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

Rail Industry Safety and Standards Board (RISSB)

National Framework for Rail Interoperability (NFRI)

Overview and discussion paper

v1.0, January 2022

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One national network, but 15 centres for decision-making

1 Multiple Interconnecting Networks

The national rail network is made up of interconnecting networks, managed by 15 different Network Authorities.

Train operations frequently span several networks.

2 A move to new network control systems

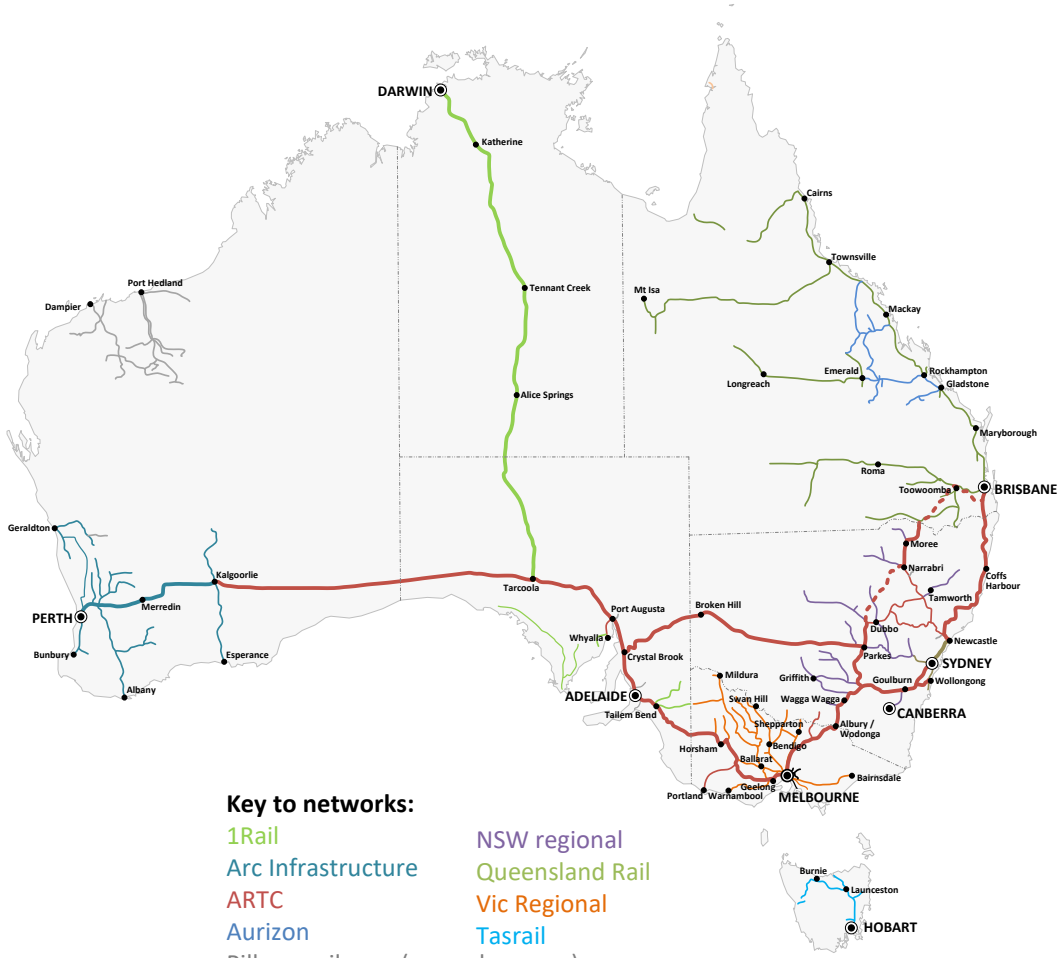
Many Network Authorities are moving to adopt new network control systems across their network. This is part of a wider international trend of increasing the use of the technology in railway operations to bring benefits of improved safety, capacity and cost savings.

Due to these trends, it is likely most other Network Authorities to consider the introduction of such systems on their networks.

3 Investment decisions at individual network level

Each Network Authority has the prerogative to make decisions on their network that are for the good of their network. Often this means limited consideration of the impacts of those decisions beyond their network.

There is currently no requirement that a Network Authority has to consider the national picture or operations outside their network, even though operators travel over multiple different boundaries/areas.



Key to networks:

1Rail
Arc Infrastructure
ARTC
Aurizon
Pilbara railways (several owners)
NSW regional
Queensland Rail
Vic Regional
Tasrail

Not visible: suburban networks in Brisbane, Perth, Adelaide, Sydney and Melbourne.

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Lack of coordination may lead to interoperability problems with new network control systems

Introduction of new railway control systems challenges current interoperability and ways of working

National rail network includes multiple managers and interconnecting networks

+

A move to new network control systems

+

Decision making at an individual network level

Risk of misaligned approaches that may increase risk of safety gaps and interoperability issues

Current approaches to implementing new systems focus on solutions that are safe and optimised for each individual network, but the overall solution may be sub-optimal when considering the national network.

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Responsibility for and impacts of interoperability

And will result in an optimally efficient, safe and productive national rail network.

Freight forwarders and customers ultimately bear the cost of inefficiencies introduced by lack of interoperability.

Is necessary to provide a consistent and safe interface to operators …

Rolling Stock Operators (RSOs) service routes and customers where business opportunities present, and must respond to decisions made by each RIM / network authority on these routes.

Railway interoperability across below-rail networks …

Multiple networks managed by separate RIMs and network authorities, each making decisions for the good of its own network.

Rail Infrastructure Manager (RIM):
The entity responsible under Rail Safety National Law for managing the network in a safe manner.

Network Authority:
The entity responsible for making decisions on strategy, investments and direction for a network.

Note: In some instances the Network Authority and RIM are the same entity.

Decisions leading go interoperability (or not) are made by Network Authorities. The impacts of these decisions (good and bad) are felt by others.

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Context model for the National Framework for Rail Interoperability

The framework has been conceived in a comparable way to a safety case, where arguments are constructed at different levels, but all arguments contribute to demonstrating an overarching objective.

National Network Layer – applies to the entire national network

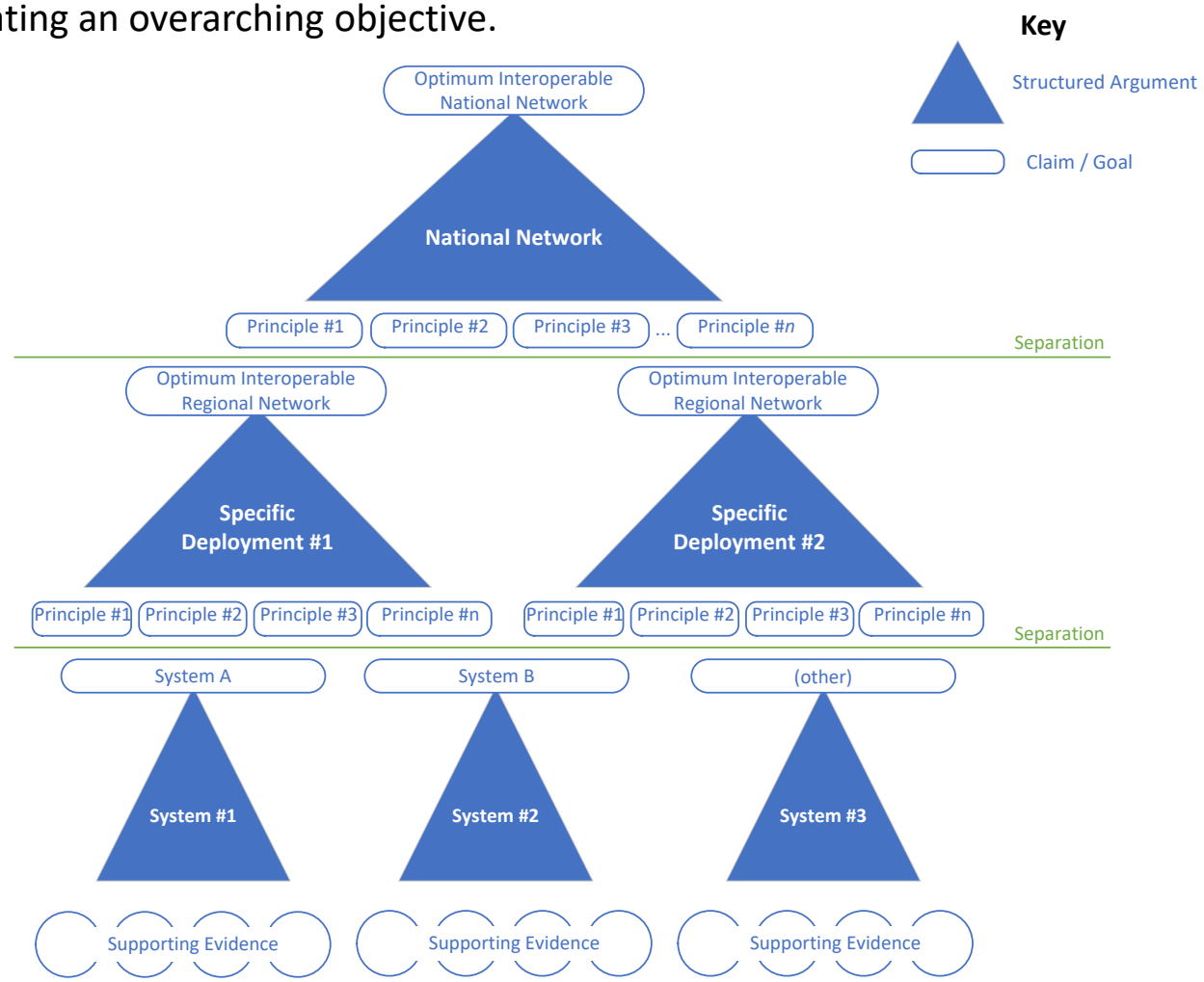
- Provides principles to align Deployed arguments towards an overall network outcome.
- Administered by an industry-wide coordination group (tbc)?

Deployment Layer – developed by a network authority for part or all of its network

- Demonstrates how selected technologies are applied to provide a safe and interoperable outcome.
- Demonstrates how the deployed argument address the strategic principles.
- Identifies constraints exported to other areas / networks.

Systems Layer – developed for each technology / system

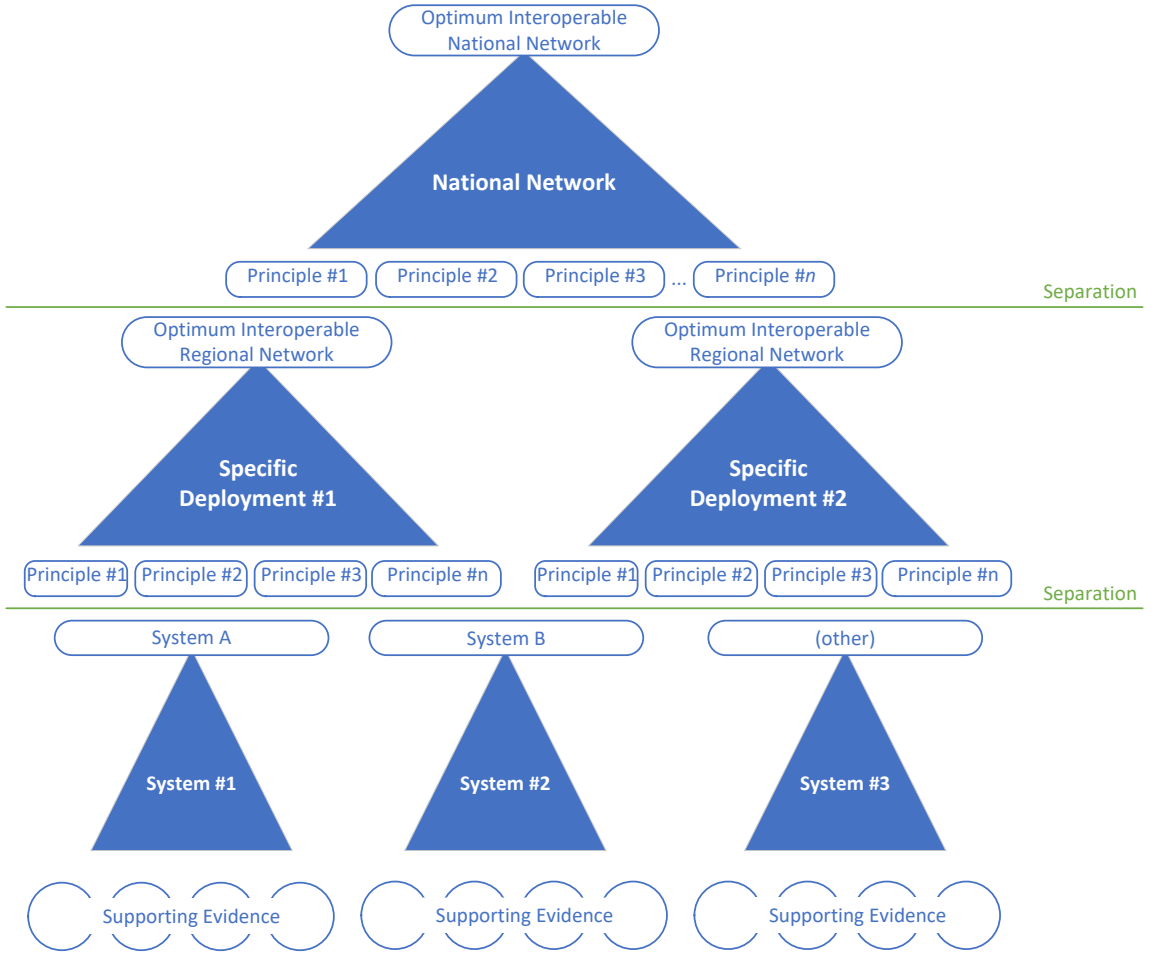
- Includes information on systems from the supplier or manufacturer, plus information on the application of the system by RIMs
- Demonstrates how the technology is intrinsically safe and functional, when applied within the design boundaries.
- Identifies exported constraints to be addressed externally to the system.



Influences between layers of the National Rail Safety Case for Interoperability

Objectives and Principles:

Each layer of the model sets out the strategic objectives for that layer, and the principles that must be met by the lower layer to ensure that the strategic objectives are achieved.



Supporting Argument:

Each layer prosecutes its own case, but also provides a robust foundation for the arguments to be demonstrated in the layer above by addressing to the identified principles.

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Top level interoperability objective for the national rail network

Vision for Interoperability (developed by the NTC Interoperability Working Group)

Passengers and freight will move seamlessly and safely between major cities and regions on a modern, integrated, and productive rail network that works as one interoperable system.

Proposed **top level interoperability objectives**

The National Rail network must:		
1.	Be as **Safe** as reasonably practicable	Safety is the number one priority for rail networks and operators, but what is 'reasonably practicable' may vary from location to location given the characteristic of that portion of the national network. The network authority holds accountability for this evaluation. Regardless of what decision is made, the interoperability objective is that all trains operating on that corridor are operating to the maximum level of safety that is reasonably practicable on that corridor.
2.	Enable operations that are as **Efficient** as possible	Different areas of the network have different requirements for efficiency, with the most highly trafficked lines demanding higher levels of efficiency than more lightly trafficked corridors. Decisions on network improvements to improve efficiency often involve the network authority /RIM, as well as operators. The interoperability objective is that all trains operating on a corridor are operating with the maximum level of efficiency possible on that corridor.
3.	Maximise **Productivity** of the rail industry	Decisions on systems and strategies to be applied on each network are made by the network authority for that network. These parties have the right to make decisions they see as in the best interest of their network and business. However, these decisions should be made with due consideration of the impact of that decision on the national rail network, with the objective of improving overall productivity and minimising costs – particularly to industry players not party to the decision being made.

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Three important considerations:

1. Even ignoring network boundaries, different areas of the network must meet different needs – leading to different solutions

With systems available in the marketplace, it is currently not feasible to satisfy the diverse needs to the entire national network with one solution (noting that this may become more feasible over time).

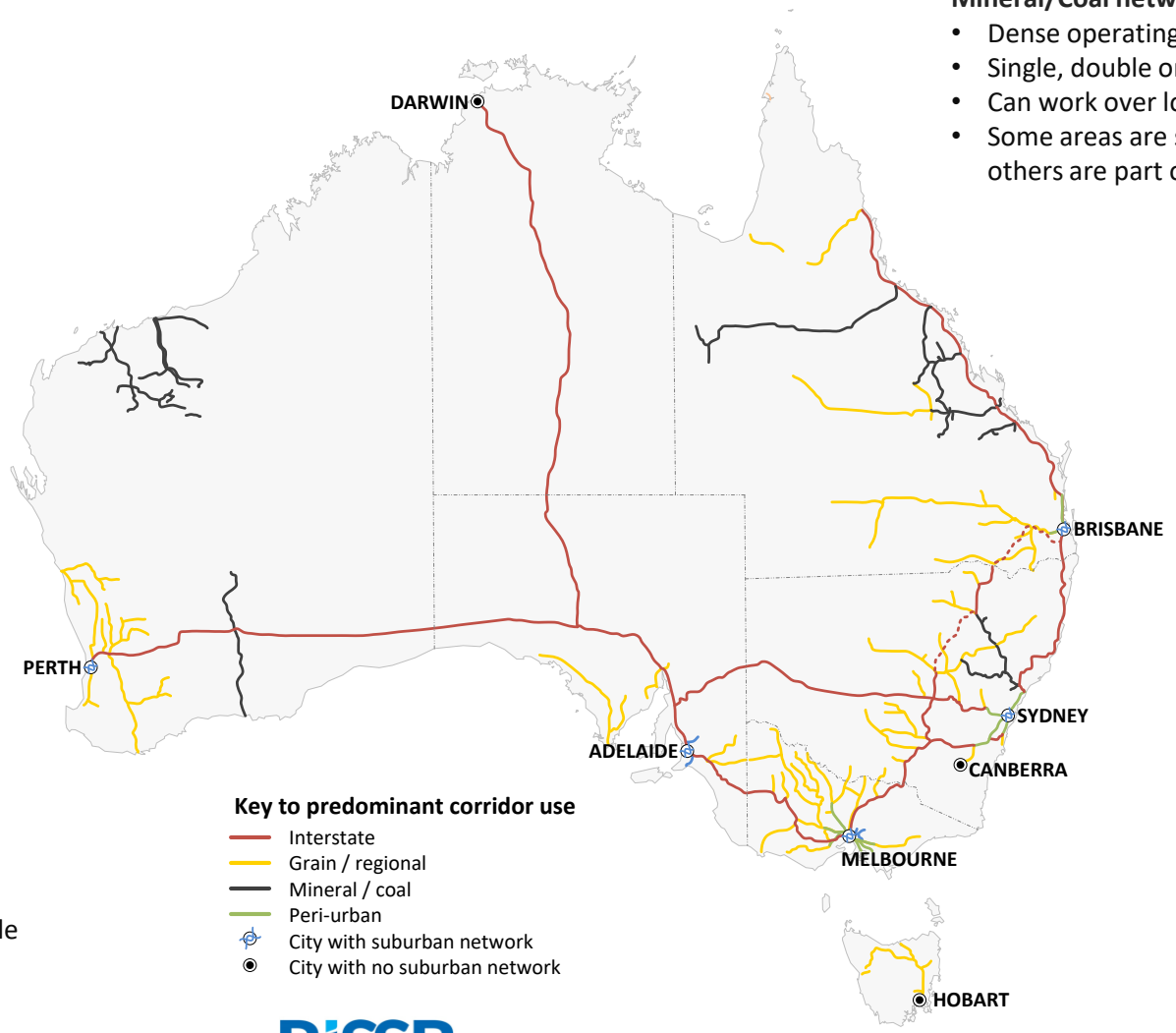
However, network similarities may mean that the same systems can satisfy needs in geographically diverse areas, where the operational and infrastructure characteristics are comparable.

Interstate Rail Network

- Long distances – travel over different areas.
- Need to optimise movements on a single- or double-track railway.
- Require systems robust to power and communications outages.
- Weather resilience.
- Interface with metro and per-urban networks.

Grain/ Regional networks

- Infrequent services
- Need to optimise movements on a single track railway.
- Need to minimise costs.
- Interface with metro networks in part.



Mineral/Coal network

- Dense operating environment
- Single, double or multiple track areas
- Can work over long distances
- Some areas are standalone or isolated, others are part of mixed traffic networks.

Urban networks

- Passenger focused
- Dense operating environments (stations)
- Optimise passenger train movements - peak vs off peak services
- Provide high infrastructure reliability and availability.
- Some have freight services mixing with passenger services (freight becomes lower priority)

Peri-urban corridors

- Connecting capital cities to major regional destinations.
- Mix of passenger and freight.
- Need to optimise for both traffic types.

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Three important considerations:

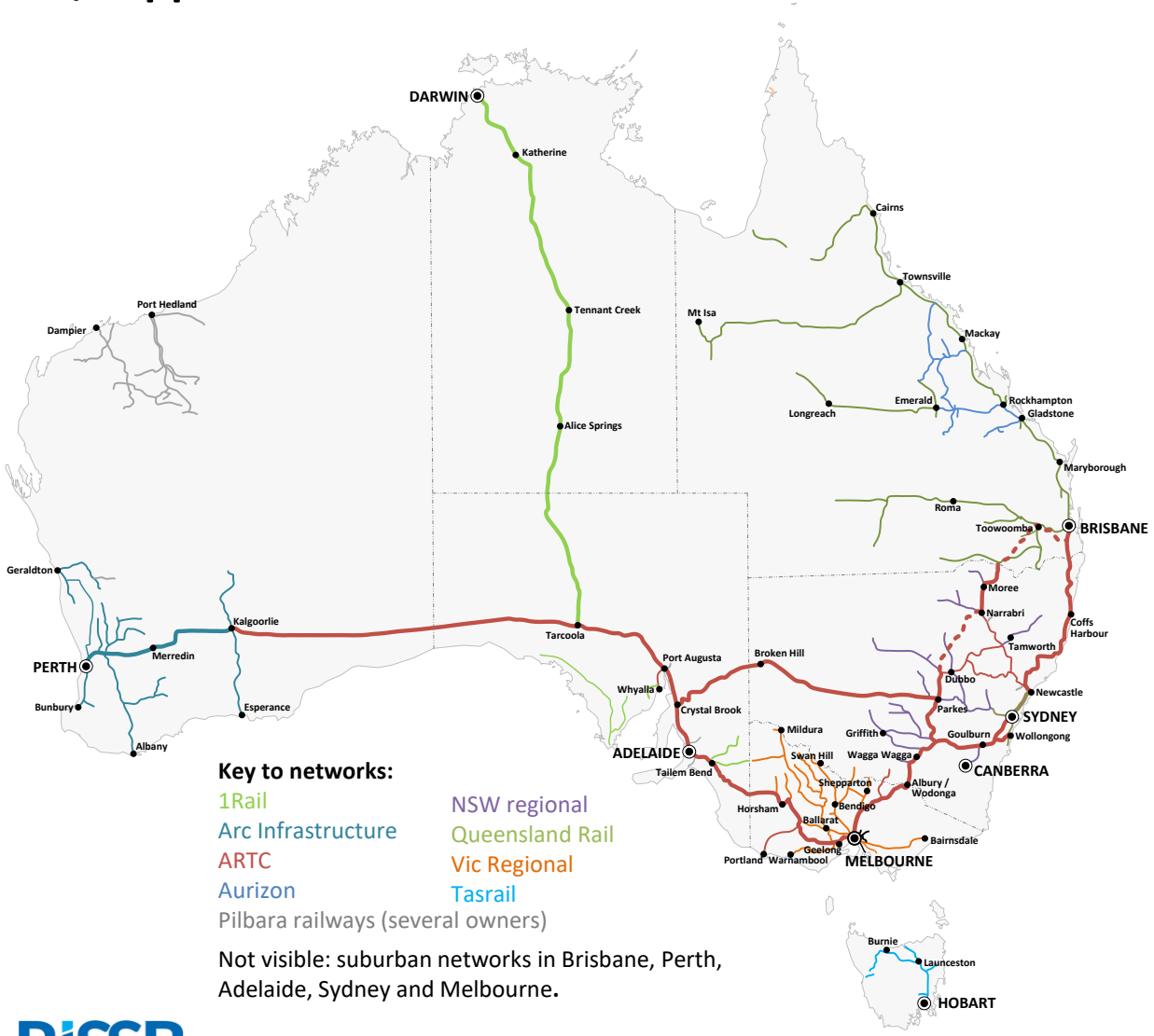
2. Greater co-operation and coordination between Network Authorities can improve the productivity of the national network, support innovation and avoid future interoperability issues

Australia is a small rail market with limited competition at the rail infrastructure level. Each network operates in a particular geography and forms part of the nationally-connected rail network services.

By co-operating there is an opportunity to drive costs down through co-ordinated investments, providing economies of scale benefits for the industry and reducing duplicated effort.

This means that the overall good of the industry will be enhanced with Network Authorities and RIMs working together to limit the impact the of system investments on operators by:

- Minimising costs passed on to operators and hence maximise competitiveness of rail vs other modes.
- Reducing barries to entry for new operators / routes.
- Fostering competition between suppliers.
- Encouraging innovation where possible.



Not visible: suburban networks in Brisbane, Perth, Adelaide, Sydney and Melbourne.

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Three important considerations:

3. An operational interface does not require network adjacency

Network	National interstate	Brisbane	Queens-land regional	Qld coal	Sydney	NSW regional	NSW coal	Melbourne	VIC regional	Adelaide	Perth
Brisbane	Interstate + regional freight, interstate passenger										
Queensland regional	Interstate + regional freight	Regional freight, regional passenger									
Qld coal			Regional freight, regional passenger								
Sydney	Interstate + regional freight, interstate + regional passenger	Interstate passenger									
NSW regional	Regional freight, interstate + regional passenger				Regional freight, regional passenger						
NSW coal	Interstate + regional freight, interstate + regional passenger	Interstate passenger			Interstate + regional freight, interstate + regional passenger	Regional freight, regional passenger					
Melbourne	Interstate + regional freight, interstate + regional passenger				Interstate passenger						
Victoria regional	Regional freight, regional passenger							Regional freight, regional passenger			
Adelaide											
Perth	Interstate freight, interstate passenger				Interstate passenger						
WA regional	Regional freight, regional passenger										Regional freight, regional passenger

An operational interface between two networks exists when trains commonly travel between the two networks, whether directly (i.e. the networks are adjacent) to indirectly (via another network).

When an operational interface exists, decisions on one network may have interoperability implications for the other network. These implications need to be considered as decisions are made by each network authority.

indicates adjacency of networks

text indicates non-adjacent operational interface

Constructing the National-level Strategic Argument

National Objectives

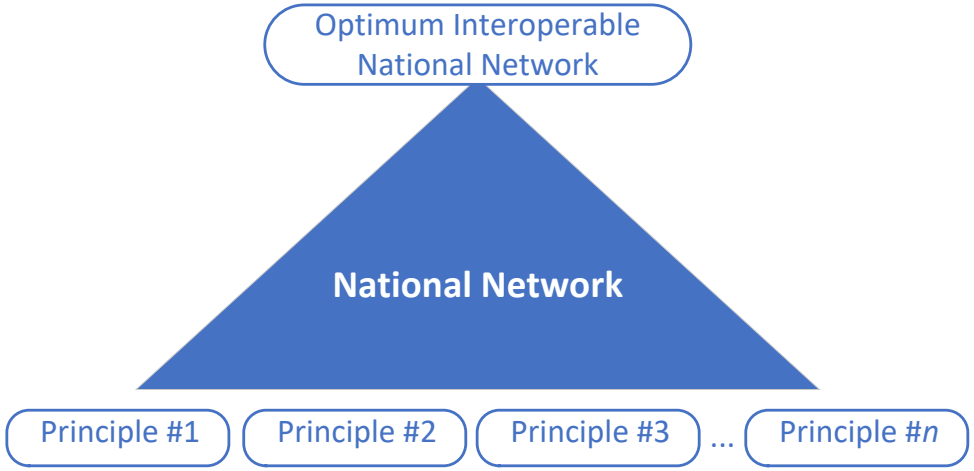
1.	Be as **Safe** as reasonably practicable
2.	Enable operations that are as **Efficient** as possible
3.	Maximise **Productivity** of the rail industry

National-level argument (considerations)

1. Different areas of the network must meet different needs:
   1a. Different systems may be required
   1b. There may be systems in use or in development that will meet the need

2. Co-operation and coordination between RIMS can improve productivity, support innovation, and reduce cost
   2a. Enable opportunities to work together to encourage competition and reduce costs to industry

3. An operational interfaces are beyond the neighbouring network [does not require network adjacency].
   3a. Consider both adjacency and operational interfaces in decision making.



National-level principles

1. Ensure decisions are aligned with the national objectives.
2. Strive for seamless services by considering network adjacency plus operational interfaces when making system decisions.
3. Adopt common solutions where possible and suitable – this means technologies plus rules plus competencies - to reduce duplicated effort.
4. Identify any wider implications of an initiative and agree a plan with any impacted party prior to committing to that initiative.
5. Any new technologies are developed with consideration of national interoperability and potential wider industry application.

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Characteristics of a technology (or set of technologies) that will deliver a good outcome for the rail industry

The set of systems includes options that deliver the required functionality and performance for efficient rail operations in each context.

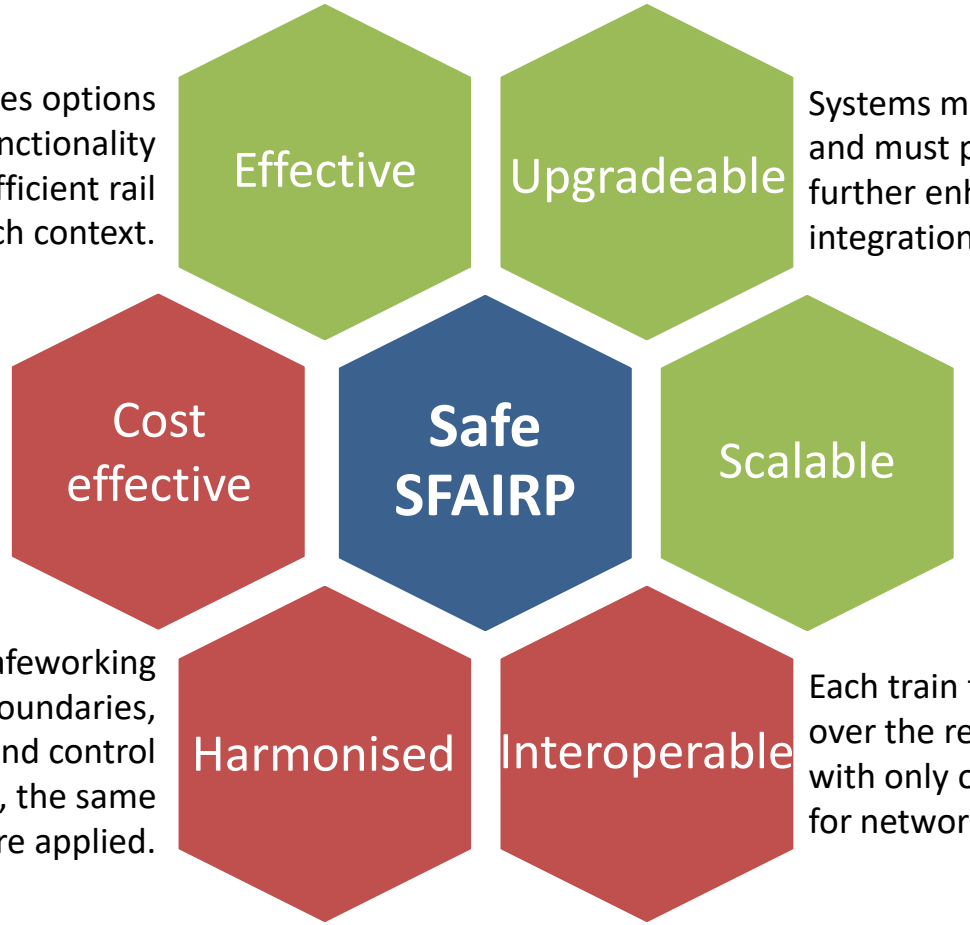
Systems must be supported, and must provide a pathway to further enhancements / integration with other systems.

Cost burden for networks is manageable, cost passed onto operators is minimised.

National suite of options includes one or multiple systems that can be cost-effectively applied across all types of railways in a seamless way, i.e. suburban, coal, interstate and regional.

Harmonising of safeworking systems across network boundaries, wherever one signalling and control system is used, the same safeworking rules are applied.

Each train fleet can operate over the required network(s) with only one onboard system for network control purposes.



Legislated objective

Considerations regarding network system options

Considerations regarding interoperability

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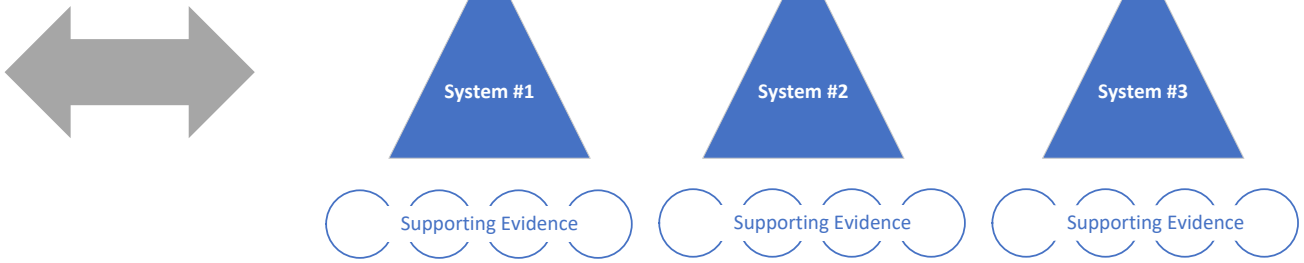
Elements of the Systems Layer

Collectively, the set of systems in the Systems Layer must meet the requirement to deliver a good outcome for the rail industry.

Systems Layer objective

1.	A 'database' of systems to make proven and interoperable options generally available.
2.	For each system. define what the system is and how it can be used.



Systems Layer evidence

1. System objectives and operating parameters.
2. Standards.
3. RAM performance
4. System specifications.
5. Operating rules.
6. Application notes.
7. Exported constraints.
8. Support and upgrade pathway.
9. Interoperability issues and solutions
10. Etc.

Data related to each system

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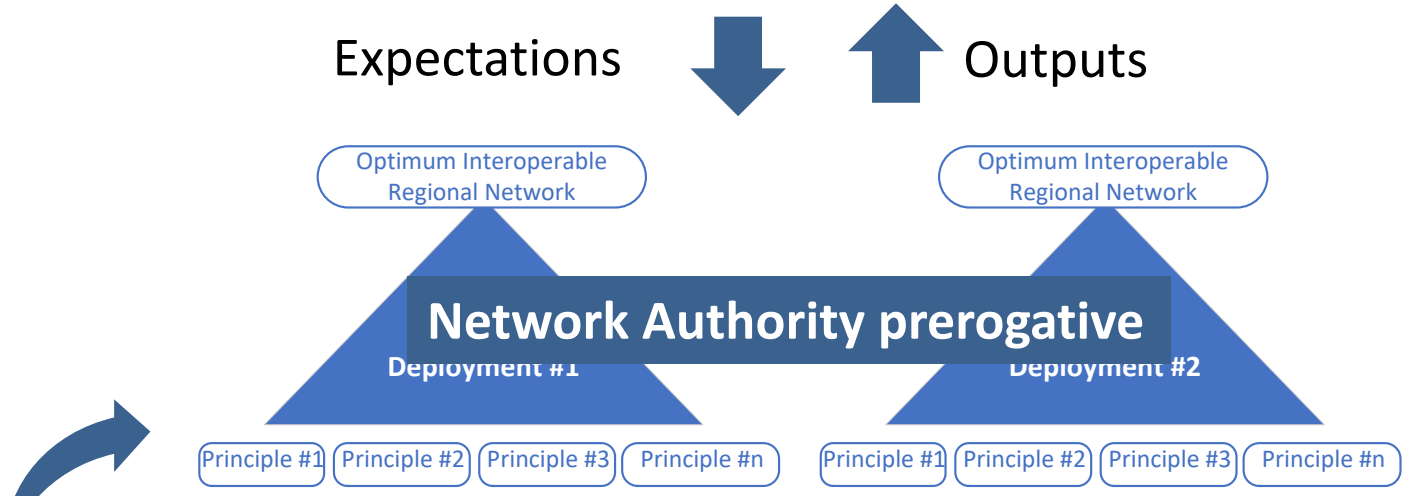
The Deployment Layer: Context for decision making by the Network Authority

National-level principles

1. Ensure decisions are aligned with the national objectives.
2. Strive for seamless services by considering network adjacency plus operational interfaces when making system decisions.
3. Adopt common solutions where possible and suitable – this means technologies plus rules plus competencies - to reduce duplicated effort.
4. Identify any wider implications of an initiative and agree a plan with any impacted party prior to committing to that initiative.
5. Any new technologies are developed with consideration of national interoperability and potential wider industry application.



Select and deploy
A Network Authority may select and use one of the established, defined and interoperable solutions.

Develop and add
A Network Authority may choose to develop and implement a new solution, including resolving any interoperability issues. Ideally then this new solution is 'added' to the Systems Layer for use by others as required.

Systems Layer objective

1.	A system 'database', to make proven and interoperable options generally available.
2.	For each system. define what the system is and how it can be used.

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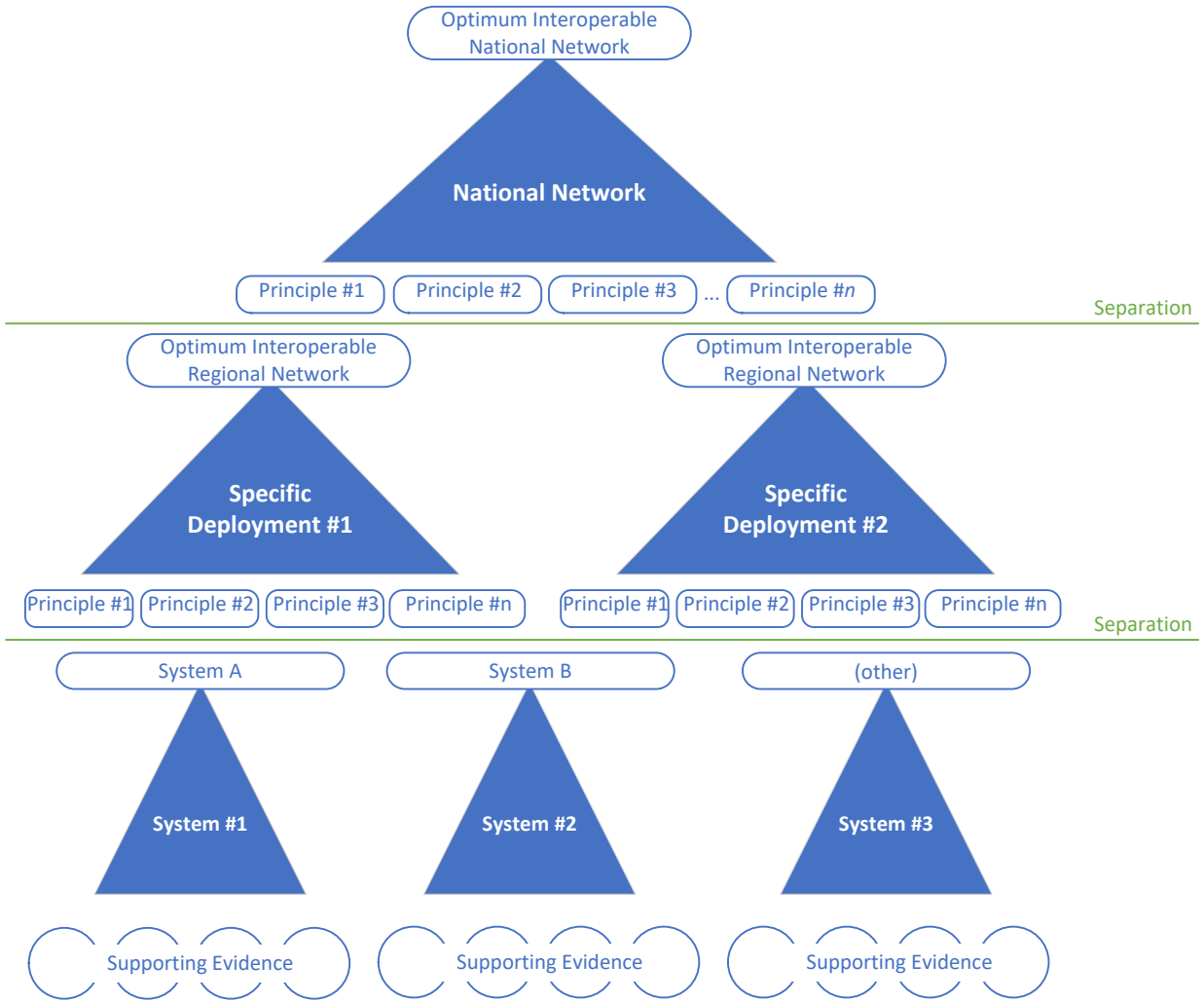
Tools to support the framework for interoperability



Tools

National Network for Interoperability

Interoperability Register (inc. SRACS, residual risks and interoperable solutions)

Standard form of interoperability assessment

Corridor Assessment Tool

Performance specifications and application notes (SRACS) for nationally consistent solutions.

Interface specifications

National rules

National competencies

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Tools to support the framework for interoperability

Tool	What	Why
National Network for Interoperability	Defines those areas of the national network where high levels of interoperability are most critical for efficiency of the national network.	To provide a focus for interoperability considerations.
Interoperability register	Provides summary information of relevant initiatives underway in all jurisdictions. Outlines any known interoperability impacts, and any solutions existing or in development that may be of value to a new initiative. Provides information on all operational interfaces between networks that must be allowed for in the assessment.	To provide a baseline of information for an interoperability assessment.
Standard form of interoperability assessment	Provides guidelines for an interoperability assessment to be used when developing a new initiative, to ensure commonality of assessment approach and completeness of the assessment. The Interoperability Assessment Framework may be published as a standard.	To ensure consistent and thorough assessment of the interoperability impacts of an initiative.
Corridor assessment tool	A standard tool to assess corridors and determine appropriate treatments, envisaged as comparable to the Australian Level Crossing Assessment Model (ALCAM). The corridor assessment tool would consider: • Corridor characteristics • Operational factors • Solutions available • Influencing decisions by adjacent networks or operators	To assist to achieve defendable safety outcomes on comparable corridors across Australia.
Performance specifications and application notes for nationally consistent solutions	Agreed specifications for each of the systems in use on the national network. • ATMS – establish an agreed baseline for use by any interested network • ETCS – reference ERA standards, potentially 'local application notes' to ensure alignment not deviation • TOW – develop a performance specification to maintain competition amongst suppliers but ensure systems are functionally equivalent	To make alignment between solutions possible.
Interface specifications	Define standard interfaces, e.g.: • Interlocking to ATMS interoperability solution – to ensure future suppliers can interface to the ATMS onboard via the IOS. • Interface to NTCS for data transmission (e.g. authority data)	To allow multiple jurisdictions and multiple suppliers to interface to other systems, to encourage innovation.
National rules	Consistent agreed safeworking rules and signalling principles for the application of one class of system (ATMS, ETCS, TOW, other?)	To reduce the burden of training and competencies on operators; to ensure consistent (best?) practice for any application of a system.
National competencies	Consistent agreed rules for the application of one class of system (ATMS, ETCS, TOW, other?)	To reduce the burden of training and competencies on operators.

Managing the National Framework for Rail Interoperability

A **National Interoperability Coordination Forum** (name tbc) is envisaged, that:

- Owns the top level national network objective,
- Owns and manages the tools
- Works to get alignment between initiatives of separate Network Authorities
- Is a cooperative body – relies on the good will and active participation of members

Parties	Interest
NTC	Chair, coordinate to ensure the outcomes and direction are aligned with the national interest of an efficient, safe and productive railway network.
Network Authority	Is and will remain the decision maker for their networks. Key issue is to get coordination between those decisions NFRI will not supersede the Network Authority decision making ability, but need to influence for the good of the national network
Operators (RSO)	Interested parties – the 'recipient' of any decisions for good and bad Act as a sounding board of what is a good outcome for the industry – if it works to make operations better, that is a good outcome. Attends the forum to view proposals, offer their perspective and ensure that all initiatives are aligned in a cogent direction.
RISSB, ARA	Observers, each with a specific area of interest. May take on actions from the NICG in order to progress interoperability initiatives.

The National Interoperability Coordination Forum concept is aligned with recent proposals developed by NTC for governance of interoperability matters.

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consulting, management, design

National Framework for Rail Interoperability (NFRI)

Explanatory paper

Version 1.0

28 January 2022

Distribution:

1. Jesse Baker, RISSB

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0.1	Bill Palazzi, Lisa Maclean, Steve Dawkins	26 November 2021	Initial draft
1.0	Bill Palazzi, Lisa Maclean, Steve Dawkins	28 January 2022	First version, updated to comments received

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Acronyms and Abbreviations

Acronym / Abbreviation	Meaning
ALCAM	Australian Level Crossing Assessment Model
ARA	Australasian Railway Association
ARTC	Australian Rail Track Corporation
ATMS	Advanced Train Management System
BITRE	Bureau of Transport and Regional Economics
ENCP	Enhanced Network Control Program
ETCS	European Train Control System
ETO	Electronic Train Order
IOS	interoperability Solution, particular referencing an emerging solution to enabling interoperability between ATMS and ETCS, as well as potentially other systems
NFRI	National Framework for Rail Interoperability
NRAP	National Rail Action Plan
NTC	National Transport Commission
NTCS	National Train Communications System
RAM	Reliability, Availability, Maintainability
RIM	Rail Infrastructure Manager
RISSB	Rail Industry Safety and Standards Board
RSNL	Rail Safety National Law
RSO	Rolling Stock Operator
SFAIRP	So Far As Is Reasonably Practicable
TMACS	Train Management and Control System
TOW	Train Order Working

1 Introduction

1.1 Background

The Australian rail network consists of a number of interconnecting local or regional networks, primarily constructed by individual states to serve their individual needs. Over time a more national focus has emerged, however different areas of the network continue to be managed by different entities.

In contrast to the localised nature of network managers, rail operations have in many instances become less localised with open access allowing operators to take advantage of business opportunities wherever they are found. Putting aside suburban services in major cities, a significant proportion of trips across the Australian rail network will involve operation across two of more networks.

Seamless movement of trains over network boundaries is therefore essential to the effective operation of the national rail network. The Bureau of Transport and Regional Economics (BITRE)[1] notes that greater alignment between networks may deliver benefits such as lower input costs, improvements in operational efficiency, higher inherent safety and lower training costs, and can also widen rail's freight market.

As a rule, investment decisions are made by Network Authorities with limited consideration of adjacent or operationally connected networks, and with limited consultation with operators – consultation is often focussed on the implementation of a decision already made, rather than on the decision itself.

The emergence of new network control systems poses a significant challenge to this model. Existing network control systems do not impose any requirement on operators to fit their locomotives with compatible equipment, however with many new systems this is no longer the case. A decision made by a Network Authority can (and often does) have implications for operators, adjacent networks and sometimes remote networks.

Ideally, these systems would be implemented in a way that would ensure that all trains can operate with maximum safety and efficiency across networks, whilst minimising the need for trains to carry multiple sets of onboard equipment for different networks.

Because of the integrated nature of rail operations across Australia, greatest efficiency of the network will be achieved with cooperation and integration between rail operators and rail network owners/managers, and between adjacent rail networks.

Implemented without coordination, this transition to new systems may mean that the benefits sought by each Network Authority are delivered, but corresponding national outcomes are compromised. Opportunities may be lost for efficiency gains, safety benefits are not realised, and higher costs are incurred by the rail industry, reducing the productivity of the rail industry and negatively impacting the rail industry's contribution as part of the national transport task.

1.2 The National Rail Action Plan

The National Rail Action Plan (NRAP)[2] has identified the need for more formal coordination and adoption of a system-wide approach to ensure investments in new rail technologies by

[1] BITRE, Report 114: Optimising Harmonisation in the Australian Railway Industry, 2006
[2] National Transport Commission, 2020

one party do not cause unforeseen consequences to other parties involved in the national rail network.

The Plan aims to implement changes to improve the delivery of rail infrastructure and to improve the safety and productivity of rail operations. An additional focus will be to create opportunities for manufacturers of rail equipment to supply rolling stock and components.

The plan supports improving the efficiency and safety of Australia's rail system by ensuring that people and goods can travel with minimal disruption across the rail network. There are two main points of focus:

1. To ensure we have the skills and labour required to build and operate the rail network; and
2. To improve the efficiency and safety of Australia's rail system by continuing to align or harmonise operating rules, infrastructure and operational standards and systems across the nation's rail network.

The plan is a collaboration between governments and the rail industry as each has a part to play in delivering the actions. Implementation of the plan is being led by the National Transport Commission (NTC).

Action 5B in NRAP tasked the Rail Industry Safety and Standards Board (RISSB) to develop a strategy to roll out an interoperable control system based on an investigation of technological options.

1.3 Background to the National Framework for Rail Interoperability (NFRI)

This work forms part of RISSB's response to Action 5B of the NRAP.

This work originated with a thought experiment. Current structures and legislation (including Rail Safety National Law (RSNL)) recognise the pre-eminence of each network and its Rail Infrastructure Manager (RIM) in making decisions related to that network. However, this approach ignores the reality that effective operations across the national rail network requires a national, joined up approach. The thought experiment posed this question: how would the rail industry approach questions of interoperability if it was managed as one single integrated network of RIMs/RSOs? For example, in that hypothetical scenario, the RSNL would expect industry to reduce safety risks So Far As Is Reasonably Practicable (SFAIRP) for the whole country rather than have rail companies only focussing on individual outcomes (which may not lead to optimal outcomes across interfaces).

The NRAP and the NRFI have been initiated in large part because of the significant challenge to interoperability that is emerging through the adoption of new train control technologies, and hence this document focusses on the issues surrounding these technologies – whether technical or otherwise (e.g., rules and procedures). However, interoperability encompasses a much wider range of issues than just these new systems – for example, rolling stock standards. It is anticipated that the structures and processes that emerge from this consideration of new train control technologies will also be applicable to the wider questions around maintaining and improving interoperability across the national rail network.

1.4 This document

This document has been developed as an explanatory paper to support the NFRI, which itself is set out in a slide pack entitled 'National Framework for Rail Interoperability (NFRI), Overview and discussion paper.' The two documents should be read in conjunction with each other.

This document provides additional narrative around the NFRI and sets out more information on how the NFRI can be applied by Network Authorities and other parties to address and improve interoperability across the Australian rail network.

1.5 A note on terms used in this document

The following terms are used throughout this document:

- **Network Authority** – the party that has effective decision-making accountability over each rail network, for example in the selection and application of new network control systems or other strategic decision related to the network.
- **Rail Infrastructure Manager (RIM)** – in accordance with RSNL, “the person who has effective control and management of the rail infrastructure” and is charged with accountabilities under RSNL for day-to-day safety of operations on a network.
- **Rolling Stock Operator (RSO)** or **Operator** – in accordance with RSNL, “the person who has effective control and management of the operation or movement of rolling stock on rail infrastructure” and is charged with accountabilities under RSNL for the safety of those operations. RSNL clarifies that the RSO should not be taken to be the individual train driver or signaller, but rather the entity accountable for the operation.

It is noted that, depending on the network, the Network Authority and the RIM may be the same party, may be related parties or may be separate parties with a contractual relationship.

2 The Problem

2.1 Why is interoperability an issue?

Australia's rail network has moved from historically servicing the interests of a collection of adjacent states, to being an important part of a national transport network. The efficiency and safety of the national rail network is critical to the ongoing productivity of Australia.

Without interoperability between systems and procedures across the national rail network, there is a risk of rail becoming inefficient and being ill-equipped to support Australia's transport needs.

The introduction of new rail control systems challenges current interoperability in the national network and supporting operations. It does this in three ways:

1. Impact on the legacy of multiple interconnected networks that form the national rail network
2. Lack of co-ordination of investment in new network control systems by Network Authorities
3. Assessment of investment in new systems is at a network level with minimal consideration of the wider impacts to operators or rail industry

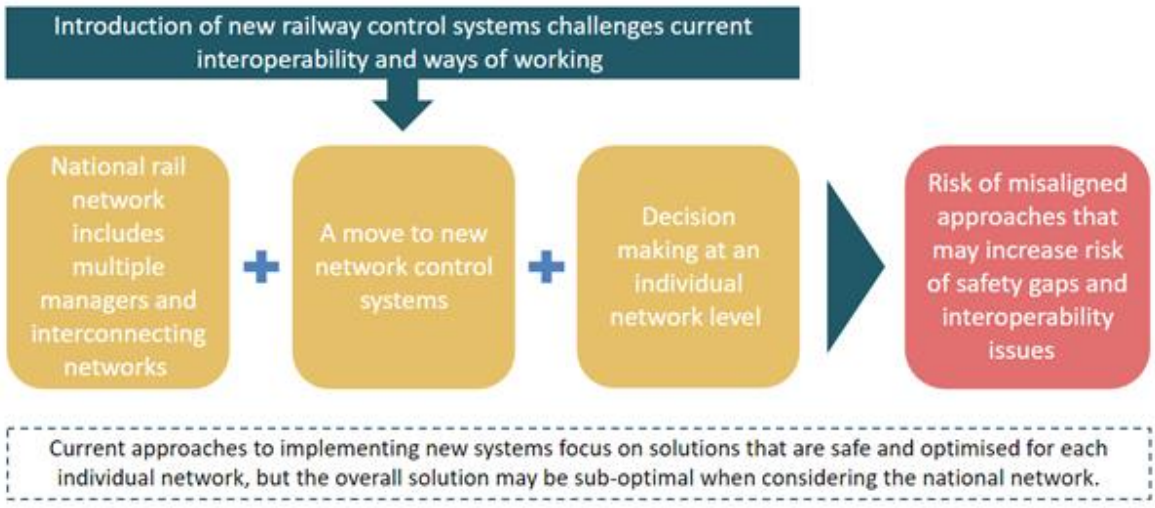

Figure 1 Pictorial of Interoperability Issue and the impact

The details of this diagram are explained in the sections below

2.2 A network of multiple interconnected networks

The Australian rail network is made up of several interconnecting networks, which in combination include:

- Around 32,900 km of track, the majority of which is operationally connected.

- 4 suburban networks as part of the connected network, plus the operationally separate Sydney Metro and TransAdelaide networks.
- 7 connected freight networks, plus the geographically separate Pilbara and Tasrail networks.
- 30+ business involved in above-rail operations, including freight and passenger.
- 3 gauges

Train operations, often owned by separate companies, frequently span several networks. These operators are impacted by the different networks established by Network Authorities and Rail Infrastructure Managers.

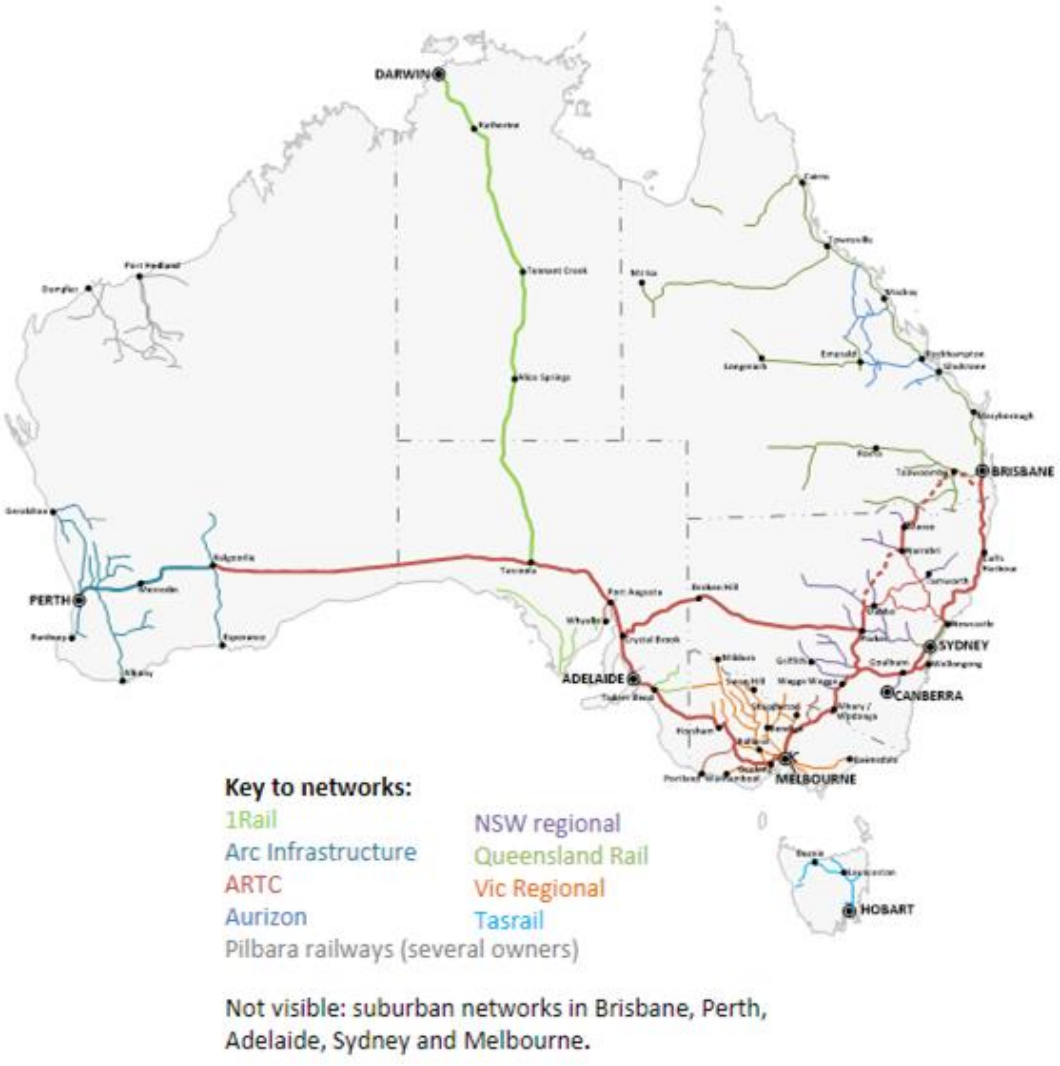

Figure 2 The Australian rail network

2.3 Investment by Network Authorities in new network control systems

The most pressing issue that may impact on interoperability across the national network is the emergence and implementation of a new signalling and control systems. This represents a significant change to railway operations and requires a major investment by railway network owners and train operators.

Many Network Authorities are moving to adopt new network control systems across their network. This is part of a wider international trend of increasing the use of the technology in railway operations to bring benefits of improved safety, capacity and cost savings.

Due to these trends, it is likely most other Network Authorities will also consider the introduction of such systems on their networks over coming years.

Existing train control systems use complex and expensive trackside infrastructure with no (or little) requirements for compatible onboard equipment. In contrast, new train control systems simplify trackside equipment but require compatible equipment to be installed trackside and on the trains. A lack of coordination in implementing these systems has the potential to negatively impact on the productivity and efficiency of the national rail network, and in increased costs to customers

2.4 Investment decisions are made at an individual network level

As a rule, investment decisions are made by Network Authorities with limited consideration of adjacent or operationally connected networks, and with limited consultation with operators – consultation is often focussed on the implementation of a decision already made, rather than on the decision itself.

This approach has been broadly acceptable to date, because existing network control systems do not impose any requirement on operators to fit their locomotives with compatible equipment (noting that softer requirements such as a need for retraining in rules changes do exist).

However, the emergence of these new systems means this separation is no longer the case. A decision made by a Network Authority can (and often does) have implications for:

- Operators, as they may be required to fit compatible equipment to locomotives,
- Adjacent networks, as issues around how a train transitions across a boundary must be resolved, and
- In some instances, remote networks where the same system has been deployed, leading to inconsistencies in implementation.

Implemented without coordination, this transition to new systems may mean that the benefits sought by each Network Authority are delivered (to an extent), but corresponding national outcomes are compromised. Opportunities may be lost for efficiency gains, safety benefits are not realised, and higher costs are incurred by the rail industry, reducing the productivity of the rail industry and negatively impacting the rail industry’s contribution as part of the national transport task.

3 Establishing a framework for interoperable decisions

3.1 Model for the National Framework for Rail Interoperability

To avoid uncoordinated decisions on systems and implementations leading to increasing un-interoperability across the national network, it will be necessary to achieve:

- An alignment of decision making with a national objective, supported by
- A baseline of system and deployment information so that decisions are well informed.

A model has been developed to provide clarity to the context within which decisions are made across the national rail network and the interfaces between them. This model aims to provide a better understanding of the key aspects at play within each domain and how decisions made at each level may affect the broader context.

The model draws on established structures and concepts for developing a safety argument and applies this thinking to the challenge of achieving interoperability across the national rail network. The model consists of three layers:

1. The **National Network Layer** which considers the issues of delivering a network at a national level which is interoperable across the different regional sub-networks. This layer sets out a set of principles that, if supported, will provide a foundation for an interoperable national network.

2. The **Deployment Layer** which considers how each Network Authority develops an argument for the specific region or network they take responsibility for. In developing the argument, choices are made that influence interoperability based on consideration of the principles for interoperability developed at the National Layer. Equally, decisions made by a Network Authority at this layer may impact other Network Authorities and their decisions.

3. The **Systems Layer** sits at the lowest level and supports the arguments above with specific systems and supporting information to show how these technologies can be shown to provide interoperable outcomes. The Systems Layer provides a basis for alignment on deployed solutions between networks but must also permit innovation and the adoption of newer and disruptive technologies.

Breaking down the problem into these different layers allows the specific concerns at each layer to be more clearly understood and more effectively resolved. The business environment within each layer is different, as are the key issues and challenges. Splitting out these layers also permits key principles to be defined for each interface, with the intent to guide the parties towards approaches that support interoperability whilst still permitting sufficient flexibility within each layer to address the specific challenge faced.

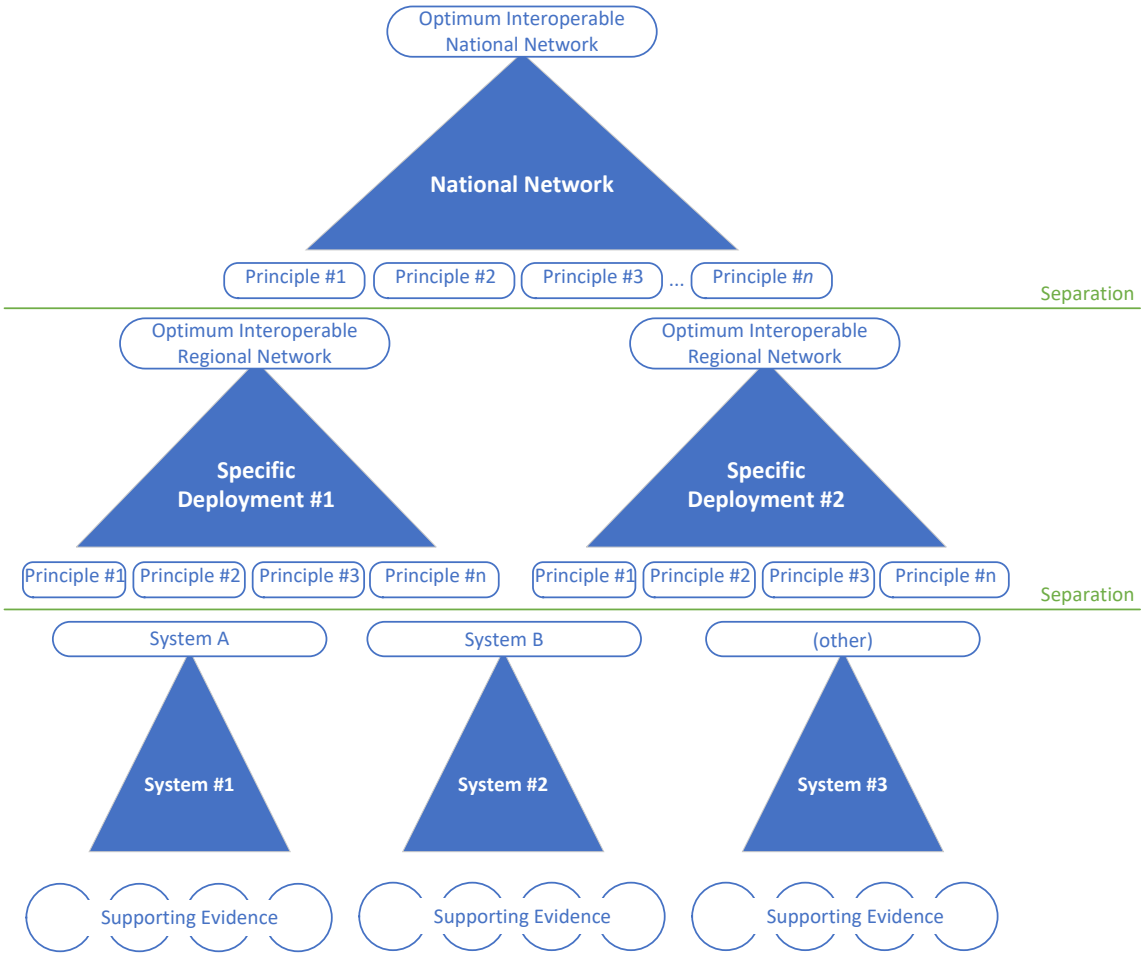

Figure 3 Model for the National Framework for Rail Interoperability

There are some specific benefits of the layer approach, including:

- **Managing complexity through clearly defined Interfaces**

A key concept behind the model is to break the problem into meaningful areas to allow complexity to be reduced and to permit better resolution of issues at each level. For example, at the national level the intent is not to try to address all the issues of managing a specific network, but instead to only highlight the underlying principles that, if respected and considered, would support interoperability to a greater degree than if each deployed network in each region acted completely independently. Similarly, at the lower technology driven layer the specific deployment arguments are less important than resolving how technologies can support the industry by providing interoperable functions or services.

- **Supports more targeted analysis**

Within the layered approach specific approaches can be adopted to assess interoperability at each level, specific to the problems, context and issues that will be dominant within that level. This would allow different tools to be suggested for

- **Allows better targeting of resources**

Specific resources can be deployed to address the different problems faced at each level. The issues at each layer are better defined and specific roles and competence can be deployed as required. Interaction can be better planned across layer be focussing on key roles within the model.

- **Provides a common baseline for all networks**

By establishing a common and interoperable baseline in the Systems Layer, proven and interoperable solutions are made available for all networks. This will reduce rework, encourage economies of scale and drive to more commonality of deployments across networks.

In terms of delivering an improved network the model focusses on key aspects:

1. Greater Efficiency – supporting the use of common ideas and leveraging key technologies and innovations to deliver benefits across the national network

2. Greater Safety – improving the maturity of arguments at each level, focussing on the key issues rather than attempting to resolve all aspects of the model in one place and gaining better understanding of systems and assets deployed in different territories through a more mature basis for exchanging ideas

3. Reduced costs – motivating greater economies of scale through direct and pro-active support for interoperability

The layered model and the description above is a simplification as the layers do depend on one another. Whilst the idea is to provide separation and allow the layers to work together, this is unlikely to be seamless in practice and greater understanding of the model can be developed by highlighting some of the challenges that will likely emerge within the structure. These may include:

- Confusion surrounding the National Layer principles. Since the principles do not prescribe or mandate specific solutions for the lower levels, they are open to interpretation. This may mean inconsistent understanding of what a national level principle is intended to convey.

- Inconsistencies across deployed networks. Deployed networks require the flexibility to develop a network to meeting the challenges of the specific area they cover. This may mean different choices are made that are not always consistent with other deployed networks. Where this complicates an interface (such as a service traversing to other areas) then the impact of this may be to compromise interoperability.

3.2 The National Network Layer

3.2.1 What is the National Network Layer?

The National perspective is currently absent from decision making when Network Authorities and RIMs are making decisions on investing in network control systems. As noted above, decision making largely rests with each Network Authority, and with little that encourages Network Authorities to consider impacts beyond their networks – in fact, current structures often do exactly the reverse.

The National Network Layer of the NFRI bridges this gap defining national objectives and principles, which can be used to guide investment consideration in network control systems in order to encourage greater interoperability and better outcomes.

The National Network Layer builds on the current interoperability work being led by the NTC, in response to the National Rail Action Plan, and expands that work into a set of principles intended to guide Network Authorities in making decisions.

3.2.2 Vision for Interoperability

The National Rail Action Plan (supported by the NTC Interoperability Steering Committee) has defined the vision for rail interoperability to be:

Passengers and freight will move seamlessly and safely between major cities and regions on a modern, integrated and productive rail network that works as one interoperable system [3]

The outcome of a safe and productive national network was of primary importance to the Committee, along with the following goals:

- Rail moves more passengers and larger volumes of freight across Australia's major cities and freight routes, with seamless connections between existing and new rail investments.
- Drivers will have a single interface on all major interconnected rail lines in Australia with a new generation of train signalling and control systems able to talk to each other.
- Harmonised rule books will support streamlined operations, greater interoperability and remove unnecessary duplication.
- Australia's supply chains and exports will flow better through the efficient movement and uninterrupted rail services that connect with the nation's ports.

3.2.3 National Interoperability Objectives

Using the interoperability vision as a guide, three interoperability objectives have been defined for the national level of the framework:

1. Be as safe as reasonably practicable
2. Enable operations to be as efficient as possible
3. Maximise the productivity of the rail industry

These three objectives are explained further in Table 1 below:

[3] Source: NTC

Table 1 National Interoperability Objectives

The National Rail network must:		
1.	Be as **Safe** as reasonably practicable	Safety is the number one priority for rail networks and operators, but what is 'reasonably practicable' may vary from location to location given the characteristic of that portion of the national network. The network authority holds accountability for this evaluation. Regardless of what decision is made, the interoperability objective is that all trains operating on that corridor are operating to the maximum level of safety that is reasonably practicable on that corridor.
2.	Enable operations that are as **Efficient** as possible	Different areas of the network have different requirements for efficiency, with the most highly trafficked lines demanding higher levels of efficiency than more lightly trafficked corridors. Decisions on network improvements to improve efficiency often involve the network authority / RIM, as well as operators. The interoperability objective is that all trains operating on a corridor are operating with the maximum level of efficiency possible on that corridor, given the context (e.g., a regional line with only one train service a month).
3.	Maximise **Productivity** of the rail industry	Decisions on systems and strategies to be applied on each network are made by the network authority for that network. These parties have the right to make decisions they see as in the best interest of their network and business. However, these decisions should be made with due consideration of the impact of that decision on the national rail network, with the objective of improving overall productivity and minimising costs – particularly to industry players not party to the decision being made.

3.2.4 Key considerations

In analysing how the vision and interoperability objective can be translated into principles that will guide and align decisions by Network Authorities, three key considerations were identified related to the nature of the national rail network and the rail industry.

1. **Even ignoring network boundaries, different areas of the network must meet different needs – leading to different solutions**

   With systems available in the marketplace, it is currently not feasible to satisfy the diverse needs to the entire national network with one solution (noting that this may become more feasible over time).

   However, network similarities may mean that the same systems can satisfy needs in geographically diverse areas, where the operational and infrastructure characteristics are comparable.

2. **Greater co-operation and coordination between Network Authorities can improve the productivity of the national network, support innovation and avoid future interoperability issues**

   Australia is a small rail market with limited competition at the rail infrastructure level. Each network operates in a particular geography and forms part of the nationally connected rail network services.

   By nature, this means that networks do not, as a rule, compete against each other: there are very limited examples where one network is able to offer a service (i.e., a rail corridor) that is a credible alternative to another network's offering. However, by co-operating there is an opportunity to drive costs down through co-ordinated investments, providing economies of scale benefits for the industry and reducing duplicated effort.

This means that the overall good of the industry will be enhanced with Network Authorities and RIMs working together where appropriate to limit the impact the of system investments on operators by:

- Minimising costs passed on to operators and hence maximise competitiveness of rail vs other modes.
- Reducing barries to entry for new operators / routes.
- Fostering competition between suppliers.
- Encouraging innovation where possible.

3. An operational interface does not require network adjacency

An operational interface between two networks exists when trains commonly travel between the two networks, whether directly (i.e., the networks are adjacent) to indirectly (via another network).

When an operational interface exists, decisions on one network may have interoperability implications for the other network. These implications need to be considered as decisions are made by each network authority.

3.2.5 National principles for interoperability

Aligning the vision and interoperability objective with the considerations discussed above, this work has defined six draft principles for further discussion and assessment to implement this framework. These are set out in Table 2, along with the rationale for each principle.

Table 2 National principles for Rail Interoperability (for consideration)

Principle	Rationale
Ensure decisions are aligned with the national interoperability objectives.	Currently decisions regarding new systems largely involve Network Authorities considering their own network requirements in the absence of how it fits with the wider national network. By aligning investment decisions with the interoperability objectives of Safety, Efficiency and Productivity defined in this framework there is an opportunity for investments to support the building of the national capacity and capability of the railway. This allows network decision makers to consider beyond the network or state boundaries to support national outcomes rather than improvements at an individual network level.
Strive for seamless services by considering network adjacency plus operational interfaces when making system decisions.	A key outcome of interoperability, which is encapsulated in the NTC vision, is seamless services. Technology choices and the implementation of systems will impact on Safety, Efficiency and Productivity of the rail industry, and the objective is to make transitions between systems and networks seamless for operators. Importantly, a train's entire journey must be considered when making interoperability decisions. Seamless operations should not only be the objective when crossing between adjacent networks but also considering non-adjacent networks where there is an operational connection.

Principle	Rationale
Adopt common solutions where possible and suitable (technologies plus rules plus competencies) to reduce duplicated effort and improve economies of scale benefits.	When it comes to purchasing control systems technologies, Australia has a relatively small railway market. There is also limited capacity and depth in the Australian market to develop and support multiple systems, and this issue is exacerbated if adaptations of commercially available system are necessary to support national interoperability. Greater efficiencies for the national rail industry will be achieved if, where possible, common, interoperable solutions are re-used rather than new systems than perform similar functions but do not provide interoperability. Adopting common solutions where possible would improve economies of scale and potentially drive costs down, as well as providing a better basis for ongoing capability enhancement and skill development.
Identify any wider implications of an initiative and agree a plan with any impacted party prior to committing to that initiative.	Implementation of a new system, or modification of an existing system, can have significant impacts on parties beyond the Network Authority responsible for the initiative. These impacts extend to operators, adjacent networks and other parties. Currently, Network Authorities develop investment cases for systems or initiatives often with minimal or limited assessment of the wider interoperability impacts, and with little consultation on how those impacts will be addressed. However, to ensure the total cost of the initiative is understood, and impacts should be identified and assessed, and a plan for addressing the impact agreed with the impacted party, before an investment decision is made.
Any new technologies are developed with consideration of national interoperability and potential wider industry application.	Whilst it may be useful and desirable to adopt existing interoperable technologies in many instances, in some circumstances this may not be a Network Authority's preferred way forward. Equally, the need to innovate and introduce new concepts and systems will mean that new technologies will constantly be introduced to the National rail network. In these instances, the national interest is best served if the new technologies are developed in a way that supports interoperability, and with the potential for wider industry application in mind. In this way the benefits of the new system can be enhanced and provide greater outcomes of the national rail industry. Note that the development of new technologies with wider industry application in mind does not negate the rights or developers or system owners to a commercial return for that wider application.

3.3 The Systems Layer

3.3.1 What is the Systems Layer?

The Systems Layer provides a base level of information about systems and solutions that have been or are being deployed, to make that information available to other railways and Network Authorities for use on their networks.

The Systems Layer is a critical support to the Strategic Layer, in that it is only by making system information generally available that other Network Authorities can leverage off previous investments and initiatives, and that industry can achieve economies of scale and avoid unnecessary duplication of effort.

Equally, the Systems Layer provides vital information for Network Authorities making system decision in the Deployed Layer, in that it sets out the suite of proven, established and interoperable system options in use across the network. Equipped with this information, the

Network Authority can make decisions on systems and processes, informed of the interoperability implications and options.

The Systems Layer could be considered a database or library of system information, albeit the nature of this repository of information is to be determined. Systems Layer information is not necessarily held in one place; the information could be a reference to information in existing standards, suppliers' websites, etc. Regardless of form, the Systems Layer is a consolidated record of systems and solutions in use across the national rail network, with an interoperability focus.

Making information apparent to Network Authorities via the Systems Layer does not compromise any commercial rights of the supplier, licence holder or others for the use of the technology.

3.3.2 System information and evidence within the Systems level

The Systems level:

1. Includes information on systems from the supplier or manufacturer, plus information on the application of the system by RIMs
2. Demonstrates how the technology is intrinsically safe and functional, when applied within the design boundaries.
3. Identifies exported constraints to be addressed externally to the system.

Importantly, the Systems Layer includes not only system information that would typically be available from suppliers, but also includes application information that addresses how the system has been deployed in Australia. This enables other Network Authorities to be fully informed on the system and enables any further deployments of the system to be fully aligned with (and hence interoperable and harmonised with) existing applications.

Typical information that should be available via the Systems Layer focusses on information about a system that impacts either

- the outcomes achieved by the Network Authority in application of the system,
- the experience of users in operating though the system, or
- Any interoperability issues or solutions that are available

This may include:

- System objectives and operating parameters.
- Standards.
- RAM performance
- System specifications.
- Operating rules.
- Application notes.
- Exported constraints.
- Support and upgrade pathway.
- Interoperability issues and solutions

3.3.3 Establishing and managing the Systems Layer

The Systems Layer should ultimately address all systems that are being (or have been) implemented and/or are being actively developed as part of a Network Authority's future technology direction – in particular where these systems have requirements on operators to use in-cab equipment, or have interoperability implications.

Candidate systems that would form part of the Systems Layer from the outset include:

- Advanced Train Management System (ATMS) – in development by ARTC,
- European Train Control System – in development by both Transport for NSW and Queensland Transport and Main Roads,
- The Electronic Train Order (ETO) system being implemented by VLine,
- The TMACS TOW system in place in regional NSW,
- potentially, some components from the Enhanced Network Control Program (ENCP) being implemented by Arc Infrastructure.

It is not proposed that the Systems Layer need reference existing, legacy systems; including the various forms of lineside signalling in use around Australia, token systems or legacy Train Order Working systems that are planned to be replaced by more modern systems.

3.3.4 Augmenting the Systems Layer with new initiatives

Over time, the Systems Layer would be augmented and updated as required so that its currency is maintained as a consolidated record of interoperable systems and solutions in place across the national rail network.

Additions to the Systems Layer would normally arise from:

- Modifications to a system that is already deployed (and hence already included in the Systems Layer), to provide new capability or other modification, or
- Decisions by a Network Authority to implement a new system – including addressing and resolving any interoperability issues inherent in that decision (see below).

New additions to the Systems Layer may also arise out of coordinated research, e.g., through a research / innovation lab, where new ideas can be developed and be assessed in line with the other layers and responding to specific industry needs.

Because the Systems Layer reflects systems in use across the network, it is driven by Network Authority decisions rather than market developments. A new system or solution developed in the marketplace would only be added to the Systems Layer when it was selected for deployment by a Network Authority.

3.4 Tools to support the interoperability framework

A number of tools have been identified to support the National Framework for Rail Interoperability. These tools are listed in Table 3 and collectively aim to:

- Provide Network Authorities with clear guidance on how to consider interoperability issues when making decisions around future system choices and their implementation, and
- Enable consistency and defendability in decision making by separate Network Authorities by providing a common framework to assess system needs and interoperability issues.

A number of these tools are already in existence and can be reused or expanded to support the National Framework for Rail Interoperability. Others require development. It is not intended that all tools need to be developed prior to establishing the framework. Rather, tools can be developed or enhanced, and additional tools identified, as required to support and encourage Network Authorities to address interoperability issues.

Tools are applicable to different levels of the National Framework for Rail Interoperability, as shown in Table 3 as follows:

- **Tools to assist at the National Layer:** these tools aim to set out a nationally consistent approach to identifying and addressing interoperability issues, to support Network Authorities as they make decisions related to new systems or ways of working.
- **Tools to assist at the Deployment Layer:** to encourage consistency and defendabilty in decisions made by separate Network Authorities, where similar circumstances apply in different networks.
- **Tools to assist at the** Systems **Level:** to provide a common approach to understanding and deploying systems, and to provide a basis for interacting and innovation.

Table 3 Tools to support the Interoperability Framework

Tool	What	Why
Tools to assist at the National Network Layer		
National Network for Interoperability	Defines those areas of the national network where high levels of interoperability are most critical for efficiency of the national network.	To provide a focus for interoperability considerations.
Interoperability register	Provides summary information of relevant initiatives underway in all jurisdictions. Outlines any known interoperability impacts, and any solutions existing or in development that may be of value to a new initiative. Provides information on all operational interfaces between networks that must be allowed for in the assessment.	To provide a baseline of information for an interoperability assessment.
Standard form of interoperability assessment	Provides guidelines for an interoperability assessment to be used when developing a new initiative, to ensure commonality of assessment approach and completeness of the assessment. The Interoperability Assessment Framework may be published as a standard.	To ensure consistent and thorough assessment of the interoperability impacts of an initiative.

Tool	What	Why
Tools to assist at the Deployment Layer		
Corridor assessment tool	A standard tool to assess corridors and determine appropriate treatments, envisaged as comparable in function to the Australian Level Crossing Assessment Model (ALCAM). The corridor assessment tool would consider: • Corridor characteristics • Operational factors • Solutions available • Influencing decisions by adjacent networks or operators	To assist to achieve defendable safety outcomes on comparable corridors across Australia.
Tools to assist at the Systems Layer		
Performance specifications and application notes for nationally consistent solutions	Agreed specifications for each of the systems in use on the national network. • ATMS – establish an agreed baseline for use by any interested network • ETCS – reference ERA standards, potentially 'local application notes' to ensure alignment not deviation • TOW – develop a performance specification to maintain competition amongst suppliers but ensure systems are functionally equivalent	To make alignment between solutions possible.
Interface specifications	Define standard interfaces, e.g.: • Interlocking to ATMS interoperability solution (IOS) – to ensure future suppliers can interface to the ATMS onboard via the IOS. • Interface to NTCS for data transmission (e.g., authority data)	To allow multiple jurisdictions and multiple suppliers to interface to other systems, to encourage innovation.
National rules	Consistent agreed safeworking rules and signalling principles for the application of one class of system (ATMS, ETCS, TOW, other?)	To reduce the burden of training and competencies on operators; to ensure consistent (best?) practice for any application of a system.
National competencies	Consistent agreed rules for the application of one class of system (ATMS, ETCS, TOW, other?)	To reduce the burden of training and competencies on operators.

4 Decision-making with interoperability in mind

4.1 The Deployment Layer

The National Network Layer and the Systems Layer exist to provide context and support for decision-making by Network Authorities in the Deployment Layer, so that interoperability considerations can be properly assessed and incorporated.

In many ways the Deployment Layer reflects the existing decision-making process used by Network Authorities to initiate and enact changes to their networks, which will be characterised by:

- Strategic assessment of needs
- Option analysis, including market sounding
- Business case and funding decision

Decisions related to each network remain the prerogative of the Network Authority. However, with respect to decisions that have implications for interoperability The National Framework for Rail Interoperability seeks to envelope this decision-making process with considerations and information that will encourage an interoperable outcome, as follows:

Table 4 Alignment between Network Authority decision processes and the National Framework for Rail Interoperability

Decision step	Influence of the National Framework for Rail Interoperability
Strategic assessment of needs	Strategic assessment is informed by the national perspective and aligned with the National Principles for Interoperability.
Option analysis, including market sounding	Existing interoperable options and solutions are evident and available for further deployment. Implications of novel initiatives can be identified and assessed against established options.
Business case and funding decision	Analysis of the project scope and requirements are fully informed on interoperability implications and requirements, plus allocation of responsibilities between impact parties. Project costing can address all works required.

4.2 Responding to the National Network Layer

The National Network Layer sets out the strategic national objectives with respect to interoperability, as well as the principles to be applied in decisions made by Network Authorities to ensure that the strategic objectives (i.e., greater interoperability) are achieved.

The objective of the National Framework for Rail Interoperability would be that any decision by a Network Authority that has interoperability implications can be shown to be aligned with the national principles for Rail Interoperability, as shown in Table 2:

1. Ensure decisions are aligned with the national objectives.
2. Strive for seamless services by considering network adjacency plus operational interfaces when making system decisions.
3. Adopt common solutions where possible and suitable – this means technologies plus rules plus competencies - to reduce duplicated effort.
4. Identify any wider implications of an initiative and agree a plan with any impacted party prior to committing to that initiative.
5. Any new technologies are developed with consideration of national interoperability and potential wider industry application.

4.3 Using and building the Systems Layer

The Systems Layer provides a foundation to allow Network Authorities to fully understand any interoperability considerations related to each deployment decision, and hence to make decisions in line with the national principles.

With respect to the application of a new system or way of working, a Network Authority has two primary options:

1. Select and deploy

A Network Authority may select and use one of the established, defined and interoperable solutions (principle 3 above). This option carries the constraint of needing to align with an established system and the associated ways of working, but also carries the benefit of importing any established interoperability solutions and arrangements. Where a suitable solution exists within the Systems Layer, further deployment of that system may be the most cost-effective and least impactful options when viewed from a national network perspective.

2. Develop and add

If no existing solution is appropriate for the Network Authority's needs, the Network Authority may choose to develop and implement a new solution. Under this option the Network Authority would be accountable for identifying and resolving any interoperability issues created by the decision, including issues created for any other impacted party (principle 4 above).

If a Network Authority chooses this option, ideally the new solution is developed with consideration of national interoperability and potential wider industry application (principle 5) then is 'added' to the Systems Layer for use by others as required – subject to any commercial rights of the supplier, licence holder or others for the use of the technology.

In many situations, decisions on new systems or modifications are made in conjunction with a procurement process, where an overriding concern is to demonstrate that value for money is achieved and that the necessary rules are followed. A critical competent of this evaluation is to include the scope and cost of developing any necessary interoperability treatments as an integral part of analysing each option. In this way the implications of a novel solution can be properly weighted up against the reuse of an established solution. This analysis is informed by the Interoperability Register and the Interoperability Assessment (see Table 3), as well as the information contained in the Systems Layer on existing systems and interoperability solutions.

4.4 Considering interoperability in the SFAIRP assessment

An integral part of any network change is to demonstrate how the decision assists the Network Authority to meet its obligations under RSNL- that is, to reduce risks SFAIRP. As noted previously, current processes tend to lead to a focus on outcomes for individual networks, which may not lead to optimal outcomes across interfaces and may not result in an outcome that is demonstrably safe SFAIRP when considering the national network.

Consideration of interoperability, and the national network, will require a wider SFAIRP analysis. As noted previously, a decision made by a Network Authority can (and often does) have implications for operators, adjacent networks and, in some instances, remote networks. For example, if the same system is implemented in slightly different ways in two different networks, this is arguably a less safe outcome than if the implementations are identical.

For completeness, to appropriately address interoperability a SFAIRP assessment will need to consider risks related to the decision:

1. Within the subject network,
2. Within adjacent networks and/or operationally connected networks, and
3. At the interface with other networks.

In addition, for completeness the SFAIRP assessment will need to consider:

- Outcomes for all network users, not just the dominant or majority user, and
- All available options for achieving interoperability.

4.5 Applying the National Framework for Rail Interoperability to assist decision-making

Figure 4 illustrates how the tools of the National Framework for Rail Interoperability work alongside a typical decision-making process to highlight options and bring interoperability issues to the fore. This flow-chart reflects the decision process that a Network Authority may go through when identifying and making a change to network control systems, including selecting and deploying a new system.

The tools and structures provided by the National Framework for Rail Interoperability may also be used by other rail entities to understand, identify and address interoperability issues. As an example, Figure 5 provides a flow chart that may be used by an operator considering changes to their service offering or routes. The Interoperability Register provides ready information about any interoperability challenges (or solutions) that may be experienced with the new routes, and the governance arrangements (discussed below) provide a forum in which issues can be addressed.

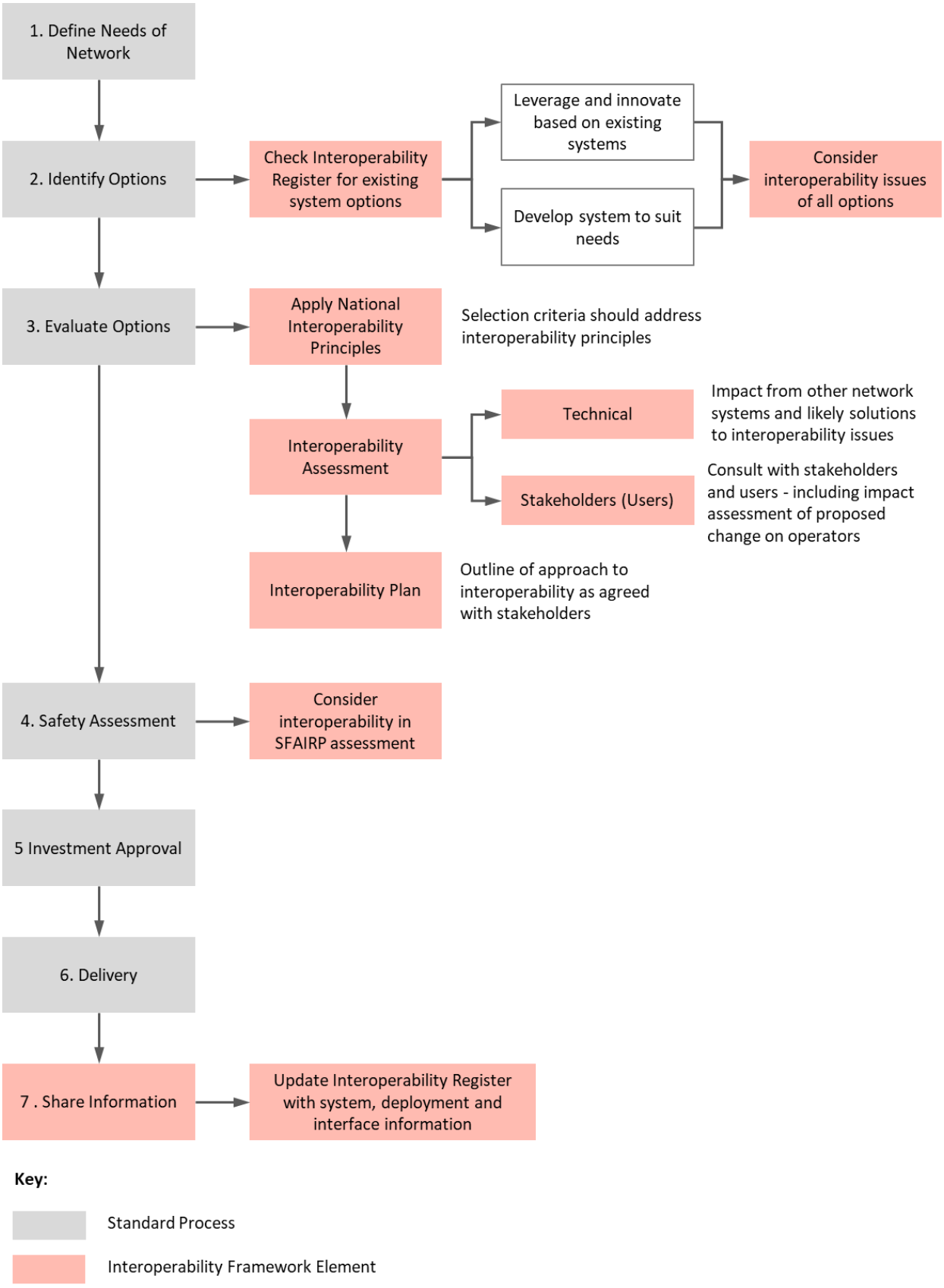

Figure 4 National Framework for Rail Interoperability steps alongside the decision-making process

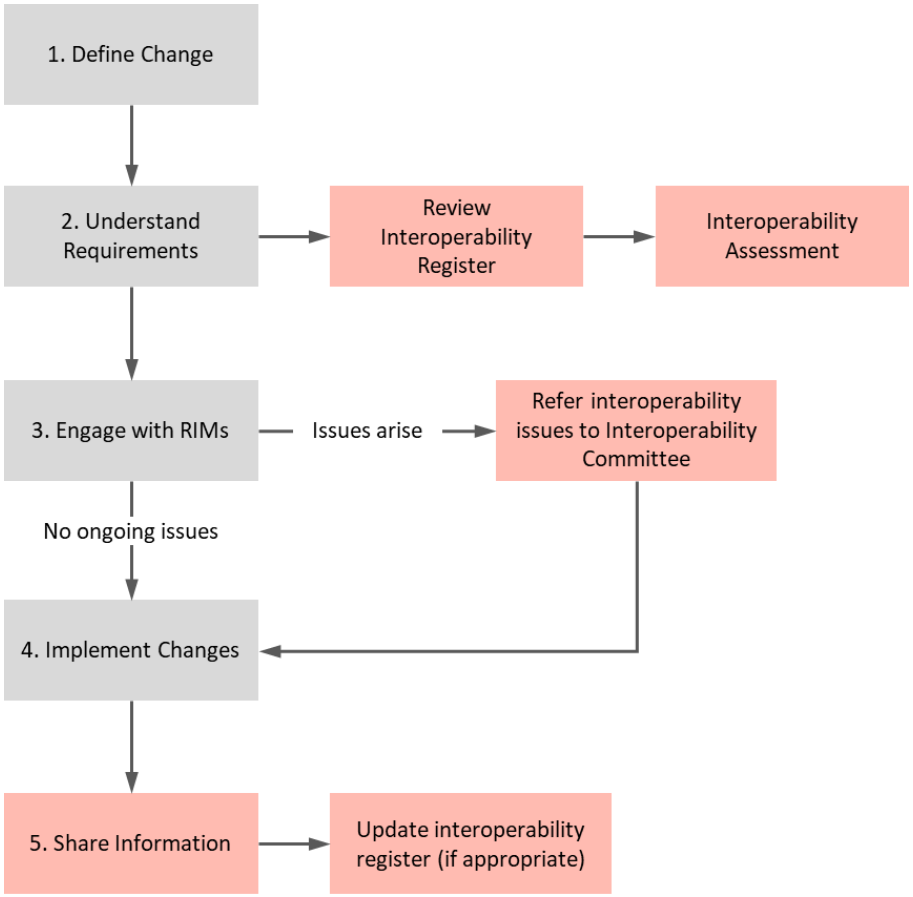

Figure 5 Using the National Framework for Rail Interoperability to assess the implications of an operational change

5 Governance of the National Framework for Rail Interoperability

A range of work has been undertaken by others to identify the optimum governance model to manage and address current and future interoperability issues. This paper does not attempt to revisit this work. The comments below are intended only to set out some thoughts on how governance of the National Framework for Rail Interoperability can be implemented and critical elements to be considered.

5.1 Governance group purpose

A National Interoperability governance group is envisaged, that:

1. Owns the top-level national network interoperability objective and principles,
2. Oversees the development of the Systems Layer,
3. Owns and manages the tools, and
4. Works to get alignment between initiatives of separate Network Authorities.

5.2 Governance group membership

To be effective, membership of the governance group should include the responsible for decisions that impact interoperability, plus other parties impacted by those decisions or that can form part of the solution. An initial view is that this includes the following parties:

Table 5 Parties to the governance of the Interoperability Framework

Parties	Interest
NTC	Chair, coordinate to ensure the outcomes and direction are aligned with the national interest of an efficient, safe and productive railway network.
Network Authority	Must include all Network Authorities with a presence on the National Network for Interoperability. Is and will remain the decision maker for their networks. Key issue is to get coordination between those decisions NFRI will not supersede the Network Authority decision making ability, but need to influence for the good of the national network
Operators (RSO)	Interested parties – the 'recipient' of any decisions for good and bad Act as a sounding board of what is a good outcome for the industry – if it works to make operations better, that is a good outcome. Attends the forum to view proposals, offer their perspective and ensure that all initiatives are aligned in a cogent direction.
RISSB, ARA	Observers, each with a specific area of interest. May take on actions from the NICG in order to progress interoperability initiatives.

5.3 Establishing governance – the initial meetings

The governance group would be established under a Terms of Reference that sets out the commitments and expectations of all parties in relation to interoperability.

Initial meeting would be focused on gaining agreement across all parties on the functioning of the group and on key points of the framework, as follows:

- Meeting 1: Review National Framework for Rail Interoperability, discuss Terms of Reference and expectations on members
- Meeting 2: Agree Terms of Reference and expectations on members, discuss Strategic objective and National Principles (National Network Layer)
- Meeting 3: Agree Strategic objective and National Principles, discuss establishment of Systems Layer and Tools including prioritisation and timing.
- …
- Meeting x: Discuss any new proposals by Network Authorities with interoperability implications, discuss any interoperability concerns by operators, review status of Systems Layer and development of Tools.

5.4 Managing decisions

For the governance group to be effective in steering towards interoperability over the national rail network, it must be able to influence decisions made by any individual Network Authority so that interoperability is considered and addressed in any new proposal.

Key to this will be:

- All parties maintaining the currency of the Interoperability Register with information about their network or operations, so that a robust interoperability assessment can be conducted.
- The proposing party undertake a thorough Interoperability Assessment against the identified items in the Interoperability Register, including identifying any potential interoperability issues or solutions and providing this to the governance group.
- All members of the governance review the proposal and provide feedback, including the acceptability of any interoperability issues or solutions proposed.
- Agreement being reached between all parties on the way forward with the proposal prior to commitment by the proposing party