The Transport for NSW
Transport Network Architecture Model

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Key topics

TfNSW Enterprise Objectives

Our Strategy

Transport Network Architecture

Transport Network Requirements

Why TNA model?

Where are we now?

Future Direction
TfNSW Enterprise Objectives

• NSW Long Term Transport Master Plan*

Improve quality of service
Improve liveability
Support economic growth and productivity
Support regional development
Improve sustainability
Improve safety and security
Strengthen transport planning processes
Reduce social disadvantage

Subordinate plans:
• Sydney’s Rail Future
• Sydney’s Light Rail Future
• Sydney’s Bus Future
• Sydney’s Ferry Future

*NSW Long Term Transport Master Plan*, Dec 2012, section 1.1, p22: ‘Our Transport Objectives’

*To be superseded by Future Transport Strategy currently under development
Our Strategy

Transport Network Architecture

Enterprise Perspective
- Enterprise / Strategic View

Management Perspective
- Requirement View
  - Business Req.
  - System Req.

Concept Perspective
- Concept / Operational View

Solution View

Realises

Supports

Traces to

Document View

Topic-based Standards
- Topic 1
- Topic 2
- Topic N

Transport Network Requirements
- Generic Business / System Requirements

Traces to

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The Transport Network Architecture
Why TNA model?

• Enable innovative solutions
• Requirement traceability to long term goals
• Improve quality of requirements
• Encourage use of model-based approach
The Transport Network Architecture

How is it developed?

• Adopt a Model-Based Engineering approach
• Adopt ‘TRAK’ Metamodel as Framework
• Adopt UML and SysML as Modelling Language
• Acquire stakeholder input
• Use a system architecture tool
The Transport Network Requirements
<table>
<thead>
<tr>
<th>#</th>
<th>Name</th>
<th>Test</th>
<th>Vehicle communications,</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Keep vehicle crew and operation staff informed on state of vehicle and systems</td>
<td>The system shall keep vehicle crew and operation staff informed on the state of the vehicle and state of the system.</td>
<td>Keep vehicle crew and state</td>
</tr>
<tr>
<td>2</td>
<td>Acquire information to be displayed</td>
<td>The system shall acquire displayed information.</td>
<td>Keep vehicle crew and state</td>
</tr>
<tr>
<td>3</td>
<td>Manage information access</td>
<td>The system shall manage information access.</td>
<td>Keep vehicle crew and state</td>
</tr>
<tr>
<td>4</td>
<td>Ensure display of information</td>
<td>The system shall ensure information is displayed.</td>
<td>Keep vehicle crew and state</td>
</tr>
<tr>
<td>5</td>
<td>Enable switching between different types of displays/Views</td>
<td>The system shall enable the switching between different types of displays/Views</td>
<td>Ensure display of information</td>
</tr>
<tr>
<td>6</td>
<td>Ensure visibility of information under degraded conditions</td>
<td>The system shall ensure visibility of information under degraded conditions</td>
<td>Ensure display of information</td>
</tr>
<tr>
<td>7</td>
<td>Prioritize information</td>
<td>The system shall prioritize displayed information.</td>
<td>Ensure display of information</td>
</tr>
<tr>
<td>8</td>
<td>Provide operation relevant information</td>
<td>The system shall provide operation relevant information.</td>
<td>Provide operation relevant</td>
</tr>
<tr>
<td>9</td>
<td>Provide control command information</td>
<td>The system shall provide control command information.</td>
<td>Provide operation relevant</td>
</tr>
<tr>
<td>10</td>
<td>Provide diagnostic information</td>
<td>The system shall provide diagnostic information.</td>
<td>Provide operation relevant</td>
</tr>
<tr>
<td>11</td>
<td>Provide maintenance information</td>
<td>The system shall provide maintenance information.</td>
<td>Provide operation relevant</td>
</tr>
<tr>
<td>12</td>
<td>Provide passenger information system information</td>
<td>The system shall provide passenger information system information.</td>
<td>Provide operation relevant</td>
</tr>
<tr>
<td>13</td>
<td>Provide timetable information</td>
<td>The system shall provide timetable information.</td>
<td>Provide operation relevant</td>
</tr>
<tr>
<td>14</td>
<td>Provide vehicle operator and driving information</td>
<td>The system shall provide vehicle operator and driving information.</td>
<td>Provide operation relevant</td>
</tr>
<tr>
<td>15</td>
<td>Provide vehicle specific radio information</td>
<td>The system shall provide vehicle specific radio information.</td>
<td>Provide operation relevant</td>
</tr>
<tr>
<td>16</td>
<td>Provide vehicle status information to the crew</td>
<td>The system shall provide vehicle status information to the crew.</td>
<td>Provide operation relevant</td>
</tr>
<tr>
<td>17</td>
<td>Provide vehicle wide communication</td>
<td>The system shall provide vehicle wide communication.</td>
<td>Provide vehicle wide comm</td>
</tr>
<tr>
<td>18</td>
<td>Manage vehicle network access</td>
<td>The system shall manage vehicle network access.</td>
<td>Manage vehicle network</td>
</tr>
<tr>
<td>19</td>
<td>Transmit data</td>
<td>The system shall transmit data via the vehicle network.</td>
<td>Manage vehicle network</td>
</tr>
<tr>
<td>20</td>
<td>Inaugurate vehicle network</td>
<td>The system shall Inaugurate vehicle network.</td>
<td>Manage vehicle network</td>
</tr>
<tr>
<td>21</td>
<td>Confirm vehicle configuration</td>
<td>The system shall confirm vehicle configuration.</td>
<td>Inaugurate vehicle network</td>
</tr>
<tr>
<td>22</td>
<td>Determine vehicle topology and configuration</td>
<td>The system shall determine vehicle topology and configuration.</td>
<td>Inaugurate vehicle network</td>
</tr>
<tr>
<td>23</td>
<td>Manage leading vehicle information</td>
<td>The system shall manage leading vehicle information</td>
<td>Determine vehicle topology</td>
</tr>
<tr>
<td>24</td>
<td>Provide orientation information for coupled elements</td>
<td>The system shall provide orientation information for coupled element</td>
<td>Determine vehicle topology</td>
</tr>
<tr>
<td>25</td>
<td>Distribute vehicle topology and configuration</td>
<td>The system shall distribute vehicle topology.</td>
<td>Inaugurate vehicle network</td>
</tr>
<tr>
<td>26</td>
<td>Manage Vehicle Operation Modes</td>
<td>The system shall manage vehicle operation modes.</td>
<td>Vehicle communications,</td>
</tr>
<tr>
<td>27</td>
<td>Manage battery protection mode</td>
<td>The system shall manage battery protection mode.</td>
<td>Manage Vehicle Operator</td>
</tr>
<tr>
<td>28</td>
<td>Manage energy saving mode</td>
<td>The system shall manage energy saving mode.</td>
<td>Manage Vehicle Operator</td>
</tr>
<tr>
<td>29</td>
<td>Manage in service mode</td>
<td>The system shall manage in service mode.</td>
<td>Manage Vehicle Operator</td>
</tr>
<tr>
<td>30</td>
<td>Manage service retention mode</td>
<td>The system shall manage service retention mode.</td>
<td>Manage Vehicle Operator</td>
</tr>
</tbody>
</table>

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The Transport Network Requirements

Why develop it?

4.1.7. Light Rail Corridor

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Criticality</th>
<th>Additional Information</th>
<th>Verification</th>
<th>Owner</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Solution shall accommodate light rail services between Wickham and Newcastle East by following the alignment indicated in Figure 1</td>
<td>Essential</td>
<td>Design Review</td>
<td>FSP</td>
<td></td>
</tr>
</tbody>
</table>
| The new light rail alignment shall be of a type consistent with its operating environments. The following forms shall be applied:  
  • Segregated, where it is in the disused rail corridor,  
  • Separated, where it is in an urban roadway and road width allows for the provision of separate light rail and road vehicle space; and  
  • Mixed, where road width is insufficient to allow for separate light rail and road vehicle lanes. | Essential   | Design Review          | FSP           |       |
| The NRL shall implement a line-of-sight signaling Solution that enables safe operation of services and controls conflicts between LRT’s, road vehicles and pedestrians at intersections. | Essential   | Design Review          | I&S           |       |
| Works within the public domain shall have a pleasing appearance, provide amenity and create no road safety risk. | Essential   | Design Review          | CS            |       |
| The NRL platform shall enable emergency vehicles (under lights and sirens only) to operate on the light rail tracks except for the platform along the disused rail corridor. | Essential   | Design Review          | FSP           |       |

Newcastle Light Rail
The Transport Network Requirements

How is it developed?
• Validate functional model
• Establish and develop requirement viewpoints
Where are we now?

TNA Document v2.0

TNA Model v1.0

Elements: 6337
Diagrams: 1556
Relationships: 45495
Perspectives: 3
Views: 7
Viewpoints: 29
Future Direction

- Use the model on transport projects
- Use case development
- Extend TNA model to other modes
- Develop transport network requirements