

Figure 5 relationship of MAPEM data element tables

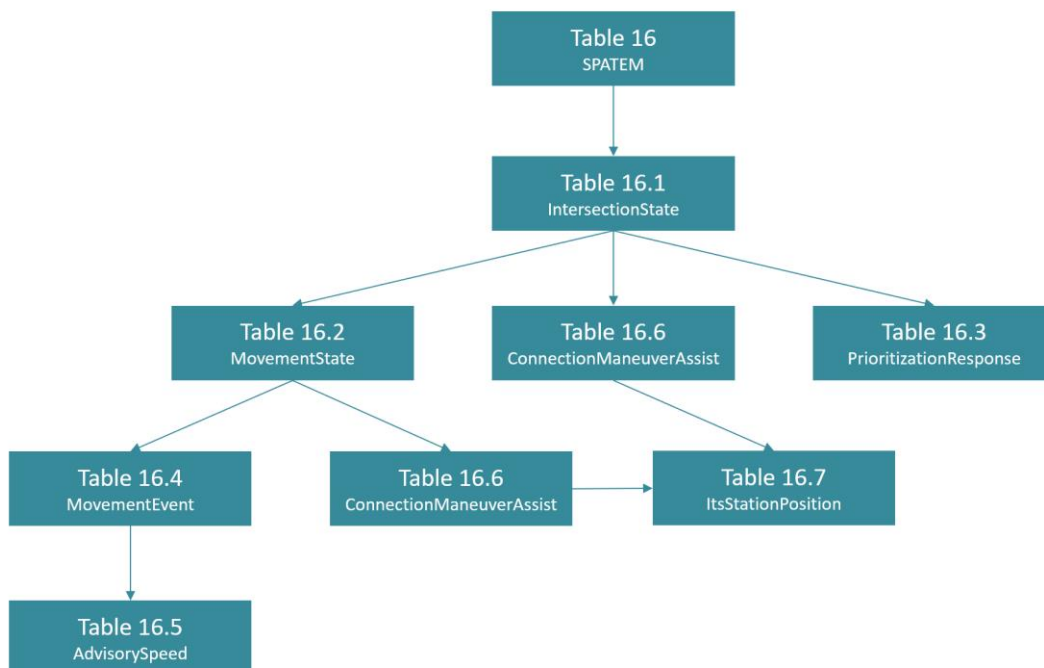


Figure 6 relationship of SPATEM data element tables

4.2.3.2 MAPEM general elements

Table 15 MAPEM data elements

Level	Name	Type	M/O	Usage	Comment
0.0	mapData	DF	Mandatory		
0.1	timeStamp	DE	Optional	Not used.	
0.2	msgIssue Revision	DE	Mandatory	Set to 0. As defined in ISO TS 19091.	
0.3	layerType	DE	Optional	Not used.	
0.4	layerID	DE	Optional	If needed, fragmentation can be applied as defined in ISO 19091 section G.8.3.2 on DE_LayerID	There do not exist requirements on logical fragmentation, e.g. full lanes, approaches or otherwise. Fragmentation is simply size- based. Also there do not exist requirements on the order of reception of fragments. The receiver shall be able to assemble the messages. The revision number of the MAPEM assures which fragments belong together. Validation of MAPEM shall be done on the message level, not the fragment level.
0.5	intersections (1..32)	DF	Optional	<p>IntersectionGeometryList ::= SEQUENCE (SIZE(1..32)) OF IntersectionGeometry (see table 15.1)</p> <p>The component 'intersections' shall be present in any MAPEM that describes one or more intersection areas or other areas that include traffic lights such as urban intersections, roundabouts or toll stations.</p> <p>Not used when MAPEM only provides road segments.</p> <p>In case of tolling stations, every direction at the tolling station shall be encoded in a dedicated intersection. Therefore, the number of intersections in intersections field of MapData reflects all the available traffic direction at the tolling station.</p>	
0.6	roadSegm ents (1..32)	DF	Optional	<p>RoadSegmentList ::= SEQUENCE (SIZE(1..32)) OF RoadSegment (see table 15.2)</p> <p>Mandatory to describe roadway segments without intersections (e.g. roadworks) and without traffic lights.</p>	No SPAT message can be linked to a MapData described with RoadSegments.
0.7	dataPara meters	DF	Optional		
0.7.1	processMetho d	DE	Optional	Not used.	

Table 15 MAPEM data elements

Level	Name	Type	M/O	Usage	Comment
0.7.2	processAgency	DE	Optional		
0.7.3	lastCheckedDate	DE	Optional	as: yyyy-mm-dd	
0.7.4	geoidUsed	DE	Optional	Not used.	
0.8	restrictionList (1..32)	DF	Optional	RestrictionClassList ::= SEQUENCE (SIZE(1..254)) OF RestrictionClassAssignment (see table 15.3).	
0.9	regional	DE	Optional	REGION.Reg-MapData. Not used.	
0.9.1	signalHeadLocations	DF	Optional	SignalHeadLocationList ::= SEQUENCE (SIZE(1..64)) OF SignalHeadLocation (see table 15.4) Not used.	

Table 15.1 IntersectionGeometryList → IntersectionGeometry

Level	Name	Type	M/O	Usage	Comment
1.0	intersectionGeometry	DF	Mandatory	Mandatory if 'intersections' is used.	
1.1	name	DE	Optional	Typically, human readable and recognizable by road authority.	
1.2	id	DF	Mandatory	(IntersectionReferenceID) The id shall be identical to the appropriate id tuple of the corresponding SPATEM 'intersectionState'. The combination of region and id shall be unique within a country.	This applies specifically to cases where multiple intersections are conveyed in one MAPEM/SPATEM combination.
1.2.1	region	DE	Mandatory		RoadRegulatorIDs are managed and assigned nationally, and each road regulator assigns IDs to intersections.
1.2.2	id	DE	Mandatory	The region-id combination shall be unique within a radius of <i>dRangeIdUnique</i> around each intersection.	The uniqueness within a radius is to ensure backwards compatibility with short-range communication deployments.
1.3	revision	DE	Mandatory	The revision number must be increased by 1 each time the MapData of this intersection changes. The revision numbers of SPATEM and MAPEM must be the same as an indication that the right MAPEM revision is used. As defined in ISO TS 19091.	

Table 15.1 IntersectionGeometryList → IntersectionGeometry

Level	Name	Type	M/O	Usage	Comment
1.4	refPoint	DF	Mandatory	The reference point shall be roughly at the centre of the conflict area, which is demarcated by the 1 st nodes of the ingress and egress lanes.	
1.4.1	lat	DE	Mandatory		
1.4.2	long	DE	Mandatory		
1.4.3	elevation	DE	Optional	Not used. Replaced by regional Reg-Position3D.	
1.4.4	regional	DF	Optional	REGION.Reg-Position3D-addGrpC. Optional. When given provides altitude.	
1.4.4.1	altitude	DF	Mandatory	Consists of altitudeValue and altitudeConfidence	
1.4.4.1.1	altitudeValue	DE	Mandatory		
1.4.4.1.2	altitudeConfidence	DE	Mandatory	When not available set to (15) = unavailable.	
1.5	laneWidth	DE	Optional	Provides the default width of the intersection, while deviations from this lane width are provided using dWidth. Also see pMinLaneWidth.	
1.6	speedLimits (1..9)	DF	Optional	SpeedLimitList ::= SEQUENCE (SIZE(1..9)) OF RegulatorySpeedLimit (see table 15.5).	
1.7	laneSet (1..255)	DF	Mandatory	<p>LaneList shall include all vehicle lanes of an intersection and all other lanes of an intersection that have signalized connections (e.g. including lanes for pedestrians (crosswalk), cyclists (bikeLane), tracked vehicles (trackedVehicles) and busses (vehicle)).</p> <p>In case of tolling stations, LaneSet shall contain all ingress and egress lanes at the tolling barrier for the current intersection geometry. Thus, the number of lanes in laneSet shall include at least two times the number of tolling lanes</p> <p>LaneList ::= SEQUENCE (SIZE(1..255)) OF GenericLane (see table 15.6).</p>	In case of tolling stations, LaneSet shall contain all ingress and egress lanes at the tolling barrier for the current intersection geometry. Thus, the number of lanes in laneSet should include at least two times the number of tolling lanes
1.8	preemptPriorityData (1..32)	DF	Optional	Not used. Data elements within are not further profiled.	

Table 15.1 IntersectionGeometryList → IntersectionGeometry

Level	Name	Type	M/O	Usage	Comment
1.9	regional	DF	Optional	Not used. REGION.Reg-IntersectionGeometry- addGrpC.	

Table 15.2 RoadSegmentList → RoadSegment

Level	Name	Type	M/O	Usage	Comment
1.0	RoadSegment	DF	Mandatory	Mandatory if 'roadSegment' is used.	
1.1	name	DE	Optional	Typically, human readable and recognizable by road authority.	
1.2	id	DF	Mandatory	(RoadSegmentReferenceID) The combination of region and id shall be unique within a country.	
1.2.1	region	DE	Mandatory		RoadRegulatorIDs are managed and assigned nationally, and each road regulator assigns IDs to road segments.
1.2.2	id	DE	Mandatory	The region-id combination shall be unique within a radius of <i>dRangeIdUnique</i> around each road segment.	The uniqueness within a radius is to ensure backwards compatibility with short-range communication deployments.
1.3	revision	DE	Mandatory	The revision number must be increased by 1 each time the MapData of this road segment changes. As defined in ISO TS 19091.	
1.4	refPoint	DF	Mandatory	The reference point can be at the beginning or end of the road section described.	
1.4.1	lat	DE	Mandatory		
1.4.2	long	DE	Mandatory		
1.4.3	elevation	DE	Optional	Not used. Replaced by regional Reg-Position3D.	
1.4.4	regional	DF	Optional	REGION.Reg-Position3D-addGrpC. Optional. When given provides altitude.	
1.4.4.1	altitude	DF	Optional	Consists of altitudeValue and altitudeConfidence. Only present for altitude with altitudeConfidence when they are known and can be provided.	
1.4.4.1.1	altitudeValue	DE	Optional		

Table 15.2 RoadSegmentList → RoadSegment

Level	Name	Type	M/O	Usage	Comment
1.4.4.1.2	altitudeConfidence	DE	Optional		
1.5	laneWidth	DE	Optional	Provides the default width of a lane for the road segment, while deviations from this lane width are provided using dWidth.	
1.6	speedLimits (1..9)	DF	Optional	SpeedLimitList ::= SEQUENCE (SIZE(1..9)) OF RegulatorySpeedLimit (see table 15.5).	
1.7	laneSet (1..255)	DF	Mandatory	LaneList shall include all vehicle lanes and should include all delimitations or barriers of a road segment (e.g. including road boundaries). Depending on the use case it may also include other types of lanes such as bicycle or pedestrian lanes. For further details see C_ROADS_WG2_TF2_Service Descriptions [9] LaneList ::= SEQUENCE (SIZE(1..255)) OF GenericLane (see table 15.6).	
1.9	regional	DF	Optional	Not used. REGION.Reg-IntersectionGeometry- addGrpC.	

Table 15.3 RestrictionClassList → RestrictionClassAssignment

Level	Name	Type	M/O	Usage	Comment
2.0	restrictionClassAssignment	DF	Mandatory	Mandatory if 'restrictionList is used.	
2.1	id	DE	Mandatory		
2.2	users	DF	Mandatory	RestrictionUserTypeList ::= SEQUENCE (SIZE(1..16)) OF RestrictionUserType	
2.2.1	restrictionUserType	DF	Mandatory		
2.2.1.1	basicType	DE	Optional	Used.	
2.2.1.2	regional (1..4)	DF	Optional	REGION.Reg-RestrictionUserType-addGrpC. Optional to provide emission restrictions.	

Table 15.3 *RestrictionClassList* → *RestrictionClassAssignment*

Level	Name	Type	M/O	Usage	Comment
2.2.1.2.1	emission	DE	Optional		
2.2.1.2.2	fuel	DE	Optional		

Table 15.4 *SignalHeadLocationList* → *SignalHeadLocation*

Level	Name	Type	M/O	Usage	Comment
3.0	SignalHeadLocation	DF	Optional		
3.1	nodeXY	DF	Mandatory		
3.2	nodeZ	DE	Mandatory		
3.3	signalGroupID	DE	Mandatory		

Table 15.5 *SpeedLimitList* → *RegulatorySpeedLimit*

Level	Name	Type	M/O	Usage	Comment
4.0	regulatorySpeedLimit	DF	Mandatory	Mandatory if 'speedLimits' is used.	
4.1	type	DE	Mandatory		
4.2	speed	DE	Mandatory		

Table 15.6 *LaneList* → *GenericLane*

Level	Name	Type	M/O	Usage	Comment
5.0	genericLane	DF	Mandatory	<p>Mandatory if 'laneSet' is used. ingress/egress not used if roadSegments are used.</p> <p>For each ingress approach at least one ingress lane of type vehicle shall be present.</p> <p>Vehicle ingress and egress lanes shall follow the main road with priority and have a minimum length of <i>pMinIngressLaneLength</i> and <i>pMinEgressLaneLength</i> respectively.</p> <p>Minor side-roads along the ingress</p>	

Table 15.6 LaneList → GenericLane

Level	Name	Type	M/O	Usage	Comment
				<p>lanes should not be described or interrupt the lane, while non-right-of-way merging lanes shall start at the diverge/merge point.</p> <p>At intersections with higher speed limits allowed ($> pSpeedLimitHigh$) the vehicle ingress lanes shall be minimum $pMinIngressLaneLengthHighSpeed$ long.</p> <p>If an adjacent intersection is closer than $pMinIngressLaneLength$ or in case the lane ends before $pMinIngressLaneLength$, ingress lanes shall be shortened to the first egress point of the adjacent intersection or to where the lane ends. If no MAPEM is transmitted for the adjacent intersection, the ingress lanes shall be shortened such that they don't intersect the adjacent intersection's conflict area.</p>	
5.1	laneID	DE	Mandatory	When an IVI message describes the same area, the lane identifiers as provided by the IVI message shall be used.	
5.2	name	DE	Optional		
5.3	ingressApproach	DE	Optional	<p>Not used when DF roadSegments is used. The following description of the usage is valid when DF intersections is used.</p> <p>Each ingress lane must have the ApproachID set. Ingress and egress approaches of the same arm have the same ApproachID.</p> <p>For unidirectional ingress lanes, the data element 'ingressApproach' (of type DE_ApproachID) shall be present and used.</p> <p>For lanes that cross both the ingress- and egress approach of an intersection arm (crosswalks) both data elements 'ingressApproach' and 'egressApproach' (of type DE_ApproachID) shall be present and used to indicate the approaches that are crossed. For further details on how to use these data elements, see ISO /TS 19091:2019 G.8.2.6.</p> <p>All bicycle lanes (separated from vehicle lanes) in one quadrant of an intersection have the same ingress ApproachID which is unique within</p>	Note: If a non-priority road is included into the ingress structure, all lanes of the non-priority roads should be grouped into one or several separate approaches that only represent these non-priority roads.

Table 15.6 LaneList → GenericLane

Level	Name	Type	M/O	Usage	Comment
				<p>the intersection. Bicycle lanes at safe islands have the ApproachID set in the same manner as pedestrian lanes, i.e. the ingress or egress ApproachID of the approach they cross.</p> <p>For lanes of type vehicle (LaneAttributes.LaneTypeAttributes = vehicle), ingress lanes of a common drive direction towards the intersection shall have a common ingress approach ID as a mandatory attribute.</p>	
5.4	egressApproach	DE	Optional	<p>Not used when roadSegments is used. The following description of the usage is valid when intersections is used.</p> <p>Each egress lane must have the ApproachID set. Ingress and egress approaches of the same arm have the same ApproachID.</p> <p>For unidirectional egress lanes, the data element 'egressApproach' (of type DE_ApproachID) shall be present and used.</p> <p>For lanes that cross both the ingress- and egress approach of an intersection arm (e.g. crosswalks) both data elements 'ingressApproach' and 'egressApproach' (of type DE_ApproachID) shall be present and used to indicate the approaches that are crossed.</p> <p>For further details on how to use these data elements, see ISO /TS 19091:2019 G.8.2.6.</p> <p>All bicycle lanes (separated from vehicle lanes) in one quadrant of an intersection have the same egress ApproachID which is unique within the intersection. Bicycle lanes at safe islands have the ApproachID set in the same manner as pedestrian lanes, i.e. the ingress or egress ApproachID of the approach they cross.</p>	Note: If a non-priority road is included into the ingress structure, all lanes of the non-priority roads should be grouped into one or several separate approaches that only represent these non-priority roads.
5.5	laneAttributes	DF	Mandatory		
5.5.1	directionalUse	DE	Mandatory		RoadSegments shall be provided as egressPath unless it is a bidirectional lane.

Table 15.6 LaneList → GenericLane

Level	Name	Type	M/O	Usage	Comment
5.5.2	sharedWith	DE	Mandatory	With bits as defined: overlappingLaneDescriptionProvided (0) multipleLanesTreatedAsOneLane (1) -- not permitted in profile as all lanes shall be described. otherNonMotorizedTrafficTypes (2) -- e.g. horse drawn individualMotorizedVehicleTraffic (3) -- passenger cars busVehicleTraffic (4) taxiVehicleTraffic (5) pedestriansTraffic (6) cyclistVehicleTraffic (7) trackedVehicleTraffic (8) pedestrianTraffic (9) -- use 6 instead (error)	
5.5.3	laneType	DF	Mandatory	Mandatory. Used in this profile: vehicle crosswalk bikeLane sideWalk median trackedVehicle -- see ISO TS19091 for pedestrian crossing examples.	
5.5.3.1	Vehicle	DE	Optional	(choice)	
5.5.3.2	crosswalk	DE	Optional	(choice)	
5.5.3.3	bikeLane	DE	Optional	(choice)	
5.5.3.4	sidewalk	DE	Optional	(choice)	
5.5.3.5	median	DE	Optional	(choice)	It can be used to indicate the kind of physical separation between traffic flows.
5.5.3.6	striping	DE	Optional	Not used.	
5.5.3.4	trackedVehicle	DE	Optional	(choice)	
5.5.3.5	parking	DE	Optional	Not used.	
5.5.4	regional	DF	Optional	Reg- LaneAttributes-addGrpC. .	
5.5.4.1	maxVehicleHeight	DE	Optional		
5.5.4.2	maxVehicleWidth	DE	Optional		
5.6	maneuvers	DE	Optional	The data element 'maneuvers' (of type DE_AllowedManeuvers) shall not be present in any instance of a 'generic lane' within a MAPEM.	
5.7	nodeList	DF	Mandatory	For toll stations, node list shall start at the tolling barrier and end where the tolling lanes merge to the motorway lanes for both ingress and egress lanes. Since the main highway road section may contain fewer lanes than the total number of channels, multiple lanes may be merged at their last	Definition: For intersections description, a 'conflict area' is the area of the intersection that is limited by the first nodes of ingress / egress vehicle lanes, first nodes of 'ingresspath' crosswalk lanes, and stop lines of bicycle lanes. For a better understanding, see also e.g. Figure G.6 in [ISO/TS 19091 2019-06].

Table 15.6 LaneList → GenericLane

Level	Name	Type	M/O	Usage	Comment
				point.	
5.7.1	nodes (2..63)	DF	Mandatory	<p>NodeSetXY ::= SEQUENCE (SIZE(2..63)) OF NodeXY (see table 15.7)</p> <p>Mandatory if 'nodeList' is used. Recommended use for curved lanes is to add an additional node when the centre line of the GenericLane deviates from the actual centre line more than 0.5m.</p> <p>When intersections is used, the first node of any vehicle lane shall be the node of the lane which is closest to the centre of the intersection. When roadSegments is used, the first node of any vehicle lane shall be the node of the lane the traffic flow reaches first.</p> <p>The number of node points shall be limited to pMaxNoOfNodesPerLane nodes per lane (for both ingress and egress lanes).</p> <p>The perpendicular distance between the linear connection of two node points and the center of the lane shall be less than pMaxPerpendDistLaneCenter.</p> <p>The number of nodes of a lane may exceed pMaxNoOfNodesPerLane to keep the perpendicular distance between the linear connection of two node points and the centre of the lane lower than pMaxPerpendDistLaneCenter, to fulfil pMinIngressLaneLength.</p> <p>The angle between the linear connection of two node points and the corresponding tangent to the lane center shall not be greater than pLaneAngleDeviation.</p>	
5.7.2	computed	DF	Optional	Not used.	
5.8	connectsTo (1..16)	DF	Optional	<p>ConnectsToList ::= SEQUENCE (SIZE(1..16)) OF Connection (see table 15.8).</p> <p>The data element 'connectsTo' (of type DF_ConnectsToList) shall be present at least for every ingress lane of an intersection that is controlled by</p>	

Table 15.6 LaneList → GenericLane

Level	Name	Type	M/O	Usage	Comment
				<p>a traffic light.</p> <p>When intersections is used, the data field 'connectsTo' shall include every possible connection between ingress and egress lanes of one intersection. The contained connections shall however not include those requiring lane changes in the conflict area (if applicable). U-turns are optional and only included if they are allowed by traffic rules. When u-turns are provided they must have a separate connection which has a signalGroupID that represents a virtual traffic signal for which SPATEM must contain movementPhaseState (9): caution-conflicting-traffic in case the maneuver is active.</p> <p>There shall be no duplicate connections indicated via 'connectsTo' between the same ingress and egress lanes for the same direction. The only exception may be userclass.</p> <p>When roadSegments is used, the data field 'connectsTo' shall include every possible connection between two lanes of a road segment.</p>	
5.9	overlays	DF	Optional	Not used.	
5.10	regional	DF	Optional	<p>REGION-Reg-GenericLane. To provide ConnectionTrajectory-addGrpC. Relevant for use case scenario safe intersection manoeuvre.</p> <p>Not used when roadSegments is used.</p>	
5.10.1	nodes	DF	Mandatory		
5.10.2	connectionID	DE	Mandatory		

Table 15.7 NodeSetXY → NodeXY

Level	Name	Type	M/O	Usage	Comment
6.0	nodeXY	DF	Mandatory	<p>Mandatory if 'nodes' is used.</p> <p>The absolute lateral offset of node points to the center of the lane shall be less than $pLateralNodeOffset$.</p>	<p>The angle between the linear connection of two node points and the corresponding tangent to the lane center shall not be greater than $pLaneAngleDeviation$.</p> <p>In more formal wording: let \vec{v} be the vector representing the linear connection of two node points, and \vec{w} be the vector representing the shortest distance of vector \vec{v} to the center of the lane (that is, is perpendicular to the tangent of the center line of the lane at the foot of the dropped perpendicular). Then for \vec{v} it shall always hold that $pLaneAngleDeviation$.</p> <p>For \vec{w} (i.e. \vec{w} crosses the lane center) the angle α between \vec{v} and the tangent to the lane center at the intersection point with the lane center shall be less than $pLaneAngleDeviation$.</p>
6.1	delta	DF	Mandatory		
6.1.1	node-XY1	DF	Optional	(choice) DF composed with X and Y, both mandatory.	
6.1.2	node-XY2	DF	Optional	(choice) DF composed with X and Y, both mandatory.	
6.1.3	node-XY3	DF	Optional	(choice) DF composed with X and Y, both mandatory.	
6.1.4	node-XY4	DF	Optional	(choice) DF composed with X and Y, both mandatory.	
6.1.5	node-XY5	DF	Optional	(choice) DF composed with X and Y, both mandatory.	
6.1.6	node-XY6	DF	Optional	(choice) DF composed with X and Y, both mandatory.	
6.1.7	node-LatLon	DF	Optional	The data element node-LatLon shall not be used for the Signalized Intersections use cases. Instead additional nodes shall be added.	
6.1.8	regional	DF	Optional	REGION.Reg-NodeOffsetPointXY. Not used.	
6.2	attributes	DF	Optional	<p>This DE provides any optional attributes which are needed. This includes changes to the current lane width and elevation. All attributes are provided in the order of the nodes (as opposed to the driving direction). Also left/right indications by attributes must be interpreted based on the order of the nodes.</p>	<p>'Merge point' definition: as all attributes are provided in the order of the nodes, a 'merge point' designates a node of a lane where the lane is split into two lanes in driving direction towards an intersection (ingress). On the other hand, a merge point on an egress lane is located, where two lanes end in one lane in driving direction. The opposite applies for 'diverge points'.</p>

Table 15.7 NodeSetXY → NodeXY

Level	Name	Type	M/O	Usage	Comment
6.2.1	localNode (1..8)	DF	Optional	<p>NodeAttributeXYList:: = SEQUENCE (SIZE (1..8)) OF NodeAttributeXY</p> <p>Node attributes Stopline, mergePoint and divergePoint are mandatory when applicable.</p> <p>The first node of an ingress lane, which is not a diverge or merge point, shall be the node that shall not be passed by a vehicle when movement is not allowed (from regulations, typically this is the stop line on the street).</p> <p>The node attribute 'stopLine' shall be used to indicate where the do-not-block section starts. In addition, the doNotBlock segment-attribute shall be appropriately enabled/disabled to indicate the do-not-block area.</p> <p>Each diverge or merge point (of type DF_NodeXY) shall be explicitly marked with corresponding node attribute (DF_NodeAttributeSetXY) "divergePoint" or "mergePoint".</p> <p>For diverging / merging lanes one node shall be defined as diverge / merge point. This node shall be present with the same absolute position with an accuracy of 0,1 meter in the ongoing lane and as first / last node in the diverging / merging lane.</p> <p>Note: this high accuracy can be achieved by calculating the cumulative node offset position relative to the referencePosition of both nodes.</p>	<p>'Merge point' definition: as all attributes are provided in the order of the nodes, a 'merge point' designates a node of a lane where the lane is split into two lanes in driving direction towards an intersection (ingress). On the other hand, a merge point on an egress lane is located, where two lanes end in one lane in driving direction. The opposite applies for 'diverge points.</p> <p>When ingress and egress approaches are not used, a merge point designates a node where two lanes end in one lane following the order of the nodes list. A diverge point designates a point where the lane is split into two lanes.</p> <p>Note: This adds on to [ISO/TS 19091 2019-06] where it is only stated that the first node "should be the node closest to the geometric centre of the intersection and is typically at the stop line". This is only part of the informative text – see [ISO/TS 19091 2019-06], 6.5.7.</p> <p>Note: For further details see [ISO/TS 19091 2019-06] 'localNode'.</p>
6.2.1.1	nodeAttributeXY	DE	Mandatory	Mandatory if localNode is used.	
6.2.2	disabled (1..8)	DF	Optional	<p>SegmentAttributeXYList ::= SEQUENCE (SIZE(1..8)) OF SegmentAttributeXY</p> <p>Subject to case. It is encouraged to use at least the segment attributes from the following categories, for which guidelines are provided in ISO TS 19091:</p>	<p>Note on tapers: the area where two lanes (partially) cover each other can be called taper-zone. The dimension of this zone is important for the path guidance of vehicles. It is expected that this zone covers the area where the real world lane width (i.e. the distance between the lane markings) is below pMinLaneWidth. This requirements cannot be checked</p>

Table 15.7 NodeSetXY → NodeXY

Level	Name	Type	M/O	Usage	Comment
				<ul style="list-style-type: none"> - General items - Porous lane states and merging - Bike lane needs - Lane geometry details - doNotBlock - taperToLeft - taperToRight <p>A SegmentAttributeXY of value 'doNotBlock' shall be present in the 'disabled' list at the first node of the lane thereafter, which may again be blocked by a vehicle.</p> <p>Tapers Tapers shall be described with a minimum of 2 nodes where the segmentAttributeXY of value "taperToLeft" or "taperToRight" is applied according to the following requirements.</p> <p>A SegmentAttributeXY of value 'taperToLeft' or 'taperToRight' shall be present in the 'enabled' list of the first node of the diverging lane (i.e. at the diverge point). For a diverging lane with tapering, the same 'taperToLeft' or 'taperToRight' shall be disabled via a SegmentAttributeXY in the 'disabled' list at the following node where the real world lane width exceeds pMinLaneWidth for the first time.</p> <p>A SegmentAttributeXY of value 'taperToLeft' or 'taperToRight' shall be present in the disabled' list of the last node of the merging lane (i.e. at the merge point). For a merging lane with tapering (as described above), the same 'taperToLeft' or 'taperToRight' shall be enabled via a SegmentAttributeXY in the 'enabled' list of the preceding node where the real world lane width falls below pMinLaneWidth for the first time.</p> <p>Note: This note provides a descriptive summary of the above requirements. For ingress lanes: in case of a fanout, the node farthest from the intersection is the merge point where 'taperToLeft' or 'taperToRight' is disabled, the other node is where the two lanes do not overlap anymore and the 'taperToLeft' or 'taperToRight' is enabled. In case of a lane-drop, the</p>	<p>based only on MAPEM-information because according to ISO 19091, clause G.8.2.8 DF_NodeAttributeSetXY, the reported laneWidth for a diverging or merging lane does not shrink towards the diverge- or merge-point.</p>

Table 15.7 NodeSetXY → NodeXY

Level	Name	Type	M/O	Usage	Comment
				<p>node closest to the intersection is the diverge point where 'taperToLeft' or 'taperToRight' is enabled, the other node is where the two lanes do not yet overlap and the 'taperToLeft' or 'taperToRight' is disabled. Left and right should in all cases be seen from the order of the nodes.</p> <p>The whiteLine attribute is used to indicate when the line on the inside of the node is continuous.</p> <p>Note: the lane width in the MAPEM is not affected throughout the taper segment (i.e. the use of dWidth is not required). However, as long as a taper is enabled it shall be assumed that 2 vehicles cannot driver side-by-side. Note: For further details see [ISO/TS 19091 2019-06] 'G.8.2.8 DF_NodeAttributeSetXY'.</p>	
6.2.2.1	segmentAttributeXY	DE	Mandatory	Mandatory if disabled is used.	
6.2.3	enabled (1..8)	DF	Optional	<p>SegmentAttributeXYList ::= SEQUENCE (SIZE(1..8)) OF SegmentAttributeXY</p> <p>Subject to case. It is encouraged to use at least the segment attributes from the following categories, for which guidelines are provided in ISO TS 19091:</p> <ul style="list-style-type: none"> - General items - Porous lane states and merging - Bike lane needs - Lane geometry details - doNotBlock - taperToLeft - taperToRight - whiteLine <p>A SegmentAttributeXY of value 'doNotBlock' shall be present in the 'enabled' list at the first node of the lane that shall not be blocked by a vehicle in case of a queue in front of the traffic light.</p> <p>For tapers and whiteLine see the usage as defined in level 6.2.2 'disabled'.</p>	
6.2.3.1	segmentAttributeXY	DE	Mandatory	Mandatory if enabled is used.	

Table 15.7 NodeSetXY → NodeXY

Level	Name	Type	M/O	Usage	Comment
6.2.4	data	DF	Optional	Not used when roadSegments is used.	
6.2.4.1	pathEndPointAngle	DE	Optional	Not used.	
6.2.4.2	pathEndPointAngle	DE	Optional	Not used.	
6.2.4.3	laneCrownPointCenter	DE	Optional	Not used.	
6.2.4.4	laneCrownPointLeft	DE	Optional	Not used.	
6.2.4.5	laneCrownPointRight	DE	Optional	Not used.	
6.2.4.6	laneAngle	DE	Optional	Not used.	
6.2.4.7	speedLimits (1..9)	DE	Optional	SpeedLimitList ::= SEQUENCE (SIZE(1..9)) OF RegulatorySpeedLimit (see table 15.5). (choice)	
6.2.4.8	regional	DF	Optional	REGION.Reg-LaneDataAttribute. Not used.	
6.2.5	dWidth	DE	Optional	The default lane width of the intersection is provided by laneWidth. Any significant lane width difference of at least 0.3 meters to this default width, shall be expressed. dWidth should not be used when no road marking exists (e.g. at toll stations) and lanes are not clearly indicated.	The location of road markings is deduced from the location of central line in the lane and the width of the lane.
6.2.6	dElevation	DE	Optional		
6.2.7	regional	DF	Optional	REGION.Reg-NodeAttributeSet-addGrpC. Mandatory for merging and diverging nodes when roadSegments is used.	
6.2.7.1	ptvRequest	DE	Optional		
6.2.7.2	nodeLink	DF	Mandatory	NodeLink ::= SEQUENCE SIZE (1..5) OF Node (see table 15.9)	

Table 15.8 ConnectsToList → Connection

Level	Name	Type	M/O	Usage	Comment
7.0	connection	DF	Optional	Mandatory if 'connectsTo' is used.	
7.1	connectingLane	DF	Mandatory		
7.1.1	lane	DE	Mandatory		
7.1.2	maneuver	DE	Mandatory	<p>The information in the data element 'maneuver' in 'connectingLane' shall be based on the lane marking arrows on the lane itself (if present).</p> <p>For data element 'maneuver' in 'connectingLane' exactly one of the first four bits of DE_AllowedManeuvers (i.e. exactly one direction indication per connectingLane) shall be set.</p> <p>The maneuver indication "maneuverLeft-/maneuverRightTurnonRedAllowed" and "maneuverLaneChangeAllowed" shall not be used. These permissions must be expressed by MovementPhaseState in SPATEM. Note: All other bits of the DE_AllowedManeuvers may be set but will not be used by current vehicle implementations.</p>	<p>The use of 'maneuver' (in connectsTo) over 'manoeuvres' (in GenericLane) is preferred, which provides the same information only in more detail. Therefore, manoeuvres (in GenericLane) is not used.</p> <p>In case there are no lane marking arrows on the street, the responsible human message designer shall decide the content of the data element individually for every lane.</p>
7.2	remoteIntersection	DF	Optional	Not used when roadSegments is used. Only used if the referenced intersection is part of the same MAPEM.	
7.2.1	region	DE	Optional		
7.2.2	id	DE	Mandatory		
7.3	signalGroup	DE	Optional	<p>Not used when roadSegments is used.</p> <p>Mandatory for every connection that is signalised with an operational traffic light. If there is no traffic light, there is no signalGroup required.</p> <p>Note that there is no 1:1 relation between signal heads and connections, e.g. if a connection is controlled by 2 signals, their combined state shall be reflected in the eventState. An exception is when multiple user classes share a lane and each user class is served with separate signals (e.g. public</p>	

				transport). In such a case, a lane may have multiple (overlapping) connections, each with a unique signalGroup and the userClass restriction set. Every given 'signalGroup' / 'intersectionReferenceID' tuple in the MAPEM shall also be found in the SPATEM.	
7.4	userClass	DE	Optional		
7.5	connectionID	DE	Optional	Shall be used to provide a connection index when ConnectionManeuverAssist or ConnectionTrajectory-addGrpC is used. Not used when roadSegments is used.	

Table 15.9 NodeLink → Node

Level	Name	Type	M/O	Usage	Comment
8.0	Node	DE	Optional		
8.1	id	DE	Mandatory	Id of the linked node.	As current use is only for merging and diverging points, it is the id of the node from another lane that is at the same position as this node.
8.2	lane	DE	Mandatory	Identifier of lane from which node has been issued shall be given.	
8.3	connectionID	DE	Optional	Not used.	
8.4	intersectionID	DF	Optional	Not used.	

4.2.3.3 SPATEM general elements

Table 16 SPATEM data elements

Level	Name	Type	M/O	Usage	Comment
0.0	Spat	DF	Mandatory		
0.1	timeStamp	DE	Optional	Not used	
0.2	name	DE	Optional	Not used	