



# Position Services

## Road Control

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RML file format

version 1.1



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## 2 HISTORY

Version	Published	Author	Description
1.1.5	8.1.2015	J. Melechovský	
1.1.5	13.2.2015	J. Melechovský	Added warning concerning some properties of the DT_VEHICLE structure
1.1.5	25.6.2015	J. Melechovský	Some missing vehicle properties added
1.1.5.	30.6.2015	J. Melechovský	Warning about the fleet homogeneity removed
1.1.5	4.9.2015	J.Melechovský	New properties added to structures DT_VEHICLE and DT_NODE
1.1.5	22.10.2015	J. Melechovský	New property <waiting_time> added to structure DT_ROUTE_NODE
1.1.5	4.2.2016	J. Melechovský	New properties added to structures DT_VEHICLE and DT_NODE. Attribute "id" added to structure DT_ROUTE
1.1.6	27.5.2016	J. Melechovský	Property <node_failures> added to structure <result> Attribute "relaxed_access" added to structure DT_ROUTE_NODE

### 3 GENERAL STRUCTURES

#### 3.1 DT\_SETTINGS

<setting type="">

Computation settings

Possible values of the "type" attribute:

TimeoutLimitInSeconds	Timeout in seconds limiting task computation time Default value: 0 (unbounded)
resultcontents	Detailed routes itinerary is/is not required

##### 3.1.1 TIMEOUTLIMITINSECONDS

Description:

Timeout in seconds limiting task computation time.

Default value: 0 (unbounded)

##### 3.1.2 RESULTCONTENTS

Description:

Specifies the required data in the result. If the detailed route itinerary is not required, the total calculation time might be reduced significantly. The returned result then contains the route schedules, but the binary data of the detailed itinerary are not present.

Default value: 0x0002

0x0001	Result without the detailed itinerary data
0x0002	Result including the detailed itinerary data

#### 3.2 DT\_VEHICLE

<vehicle>	
<id>	Mandatory parameter, unique vehicle Id within the task frame
<label>	Optional parameter, vehicle name
<type>	Optional parameter, vehicle type Enabled values:
	Auto
	Bus
	Pedestrian
	Truck
	Van



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	Default value: Auto
<profile_label>	Optional parameter, vehicle profile name
<type_special>	Optional parameter for special assignment vehicles Enabled values:
	0x0001 taxi
	0x0002 delivery
	0x0003 emergency vehicles
<route_settings>	Optional parameter, route character specifications
<setting type="">	Route character specifications Enabled values of the "type" attribute:
	Route_mode Route computation mode
	Route_directions Accepting directions
	Route_bypass_tollrd Bypassing tollroads
	Route_enhanced_urns Enhanced U-turnability
	Route_legislative_restrictions Local legislative restrictions
	Route_suppress_nothroughtr Suppressing non-rideability (through traffic)
	Route_suppress_localroads Suppressing local roads (they are considered non-rideable when determining through traffic)
	Route_enforce_dataspeeds Using speed categories stored in data layers (according to vehicle type)
</route_settings>	
<features>	Optional parameter, enhanced settings of vehicle and cargo
<feature type="">	Vehicle dimensional and cargo specifications Enabled values of the "type" attribute:
	hazmat Hazardous material
	height Height of the vehicle (cm)
	weight Weight of the vehicle (kg)
	weightperaxel Weight per axle (kg)
	length Length of the vehicle (cm)
	width Width of the vehicle (cm)
	numoftrailers Number of trailers
	numofaxles Number of axles
	kpralength KPRA length (cm)
	hazmatpermit Permits for hazardous materials
	specialcargo Additional cargo specifications
</features>	
<speed_highway>	Optional parameter, vehicle speed on highway (km/h)
<speed_class1>	Optional parameter, vehicle speed on class 1 roads (km/h)
<speed_class2>	Optional parameter, vehicle speed on class 2 roads (km/h)
<speed_class3>	Optional parameter, vehicle speed on class 3 roads (km/h)
<speed_village_road>	Optional parameter, vehicle speed on local roads (km/h)
<count>	Optional parameter, number of available vehicles Default value: 0 (unbounded)
<shift_interval>	Optional parameter, vehicle work start and duration (only local time supported at the moment)



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	ISO 8601 format "YYYY-MM-DDTHH:MM/PTxHxM". Only the interval alone is also supported (PTxHxM). E.g.: "2013-10-22T8:00:00/PT8H30M" or " PT8H30M"
<max_work_time>	Optional parameter, maximum driving time until the mandatory break in minutes.
<min_break_time>	Optional parameter, minimum break time in minutes
<initial_work_time>	Optional parameter, initial driving time in minutes
<service_time_as_break_time>	Optional parameter, the service time can be considered as the mandatory break time if its duration is at least as long as the break time duration. Enabled values: allowed denied Default value: denied
<costs_km>	Optional parameter, cost per km Default value: 1.0
<costs_ride>	Optional parameter, fixed ride cost
<idle_time_cost>	Optional parameter, cost per idle or waiting time at the customer
<cost>	Mandatory parameter, cost per time interval
<interval>	Mandatory parameter, time interval (in minutes)
<type>	Optional parameter, the type of the final cost calculation Enabled values of parameter <type>: 0 the cost is calculated as the sum of the idle time cost at each customer 1 the cost is calculated as the sum of the cost for every started idle time interval at each customer 2 the cost is calculated for the total idle time in the route rounded up to the entire interval Default value: 0
</idle_time_cost>	
<capacities>	Optional parameter, list of vehicle capacities
<capacity type="">	Optional parameter, numerical capacity value Attribute "type" is optional and links to the "type" attribute of the <demand...> field (must be unique within the vehicle frame)
</capacities>	
<start_node_id>	Mandatory parameter, ID of the starting place
<finish_node_id>	Optional parameter, ID of the finish place
<availabilities>	Optional parameter, time intervals specifying when the vehicle is available
<availability>	
<interval>	Mandatory parameter, interval (only local time is supported at the moment) ISO 8601 format: "YYYY-MM-DDTHH:MM/PTxHxM" e.g.: "2013-10-22T13:00:00/PT1H30M"
</availability>	
</availabilities>	
<rctags>	Optional parameter, semicolon delimited string containing vehicle



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	specifications (e.g.: "3P1 3602;crane")						
<attributes>	Optional parameter						
<attribute name="">	Vehicle attributes Enabled values of the "name" attribute:						
	<table border="1"><tr><td>priority</td><td>Vehicle priority in the solution</td></tr><tr><td>priority_weight</td><td>Priority weight of the vehicle usage</td></tr><tr><td>accelerator</td><td>Acceleration/deceleration of the vehicle</td></tr></table>	priority	Vehicle priority in the solution	priority_weight	Priority weight of the vehicle usage	accelerator	Acceleration/deceleration of the vehicle
priority	Vehicle priority in the solution						
priority_weight	Priority weight of the vehicle usage						
accelerator	Acceleration/deceleration of the vehicle						
</attributes>							
<max_number_reloads>	Optional parameter, maximum number of reloads at the depot Default value: 0 (unbounded)						
</vehicle>							

### 3.2.1 ROUTE\_SETTINGS

#### 3.2.1.1 ROUTE\_MODE

Description:

Route computation criteria.

Default value: fastest

Enabled values:

fastest	Fastest route is preferred
shortest	Shortest route is preferred

#### 3.2.1.2 ROUTE\_DIRECTIONS

Description:

Enforces restrictions for one-way roads.

Default value: true

true	
false	

#### 3.2.1.3 ROUTE\_BYPASS\_TOLLRD

Description:

Enforces bypassing of toll roads.

Default value: false

true	
false	



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#### 3.2.1.4 ROUTE\_ENHANCED\_UTURNS

Description:

Enables enhanced U-turnability. If "true" the vehicle can revisit previously visited areas to reach routes that haven't been allowed before (due to turn prohibitions etc).

Default value: false

true	
false	

---

#### 3.2.1.5 ROUTE\_LEGISLATIVE\_RESTRICTIONS

Description:

Enforces local legislative restrictions.

Default value: false

true	
false	

---

#### 3.2.1.6 ROUTE\_SUPPRESS\_NOTHROUGHTR

Description:

Suppresses non-rideability (through traffic). If "true" the vehicle can route through non-rideable areas.

Default value: false

true	
false	

---

#### 3.2.1.7 ROUTE\_SUPPRESS\_LOCALROADS

Description:

Suppresses local roads. If "true" they are considered non-rideable when determining rideability.

Default value: false

true	
false	

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#### 3.2.1.8 ROUTE\_ENFORCE\_DATASPEEDS

Description:





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Defines which speed values will be used when computing routes.

Default value: false

true	When computing routes the algorithm will use internal speeds stored in data layers of the individual countries.
false	When computing routes the algorithm will use speeds defined in the DT_VEHICLE (<speed_... >) structure. Unspecified categories will use preset values from the base vehicle profile.

### 3.2.2 FEATURES

#### 3.2.2.1 HAZMAT

**Beware:** This field contains a bitmask value of all the hazardous materials in the cargo

0x0001	Explosives
0x0002	Gas
0x0004	Flammables
0x0008	Flammable solid/combustible
0x0010	Organic
0x0020	Poison
0x0040	Radioactive
0x0080	Corrosive
0x0100	Other
0x0200	Poisonous inhalation hazard
0x0400	Goods harmful to water
0x0800	Explosive and flammable

#### 3.2.2.2 HAZMATPERMIT

**Beware:** This field contains a bitmask value of all the permits for hazardous materials in the cargo

0x0001	Explosives
0x0002	Gas
0x0004	Flammables
0x0008	Flammable solid/combustible
0x0010	Organic
0x0020	Poison
0x0040	Radioactive
0x0080	Corrosive
0x0100	Other
0x0200	Poisonous inhalation hazard

#### 3.2.2.3 SPECIALCARGO

**Beware:** This field contains a bitmask value of all the special cargo types

0x0001	Refrigerated
0x0002	Car transport



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0x0004	Quick degrading goods
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### 3.2.3 ATTRIBUTES

#### 3.2.3.1 PRIORITY

Description:

Vehicle priority in the solution. In the current version only boolean values are supported determining whether the vehicle should be included the available vehicles.

Default value: 1.0

1.0	The vehicle can be used in the solution
0.0	The vehicle can not be used in the solution

#### 3.2.3.2 PRIORITY\_WEIGHT

Description:

Priority weight of the vehicle usage. Vehicles with greater value of priority weight are preferred if the value of the attribute "PRIORITY" equals 1.0 as well.

Default value: 1.0

1.5	top priority
1.0	medium priority
0.5	low priority

#### 3.2.3.3 ACCELERATOR

Description:

A coefficient which multiplies the speeds defined in DT\_VEHICLE (<speed\_... >).

Default value: 1.0

>1.0	fast vehicle
1.0	standard speed settings
<1.0	slow vehicle

**Remark:** Values in the interval [0.8;1.2] are recommended.

### 3.3 DT\_NODE

<node>	
<id>	Mandatory parameter, unique place ID (in the solution scope)
<label>	Optional parameter, place label
<position>	Mandatory parameter, place coordinates in format:



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	<position>PROJECTION_ID;LONGITUDE;LATTITUDE</position> E.g.: "<position>WGS-84; 14.433820; 50.073897</position>"
<sdblabeled>	Optional parameter, sdb label
<country>	Optional parameter, country (not supported in the current version)
<zip>	Optional parameter, zip
<region>	Optional parameter, region (not supported in the current version)
<county>	Optional parameter, county
<city>	Optional parameter, city
<street>	Optional parameter, street
<house_number>	Optional parameter, house number
<attributes>	Mandatory parameter
<attribute name="">	Enabled values of the "name" attribute:
type	Place type
fixed_vehicle_id	Link to a specific vehicle
fixed_order	Fixed place in the places order
priority	Place usage priority
priority_weight	Place service priority weight
</attributes>	
<time_windows>	Optional parameter, time windows for the place
<time_window>	Mandatory parameter, definition of the time window when this place can be served
<interval>	Mandatory parameter, time interval (only local time supported at the moment) ISO 8601 format: "YYYY-MM-DDTHH:MM/PTxHxM" E.g.: "2013-10-22T13:00:00/PT1H30M"
<service_time>	Optional parameter, time in minutes required to serve the place in this time window
</time_window>	
</time_windows>	
<demands>	Optional parameter, list of demands
<demand>	
<capacity type="">	Mandatory parameter, numerical value indicating demand for the given capacity type (if specified) Attribute "type" is optional and serves to link to the "type" attribute of vehicle capacity (has to be unique in the demands scope)
</demand>	
</demands>	
<handling_times>	Optional parameter, time required to manipulate a certain quantity, used together with the parameter demands
<handling_time type="">	Mandatory parameter, the handling time definition. Attribute "type" is optional and serves to link to the same attribute of demands (has to be unique in the handling_times scope)
<time>	Mandatory parameter, handling time (minutes)
<units>	Mandatory parameter, number of units linked to the handling time definition Example: <time>30</time> <units>100</units>



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	Handling of 100 units takes 30 minutes.
</handling_time>	
</handling_times>	
<rctags>	Optional parameter, list of the place tags
<inclusive>	Optional parameter, semicolon delimited string defining required properties (E.g.: "crane;Freddy")
<exclusive>	Optional parameter, semicolon delimited string defining prohibited properties
</rctags>	
<custom_note>	Optional parameter, additional information describing the place
</node>	

### 3.3.1 ATTRIBUTES

#### 3.3.1.1 TYPE

**Beware:** Mandatory field.

Description:

Sets the place type according to its function. In current version only distribution places (depots) and service places (customers) are supported.

Default value: service

depot	Distribution place
service	Service requiring place

#### 3.3.1.2 FIXED\_VEHICLE\_ID

Description:

Only specified if this place is to be fixed to a given vehicle Id. The place will be served with the specified vehicle.

**Remark:** Actually, this attribute is valid only if all places of the type "service" have attributes "fixed\_vehicle\_id" and "fixed\_order".

Default value: none

vehicle_id:vehicle_order	Two identifiers linking vehicle to a place. E.g. "0:0"
--------------------------	--

#### 3.3.1.3 FIXED\_ORDER

Description:

Place order in the given vehicle route linked through the <attribute name="fixed\_vehicle\_id"> field. If no valid result is found in <result> or the "fixed\_vehicle\_id" value isn't specified, this value is ignored.

**Remark:** Actually, this attribute is valid only if all places of the type "service" have attributes "fixed\_vehicle\_id" and "fixed\_order".

Default value: none

integer	Place order in the list of all the fixed places
---------	---

### 3.3.1.4 PRIORITY

Description:

Place priority in the solution. In the current version only boolean values are supported determining whether the place should be included the solution.

Default value: 1.0

1.0	Place has to be served
0.0	Place must not be served

### 3.3.1.5 PRIORITY\_WEIGHT

Description:

Place service priority weight. In case the vehicle fleet size is not sufficient to service all places in the solution, places with larger priority weight are preferred. The value of the attribute "PRIORITY" must equal 1.0 as well.

Default value: 1.0

2.0	top priority
1.0	standard priority

## 3.4 DT\_ROUTE\_NODE

<node>	Always present, at least 2 instances
<node_id>	Always present, place Id
<arrival>	Always present, time of arrival to the place (in current version only local time is supported) ISO 8601 format: "YYYY-MM-DDTHH:MM"
<departure>	Always present, time of departure from the place (in current version only local time is supported) ISO 8601 format: "YYYY-MM-DDTHH:MM"
<latest_departure>	Always present, time of the latest tolerable departure from the place (in current version only local time is supported) ISO 8601 format: "YYYY-MM-DDTHH:MM"
<depot_distance>	Always present, cumulative distance from the depot (m)
<time_window_index>	Present if the time window contains the arrival time, index of the time window used
<service_time>	Present if there is a specific amount of time needed to service this place (minutes)



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<loads>	Present if a list of loads was specified for this place
<load type="">	Numerical value, ammount loaded "type" attribute is optional and links to the "type" attribute of vehicle capacity, has to be unique in the loads scope
</loads>	
<unloads>	Present if a list of unloads was specified for this place
<unload type="">	Numerical value, ammount unloaded "type" attribute is optional and links to the "type" attribute of vehicle capacity, has to be unique in the unloads scope
</unloads>	
<breaks>	Present if some computed breaks were specified
<break>	
<interval>	Always present, time interval of the break (in current version only local time is supported) ISO 8601 format: "YYYY-MM-DDTHH:MM/PTxHxM", E.g.: "2013-10-22T13:00:00/PT1H30M"
<during_service>	Present if a break is planned during this place's service, contains the place Id
</break>	
</breaks>	
<attributes>	Present if any extended place info was specified
<attribute name="">	Enabled values of the "name" attribute:
relaxed	General information about some condition's relaxation
relaxed_twfrom	Time window start is relaxed
relaxed_twto	Time window end is relaxed
relaxed_incltags	Place inclusive tags are relaxed
relaxed_excltags	Place exclusive tags are relaxed
relaxed_demand_dim1	First demand condition is relaxed
relaxed_demand_dim2	Second demand condition is relaxed
relaxed_demand_dim3	Third demand condition is relaxed
relaxed_demand_dim4	Fourth demand condition is relaxed
relaxed_demand_dim_other	Demand for an unspecified type is relaxed
relaxed_access	Vehicle profile restrictions are relaxed
</attribute>	
</attributes>	
</node>	

### 3.4.1 ATTRIBUTES

#### 3.4.1.1 RELAXED

Description:

Information of a certain task condition's relaxation.

Default value: false



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true	Condition is relaxed
false	Condition is complied

#### 3.4.1.2 RELAXED\_TWFROM

Description:

Relaxation of the time window start condition.

Default value: false

true	Condition is relaxed
false	Condition is complied

#### 3.4.1.3 RELAXED\_TWTO

Description:

Relaxation of the time window end condition.

Default value: false

true	Condition is relaxed
false	Condition is complied

#### 3.4.1.4 RELAXED\_INCLTAGS

Description:

Relaxation of the inclusive tags condition.

Default value: false

true	Condition is relaxed
false	Condition is complied

#### 3.4.1.5 RELAXED\_EXCLTAGS

Description:

Relaxation of the exclusive tags condition.

Default value: false

true	Condition is relaxed
false	Condition is complied

#### 3.4.1.6 RELAXED\_DEMAND\_DIM1

Description:



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Relaxation of the first demand condition.

Default value: false

true	Condition is relaxed
false	Condition is complied

---

#### 3.4.1.7 RELAXED\_DEMAND\_DIM2

Description:

Relaxation of the second demand condition.

Default value: false

true	Condition is relaxed
false	Condition is complied

---

#### 3.4.1.8 RELAXED\_DEMAND\_DIM3

Description:

Relaxation of the third demand condition.

Default value: false

true	Condition is relaxed
false	Condition is complied

---

#### 3.4.1.9 RELAXED\_DEMAND\_DIM4

Description:

Relaxation of the fourth demand condition.

Default value: false

true	Condition is relaxed
false	Condition is complied

---

#### 3.4.1.10 RELAXED\_DEMAND\_DIM\_OTHER

Description:

Relaxation of the demand condition for an unspecified type.

Default value: false

true	Condition is relaxed
false	Condition is complied



### 3.4.1.11 RELAXED\_ACCESS

Description:

Relaxation of vehicle profile restrictions.

Default value: false

true	Condition is relaxed
false	Condition is complied

## 3.5 DT\_ROUTE

<route id="">	The attribute "id" is always present, route identifier in the result scope
<vehicle_id>	Always present, Id of the vehicle
<vehicle_order>	Always present, order of the vehicle
<cost>	Always present, cost of the vehicle's route
<time>	Always present, total route time (minutes)
<length>	Always present, total route length (m)
<routeloads>	Present if demands were specified, total route load
<load type="">	Amount loaded (numerical value) "type" attribute is optional and links to the "type" attribute of vehicle capacity, must be unique in the loads scope
</routeloads>	
<nodes>	Always present
DT_ROUTE_NODE	DT_ROUTE_NODE structure
</nodes>	
<route_attributes>	Present if enhanced route information were specified
<attribute name="">	Enabled values of the "name" attribute: vehicle_flags      Additional vehicle characteristic used in the solution
</route_attributes>	
</route>	

### 3.5.1 ROUTE\_ATTRIBUTES

#### 3.5.1.1 VEHICLE\_FLAGS

Description:

Additional vehicle characteristic used in the solution. In the current version it's only present if the given route is serviced by a virtual vehicle (meaning that not enough vehicles of the given type are available to create a solution).

Default value: 0

0	No additional vehicle characteristic
0x0001	Virtual vehicle

#### 4 FORMAT OF RML VERSION 1.1

<rml version="1.1">	
<params>	Mandatory, parameters of the Road Control task
<settings>	Optional parameter, general settings
DT_SETTINGS	DT_SETTINGS
</settings>	
<vehicles>	Mandatory parameter, vehicle fleet specification
DT_VEHICLE	DT_VEHICLE structure
</vehicles>	
<nodes>	Mandatory parameter, places specification
DT_NODE	DT_NODE structure
</nodes>	
</params>	
<result>	
<totalcost>	Always present, total solution cost
<totallength>	Always present, total length of all the routes (m)
<totalloads>	Present if loads are specified, total amount loaded
<load type="">	Numerical value, amount loaded "type" attribute is optional and links to the "type" attribute of vehicle capacity, has to be unique in the loads scope
</totalloads>	
<node_failures>	Optional parameter, list of places that could not be served.
<failure nodeid="">	Reason of place service failure. The attribute "nodeid" is mandatory. It holds the place identifier. Enabled values:
	0 no failure
	1 distance matrix calculation failed to process the place due to vehicle profile restrictions
	2 place was rejected from the solution during the optimization phase due to restrictive working time settings
	3 place was rejected during the final route itinerary calculation due to vehicle profile restrictions
</node_failures>	
<routes>	Always present, routes list
DT_ROUTE	DT_ROUTE structure
</routes>	
</result>	
</rml>	

## 5 EXAMPLES

### 5.1 EXAMPLE 1 – RML TASK SPECIFICATION FOR ROADCONTROL

```
<rml version="1.1">
  <params>
    <settings>
    </settings>
    <vehicles>
      <vehicle>
        <id>0</id>
        <label>Vehicle 1</label>
        <profile_label>Auto</profile_label>
        <route_settings>
          <setting type="Route_enforce_dataspeeds">>false</setting>
        </route_settings>
        <features>
        </features>
        <speed_highway>114</speed_highway>
        <speed_class1>76</speed_class1>
        <speed_class2>55</speed_class2>
        <speed_class3>41</speed_class3>
        <speed_village_road>25</speed_village_road>
        <shift_interval>PT12H</shift_interval>
        <max_work_time>270</max_work_time>
        <min_break_time>45</min_break_time>
        <service_time_as_break_time>denied</service_time_as_break_time>
        <costs_km>2.000000000</costs_km>
        <costs_ride>250.000000000</costs_ride>
        <idle_time_cost>
          <cost>100.000000000</cost>
          <interval>60</interval>
          <type>0</type>
        </idle_time_cost>
        <capacities>
          <capacity type="kg">800.000000</capacity>
          <capacity type="m3">100.000000</capacity>
          <capacity type="pcs">1000.000000</capacity>
          <capacity type="l">12000.000000</capacity>
        </capacities>
        <start_node_id>0</start_node_id>
        <rctags>Vozidlo 1</rctags>
        <attributes>
          <attribute name="priority">1.000000000</attribute>
        </attributes>
      </vehicle>
    </vehicles>
    <nodes>
      <node>
        <id>0</id>
        <label>Depot1</label>
        <sdbl_label>CZ, Praha 7, Tusarova 1439/12</sdbl_label>
        <position>Gauss Pas3;5552446.65;3460446.22</position>
      </node>
    </nodes>
  </params>
</rml>
```



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```
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</xml>
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Position s.r.o.

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