National ITS Architecture, FRAME Content Mapping

20 June 2017

Austroads

Today’s moderator

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About Austroads

The peak organisation of Australasian road transport and traffic agencies

- Roads and Maritime Services New South Wales
- Roads Corporation Victoria
- Department of Transport and Main Roads Queensland
- Main Roads Western Australia
- Department of Planning, Transport and Infrastructure South Australia
- Department of State Growth Tasmania
- Department of Transport Northern Territory
- Transport Canberra and City Services Directorate, Australian Capital Territory
- Commonwealth Department of Infrastructure and Regional Development
- Australian Local Government Association
- New Zealand Transport Agency

Housekeeping

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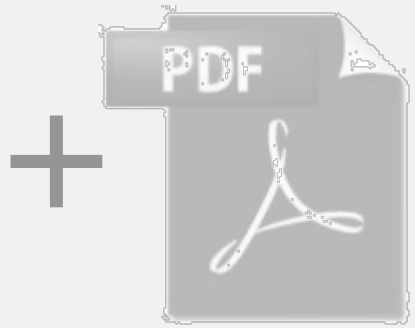
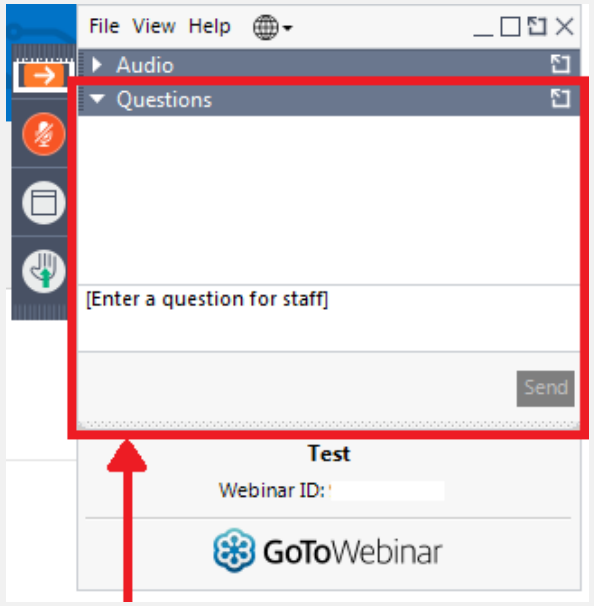
Presentation = 35 mins

Question time = 15 mins

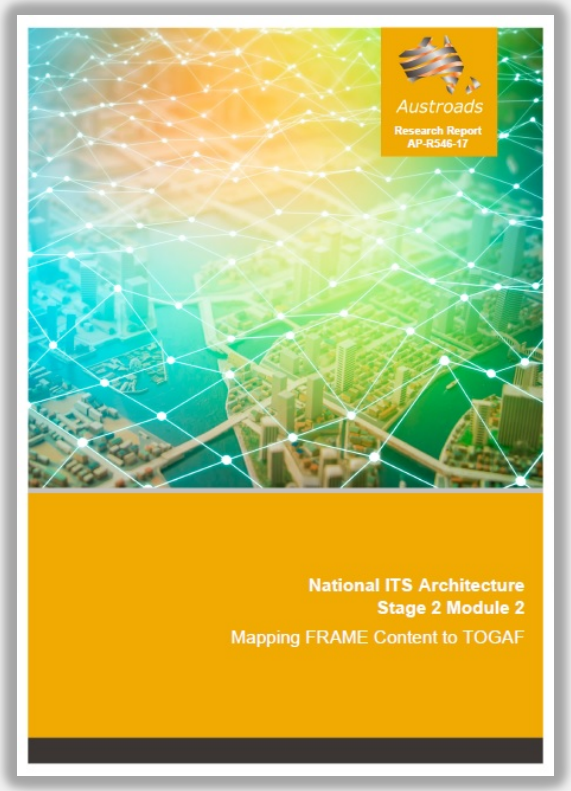


GoToWebinar



Please type your questions here

Austroads Reports



Download from the Austroads website:

http://www.austroads.com.au/road-operations/network-operations/national-its-architecture

Today’s presenters

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National Practice Manager
Technical Services
Integral Technology Solutions

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E: wsweeney@integraltech.com.au

Agenda

The journey so far

An introduction to FRAME

Understanding the NIAF approach and Meta Model

Mapping FRAME content to NIAF

Accessing and using the NIA Content

NIAF next steps

Introducing NIAF

NIAF Benefits

- Provide a national ITS architecture which
  - leverages international ITS architecture and framework
  - is contextualised for Australia
  - supports more efficient development of interoperable ITS solutions,
  - supports more competitive innovative and open marketplace to
  - increases effectiveness of ITS services to customers.
- Enables greater collaboration through a common language and framework
- Can encourage and leverage national information / data concepts

The (Recent) Journey

The transition plans (Q1 2015)

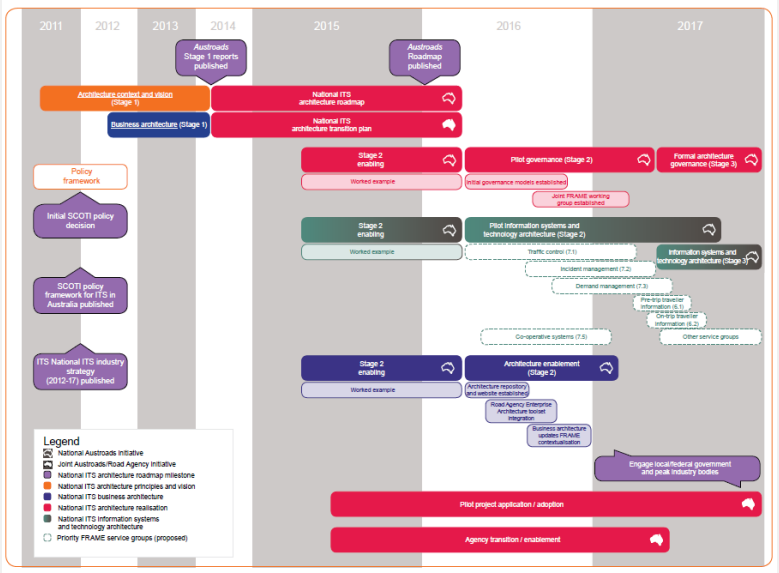
- Supporting architecture alignment nationally

The NIAF enabling work (Q2-3 2015)

- Established a sample set of architecture models to support agency transition planning and execution (Traveller Information Scenario)
- Initial FRAME Mapping
- Direction on Meta-model Mapping and further architecture stages

Complete FRAME content mappings (Q2 2016)

- Confirmation of FRAME to NIA Meta-model alignment
- Mapping of all applicable FRAME content
- Content exports for external NIA content use
- Additional clarity on future architecture development



Important things to know

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Context

- FRAME is better aligned at NIAF's Information Systems level
- Stage 1 documents require realignment
- NIAF will drive value with a strong focus on business motivation and business architecture

NIAF is

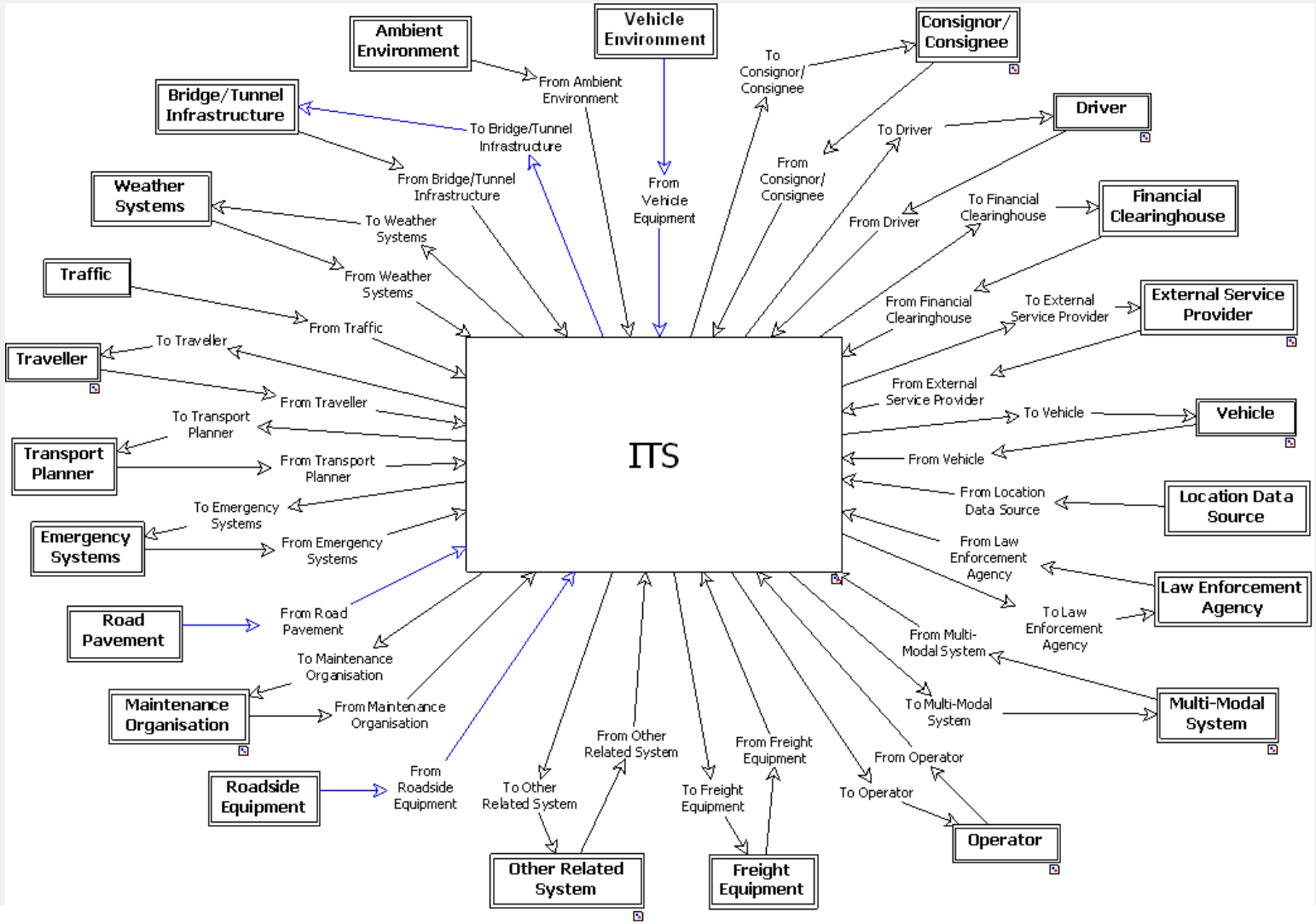
- A reference architecture
- Based on the FRAME function and user need definitions
- Extends FRAME to incorporate business models
- Includes guidance on adoption/use

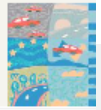
NIAF is not

- Prescriptive
- A solution architecture

Introducing FRAME

The FRAME Content





ITS
Context Diagram
Functional Area Diagram (DFD0)
1. Provide Electronic Payment Fac
2. Provide Safety and Emergency
3. Manage Traffic
4. Manage Public Transport Opera
5. Provide Advanced Driver Assist
6. Provide Traveller Journey Assis
DFD 6. Provide Traveller Journ
Functional Tree of Area 6
6.3 Support Trip
6.5 Prepare Trip Plan
DFD 6.5 Prepare Trip Plan
6.5.3 Trip Planning
DFD 6.5.3 Trip Planning
6.5.3.10 Obtain Data fo
6.5.3.11 Provide Green
6.5.3.12 Provide Trip Pl
6.5.3.13 Provide Data
6.5.3.3 Collect PT Data
6.5.3.7 Enable Operato
6.5.3.8 Collect Data Ab
6.5.3.9 Plan Trip Detail
6.5.6 Make Bookings and P
6.5.7 Provide Traveller with
6.5.8 Enable Final Approva
6.6 Provide Traveller Informat
6.7 Manage General Trip Prefe

Low Level Function
6.5.3.13 Provide Data & Routes to Fleet Operators & Drivers

Overview

This Function shall provide data and routes to functionality serving Fleet Operators and Drivers at their request and contribute information about freight and hazardous goods that may be relevant to general trip planning. The data that can be requested by Fleet Operators and Drivers shall comprise specific items such as pollution, traffic and weather conditions, for which the Function shall obtain the current values from the store of Road Trip Planning Data. When data is received from the Manage Freight and Fleet Operations functionality, it shall be stored in the store of Road Trip Planning Data by the Function. On request from functionality connected to the Freight Operator and Hazardous Goods Vehicle Driver the Functions shall prepare routes using the parameters provided in the request and data from the store of Road Trip Planning Data.

Functional Requirements

(a) continuously monitor for receipt of the freight and hazardous goods information plus on-board information and requests data flows
(b) when either of the data flows in (a) is received, send their contents to the store of Road Trip Planning Data in the data flow containing store ffm and hazardous goods data
(c) continuously monitor for receipt of any of the "request....situation" data flows
(d) when any of the data flows in (c) is received, obtain the required data from the store of Road Trip Planning Data using the data flows called store ffm and hazardous goods data and retrieve road situation data
(e) when the data in (d) has been retrieved, send it back to the Manage Freight and Fleet Operations (mffo) functionality that requested it using the "answer....situation" data flow that corresponds to the request
(f) continuously monitor for receipt of the route optimisation request data flow from the Manage Freight and Fleet Operations (mffo) functionality and the hazardous goods vehicle route request data flow from the Provide Support for Cooperative Systems (pscs) functionality
(g) when either of the data flows in (f) is received, prepare a route according to the parameters contains in the request and data that is retrieved from the store of Road Trip Planning Data using the data flows called store ffm and hazardous goods data and retrieve ffm route planning data
(h) when the route has been prepared in (g) send it back to the Manage Freight and Fleet Operations (mffo) functionality and the Provide Support for Cooperative Systems (pscs) functionality in the route and hazardous goods vehicle route response data flows respectively.

Diagrams

The Diagram(s) is (are) the diagram(s) where you can find the function :

- DFD 6.5.3 Trip Planning
- Functional Tree of Area 6

Parent Higher Level Function

- 6.5.3 Trip Planning

Input logical dataflows

- mffo.ptja_freight_and_hazardous_goods_information
- mffo.ptja_on_board_informations_and_requests
- mffo.ptja_request_on_pollution_situation
- mffo.ptja_request_on_traffic_situation
- mffo.ptja_request_on_weather_situation
- mffo.ptja_route_optimisation_request
- pscs.ptja_hazardous_goods_vehicle_route_request
- ptja_retrieve_ffm_route_planning_data
- ptja_retrieve_road_situation_data

Output logical dataflows

- ptja.mffo_answer_on_pollution_situation
- ptja.mffo_answer_on_traffic_situation
- ptja.mffo_answer_on_weather_situation
- ptja.mffo_route
- ptja.pscs_hazardous_goods_vehicle_route_response
- ptja_store_ffm_and_hazardous_goods_data

User needs

Number	Description
5.3.2.1	**The system shall be able to support the planning (e.g. routes) plus the subsequent authorisation and movement of hazardous goods.**
6.1.2.5	**The system shall be able to analyse, process and retrieve data from different combinations of sources (including floating car).**

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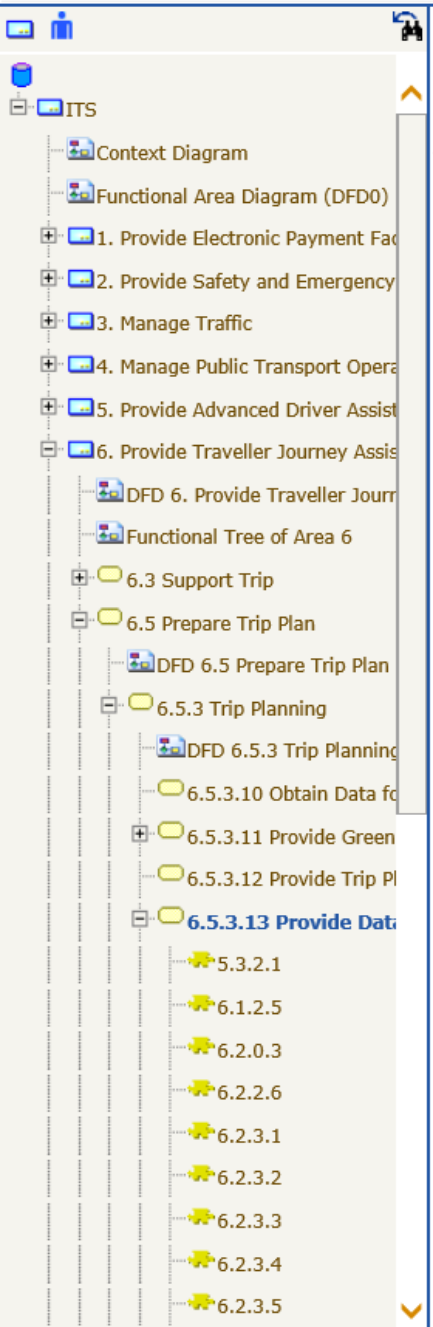

User Need 5.3.2.1

Description

The system shall be able to support the planning (e.g. routes) plus the subsequent authorisation and movement of hazardous goods.

Functions

Here are the functions that serve this User Need

- 6.5.3.13 Provide Data & Routes to Fleet Operators & Drivers
- 9.4.2 Manage and Monitor Hazardous Goods Vehicle Routes
- 9.4.3 Provide Hazardous Goods Vehicle Driver Interface

User Need Category

5.3.2 Planning

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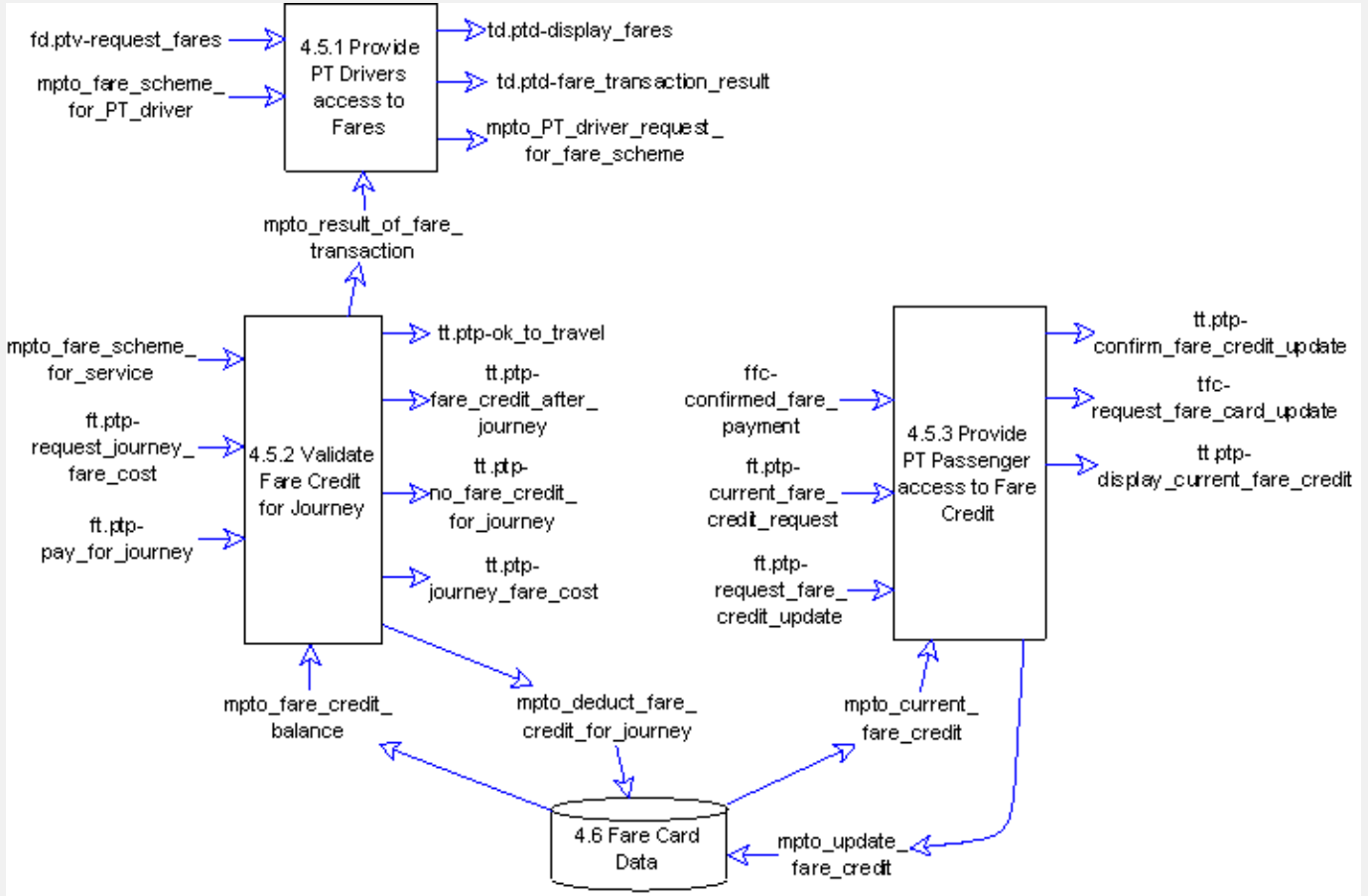
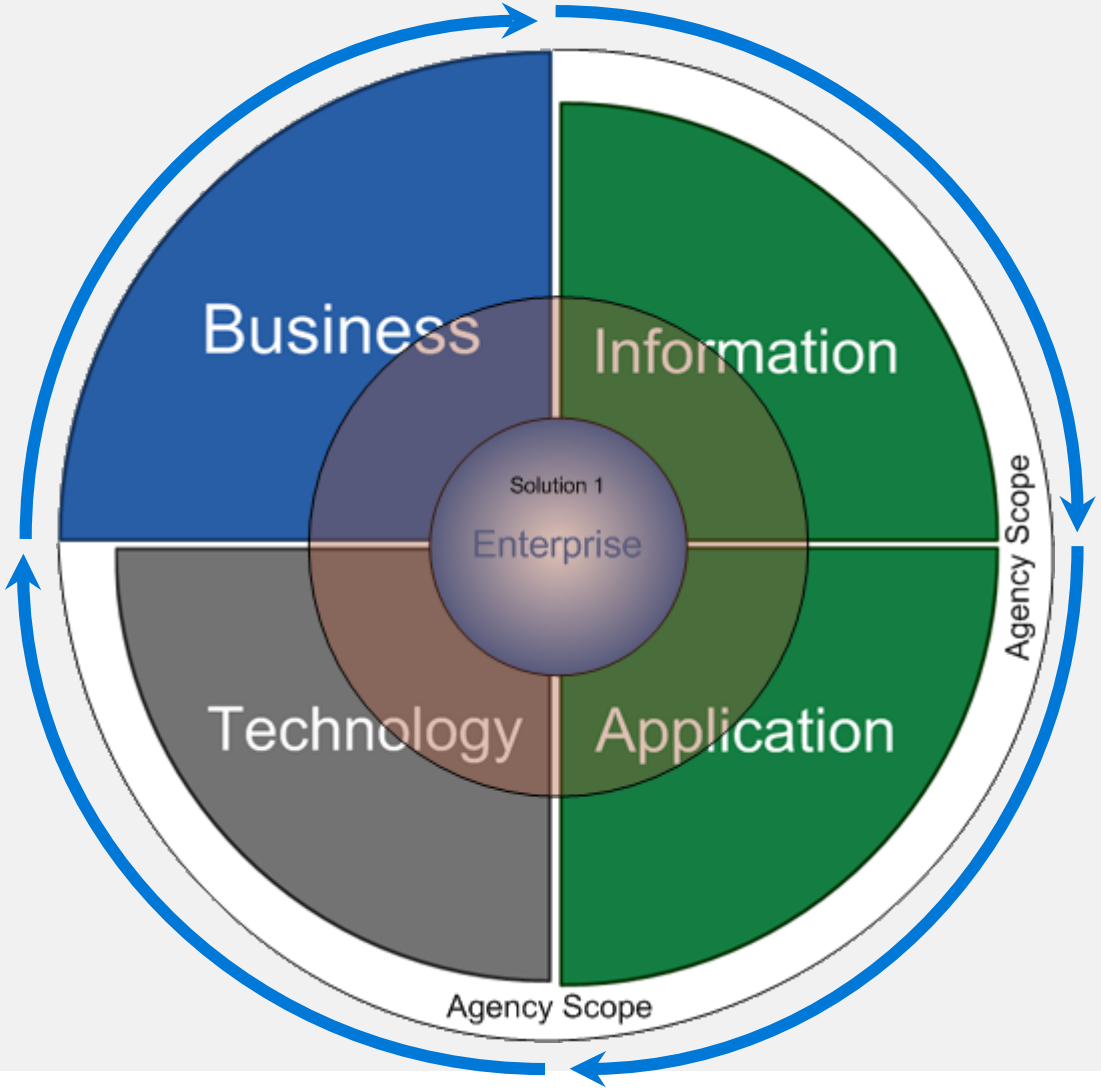
The FRAME Content

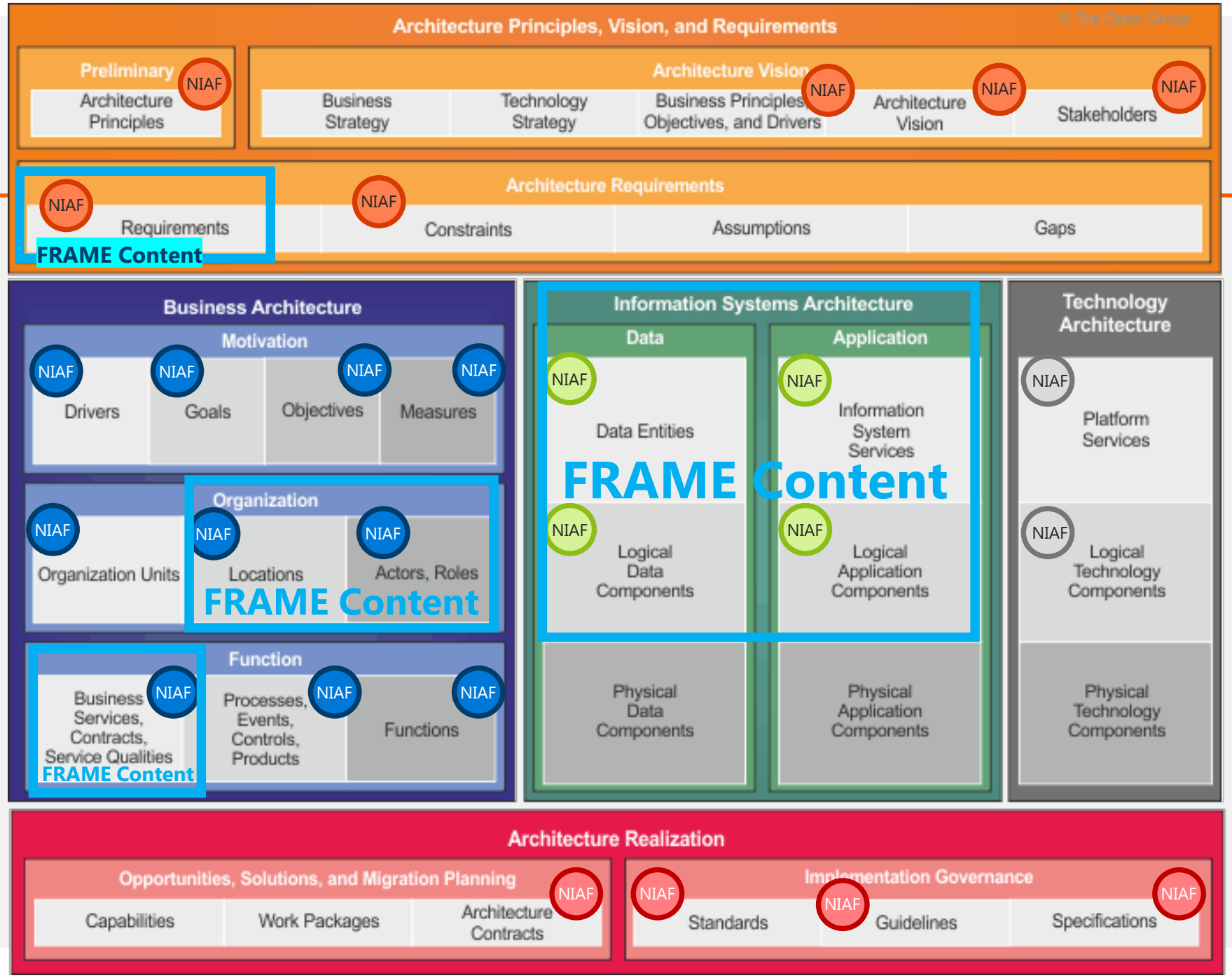


The NIAF Approach and Meta Model

The NIAF Approach



NIAF



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The FRAME to NIA Content Mappings

Project Benefits

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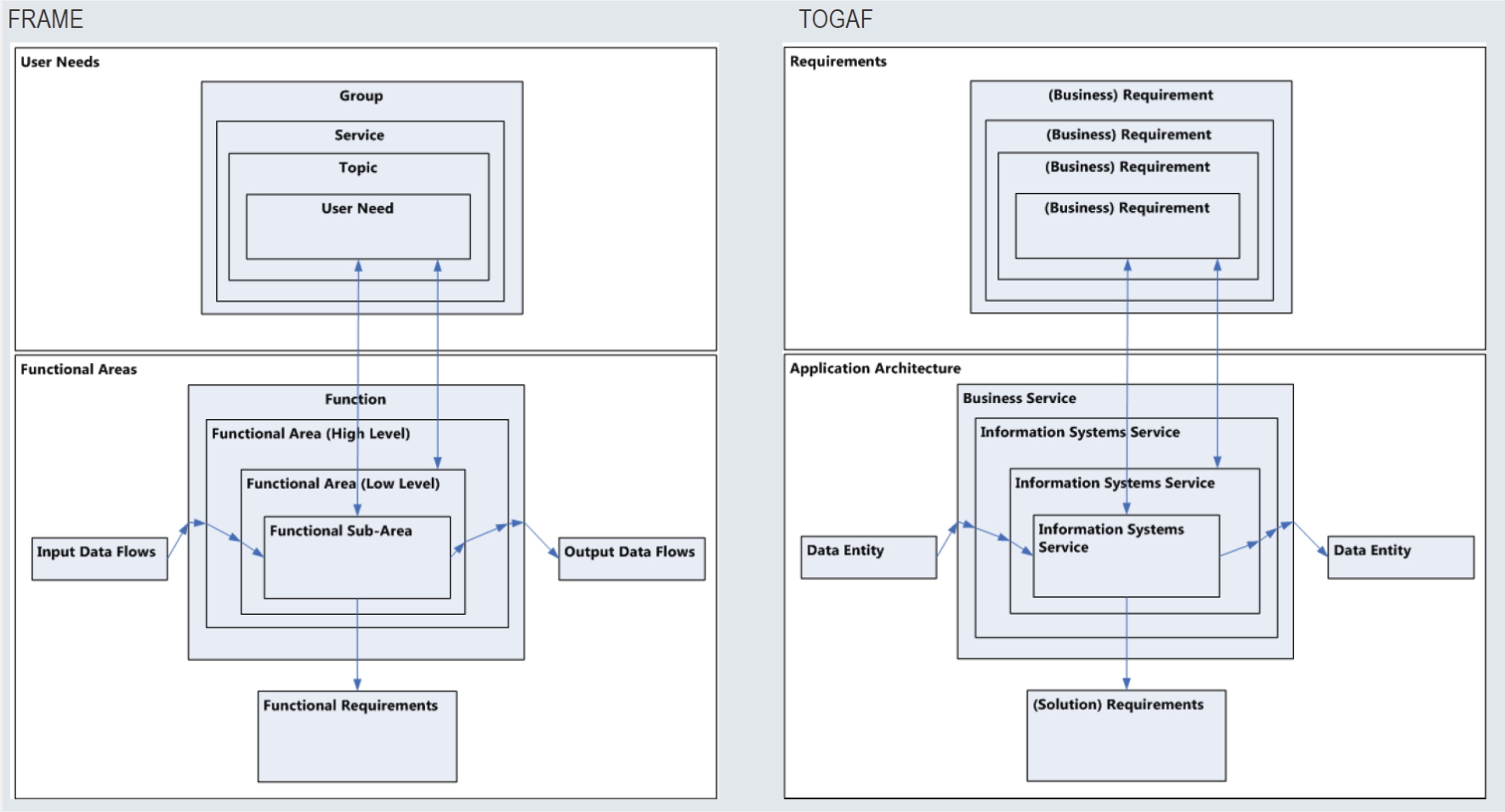
- Populate NIAF with complete reference architecture content
- Provide TOGAF version of FRAME architecture
  - Provide standard content export formats for import
  - Enable consumption of reference content across agencies
  - Support collaboration with FRAME Forum
- Confirm and inform future architecture development steps

Functional and User Need Mappings



Complete Mapping Set

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FRAME Entity	TOGAF Entity	TOGAF Content Area	Notes
Actor	Actor	Business Architecture	
Data Flow			No direct mapping. FRAME data entities could be extracted as TOGAF Data Entities. Consolidation of FRAME message attributes and the determination of Conceptual data entities will occur in stage 3.
Data Store	Logical Data Component	Information Systems Architecture, Data	FRAME describes Data Stores as follows. "Taken together, the Data Store descriptions provide the Information Viewpoint representation of the Framework Architecture."
Functional Area	Information Systems Service	Information Systems Architecture, Application	FRAME describes Functional Areas as follows. "...Functional Areas, each of which contains the functionality that is responsible for a specific area of operations."
Functional Subarea	Information Systems Service	Information Systems Architecture, Application	These are effectively low level function definitions

Complete Mapping Set

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FRAME Entity	TOGAF Entity	TOGAF Content Area	Notes
Function	Business Service	Business Architecture	High level functions (Top level in FRAME Functional hierarchy) will be logically mapped as TOGAF Business Services to link Business process and function definitions with Information Systems Services.
Terminator	Actor or Org Unit	Business Architecture	FRAME describes Terminators as follows. "A person, or a system with which data can be exchanged, or a physical entity from which data can be obtained, such as the atmosphere, or road surface." These items are represented as Org Units in the FRAME content repository and could be mapped to either Actors or Org Units in TOGAF.
User Need Group	Requirements (User/Business)	Architecture Requirements	FRAME describes User Needs as follows "What the Stakeholders themselves want should be expressed in their own words in the Stakeholder Aspirations. The Aspirations are “mapped” to the User Needs". These will be mapped to User requirements in the NIAF TOGAF model

Complete Mapping Set

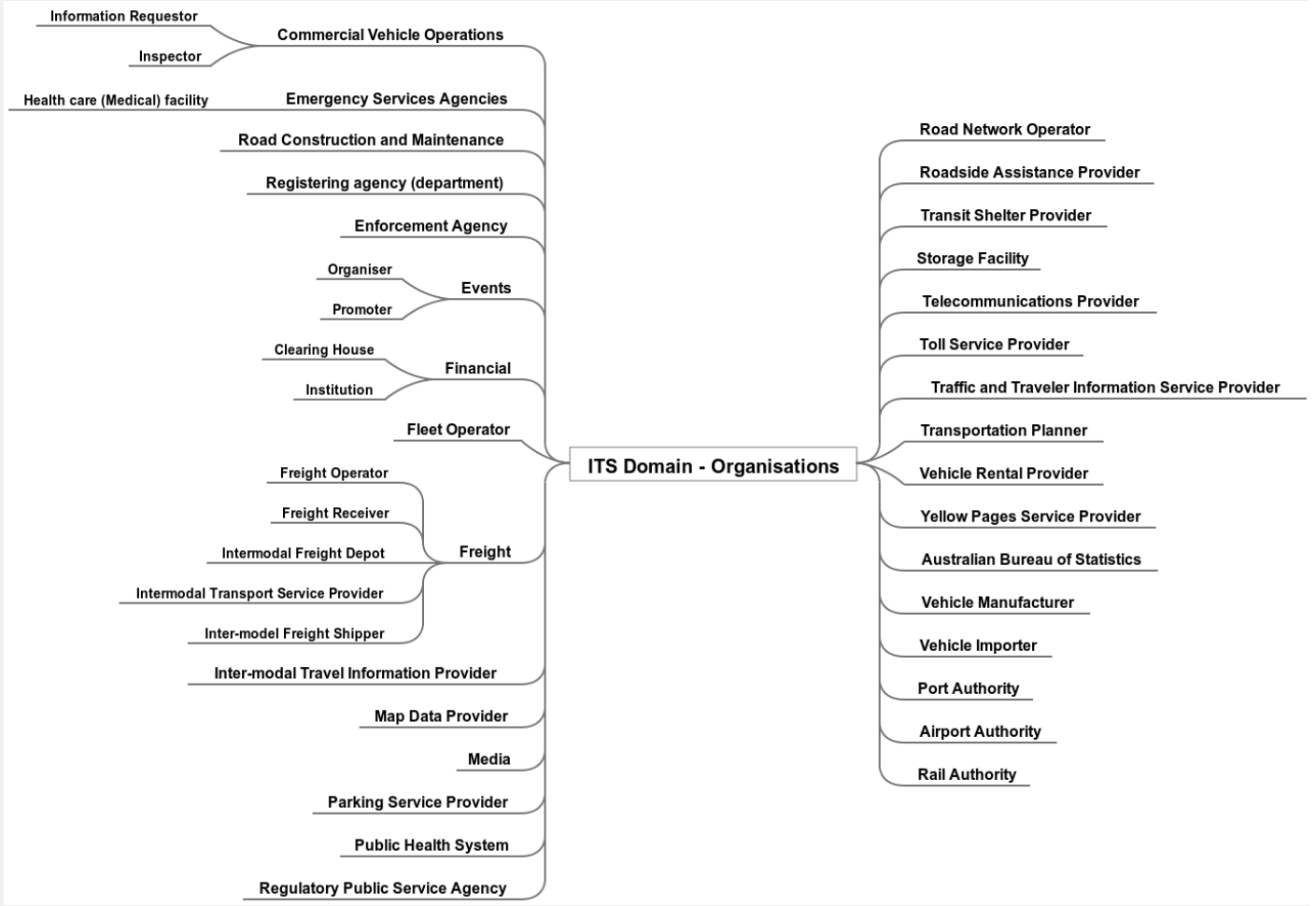
Austroads

FRAME Entity	TOGAF Entity	TOGAF Content Area	Notes
User Need Service	Requirements (User/Business)	Architecture Requirements	
User Need Topic	Requirements (User/Business)	Architecture Requirements	
User Need	Requirements (User/Business)	Architecture Requirements	

Mapping Recommendations

FRAME Actors and Terminators

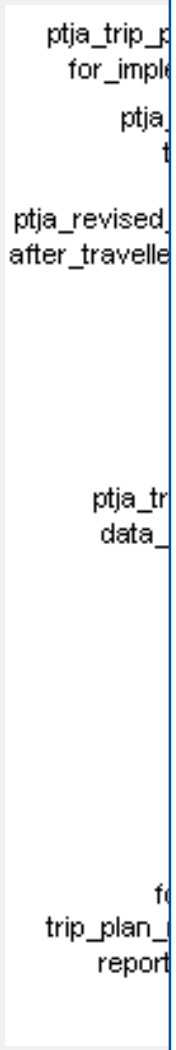
- FRAME terminator definitions are better mapped as TOGAF Actors. They define system entities or human entities.
- Austroads to establish a stage 3 project which undertakes analysis of ITS Organisation structures and governance and provide a common reference set of Organisational Unit definitions in NIA.
- Stage 1 Organisational Unit definitions to be used in the interim



Mapping Recommendations

FRAME Data Stores and Data Flows

- The message flows and their associated data attributes that are modelled within FRAME are low level and relate more to the physical representation of system data and consequently don't support mapping to conceptual data entity definitions
- Austroads to establish a stage 3 project which undertakes analysis of FRAME data stores and messages to define NIA data entity extensions



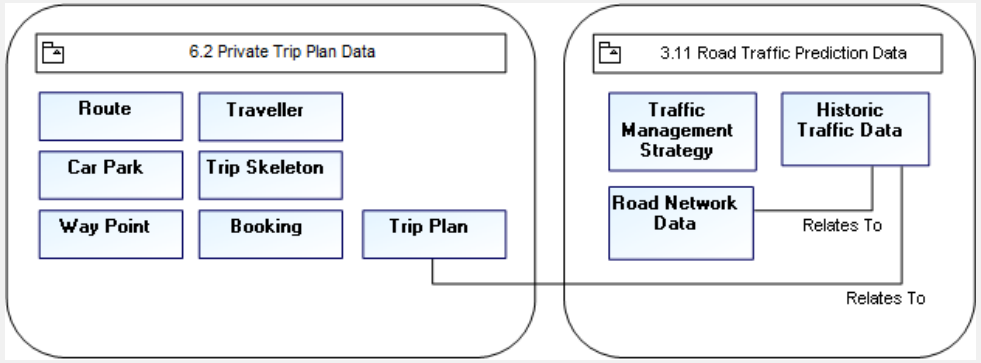
This Data Store shall be used within the Provide **Traveller** Journey Assistance Area. It shall contain data that is the result of the **trip plan**ning process. This data is retained for the prime purpose of supporting the Traveller during the trip. The most notable requirement is to react to the consequences of perturbations in the situation(s) existing during trip planning. All the considerations that resulted in production of the trip itinerary are included in this Data Store.

The data in the Store shall be structured in the following way:
- Traveller's ID (number)
- Traveller's preferred language (characters)
- Traveller's disabilities (characters)
- **route** (data for a digital roadmap using a standard format, e.g. GDF, plus characters and/or numbers, e.g. GPS/Galileo data)
- trip origin characters and/or numbers, e.g. GPS/Galileo data()
- departure date (date string)
- departure time (numbers defining hours, minutes and seconds)
- way point:
  - location (characters and/or numbers, e.g. GPS/Galileo data)
  - expected arrival date (date string)
  - expected arrival time (numbers defining hours, minutes and seconds)
  - car park information (characters)
- trip destination (characters and/or numbers, e.g. GPS/Galileo data)
- expected arrival date (date string)
- expected arrival time (numbers defining hours, minutes and seconds)
- **car park** information (characters)
- description of cargo to be carried on trip (characters)
- number of passengers expected in Vehicle (number)
- hotel **booking**s completed (characters)
- hotel bookings still to be made (characters)
- car rental bookings completed (characters)
- car rental bookings still to be made (characters)
- other travel mode bookings completed (characters)
- other travel mode bookings still to be made (characters)
- vehicle breakdown assistance information (characters)
- way of communication with Traveller while on-trip (characters + numbers)
- route guidance facilitation parameters (characters)
- trip skeletons (see below).

It shall be possible for there to be none, or more that one way point, plus hotel. car rental and other travel mode bookings.

A special feature of the data in the Store to support the Traveller shall be the "**trip skeleton**", which shall be available for use in two ways:
(1) as the start of the search for alternatives during trip planning;
(2) as the fixed part of the trip if the trip has to be retained for future reuse.
The core part of the "skeleton" shall be the origin-destination combination and a date and/or time for the start or the arrival and possibly a number of intermediate locations - see data to be stored above. In both cases, trip preferences are part of the trip skeleton for trip planning purposes and it shall be possible to obtain these from the store of GTP data.

The NIA Logical Data Components



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- departure date (date string)
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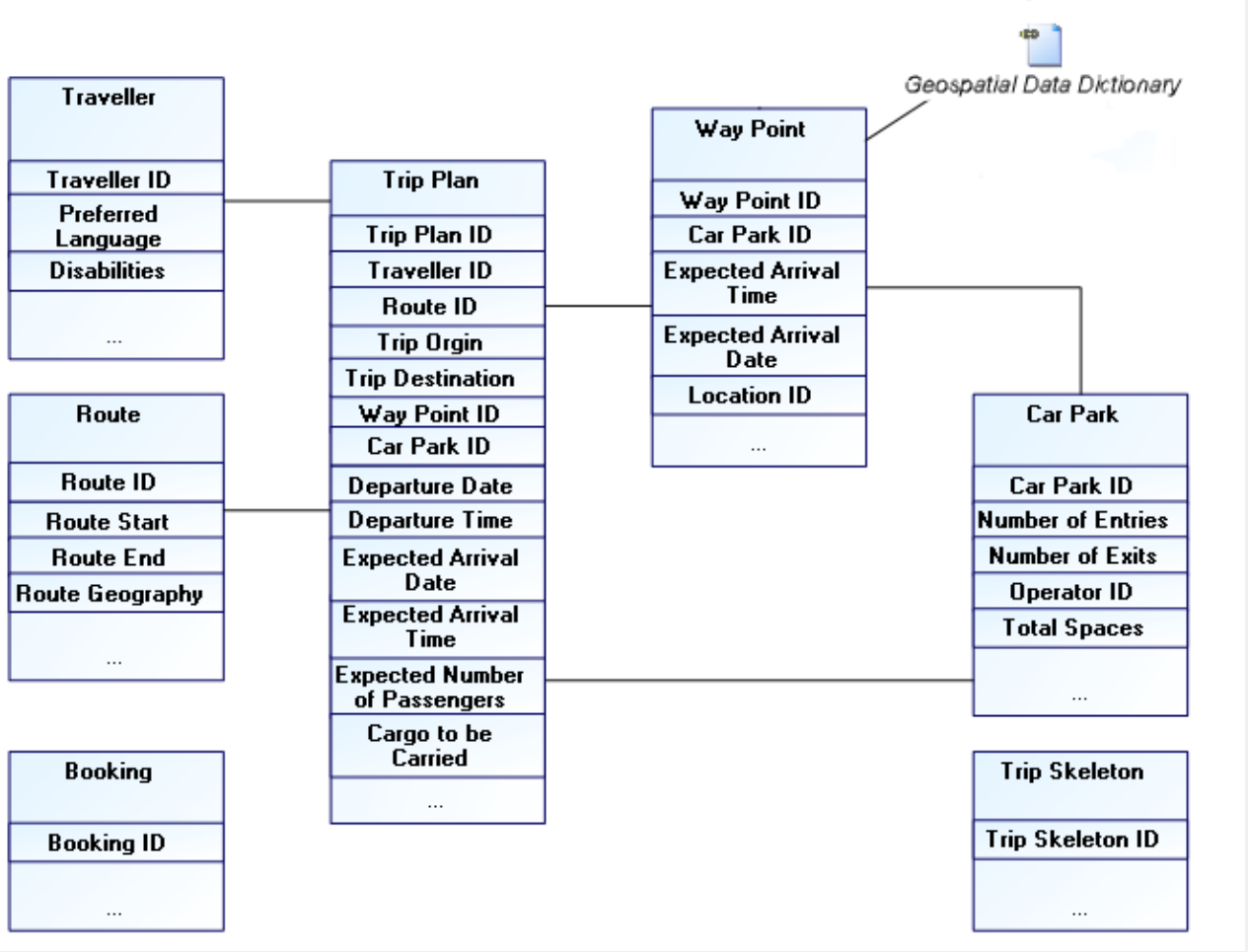
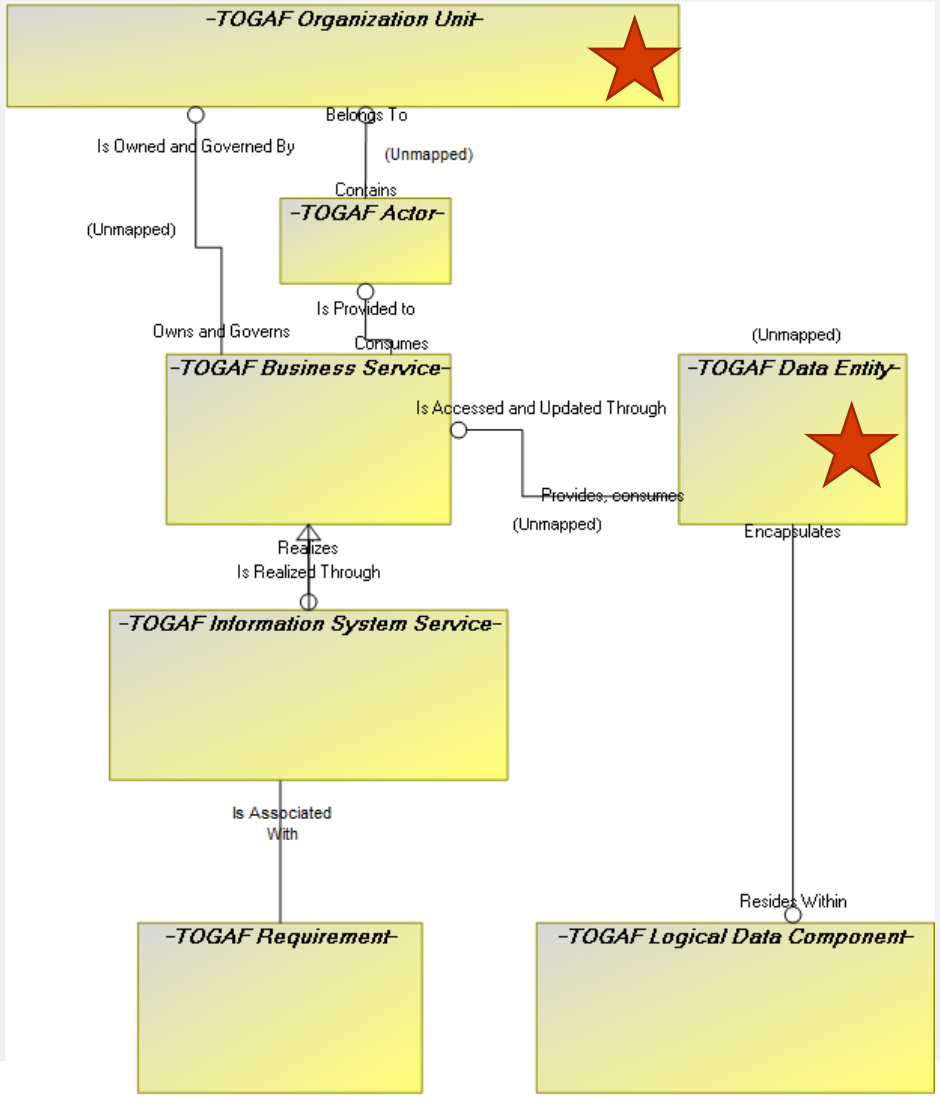
  - expected arrival time (numbers defining hours, minutes and seconds)
  - car park information (characters)
- trip destination (characters and/or numbers, e.g. GPS/Galileo data)
- expected arrival date (date string)
- expected arrival time (numbers defining hours, minutes and seconds)
- **car park** information (characters)
- description of cargo to be carried on trip (characters)



NIAF TOGAF Meta-model Subset



Unmapped Entities

The NIA Content

NIAF Identifiers and Naming Standards

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Identifier Format : NIAF_<Class>_<Numeric Identifier>

- Class - acronym representing the TOGAF meta model class of the object.
- Numeric Identifier – x.x.x.x with varying levels of nesting expanding as required to represent TOGAF hierarchical or decomposition relationships.

FRAME Entity	FRAME Identifier/Name	TOGAF Entity	Class	NIAF Identifier
Functional Area	5.14 Provide In-vehicle Trip Planning & Implementation	Information Systems Service	ISS	NIAF_ISS_5.14
Functional Subarea	5.14.1 Provide Driver Interface for Trip Planning	Information Systems Service	ISS	NIAF_ISS_5.14.1

NIAF Content Export

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Supported Formats

- Comma Separated Values (CSV)
- Microsoft Excel (XLSX)
- eXtensible Markup Language (XML)

Character in FRAME/NIA Text	XML Escaped Character Sequence
&	&
<	<
>	>

Content Structure

- One file per TOGAF Entity
- One file for TOGAF Entity Relationships

NIAF XML Content Export - Actors

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                  version="0.1" export_date="April 13, 2017" export_time="13:42:48" descriptor_name="National ITS Architecture - Actors - XML"
                  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
                  xsi:schemaLocation="http://www.austroads.com.au/road-operations/network-operations/national-its-architecture NIA_Actors.xsd">
        <actors>
            <actor id="7tMu)HkxOH5V" niaf_id="NIAF_Actor_1.0.0" type="actor">
                <name>Ambient Environment</name>
                <description>This Terminator shall represent the operational setting in which road-related ITS services interface and operate.  It shall consist of weather
                effects such as snow, rain, fog, pollution effects such as dust, smoke, and man-made electromagnetic effects.  This terminator is a physical entity from which
                data can be obtained.  In this case the data shall be obtained through monitoring by appropriate functionality within the System.  The data provided by this
                functionality shall enable Travellers to be informed about adverse conditions.  The monitoring shall also enable Authorities and System Operators to choose
                relevant management strategies to minimise any adverse effects on the use of the road network
                </description>
                <comprises_of>
                </comprises_of>
            </actor>
        </actors>
    </niaf_objects>
</xml>
```

NIAF XML Content Export – Actor Relationships

Austroads

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                        xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
                        xsi:schemaLocation="http://www.austroads.com.au/road-operations/network-operations/national-its-architecture NIA_Relationships.xsd">
        <relationship type="Comprises Of">
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                    <target id="qtG67M5xOf5L" niaf_id="NIAF_Actor_4.2.0" type="actor"/>
                    <target id="BrG6WO5xOPHL" niaf_id="NIAF_Actor_4.3.0" type="actor"/>
                    <target id="oqG6KR5xOXaL" niaf_id="NIAF_Actor_4.4.0" type="actor"/>
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        </relationship>
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NIAF Excel Content Export - Actors

Version	Export_Date	Export_Time	Descriptor_Name	Object_ID	NIAF_ID	Object_Type	Name	Description	Comprises_Of_Object_ID	Comprises_Of_NIAF_ID	Comprises_Of_Type	Comprises_Of_Name
0.1	April 13, 2017	13:42:48	National ITS Architecture - Actors - XML	7tMu)HkxOH5V	NIAF_Actor_1.0.0	actor	Ambient Environment	This Terminator shall represent the operational setting in which road-related ITS services interface and operate. It shall consist of weather effects such as snow, rain, fog, pollution effects such as dust, smoke, and man-made electromagnetic effects. This terminator is a physical entity from which data can be obtained. In this case the data shall be obtained through monitoring by appropriate functionality within the System. The data provided by this functionality shall enable Travellers to be informed about adverse conditions. The monitoring shall also enable Authorities and System Operators to choose relevant management strategies to minimise any adverse effects on the use of the road network				

Accessing NIAF Content

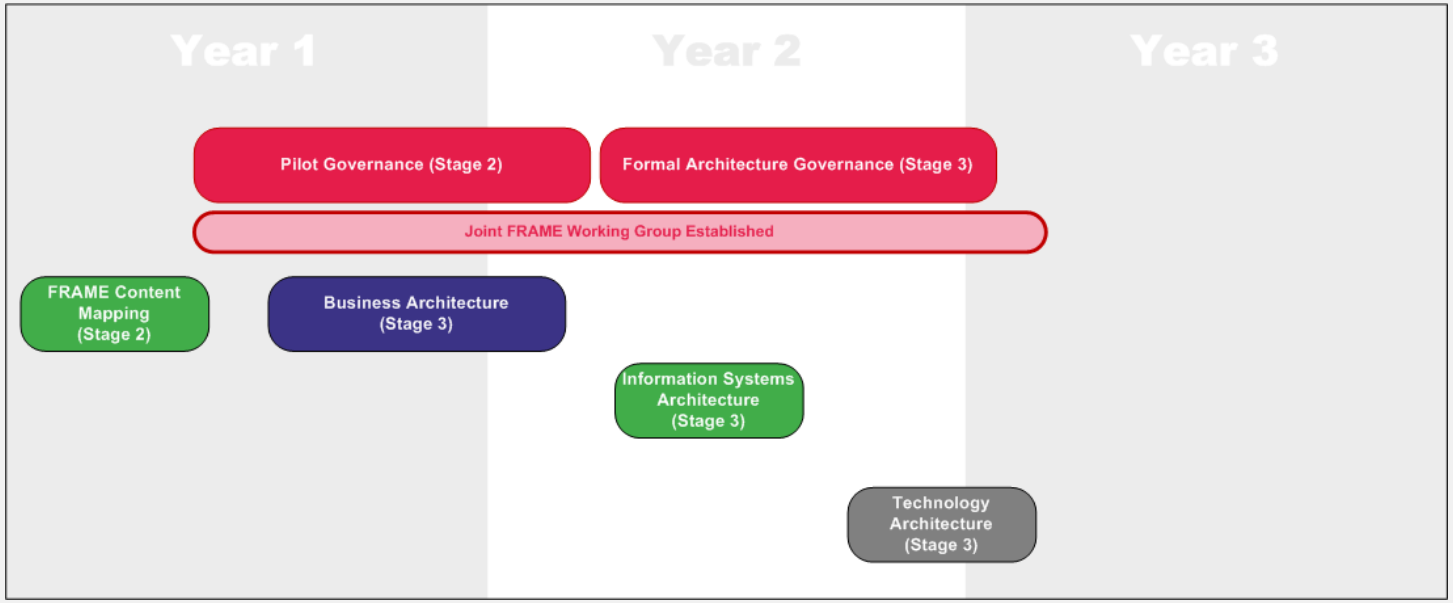
Object Type	XML Files	CSV Files	XLSX Files
Actors	NIA_Actors.xml NIA_Actors.xsd NIA_Actors_Relationships.xml NIA_Relationships.xsd	NIA_Actors.csv NIA_Actors_Relationships.csv	NIA_Actors.xlsx NIA_Actors_Relationships.xlsx
Business Services	NIA_BusinessServices.xml NIA_BusinessServices.xsd NIA_BusinessServices_Relationships.xml NIA_Relationships.xsd	NIA_BusinessServices.csv NIA_BusinessServices_Relationships.csv	NIA_BusinessServices.xlsx NIA_BusinessServices_Relationships.xlsx
Information System Services	NIA_InformationSystemServices.xml NIA_InformationSystemServices.xsd NIA_InformationSystemServices_Relationships.xml NIA_Relationships.xsd	NIA_InformationSystemServices.csv NIA_InformationSystemServices_Relationships.csv	NIA_InformationSystemServices.xlsx NIA_InformationSystemServices_Relationships.xlsx
Logical Data Components	NIA_LogicalDataComponents.xml NIA_LogicalDataComponents.xsd	NIA_LogicalDataComponents.csv NIA_LogicalDataComponents_Relationships.csv	NIA_LogicalDataComponents.xlsx NIA_LogicalDataComponents_Relationships.xlsx
Organisational Units	NIA_OrgUnits.xml NIA_OrgUnits.xsd	NIA_OrgUnits.csv NIA_OrgUnits_Relationships.csv	NIA_OrgUnits.xlsx NIA_OrgUnits_Relationships.xlsx
User Requirements	NIA_UserRequirements.xml NIA_UserRequirements.xsd	NIA_UserRequirements.csv NIA_UserRequirements_Relationships.csv	NIA_UserRequirements.xlsx NIA_UserRequirements_Relationships.xlsx

Available online at:

http://www.austroads.com.au/road-operations/network-operations/national-its-architecture

NIAF Next Steps

NIAF Roadmap Updates



Roadmap Modules

- NIAF Governance
- Business Architecture
  - Motivation (drivers/objectives)
  - Organisation (org units)
  - Function (processes)
- Information Systems Architecture
  - Logical Data Components
- Technology Architecture
  - Platform Services
  - Logical Technology Components

Questions?

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