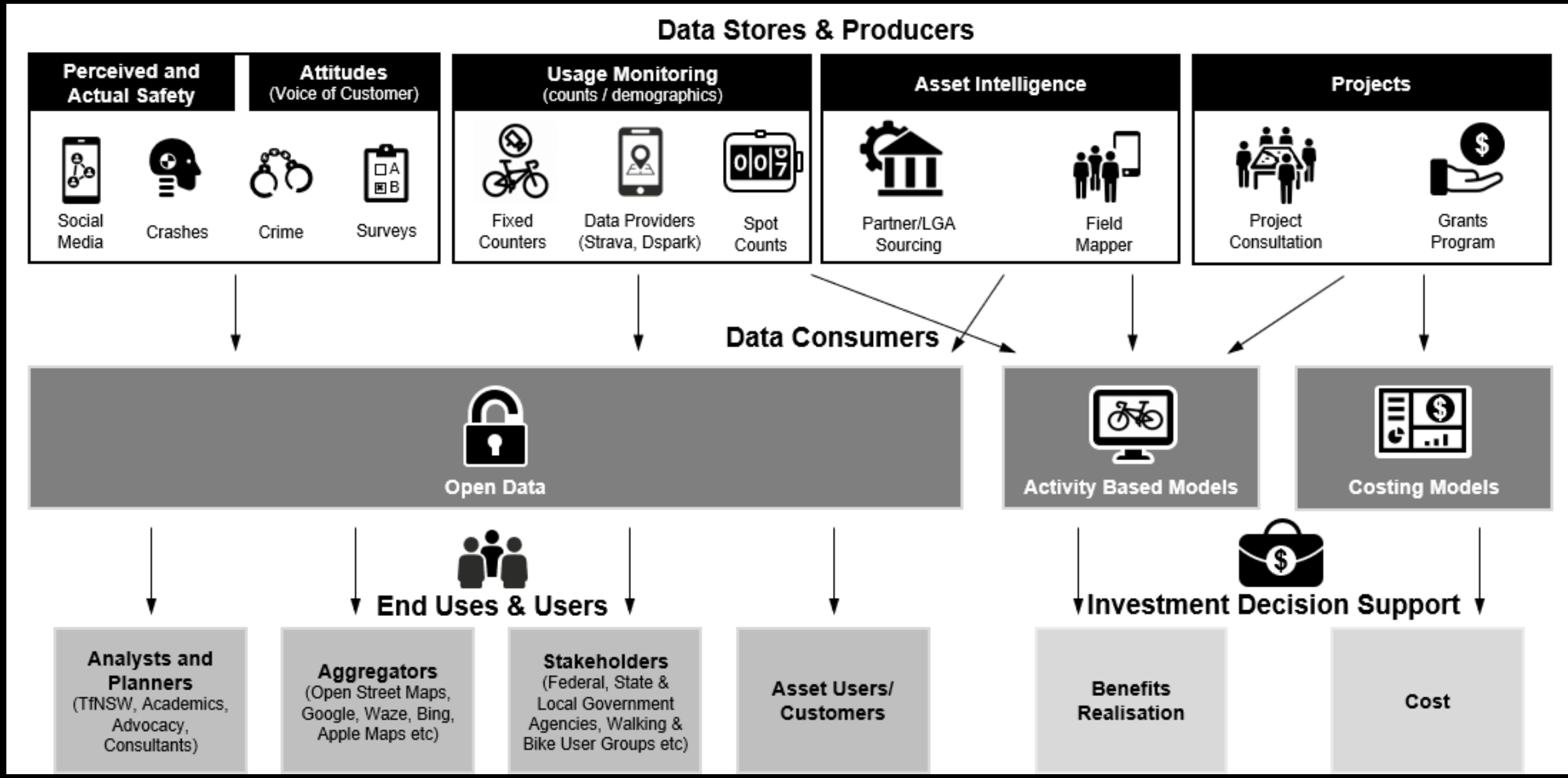
Planning, design & portfolio management

Investment decision support

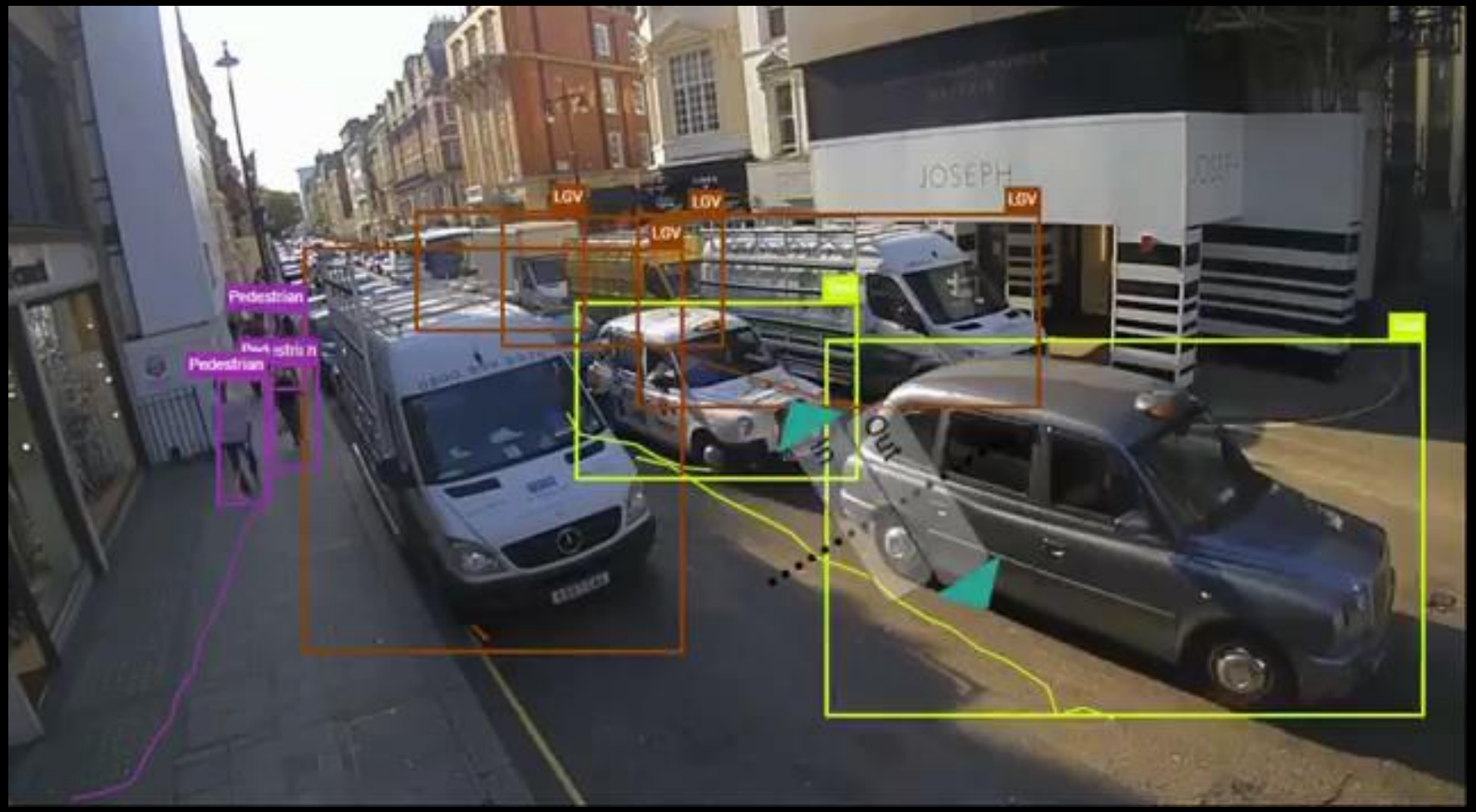
Open-source sharing of information

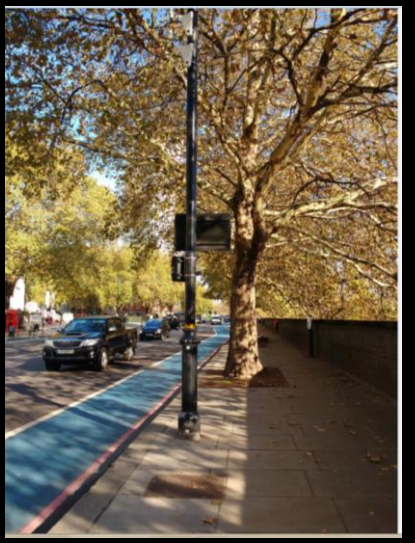
Customer experience

Active Transport – Data Ingestion



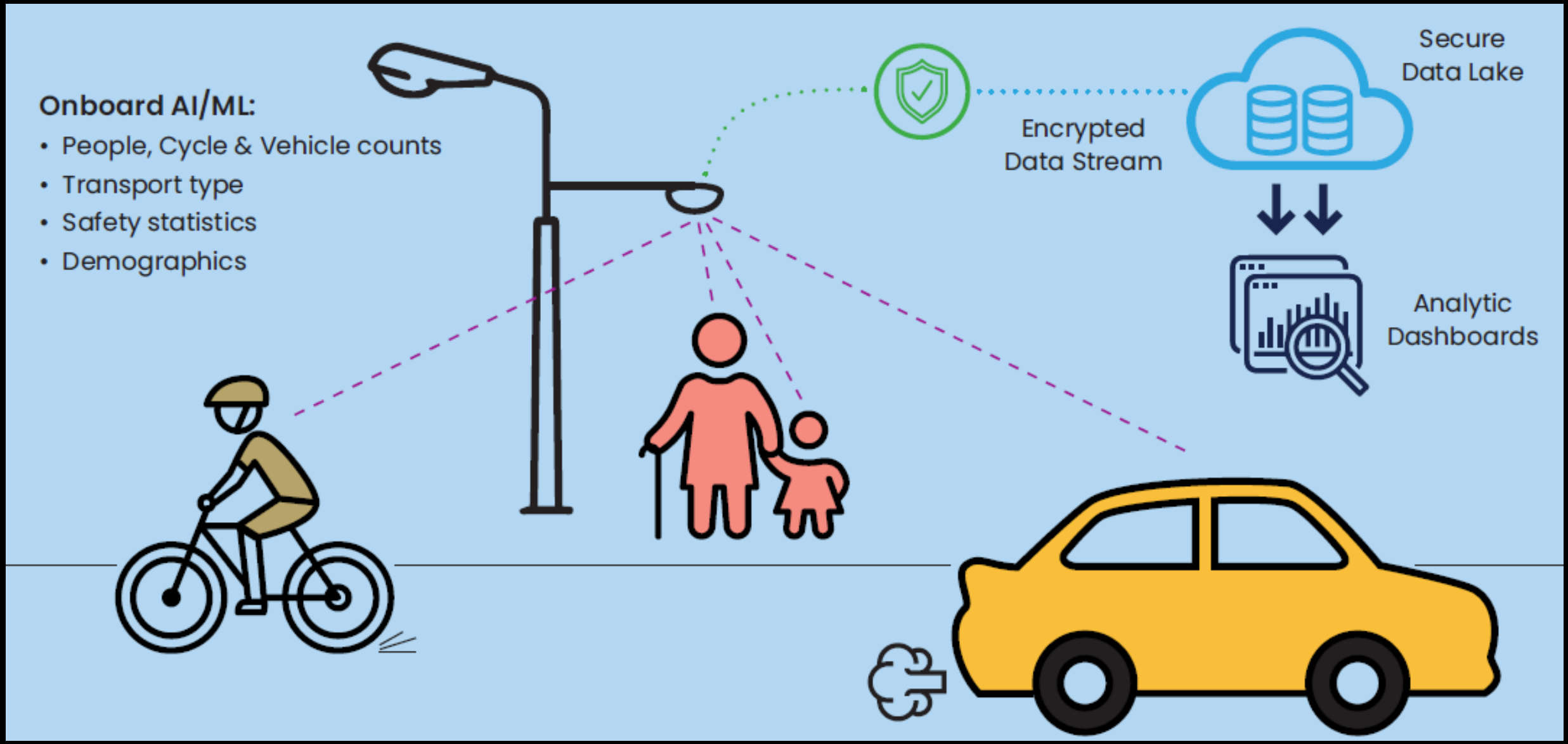
Active Transport – Benefits Tracking using Sensors





Source: Transport for London

Active Transport – Benefits Tracking using Sensors



Active Transport – Voice of Customer

Enabling informed decisions from commuter & stakeholder engagements

Listen
Commuters & Stakeholders

Owned Properties
E.g. TfNSW websites, mobile apps, social media

Partner Properties
E.g. Council, cycle groups, business association website

Existing AT Projects
E.g. Research/surveys already deployed & underway

Internal Sources
E.g. Opal transactions, traffic incidents, social advertising

External Sources
E.g. Strava, Uber, REA, Gumtree, Ebay

Understand
Platform Intelligence

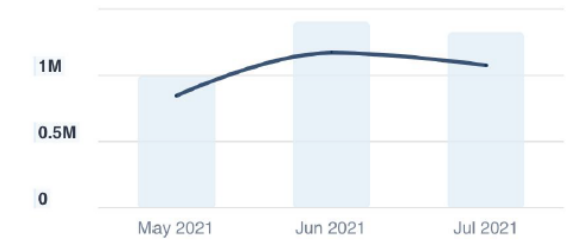
NSW GOVERNMENT | Transport for NSW

Visualise
Enable Decisioning

Stakeholder & Commuter Sentiment Score

X% X% X%

Trending Performance



Word Cloud
Frequency

Act
Influence Behaviour

Web Experience
E.g. Personalise web content, navigation

Communications
E.g. Personalise comms in the email, mobile channel

Mobile
E.g. In-app notifications, geo location

Advertising
E.g. Include, suppress or find look-a-likes

Service
E.g. Create tasks, service agent insights, call deflection

Security & Revenue Protection (Link)

Improved data for analytical modelling

Single source of truth

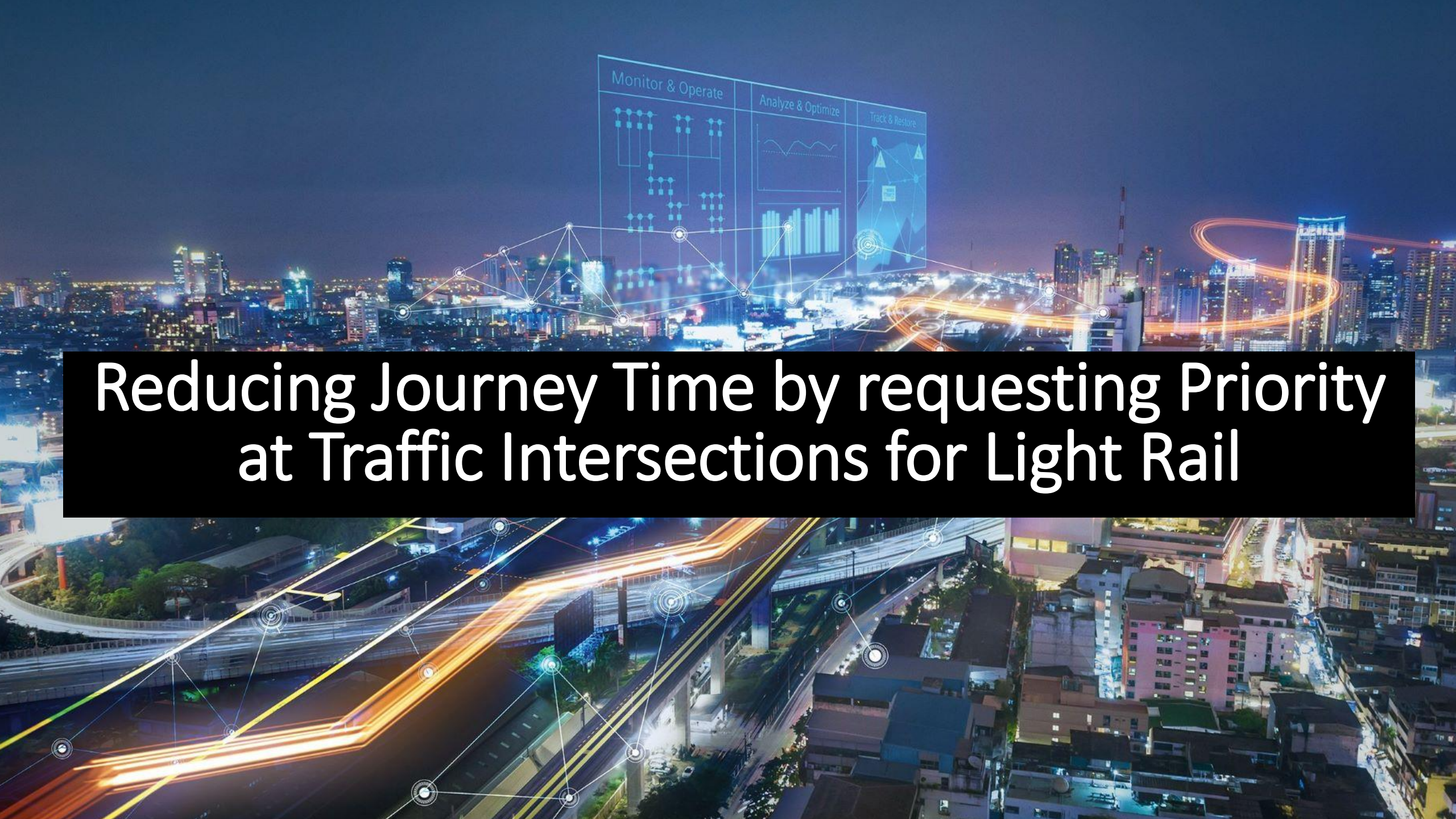
Consolidate and **standardise** the input of a number of data sources

Interactive visualisations and heat maps

TfNSW, operators and NSW Police

Increased **revenue** through improved **fare compliance**

Improved **customer satisfaction** and **security** outcomes



Reducing Journey Time by requesting Priority at Traffic Intersections for Light Rail

Light Rail Priority

- Circular Quay – Randwick and Kingsford
- Turn up and go services every four minutes between CBD and Moore Park
- Each vehicle carries up to 450 people equivalent to nine standard buses
- 12 kms track - 19 Stops - 54 traffic lights – 20 Trams of 67 meters length
- Software-based priority deployed in production


Monitoring Services delivered across Bus, Ferry, Light Rail & Sydney Metro (Link)

Multi-Modal Performance Reporting Program Objectives

01

ESTABLISH OPERATIONAL DATA LAKE

A unified data service platform supporting:

- All purpose data ingestion, storage and curation;
- Descriptive Analytics; and
- Predictive & Prescriptive Analytics

02

PROVIDE EVIDENCE BASED PERFORMANCE REPORTING

Provide evidence based real-time and historic performance reporting for:

- Bus Network *(Metro, Regional & Outer Metropolitan);*
- Ferry;
- Light Rail *(CSELR);*
- Sydney Metro; and
- Community Transport

03

PROVIDE SELF-SERVICE ANALYTICS CAPABILITY

Support Data Scientists and Data Analysts through APIs:

- OpenData
- Internal Portal

Multi-Modal Performance Reporting Program Outcomes, Publications & Achievements

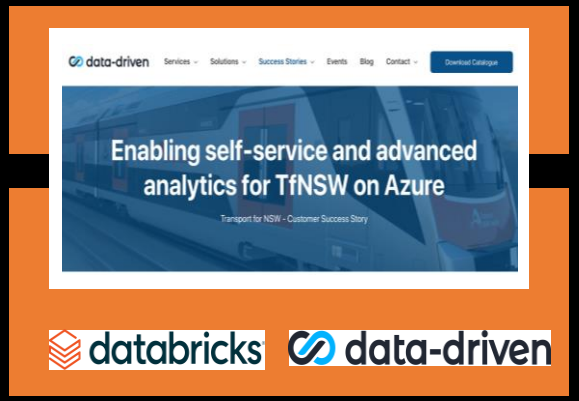
Established
Operational Data Lake

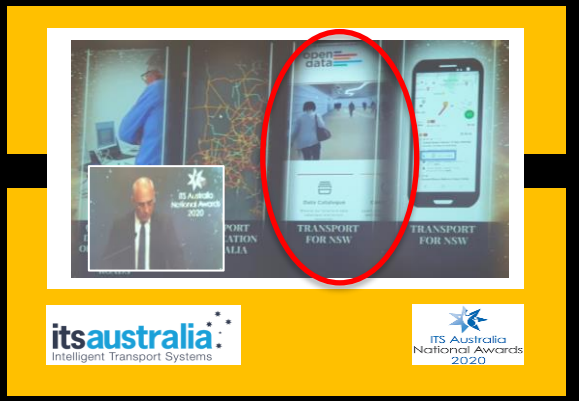
Data Ingestion
of real-time *(all modes)* telemetry data
(every 10 seconds; ~500GB/day)

Consolidated
Contract Performance information

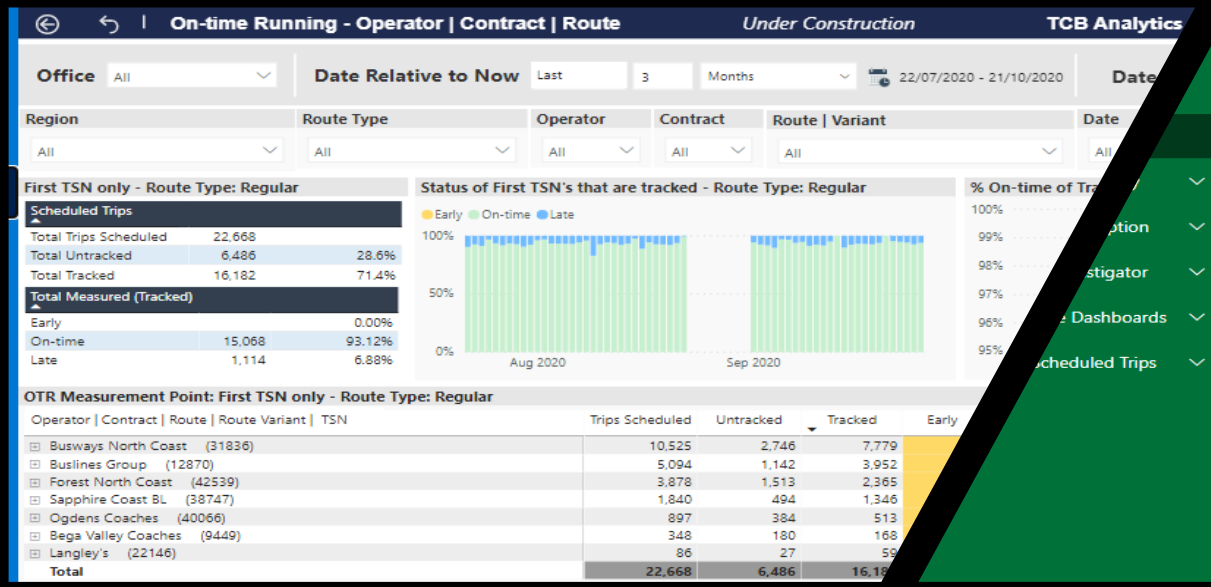
Productionised
Bus, Ferry, Light Rail & Sydney Metro Dashboards

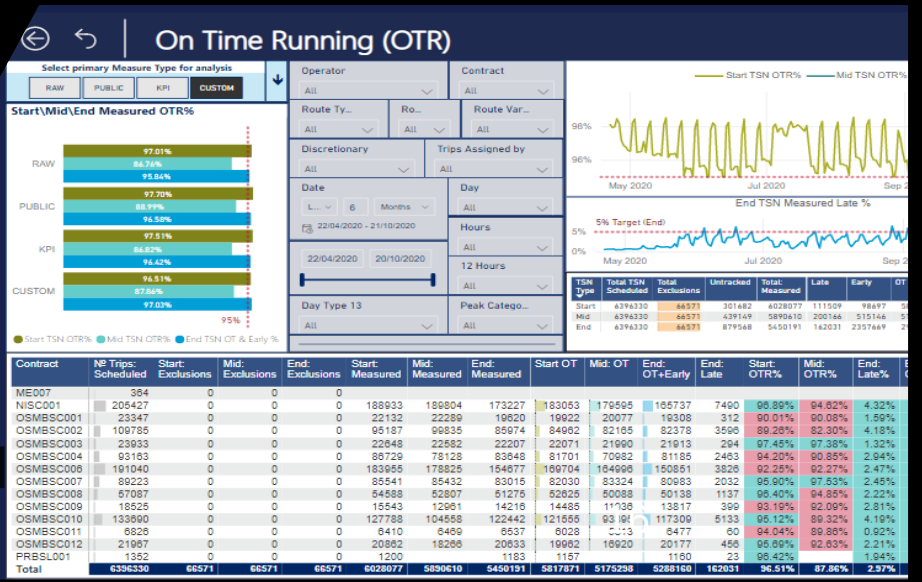
On Track
Data & Change Management
June 2021



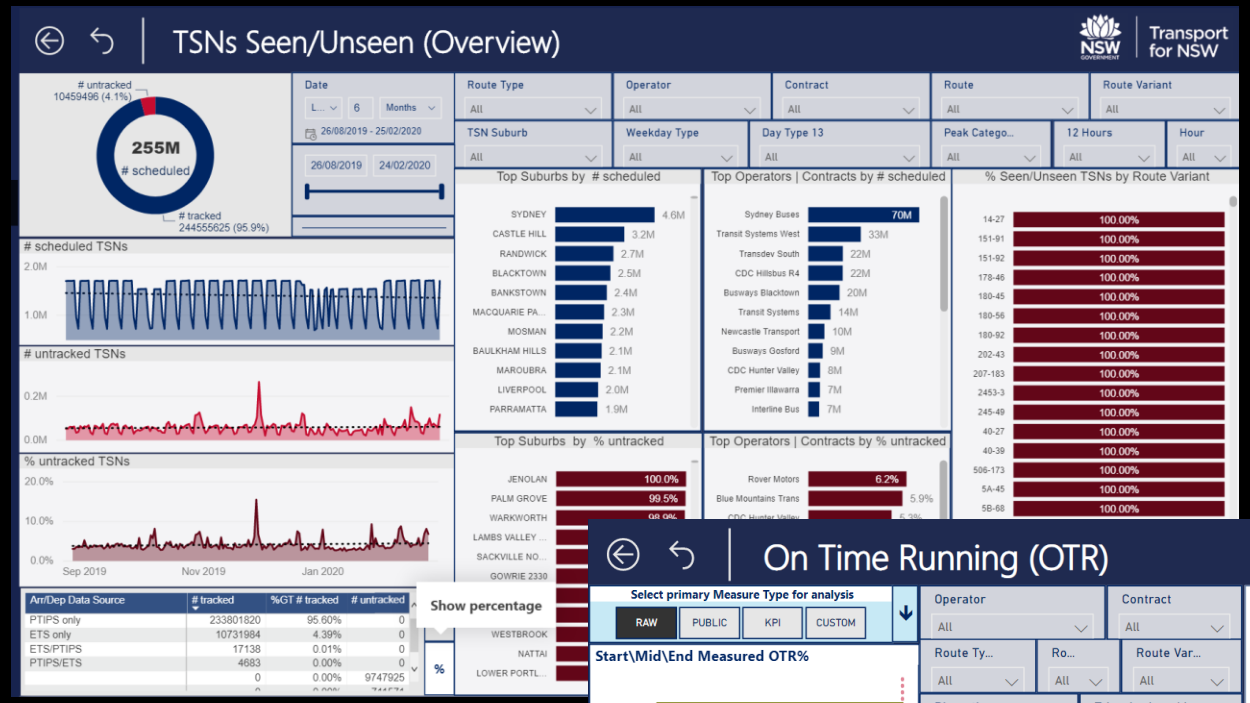


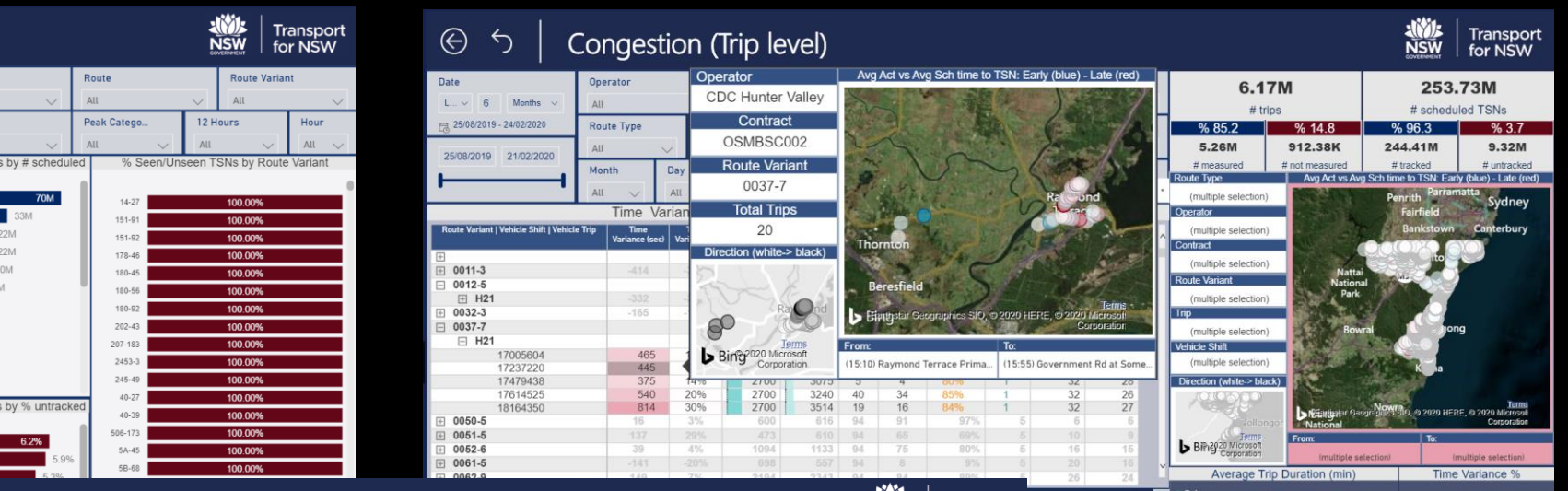
Dashboards & Reports Delivered

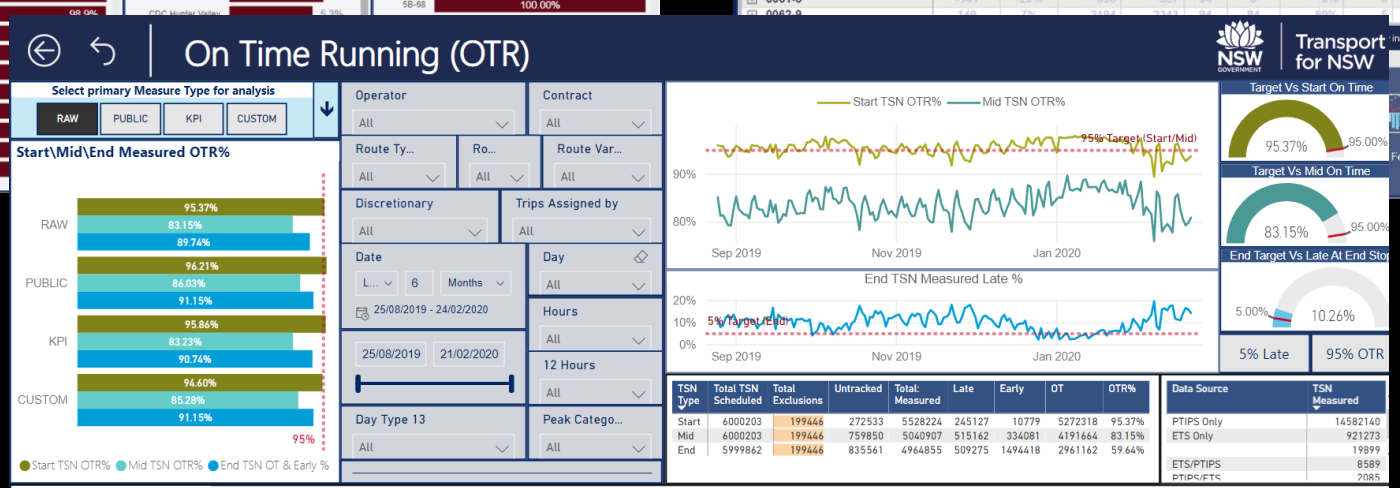




How many Bus journeys took place?

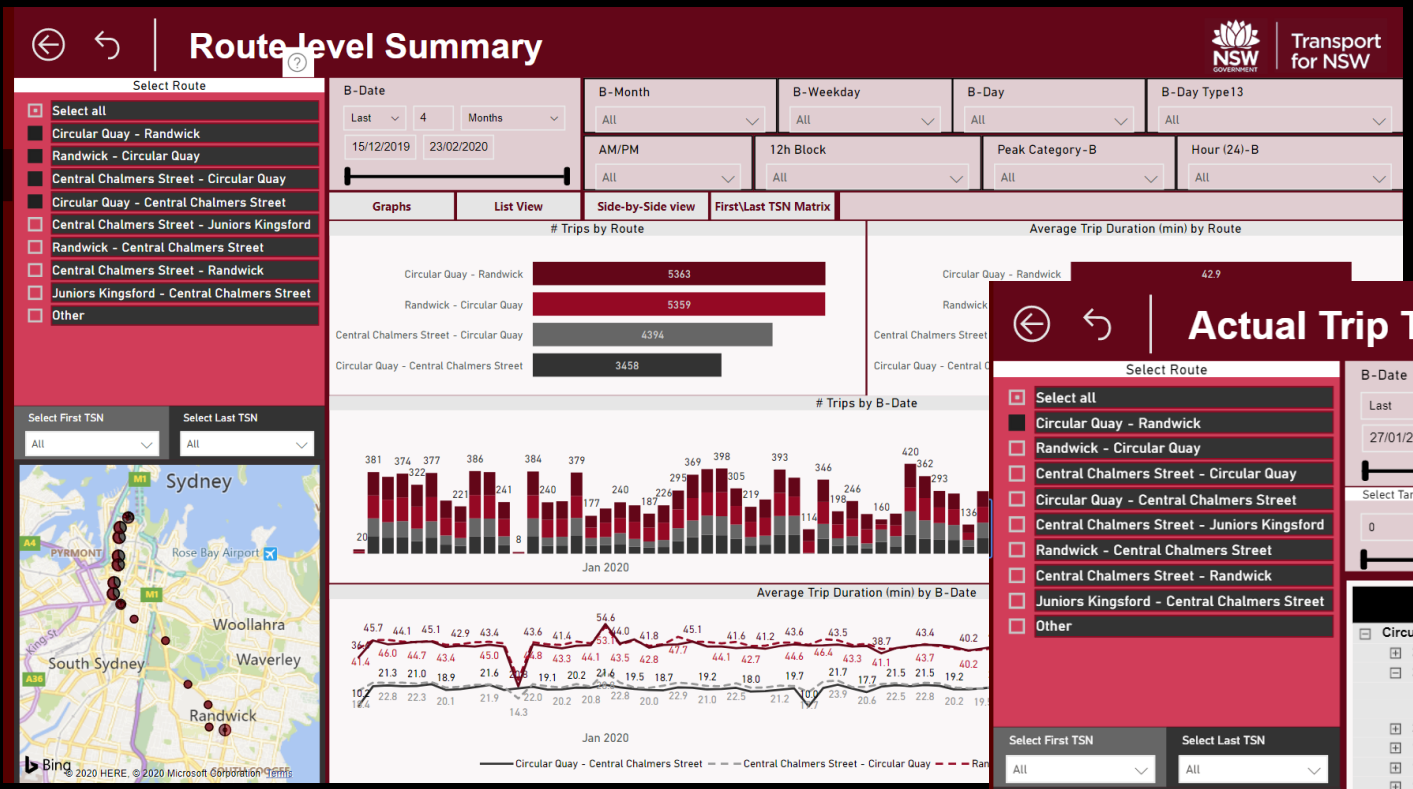


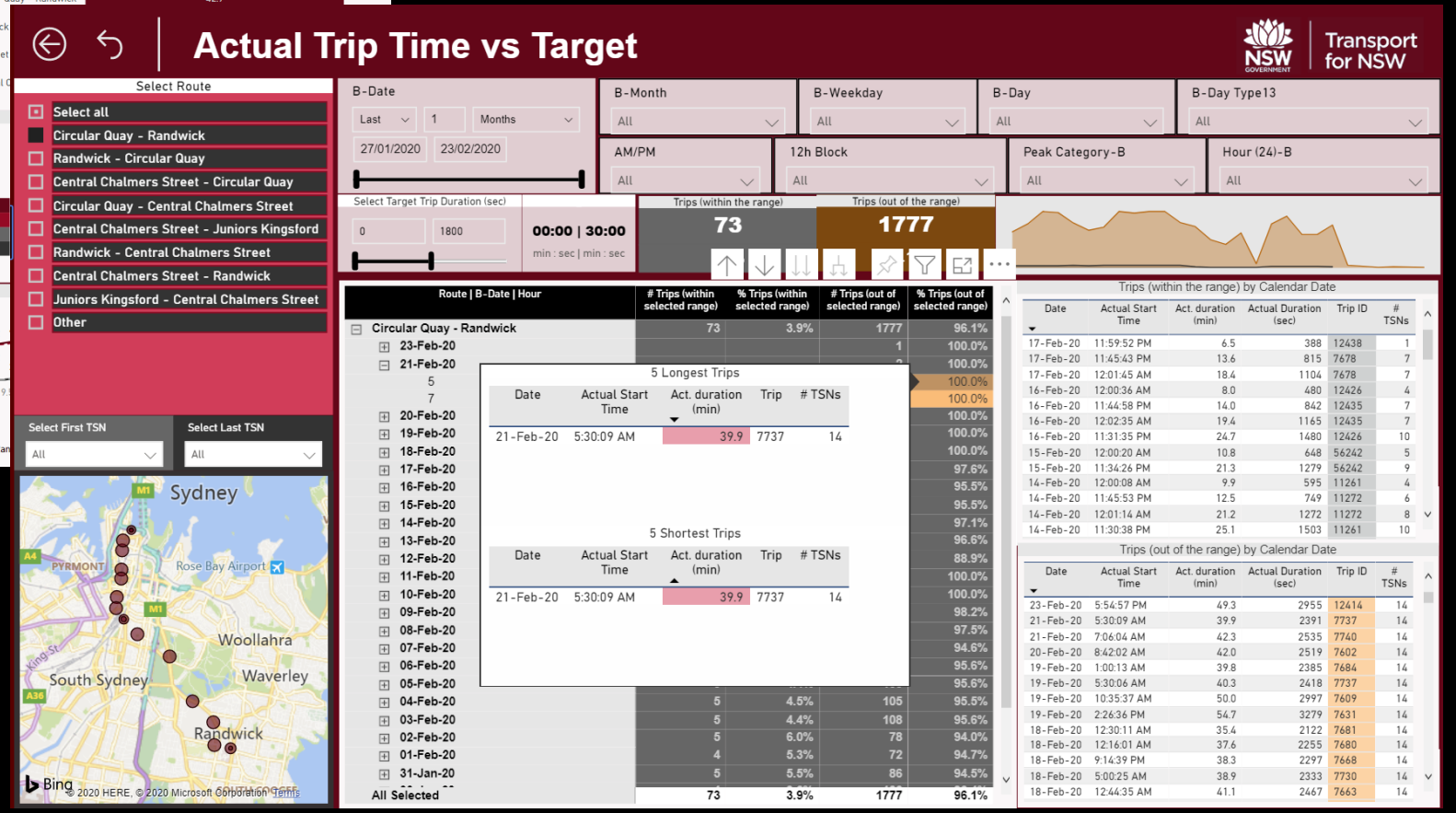




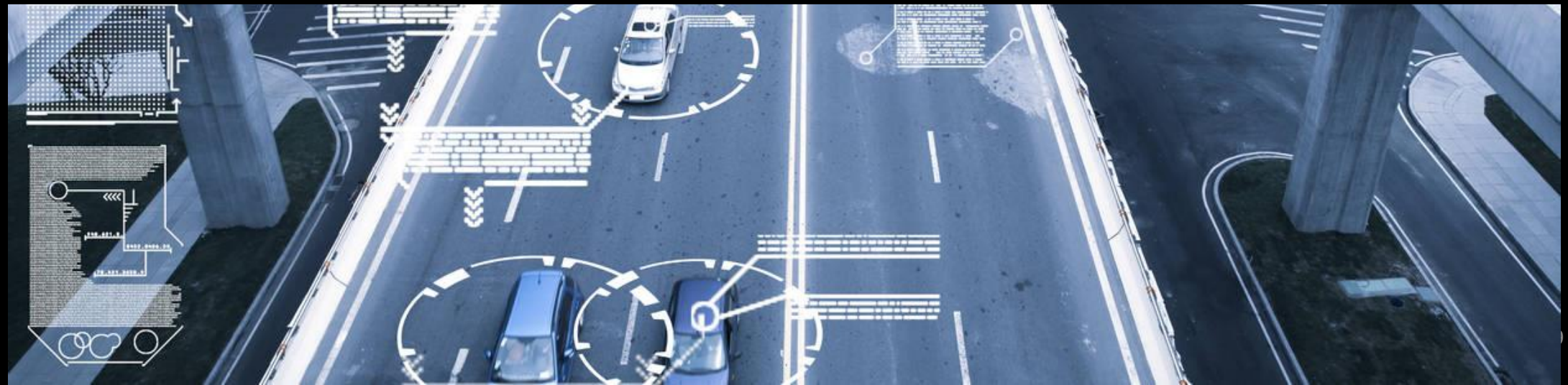
Operator | Contract | Route Variant | TSN №	№ Trips: Scheduled	Start: Exclusions	Mid: Exclusions	End: Exclusions	Start: Measured	Mid: Measured	End: Measured	Start OT	Mid: OT	End: OT+Early	End: Late	Start: OTR%	Mid: OTR%	End: Late%	End: OT/Early %
Sydney Buses	1917045	198612	198612	198612	1629405	1580530	1482083	1540331	1260736	1269738	212345	94.53%	79.77%	14.33%	85.67%
Transit Systems West	815315	0	0	0	775180	685873	706156	737118	557952	613789	92367	95.09%	81.35%	13.08%	86.92%
CDC Hillsbus R4	533873	0	0	0	510911	496484	466214	494472	402568	448879	17335	96.78%	81.08%	3.72%	96.28%
Busways Blacktown	468890	0	0	0	454701	385052	381555	439224	335983	361019	20536	96.60%	87.26%	5.38%	94.62%
Transdev South	424399	834	834	834	406876	337465	339695	385911	278816	301183	38512	94.85%	82.62%	11.34%	88.66%
Transit Systems	244742	0	0	0	238262	214900	229277	232896	193193	215912	13365	97.75%	89.90%	5.83%	94.17%
Newcastle Transport	198218	0	0	0	180666	180780	165944	165030	133425	141149	24795	91.35%	73.81%	14.94%	85.06%
CDC Hunter Valley	188178	0	0	0	169699	171752	156332	162230	153098	146581	9751	95.60%	89.14%	6.24%	93.76%
Busways Gosford	179449	0	0	0	172707	152789	144114	163973	139567	136187	7927	94.94%	91.35%	5.50%	94.50%
Interline Bus	160962	0	0	0	152174	145558	131223	144030	124572	118520	12703	94.65%	85.58%	9.68%	90.32%
Nevilles Bus Service	156315	0	0	0	151317	57132	117022	145778	49635	110497	6525	96.34%	86.88%	5.58%	94.42%
Forest Coach Lines	127995	0	0	0	123230	123497	112312	118920	103036	102075	10237	96.50%	83.43%	9.11%	90.89%
Premier Illawarra	126225	0	0	0	122054	99034	116170	115868	86829	105934	10236	94.93%	87.68%	8.81%	91.19%

How many Light Rail journeys took place?
What was the duration?





Using real-time data to enable efficient bus network through PTIPS (Link)



Allow multi-modal trip planning by providing Time-Table and Real-Time data on Customer Apps

Trip Planner | Departures

From
Roseville Station, Roseville

To
Randwick Light Rail, Randwick

Public transport 58min | 28min | 56min | -

20:00, Today (Wed) | Refine

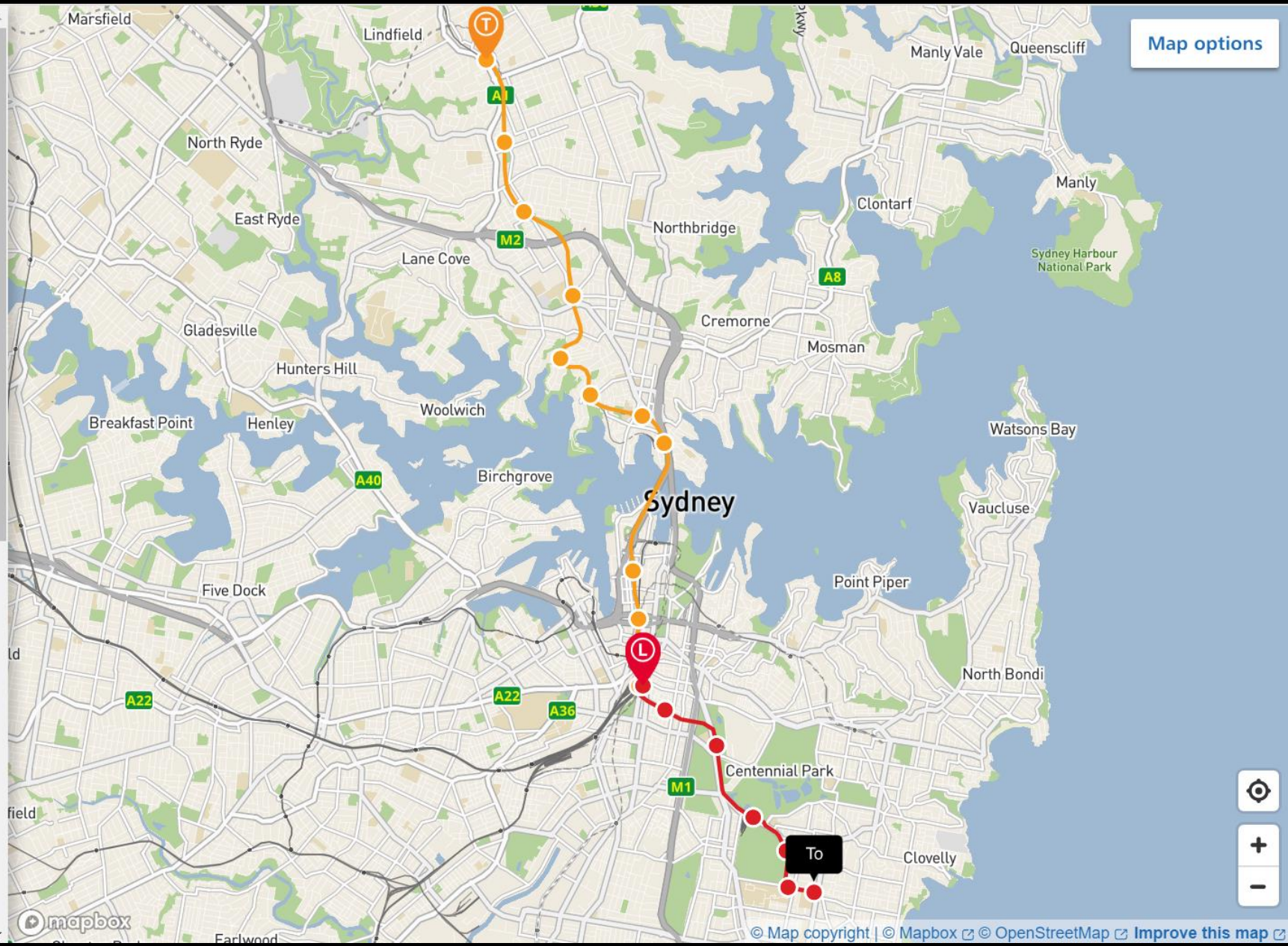
Earlier | Clear | ☆ Favourite

Leaving 54 min
T T1 › L L2
20:10 - 21:09 58min

opal $4.86

Leaving 1 hour
T T1 › L L2
20:2[illegible]

Refresh results



Summary

- TfNSW is using DSIs to improve customer experience through journey planning and trip updates
- TfNSW is using DSIs to measure and improve Operator Performance
- Future is reliant on using data and DSIs effectively to deliver Smart Infrastructure and improve stakeholder outcomes