

# Advanced Travel Companion and Tracking Services

## D1.3 – WP1 Trip Tracking Ontology

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## Related documents

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Reference Number	Title	Revision	Date
1	Proposal	final	
2	IT2Rail ontology	final	
3	ATTRACKTIVE D1.2 – Trip Tracking Specification	final	
4	TRIAS Specification	v1.2	
5	Co-Active D1.4 - TD4.2 FREL Ontology	final	
6	Co-Active D2.4 - TD4.3 FREL Ontology	final	

**Table 1: Referenced documents**

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## **EXECUTIVE SUMMARY**

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This document focuses on the ontology for the Trip Tracking which contains the de-/activation of tracking and the event processing. Although managing alternatives is part of Trip Tracking, the underlying concept is that of Travel Shopping, Booking, and Ticketing. The ontologies for these parts of Shift2Rail are specified in other documents [5, 6].

## 1. INTRODUCTION

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The Trip Tracking part of the Shift2Rail (S2R) Ontology is presented in this document via a glossary with terms and relationships among them as they are used by the S2R-IP4 (Innovation Program 4).

In general, an ontology is used to capture knowledge about some domain of interest. The domain of interest of S2R-IP4 is focused on a multimodal travel combining several modes of transport, several operators in several countries. This document presents the Trip Tracking part of this ontology with a formal representation of the domain's knowledge by a set of concepts and the relationships between those concepts.

In others words, an ontology provides a vocabulary that is shared among the involved stakeholders which can be used as a model. Having a shared model eases the understanding of the formal definitions of concepts and their relationships.

The represented ontology used in S2R-IP4 program started with the IT2Rail project (Information Technology for Shift to Rail). It was the first stage of subsequent multiple projects aiming to give Travellers full control over the door-to-door travel experience across transport modes and services.

The model with the mentioned features is needed for the coordination among the different and on-going projects within the IP4 such as CONNECTIVE, ATTRACKTIVE and Co-Active.

This document presents the ontology developed for the Trip Tracking under the ATTRACKTIVE project.

The document starts with the visual representation of the Trip Tracking ontology through a schema where it displays the main terms involved. Those terms are linked with each other through their relationship.

The second part is a glossary with the main terms of the mentioned schema and the explanation of them to give a formal description of the domain of interest.

## 2. TRIP TRACKING ONTOLOGY

In this section, the schema of the Trip Tracking is described to be used as an input for the ontology. As mentioned earlier, the following schema illustrates a *visual representation* of the ontology proposed for IP4, and in particular, the parts applicable for the Trip Tracking.

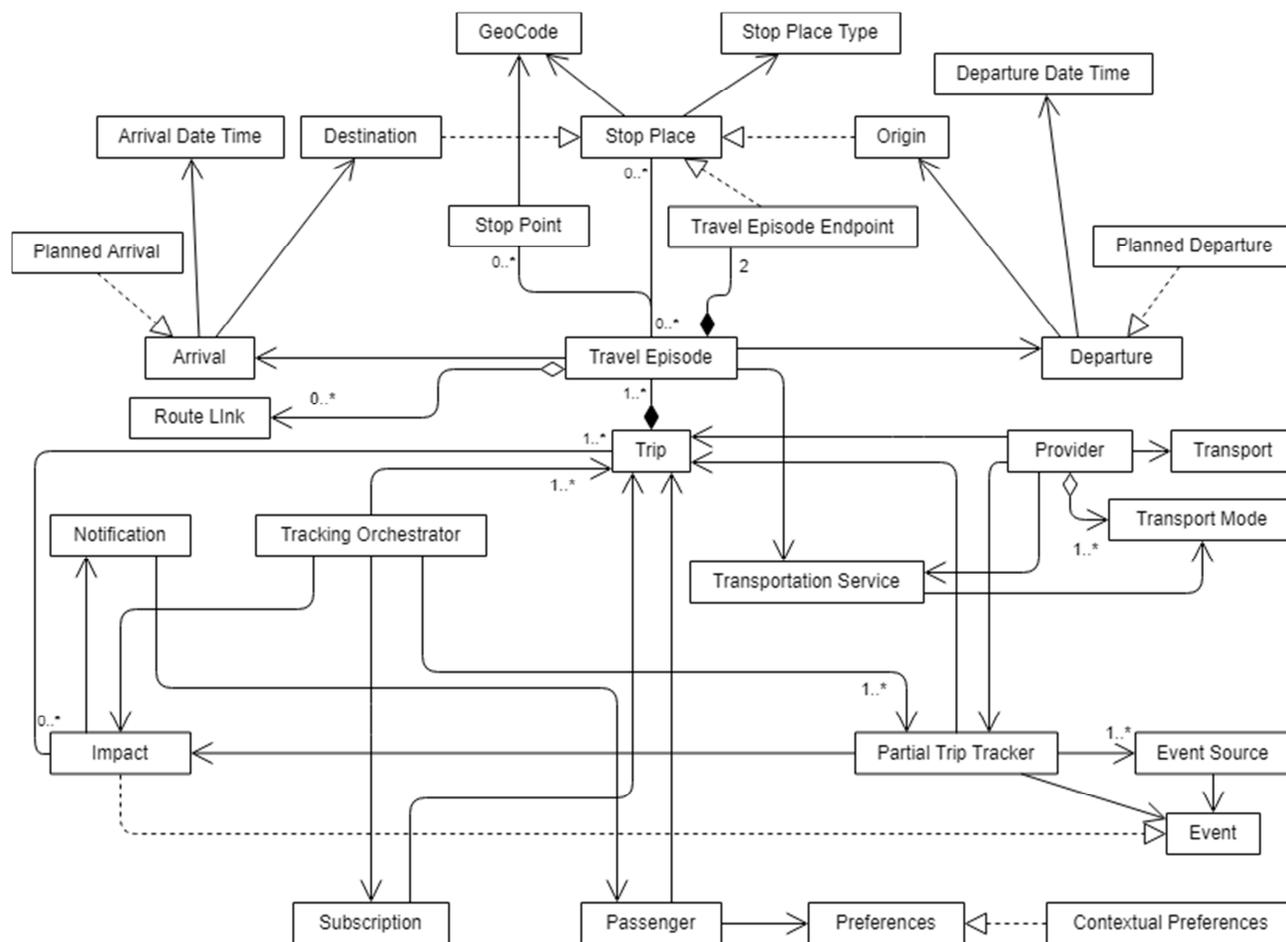


Figure 1: Trip Tracking Ontology's Schema

### 3. TRIP TRACKING CONCEPTS

Based on the concept explained in the introduction of the document, this paragraph describes the terms used within the schema.

The table is structured as followed:

- **Term:** the name of the concept that is to be described and which is used in the schema.
- **Description:** the meaning of the term in context of the Trip Tracking domain. It contains the definition from the S2R glossary.
- **Relations:** list of other terms of the S2R-IP4 ontology which also links this part of the ontology to the other ontology parts in S2R-IP4.
- **Terms described in S2R and its relation with other ontologies:** this column explains the origin of the term.
- **Representation in TRIAS:** The name of the element, group or structure in the TRIAS specification which is used to represent the term within Trip Tracking.

In ATTRACTIVE, TRIAS (Travellers' Realtime Information and Advisory Standard) is specified as the protocol to be used to implement the Trip Tracking functionality between the Shift2Rail ecosystem and the Travel Experts, or more specifically between the partial Trip Tracker (pTT) of a Travel Expert and the Trip Tracking module of S2R. Therefore, this ontology also documents where the terms are represented in TRIAS.

Term	Description	Relations	Terms described in S2R and its relation with other ontologies	Representation in TRIAS
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Term	Description	Relations	Terms described in S2R and its relation with other ontologies	Representation in TRIAS
Arrival	An Arrival is a Transport Event, occurring, or planned to occur at a specific Arrival Date Time and Stop Place.	<ul style="list-style-type: none"> <li>Travel Episode</li> <li>Destination</li> <li>Arrival Date Time</li> <li>Planned Arrival</li> </ul>	This term is inherited from IT2Rail	<ul style="list-style-type: none"> <li>LegAlight</li> <li>LegEnd</li> <li>StopPlace</li> <li>Call</li> </ul>
Arrival Date Time	The date and time values associated with the Arrival that marks the actual and/or planned end of a Travel Episode.	<ul style="list-style-type: none"> <li>Arrival</li> </ul>	This term is inherited from IT2Rail	<ul style="list-style-type: none"> <li>ServiceTime</li> <li>AimedArrivalTime</li> <li>ExpectedArrivalTime</li> <li>TimetabledTime</li> </ul>
Contextual Preferences (C)	These preferences depend on the context of the travel; therefore, they are tailored to each situation or a certain type of travel (e.g.: leisure vs. working trip, airplane vs. train, temporary impairment or others). Some of these preferences are connected to travels and travel habits and can be accounted for by the Travel Companion whenever a given context is active.	<ul style="list-style-type: none"> <li>Passenger</li> <li>Preference</li> </ul>	This term has been included in S2R-IP4 glossary and, regarding exchange of data, it is a set of preferences related to a specific passenger when the passenger has activated a specific profile or when a profile has been used for a specific travel.	

Term	Description	Relations	Terms described in S2R and its relation with other ontologies	Representation in TRIAS
Departure	A Departure is a Transport Event, occurring, or planned to occur at a specific Departure Date Time and Stop Place.	<ul style="list-style-type: none"> <li>• Travel Episode</li> <li>• Departure Date Time</li> <li>• Panned Departure</li> <li>• Origin</li> </ul>	This term is inherited from IT2Rail	<ul style="list-style-type: none"> <li>• LegStart</li> <li>• LegBoard</li> <li>• StopPlace</li> <li>• Call</li> </ul>
Departure Date Time	The date and time values associated with the Departure which marks the actual and/or planned start of a Travel Episode.	<ul style="list-style-type: none"> <li>• Departure</li> </ul>	This term is inherited from IT2Rail	<ul style="list-style-type: none"> <li>• ServiceTime</li> <li>• AimedDepartureTime</li> <li>• ExpectedDepartureTime</li> <li>• TimetabledTime</li> </ul>
Destination	A Destination is a Location marking the logical end of the Itinerary.	<ul style="list-style-type: none"> <li>• Arrival</li> <li>• Stop Place</li> </ul>	This term is inherited from IT2Rail	<ul style="list-style-type: none"> <li>• LegAlight</li> <li>• LegEnd</li> </ul>
Event	<p>Is a situation not consistent with the norm. Events are treated by Trip Tracking functionalities.</p> <p>The processing of an Event by a pTT may lead to the generation of an Impact.</p>	<ul style="list-style-type: none"> <li>• Impact</li> <li>• Event Source</li> <li>• Partial Trip Tracker</li> </ul>	This conceptual term has been included in S2R-IP4 ontology.	<ul style="list-style-type: none"> <li>• Situations</li> <li>• Call (SIRI)</li> <li>• Consequence (SIRI)</li> </ul>

Term	Description	Relations	Terms described in S2R and its relation with other ontologies	Representation in TRIAS
Event Source	Input System for Trip Tracking functionalities providing any kind of event streams that could be relevant to detect disruption. Events are generally localised into a transportation area. They can also come from social networks or other specific streams (e.g. cultural events ...)	<ul style="list-style-type: none"> <li>Event</li> <li>Partial Trip Tracker</li> </ul>	This conceptual term has been included in S2R-IP4 ontology.	<ul style="list-style-type: none"> <li>ProducerResponseEndpoint (SIRI)</li> </ul>
GeoCode	The GeoCode represents the geographical position of a location with the values for altitude, latitude, and longitude.	<ul style="list-style-type: none"> <li>Stop Place</li> <li>Stop Point</li> </ul>	This term is inherited from IT2Rail (GeoCoordinates). But in S2R-IP4 ontology, it has been changed into a new entity for exchanges.	<ul style="list-style-type: none"> <li>GeoPosition</li> </ul>
Impact	An Impact is a consequence of current situations on a traveller's trip based on treated Events.	<ul style="list-style-type: none"> <li>Trip</li> <li>Notification</li> <li>Event</li> <li>Partial Trip Tracker</li> <li>Tracking Orchestrator</li> </ul>	This conceptual term has been included in S2R-IP4 ontology.	<ul style="list-style-type: none"> <li>Situations</li> <li>Call (SIRI)</li> <li>Consequence (SIRI)</li> </ul>

Term	Description	Relations	Terms described in S2R and its relation with other ontologies	Representation in TRIAS
Notification	<p>A Notification signals travel related information for a trip to the Passenger.</p> <p>In Trip Tracking, a notification signals an Impact.</p>	<ul style="list-style-type: none"> <li>• Impact</li> <li>• Passenger</li> </ul>	<p>This conceptual term has been inserted in S2R-IP4 ontology.</p>	
Origin	<p>An Origin is a Location marking the logical start of the Itinerary or of a travel segment.</p>	<ul style="list-style-type: none"> <li>• Stop Place</li> <li>• Departure</li> </ul>	<p>This term is inherited from IT2Rail.</p>	<ul style="list-style-type: none"> <li>• LegBoard</li> <li>• LegStart</li> </ul>

Term	Description	Relations	Terms described in S2R and its relation with other ontologies	Representation in TRIAS
Partial Trip Tracker	<p>A module within the Trip Tracking functionality that treats incoming Events and sends impacts to the Tracking Orchestrator.</p> <p>A Partial Trip Tracker receives Events from Event Sources as input data. The Partial Trip Tracker processes the events that may be the cause of generated impacts.</p> <p>Afterwards, the Tracking Orchestrator processes the impacts, and may generate Notifications from them.</p> <p>Partial Trip Trackers are a service of Providers that are used by S2R to track the whole trip.</p>	<ul style="list-style-type: none"> <li>• Event Source</li> <li>• Event</li> <li>• Impact</li> <li>• Provider</li> <li>• Trip</li> <li>• Tracking Orchestrator</li> </ul>	<p>This conceptual term has been included in S2R-IP4 ontology.</p>	<ul style="list-style-type: none"> <li>• TriasService</li> </ul>

Term	Description	Relations	Terms described in S2R and its relation with other ontologies	Representation in TRIAS
Passenger	<p>Using the Personal Application on the internet enabled device or physical tokens access to the transport network; they go from a point A to a point B through one or more Transport Service Providers vehicles.</p> <p>In Trip Tracking, the Passenger uses the PA to activate or deactivate the tracking of the passenger's trips or sets the tracking related preferences.</p>	<ul style="list-style-type: none"> <li>• Preference</li> <li>• Trip</li> <li>• Notification</li> </ul>	<p>This term is inherited from IT2Rail and partially updated in order to adapt it to the new concepts in the S2R ontology.</p>	<ul style="list-style-type: none"> <li>• FaresPassenger</li> </ul>
Planned Arrival	<p>Refers to arrival information, which is planned before travelling, such as: date, time, Stop Place.</p>	<ul style="list-style-type: none"> <li>• Arrival</li> </ul>	<p>This term is inherited from IT2Rail conceptually but in S2R-IP4 ontology regarding exchanges of data it is described in the related fields into the properly entity (Offer or Travel Episode)</p>	<ul style="list-style-type: none"> <li>• LegAligh</li> <li>• LegEnd</li> <li>• ServiceTime</li> <li>• AimedArrivalTime</li> <li>• TimetabledTime</li> </ul>
Planned Departure	<p>Refers to departure information, which is planned before travelling, such as: date, time, Stop Place.</p>	<ul style="list-style-type: none"> <li>• Departure</li> </ul>	<p>This term is inherited from IT2Rail conceptually but in S2R-IP4 ontology regarding exchanges of data it is described in the related fields into the properly entity (Offer or Travel Episode).</p>	<ul style="list-style-type: none"> <li>• LegBoard</li> <li>• LegStart</li> <li>• ServiceTime</li> <li>• AimedDepartureTime</li> <li>• TimetabledTime</li> </ul>

Term	Description	Relations	Terms described in S2R and its relation with other ontologies	Representation in TRIAS
Preference	The Traveller-related information that represents the travel-related needs.	<ul style="list-style-type: none"> <li>• Passenger</li> <li>• Contextual Preferences</li> </ul>	This term is inherited from IT2Rail ontology but it was not used in its (IT2Rail) environment exchanges.	<ul style="list-style-type: none"> <li>• MonitoringParameter</li> </ul>
Provider	<p>A Travel Service Provider (TSP) is a company providing travel services. TSP includes the transportation (on-board vehicles) and possibly services that are not transport but connected to it – either at the beginning or during the travel, like the access to a lounge or trip tracking – or at the end of the trip, like the access to after sales services.</p> <p>See Partial Trip Tracker as a service of a Provider in Trip Tracking.</p>	<ul style="list-style-type: none"> <li>• Trip</li> <li>• Transport Mode</li> <li>• Transportation Service</li> <li>• Transport</li> <li>• Partial Trip Tracker</li> </ul>	<p>In IT2Rail exists various concepts related to it (e.g. Booking Provider). Those concepts have been kept from the glossary of S2R-IP4.</p> <p>In S2R-IP4 ontology, regarding exchange of data, they have been simplified in this unique entity where main differences are described in its related entity called additional Info.</p>	<ul style="list-style-type: none"> <li>• OperatorCodeType</li> </ul>
Route Link	An element of a Route that connects a pair of contiguous Stop Place(s) of the Route that will be performed with a vehicle.	<ul style="list-style-type: none"> <li>• Travel Episode</li> </ul>	This term is inherited from IT2Rail.	<ul style="list-style-type: none"> <li>• TripLeg</li> </ul>

Term	Description	Relations	Terms described in S2R and its relation with other ontologies	Representation in TRIAS
Stop Place	<p>Is an element of the Infrastructure where Vehicle(s) may stop and where Traveler(s) may board or leave Vehicle(s).</p> <p>In most of the cases, a stop place has means to control the access to the transportation system.</p>	<ul style="list-style-type: none"> <li>• Destination</li> <li>• Origin</li> <li>• Travel Episode</li> <li>• Stop Place Type</li> <li>• GeoCode</li> <li>• Travel Episode End Point</li> </ul>	This term is inherited from IT2Rail.	<ul style="list-style-type: none"> <li>• StopPlace</li> </ul>
Stop Place Type	Indicates the type of transport that starts and arrives in a stop place.	<ul style="list-style-type: none"> <li>• Stop Place</li> </ul>	<p>In IT2Rail it was defined as a concept for each stop place (e.g. Airport).</p> <p>In S2R-IP4 glossary is kept these IT2Rail concepts.</p> <p>In S2R-IP4 ontology (exchange of data), it has been simplified in the same concept with a list of possible values (type within stop place).</p>	<ul style="list-style-type: none"> <li>• Mode</li> </ul>
Stop Point	The physical point at which passengers board or alight from Vehicle(s).	<ul style="list-style-type: none"> <li>• Travel Episode</li> <li>• GeoCode</li> </ul>	This conceptual term has been included in S2R-IP4 ontology.	<ul style="list-style-type: none"> <li>• StopPoint</li> </ul>

Term	Description	Relations	Terms described in S2R and its relation with other ontologies	Representation in TRIAS
Subscription	Describes a request issued by the TO to a pTT, in order to be notified for Impacts for a given Trip.	<ul style="list-style-type: none"> <li>Tracking Orchestrator</li> <li>Trip</li> </ul>	This conceptual term has been inserted in S2R-IP4 ontology.	<ul style="list-style-type: none"> <li>SubscriptionRequest</li> <li>TripMonitoringSubscriptionRequest</li> </ul>
Tracking Orchestrator	A module inside the Trip Tracker functionality that uses pTT information as input (Impacts) and sends incident data and trips alerts to the TC; thus the traveller receives real-time information that impacts his journey.	<ul style="list-style-type: none"> <li>Partial Trip Tracker</li> <li>Trip</li> <li>Subscription</li> <li>Impact</li> </ul>	This conceptual term has been inserted in S2R-IP4 ontology.	<ul style="list-style-type: none"> <li>RequestorEndpoint</li> <li>SubscriberEndpoint</li> <li>ConsumerAddress</li> <li>SubscriberRef</li> </ul>
Transport	A category of travel that refers to on-board vehicle travel.	<ul style="list-style-type: none"> <li>Provider</li> </ul>	This conceptual term has been inserted into S2R-IP4 ontology.	

Term	Description	Relations	Terms described in S2R and its relation with other ontologies	Representation in TRIAS
Transport Mode	Identifies the type of transportation for a specific segment offered by the travel service provider.	<ul style="list-style-type: none"> <li>• Provider</li> <li>• Transportation Service</li> </ul>	<p>In IT2Rail it was defined as a concept for each transport mode (e.g. Air transport mode).</p> <p>In S2R-IP4 glossary is kept these IT2Rail concepts.</p> <p>In S2R-IP4 ontology (exchange of data), it has been simplified in the same concept with a list of possible values (type within Provider related to Offer Item).</p>	<ul style="list-style-type: none"> <li>• Mode</li> </ul>
Transportation Service	Service (Flight, Rail ...) that provides transportation on a Travel Episode.	<ul style="list-style-type: none"> <li>• Transport Mode</li> <li>• Provider</li> <li>• Travel Episode</li> </ul>	<p>This conceptual term has been inserted in S2R-IP4 ontology.</p> <p>Regarding exchange of data, it is inherited from IT2Rail and inserted in a specific field into the related entities Provider and Travel Episode.</p>	<ul style="list-style-type: none"> <li>• Service</li> </ul>

Term	Description	Relations	Terms described in S2R and its relation with other ontologies	Representation in TRIAS
Travel Episode	Part of itinerary, characterized by Departure and Arrival, consisting of an ordered sequence of Route Links operated with the same vehicle.	<ul style="list-style-type: none"> <li>• Departure</li> <li>• Arrival</li> <li>• Stop Place</li> <li>• Stop Point</li> <li>• Route Link</li> <li>• Trip</li> <li>• Transportation Service</li> <li>• Travel Episode End Point</li> </ul>	This term is inherited from IT2Rail but it has been modified in order to summarize the whole information itself instead of using other entities.	<ul style="list-style-type: none"> <li>• TripLeg</li> </ul>
Travel Episode Endpoint	A Travel Episode Endpoint is a Stop Place at which a Travel Episode starts or ends.	<ul style="list-style-type: none"> <li>• Stop Place</li> <li>• Travel Episode</li> </ul>	This term has been inherited at conceptual level from IT2Rail but regarding exchange of data, it has been deleted and linked directly to the Stop Place in order to simplify the ontology in S2R-IP4.	<ul style="list-style-type: none"> <li>• LegEnd</li> <li>• LegAlight</li> </ul>



Term	Description	Relations	Terms described in S2R and its relation with other ontologies	Representation in TRIAS
Trip	A set of linked segments of an offer.  However, for tracking a trip, the offer is not necessary.	<ul style="list-style-type: none"><li>• Travel Episode</li><li>• Provider</li><li>• Partial Trip Tracker</li><li>• Passenger</li><li>• Subscription</li><li>• Impact</li><li>• Tracking Orchestrator</li></ul>	This conceptual term has been inherited from IT2Rail.	<ul style="list-style-type: none"><li>• Trip</li></ul>

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