RISSB Product Proposal (and Prioritisation)

RISSB
RAIL INDUSTRY SAFETY AND STANDARDS BOARD
ABN: 58 105 001 465

Primary information	
Type of product being suggested:	Guideline
Title of product being suggested:	Rail System Description Models
Date of suggestion:	12/02/2019
Reason for suggestion:	There are many common asset configurations utilised by railways across Australia that could be described by generic models, that could then be tailored to become specific for individual railways. Currently, in 2019, with major investments being made into Australian railway projects, there is a recurring need to document and define the baseline of the existing and future rail network in terms of functional & system configurations. In the worst cases, project requirements are being specified as 'outcome' and/or 'system' requirements divorced of traceability to an existing baseline. In the event of limited definition or documentation of existing baselines, business cases and projects-in-development are required to specify both the existing and future baselines of the rail networks, with varying levels of completeness and consistency. The limited definition of existing baselines can in some cases be influenced by large gaps in major investments. Describing the 'typical' interfaces, functions and composition of critical systems & assets required for a functional railway within Australia will: • Provide a consistent baseline for railways to tailor and compare against (existing vs future, other railways); • Provide a baseline for 'typical' system asset interfaces, functions, system composition and expected requirements (e.g. performance, criticality, safety considerations); • Assist in mapping user & functional requirements to systems & assets; • Provide a baseline for suppliers, rail operators and managers to understand the user & functional requirements, system & asset dependencies; • Provide a baseline for suppliers, rail operators and managers to identify common requirements for strategic investments and procurements; • Assist in cross-discipline, systems thinking and industry-specific familiarisation of typical rail system assets; and • Assist in defining a baseline for reporting reliability and performance of assets, systems and functions, e.g. evaluation of equivalent systems.
Railway discipline area:	Infrastructure, Rolling Stock, Train Control, Safety

Objective:

Develop models of the 'typical' interfaces, functions and composition of critical systems & assets required for a functional railway within Australia.

Describing the 'typical' interfaces, functions and composition of critical systems & assets required for a functional railway within Australia will:

- Provide a consistent baseline for railways to tailor and compare against (existing vs future, other railways);
- Provide a baseline for 'typical' system asset interfaces, functions, system composition and expected requirements (e.g. performance, criticality, safety considerations);
- Assist in mapping user & functional requirements to systems & assets;
- Provide a baseline for suppliers, rail operators and managers to understand the user & functional requirements, system & asset dependencies;
- Provide a baseline for suppliers, rail operators and managers to identify common requirements for strategic investments and procurements;
- Assist in cross-discipline, systems thinking and industry-specific familiarisation of typical rail system assets; and
- Assist in defining a baseline for reporting reliability and performance of assets, systems and functions, e.g. evaluation of equivalent systems.

Developing the rail system description models as a RISSB Guideline will:

- Consolidate or reduce the total overall investment of developing 'typical' rail system models and baselines for Australian rail networks, that would be otherwise duplicated;
- Provide a common understanding of 'typical' rail systems across the Australian rail industry;
- Provide a useful tool for assessing the impact of changes in technology, operation and maintenance from typical rail network baseline, e.g. step changes in technology;
- Provide a common baseline model for rail operators / managers to tailor specific to their needs;
- Provide a common baseline model for rail operators / managers to share future model developments, improvements and maintenance effort.

Scope:

Develop models of the 'typical' interfaces, functions and composition of critical systems & assets required for a functional railway within Australia.
Models shall be developed for 'critical' systems & assets that are 'typical' (i.e. common) of railways in Australia.

It is expected the models developed by RISSB will provide a common baseline for railway operators / managers to tailor and specify for their needs.
It is expected further developments, improvements and maintenance of the models by railway operators / managers will be shared with RISSB.

The models may be of the form of:

Essential -

- system descriptions;
- system boundary diagrams;
- functional block diagrams;
- function-to-system maps;

, and,

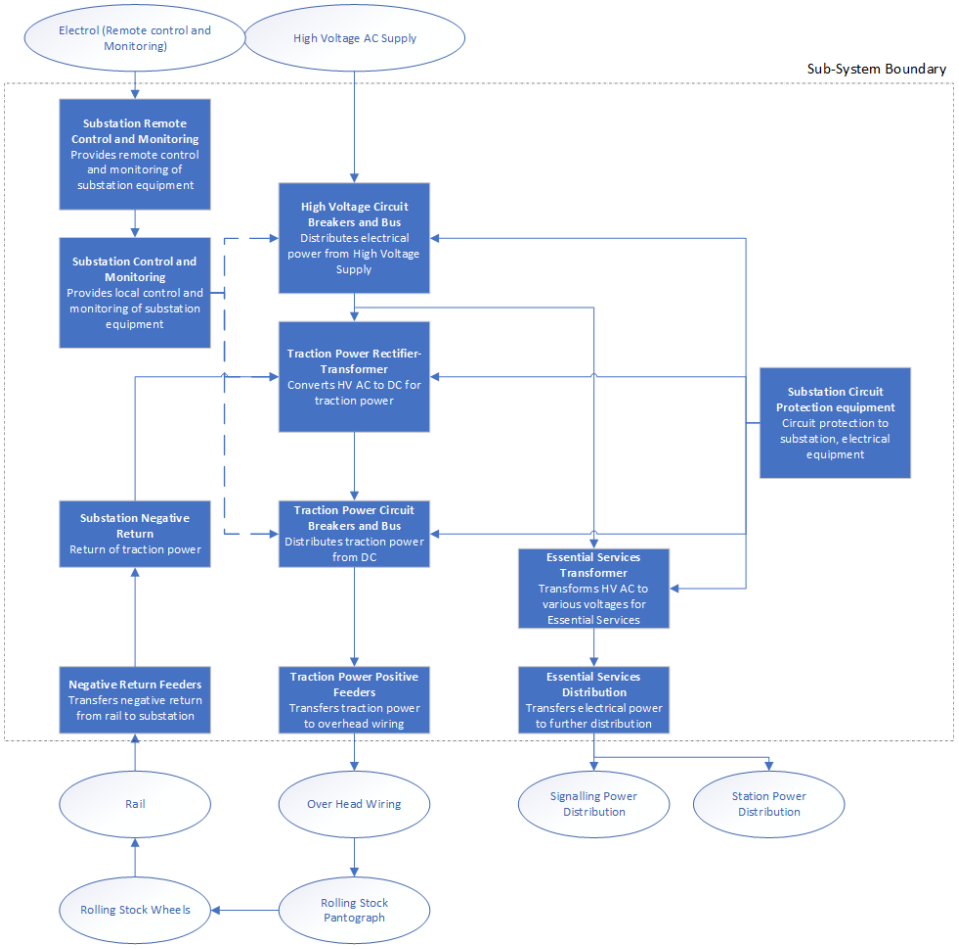
Extended -

- logical architecture;
- physical architecture;
- reliability block diagrams.

Examples

Substation:

Class name	Substation
Primary Function(s)	1. Provide switching, transforming and/or rectification of electrical power to, or from: A. High Voltage electrical supply o Commercial electricity suppliers o Dedicated train / tram electricity supply network B. Traction power systems o Positive feeders (e.g. to overhead wire / bar) o Negative feeders (e.g. return from rail) C. Essential services o Signalling systems o Stations / platforms (e.g. lighting, CCTV)
Ancillary Function(s)	a) Provide control and monitoring of substation and input / output electrical power connections
Sub-class(es)	• Traction Power substation • Switching / Tie substation (nil HV electrical supply, switching only) • Essential Services substation (nil traction power function) • …

Functional Block Diagram	
Child class(es) / component(s)	I. Substation Remote Control and Monitoring II. Substation Control and Monitoring III. High Voltage Circuit Breakers and Bus IV. Traction Power Rectifier-Transformer V. Traction Power Circuit Breaker and Bus VI. Traction Power Positive Feeders VII. Substation Negative Return VIII. Negative Return Feeders IX. Essential Services Transformer X. Essential Services Distribution o AC Circuit Breakers (qty: 1 or more) o AC Bus (qty: 1 or more) o … XI. Substation Circuit Protection equipment
Key interface(s)	• HV AC Supply - Electrical utility service provider (e.g. Ausgrid, Jemena) • Electrol - Operations Control Centre or equivalent – to receive SCADA alerts or alarms • Overhead wiring and traction power positive feeders • Rail and negative return feeders • Signalling power distribution • Station power distribution • …
Typical requirement(s)	**Typical**: • **Requirement**: High availability. **Justification**: Availability of electrical power is critical for rail network

	operation. Reduction of single points of failure via redundancy or high reliability. … **Specific rail network #1**: • **Requirement**: Redundancy of all substation equipment, excluding electrical bus, cables / feeders. **Justification**: Availability of electrical power for traction power and essential services is critical for rail network operation. Reduction of single points of failure via redundancy or high reliability. • …
Related Hazards	**RISSB Hazard Register:** • 6.24 Electric Shock • …
…	**…**

Hazard identification:			
1	Identify 'typical' rail system interfaces, functions and assets as a baseline for conducting impact and / or safety assessments – **reduce the risk of not identifying or considering a critical interface, function or asset for impact assessments**	6	
2	Provide a common baseline for rail operators / managers to tailor specific to their needs **- reduce the risk of not identifying or considering deviations from typical system baseline for impact assessments**	7	
3	Provide a common baseline for understanding of rail systems, functions and dependencies **- reduce the risk of human errors caused by limited rail systems knowledge**	8	
4		9	
5		10	

Definitions

i A ***Guideline*** is a set of informative guidance. It is not normative but informative.

A ***Code of Practice*** is a set of descriptions. It is the "how" one can meet a higher-level requirement (either of a Standard, or a piece of Legislation). It is normative, but by its nature can contain several options about how to achieve compliance with the higher-level requirement. It can also have some informative guidance within it if it is more practical than writing a separate guideline.

A ***Standard*** is a set of requirements only. It is the "what" must be done to be claim compliance to the standard. It is normative. It can also contain optional and/or supplementary requirements, but they still should be worded as requirements.

Benefits:

Safety

- Identify 'typical' rail system interfaces, functions and assets as a baseline for conducting impact and / or safety assessments
    - reduce the risk of not identifying or considering a critical interface, function or asset for impact assessments.
- Provide a common baseline for rail operators / managers to tailor specific to their needs
    - reduce the risk of not identifying or considering deviations from typical system baseline for impact assessments.
- Provide a common baseline for understanding of rail systems, functions and dependencies
    - reduce the risk of human errors caused by limited rail systems knowledge.

Interoperability / harmonisation

- Provide a consistent baseline for railways to tailor and compare against (existing vs future, other railways).
    - It is expected the models developed by RISSB will provide a common baseline for railway operators / managers to tailor and specify for their needs.
    - It is expected further developments, improvements and maintenance of the models by railway operators / managers will be shared with RISSB.
- Provide a baseline for 'typical' system asset interfaces, functions, system composition and expected requirements (e.g. performance, criticality, safety considerations).
- Provide a baseline for suppliers, rail operators and managers to understand the user & functional requirements, system & asset dependencies.
- Assist in cross-discipline, systems thinking and industry-specific familiarisation of typical rail system assets.

Financial

- Consolidate or reduce the total overall investment of developing 'typical' rail system models and baselines for Australian rail networks, that would be otherwise duplicated;
- Provide a baseline for suppliers, rail operators and managers to identify common requirements for strategic investments and procurements;
- Provide a common baseline model for rail operators / managers to share future model developments, improvements and maintenance effort.

Impacts:

1. Need for specialist tools and resources
    a. Subject Matter Expert – System Architect & Modeller labour effort
    b. Modelling tool selection
2. Documentation of major project designs are often under commercial-in-confidence arrangements. Commercial agreements such as provision of redacted copies of the reference / source documents may be required, including applicable delay time.
3. No common definition of 'typical' rail systems, interfaces and functions; level of detail to be included in-scope will be argued between various rail operators / managers, suppliers, etc.
4. Choice to include 'legacy' / deprecated rail systems to be defined.

Reference / source materials:		
#	Reference / source material	Available from
1	TfNSW - Transport Network Architecture	TfNSW https://www.transport.nsw.gov.au/industry/asset-standards-authority/find-a-standard/transport-network-architecture-2
2	Level Crossing Removal Project Caulfield To Dandenong PAR TO PKE – Generic System Architecture Signalling Design Report P03-000-C-CTD-REP-00-PAR-GSG-0691 Revision 0	Level Crossing Removal Authority (LXRA) Victoria (may be commercial-in-confidence)
3	Mernda Rail Extension Project – RAM Analysis Report FINAL MRE-000-JHG-REP-XVV-0002 Revision 0	Level Crossing Removal Authority (LXRA) Victoria (may be commercial-in-confidence)
4	NEPA 1 – RAM Assurance Report NEP-000-NEA-PLN-XVV-0001 Revision 0	Level Crossing Removal Authority (LXRA) Victoria (may be commercial-in-confidence)
5	EN 15380 Designation System for Railway Vehicles -2, -4, -5	International standards
6	Functional and technical requirements specification for perturbation management ONT-WP4-D-TUD-015-05 Revision 2 Work package no.: 4 Deliverable no.: D4.1	Project Title: Optimal Networks for Train Integration Management across Europe www.ontime-project.eu
7	Functional and technical requirements specification for large scale perturbation management ONT-WP05-I-IFS-015-00 Revision 2 Work package no.: 5 Deliverable no.: D5.1	Project Title: Optimal Networks for Train Integration Management across Europe www.ontime-project.eu
8	Operational failure modes of Switches and Crossings Date: 5 May 2015 Public deliverable D 13.1	Project title: CAPACITY4RAIL http://capacity4rail.eu/results

Definitions

ii ***Interoperability*** is the ability of a process, system or a product to work with other process, systems or products (aka compatible systems through managed interfaces).
iii ***Harmonisation*** - the act of bringing into agreement so as to work effectively together (aka uniformity of systems).