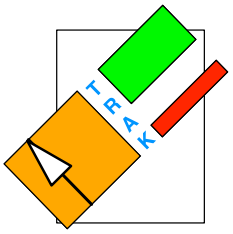

TRAK
ENTERPRISE ARCHITECTURE FRAMEWORK
METAMODEL

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NETWORK LOCATION

This document is available at https://sf.net/p/trakmetamodel

HISTORY

Changes to the TRAK metamodel are also tracked via a set of RSS feeds and in the trakmetamodel code repository - http://sourceforge.net/p/trakmetamodel/code/

Author(s)	Date	Changes
Nic Plum	10th April 2020	Bugs: #63. Corrected background colour for 'for' relationship element in Table 4.4: TRAK Metamodel Element Types - Connectors to match Concept Perspective colour. #62. Removed 'Architecture Viewpoint is a Document from 3.1 Introduction. Removed inheritance of properties for Architecture Viewpoint element definition in Table 4.3 #61. Added numerated value 'None' to compliance level claimed attribute for Claim in Table 4.4 and to compliance level claimed in Table 4.1. #59. New row added to Table 4.2: Metamodel Elements from which Others Inherit for Risk, Event. Corrected title of Figure 1-1 (context diagram for this document). Feature Requests: #57. Added 'Resource Interaction *poses* Threat , 'Interaction Element *poses* Threat' #56. Added 'Event (Risk) *caused by* Interaction Element' , 'Event (Risk) *caused by* Resource Interaction' #55 'impact severity ranking' attribute (values - 'High', 'Medium', 'Low', 'Not Set' default = 'Not Set' added to Event and Table 4.1: TRAK Metamodel Element Attributes. Modified definition of 'impact severity' to remove 'qualitative'.
Nic Plum	31st January 2018	#53. Added 'Physical *physically supports* Physical', 'Physical i*s attached to* Physical' to metamodel.

Author(s)	Date	Changes
		#60. Removed +Architecture Description Element attributes from 'allows' relationship in Table 4.4.
Nic Plum	8th December 2017	Added 'Document *has part* Document'
Nic Plum	01st December 2017	Title of section 5 changed to 'TRAK Metamodel Relationship Rules' and sub-headings 5.1 and 5.2 removed. Requests. #52 Added 'Architecture Description Element *satisfies* Contract', 'Architecture Description Element *traces to* Contract' (via 'Architecture Description Element *traces to* Document'), 'Contract *governs Architecture Description Element*', 'Contract supersedes *Contract*', 'Contract *depends on Contract*', 'Contract *has part Requirement*' #51 Added 'Architecture Description Element i*s equivalent to* Architecture Description Element' (for taxonomy) #50 Added 'Document *issued by* Organisation' – adds 'Architecture Description/Architecture View/ Architecture Viewpoint/Contract/Evidence *issued by* Organisation' by inheritance to existing 'Standard *issued by* Organisation'. #49 Added 'Architecture Description Element *satisfies* Standard' #44 New table Table 4.2 Metamodel Elements from which Others Inherit added to show inheritance. Change in table number for Table 4.3 and Table 4.4. Bugs. #58 Table 4.1 - 'title' property definition changed. #57 Added 'Architecture Viewpoint *is a* Document' - Table 4.2, Table 4.3.

Author(s)	Date	Changes
Nic Plum	02nd October 2017	#56. Changed URI for Reference 3 (MODAF). #55. 'reference URL' attribute removed from Architecture Description Element in Table 4.2. #53. Background colour for '*is a*' relationship changed to match colour of Management Perspective in Table 4.3. '*is member of*' changed to Management Perspective. Additions: #47. Added tuple 'Architecture Description Element satisfies Requirement (including 'Requirement *satisfies* Requirement') to metamodel. Added 'satisfies' to Table 4.3.
Nic Plum	28th January 2017	#51. Corrected description of inheritance of Resources and Function from Architecture Description Element. Added '+ Architecture Description Element' to System, Software, Role, Physical, Organisation and Job. Removed '+ Architecture Description Element' from Safety-Monitored Element in Table 4-2. Corrected Figure 'Safety Monitored Elements (Stereotypes) in TRAK'.
Nic Plum	24th December 2016	Changed links to TRAK project sites on Sourceforge from 'http' to 'https' in anticipation of implementation on Sourceforge. Added tuples: 'Requirement *derived from* Requirement' #52. 'Function *poses* Threat (Hazard)' Consistency / completeness arising from placing description of TRAK into graph database: #51. Added 'for' relationship to Table 4.3 to reflect metamodel. #50. Removed '+ Architecture Description Element' from Architecture View (since it inherits these properties already via Document). #49. Changed 'Identifier' to 'Connection' in defini-

Author(s)	Date	Changes
		tion of 'port connection identifier' in Table 4-1. #48. Added definition for 'item exchange identifier' to Table 4-1. #47. Changed Architecture Task attribute name from 'stakeholder' to 'stakeholders'. #46. Changed 'Perspective' to 'Viewpoint' in definition of 'viewpoint description' in Table 4-1. #45. Removed 'description' attribute from Document (duplicates 'description' in Architecture Description Element) #44. Added definition of 'withdrawal date' for Standard to Table 4-1. Added 'Date Modified' column to Table 4-1. Changed title of column 'Date' to Date Modified' for Table 4-1 and Table 4-2.
Nic Plum	2nd July 2016	Added geographic extent attribute to Resource
Nic Plum	1st January 2016	Added tuples:- Event *impacts on* Function Event *caused by* Function Changed Resource *causes* Event to Event *caused by* Resource (for consistency). Changed 'causes' in Table 4.4: TRAK Metamodel Element Types - Connectors to 'caused by'.
Nic Plum	12th December	Metamodel extended to allow description of safety, security and risk:- Added tuples: Resource / Function / Interaction Element / Resource Interaction *has* Vulnerability Threat *exploits* Vulnerability Vulnerability *contributes to* Vulnerability Event *caused by* / *impacts* Resource Resource *poses* Threat *to* Resource / Function / In-

Author(s)	Date	Changes
		teraction Element / Resource Interaction Resource causes Event Event impacts Resource Threat *exploits* Vulnerability *results in* Risk Threat *poses* Risk, Resource *exposed to* Risk Risk *is a* Event *can lead to exposure to* Threat Resource *exposed to* Risk *is managed by* Mitigation *uses* Function / Resource Vulnerability contributes to Vulnerability Table 4.1: TRAK Metamodel Element Attributes - added 'likelihood' and 'impact severity' Table 4.3: TRAK Metamodel Element Types - Blocks - added Event (syn. Accident), Mitigation, Risk, Threat (syn. Hazard), Vulnerability Table 4.4: TRAK Metamodel Element Types - Connectors - added *can lead to exposure to*, *exploits*, *exposed to*, *is managed by*, *poses*, *results in*, *using* Added sf.net/p/ short form to URLs for [Ref. 5] , [Ref. 6] and [Ref. 7] .
Nic Plum	7th September	#43. Claim. Changed 'conformance level claimed' attribute to 'compliance level claimed'. Requirement Changed 'compliance level' to 'compliance level required'.
Nic Plum	5th September 2015	Architecture Description Element. #42. Privacy marking attribute values for 'pm commercial', pm descriptor' and 'pm marking' option. #39. Added 'date created', 'date modified', 'element author'. Deleted 'AD exchange element external reference'. #38. Architecture Description. Separated 'assumptions and constraints' into 'assumptions' and 'constraints'. Added 'decisions'. Architecture View. #41. Removed 'view description'. #40. Added 'view element identifier' #39. Added 'assessment result' attribute to

Author(s)	Date	Changes
		disproves, *proves*, *supports*, *opposes* relationships. Added 'assessment', 'assessment date' to *supports*, *opposes* relationships. #38. Deleted 'issue', 'number' and 'issue date' from Standard. Claim. Added 'claimed conformance level'. Document. Deleted 'DCMI description'. Evidence. Changed 'evidence identification' to 'evidence definition'. Port. Deleted 'port name'. Changed 'port ID' to 'port identifier' Resource Interaction. Changed 'interaction type' to 'exchange type'. #40. Deleted *declares* (now Architecture View *presents* Architecture Description Element). Added Table 4.1 TRAK Metamodel Element Attributes
Nic Plum	23rd July 2015	Added document identifier - 'TRAK00002' (feature request) #37 Architecture Description, Architecture View inherit from ('*is a*') Document. #36 Added 'Architecture Task *has part* Architecture Task' #35 Added attributes 'claim identifier' to Claim, 'argument identifier' to Argument, 'evidence identifier' to Evidence. Added 'concern identifier' to Concern. #34 Added 'sequence identifier' to Requirement. #33 Added 'N/A' to list of values for 'compliance level' (Requirement). #32 Added 'closure action' to Concern. Added missing relationships '*has*', '*owns*' to Table 4.4: TRAK Metamodel Element Types - Connectors Changed / tweaked definition of Architecture Framework, Architecture Product, Architecture View, Enterprise Goal, Role.

Author(s)	Date	Changes
		Added 'Architecture Description Element *is member of* Architecture Perspective', 'Architecture View is member of Architecture Perspective', 'Architecture Viewpoint *is member of* Architecture Perspective' to 'management' part of metamodel (Figure). Added 'Architecture View *declares* Architecture Description Element' to cater for concept of Master Architecture View. Rationale added to Table 5.2. Added description to each relationship / connector. (bug) #37 Changed "Safety Monitored Resource is a Architecture Description Tuple' to Safety Monitored Resource is a Architecture Description Element' in Figure.
Nic Plum	23rd May 2015	#36. Added missing '*opposes*', '*proves*', '*disproves*' to Table 4.4: TRAK Metamodel Element Types - Connectors. #35. Added continuation to Requirement to reveal hidden attributes. #34. Added missing '*makes*', to Table 4.4: TRAK Metamodel Element Types - Connectors. #31. Added rationale attribute to Architecture Description Element #30. Added Architecture Description Element *traces to* Standard. Added Glossary, Abbreviations and Index.
Nic Plum	3rd January 2015	#33. Added missing 'Evidence *has part* Evidence', 'Evidence *opposes* Argument', 'Argument *opposes* Claim' to metamodel diagram.
Nic Plum	24th December 2014	Added Claim, Argument and Evidence objects and following relationships to support new MVp-04 Assurance viewpoint. 'Organisation / Role *makes* Claim', 'Claim *about* Architecture Description Element', 'Argument *supports/opposes* Claim', 'Evidence *supports/opposes* Claim', 'Evidence *proves/*

Author(s)	Date	Changes
		disproves Claim', 'Architecture Description Element *traces to* Argument', 'Claim *supports/opposes* Claim', Argument *supports/opposes* Argument' Added TS6, TS7 and TS8 to Table 5-2 Relationship Rules. #28 Added Standard *governs* Standard. #27 Added Requirement *governs* Architecture Description Element for consistency with a Standard having normative requirements. #25 Added attribute 'interface authority' to Port Connection to be consistent with Resource Interaction. #31 - changed classification of '*carries*' to Management Perspective (was Concept Perspective). #30 - changed '*necessary for*' in metamodel diagram to '*is necessary for*' to match Table 3-2.
Nic Plum	24th December 2013	#26. Added Standard *applies* Standard to metamodel. Needed for consistency since both a Contract and Standard are normative documents and to allow a chain of standards to be applied by applying the topmost one in the hierarchy.
Nic Plum	6th December 2012	#24 Added Physical *contains* System and Physical *contains* Physical to metamodel. Added rationale for transitive nature of containment. #29 Changed 'Vision' to 'Enterprise Goal' in Comments against Enterprise Goal in element type definitions table. URIs changed to reflect transfer of project into new Sourceforge platform. Update of ISO/IEC 42010 to 2011 release.
Nic Plum	2nd January 2012	#3445565 Added 'pm commercial' to Architecture Description Element - to capture commercial

Author(s)	Date	Changes
		markings. #3420645. Separated connector (relationship) definitions into a separate Table 3-2 and subsumed table from section 5.
Nic Plum	30th Sept 2011	#3395042 Need. Changed 'flow type' to 'need type'. #3397409 / #3390954 Architecture Description Element - all attributes beginning with 'model exchange element ...' now changed name to 'AD exchange element ...' #3400232 Resource now only inherits from Safety Monitored Element. #3400174 Resource - location attributes changed to meet RFC 5870 i.e. decimal degrees latitude, longitude, optional height in m. #3400255 Human Resource now only inherits from Resource. #3403039 Document. Deleted 'ISBN' as the ISBN should be stored under ;identifier' in accordance with Dublin Metadata Core Initiative (DCMI). #3403045 Document - added 'DCMI' prefix to identify DCMI attributes. #3403050 Document - added 'DCMI format' attribute. #3404462 Architecture Viewpoint - added attributes to capture section headings of a TRAK viewpoint #3395089 Concern - enumerated values for concern scope clarified (Architecture, Architecture Description, Architecture Framework, Task, Not Specified'). #3387152 Architecture Description *has part* Architecture Description added to allow for the situation where concerns overlap. All enumerated values take title case i.e. 1st letter of each word capitalised. Added Figure 2-2 to place normative documents in context. Added introduction to TRAK metamodel outlining purpose. Added implementation of TRAK and reference to normative implementation document. Removed Type and Transitive columns from Table 5-1.

Author(s)	Date	Changes
Nic Plum	20th August 2011	#3391461 added resource interaction identifier attribute. #3394979 added port connection identifier attribute. #3393118 added dependency type (=Unknown/Proximity/Alignment) to 'physically depends on'. Split text on implementation into own section. #3395037 changed 'Materiel' to 'Resource' in flow type attribute for Need
Nic Plum	5th August 2011	#3305946 adds Contract has part Contract to enable contract structure to be described.
Nic Plum	8th April 2011	#3234541 removes Design Authority, Manufacturer from System, Software, Physical and System Authority from System - denoted by Role Extent form of SV-01 not attribute. #3263540 explicitly adds name and description attribute to Architecture Description Element.
Nic Plum	28th Feb 2011	#3185152 added Requirement - compliance level attribute (Unknown/Desirable - Freedom, Desirable - Commitment/Mandatory) #3185658 Resource Interaction *supports* Function added - see also TS5
Nic Plum	11th Feb 2011	#3171404 Added Item exchange *from/to* Node. #3165826, #3165829, #3165831, #3165833 Changed 'Materiel' in type for Item Exchange/Item/Resource Interaction /Interaction Item to 'Resource'. #3174841 Tweaked System definition. #3175112 Error in metamodel diagram - Architecture View- also Architecture Viewpoint, Architecture Metamodel. #3180634 Added relationship rule TS4 (Need before Item Exchange)
Nic Plum	3rd Feb 2011	Added table identifying exclusions from TRAK metamodel.

Author(s)	Date	Changes
Nic Plum	27th January 2011	Added requirement ID attribute to Requirement. #3165839 Changed 'Architecture Element' to 'Architecture Description Element' in stereotypes inheriting attributes. #3161826 Added 'Requirement *has part* Requirement'. #3138601 Added 'Function *precedes* Function', 'Concept Activity *precedes* Concept Activity'. Expanded justification of relationships.
Nic Plum	18th January 2011	Moved common text into new TRAK Architecture Framework document (Important Ideas, Glossary, Colour Rule, TRAK Bye Laws). #3141967 corrected typo in introduction to stereotypes section. #3160749 'Architecture Tuple' now 'Architecture Description Tuple'. #3160753 / #3082094 'Architecture Element' now 'Architecture Description Element'
Nic Plum	20th October 2010	Added reference to change log for trakmetamodel project. #3039332 Added 'for' such that Node has Need for Node i.e. Node needs Node can be expressed. #3082084 Safety Monitored Resource change of name to Safety Monitored Element. #3041161 Added hierarchy to show safety monitored elements. Replaced GNU Free Documentation License text with link to the text.
Nic Plum	26-Jul-2010	Added metamodel design rule BLM-4 to Bye Laws. Added section to allow justification for tuple sets to be captured.
Nic Plum	29-Apr-2010	Moved TRAK baseline wrt MODAF 1.2 to separate invariant section at end of document. #2989344 Operational Perspective renamed Concept Perspective to avoid application to the purely day to day activity. Affects use of colour, relationship rules. #2993201 Capability Perspective renamed

Author(s)	Date	Changes
		Enterprise Perspective - EV prefix to avoid naming conflicts & name after the 'thing' rather than its activity. 'Operational Activity' stereotype now 'Concept Activity'
Nic Plum	15- Apr-2010	Added attribute 'job holder name' to Job. Request #2987606
Nic Plum	30-Mar-2010	Added a section on important ideas for TRAK. Rule BLM-3 created wrt specialisation of the metamodel base types.
Nic Plum	17-Mar-2010	Removed 'sponsors' relationship since 'sponsor' is a Role. 'extends to' allowed for Architecture Task in its place. Used in MV-02. Simplified metamodel modified.
Nic Plum	16-Mar-2010	Added URI , protective marking attributes to Architecture Element.
Nic Plum	12-Mar-2010	Added relationship types. Added Dublin Core Metadata elements to Document Added metamodel bye law BLM-2
Nic Plum	01-Mar-2010	Added underlying management stereotypes to simplified metamodel. Relationships added to table.
Nic Plum	26-Feb-2010	Added relationship rule TS2 wrt Resource *realises* Node and TS3 for Resource *exposes* Port
Nic Plum	25-Feb-2010	Added MODAF® trademark. Added missing 'has part' to Interaction Element. Definition of Architecture Task. Added definition of Human Resource.
Nic Plum	22-Feb-2010	Added clarification wrt use of graphic for presentation of element - colour rule CR10.
Nic Plum	21-Feb-2010	Incorrect definition of Project Activity, Milestone. 'owns' in Table 4 assigned to Procurement.

Author(s)	Date	Changes
Nic Plum	20-Feb-2010	Original release.

ACKNOWLEDGEMENTS

This work was originally commissioned by London Underground Ltd.

This Document is based on and incorporates aspects of the Ministry of Defence Architecture Framework MODAF Version 1.2. [Ref. 3]

A summary of the differences between the initial release of the TRAK Metamodel and the MODAF Version 1.2 can be found at http://trakmetamodel.sourceforge.net. A comparison of the set of TRAK metamodel against the MODAF 1.2 metamodel is preserved at the back of this document.

The Document incorporates:

- beta testing and feedback from Joe Silman at the Centre for Railway Research and Education at The of University of Birmingham, UK.
- Human Factors advice and feedback from Christopher Lowe at Liv Systems Ltd.
- advice on definitions, relationship types (!) and ISO 42010 from Colin Wood at London Underground Limited
- MODAF experience & metamodel relationships - Nic Plum at Eclectica Systems Ltd for London Underground Ltd.

GLOSSARY

Term	Definition	Source
Architecture	(system) fundamental concepts or properties of a system in its environment embodied in its elements, relationships, and in the principles of its design and evolution.	ISO/IEC/IEEE 42010 [Ref. 1]
Architecture Description	Work product used to express an architecture.	ISO/IEC/IEEE 42010 [Ref. 1]
Architecture Description Language	An architecture description language is any language for use in an architecture description. Examples include Architecture Analysis & Description Language (AADL) , SysML], and ArchiMate.	ISO/IEC/IEEE 42010 [Ref. 1]
Architecture Description Tuple	Fundamental unit of TRAK architecture description. Comprises of a named architecture description element (block) with a named relationship with itself or another architecture description element. Forms a declarative statement e.g. '(Organisation) Make This PLC has part (Organisation) Engineering Directorate'.	TRAK Metamodel.
Architecture Framework	Conventions, principles and practices for the description of architectures established within a specific domain of application and/or community of stakeholders	ISO/IEC/IEEE 42010 [Ref. 1]
Architecture Viewpoint	Work product establishing the conventions for the construction,	ISO/IEC/IEEE 42010 [Ref. 1]

Term	Definition	Source
	interpretation and use of architecture views to frame specific system concerns. Note: 1 Architecture Viewpoint governs 1 Architecture View	

ABBREVIATIONS

AD	Architecture Description
ADL	Architecture Description Language
BPMN	Business Process Modelling Notation
DODAF	Department of Defense Architecture Framework
MODAF	Ministry of Defence Architecture Framework
UML	Unified Modelling Language

1 INTRODUCTION / SCOPE

This represents part of the logical definition of TRAK, an enterprise architecture framework. It provides a means of describing the architecture of systems and is based on the requirements of ISO/IEC 42010 [Ref. 1] .

TRAK allows you to describe an enterprise, a concept, a solution (and its procurement) and an architecture task. In ISO/IEC terms each is a 'system of interest' and has stakeholders who have concerns that need to be addressed through the resulting architecture description.

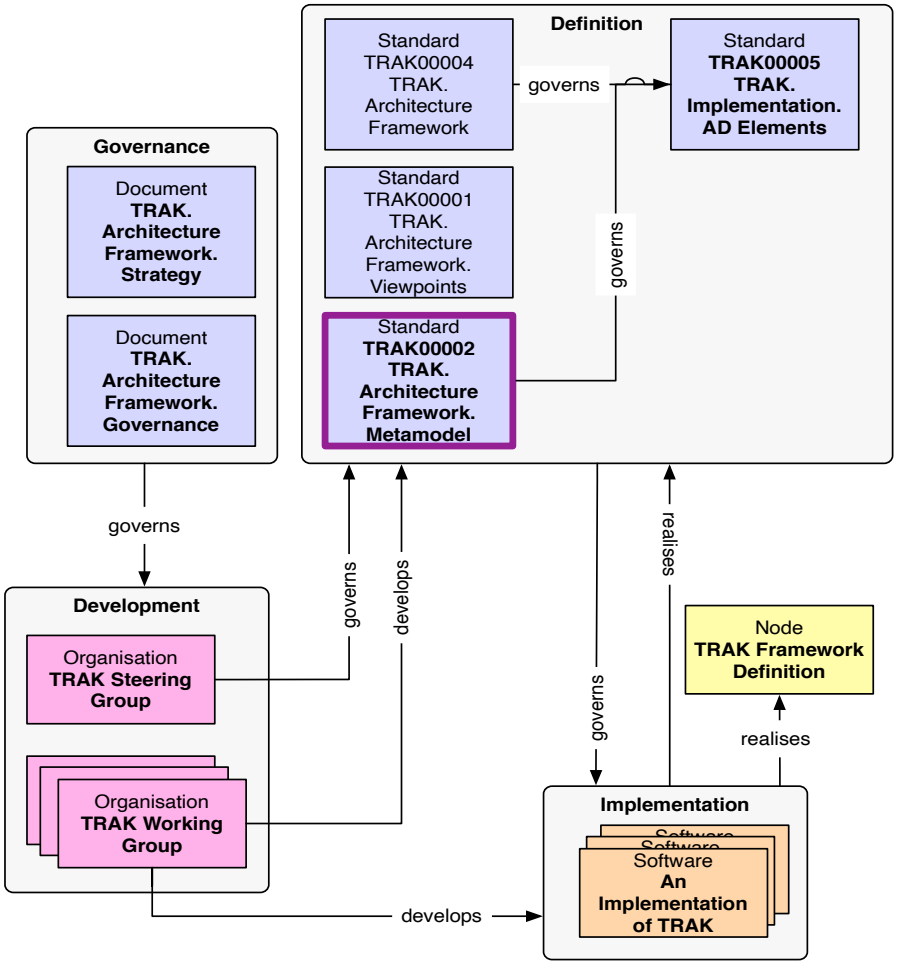


Figure 1-1 - Context for the TRAK Metamodel Document (This Document)

TRAK is solution or implementation free i.e. any UML profile or template is one possible solution to this set of logical requirements in producing TRAK-compliant architecture views and may contain tool or implementation-specific artefacts or constructs. For example the set of attributes that any architecture description element type has is important, the inheritance isn't (to TRAK - it might be for repository management).

There are 3 parts to the logical definition of TRAK:-

- TRAK. Architecture Framework [Ref. 5] **.** Defines and describes TRAK as a whole and invokes the TRAK Metamodel and TRAK Viewpoints documents. It explains important ideas, provides a common glossary, defines rules that apply to colour and presentation. It also provides guidance on choice of a language to represent TRAK. It defines how TRAK aligns with ISO/IEC 42010 and what conformance with TRAK means. It defines a minimum modelling process.

- **TRAK Metamodel. - this document** Defines the element types, their attributes and the relationships between the types. This provides the set of "things" from which a TRAK architecture description is constructed and how they are connected.

- TRAK Viewpoints [Ref. 6] . Defines for each TRAK architecture view, what questions/concerns are addressed by each, what relationships from the TRAK metamodel must and should be used, what is the minimum acceptable content and presentation and what consistency rules apply. This follows the ISO 42010 standard for architecture description.

2 IMPLEMENTATION OF TRAK

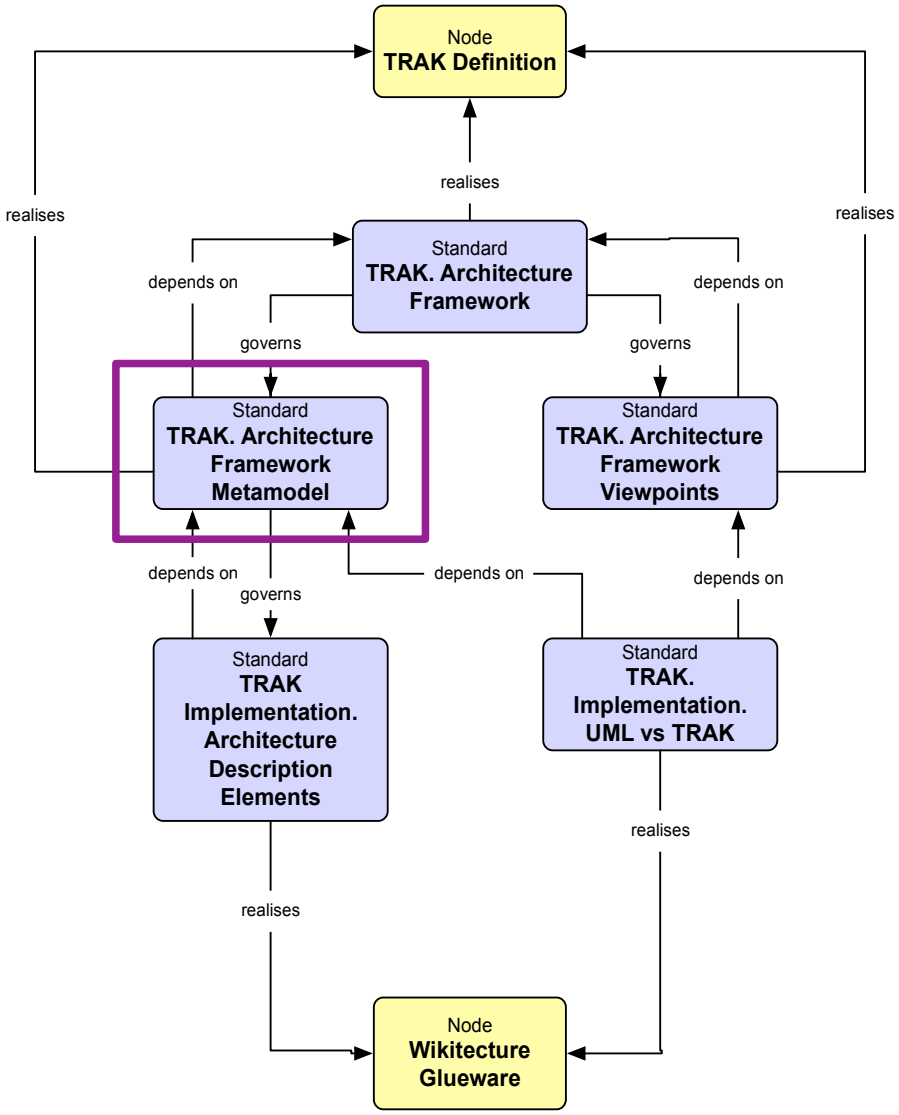


Figure 2-2 Normative TRAK Documents - Logical Definition vs Implementation of TRAK

At any time there may be many implementations of the logical definition of TRAK. These might realise TRAK in a particular modelling tool or a particular Architecture Description Language (ADL - see glossary). A list of known implementations of TRAK is maintained on Sourceforge.

An implementation might implement TRAK in full or only partially. Equally an implementation might introduce its own limitations or artefacts. It is hoped that any implementation will identify any limitations or artefacts that it introduces. If this is done it will help users of TRAK understand what is a product of the TRAK definition and what is a product of the implementation of TRAK using an architecture description language (e.g. UML, BPMN, ArchiMate) or a tool.

All implementations of TRAK shall comply with TRAK. Implementation. Architecture Description Elements [Ref. 14] .. This defines how names of the TRAK metamodel stereotypes and attributes, enumerated lists and applicable standards are to be implemented and is an essential part of assuring consistency of implementation of TRAK. As this is a normative document it is represented as a Standard in TRAK in Figure 2-2.

3 TRAK METAMODEL

3.1 Introduction

The TRAK metamodel defines the node elements and connector elements that can appear within the TRAK architecture viewpoints and therefore TRAK architecture views. In effect it defines the language used to describe the real world in a TRAK architecture description. Each node-connector-node tuple is a sentence that makes a statement or asserts something.

As such the metamodel does not need to contain representations of the mechanisms that TRAK itself uses to enforce or manage (which may be through textual requirements) - it only needs to contain elements that can appear in TRAK viewpoints and views. It is deliberately user- rather than specifier-centric. Any metamodel element that does not appear in a TRAK viewpoint represents an overhead. It is important to keep the size of the TRAK metamodel as small as possible.

The purpose of the metamodel is also to constrain and improve consistency.

TRAK Metamodel

10th April 2020

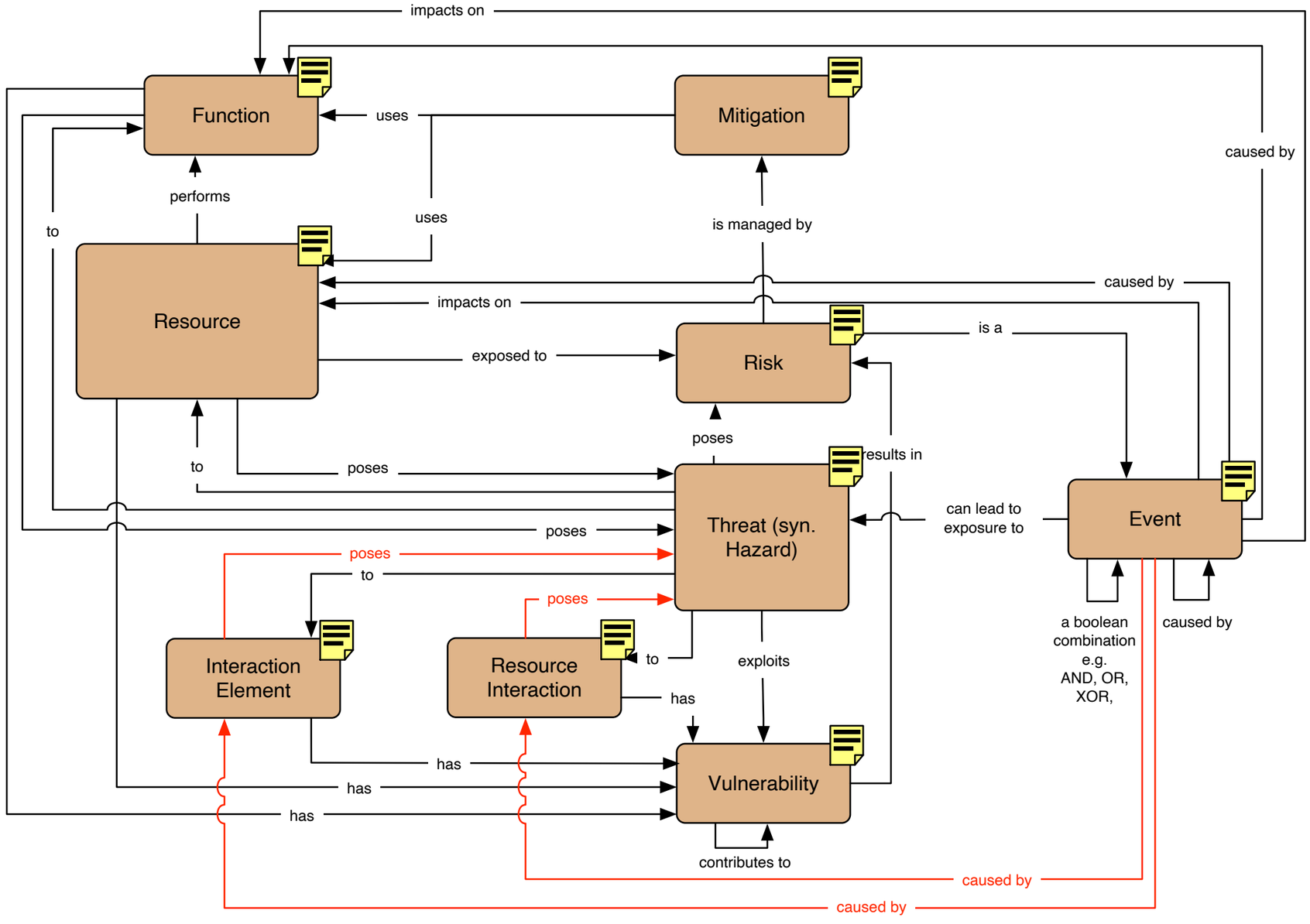
Architecture Description Element

Enterprise Goal
Enterprise
Metric
Capability
Node
Need
Item Exchange
Item
Concept Activity
Resource Interaction
Function
Competence
Interaction Element
Port Connection
Port
Protocol
Project Activity
Milestone
Project
Resource
System
Physical
Software
Human Resource
Role
Job
Organisation
Requirement
Standard
Contract
Document
Architecture Description
Architecture View
Concern
Claim
Argument
Evidence

is quantified by
has part
aspires to
realises
requires
is quantfied by
depends on
from/to
has part
has
= Node needs Node
for
conducts
requires
carries
precedes
triggers
has part
realises
supports
is qualified by
delivers / removes
is necessary for
marked by
marks introduction/ removal of
owns
undertakes
has part
is configured with
contains
is attached to
physically supports
hosted on
has part
contains
physically depends on
is configured with
is configured with
has part
governs
plays
is member of
has part
extends to
plays
governs
has part
governs
* also used to represent sponsor & stakeholder of Architectural Task
exposes
makes
makes
has
addresses
about
has part
performs
to conduct
requires
carries
exchanges
from/to
implements
uses
has part
contains
has part
satisfies
governs
derived from
traces to
traces to
has part
has part
enacts
has part
equivalent to
satisfies
applies
supersedes
depends on
has part
depends on
applies
governs
satisfies
supersedes
traces to
has part
issued by
has part
is a
equivalent to
for definition of Architecture Description Elements e.g. import into repository
supports
about
supports / opposes
traces to
has
has part
opposes
supports
opposes
supports / opposes
has part
has part
proves / disproves

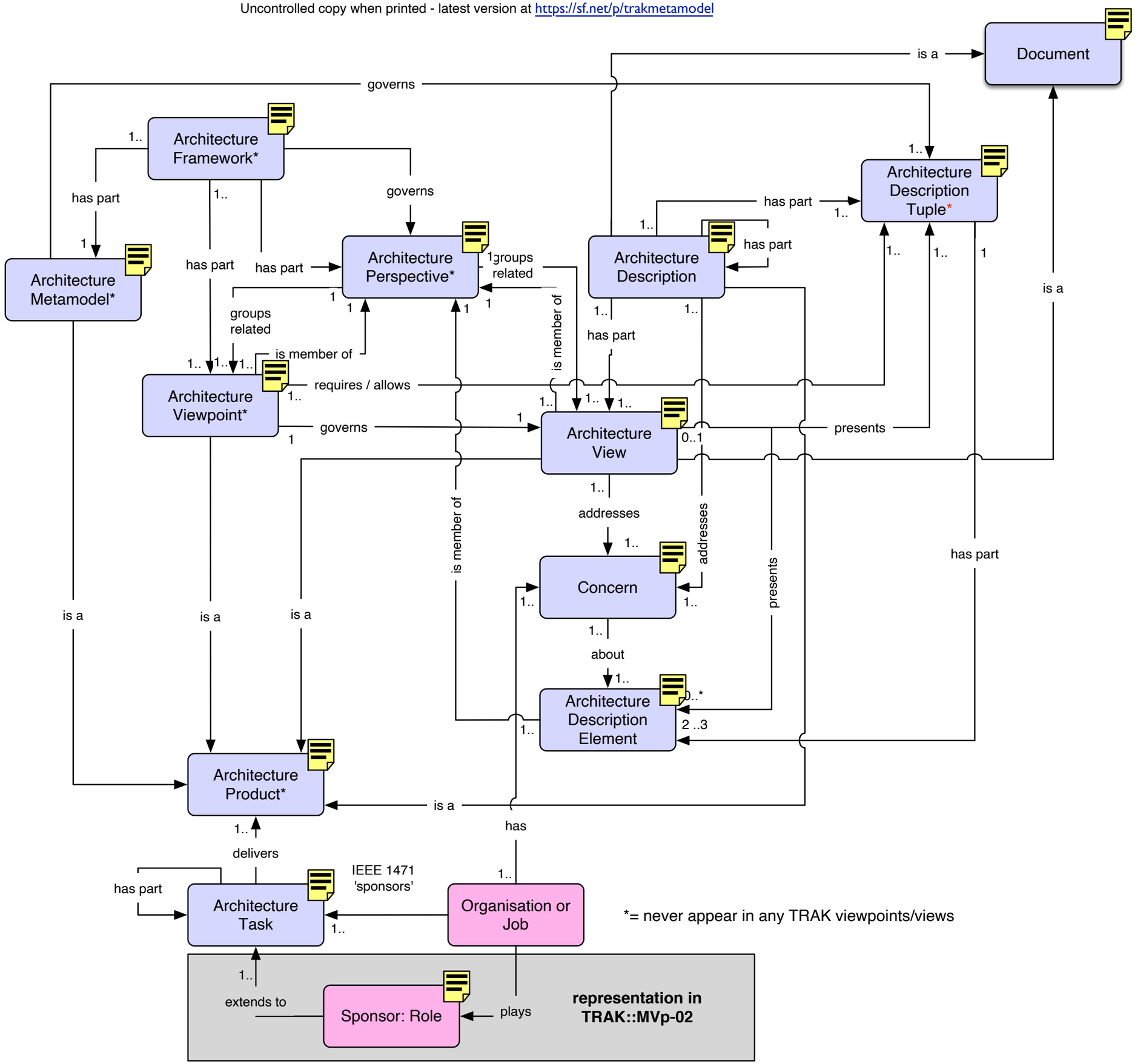
TRAK Metamodel

10th April 2020



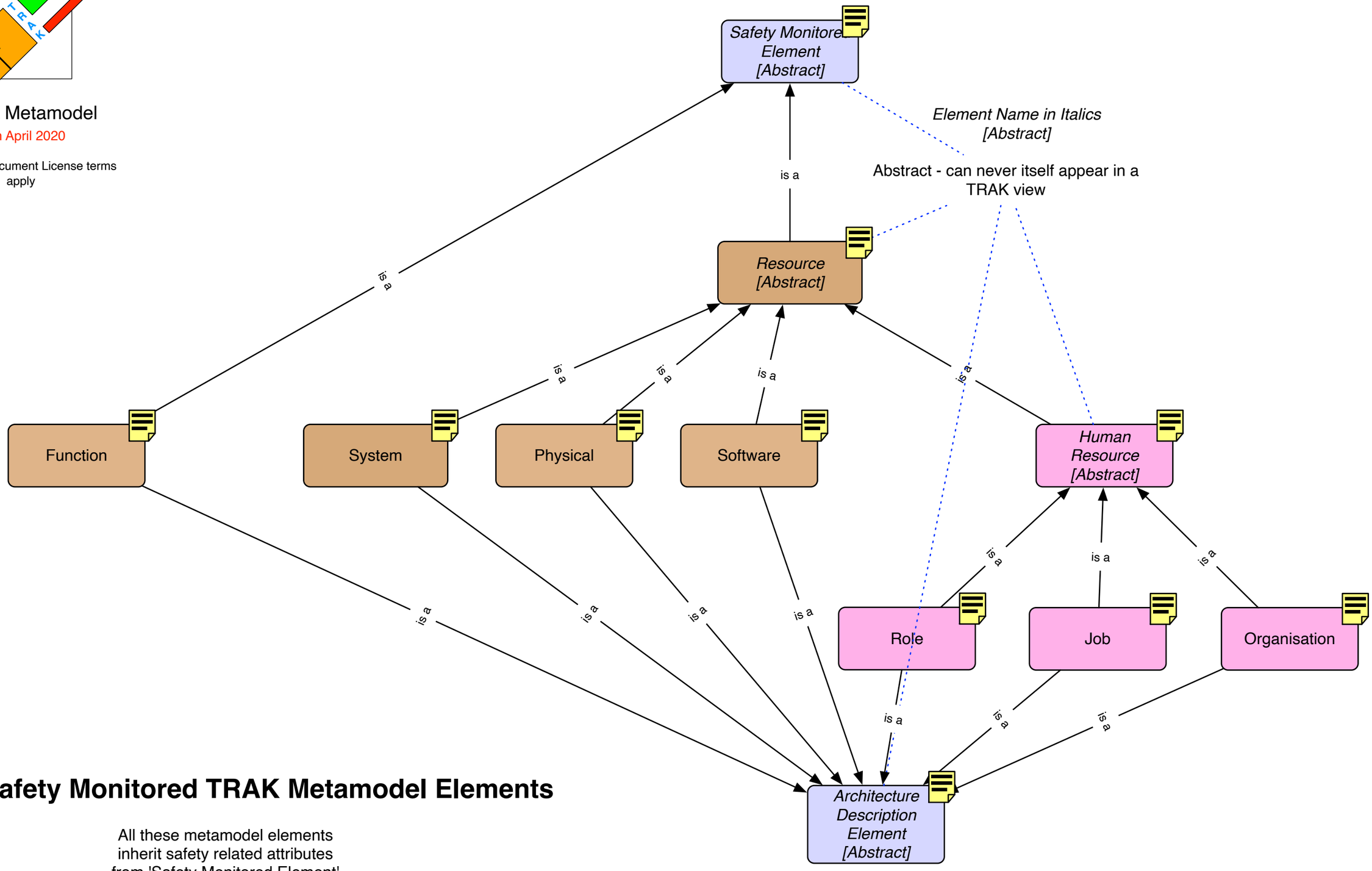
TRAK Metamodel

10th April 2020



TRAK Metamodel

10th April 2020



Safety Monitored TRAK Metamodel Elements

All these metamodel elements inherit safety related attributes from 'Safety Monitored Element'

4 TRAK METAMODEL ELEMENTS

4.1 Introduction

This section defines each element type within the TRAK metamodel (see glossary). These are the types of thing that are used to construct a TRAK architecture description. For example, if I want to represent part of the real world structure of the UK Department of Transport I would use the Organisation element type.

> ISO 42010:2007 states: 'An organisation desiring to produce an architecture framework for a particular domain can do so by specifying a set of viewpoints and making the selection of those viewpoints normative for any AD claiming conformance to the domain-specific architectural framework.'

In other words TRAK, as an architecture framework, has to specify a set of viewpoints. These in turn use architecture tuples from the TRAK metamodel.

The overall requirements for conformance and non-conformance with TRAK are defined in Section 6, Conformance with TRAK, in the TRAK Enterprise Architecture Framework document.

Any AD that wishes to claim conformance to TRAK shall conform to the TRAK metamodel.

The AD can state the version of TRAK to which it conforms by date (see configuration). Alternatively, if no date is stated it will be deemed by default to comply with the latest version of TRAK.

4.2 Metamodel Element Identification

Other architecture frameworks such as MODAF and DODAF may have similarly-named metamodel elements . Where there is a risk of confusion or a need to disambiguate a TRAK:: namespace must be used.

For example TRAK::System does not, correspond to MODAF::System.

4.3 Metamodel Element Implementation

The means of implementing the logical metamodel element definitions is defined in a separate document - TRAK. Implementation. Architecture Description Elements [Ref. 14] . This includes the names, enumerated list values and applicable standards.

4.4 Element Definitions

The TRAK metamodel provides the elements defined in the following table. For each element there is a definition of what it represents in the real world architecture and the attributes of the element.

Where it helps additional tests to test for or against the element are provided i.e. how do we know when we have a Requirement? Answer: if it is an atomic statement of need then it is is likely to be a Requirement. If, however, it is a collection of Requirement then it is most likely a Standard in TRAK terms.

4.4.1 Attributes

Date Modified	Property	Notes	Use / Application	Applies To
30, Sept, 2011	**AD exchange element owning ID**	The unique identifier for the architectural element belonging to the AD element owning organisation.	Used to identify the element. Typically where a tool is used this will be a GUID (globally unique identifier).	Architecture Description Element
30, Sept, 2011	**AD exchange element owning organisation**	The name of the owning organisation of the architectural description element.		Architecture Description Element
30, Sept, 2011	**AD exchange element recipient element name**	The name of the architectural description element in the recipient organisation		Architecture Description Element
30, Sept, 2011	**AD exchange element recipient ID**	The unique identifier for the architectural description element belonging to the organisation receiving the architectural description element.		Architecture Description Element
30, Sept, 2011	**AD exchange element recipient organisation**	The name of the organisation receiving the architectural description element.		Architecture Description Element
30, Sept, 2011	**AD exchange element reference**	A URL that provides information on the architectural description element		Architecture Description Element

Date Modified	Property	Notes	Use / Application	Applies To
	URL			
15, Feb, 2010	**approval authority**	The approval authority for the architecture description.	Typically an individual, a role or an organisation or a combination.	Architecture Description
15, Feb, 2010	**architect**	The names(s) of the architect(s) who produced the architecture description i.e. the authors.		Architecture Description
23, July, 2015	**argument identifier**	Unique identifier assigned to evidence architecture description element. Note this is different from the artefact / document from which the evidence is taken.		Argument
05, Sept, 2015	**assessment**	The assessment text / narrative.		disproves opposes proves supports
05, Sept, 2015	**assessment result**	The conclusion / result of the assessment. Allowed values = 'Unknown', 'Accepted', 'Rejected', N/A'		disproves opposes proves supports

Date Modified	Property	Notes	Use / Application	Applies To
		Default value = 'Unknown'		
05, Sept, 2015	**assumptions**	Any assumptions made, any constraints or limitations that apply to the analysis or the task for which the architecture description is produced.	This should make reference to the MV-02 Architecture Description Design Record View(s) created during the task.	Architecture Description
23, July, 2015	**claim identifier**	A unique identifier for a claim.		Claim
15, Feb, 2010	**closed date**	The date at which the Concern was closed		Concern
23, July, 2015	**closure action**	The action taken to close the Concern.		Concern
10, Apr, 2020	**compliance level claimed**	Degree of level of conformance or compliance claimed against a Contract, Requirement or Standard. Allowed values = 'Unknown', 'Partial', 'Full', 'N/A', 'None' Default = 'N/A'		Claim

Date Modified	Property	Notes	Use / Application	Applies To
07, Sept, 2015	**compliance level required**	Indicates the level of compliance needed against the stated requirement. Allowed values are: 'Unknown';'Desirable - Freedom' - a freedom, usually indicated by 'may'; 'Desirable - Obligation' - an obligation or intent (but not mandatory) - usually indicated by 'will' ; 'Mandatory' - has to be met. Default value = 'Unknown'	N/A' would be used for a heading or informative text / note.	Requirement
23, July, 2015	**concern identifier**	Unique identifier for the Concern.	Used to identify the Concern.	Concern
15, Feb, 2010	**concern scope**	The scope or type of Concern. Allowed values = 'Architecture', 'Architecture Description', 'Architecture Framework', 'Task', 'Not Specified' Default value='Not Specified'	Used to identify whether the Concern applies to the architecture being described, the description of the architecture, the architecture framework used or the task requiring this.	Concern
15, Feb, 2010	**concern status**	The status of the Concern.	Provides means to filter and sort concerns.	Concern

Date Modified	Property	Notes	Use / Application	Applies To
		Allowed values 'Open', 'Closed', 'Not Specified'. Default value = 'Open'		
02, Jan, 2012	**concerns addressed**	The (stakeholder) concerns addressed by the viewpoint.	Management of TRAK. Not used in TRAK views.	Architecture Viewpoint
02, Jan, 2012	**consistency rules**	Rules that apply to AD elements in order to keep the Architecture Description consistent.	Management of TRAK. Not used in TRAK views.	Architecture Viewpoint
05, Sept, 2015	**constraints**	Any restrictions, limitations or exclusions that apply to the analysis or the task for which the architecture description is produced.		Architecture Description
05, Sept, 2015	**date created**	Date on which AD element created		Architecture Description Element
05, Sept, 2015	**date modified**	Date on which AD element modified		Architecture Description Element
30, Sept, 2011	**DCMI contributor**	Dublin Core Metadata Initiative: An entity responsible for making contributions to	Used to identify any contributors.	Document

Date Modified	Property	Notes	Use / Application	Applies To
		the content of the resource. Examples of a Contributor include a person, an organization or a service. Part of the simple Dublin core metadata element set - http://dublincore.org/documents/usageguide/elements.shtml		
30, Sept, 2011	**DCMI creator**	Description: Dublin Core Metadata Initiative. An entity primarily responsible for making the content of the resource. Examples of a Creator include a person, an organization, or a service. Part of the simple Dublin core metadata element set - http://dublincore.org/documents/usageguide/elements.shtml	Used to identify the author.	Document
30, Sept, 2011	**DCMI format**	Dublin Core Metadata Initiative. The physical or digital manifestation of the resource. Typically, Format may include the media-type or dimensions of the resource. Examples of dimensions include	Format may be used to determine the software, hardware or other equipment needed to display or operate the resource. Recommended best practice is to select a value	Document

Date Modified	Property	Notes	Use / Application	Applies To
		size and duration.	from a controlled vocabulary (for example, the list of Internet Media Types [http://www.iana.org/ assignments/media-types/] defining computer media formats).	
30, Sept, 2011	**DCMI identifier**	Dublin Core Metadata Initiative: 'An unambiguous reference to the resource within a given context. Recommended best practice is to identify the resource by means of a string or number conforming to a formal identification system. Examples of formal identification systems include the Uniform Resource Identifier (URI) (including the Uniform Resource Locator (URL), the Digital Object Identifier (DOI) and the International Standard Book Number (ISBN).' document identifier - whether number of string. Part of the simple Dublin core metadata element set - http://dublincore.org/documents/us-		Document

Date Modified	Property	Notes	Use / Application	Applies To
		ageguide/elements.shtml		
30, Sept, 2011	**DCMI language**	Dublin Core Metadata Initiative. A language of the intellectual content of the resource. Part of the simple Dublin core metadata element set - http://dublincore.org/documents/usageguide/elements.shtml TRAK mandates the 2 letter code as a minimum.	Recommended best practice for the values of the Language element is defined by RFC 3066 [RFC 4646, http://www.ietf.org/rfc/rfc4646.txt] which, in conjunction with ISO 639 [ISO 639, http://www.oasis-open.org/cover/iso639a.html]), defines two- and three-letter primary language tags with optional subtags. Examples include "en" or "eng" for English, "akk" for Akkadian, and "en-GB" for English used in the United Kingdom.	Document
30, Sept, 2011	**DCMI publisher**	'The entity responsible for making the resource available. Examples of a Publisher include a person, an organization, or a service. Part of the simple Dublin core metadata element set - http://dublincore.org/documents/usageguide/	Typically, the name of a Publisher should be used to indicate the entity.The intent of specifying this field is to identify the entity that provides access to the resource. If the Creator and Publisher are the same, do	Document

Date Modified	Property	Notes	Use / Application	Applies To
			not repeat the name in the Publisher area. If the nature of the responsibility is ambiguous, the recommended practice is to use Publisher for organizations, and Creator for individuals. In cases of ambiguous responsibility, use Contributor.'	
30, Sept, 2011	**DCMI source**	Description: Dublin Core Metadata Initiative. 'A Reference to a resource from which the present resource is derived. The present resource may be derived from the Source resource in whole or part.	Recommended best practice is to reference the resource by means of a string or number conforming to a formal identification system. In general, include in this area information about a resource that is related intellectually to the described resource but does not fit easily into a Relation element.'	Document
30, Sept, 2011	**DCMI source type**	Dublin Core Metadata Initiative. 'The nature or genre of the content of the resource. Type includes terms describing general categories, functions, genres, or ag-	Recommended best practice is to select a value from a controlled vocabulary (for example, the Dublin Core type vocabulary - http://dub-	Document

Date Modified	Property	Notes	Use / Application	Applies To
		gregation levels for content. In TRAK – allowed values = 'Unknown','Collection','Event','Image','Interactive Resource','Moving Image','Service', 'Software', 'Sound', 'Text'	lincore.org/documents/dcmi-type-vocabulary/' To describe the physical or digital manifestation of the resource, use the FORMAT element.	
30, Sept, 2011	**DCMI subject**	Description: Dublin Core Metadata Initiative. 'The topic of the content of the resource. Typically, a Subject will be expressed as keywords or key phrases or classification codes that describe the topic of the resource. Recommended best practice is to select a value from a controlled vocabulary or formal classification scheme. ' Part of the simple Dublin core metadata element set - http://dublincore.org/documents/usageguide/		Document
30, Sept, 2011	**DCMI title**	Description: Dublin Core Metadata Initiative.' Typically, a Title will be a name by which the resource is formally known. '		Document

Date Modified	Property	Notes	Use / Application	Applies To
		Part of the simple Dublin core metadata element set - http://dublincore.org/documents/usageguide/.		
30, Sept, 2011	**DCMI type**	The nature or genre of the content of the resource. Type includes terms describing general categories, functions, genres, or aggregation levels for content.	Recommended best practice is to select a value from a controlled vocabulary (for example, the Dublin Core type vocabulary - http://dublincore.org/documents/dcmi-type-vocabulary/ To describe the physical or digital manifestation of the resource, use the FORMAT element.	Document
05, Sept, 2015	**decisions**	Any decisions made during the architecture task.		Architecture Description
20, Aug, 2011	**dependency type**	Type or descriptor for the dependency. Allowed values = 'Unknown', 'Proximity', 'Alignment' Default = 'Unknown'		physically depends on
08, Apr, 2011	**description**	A description of the architecture element		Architecture Description

Date Modified	Property	Notes	Use / Application	Applies To
		being represented by the architecture description element.		Element
05, Sept, 2015	**element author**	The name of the creator of the AD element.		Architecture Description Element
24, Dec, 2016	**element type**	Type of element. Allowed values: 'Unknown', 'Data' , 'Energy', 'Resource' Default value = 'Unknown'		Interaction Element
03, Feb, 2011	**element URI**	The Uniform Resource Identifier for the architectural element itself (i.e. not a reference).	This provides the means to address the individual element. URIs are to conform to RFC 3986. Uniform Resource Identifier (URI): Generic Syntax. Jan 2005. http://tools.ietf.org/html/rfc3986	Architecture Description Element
05, Sept, 2015	**evidence definition**	Identification of the statements that identifies the artefact as the evidence (supporting the argument(s) and claim(s) identified.)	Typically this is a specific fragment of a document artefact (including any type of media) rather than a whole document.	Evidence

Date Modified	Property	Notes	Use / Application	Applies To
23, July, 2015	**evidence identifier**	Unique identifier assigned to evidence architecture description element.		Evidence
24, Dec, 2016	**exchange type**	Type of element, Allowed values: 'Unknown', 'Data' , 'Energy', 'Resource' Default value = 'Unknown'		Item Exchange Resource Interaction
15, Feb, 2010	**finish date**	The end date or date of completion.		Architecture Task Contract Enterprise Project Activity
02, July, 2016	**geographic extent**	The area that the element occupies.	Geo-referenced element on a map (to scale)	
05, Sept, 2015	**identifier**	Unique identifier for the Resource.		Resource
10, Apr, 2020	**impact severity**	A measure of the impact on something. Numeric.	Quantitative ~~or qualitative~~ means of ranking the effect of an event.	Event Risk
10, Apr, 2020	**impact severity ranking**	Label indicating ranking of the impact on something. Allowed values : 'Not Set', 'Low', 'Medium',	Qualitative means of ranking the impact of an event. Allows filtering and selection before numeric values	Event Risk

Date Modified	Property	Notes	Use / Application	Applies To
		'High'	available.	
20, Dec, 2014	**interface authority**	The organisation responsible for the definition / management of the interface.		Port Connection
15, Feb, 2010	**issue**	Issue identifier		Document
15, Feb, 2010	**issue date**	A date associated with the issue of the resource.	Typically, Date will be associated with the creation or availability of the resource. Recommended best practice for encoding the date value is defined in a profile of ISO 8601 [Date and Time Formats, W3C Note, http://www.w3.org/TR/NOTE- datetime and follows the YYYY-MM-DD format. If month or day not known use '01' e.g. unknown date in 2010 would be 2010-01-01 format	Document

Date Modified	Property	Notes	Use / Application	Applies To
24, Dec, 2016	**issuing organisation**	The name of the organisation that issues the document.	Allows the issuing organisation to be recorded separately from the publishing organisation.	Architecture Description Architecture View Contract Document Evidence Standard
20 Aug 2011	**item exchange identifier**	Unique identifier for the Item Exchange		Item Exchange
24, Dec, 2016	**item type**	Type of Item . Allowed values: 'Unknown', 'Data' , 'Energy', 'Resource' Default value = 'Unknown'		Item
15, Apr, 2010	**job holder name**	The name of the person who holds the job.	Organisation chart.	Job
12, Dec, 2015	**likelihood**	The probability that the event takes place.	Means to apply a quantitative or qualitative ranking to an event or risk based on how likely the event is to occur.	Event Risk

Date Modified	Property	Notes	Use / Application	Applies To
30, Sept, 2011	**location**	The location of the Resource (latitude, longitude, altitude).	Formatted in accordance with RFC 5870 http://tools.ietf.org/html/rfc5870 - lattitude (decimal degrees), longitude (decimal degrees)[, altitude (metres)] Altitude is optional	Resource
15, Feb, 2010	**location code**	A means of specifying a location code string e.g. post code		Resource
02, Jan, 2012	**location label**	A text label for the location		Resource
30, Sept, 2011	**mandatory tuples**	The Architecture Description Tuples that are required for a well-formed Architecture View.	Management of TRAK. Not used in TRAK views.	Architecture Viewpoint
30, Sept, 2011	**master architecture view**	The name / identifier of the architecture view that first declares an AD element.	Management of TRAK. Not used in TRAK views.	Architecture Viewpoint
08, Apr, 2011	**name**	Name of the architecture description element		Architecture Description Element
20, Aug, 2011	**need identifier**	Unique identifier for the Need		Need

Date Modified	Property	Notes	Use / Application	Applies To
15, Feb, 2010	**need type**	Type of Need. Allowed values: 'Unknown', 'Data' , 'Energy', 'Resource' Default value = 'Unknown'		Need
23, July, 2015	**network location**	Position of Resource in network e.g. sequence or topology		Resource
15, Feb, 2010	**opened date**	The date at which the Concern was opened (raised)		Concern
30, Sept, 2011	**optional tuples**	The Architecture Description Tuples that may be added to an Architecture View to provide context or clarity.	Management of TRAK. Not used in TRAK views.	Architecture Viewpoint
15, Feb, 2010	**part**	Identifier for a part of a Standard	e.g. IEC 61508 – 4 (Part 4)	Standard
15, Feb, 2010	**party to contract**	A party to the contract.	In a written contract the organisation would be a signatory to the contract. In a verbal contract it would represent the organisations (individuals of) who formed the	Contract

Date Modified	Property	Notes	Use / Application	Applies To
			verbal agreement.	
15, Feb, 2010	**perspective description**	Description of the Architecture Perspective.	Management of TRAK. Not used in TRAK views.	Architecture Perspective
5, Sept, 2015	**perspective identifier**	Unique identifier for Architecture Perspective.	Management of TRAK. Not used in TRAK views.	Architecture Perspective
15, Feb, 2010	**perspective title**	Short title for the Architecture Perspective.	Management of TRAK. Not used in TRAK views.	Architecture Perspective
02, Jan, 2012	**pm codeword**	A codeword is another mechanism to limit distribution - only those with the need to know and the codeword have access to the element		Architecture Description Element
02, Jan, 2012	**pm commercial**	Commercial privacy marking.	Typical Values: COMMERCIAL IN CONFIDENCE, COMMERCIAL IN SECRET, IN STRICT CONFIDENCE Default: NONE	Architecture Description Element
02, Jan, 2012	**pm descriptor**	A qualifier used with the protective marking to denote the type of information, sensitivity or need to protect e.g. Personal.	Typical Values: NONE, BUDGET, COMMERCIAL , IN CONFIDENCE, INVESTIGATION, MAN-	Architecture Description Element

Date Modified	Property	Notes	Use / Application	Applies To
		Commercial. i.e. combination might be PROTECT - PERSONAL.	AGEMENT, MEDICAL, PERSONAL, PERSONAL DATA, POLICY & STRATEGY Default: NONE	
02, Jan, 2012	**pm marking**	An enumerated list - used to indicate the severity or impact of the loss of the item so marked.	Typical values: 'NOT PROTECTIVELY MARKED' , 'PROTECT', 'RESTRICTED' , 'CONFIDENTIAL', 'SECRET', 'TOP SECRET' and may be further qualified through ownership, nationality caveat, descriptor and codeword.	Architecture Description Element
02, Jan, 2012	**pm marking owner**	The owner of the protective marking who has the authority to sanction release or lower the protective marking classification.	It is used in conjunction with the protective marking, usually as the prefix e.g. NHS PROTECT, TFL CONFIDENTIAL, or as a national authority - UK RESTRICTED.	Architecture Description Element
02, Jan, 2012	**pm national caveat**	A restriction of the audience who can see the element by nationality e.g. UK EYES ONLY would restrict the potential audi-	This is not the same as the protective marking owner i.e. UK PROTECT does not restrict the audi-	Architecture Description Element

Date Modified	Property	Notes	Use / Application	Applies To
		ence to UK nationals.	ence and therefore the combination would be for example UK EYES ONLY, UK PROTECT	
24 Dec 2016	**port connection identifier**	Unique identifier for the Port Connection.		Port Connection
20, Aug, 2011	**port identifier**	Unique identifier for the Port.		Port
15, Feb, 2010	**priority**	Priority attached to the Concern. Allowed values: 'High'; 'Medium'; 'Low'; 'Not Specified' Default value = 'Not Specified'		Concern
15, Feb, 2010	**purpose**	The purpose for which the architecture description is produced. This should reference the task stakeholder(s) and concerns.		Architecture Description
15, Feb, 2010	**raised by organisation**	The organisation that raised the Concern		Concern

Date Modified	Property	Notes	Use / Application	Applies To
23, May, 2015	**rationale**	A reasoned exposition of principles; an explanation or statement of reasons; (also) an (attempted) justification for something. [OED]	Can be used to justify a relationship or an element or its decomposition.	Architecture Description Element
15, Feb, 2010	**recommendations**	Any recommendations that result from the architecture task and consequent analysis.		Architecture Description
15, Feb, 2010	**requirement identifier**	The unique identifier for the atomic requirement e.g 'ABC123456'		Requirement
08, Apr, 2011	**requirement owner**	The organisation that owns the requirement.		Requirement
15, Feb, 2010	**requirement paragraph**	The paragraph number of the requirement. e.g. '3.2.4'		Requirement
5, Sept, 2015	**requirement priority**	The priority attached to the requirement. Allowed values = 'High', 'Medium', 'Low', 'Not Specified' Default value = 'Not Specified'		Requirement

Date Modified	Property	Notes	Use / Application	Applies To
15, Feb, 2010	**requirement scope**	The scope of the thing to which the requirement applies. Allowed values: 'Enabling' - the thing that produces the product, 'Product' - the product or system itself , 'Unknown' Default value = 'Unknown'		Requirement
15, Feb, 2010	**requirement text**	The requirement text		Requirement
15, Feb, 2010	**requirement title**	Brief title for the requirement.		Requirement
08, Apr, 2011	**requirement type**	The type of requirement. For example a contract will contain requirements that are 'commercial' and possibly also 'legal' ones or unknown. Allowed values: 'Commercial', 'Legal', 'Technical', 'Unknown' Default value = 'Unknown'		Requirement

Date Modified	Property	Notes	Use / Application	Applies To
20, Aug, 2011	**resource interaction identifier**	Unique identifier for the Resource Interaction.		Resource Interaction
15, Feb, 2010	**safety integrity level**	An indicator of the degree of risk reduction required for a resource or function performed by a resource. Allowed values: Unknown,1,2,3,4,Not Applicable Default value = 'Unknown'		Safety Monitored Element
23, May, 2015	**sequence identifier**	Position in sequence of requirement statements.	Used to list requirement statements in required sequence.	Requirement
15, Feb, 2010	**sponsor**	The promoter or supporter of the thing represented by the element.		Architecture Task
30, Sept, 2011	**stakeholders**	A person, role or organisation that has an interest in the the thing represented by the element.		Architecture Task Architecture Viewpoint
15, Feb, 2010	**start date**	Starting date		Architecture Task Contract Enterprise

Date Modified	Property	Notes	Use / Application	Applies To
				Project Activity
23, May, 2015	**submission date**	The date on which the related architecture description element was submitted for assessment.		disproves opposes proves supports
15, Feb, 2010	**summary of findings**	A summary of the findings made during the architecture description task.	This should make reference to TRAK Management Perspective views such as the MV-02 Architecture Description Design Record View which will describe the scope and list Concerns found and/or actioned.	Architecture Description
01, Dec, 2017	**title**	An inscription placed on or over an object, giving its name or describing it; a legend; http://www.oed.com/view/Entry/202602 [OED, Accessed 30th Nov 2017]		Concern
15, Feb, 2010	**tools used**	Identifies the tools and methods used in the construction of the architecture de-		Architecture Description

Date Modified	Property	Notes	Use / Application	Applies To
		scription and analysis of it.		
05, Sept, 2015	**tuple identifier**	A unique identifier for an Architecture Description Tuple.	Management of TRAK. Not used in TRAK views.	Architecture Description Tuple
30, Sept, 2011	**url**	The URL of the actual document being represented by this element.		Document
05, Sept, 2015	**view element identifier**	Unique identifier for the architecture view represented (if this is a separate element)	Used if the element is a shortcut / alias to the architecture view.	Architecture View
15, Feb, 2010	**view identifier**	The identifier - text or number short-code - for the architecture view e.g. CV-01		Architecture View
15, Feb, 2010	**view title**	The title of the architecture view e.g. Solution Function		Architecture View
24 Dec 2016	**viewpoint description**	Description of the Architecture Viewpoint.	Management of TRAK. Not used in TRAK views.	Architecture Viewpoint
05, Sep, 2015	**viewpoint identifier**	Unique identifier for the Architecture Viewpoint.	Management of TRAK. Not used in TRAK views.	Architecture Viewpoint

Date Modified	Property	Notes	Use / Application	Applies To
15, Feb, 2010	**viewpoint title**	Title of the Architecture Viewpoint.	Management of TRAK. Not used in TRAK views.	Architecture Viewpoint
15, Feb, 2010	**views**	The set of views that form the architecture description		Architecture Description
30, Sept, 2011	**views needed**	The Architecture Views that must first be created to declare the AD element(s) needed for the Architecture View that responds to this Architecture Viewpoint.	Management of TRAK. Not used in TRAK views.	Architecture Viewpoint
05, Sep, 2015	**well formedness**	Minimum acceptable content for an Architecture View in terms of Architecture Description Tuples.	Management of TRAK. Not used in TRAK views.	Architecture Viewpoint
24 Dec 2016	**withdrawal date**	The date at which the document is withdrawn and is then no longer in effect.		Standard

Table 4.1: TRAK Metamodel Element Attributes

4.4.2 Inheritance

The TRAK metamodel elements outlined in the Figures in section 3 TRAK Metamodel and defined in Table 4.3 TRAK Metamodel Element Types - Blocks and Table 4.4 TRAK Metamodel Element Types - Connectors use inheritance where there are groups of elements that share attributes. Inheritance is indicated by a '+' in the Attributes column of Table 4.3 and Table 4.4 e.g.

Architecture View …..'+Architecture Product' - indicates that the Architecture View element inherits from the Architecture Product element. Where an element has '(abstract)' this indicates that it can't appear in a TRAK architecture description (and is not therefore an Architecture Description Element) but is used as a means to inherit attributes and relationships.

If the parent element participates in a relationship or tuple then the child element inherits this set of relationships and participates in these as well. e.g

Vulnerability inherits from Architecture Description Element and therefore '**Requirement** *governs* **Architecture Description Element**' means that '**Requirement** *governs* **Vulnerability**'.

Evidence inherits from Document and therefore '**Document** *issued by* **Organisation**' means that '**Evidence** *issued by* **Organisation**'.

Inheritance therefore provides a compact way to describe and present the TRAK Metamodel.

Parent Element		Child Elements
Architecture Description Element	← is a —	**Block Elements** Architecture Description, Architecture Task, Architecture View, Argument, Capability, Claim, Competence, Concept Activity, Concern, Contract, Document, Enterprise, Enterprise Goal, Event, Evidence, Function,

Parent Element		Child Elements
		Interaction Element, Item, Job, Metric, Milestone, Mitigation, Node, Organisation, Physical, Port, Project, Project Activity, Protocol, Requirement, Risk, Role, Software, Standard, System, Threat, Vulnerability Connector Elements AND, Item Exchange, NOT, Need, OR, Port Connection, Resource Interaction, about, addresses, applies, aspires to, can lead to exposure to, carries, caused by, conducts, contains, contributes to, delivers, depends on, derived from, disproves, enacts, equivalent to, exchanges, exploits, exposed to, exposes, extends to, from, governs, has, has part, hosted on, impacts on, implements, is a, is configured with, is managed by, is member of, is necessary for, is quantified by, issued by, makes, marked by, marks introduction of, marks removal of, opposes, owns, performs, physically depends on, plays, poses, precedes, proves, realises, removes, requires, results in, satisfies, supersedes, supports, to, to conduct, traces to, triggers, undertakes, uses
Architecture Product (abstract)	← is a —	Architecture Description, Architecture Perspective, Architecture View, Architecture Viewpoint
Document	← is a —	Architecture Description, Architecture View, ~~Architecture Viewpoint~~, Contract, Evidence, Standard
Event	← is a —	Risk
Human Resource (abstract)	← is a —	Job, Organisation, Role

Parent Element		Child Elements
Resource	← is a —	Human Resource, Physical, Software, System
Safety-Monitored Element	← is a —	Function, Resource

Table 4.2: Metamodel Elements from which Others Inherit

4.4.3 Blocks

Date Modified	Element Type Name	Perspective	Definition	Attributes	Tests For	Tests Against	Comment
12, Dec, 2015	**Accident**		See Event				
5, Sept, 15	**Architecture Description**	Management	IEEE 1471: An architectural description is a model of the architecture; its purpose is to answer all identified stakeholders' questions	+ Architecture Description Element + Architecture Product + Document • approval authority • architect			The purists will not like it (self-references / infinite recursion) but it provides a useful means for describing the scope/results for an architectural task using the

Date Modified	Element Type Name	Perspective	Definition	Attributes	Tests For	Tests Against	Comment
			about all identified architecture-related concerns for the system of interest; The collection of architecture products that describes a system of interest.	• assumptions • constraints • purpose • recommendations • decisions • summary of findings • tools used • views			MV-02 Architecture Design Record.
02, Oct, 17	**Architecture Description Element**	Management	An individual architecture description object that is used to describe or represent an item of real-world architecture. An architecture description element can appear in an architecture description.	• name • description • element URI • AD exchange element owning ID • AD exchange element owning organisation • AD exchange element recipient ele-			The parent of all TRAK element types used in ADs. The intent of the attributes is to capture identification and ownership to allow bi-directional exchange of ADs between 2 organisations.

Date Modified	Element Type Name	Perspective	Definition	Attributes	Tests For	Tests Against	Comment
				ment name • AD exchange element recipient element ID • AD exchange element recipient organisation • AD exchange element reference URL • pm codeword • pm descriptor e.g. None/Budget/Commercial/In Confidence/ Investigation/Management/Medical/Personal/Personal Data/ Policy & Strategy • pm marking e.g Not Protectively Marked/			

Date Modified	Element Type Name	Perspective	Definition	Attributes	Tests For	Tests Against	Comment
				Protect/Restricted/ Confidential/Secret/ Top Secret • pm marking owner (organisation) • pm commercial e.g. (None / Commercial in Confidence / Commercial In Secret / In Strict Confidence) • pm national caveat • • rationale • element author • date created • date modified			
18, Jan, 11	***Architecture Description Tuple***	Management	A named architecture description element connected by a named	• tuple identifier			Smallest unit of architecture description in TRAK Basis for natural language

Date Modified	Element Type Name	Perspective	Definition	Attributes	Tests For	Tests Against	Comment
			relationship to a named architecture description element. i.e. subject - predicate - object - the basis of a sentence				and machine understandable such as RDF. Element itself doesn't appear in TRAK views – only the Architecture Description Elements that form a tuple.
23, July, 15	**Architecture Framework**	Management	ISO/IEC/IEEE 42010 'conventions, principles and practices for the description of architectures established within a specific domain of application and/or community of stakeholders.'				Not used in TRAK views
17, Feb, 10	**Architecture Metamodel**	Management	"Metamodeling" is the construction of a col-				Not used in TRAK views

Date Modified	Element Type Name	Perspective	Definition	Attributes	Tests For	Tests Against	Comment
			lection of "concepts" (things, terms, etc.) within a certain domain. A model is an abstraction of phenomena in the real world; a metamodel is yet another abstraction, highlighting properties of the model itself. A model conforms to its metamodel in the way that a computer program conforms to the grammar of the programming language in which it is written.				

Date Modified	Element Type Name	Perspective	Definition	Attributes	Tests For	Tests Against	Comment
15, Feb, 10	**Architecture Perspective**	Management	IEEE 1471 refers to an Architectural Perspective as 'Sharing of architectural models also facilitates an "aspect-oriented" style of architectural description' i.e. a grouping of related and overlapping architectural views.	+ Architecture Product • perspective description • perspective title • perspective identifier			Not used in TRAK views
23, July, 15	**Architecture Product**	Management	A work product / artefact with architectural modelling content.				Architecture Product is not used in any of the TRAK views and does not appear in any Architecture Description. It is part of the background definition of TRAK.

Date Modified	Element Type Name	Perspective	Definition	Attributes	Tests For	Tests Against	Comment
							Architecture Product does not therefore have a Master Architecture View
5, Sept, 11	**Architecture Task**	Management	A task which results in the delivery of one or more architecture products	+ Architecture Description Element • finish date • start date • sponsor • stakeholders			Used on the MV-02 to describe the task for which the AD is produced - and to plan / organise the use/ development of the models.
5, Dec, 16	**Architecture View**	Management	ISO/IEC/IEEE 42010: A representation of a whole system from the perspective of a related set of concerns	+ Architecture Product + Document • view identifier • view element identifier • view title			Used in the MV-02 Architecture Design record.
10, Apr,	**Architecture**	Management	A viewpoint defines a	+ Architecture Product			Not used in TRAK views

Date Modified	Element Type Name	Perspective	Definition	Attributes	Tests For	Tests Against	Comment
20	**Viewpoint**		set of conventions (notations, languages and model types) for constructing a certain kind of view.	~~+ Document~~ • stakeholder(s) • concerns addressed • mandatory tuples • optional tuples • well formedness • consistency rules • views needed • master architecture view • viewpoint description • viewpoint title • viewpoint identifier			
23, July, 15	**Argument**	Management	A connected series of statements or reasons intended to establish a position (and, hence, to refute the opposite); a process of reas-	+ Architecture Description Element • argument identifier			•OED http://www.oed.com/view/Entry/10663 (accessed August 08, 2013)

Date Modified	Element Type Name	Perspective	Definition	Attributes	Tests For	Tests Against	Comment
			oning; argumentation				
27, Jan, 11	**Capability**	Enterprise	The ability to undertake a particular kind of action or the extent of someone's or something's ability.	+ Architecture Description Element	makes sense when used with 'Enterprise requires ...' easy to reuse	includes technology includes a 'thing'	• keep short • use active (doing) voice • should be able to be reused easily across ADs / models
10, Apr 20	**Claim**	Management	That which is claimed. To claim - To assert and demand recognition of i.e. something which is asserted.	+ Architecture Description Element • claim identifier • compliance level claimed(Unknown, Partial, Full, N/A, None)			• "claim, v.". OED Online. June 2013. Oxford University Press. http://www.oed.com/view/Entry/33646 (accessed August 08, 2013). • "claim, n.". OED Online. June 2013. Oxford University Press. http://www.oed.com/viewdictionaryentry/Entry/3

Date Modified	Element Type Name	Perspective	Definition	Attributes	Tests For	Tests Against	Comment
							3645 (accessed August 08, 2013)
27, Jan, 11	**Competence**	Solution	The scope of knowledge or ability.	+ Architecture Description Element			• important for human factors or human resources analysis
27, Jan, 11	**Concept Activity**	Concept	A high level logical activity or process which is independent of how the activity is carried out i.e. no 'how'.	+ Architecture Description Element	logical	contains solution or technology in phrase	if Node is too like a real thing then Concept Activity is likely to be indistinguishable from a solution Function associated with a resource
23, July, 15	**Concern**	Management	An interest in a subject held by one or more stakeholder Human Resource	+ Architecture Description Element • concern identifier • title (string) • opened date (date) • priority (High, Medium, Low, Not Spe-			This is allied to IEEE1471 where generic concerns are addressed through a Viewpoint (specification). Individual Architectural views address specific concerns. The type of concern

Date Modified	Element Type Name	Perspective	Definition	Attributes	Tests For	Tests Against	Comment
				cified) • concern scope (Architecture, Architecture Description, Architecture Framework, Task, Not Specified) • concern status (Open, Closed, Not Specified) • raised by organisation • closure action (text) • closed date (date)			identified in the scope attribute are: Not Specified
15, Feb, 10	**Contract**	Management	A written or spoken agreement. between at least 2 parties that is intended to be enforceable by law.	+ Document • finish date (date) • party to contract (organisation) • start date (date)			Used in the MV-03 Requirements & Standards View.
5, Dec, 2016	**Document**	Management	A document artefact - a piece of written,	+ Architecture Description Element			Dublin Core Metadata simple elements - type

Date Modified	Element Type Name	Perspective	Definition	Attributes	Tests For	Tests Against	Comment
			printed, or electronic matter that provides information or evidence or that serves as an official record. Dublin Core Metadata elements are defined at http://dublincore.org/documents/usageguide/elements.shtml	• DCMI contributor • DCMI creator (string) • • DCMI identifier (string) • DCMI source (string) • DCMI source type (enumeration) • issue (string) • issue date (date) • issuing organisation (organisation) • DCMI language (string) • DCMI publisher (organisation) • DCMI subject (string)			takes values from DCMI Type Vocabulary. Language code takes values from ISO 639. 2 letter code e.g. 'en', 'fr' See http://www.sil.org/iso639-3/codes.asp dcmi source = source(s) for this document - may be another document http://dublincore.org/documents/dces/

Date Modified	Element Type Name	Perspective	Definition	Attributes	Tests For	Tests Against	Comment
	Document (continued)	Management		• DCMI title (string) • DCMI format • url • DCMI type (enumeration)			See TRAK00005 TRAK. Implementation. Architecture Description Elements. https://sourceforge.net/projects/trak/files/Implement%20TRAK/.
27, Jan, 11	**Enterprise**	Enterprise	An organisation - often a collection - having common goals of "bottom line". Also represents a period or duration within the total life of the bigger Enterprise.	+ Architecture Description Element • finish date • start date	• abstract	• concrete	
23, July, 15	**Enterprise Goal**	Enterprise	An objective or target for an Enterprise (phase). i.e. it has an associated period or	+ Architecture Description Element			A Vision (Statement) outlines what the organisation wants to be. It concentrates on the future. It is a

Date Modified	Element Type Name	Perspective	Definition	Attributes	Tests For	Tests Against	Comment
			notion of phasing and is likely to be different or change between Enterprise Phases.				source of inspiration. It provides clear decision-making criteria. [Wikipedia]. A Mission Statement tells you the fundamental purpose of the organisation. It concentrates on the present. In TRAK therefore if an Enterprise is defined as having both the start and finish dates as [Today] and an Enterprise Goal is attached this is the equivalent to a Mission Statement.
05, Sept, 15	**Evidence**	Management	Testimony or facts tending to prove or disprove any conclusion or	+ Document • evidence identifier • evidence definition			OED http://www.oed.com/viewdictionaryentry/Entry/65368 (accessed August 08, 2013).

Date Modified	Element Type Name	Perspective	Definition	Attributes	Tests For	Tests Against	Comment
			something serving as a proof.				In TRAK evidence takes the form of a document artefact which can therefore include any type of media. Evidence identification captures identifies statement(s) that offer proof and define artefact as evidence.
10, Apr, 2020	**Event (syn. Accident)**	Solution	Anything that happens, or is contemplated as happening; an incident, occurrence.	+ Architecture Description Element • likelihood • impact severity • impact severity ranking			OED http://www.oed.com/view/Entry/65287 (accessed December 12th , 2015) An accident sequence is a sequence of events.

Date Modified	Element Type Name	Perspective	Definition	Attributes	Tests For	Tests Against	Comment
27, Jan, 11	**Function**	Solution	An activity which is specified in context of the resource (human or machine) that performs it.	+ Architecture Description Element + Safety Monitored Element	• associated with a technology		
12, Dec, 2015	**Hazard**	Solution	See Threat	+ Architecture Description Element			
30, Sep, 11	***Human Resource***	Solution	Human organisational asset.	+ Resource			• abstract • parent class of Organisation, Role, Job • not used in any TRAK view
11, Feb, 11	**Interaction Element**	Solution	A formalised representation of the thing that is exchanged between Resources.	+ Architecture Description Element • element type (Unknown, Data, Energy, Resource)	expressed as tangible thing being passed e.g. real message, 'stuff'		
11, Feb,	**Item**	Concept	A high level quantity	+ Architecture			It is important to note

Date Modified	Element Type Name	Perspective	Definition	Attributes	Tests For	Tests Against	Comment
11			or thing that can flow.	Description Element • item type = Unknown, Data, Energy, Resource			that this isn't just information - it might be a materiel / resource flow, energy or data.
28, Jan, 17	**Job**	Solution	A position of employment - usually but not always paid..	+ Architecture Description Element + Human Resource • job holder name	title on an organisation chart	sounds like a responsibility	
12, May, 11	**Metric**	Management	A measure.	+ Architecture Description Element			May be better as attribute of any architecture element? As an element type it allows taxonomies of metrics to be prepared and metrics to be shared.
27, Jan, 11	**Milestone**	Procurement	event marking a significant change or stage in development	+ Architecture Description Element			
12, Dec,	**Mitigation**	Solution	The action of reducing	+ Architecture			

Date Modified	Element Type Name	Perspective	Definition	Attributes	Tests For	Tests Against	Comment
2015			the severity, seriousness, or painfulness of something.	Description Element			
23, July, 15	**Node**	Concept	A node is a solution-agnostic/logical entity. It can represent anything providing that no knowledge of how things are done is implied.	+ Architecture Description Element			
28, Jan, 17	**Organisation**	Solution	An organised body of people, associated for a particular purpose.	+ Architecture Description Element + Human Resource	concrete well-defined structure wrt parts and membership	abstract	
28, Jan, 17	**Physical**	Solution	A physical thing. Can represent an equipment (which can host Software), a building or	+ Architecture Description Element + Resource	bricks & mortar	contains an organisation	Note that there is a difference between a HQ - the building and a HQ as an Organisational Resource

Date Modified	Element Type Name	Perspective	Definition	Attributes	Tests For	Tests Against	Comment
			civil item, train etc.				(which is housed in the building).
5, Sept, 15	**Port**	Solution	A socket or opening (logical or physical) provided by a thing.	+ Architecture Description Element • port identifier			
27, Jan, 11	**Project**	Procurement	An individual or collaborative enterprise that is carefully planned and designed to achieve a particular aim.	+ Architecture Description Element	can it be given to another organisation to manage/run? concrete i.e. not Enterprise	integral part of a company i.e. Organisation how it is resourced/ staffed Organisation	
27, Jan, 11	**Project Activity**	Procurement	An activity undertaken within a project which results in something being delivered.	+ Architecture Description Element • finish date • start date			The use of Project Activity (with Project) in the architecture enables the architecture to represent snap-

Date Modified	Element Type Name	Perspective	Definition	Attributes	Tests For	Tests Against	Comment
							shots or change in architecture with time. It enables a view to show what capability is delivered at a point in time (& compared with another, say, now).
27, Jan, 11	**Protocol**	Solution	A set of rules governing the exchange procedure between things.	+ Architecture Description Element			
7, Sept, 15	**Requirement**	Management	An atomic requirement or constraint - a statement of need.	+ Architecture Description Element • requirement identifier • sequence identifier • requirement priority • compliance level required = Unknown, • Desirable - Freedom, Desirable - Commit-	atomic	takes form of a document - would then be either a Standard or Contract	It is NOT a requirements document. It is intended to represent a requirement - something that might be exported from a requirement management tool. It can be associated with any architecture element inside the boxed area. This

Date Modified	Element Type Name	Perspective	Definition	Attributes	Tests For	Tests Against	Comment
				ment, Mandatory, N/A • requirement paragraph (number e.g.. 1.2.33) • requirement owner (organisation) • requirement scope = Unknown, Enabling, Product • requirement text • requirement title • requirement type = Unknown, Commercial, Legal, Technical			provides a mechanism to associate requirements with model elements Desirable - Freedom e.g 'may' Desirable - Commitment e.g. 'will' Mandatory e.g. 'shall'
2, July, 16	***Resource***	Solution	Part of the solution - a generic thing that refers to human-related and machine-related entities.	+ Safety Monitored Element • identifier • location label • location code			Abstract parent class of System, Physical, Software, Human Resource not used in any TRAK

Date Modified	Element Type Name	Perspective	Definition	Attributes	Tests For	Tests Against	Comment
				• location (latitude, longitude, altitude) • network location (sequence., topology) • geographic extent (line, polygon)			view Label - descriptive, not necessarily unique Code - a text location identifier e.g. LOCN2345 location - RFC 5870 Uniform Resource Identifier for Geographic Locations [Ref. 13]
12, Dec, 2015	**Risk**	Solution	An uncertain event that has a harmful impact or consequence.	+ Architecture Description Element + Event			If a Risk (event) is 100% certain to occur it is not a risk – it is an Event.

Date Modified	Element Type Name	Perspective	Definition	Attributes	Tests For	Tests Against	Comment
28, Jan, 17	**Role**	Solution	The duties or status assumed or part played by a person or organisation.	+ Architecture Description Element + Human Resource	many roles map to a single job		If a single role occupies most of a job-holder's time it may result in the job being redefined around the role.
28, Jan, 17	***Safety Monitored Element***	Solution	Something that has possible safety-related attributes	• safety integrity level = Unknown/1/ 2/3/4/ Not Applicable			Enables Safety Integrity Level (SIL) to be captured if appropriate. Abstract. Applied to Resource and to Function not used in any TRAK view
28, Jan, 17	**Software**	Solution	The programs and other operating information used by a computer.	+ Architecture Description Element + Resource			
05, Sept,	**Standard**	Management	A normative docu-	+ Document	takes form		Used in the MV-03 Stand-

Date Modified	Element Type Name	Perspective	Definition	Attributes	Tests For	Tests Against	Comment
15			ment. It is a formal document that establishes criteria, processes, practices or defines protocols. Note that although it is a form of Requirement it only applies through the application of a Requirement whether a contractual or technical.	• part (string) • withdrawal date (date)	of a document normative law requirement document normative plan document		ards View.
28, Jan, 17	**System**	Solution	A composite structure exhibiting emergent behaviour.	+ Architecture Description Element + Resource	'has feedback/control mechanism via its parts that keeps it stable/opposes per-	consists of Physical elements (with no behaviour) sum of functions of parts in configura-	Can consist of purely human elements. A system is stable and maintains itself this way - the constituent parts must therefore collectively provide the mechanism to

Date Modified	Element Type Name	Perspective	Definition	Attributes	Tests For	Tests Against	Comment
					turbations	tion i.e.no emergent behaviour or properties	keep the system stable. If an essential part of a system is removed it destroys that system (it might become a different system because the system boundary is then different). As ever "the whole is more than the sum of the parts"
12, Dec, 2015	**Threat (synonym Hazard)**	Solution	Something that has the potential to cause harm; danger; peril.	+ Architecture Description Element			
12, Dec, 2015	**Vulnerability**	Solution	A weakness or susceptibility.	+ Architecture Description Element			

Table 4.3: TRAK Metamodel Element Types - Blocks

4.4.4 Connectors

Date Modified	Element Type Name	Perspective	Definition	Attributes	Tests For	Tests Against	Comment
23, July, 15	**about**	Management	On the subject of.	+ Architecture Description Element			
31, Jan, 18	**allows**	Management	Sanctions or permits.				Not used in any TRAK view.
23, July, 15	**addresses**	Management	Directs attention, frames for particular audience.	+ Architecture Description Element			
1st, Jan, 16	**AND**	Solution	Logical conjunction; the and of a set of operands is true if and only if all of its operands are true	+ Architecture Description Element			
23, July, 15	**applies**	Management	Bring or put into operation or practical use.	+ Architecture Description Element			
23, July, 15	**aspires to**	Enterprise	Ambition for something, seeks to obtain.	+ Architecture Description Element			

Date Modified	Element Type Name	Perspective	Definition	Attributes	Tests For	Tests Against	Comment
12, Dec, 15	**can lead to exposure to**	Solution	Potential to uncover or make visible to.	+ Architecture Description Element			
23, July, 15	**carries**	Management	Conveys or transfers.	+ Architecture Description Element			
01, Jan, 16	**caused by**	Solution	The cause of; effects, brought about by	+ Architecture Description Element			OED (accessed 12th December 2015) http://www.oed.com/view/Entry/29148
23, July, 15	**conducts**	Concept	Directs, manages, carries on.	+ Architecture Description Element			
23, July, 15	**contains**	Solution	Have or hold something within.	+ Architecture Description Element			Note - if Physical contains System or Physical it contains the 'parts' of the System/Physical.
12, Dec, 15	**contributes to**	Solution	Has a part in bringing (it) about; has a part or share in producing.	+ Architecture Description Element			OED (accessed 12th December 2015) http://www.oed.com/view/Entry/40529

Date Modified	Element Type Name	Perspective	Definition	Attributes	Tests For	Tests Against	Comment
23, July, 15	**delivers**	Management	Provides or produces.	+ Architecture Description Element			
23, July, 15	**depends on**	Management	Rely on. If A depends on B and B changes then it is likely that A changes in some way.	+ Architecture Description Element			
24, Dec, 16	**derived from**	Management	Drawn, obtained, descended, or deduced from a source.	+ Architecture Description Element			OED (accessed 24th December 2016) http://www.oed.com/view/Entry/50614
05, Sept, 15	**disproves**	Management	Demonstrate not to be the specified thing by evidence or argument.	+ Architecture Description Element • submission date • assessment (string) • assessment result = Unknown / Accepted / Rejected / N/A			The submission / assessment is for a (particular) Evidence disproves (particular) Claim. The same Evidence may be used for other Claims – this is a separate submission / assessment.

Date Modified	Element Type Name	Perspective	Definition	Attributes	Tests For	Tests Against	Comment
23, July, 15	**enacts**	Management	Put into practice.	+ Architecture Description Element			
23, July, 15	**equivalent to**	Management	Having the same meaning or effect or being virtually identical to.	+ Architecture Description Element			
23, July, 15	**exchanges**	Solution	Act of giving and receiving (between 2 entities).	+ Architecture Description Element			
12, Dec, 15	**exploits**	Solution	To utilize for the entity's own ends	+ Architecture Description Element			
23, July, 15	**exposes**	Solution	Uncover / make visible.	+ Architecture Description Element			
12, Dec, 15	**exposed to**	Solution	Uncovered, made visible to	+ Architecture Description Element			
23, July, 15	**extends to**	Solution	Expand in scope to (a defined set of entities).	+ Architecture Description Element			Used to indicate the extent of a role.

Date Modified	Element Type Name	Perspective	Definition	Attributes	Tests For	Tests Against	Comment
24, Dec, 16	**for**	Concept	Of purpose or destination.	+ Architecture Description Element			OED (accessed 24th December 2016) http://www.oed.com/view/Entry/72761
23, July, 15	**from**	Management	Defines the origin of a an exchange.	+ Architecture Description Element			Used to describe the direction of an exchange.
23, July, 15	**governs**	Management	Constitutes a law or rule for.	+ Architecture Description Element			
23, July, 15	**groups related**	Management	Brought together as the result of deliberate arrangement or composition - things having some related properties or attributes in common.				Not used in any TRAK view.
23, July, 15	**has**	Management	Duty or obligation to.	+ Architecture Description Element			

Date Modified	Element Type Name	Perspective	Definition	Attributes	Tests For	Tests Against	Comment
23, July, 15	**has part**	Management	Identifies a fraction or piece of something.	+ Architecture Description Element			
23, July, 15	**hosted on**	Solution	Something provides space or an environment for the hosted entity. Not an exchange or interaction.	+ Architecture Description Element			
12, Dec, 15	**impacts on**	Solution	Has a (pronounced) effect on.	+ Architecture Description Element			OED (accessed 12th December 2015) http://www.oed.com/view/Entry/92038
23, July, 15	**implements**	Solution	Put into effect	+ Architecture Description Element			

Date Modified	Element Type Name	Perspective	Definition	Attributes	Tests For	Tests Against	Comment
23, July, 15	**is a**	Management	Membership of a more general type e.g. a rose is a plant. Used to identify inheritance / taxonomy.	+ Architecture Description Element			Used to support the assertion of inheritance between metamodel elements. Taxonomy views support the management of repositories and are outside the scope of TRAK.
31, Jan, 18	**is attached to**	Solution	To fasten or join (a thing) to another thing, or a place or position	+ Architecture Description Element			OED (accessed 18th January 2018) http://www.oed.com/view/Entry/12699
23, July, 15	**is configured with**	Solution	Put together in particular form or arrangement.	+ Architecture Description Element			
12, Dec, 15	**is managed by**	Solution	Controlled, directed or to deal or cope with.	+ Architecture Description Element			

Date Modified	Element Type Name	Perspective	Definition	Attributes	Tests For	Tests Against	Comment
02, Oct, 17	**is member of**	Management	Belonging to or having membership of (a group of organisations organized for a joint purpose). Distinct from is part of which implies a whole/part relationship.	+ Architecture Description Element			
23, July, 15	**is necessary for**	Procurement	Required for or need for.	+ Architecture Description Element			
23, July, 15	**is quantified by**	Management	Express or measure using.	+ Architecture Description Element			
23, July, 15	**issued by**	Management	Supplied/distributed by.	+ Architecture Description Element			

Date Modified	Element Type Name	Perspective	Definition	Attributes	Tests For	Tests Against	Comment
23, July, 15	**Item Exchange**	Concept	A solution-agnostic/logical exchange of an Item (data, resource, energy) between two entities.	+ Architecture Description Element • Item exchange identifier • exchange type (Unknown, Data, Energy, Resource)			The Item Exchange flows in the opposite direction to the direction of need. labelled using 'from/to'
23, July, 15	**makes**	Management	Creates, prepares or produces.	+ Architecture Description Element			
23, July, 15	**marked by**	Procurement	Show the position of.	+ Architecture Description Element			
23, July, 15	**marks introduction of**	Procurement	The position or time at which (something) is brought into use or started.	+ Architecture Description Element			

Date Modified	Element Type Name	Perspective	Definition	Attributes	Tests For	Tests Against	Comment
23, July, 15	**marks removal of**	Procurement	The position or time at which (something) is removed from use or finished.	+ Architecture Description Element			
23, July, 15	**Need**	Concept	A necessity or requirement for (something).	+ Architecture Description Element • need identifier • need type (enumeration = Unknown, Data, Energy, Resource)		if routing matters it isn't a Need	labelled using 'has' ... Need ... 'for' A Need may be defined using one or more Requirements as part of a normative document (Standard).

Date Modified	Element Type Name	Perspective	Definition	Attributes	Tests For	Tests Against	Comment
1st, Jan, 2016	NOT	Solution	In logic, negation, also called logical complement, is an operation that takes a proposition p to another proposition "not p", which is interpreted intuitively as being true when p is false and false when p is true				
05, Sept, 15	opposes	Management	Dispute the truth or validity of.	+ Architecture Description Element • submission date • assessment (string) • assessment result = Unknown / Accepted / Rejected / N/A			

Date Modified	Element Type Name	Perspective	Definition	Attributes	Tests For	Tests Against	Comment
1st, Jan, 16	**OR**	Solution	Logical (inclusive) disjunction, also known as alternation; the or of a set of operands is true if and only if one or more of its operands is true.				
23, July, 15	**owns**	Procurement	Possesses (denotes belonging).	+ Architecture Description Element			
23, July, 15	**performs**	Solution	To carry out one's function, to do one's part; to do, act.	+ Architecture Description Element			
23, July, 15	**physically depends on**	Solution	A physical dependency between two entities.	+ Architecture Description Element • dependency type = Unknown /Proximity/ Alignment			

Date Modified	Element Type Name	Perspective	Definition	Attributes	Tests For	Tests Against	Comment
31. Jan, 18	**physically supports**	Solution	To keep from falling,	+ Architecture Description Element			OED (accessed 19th January 2018) http://www.oed.com/view/Entry/87689
23, July, 15	**plays**	Solution	Takes part or engages in.	+ Architecture Description Element			
20, Dec, 14	**Port Connection**	Solution	Asserts that a connection exists between two ports.	+ Architecture Description Element • port connection identifier • interface authority = organisation			labelled using 'from/to'
12, Dec, 15	**poses**	Solution	To present or constitute (a difficulty, problem, danger, or threat)	+ Architecture Description Element			OED (accessed December 12th , 2015) http://www.oed.com/view/Entry/148291
23, July, 15	**precedes**	Management	Comes before (something) in time.	+ Architecture Description Element			

Date Modified	Element Type Name	Perspective	Definition	Attributes	Tests For	Tests Against	Comment
23, July, 15	**presents**	Management	Exhibits or displays.	+ Architecture Description Element			Not used in any TRAK view.
05, Sept 2015	**proves**	Management	Asserts that the source element establishes a fact or the truth of the object of the relationship.	+ Architecture Description Element • submission date • assessment (string) • assessment result = Unknown / Accepted / Rejected / N/A			The submission / assessment is for a (particular) Evidence proves (particular) Claim. The same Evidence may be used for other Claims – this is a separate submission / assessment.
23, July, 15	**realises**	Management	Give physical form to.	+ Architecture Description Element			
23, July, 15	**removes**	Management	Take away.	+ Architecture Description Element			
23, July, 15	**requires**	Management	Needs or demands for a particular purpose.	+ Architecture Description Element			

Date Modified	Element Type Name	Perspective	Definition	Attributes	Tests For	Tests Against	Comment
12, Dec, 15	**results in**	Solution	Effects; the product or consequences of something	+ Architecture Description Element			
5, Sept, 15	**Resource Interaction**	Solution	A formalised representation of the thing exchanged between Resource.	+ Architecture Description Element • resource interaction identifier • exchange type = Unknown, Data, Energy, Resource • interface authority = organisation	something flows or is exchanged not part of the specification of the environment	in realms of physics e.g. thermal flow effect of/on immediate environment e.g. EMC, vibration, climate	Can be a flow of data, energy or resource (Physical, Human Resource, System, Software) labelled using 'from/to'
2, Oct, 17	**satisfies**	Management	Fulfil completely or comply with.	+ Architecture Description Element			OED (accessed 02 Oct 2017) http://www.oed.com/view/Entry/171239?redirectedFrom=satisfies&

Date Modified	Element Type Name	Perspective	Definition	Attributes	Tests For	Tests Against	Comment
23, July, 15	**supersedes**	Management	Take place of something previously in force.	+ Architecture Description Element			
05, Sept, 15	**supports**	Management	Give assistance to / enable to function or act.	+ Architecture Description Element • submission date • assessment (string) • assessment result = Unknown / Accepted / Rejected / N/A			
23, July, 15	**to**	Management	Defines the destination or target of an exchange.	+ Architecture Description Element			Used to describe the direction of an exchange.
23, July, 15	**to conduct**	Solution	To direct, manage, carry on.	+ Architecture Description Element			
23, July, 15	**traces to**	Management	Marks the source for something.	+ Architecture Description Element+ Architecture Description Element			

Date Modified	Element Type Name	Perspective	Definition	Attributes	Tests For	Tests Against	Comment
23, July, 15	**triggers**	Management	Cause to happen or exist.	+ Architecture Description Element			
23, July, 15	**undertakes**	Procurement	Commit to / take on.	+ Architecture Description Element			
23, July, 15	**uses**	Solution	To put into action or effect.	+ Architecture Description Element			

Table 4.4: TRAK Metamodel Element Types - Connectors

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5 TRAK METAMODEL RELATIONSHIP RULES

The definitions of the metamodel connectors used to represent relationships that can appear in a TRAK Architecture Viewpoint and TRAK Architecture View are listed in Table 4.4. This section defines any rules that apply to combinations of architecture tuples within the TRAK metamodel. when producing an architecture description

There are also rules for consistency that apply to tuples within TRAK architecture viewpoints (and hence architecture views) that are defined in the separate TRAK Architecture Viewpoints document.

The following rules shall apply to any TRAK-compliant architecture description:

	Precedence Rules		
ID	**Initial Tuple (Set)**	**Follow-on Tuple/Tuple Set**	**Justification**
	must occur	before	
TS1	Resource - *performs* - Function - *realises* - Operational Activity - *supports* Capability	System *realises* Capability	Requires that folks identify the justification/rationale for 'System *realises* Capability' otherwise short cut will be taken and rationale never developed.
TS2	Resource - *performs* - Function - *realises* - Concept Activity **AND** Node *conducts* Concept Activity	Resource *realises* Node	Requires that folks identify the justification/rationale for 'Resource *realises* Node' otherwise short cut will be taken and rationale never developed.
TS3	Resource - from - Resource Interaction - to Resource	Resource *exposes* Port	Identification of a Resource Interaction must occur before it is characterised. Also stated in SVp-02 architecture viewpoint.
TS4	Node *needs* Node	Node - *from* - Item Exchange - *to* - Node	Must establish that one node needs something from another node before the exchange can be characterised.
TS5	Resource Interaction	Resource - *performs* - Function	If Function identified then before

	Precedence Rules		
ID	Initial Tuple (Set)	Follow-on Tuple/Tuple Set	Justification
	must occur	before	
	supports Function	+ Resource Interaction (*from/to* Resource) *carries* Interaction Element *triggers* Function	defining more detail via Resource Interaction the functional justification for the interaction must be established. See MVp-03 viewpoint.
TS6	Claim *about* Architecture Description Element	Argument *supports / opposes* Claim	Must frame Claim in the context of the Architecture Description Element otherwise it isn't possible to test whether the Claim is a valid one.
TS7	Argument *supports* Claim	Evidence *supports / opposes* Argument	Must first frame Argument in the context of the Claim otherwise it isn't possible to test whether the Evidence supports or opposes the Claim.
TS8	Claim *about* Architecture Description Element + Argument *supports / opposes* Claim + Evidence *supports / opposes* Argument	Evidence *proves / disproves* Claim	Must define Argument and Evidence supporting or opposing Claim before closing loop and asserting that Evidence proves or disproves Claim.

Table 5.1 - TRAK Relationship Rules

5.1 TRAK Tuple Relationship Rationale

This section provides supporting rationale for relationships or combinations of relationships within the TRAK metamodel. It is not normative but might be useful when modelling or when taking decisions that affect the TRAK metamodel.

	Rationale		
ID	Initial Tuple (Set)	Follow-on Tuple/Tuple Set	Justification
TR1	Organisation - *per-*	Job *performs* Role	This allows the role of the or-

	Rationale		
ID	Initial Tuple (Set)	Follow-on Tuple/Tuple Set	Justification
	forms - Role		ganisation to be captured even though the part(s) of the organisation that discharge the role are not known. A single role for the organisation might be subdivided into different roles and allocated to several jobs within the organisation.
TR2	Project *owns* Milestone *marks introduction of / marks removal of* System	Project *undertakes* Project Activity *delivers / removes* System / System *necessary for* Project Activity	Allows relationship between Project and System to be established even if details of Project Activities not known.
TR3	Requirement *has part* Requirement	-	Allows a requirement hierarchy to be established - useful for representing requirement documents (=TRAK::Standard)
TR4	Function *precedes* Function / Concept Activity *precedes* Concept Activity	-	Allows an activity order to be established.
TR5	(only) System *realises* Capability	-	System' is the fundamental centre of the TRAK metamodel. Systems engineering deals with types and relationships and abstracts/keeps "out of the weeds". to enable structure and relationships to be more clearly seen. Forces thinking/architecture description in systems.
TR6	Project Activity delivers / removes System	-	
TR7	System necessary for Project Activity	-	
TR8	Milestone marks introduction of / removal of System	-	
TR9	Resource Interaction *supports* Function	-	Enables justification of a Resource Interaction knowing only 1 other thing - the Function

	Rationale		
ID	Initial Tuple (Set)	Follow-on Tuple/Tuple Set	Justification
TR10	Resource Interaction *supports* Function	Resource *performs* Function *triggers* Interaction Element + Resource Interaction *from/to* Resource *carries* Interaction Element	Need to assert that Resource Interaction supports a Function (otherwise Function or Resource Interaction may not be needed or able to be implemented). Enables this to be established in a simple and direct fashion. Once established the detail can be described. Consistent with requiring the Resource Interaction before the Port Connection is described.
TR11	Physical *contains* System	System *is configured with* Resource	Assertion that if the System is contained then its essential parts (Resource) are also contained by the Physical. If all the parts are not contained then it is not the same System or possibly not a System at all.
TR12	Architecture Viewpoint *is member of* Architecture Perspective Architecture View *is member of* Architecture Perspective Architecture Description Element *is member of* Architecture Perspective	-	Need to be able to assert relationship between Viewpoint, View and Architecture Description Element and a TRAK Perspective. Management of TRAK itself. Not used in viewpoints or views.

	Rationale		
ID	Initial Tuple (Set)	Follow-on Tuple/Tuple Set	Justification
TR13	Architecture View *declares* Architecture Description Element	-	Need to be able to represent a Master Architecture View in which each element is first declared in an Architecture Description. Management of TRAK - not used in viewpoints or views.

Table 5.2 - TRAK Relationship Rationale

5.2 TRAK Metamodel Relationship Exclusions

This section lists the rationale for things that have been excluded from the TRAK metamodel by design.

	Rationale	
ID	Element Type / relationship	Justification
TE1	"is a" (specialisation / generalisation)	Specialisation e.g. "iPhone is a Smart Phone is a Mobile Phone" is used for creating taxonomies or hierarchies and is typically used to form library or dictionary-like structures or for organisation of repository content. It could be used with any Architecture Description Element. These are common uses but not within the scope of any one architecture framework. TRAK allows taxonomy views as non-conforming products to be included with architecture descriptions (see Conformance with TRAK in the TRAK Enterprise Architecture Viewpoint document) in addition to the MV-01 Architecture Description Design Record so it makes no sense to add this to every element on the metamodel.

Table 5.3 - TRAK Metamodel Exclusion Rationale

6 ORIGINAL TRAK BASELINE VS MODAF 1.2

February 2010 Original Release - based on MODAF® 1.2 (and hence also DODAF 1.5).

The baseline comparison is broken down into:-

- a comparison of MODAF® 1.2 elements against those in TRAK at original release
- a comparison of relationships used in the simplified TRAK metamodel

6.1 Baseline - Metamodel Elements

TRAK Metamodel Element	Status (New / Changed / Unchanged) wrt MODAF®	MODAF® v 1.2 Metamodel Element	TRAK
Architecture Description	Changed	MODAF::Architecture Description - 'A specification of a system of systems at a technical level which also provides the business context for the system of systems.'	TRAK::Architecture Description - 'IEE1471: An architectural description is a model of the architecture; its purpose is to answer all identified stakeholders' questions about all identified architecture-related concerns for the system of interest; The collection of architecture products that describes a system of interest.' Also adds attributes.
Architecture Element	New	In MODAF the Architecture Description is defined as comprising Architectural Product which is defined as comprising architectural elements. There is no architecture element defined in MODAF.	TRAK::Architecture Element - 'An individual architectural object.' Adds attributes for AD/model exchange.
Architecture	Changed	MODAF::Architecture	TRAK::Architecture Framework -

TRAK Metamodel Element	Status (New / Changed / Un-changed) wrt MODAF®	MODAF® v 1.2 Metamodel Element	TRAK
Framework		Framework - 'A set of connected View specifications which serve to define how an Enterprise may be represented by an Architectural Description'.	'An Enterprise Architecture Framework (EA Framework) is a framework Enterprise Architecture which specifies the allowed object types and relationships and which specifies how these are presented in architecture views associated with an Enterprise Architecture.'
Architecture Metamodel	New	MODAF::Architecture Framework is defined as comprising MODAF::View but there is no metamodel. (MODAF::MetaData refers to the Dublin Core metadata for the AD.)	TRAK:: Architecture Metamodel - '"Metamodeling" is the construction of a collection of "concepts" (things, terms, etc.) within a certain domain. A model is an abstraction of phenomena in the real world; a metamodel is yet another abstraction, highlighting properties of the model itself. A model conforms to its metamodel in the way that a computer program conforms to the grammar of the programming language in which it is written.'
Architecture Perspective	New	In MODAF the grouping of a collection of architecture views is the Viewpoint which isn't represented in the M3.	TRAK::Architecture Perspective - 'IEEE 1471 refers to an Architectural Perspective as 'Sharing of architectural models also facilitates an "aspect-oriented" style of architectural description' i.e. a grouping of related and overlapping architectural views.'

TRAK Metamodel Element	Status (New / Changed / Un-changed) wrt MODAF®	MODAF® v 1.2 Metamodel Element	TRAK
Architecture Product	Changed	MODAF::Architectural Product - 'A connected and coherent set of Architectural Elements which conform to a View.'	TRAK::Architecture Product - 'Something with architectural modelling content.' In TRAK it refers to the AD, Architecture Viewpoints, Architecture Views not just the elements connected to a View.
Architecture Task	New		TRAK::Architecture Task - 'Something that will result in an architecture description.' Central to conformance with ISO 42010 is the premise that an AD is produced in response to a task to address concerns.
Architecture View	Changed	MODAF equates MODAF ::View with IEEE 1471 – in MODAF, however, views are not specified using Viewpoints (or any element in the M3).	TRAK::Architecture View - 'ISO42010: A representation of a whole system from the perspective of a related set of concerns.' Each TRAK::Architecture View is specified by its own TRAK::Architecture Viewpoint.
Architecture Viewpoint	New	MODAF uses viewpoints to organise collections of related MODAF views. The M3 does not represent the viewpoint.	See TRAK::Architecture View for difference use of 'viewpoint.
Capability	Changed	MODAF::Capability - 'A high level specification of the enterprise's ability'.	TRAK::Capability - 'The ability to undertake a particular kind of action or the extent of someone's or something's ability.'

TRAK Metamodel Element	Status (New / Changed / Unchanged) wrt MODAF®	MODAF® v 1.2 Metamodel Element	TRAK
Competence	Changed		Replaces MODAF::Actual Competence, MODAF::Competence
Concern	Unchanged		TRAK::Concern - 'An interest in a subject held by one or more stakeholder Human Resource'. In TRAK Concern is typed by model architecture, modelling style, framework, task. This is broader than the ISO 42010 sense.
Contract	New		Used to apply standards at contract issue.
Document	New		TRAK – allows a trace to be made to reference or supporting documents.
Enterprise	Changed	Whole Life Enterprise and Enterprise Phase in MODAF. Enterprise Phase has 'is structural part' of relationship with Whole Life Enterprise. Enterprise Phase is therefore a temporal part of the Whole Life Enterprise.	Replaced in TRAK by a single TRAK::Enterprise metamodel element and a 'has part' relationship. Rather than embed any notion of time into the name it is changed to Enterprise and attribute values used to represent the start and finish dates (period).
Enterprise Goal	Changed	Enterprise Goal and Enterprise Vision	Replaced by TRAK::Enterprise Goal since vision is a type of goal.
Function	Changed		TRAK:Function adds Safety Integrity Level and Independent Safety Auditor,
Human Resource	Changed		TRAK::Human Resource inherits Safety Integrity Level and Independent Safety Auditor, Location
Interaction Element	Changed	MODAF – Data Element	TRAK::Interaction Element typed by 'Unknown, Data, Energy, Materiel'

TRAK Metamodel Element	Status (New / Changed / Un-changed) wrt MODAF®	MODAF® v 1.2 Metamodel Element	TRAK
Item	New	In MODAF Information Exchange is the only metamodel element that describes a logical exchange and it bundles information elements.	Since logical exchanges also include resource, materiel as well as information and need to be represented a new metamodel element was needed.
Item Exchange	New	Information Element is used in MODAF.	TRAK::Item can represent resource, materiel of information. It is typed by 'Unknown, Data, Energy, Materiel'
Job	Changed		Replaces MODAF::ActualPost and MODAF::Post. Adds Safety Integrity Level and Independent Safety Auditor, Location
Metric	Changed	MODAF::Measurable Property. MODAF also has 'Capability with Metric'.	At the present time Metric can only be attached to Enterprise Goal, Capability, Operational Activity or Function as these are the most likely stereotypes to need to be quantified.
Milestone	Changed	MODAF::Milestone is defined as a type of Project where startTime = endTime	TRAK::Milestone - 'event marking a significant change or stage in development'. It has no associated start or finish time.
Need	Changed	Needline' in MODAF.	TRAK::Need is typed by 'Unknown, Data, Energy, Materiel'
Node	Unchanged	In the MODAF metamodel Node has no definition.	TRAK::Node - 'A node is a logical operational entity.'
Operational Activity	Unchanged		Minor changes to definition.

TRAK Metamodel Element	Status (New / Changed / Un-changed) wrt MODAF®	MODAF® v 1.2 Metamodel Element	TRAK
Organisation	Changed		Replaces MODAF::Actual Organisation and MODAF::Organisation Type . Adds Safety Integrity Level and Independent Safety Auditor, Location
Physical	Changed	MODAF includes stereotypes such as Platform (not present in TRAK.) MODAF - Artefact	Name change. Additional attributes properties wrt Design Authority Organisation, Manufacturer Organisation, Safety Integrity Level and Independent Safety Auditor
Port	Changed	Port Type, System Port	TRAK:Port replaces MODAF:SystemPort? Adds ID and name.
Port Connection	New		
Project	Changed	MODAF::Project - 'A time-limited endeavour to create a specific set of products or services.'	As TRAK can represent the business (system) that delivers a system it is important to note that this is a Project not the organisation that staffs the project. A Project can be handed over to another organisation. TRAK::Project - 'An individual or collaborative enterprise that is carefully planned and designed to achieve a particular aim.'
Project Activity	New		TRAK – allows description of building blocks in a programme. Useful for justification / explanation of context.
Protocol	Unchanged		
Requirement	Changed	MODAF – Requirements identified but not part of the MODAF specification.	TRAK - an atomic requirement. Adds owning organisation, priority, type, text, title,

TRAK Metamodel Element	Status (New / Changed / Unchanged) wrt MODAF®	MODAF® v 1.2 Metamodel Element	TRAK
Resource	Changed		TRAK::Resource has additional attributes for identity and location.
Resource Interaction	Changed	MODAF::Resource Interaction is defined around data exchange.	TRAK::Resource Interaction is an interaction and is typed by 'Unknown, Data, Energy, Materiel'
Role	Unchanged?	In the MODAF metamodel Role has no definition.	TRAK::Role - 'The function assumed or part played by a person or organisation.'
Safety Monitored Resource	New		Used to apply Safety Integrity Level and Independent Safety Auditor to Resource and Function.
Software	Changed		Additional attributes properties wrt Design Authority Organisation, Manufacturer Organisation. Safety Integrity Level and Independent Safety Auditor
Standard	Changed		Additional attribute to capture part.

TRAK Metamodel Element	Status (New / Changed / Un-changed) wrt MODAF®	MODAF® v 1.2 Metamodel Element	TRAK
System	Changed	MODAF::System is an artefact and part of the physical architecture alongside Platform and cannot have Organisation, Post or Role. The MODAF System Viewpoint [Ref. 4] states that artefacts are 'Physical objects made for a purpose (eg system, sub-system, platform, component or any physical item that occupies space and has attributes)'. MODAF also states that ' a system cannot contribute [to capability] alone; it must be hosted on a physical asset used by an organisational resource of both' Capability Configuration is also defined as part of the physical architecture.	TRAK::System is central to the framework. TRAK defines humans as part of the system of interest. TRAK::System sits where MODAF::Capability Configuration does - dead centre. There are also rules to prevent architects making shortcuts to bypass system definition. It can also be used to represent an increment by configuring it with the things that are added. Addition or removal is indicated using a relationship with Milestone. Additional attributes properties wrt System Authority Organisation, Design Authority Organisation, Manufacturer Organisation

Table 6.1: TRAK Launch Baseline wrt MODAF - Stereotypes

6.2 Baseline - Relationships

In order to keep the comparison between TRAK and MODAF® 1.2 to a reasonable length(!);

- only the element types from TRAK which are used in architecture views are shown

- for each element type only the relationships directed away from the element type are shown in order to prevent duplication.

Starting from TRAK Element Type	TRAK Relationship	Status (New / Changed / Unchanged) wrt MODAF®	MODAF® v 1.2	TRAK
Architecture View	• Architecture View addresses Concern	New		Stems from ISO 42010
Architecture Description	• Architecture Description addresses Concern	New		Stems from ISO 42010
Capability	•Capability is quantified by Metric •Enterprise Goal requires Capability •Enterprise requires Capability •Operational Activity supports Capability •Capability depends on Capability •System realises Capability	Changed	MODAF uses the Enterprise Phase has Capability.	Broadly similar. Changes to stereotypes. Deliberate attempt to try and replace 'has'es with something less ambiguous.
Competence	• Competence to conduct Function	Unchanged		

Starting from TRAK Element Type	TRAK Relationship	Status (New / Changed / Unchanged) wrt MODAF®	MODAF® v 1.2	TRAK
Concern	•Concern about Architecture Element	Changed	MODAF – Organisation, Post has Concern No relationship between Concern and the thing that the concern relates to.	
Contract	•Contract applies Standard •Contract is a Document	New		Used to apply standards at contract issue and therefore distinguish from latest issue.
Document	•Architecture Element traces to Document	New		
Enterprise	•Enterprise has part Enterprise •Enterprise realised by Organisation •Enterprise aspires to Enterprise Goal	New	MODAF uses Whole Life Enterprise has Enterprise Phase	In TRAK the 'has part' with suitable start and end dates is used to denote an enterprise phase. One less stereotype needed.
Enterprise Goal	•Enterprise Goal requires Capability	Changed	MODAF uses Enterprise Phase has Capability	
Function	•Function triggers Interaction Element •Function realises Operational Activity •Function has part Function	Changed	In MODAF the linkage between Function and Data Element is via Function Flow from/to Function carries Data Element	In TRAK the model is that functions trigger or are triggered by interaction items.

Starting from TRAK Element Type	TRAK Relationship	Status (New / Changed / Unchanged) wrt MODAF®	MODAF® v 1.2	TRAK
Interaction Element	•Interaction Element triggers Function	Changed		In TRAK it is typed by interaction type (Unknown, Data, Energy, Materiel'). Also captures Interface Authority.
Item	•Item triggers Operational Activity •Item has part Item	Changed	In MODAF::Information Element captures information	Name changed to better recognise that other types of exchange need to be described. TRAK attempts to capture other 'item flows'. Typed by 'Unknown, Data, Energy, Materiel'
Item Exchange	•Item Exchange carries Item	Changed	MODAF::Information Exchange - 'A relationship specifying the need to exchange information between nodes. Formally known as a "needline".' The guidance documentation for the MODAF::Operational Viewpoint shows <<NodeConnector>> representing materiel and energy in addition to <<Needline>>.	Typed by 'Unknown, Data, Energy, Materiel'

Starting from TRAK Element Type	TRAK Relationship	Status (New / Changed / Unchanged) wrt MODAF®	MODAF® v 1.2	TRAK
Job	•Job plays Role •Job governs Job •Job exposes Port •Job realises Node •Job performs Function •Job (Resource Interaction) from/to Resource •Job has Concern	Changed/ New		Port can be added to any Human Resource to describe exchanges with Organisation, Job and Role
Metric	• Capability / Operational Activity / Function is quantified by Metric		In MODAF a trace can be made to a metric. The relationship doesn't seem to be named.	
Milestone	•Milestone marks introduction of System •Milestone marks removal of System	New	MODAF uses Capability Increment and Out of Service stereotypes.	TRAK needed a pragmatic and explicit method of showing whether things (and therefore capabilities) were being added or things being removed losing capabilities.
Need	•Need requires Item Exchange	Changed.	Needline bundles Information Element. 'Bundles' seems to represent aggregation.	
Node	•Node has part Node	New	In MODAF the Node is subdivided using a NodeAssemblyUsage.	In TRAK there is a need to be able to express a logical structural boundary from the set of logical things that form the logical whole Node.

Starting from TRAK Element Type	TRAK Relationship	Status (New / Changed / Un-changed) wrt MODAF®	MODAF® v 1.2	TRAK
Operational Activity	•Operational Activity triggers Information Element •Operational Activity has part Operational Activity	Changed	In MODAF the linkage between Function and Data Element is via Function Flow (from/to Function) carries Information Element	In TRAK the model is that operational activities trigger or are triggered by information items.
Organisation	•Organisation plays Role •Organisation is member of Organisation •Organisation governs Organisation •Contract governs Organisation •Organisation has part Job •Organisation realises Enterprise •Organisation governs Project •Organisation exposes Port •Organisation realises Node •Organisation performs Function •Organisation (Resource Interaction) from/to Resource •Organisation has Concern	Changed/ New	MODAF supports Organisation has Job, Organisation has part SubOrganisation	TRAK allows organisation governance and membership/affiliation to be described. TRAK also establishes linkage between representations of Organisation in solution and capability perspectives. TRAK attempts to try and eliminate 'has' relationships where possible as these are potentially ambiguous – possession, aggregation etc. Note that any Human Resource can have a Port.

Starting from TRAK Element Type	TRAK Relationship	Status (New / Changed / Unchanged) wrt MODAF®	MODAF® v 1.2	TRAK
Physical	•Physical has part Physical •Physical physically depends on Physical •Physical realises Node •Physical performs Function •Physical (Resource Interaction) from/to Resource	New	In MODAF physical is represented by Artefact. Artefact is therefore a part of the physical architecture (and system is a type of Physical Asset)	TRAK allows physical dependencies to be described between things. Physical dependencies sub-typed as : Unknown, Alignment, Proximity
Port	•Port implements Protocol	Unchanged		Note that in TRAK Human Resource (Organisation, Job, Role) can have ports.
Port Connection	•Port Connection from/to Port •Port Connection exchanges Interaction Element •Port Connection realises Resource Interaction •Port Connection uses Protocol	Changed		TRAK::Port Connection typed by 'Unknown, Data, Energy, Materiel' since TRAK attempts to represent more than just data exchanges in the solution perspective.

Starting from TRAK Element Type	TRAK Relationship	Status (New / Changed / Unchanged) wrt MODAF®	MODAF® v 1.2	TRAK
Project	•Project owns Milestone •Project undertakes Project Activity •Project has part Project	Changed	MODAF uses MilestoneInProject stereotype to assert that a milestone belongs to a project. MODAF has a more complicated relationship using ProjectOwnership and OrganisationalProjectOwnership stereotypes.	
Project Activity	•Project Activity marked by Milestone •Project Activity delivers System •Project Activity removes System	New		
Requirement	• Requirement traces to Architecture Element	New	Discussed but not part of MODAF specification	
Resource Interaction	•Resource Interaction from/to Resource	Changed	MODAF::Resource Interaction is limited to data exchange.	TRAK::Resource Interaction typed by 'Unknown, Data, Energy, Materiel' and has additional attributes to capture Interface Authority.

Starting from TRAK Element Type	TRAK Relationship	Status (New / Changed / Unchanged) wrt MODAF®	MODAF® v 1.2	TRAK
Role	•Role requires Competence •Role extends to Resource •Role exposes Port •Role realises Node •Role performs Function •Role (Resource Interaction) from/to Resource •Role has Concern	New, Changed	Role has Competence	TRAK allows organisational roles to be described. It also allows a responsibility scope to be defined using 'extends to' for example to System Authority, Prime Contractor or Movement Authority. Note that any Human Resource can have a Port.
Software	•Software has part Software •Software hosted on Physical •Software realises Node •Software performs Function •Software (Resource Interaction) from/to Resource	New		

Starting from TRAK Element Type	TRAK Relationship	Status (New / Changed / Unchanged) wrt MODAF®	MODAF® v 1.2	TRAK
Standard	• Standard governs Architecture Element •Standard issued by Organisation •Standard supersedes Standard •Standard enacts Standard •Standard is equivalent to Standard •Standard depends on Standard •Standard has part Standard •Standard has part Requirement	Changed / New	Standard can be applied to any element.	TRAK establishes dependencies and precedence between standards. Standard can be applied via 'governs' to any stereotype.

Starting from TRAK Element Type	TRAK Relationship	Status (New / Changed / Unchanged) wrt MODAF®	MODAF® v 1.2	TRAK
System	•System realises Node •System realises Capability •System is configured with Physical •System is configured with Software •System is configured with Organisation •System is configured with Job •System is configured with Role •System is configured with System •System performs Function •System (Resource Interaction) from/to System •System necessary for Project Activity	??	The nearest equivalent to TRAK::System is MODAF::Capability Configuration (not MODAF::System)	TRAK is deliberately System-centric.
View	•Architecture View addresses Concern	Changed	View used to cover Concern (an aggregation).	TRAK adopts ISO 42010 approach.

Table 6.2: TRAK Launch Baseline wrt MODAF - Relationships

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BACK COVER