Emergency Services Organisations

ESO Data Dictionary Project
Phase 2

Deliverable 1 - Core Class Model

Version 2

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Associates

Document Control

Document Purpose

This document represents the first deliverable of Phase 2 of the ESO Data Dictionary Project being the ESO Core Class Model.

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Version History

Version	Effective Date	Reason
0-1	14 December 2010	Initial Workshop with Project Team
0-2	15 December 2010	Update as result of local ESO Workshop
1-0	16 February 2011	Pre-release document for Fire & Rescue NSW Review
1-1	24 February 2011	Formal Phase 1 release document
2-0	23 March 2011	Update as a result of feedback after Advisory Group Review

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1. INTRODUCTION

The National Disaster Mitigation Program has initiated a Project to develop a Data Model, Data Classification Schema and Data Dictionary to support collection of common, consistent and relevant data for Prevention, Preparedness, Response and Recovery activities.

Phase 1 of this Project developed three draft, high level data models (core class models) and associated environmental scan and gap analysis. This information is being used by Phase 2 of the project to review the Phase 1 draft data models and merge the business content of these models into a single model. In later Stages, this model will then be extended to include a detailed classification model and data dictionary for activity related data.

Phase 2 is introducing revised terminology to remove ambiguity that remained after Phase 1. The full Data Model resulting from Phase 2 will include the following:

- The Core Class Model: representing the high-level classes of data.
  The core class model is the subject of this document.
- The Classification Model
- Subject Area (Activity) Data Model(s)
- The Data Dictionary

This document defines the revised Core Class Model developed during a rigorous review and restructuring of the Phase 1 Data Model(s). This document resolves the differences between the three models remaining in the Phase 1 Report.

In later stages of the project, this document will act as a working document used to present project results as they evolve. For the moment, however:-

- **Section 2** confirms the revised Core Class Model. This is the formal deliverable of Stage 1 of the project.
- **Appendix A** introduces preliminary views of the higher levels of the Classification Model.
- **Appendix B** shows how a number of business scenarios can be reflected in the Models.
- **Appendix C** describes Stage 1 and Stage 2 of the project methodology in detail.
- **Appendix D** contains responses to questions from stakeholders.

2. THE CORE CLASS MODEL

2.1 Purpose of this Section

The purpose of this Section is to present a single, revised high level model which resolves the differences manifested in the three models developed in Phase 1.

The existing models were reviewed in the light of current best practice together with insights gained from initial work on the development of the Classification Model. The result of this analysis is a revised Core Class Model for review by the Project Advisory Group and approval by the Project Steering Committee.

This section comprises the deliverable for Stage 1 of the Phase 2 project.

2.2 Revisiting the Model

The 'helicopter' view of an organisation's data is provided by a data model made up of core classes and their associated relationship classes. These classes, together, encompass all the business concepts that the organisation needs to track in order to achieve its mission. (For a more detailed discussion of this, and other aspects of the Data Model refer to Appendix A which describes the methodology deployed in the current project).

Phase 1 of the Data Dictionary project has identified a potential list of core classes. The following discussion will review and revise this list in the context of a more rigorous approach to subclassing. (Note: as an example of this increase in rigour, references to 'subject area' in Phase 1 definitions have been replaced by 'class')

The usual approach to identifying concepts or classes of interest to an organisation is to start with the questions:-

- **Who)**
- **Where)**
- **What) Is the organisation all about?**
- **How)**
- **Why)**
- **When)**

The questions are discussed in turn below.

2.2.1 Who?

The 'who' of an organisation's environment is usually quite straightforward to define. It is the people and organisations of interest to the organisation. This class is conventionally given the name '**Party**'. However, an ESO is also interested in protecting non-human (animal) species, so we can extend the conventional meaning of Party to include animals. The definition from Phase 1 remains appropriate:-

> "The *Party* class contains information about the participants of emergency service related activities. A party may be an individual person or non-person living specie, or a formal or informal organisation. Typical examples of parties include emergency service workers including volunteers and the general public. Formal organisations include an emergency service organisation, a government department, a school, and a small business.

> Informal organisations would be the local community or neighbourhood. Non-person living specie includes animals such as livestock, birds, or pets."

A concise definition for Party is:-

> A Party is any individual, organisation, animal or group of animals of interest to the Emergency Services Organisation.

2.2.2 Where?

The 'where' is again, usually quite straightforward to define. This class is conventionally given the name '**Location**'. The Phase 1 definition goes some of the way toward describing Location.

> "The Location class contains information about addresses associated with Parties; emergency services related Events; Incidents; Activities; or Materials. Location information may be a postal location, or a physical location. Typical examples of locations include street addresses, post office boxes, geographic coordinates, and spatial references such as four kilometres north of town."

This definition is, however, not complete. To conform to best practice, the definition of 'location' needs to also explicitly include geographical areas such as Local Government Areas, Postal Code Areas etc and lines such as boundaries.

A concise definition for Location is:-

> A Location is any point, line or area of interest to the Emergency Services Organisation.

2.2.3 What?

The question 'what?' breaks down into two questions:-

What things in the environment are of interest to the organisation, and *What* does the organisation *Do*?

Firstly, *What things* in the environment are of interest to the organisation?

The class **Material**, identified in Phase 1 of the project, answers (with some extensions) the question 'what things'.

> "The Material class contains information about Equipment such as fire trucks and breathing apparatus, Structures such as buildings and bridges, and Natural Environment materials such as rivers and mountains."

In addition, best practice suggests that subtypes of material include "Documentation Item", which is the physical manifestation of documentation (physical documents, electronic files etc).

A concise definition for Material is:-

> A Material is any item or substance of interest to the Emergency Services Organisation.

Next, *What* does the organisation *do*?

The class '**Activity**' identified in Phase 1 of the project, answers the question 'what does the organisation do'.

> "The Activity class is anything that an Emergency Services Organisation does either in delivering services or supporting its own business."

The occurrence of an activity usually results in some outcome.

A concise definition for Activity, therefore, is:-

> An Activity is anything that the Emergency Services Organisation does either in delivering services or supporting its own business.

2.2.4 How?

The answer to the 'how' question lies in standards definitions, procedure manuals, maintenance manuals, standard formulas. In other words, data that documents how the organisation operates on a day-to-day basis. The Phase 1 data model does not contain such a class, so a new class is now introduced, "**Business Driver**".

A concise definition for Business Driver is:-

> A business driver is those aspects of an Emergency Services Organisation's nature or environment that defines the manner and circumstances under which it will carry out its business.

2.2.5 Why?

An organisation carries out activities as a consequence of being stimulated to do so, either by some happening in its environment, or by the passing of time.

Activities stimulated by the passing of time are usually to do with the day-to-day running of the organisation and are focussed on achieving specific targets, implementing specific strategies, or complying with specific legislation or standards. These targets, strategies etc can all be seen as subclasses of '**Business Driver'**. So, part of the 'why' can be answered by Business Driver.

The other stimulus, "something happening in the environment" is usually represented in best-practice by the class "**Event**". An Event can be defined as a happening of interest to the organisation. Important subtypes of Event include Incidents and Contacts. The occurrence of an event usually has an effect.

A concise definition for Event is:-

> An Event is a happening or occurrence of interest to the Emergency Services Organisation.

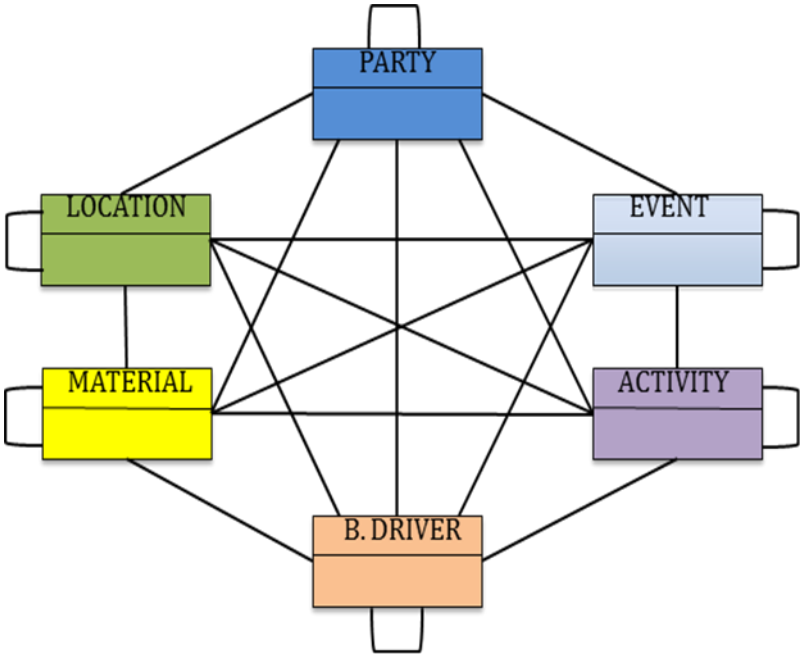
2.2.6 When?

Time is generally represented in data models as attributes of classes. Therefore, in general, the time dimension will be found in the Descriptor hierarchy and will not be represented as a separate Core Class.

One aspect of "when" which requires an explicit class are schedules (ie forward plans as to when activities or events are planned to be carried out or occur). This is closely tied to planning so a Schedule can be seen as a type of **Business Driver**.

2.3 Summarising the Model

The Core Class Model now comprises 6 core classes and associated relationship classes.



Question	Class	Definition
Who?	Party	Any individual, organisation, animal or group of animals of interest to the ESO.
Where?	Location	Any point, line or area of interest to the ESO.
What things?	Material	Any item or substance of interest to the ESO.
What we do?	Activity	Anything that the ESO does either in delivering services or supporting its own business.
How we do it?	Business Driver	Those aspects of an ESO's nature or environment that defines the manner and circumstances under which it will carry out its business.
Why we do it?	Event, Business Driver	A happening or occurrence of interest to the ESO.
When we do it?	Business Driver *Attribute*	For Schedules The Core Classes and Relationship Classes will be populated with attributes that are inherited by all subclasses of the class. These attributes will usually include start date/time and finish date/time attributes.

To complete the high level data model relationship classes between all the core classes are included. There are 21 of these:-

Party is related to *Party*	*Location* is related to *Location*	*Material* is related to *Material*	*Activity* is related to *Activity*	*Business Driver* is related to *Business Driver*
Party is related to *Location*	*Location* is related to *Material*	*Material* is related to *Activity*	*Activity* is related to *Business Driver*	*Business Driver* is related to *Event*
Party is related to *Material*	*Location* is related to *Activity*	*Material* is related to *Business Driver*	*Activity* is related to *Event*	
Party is related to *Activity*	*Location* is related to *Business Driver*	*Material* is related to *Event*		*Event* is related to *Event*
Party is related to *Business Driver*	*Location* is related to *Event*			
Party is related to *Event*				

These classes are similar across the majority of the world's organisations, which is not surprising considering the very high level of abstraction. The differences between organisations become explicit as the subtype classes are identified and defined. The following paragraphs commence this process.

2.4 Comparison with the Phase 1 Data Models (Core Class Models)

This section provides a concise summary of the differences between the Phase 2 Core Class Model and the 3 Phase 1 models, together with the reasons for these differences.

The major differentiator between the models in the two Phases is that the Phase 2 model strictly enforces the rule that a 'Core Class' is a supertype of a set of subtype classes where the supertype and all its subtypes concern information about the same business concept (and **only** about that concept). For example, 'Party' concerns information about people and organisations (and animals). Party does not refer to information about, for instance addresses. Addresses are a subtype of Location. Explicit subtypes of Core Classes will, in due course, be documented in the Classification Model.

For a deeper understanding of the Phase 2 Data Model, refer to **Appendix A** – Preliminary Classification Model, **Appendix B** – Scenarios from Phase 1 Project, and **Appendix C** – Methodology Overview.

2.4.1 General Differences

A) The Phase 2 Core Class Models apply a more rigorous definition of core classes than that applied in Phase 1. Because the Phase 2 Core Classes are in fact 'supertypes' of classification values in the Classification Model, they cannot include information that is not of their specific 'type'. The Phase 1 Project, on the other hand, allowed the nature of Core Classes to include aspects of *Subject Areas*. Subject Areas are broad groupings of information that can include information not of the same type as the Core Class.

An example of this is the inclusion, by the Phase 1 Project, of *Program*, *Portfolio*, *Legislation* and *Policy* in the 'Activity' Core Class/Subject Area. In the model diagrams they are (quite rightly) not modelled as subtypes of Activity, are but nonetheless still placed in the 'Activity' Class. The Phase 2 Project, however, recognises that these concepts (Program, Legislation etc) are not activities but are things that drive the business and so are included in a new class, 'Business Driver'.

Applying a more rigorous classification regime to the definition of Core Classes enabled some of the confusion evidenced in Phase 1 (specifically, the existence of 3 models) to be resolved. In particular, the definition of 'Activity' as being "Anything that the Emergency Services Organisation does either in delivering services or supporting its own business." (from Phase 1) enables an Outcome to be defined precisely as being the result of an Activity (as against a *target* which now fits in the Business Driver Class.)

B) The Phase 1 Model included a multi-way relationship between Core Classes. This has caused some confusion as to what specific types of relationship between core classes are implied. In order that the relationships between core classes can be more clearly defined, t he Phase 2 Core Class Model shows linkages between Core Classes as Relationship Classes existing between two (and only two) classes.

It also does away with the need to differentiate between relationship classes that link classes of the same type (referred to in Phase 1 as a Linking Relationship), and relationships between different classes (referred to in Phase 1 as Class Relationships). All 21 links between Classes in the Phase 2 model are all referred to as Relationship Classes.

2.4.2 Specific Differences – Party, Location, Material

The classes **Party**, **Location**, and **Materia**l conform across all 3 Phase 1 models. They also appear in the Phase 2 model with virtually the same definition as appear in Phase 1. That said, the subtypes of these classes will be altered and extended as a result of applying a more formal classification approach to the identification of sub-classes.

In particular:-

Party	The subclassing structure is altered to better include animals and groups of animals in Party.
Location	The subclassing is altered to explicitly include addressable points, areas and lines.
Material	The subclassing is extended to include additional types of Material including 'documentation'.

2.4.3 Specific Differences – Activity, Event, Business Driver

Phase 2 constrains 'Activity' to those things being done by the ESO. An important classification of Activity is ACTIVITY OUTCOME TYPE. This implies that Activities can have (one of more) outcomes. Note that an 'outcome' only applies to something that the ESO has done.

An 'Event' is a happening or occurrence of interest to the Emergency Services Organisation. It is something that will usually spur the ESO into action. The two important subtypes of Event are 'Trigger Event' and 'Incident'. An Incident can result in one or more 'Effects'.

A Business Driver has three aspects. Firstly it represents data about the standard way the ESO carries out its operations (standard procedures, user guides etc). Secondly it defines targets including objectives, strategies, policies, programs etc. Finally it represents (time) Schedules of activities and events.

2.4.4 Summary of Differences

Model 1

'Cause' is represented in the **Event** class in the Phase 2 model.

'Effect' is represented in the **Event** class in the Phase 2 model.

' Outcome' is represented in the **Business Driver** Class in the Phase 2 model.

Model 2

'Effect' is represented in the **Event** class in the Phase 2 model.

Model 3

'Event' is represented in the **Event** class in the Phase 2 model.

'Response' is represented in the **Activity** class in the Phase 2 model.

'Outcome' is represented in the **Activity** class in the Phase 2 model.

3. APPENDIX A – PRELIMINARY CLASSIFICATION MODEL

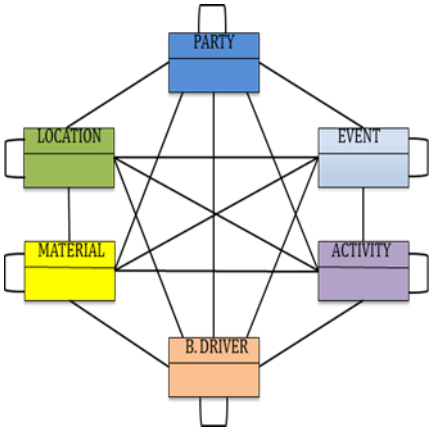
Each core class in the Core Class Model represents a single concept and provides a helicopter view of a group of (subtype) classes. Each of these subtype classes reflects a particular aspect of the core class. For example, the Core Class 'Party' may have subtypes 'Individual' and 'Organisation'. A core class may have very many subtype classes.

The **Classification Model** is used to document these subtype classes in a systematic way. It has a specific structure to allow for the fact that a particular class may be sub-classified in more than one way. For example, an *Activity* could be classified according to its strategic focus, i.e. a preparedness, prevention, response or recovery activity. Alternatively, it could be classified according to its structure, i.e. a project, a program, a task etc. Of course an *Activity* will also be classified as to what type of activity is being carried out, ie evacuation, training etc. The Classification Model introduces the concept of a *Classification Scheme* which defines the way in which a class is being classified. For each class (or sub-class) there can be one or more classification schemes.

Therefore the classification model comprises a hierarchy containing interleaved layers of classes and classification schemes. To differentiate classes form classification schemes, classification schemes are identified in all upper case text.

For a more complete discussion of the Classification Model, refer to Appendix C – Methodology Overview.

The core class model comprises 6 core classes is as follows:-



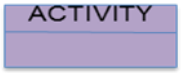
The classification model therefore comprises 6 class hierarchies. (In fact, it is a bit more complicated than that – this will point will be expanded in Stage 2 of the project.)

The preliminary, high level classification model described in the following paragraphs is an early draft and is presented here to provide an indication of the types of classification schemes and values that will appear in the completed classification model. Development of the Classification Model is the focus of Stage 2 of this project.

In the following paragraphs each core class is presented as:-

- the diagrammatic representation of the core class and the class's definition
- a classification model showing classification schemes and classes that comprise the core class
- (For the more technically minded) A Class Model Diagram which shows one way in which the core class could be represented as a class diagram. Here key subtype classes are displayed, together with an indication of the attributes the various classes could contain.

3.1.1 Activity



"An Activity is anything that the Emergency Services Organisation does either in delivering services or supporting its own business."

Preliminary, High Level, Classification Model

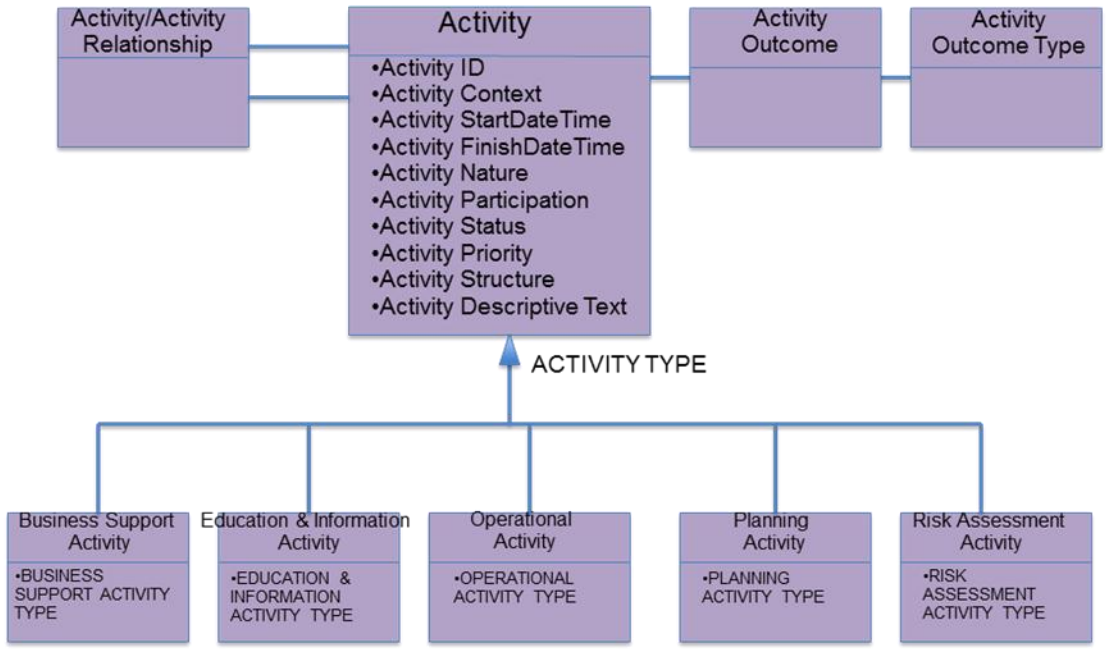
Activity

.. ACTIVITY FOCUS
... Preparedness
... Prevention
... Recovery
... Response
.. ACTIVITY NATURE
... Planned activity
... Unplanned activity
.. ACTIVITY OUTCOME REASON
... Equipment breakdown
... Equipment inappropriate/insufficient
... Insufficient personnel
... Joint agency issue
... Radio communication problem
... Vehicle breakdown
... Vehicle delayed
.. ACTIVITY OUTCOME TYPE
... Area secured
... Bodies recovered
... Community education delivered
... False alarm
... Job cancelled
... PPRR outcome???
... Referred to external agency
... Referred to other ESO
... Safe perimeter established
... Training completed
.. ACTIVITY PARTICIPATION
... ESO only participation
... External party participation
... Joint agency participation
.. ACTIVITY PRIORITY
.. ACTIVITY STATUS
... Activity status complete
... Activity status in progress
... Activity status incomplete
... Activity status on hold
.. ACTIVITY STRUCTURE
... Job
... Procedure
... Program
... Project
... Task

.. ACTIVITY TYPE
... Business support activity
.... BUSINESS SUPPORT ACTIVITY TYPE

..... Asset management
..... Financial management
..... Human resource management
... Education and information activity
.... EDUCATION AND INFORMATION ACTIVITY TYPE
..... Training
... Operational activity
.... OPERATIONAL ACTIVITY TYPE
..... Response activity
..... RESPONSE NATURE
..... Critical response
..... Extended (long term) response
..... RESPONSE TYPE
..... Crowd control
..... Evacuation
..... First aid
..... Search
..... Vertical rescue
... Planning activity
.... PLANNING ACTIVITY TYPE
... Research
... Risk assessment

Preliminary Class Model



3.1.2 Business Driver

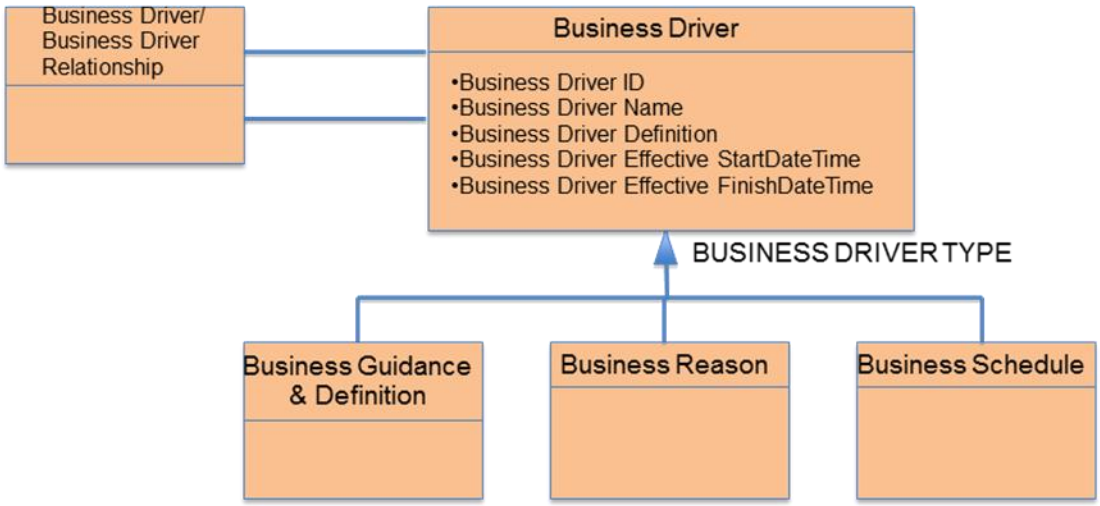
"A business driver is those aspects of an Emergency Services Organisation's nature or environment that defines the manner and circumstances under which it will carry out its business."

Preliminary, high level Classification Model

Business Driver
.. BUSINESS DRIVER TYPE
... Business guidance and definition
.... BUSINESS GUIDANCE AND DEFINITION TYPE
..... Business procedure definition
..... Standards calculation
... Business reason
.... BUSINESS REASON TYPE
..... Best practice
..... Business target
..... BUSINESS TARGET TYPE
..... Compliance
..... Corporate intelligence
..... Interagency agreement
..... Legislation
..... Memorandum of understanding
..... Policy

- Business schedule

Preliminary Class Model



3.1.3 Event

"An Event is a happening or occurrence of interest to the Emergency Services Organisation."

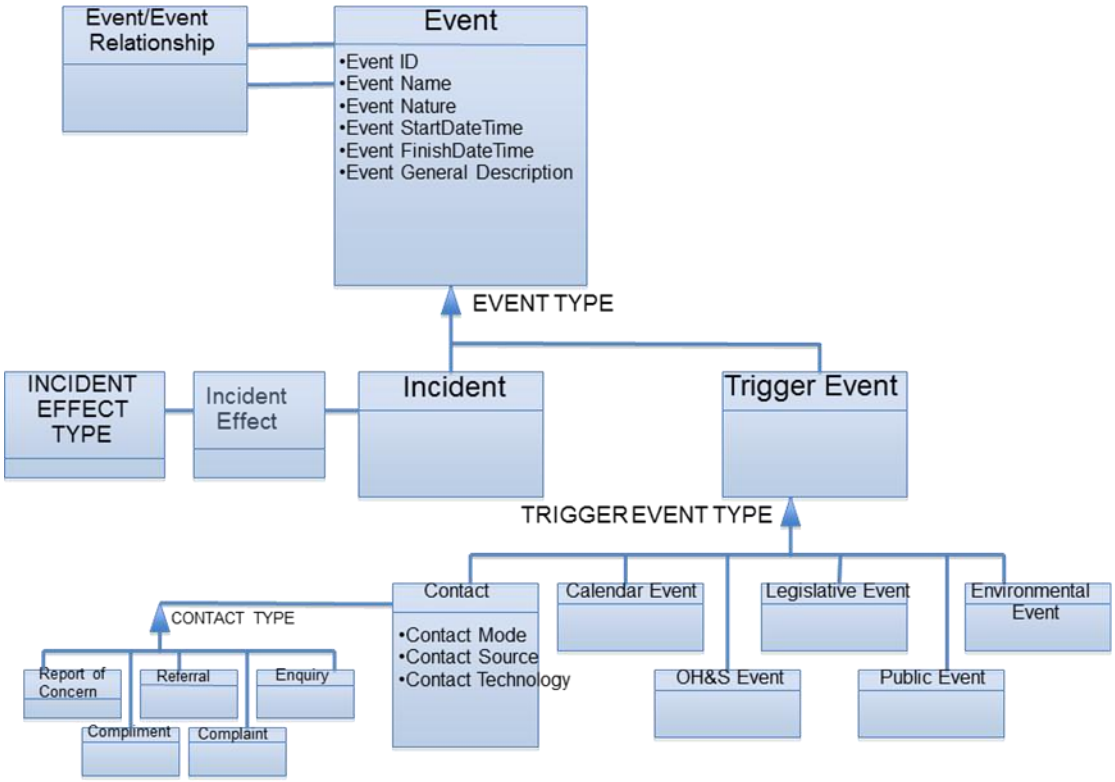
Preliminary, high level, Classification Model

Event

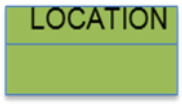
.. EVENT NATURE
... Planned event
... Unplanned event
.. EVENT TYPE
... Trigger Event
.... TRIGGER EVENT TYPE
..... Calendar event
..... Contact
..... CONTACT MODE
..... Automated contact
..... Manual contact
..... CONTACT SOURCE
..... Call centre
..... Direct
..... News media
..... Spotter plane
..... Walk-in
..... CONTACT TECHNOLOGY
..... Alarm signal
..... Alert
..... Emergency services radio
..... EPIRB
..... Fax
..... Online
..... SMS
..... Telephone
..... CONTACT TYPE
..... Complaint
..... Compliment
..... Enquiry
..... Referral
..... Report of concern
..... Environmental event
..... ENVIRONMENT EVENT TYPE
..... Flood
..... Natural disaster
..... Weather event
..... WEATHER EVENT TYPE
..... Hail
..... Snow
..... Legislative event
..... OH & S event [Use TOOCS]
..... Public event
... Incident
.... INCIDENT EFFECT
..... Casualty
..... Damage

..... Fatality
.... INCIDENT EFFECT REASON TYPE
..... Insufficient water
..... Language difficulty
..... Road blocked
..... Weather conditions
.... INCIDENT STATUS
..... Incident confirmed
..... Incident reported
..... Incident unconfirmed
..... No incident
.... INCIDENT TYPE
..... Building collapse
..... Fire
..... Flood
..... HAZMAT incident
..... Roof damage
..... Traffic accident

Preliminary Class Model



3.1.4 Location



"A Location is any point, line or area of interest to the Emergency Services Organisation."

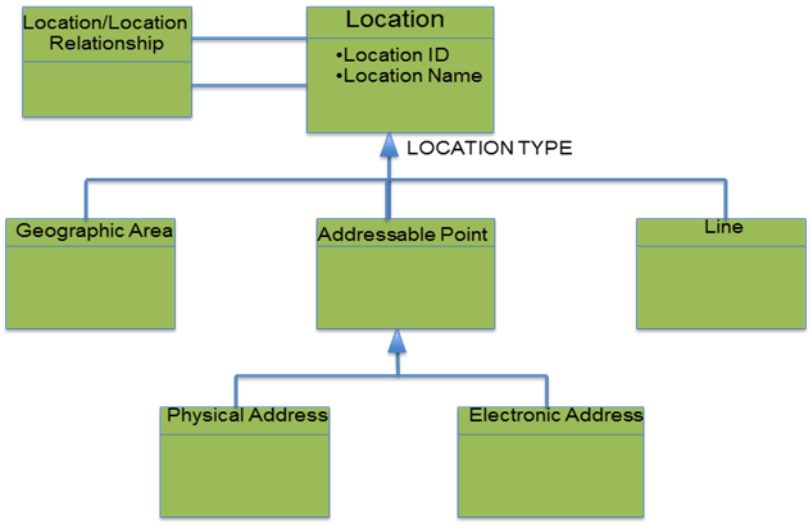
Preliminary, high level, Classification Model

Location
.. LOCATION CHARACTERISTIC
... Indoor area
... Open area
.. LOCATION TYPE
... Addressable point
.... ADDRESS TYPE
..... Electronic address
..... ELECTRONIC ADDRESS TYPE
..... Physical address
..... PHYSICAL ADDRESS TYPE
..... Postal address
..... GPS position

..... Geographic area
..... GEOGRAPHIC AREA TYPE
..... Drought declared area
..... Federal electorate
..... Local government area
..... Natural disaster area
..... State/Territory electorate

..... Line
..... LINE TYPE
..... Border
..... Contour line

Preliminary Class Model



3.1.5 Material

"A Material is any item or substance of interest to the Emergency Services Organisation."

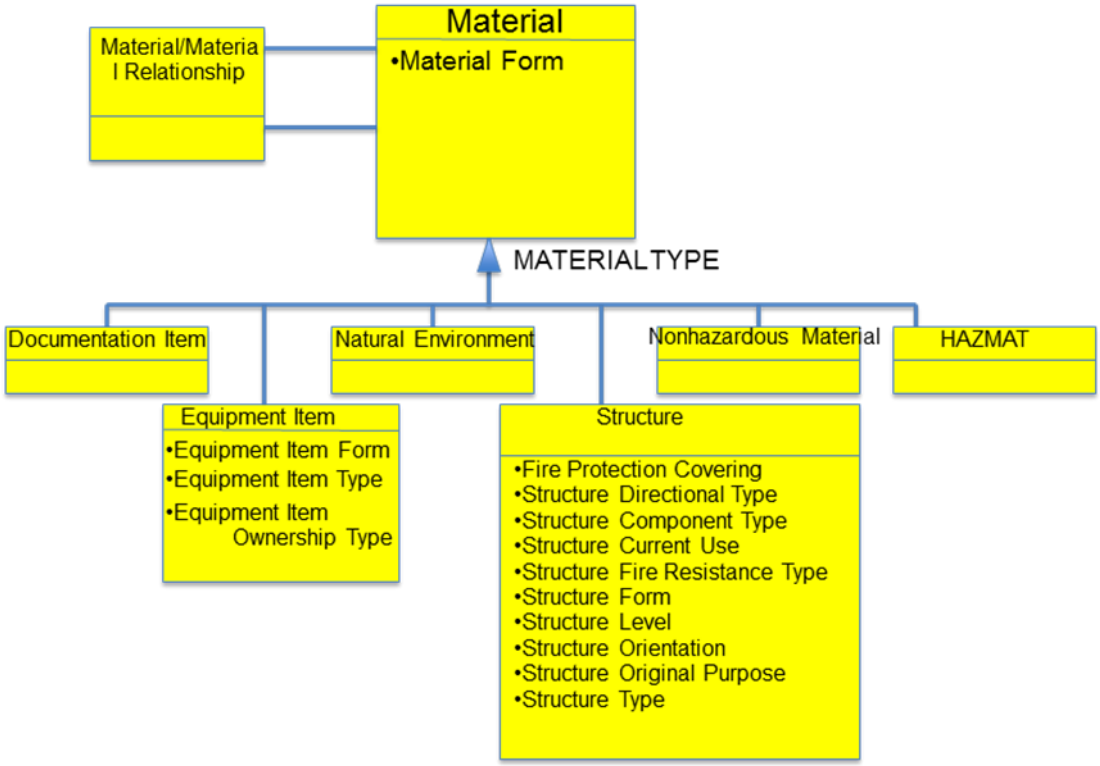
Preliminary, high level, Classification Model

Material

.. MATERIAL FORM
.. MATERIAL TYPE
... Documentation item
... Equipment item
.... EQUIPMENT ITEM FORM
..... Collection of items
..... Miscellaneous components
..... Single item
.... EQUIPMENT ITEM TYPE
.... EQUIPMENT OWNERSHIP TYPE
..... Agency owned
..... External party owned
... HAZMAT
... Natural environment
... Nonhazardous material
... Structure
.... FIRE PROTECTION COVERING
..... Protected covering
..... Unprotected covering
.... STRUCTURE DIRECTIONAL TYPE
..... Front
..... Left (facing)
..... Rear
..... Right (facing)
.... STRUCTURE COMPONENT TYPE
..... Attached structure
..... Basement
..... Doorway
..... Hall
..... Landing
..... Stair
..... Window
.... STRUCTURE CURRENT USE
.... STRUCTURE FIRE RESISTANCE TYPE
..... Combustible structure
..... Fire resistant structure
..... Lightweight foaming
..... Non-combustible structure
..... Non-fire resistant structure
.... STRUCTURE FORM
..... Complex
..... Single structure
..... Structural component
.... STRUCTURE LEVEL
..... Above roof
..... Ground level
..... Roof level
..... Storey #
..... Underground
.... STRUCTURE ORIENTATION

..... East
..... North
..... South
..... West
.... STRUCTURE ORIGINAL PURPOSE
.... STRUCTURE TYPE
..... Building
..... Storage tank??
..... Wall

Preliminary Class Model



3.1.6 Party

"A Party is any individual, organisation, animal or group of animals of interest to the Emergency Services Organisation."

Preliminary, high level, Classification Model

Party

.. PARTY TYPE

... Individual...

.... INDIVIDUAL GENDER TYPE
.... INDIVIDUAL MARITAL STATUS TYPE
.... INDIVIDUAL HEALTH STATUS TYPE
.... INDIVIDUAL EMPLOYMENT STATUS TYPE
.... INDIVIDUAL OCCUPATION
.... INDIVIDUAL ETHNICITY
.... INDIVIDUAL RACE

... Organisation

.... ORGANISATION TYPE

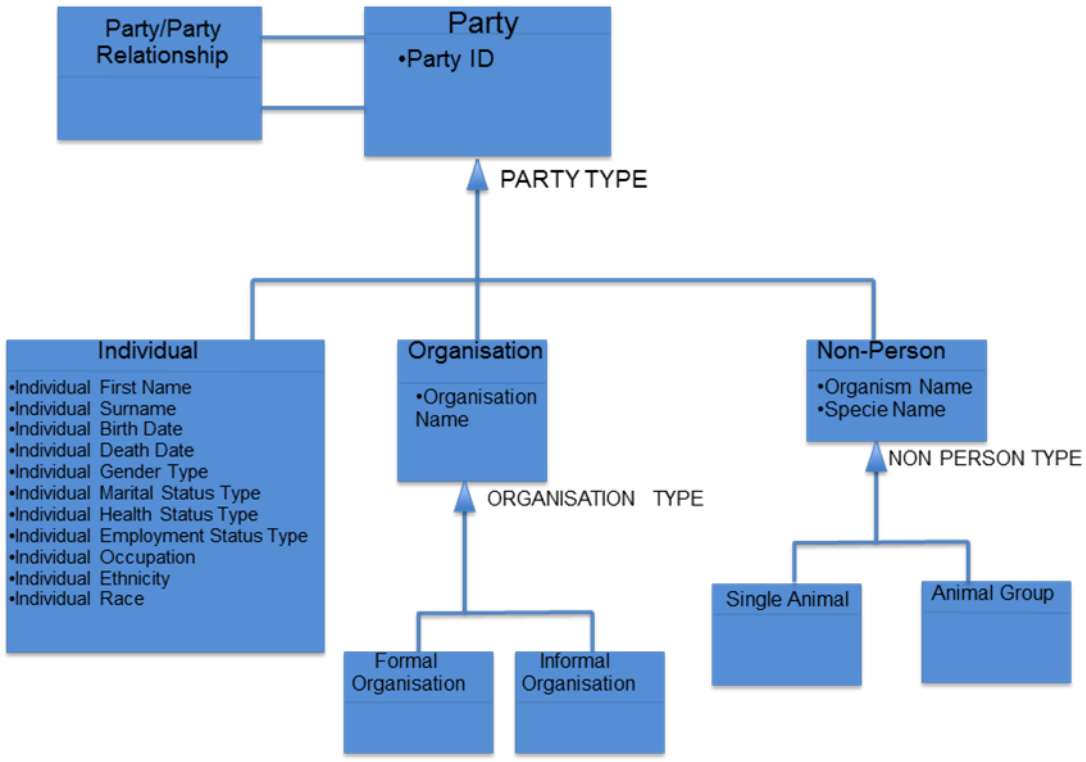
..... Formal organisation
..... Informal organisation

... NonPerson

.... NONPERSON TYPE

..... Single Animal
..... Animal Group

Draft Class Model



4. APPENDIX B - SCENARIOS FROM PHASE 1 PROJECT

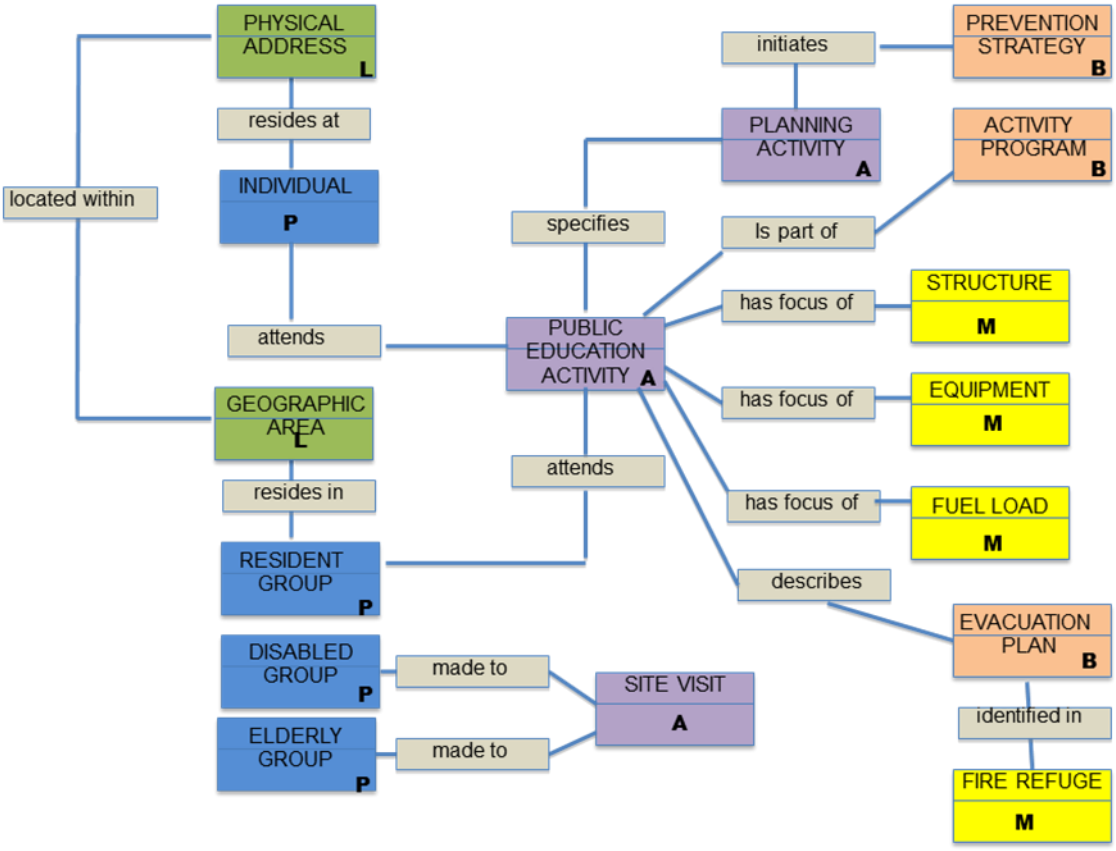
The Phase 1 project presented a set of scenarios to demonstrate the application of the data model. These scenarios are replicated below. A data model diagram is developed for each scenario. The models display the explicit subtypes of the 6 core classes that would be relevant in each of the scenarios. For clarity the first letter of the relevant core class is displayed with each subtype.

Note: The following diagrams are for illustrative purposes only. Precise identification of subtypes will occur in Stage 2 of the Phase 2 project.

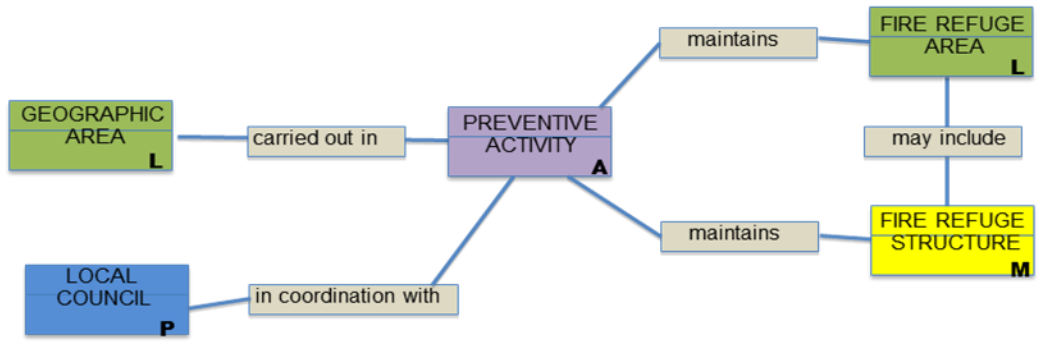
4.1 Prevention Scenarios

A) Much planning and preparation went into educating the community on plans for preventing fires in the bushfire prone regions of the Adelaide Hills. Community education programs including discussion forums, leaflet drops, house visits and radio announcements were made to educate residents on the importance of being prepared for the bushfire season. Residents were encouraged to minimise fuel loads around their homes, check that their fire extinguishers and other equipment were serviced and ready for use, ensure they had evacuation plans ready including the nearest designated fire refuge, ensured they understood the warning messages for evacuation and were prepared early on as to whether to stay and defend their property or to evacuate.

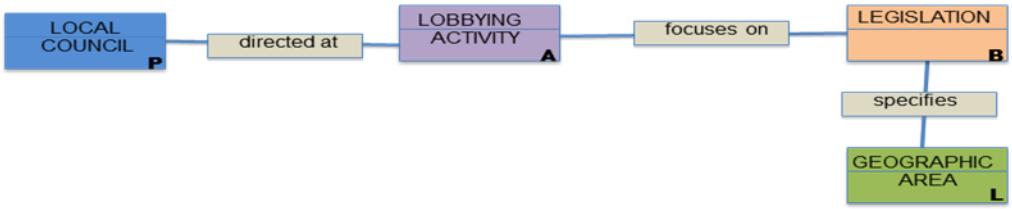
Visits were conducted to vulnerable residents such as the elderly and the disabled to advise them of evacuation plans in the event of a fire danger.



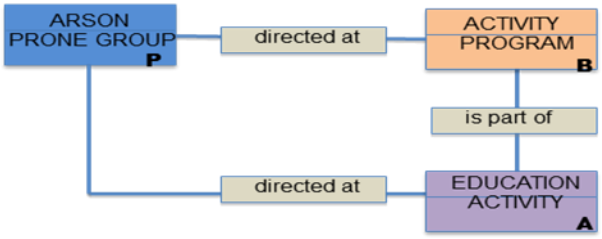
B) Back burning was conducted in the Adelaide Hills region and in conjunction with the local council designated fire refuges were cleaned up to ensure they were safe from possible fires.



C) Council was lobbied to review planning legislation around building in bushfire prone areas.



D) Education campaigns on the dangers of unintentional arson (such as irresponsibly discarding cigarette butts) were also advertised on television and radio. It included comments from the state premier on the dangers of this. Groups prone to arson were also targeted in education and other campaigns to prevent offending or re-offending.



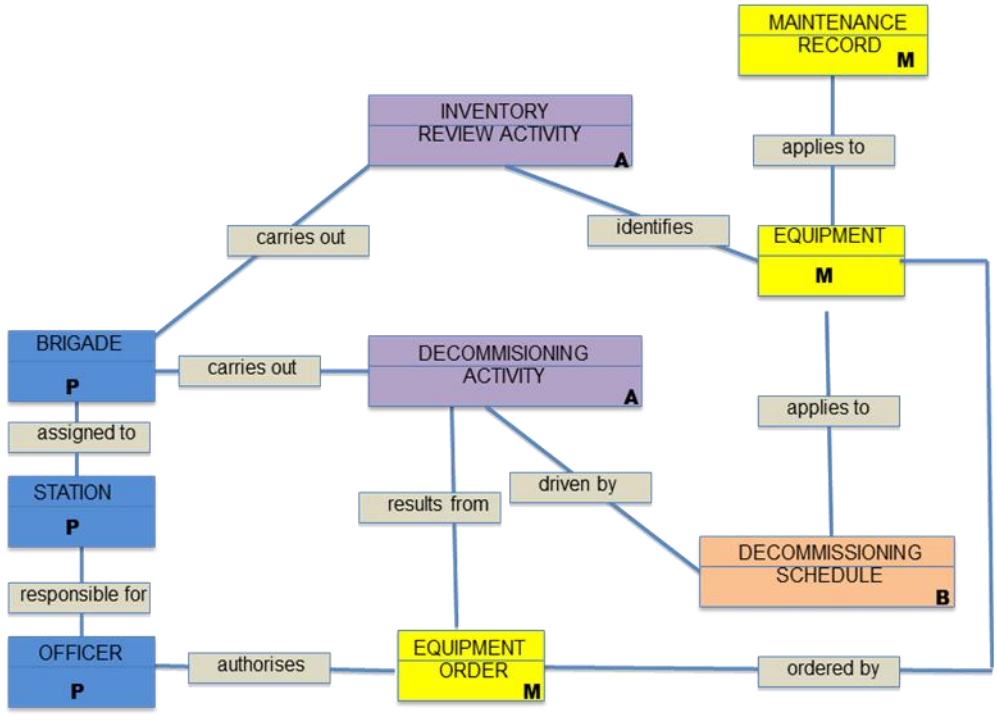
E) Despite consecutive days with temperatures over 40 degrees, the summer of 2008 went with little in the way of fire incidents. Several small fires did occur but were contained very quickly. Prevention efforts succeeded in ensuring that no major fire outbreaks occurred.

4.2 Preparedness Scenario

A review of inventory for the Country Fire Authority has shown that pieces of equipment including breathing apparatus, fire fighting hoses, extinguishers, and extrication implements were approaching the end of their useful life.

By legislation tracking and maintenance of some of this equipment must be recorded. Some equipment must be decommissioned upon reaching a specified age.
Each station is assigned with the task of decommissioning equipment and sending others that require maintenance to the maintenance team.

An order is made for any equipment that is decommissioned. Orders that are above $15,000 are to be approved by the station officer.



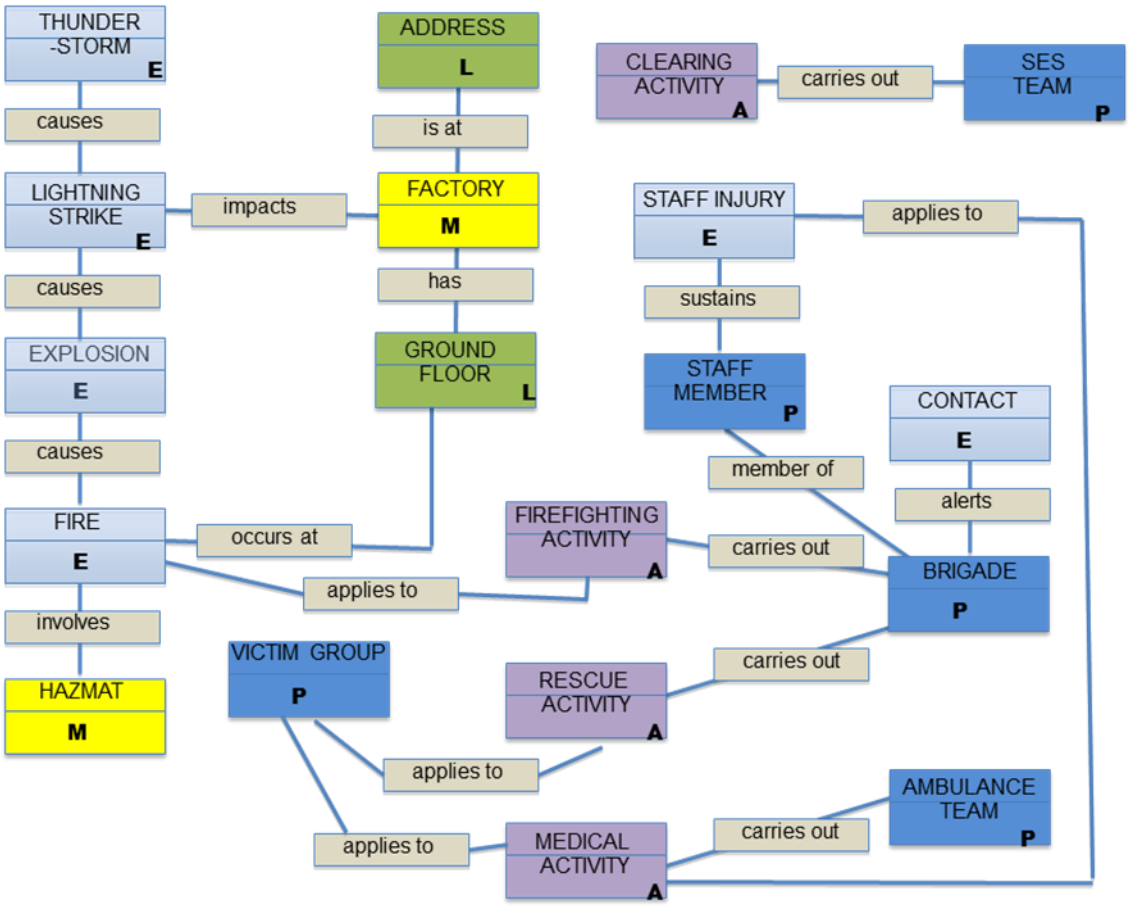
4.3 Response Scenarios

It's 6am on a Friday morning in December. We have been experiencing spate summer weather conditions, with lots of storms and bad weather. A heavy thunderstorm has just started where you live. At 06:17am, lightning strikes the local plastics factory, causing a huge explosion. The early shift started in the factory at 6am. The explosion causes a fire in the ground floor of the factory. The building is close to the main road going through town.

NSW Fire Brigades is notified of the incident through the communications centre. The nearest brigade is dispatched to the location of the incident, in an industrial part of Bankstown.

As the fire contains hazardous materials, fire fighters trained in handling hazardous materials are in attendance with the appropriate clothing and equipment.

Factory workers are trapped in the factory and require rescuing. Ambulance attends the scene and provides medical treatment to workers that have been rescued. A fire fighter is injured whilst rescuing a worker and is also given treatment.
Due to the severity of the storm impact SES is called in to assist in the aftermath of the storm. The SES volunteers cleared the tree branches that had fallen on the road surface.



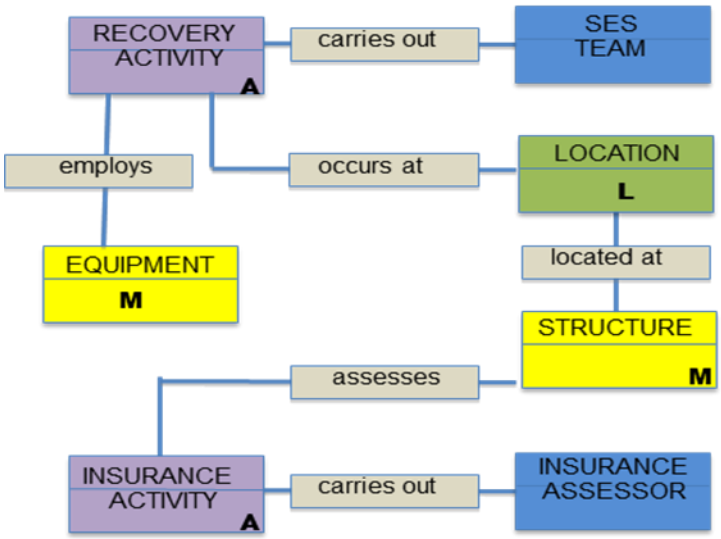
4.4 Recovery Scenario

Storms and flooding in northern Queensland resulted in many homes and businesses being damaged. SES crew were tasked with recovering sand bags, cleaning up streets, removing tree branches.

During the storms, many roofs were destroyed, and so SES was out with long ladders tarping the damaged roofs.

After the storms ended, recovery operations meant that SES was out reclaiming the tarps and ropes used to patch the roofs.

Insurance investigators come out and assess damage to affected homes (flood and storm damage).



5. APPENDIX C - METHODOLOGY OVERVIEW

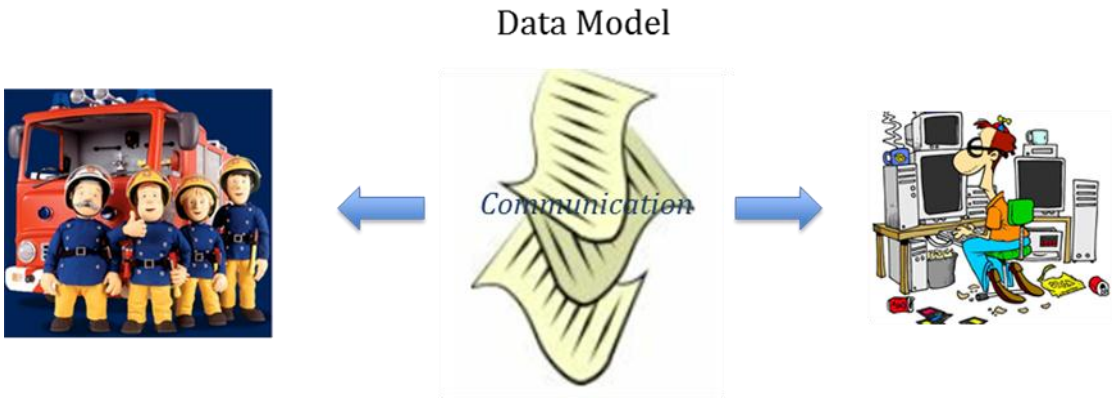
5.1 Purpose of this Section

The purpose of this Section is to introduce the structure and use of the Data Model to Emergency Services Organisation (ESO) staff who do not have experience in the data modelling process. It is recommended that ESO IT staff also review the document in order to understand the specific methodology being deployed in this project.

As much as possible, the methodology builds upon that used in Phase 1 of the Project. There are, however, some minor variations in order to include current best practice.

5.2 What is a Data Model?

A data model is a set of documents that enable an organisation's business staff and management to describe the organisation's data in a way that is sufficiently precise that IT staff can design and implement this data within Information Systems. It is a means of enabling clear, concise and complete communication between business staff and IT staff concerning the organisation's data.



Each document, in the set of interconnected documents making up the overall data model, performs a specific role in enabling this communication. Each of these documents will be described as the discussion proceeds.

5.3 What data are we talking about?

An organisation maintains data (be it held as paper files or computer databases) in order that it can record, and therefore manage, its day-to-day activities. To do this it maintains data about *things* (including people) that make up its environment and how those things are *related* to one another. For example, it maintains data about employees, departments, and which employees work in which departments.

The range of data that it maintains about any particular thing is relatively small. Typically, for each 'thing', it holds data such as:-

Identifiers:	eg, name, code
Dates & Times:	eg start date, finish time.
Quantities;	eg, time, material, money
Classifications:	eg, type, status, priority
Descriptors:	eg, colour, age
Descriptive text:	eg, general description

This list will be investigated in more detail as the discussion proceeds. Suffice to say at this stage that for each 'thing' (or 'relationship between things') there is a limited number of items the organisation needs to track.

Considering the above, it would appear that building a data model should be easy. Unfortunately, as shall be shown, the difficulty in building a data model lies in the wide range of things the organisation needs to track.

5.4 A simple Data Model

The paragraphs above have introduced the three basic elements that make up any data model, viz, *things* (referred to as concepts or classes or entities), *relationships between things* (referred to as relationships or associations) and the *data items* that need to be tracked about things or their relationships (referred to as attributes or fields).

To see how a data model comes together a simple case will be built up to a more complex situation. Consider the situation where an Emergency Services Organisation employee attends an emergency. There are three concepts here, "Employee", "attends" and "Emergency". This situation can be displayed using three, linked elements:-

Unfortunately, if it was necessary to represent every employee, every emergency and every fact that an employee attended an emergency as separate elements in the model, the model would get impossibly large. So, a rule is introduced stating that each element represents *types* of thing rather than specific instances of things. For example, in the model above, the "Employee" cloud represents not one, but every employee. The easiest way to think of this is to imagine that each cloud in our diagram is the name of a stack of cards where each card represents one instance of the thing. Therefore there would be a stack of cards called "Employee" with each card in the stack representing one employee.

To make the data model useful, it is necessary to give each of the elements some 'attributes' (the cards need have some data written on them). For example:-

Where one card from each pile might be: -

If this data model were to be implemented in an information system (a computer database can be seen as a set of electronic cards), then there is enough data to report on such things as:-

- A list of employees attending a particular emergency (eg EMG9999)

Method: *> Pick up the "attends" cards, pull out all cards with the emergency identifier = EMG9999*
> For each "attends" card that has been extracted, extract the related employee card from the employee pile (ie the card that has the same employee name as on the 'attends' card).
> Print out the contents of all the extracted 'employee' cards.

- The time a particular employee spent at a particular emergency
- Etc.

To be able to report more comprehensively on this part of the organisation, more 'things' need to be introduced. For example:-

By giving the new elements suitable attributes, the cards can be used (or the database that is equivalent to these cards) to tell such things as:-

- Where did the emergency occur,
- What other emergencies have occurred at this address,
- A history of who has driven a particular truck

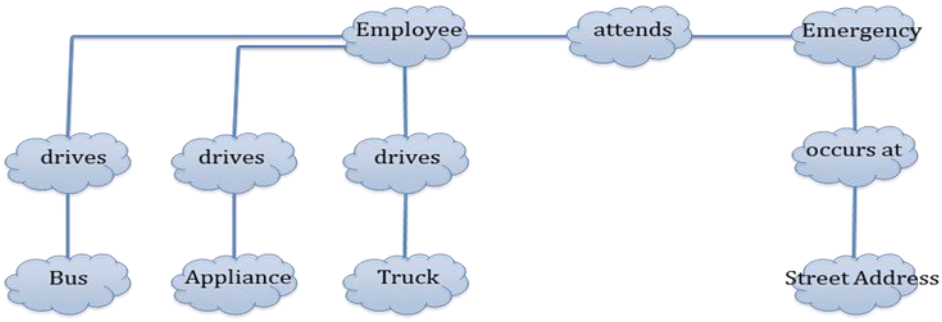
So, by adding more and more elements, a data model can built up that defines all the data items that would be needed in order to manage the organisation.

There is, however, a difficulty. In any organisation many hundreds, if not thousands, of 'things' that make up its environment can be identified. This means that a data model that has elements to represent every different type of thing in its environment would be extremely complex.

Fortunately, there is a technique, used by humans for time immemorial, to simplify the understanding and management of complex environments:- Classification.

5.5 Classification

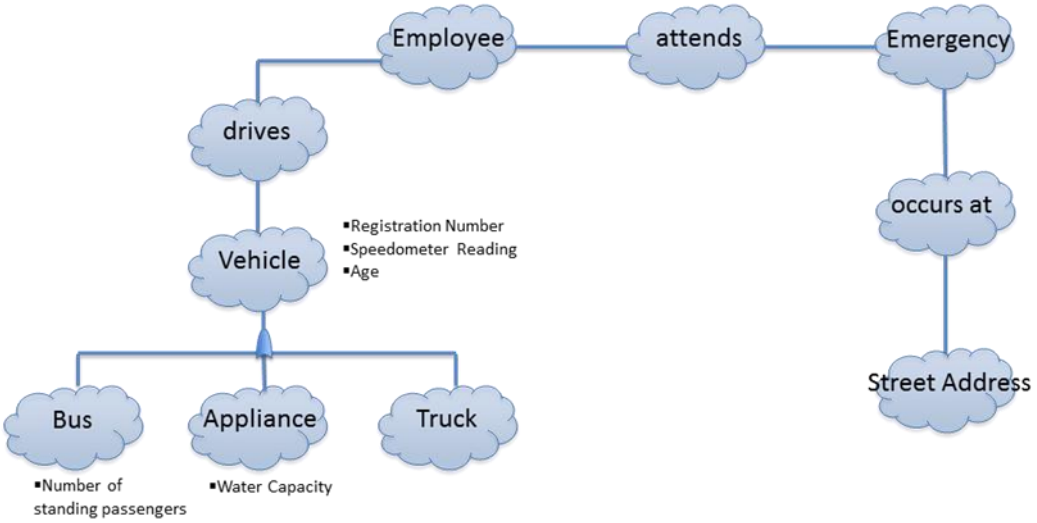
Take the example of "Truck" in the example above. It is easy to see that a complete model would also have elements like Passenger Car, Fire Appliance and Bus. (For purposes of this example 'appliance' implies a fire fighting vehicle). So the model would start getting more complicated:-



However, keep in mind a *data* model is being created. A data model describes the data that must be maintained about the things in the environment. From the point of view of the *data* needed to be

held about them, Trucks, Passenger Cars, Fire Appliances and Buses are very similar. For all of them it would be necessary to know their registration number, their speedometer reading, their age, etc. Also, for each of these things there is data necessary to be held about solely that thing, where that data is not relevant to the other things, for example, maximum number of standing passengers for a bus, or water capacity for a fire appliance.

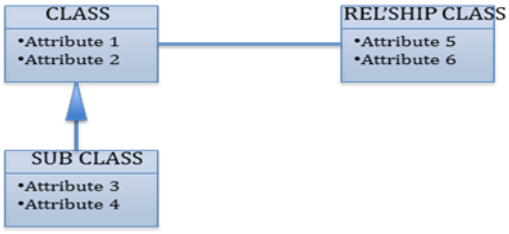
The model can be simplified by introducing the concept of classes and subclasses. Trucks, passenger cars, fire appliances and buses are all vehicles. That is, they are all subtypes of one class of thing called Vehicle. By introducing a class 'Vehicle' into the model, the fact that employees drive various types of vehicle can be represented more simply. See below.



Notice an important point. Subclasses 'inherit' the attributes and relationships of their parent class. In the diagram above, it is implicit that the attributes of, for example, *Bus*, include registration number, speedometer reading, age, which have been 'inherited' from *Vehicle*. Also, it is implied that *Bus* has a relationship 'drives' (is driven by) employee, which has been inherited from *Vehicle*.

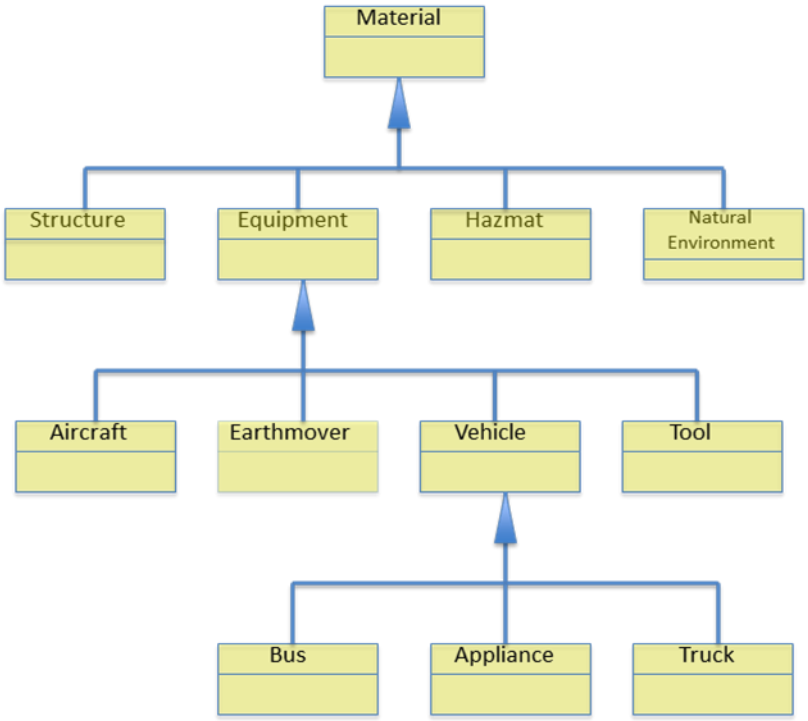
5.6 Naming Conventions & Diagramming

At this stage it is appropriate to firm up on more formal terminology used to describe data models. 'Thing' represents any concept of interest to the organisation. Data modellers refer to "Entity" or "Class" when discussing concepts of interest to the organisation. Relationships between things are referred to as Associations, Relationships or Relationship Classes, and the items of data we wish to hold information about are attributes or fields. To conform to the standards used in Phase 1 of this project the terms "Class", "Relationship Class" and "Attribute" will be used. The graphical representation also becomes more formalised:-



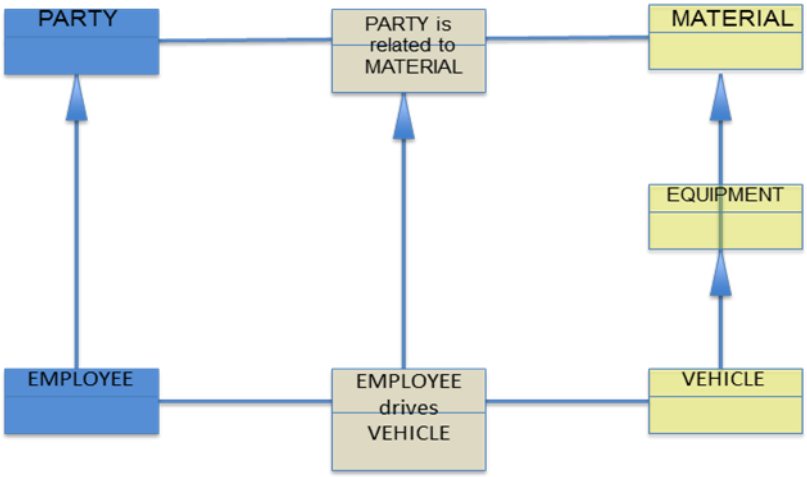
5.7 More about Classifications

Above, the data model was simplified by creating a Class of thing called Vehicle, with Bus etc as its subclasses. If vehicles are thought about more broadly, it is clear that a Class of thing, 'Equipment' could be identified, of which Vehicle is a subclass. Other subclasses of Equipment might include Tools, Earthmoving Equipment, Aircraft etc. Furthermore, thinking about Equipment more broadly, it can be seen that Equipment is a subclass of a class of things that could be called Material, which is all types of materials and resources of interest to the Emergency Services Organisation. So, a portion of the data model could look like this:-



5.7.1 Relationship Classes

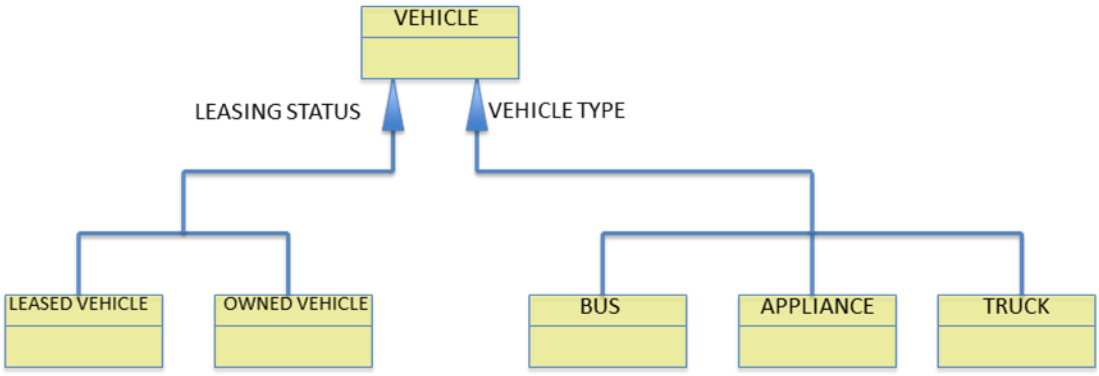
Relationship Classes can also have subclasses. Assume that a model includes a class 'Material', and a class 'Party', where 'Party' has subclasses including 'Employee'. Now, assume that there is a relationship class 'PARTY is related to MATERIAL' linking 'Party' and 'Material'. This class is a superclass of all possible relationship classes that can exist between the subclasses of 'Party' and 'Material'. The diagram below shows one example of such a subclass – 'EMPLOYEE drives VEHICLE'.



Attribute inheritance works for relationship classes also. For example, the data model above may include the fact that 'PARTY is related to MATERIAL' has the attributes 'Start Period' and 'End Period'. This implies that 'EMPLOYEE drives VEHICLE' inherits the attributes 'Start Period' and 'End Period'.

5.7.2 More about Classifications

The discussions above imply that a particular class can only be sub-classified in one way. For example, that Vehicles can only have subclasses BUS, APPLIANCE, TRUCK, and any other class of thing that is a 'type of' Vehicle, eg CAR. However, any class can be sub-classified in more than one way. For example, the leasing department may not care what type of vehicle an asset is, but is very interested in whether it is leased or not. Therefore, the sub-classes of Vehicle that the leasing department is interested in are "Leased Vehicle" and "Owned Vehicle". What is happening here is that two different methods to create sub-classes are being used. "VEHICLE TYPE" and "LEASING STATUS" are used to create two separate groups of subclasses of Vehicle. These classification mechanisms are called *classification schemes* or *discriminators*. The data model looks like this:-



In this model, the attributes of the subclasses under the LEASING STATUS classification scheme would include such things as Lease Period, Residual Value, Purchase Price.

5.8 Core Class Model

The discussion above has introduced the classification concept by building class/subclass structures from the bottom up (looking at a set of classes and identifying that they have a superclass). From a top-down perspective, it is possible to identify a small number of superclasses, which together encompass all aspects of the organisation's data. This provides a useful 'helicopter view' of organisational data. Typically 5-9 superclasses (referred to as Core Classes) are defined. These Core Classes, together with the relationship classes that link them, make up the Core Class

Model. The Core Class Model will be discussed in the next Section. The Core Class Model is the first of the set of documents that make up the full Activity Data Model. Other documents include the Classification Model, the Logical Subject Area (Activity) Data Model and the Data Dictionary.

5.9 The Classification Model

Clearly, a model of a complete organisation will comprise many subclasses. The model diagram will become extremely complex (especially if relationship classes and sub-classes are included). Fortunately, there is a shorthand for documenting the various classes and subclasses that exist in the organisation without having to develop a data model diagram. This is referred to as a classification model.

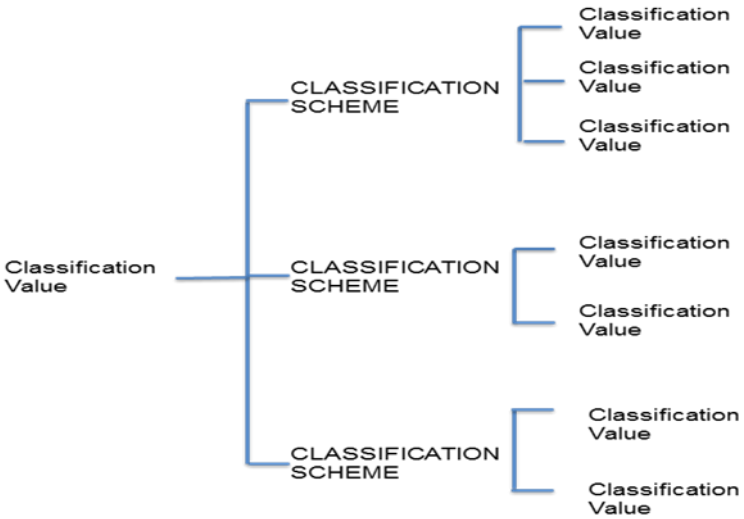
The classification model provides business staff with a mechanism by which they can identify and define all concepts that make up their business environment. No technical IT knowledge is required to develop this model, however when it is completed (even partially) a powerful communication medium exists to enable to business to speak about its data with IT Staff.

A classification model comprises three classification hierarchies:-

- the *fundamental* hierarchy which shows the classes and subclasses within the organisation
- the *relationship* hierarchy which shows the relationships classes and subclasses within the organisation
- the *descriptor* hierarchy which shows the classes and subclasses of descriptive information within the organisation.

The important distinction between the class (or entity-relationship) model and the classification model is that the class model explicitly shows the relationships between *fundamental*, *relationship* and *descriptor* items (but does not usually display all possible subtypes) , while the classification model does not show the relationships between fundamental, relationship and descriptor items, but does, if complete, display all possible subtypes.

The classification model has, at the top of each of the 3 hierarchies, the name of a Class, referred to in the classification modelling methodology as a classification value. The next level in the hierarchy contains one or more classification schemes. The level after that contains classification values, next level classification schemes, then value, scheme, value, scheme down the hierarchy.



5.9.1 The Fundamental Hierarchy

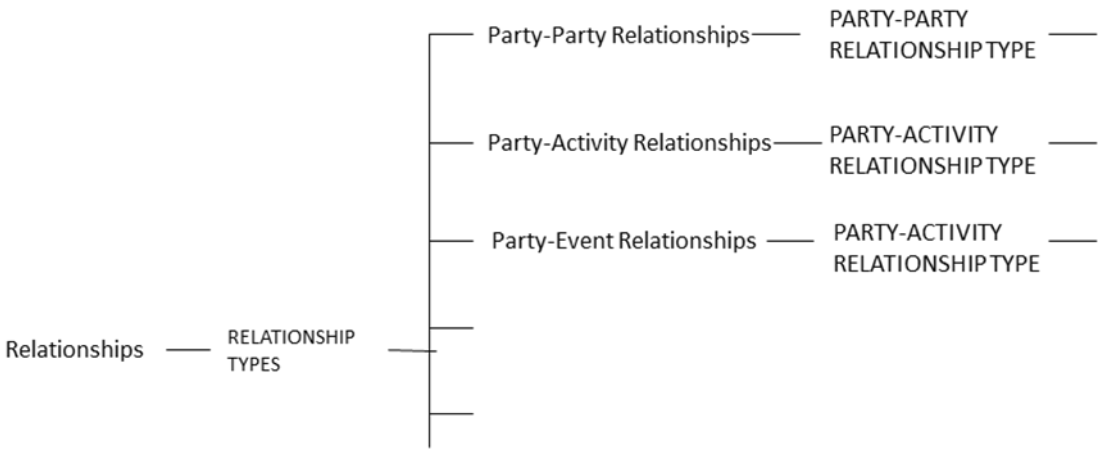
The Fundamental Hierarchy commences as follows:-

The (in this case 6) classification values at the third level of the hierarchy comprise the Core Classes in the Class Model. (These will be discussed in more detail in the next section).

The fourth level of this hierarchy contains classification schemes used to differentiate subtypes of the Core Classes. The fifth level contains the subtype classes, and the sixth level the classification schemes used to further subclassify these subtype classes.

5.9.2 The Relationship Hierarchy

The Relationship Hierarchy commences as follows:-

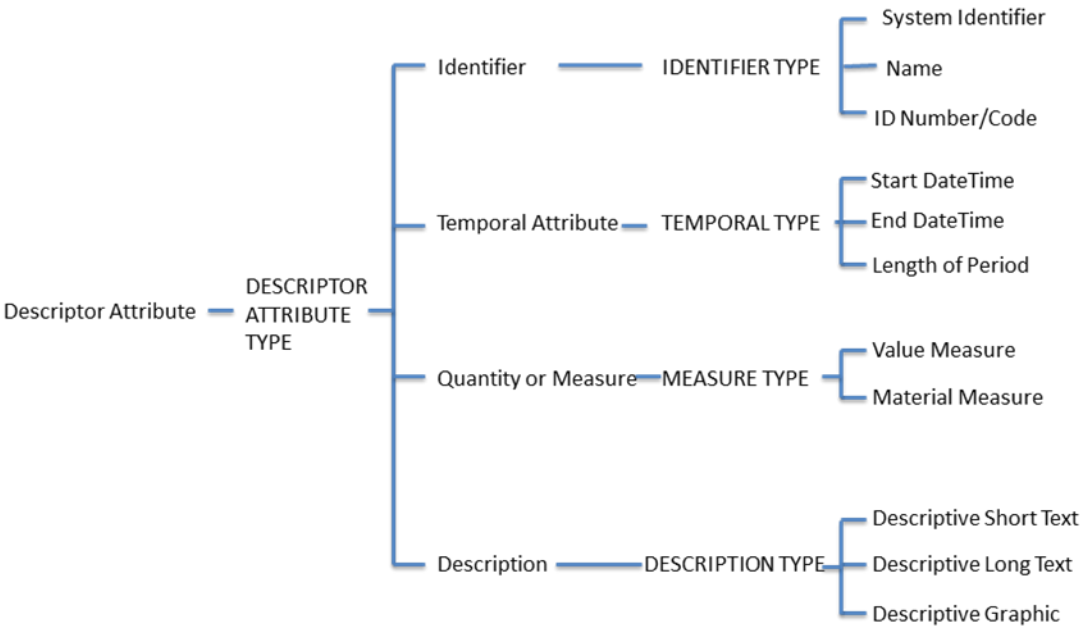


The third level of this hierarchy comprises the relationship classes that appear in the Core Class Model. The fifth level comprises specific relationships that exist between subtypes of the Core Classes. For example, classification values under PARTY-PARTY RELATIONSHIP TYPE may be 'Party is spouse of Party', or, 'Party reports to Party'.

5.9.3 The Descriptor Hierarchy

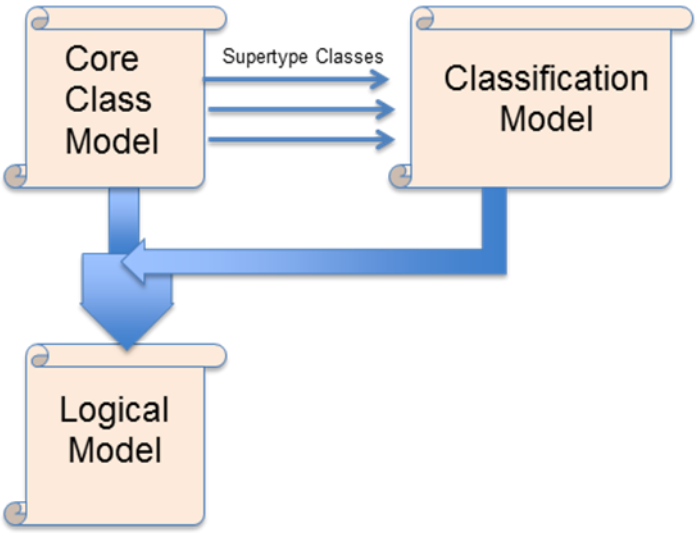
The Descriptor Hierarchy is somewhat of a special case in that it provides a general classification of data items that *describe* instances of classes. In other words, it provides a classification of attributes, but does not specify which fundamental or relationship classes these attributes belong to.

The higher levels of the descriptor hierarchy are shown below.



5.10 Expressing the Classification Model in a Class Model

As described above, the Classification Model comprises three hierarchies which represent: classes and subclasses of fundamental concepts; relationships; and descriptors. A Class Model (or Entity-Relationship model if that representation is being used) assembles elements of these three hierarchies into specific model structures (classes, relationships and attributes within classes) that reflect the business rules of the particular aspect of the organisation being modelled.
The Class Model (or Entity Relationship Model) developed in this process is referred to a Logical Data Model. The high level Core Class Model is used as the basis for the structure of the model, while Classification Model provides the detail.

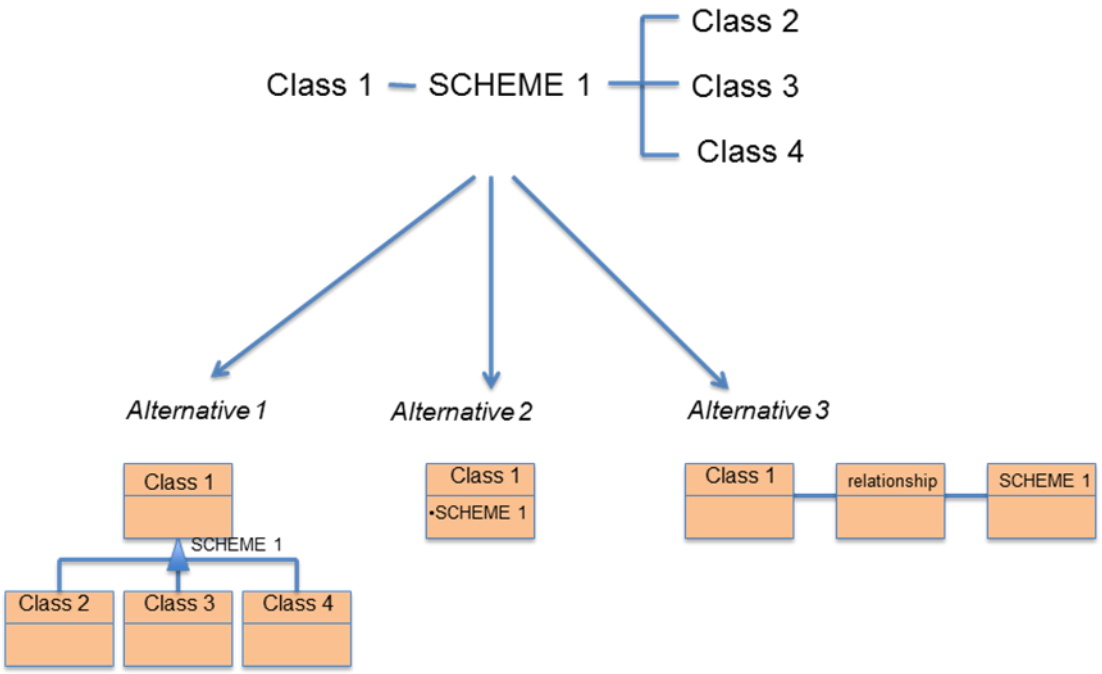


An abridged summary of the approach is outlined below.

Technical Note: The logical data model can take the form of a UML Class Model, an Entity-Relationship Model, or an XML Schema. Typically, the UML model would be developed for use in an application development environment, an Entity-Relationship Model would be used if a logical database design was required, or an XML schema if middleware/SOA initiatives were the objective.

5.10.1 Modelling the Fundamental Hierarchy

A class-subclass portion of a fundamental hierarchy can be modelled in three ways:-

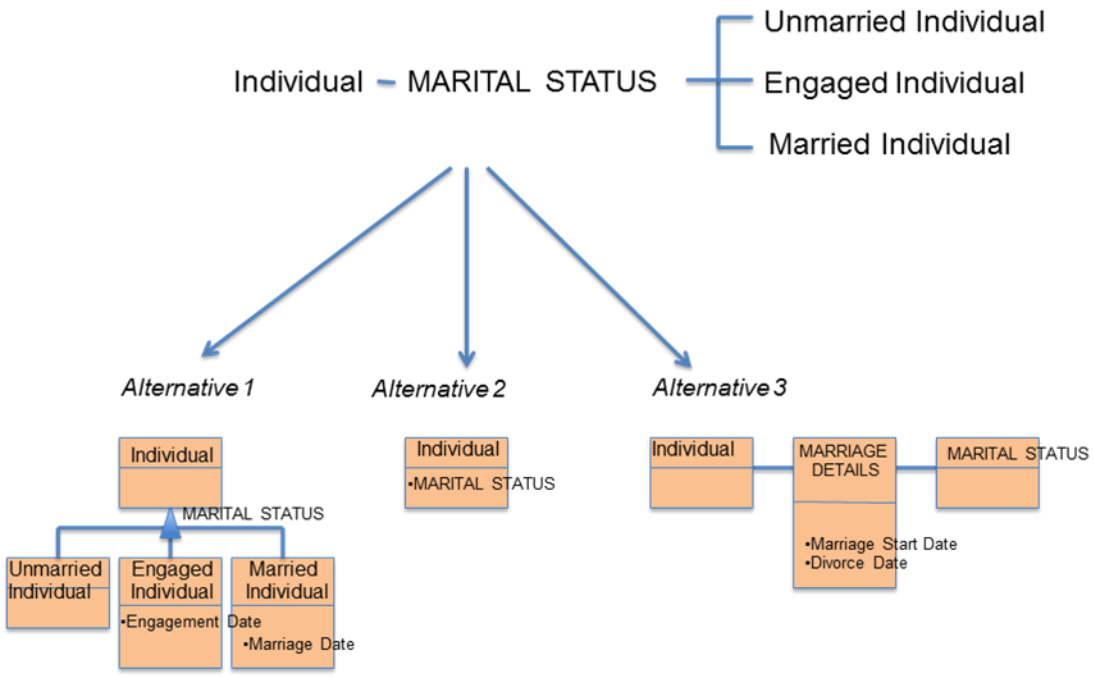


Alternative 1: Classes 2, 3 and 4 each have unique attributes and/or relationships which exist in addition to those inherited from Class 1. In which case, the four classes are represented in the Class Model as separate classes in a class/subclass structure.

Alternative 2: An instance of Class 1 can be one of three possible subclasses. However, the attributes and relationships of Class 1 are the same whether Class 1 is of Type 'Class 2', 'Class 3' or 'Class 4'. In this case Class 1 contains an attribute, SCHEME 1, whose value can be either 'Class 2', 'Class 3' or 'Class 4'. The value of the attribute indicates which subclass the instance of 'Class 1' belongs to.

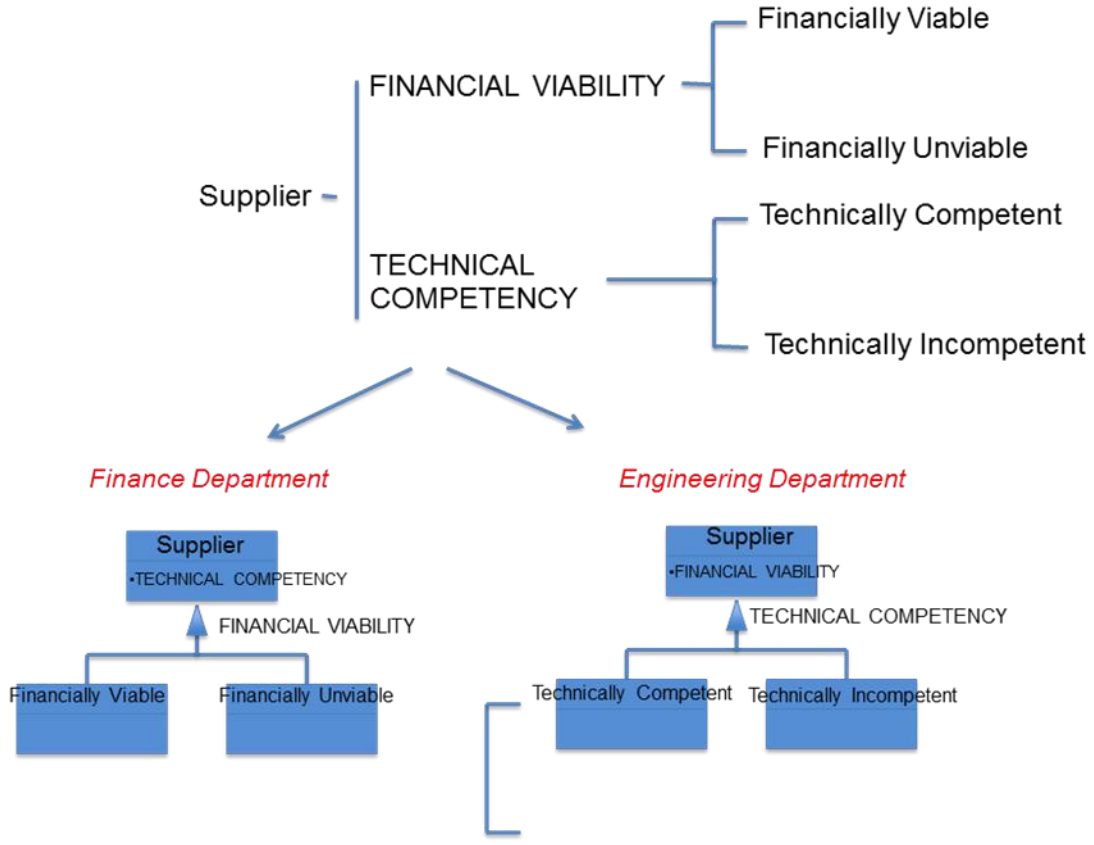
Alternative 3: An instance Class 1 can belong to more than one class. In which case, SCHEME 1 becomes a Class whose members can be Class2, Class 3 or Class 4. This 'Classifying' Class is related to Class 1 on a many-to-many basis. An example of this situation occurs when the subclasses are not mutually exclusive or when the class can belong to different subclasses over time.

For example, an Individual's Marital Status could be modelled in a number of ways:-



The choice of which structure to use when creating a class model form a portion of the Classification Model depends on the specific business rules which apply to the business area being modelled.

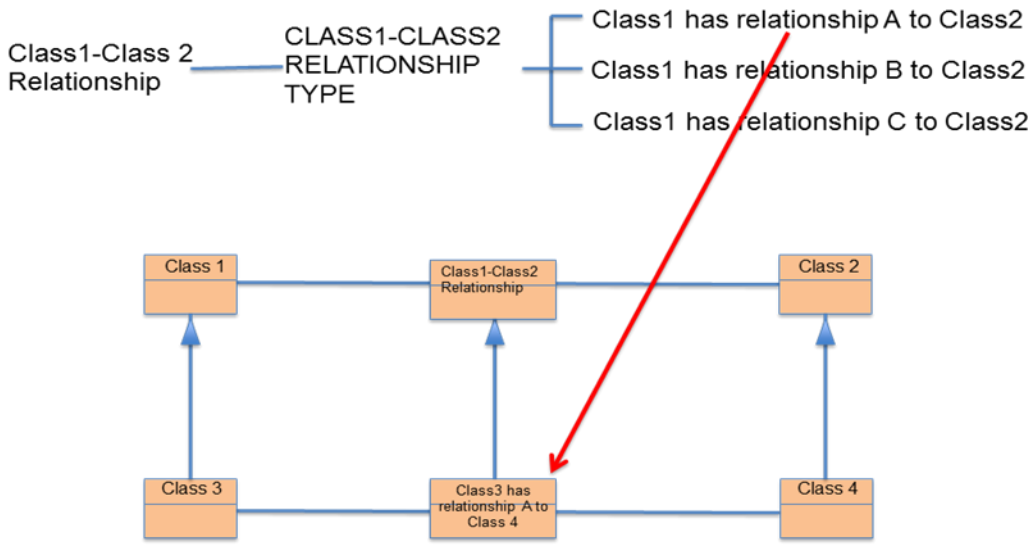
For example, a Classification Value, 'Supplier', may have the classification schemes FINANCIAL VIABILITY and TECHNICAL COMPETENCY. One can envisage two possible structures for the Class model of Supplier, depending on whether the Finance Department (who need additional attributes about viable and non-viable entities) or the Maintenance Department (who need additional attributes about competent or non-competent contractors) is creating the model.



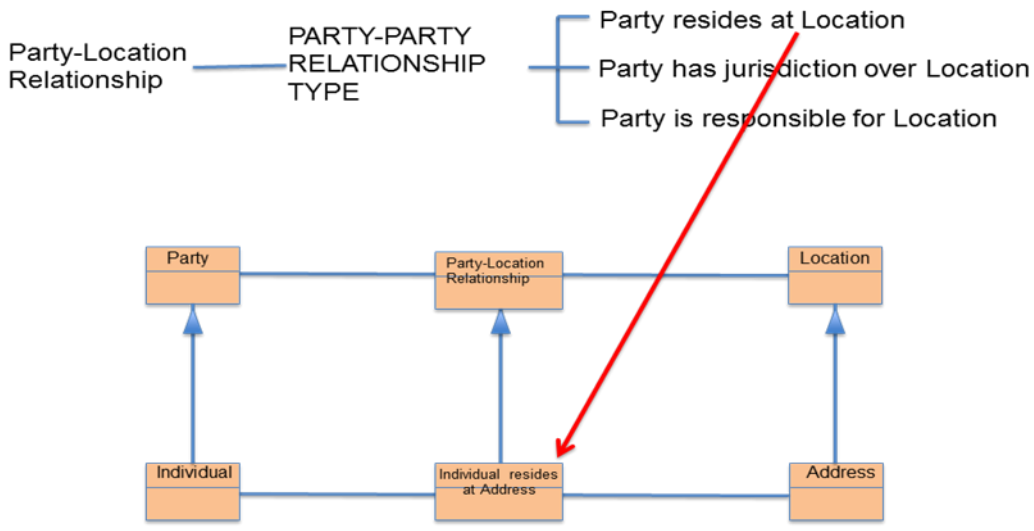
5.10.2 Modelling the Relationship Hierarchy

Modelling the relationship hierarchy is slightly more straightforward than the fundamental hierarchy. As discussed above, the Relationship Hierarchy defines relationships that may exist between sub-classes of the Core Classes (say Class A and Class B) by placing them as classification values below the Classification Scheme 'Class A-Class B relationship type'.

Modelling the relationship hierarchy consists of identifying a relationship class that exists between two classes by reviewing the relevant portion of the Relationship Classification Hierarchy. The relevant relationship classification value becomes a relationship class with the Core Class names replaced by the specific subtype class names. Next, the cardinality of the relationship is defined which will result in one to one, one to many relationships between the two classes and the relationship class. See diagram below.



Or, taking a simple example:-



Technical Note: The Class Model generated from the Classification Model is in Fifth Normal Form, and takes the form of a Binary Relationship or Object Role Model.

5.10.3 Modelling the Descriptor Hierarchy

The discussion of "Modelling the Fundamental Hierarchy", above, showed that a Classification Scheme could become an Attribute of a Class. These Attributes, classify the parent Class into subclasses; they are 'Classifying' Attributes.

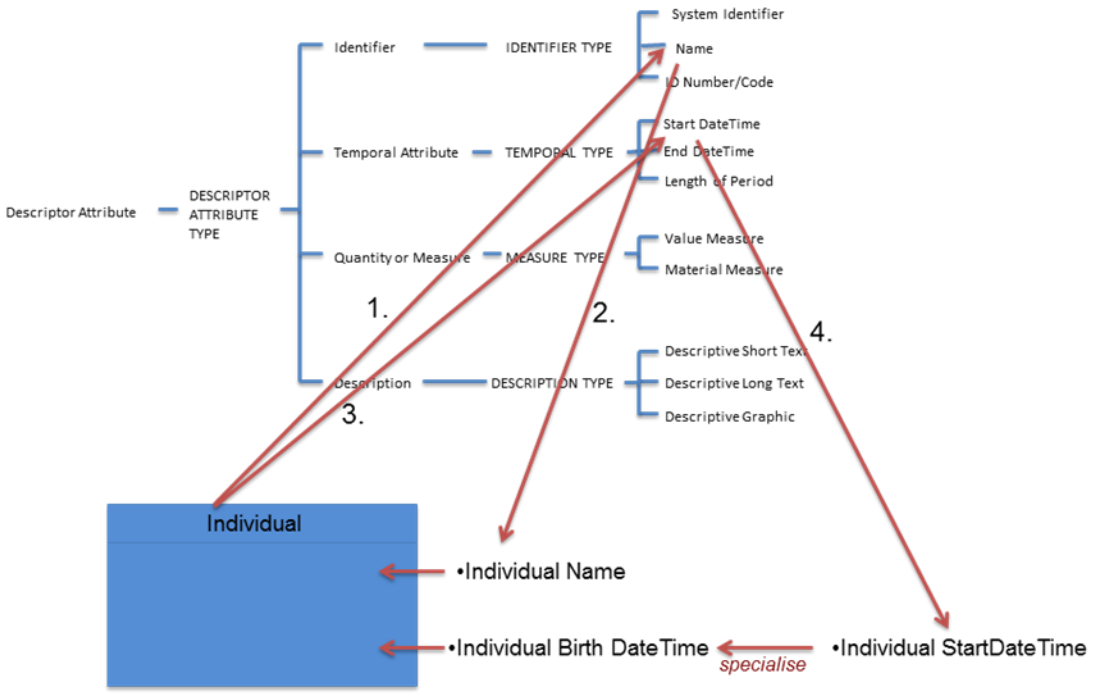
However, there are other types of Attribute which do not classify the parent Class, rather, they describe a particular instance of the Class. For example, a 'Name' describes a particular instance of a Class, it does not classify the class into subclasses. 'John Howard' describes one, specific individual, not a class of individuals. 'Name' is a descriptor attribute. Descriptor Attributes appear in the Classification Model in the 'Descriptor Hierarchy'.

The Descriptor Hierarchy can be used to identify descriptor attributes for any Class within the Class Model. For example, a Classification Value in the Descriptor Hierarchy is 'Name'. Many different Fundamental Classes can have a 'Name' (ie have 'Name' as an attribute). The Descriptor Hierarchy indicates 'Name' is a potential descriptive attribute for any Class in the model.

It is good modelling practice to give each attribute in the class model a distinct identification. So, if the Class 'Individual' can have an attribute 'Name' and the Class 'Project' can have an attribute 'Name', then, to avoid duplication, the Class Name is appended to the descriptor name to make it unique. So Individual has an attribute 'Individual Name' and Project has an Attribute 'Project Name'. It is often useful to make the attributes even more distinct by adding adjective(s) to the name or altering the attribute's identifier to make it more specific. So, for example, 'Start DateTime' in Individual would become 'Individual StartDateTime', or more specifically, 'Individual BirthDateTime'.

Modelling the descriptor hierarchy involves taking each Fundamental and Relationship Class in the Class model and reviewing the Descriptor hierarchy to identify any classification values that may be appropriate as attributes of each Class. The Attribute is then named using the Class Name concatenated with the Descriptor Value Name. The Attribute name is then altered to best reflect the meaning of the Attribute in the context of the Class.

See the example below:-



5.11 The Physical Data Model / Data Dictionary

In order to create an unambiguous specification of data for the purposes of IT staff who will be creating Databases, Messages and Information Services that automate the data, it is necessary to provide information as to the physical structure of the data items in the data model.

This is done by defining a set of 'Datatypes' which define the different ways in which data can be represented in computer storage. For example, as an Integer or as a Character String. To complete the Data Model it is necessary to

1. Define the set of available Datatypes
2. Assign each Attribute in the Data Model a specific Datatype.

This will be discussed in more detail as the project proceeds.

5.12 Summary of the Overall Data Model Documents

As stated at the beginning of this discussion, a Data Model is a set of interlinked documents designed to enable clear communication between an organisation's business people and IT people.

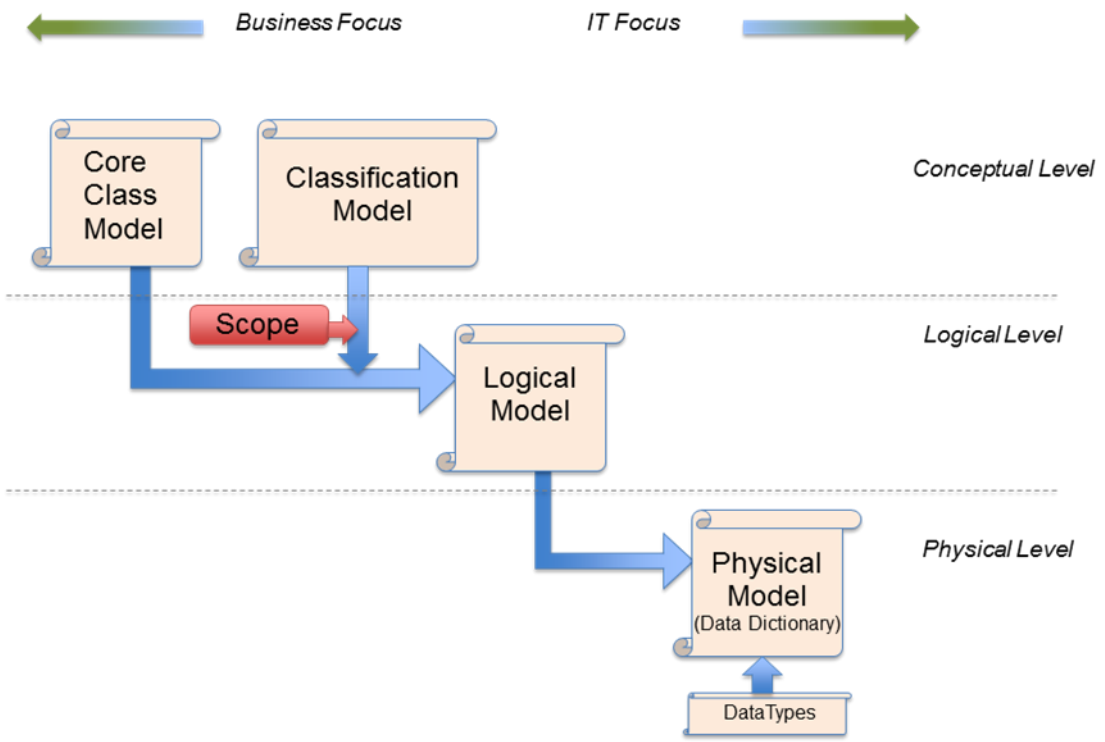
Firstly, the **Core Class Model** provides a high level view of the major concepts that make up the organisation's data. The Core Class Model provides a 'scaffolding' upon which more detailed representations of the structure of information within the organisation can be built. It provides a mechanism by which the business and IT can agree the overall structure of organisational data as it applies across the organisation.

Next, the **Classification Model** provides a definition of the sub-classes of data that make up the detail of the organisation's data. The Classification Model provides the taxonomy or vocabulary of terms used by the business. Each term is closely defined by the business. The Classification Model is the language the business can use to describe its data, in detail to the technical staff.
The Classification Model provides the 'raw material' from which detailed structures of the organisation's data can be developed.

Next, **Logical Subject Area Models** provide a description of how a portion of the organisation's data should be structured (into classes, attributes etc) for a particular purpose. These purposes may include the requirements for a database or business system, reporting requirements or the definition of messages to be transferred between parts of the organisation's information systems or other organisation's information systems.

Finally, the **Physical Data Model** or Data Dictionary provides a detailed technical definition of individual data items, their format (and often, how they are structured in an actual database or message stream.

The diagram below shows the various documents that make up the Data Model. (The Conceptual, Logical and Physical Levels are discussed in Reference Guide to Phase 1 – Attachment 3: Data Model.)



5.13 Positioning of Models within the Data Dictionary Project

The objective of the Data Dictionary Project is to create a data dictionary of those data items necessary for ESO's to report on their activities in a consistent manner. The approach to the project, using the methodology outlined above, involves:-

1. Developing the Core Class Model.
2. Developing the Classification Model (at a high level across the ESO)
3. Developing a detailed Classification Model within the area of the scope of the project (Activity)
4. Scoping the Classification Model within the scope of the project
5. Developing a Logical Data Model of the scope (Activity).
6. Developing a Physical Data Model / Data Dictionary for the scope (minimum data set).

6. APPENDIX D – RESPONSE TO QUESTIONS FROM STAKEHOLDERS

This report was circulated to members of the Project Advisory Group and to members of the Project Steering Committee. A number of specific questions were raised by the members and are addressed in this section.

The majority of the issues below will be resolved in Stage 2 where the Classification Model will be developed and reviewed. (The classification information included in this report is preliminary and presented as an example only).

Question:- *Is the Business Driver Class necessary?* Yes. Because each class in the Core Class Model concerns a specific aspect of the business (and, conversely, one aspect of the business is reflected in only one Core Class), there needs to be a class to include objectives, strategies, plans, legislation, policies etc. Other concepts which 'drive' the business are standards and guidelines. These also need a 'home' in the model. Note that hese concepts are not the same as 'Activities. ' Refer also sections 2.2.4, 2.2.5, 2.2.6, 2.4.3.

Question: *how will specific relationships between classes be defined*? The classification model will include a classification hierarchy for relationships where selected specific relationships between core classes will be documented. Relationships in the Phase 2 model are essentially bidirectional in nature. Relationship directionality and cardinality (eg 1 -> M) for specific relationships will be informed by development of the data dictionary.

Question*: can the definition of Party be altered to include 'groups of individuals' as well as 'organisations'?* The definitions of Core Classes will be updated, if necessary, as a result of development of the classification model.

Question:- *re Section 2.2.4. should it (Business Driver) also include legislative requirements on an organisation?* Yes, legislation is a major business driver.

Question:- re *Section 2.4.1 Part A paragraph 3. Does this (Activity) also include maintenance; administration; training; community education*? Yes.

Question: *re Section 2.4.2. Location – would these items cover locations in bodies of water (in a river, lake, ocean)?* Yes. This aspect will be included in the Stage 2 classification model.

Statement: re Section 3.1.1. Activity Status – 'Called off needs to be a status'. Yes. This aspect will be included in the Stage 2 classification model.

Statement: *re Section 3.1.4. Location – need to signify land vs water*. Yes. This aspect will be included in the Stage 2 classification model.

Question*: re Section 5.11. Will we be asked to provide information on the data we currently use? How will discrepancies between agencies be resolved?* Stage 3 of the Phase 2 project will scope out the content of the data dictionary. This scoping activity will include indentifying data currently being used by members. This activity will also include workshop(s) designed to achieve a consensus as to what data makes up the data dictionary.