WSRP instance structure

This document explains data structure of WSRP instances. There are 42 instances grouped into 6 scenarios. Each scenario has 7 problem instances.

A zip folder contains data for an instance. Each zip folder contains 9 files.

1. areas.xml
2. transportaionmodes.xml
3. humanresources.xml
4. contracts.xml
5. tasks.xml
6. matrices.xml
7. humansolution.xml
8. metadata.xml
9. extraction.log

Note that data contain in file number 1-7.

The following pages describes xml structure, fields and attributes on each data file.

* 1. **File #1: areas.xml**
     1. **XML File**

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| --- | --- |
| 1:  2:  3:  4:  5:  6:  7:  8: | <?**xml** **version**="1.0"?>  <**areas** **version**="2.0">  <**area** **id**="xs:integer">  <**location** **id**="xs:integer"/>  ⁞  </**area**>  </**areas**> |

* + 1. **Description**

The areas.xml file contains a list of all areas and in each area a list of all its locations. Only the IDs are stored. All distances information are provided by the matrices.xml file using the locations IDs.

* + 1. **Details**

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| --- | --- | --- | --- |
| **Line** | **Field** | **Attribute** | **Description** |
| 4: | **area** | **id** | Id number of a given area. |
| 5: | **location** | **id** | Id number of a given location. |

* 1. **File #2: transportationmodes.xml**
     1. **XML File**

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| 1:  2:  3:  4:  5:  6:  7:  8:  9:  10:  11:  12:  13:  14:  15:  16:  17:  18:  19:  20:  21:  22: | <?**xml** **version**="1.0"?>  <**transportationModes** **version**="2.0">  <**transportationMode** **id**="xs:integer">  <**distanceMatrix** **id**="xs:integer"/>  <***timeMatrix*** **id**="xs:integer"/>  <**availableAreas**>  <***availableInEveryArea***/>  <***area*** **id**="xs:integer"/>  ⁞  </**availableAreas**>  <***costs***>  <***costMatrix*** **id**="xs:integer"/>  <***fixedMileage*** **mileRate**="xs:float" ***minimumPayment***="xs:float"/>  <***tasksMileages***>  *<****standardMileage*** **mileRate**="xs:float" ***minimumPayment***="xs:float"/>  *<****mileage*** **taskId**="xs:integer" **mileRate**="xs:float" ***minimumPayment***="xs:float"/>  ⁞  </***tasksMileages***>  </***costs***>  </**transportationMode**>  </**transportationModes**> |

* + 1. **Description**

The transportationmodes.xml file presents all the information regarding the available transportation modes. Note that if different staff members use similar transportation modes (for instance, car), but the cost is calculated differently, two different transportation modes should be used, one for each staff member.

* + 1. **Details**

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| **Line** | **Field** | **Attribute** | **Description** |
| 4: | **transportationMode** | **id** | Id of a given transportation mode (car, bus, etc.). |
| 5: | **distanceMatrix** | **id** | Id of the distance matrix used by this transportation mode. |
| 6: | **timeMatrix** | **id** | Id of the time matrix used by this transportation mode. |
| 7: | **availableAreas** | **-** | Area in which the transportation mode is available. |
| 8: | **availableInEveryArea** | **-** | Means that the given transportation mode is available in all areas. |
| 9: | **area** | **id** | Id of the area in which the given transportation mode is available. |
| 12: | **costs** | **-** | Field indicating how the costs are calculated for the given transportation mode. Note that if multiple costs are selected, they should be summed. |
| 13: | **costMatrix** | **id** | Id of the matrix containing the travelling costs between locations. Used on features #1 and #22. |
| 14: | **fixedMileage** | **-** | This field indicated a fixed mileage for all routes. Used on features #1 and #22. |
| 14: | **fixedMileage** | **mileRate** | This attribute is a real value representing the locomotion costs of the given transportation mode for a mile. Used on features #1 and #22. |
| 14: | **fixedMileage** | **minimumPayment** | This attribute is a real value representing the minimum amount that should be paid for a travel. Default value: 0.0. Used on features #1 and #22. |
| 15: | **tasksMileages** | **-** | This field represents a cost mode where travelling to each task has different costs. Used on features #1 and #22. |
| 16: | **standardMileage** | **-** | This field represents a standard value to be used in case a task has no special mileage. Used on features #1 and #22. |
| 16: | **standardMileage** | **mileRate** | This attribute is a real value representing the locomotion costs of the given transportation mode for a mile. Used on features #1 and #22. |
| 16: | **standardMileage** | **minimumPayment** | This attribute is a real value representing the minimum amount that should be paid for a travel. Default value: 0.0. Used on features #1 and #22. |
| 17: | **mileage** | **-** | This field contains the value to calculate the mileage to a specific task. Used on features #1 and #22. |
| 17: | **mileage** | **taskId** | The id of the task for the given mileage costs. |
| 17: | **mileage** | **mileRate** | This attribute is a real value representing the locomotion costs of the given transportation mode for a mile. Used on features #1 and #22. |
| 17: | **mileage** | **minimumPayment** | This attribute is a real value representing the minimum amount that should be paid for a travel. Default value: 0.0. Used on features #1 and #22. |

* 1. **File #3: humanresources.xml**
     1. **XML File**

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| 1:  2:  3:  4:  5:  6:  7:  8:  9:  10:  11:  12:  13:  14:  15:  16:  17:  17a  18:  19:  20:  21:22:  23:  23a  24:  25:  26:  27:  28:  29:  30:  31:  32:  33:  34:  35:  36: | <?**xml** **version**="1.0"?>  <**humanResources** **version**="2.0">  <**humanResource** **id**="xs:integer">  <**startLocation** **id**="xs:integer"/>  <**endLocation** **id**="xs:integer"/>  <**contracts**>  <**contract** **id**="xs:integer"/>  ⁞  </**contracts**>  <**skills**>  <**skill** **id**="xs:integer" ***proficiencyLevel***="xs:float" ***alternative***="yes|no" />  ⁞  </**skills**>  <**availabilities**>  <***availableAlltheTime***/>  <***notAvailable***/>  <***available*** **day**="xs:integer" **from**="xs:integer" **to**="xs:integer"  ***preferenceLevel***="xs:float"/>  ⁞  </**availabilities**>  <**availableAreas**>  <***availableInEveryArea***/>  <***notAvailable***/>  <***area*** **id**="xs:integer" ***preferenceLevel***="xs:float"/>  ⁞  </**availableAreas**>  <**availableTransports**>  <**transportationMode** **id**="xs:integer" ***preferenceLevel***="xs:float"/>  </**availableTransports**>  <***preferredPartners***>  <**hr** **id**="xs:integer" ***preferenceLevel***="xs:float"/>  ⁞  </***preferredPartners***>  </**humanResource**>  ⁞  </**humanResources**> |

* + 1. **Description**

The humanresources.xml file presents all the information and preferences of staff members. The file is composed by a list of staff members each one with its basic data and preferences.

* + 1. **Details**

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| **Line** | **Field** | **Attribute** | **Description** |
| 4: | **humanResource** | **id** | Id of a given human resource. |
| 5: | **startLocation** | **id** | Id of the start location in which the staff member starts its daily route. |
| 6: | **endLocation** | **id** | Id of the end location in which the staff member starts its daily route. |
| 7: | **contracts** | **-** | List of contracts valid for the given staff member. |
| 8: | **contract** | **id** | Id of a valid contract. |
| 11: | **skills** | **-** | List of skills possessed by a staff member. |
| 12: | **skill** | **id** | Id of a skill. Note that the id is the only information stored in the files. |
| 12: | **skill** | **proficiencyLevel** | Proficiency level of the staff member in the given skill. Default value: 0.0. |
| 12: | **skill** | **alternative** | Indicates if the given skill is a main skill (no) or an alternative skill (yes). Alternative skills are used in case no one else has the skill to perform a given task. Default value: no. |
| 16: | **availabilities** | **-** | List of time periods in which the given staff member is available to work. |
| 17: | **availableAllTheTime** | **-** | Empty field indicating that a staff member is available all the time during the timetabling period. |
| 17a | **notAvailable** | **-** | Empty field indicating that a staff member is not available during the timetabling period. |
| 17: | **available** | **day** | Field containing the availability information. The attribute day contain the number of a timetabling day. |
| 18: | **available** | **from/to** | Attributes from and to represents the time interval in which the given staff member is available on the day 'day'. |
| 19: | **available** | **preferenceLevel** | Indicates the preference level for the availability. Default value: 0.0. |
| 22: | **availableAreas** | **-** | List of areas in which the given staff member is available to work. |
| 23: | **availableInEveryArea** | **-** | Means that the given transportation mode is available in all areas. |
| 24: | **area** | **id** | Id of the area in which the staff member is available. |
| 24: | **area** | **preferenceLevel** | Indicates the preference level for the area. Default value: 0.0. |
| 27: | **availableTransports** | **-** | List of transportation modes that can be considered for a given staff member. |
| 28: | **transportationMode** | **id** | Id of a valid transportation mode, compliant with the transportationmodes.xml file. |
| 28: | **transportationMode** | **preferencelevel** | Indicates the preference level for the transportation mode. Default value: 0.0. |
| 30: | **preferredPartners** | **-** | List of the partners that are preferred (or unpreferred) to work together with the given staff member. |
| 31: | **hr** | **id** | Id of a valid staff member. |
| 31: | **hr** | **preferenceLevel** | Indicates the preference level for the given partner. |

* 1. **File #4: contracts.xml**
     1. **XML File**

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| 1:  2:  3:  4:  5:  6:  7:  8:  9:  10:  11:  12:  13:  14:  15:  16:  17:  18:  19:  20:  21:22:  23:  24:  25:  26:  27:  28:  29:  30:  31: | <?**xml** **version**="1.0"?>  <**contracts** **version**="2.0">  <**contract** **id**="xs:integer">  <***payments***>  <***payByHour*** **rate**="xs:float" ***minimumPayment***="xs:float"  ***overtime***="xs:float"/>  <***payByTasks***>  *<****standardWage*** **rate**="xs:float"/>  *<****wage*** **taskId**="xs:integer" **rate**="xs:float"/>  ⵗ  </***payByTasks***>  <***payByTaskHours***>  *<****standardWage*** **rate**="xs:float" ***minimumPayment***="xs:float"  ***overtime***="xs:float"/>  *<****wage*** **taskId**="xs:integer" **rate**="xs:float" ***minimumPayment***="xs:float"  ***overtime***="xs:float"/>  ⵗ  </***payByTaskHours***>  <***payByTravelHours***>  *<****standardWage*** **rate**="xs:float" ***minimumPayment***="xs:float"/>  *<****wage*** **taskId**="xs:integer" r**ate**="xs:float" ***minimumPayment***="xs:float"/>  ⵗ  </***payByTravelHours***>  *<****costMatrix******id****="xs:integer"/>*  </***payments***>  <**workingHour** **min**="xs:float" **max**="xs:float" ***overtime***="xs:float"/>  <***inProbation***/>  </**contract**>  </**contracts**> |

* + 1. **Description**

The contracts.xml file presents all the information regarding staff payment and work regulations. Each worker is allowed to have more than one contract.

* + 1. **Details**

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| **Line** | **Field** | **Attribute** | **Description** |
| 4: | **contract** | **id** | Id of a given contract. |
| 5: | **payments** | **-** | Indicates how the wage is calculated for the owner of the given contract. |
| 6: | **payByHour** | **-** | Payment mode that considers paying a fixed hourly wage for a staff member regardless of the task he performs. |
| 6: | **payByHour** | **rate** | The hourly rate. |
| 6: | **payByHour** | **minimumPayment** | The minimum amount that should be paid for a task. |
| 7: | **payByHour** | **overtime** | The overtime rate. |
| 8: | **payByTasks** | **-** | Payment mode that considers paying different fixed wages according to the tasks performed. A fixed value is used for each task. |
| 9: | **standardWage** | **rate** | The standard price for a task. Any task not listed is considered to have this value. |
| 10: | **wage** | **taskId** | The id of a given task. |
| 10: | **wage** | **rate** | The price for the given task. |
| 13: | **payByTaskHours** | **-** | Payment mode that considers paying different hourly wages according to the tasks performed. |
| 14: | **standardWage** | **rate** | The standard price for a task. Any task not listed is considered to have this value. |
| 14: | **standardWage** | **minimumPayment** | Minimum payment to be made for performing a task. Default value: 0.0. |
| 15: | **standardWage** | **overtime** | Rate to be paid in case of overtime. Default value: same as the attribute 'rate'. |
| 16: | **wage** | **taskId** | The id of a given task. |
| 16: | **wage** | **rate** | The payment rate for a task. |
| 16: | **wage** | **minimumPayment** | Minimum payment to be made for performing a task. Default value: 0.0. |
| 17: | **wage** | **overtime** | Rate to be paid in case of overtime. Default value: same as the attribute 'rate'. |
| 20: | **payByTravelHours** | **-** | Payment mode that considers paying a staff member for the hours spend travelling. |
| 21: | **standardWage** | **rate** | The standard hourly rate for a travel to a task. Any task not listed is considered to have this value. |
| 21: | **standardWage** | **minimumPayment** | Minimum payment to be made for travelling. Default value: 0.0. |
| 22: | **wage** | **taskId** | The id of a given task. |
| 22: | **wage** | **rate** | The hourly rate for a travel to a task. |
| Line | **Field** | **Attribute** | Description |
| 22: | **wage** | **minimumPayment** | Minimum payment to be made for performing a task. Default value: 0.0. |
| 25: | **costMatrix** | **id** | Id of the matrix containing the payment costs for all possible tasks. |
| 27: | **workingHours** | **min/max** | Minimum and maximum working hours allowed for the staff member during the timetabling period. |
| 27: | **workingHour** | **overtime** | Maximum overtime hours allowed for the given staff member. Default value: 0.0. |
| 28: | **inProbation** | **-** | Indicated that, for the contract, the given staff member is in probation period. |

* 1. **File #5: tasks.xml**
     1. **XML File**

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| 1:  2:  3:  4:  5:  6:  7:  8:  9:  10:  11:  12:  13:  14:  15:  16:  17:  18:  19:  20:  21:22:  23:  24:  25:  26:  27:  28  29:  30:  31:  32:  33:  34: | <?**xml** **version**="1.0"?>  <**tasks** **version**="2.0">  <**task** **id**="xs:integer">  <***priority***>xs:integer</***priority***>  <**location** **id**="xs:integer"/>  <**date**>"xs:integer"</**date**>  <**timeWindow begin**="xs:integer" **end**="xs:integer"**/>**  <***preferredTimeWindow* begin**="xs:integer" **end**="xs:integer"**/>**  <**duration**>xs:integer</**duration**>Eu  <**humanResources** **min**="xs:integer" **max**="xs:integer"/>  <**skillsRequirements**>  <**skill** **id**="xs:integer" ***proficiencyLevel***="xs:float"  ***preferenceLevel***="xs:float"/>  ⁞  </**skillsRequirements**>  <***staffRequirements***>  <**humanResource** **id**="xs:integer" ***preferenceLevel***="xs:float"/>  ⁞  </***staffRequirements***>  <***relatedTasks***>  <***alternativeTask*** **id**="xs:integer"/>  <***nonOverlappingTask*** **id**="xs:integer"/>  <***requiredTask*** **id**="xs:integer"/>  <***synchronisedTask*** **id**="xs:integer">  <**start** **min**="xs:integer" **max**="xs:integer"/>  <**end** **min**="xs:integer" **max**="xs:integer"/>  </***synchronisedTask***>  ⁞  </***relatedTasks***>  <***value***>xs:float</***value***>  </**task**>  ⁞  </**tasks**> |

* + 1. **Description**

The tasks.xml file presents the information regarding the visits. It describes where the task must be performed, how and what the requirements are.

* + 1. **Details**

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| **Line** | **Field** | **Attribute** | **Description** |
| 4: | **task** | **id** | Id of a given task. |
| 5: | **priority** | **-** | Optional field indicating the priority of a task. Integer value between 0 and 10. |
| 6: | **location** | **id** | Id of the location where the task must be performed. |
| 7: | **date** | **-** | Field containing the date that the task must be performed. |
| 8: | **timeWindow** | **begin/end** | Begin and end of the time window in which the task must commence. |
| 9: | **preferredTimeWindow** | **begin/end** | Begin and end of the preferred time window in which the task must commence. |
| 10: | **duration** | **-** | The estimated duration of the task. |
| 11: | **humanResources** | **min/max** | Minimum/Maximum staff members required to perform the task. |
| 12: | **skillsRequirements** | **-** | List of skills required to perform the task. |
| 13: | **skill** | **id** | Id of the skill. |
| 13: | **skill** | **proficiencyLevel** | Proficiency level required for the skill to be performed. Default value: 0.0. |
| 14: | **skill** | **preferenceLevel** | Preference level of the skill. The default value is '1', meaning that in case this field is not present, the skill is mandatory. Default value: 1.0. |
| 17: | **staffRequirements** | **-** | A list of required/denied/preferred staff members to performed the given task. |
| 18: | **humanResource** | **id** | The id of the staff member. |
| 18: | **humanResource** | **preferenceLevel** | The preference level for the staff member. Default value: 1.0. |
| 21: | **relatedTasks** | **-** | A list with all the tasks that are related to the given task. |
| 22: | **alternativeTask** | **id** | Field indicating a task that may be performed in place of the given task. |
| 23: | **nonOverlappingTask** | **id** | Field indicating a task that may not be executed at the same time as the given task. |
| 24: | **requiredTask** | **id** | Field indicating a task that should be performed before the given task. |
| 25: | **synchronisedTask** | **id** | Field that indicates a task that should be synchronised with the given task. |
| 26: | **start** | **min/max** | Indicated that the synchronised task should start in the indicated time window considering the start of the given task as a reference point. |
| 27: | **end** | **min/max** | Indicated that the synchronised task should start in the indicated time window considering the end of the given task as a reference point. |
| 31: | **value** | **-** | Optional field indicating the value, or profit of a task. Default value: 0. |

* 1. **File #6: matrices.xml**
     1. **XML File**

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| --- | --- |
| 1:  2:  3:  4:  5:  6:  7:  8:  9:  10:  11:  12:  13:  14:  15:  16:  17:  18:  19:  20:  21: | <?**xml** **version**="1.0"?>  <**matrices** **version**="2.0">  <**matrix id**="xs:integer"**type=**"distance|time|cost">  <**nOfLocations**>xs:integer</**nOfLocations**>  <**nOfTimeIntervals**>xs:integer</**nOfTimeIntervals**>  <**locationList**>  <**location** **id**="xs:integer"/>  ⁞  </**locationList**>  <**timeIntervalList**>  <**time** **id**="xs:integer" **from**="xs:integer" **to**="xs:integer"/>  ⁞  </**timeIntervalList**>  <**data**>  <**interval** **id**="xs:integer">0.0,...,0.0</**interval**>  ⁞  </**data**>  </**matrix**>  ⁞  </**matrices**> |

* + 1. **Description**

The matrices.xml file presents all distance and time matrices for a given instance.

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| **Line** | **Field** | **Attribute** | **Description** |
| 4: | **matrix** | **id** | The id of a matrix. |
| 4: | **matrix** | **type** | A matrix can be a distance matrix, a time matrix or a cost matrix, this attribute indicates which one. |
| 5: | **nOfLocations** | **-** | Number of locations covered by the matrix. |
| 6: | **nOfIntervals** | **-** | Number of time intervals covered by the matrix. |
| 7: | **locationList** | **-** | List of the locations. The order of the data presented follows the one of this list. |
| 8: | **location** | **id** | Id of a location. |
| 11: | **timeIntervalList** | **-** | List of time intervals |
| 12: | **time** | **id** | Id of a time interval. |
| 12: | **time** | **from/to** | Time covered by the current time interval. |
| 15: | **data** | **-** | The data of the matrix. |
| 16: | **interval** | **id** | The id of the interval covered by the data. |
| 16: | **interval** | **-** | The data of the matrix, presented as a list of real values separated by commas. |

* 1. **File #7: solution.xml**
     1. **XML File**

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| 1:  2:  3:  4:  5:  6:  7:  8:  9:  10:  11:  12:  13:  14:  15:  16:  17:  18: | <?**xml** **version**="1.0"?>  <**solution** **version**="2.0">  <**author**>xs:string</**author**>  <**method**>xs:string</**method**>  <**timetable**>  <**humanResource** **id**="xs:integer">  <**task** **id**="xs:integer">  <**date**>xs:integer</**date**>  <**startTime**>xs:integer</**startTime**>  <**taskDuration**>xs:integer</**taskDuration**>  <**transportationMode** **id**="xs:integer"/>  <**contract** **id**="xs:integer"/>  </**task**>  ⁞  </**humanResource**>  ⁞  </**timetable**>  </**solution**> |

* + 1. **Description**

The solution.xml file presents a single solution obtained by the solver. It contains the timetable for the tasks and staff contained in the given problem instance.

* + 1. **Details**

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| **Line** | **Field** | **Attribute** | **Description** |
| 4: | **author** | **-** | Author of the method of the solution. |
| 5: | **method** | **-** | Name of the method of the solution. |
| 6: | **timetable** |  | The timetable organized by staff then tasks. |
| 7: | **humanResource** | **id** | Id of the staff member. |
| 8: | **task** | **id** | If of the task performed by the given staff member. |
| 9: | **date** | **-** | Date of the task. |
| 10: | **startTime** | **-** | Time that the staff member should arrive at the task location. |
| 11: | **taskDuration** | **-** | Duration of the task. |
| 12: | **transportationMode** | **id** | Transportation mode that the staff member should use. |
| 13: | **contract** | **id** | Contract chosen for the staff member. |