



27<sup>th</sup> annual **INCOSE**  
international symposium

Adelaide, Australia  
July 15 - 20, 2017



# The Transport for NSW Transport Network Architecture Model

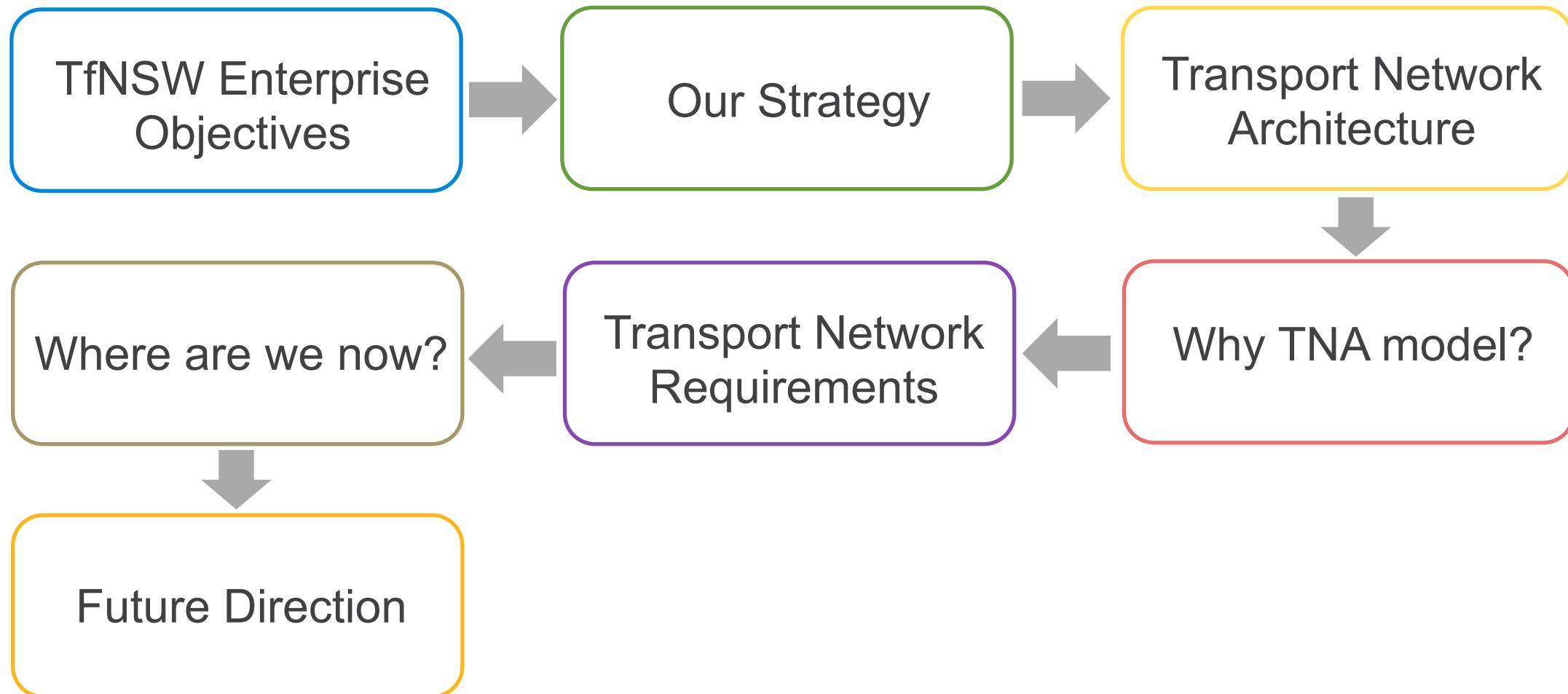
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# Key topics





# TfNSW Enterprise Objectives

- NSW Long Term Transport Master Plan\*



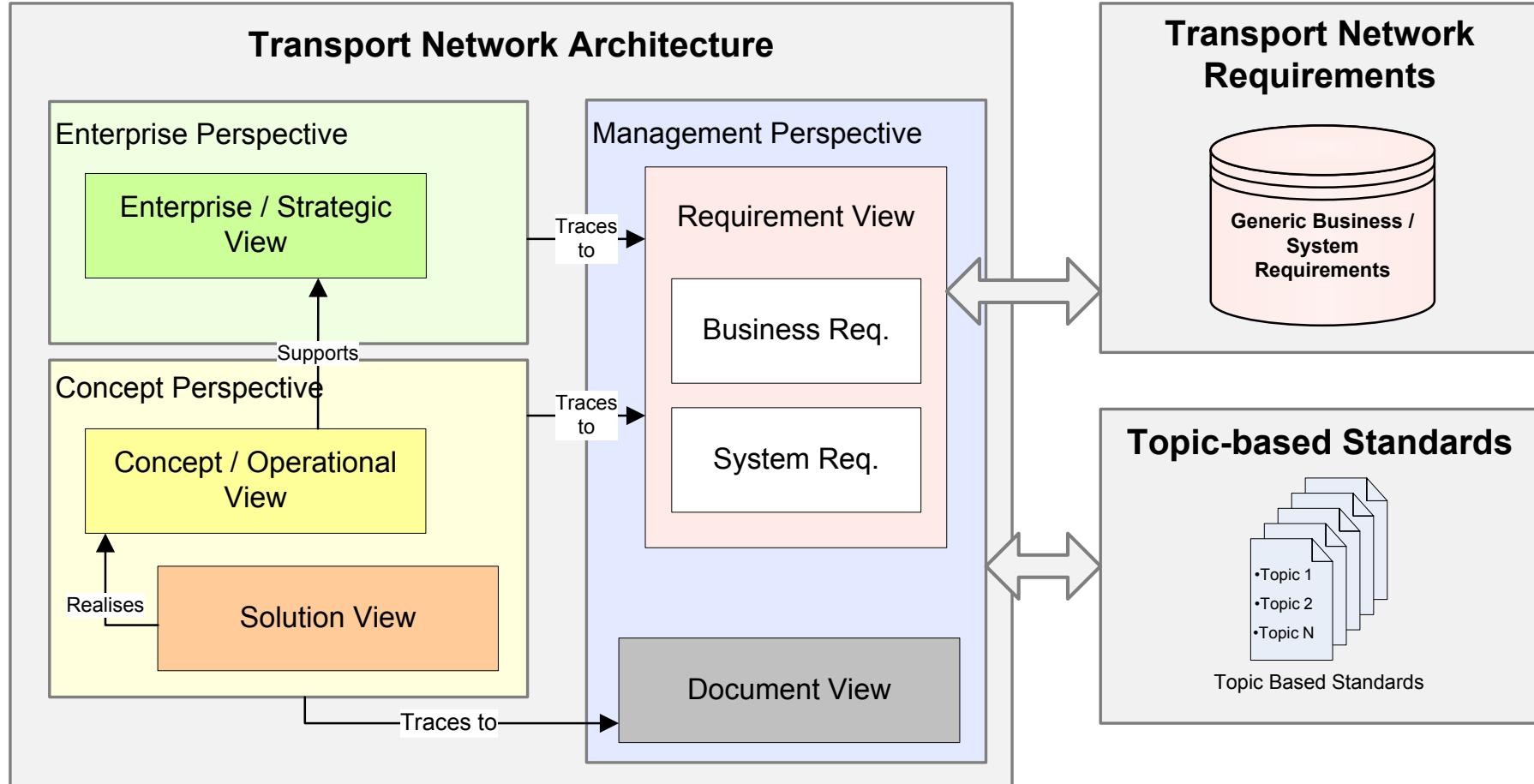
## Subordinate plans:

- 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'

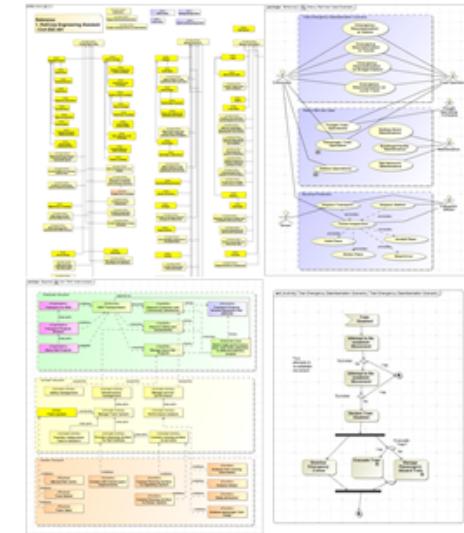
\*To be superseded by [Future Transport Strategy](#) currently under development

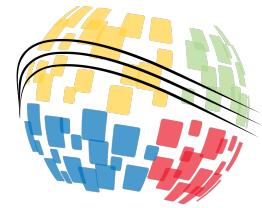
# Our Strategy





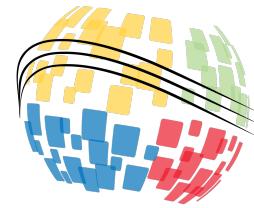
# The Transport Network Architecture





# Why TNA model?

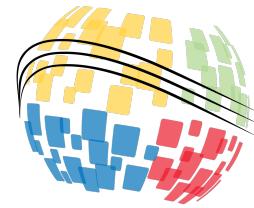
- Enable innovative solutions
- Requirement traceability to long term goals
- Improve quality of requirements
- Encourage use of model-based approach



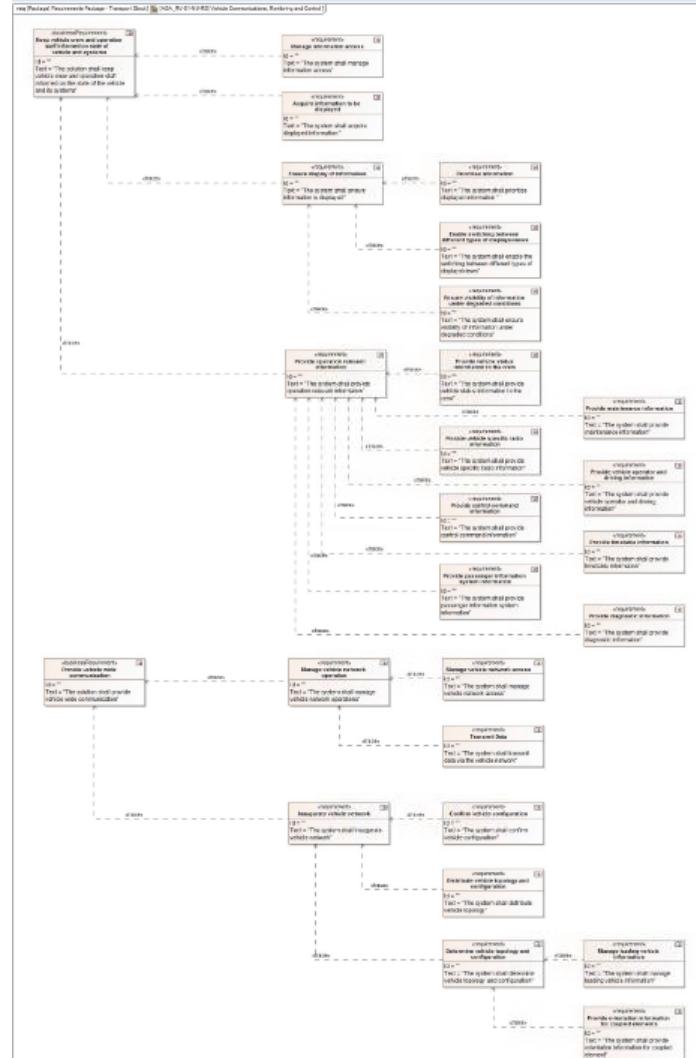
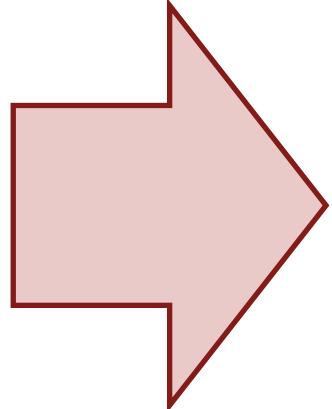
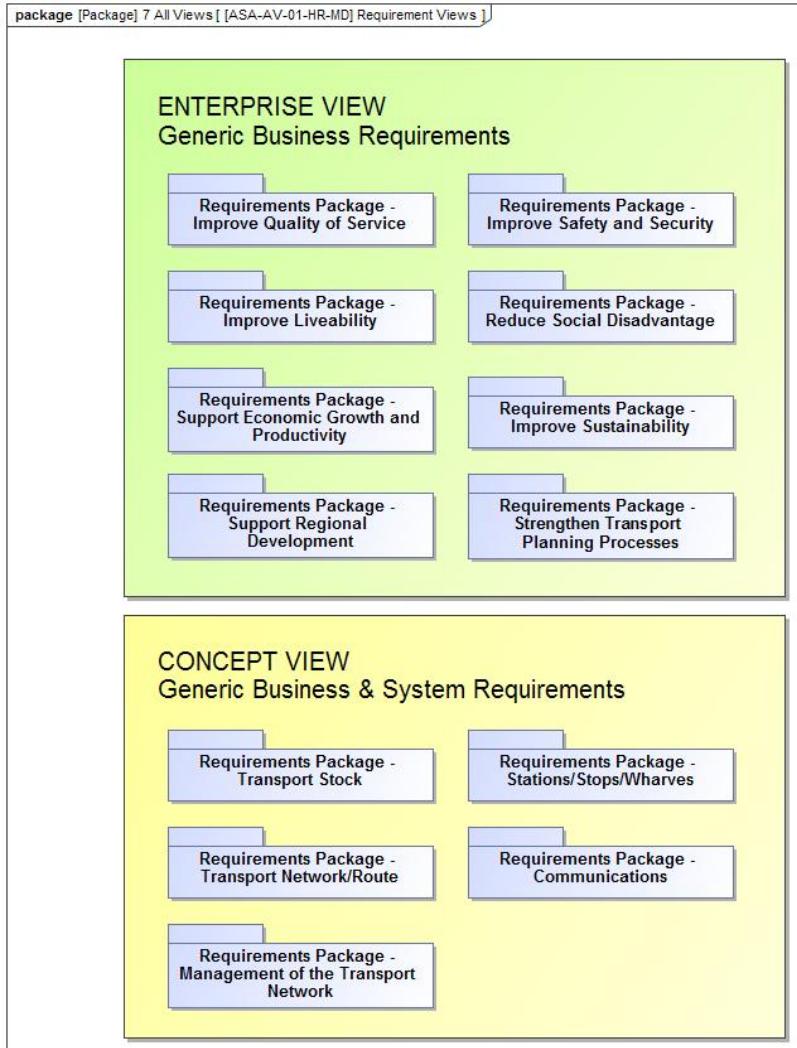
# The Transport Network Architecture

## 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





# The Transport Network Requirements

#	Name	Text	Owner
1	Keep vehicle crew and operation staff informed on state of vehicle and systems	The solution shall keep vehicle crew and operation staff informed on the state of the	Vehicle communications, r
2	Acquire information to be displayed	The system shall acquire displayed information	Keep vehicle crew and ope
3	Manage information access	The system shall manage information access	Keep vehicle crew and ope
4	Ensure display of information	The system shall ensure information is displayed	Keep vehicle crew and ope
5	Enable switching between different types of displays/views	The system shall enable the switching between different types of displays/views	Ensure display of informat
6	Ensure visibility of information under degraded conditions	The system shall ensure visibility of information under degraded conditions	Ensure display of informat
7	Prioritise information	The system shall prioritise displayed information	Ensure display of informat
8	Provide operation relevant information	The system shall provide operation relevant information	Keep vehicle crew and ope
9	Provide control command information	The system shall provide control command information	Provide operation relevan
10	Provide diagnostic information	The system shall provide diagnostic information	Provide operation relevan
11	Provide maintenance information	The system shall provide maintenance information	Provide operation relevan
12	Provide passenger information system information	The system shall provide passenger information system information	Provide operation relevan
13	Provide timetable information	The system shall provide timetable information	Provide operation relevan
14	Provide vehicle operator and driving information	The system shall provide vehicle operator and driving information	Provide operation relevan
15	Provide vehicle specific radio information	The system shall provide vehicle specific radio information	Provide operation relevan
16	Provide vehicle status information to the crew	The system shall provide vehicle status information to the crew	Provide operation relevan
17	Provide vehicle wide communication	The solution shall provide vehicle wide communication	Vehicle communications, r
18	Manage vehicle network operation	The system shall manage vehicle network operations	Provide vehicle wide comm
19	Manage vehicle network access	The system shall manage vehicle network access	Manage vehicle network o
20	Transmit Data	The system shall transmit data via the vehicle network	Manage vehicle network o
21	Inaugurate vehicle network	The system shall inaugurate vehicle network	Provide vehicle wide comm
22	Confirm vehicle configuration	The system shall confirm vehicle configuration	Inaugurate vehicle netw
23	Determine vehicle topology and configuration	The system shall determine vehicle topology and configuration	Inaugurate vehicle netw
24	Manage leading vehicle information	The system shall manage leading vehicle information	Determine vehicle topolog
25	Provide orientation information for coupled elements	The system shall provide orientation information for coupled element	Determine vehicle topolog
26	Distribute vehicle topology and configuration	The system shall distribute vehicle topology	Inaugurate vehicle netw
27	Manage Vehicle Operation Modes	The solution shall manage vehicle operation modes	Vehicle communications, r
28	Manage battery protection mode	The system shall manage battery protection mode	Manage Vehicle Operation
29	Manage energy saving mode	The system shall manage energy saving mode	Manage Vehicle Operation
30	Manage in service mode	The system shall manage in-service mode	Manage Vehicle Operation
31	Manage service retention mode	The system shall manage service retention mode	Manage Vehicle Operation



# The Transport Network Requirements



Transport  
for NSW

## Business Requirements Specification

### 4.1.7. Light Rail Corridor

#### Newcastle Light Rail

#### Document Information

Version: 1.10

Version Release Date: 7 December 2015

Author(s):

Print Date: 7 Dec 2015

Status: Approved

Objective No: A4809567

Restriction: Restricted

#### Endorsement

Name and Position	Date	Signature
Deputy Secretary Freight, Strategy and Planning, TINNSW	27/11/15	
Deputy Secretary, Customer Services, TINNSW	30/11/15	
Deputy Secretary Infrastructure and Services, TINNSW	7.12.15	

#### Approval

Name and Position	Date	Signature
Deputy Secretary Infrastructure and Services, TINNSW	27/11/15	

## Why develop it?

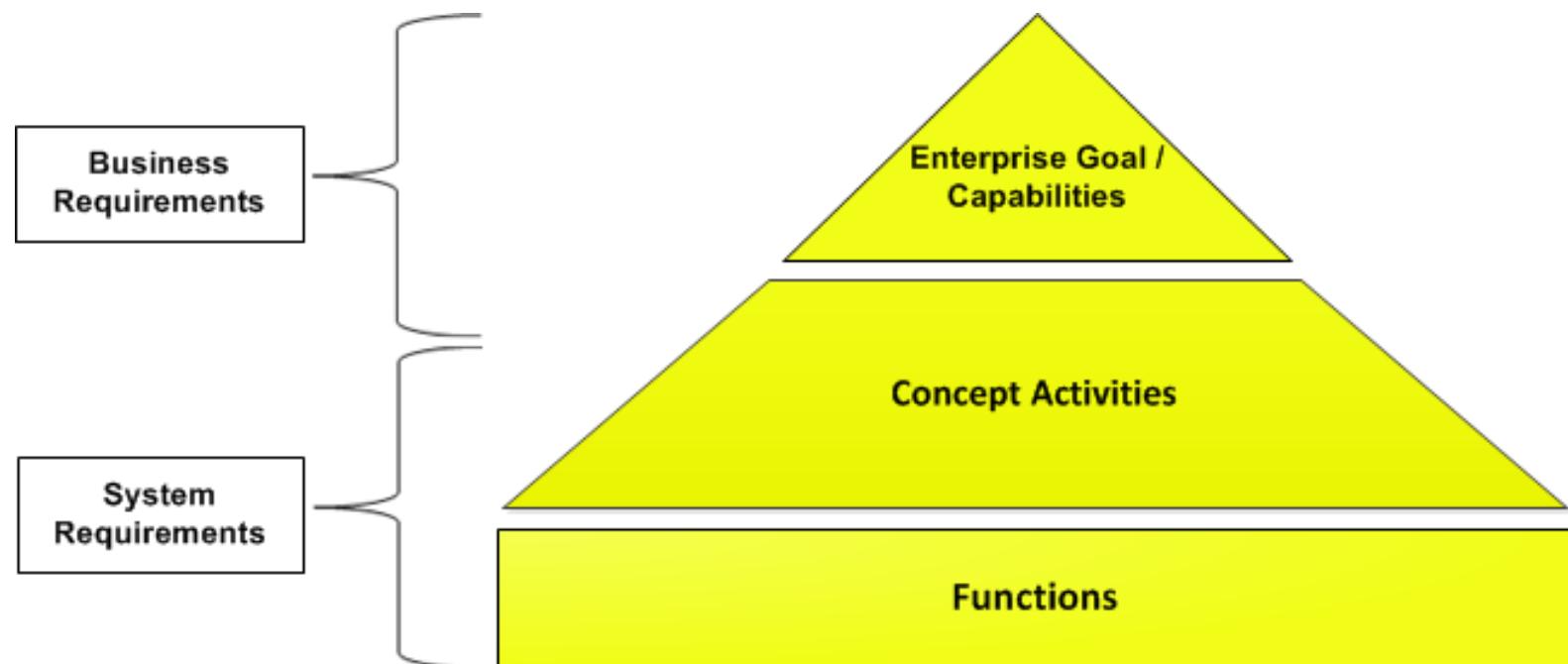
DOORS ID	Requirement	Criticality	Additional Information	Verification	Owner
PRJ-NLR-280	The Solution shall accommodate light rail services between Wickham and Newcastle East by following the alignment indicated in Figure 1.	Essential		Design Review	FSP
PRJ-NLR-162	The new light rail alignment shall be of a type consistent with its operating environments. The following forms shall be applied: <ul style="list-style-type: none"><li>▪ Segregated, where it is in the disused rail corridor,</li><li>▪ Separated, where it is in an urban roadway and road width allows for the provision of separate light rail and road vehicle space, and</li><li>▪ Mixed, where road width is insufficient to allow for separate light rail and road vehicle lanes.</li></ul>	Essential		Design Review	FSP
PRJ-NLR-163	The NLR shall implement a line-of-sight signalling Solution that enables safe operation of services and controls conflicts between LRVs, road vehicles and pedestrians at intersections.	Essential		Design Review	I&S
PRJ-NLR-165	Works within the public domain shall have a pleasing appearance, provide amenity and create no road safety risk.	Essential	This includes the provision of the following types of amenity where required: <ul style="list-style-type: none"><li>▪ fencing and balustrading;</li><li>▪ landscaping;</li><li>▪ street lighting; and</li><li>▪ footpaths, shared paths and cycleways. Whole of life costs should be considered in determining the extent of public amenity.</li></ul>	Design Review	CS
PRJ-NLR-166	The NLR perway shall enable emergency vehicles (under lights and sirens only) to operate on the light rail tracks except for the perway along the disused rail corridor.	Essential		Design Review	FSP

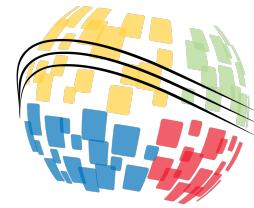


# The Transport Network Requirements

## How is it developed?

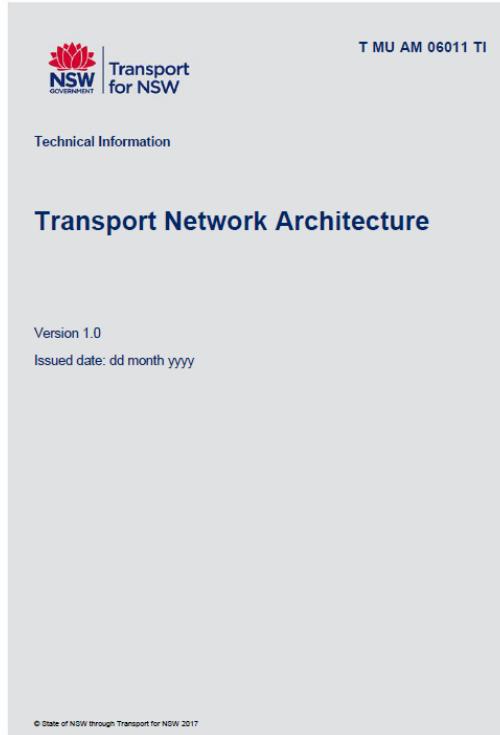
- Validate functional model
- Establish and develop requirement viewpoints



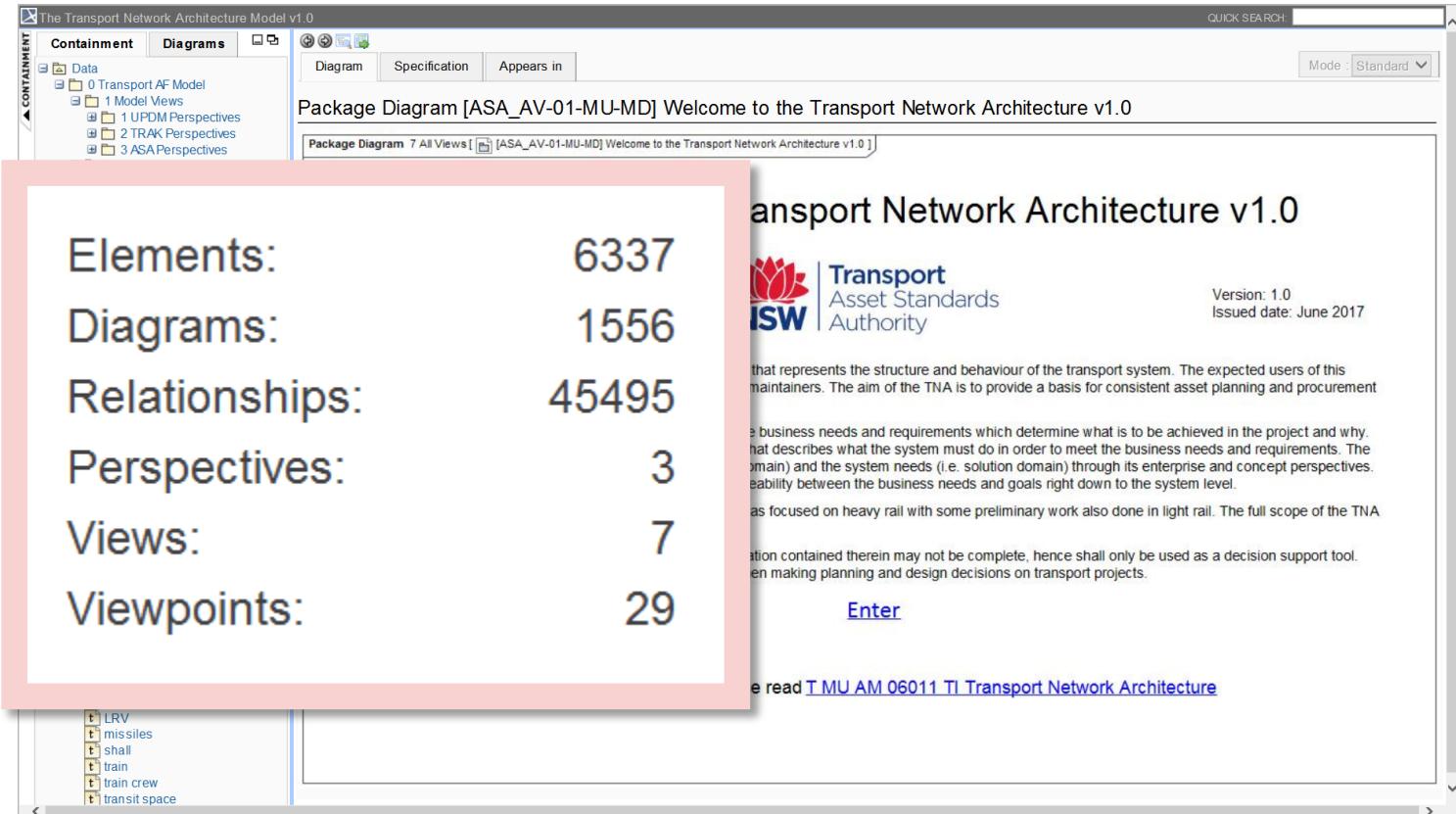


# Where are we now?

## TNA Document v2.0



## TNA Model v1.0





# Future Direction

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



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