Data Dictionary and Messaging Standards

DATEX Traffic/Travel Situation Publication Data Model

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1 INTRODUCTION

This discussion provides another angle on our DATEX Data Model. It focuses on the exchange of the data in a subscription/publication environment such as defined by DATEX-ASN.

2 PUBLICATION OVERVIEW

The publication that we shall define will describe an individual traffic/travel situation. Hence a client will obtain a list of situations that a data provider knows about (perhaps via a higher level publication) and will subscribe to those that interest him.

As we have seen before, a traffic/travel situation is made up of one or more situation elements. Hence our publication will also contain one or more situation elements.

Is there an equivalent data message in DATEX-Net? Not quite. Our publication will use DATEX-Net's TRAVIN message as its inspiration. However the TRAVIN message differs from our publication in two ways. Firstly, each TRAVIN messages contains a single data element (and hence several TRAVIN messages are required to convey a situation). Secondly, TRAVIN is dual purpose - it can convey situations and diversion information. We shall include only the data relevant to situations.

3 DEVELOPING THE MODEL

3.1 The Basic Structure

The basic structure for our model is straightforward enough. A situation comprises one or more situation elements, each of which may be an Accident, Incident, Road Maintenance etc. This leads us to the UML extract contained in Figure 1.

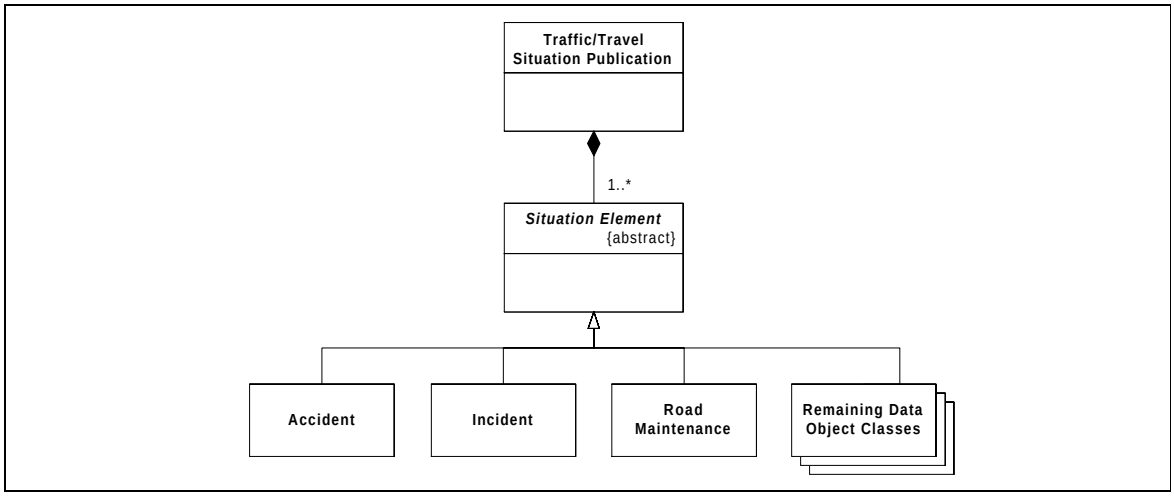

Figure 1 - The Basic Structure

3.2 The Common Attributes of Data Objects

First we shall consider the attributes that are common to all data objects. Examination of the TRAVIN message provides a rather different model for these than was initially proposed. Before discussing this, let's see the model with the addition of the common attributes (Figure 2).

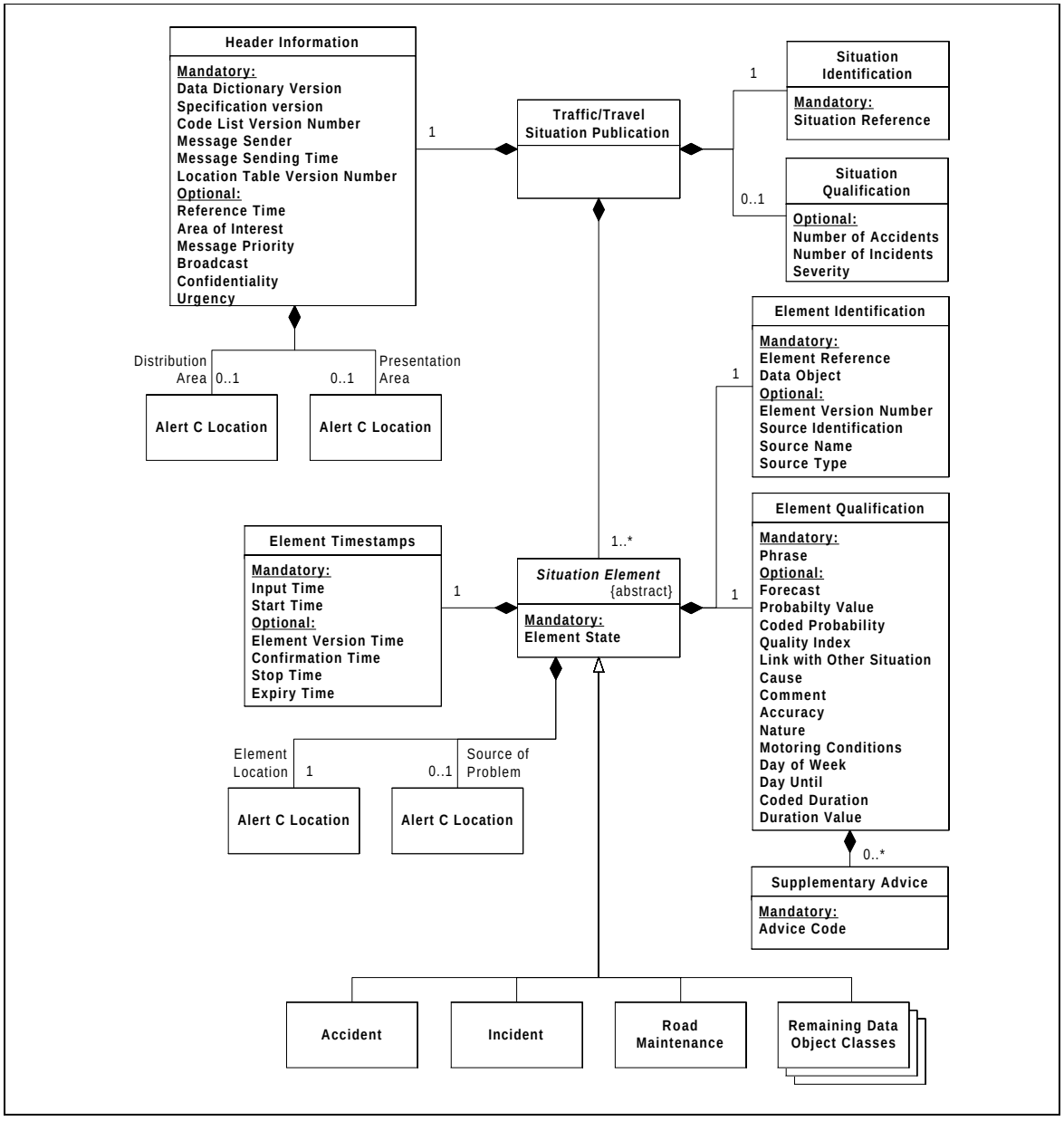

Figure 2 - Addition of the Common Attributes

3.2.1 Notation for Optional Attributes of a Class

The first thing to note is that we have qualified the attributes of each class as being either 'Mandatory' or 'Optional'. This is due to the nature of the data contained within the

publication. Whilst the publication must be able to contain every attribute that may be applied to a situation, it must also be able to convey a small subset. We can achieve this in two ways - we can have very many small classes that match the granularity of the published data, or we can have larger classes with optional attributes within them. Clearly the latter option will provide a clearer data model.

The problem with this approach, however, is notation. The UML does not provide the ability to flag attributes as optional (other than via the textual data dictionary that would accompany the diagram). Hence I have introduced my own notation that should be found intuitively obvious.

3.2.2 Associating Classes with the Publication

Examination of the common attributes shows that many, such as 'Message Sending Time (MST)', are associated with the publication as a whole rather than with any single situation element. Others, such as 'Situation Reference (SNM)', are associated with the situation as a whole. Hence we have introduced classes with a composition relationship with the top level 'Publication' class.

3.2.3 Creation of State

DATEX-Net has 'Cancel' and 'End' attributes. These would initially appear to be commands rather than attributes. However, with DATEX-Net's 'All Situation element Updating' method (see section 9.6.3 of the Datex Data Exchange Document) situation elements that have ended or have been cancelled can still be sent. Hence these attributes remain as such. However, we shall model them as an 'Element State' attribute that may have values of 'Active', 'Cancelled' or 'Ended'.

3.2.4 Demise of Earlier Data Object Classes

Some of the earlier identified data object classes become common data in the context that we are now considering. The biggest contributing factor to this is the assumption that the 'Traffic Data' object set contains data objects that are used, as the name suggests, for traffic data messages (contained in a TRAILS message) and not as part of Traffic/Travel Situations.

3.2.4.1 *'Miscellaneous' Class*

Let us first consider the 'Miscellaneous' class (refer to TN005.1 for its definition). This contained the following attributes:

- TREM Card Number (TRN)
- Link with Other Situation (LNK)
- Supplementary Information (SAD)
- Comment (SUR)
- Data Group (DRG)
- Situation Table (TAB)

The DATEX-Net TRAVIN message has the 'TREM Card Number' in the 'Dangerous Goods' message segment. From this we can reasonably assume that it is related to the dangerous goods and can hence move it into our 'Dangerous Goods (Static)' class.

The 'Data Group' and 'Situation Table' are not contained in the TRAVIN message and are marked as 'TBD' in the DATEX Data Dictionary. So for now, I propose that we leave them out of this data model. The three remaining attributes ('Link with Other Situation', 'Supplementary Information' and 'Comment') are used by all data objects other than those in the Traffic Data Object Set and so can be applied to all situation elements.

3.2.4.2 *'Qualitative' and 'Duration' Classes*

Most of the attributes in these classes are either used by all of the remaining data objects or are general enough in nature to be applied to all data objects as an optional field.

The only exception to this is 'Mobility'. Hence we keep the 'Mobility' sub-class and move the remaining attributes into our common classes.

3.2.4.3 *'NAC' and 'NIC' (Number of Accidents/Incidents)*

The DATEX Data Dictionary defines these as *'The number of accidents/incidents included in a situation'*. Hence we should move them out of the 'Accident' and 'Incident' data object classes and associate them with a 'Situation'.

3.2.5 Alert C Location

Examination of the TRAVIN message shows that a situation may have associated with it up to four Alert C locations - the element location (mandatory), the location of the source of the problem, a distribution area and a presentation area. Each of these is defined using the same Alert C format. In modelling terms this equates to a single class used to convey more than one entity. We can show this in UML by creating a single class ('Alert C Location') that is part of more than one relationship. Each relationship is annotated with the role of the class in the relationship. So instead of having, for example, a relationship to an 'Element Location' class, we have a relationship to an 'Alert C Location' class annotated as 'Element Location'.

The 'Presentation Area' relates to the area over which the data may be broadcast. As such it would appear to be additional information related to the 'Broadcast' attribute. As such we choose to show it as a composition relationship to the class that contains the attribute.

Similarly, the 'Distribution Area' relates to the area over which the information may be re-distributed. This appears to relate to the 'Area of Interest' attribute and so we show the 'Distribution Area' as a composition relationship to its class.

The 'Element Location' and the 'Source of Problem' locations are clearly related to each situation element and are shown thus.

The content of the 'Alert C Location' class is discussed in the next section.

3.3 Alert C Location

DATEX-Net describes four methods of ALERT C Location Referencing:

- Method 1 - Predefined Primary Location + Extent
- Method 2 - Predefined Primary and Secondary Locations
- Method 3 - Predefined Primary Location + Extent + Distances
- Method 4 - Predefined Primary and Secondary Locations + Distances

Further analysis shows that a location is made up of a predefined primary location, a secondary location that may be defined as either a predefined location or an extent, a direction and the distances from the primary and secondary locations. Only the primary location is mandatory.

Hence the referencing methods may be summarised as follows:

	Primary Location?	Optional Secondary Location defined by:	Direction?	Distance?
Method 1	Yes	Extent	Optional	No
Method 2	Yes	Predefined Location	Optional	Optional
Method 3	Yes	Extent	Optional	No
Method 4	Yes	Predefined Location	Optional	Optional

This we can model using UML as shown in Figure 3.

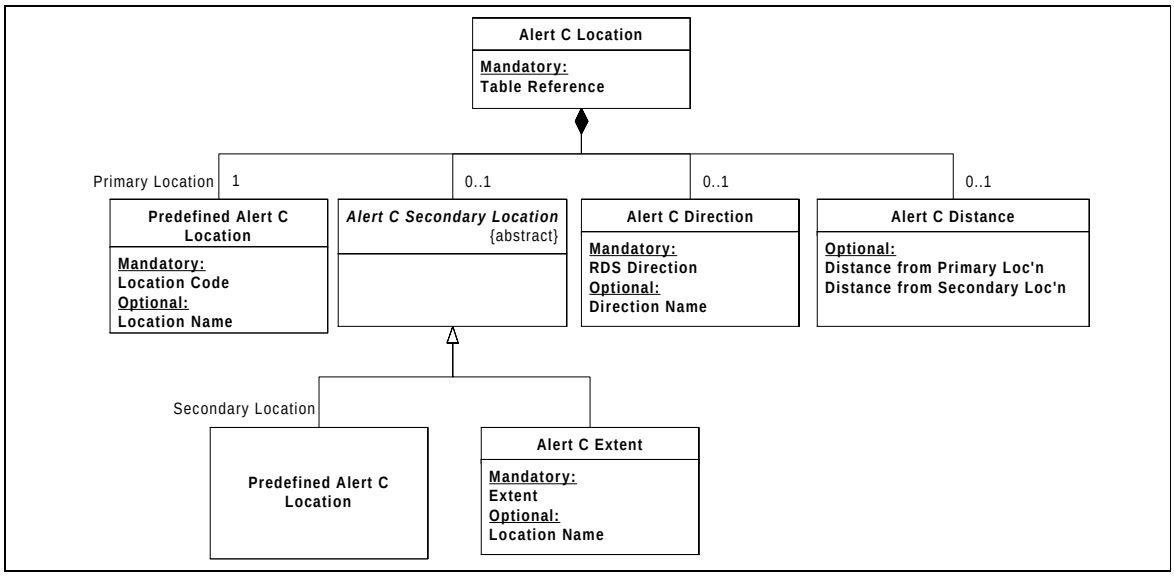

Figure 3 - Alert C Location

It is worth noting here that we have lost most of the Alert C attributes that were listed in our original 'Alert C (Common)' class. Whilst the DATEX Data Dictionary led us to believe that these attributes were directly part of all data objects, they are in fact included indirectly. They

are contained in a Location Table that is referenced by the situation's location entries and would hence only appear in the location table's data model.

3.4 Expanding Data Object Classes

Our last task is to expand each of the data object classes. This is achieved simply by constructing our data objects from our 'building block' classes that we created in our original model. Indeed the construction is the same as the original model apart from the changes caused by the demise of some of our 'building blocks' as discussed in section 3.2.4 (Demise of Earlier Data Object Classes). The expansion of the Accident data object is shown in Figure 4.

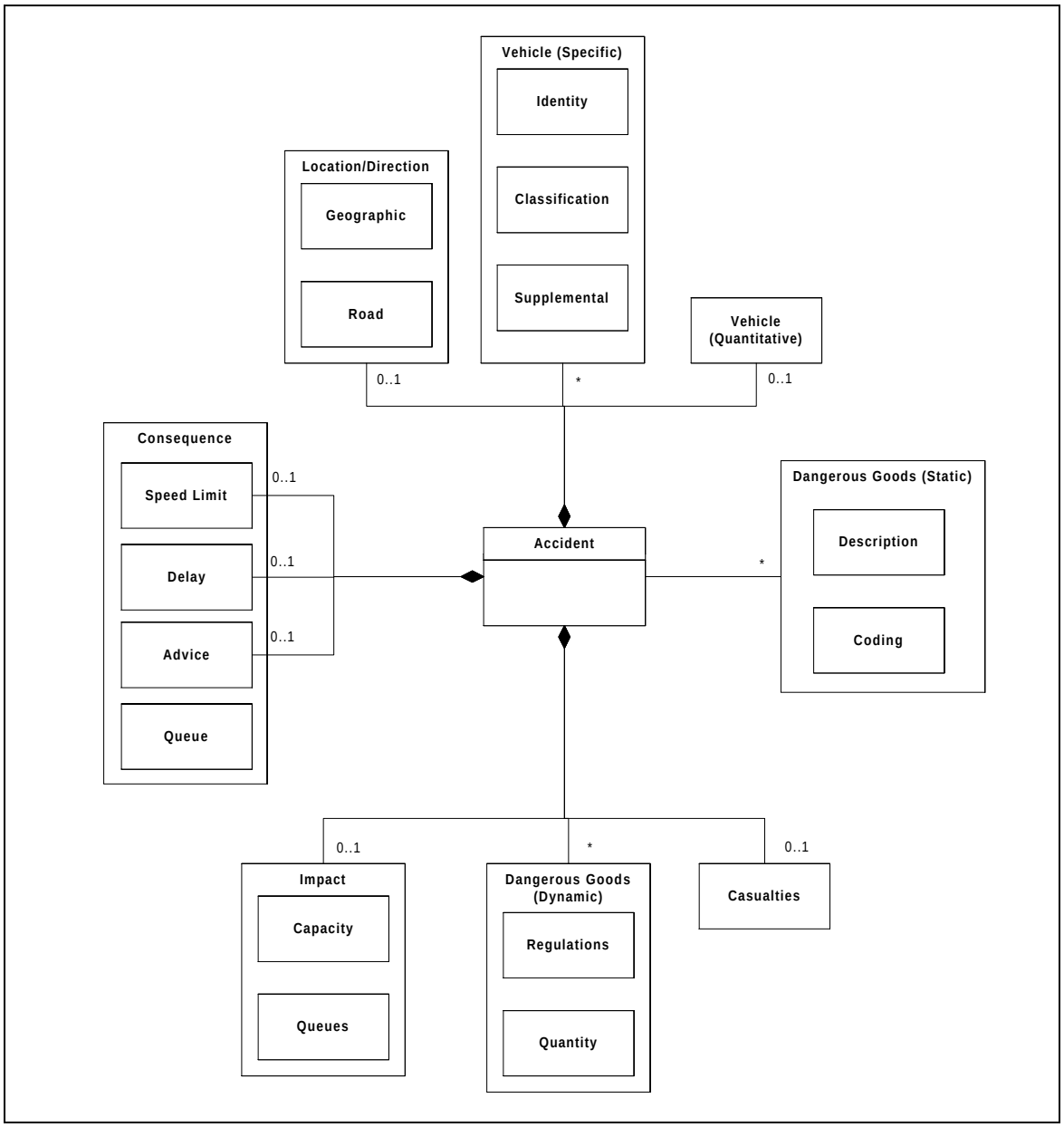

Figure 4 - Expanding the Accident Data Object Class

3.5 Bringing it all Together

The complete set of UML diagrams for our Accident, Incident and Road Maintenance Traffic/Travel Situation Publication data model are contained in Appendix A for ease of reference. Note that we have, as in our earlier model, left the textual descriptions of the classes and attributes until agreement has been reached on the model's overall structure.

4 MOVING FROM CONCEPTUAL TO IMPLEMENTATION

An implementation version of our model will gain methods to allow the publication to be initialised and transmitted. These will differ according to the implementation's transport mechanisms. For example, a CORBA implementation may well have a method on the top-level publication class to return all of the data in one go (as has become the way with CORBA in the traffic/travel domain). This method would be used, remotely, by a client via the CORBA infrastructure. For an object-oriented DATEX-ASN implementation, we may have a 'get ASN.1 encoded data' method to give an octet stream for transmission. Alternatively we could embed the code that sends the data (via TCP/IP) within the publication object and have a 'Publish Me' method.

5 WHAT ELSE COULD BE DONE?

Our publication model only details the Accident, Incident and Road Maintenance situation elements. The remaining types of situation elements will also need to be specified.

We will additionally need a model for the corresponding subscription and models for the components of all the other DATEX-Net exchanges (traffic data, location table, measurement point table, diversion agreements and situation catalogues).

APPENDIX A - ACCIDENT, INCIDENT AND ROAD MAINTENANCE TRAFFIC/TRAVEL SITUATION PUBLICATION DATA MODEL

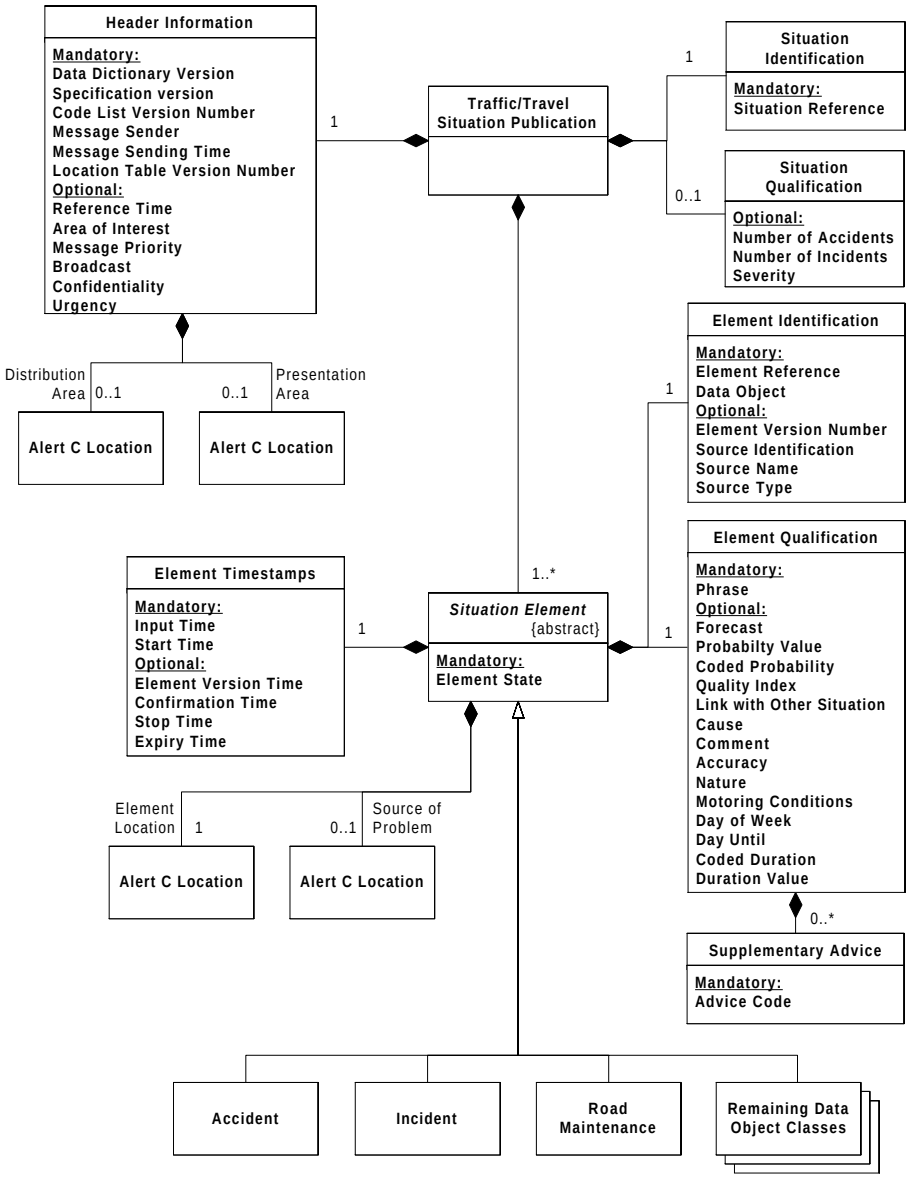

Diagram 1 - Traffic/Travel Situation Publication

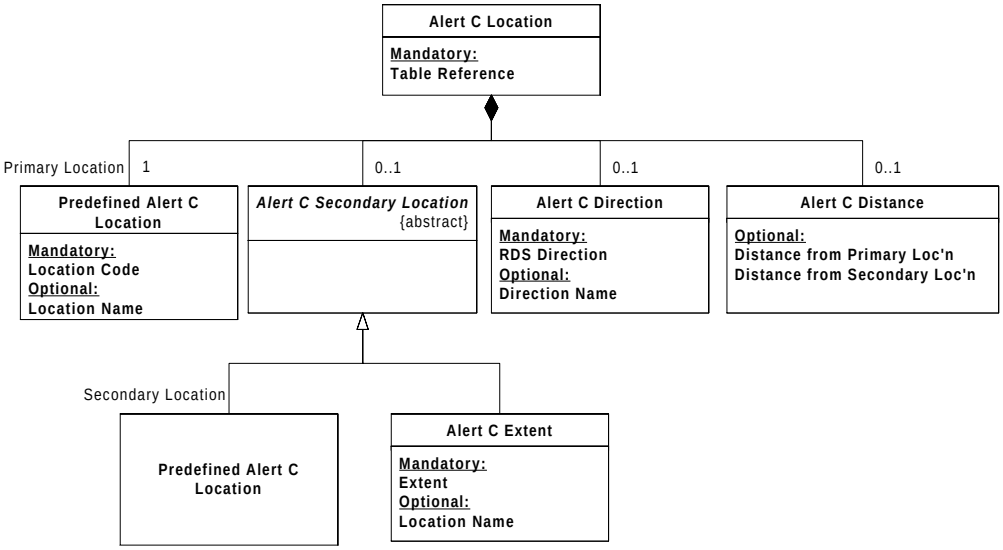

Diagram 2 - Alert C Location

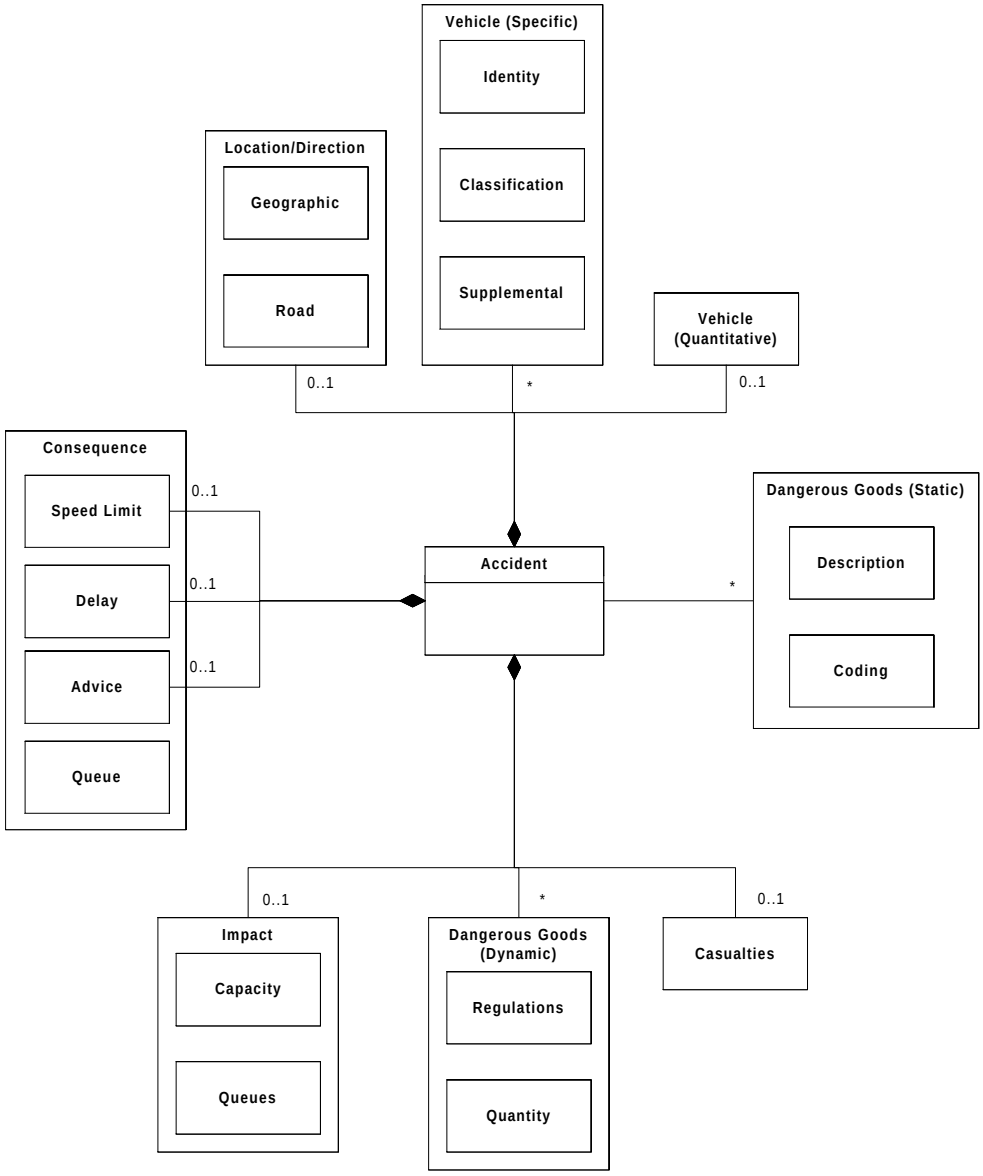

Diagram 3 - Accident Situation Element

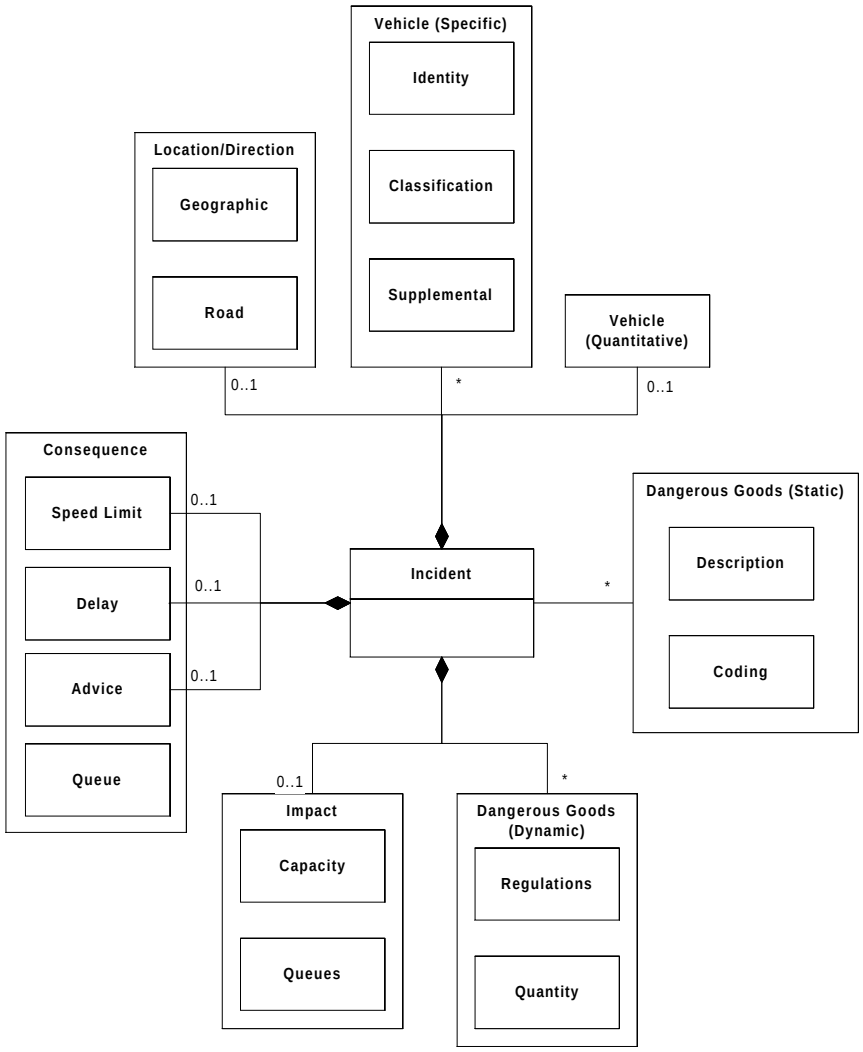

Diagram 4 - Incident Situation Element

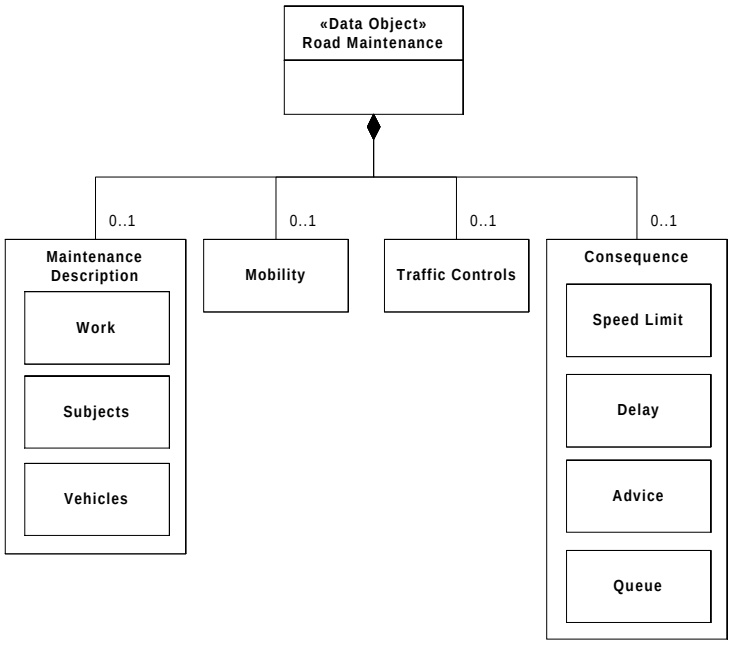

Diagram 5 - Road Maintenance Situation Element

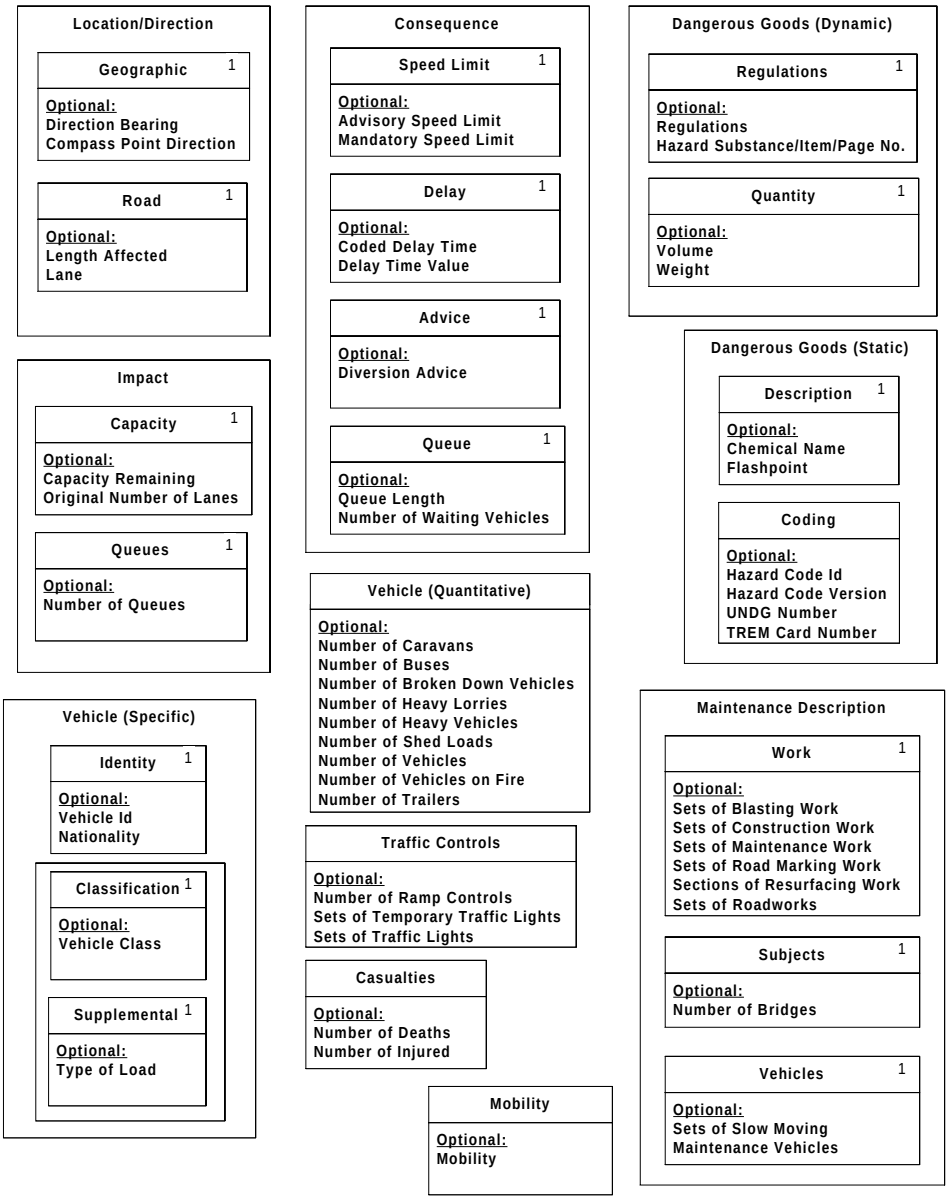

Diagram 6 - 'Building Block' Classes

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