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Information Technology – Geographic Information Framework Data Content Standard

Part 7b: Rail

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Foreword

Geographic information, also known as geospatial information, both underlies and is the subject of much of the political, economic, environmental, and security activities of the United States. In recognition of this, the United States Office of Management and Budget issued Circular A-16 (revised 2002), which established the Federal Geographic Data Committee (FGDC) as a coordinating organization.

Work on this standard started under the Geospatial One-Stop e-Government initiative. The standard was developed with the support of the member agencies and organizations of the FGDC and aids in fulfilling a primary objective of the National Spatial Data Infrastructure (NSDI), that is, creation of common geographic base data for seven critical data themes. The seven core data themes are considered framework data of critical importance to the spatial data infrastructure.

The increasing need to coordinate collection of new data, identify applicability of existing data, and exchange data at the national level led to the submission of this standard to the ANSI process to become an American National Standard. The national standard contained in this document and its parts was sponsored by Technical Committee L1, Geographic Information Systems, of the InterNational Committee for Information Technology Standards (INCITS), an ANSI-accredited standards development organization.

As the Geographic Information Framework Data Content Standard was developed using public funds, the U.S. Government will be free to publish and distribute its contents to the public, as provided through the Freedom of Information Act (FOIA), Part 5 United States Code, Section 552, as amended by Public Law No. 104-231, “Electronic Freedom of Information Act Amendments of 1996”.

Introduction

The primary purpose of this part of the Geographic Information Framework Data Content Standard is to support the exchange of rail transportation data. This part seeks to establish a common baseline for the semantic content of rail transportation databases for public agencies and private enterprises. It also seeks to decrease the costs and simplify the exchange of rail transportation data among local, Tribal, State, and Federal users and producers. That, in turn, discourages duplicative data collection. Benefits of adopting this part of the standard also include the long-term improvement of the geospatial rail transportation data within the community, improved integration of safety, emergency response, and enforcement data, and streamlined maintenance procedures.

Framework Data Content Standard – Rail

1 Scope

The Geographic Information Framework Data Content Standard, Part 7b: Rail defines components of a model for describing the railway system, which is one of five modes that compose the Transportation theme of the NSDI framework data. The primary purpose of this part of the standard is to support the exchange of transportation data related to the railway system. It is the intent of the part to allow the widest utility of railway transportation data for the user and producer of transportation information by enhancing data sharing and reducing redundant data production.

At a high level, the rail system described in this part of the Framework Data Content Standard is made up of rail features, which can have geographic locations and characteristics. These rail features can be interconnected in various ways to represent rail networks for routing applications. While the Rail Modeling Advisory Team (MAT) initially considered defining the content for detailed, engineering level datasets, this part of the standard focuses on a generalized view of the rail network that enables the broadest variety of operational uses. It is anticipated that the current version of the part will be suitable for some engineering applications. However, the development team recognizes that all engineering needs will not be satisfied by this part of the standard. It is anticipated that future versions of the Rail part will better define the content for rail engineering datasets in order to satisfy the data sharing needs of the entire rail community.

This part of the Framework Data Content Standard can be implemented using a variety of software packages and is designed to accommodate data encoded with or without geometry as well as to support the exchange of data encoded in a variety of geographic information systems. It is designed to be able to depict the complete rail system at all levels of service and all functional classes that may be defined by a data-providing agency. It also accommodates assets associated with the rail system that are typically used for navigation, safety, and measurement.

The Rail part will initially apply to NSDI framework transportation data produced or disseminated by or for the Federal Government. According to Executive Order 12906, Coordinating Geographic Data Acquisition and Access: The National Spatial Data Infrastructure, Federal agencies collecting or producing geospatial data, either directly or indirectly (for example, through grants, partnerships, or contracts with other entities), shall ensure, prior to obligating funds for such activities, that data will be collected in a manner that meets all relevant standards adopted through the Federal Geographic Data Committee (FGDC) process.

Because of the North American scope of the railway network, this part attempts to address the differences between Canadian and U.S. definitions of railway, related concepts, and terminology to harmonize the model to be applicable to both user communities. The rail development team is composed of representative stakeholders from both countries that address these issues as appropriate.

2 Conformance

This thematic part includes a data dictionary based on the conceptual schema presented below. To conform to this part, the user shall satisfy the requirements of the data dictionary. The user's conforming dataset shall include a value for each mandatory element, and a value for each conditional element for which the condition is true. It may contain values for any optional element. The data type of each value shall be that specified for the element in the data dictionary and the value shall lie within the specified domain. This part only specifies the special requirements of conformance for a dataset containing information on the rail system. Conformance to the part requires additional actions specified in the Base Document (Part 0) and the Transportation Base (Part 7).

3 Normative references

Annex A lists normative references applicable only to the Rail part. No additional normative references are specified in the Transportation Base (Part 7). Annex A of the Base Document (Part 0) lists normative references applicable to two or more parts of the standard, including those other than the transportation parts. Informative references applicable to two or more transportation parts only are listed in Annex C of the Transportation Base. Annex D of the Base Document lists informative references applicable to two or more of the parts, including those other than the transportation parts.

4 Maintenance authority

4.1 Level of responsibility

The FGDC is the responsible organization for coordinating work on all parts of the Geographic Information Framework Data Content Standard. The United States Department of Transportation (USDOT), working with the FGDC, is the responsible organization for coordinating work on the Geographic Information Framework Data Content Standard, Part 7: Transportation Base and subparts (Parts 7a, 7b, 7c, and 7d, excluding 7e) and is directly responsible for development and maintenance of the transportation parts (excluding 7e) of the Framework Data Content Standard.

The FGDC shall be the sole organization responsible for direct coordination with the InterNational Committee for Information Technology Standards (INCITS) concerning any maintenance or any other requirements mandated by INCITS or ANSI.

4.2 Contact information

Address questions concerning this part of the standard to:

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590 National Center
Reston, Virginia 20192 USA

Telephone: (703) 648-5514
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Internet (electronic mail): gdc@fgdc.gov
WWW Home Page: http://fgdc.gov

5 Terms and definitions

Definitions applicable to the Rail part are listed here. Other terms and definitions applicable to multiple transportation parts of the standard are listed in the Transportation Base (Part 7). More general terms and definitions can be found in the Base Document (Part 0) part of the standard. Users are advised to consult these documents for a complete set of definitions.

5.1
amalgamated station

named geographic area that contains one or more **station points**

5.2
non-operating property

land or asset that is not dedicated to the direct operation of the railway

NOTE A non-operating property can have buildings on it, but will not have active tracks on it.

5.3
operating property

land or asset required for the operation of the rolling stock, whether it is in movement or at a standstill

EXAMPLE Rail Right-of-Way

5.4
railroad administrative region

geographic region where a railroad operates and that is managed by a supervisor, superintendent, manager, vice-president, or other designated person of responsibility

NOTE Such a geographic region is not necessarily limited to the boundaries of the real property owned by the railroad.

5.5
rail network

set of rail features and their topological relationships which together define all possible movements through the **rail system**

5.6
rail system

physical and non-physical components representing the rail mode of travel that allow the movement of goods and people between locations

5.7
station, or station point

named location where railroad or non-railroad revenue and/or operating business occurs

NOTE A station or station point does not necessarily have to be a building.

6 Symbols, abbreviated terms, and notations

The following symbols, abbreviations, and notations are applicable to the Rail part. Those common to two or more transportation parts are listed in the Transportation Base (Part 7). Symbols, abbreviations, and notations applicable to multiple parts, including the transportation parts, are listed in the Base Document (Part (0).

DTL – Direct to Locomotive

FSAC – Freight Station Accounting Code

SPLC – Standard Point Location Code

7 The transportation feature meta model

A feature is an abstraction of a real world phenomenon that is of interest to the application. Instances of features that share common characteristics are organized in classes. Classes are object realizations of the Metaclasses defined in the ISO Rules for Application Schemas Standard [ISO 19109], and instances of the types described in the ISO Feature Catalogs Standard [ISO 19110]. Rail Segments (RailSeg) and intersections are examples of Feature Types.

8 Rail system

8.1 General

This part of the Framework Data Content Standard attempts to accommodate the principal aspects of rail transportation including geographic locations, interconnectedness, and characteristics of the transportation system. The rail transportation system includes physical and non-physical components representing the rail mode of travel that allow the movement of goods

and people between locations. It also includes the supporting infrastructure necessary for rail operations and maintenance.

The transportation infrastructure is the physical component of the entire transportation system. Thus, the Transportation theme includes many modes, or subthemes. Geospatial data depicting airport facilities, rail, road, transit, and inland waterway systems represent the transportation infrastructure that make up this part of the Framework Data Content Standard. Each subtheme has developed a part that accommodates the uniqueness of that mode. The Rail part is a companion document to the Transportation Base and deals only with railways.

This part of the standard considers the engineering and operational requirements of the rail network. As shown in Figure 1, from the operational point of view applications are not necessarily required to capture each track individually. Instead, a collection of adjacent tracks is represented as a centerline. For rail engineering applications, it is required to capture each rail track from point-of-switch to point-of-switch. This part uses a variety of ways to describe the rail network for both operational and engineering applications. However, all aspects of the model hinge on three main components: segments, points, and events. Segments represent portions of the physical rail network that are defined by the application domain using business rules that may vary between operational and engineering applications. Therefore, in this part of the standard, RailSeg represents two somewhat different semantics:

- Each RailSeg may represent a track, which extends between two points-of-switch. This is depicted in the “Engineering” view in Figure 1.
- Each RailSeg represents one or more adjacent tracks. In this case, RailSeg has an attribute which indicates the number of tracks it represents. This is depicted in the “Operational” view in Figure 1, where Seg 2 is the representative of Track 1 and Track 2.

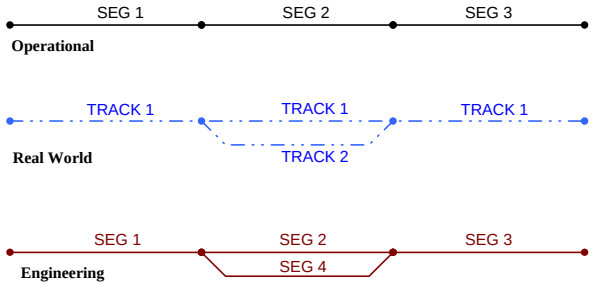

Figure 1 – Different representation of the rail network

RailPoints represent discrete locations of interest along the rail network that represent segment termini. Events represent attributes that occur along or near the rail network. To encourage a maximum of utility in a variety of contexts, the Rail part accommodates two different views of rail network. However, it does not prescribe any specific business rules for segmentation, or locating points and attributes along the rail network. The focus of this part is to define a way to encode rail segments, their start and end points, and their attributes, which may have varying values along each segment. The rail model contains five parts that help to group its components:

- A segmentation model, derived from the Transportation Base model that defines segments and their associated geometries and topology
- A tracks and segments package defining the representation of rail where each segment is the centerline of the rail or an individual track

- A linear reference system (LRS), which defines a measurement method used to apply attributes to segments by locating their endpoints and defining their extent
- An event model which defines a method to model attributes that may have values that may change along the length of a segment or path and to linearly locate features along segments and paths
- A facilities or administrative areas package defining the important features in a rail system

8.2 Segmentation model

Figure 3 shows that RailPath, RailSeg, and RailPoint are subclasses of TranPath, TranSeg, and TranPoint respectively, and inherit the properties of these classes. RailPath, RailSeg, and RailPoint are the three central features in this model. For a full discussion of the general transportation segmentation model, users are advised to consult the Framework Data Content Standard, Part 7: Transportation Base.

A TranSeg is a linear section of the physical transportation network. For example, in Figure 2 below, there exists a road that is fifteen miles long; at miles 5 (Pt 2) and 10 (Pt 3) there are intersections. The road is divided into separate pieces at those points. Those pieces, labeled Seg 1, Seg 2, and Seg 3, would represent TranSegs in Figure 3. In the Transportation Base, TranSegs are described by the following attributes: status, fieldMeasure, length, geometry and topology.

Figure 2 – TransFeature example

TranPoints are associated with TranSegs. TranPoints define where TranSegs start and end. In Figure 2, each segment is bounded by two circles. Seg 1 is bounded by circles labeled Pt 1 and Pt 2, Seg 2 is bounded by circles labeled Pt 2 and Pt 3, and Seg 3 is bounded by circles labeled Pt 3 and Pt 4. These circles would represent TranPoints in Figure 3. In the Transportation Base, TranPoints are described by the geometry and topology attributes.

TranPaths are an aggregate of TranSegs representing how they are organized and used. More specifically, a TranPath is comprised of an ordered list of whole or partial TranSegs. In Figure 2 above, a path representing Route 1 between the circle labeled Pt 1 and the circle labeled Pt 4 would consist of the segments labeled Seg 1, Seg 2, and Seg 3; in that order. These segments, listed in order from 1 to 3, would represent a TranPath in Figure 3. In the Transportation Base, TranPath is described by the attributes geometry and topology. In the Rail part, TranPaths are further defined by the subclass RailPath. RailPaths inherit all the attributes and properties of TranPaths but are described further by the following attributes: name, startingPlace, endingPlace, isActive, and operator.

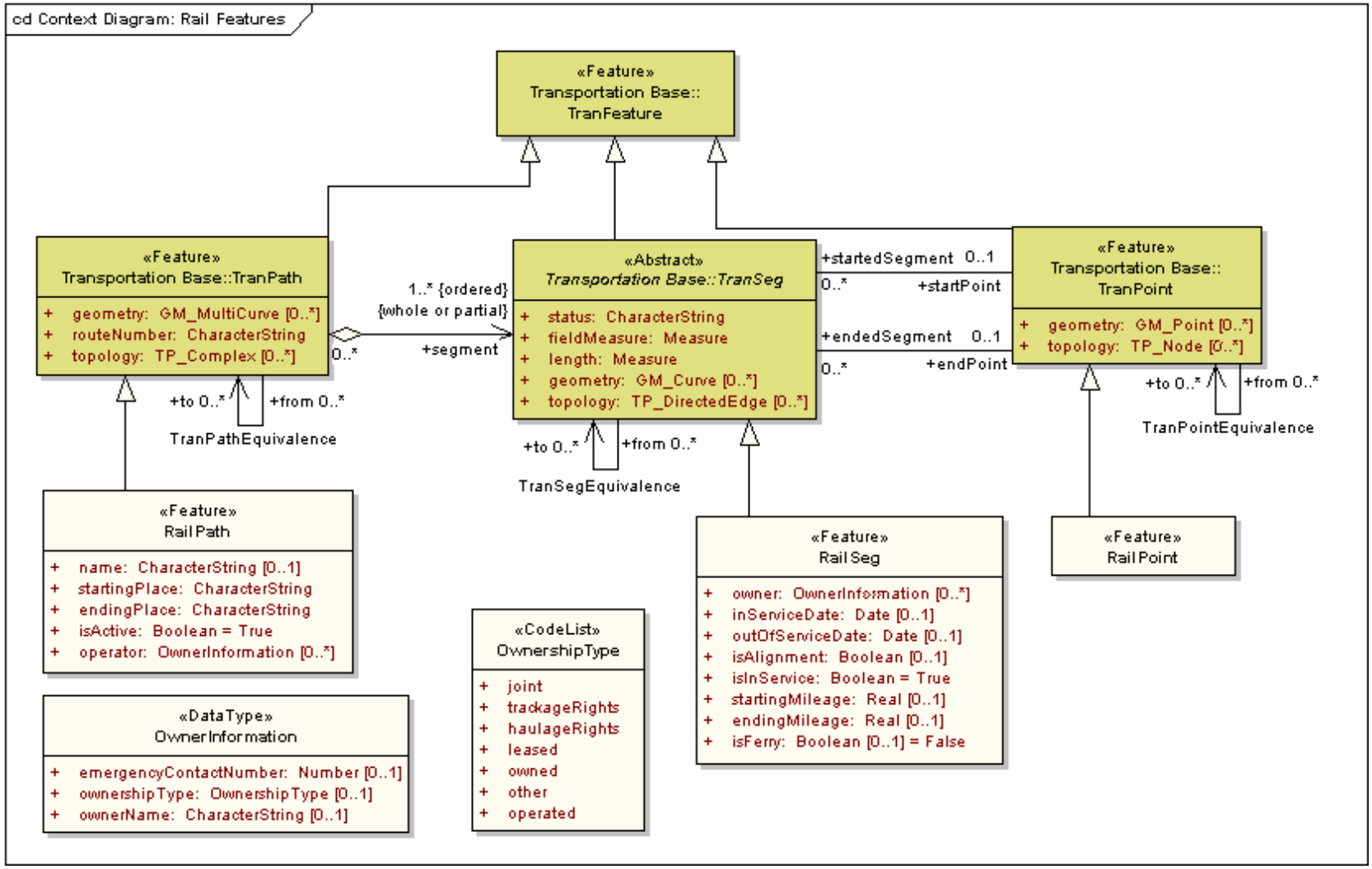

Figure 3 – Rail segmentation model

461 **Table 1 – Data dictionary for segmentation model**

Line	Name/Role Name	Definition	Obligation/ Condition	Maximum Occurrence	Data Type	Domain
1	Transportation Base::TranFeature	Abstraction of a real world transportation phenomenon			<<Feature>>	
2	Transportation Base:: TranPath	Ordered collection of one or more, whole or partial, TranSegs to represent a route within the transportation network			<<Feature>>	Lines 3-8
3	geometry	Shape and geolocation of a feature	O	*	<<Type>> GM_MultiCurve	Defined in ISO 19107
4	routeNumber	Route identifier	M	1	Characterstring	Unrestricted
5	topology	Connectivity of the participating elements	O	*	<<Type>> TP_Complex	Defined in ISO 19107
6	Role name: segment	An ordered list of whole or partial TranSegs	M	*	<<Abstract>> Transportation Base:: TranSeg	
7	Role name: from	Source TranPath in equivalency	C/part of equivalency?	*	<<Feature>> Transportation Base:: TranPath	Whole or partial TranPaths
8	Role name: to	Destination TranPath in equivalency	C/part of equivalency?	*	<<Feature>> Transportation Base:: TranPath	Whole or partial TranPaths
9	RailPath	Ordered collection of one or more, whole or partial, RailSegs to represent a route within the railroad network			<<Feature>>	Lines 10-14
10	name	Word or phrase that constitutes the distinctive designation of RailPath	O	1	CharacterString	Unrestricted
11	startingPlace	Point at which the RailPath begins	M	1	CharacterString	Unrestricted
12	endingPlace	Point at which the RailPath ends	M	1	CharacterString	Unrestricted

Line	Name/Role Name	Definition	Obligation/ Condition	Maximum Occurrence	Data Type	Domain
13	isActive	Denotes whether or not the RailPath is active	M	1	Boolean	True or False
14	operator	Person(s) or organization(s) that operates the RailPath	O	*	<<DataType>> OwnerInformation	Unrestricted
15	Transportation Base::TranSeg	Linear section of a physical transportation system designed for, or the result of, human or vehicular movement			<<Abstract>>	Lines 16-24
16	status	Condition of a TranSeg	M	1	CharacterString	Unrestricted
17	fieldMeasure	Length of segment, as determined in the field; if isAnchorSection = True, then this is the official length of the segment for the LRS	M	1	Measure	Defined in ISO 19103
18	length	Length of the TranSeg feature, which may differ from the field measured length due to differences in calculation	M	1	Measure	Defined in ISO 19103
19	geometry	Shape and geolocation of a feature.	O	*	<<Type>> GM_Curve	Defined in ISO 19107
20	topology	Connectivity of the participating elements	O	*	<<Type>> TP_DirectedEdge	Defined in ISO 19107
21	Role name: from	Source TranSeg in equivalency	C/part of equivalency?	*	<<Abstract>> Transportation Base:: TranSeg	Whole or partial TranSegs
22	Role name: to	Destination TranSeg in equivalency	C/part of equivalency?	*	<<Abstract>> Transportation Base:: TranSeg	Whole or partial TranSegs
23	Role name: startPoint	TranPoint corresponding to segment start	O	1	<<Feature>> Transportation Base:: TranPoint	

Line	Name/Role Name	Definition	Obligation/ Condition	Maximum Occurrence	Data Type	Domain
24	Role name: endpoint	TranPoint corresponding to segment end	O	1	<<Feature>> Transportation Base:: TranPoint	
25	RailSeg	A linear section of a physical transportation system designed for railroad movement			<<Feature>>	Lines 26-33
26	owner	Person(s) or organization(s) that possess RailSeg	O	*	<<DataType>> OwnerInformation	Unrestricted
27	inServiceDate	Date the RailSeg was placed into service	O	1	Date	Valid historical or current date and time
28	outOfServiceDate	Date the RailSeg was taken out of service	O	1	Date	Valid historical or current date and time
29	isAlignment	Denotes whether or not the RailSeg is an Alignment	O	1	Boolean	True or False
30	isInService	Denotes whether or not the RailSeg is in service	M	1	Boolean	True or False
31	startingMileage	Mile at which the RailSeg begins	O	1	Number	Real Numbers
32	endingMileage	Mile at which the RailSeg ends	O	1	Number	Real Numbers
33	isFerry	Denotes whether or not the RailSeg represents a Ferry crossing	O	1	Boolean	True or False
34	Transportation Base::TranPoint	Point along the transportation system that has some special significance either for starting or ending a segment			<<Feature>>	Lines 35-40
35	geometry	Shape and geolocation of a feature	O	*	<<Type>> GM_Point	Defined in ISO 19107
36	topology	Connectivity of the participating elements	O	*	<<Type>> TP_Node	Defined in ISO 19107

Line	Name/Role Name	Definition	Obligation/ Condition	Maximum Occurrence	Data Type	Domain
37	Role name: startedSegment	Segment that starts at the transportation point	O	*	<<Abstract>> Transportation Base:: TranSeg	Unrestricted
38	Role name: endedSegment	Segment that ends at the transportation point	O	*	<<Abstract>> Transportation Base:: TranSeg	Unrestricted
39	Role name: from	Source TranPoint in equivalency	C/part of equivalency?	*	<<Abstract>> Transportation Base:: TranPoint	Unrestricted
40	Role name: to	Destination TranPoint in equivalency	C/part of equivalency?	*	<<Abstract>> Transportation Base:: TranPoint	Unrestricted
41	RailPoint	Point along the rail system that has some special significance either for starting or ending a RailSeg			<<Feature>>	
42	OwnerInformation				<<DataType>>	Lines 43-45
43	emergencyContactNumber		O	1	Number	
44	ownershipType		O	1	<<CodeList>> OwnershipType	Unrestricted
45	ownerName		O	1	CharacterString	Unrestricted

8.2.1 RailPoint

A RailPoint is a location along the rail network that has significance either for starting or ending a RailSeg. RailPoint, shown in Figure 4, is a subclass of TranPoint. RailPoints, therefore, inherit all the geometric and topological properties associated with TranPoint. Geometry is restricted to be of type GM_Point and topology to be of type TP_Node. Both GM_Point and TP_Node are defined in ISO 19107. Referring to Figure 3, the reader will notice that RailPoints are associated with RailSegs in the roles of startPoint and endPoint.

No requirements are specified on where to place RailPoints, except to satisfy the requirements for start and endpoints for RailSeg, and that whatever segmentation method is employed, it is applied consistently throughout the dataset.

For a complete data dictionary of the RailPoint feature, please reference Table 1.

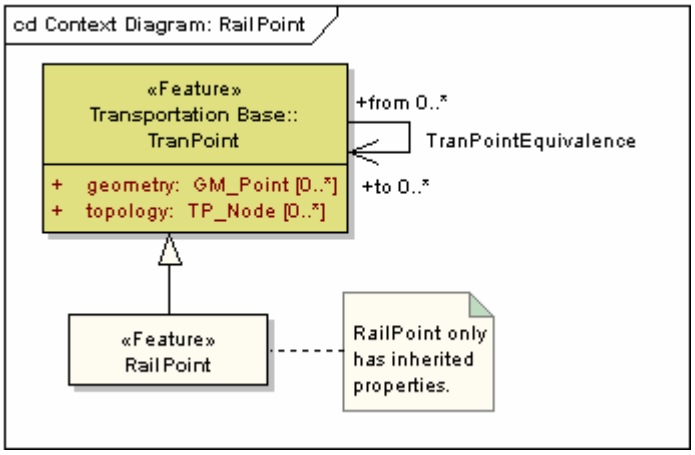

Figure 4 – RailPoint

8.2.2 RailSeg

A RailSeg represents a linear section of the physical rail network designed for the movement of trains. RailSeg extends TranSeg and is depicted in Figure 5. Within the Rail part, RailSeg may be defined in a variety of ways for a given stretch of rail track. For example, a single RailSeg can represent either the entire identified area of tracks (for example, a section that has more than one track) between two points or a separate RailSeg can be defined for each track. RailSegs can have geometry of type GM_Curve as defined in ISO 19107. RailSeg can also have a topology of type TP_DirectedEdge, as defined in ISO 19107. According to ISO 19107, GM_Curve extends GM_OrientableCurve and therefore has direction. The direction of a RailSeg is determined by the “from” and “to” RailPoints.

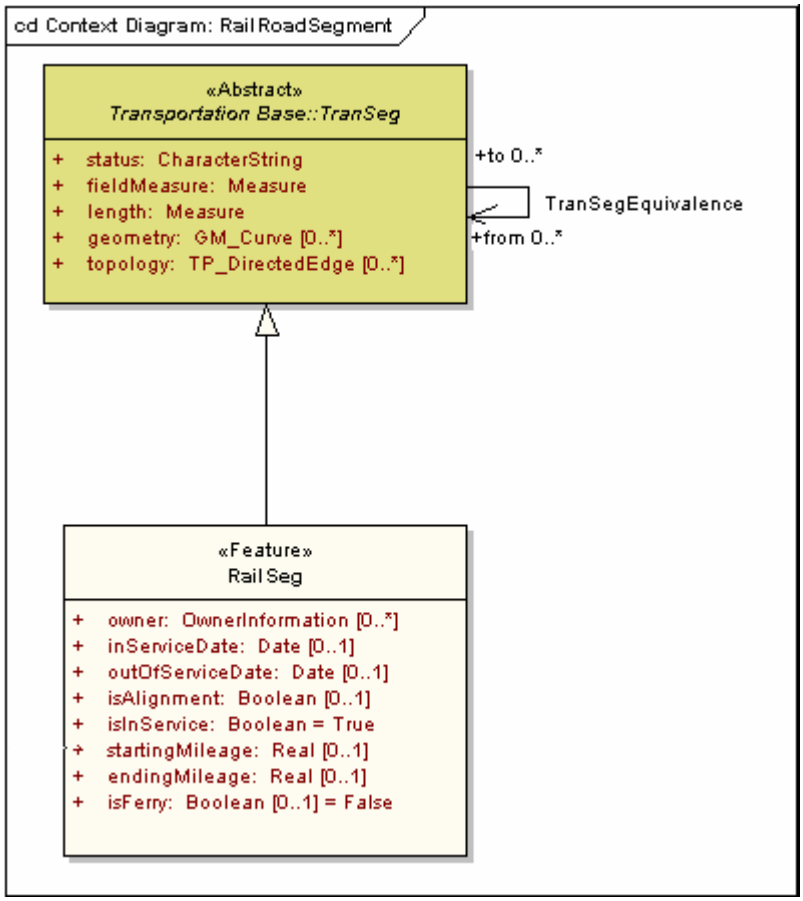

Figure 5 – RailSeg

The reason TP_DirectedEdge has been introduced is to facilitate the representation of feature topology through its combinatorial structures, independent of its geometry. For example, in the implementation of the Rail part, a data provider may choose to represent only the geometry of a RailSeg, which implies a direction inherited from GM_OrientableCurve. Another data provider may choose not to supply rail feature geometry and only provide the orientation of the RailSeg using its topology attribute.

RailSegs can have an integer-valued attribute that identifies the number of tracks it represents. Since the number of tracks can vary along the length of a RailSeg, it is more properly represented as a RailLinearAttributeEvent. A RailSeg has a unique identifier and it is highly recommended that RailSegs be bounded by two RailPoints. No mandates are provided on how to segment the rail network except that the data provider is consistent in segmentation methodology.

The defining agency can add attributes that are related to physical characteristics of the rail to the RailSeg (see ExtendedAttribute in the Transportation Base). If they are added as attributes of the RailSeg, as shown in Figure 5, the value of the attribute applies to the entire length of the RailSeg. In other words, attributes should only be assigned directly to a RailSeg if the intent is to force segmentation at changes in the specified attribute value. In these cases, the RailSeg terminates and a new one is started at the point where the attribute value changes. If it is necessary to allow the value of the attribute to change as the RailSeg is traversed, then that attribute should instead be assigned to the RailSeg as a RailLinearAttributeEvent (see Figure 7).

For a complete data dictionary of the RailSeg feature, see Table 1.

8.2.3 RailTrack

If an engineering view is followed, the RailTrack class is used to represent the centerline of each pair of rails. In the case of a monorail, RailTrack is at the centerline of the monorail. In the engineering view, the function of a RailTrack is similar to that of a RailSeg in the operational view in that it represents a section of the physical rail network. It is, therefore represented as a subtype of RailSeg, allowing it to have events defined along its length. The Rail part does not prescribe specific business rules on how tracks are segmented. However, in most engineering applications, tracks are segmented between points-of-switch. RailLinearAttributeEvents are used to represent varying attributes along a track. For example, the same TrackSeg may have different "weight of rail" values. In this case, linear reference methods can be used to indicate the portion of the track where this attribute value applies, independent of the track segmentation.

What service a track supports can also vary along a track segment so it is also represented as a RailLinearAttributeEvent. The type of service is the attribute value of the RailLinearAttributeEvent.

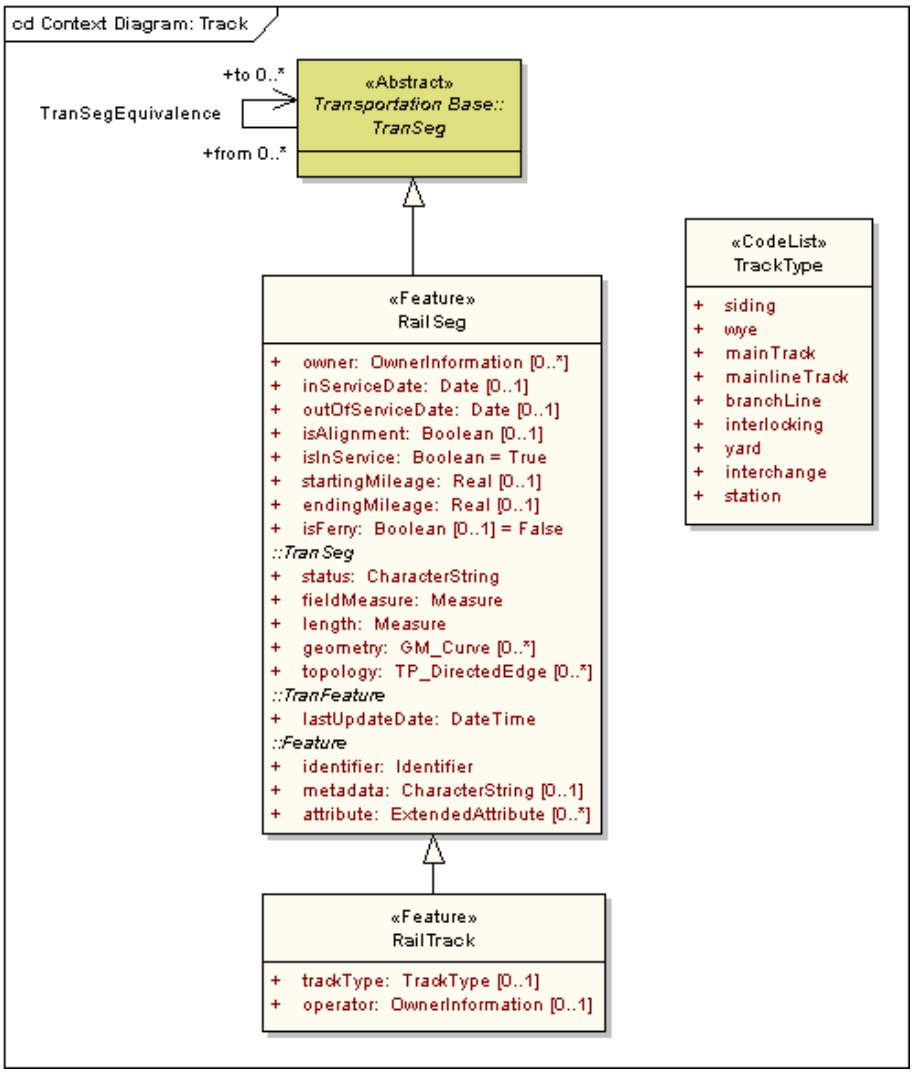

Figure 6 – RailTrack

528 **Table 2 – Data dictionary for RailTrack**

Line	Name/Role Name	Definition	Obligation Condition	Maximum Occurrence	Data Type	Domain
46	RailSeg	Linear section of a physical transportation system designed for railroad movement			<<Feature>>	Lines 47-65
47	owner	Person(s) or organization(s) that possess RailSeg	O	*	<<DataType>> OwnerInformation	Unrestricted
48	inServiceDate	Date the RailSeg was placed into service	O	1	Date	Valid historical or current date and time
49	outOfServiceDate	Date the RailSeg was taken out of service	O	1	Date	Valid historical or current date and time
50	isAlignment	Denotes whether or not the RailSeg is an Alignment	O	1	Boolean	True or False
51	isInService	Denotes whether or not the RailSeg is in service	M	1	Boolean	True or False
52	startingMileage	Mile at which the RailSeg begins	O	1	Number	Real Numbers
53	endingMileage	Mile at which the RailSeg ends	O	1	Number	Real Numbers
54	isFerry	Denotes whether or not the RailSeg represents a Ferry crossing	O	1	Boolean	True or False
55	Transportation Base:: TranSeg:status		M	1	CharacterString	Unrestricted
56	Transportation Base:: TranSeg::fieldMeasure		M	1	Measure	
57	Transportation Base:: TranSeg::length		M	1	Measure	
58	Transportation Base:: TranSeg::geometry	Shape and geolocation of a feature	O	*	<<Type>> GM_Curve	Defined in ISO 19107

Line	Name/Role Name	Definition	Obligation Condition	Maximum Occurrence	Data Type	Domain
59	Transportation Base:: TranSeg::topology	Connectivity of the participating elements	O	*	<<Type>> TP_DirectedEdge	Defined in ISO 19107
60	Transportation Base:: TranFeature::lastUpdateDate	Timestamp indicating when the RailSeg was last edited	M	1	DateTime	Valid historical or current date and time
61	Framework::Feature::Identifier	Feature identifier for the RailSeg	M	1	<<DataType>> Framework::Identifier	Unrestricted
62	Framework::Feature::metadata	Structured or unstructured metadata as defined by the community of practice	O	1	CharacterString	May be text or structured metadata fragment
63	Framework::Feature::attribute	Producer-defined attribute for inclusion in transfer	O	*	<<DataType>> ExtendedAttribute	Unrestricted
64	Role name: from	Source TranSeg in equivalency	C/part of equivalency?	*	<<Abstract>> Transportation Base:: TranSeg	Whole or partial TranSegs
65	Role name: to	Destination TranSeg in equivalency	C/part of equivalency?	*	<<Abstract>> Transportation Base:: TranSeg	Whole or partial TranSegs
66	RailTrack	Class used to represent the centerline of each pair of rails. In the case of a monorail, RailTrack is at the centerline of the monorail			<<Feature>>	Lines 67-68
67	trackType	Kind of track the feature represents	O	1	<<CodeList>> TrackType	Unrestricted
68	operator	Person(s) or organization(s) that operate the track	O	1	<<DataType>> OwnerInformation	Unrestricted

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8.2.4 RailPath

A RailPath represents a route through the physical rail network. It is an ordered list of one or more, whole or partial RailSegs. A RailSeg is used to represent the physical railway itself, and so, can contain attributes about the physical railway. RailPath can be used to represent a connection between an origin and destination. An example of this is an Amtrak Route between Union Station in Washington, D.C. and Penn Station in New York.

RailPath extends TranPath and is shown in Figure 3. The geometry of RailPath can be explicitly defined by a GM_MultiCurve or implicitly defined by the sum of the geometries defined for the RailSegs it uses. It is also possible to use both geometry approaches. For example, the RailSeg geometries may be a more precise representation of the rail network, whereas the RailPath geometry may be a more generalized representation.

For a complete data dictionary of the RailPath feature, see Table 1.

8.3 Linear reference system

Linear reference systems (LRSs) are, in the strictest sense, not a central part of the Rail part and are also complex enough to warrant separate treatment. The Rail part references the linear reference scheme specified by ISO 19133. LRSs are used in this part to support the exchange of asset information, such as sign locations and project boundaries. In this part, assets are considered to be features. Features can have their own geometry, such as may be created through GPS data. A feature can also be given an LRS location that describes its linear location along a transportation segment or transportation path feature. In this case, a FeatureEvent is created to specify the feature's linear location. Features can have their own geometry, such as may be created through GPS data, and they also can have an LRS location that describes their location along or near a transportation feature.

Another key use of LRS in this model allows the exchange of attribute information that describes transportation features, such as the speed limit of a track. In the Rail part, these attributes are called attribute events. Attribute events can apply to a single point along a segment or path feature; or an interval along a segment or path feature. This use of LRS may not be familiar to many readers of this document, but it has important implications for feature segmentation and attribution for data exchange.

8.4 Rail event model

Transportation events are the mechanism by which attributes or entities can be linearly located along either a RailSeg or RailPath feature. Refer to the transportation event model in the Transportation Base for a more detailed overview of the general model. Transportation events can be either attribute events or feature events. Within this subpart, events specific to the rail network are supported as specializations of transportation attributes and feature events. Attributes may be either rail characteristics, such as number of tracks, speed restrictions, or rail elements, such as bridges and intersections. Elements may be alternatively represented as feature events, which can include their own geometry. Attribute and feature events may take the form of point or linear phenomena.

Attribute and feature events are located on the applicable RailSeg or RailPath using a linear reference method (LRM). A linear referenced position expression specifies the applicable LRM, identifies the relevant RailSeg or RailPath feature on which the event occurs, a distance along the RailSeg or RailPath, an offset referent from which any lateral displacement should occur, the direction from the referent to the specified event location, and the lateral displacement distance, if any. Annex B of the Transportation Base provides additional information about linear referencing.

8.4.1 RailAttributeEvent

When an attribute always applies to an entire rail segment or path, it should be a property of the RailSeg or RailPath class, as applicable. However, when an attribute may apply to only a portion of a rail segment or path, attribute event classes should be utilized to store its occurrences and

values. Each rail attribute event stores the value of a specified attribute and the location where that value applies. The difference between the two instantiable rail attribute event classes is how the location information is presented. The location of a point event is defined by a single linear reference (at). The location of a linear event is defined by a pair of endpoint linear references (start and end).

Figure 7 shows the RailAttributeEvent model. RailLinearAttributeEvent and RailPointAttributeEvent are subclasses of the class RailAttributeEvent from the general event model contained in the Transportation Base. At a minimum, a RailAttributeEvent class must include properties to indicate the attribute conveyed (event type), the attribute's value (attributeValue), the source of the data (source), and the event's location (atPosition or startPosition and endPosition).

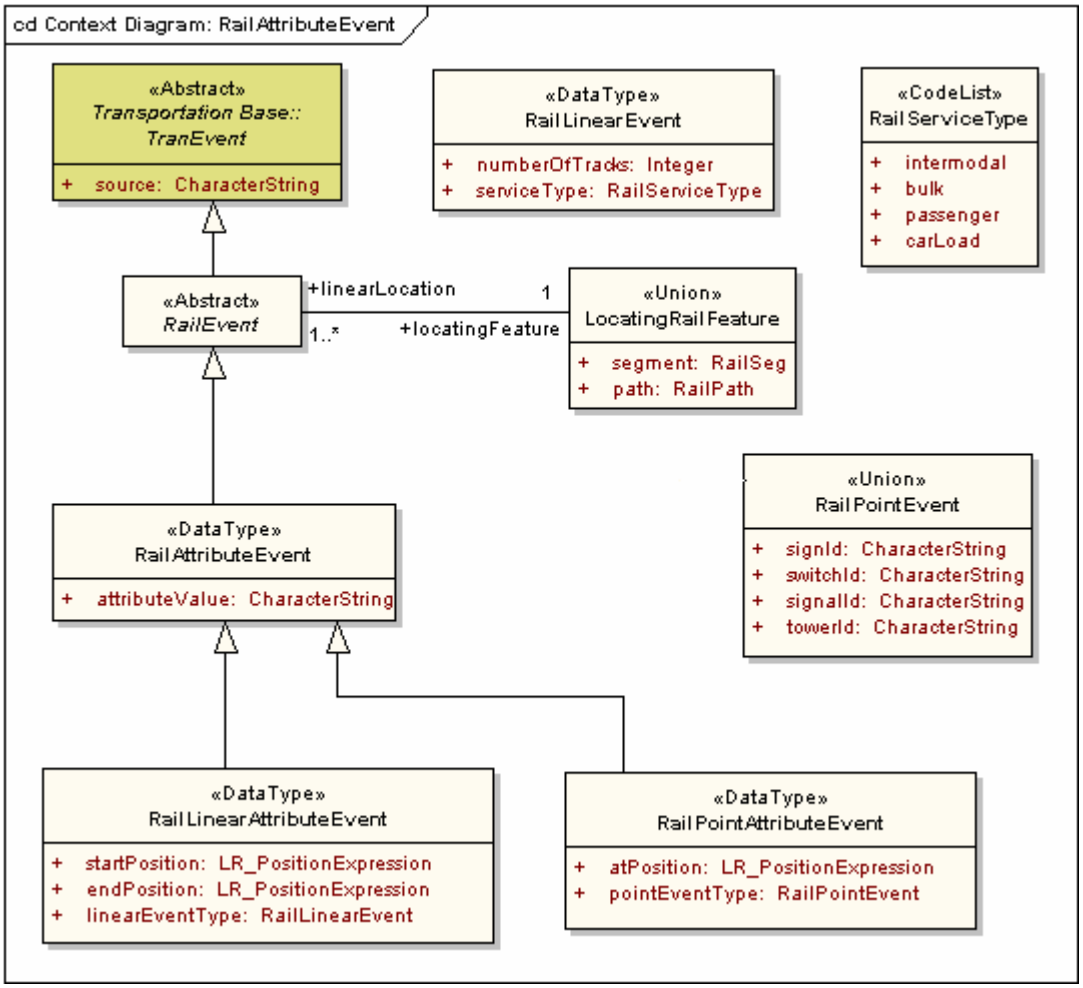


Figure 7 – RailAttributeEvent model

8.4.1.1 RailLinearAttributeEvent

RailLinearAttributeEvent provides the means of specifying the value and location of a single segment or path attribute that may apply to only part of the segment or path. The name of the attribute is specified by the linearEventType property. The value of the segment or path attribute is specified through the attributeValue property. The location interval along which the value applies is specified by start and end positions along the segment or path using linearly referenced

position expressions, as explained in Annex B of the Transportation Base. RailLinearAttributeEvents have no geometry of their own but instead inherit any geometry that may have been defined for the applicable portion of the rail segment or path.

8.4.1.2 RailPointAttributeEvent

RailPointAttributeEvent provides the means of specifying the value and location of an attribute that has a particular value at only a single point along a rail segment or path. The name of the attribute is specified by the pointEventType property. The value of the segment or path attribute is specified as the attributeValue. The location at which the value applies is specified by a single linearly referenced position expression, as explained in Annex B of the Transportation Base. RailPointAttributeEvents have no geometry of their own but instead inherit any geometry that may have been defined for the applicable portion of the rail segment or path.

8.4.2 RailFeatureEvent

Features can have attributes, each with a single, constant value. One of these attributes can be its representative geometry. For example, a rail signal feature can have a height attribute and point geometry. Features can also have topology, identifier, metadata, lastUpdateDate, and extendedAttribute attributes. The feature can also be linearly located along a rail segment or path using a rail feature event. RailFeatureEvent have a location property and a data source.

FeatureEvents are subtyped into point and linear forms. A RailPointFeatureEvent occurs at a single location (at) on a rail segment or path. A RailLinearFeatureEvent occurs along a section (start and end) of the rail segment or path. The “at” or “start” and “end” positions used to locate an event are specified using a linearly referenced position expression. The form of these expressions is described in Annex B of the Transportation Base. As with attribute events, a feature need not contain its own geometry, but may utilize that of the linear rail segment or path on which it is located through the linearly referenced position expression. Thus, there are two potential sources of feature geometry: the feature class and the rail segment or path class.

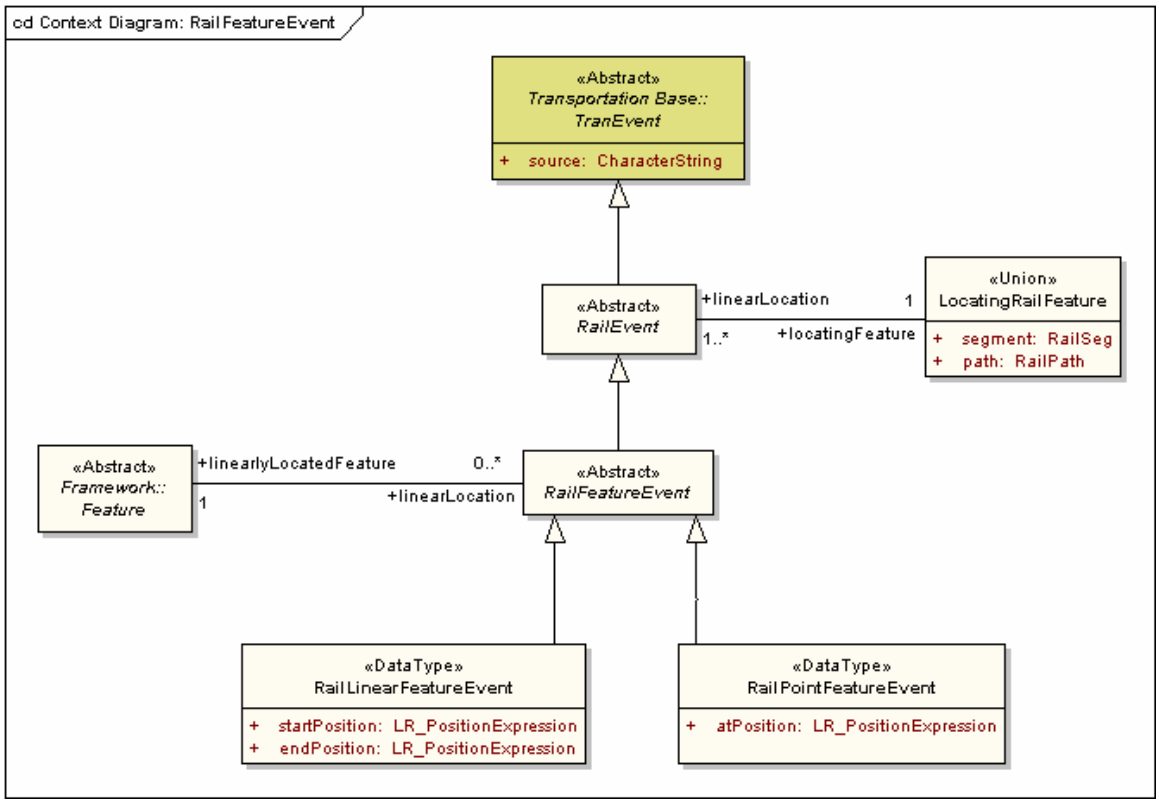


Figure 8 – RailFeatureEvent model

8.4.2.1 RailLinearFeatureEvent

RailLinearFeatureEvent provides the means for specifying a linear location for a feature located along a rail segment or path. All of the feature's attributes, including optional geometry, are properties of the feature, which could be stored in a user-specified instantiable subclass of TranFeature. RailLinearFeatureEvent stores the location information tying the feature to the rail segment or path.

There are no restrictions on the type of feature being located. The feature can have a linear footprint, like a RailPlatform instantiated as a RailLinearFeatureEvent. Platform attributes, such as platformType or platformName, are kept with the platform feature, which could be a user-specified instantiable subclass of TranFeature. Features with area geometries, like a county, are also supported. In this case, a RailLinearFeatureEvent could depict what part of the rail segment or path is located within the county.

8.4.2.2 RailPointFeatureEvent

RailPointFeatureEvent provides the means for specifying a point location for a feature along a rail segment or path. All of the feature's attributes, including optional geometry, are properties of the feature, which could be stored in a user-specified instantiable subclass of TranFeature. RailPointFeatureEvent stores the location information tying the feature to the rail segment or path.

There are no restrictions on the type of feature being located. The feature can have a point footprint, like a RailCommunicationTower. Railroad tower attributes, like tower type and height, are kept with the tower feature. Features with a linear geometry, such as a county boundary, are also supported. In this case, a RailPointFeatureEvent could be used to depict every location where a county boundary crosses a rail segment or path.

651 **Table 3 – Data dictionary for Rail event model**

Line	Name/Role Name	Definition	Obligation/ Condition	Maximum Occurrence	Data Type	Domain
69	Transportation Base::TranEvent	Mechanism for locating an attribute value or feature			<<Abstract>>	Line 70
70	source	Supplier of the event object	M	1	CharacterString	Unrestricted
71	RailEvent	Mechanism for locating an attribute value or feature along a railroad			<<Abstract>>	Line 72
72	Role name: locatingFeature		M	1	<<Union>> LocatingRailFeature	Unrestricted
73	RailAttributeEvent	Mechanism for locating an attribute value along a railroad			<<DataType>>	Line 74
74	attributeValue	Value of the attribute at the specified location	M	1	CharacterString	Unrestricted
75	RailLinearAttributeEvent	Mechanism for locating an attribute value for an interval along a railroad			<<DataType>>	Lines 76-78
76	startPosition	Starting location along the railroad for the attribute value	M	1	<<Type>> LR_PositionExpression	Defined in ISO 19133
77	endPosition	Ending location along the railroad for the attribute value	M	1	<<Type>> LR_PositionExpression	Defined in ISO 19133
78	linearEventType	Name of the attribute	M	1	<<DataType>> RailLinearEvent	Unrestricted
79	RailPointAttributeEvent	Mechanism for locating an attribute value at a single point along a railroad			<<DataType>>	Lines 80-81
80	atPosition	Point location along the railroad at which the attribute value applies	M	1	<<Type>> LR_PositionExpression	Defined in ISO 19133
81	pointEventType	Name of the attribute	M	1	<<Union>> RailPointEvent	Unrestricted

Line	Name/Role Name	Definition	Obligation/ Condition	Maximum Occurrence	Data Type	Domain
82	RailFeatureEvent	Mechanism for locating a feature along a railroad			<<Abstract>>	Line 83
83	Role name: linearlyLocatedFeature		M	1	<<Feature>> Framework::Feature	
84	RailLinearFeatureEvent	Mechanism for locating a feature along an interval along a railroad			<<DataType>>	Lines 85-86
85	startPosition	Starting location along the railroad for the feature	M	1	<<Type>> LR_PositionExpression	Defined in ISO 19133
86	endPosition	Ending location along the railroad for the feature	M	1	<<Type>> LR_PositionExpression	Defined in ISO 19133
87	RailPointFeatureEvent	Mechanism for locating a feature at a single point along a railroad			<<DataType>>	Line 88
88	atPosition	Point location along the railroad at which the feature is located	M	1	<<Type>> LR_PositionExpression	Defined in ISO 19133
89	LocatingRailFeature	Railroad feature used to locate a railroad event			<<Union>>	Lines 90-92
90	segment	The RailSeg used to locate a railroad event	C/if path is not specified	1	RailSeg	Unrestricted
91	path	The RailPath used to locate a railroad event	C/if segment is not specified	1	RailPath	Unrestricted
92	Role name: event	Railroad event located by the feature	M	*	<<Abstract>> RailEvent	Unrestricted
93	Framework::Feature	Feature from any framework part			<<Abstract>>	Line 94
94	Role name: linearLocation	Location of the Framework Feature along a RailSeg or RailPath	O	*	<<Abstract>> RailFeatureEvent	Unrestricted
95	RailLinearEvent	Kind of rail linear event			<<DataType>>	Lines 96-97

Line	Name/Role Name	Definition	Obligation/ Condition	Maximum Occurrence	Data Type	Domain
96	numberOfTracks	Number of tracks represented by the RailSeg	C/if not serviceType	1	Integer	All positive integers
97	serviceType	Kind of service the RailSeg carries.	C/if not numberOfTracks	1	<<CodeList>> RailServiceType	Unrestricted
98	RailPointEvent	Kind of rail point event			<<Union>>	Lines 99-102
99	signId	Identity of the RailSign	C/if not switchID, signalID, or towerID	1	CharacterString	Unrestricted
100	switchId	Identity of the RailSwitch	C/if not signID, signalId, or towerID	1	CharacterString	Unrestricted
101	signalId	Identity of the RailSignal	C/if not signID, switchID, or towerID	1	CharacterString	Unrestricted
102	towerId	Identity of the RailCommunicationTower	C/if not signID, switchID, or signalID	1	CharacterString	Unrestricted

8.5 Facilities and administrative areas model

This section deals with the supporting infrastructure that is used by the rail industry to conduct ongoing rail operations. These include designated areas for aggregating rail stock, shipping facilities, regulatory signage and signals, and other facilities necessary for the safe and efficient operation of the rail industry.

Figure 9 shows that the RailFacilityOrAdminFeature is a subclass of TranFeature. As shown in Figures 9 through 21, the features defined in this section are subtypes of the RailFacilityOrAdminFeature and therefore inherit all the attributes of RailFacilityOrAdminFeatures. These attributes are owner, lastUpdateDate, identifier, geometry, metadata, topology and attribute.

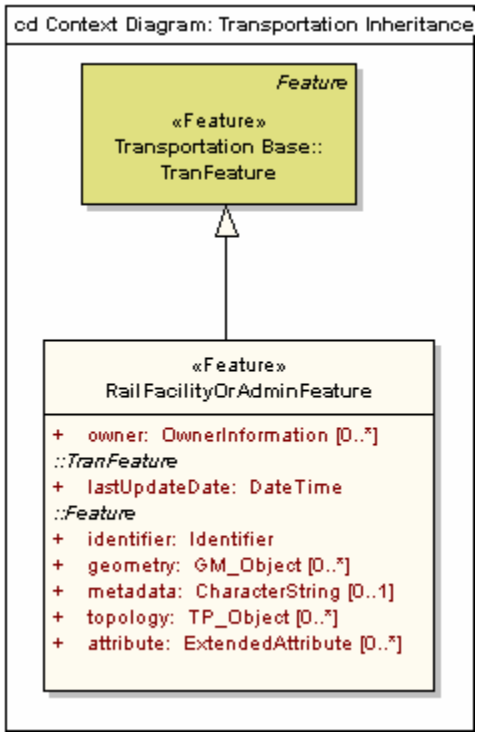


Figure 9 – RailFacilityOrAdminFeature

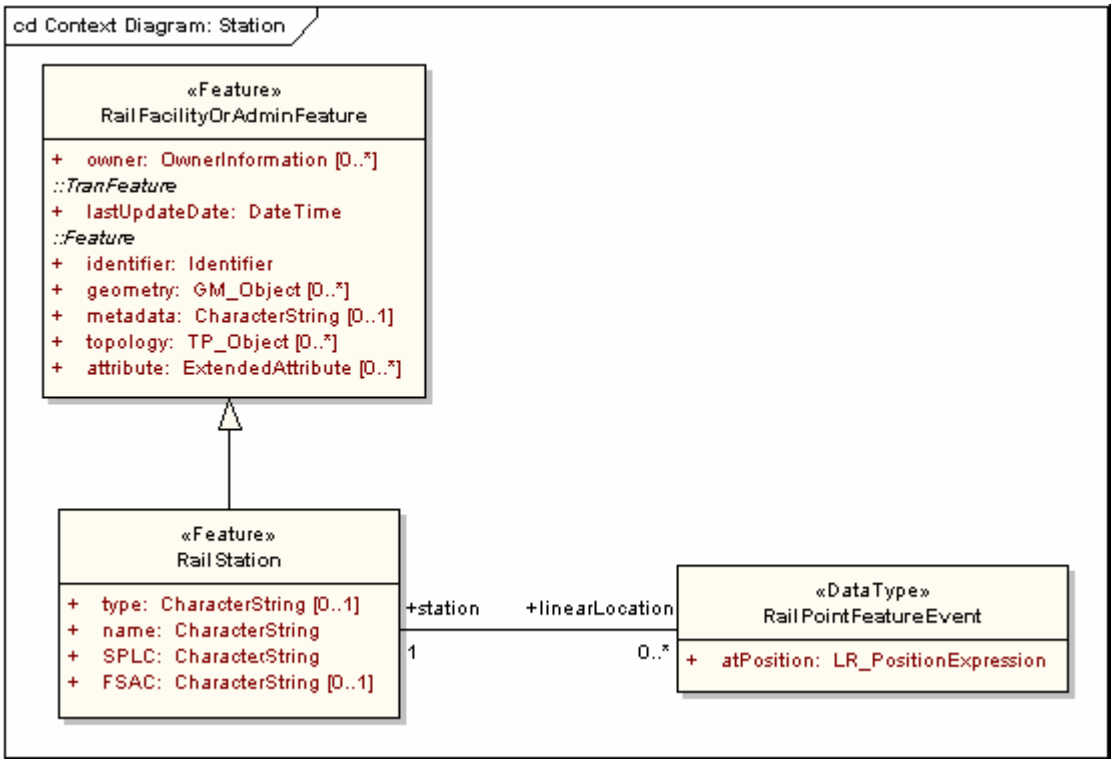
666 **Table 4 – Data dictionary for RailFacilityOrAdminFeature**

Line	Name/Role Name	Definition	Obligation/ Condition	Maximum Occurrence	Data Type	Domain
103	RailFacilityOrAdminFeature	Features for supporting the railroad infrastructure			<<Feature>>	Lines 104-110
104	owner	Person(s) or organization(s) that posses the station	O	*	<<DataType>> OwnerInformation	Unrestricted
105	Transportation Base:: TranFeature::lastUpdateDate	Timestamp indicating when the RailFacilityOrAdminFeature object was last edited	M	1	DateTime	Valid historical or current date and time
106	Framework::Feature::identifier	Feature identifier for the RailFacilityOrAdminFeature	M	1	<<DataType>> Framework::Identifier	Unrestricted
107	Framework::Feature::geometry	Shape and geolocation of a feature	O	*	<<Type>> GM_Object	Defined in ISO 19107
108	Framework::Feature::metadata	Structured or unstructured metadata as defined by the community of practice	O	1	CharacterString	May be text or structured metadata fragment
109	Framework::Feature::topology	Connectivity of the participating elements	O	*	<<Interface>> TP_Object	Defined in ISO 19107
110	Framework::Feature::attribute	Producer-defined attribute for inclusion in transfer	O	*	<<DataType>> Framework:: ExtendedAttribute	Unrestricted

667 ### 8.5.1 RailStation

668 The feature RailStation is shown in Figure 10. RailStation has optional character string attributes
669 of type and FSAC (Freight Station Accounting Code) and mandatory character string attributes
670 name and SPLC (Standards Point Location Codes). A RailPointFeatureEvent may be used to
671 locate the RailStation along a RailSeg, a RailPath, or a RailTrack.

672



673

674 **Figure 10 – RailStation**

675

676 **Table 5 – Data dictionary for RailStation**

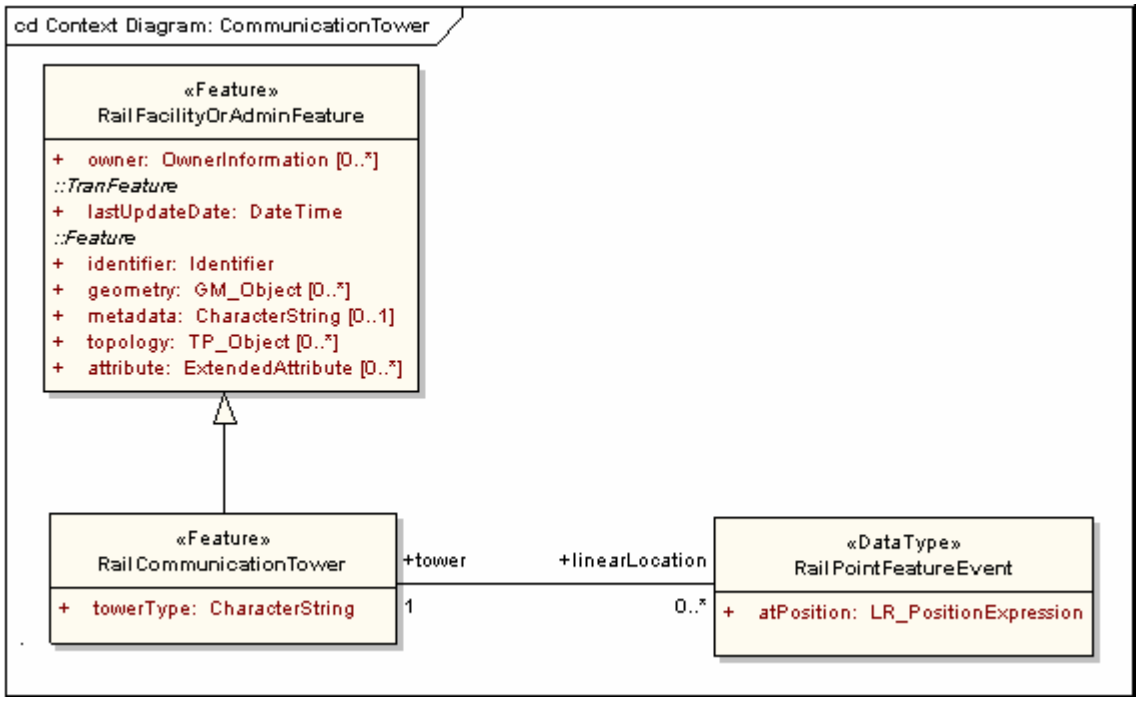
Line	Name/Role Name	Definition	Obligation/ Condition	Maximum Occurrence	Data Type	Domain
111	RailFacilityOrAdminFeature	Features for supporting the railroad infrastructure			<<Feature>>	Lines 112-118
112	owner	Person(s) or organization(s) that posses the station	O	*	<<DataType>> OwnerInformation	Unrestricted
113	Transportation Base:: TranFeature::lastUpdateDate	Timestamp indicating when the RailFacilityOrAdminFeature object was last edited	M	1	DateTime	Valid historical or current date and time
114	Framework::Feature::identifier	Feature identifier for the RailFacilityOrAdminFeature	M	1	<<DataType>> Framework::Identifier	Unrestricted
115	Framework::Feature::geometry	Shape and geolocation of a feature	O	*	<<Type>> GM_Object	Defined in ISO 19107
116	Framework::Feature::metadata	Structured or unstructured metadata as defined by the community of practice	O	1	CharacterString	May be text or structured metadata fragment
117	Framework::Feature::topology	Connectivity of the participating elements	O	*	<<Interface>> TP_Object	Defined in ISO 19107
118	Framework::Feature::attribute	Producer-defined attribute for inclusion in transfer	O	*	<<DataType>> Framework:: ExtendedAttribute	Unrestricted
119	RailStation	Named location where railroad or non-railroad revenue and/or operating business occurs; it does not necessarily have to be a building			<<Feature>>	Lines 120-124
120	type	Kind of RailStaton	O	1	CharacterString	Unrestricted
121	name	Word or phrase that constitutes the distinctive designation of the rail station	M	1	CharacterString	Unrestricted

Line	Name/Role Name	Definition	Obligation/ Condition	Maximum Occurrence	Data Type	Domain
122	SPLC	Standard Point Location Codes	M	1	CharacterString	Unrestricted
123	FSAC	Freight Station Accounting Code	O	1	CharacterString	Unrestricted
124	Role name: linearLocation	Location of the RailStation along a RailSeg or Railpath	O	*	<<DataType>> RailPointFeatureEvent	Unrestricted
125	RailPointFeatureEvent	Mechanism for locating a feature at a single point along a railroad			<<DataType>>	Lines 126-127
126	atPosition	Point location along the railroad at which the RailStation is located	M	1	<<Type>> LR_PositionExpression	Defined in ISO 19133
127	Role name: station	Named location where railroad or non-railroad revenue and/or operating business occurs; it does not necessarily have to be a building	M	1	<<Feature>> RailStation	Unrestricted

677 ### 8.5.2 RailCommunicationTower

678 Figure 11 describes the feature RailCommunicationTower. RailCommunicationTower is a
679 subclass of RailFacilityOrAdminFeature and inherits the attributes owner, lastUpdateDate,
680 identifier, metadata, and attribute. As a feature, a RailCommunicationTower may have geometry
681 and topology as specified in ISO 19107. RailCommunicationTower has one attribute, towerType,
682 which is expressed as a character string. A RailPointFeatureEvent may be used to locate the
683 RailCommunicationTower along a RailSeg, a RailPath, or a RailTrack.

684



685

686 **Figure 11 – RailCommunicationTower**

687

688 **Table 6 – Data dictionary for RailCommunicationTower**

Line	Name/Role Name	Definition	Obligation/ Condition	Maximum Occurrence	Data Type	Domain
128	RailFacilityOrAdminFeature	Features for supporting the railroad infrastructure			<<Feature>>	Lines 129-135
129	owner	Person(s) or organization(s) that posses the station	O	*	<<DataType>> OwnerInformation	Unrestricted
130	Transportation Base:: TranFeature::lastUpdateDate	Timestamp indicating when the RailFacilityOrAdminFeature object was last edited	M	1	DateTime	Valid historical or current date and time
131	Framework::Feature::identifier	Feature identifier for the RailFacilityOrAdminFeature	M	1	<<DataType>> Framework::Identifier	Unrestricted
132	Framework::Feature::geometry	Shape and geolocation of a feature	O	*	<<Type>> GM_Object	Defined in ISO 19107
133	Framework::Feature::metadata	Structured or unstructured metadata as defined by the community of practice	O	1	Characterstring	May be text or structured metadata fragment
134	Framework::Feature::topology	Connectivity of the participating elements	O	*	<<Interface>> TP_Object	Defined in ISO 19107
135	Framework::Feature::attribute	Producer-defined attribute for inclusion in transfer	O	*	<<DataType>> Framework:: ExtendedAttribute	Unrestricted
136	RailCommunicationTower	Railroad building or structure typically higher than its diameter and high relative to its surroundings that may stand apart, or be attached to a larger structure, that may be fully walled in or of skeleton framework and used for communications			<<Feature>>	Lines 137-138
137	towerType	Kind of RailCommunicationTower	M	1	CharacterString	Unrestricted
138	Role name: linearLocation	Location of the RaiCommunicationTower along a	O	*	<<DataType>>	Unrestricted

Line	Name/Role Name	Definition	Obligation/ Condition	Maximum Occurrence	Data Type	Domain
		RailSeg or RailPath			RailPointFeatureEvent	
139	RailPointFeatureEvent	Mechanism for locating a feature at a single point along a railroad			<<DataType>>	Lines 140-141
140	atPosition	Point location along the railroad at which the RailCommunicationTower is located	M	1	<<Type>> LR_PositionExpression	Defined in ISO 19133
141	Role name: tower	Railroad building or structure typically higher than its diameter and high relative to its surroundings that may stand apart, or be attached to a larger structure, that may be fully walled in or of skeleton framework and used for communications	M	1	<<Feature>> RailCommunication Tower	Unrestricted

8.5.3 RailPlatform

The feature RailPlatform, shown in Figure 12, is a subclass of RailFacilityOrAdminFeature and therefore can have geometry and topology as defined in ISO 19107. A RailPointFeatureEvent may be used to locate the RailPlatform along a RailSeg, a RailPath, or a RailTrack.

The code list PlatformType in Figure 12 provides the values for platformType. The other code list, PlatformHeightType, gives values for the height of the platform. Other attributes include stationServiced, measuredLength, owner, and platformName.

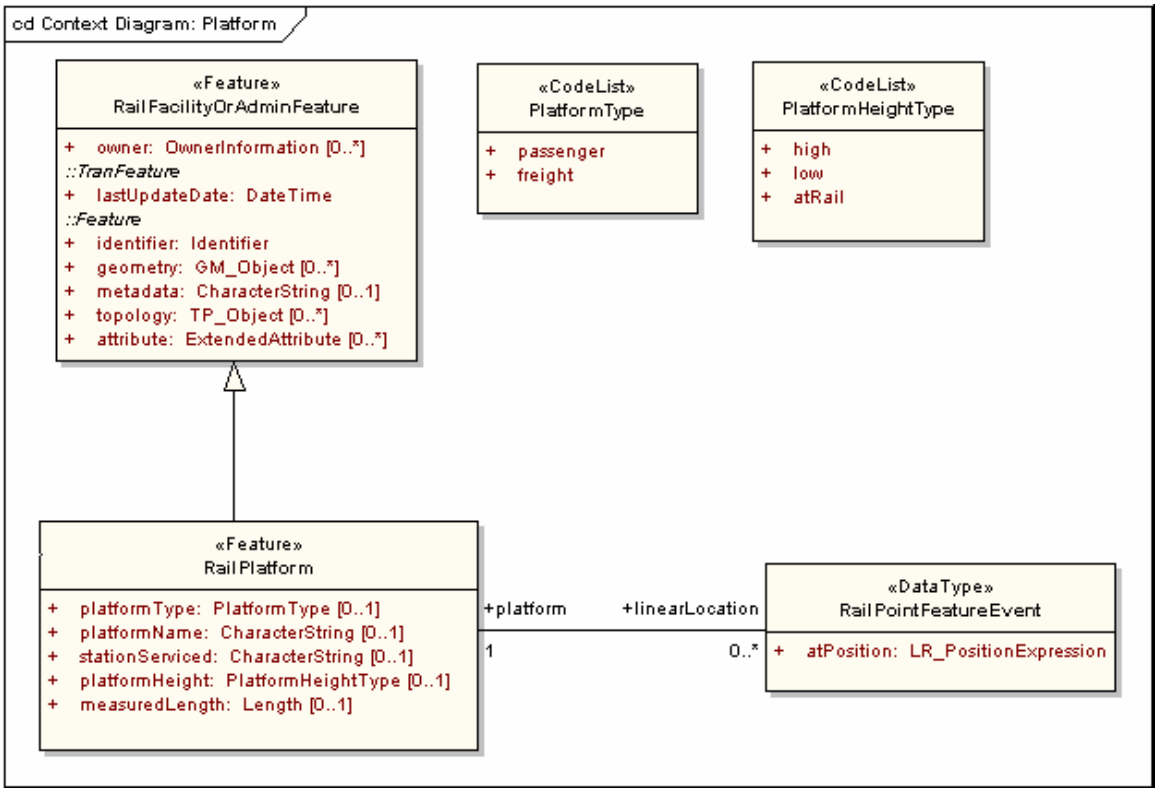


Figure 12 – RailPlatform

700 **Table 7 – Data dictionary for RailPlatform**

Line	Name/Role Name	Definition	Obligation/ Condition	Maximum Occurrence	Data Type	Domain
142	RailFacilityOrAdminFeature	Features for supporting the railroad infrastructure			<<Feature>>	Lines 143-149
143	owner	Person(s) or organization(s) that posses the station	O	*	<<DataType>> OwnerInformation	Unrestricted
144	Transportation Base:: TranFeature::lastUpdateDate	Timestamp indicating when the RailFacilityOrAdminFeature object was last edited	M	1	DateTime	Valid historical or current date and time
145	Framework::Feature::identifier	Feature identifier for the RailFacilityOrAdminFeature	M	1	<<DataType>> Framework::Identifier	Unrestricted
146	Framework::Feature::geometry	Shape and geolocation of a feature	O	*	<<Type>> GM_Object	Defined in ISO 19107
147	Framework::Feature::metadata	Structured or unstructured metadata as defined by the community of practice	O	1	CharacterString	May be text or structured metadata fragment
148	Framework::Feature::topology	Connectivity of the participating elements	O	*	<<Interface>> TP_Object	Defined in ISO 19107
149	Framework::Feature::attribute	Producer-defined attribute for inclusion in transfer	O	*	<<DataType>> Framework:: ExtendedAttribute	Unrestricted
150	RailPlatform	Usually raised horizontal flat surface			<<Feature>>	Lines 151-156
151	platformType	Kind of platform	O	1	<<CodeList>> PlatformType	Unrestricted
152	platformName	Word or phrase that constitutes the distinctive designation of the platform	O	1	CharacterString	Unrestricted
153	stationServiced	Kind of railStation serviced	O	1	CharacterString	Unrestricted

Line	Name/Role Name	Definition	Obligation/ Condition	Maximum Occurrence	Data Type	Domain
154	platformHeight	Height of the platform relative to the rail adjacent to it	O	1	<<CodeList>> PlatformHeightType	Unrestricted
155	measuredLength	Length of the RailPlatform feature, which may differ from the field measured length due to differences in calculation	O	1	Measure	Defined in ISO 19103
156	Role name: linearLocation	Location of the RailPlatform along a RailSeg or RailPath	O	*	<<DataType>> RailPointFeatureEvent	Unrestricted
157	RailPointFeatureEvent	Mechanism for locating a feature at a single point along a railroad			<<DataType>>	Lines 158-159
158	atPosition	Point location along the railroad at which the RailPlatform is located	M	1	<<Type>> LR_PositionExpression	Defined in ISO 19133
159	Role name: platform	Usually raised horizontal flat surface	M	1	<<Feature>> RailPlatform	Unrestricted

8.5.4 RailWaysideDetectionDevice

The RailWaysideDetectionDevice is depicted in Figure 13 and is shown to be a subtype of RailfacilityOrAdminFeature. RailWaysideDetectionDevice inherits the attributes owner, lastUpdateDate, identifier, metadata, attributes, and may have geometry and topology as defined in ISO 19107. It also has the attributes, deviceType, name and alarmType. A RailPointFeatureEvent may be used to locate the RailWaysideDectectionDevice along a RailSeg, a RailPath, or a RailTrack.

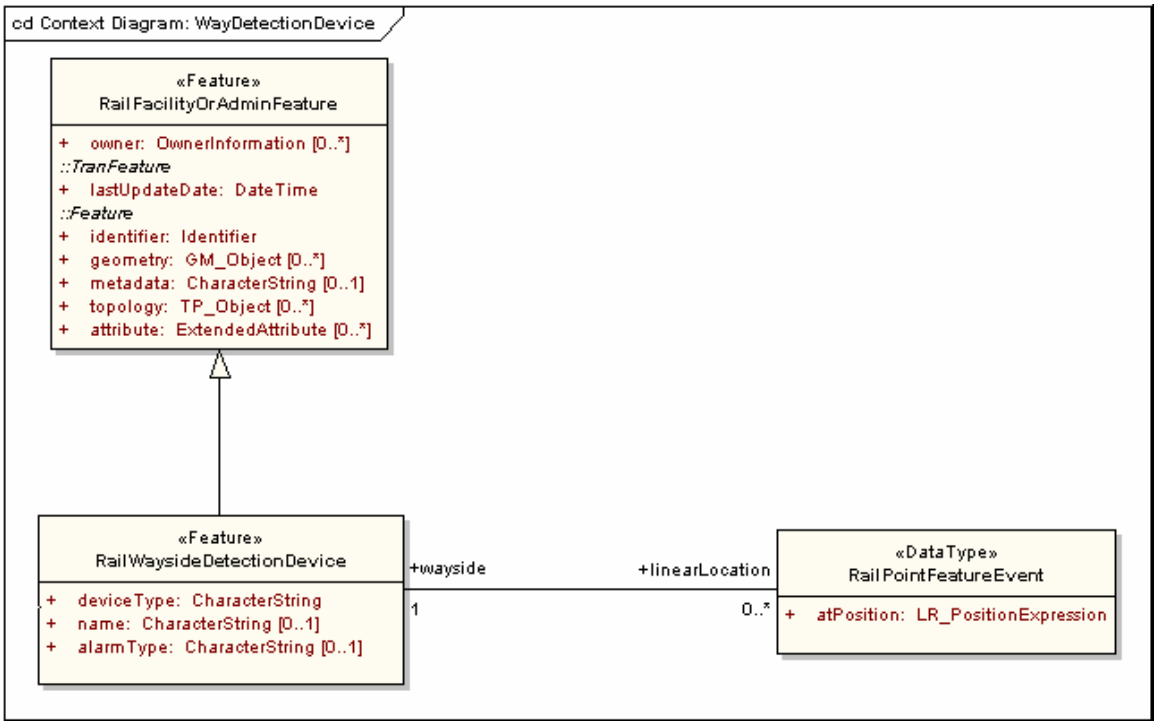


Figure 13 – RailWaysideDetectionDevice

712 **Table 8 – Data dictionary for RailWaysideDetectionDevice**

Line	Name/Role Name	Definition	Obligation/ Condition	Maximum Occurrence	Data Type	Domain
160	RailFacilityOrAdminFeature	Features for supporting the railroad infrastructure			<<Feature>>	Lines 161-167
161	owner	Person(s) or organization(s) that posses the station	O	*	<<DataType>> OwnerInformation	Unrestricted
162	Transportation Base:: TranFeature::lastUpdateDate	Timestamp indicating when the RailFacilityOrAdminFeature object was last edited	M	1	DateTime	Valid historical or current date and time
163	Framework::Feature::identifier	Feature identifier for the RailFacilityOrAdminFeature	M	1	<<DataType>> Framework::Identifier	Unrestricted
164	Framework::Feature::geometry	Shape and geolocation of a feature	O	*	<<Type>> GM_Object	Defined in ISO 19107
165	Framework::Feature::metadata	Structured or unstructured metadata as defined by the community of practice	O	1	CharacterString	May be text or structured metadata fragment
166	Framework::Feature::topology	Connectivity of the participating elements	O	*	<<Interface>> TP_Object	Defined in ISO 19107
167	Framework::Feature::attribute	Producer-defined attribute for inclusion in transfer	O	*	<<DataType>> Framework:: ExtendedAttribute	Unrestricted
168	RailWaysideDetectionDevice	Piece of equipment or a mechanism, adjacent to the railroad, designed to detect characteristics of train movement			<<Feature>>	Lines 169-172
169	deviceType	Kind of wayside detection device	M	1	CharacterString	Unrestricted
170	name	Word or phrase that constitutes the distinctive designation of the wayside detection device	O	1	CharacterString	Unrestricted

Line	Name/Role Name	Definition	Obligation/ Condition	Maximum Occurrence	Data Type	Domain
171	alarmType	Kind of alarm the wayside detection device will activate	O	1	CharacterString	Unrestricted
172	Role name: linearLocation	Location of the RailWaysideDetectionDevice along a RailSeg or RailPath	O	*	<<DataType>> RailPointFeatureEvent	Unrestricted
173	RailPointFeatureEvent	Mechanism for locating a feature at a single point along a railroad			<<DataType>>	Line 174-175
174	atPosition	Point location along the railroad at which the RailWaysideDetectionDevice is located	M	1	<<Type>> LR_PositionExpression	Defined in ISO 19133
175	Role name: wayside	Piece of equipment or a mechanism, adjacent to the railroad, designed to detect characteristics of train movement	M	1	<<Feature>> RailWaysideDetection Device	Unrestricted

8.5.5 RailYard

Figure 14 shows the feature class RailYard and its relationship as a subtype of RailFacilityOrAdminFeature. It can have geometry and topology and inherits the attributes owner, lastUpdateDate, identifier, metadata, and attributes. It is further described by the attributes name, type, and capacity. The code list RailYardType gives the values for attribute "type". Also, a RailLinearFeatureEvent may be used to locate the RailYard along a RailSeg, a RailPath, or a RailTrack.

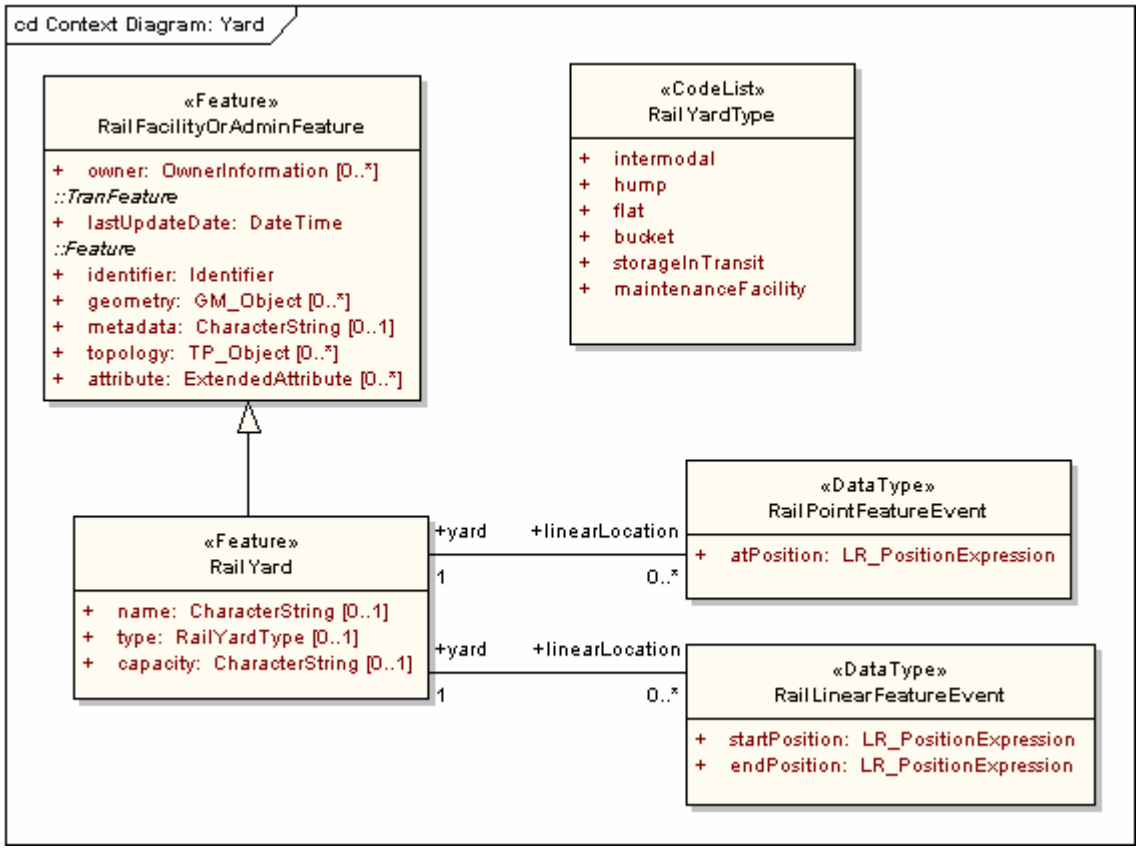


Figure 14 – RailYard

724 **Table 9 – Data dictionary for RailYard**

Line	Name/Role Name	Definition	Obligation/ Condition	Maximum Occurrence	Data Type	Domain
176	RailFacilityOrAdminFeature	Features for supporting the railroad infrastructure			<<Feature>>	Lines 177-183
177	owner	Person(s) or organization(s) that posses the station	O	*	<<DataType>> OwnerInformation	Unrestricted
178	Transportation Base:: TranFeature::lastUpdateDate	Timestamp indicating when the RailFacilityOrAdminFeature object was last edited	M	1	DateTime	Valid historical or current date and time
179	Framework::Feature::identifier	Feature identifier for the RailFacilityOrAdminFeature	M	1	<<DataType>> Framework::Identifier	Unrestricted
180	Framework::Feature::geometry	Shape and geolocation of a feature	O	*	<<Type>> GM_Object	Defined in ISO 19107
181	Framework::Feature::metadata	Structured or unstructured metadata as defined by the community of practice	O	1	CharacterString	May be text or structured metadata fragment
182	Framework::Feature::topology	Connectivity of the participating elements	O	*	<<Interface>> TP_Object	Defined in ISO 19107
183	Framework::Feature::attribute	Producer-defined attribute for inclusion in transfer	O	*	<<DataType>> Framework:: ExtendedAttribute	Unrestricted
184	RailYard	System of tracks for storage and maintenance of cars and making up trains			<<Feature>>	Lines 185-189
185	name	Word or phrase that constitutes the distinctive designation of the RailYard	O	1	CharacterString	Unrestricted
186	type	Kind of RailYard	O	1	<<CodeList>> RailYardType	Unrestricted

Line	Name/Role Name	Definition	Obligation/ Condition	Maximum Occurrence	Data Type	Domain
187	capacity	Maximum amount or number of rail cars that can be contained or accommodated	O	1	CharacterString	Unrestricted
188	Role name: linearLocation	Location of the RailYard along a RailSeg or RailPath	O	*	<<DataType>> RailPointFeatureEvent	Unrestricted
189	Role name: linearLocation	Location of the RailYard along a RailSeg or RailPath	O	*	<<DataType>> RailLinearFeatureEvent	Unrestricted
190	RailPointFeatureEvent	Mechanism for locating a feature at a single point along a railroad			<<DataType>>	Lines 191-192
191	atPosition	Point location along the railroad at which the RailYard is located	M	1	<<Type>> LR_PositionExpression	Defined in ISO 19133
192	Role name: yard	System of tracks for storage and maintenance of cars and making up trains	M	1	<<Feature>> RailYard	Unrestricted
193	RailLinearFeatureEvent	Mechanism for locating a feature along an interval along a railroad			<<DataType>>	Lines 194-196
194	startPosition	Starting location along the railroad for the attribute value	M	1	<<Type>> LR_PositionExpression	Defined in ISO 19133
195	endPosition	Ending location along the railroad for the attribute value	M	1	<<Type>> LR_PositionExpression	Defined in ISO 19133
196	Role name: yard	System of tracks for storage and maintenance of cars and making up trains	M	1	<<Feature>> RailYard	Unrestricted

8.5.6 RailBridge

Figure 15 shows RailBridge to be a subclass of RailFacilityOrAdmenFeature and therefore can have geometry and topology as defined in ISO 19107. A RailLinearFeatureEvent may be used to locate the RailBridge feature along a RailSeg, a RailPath, or a RailTrack. Certain RailBridge attributes, bridgeName, bridgeType, isBallasted, and utilitiesCarried, are expressed as character strings.

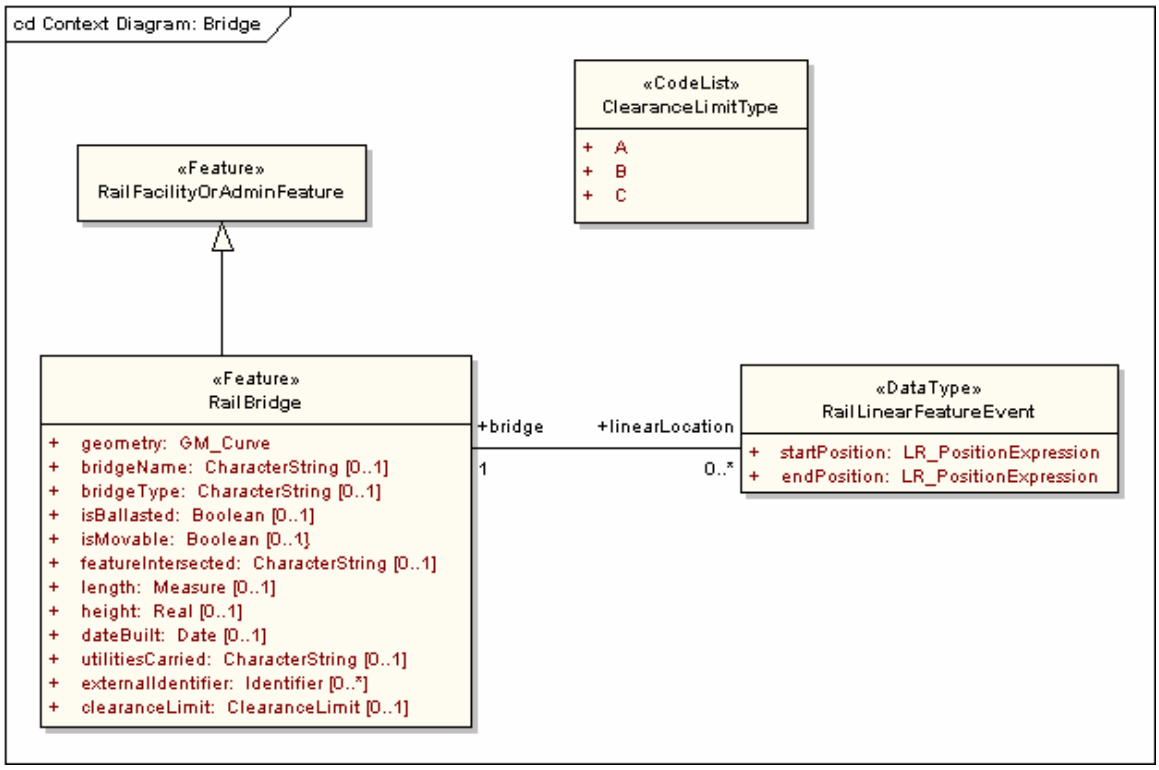


Figure 15 – RailBridge

735 **Table 10 – Data dictionary for RailBridge**

Line	Name/Role Name	Definition	Obligation/ Condition	Maximum Occurrence	Data Type	Domain
197	RailFacilityOrAdminFeature	Features for supporting the railroad infrastructure			<<Feature>>	Lines 198-204
198	owner	Person(s) or organization(s) that posses the station	O	*	<<DataType>> OwnerInformation	Unrestricted
199	Transportation Base:: TranFeature::lastUpdateDate	Timestamp indicating when the RailFacilityOrAdminFeature object was last edited	M	1	DateTime	Valid historical or current date and time
200	Framework::Feature::identifier	Feature identifier for the RailFacilityOrAdminFeature	M	1	<<DataType>> Framework::Identifier	Unrestricted
201	Framework::Feature::geometry	Shape and geolocation of a feature	O	*	<<Type>> GM_Object	Defined in ISO 19107
202	Framework::Feature::metadata	Structured or unstructured metadata as defined by the community of practice	O	1	CharacterString	May be text or structured metadata fragment
203	Framework::Feature::topology	Connectivity of the participating elements	O	*	<<Interface>> TP_Object	Defined in ISO 19107
204	Framework::Feature::attribute	Producer-defined attribute for inclusion in transfer	O	*	<<DataType>> Framework:: ExtendedAttribute	Unrestricted
205	RailBridge	Structure carrying a railway over a depression or obstacle			<<Feature>>	Lines 206-218
206	geometry	Shape and geolocation of a feature	M	1	<<Type>> GM_Curve	Defined in ISO 19107
207	bridgeName	Word or phrase that constitutes the distinctive designation of the RailBridge	O	1	CharacterString	Unrestricted
208	bridgeType	Kind of RailBridge	O	1	CharacterString	Unrestricted

Line	Name/Role Name	Definition	Obligation/ Condition	Maximum Occurrence	Data Type	Domain
209	isBallasted	Denotes whether or not there exist gravel or broken stone laid in the railroad	O	1	Boolean	True or False
210	isMovable	Denotes whether or not the bridge is movable	O	1	Boolean	True or False
211	featureIntersected	Obstruction being traversed	O	1	CharacterString	Unrestricted
212	length	Length of the RailBridge feature, which may differ from the field measured length due to differences in calculation	O	1	Measure	Defined in ISO 19103
213	height	Height of the bridge above the feature being traversed	O	1	Real	All real numbers
214	dateBuilt	Date the bridge construction was completed	O	1	Date	Valid historical or current date and time
215	utilitiesCarried	Public utility and the equipment used to carry that service across the railroad bridge	O	1	CharacterString	Unrestricted
216	externalIdentifier	Feature identifier for the feature being traversed	O	*	<<DataType>> Framework::Identifier	Unrestricted
217	clearanceLimit	Minimum height and width the train must be to safely traverse the bridge	O	1	<<CodeList>> ClearanceLimitType	Unrestricted
218	Role name: linearLocation	Location of the RailBridge along a RailSeg or RailPath	O	*	<<DataType>> RailLinearFeatureEvent	Unrestricted
219	RailLinearFeatureEvent	Mechanism for locating a feature along an interval along a railroad			<<DataType>>	Lines 220-222
220	startPosition	Starting location along the railroad for the attribute value	M	1	<<Type>> LR_PositionExpression	Defined in ISO 19133
221	endPosition	Ending location along the railroad for the attribute value	M	1	<<Type>> LR_PositionExpression	Defined in ISO 19133

Line	Name/Role Name	Definition	Obligation/ Condition	Maximum Occurrence	Data Type	Domain
222	Role name: bridge	Structure carrying a railway over a depression or obstacle	M	1	<<Feature>> RailBridge	Unrestricted

8.5.7 RailControlPoint

RailControlPoint is depicted in Figure 16, which shows that RailControlPoint is a subtype of RailFacilityOrAdminFeature. RailFacilityOrAdminFeature can have geometry and topology as defined in ISO 19107. A RailPointFeatureEvent can be used to define the location of the control point along a RailSeg, a RailPath or a RailTrack. The code list ControlPointType gives the values for attribute pointType. Attribute name is expressed as a character string.

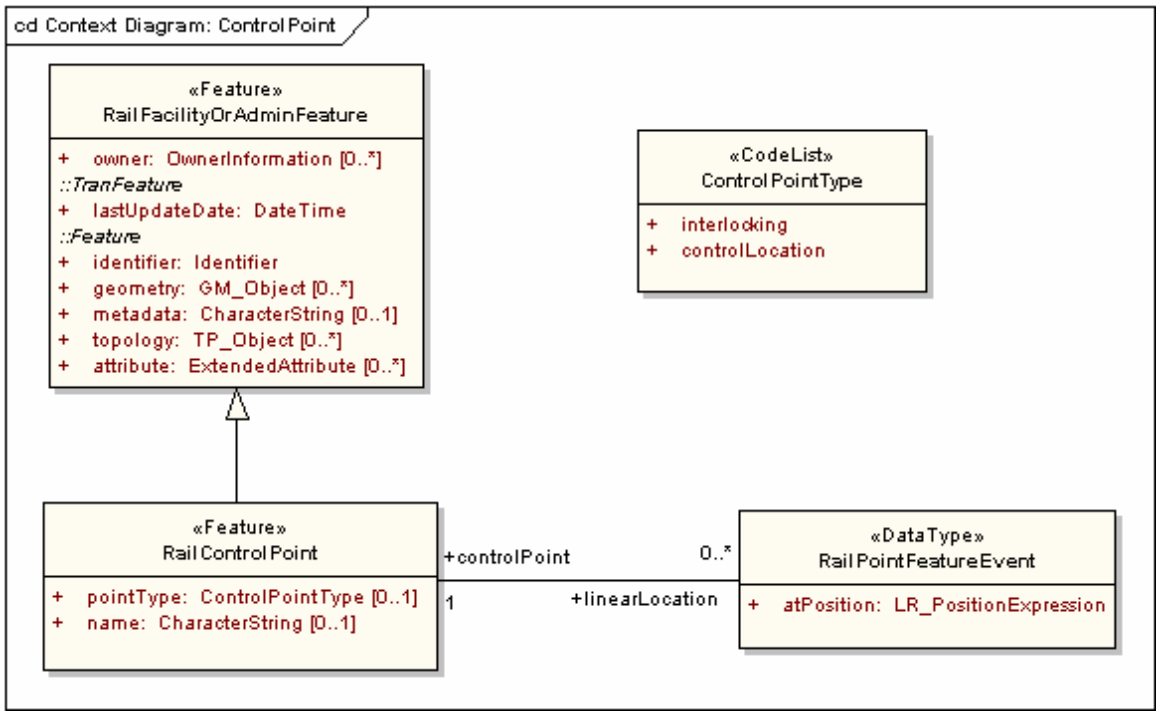


Figure 16 – RailControlPoint

746 **Table 11 – Data dictionary for RailControlPoint**

Line	Name/Role Name	Definition	Obligation/ Condition	Maximum Occurrence	Data Type	Domain
223	RailFacilityOrAdminFeature	Features for supporting the railroad infrastructure			<<Feature>>	Lines 224-230
224	owner	Person(s) or organization(s) that posses the station	O	*	<<DataType>> OwnerInformation	Unrestricted
225	Transportation Base:: TranFeature::lastUpdateDate	Timestamp indicating when the RailFacilityOrAdminFeature object was last edited	M	1	DateTime	Valid historical or current date and time
226	Framework::Feature::identifier	Feature identifier for the RailFacilityOrAdminFeature	M	1	<<DataType>> Framework::Identifier	Unrestricted
227	Framework::Feature::geometry	Shape and geolocation of a feature	O	*	<<Type>> GM_Object	Defined in ISO 19107
228	Framework::Feature::metadata	Structured or unstructured metadata as defined by the community of practice	O	1	CharacterString	May be text or structured metadata fragment
229	Framework::Feature::topology	Connectivity of the participating elements	O	*	<<Interface>> TP_Object	Defined in ISO 19107
230	Framework::Feature::attribute	Producer-defined attribute for inclusion in transfer	O	*	<<DataType>> Framework:: ExtendedAttribute	Unrestricted
231	RailControlPoint				<<Feature>>	Lines 232-234
232	pointType	Kind of wayside detection device	O	1	<<CodeList>> ControlPointType	Unrestricted
233	name	Word or phrase that constitutes the distinctive designation of the controlPoint	O	1	CharacterString	Unrestricted
234	Role name: linearLocation	Location of the RailControlPoint along a RailSeg or RailPath	O	*	<<DataType>> RailPointFeatureEvent	Unrestricted

Line	Name/Role Name	Definition	Obligation/ Condition	Maximum Occurrence	Data Type	Domain
235	RailPointFeatureEvent	Mechanism for locating a feature at a single point along a railroad			<<DataType>>	Lines 236-237
236	atPosition	Point location along the railroad at which the RailControlPoint is located	M	1	<<Type>> LR_PositionExpression	Defined in ISO 19133
237	Role name: controlPoint		M	1	<<Feature>> RailControlPoint	Unrestricted

8.5.8 RailFuelingFacility

The feature class RailFuelingFacility is depicted in Figure 17. It is shown to be a subtype of RailFacilityOrAdminFeature and therefore can have geometry and topology as defined in ISO 19107. A RailPointFeatureEvent may be used to locate the RailFuelingFacility along a RailSeg, a RailPath, or a RailTrack. The attribute name is given as a character string and attributes isDTL (Direct to Locomotive) and isPipelineDelivery are Boolean expressions. Attribute capacity is given as a volume expression.

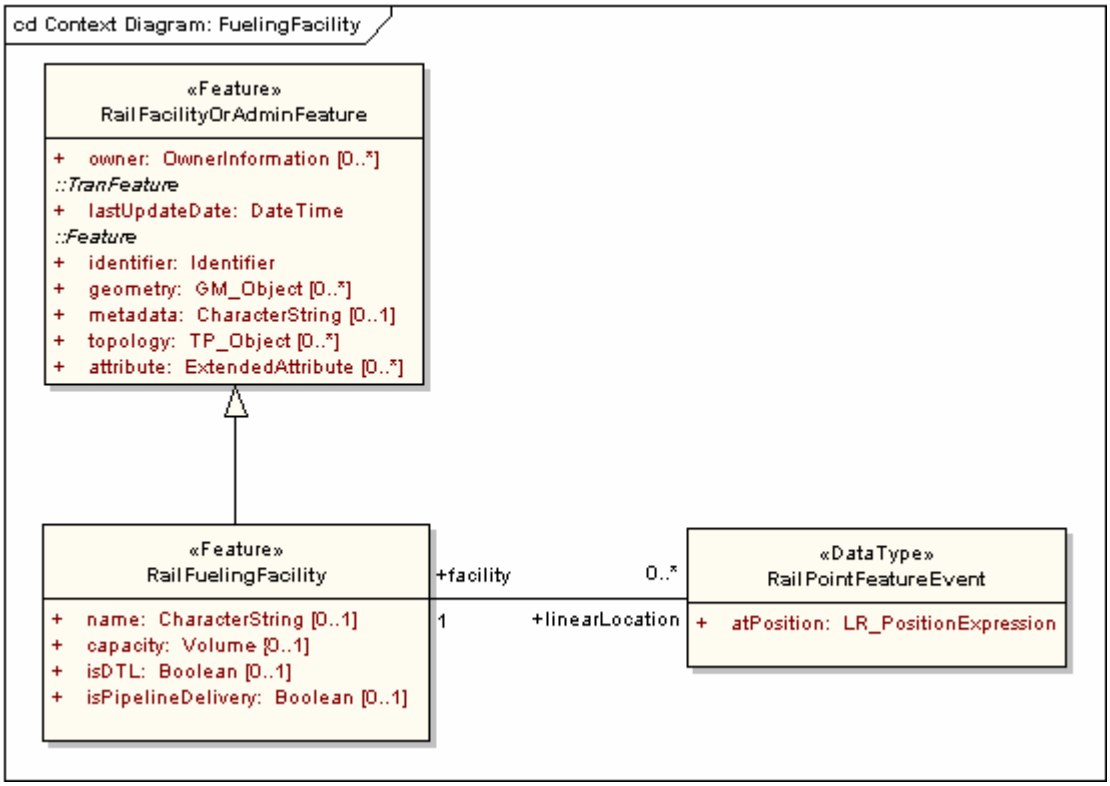


Figure 17 - RailFuelingFacility

758 **Table 12 – Data dictionary for RailFuelingFacility**

Line	Name/Role Name	Definition	Obligation/ Condition	Maximum Occurrence	Data Type	Domain
238	RailFacilityOrAdminFeature	Features for supporting the railroad infrastructure			<<Feature>>	Lines 239-245
239	owner	Person(s) or organization(s) that posses the station	O	*	<<DataType>> OwnerInformation	Unrestricted
240	Transportation Base:: TranFeature::lastUpdateDate	Timestamp indicating when the RailFacilityOrAdminFeature object was last edited	M	1	DateTime	Valid historical or current date and time
241	Framework::Feature::identifier	Feature identifier for the RailFacilityOrAdminFeature	M	1	<<DataType>> Framework::Identifier	Unrestricted
242	Framework::Feature::geometry	Shape and geolocation of a feature	O	*	<<Type>> GM_Object	Defined in ISO 19107
243	Framework::Feature::metadata	Structured or unstructured metadata as defined by the community of practice	O	1	CharacterString	May be text or structured metadata fragment
244	Framework::Feature::topology	Connectivity of the participating elements	O	*	<<Interface>> TP_Object	Defined in ISO 19107
245	Framework::Feature::attribute	Producer-defined attribute for inclusion in transfer	O	*	<<DataType>> Framework:: ExtendedAttribute	Unrestricted
246	RailFuelingFacility	Structure established to transfer fuel onto locomotives			<<Feature>>	Lines 247-251
247	name	Word or phrase that constitutes the distinctive designation of the fueling facility	O	1	CharacterString	Unrestricted
248	capacity	Maximum amount of fuel that can be contained or accommodated at the facility	O	1	Volume	Defined in ISO 19103
249	isDTL	Denotes whether or not the fueling facility transfers the fuel direct to the	O	1	Boolean	True or False

Line	Name/Role Name	Definition	Obligation/ Condition	Maximum Occurrence	Data Type	Domain
		locomotive				
250	isPipelineDelivery	Denotes whether or not the fueling facility is supplied by a pipeline	O	1	Boolean	True or False
251	Role name: linearLocation	Location of the RailFuelingFacility along a RailSeg or RailPath	O	*	<<DataType>> RailPointFeatureEvent	Unrestricted
252	RailPointFeatureEvent	Mechanism for locating a feature at a single point along a railroad			<<DataType>>	Lines 253-254
253	atPosition	Point location along the railroad at which the RailFuelingFacility is located	M	1	<<Type>> LR_PositionExpression	Defined in ISO 19133
254	Role name: facility	Structure established to transfer fuel onto locomotives	M	1	<<Feature>> RailFuelingFacility	Unrestricted

8.5.9 RailLinearOccupancy

Figure 18 shows the RailLinearOccupancy feature class, which is shown to be a subclass of RailFacilityOrAdminFeature. RailLinearOccupancy therefore can have geometry and topology as defined in ISO 19107. A RailLinearFeatureEvent may be used to locate the RailLinearOccupancy along a RailSeg, a RailPath, or a RailTrack. The value for attribute utilityOwner is supplied by the data type OwnerInformation. Values for attribute levelOfGrade are supplied by the CrossingLevelKind enumeration. OccupancyTypes are expressed as characterStrings.

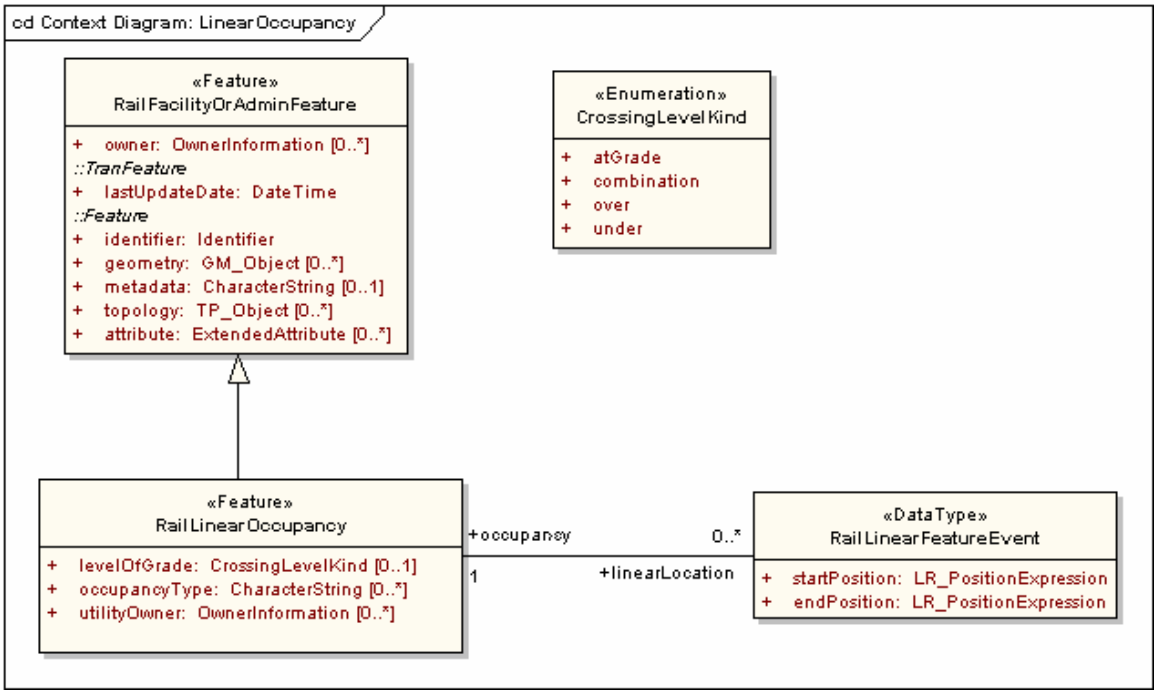


Figure 18 – RailLinearOccupancy

770 **Table 13 – Data dictionary for RailLinearOccupancy**

Line	Name/Role Name	Definition	Obligation/ Condition	Maximum Occurrence	Data Type	Domain
255	RailFacilityOrAdminFeature	Features for supporting the railroad infrastructure			<<Feature>>	Lines 256-262
256	owner	Person(s) or organization(s) that posses the station	O	*	<<DataType>> OwnerInformation	Unrestricted
257	Transportation Base:: TranFeature::lastUpdateDate	Timestamp indicating when the RailFacilityOrAdminFeature object was last edited	M	1	DateTime	Valid historical or current date and time
258	Framework::Feature::identifier	Feature identifier for the RailFacilityOrAdminFeature	M	1	<<DataType>> Framework::Identifier	Unrestricted
259	Framework::Feature::geometry	Shape and geolocation of a feature	O	*	<<Type>> GM_Object	Defined in ISO 19107
260	Framework::Feature::metadata	Structured or unstructured metadata as defined by the community of practice	O	1	CharacterString	May be text or structured metadata fragment
261	Framework::Feature::topology	Connectivity of the participating elements	O	*	<<Interface>> TP_Object	Defined in ISO 19107
262	Framework::Feature::attribute	Producer-defined attribute for inclusion in transfer	O	*	<<DataType>> Framework:: ExtendedAttribute	Unrestricted
263	RailLinearOccupancy	Public utility or utilities that occupy the land adjacent to the railroad			<<Feature>>	Lines 264-267
264	levelOfGrade	Level at which the utility is carried in reference to the ground	O	1	<<Enumeration>> CrossingLevelKind	over, under, atGrade, combination
265	occupancyType	Kind of public utility occupying the land adjacent to the rail tracks	O	*	CharacterString	Unrestricted
266	utilityOwner	Person(s) or organization(s) that posses the public utility	O	*	<<DataType>> OwnerInformation	Unrestricted

Line	Name/Role Name	Definition	Obligation/ Condition	Maximum Occurrence	Data Type	Domain
267	Role name: linearLocation	Location of the RailLinearOccupancy along a RailSeg or RailPath	O	*	<<DataType>> RailLinearFeatureEvent	Unrestricted
268	RailLinearFeatureEvent	Mechanism for locating a feature along an interval along a railroad			<<DataType>>	Lines 269-271
269	startPosition	Starting location along the railroad for the attribute value	M	1	<<Type>> LR_PositionExpression	Defined in ISO 19133
270	endPosition	Ending location along the railroad for the attribute value	M	1	<<Type>> LR_PositionExpression	Defined in ISO 19133
271	Role name: occupancy	Public utility that occupies the land adjacent to the train tracks	M	1	<<Feature>> RailLinearOccupancy	Unrestricted

8.5.10 RailSignal

Figure 19 shows the RailSignal feature class. The RailSignal feature class is a subtype of RailFacilityOrAdminFeature and therefore can have geometry and topology as defined in ISO 19107. A RailPointFeatureEvent may be used to locate the RailSignal along a RailSeg, a RailPath, or a RailTrack. The attribute numberOfTracksServed is given as an integer and attribute description is given as a character string. The enumeration TravelDirectionKind supplies the values for the attribute travelDirection and the code list SignalType supplies values for the attribute signalType.

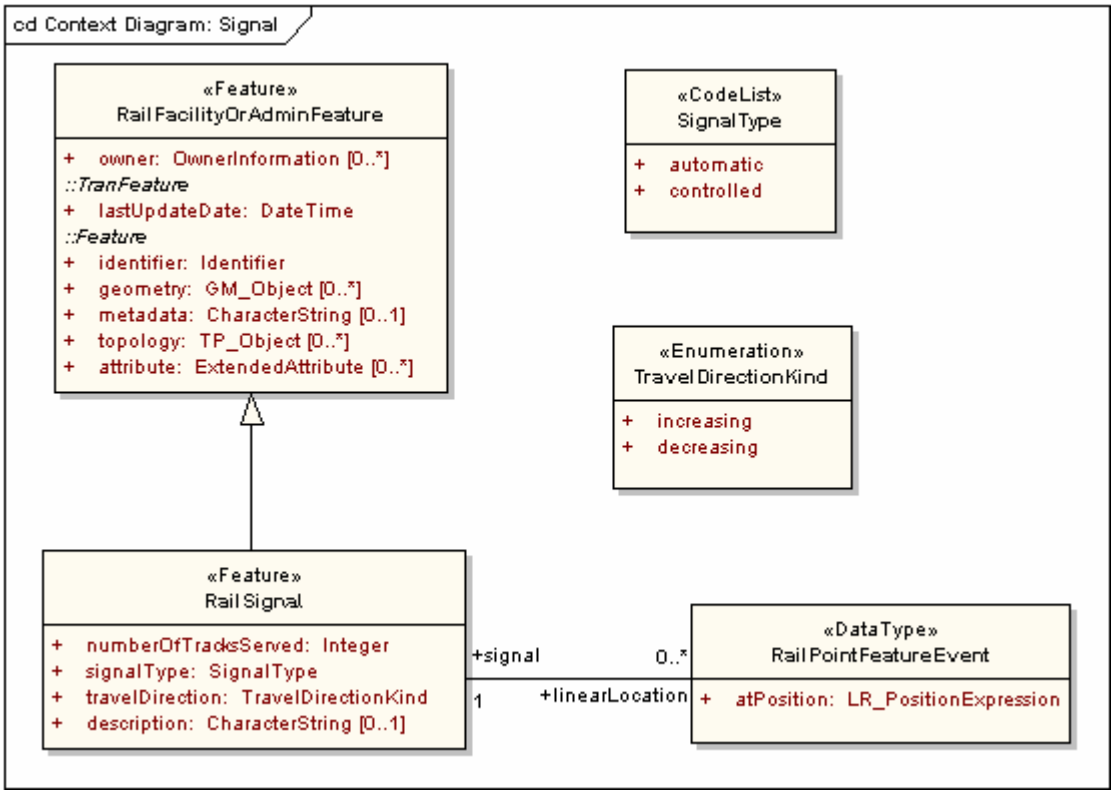


Figure 19 – RailSignal

783 **Table 14 – Data dictionary for RailSignal**

Line	Name/Role Name	Definition	Obligation/ Condition	Maximum Occurrence	Data Type	Domain
272	RailFacilityOrAdminFeature	Features for supporting the railroad infrastructure			<<Feature>>	Lines 273-279
273	owner	Person(s) or organization(s) that posses the station	O	*	<<DataType>> OwnerInformation	Unrestricted
274	Transportation Base:: TranFeature::lastUpdateDate	Timestamp indicating when the RailFacilityOrAdminFeature object was last edited	M	1	<<Type>> DateTime	Valid historical or current date and time
275	Framework::Feature::identifier	Feature identifier for the RailFacilityOrAdminFeature	M	1	<<DataType>> Framework::Identifier	Unrestricted
276	Framework::Feature::geometry	Shape and geolocation of a feature	O	*	GM_Object	Defined in ISO 19107
277	Framework::Feature::metadata	Structured or unstructured metadata as defined by the community of practice	O	1	CharacterString	May be text or structured metadata fragment
278	Framework::Feature::topology	Connectivity of the participating elements	O	*	<<Interface>> TP_Object	Defined in ISO 19107
279	Framework::Feature::attribute	Producer-defined attribute for inclusion in transfer	O	*	<<DataType>> Framework:: ExtendedAttribute	Unrestricted
280	RailSignal	Structure established to transfer fuel onto locomotives			<<Feature>>	Lines 281-285
281	numberOfTracksServed	Number of railroad tracks served by the signal	M	1	Integer	Positive integers
282	signalType	Kind of signal	M	1	<<CodeList>> SignalType	Unrestricted
283	travelDirection	Direction in which the train travels relative to the signal	M	1	<<Enumeration>> TravelDirectionKind	increasing, decreasing

Line	Name/Role Name	Definition	Obligation/ Condition	Maximum Occurrence	Data Type	Domain
284	description	Description of the RailSignal	O	1	CharacterString	Unrestricted
285	Role name: linearLocation	Location of the RailSignal along a RailSeg or RailPath	O	*	<<DataType>> RailPointFeatureEvent	Unrestricted
286	RailPointFeatureEvent	Mechanism for locating a feature at a single point along a railroad			<<DataType>>	Line 286-288
287	atPosition	Point location along the railroad at which the RailSignal is located	M	1	<<Type>> LR_PositionExpression	Defined in ISO 19133
288	Role name: signal	Structure established to transfer fuel onto locomotives	M	1	<<Feature>> RailSignal	Unrestricted

8.5.11 RailSwitch

The feature class RailSwitch is depicted in Figure 20. It is shown to be a subtype of RailFacilityorAdminFeature and therefore can have geometry and topology as defined in ISO 19107. A RailPointFeatureEvent may be used to locate the RailSwitch along a RailSeg, a RailPath, or a RailTrack. The value for switchAngle is given by the code list SwitchAngleType. The attribute isManual is a Boolean value.

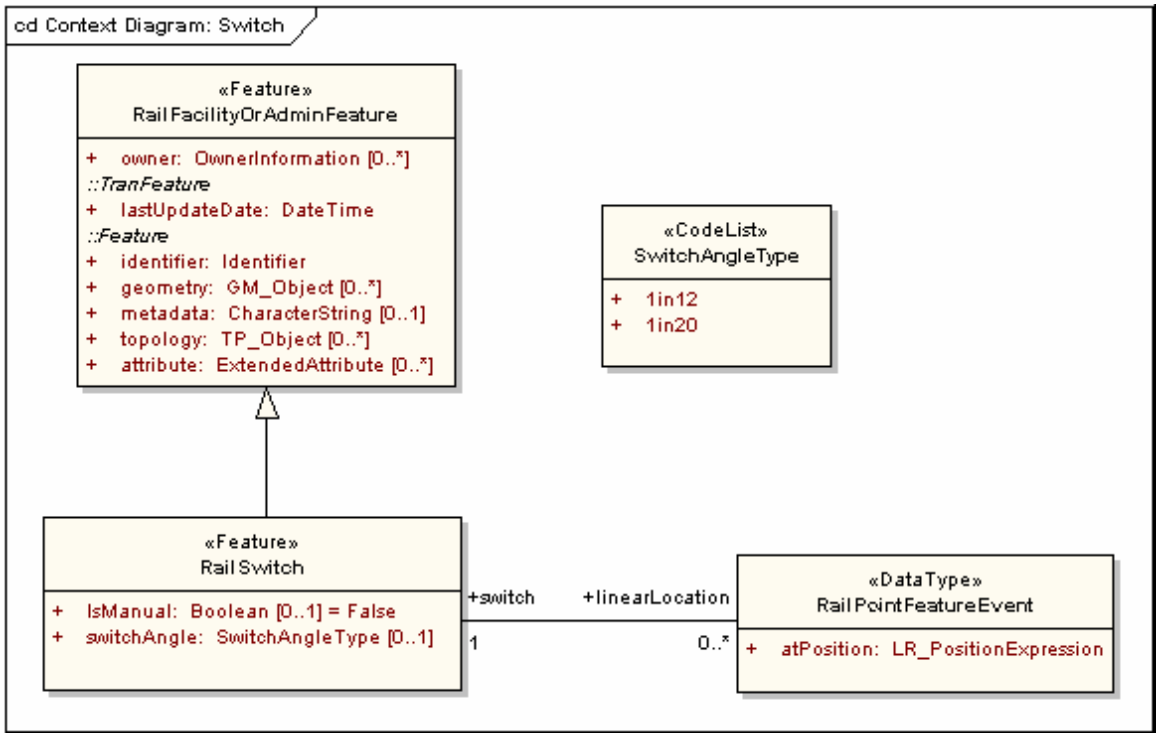


Figure 20 – RailSwitch

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Table 15 – Data dictionary for RailSwitch

Line	Name/Role Name	Definition	Obligation/ Condition	Maximum Occurrence	Data Type	Domain
289	RailFacilityOrAdminFeature	Features for supporting the railroad infrastructure			<<Feature>>	Lines 290-296
290	owner	Person(s) or organization(s) that posses the station	O	*	<<DataType>> OwnerInformation	Unrestricted
291	Transportation Base:: TranFeature::lastUpdateDate	Timestamp indicating when the RailFacilityOrAdminFeature object was last edited	M	1	DateTime	Valid historical or current date and time
292	Framework::Feature::identifier	Feature identifier for the RailFacilityOrAdminFeature	M	1	<<DataType>> Framework::Identifier	Unrestricted
293	Framework::Feature::geometry	Shape and geolocation of a feature	O	*	<<Type>> GM_Object	Defined in ISO 19107
294	Framework::Feature::metadata	Structured or unstructured metadata as defined by the community of practice	O	1	CharacterString	May be text or structured metadata fragment
295	Framework::Feature::topology	Connectivity of the participating elements	O	*	<<Interface>> TP_Object	Defined in ISO 19107
296	Framework::Feature::attribute	Producer-defined attribute for inclusion in transfer	O	*	<<DataType>> Framework:: ExtendedAttribute	Unrestricted
297	RailSwitch	Mechanism used to transfer railcars from one set of tracks to another			<<Feature>>	Lines 298-300
298	isManual	Denotes whether or not the railroad switch is manually operated	O	1	Boolean	True or False
299	switchAngle	Angle at which the switch diverts to the next track	O	1	<<CodeList>> SwitchAngleType	Unrestricted
300	Role name: linearLocation	Location of the RailSwitch along a RailSeg or RailPath	O	*	<<DataType>> RailPointFeatureEvent	Unrestricted

Line	Name/Role Name	Definition	Obligation/ Condition	Maximum Occurrence	Data Type	Domain
301	RailPointFeatureEvent	Mechanism for locating a feature at a single point along a railroad			<<DataType>>	Lines 302-303
302	atPosition	Point location along the railroad at which the RailSwitch is located	M	1	<<Type>> LR_PositionExpression	Defined in ISO 19133
303	Role name: switch	Mechanism used to transfer railcars from one set of tracks to another	M	1	<<Feature>> RailSwitch	Unrestricted

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8.5.12 RailTransportationCrossing

Figure 21 depicts the feature class RailTransportationCrossing. It is a subtype of RailFacilityOrAdminFeature and therefore can have geometry and topology as defined by ISO 19107. A RailLinearFeatureEvent may be used to locate the RailTransportationCrossing along a RailSeg, a RailPath, or a RailTrack. The code list TransportationCrossingType supplies values for the attribute crossingType. The enumeration CrossingLevelKind supplies values for the attribute levelOfCrossing. Attributes name, nearestRoad, and nearestAddress are expressed as character strings.

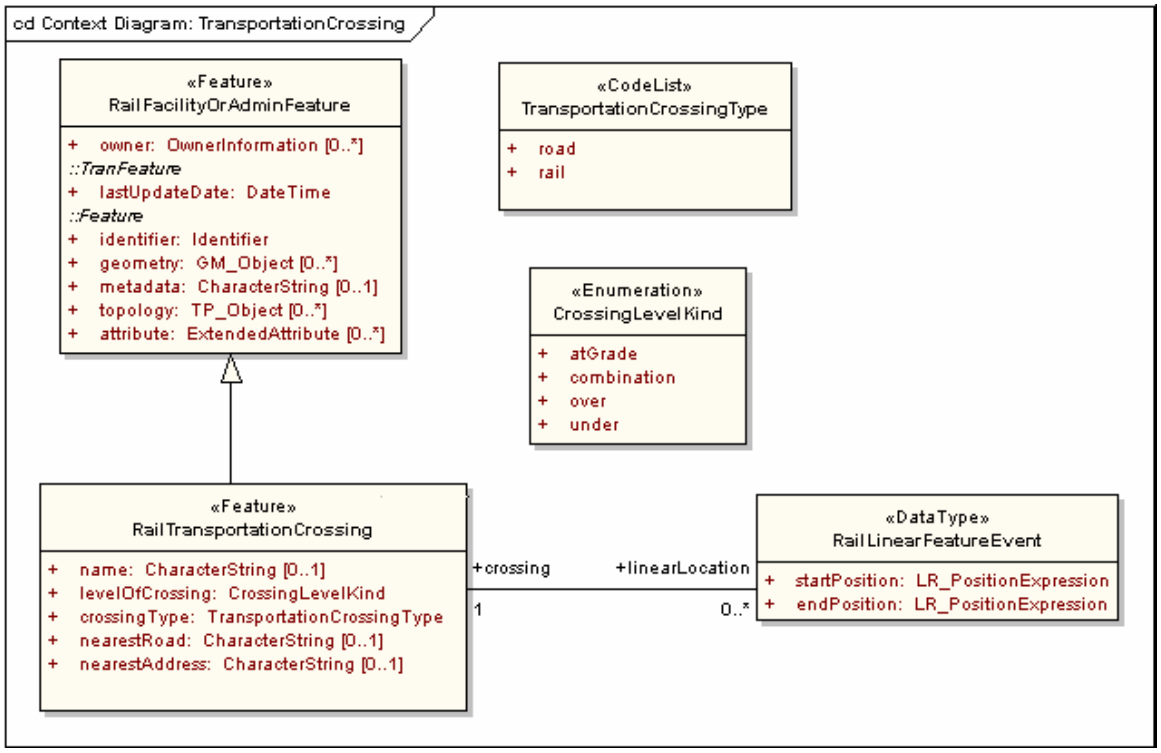

Figure 21 – RailTransportationCrossing

808 **Table 16 – Data dictionary for RailTransportationCrossing**

Line	Name/Role Name	Definition	Obligation/ Condition	Maximum Occurrence	Data Type	Domain
304	RailFacilityOrAdminFeature	Features for supporting the railroad infrastructure			<<Feature>>	Lines 305-311
305	owner	Person(s) or organization(s) that posses the station	O	*	<<DataType>> OwnerInformation	Unrestricted
306	Transportation Base:: TranFeature::lastUpdateDate	Timestamp indicating when the RailFacilityOrAdminFeature object was last edited	M	1	DateTime	Valid historical or current date and time
307	Framework::Feature::identifier	Feature identifier for the RailFacilityOrAdminFeature	M	1	<<DataType>> Framework::Identifier	Unrestricted
308	Framework::Feature::geometry	Shape and geolocation of a feature	O	*	<<Type>> GM_Object	Defined in ISO 19107
309	Framework::Feature::metadata	Structured or unstructured metadata as defined by the community of practice	O	1	CharacterString	May be text or structured metadata fragment
310	Framework::Feature::topology	Connectivity of the participating elements	O	*	<<Interface>> TP_Object	Defined in ISO 19107
311	Framework::Feature::attribute	Producer-defined attribute for inclusion in transfer	O	*	<<DataType>> Framework:: ExtendedAttribute	Unrestricted
312	RailTransportationCrossing	Intersection between the railroad and another railroad or roadway			<<Feature>>	Lines 313-318
313	name	Word or phrase that constitutes the distinctive designation of the Transportation Crossing	O	1	Character String	Unrestricted
314	levelOfCrossing	Level at which the transportation crossing intersects the railroad	M	1	<<Enumeration>> CrossingLevelKind	over, under, atGrade, combination
315	crossingType	Kind of crossing	M	1	<<CodeList>> TransportationCrossing	Unrestricted

Line	Name/Role Name	Definition	Obligation/ Condition	Maximum Occurrence	Data Type	Domain
					Type	
316	nearestRoad	Closest road to the transportation crossing	O	1	CharacterString	Unrestricted
317	nearestAddress	Closest address to the transportation crossing	O	1	CharacterString	Unrestricted
318	Role name: linearLocation	Location of the RailTransportationCrossing along a RailSeg or RailPath	O	*	<<DataType>> RailLinearFeatureEvent	Unrestricted
319	RailLinearFeatureEvent	Mechanism for locating a feature along an interval along a railroad			<<DataType>>	Lines 320-322
320	startPosition	Starting location along the railroad for the attribute value	M	1	<<Type>> LR_PositionExpression	Defined in ISO 19133
321	endposition	Ending location along the railroad for the attribute value	M	1	<<Type>> LR_PositionExpression	Defined in ISO 19133
322	Role name: crossing		M	1	<<Feature>> RailTransportation Crossing	Unrestricted

8.5.13 RailUtilityCrossing

Figure 22 depicts the feature class RailUtilityCrossing. It is a subtype of RailFacilityOrAdminFeature and therefore can have geometry and topology as defined by ISO 19107. A RailPointFeatureEvent may be used to locate the RailUtilityCrossing along a RailSeg, a RailPath, or a RailTrack. The code list UtilityCrossingType supplies values for the attribute crossingType. The enumeration CrossingLevelKind supplies values for the attribute crossingLevel. Attributes nearestRoad, and nearestAddress are expressed as character strings.

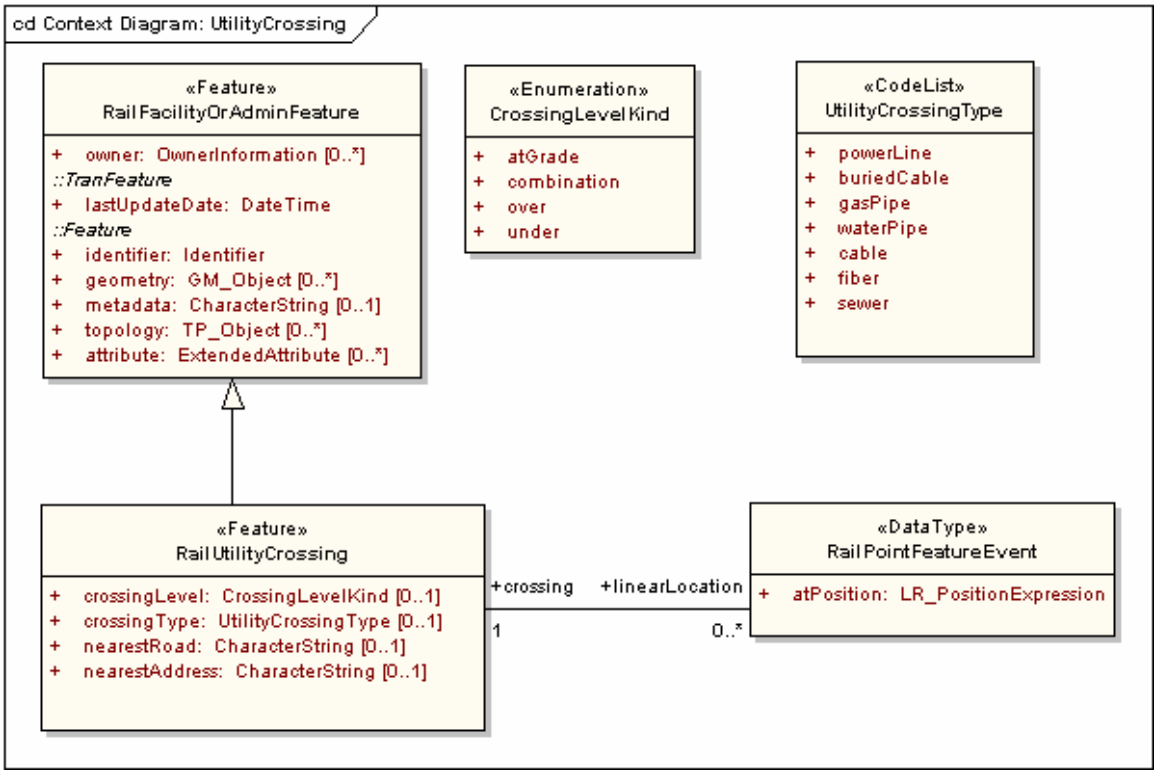

Figure 22 – RailUtilityCrossing

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Table 17 – Data dictionary for RailUtilityCrossing

Line	Name/Role Name	Definition	Obligation/ Condition	Maximum Occurrence	Data Type	Domain
323	RailFacilityOrAdminFeature	Features for supporting the railroad infrastructure			<<Feature>>	Lines 324-330
324	owner	Person(s) or organization(s) that posses the station	O	*	<<DataType>> OwnerInformation	Unrestricted
325	Transportation Base:: TranFeature::lastUpdateDate	Timestamp indicating when the RailFacilityOrAdminFeature object was last edited	M	1	DateTime	Valid historical or current date and time
326	Framework::Feature::identifier	Feature identifier for the RailFacilityOrAdminFeature	M	1	<<DataType>> Framework::Identifier	Unrestricted
327	Framework::Feature::geometry	Shape and geolocation of a feature	O	*	<<Type>> GM_Object	Defined in ISO 19107
328	Framework::Feature::metadata	Structured or unstructured metadata as defined by the community of practice	O	1	CharacterString	May be text or structured metadata fragment
329	Framework::Feature::topology	Connectivity of the participating elements	O	*	<<Interface>> TP_Object	Defined in ISO 19107
330	Framework::Feature::attribute	Producer-defined attribute for inclusion in transfer	O	*	<<DataType>> Framework:: ExtendedAttribute	Unrestricted
331	RailUtilityCrossing	Intersection between the railroad and public utility equipment			<<Feature>>	Lines 332-336
332	crossingLevel	Intersection between the railroad and public utility equipment	O	1	<<Enumeration>> CrossingLevelKind	over, under, atGrade, combination
333	crossingType	Kind of crossing	O	1	<<CodeList>> UtilityCrossingType	Unrestircted
334	nearestRoad	Closest road to the transportation crossing	O	1	CharacterString	Unrestricted

Line	Name/Role Name	Definition	Obligation/ Condition	Maximum Occurrence	Data Type	Domain
335	nearestAddress	Closest address to the transportation crossing	O	1	CharacterString	Unrestricted
336	Role name: linearLocation	Location of the RailUtilityCrossing along a RailSeg or RailPath	O	*	<<DataType>> RailPointFeatureEvent	Unrestricted
337	RailPointFeatureEvent	Mechanism for locating a feature at a single point along a railroad			<<DataType>>	Lines 338-339
338	atPosition	Point location along the railroad at which the RailUtility is located	M	1	<<Type>> LR_PositionExpression	Defined in ISO 19133
339	Role name: crossing		M	1	<<Feature>> RailUtilityCrossing	Unrestricted

8.6 Code lists and enumerations

8.6.1 Code lists

8.6.1.1 ClearanceLimitType code list

ClearanceLimitType is a CodeList of values for the attribute clearanceLimit.

Table 18 – CodeList for ClearanceLimitType

Name	Definition
A	
B	
C	

8.6.1.2 ControlPointType code list

ContolPointType is a CodeList of values for the attribute pointType.

Table 19 – CodeList for ControlPointType

Name	Definition
interlocking	
controlLocation	

8.6.1.3 OwnershipType code list

OwnershipType is a CodeList of values for the attribute ownershipType.

Table 20 – CodeList for OwnershipType

Name	Definition
joint	
trackageRights	
haulageRights	
leased	
owned	
other	
operated	

8.6.1.4 PlatformHeightType code list

PlatformHeightType is a CodeList of values for the attribute platformHeight.

Table 21 – CodeList for PlatformHeightType

Name	Definition
high	
low	
atRail	

8.6.1.5 PlatformType code list

PlatformType is a CodeList of values for the attribute platformType.

Table 22 – CodeList for PlatformType

Name	Definition
passenger	
freight	

8.6.1.6 RailServiceType code list

RailServiceType is a CodeList of values for the attribute serviceType.

Table 23 – CodeList for RailServiceType

Name	Definition
intermodal	
bulk	
passenger	
carLoad	

8.6.1.7 RailYardType code list

RailYardType is a CodeList of values for the RailYard attribute type.

Table 24 – CodeList for RailYardType

Name	Definition
intermodal	
hump	
flat	
bucket	
storageInTransit	

Name	Definition
maintenanceFacility	

857

858 **8.6.1.8 TrackType code list**

859 TrackType is a CodeList of values for the attribute trackType.

860

861 **Table 25 – CodeList for TrackType**

Name	Definition
siding	
wye	
mainTrack	
mainlineTrack	
branchLine	
interlocking	
yard	
interchange	
station	

862

863 **8.6.1.9 TransportationCrossingType code list**

864 TransportationCrossingType is a CodeList of values for the attribute crossingType.

865

866 **Table 26 – CodeList for TransportationCrossingType**

Name	Definition
road	
rail	

867

868 **8.6.1.10 SignalType code list**

869 SignalType is a CodeList of values for the attribute signalType.

870

871 **Table 27 – CodeList for SignalType**

Name	Definition
automatic	
controlled	

872

8.6.1.11 SwitchAngleType code list

SwitchAngleList is a CodeList of values for the attribute switchAngle.

Table 28 – CodeList for SwitchAngleType

Name	Definition
1in12	
1in20	

8.6.1.12 UtilityCrossingType code list

UtilityCrossingType is a CodeList of values for the attribute crossingType.

Table 29 – CodeList for UtilityCrossingType

Name	Definition
powerLine	
buriedCable	
gasPipe	
waterPipe	
cable	
fiber	
sewer	

8.6.2 Enumerations

8.6.2.1 CrossingLevelKind enumeration

CrossingLevelKind is an enumeration of values for the attributes crossingLevel, levelOfCrossing, and levelOfGrade.

Table 30 – CrossingLevelKind enumeration

Name	Definition
atGrade	
combination	
over	
under	

8.6.2.2 TravelDirectionKind enumeration

TravelDirectionKind is an enumeration of values for the attribute travelDirection.

892

893 **Table 31 – TravelDirectionKind enumeration**

Name	Definition
increasing	
decreasing	

894

Annex A
(normative)
Normative references

This annex lists normative standards that support this part of the Framework Data Content Standard. Annex A of the Base Document (Part 0) lists normative references applicable to two or more parts of the standard, including those other than the transportation parts.

ANSI and ISO standards may be purchased through the ANSI eStandards Store at http://webstore.ansi.org/ansidocstore/default.asp, accessed October 2006.

ISO 19110:2005, Geographic information – Methodology for feature cataloguing

Annex B
(informative)
Railway use cases

B.1 Introduction

In developing the Rail part of the Framework Data Content Standard, a series of general use cases were developed to assist in defining the requirements for a rail model. While these use cases focus on scenarios common to a broad segment of the rail industry, they are not comprehensive in defining all the potential uses of rail data. They were critical in providing focus for the development team. In future versions of the part, more detailed and formalized use cases will be developed to facilitate expansion and refinement of the rail model.

B.1.1 Emergency response use case

This use case details an emergency response scenario involving the following user groups:

- Locomotive engineer
- Railroad dispatcher

An event, such as a derailment, occurs that requires the railroad to involve outside agencies. The locomotive engineer needs to summon non-railroad emergency response agencies, such as fire departments to control fires, rescue squads to provide injury assistance, environmental agencies to contain hazardous material spills, or law enforcement to assist the population in vicinity of the incident.

During this type of scenario, the engineer contacts the railroad dispatcher and describes the event location by track and milepost. In response, the dispatcher contacts outside agencies to relate the railroad location to a location reference understood by the outside agency. By having the GIS data layers for tracks and mileposts as well as for streets, highways, municipal boundaries, waterways, and other pertinent geospatial layers, the dispatcher can describe the location relative to an intersection or provide a distance from a road crossing, city, or river for the outside agency to direct them to the derailment.

B.1.2 Emergency stop use case

This use case details a scenario that requires the cessation of rail traffic along a specific section of track. This scenario involves the following user groups:

- Railroad customer service center representative
- Railroad dispatcher
- Locomotive engineer
- Local law enforcement officer
- Local law enforcement central dispatching

An event occurs that requires the railroad to stop a train, such as a car stuck on a crossing. In response, a local law enforcement officer needs to contact the railroad to ensure on-coming rail traffic is stopped.

In this scenario, the law enforcement officer contacts the central dispatcher who then calls the railroad thought to be the owner of the track using a 1-800 number for the railroad. The railroad customer service center representative receives the call and the law enforcement officer relays information regarding the incident and the location of the road crossing. This could include the following types of location information:

- Street or highway name

- Municipality and/or county name
- State, Province, or Territory
- Closest intersection (highways or streets)
- Closest town or municipality to the event
- Proximity to other landmarks such as a bridge or river

The service representative will use GIS data for the rail network, such as track and milepost, overlaid with other GIS data layers for streets, highways, municipal boundaries, and waterways to correlate the location received from the law enforcement officer with a track and mile post. The service representative contacts the dispatcher in control of the identified track and sends notification of the situation. The dispatcher will then radio the locomotive engineers on approaching trains to have them stop at a safe distance from the crossing.

Additionally, if there are multiple tracks at the crossing and there is the possibility that another railroad could be operating through the crossing, the first railroad customer representative can contact the other railroad in order to stop their trains.

B.1.3 Incident reporting use case

This use case details a scenario in which a member of the public contacts an “authority” to report an incident. This scenario involves the following user groups:

- The railroad's rail traffic control center
- The railroad’s law enforcement personnel
- Non-railroad emergency response agencies (911, fire departments, ambulance services, contractors, population in vicinity of incident)

A member of the general public witnesses an incident on a railroad and needs to contact the appropriate "authorities" to describe the incident and the location. The citizen may not know the railroad track owner, subdivision name, and mileage sign location. Other location information that may be provided is:

- Street or highway name
- Municipality and/or county name
- State, Province or Territory
- Closest intersection (highways or streets)
- Closest town or municipality
- GPS location
- Information found on the back of crossbucks
- Proximity to other landmarks such as a bridge or river
- Track configuration at incident (single track, multiple tracks)
- Whether incident is at a crossing

The "public" emergency responder would then dispatch appropriate services and would also try to identify and then contact the appropriate rail company. The "public" responder would also need to convey the location description to the railroad.