Digital Systems: More than just technology
Stephen Lemon, Program Director Digital Systems, 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.
Why Digital Systems?
Introducing Digital Systems
What is Digital Systems?

Focus on controlling signals

Signalling Control System

Train drivers react to signals

Many types of outdated high maintenance trackside equipment

Signal
Active balise
Track circuit section
LEU
Trainstop
Impedance bond

Focus on managing traffic

Traffic Management System

Radio link

Signalling information provided to driver in-cab

Simplified and modern low maintenance trackside equipment

Axle counter head
Passive balise
Point machine
Interface unit

Digital Systems Program
More than just technology

**PEOPLE**
- Values and culture
- Skills and competencies
- Learning, training, and development
- Roles and organisational structure

**Processes**
- Internal operation
- Operational models of operation
- Operation of real traffic
- Access to track

**Technology**
- Network Control
- Traffic Management
- Signalling information provided to drivers on-board
- Automatic Train Operation
- Track Circuit
- Signalling and power
- Real-time maintenance, fault diagnosis, and equipment

Digital Systems Program
First deployment area
Program scope and timeline

TIMELINE FOR DIGITAL SYSTEMS DEPLOYMENT

- **2018**: Planning and development with Sydney Trains
- **2019**: Procurement of major supplier packages
- **2020**: Detailed design
- **2021**: Site installation works
- **2022**: Cab signalling in operation
- **2023**: ATO development
- **2024**: ATO in operation

**2020**: Funding for wider deployment in other areas

Deployment commences from 2022 over the next 10 years (subject to funding).

**2030s**: Digital Systems deployed across whole Sydney network

Transformation for Operational Readiness

Transformation of targeted implementation areas

Ongoing BAU refinement
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

• 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

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

- An integrated and collaborative approach
- New systems, new ways of working
- Whole of life thinking
- A learning and growth culture
- Configure not customise
- Early wins for customers
- No network disruption
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

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.
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

- **40% GROWTH**

**CREATED SYDNEY POPULATION**

- **4.7 MILLION** to **8.0 MILLION** people

- **$28M** IN 2056
  - **38 MILLION TRIPS PER DAY EXPECTED**

**Program benefits**

- **Reduced journey times**
- **Lower energy consumption**
- **Bigger customer information**
- **Higher capacity for current and future demand**
- **Lower capital and operational costs**
- **More reliable services**
- **Safer and more efficient operation and maintenance**