NSW GOVERNMENT

Digital Systems Program

Digital Systems: More than just technology

Stephen Lemon, Transport for NSW

The Digital Systems Program acknowledges Aboriginal and
Torres Strait Islander peoples as the traditional custodians of our land – Australia,
and acknowledges the Gadigal of the Eora Nation as
the traditional custodians of the place we now call Sydney.

375 MILLION
ANNUAL PATRONAGE

1.3 MIL.
PASSENGER JOURNEYS
Per Weekday

46,000
TIMETABLED STOPS
Per Weekday

3,200
TIMETABLED SERVICES
Per Weekday

56%
CUSTOMERS TRAVEL
to and from work

66%
CUSTOMERS TRAVEL
at least 4 days
per week

38%
CUSTOMERS AGED
between 25-39 years

1000+ NUMBER OF PASSENGERS ONE EIGHT-CAR TRAIN CAN CARRY

10K
Workforce
(budgeted positions)

30Million
Waratah Train
Capitalised Value

175
Stations
(incl. 4 on Airport Line)

2,216
Fleet
Electric & diesel cars
(incl. 574 NSW TrainLink)

1,617km
Track maintained
(incl.NSW TrainLink)

935km
Electrified Track
(Sydney Metro area only)

10K+
CCTV
Cameras maintained

1,550km
Overhead wiring
Maintained
(incl. NSW TrainLink)

2.7B
Total cost of
Operations

$39B
Assets under
Management

Sydney rail network

M Metro T Trains

Sydney metro and train lines

M *Metro North West Line* Chatswood Tallawong	T1 *North Shore & Western Line* North Shore Western Richmond	T2 *Inner West & Leppington Line* Inner West Leppington City	T3 *Bankstown Line* Liverpool Lidcombe City	T4 *Eastern Suburbs & Illawarra Line* Eastern Suburbs Illawarra Cronulla
T5 *Cumberland Line* Leppington Richmond	T6 *Carlingford Line* Carlingford Clyde	T7 *Olympic Park Line* Olympic Park Lidcombe	T8 *Airport & South Line* Airport South City	T9 *Northern Line* Northern Gordon

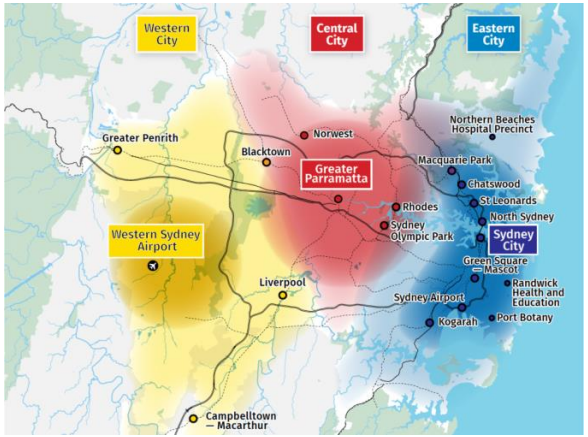
Why Digital Systems?

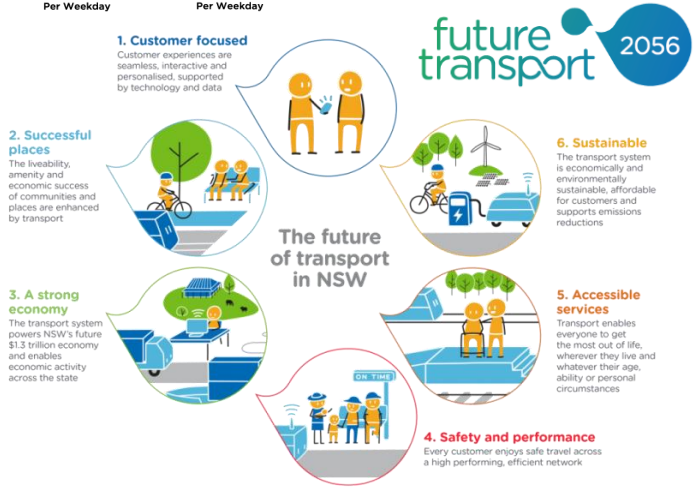
Sydney Trains Corporate Plan 19/20

1.3MIL. PASSENGER JOURNEYS Per Weekday

46,000 TIMETABLED STOPS Per Weekday

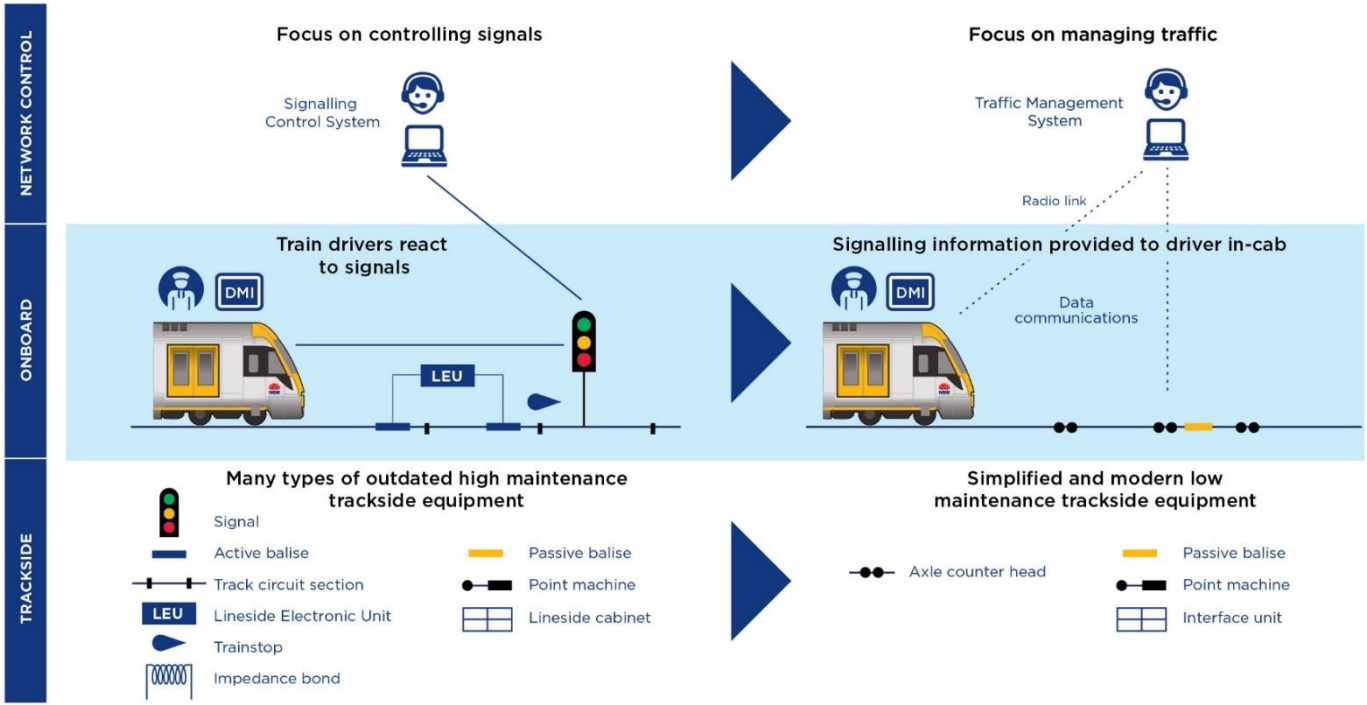
3,200 TIMETABLED SERVICES Per Weekday





Introducing Digital Systems

What is Digital Systems?



More than just technology

PEOPLE

- Mindset/ values/ culture
- Skills and competencies
- Learning, training and development
- Roles and organisational structure

PROCESSES

- Normal operation
- Degraded models of operation
- Operation of mixed traffic
- Access to track

TECHNOLOGY

NETWORK CONTROL

Network Traffic Management
Traffic Management System

+

ONBOARD

Signalling information provided to driver in-cab

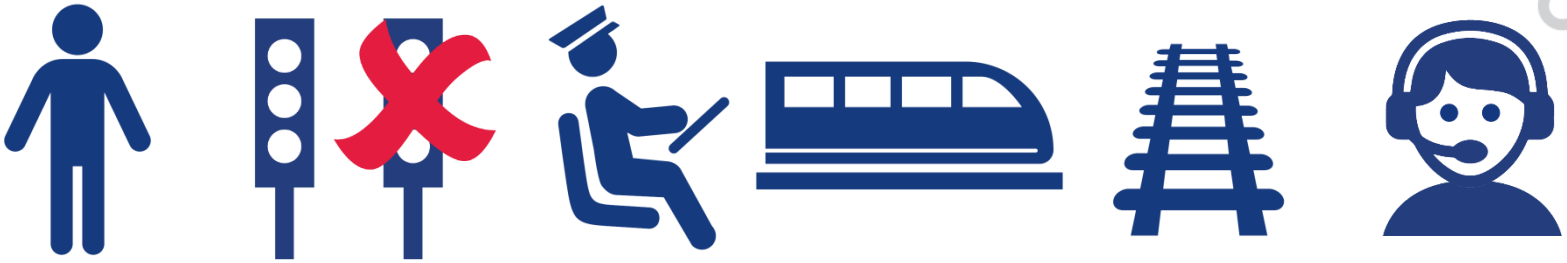
Automatic Train Operation

+

TRACKSIDE

Simplified and modern
low maintenance trackside equipment

Our business transformation challenge



10K
Employees

10yrs
Dual mode operation

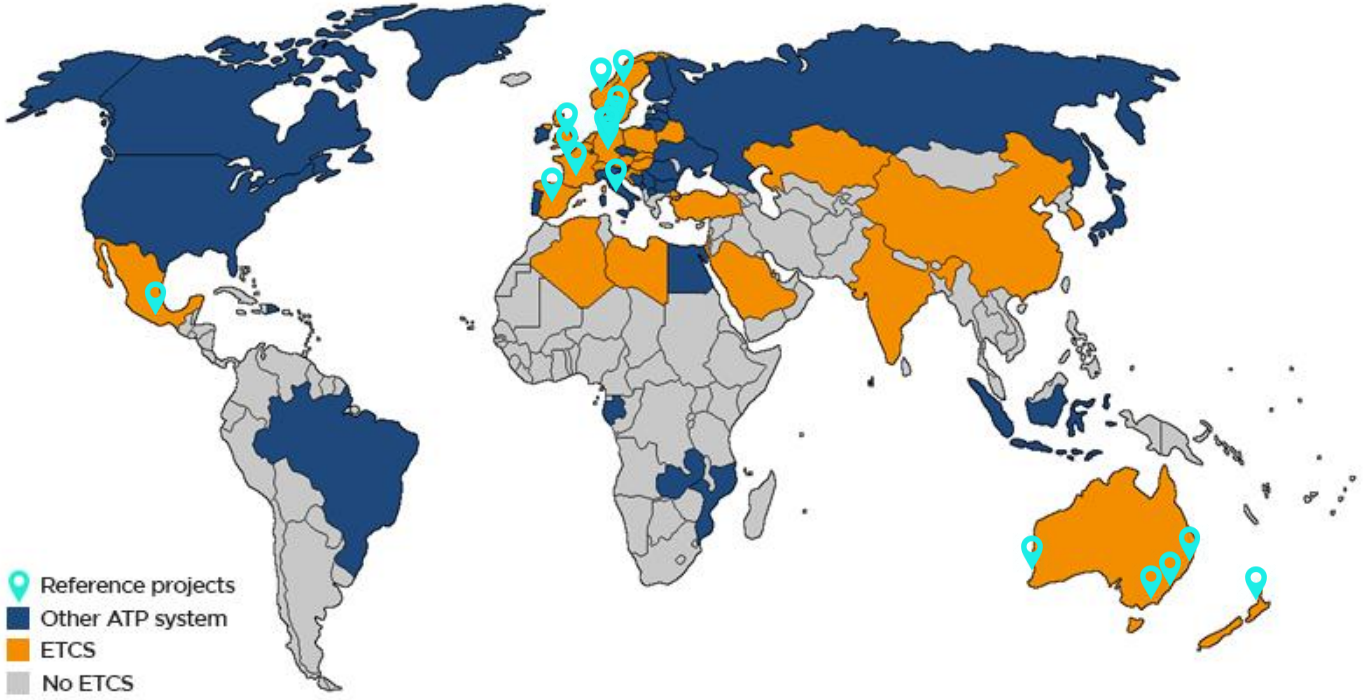
2469
Train crew

2191
Fleet

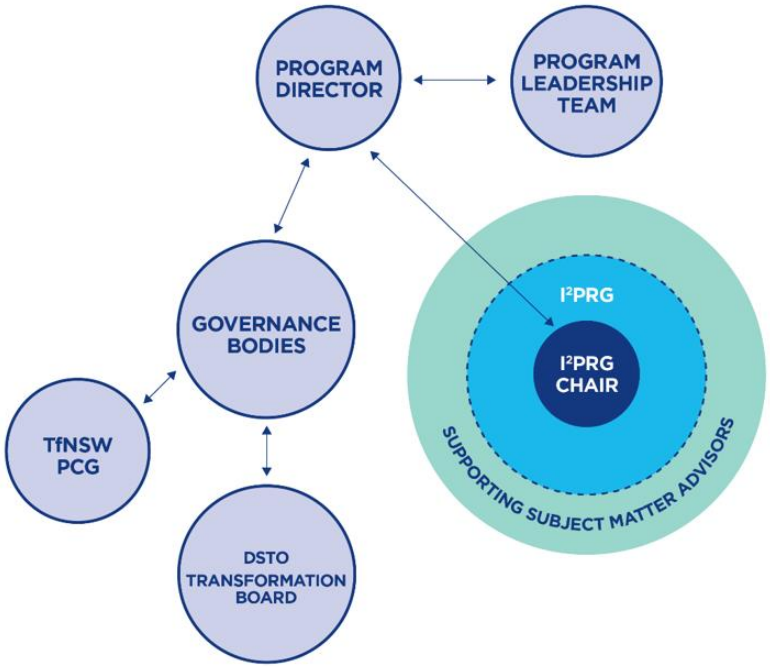
1643km
Track maintained

TMS
New systems

Lessons learned: reference projects



International Independent Peer Review Group (I²PRG)



Focus is ongoing test of whether the Program solution and approach is objectively best practice.

Maintains and updates a Program Reference Projects Register and Lessons Learned Register derived from international experience.

Objectively tests proposed Program solutions, approaches and significant decisions, informed by a broad cross-section of international subject matter experts.

Lessons Learned – wide range of sources

Studies and White Papers from Industry Bodies and Specialist Consulting Firms

- IRSE International Technical Committee, ‘Why signalling projects fail’
- Atkins, ‘Lessons learned from a national ETCS roll-out’

Topical Conference Presentations

- CBTC World Congress, ‘Managing complex projects’
- Train Control and Management Systems, Lessons learned ETCS Auckland

Relevant Magazine Articles

- IRSE News, ‘Resignalling the East Rail Line in Hong Kong’

Lessons Learned – wide range of sources (contd.)

Post-Mortem Project Analyses

- Transport for London / KPMG, ‘Sub-Surface Upgrade Programme ATC lessons learnt’
- UK National Audit Office, ‘Lessons from major rail infrastructure programmes’

Observations from Reference Projects

- Continuous market research (see next slide)
- Perspectives from System Integrator and I2PRG

Notes and Reports from Interviews, Meetings and Audits

- Lessons learned workshops with e.g. ROC and ATP projects
- WSP/Aurecon, Lessons learned in Scandinavia
- Network Rail Consulting, High level review of UK Digital Railway projects (for Sydney Trains)

Reference projects – local and global

TfNSW Technology Projects

- ROC, ATP, DTRS, Tangara Technology Upgrade

Regional Projects for Next Generation Signalling (Australia / New Zealand)

- ETCS L2 / ATO: Brisbane Inner City and Cross River Rail
- CBTC: Sydney Metro, Melbourne Metro Tunnel, Perth Automatic Train Control
- ETCS Level 1: Sydney ATP, Auckland, Adelaide

International Projects for Next Generation Signalling

- UK: Thameslink, Crossrail, Digital Railway, London Underground CBTC
- ATO over ETCS: Netherlands, Switzerland, France, Germany, European Union (Shift2Rail)
- Network-wide ETCS rollout: Denmark, Sweden, Norway
- ETCS in Cities: Madrid Cercanias, Italy High Density Urban Nodes, Hamburg Digital S-Bahn

Lessons Learned analysis and prioritisation

Analysis of Input Sources for Relevance

- Specific technology and domain knowledge required
- Current: ETCS specialist advisor within DS project team (resident domain expert)
- Future: Independent Peer Review Group (international domain experts)

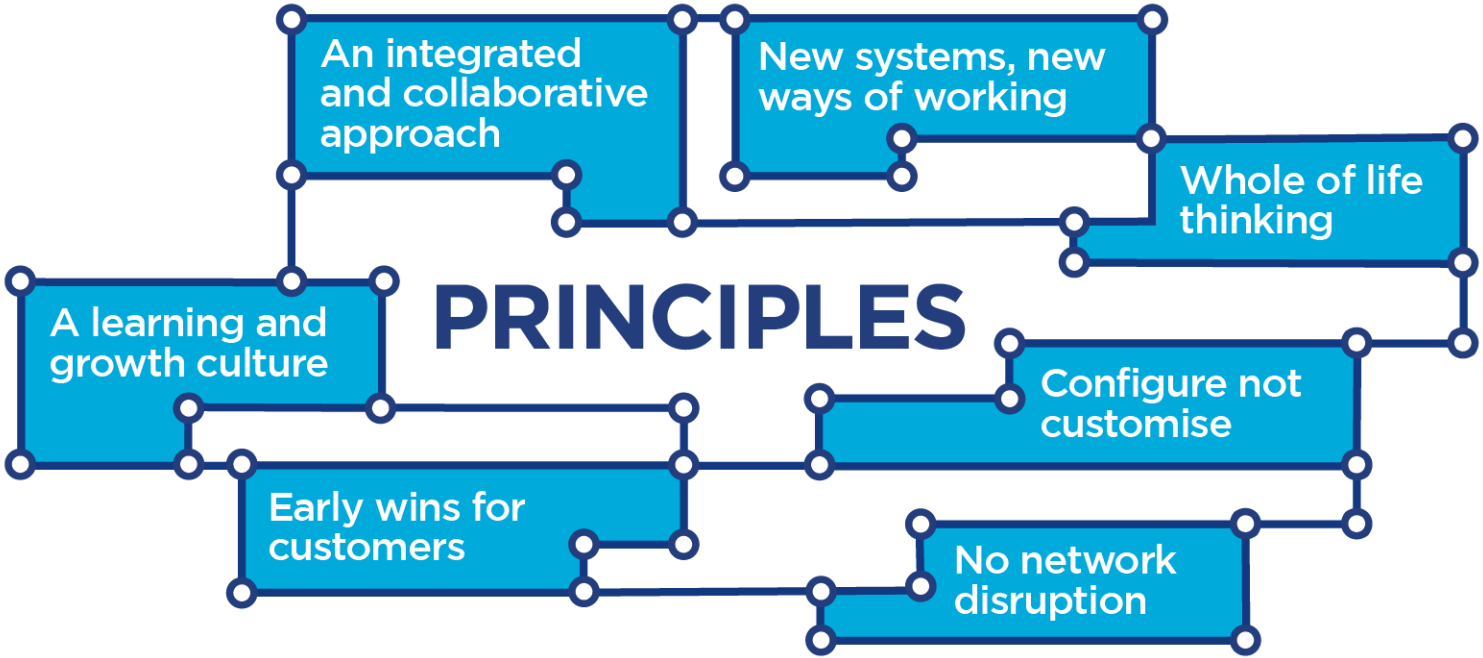
Prioritisation of Key Lessons

- Too much detail becomes unmanageable (“can’t see the forest for the trees”)
- Curate to 25-30 key lessons in Lessons Learned Register
- ‘Top Ten’ lessons for particular management attention

Top Lessons Learned relate to key DS principles

Lesson Learned	Example reference projects	Digital Systems Principle
Use proven technical solutions, avoiding customisation	• UK Digital Railway projects	**Configure not customise**
Minimise network disruption	• Thameslink London • Hong Kong East Rail Line Resignalling	**No network disruption**
Collaboration	• London Northern Line Upgrade • Thameslink London	**An integrated and collaborative approach**
Reduce delivery risk	• Sha Tin to Central Link (SCL) Hong Kong • S-Bane Copenhagen	**Early wins for customers**
Focus on long-term benefits, governance, integration and interoperability	• Train Management and Control System (TMACS) NSW	**Whole of life benefits**
Change management/business transformation	• Denmark National ETCS rollout • Rail Operations Centre (ROC) Sydney	**New systems, new ways of working**
Ensure adequate staff and supplier qualification	• London Underground Sub-Surface Upgrade Programme (SUP) • Rail Operations Centre (ROC) Sydney	**A learning and growth culture**

Lessons learned - informing our principles



A learning and growth culture

We’re focused on creating a learning and growth culture, implementing global lessons learned to continually improve the Program and develop a sustainable workforce.

We don’t just ‘set and forget’. Rather, we ‘set and refresh’. We continuously update our Lessons Learned register to inform our Program while we live and breathe our principles.

Early wins for customers

Digital Systems provides a step-change in improvement of system reliability, availability and maintainability, and a pathway to further improvement.

Realising early project benefits for customers will help reinforce our stakeholders' motivation and buy-in.

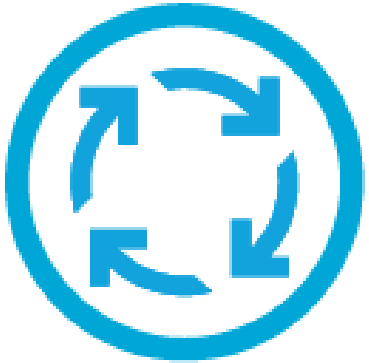
New systems, new ways of working

New systems, new ways of working

To fully realise the benefits of the new systems and technologies, we will develop new rules, principles, procedures and competencies.

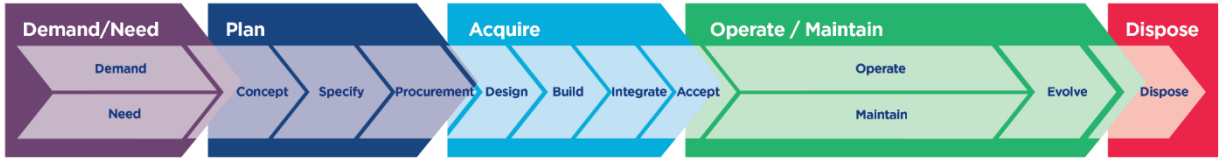
Our new ways of working will support a sustainable future for our customers.

Whole of life thinking



Digital Systems will embrace ‘whole of life’ systems thinking and asset management to optimise future operations and maintenance efficiency.

We will not sacrifice long-term Program benefits to achieve short-term gains.



Configure not customise

Digital Systems will adopt standard equipment and systems, taking off-the-shelf solutions and configuring them for the Sydney network.

This approach will allow us to benefit from future developments and innovation as part of global technology roadmaps.

No network disruption

We’re determined that the implementation of Digital Systems will not disrupt services for customers.

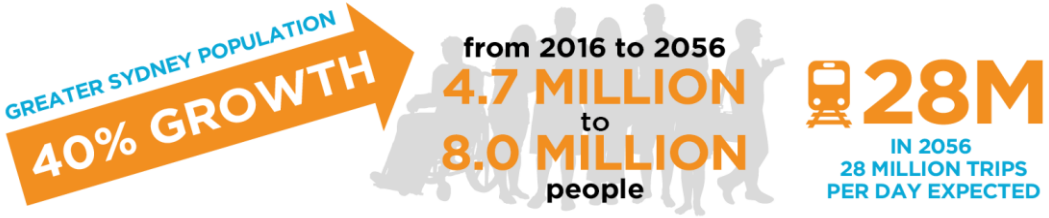
Innovative tools and methodologies will allow us to deploy and test new systems while minimising the need for network access.

An integrated and collaborative approach

International experience has consistently demonstrated the need for meaningful collaboration between clients and suppliers, moving away from adversarial client/contractor relationships.

The Digital Systems program will also integrate this collaborative approach with the operator/maintainer, ensuring engagement and meaningful consultation with frontline employees as end-users.

NSW projected growth and Program benefits



- Reduced journey times
- Lower energy consumption
- Better customer information
- Higher capacity for current and future demand
- Lower capex and opex costs
- More reliable services
- Safer and more efficient operation and maintenance