railML® Use Case Definition
Schematic Track Plan

Abbreviation	SCTP
Implementation	railML® 3.1 (release: 19.02.2019)
Date	19.02.2019
Version	1.0
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Revision History

| Version	Date	Description	Name
0.1	06.10.2016	Initial Version	Christian Rahmig
0.2	21.10.2016	Including List of Requirements	Christian Rahmig
0.3	06.03.2017	Updating informal use case description	Christian Rahmig
0.4	11.11.2018	Updating according railML 3.1 release candidate schema	Christian Rahmig
1.0	19.02.2019	First release of use case SCTP	Christian Rahmig

1   Informal Use Case Description

The infrastructure manager uses maps for the visualization of their railway infrastructure. These maps comprise:

- Geographic maps
- Geo-schematic maps / drawings
  - Operational points have geodetic coordinates
  - In between, the line layout is schematically interpolated
- Schematic drawings
  - All elements have screen coordinates resulting from their complete schematic layout

The following figure depicts an example for a schematic drawing:
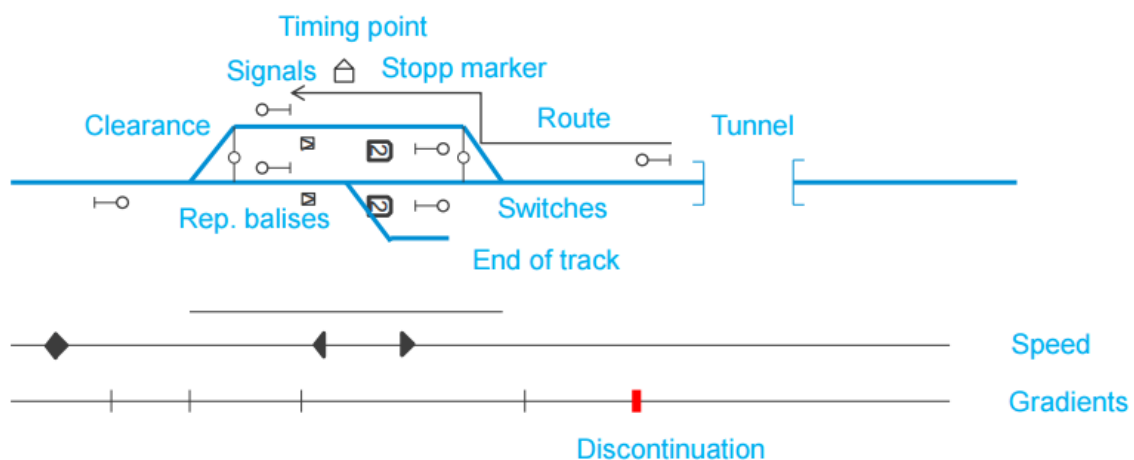
A more complex real world example of a schematic track plan is depicted in the following figure:
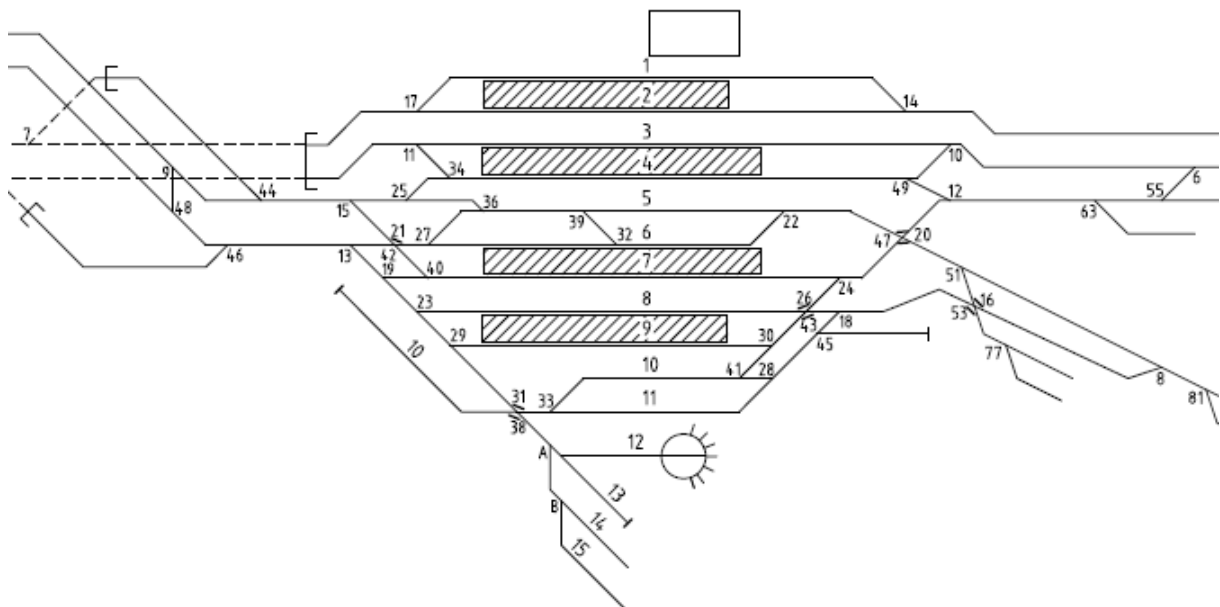
1.1   Data Flows and Interfaces

The infrastructure manager uses data from their own data bases to visualize them in the mentioned different types of maps. If the visualizing system comprises also editor functionality, there will be also a feedback channel to import the modified data into the infrastructure manager data bases.
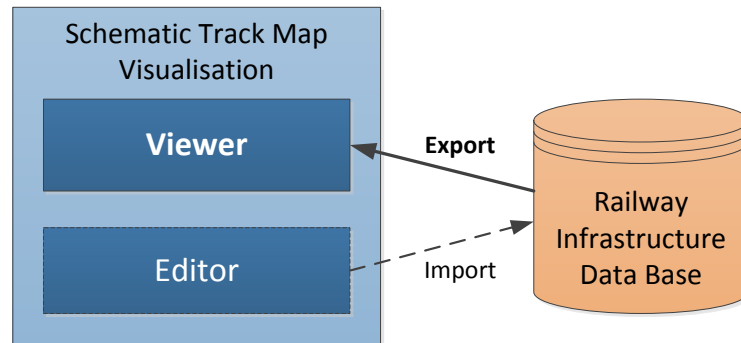
Figure 1: SCTP Data Flows and Interfaces

1.2   Data Characterization

How often do the data change (update)?
- Static (not changing)
- Yearly

How big are the data fragments to be exchanged (complexity)?
- big (station/yard)
- huge (region)
- whole data set (network)

Which views are represented by the data (focus)?
- Topology: track network, line network
- Construction: assets along the track / line
- Railway Operation: track numbers

Which specific data are expected (elements)?
- Infrastructure:
  - Topology: Lines + operational points
  - Coordinates: geodetic coordinates, screen coordinates
  - Geometry: slope (gradient profile)
  - Railway Operation: border points, speed profiles, lines, operational points, tracks, switches
  - Signalling assets: signals, stop posts, derailer, train detectors
  - Engineering assets: tunnels, bridges, level crossings, platform edges
  - Rails: track gauge, clearance gauge, switches, crossings
- Interlocking:
  - Routes

2 Schema Implementation

2.1 Sub-schema References

The implementation of the SCTP use case is based on elements of the following railML® sub-schemas:

- Common
- Infrastructure

2.2 Element Classification

This section serves to list all the railML® elements that are required for the implementation of the SCTP use case. For all the related sub-schemas the listing is done using tables in the following structure:

{Topic}		
{mandatory element/@attribute}	**m**	{Description}
{optional element/@attribute}	**o**	{Description}

Mandatory elements have to be provided by an export interface and have to be understood by an import interface. Optional elements are recommended for export and import interfaces.

2.2.1 Common

The following tables contain the railML® common elements required for the SCTP use case:

common		
organizationalUnits	**m**	At least all involved infrastructure managers owning parts of the described railway network shall be listed.
positioning	**m**	The element <positioning> includes all positioning systems that are used by element coordinates.

2.2.1.1 Organizational Units

organizationalUnits		
infrastructureManager	**m**	The infrastructure manager who owns at least some part of the described railway network shall be named by their infrastructure manager code (reference to codelist InfrastructureManagers.xml.

infrastructureManager		
@id	**m**	The ID must be unique in the whole railML file.
@code	**m**	Insert the infrastructure manager code as listed in the codelist *InfrastructureManagers.xml*.

2.2.1.2 Positioning

positioning		
linearPositioningSystems	**m**	There shall be at least one <linearPositioningSystem> for defining the mileage along the railway line.
screenPositioningSystems	**o**	It is recommended to define at least one <screenPositioningSystem> for linking infrastructure object positions with screen coordinates.

linearPositioningSystems		
linearPositioningSystem	**m**	At least one <linearPositioningSystem> has to be provided.

linearPositioningSystem		
name	**o**	It is recommended to provide a human readable name for the linear positioning system in a relevant language and eventually with additional descriptions.
isValid	**m**	Definition of the time period when the positioning system is valid defined by dates for begin and/or end of validity
anchor	**m**	All mileage changes and other mileage anomalies shall be modelled using <anchor> elements.
@id	**m**	The ID must be unique in the whole railML file.
@units	**m**	Mileage shall be given in meters.
@startMeasure, @endMeasure	**m**	Mileage shall be given in meters with two digits after the comma.

isValid		
from	**o**	If the time period starts at a certain day, this day need to be defined via attribute @from.
to	**o**	If the time period ends at a certain day, this day need to be defined via attribute @to.

anchor		
@id	**m**	The ID must be unique in the whole railML file.
@measure	**m**	This is the actual (incoming) mileage value of the mileage change given in meters.
@measureToNext	**m**	The distance from this mileage change until the next <anchor> point or until the end of the <netElement>.

screenPositioningSystem		
@id	**m**	The ID must be unique in the whole railML file.
@pxX	**m**	Pixel resolution in dimension X
@pxY	**m**	Pixel resolution in dimension Y
@pxZ	**o**	Pixel resolution in dimension Z; default value: 1

2.2.2 Infrastructure

The following tables contain the railML® infrastructure elements required for the SCTP use case:

infrastructure

topology	m	The topology of the described railway network has to be given.
functionalInfrastructure	m	The functional infrastructure includes all elements that form the operational railway infrastructure network.
infrastructureVisualizations	m	An infrastructure visualization defines a layout of the railway infrastructure network on the screen or on paper. There can be multiple visualizations of the same infrastructure.
infrastructureStates	o	It is recommended to provide the state of the infrastructure in order to specify the time span when the described functional infrastructure is available.

2.2.2.1   Topology

topology		
netElements	m	<netElement> objects have to be given at least for microscopic (track) level.
netRelations	m	<netRelation> objects have to be defined for connecting the microscopic level <netElement> objects.
networks	m	The <network> shall contain at least one child element <level> for describing the microscopic railway network on track level.

netElements		
netElement	m	At least one <netElement> has to be provided.

netElement		
associatedPositioningSystem	m	The associated positioning system defines the reference positioning system, which provides a spatial dimension to the topology element
@id	m	The ID must be unique in the whole railML file.
@length	o	It is recommended that for <netElement> objects representing tracks that have a specified physical length, this length shall be provided.

associatedPositioningSystem		
intrinsicCoordinate	m	The associated positioning system contains at least one <intrinsicCoordinate> providing a reference to a specific linear (e.g. mileage) coordinate.
@id	m	The ID must be unique in the whole railML file.

intrinsicCoordinate		
*Coordinate	m	
@id	m	The ID must be unique in the whole railML file.
@intrinsicCoord	m	The value is "0" for non-linear <netElement> and between "0" and "1" for linear <netElement> objects.

*Coordinate		
@positioningSystemRef	m	reference to the linear positioning system
@measure	m	measure of linear mileage in meters

netRelations		
netRelation	m	At least one <netRelation> has to be provided.

netRelation		
elementA	m	the reference to <netElement> at the begin of the <netRelation> has to be given
elementB	m	the reference to <netElement> at the end of the <netRelation> has to be given
@id	m	The ID must be unique in the whole railML file.
@positionOnA	m	intrinsic coordinate on <netElement> referenced by <elementA> (0 or 1) has to be given
@positionOnB	m	intrinsic coordinate on <netElement> referenced by <elementB> (0 or 1) has to be given
@navigability	m	the navigability has to be provided for each <netRelation>

elementA		
@ref	m	reference to <netElement> at the begin of the <netRelation> has to be given

elementB		
@ref	m	reference to <netElement> at the end of the <netRelation> has to be given

networks		
network	m	At least one <network> has to be provided.

network		
level	m	The <network> shall contain at least one child element <level> for describing the microscopic railway network on track level.
@id	m	The ID must be unique in the whole railML file.

level		
networkResource	m	This repeatable child element is used to reference all the topology network resources (netElement, netRelation) that belong to this topology level.
@id	m	The ID must be unique in the whole railML file.
@descriptionLevel	m	There shall be at least one instance of <level> with @descriptionLevel="Micro".

2.2.2.2 Geometry
No elements required.

2.2.2.3 Functional Infrastructure

functional Infrastructure		
balises	o	It is recommended to define all balises and balise groups by their position in the railway track network.
borders	o	It is recommended to define the borders of stations, countries and areas of any type that are relevant for the schematic track layout representation.
bufferStops	m	All track ends (buffer stops) have to be given by their location in the track network.
crossings	m	All crossings (intersections of railway tracks without switches) have to be given with their location in the track network.
keyLocksIS	o	It is recommended to provide the track location of all key locks.
levelCrossingsIS	m	All level crossings (crossing of railway track with road/street) have to be given with their location and information about their technical equipment.
lines	m	All railway lines that are at least partially included in the schematic railway track plan have to be given by their name, designator and mileage.
loadingGauges	o	It is recommended to define the loading gauge for the complete railway track network.
operationalPoints	m	All operational points that are at least partially included in the railway track network, have to be given with their track related location and technical equipment.
overCrossings	m	All over crossings that are at least partially included in the railway track network have to be given with their track related location and information about the crossed way/river/etc.
platforms	m	All platforms/platform edges that are included in the railway track network have to be given with their name(s) and designator(s).
serviceSections	m	All service sections that are included in the railway track network have to be given with their track related location and available services.
signalsIS	m	All signals that are located along the tracks of the selected railway track network have to be given with their track related location and their classification.
speeds	x	
switchesIS	m	All switches that are included in the railway track network have to be given with their track related location, speed and geometry configuration.
tracks	m	All railway tracks have to be provided with their name(s), designator(s) and operational classification.
trainDetectionElements	m	All train detection elements installed along the tracks of the railway track network have to be provided with

	m	their track related location, name(s), designator(s) and system type.
underCrossings	m	All under crossings that are at least partially included in the railway track network have to be given with their track related location and information about the crossed way/river/etc.

2.2.2.3.1 Balises

balises		
balise	m	At least one <balise> has to be provided.

balise		
*Location	m	Each <balise> has to be located by its linear line kilometer coordinate.
@id	m	The ID must be unique in the whole railML file.
@type	o	If the <balise> represents a single balise, it is recommended to specify whether this balise is a fixed data balise or a transparent data balise.
@isBaliseGroup	o	It is recommended to specify whether <balise> represents a single balise or a balise group.
@baliseGroupType	o	If the <balise> represents a balise group, it is recommended to specify the type of the balise group.
@belongsToParent	o	If the <balise> represents a single balise that belongs to a balise group, it is recommended that this balise references its (parent) balise group.

2.2.2.3.2 Borders

borders		
border	m	At least one <border> has to be provided.

Border		
*Location	m	Border points have to be located by the linear coordinate (line kilometer) of their center point.
name	m	Border point names shall be provided in all languages of the connected railway network countries.
markedByInfrastructureElement	o	It is recommended to reference elements of functional infrastructure that mark the border point.
@id	m	The ID must be unique in the whole railML file.
@isOpenEnd	m	Please specify if the border point connects to "terra incognita".
@type	m	Please specify the border type.
@externalRef	o	It is recommended to provide the external identifier that allows to reference information about the "terra incognita" behind this open end.

2.2.2.3.3   Buffer Stops

bufferStops		
bufferStop	**m**	At least one <bufferStop> has to be provided.

bufferStop		
***Location**	**m**	Buffer stops have to be located within the railway track network with their linear kilometer coordinates.
@id	**m**	The ID must be unique in the whole railML file.
@type	**o**	It is recommended to specify the type of the buffer stop in order to allow different graphical representations in the schematic track plan.

2.2.2.3.4   Crossings

crossings		
crossing	**m**	At least one <crossing> has to be provided.

crossing		
***Location**	**m**	Crossings have to be located within the railway track network with their linear kilometer coordinates.
@id	**m**	The ID must be unique in the whole railML file.

2.2.2.3.5   Key Locks

keyLocksIS		
keyLockIS	**m**	At least one <keyLockIS> has to be provided.

keyLockIS		
***Location**	**m**	Every key lock that is installed along a track within the railway track network, need to be located with their linear kilometer coordinate.
@id	**m**	The ID must be unique in the whole railML file.

2.2.2.3.6   Level Crossings

levelCrossingsIS		
levelCrossingIS	**m**	At least one <levelCrossingIS> has to be provided.

levelCrossingIS		
***Location**	**m**	Every level crossing included in the railway track network has to be located with their linear kilometer coordinates. The location can be based on a spot (center crossing point), linear or area (crossing area)
name	**m**	The name of the level crossing shall be provided as it used in the schematic track plan for human-readable

		identification.
protection	o	It is recommended to specify the level crossing's technical protection equipment that is visualized in the schematic track plan.
@id	m	The ID must be unique in the whole railML file.

protection		
@hasActiveProtection	m	Set true if the level crossing is actively protected (has technical protection systems apart from saltire).

2.2.2.3.7 Lines

lines		
line	m	At least one <line> has to be provided.

line		
*Location	m	The railway line shall be located in the topology network and further shall be connected with the traditional railway line coordinate system (mileage)
name	m	The name of the railway line has to be provided.
designator	m	The line can be specified by a designator or line code that is known in some external register.
beginsInOP	o	It is recommended to explicitly reference the operational point where the line section begins.
endsInOP	o	It is recommended to explicitly reference the operational point where the line section ends.
lineLayout	o	It is recommended to specify the line layout for the whole line in terms of number of tracks.
@id	m	The ID must be unique in the whole railML file.
@infrastructureManagerRef	o	It is recommended to refer to the infrastructure manager that is responsible for the operation on that line
@lineCategory	o	It is recommended to provide the category of the line according to the EU regulation EN 15528 (A, B1, B2, C2, ..., E5; other national values are also possible)
@lineType	m	Please specify whether the line is a main line or a branching line.

lineLayout		
@numberOfTracks	m	Please specify the number of tracks that belong to this line: most common values are "double" and "single".

2.2.2.3.8 Loading Gauges

loadingGauges		
loadingGauge	m	At least one <loadingGauge> has to be provided.

loadingGauge		
*Location	**m**	The loading gauge element has to be located on a microscopic railway topology element.
@id	**m**	The ID must be unique in the whole railML file.
@code	**m**	The loading gauge has to be provided for the railway track (see codelist TrainClearanceGauges.xml).

2.2.2.3.9   Operational Points

operationalPoints		
operationalPoint	**m**	At least one <operationalPoint> has to be provided.

operationalPoint		
*Location	**m**	Each operational point shall be located in at least one railway line kilometer reference system with its center point. Further, the operational point shall be located in the microscopic topology, where its borders are referenced.
name	**m**	Each operational point shall be specified by an (operational or traffic) name.
designator	**m**	Each operational point shall be specified by at least one designator that represents a common abbreviation or identification code of the operational point in an external register.
infrastructureManagerRef	**o**	It is recommended to refer to the infrastructure manager that operates the operational point
connectedToLine	**o**	It is recommended to refer to the railway line that starts, ends or runs through this operational point.
limitedByBorder	**m**	The borders of an operational point have to be explicitly referenced.
opEquipment	**o**	It is recommended to provide further details about the infrastructure that belongs to the operational point.
opOperations	**o**	It is recommended to provide further details about the type of railway operations that are executed in the operational point.
@id	**m**	The ID must be unique in the whole railML file.
@timezone	**o**	It is recommended to provide the timezone that is relevant for the railway operation in this operational point.

opEquipment		
ownsPlatform	**o**	It is recommended to reference the platforms (if defined) and platform edges from the operational point.
ownsTrack	**o**	It is recommended to reference the tracks from the operational point.
ownsSignal	**o**	It is recommended to reference the signals (if defined) from the operational point.

ownsServiceSection	o	It is recommended to reference the service sections (if defined) from the operational point.

opOperation		
@operationalType	m	Please specify the operational point by the type of operations taking place.
@trafficType	o	It is recommended to specify the operational point by the type of traffic that occurs there.

2.2.2.3.10 Over Crossings

overCrossings		
overCrossing	m	At least one <overCrossing> has to be provided.

overCrossing		
*Location	m	Each over crossing has to be located with its center point in the railway line kilometer reference system. Further, each over crossing has to be located in the microscopic topology.
name	m	The name of the over crossing (e.g. bridge) has to be provided so that it can be used in a schematic track plan.
designator	o	It is recommended to provide additional designators of the over crossing used in different registers for identification.
length	o	It is recommended to define the (physical) length of the over crossing.
crossesElement	m	The type of infrastructure that crosses over the railway line shall be specified.
@id	m	The ID must be unique in the whole railML file.
@constructionType	m	Please specify whether the over crossing is built as a tunnel or a (crossing) bridge.

crossesElement		
name	o	It is recommended to provide the name of the element (e.g. road), so that it can be used in a schematic track plan.
@id	m	The ID must be unique in the whole railML file.
@type	m	Please specify the type of infrastructure that is crosses over the railway line, e.g. road, railway or motorway.
@ref	o	If the crossing element is a railway track/line, it is recommended to explicitly reference this track/line.

2.2.2.3.11 Platforms

platforms		
platform	m	At least one <platform> has to be provided.

platform		
*Location	**m**	Platform edges shall be modelled as linear elements located in the microscopic topology network. Further, their lateral side (left/right) in reference to the underlying NetElement shall be provided.
name	**m**	Platforms and platform edges shall be identified by their operational names.
width	**o**	It is recommended to provide the (physical) width of the platform.
length	**m**	The (physical) length of the platform edge shall be given in meters.
@id	**m**	The ID must be unique in the whole railML file.
@belongsToParent	**o**	If platform edges belong to a platform, it is recommended that the platform edges reference this platform via this attribute.

2.2.2.3.12 Service Sections

serviceSections		
serviceSection	**m**	At least one <serviceSection> has to be provided.

ServiceSection		
*Location	**m**	Service sections shall be located in the microscopic topology network (track level) as linear elements.
@id	**m**	The ID must be unique in the whole railML file.
@{service}	**o**	It is recommended to specify the specific services that are available in the service section by setting the related Boolean attribute to TRUE.

2.2.2.3.13 Signals

signalsIS		
signal	**m**	At least one <signal> has to be provided.

signalIS		
*Location	**m**	Each signal/panel shall be located in at least one railway line kilometer reference system. Further, it shall be located in the microscopic topology level.
name	**m**	Please provide the name of the signal so that it can be used in the schematic track plan.
designator	**o**	It is recommended to provide additional designators of the signal/panel used in different registers for identification.
is*Signal	**m**	In order to distinguish between different types of signals/panels, each <signalIS> has to be further specified by matching child elements.

isAnnouncementSignal	**o**	If the signal announces a signal aspect to be executed, the child element <isAnnouncementSignal> shall be chosen.
isCatenarySignal	**o**	If the signal provides information related to the catenary, the child element <isCatenarySignal> shall be chosen.
isDangerSignal	**o**	If the signal warns of any kind of danger, the child element <isDangerSignal> shall be used.
isEtcsSignal	**o**	If the signal is specific for the ETCS (e.g. markerboard), the child element <isEtcsSignal> shall be used.
isInformationSignal	**o**	If the signal informs about something, the child element <isInformationSignal> shall be used.
isLevelCrossingSignal	**o**	If the signal is related to a level crossing (only railway side), the child element <isLevelCrossingSignal> shall be used.
isMilepost	**o**	If the signal is a milepost of a railway line kilometer reference system, the child element <isMilepost> shall be used.
isSpeedSignal	**o**	If the signal is related to the allowed speed on the railway track/line, the child element <isSpeedSignal> shall be used.
isStopPost	**o**	If the signal is a stop post indicating a stopping point for a railway vehicle, the child element <isStopPost> shall be used.
isTrainMovementSignal	**o**	If the signal controls train movements (incl. shunting), the child element <isTrainMovementSignal> shall be used.
isTrainRadioSignal	**o**	If the signal is related to the train radio system available on railway track/line, the child element <isTrainRadioSignal> shall be used.
isVehicleEquipmentSignal	**o**	If the signal refers to any kind of vehicle equipment action (e.g. lowering pantograph), the child element <isVehicleEquipmentSignal> shall be used.
signalConstruction	**m**	For each signal/panel, its location related to the track (left/right/above) and the type of construction has to be given.
@id	**m**	The ID must be unique in the whole railML file.
@isSwitchable	**o**	In order to distinguish between signals (several signal aspects) and panels (only one signal aspect), it is recommended to make use of this attribute.
@belongsToParent	**o**	It is recommended to group signals that are installed at the same pole or that are addressed together from the interlocking <signalIL> element.

isLevelCrossingSignal		
refersToLevelCrossing	**o**	It is recommended to provide reference to the connected level crossing.
@type	**m**	The type of level crossing signal (activating, announcing, supervision, …) shall be given.

isMilepost		
@shownValue	**m**	Please specify the value that is shown on the milepost panel.

signalConstruction		
@positionAtTrack	**m**	For each signal/panel, its location related to the track (left/right/above) has to be given.
@type	**m**	For each signal/panel, its type of construction (board, light, pole, semaphore, virtual) has to be given.

2.2.2.3.14 Switches

switchesIS		
switchIS	**m**	At least one <switchIS> has to be provided.

switchIS		
*Location	**m**	Every switch has to be located in the microscopic topology network at least with a spot location of its center point. Alternatively, an area location is recommended. In addition, each switch has to be located in the railway line kilometer reference system with its center point.
leftBranch	**m**	Please specify the left branch of the switch as seen from switch begin.
rightBranch	**m**	Please specify the right branch of the switch as seen from switch begin.
@id	**m**	The ID must be unique in the whole railML file.
@type	**m**	Please specify the type of the switch.
@continueCourse	**m**	The continue course (left/right) describes the main track continuation of the switch.
@branchCourse	**m**	The branch course (left/right) describes the branching track of the switch.
@defaultCourse	**o**	It is recommended to define the default course (left/right) of the switch.
@belongsToParent	**o**	If the switch is a complex one (e.g. switch crossing), it is recommended to divide it into "simple" components, which reference a parent switch element.

*Branch		
@speedBranching	**o**	For each switch branch it is recommended to define the maximum allowed speed passing the switch branch facing.
@speedJoining	**o**	For each switch branch it is recommended to define the maximum allowed speed passing the switch branch joining.
@netRelationRef	**o**	It is recommended to provide the reference from each switch branch to the related topology <netRelation> element in order to allow for routing.

@radius	m	For each switch branch define the radius of the track in meters. If the curve turns to the left as seen from switch begin, the radius should be negative.

2.2.2.3.15 Tracks

tracks		
track	m	At least one <track> has to be provided.

track		
***Location**	m	Each track has to be located with its begin and end in the railway line kilometer reference system. Further, all tracks have to be linked with the microscopic topology level.
name	m	For each track its operational name and/or traffic name shall be provided.
designator	m	For each track its designator(s) / code(s) shall be given in order to allow their identification within the scope of related registers.
trackBegin	o	It is recommended to reference the infrastructure element where the track begins (e.g. switch or buffer stop)
trackEnd	o	It is recommended to reference the infrastructure element where the track ends (e.g. switch or buffer stop)
length	m	The physical length of each track has to be given in meters.
@id	m	The ID must be unique in the whole railML file.
@type	m	The type of the track has to be given to distinguish between main, secondary, connecting and siding tracks.
@infrastructureManagerRef	m	The infrastructure manager that operates the track has to be provided.
@mainDirection	m	For each track the main direction of operation shall be defined.

2.2.2.3.16 Train Detection Elements

trainDetectionElements		
trainDetectionElement	m	At least one <trainDetectionElement> has to be provided.

TrainDetectionElement		
***Location**	m	Train detection elements shall be located in the railway line kilometer reference system. Further, every train detection element shall be located in the microscopic topology network.
name	m	Please specify the name of the train detection element.

designator	m	Please specify the designator of the train detection element in order to allow its identification in various registers.
@id	m	The ID must be unique in the whole railML file.
@type	m	The type of train detection element shall be given.

2.2.2.3.17 Under Crossings

underCrossings		
underCrossing	m	At least one <underCrossing> has to be provided.

underCrossing		
*Location	m	Each under crossing has to be located with its center point in the railway line kilometer reference system. Further, each under crossing has to be located in the microscopic topology.
name	m	The name of the under crossing (e.g. bridge) has to be provided so that it can be used in a schematic track plan.
length	o	It is recommended to provide the (physical) length of the under crossing in meters (from train perspective).
@id	m	The ID must be unique in the whole railML file.
@constructionType	m	Please specify whether the <underCrossing> is built in form of a tunnel or a crossing bridge (from train perspective).
@verbalConstraint	o	It is recommended to define restrictions on the usage of the under crossing, e.g. weight limitations.

crossesElement		
name	o	It is recommended to provide the name of the element (e.g. road), so that it can be used in a schematic track plan.
@id	m	The ID must be unique in the whole railML file.
@type	m	Please specify the type of infrastructure/nature that crosses under the railway line, e.g. river, railway or road.
@ref	o	If the crossing element is a railway track/line, it is recommended to explicitly reference this track/line.

2.2.2.4 Infrastructure Visualizations

infrastructureVisualizations		
visualization	m	At least one <visualization> has to be provided.

visualization		
*ElementProjection	m	A <visualization> must contain a projection of at least one element.

@id	m	The ID must be unique in the whole railML file.
@positioningSystemRef	m	Reference to a screen coordinate system that is used for all the included projections.

spotElementProjection		
name	o	It is recommended to provide at least one name for the projected element as it can be used in the visualization.
usesSymbol	o	If the element shall be visualized with a symbol in the visualization, this symbol can be referenced here.
coordinate	m	One set of coordinates of the projection of the element in the referenced screen coordinate system.
@id	m	The ID must be unique in the whole railML file.
@refersToElement	m	Reference to the infrastructure element that is being projected in the visualization.

linearElementProjection		
name	o	It is recommended to provide at least one name for the projected element as it can be used in the visualization.
usesSymbol	o	If the element shall be visualized with a symbol in the visualization, this symbol can be referenced here.
coordinate	m	At minimum two sets of coordinates of the projection of the element in the referenced screen coordinate system.
@id	m	The ID must be unique in the whole railML file.
@refersToElement	m	Reference to the infrastructure element that is being projected in the visualization.

areaElementProjection		
name	o	It is recommended to provide at least one name for the projected element as it can be used in the visualization.
usesSymbol	o	If the element shall be visualized with a symbol in the visualization, this symbol can be referenced here.
coordinate	m	At minimum three sets of coordinates of the projection of the element in the referenced screen coordinate system. The last set of coordinates must be identical with the first set of coordinates in order to close the area.
@id	m	The ID must be unique in the whole railML file.
@refersToElement	m	Reference to the infrastructure element that is being projected in the visualization.

usesSymbol		
isLocatedAt	m	Coordinates of the defined footpoint of the symbol in the projection of the element in the referenced screen coordinate system.
@externalIconRef	o	It is recommended to provide the link to the symbol e.g. in form of a URI.
@orientation	m	Please provide the orientation of the symbol being used in the projection of the element.

coordinate		
@x	**m**	Every set of coordinates contains at least a 1D coordinate.
@y	**o**	If the used screen coordinate system is 2D, every coordinate set has to contain 2D coordinates.
@z	**o**	If the used screen coordinate system is 3D, every coordinate set has to contain 3D coordinates.

2.2.2.5   Infrastructure States

infrastructureStates		
infrastructureState	**m**	At least one <infrastructureState> has to be provided.

infrastructureState		
validityTime	**m**	The infrastructure state has to be linked with at least one time span or time period defining its temporal validity.
elementState	**o**	If there are several infrastructure states defined, it is recommended to reference all functional infrastructure element (and their states) that are included in this infrastructure (state).
@id	**m**	The ID must be unique in the whole railML file.
@value	**m**	The infrastructure type of state has to be provided.

elementState		
validityTime	**m**	The infrastructure element state has to be linked with at least one time span or time period defining its temporal validity.
@id	**m**	The ID must be unique in the whole railML file.
@refersToElement	**m**	Reference to the infrastructure element for which the state is provided.
@value	**m**	The infrastructure element type of state has to be provided.

2.2.3   Interlocking
No elements required.

2.2.4   Timetable
No elements required.

2.2.5   Rollingstock
No elements required.

3   Additional Remarks

No entries.

4   References

[1]   railML.org Wiki: Use case Schematic Track Plan. In:
https://wiki.railml.org/index.php?title=UC:IS:Schematic_Track_Plan; last access: 11.11.2018