Open Sales and Distribution Model OSDM

This IRS is to be published only in English

International Railway Solution to be classified in volumes of

UIC 9 - Information, Technology, Miscellaneous

Application:

With effect from 1st April 2020

All members of the International Union of Railways

Record of updates:

2020 March	Version 1.0 Fares only
2020 December	Version 1.0 OSDM
2021 February	Version 1.1 OSDM (Offline & Online)
2021 June	Version 1.2 OSDM (Offline & Online)

Printed by the International Union of Railways (UIC)

ISBN 978-2-xxxxxx

The International Railway Solution

The International Railway Solutions (IRS) are structured in a General Part and in some eventual Application Parts.

The General Part is valid worldwide, while the Application Parts are valid for a specific railway application, based on a geographical or on a service implementation.

The eventual Application Parts may thus be added according to the current needs of the Railway Community.

Structure of the International Railway Solution:

IRS 90918-10: Open Sales and Distribution Model OSDM

General Part

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Foreword

Current Situation

Offline Distribution

The first main goal of this specification is to addresses the difficulties in the fare data exchange and sales with the current data exchange formats specified in UIC leaflet 108.1 and 2. Some of the difficulties are:

- Missing access to yield managed fares
- Current data exchange is partially non-structured (word, excel, text, …)
- Fare data are not in line with timetable data (different station codes)
- Missing solution in case of two carriers on the same line
- Data exchange possible only once a year
- Mapping of fares to passengers is difficult

Online Distribution

The second main goal of this specification to address the lack of a unified interface for distribution of admissions (i.e., tickets), reservations, integrated reservation and ancillaries. Currently within the rail sector there exists a variety of very complex and incompatible interfaces to distribute rail services within Europe and beyond. Thus, international distributions demands major investments and produces high operating costs.

Furthermore, for a customer the booking of a rail ticket is unnecessarily complicated. This fact weakens rail as a convenient and ecological means of transportation.

Objectives

The main objectives guiding this specification were:

Objectives for Offline Distribution

- Create a new tariff model to enable the NRT-carriers/operators to offer customer-friendly and competitive prices for international travel, preferably based on timetables.
- Enable the allocating carrier/operator to offer through-tickets based on different conditions-ranges (e.g. fully flexible, semi flexible, non-flex, others).
- The portfolio to be offered to the customer shall be set at the decision of the issuing undertaking.
- Focus on easy possibly online-solutions to be implemented within the next two years taking into account upcoming requirements, i.e. new RICS-codes etc.
- The reservation should be fully integrated in the new technology

Objectives for Online Distribution

- To provide a convenient way for a customer to book an international train service, including refund and exchange processes.
- To define unified process steps for offering, booking, fulfillment and after sale.
- To define unified messages that are support the distributor, the allocator as well as the fare provider role.
- To provide a specification that can be supported by existing or upcoming systems without major investments to secure existing investments
- To reduce unnecessary message conversions between callers as they provide no business value

Summary

The specification covers two aspects:

- Data exchange and sales services for rail products either to provide fare details to combine fares into offers and to provide entire offers for tickets as well. It defines the data structures to define the fares in detail and the combination rules for fares.

The specification covers static fares that can be exchanged as bulk data as well as dynamic fares and offers that need to be requested and booked online. Reservation of places is included to have a harmonized solution for the complete sales service.

A migration is supported by additional data items to cover conversion into the existing data formats 108.1 and to support existing reservation service IRS 90918-1 and accounting data formats IRS 30301.

- A set of services and unified messages to distribute rail content involving all parties in the distribution process.

We started with the customer experience and worked backwards to define the sales and distributions processes supported by OSDM. This resulted in a booking process modelled by the following steps:

1. Searching for trips
2. Getting offers
3. Booking an offer
4. Confirmation of the booking
5. Fulfillment of the booking

Analogously, the after-sale process is modelled in the following steps:

1. Getting a refund/exchange offers
2. Booking a refund/exchange offer
3. Fulfillment of the booking

By involving the experts of the parties (distributors, railways and legal experts), we are confident that the OSDM online standard is powerful enough to support the distribution of existing or upcoming commercial products and can be implemented and supported at reasonable cost.

What's New in OSDM Version 1.2

The following features have been added with version 1.2 of OSDM.

- **Add support to sell non-journey based products (passes)**

  A new booking flow enables to sell tickets that are not bound to a trip, e.g., day passes or ancillary service such a WIFI access. This feature opens the possibility to potentially sell public transportation unrelated services such as entrance to a museum or concert.

  See the `/non-trip-based-offers` for more details.

- **Add support to query availabilities**

  If supported by the underlying systems, the attribute `numericAvailability` returns the number of offers of a given fare still available. Having the number of available service is of special values for agents helping a passenger to find the best time to travel

  Note that the availability is on *fares* and not on actual seats.

- **Complete support for partial refund/exchange**

  Exchange of tickets especially with yielded fares is a difficult topic. In this release we have carefully reviewed the initial implementation of OSDM V1.1 and completed it where necessary. The most atomic element we can after-sale on is a ticket (Ticket Control Number). See the resources under **Exchange**.

- **Combination of offers**

  While there are powerful combination rules on fare level, OSDM was lacking this feature on offer level. With this release, we have added a light-weight option to steer the combination of offers. This allows a fare provider or allocator to control the combination of its offers with other. This can be used for return tickets as well as offer-based through fares.

  In a nutshell the mechanism is the following: if no combination tags are set, an offer can be combined with any other offer. However, if the tags are set, only offers which contain the tags can be combined. The tags can be defined mutually between two parties. See the `tripTags` and `returnTags` attribute on `Offer`.

- **Add full support for PRMs**

  If a passenger has reduced mobility the basic idea is that an OSDM allocator implementation informs the *UIC's PRM ABT* about the travel wish such that he or she can be contacted by the experts. The impacts on OSDM are:

- If we have a PRM travelling from to *A* to *B* (via *C*) a system implementing OSDM must inform the UIC's PRM ABT tool about the assistance needs a these stops.

  Impact on specification: The `PRMNeedType` `NEED_PRM_SUPPORT` allows to indicate the need to ask for support at a station. In this case the allocator needs to inform the UIC ABT Tool to contact the passenger. The allocator thus needs to transfer the passenger's contact address (mail or phone) and the booking id.

- If a request of PRM assistance cannot be met, a refund/exchange process must be triggered by UIC's PRM ABT tool via the OSDM protocol and the PRM must be informed accordingly.

  Impact on specification: The overrule code `PRM_SUPPORT_UNAVAILABLE` allows a booking to be refunded or exchanged by the UIC PRM ABT tool even when the fare is non-refundable/exchangeable.

Other work addressed includes:

- Improved the chapter "Offline Sale and Distribution"
- Improving the API's description
- Fixing minor inconsistencies
- Incorporating feedback from the first implementors
- Setting up a mock infrastructure as well as writing actual mocks
- Added best practices concerning non-functional requirements

Normative References

UIC Leaflets

International Union of Railway (UIC)

- *UIC Leaflet 920-1: Standard numerical coding for railway undertakings, infrastructure managers and other companies involved in rail-transport chains*
- *UIC Leaflet 920-2: Standard numerical coding of locations*
- *UIC Leaflet 920-14: Standard numerical country coding for use in railway traffic*

International Rail Standards

International Union of Railway (UIC)

- *IRS 30301: Accountancy regulations for international "Passenger" traffic*
- *IRS 90918-0: Electronic seat/berth reservation and electronic production of travel documents*
- *IRS 90918-1: Electronic reservation of seats/berths and electronic production of travel documents - Exchange of messages*
- *IRS 90918-4: e-Ticket Exchange for Control*
- *IRS 90918-9: Digital Security Elements for Rail Passenger Ticketing*

CIT Manual for International Rail Tickets (MIRT)**

CIT Guidelines on Protection of Privacy and Processing of Personal Data used in International Passenger Traffic by Rail (GDP CIT)

International Union of Railway (UIC)/PSS

- *Implementation guide reservation systems*

International Standards

International Organization for Standardization (ISO)**

- *ISO 3166:2006: Codes for the representation of names of countries and their subdivisions,* 2006
- *ISO 4217:2001: Codes for the representation of currencies and funds,* 08-2001

European Union Agency for Railways (ERA)

- *ERA TAP TSI Technical Document B.6: Electronic seat/berth reservation and electronic*
- *production of transport documents - Transport documents (RCT2 Standard)*
- *ERA TAP TSI Technical Document B.7: International Rail Ticket for Home Printing*
- *ERA TAP TSI Technical Document B.8: Standard numerical coding for railway undertakings, infrastructure managers and other companies involved in rail-transport chains*
- *ERA TAP TSI Technical Document B.9: Standard numerical coding of locations*

European Union (EU)

- *Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons regarding the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation)*

International Civil Aviation Organization (ICAO)

- *Doc 9303 Machine Readable Travel Documents - Part 3: Specifications Common to all*
- *MRTDs,* 7th edition, 2015

Terms and Definitions

Term	Definition
Admission	The right to travel on a train, aka. as ticket.
Ancillary	An extra service like meal or WIFI
Conditions	Conditions that limit the use of a travel contract or the changes of a travel contract.
Fare	Proposal to purchase a transport service for specific passenger subject to specific conditions for a specific price. Handling fees by the allocator or ticket vendor are not included.
Fare structure	A fare is the fee paid by a passenger for use of a public transport system: rail, bus, taxi, etc. In the case of air transport, the term airfare is often used. Fare structure is the system set up to determine how much is to be paid by various passengers using a transit vehicle at any given time.
e-Ticket	The electronic representation of the travel contract on a data base. The home print ticket (A4RT or FST) where the contract of travel is represented in a printed or displayed bar code is not an e-ticket according to this definition. Synonym: dematerialized ticket
Integrated Reservation Ticket (IRT)	Ticket for a specific train on a travel day usually including the seats. All tickets for a train are managed in one central system of the allocator. The ticket is valid on that train on a certain day only.
Non-integrated Reservation Ticket (NRT)	A ticket not including an integrated reservation. Multiple allocators can create tickets for the same route independently. The allocator of the ticket is usually the same company that issues the ticket. The ticket might be applicable to a route with many trains or a zone or a list of trains or combinations of these. The validity might be more than one day. Some conditions allow a partial refund on unused parts of the ticket route. Refund can be done via the ticket vendor. These conditions depend on the fare providers and the allocator (i.e. providing the option of reducing the number of passengers or to interrupt the journey). NRTs not linked to a train might be reused in case the use is not tracked.
Ticket	Medium to carry the travel contract or a reference to the travel contract. The ticket might provide proof of the travel contract via its security features. The tickets are sold by ticket vendors. The assembling of the ticket is done by the allocator(s). The allocator holds the master ticket data/contract of the sold ticket. A ticket can include multiple fare providers in the travel contract. The control of one ticket is done by one or many Ticket Controlling Organizations (TCO) 1. Other means of ticket checking (e.g. gates) will also be named TCOs.

Term	Definition
Sales fee	Sales fees are fees added by the allocator or a ticket vendor to the price provided by the fare provider. Sales fees are not part of the fare provider offers defined in the scope of this document.
Station fee	A station fee is a fee for the use of a station by a traveller. It might be included in the fare provider offer.
Station	A station is a is a location where trains or busses regularly stop to load or unload travellers
Tariff	A schedule of prices for the sale or rental of a product or service. In UIC context the term “tariff” is used for fare structure.
Individual ticketing	A separate ticket is created per traveller.
Individual contracts	A separate ticket is created per traveller and these tickets can be treated as individual contracts of carriage. After sales transactions can be applied independently per traveller and ticket.
Fulfilment	A fulfilment is a document (either for paper printing or electronically) provided to the passenger to prove his travel right,facilitate access to trains and stations (e.g. via gates), provide further information on the travel and provide access to services either directly or via exchange (voucher)
Offer Part	An abstraction of things that can be offered. Can be of type Admission, Reservation or Ancillary.

Acronyms

Acronyms	Acronym Description
EWT	**East West tariff**: Tariff used for Non-Integrated-Reservation-Tickets. The fare data model follows UIC IRS 10108.1.
FCB	**Flexible Content Bar Code**: Barcode specification that contains ticket data for control as structured data and is therefore machine interpretable. The Specification provides a data model of a ticket for control. FCB covers various ticket type (IRT, NRT, RPT,..). (UIC 90918-9)
JWT	**JSON Web Token**: Specification to transport authentication information used by the OAUTH2 authorization protocol. JSON Web Token - RFC 7519
NRT	**Non-Integrated Reservation Tariff**: Tariff used for Non-Integrated-Reservation-Tickets. The fare data model follows UIC IRS 10108.1.
NRT	**Non-Integrated Reservation Ticket**: Ticket not including an integrated reservation.
REST	**Representational State Transfer (REST)**: REST is a software architectural style that defines a set of constraints to be used for creating Web services. Web services that conform to the REST architectural style, called RESTful Web services, provide interoperability between computer systems on the internet. RESTful Web services allow the requesting systems to access and manipulate textual representations of Web resources by using a uniform and predefined set of stateless operations. Other kinds of Web services, such as SOAP Web services, expose their own arbitrary sets of operations.
SiP	**Security in Paper**: A ticket (representing the contract of carriage) is unique and printed on secured paper to avoid modification or creation by other than a railway company. The security is provided by the quality of the security elements included in the paper and the quality of the stock control process that controls the access to blank secure paper. (UIC IRS 90918-0)
SiD	**Security in Data**: A ticket contains security elements. These are created/calculated based on the content of the ticket, resulting in a non-compliant security element in case of falsification or modification. SiD tickets are usually easy to regenerate or to copy. As SiD does not provide copy protection additional measures must be taken to avoid double use. The tickets are personalized, and the validity of the ticket is limited. (UIC IRS 90918-0)
SiS	**Security in System**: The contract is on a server. Every operation (creation, check, modification, …) on the ticket is conducted on the record(s) on the server or a synchronized replica. The access to the contract requires an authentication of the traveller. The ticket control id (key to the ticket) or personal data of the traveller (name, date of birth,) are used to retrieve the ticket. (UIC IRS 90918-0)
SiV	**Security by Visual** elements: The ticket is controlled by a visual element printed with the ticket data on blank paper of displayed on a device. To use

Acronyms	Acronym Description
	an image as a security feature the costs to create the complex image must be higher than the price of the ticket. (UIC IRS 90918-0)
TCO	**Ticket Controlling Organization**
TLT	**Train Linked Ticket**: Ticket not including a reservation but restricted to a train run (or multiple train runs along the route)
TLB	**Ticket Layout Barcode**: Barcode specification describing the "printed" layout of a ticket. It is not machine interpretable and does not provide ticket data, only a ticket display.
UML	**Unified Modelling Language**: A specification defining a graphical language for visualizing, specifying, constructing, and documenting the artifacts of distributed object systems.
UUID	**Universally Unique Identifier**: Standard to create a unique id. The specification is published as ISO/IEC 9834-8:2005.

Requirements

Common Functional Requirements

Requirements on Product Range

It must be possible to distribute and sell all existing products on a fare as well as on an offer basis. Existing products include admissions (a.k.a Tickets), reservations and ancillaries.

Requirements on Price

A price has a currency, an amount and a scale. Per default the scale is set to two.

A price has a set of value added taxes. A tax is valid for a country and has amount.

Requirements on Personal Data

The needed personal data must be indicated. Only personal data needed for the given business process can be transferred between the parties involved.

Functional Requirements Distribution

Requirements on Passenger

A passenger is the person travailing on a vehicle. A passenger must not necessarily be the person who has bought the booking, i.e. the customer.

A passenger has a gender (male, female or X) and date of birth. A passenger can own reductions, most often in the form of cards.

A reduction has a type, a name and an issuer.

Passenger information must be collected sparsely and only if needed for a dedicated process step. Passenger details providing personal information shall only be used to meet the requirements of the offer. It is not allowed to send personal information not required in the offer reply. It is not allowed to send these personal data already in the offer request.

Additional personal data of a passenger are title, first name, last name, phone numbers, emails or other social account.

For certain context it might be necessary to have information about the passenger's passport. This information can be added to a passenger if needed (e.g. Eurostar trains).

A passenger can have a set of reduction cards.

A passenger can further transport dogs, bicycles, cars, motorcycles or trailers if this is supported by the transport vehicle.

Requirements on Location

A location uniquely identifies a place in space. A location can be of type station, point-of-interest, address or geo-coordinate.

For railway stations the UIC code station codes most be supported.

To support other means of transportation the types can potentially be extended.

Requirements on Trip

A trip must contain the following information.

- `origin`: a location where the vehicle departs
- `destination`: a location where the vehicle arrives
- `duration`: the duration of the trip
- `segments`: a list of segments

A segment represents a subsection of a trip that is realized with the same transport vehicle. In railways it is typically one train (between the moment passenger steps on-board until stepping out of that train) but could be using different means of transportation. A segment has an origin, a destination and duration.

A vehicle is defined by a number or line and a service brand.

A transfer is a special kind of segment, defining how long the transfer takes.

Requirements on Offers

An overall offer presented to an allocator or a distributer bundles offers that contain admissions, reservation and ancillaries.

An offer has an overall comfort class and an overall flexibility.

An offer has a minimal price. The minimal price is the price that does not include optional reservations or ancillaries.

An offer is valid for a given time.

An offer can be pre-booked.

An offer should span at least one segment of the trip and include all needed services.

Requirements on Admission

An admission provides the right to travel on a vehicle.

An admission has a price. In general, the price is calculated per passenger.

An admission offer is valid for a given time. An admission offer shows which reductions has been applied.

An admission is linked to one or more passengers.

An admission is in state **CONFIRMED, FULFILLED, USED, REFUNDED.**

In general, there's a one-to-one relationship between offer and product. Only for some combinations of TGV and TER in France an offer must support referencing two products. Additionally, an included reservation does not reference a product.

An admission might be linked mandatorily or optional to one or more reservations

Requirements on Reservation

A reservation provides the right to sit or lay on dedicated place in a vehicle

A reservation has a price. A reservation can be **OPTIONAL, MANDATORY, INCLUDED** to an admission.

A reservation offer is valid for a given time. An admission offer shows which reductions have been applied.

A reservation is linked to one or more passengers.

A reservation is in state **CONFIRMED, FULFILLED, USED, REFUNDED.**

A reservation has a one-to-one relationship to a product.

An integrated reservation shall be modelled as an admission with an included reservation.

Requirements on Ancillary

An ancillary is a service that can be offered to a customer. Examples for ancillary services: Wifi access or on-board meal.

An ancillary has a price.

An ancillary offer is valid for a given time.

An ancillary is linked to one or more passengers.

An ancillary is in state **CONFIRMED, FULFILLED, USED, REFUNDED.**

An ancillary has a one-to-one relationship to a product.

Requirements on Fees

Fees of an allocator or a carrier can be required upon the sale of reservations, admissions or ancillaries or collectively for a set of reservations, or for a booking.

A fee has a value.

A fee applies to one or more offer parts, and to one or more passengers.

A fee is automatically added to a booking if the relevant offer parts are included, e.g. a reservation fee is automatically added when any reservation has been selected.

Whether a fee is refundable is defined by the tariff.

The state of a fee depends on the state of the associated product.

Requirements on Offer Combination

If offers have no combination restrictions they can be combined freely. However if business rule require, it must be to express combination constraints to secure the tariff validity.

The combination logic needs to be fast (<20ms).

The combination tags most be unique across all partners involved on a given trip.

Requirements on Round Trips

Round trip offers should be possible considering both trips when making the offer.

Support for round trips consisting of one or two products need to be supported.

Requirements on Booking

A booking consists of a selected offer and optionally reservations or optional ancillaries.

It must be possible to search for bookings:

- Passenger first name, last name or passenger date
- Booking reference
- Fulfillment reference
- Travel date or end
- Origin or destination

To support stateless booking a explicit pre-booking step is *not* supported by design.

Booking must be supported by all parties.

Requirements on Products

A product must contain the following information:

- `id`: an id uniquely identifying the product, e.g. “Sparschiene”
- `description`: A textual description of the product
- `conditions`: A structured description of the sales or after-sales conditions which can be machine interpreted.
- `refundable`: Indicates whether a product is refundable, refundable with conditions or not refundable
- `exchangeable`: Indicates whether a product is exchangeable, exchangeable with conditions or not exchangeable
- `serviceClass`: The service class describing the level of comfort.

Other attributes may define the supported fulfillment media types of the product as well as text defining service or carrier constraint.

Requirements on fulfillment

A fulfillment must be in a well-defined state (**CONFIRMED, FULFILLED, CHECKED_IN, REFUNDED**) and have a unique control number. The fulfillment must reference the offer parts covered by the fulfillment.

A fulfillment must reference fulfillment documents (aka. tickets). Fulfillment documents in form of a UIC PDF ticket most be supported by all parties. Other media types such as **RCT2, RCCST, UIC_PDF, PDF_A4, PKPASS, TICKETLESS, ALLOCATOR_APP, SOCIAL_MEDIA_ACCOUNTS** can be supported. Especially the support ticketless is encouraged to be supported by all parties.

In allocator mode only: A fulfillment may reference fulfillment items such as visual security elements, additional bar codes or control key,

Requirements on refund

For a given a booking a refund can be requested.

A refund can have a fee.

Cancellation (a.k.a. revoke) is a special kind of refund where no fees apply, and the complete amount is returned.

Cancellation must be supported by all parties.

Total refund must be supported by all parties.

Requirements on partial refund or exchange

Partial refund is regarded as special form of exchange

Partial refund as well as exchange may be supported by all parties.

Functional Requirements Allocation

The requirements covered by this specification are listed here with references to the implementation. Changes in the requirements during the lifecycle of this specification might lead to changes in the corresponding implementations.

Requirements on regional validity

Users of the data:

- The allocator to link a journey from the timetable to the valid offers based on the fare data (automated)
- The passenger in a readable form to know which transport connections he can use (manual)
- A controller to validate the ticket on a train or station or station (manual and/or automated (e.g. gates))

Non-functional:

- The fares depend on the timetable. The station data are not part of the fare structure. Stations will always be referenced by the station code used in the timetable. Station codes used are those in the timetable according to EU TAP-TSI B.1.

Functional concepts:

Station

A station which could be used in timetable data to embark and/or disembark passengers.

Fare reference station set (virtual pricing point)

A fare reference station is a list of stations where the fare is valid with a common name.

Route

A route is defined as an ordered list of stations or "fare reference stations" along a possible travel route. In the human readable form, the stations are separated by "*".

A route can split into optional routes indicated in the human readable route by "/".

The end of a route of one carrier when combined to another route of another carrier is indicated with an additional "(FR)" in the human readable form if it is not at a "real" station.

Are routes used as line routes or as bubble routes?

`A*B/D*C` as line routes: `A-E-C` is not allowed

`A*B/D*C` as bubble route: `A-E-C` is allowed

Decision: only the line routes will be supported, "bubbles" must be defined as areas

More than two alternative routes must be possible in the route description.

Areas

Areas for the regional validity are needed. The areas defined in IRS 90918-4 (control) and IRS 90918-9 (bar codes) will be available for the fares as well:

- Zones
- Countries
- Geographical polygons

Route for dynamic fares:

- Train bound ticket only
  - No route
  - List of train number, travel date and time, service brand (optional), from/to station
- Route based only
  - Route same as for non-yielded NRT
  - Optionally depending on service brand(s)

- Train bound (long distance) + route (regional)
  - Yield management can be on both parts combined, so the complete part must be requested online
- Train bound (carrier 1) + Train bound (carrier 2)
  - Train bound offer until the border point/connection point on both sides
  - Train bound can be combined into one
- Train bound (carrier 1) + route (carrier 2)
  - Train bound offer until the border point/connection point
  - Route description from the border point/connection point onwards

Connection Point

Regions (routes) of different carriers can be connected at defined connection points. The old concept of a central predefined list of border points (as part of TAP-TSI) is replaced by the concept of "connection points" which can be defined by each carrier independently using the station codes.

Connection points will include a border point code to support existing implementations where the border point code is compared with the timetable data. As in principle every station can become a connection point (e.g. all stops from Aachen to Brussels are connection points from DB to SNCB) implementations based on border point codes cannot cover all connections.

As on both sides of a connection multiple small stations could be connected and not all of them might be in the timetable of a train the connection point should allow to connect sets of stations.

Requirements on Allowed Service

Allowed Services

Open tickets - not linked to a train - might be valid for some carriers or services on the route only.

As the offers should be created based on the timetable the allowed services in an offer should be defined based on the service brand code in the timetable data.

Carriers and service brands can be included or excluded.

Class of Service

List of classes allowed in the ticket. Railways use different notions and names on service classes on their trains. A common type is needed to combine different levels of service from different railways.

There needs to be a marketing name for the class.

Service class is optional for transportables

- Bicycle

- Dog (might depend on the class of the ticket)
- Luggage (might depend on the class of the ticket)
- Oversize Luggage (might depend on the class of the ticket)

IRT fares don't use classes but service levels (defined in IRS 90918-1) to cover the more detailed products available via reservation.

In case NRT and Reservation needs to be combined, rules are needed which service levels of the reservation are allowed in combination with a fare.

SalesAvailability defines the constraints on the time when a sale of a fare can start or end. The sales availability is used in the offline data exchange only. A constraint is provided as a list of salesRestrictions that have to be applied.

Sales restrictions can define a start and end of the sale relative to the date of sale or the date of travel.

A reference to a calendar can be provided to indicate all sales dates.

Requirements on availability for purchase

An offer is available a specific time range before the start of travel at the first departure station in the time zone of the departure station.

An offer might become unavailable a specific time range before the start of travel at the first departure station in the time zone of the departure station.

An offer might be available from a specific time onwards or in a time range or time ranges (either in UTC or alternatively in the time zone of the ticket vendor).

Example:

- Offer A is available from 3 months before departure until 2 days before departure and can be purchased in June and July on Thursdays only.

Real examples

- Available for purchase 180 to 3 days before departure day
- Available for purchase 01 JUN – 30 JUN for travels 01 JUL – 31 AUG for 30 consecutive days of validity
    - purchase 01 JUN – 30 JUN
    - travels in 01 JUL – 31 AUG (validity for usage)
    - 30 days of validity (validity for usage)
- Available for purchase 180 to 0 days before departure day, valid for 2 consecutive days

The following rules can be defined (and combined):

- Sales start hours or days prior to the departure in the time zone of the departure station

- Sales ends minutes, hours or days prior to the departure in the time zone of the departure station
- Sales start hours or days prior to the start of validity in the time zone of the departure station
- Sales ends minutes, hours or days prior to the start of validity in the time zone of the departure station
- Sales ends minutes, hours after the start of validity in the time zone of the departure station
    - A specific range of days in UTC
- A specific range of days in the time zone of the sales location

Requirements on validity for usage

The validity of usage defines the time when the passenger is allowed to use a fare. To define this time there is a need to:

- Simple duration (number of days starting from the first day of validity 00:00 in the time zone of the departure station until the number of days and hours later at a specified time in the time zone of the arrival station:

Example:

Start of Validity: 1.1.2020 00:00 CET

Validity data: 4 days 5 hours

End of Validity: 5.1.2020 05:00 GMT

Printed text on the ticket: 1.1.2020 – 4.1.2020

- Duration as number of days and hours + number of days of the journey according to the timetable
- Exclusions (e.g. not valid during peak hours 8:00 – 10:00)
    - Peak hours in case the journey starts in the peak hours (e.g. at NS)
    - Peak hours in general
- Restrictions to specific days
    - Mondays
    - Tuesdays
    - …
    - Sundays
    - Specific dates or date ranges
- Restriction on return tickets
    - return ticket of the same carrier must be sold

  - the number of nights in between the inbound and outbound part of a return ticket
  - a specific weekday in between the inbound and outbound part of a return ticket is not allowed

Decision: no return tickets on one "paper" but return fares should be possible.

- Validity for passes
  - Indication that the ticket is a pass
  - Start and end of validity in UTC
  - Number of allowed trips or days
- Examples:
  - Valid Monday – Friday if work day from 09:00 until 03:00 the following day
  - Valid Saturday – Sunday and public holidays from 00:00 until 03:00 the following day

Requirements on validity for passengers / transportables

Transportables can be different types of passengers, animals or other items carried by a passenger.

- A passenger might have an upper and / or lower age limit.
- A passenger might have an additional age limit for travelling alone.
- There might be a limit on the number of accompanying passengers of one type a passenger of another type can accompany. (e.g. not more than 8 children with one adult)
- A passenger might have an additional age limit for being entitled for reservation.
- A number of passengers might be entitled to carry a number of passengers of another type for free (1 Adult + 1 accompanying person for PRM).

A fare might be available with a specific number of passengers only (group fares):

The passenger weight of each passenger type needs to be considered.

Requirements on validity for reductions

Reductions are price reductions due to a reduction "card" an existing ticket or a pass which the passenger already holds. It might be that the physical card does not correspond to a specific reduction but provides the option to carry different reductions.

Different prices due to the age of the passenger are separate fares, not reductions to a fare.

- A card might be valid only for combined tickets only (special NS card)
- Multiple cards might apply to the same route segment, but only one of them would be applied.
- A reduction might grant a 100% price reduction

In this case an NRT is created up to the final station the customer goes with the price to the border of the area. The ticket indicates that the ticket has a reduction of 100% within the area and an indication that it is valid only together with the card. Pricing data are needed for the free travel area to get the route description.

Requirements on prices

Prices might be needed in more than one currency.

- Currency (local currency might be required additionally due to local legislation for two carriers in one country)
- Amount

Value Added Tax (VAT) details must be given to the customer to enable a business customer to claim a refund. The VAT details include:

- Country
- VAT-Company-Id
- Percentage
- Amount

The VAT given is the VAT the carrier pays for this fare to the countries where he is providing his service. The VAT might depend additionally on whether the fare is issued as national ticket, international ticket or integrated in an international ticket. Also, the VAT might depend on whether the fare is used for short distance or integrated in a long-distance ticket.

Note: There are national rules on where and when to display the VAT on a ticket or receipt when a ticket is sold in that country. These are not considered here.

Possible Price formats are:

- Fixed prices attached to a route (and fare) including VAT details (country, percentage, amount, VAT id)
- Prices depending on an intermediate distance ("fare kilometer")
- Price depending of other prices.

Decision: The price will be delivered also in case of reductions or kilometers. No calculation is needed at the receiver side of the data.

Requirements on the basic fare structure

The basic fare element links the constraints and the price.

A name of the fare needs to be provided.

Requirements on the after sales conditions

After sales conditions define fees to be taken in case of an after sales transaction on behalf of a customer. The after sales transactions considered are:

- Cancellation (Refund)
- Exchange with a new fare of the same carrier
- Exchange with a new fare of another carrier
- Exchange for the same travel day
- Upgrade

After sales transactions due to service violations of the carrier are governed by PRR rules and are not considered here.

Some railways make refunds using other "means of payment" like bonus points, vouchers. These are not considered here and thus will not apply to the fares defined here.

Some railways apply different refund rules depending on the type of payment. These restrictions will not be considered here. It is assumed that the refund will be processed by the allocator who manages the combined fare. He needs to consider payment restrictions in order to avoid fraud (e.g. no cash refund on electronically payed tickets, no refund unless ticket control data have been received, …).

The refund fee can be claimed by the carrier.

Requirements on conditions on fulfillment

The fulfillment defines the required types of creating a ticket for the passenger and therefore especially the required types of security to be applied.

The fulfillment might be restricted depending on:

- Allowed types of fulfillment
- Accepted / required bar codes
- Required control data exchange
- Individual ticketing

The Required personal data might depend on the fulfillment:

- Required personal data to be provided from the allocator to the carrier depending on type of fulfillment
- Depending on border crossing and train types (Belgium border crossing of high-speed trains requires personal data)
- Data might be required for ticket holders only or for all passengers

Requirements on dynamic fares and train linked tickets

Indication of dynamic fares available online

The allocator needs to find where he can request offers online.

- Solution 1: add the carrier(s) providing offers in their systems to the trains in the timetable

- Solution 2: publish station or ODs (optionally also by country) and/or train types (service brands) and/or the carrier(s) mentioned in the timetable where fares can be requested
- Solution 3: publish for which carriers and service brands (and optionally trains) offers can be requested

Decision: The solution should be independent from the timetable.

Indication of train links on the ticket

Tickets might be linked to the use of specific trains even in case there is no reservation. There are different options on how to indicate this restriction:

- DB solution: The train information replaces the corresponding route part
- ÖBB solution: The route description is identical to the ticket without train link and the trains are added in the condition description

Decision: in case of a train bound ticket the route of the train should replace the route description for the part of the train bound*

Train link should include:

- Date and departure time
- Service Brand Abbreviation (e.g. RJ, ICE) (can be retrieved from timetable data)
- Train number
- Departure Station (short name)
- Arrival Station (short name)

Request for online fares

- The complete connection must be sent
  - To check whether it is international
  - To check that it is not inside some regional tariff area
  - To calculate the correct VAT
  - To check for supplements applicable only at the start or end of the journey
- The part where the offer should be built must be provided
  - the station/connection point from and to where the offer is needed

Requirements on combining fares

Multiple models are defined for combining fares. The carrier defines in the fare data which model(s) the allocator can apply.

Combining the fares tries to achieve:

- Apply the conditions set by the carrier for the service he provides to secure the business model and financial interests of the carrier

- Create a simple combined fare for the customer

It is not possible to achieve both target at the same time. The different models of combining fares implement different priorities given to these targets.

In general, the basic parameters defining the price must be listed separately on the combined offer:

- route description / train link
- class of service
- passenger types

The combined price is always the sum of the prices of the parts. The allocator might add a handling fee.

SEPARATE_CONTRACTS model

This is the model for not combining the fares in one ticket and not allowing the integration in one contract. The rules applied for this ticket are exactly the rules defined by the carrier in the fare data.

The allocator must ensure that it is clear for the customer that no common contract was established.

Implementation Aspect

Relevant attributes:

```
- FareCombinationConstraintDef.combinationModels.model == SEPARATE_CONTRACT
- FareCombinationConstraintDef.combinationModels.allowedCommonContracts
```

Business Rule

Let CC_A be the set of allowedCommonContracts for Fare A and let CC_B be the set of allowedCommonContracts for Fare B.

If the intersection of two sets CC_A and CC_B is empty, **then** separate contracts most be issued. Otherwise a combined contract can be issued.

CLUSTERING model

The `CLUSTERING` model tries to simplify conditions and fares for the customer but sacrifices a part of the control of the carrier on its fares.

Similar types of fares are defined to belong to the same “cluster”. The after sales conditions for a cluster are defined by the allocator. However, the after sales conditions must respect basic rules on after sales for that cluster.

The clusters correspond to the flexibility a passenger receives to change the booked train. This corresponds directly to the after sales conditions. Hereby the fees to be paid for such an exchange are essential for the definition of clusters and not the complexity of the process

to change. Thus, a train bound ticket and an open ticket belong to the same cluster in case the fees to change to different trains / times are comparable.

The after sales fees can be demanded by the carrier.

The other conditions might either be listed per carrier or combined by rules.

The customer buying products from one allocator has a simple unique view on after sales conditions. Optionally this might be restricted by a list of carriers and/or allocators where this combination is allowed.

The validity for usage is combined to be:

> The minimal validity of all included fares but at least the time needed for the combined journey according to a timetable information.

The combined fare is available for sale only if all parts are available for sale.

The following clusters are defined (with the order from high to low flexibility): `BUSINESS` > `FULL-FLEX` > `SEMI-FLEX` > `NON-FLEX` > `PROMO`.

Any of the clusters can contain train-linked or non train-linked offers.

Offers of a less restrictive cluster can be included in a more restrictive cluster using the more restrictive rules for the combined offer, e.g., `BUSINESS` + `FULL-FLEX` leads to `FULL-FLEX`.

`BUSINESS`:

- Refundable after the departure or last day of validity
- Exchangeable after the departure or last day of validity

`FULL-FLEX`:

- Refundable before the departure or last day of validity
- Exchangeable before the departure or last day of validity

`SEMI-FLEX`:

- Refundable with fee depending on conditions of the allocator
- Exchangeable with fee depending on conditions of the allocator
- Minimum validity applies

`NON-FLEX`:

- Non refundable
- Non exchangeable
- Minimum validity applies

`PROMO`:

- Non refundable

- Non exchangeable
- Minimum validity applies
- Restricted combination with other cluster offers

Implementation Aspect

Relevant attributes:

```
- FareCombinationConstraintDef.combinationModels.model == CLUSTERING
- FareCombinationConstraintDef.combinationModels.combinableCarriers
- FareCombinationConstraintDef.combinationModels.referencedCluster
- FareCombinationConstraintDef.combinationModels.allowedAllocators
```

Business Rule

Let A, B be fares.

If A.referenceCluster is element of B.allowedClusters AND if the fare provider of fare B is in A.combinableCarriers AND if the fare provider of fare A is in B.combinableCarriers **then** the fare A and B are combinable according to the CLUSTERING MODEL.

COMBINATION model

The `COMBINING` model tries to be close to the fare conditions defined by the carrier but sacrifices the simplicity of the fare towards the customer.

The after sales conditions of the different fares will be combined into one condition to best reflect the conditions of all included carriers.

The after sales conditions will thus depend on the combinations of carriers.

Optionally this might be restricted by a list of carriers where this combination is allowed.

The combination model tries to apply all rules of the involved carriers but sacrifices simplicity of rules.

The validity is combined to be:

> The minimal validity of all included fares but at least the time needed for the combined journey according to a timetable information.

The combined fare is available for sale only if all parts are available for sale.

The after sales fees are combined accordingly:

> At any time, the fees defined by the carriers are applied on the price part of these carriers only. The result is a list of times with increasing fees.

Example

- Fare 1: 10% 20 days before departure, price: 100€
- Fare 2: 90% 2 days before departure, price: 200 €
- Result: 10€ fee 20 days before departure

10€ + 180€ = 190€ fee 2 days before departure

Implementation Aspect

Relevant attributes:

- `FareCombinationConstraintDef.combinationModels.model == COMBINING`
- `FareCombinationConstraintDef.combinationModels.combinableCarriers`
- `AfterSalesCondition.afterSalesRules.fee`
- `AfterSalesCondition.afterSalesRules.applicationTime`

Requirements on Reservation

It should be possible to book reservations within the same technology.

The existing reservation services in IRS 90918-1 should also be supported.

Requirements on Fare Exchange

Will be released as part of version 1.2

Fares-in OSDM are expressed in Euro.

Fares must be delivered by fare providers twice a year: **October 1st** each year for *winter timetable change (mid of December)* and **April 1st** each year for *summer timetable change (mid of June)*. The data for these mandatory data exchange must be delivered by all fare providers to the OSDM-Offline platform. Additionally, all allocators must import relevant fares from the the OSDM-Offline platform to guarantee that up-to-date fare data is used for price calculation.

Fare-prices shall remain unchanged unless optional deliveries in between these dates (October 1st and April 1st each year) are agreed on bi-/multilateral basis. These optional data are also delivered to the OSDM-Offline platform.

In principle prices for customers are created by addition of prices per fare provider. Nevertheless, bi-multilateral agreements may include other regulations.

Conversion from Euro into a national currency (if necessary, vice versa) is subject to national distribution systems of the carrier/distributor concerned.

Architectural Requirements

Requirements on aligned processes end to end

The processes must be are aligned over all actors to reduce overall complexity and thus costs.

Requirements on aligned services

The services must be aligned such that there is a close mapping to the processes supported by the services.

The services must be aligned such that the call chain between the services does not involve unnecessary mappings between different actors.

Requirements on messages

The messages of the online services must contain no unnecessary attributes or data structures. Unnecessary attributes are attributes that are not needed for the online processes.

Requirements on extendibility

The specification must be extendible in various dimensions:

- Support of new products on the fare as well as on the offer level
- Support of new processes, e.g. product-based distribution
- Support of new modes of transportations, e.g. scooters or rail

Requirements on security

The specification must include the protocols to ensure secure authentication and data transfer.

Legal Requirements

The flowing legal regulations provide requirements that affect the solution:

Rail PRR Regulation (EC) 1371/2007 on Rail Passengers' Rights and Obligations

This regulation must be fulfilled.

GDPR: Regulation (EU) 2016/679 on data protection

- The traveller must be informed on the use of his data and on passing his data to the carrier and TCO
- The traveller must be informed which data are stored including data passed to the carrier and TCO
- The traveller has the right to ask to delete the data in case the data are not required to fulfil the contract of carriage
- The traveller has the right to ask for data correction in case the data are wrong
- Legal basis for processing of personal data with a view of black listing

  Although the exchange of blacklists is not in the scope of the specification the data exchanged can be used by the allocator for a local blacklist. He has therefore to obey the regulations when using the data.

  Two processing actions (automated profiling) are concerned:

  1. Collection and analysis of personal data on regular basis for trigger points: consent of passengers or legitimate interests of the rail carrier is needed

2. Storage of information in the blacklists: legitimate interest of the rail carrier is needed

- General black list for use by multiple companies is allowed

  1. No access to the full list is provided
  2. No automatic checking in all cases

- Pre-cautions to be pursued by the railway undertaking

  1. Ensure right of access and objection
  2. Information preceding such processing and notification of inclusion into the blacklist
  3. Safeguards to prevent confusion
  4. Additional organizational and technical safeguards for processing

Art. 101§1 TFEU (Competition Law)

All agreements between undertakings, decisions by associations of undertakings and concerted practices which are restrictive of competition are prohibited and void

Sensitive activities are:

- Information sharing
- Joint purchasing/selling
- Technical standards
- Standard terms and conditions

The following guidelines apply:

- Technical specifications for data formats should be ok
- Technical specifications for data exchange scenarios should be ok, but excessive error handling scenarios should be optional and agreed bilaterally as unnecessarily high requirements would be a restriction for small companies
- Service Level Requirements should be minimal requirements as unnecessarily high requirements would be a restriction for small companies, higher service levels must be agreed bilaterally
- Information exchange is allowed between the carriers within one contract of carriage as they are all involved in the contract. This does not apply in case of separate contracts.

Requirements not in Scope

- Payment procedures including payment procedures via private currencies alike bonus points

  Information whether such payments are allowed can be included in the fare data, but the required service to handle such payments are not specified here.

- Validation of customer cards
- Combination with non-rail related fares, e.g., flight
- Combination with fares build on pay-per-use basis. e.g., scooters

Note: to be released with version 1.1

Actors / Business Capabilities

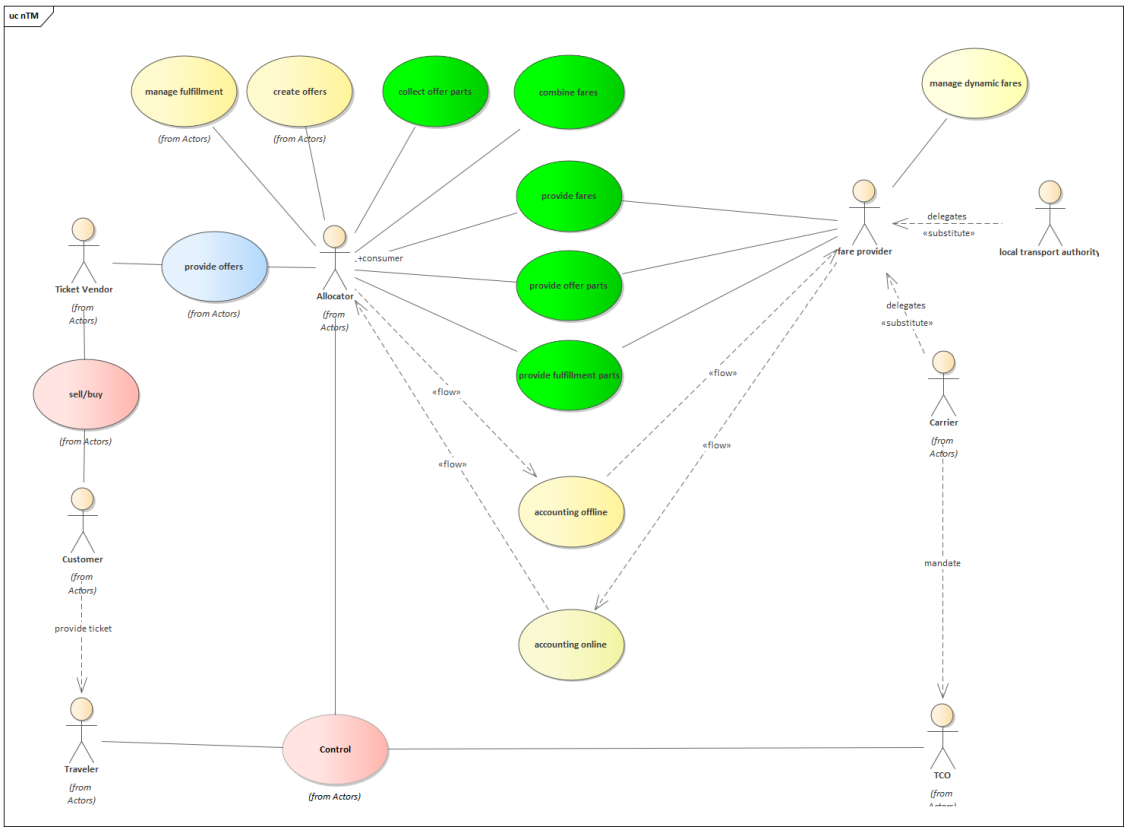
Actor Model

Actors are defined according to the UML specification. An Actor models a type of role played by an entity that interacts with the subject (e.g., by exchanging signals and data), but which is external to the subject.

Actors may represent roles played by human users, external hardware, or other subjects.

Note that **an actor does not necessarily represent a specific entity but merely a facet (e.g., "role") of some entity** that is relevant to the specification of its associated use cases. Thus, a single instance may play the role of several different actors and, conversely, a given actor may be played by multiple different instances.

The following diagram shows the actors and principal use cases involved in rail distribution and control. The principal use case relevant for this specification is marked in yellow.



Actor Model

Actors in OSDM

Actor	Description	Motivation / Distinction to other roles
Allocator	The **allocator** manages the lifecycle of a product sold (the travel contract). He therefore needs to establish information exchange with the ticket **vendor**, **carriers** and **TCOs** involved. The **allocator** makes products available to the **ticket vendor**. The allocator could provide direct services to the **passenger** to modify the ticket status (e.g. activate / check in on a ticket). The allocator combines fares defined by the carriers according to their rules.The allocator creates the ticket fulfillment data (e.g. pdf, pkpass, …). *Note*: To avoid confusion due to usage differences (see the CIT term bank as well as the European TAP-TSI regulation), the terms “Issuer” and “Attributor” have been avoided in this IRS.	The allocator is introduced to separate the role of just selling tickets along a route (Ticket Vendor) from the role of creating the ticket content and providing it to vendors for sale.

Actor	Description	Motivation / Distinction to other roles
Carrier	The **carrier** is the owner of the fare. He provides the transport service to the **traveller himself or via a substitute carrier**. The travel contract provided to the customer establishes a contract between the traveller and each carrier participating in the service. Carriers include Railway undertaking, Bus companies, Maritime companies.	
Customer	The **customer** purchases a travel contract for one or more traveller. *Note*: **The customer** is entitled to receive refund payments.	
Distributor	The **distributor** is the company selling the ticket provided and managed by the allocator to the customer.	Alias: **Ticket Vendor**
Fare Provider	The **fare provider** manages fares on behalf of a carrier or a local transport authority.	
Local Transport Authority	The **local transport authority** organizes the local traffic within an area a behalf of the government or is itself a governmental organization. It defines a fare structure for the local transport which all carriers included must apply.	
Passenger	The **passenger** is the person who travels using a travel contract.	The passenger and the customer can be to distinct person, e.g., if a mom buys a ticket for her daughter.
Ticket Controller	Ticket checking machines, e.g. gates are also part of a ticket controller are also part of a **ticket controlling organization**.	Alias: **Train Agent**
Ticket Vendor	The **ticket vendor** is the company selling the ticket provided and managed by the allocator to the customer. The ticket vendor does not combine fare into one ticket.	Alias: **Distributor**
Train agent	A **train agent** controls whether the passenger has a valid travel contract. The train agent is part of a **ticket controlling organization**.	Alias: **Ticket Controller**

Common Business Capabilities

Powerful Fare Combination

It must be possible to combine fare according to existing fare combinations (e.g. NRT-style PRIFIS) as well as new fare combination models.

Simple Distribution

It must be easily possible to distribute existing and new products. Easily possible means two things: Firstly, for a customer it must be easily possible to find and book and – if needed – refund a booking. Secondly, for the rail sector as a whole the complexity of distribution must be reduced to save costs both for development as well as distribution.

Business Capabilities for Distribution

Lookup Location

In order to uniquely identify a place of origin and destination a service to look up the unique code is needed. For railway stations this code is the UIC station code.

Search Trips

A service to lookup possible trips from origin to destination is needed, especially as the most attractive offers are bound to trip.

Find Offers

For a given trip possible offers spanning the complete trip need to be calculated to the customer. An offer has an overall flexibility, an overall comfort class and a minimal price. An offer consists of admissions, reservations or ancillaries. Reservations or ancillaries can be included, optional or mandatory.

The overall offer should be “homogenous”, i.e. consisting of offers of the same service class if possible. For the Italian market, non-homogenous offers need to be supported. Some trains of the trip might not support all service classes.

Searching for non-trip based offers is supported by a dedicated service. Search criteria can be tags, regions, geo-coordiantes.

Pre-book Offers

If a customer puts an offer into a basket on a distributor channel, it most be possible to retain this offer for a given time using a prebook service. In our design this service creates a booking in the created in the status “pre-booked”. If the pre-booked booking is not booked after a given time limit it well be freed which also includes freeing all eventual reservations on inventories.

Book pre-booked Booking

After the booking has been paid by the customer, he or she owns the booking and the booking is changed to “booked” by a booking service.

Fulfill Booking

After the booking process the customer needs a set of documents to travel and to prove to a ticket control organization that he or she is eligible to travel. Therefore, a service to fulfill a booking in given form, e.g. a ticket is needed. Internally, the state of the booking is changed to “fulfilled”.

Multiple formats and media are supported including pdf, pkpass. Parts to be included in a fulfillment (visual security elements, separate bar code) can be used as well in case of fares.

Get Booking

To get the booking of a customer a service is needed. Specially care needs to be taken into account that privacy regulations are respected.

Refund Booking

If a customer wants to refund a booking a service to refund a booking is needed. The service calculates a refund offer including fees and amount returned which is offered to the customer. If he or she accepts the refund offer the refund offer can be booked. Special refund reasons need to exist, which affect fees and amount returned. Especially, if an agent or a machine makes a mistake a refund reason is needed to refund a booking with no penalties.

By design, the refund process is modelled similarly to the offer/booking process.

Scope: Only support for total refund is mandatory in this version of the specification.

Exchange Booking

If a customer wants to exchange a booking a service to exchange is needed. Conceptually it takes the existing booking and a new trip and calculates an exchange-offer. This exchange-offer can be booked and fulfilled similarly to refund-offer.

Scope: This capability is optional to support in this version of the specification.

Graphical Seat Reservation

In order to display the layout of a train to a customer a service to access coach layout data and availability pf places is needed.

Scope: This capability is optional to support in this version of the specification.

Edit Passenger Information

To add or in special cases edit passenger information a service is provided. This service is explicitly designed to be fully complaint to GDPR regulation.

Retrieve Product Information

A service to access the attributes of a product such as detailed sales and after-sales is optional. Product informatio n is part of the offer or booking and is included there by default.

Retrieve Stored Personal Data

A customer can request information on the stored personal data. This includes also information on personal data passed on to allocators. The booking data can be used to show the stored personal data.

Business Capabilities for Fare Allocation

Combine Fares

The allocator combines fares from different carriers into one offer. The rules on how to combine fares are part of the fare data.

Service Resource Location (Locate Dynamic Fares)

Dynamic fares must be requested online. The allocator needs to find the online resource where to request the offer and book. The fare data provide information on how to find the online service.

Provide Bulk Fare Data

The carrier provides bulk data on his static fares and additional data for locating online services to the allocators.

Provide Dynamic Fare

The carrier provides an online service to retrieve dynamic fares.

Book Offer

The carrier provides online services to book fares and cancel or exchange fares. These can be either as defined in the specification herein or via the interface defined in IRS 90918-1.

Fulfillment

All necessary information for an allocator to build a valid a ticket including necessary attributes and control elements most be included by the fare provider.

Reservation

Reservation has been included in the online services and the inventory resolution data for fare or reservation are included in the bulk data (see FareResourceLocation).

Option/Step 1: Using 90918-1 messages for reservation

1. offer (90918-10 REST service) à parameters for 90918-1 soap services are delivered

2. reservation as-if (90918-1 soap service) / graphical place display (90918-1 soap service)
3. reservation (90918-1 soap service) / specific place reservation (90918-1 soap service)
4. pre-booking NRT (90918-10 REST service)
5. confirm booking NRT (90918-10 REST service)

Option/Step 2: Using REST services 90918-10 for all services

1. offer (90918-10 REST service)
2. checkPreferences (90918-10 REST service) / graphical place display (90918-10 REST service)
3. pre-booking NRT / reservation (90918-10 REST service)
4. confirm booking of reservation / NRT (90918-10 REST service)

Get Booking

To get the booking of a customer a service is needed. Specially care needs to be taken into account that privacy regulations are respected.

Refund Booking

If a customer wants to refund a booking a service to refund a booking is needed. The service calculates a refund offer including fees and amount returned which is offered to the customer. If he or she accepts the refund offer the refund offer can be booked. Special refund reasons need to exist, which affect fees and amount returned. Especially, if an agent or a machine makes a mistake a refund reason is needed to refund a booking with no penalties.

By design, the refund process is modelled similarly to the offer/booking process.

Scope: Only support for total refund is mandatory in this version of the specification.

Exchange booking

If a customer wants to exchange a booking a service to exchange is needed. Conceptually it takes the existing booking and a new trip and calculates an exchange-offer. This exchange-offer can be booked and fulfilled similarly to refund-offer.

Scope: This capability is optional to support in this version of the specification.

Accounting

The specification of the accounting data is not part of this document, however some on the fare content defined in this specification must be included in the accounting data.

The accounting data of a booking should include:

- The identification of the entire ticket sold (unique id within the context of the allocator for at least 2 years)

- The booking id provided by the carriers in case of online fares (unique id within the context of the carrier for at least 2 years)
- The identification of each fare included in the ticket (unique id e.g. UUID)
- The identification of individual tickets of the allocator (unique id within the context of the allocator for at least 2 years)
- The identification of individual tickets of the carriers (unique id within the context of the carrier for at least 2 years)
- The price for each fare and carrier included in the ticket
- The VAT does not need to be included in the accounting data (to be verified in RCF-1)

When using the existing 301 data file structure the ids cannot be included. Until the accounting data structures have not been extended the following intermediate solution is included:

For NRT fares distributed in the bulk data exchange:

A legacy accounting identifier is included in the fare element:

- `seriesId`: the last five digits of the index of a regionalValidity within the list of regional validities
- `addId`: the remaining digits of the index of a regionalValidity within the list of regional validities (max. 2 digits)
- `tariffId`: the index of the fare Element in a list of all fare elements referencing the same regionalValidity

Thereby it is possible to identify the fare element uniquely in the context of a fare data delivery.

Accounting data flow:

- In case of NRT fares used from a bulk data exchange:

The allocator is responsible for the accounting. The data structure for NRT is used.

- In case of fares (IRT or NRT) used with an online booking service:

The carrier is responsible for the accounting. The data structure for IRT is used.

- In case of fares (IRT or NRT) used with an online booking service but with carrier fees defined by the allocator:

The carrier is responsible for the accounting. The data structure for IRT is used. The allocator will inform the carrier on the applied fees in the cancellation confirmation.

Graphical seat reservation

In order to display the layout of a train to a customer a service to access coach layout data and availability pf places is needed.

Scope: This capability is optional to support in this version of the specification.

Edit passenger information

To add or in special cases edit passenger information a service is provided. This service is explicitly designed to be fully complaint to GDPR regulation.

Retrieve stored personal data

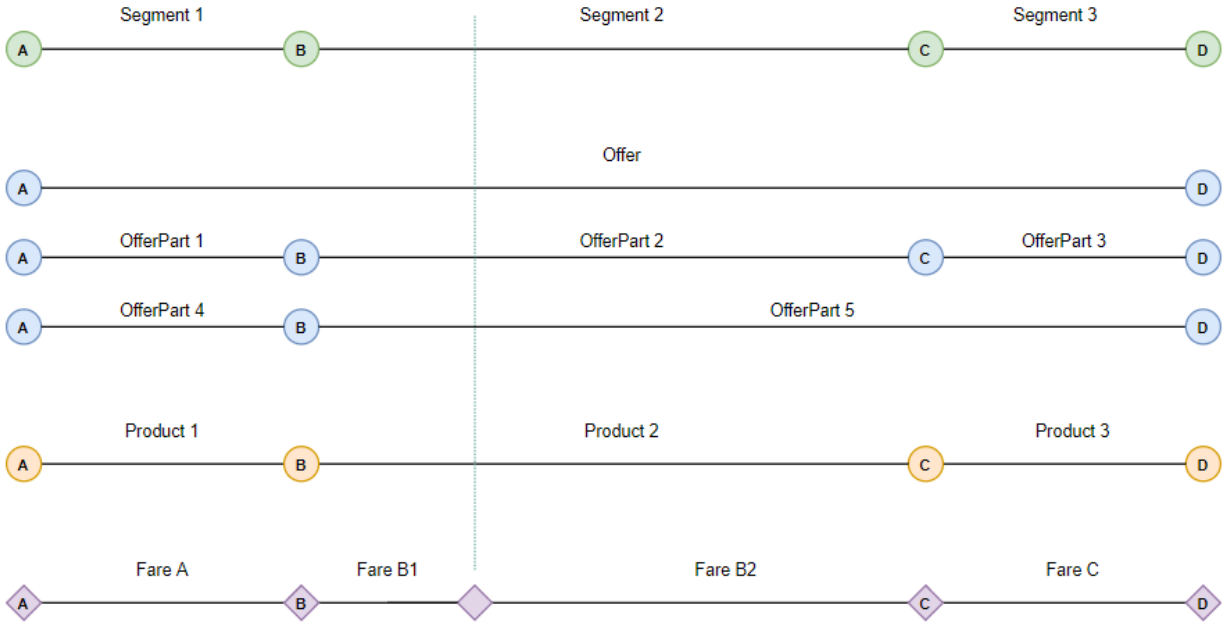
There is no specific service to retrieve stored personal data. The booking can be retrieved to get the passenger references and then the passengers can be retireved. This will provide all stored personal data.

Relationships between Offers, OfferParts, Products and Fares

The entities `offer`, `offerpart`, `product` and `fare` represent different concepts.

An `offer` spans the trip consisting of segments. An `offerpart` spans a segment or - in the case of through fares - multiple segments. An `offerpart` references zero or two products. Mostly, the relationship is one-to-one (zero in case of included seat reservation, whereas two products are only referenced in some rare TGV-TER scenarios).

A `fare` is not necessarily bound to segments but reflects the tariff worlds. A `fare` often starts or ends at country borders where no train station exist. This border points are thus called `virtual border points` which can be modelled by `ConnectionPoints`. Fares are combined following a `fare combination model` to an offer.



Relationships between Offers, OfferParts, Products and Fares

Note: This example assumes that the complete trip can be priced.

Ways to Access Fares

There are three ways for an allocator to access fares.

First Scenario: Complete Offline Import of Fares

An allocator imports all fares of a given railway using a batch import from the OSDM-Offline platform.

The fares contain all relevant information to create offers, bookings and fulfillments (aka. tickets). If a booking occurs the RU informs the RU of the fare sold using UIC 301.

Second Scenario: Import of Relevant Fares at Offer Step

At offer time, an allocator looks up the fares for a given origin/destination in its database. If it doesn't find it the allocator imports the relevant fares online. If a booking occurs the RU informs the RU of the fare sold using UIC 301.

Third Scenario: No Explicit Import of Fares

For a given origin/destination and date of travel the relevant fares are returned as part of the `Offer`.

If the fare is sold as part of an offer then the fare is booked online at the offering allocator.

Attributes of an Online Fare

Attributes of An Online Fare

Roles of Fare Attributes in the Booking and After Sales Processes

The fare contains all information so that an allocator can calculate correct prizes, render a valid fulfillment and account correctly.

The following sections describe which fare attributes are used at which step:

Offer Creation Step

Relevant fare attributes for the offer creation step are:

- `price`
- `regionalConstraint`

  Examples: a list of stations, a list of zones or a list of train link,…

  An allocator needs to guarantee that the whole trip is covered by fares.
- `serviceConstraint`

  Examples: `IC`, `TGV`, `BEX`, …

  An allocator can create offers only if the trip/segment is run by the service.
- `carrierConstraint`

  Examples: Thalys, Eurostar, …

  An allocator can create offers only if the trip/segment is run by the carrier.
- `regulatoryConditions`

  Examples: `CIV`, `MD` or `EU-PER`

  The regulatory conditions need to be indicated in the offer to inform the customer.
- `serviceClass`

  Examples: `HIGH`, `BEST`, `STANDARD` or `BASIC`

  An allocator needs to consider `serviceClass` depending on the `FareCombinationModel` applied.

  The service class needs to be indicated in the offer to inform the customer.
- `comfortClass`

  Examples: `FIRST` or `SECOND`

  The comfort class needs to be indicated in the offer to inform the customer.
- `accommodationDetails`

  Example: `SEAT`, `COUCHETTE`, `BERTH` or `VEHICLE`

  If the train is a night train or car carriage the accommodation details need to be reflected in the offer.

- `afterSalesCondition`

  Example: Non-refundable after departure.

  An allocator needs to consider `afterSalesCondition` depending on the `FareCombinationModel`applied.

  The refund/exchange conditions need to be indicated in the offer to inform the customer.

- `combinationConstraint`

  Examples: `SEPARATE_CONTRACTS` model, `SEPARATE_TICKETS` model, `CLUSTERING` model or `COMBINATION` model

  An allocator can only combine fares respecting the combination models.

- `fulfillmentConstraint`

  Examples: `SIP`, `SID` or `SIS`

  An allocator can only create offers which respect the constraints concerning the ticket control. If `fulfillmentConstraint` are mixed, then all constraints need to be served.

- `reductionConstraint`

  Example: `1085_GA` where 1085 denotes SBB, `1080_Bahncard50`, where 1080 denotes DB, …

  An allocator can create offers only if the passenger(s) own(s) the reduction(s).

- `travelValidityConstraint`

  Example: Valid 24h after departure

  The travel validity constraint needs to be communicated in the offer to inform the customer.

- `placeSelection`

  Example: Selected places in a graphical seat map, reference place for adjacent reservation or place preferences

  An allocator most respect the selected places. The other types are optional to be respected by the allocator.

- `coveredSection`

  Example: Start and end location

An allocator has to create an offer that covers the whole trip from start location to end location.

Booking Step

Relevant fare attributes for the booking process step are:

- `price`
- `reservationDetails`

  Example: Wagon 19, Seat 44

  The reservation details need to be communicated at the pre-booking step to the customer.

- `legacyAccountingIdentifier`

  The legacy accounting identifier information is used to write a correct 301 record.

Fulfillment Step

Relevant fare attributes for the fulfillment step are:

- `price`

  The price needs to be communicated to the passenger(s), e.g. printed on the ticket.

  Additionally, it needs to be encoded in the security element(s).

- `regionalConstraint`

  The regional constraint need to be communicated to the passenger(s), e.g. printed on the ticket.

  Additionally, it needs to be encoded in the security element(s).

- `regulatoryConditions`

  The regulatory conditions need to be communicated to the passengers(s), e.g. printed on the ticket.

- `reservationsDetails`

  The reservation details need to be communicated to the passengers(s), e.g. printed on the ticket.

  Additionally, it needs to be encoded in the security element(s) in case of mandatory reservations.

- `serviceClass`

The service class need to be communicated to the passengers(s), e.g. printed on the ticket.

Additionally, it needs to be encoded in the security element(s).

- `travelValidityConstraint`

  The date are needed to create valid barcode and control data.

  Additionally, it needs to be encoded in the security element(s).

- `passengerConstraint`

  Example: Age between 6 and 16 years

  The passenger constraint need to be communicated to the passengers(s), e.g. printed on the ticket.

After Sale

Refund Offer Creation Step

Relevant fare attributes for the creation of a refund offer are:

- `price`
- `afterSaleConditions`

  An allocator can create offers only if the after sale condition support its creation.

Exchange Offer Creation Step

Relevant fare attributes for the creation of a refund offer are the `afterSaleConditions` as well as all the attributes for offer creation.

Design Guidelines

- **Do not reinvent the wheel** - Use existing concepts whenever possible (e.g. type system of OpenAPI, Problem details,…).
- Strive for a Level 3 of REST maturity.
- Use semantic versioning.

Derived Guidelines

- Whenever a resource returned in a response can contain embedded resources, the request must allow specifying whether and which embedded resources should be returned in full or as references.
- Follow Zalando RESTful API and Event Scheme guidelines
- Use of the JSON Problem element
- Standard Patch operations (not JSON PATCH)
- A resource is either represented in full or as a reference. The reference element has the name of the resource post-fixed with “Ref”. References normally only contains

the URL to the referenced resource and a title element allowing to summarize the resource in one short string
- Although examples or recommendations are provided as to which information should best be represented in the title string, each implementor as the freedom to modify it to best suit his needs.
- Enumerations for very stable entities with limited set only, otherwise code lists. Stations codes are code lists.
- Where possible, existing UIC code lists should be favored.
- Creation/ modification calls return the created/modified resource (not just an ok code)

Error Handling

In order to communicate errors to a consumer we support RFC7807.

This RFC defines a "problem detail" as a way to carry machine- readable details of errors in a HTTP response to avoid the need to define new error response formats for HTTP APIs.

A problem details object can have the following members:

- `type`: A URI reference RFC3986 that identifies the problem type. This specification encourages that, when dereferenced, it provide human-readable documentation for the problem type (e.g., using HTML [W3C.REC-html5-20141028]). When this member is not present, its value is assumed to be "about:blank".
- `title`: A short, human-readable summary of the problem type. It SHOULD NOT change from occurrence to occurrence of the problem, except for purposes of localization (e.g., using proactive content negotiation; see RFC7231, Section 3.4).
- `status`: The HTTP status code (RFC7231, Section 6) generated by the origin server for this occurrence of the problem.
- `detail`: A human-readable explanation specific to this occurrence of the problem.
- `instance`: A URI reference that identifies the specific occurrence of the problem. It may or may not yield further information if dereferenced.

Consumers MUST use the `type` string as the primary identifier for the problem type; the `title` string is advisory and included only for users who are not aware of the semantics of the URI and do not have the ability to discover them (e.g., offline log analysis). Consumers SHOULD NOT automatically dereference the type URI.

Authentication

The following three design principles are binding for each implementor:

1. Don't reinvent crypto, thus we are using **OAuth2**.
2. The JWTs in use for the authentication should be **short-lived** (think of timeout duration single-digit multiples)

3. The JWTs sent by the consumer, regardless of where they are generated, must be **digitally signed** using a private key for which the provider is able to find the matching public key

These principles can be implemented as follows:

- A **registration service** allows a consumer to register the necessary data (like: organization, technical admin, commercial admin, support line, other non-functional requirements like throtteling limits) for approvement by the team providing access. any registered consumer will be approved or rejected if approved a unique, technical "ClientId" results and will be passed to the consumer
- A **login service** allows to request a valid token (for e.g. OAauth2) by the registered ClientId and related secret per configuration the validity duration of the token may be set (for e.g. 10min.), after that the token must be renewed by the consumer optionally the token might be revoked (for e.g. if your devOps realizes the consumer does not behave as expected)

In multi-environments (like DEV, TEST, INT, PROD) consumers might register for each environment separately.

User Lookup

From a devOps perspective it might by hard to control who uses your API (for e.g. `ClientId` and secret might by passed around or hacked).

The following issues should be defined outside of OSDM:

- Additional legal contracts with consumer
- IP white listing
- Mapping of related user properties to the technical `ClientId`

Common Data Structures in Offline and Online Mode

The following chapters contain the detailed description of data structures used to describe fares.

The data structure definitions are used in the bulk data exchange and the online services. The requirements listed in chapter "Requirements" reference the data structures that implement the requirement.

General

The following general data types shall be used:

- DateTime Formats: Date time values must be encoded according to RFC 3339, section 5.6.
- Station Codes: Station codes must be taken from the MERITS code list.

- Station Names: Station names should not include ”/”,”*”. These characters are used to define routes and alternative routes in route descriptions.

Versioning

The specification (open api specification and schema files for offline data) are published as mayor versions in case they are not interoperable. Minor versions will include interoperable changes on the data structure which also includes providing additional data elements that are optional. Implementers must be able to ignore additional elements.

Minor minor versions will include additional documentation only.

Indication of personal data

Within the online part the required personal data are indicated. The general grammar to indicate required data is used.

Indication of required data

Required data are indicated in a structured way using the following language: Data elements are indicated by their path to the resource separated by dots:

- `passenger.gender`
- `passenger.email`
- `passenger.phoneNumber`

The required data elements can be combined using the logical operators:

- `AND`
- `OR`

Brackets `(` and `)` can be used in the standard way as for logical expressions, e.g.:
`passenger.gender AND (passenger.email OR passenger.phoneNumber)`

Detailed data structures

The data structures to be used are defined in the schema and open api specification files. This section serves as additional documentation only.

AfterSalesRules

After sales conditions define fees to be taken in case of an after sales transaction on behalf of a customer. The after sales transactions considered are:

- Cancellation (= Refund)
- Exchange with a new fare of the same carrier
- Exchange with a new fare of another carrier
- Upgrade

See code list: `TransactionType`

The after sales rules might include rules for a delayed payment to avoid fraud. This might depend in the type of fulfillment. (e.g. no cash refund on electronically payed tickets, no refund unless ticket control data have been received, …).

The refund fee can be claimed by the carrier.

The after sales rules bundle a set of after sales conditions under an id that can be referenced by a fare.

An after sales condition applies for a set of after sales transactions and specified:

- the fee to be applied
- the time when the fee needs to be applied
- whether the fee needs to be given to the carrier or can be kept by the allocator
- The data include the amount to be refunded. The amount is given to avoid any calculations with complex rules (percentage + minimum / maximum value) at the allocator side.:
- The value and currency to be applied
- A percentage for customer information. Due to rounding errors a calculated percentage could result in strange numbers (e.g. 9.99% instead of 10%)
- The unit on which the value is calculated (travellers or bookings) The time when the fee needs to be applied is defined by:
- The time unit (hours, minutes, …)
- The time difference value
- The time reference (before departure…)

See code lists: `TimeReference`, `TimeUnit`

An after sales fee is applied from a time before departure, after sale,..)

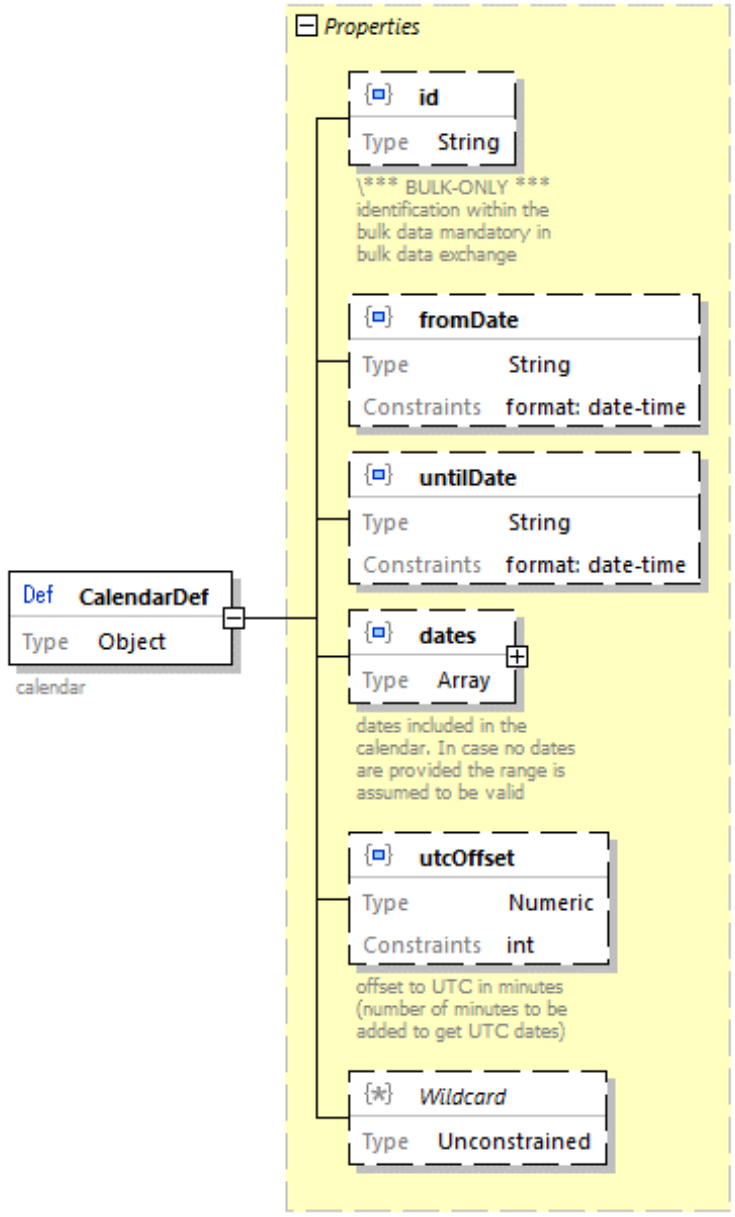
In case multiple rules apply to the same after sales transaction the rule with the closest time in the future must be applied.

Data Constraints on AfterSaleRule

Code	Description
`fee/feeRef`	In online services a fee is included directly, in bulk data exchange a fee must be included in the list of prices and referenced by an id. The fee provided must include the currency € if not agreed bilaterally otherwise.
`applicationTime` / `applicationTimeStamp`	An application time stamp can be used in online services only. If an application time stamp is provided the allocation Time as relative time must not be included.

Calendar

A Calendar is referenced by a unique id which can be referenced from other data structures linked to the fare. A Calendar defines a list of days between two dates. If the dates are not provided in UTC the offset to UTC must be provided additionally.



Calendar

Data Constraints on Calendar

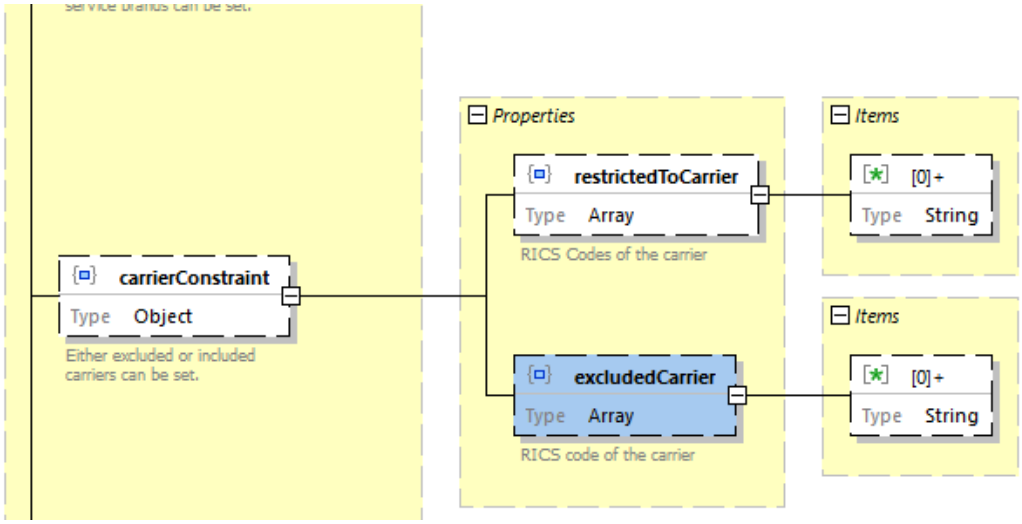
Code	Description
`fromDate, untilDate`	fromDate and untilDate must be provided and `fromDate <= untilDate`
`dates`	`fromDate <= date <= untilDate`

CarrierConstraint

Carrier constraint limits an open fare - not linked to a train - to some carriers. The carriers can be specified either as exclusion list or alternatively as inclusion list. In case of

admissions (train linked or non-train linked) the included carriers specify the responsible carriers to be listed for the customer on an fulfillment.

Carriers are specified by their Company code (RICS code).



Carrier Constraint Type

The included / excluded carriers are also part of the FCB barcode (*IRS 90918-4*) content and the ticket control data (*IRS 90918-9*).

The offline data structure includes an additional id to reference the constraint within a fare data delivery.

Data Constraints on CarrierConstraint

Code	Description
`includedCarriers/excludedCarriers`	Either a list of included or a list of excluded carriers must be provided. It is not allowed to provide both lists.

ConnectionPoint

A connection point defines a point where two regional validities of different carriers can be connected. A connection point is implemented as the list of stations which hit connects.

In case a route ends at a real station the connection point includes the real station.

In case the combination is not at a real station an indication is needed to define the allowed combinations. This could be done by listing the next stations of other carriers which would allow a combination. Combinations would be allowed if the combination points of two routes share two common stations.

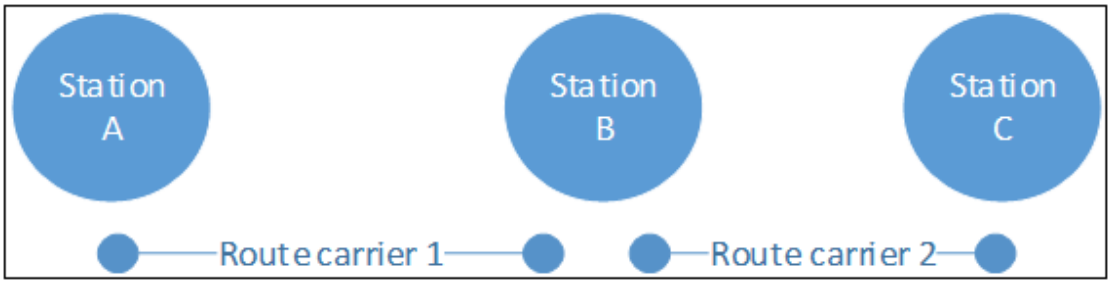
This would also work with multiple stations.

Connection points will include a border point code to support existing implementations where the border point code is compared with the timetable data. As in principle every

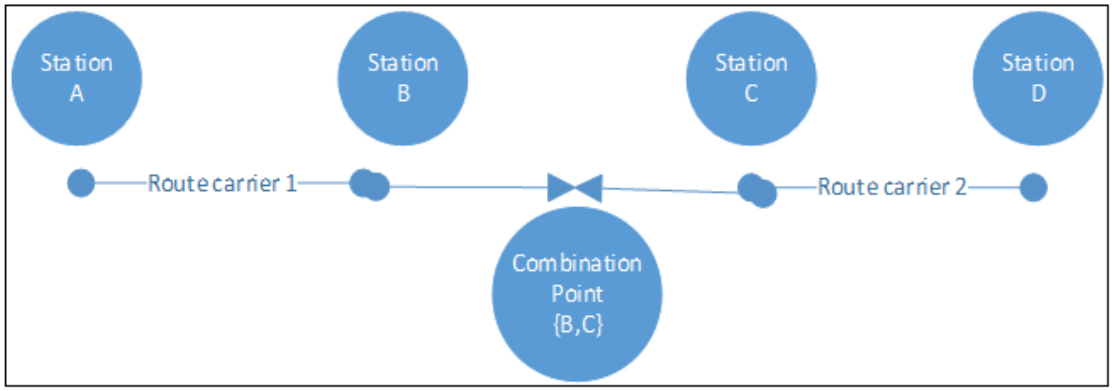
station can become a connection point (e.g. all stops from Aachen to Brussels are connection points from DB to SNCB) implementations based on border point codes cannot cover all connections.

As on both sides of a connection multiple small stations could be connected and not all of them might be in the timetable of a train the connections point should allow to connect sets of stations.

1. Two fares can be connected in case their connection points share a common station in the provided station sets if only one set is provided by a connection point.
2. Two fares can be connected in case their connection points share a common station in two if the provided station sets of each connection point.

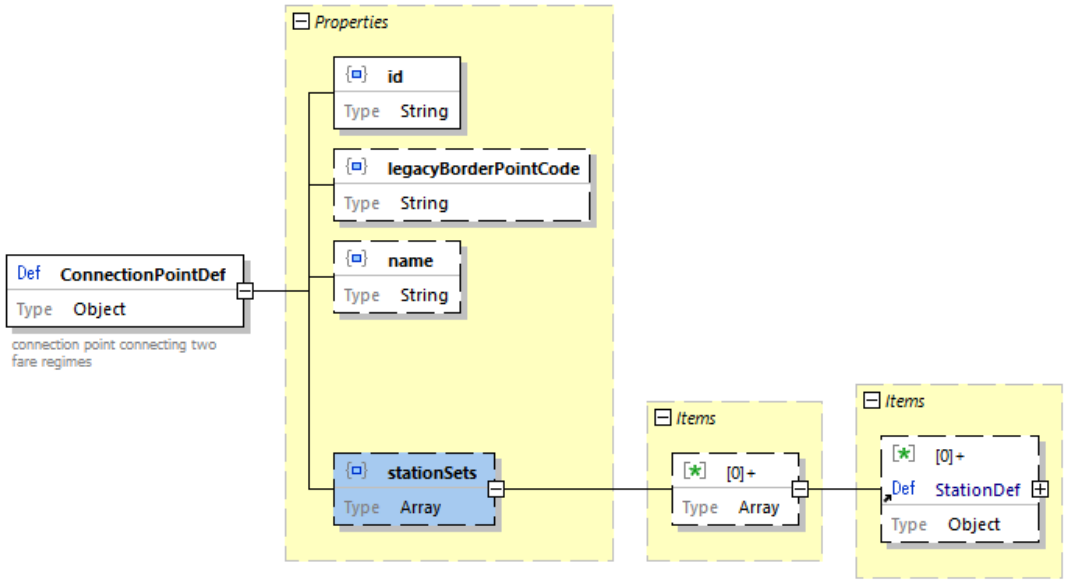


Fare Connection Point - Simple Case



Fare Connection Point - Complex Case

The online data structure does not include the id and the legacy code.



Fare Connection Point

Data Constraints on ConnectionPoint

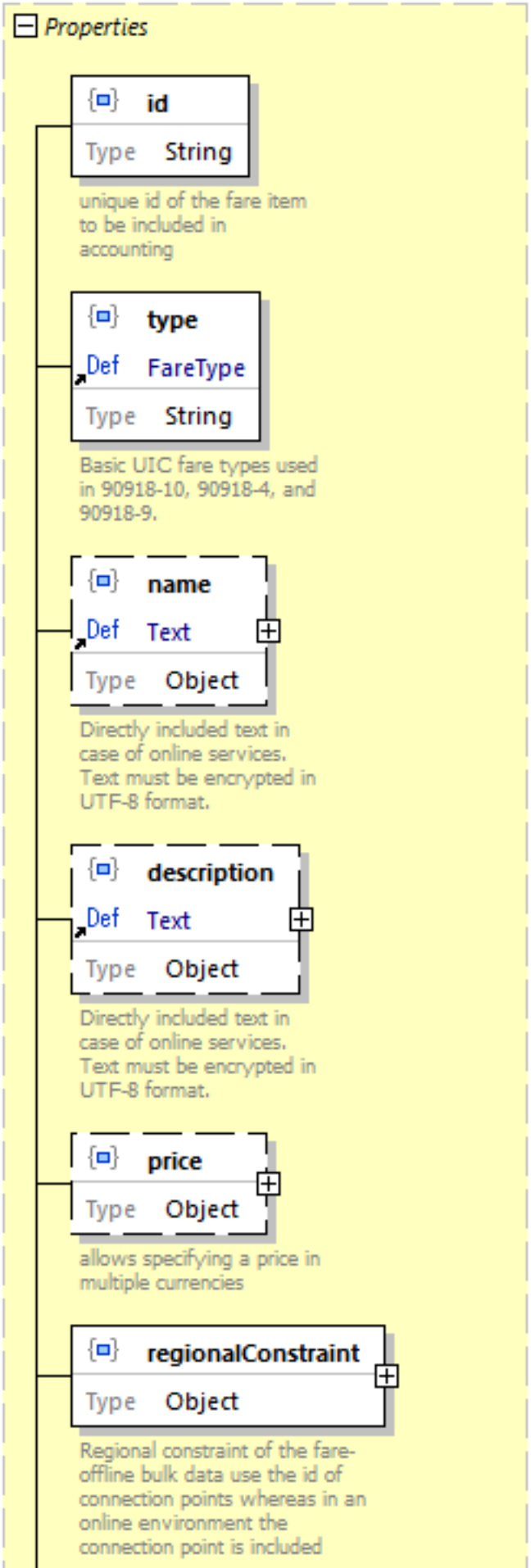
Code	Description
`stationSets`	At least one set with one station must be provided in case the fare border is a real station. Two station sets must be provided in case the fare border is between two real stations.
`legacyBorderPointCode`	The legacy border point code must be provided for the time being. New implementations should not use the border point code.

Fare

An elementary fare to create an offer linking all constraints to one price.

Data elements	Description
`fareType`	**NRT**, **IRT**, **Ancillaries** , **Reservations**
`name`	Name of the fare
`fareDetailDescription`	Additional explanation on the fare (e.g. on included fees like Diabolo or Venice fee).
`price`	Price with currency € must be provided if not otherwise agreed bilaterally.
`regionalConstraint`	Definition of the regional validity of the fare and the geographical combination rules (connection points).
`serviceConstraint`	Restrictions of the service allowed to be used.

Data elements	Description
carrierConstraint	Restriction on the carriers that can be used with the fare.
serviceClass	Class the passenger can use.
serviceLevel	Mode detailed category of places the passenger can use.
passengerConstraint	Rules and restrictions on the passenger types allowed to use the fare and rules on combining passengers.
afterSalesRules	After sales rules for the fare. In case the allocator is responsible for the after sales rules this is almost empty.
combinationConstraint	Rules on the model of combination of this fare with fares of other carriers.
fulfillmentConstraint	Restrictions and requirements on the fulfillment and security to be applied by the allocator.
reductionConstraint	Rules on reduction cards necessary to apply the fare.
reservationParameter	Information on parameters for reservation via the *IRS 90918-1* interface and reservation options.
regulatoryConditions	Legal regimes to be applied to the fate (e.g. COTIV, SMPS regulations).
personalDataConstraint	Rules on the personal data to be provided in a booking.
legacyAccountingIdentifier	Data to be included in the current *IRS 30301* accounting data format.
salesAvailabilityConstraint	Rules on the allowed sates dates for the fare.
travelValidityConstraint	Rules on the validity for travel of this fare.
legacyConversion	Defines whether this fare is allowed to be converted to the old 108.1 data structure and used according to the old rules (YES, NO, ONLY (this fare is provided for conversion only)).


Properties
id
Type String
unique id of the fare item to be included in accounting
type
Def FareType
Type String
Basic UIC fare types used in 90918-10, 90918-4, and 90918-9.
name
Def Text
Type Object
Directly included text in case of online services. Text must be encrypted in UTF-8 format.
description
Def Text
Type Object
Directly included text in case of online services. Text must be encrypted in UTF-8 format.
price
Type Object
allows specifying a price in multiple currencies
regionalConstraint
Type Object
Regional constraint of the fare- offline bulk data use the id of connection points whereas in an online environment the connection point is included

Fare (Online)

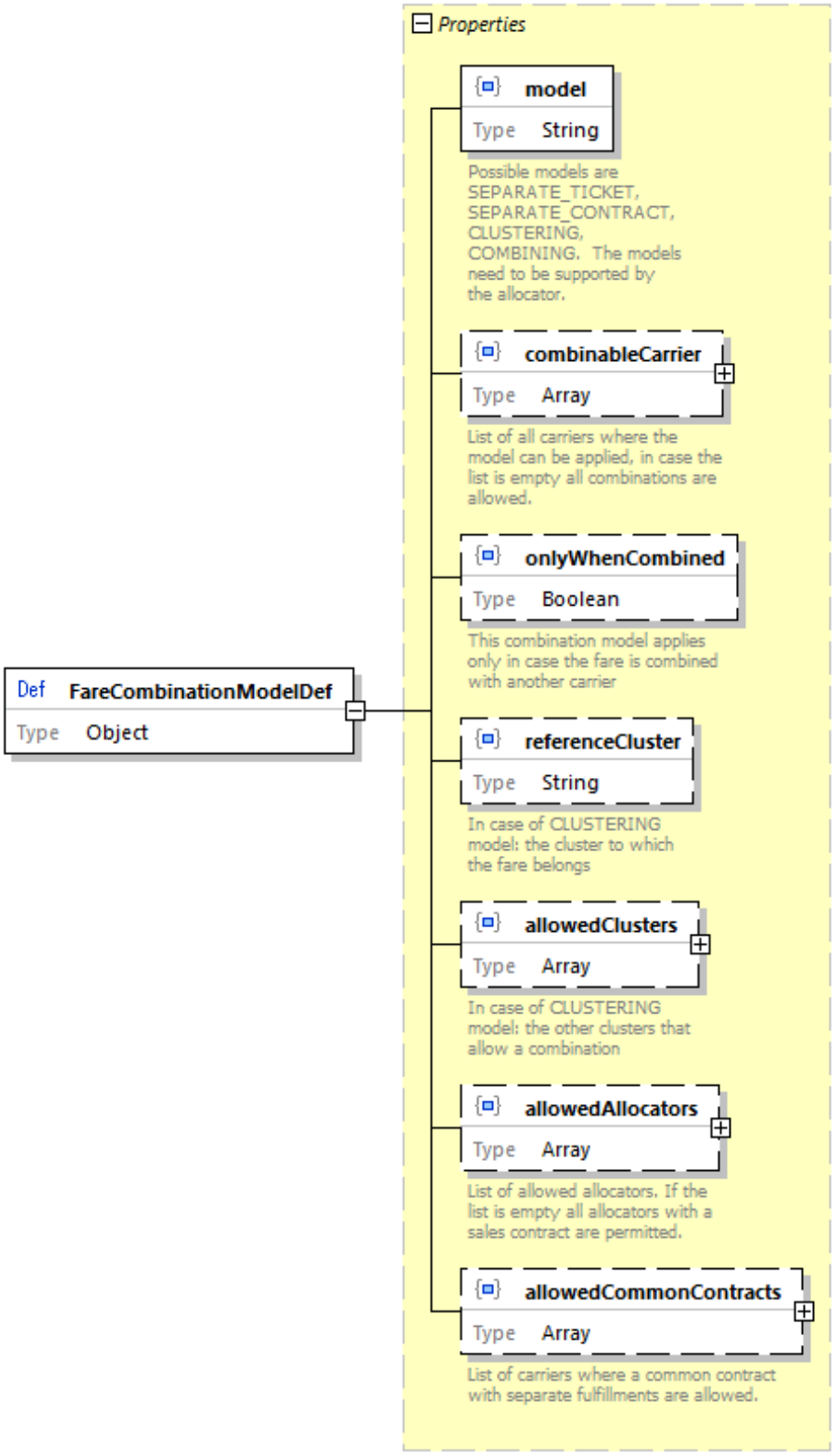
Data Constraints on Fare

Code	Description
`price`	A price must be provided for all offline fares including those where the price is zero.
`legacyAccountingIdentifier`	In case *IRS 30301* in the current version is used to accounting these data must be provided for offline fares
`serviceClass`	Must be provided for offline fares
`combinationConstraint`	Must be provided for offline fares
`travelValidityConstraint`	Must be provided for offline fares
`salesAvailabilityConstraint`	Must be provided for offline fares

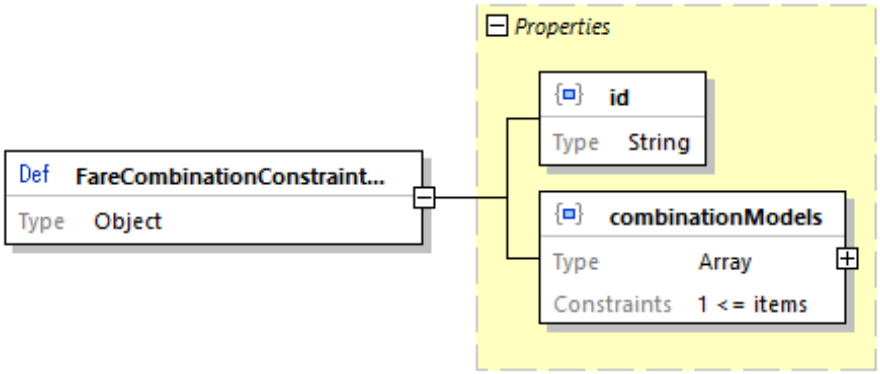
FareCombinationConstraint

The fare combination constraint defines the rules of combining fares from different carriers. It provides a list of combination models the allocator can choose of.

Content	Description
`model`	Code of the combination model applied
`combinableCarriers`	List of carriers that can be combined with this fare. If empty, there is no restriction in combining different carriers. Carriers are listed by their RICS company codes.
`onlyWhenCombined`	Indicates that this fare can be used only if it is combined with another fare of another carrier.
`referenceCluster`	Cluster within the clustering model to which this fare belongs
`allowedClusters`	List of clusters with which this fare can be combined
`allowedAllocators`	List of allocators which can combine this fare. . . If empty, there is no restriction in combining different carriers. Carriers are listed by their RICS company codes. Allowed allocators is not present in the online data.
`allowedCommonContracts`	List of Carriers with which the allocator can for a common contract. If empty, there is no restriction in indicating common contracts to the passenger except for the `SEPARATE_CONTRACT` model. Carriers are listed by their RICS company codes.



Fare Combination Model



Fare Combination Constraint

Combination Model

SEPARATE_CONTRACT Model

This `SEPARATE_CONTRACT` model is the model for not combining the fares in one ticket and not allowing the integration in one contract. The rules applied for this ticket are exactly the rules defined by the carrier in the fare data.

The allocator must ensure that it is clear for the customer that no common contract was established.

CLUSTERING Model

The `CLUSTERING` model tries to simplify conditions and fares for the customer but sacrifices a part of the control of the carrier on his fares.

Similar types of fares are defined to belong to the same cluster. The after sales conditions for a cluster are defined by the allocator. However, the after sales conditions must basic rules on after sales for that cluster.

The clusters correspond to the flexibility a passenger receives to change the booked train. This corresponds directly to the after sales conditions. Hereby the fees to be paid for such an exchange are essential for the definition of clusters and not the complexity of the process to change. Thus, a train bound ticket and an open ticket belong to the same cluster in case the fees to change to different trains / times are comparable.

The after sales fees can be demanded by the carrier.

The other conditions might either be listed per carrier or combined by rules.

The customer buying products from one allocator has a simple unique view on after sales conditions.

The basic parameters defining the price must be obeyed individually within separately on the combined fare/offer:

- route description / train link
- class of service

- passenger types

COMBINING Model

The `COMBINING` model tries to be close to the fare conditions defined by the carrier but sacrifices the simplicity of the fare towards the customer.

The after sales conditions of the different fares will be combined into one condition to reflect the conditions of all included carriers.

The after sales conditions will thus depend on the combinations of carriers.

At any time, the after sales fees defined by the carriers are applied on the price part of these carriers only. The result is a list of times with increasing fees.

COMBINING Model Example

- Carrier 1: 10% 20 days before departure. Price: 100€
- Carrier 2: 90% 2 days before departure. Price: 200 €
- Result:
  - 10€ fee: 20 days before departure
  - 190€ fee: 2 days before departure

Additional Clustering Model Data

Fare clusters reflect the flexibility a fare provides to the customer. Flexibility is defined by the after sales conditions that apply when a passenger wants to change his ticket.

Fare cluster code	description
`BUSINESS`	Refundable/Exchangeable after the departure or last day of validity
`FULL_FLEX`	Refundable/Exchangeable before the departure or last day of validity
`SEMI_FLEX`	Refundable/Exchangeable with fee depending on conditions of the allocator. Minimum validity applies
`NON_FLEX`	Non refundable. Non exchangeable. Minimum validity applies
`PROMO`	Used on a bilateral basis only. Non refundable. Non exchangeable. Minimum validity applies

Combinations of fares of different clusters is allowed with the fare clusters listed in `allowedClusters`. However not all combinations would be provided to the customer. A fare will be combined with a fare of the same cluster and in case his is not available with one of the higher clusters.

Clustering Model Example

- Carrier 1:
  - `BUSINESS` -> CombinableClusters: `BUSINESS`, `FULL_FLEX`, `SEMI_FLEX`, `NON_FLEX`
  - `SEMI_FLEX` -> CombinableClusters: `SEMI_FLEX`, `NON_FLEX`
- Carrier 2:

  - BUSINESS -> CombinableClusters: BUSINESS, FULL_FLEX, SEMI_FLEX, NON_FLEX
  - FULL_FLEX -> CombinableClusters: FULL_FLEX, SEMI_FLEX, NON_FLEX

Possible combined offers are:

- BUSINESS (Carrier 1 BUSINESS + Carrier 2 BUSINESS)
- FULL_FLEX (Carrier 1 BUSINESS + Carrier 2 FULL_FLEX)
- SEMI_FLEX (Carrier 1 SEMI_FLEX + Carrier 2 FULL_FLEX)

A NON_FLEX would be formally allowed, but with the same price as the SEMI_FLEX so it should not be shown to the customer:

- NON_FLEX (Carrier 1 SEMI_FLEX + Carrier 2 FULL_FLEX)

Other combinations would also be formally allowed by the data but suppressed as they would only offer a higher price. These should be suppressed by the allocator. E.g.:

- FULL_FLEX (Carrier 1 BUSINESS + Carrier 2 BUSINESS)

Data Constraints on FareCombinationConstraint

Code	Description
combinationModel	At least one model must be provided

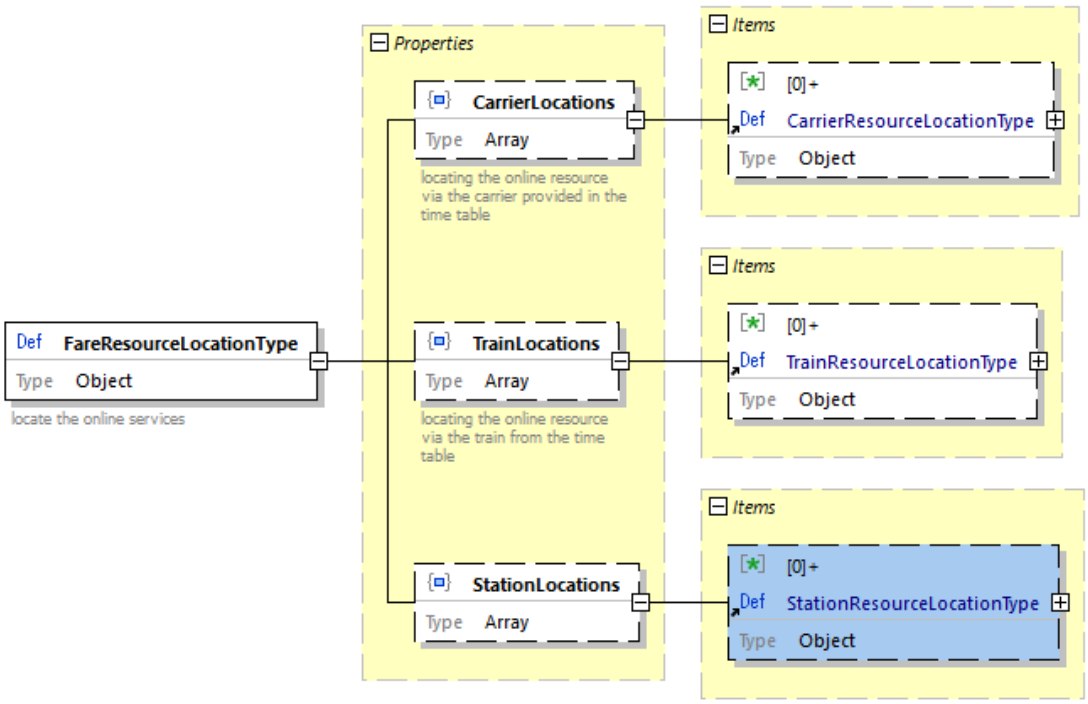
FareResourceLocation

Fare resource location provides data on where to find online services for fares. The fare location provides three options:

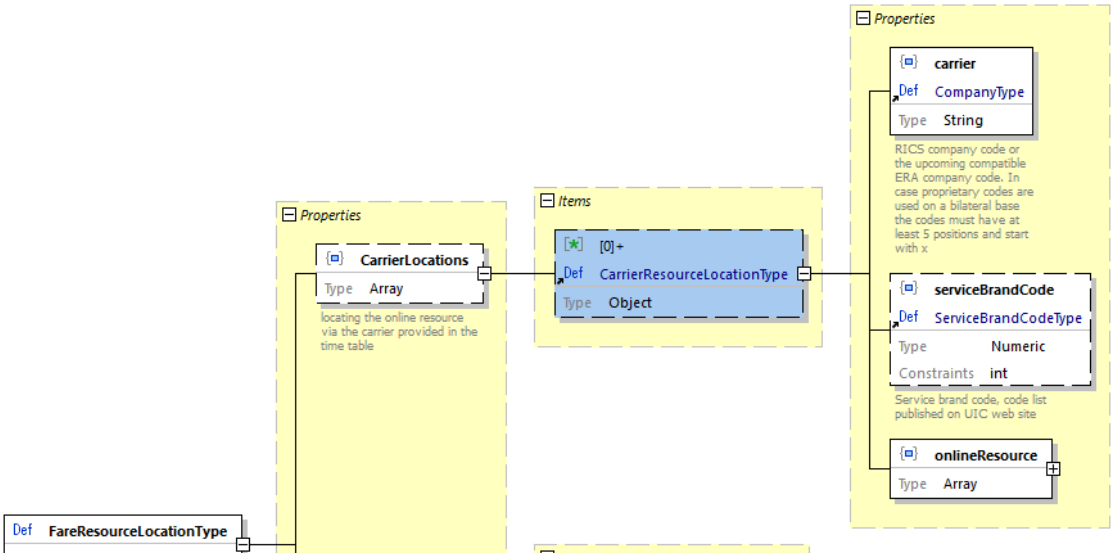
- Link a resource to a carrier – the carrier must be known from the timetable
- Link a resource to the train – the data must be updated in case of new trains
- Link a resource to stations:
  - The link can be made for stations and for connection points
  - The link is valid if start and end station (or connection points) provide the link

The online link provides information on:

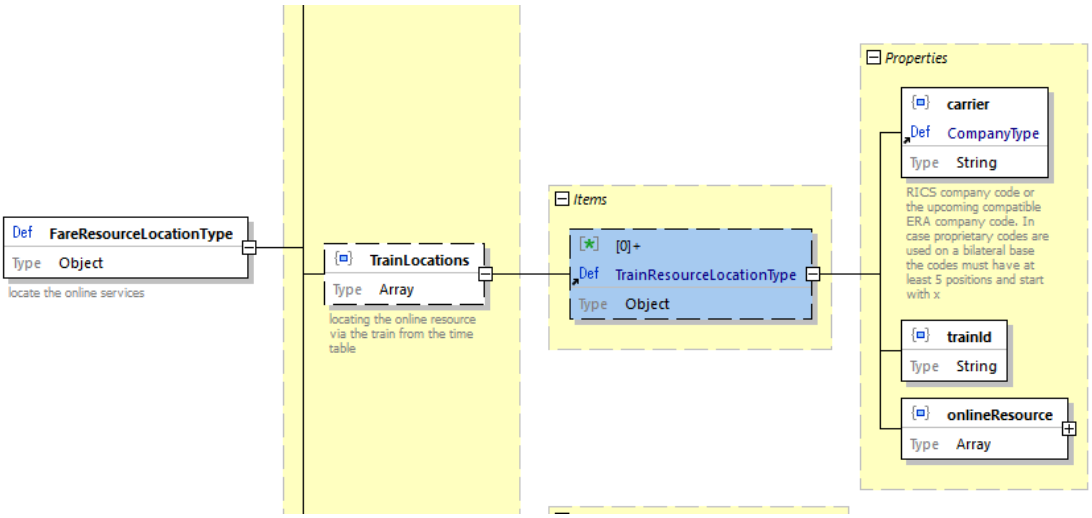
- The type of resource either for a whole train of an area. In case of a train the request must be for the train route between stations (e.g. IRT), whereas for areas there might be multiple splits in-between a train run (e.g. NRT).



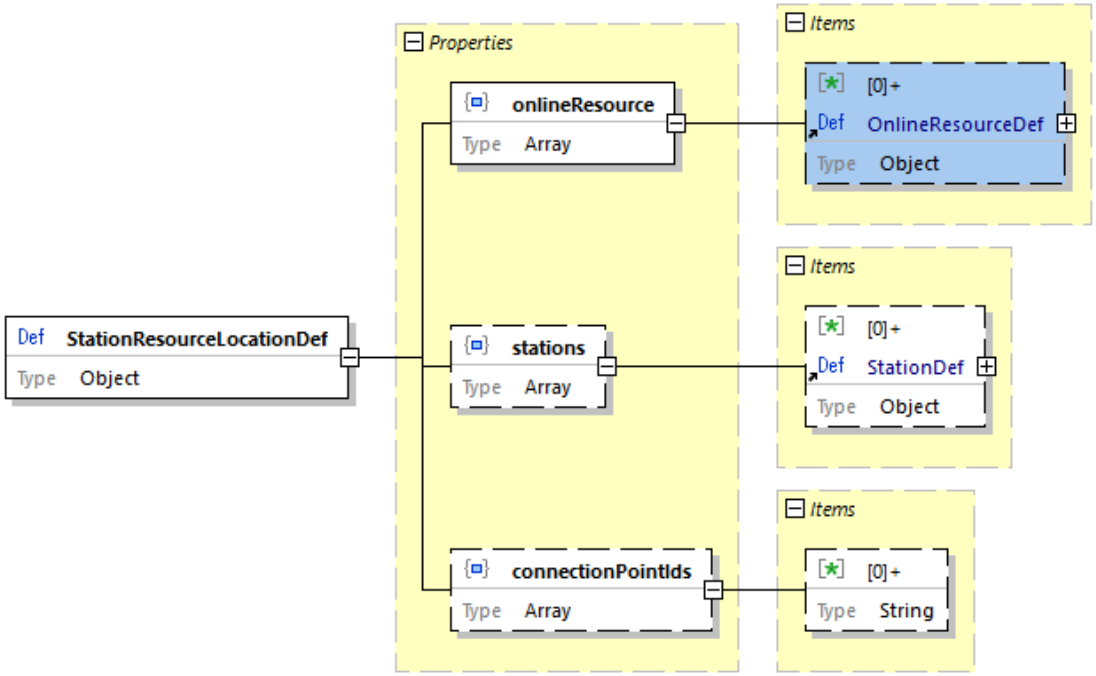
Fare Resource Location Type



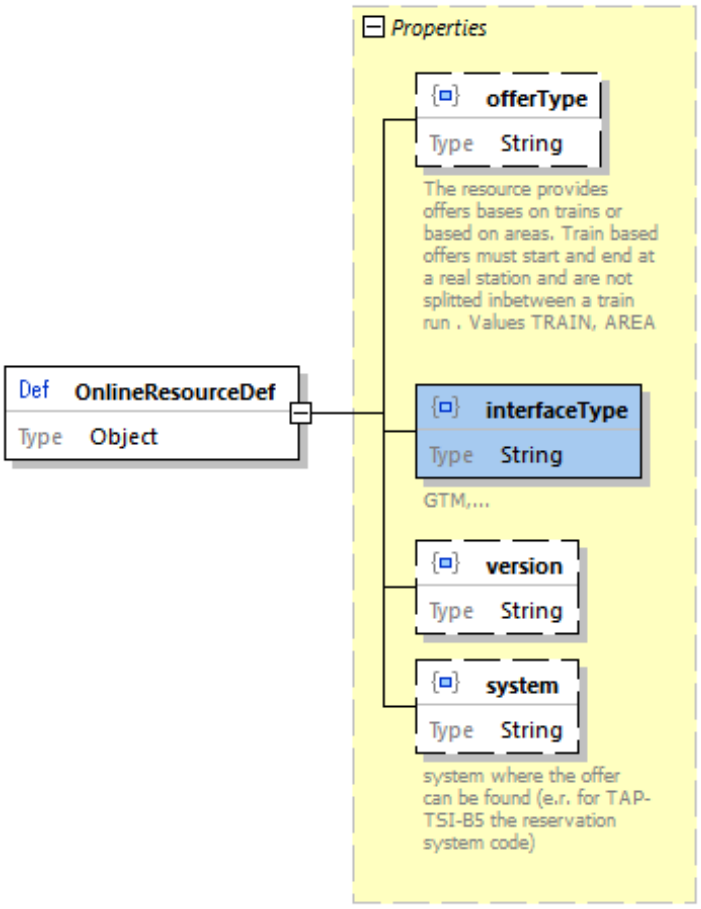
Fare Resource Location Type - Carrier Link



Fare Resource Location Type - Train Link



Fare Resource Location Type - Station Link



Fare Resource Location Type - Online Resource

Graphics Icons

Graphic icons are used to display a coach including its facilities based on the coach layout and availability of places. The graphical items include frames and icons to display seats etc. Graphical items must be provided by the sales application of the issuer application to ensure a unique look and feel of the application.

The coach layout provides only the position of graphic items (co-ordinates) not the graphical presentation at the sales application (pictures).

A large table spans two places, whereas a small table spans only one place. A small wall spans two places and a large wall spans 3 places. A very small wall spans one place only.

Data constraints on FareResourceLocation

Code	Description
`System`	For reservation interface 90810-1 the reservation system code is used.

FareReferenceStationSet

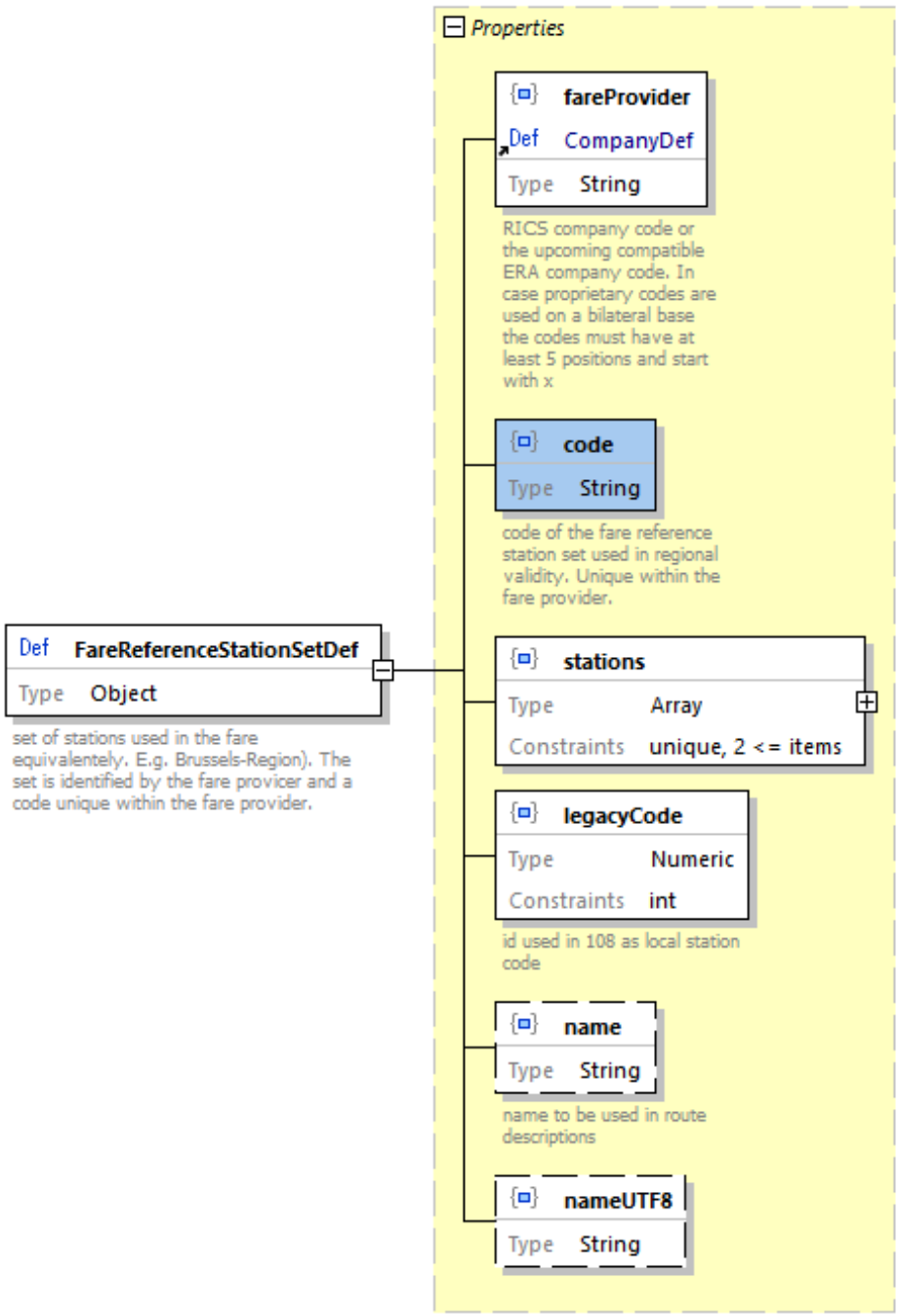
The fare reference station set defines a set of stations where the fare is valid for all included stations. This set can be used in the regionalValidity description.

The corresponding bar code ab ticket control data will only contain the code of the station set, but the allocator needs the complete list of station to link the fare to the train routes.

A name can be provided.

The station set is referenced by the company code of the fare provider and a code unique within the fare provider.

A `legacyCode` can be provided to include the current code in the 108.1 data.



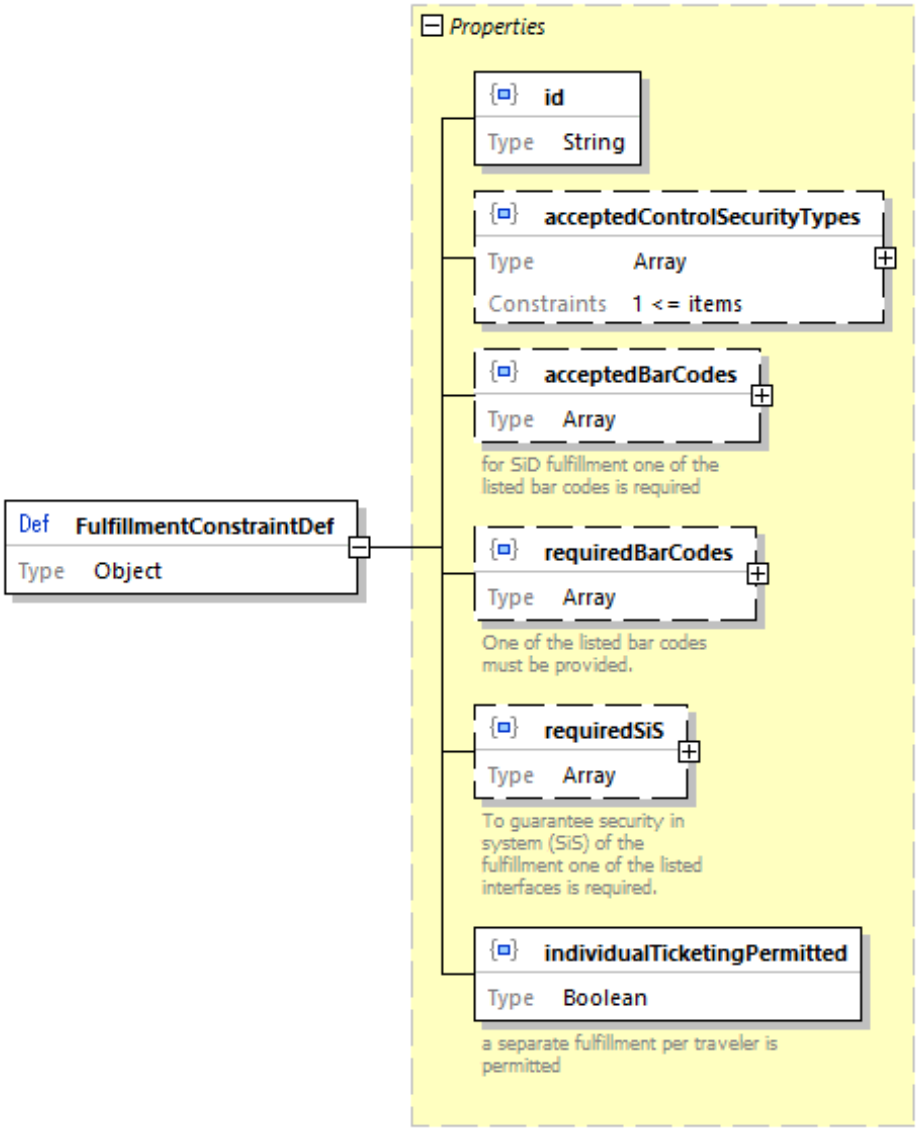
Fare Reference Station Set

Data Constraints on FareReferenceStationSet

Code	Description
`legacyCode`	A legacyCode must be provided for the time being. New implementations should not rely on that code.
`name`	The name should not include ”/”.”*”.

FulfillmentConstraint

The fulfillment constraint limits the applicable types of fulfillment and defined whether control data need to be transferred via a standard interface (*IRS 90918-4*).



Fulfillment Constraint

Code lists for required `SiS`: `CardType`

The following code list defines the card types for cards used

Predefined Card-Ids	Description
`LOYALTY_CARD`	Loyalty card
`REDUCTION_CARD`	Card providing reduction
`PASS`	Pass for travelling

`ControlDataExchangeType`:

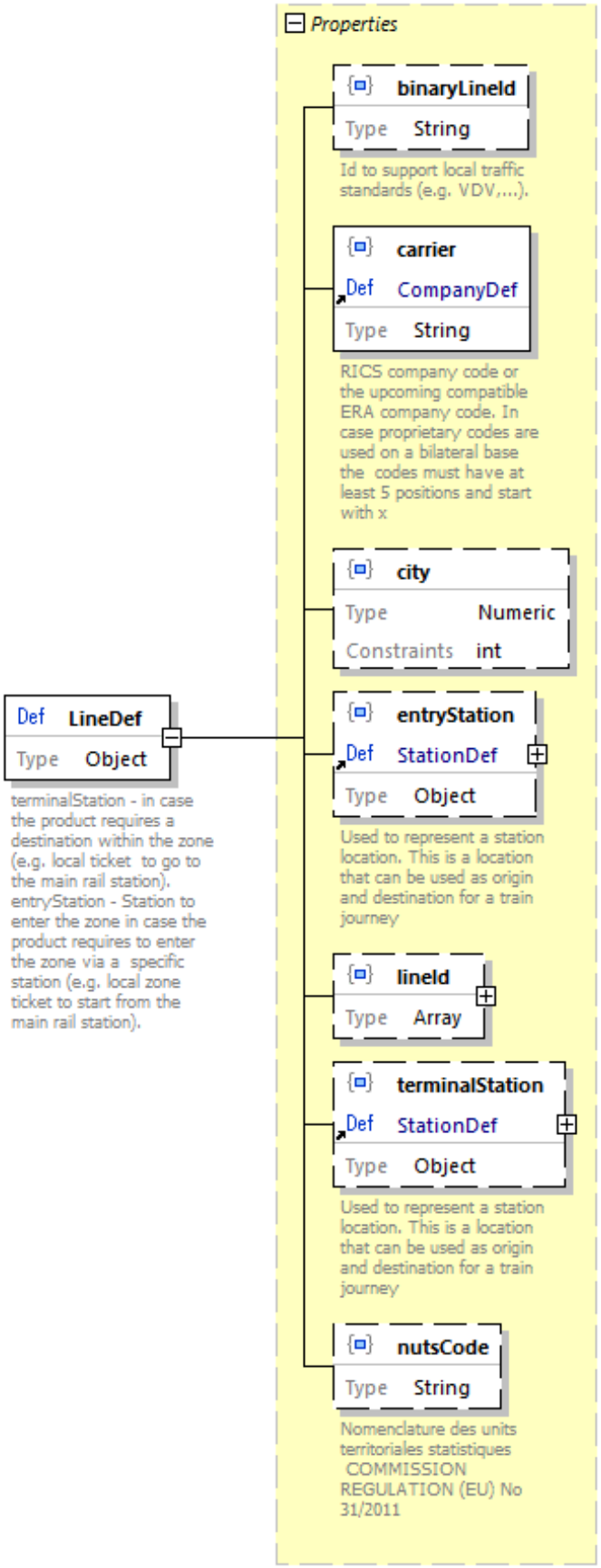
- for bar codes: `BarcodeType`
- for fulfillment: `ControlSecurityType`

Data Constraints on FulfillmentConstraint

Code	Description
`acceptedFulfillmentType`	At least one accepted fulfillment type must be provided

Line

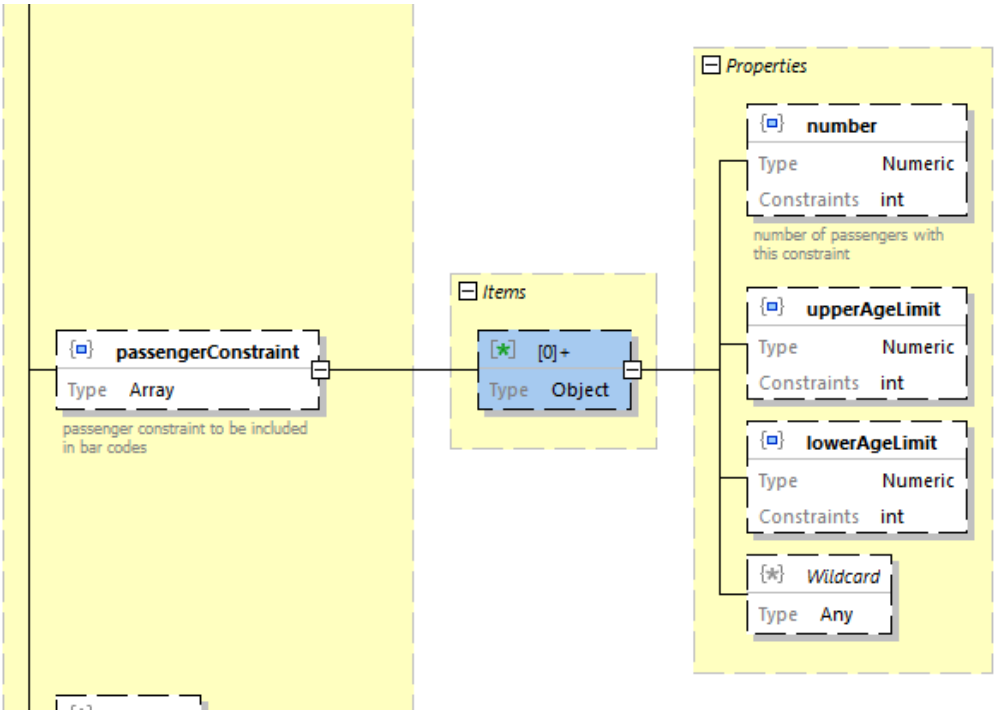
Line defines the regional validity on a specific line. It might have additional restrictions to enter or leave at specific stations or to be used within an area or city only.


Properties
binaryLineId
Type String
Id to support local traffic standards (e.g. VDV,...).
carrier
Def CompanyDef
Type String
RICS company code or the upcoming compatible ERA company code. In case proprietary codes are used on a bilateral base the codes must have at least 5 positions and start with x
city
Type Numeric
Constraints int
Def LineDef
Type Object
terminalStation - in case the product requires a destination within the zone (e.g. local ticket to go to the main rail station). entryStation - Station to enter the zone in case the product requires to enter the zone via a specific station (e.g. local zone ticket to start from the main rail station).
entryStation
Def StationDef
Type Object
Used to represent a station location. This is a location that can be used as origin and destination for a train journey
lineId
Type Array
terminalStation
Def StationDef
Type Object
Used to represent a station location. This is a location that can be used as origin and destination for a train journey
nutsCode
Type String
Nomenclature des units territoriales statistiques COMMISSION REGULATION (EU) No 31/2011

Line

PassengerConstraint

Passenger constraint defines restrictions of a fare concerning passengers. In online services the structure is reduced to constraints that need to be passed on for control to bar codes and control registries.



Passenger Constraint

Data Constraints on PassengerConstraint

Code	Description
`upperAgeLimit, lowerAgeLimit`	`upperAgeLimit >= lowerAgeLimit`

PersonalDataConstraint

Specification of personal data to be delivered to the carrier. Personal data might be included in:

- Booking service (OSDM and/or *IRS 90918-1*)
- Control data (bar code and/or control data delivery *IRS 90918-4*)

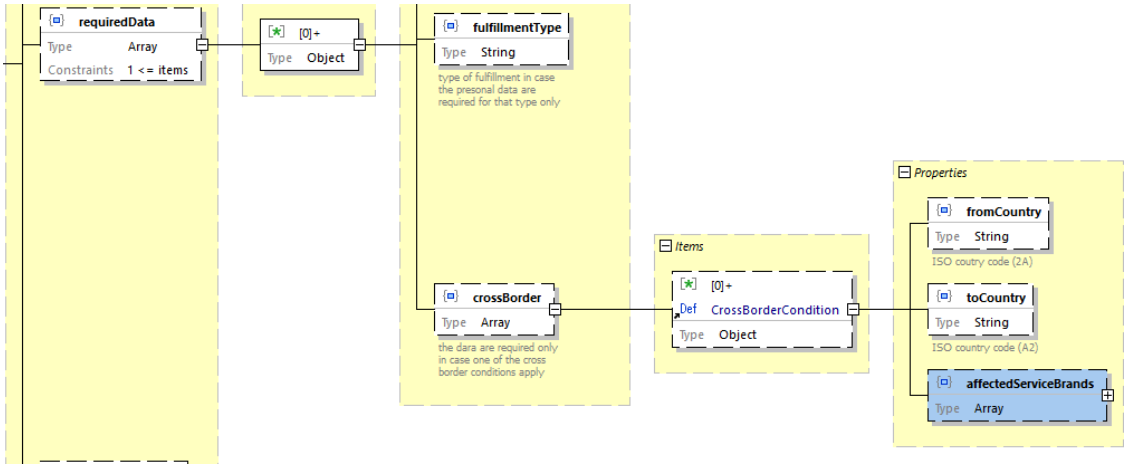
The requirement for personal data might depend on the type of fulfillment or on specific border crossings.

Code	Description
`acceptedReason`	Accepted reason to change personal data after booking confirmation. See code list: Personal data change reasons

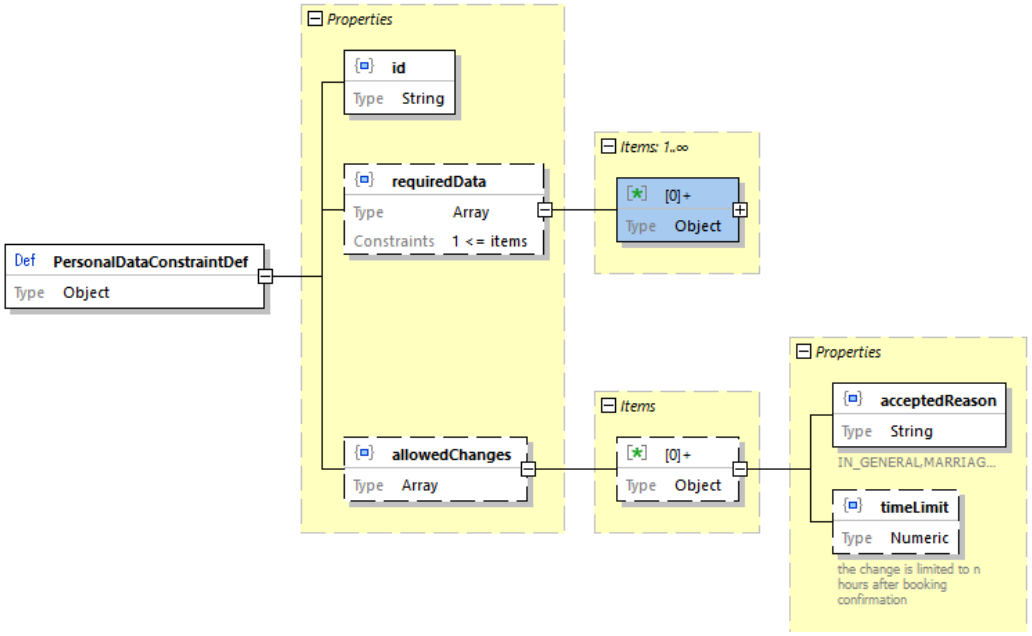
Code	Description
`transfer`	The way the personal data are transferred. See code list: Personal data transfer types
`ticketHolderOnly`	Personal data are required for the ticket holder only
`dataItem`	Code of the data item required. Consists of `languageCode`, `overruleCode` (see below) and personal data items.

Overrule Code

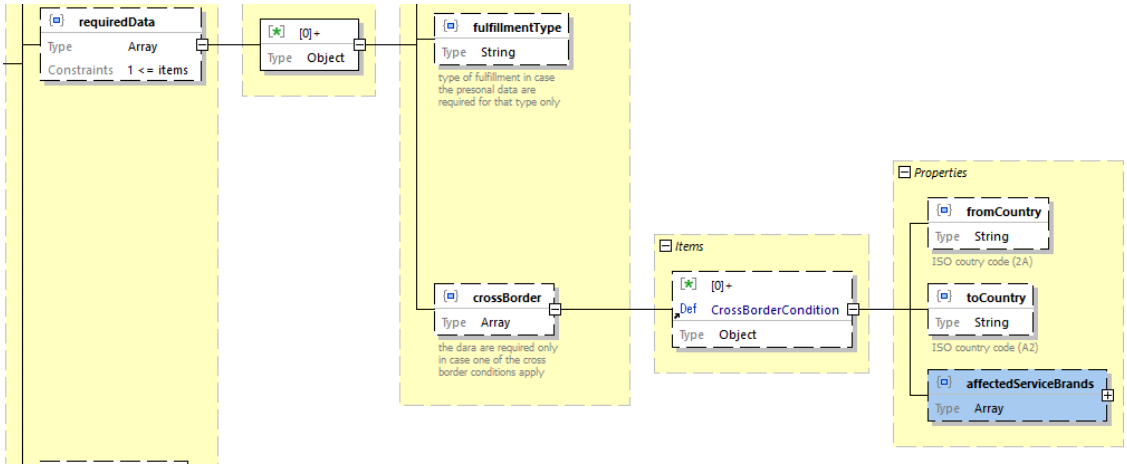
Code	Description
`STRIKE`	Refund due to strike
`SALES_STAFF_ERROR`	Refund due to an error made by the sales staff
`PAYMENT_FAILURE`	Refund as the payment failed



Personal Data



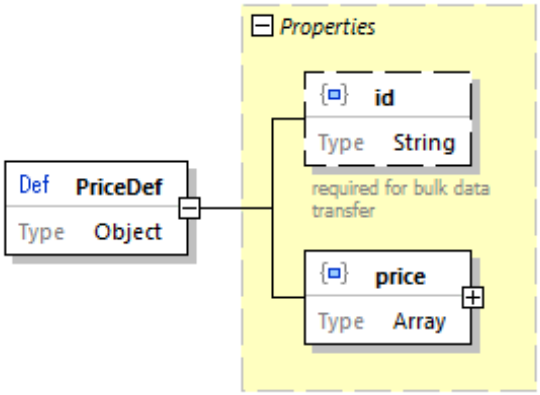
Personal Data - Allowed Changes



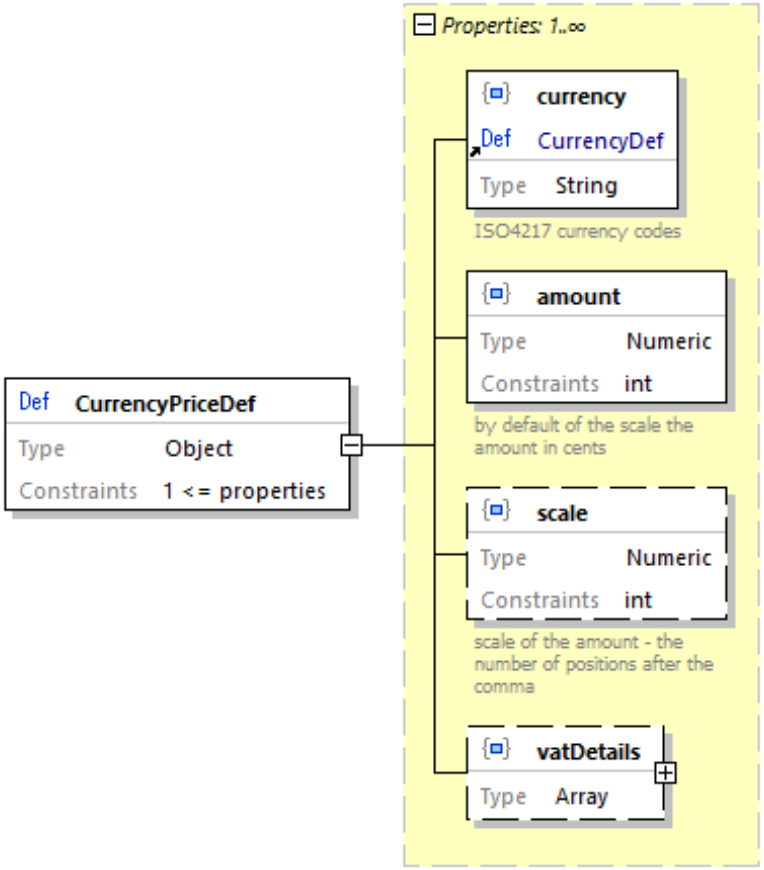
Personal Date - Cross Border Conditions

Price

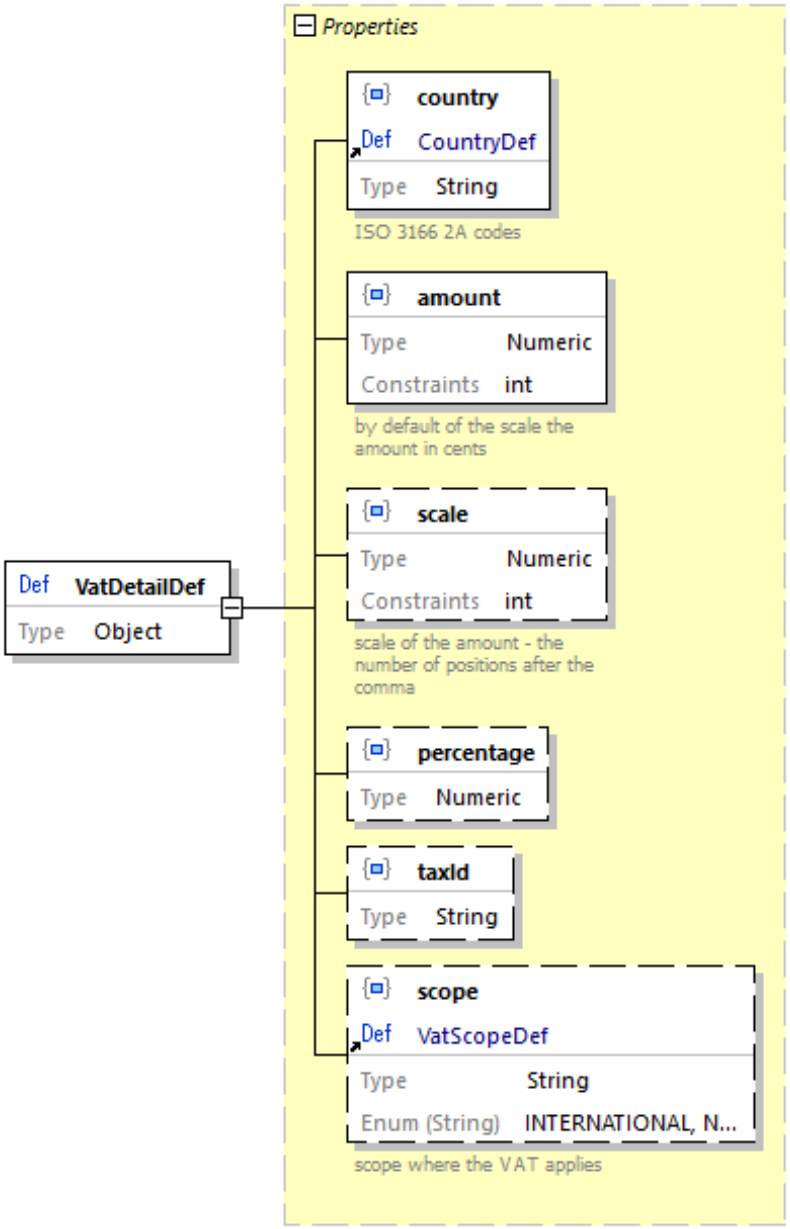
The price data structure provides the price or a fee including the VAT details optionally in different currencies.



Price



Currency Price



VAT Detail

Scope: see code list TaxScope

Data Constraints on Price

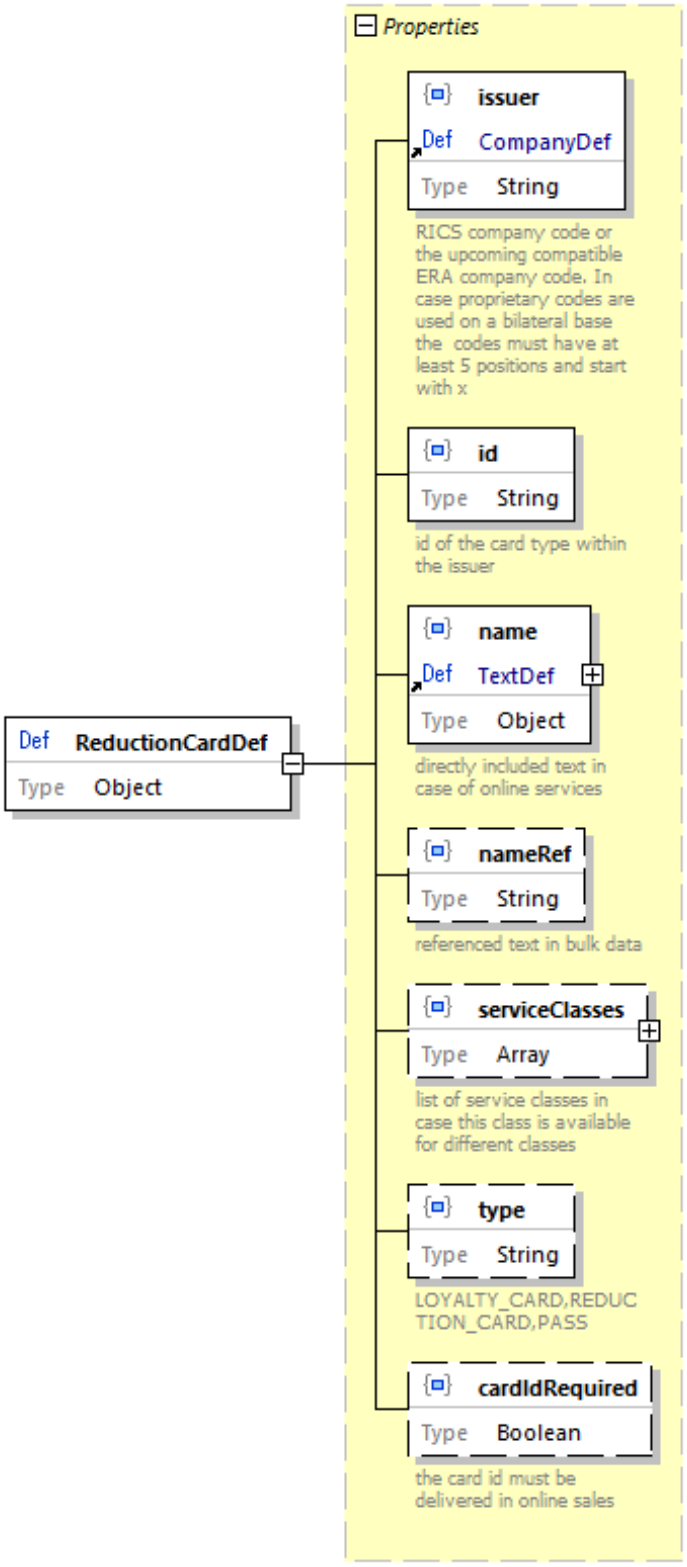
Code	Description
amount	Amount >= sum of VAT-amounts

ReductionCard

The reduction cards of a carrier are listed in the bulk data.

List of Carrier Cards

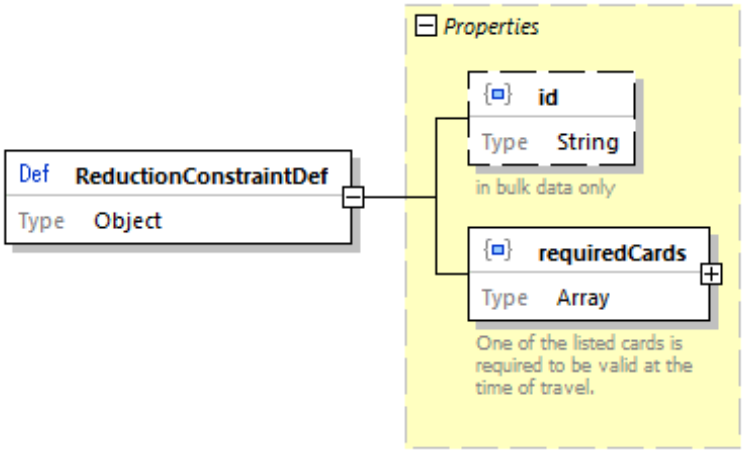
Code	Description
`id`	Unique id of the card. The id must start with the RICS code of the carrier
`name`	Name and short name of the card. The name should be used for the card selection by the customer, the short name should be used for bar codes.Usually the card name is not translated, but the card name might be provided in different languages by carriers in multilingual countries.
`serviceClass`	Service class indicated for the class
`issuer`	Issuer of the card. Usually the carrier providing the fare data.
`type`	Type of the cards to separate between loyalty cards, cards that are tickets (passes), and reduction cards (`LOYALTY_CARD`, `REDUCTION_CARD,PASS`).
`cardIdRequired`	Indicates that the card id must be provided in the pre-booking request to validate the card. This card cannot be used without the online services for booking



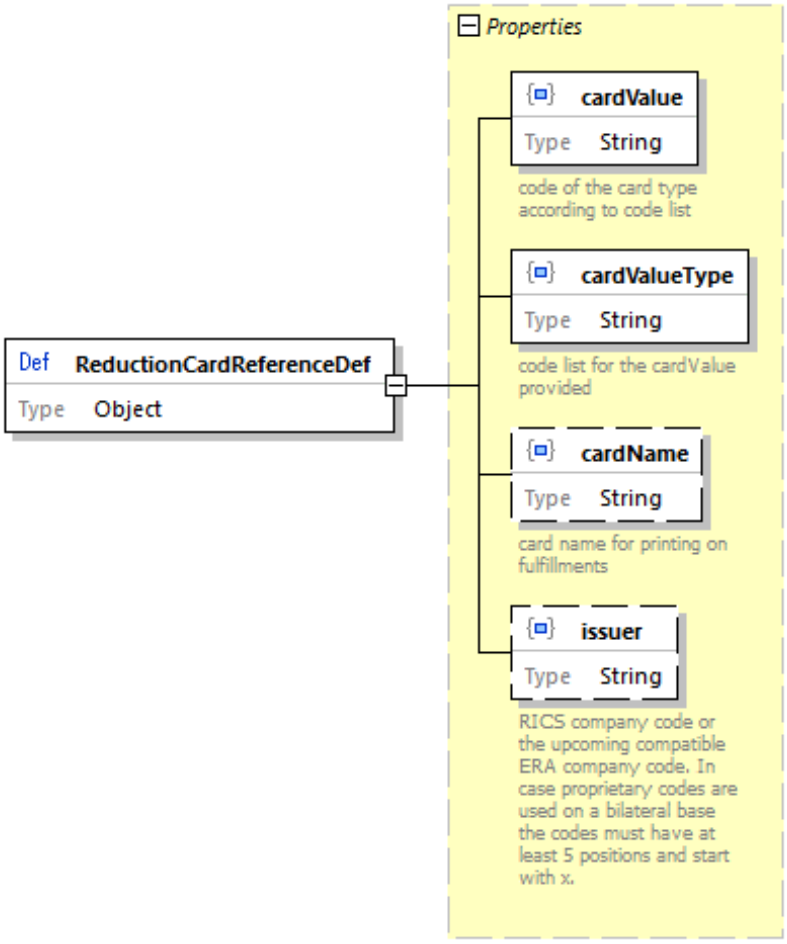
Reduction Card

ReductionConstraint

A fare associated with this constraint requires one of the listed cards to be presented by the passenger on the trip. Card Ids can be taken from the listed cards provided within the fare data delivery or from the common code list in Reduction “cards”.



Reduction Constraint



Reduction Card Reference

RegionalConstraint

Definition of a regional validity of a fare. The regional validity constraint is defined by an entry connection point and an exit connection point to combine this regional validity with other regional validities of other carriers and the specification of the regional validity that is sued and described in *IRS 90918-4* for ticket control. The entry or exit connection point might be missing in case the fare cannot be combined or can be combined on one side only.

Content	Description
`entryConnectionPoint`	Defines the connection point for connecting this fare at the start of regional validity (see ConnectionPoint)
`exitConnectionPoint`	Defines the connection point for connecting this fare at the start of regional validity (see ConnectionPoint)
`regionalValidity`	Definition of the regional validity as defined in *IRS 90918-4*. It provide data structures for zones, Lines, train links, geographical polygons and routes.

The connection points are included for combining regions. When combining two regional validities from two carriers the connection points will disappear in the combined data structure for bar codes and ticket control and from the textual description for the passenger.

E.g.:

- Carrier 1: RegionalConstraint {Exit (A,B), RegionalValidity X – Y/Z- A}
- Carrier 2: RegionalConstraint {Entry (A,B), RegionalValidity B – C/D – E}
- *Result*: X*Y*/Z*AB*C/D*E

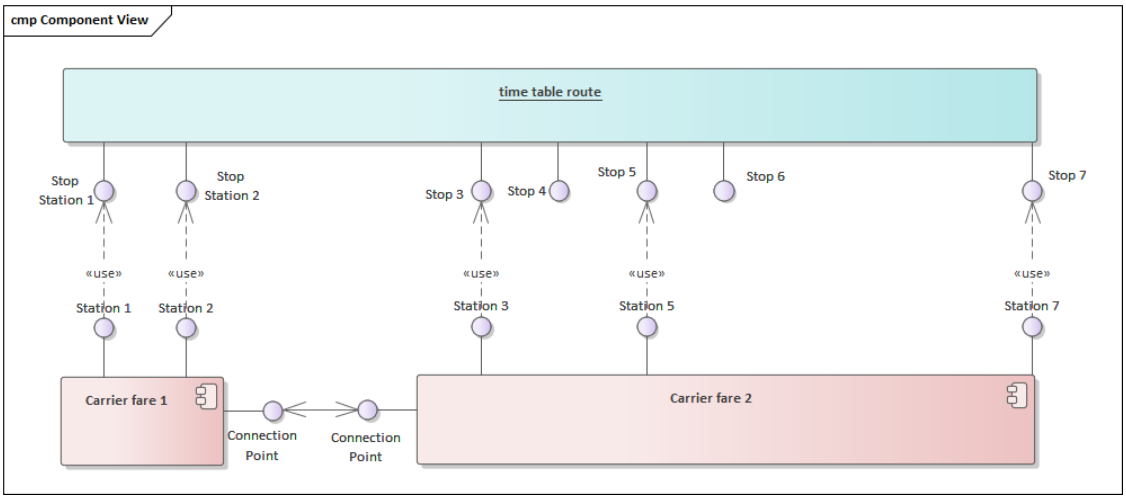
The allocator might need to remove doubled stations in routes in case the connection point is a real station used in both regional validity descriptions in case it is displayed as one combined text:

- Carrier 1: RegionalConstraint {Exit (A), RegionalValidity X – Y/Z- A}
- Carrier 2: RegionalConstraint {Entry (A), RegionalValidity A – C/D – E}
- *Result*: X*Y*/Z*AA*C/D*E* –> *X*Y/Z*A*C/D*E

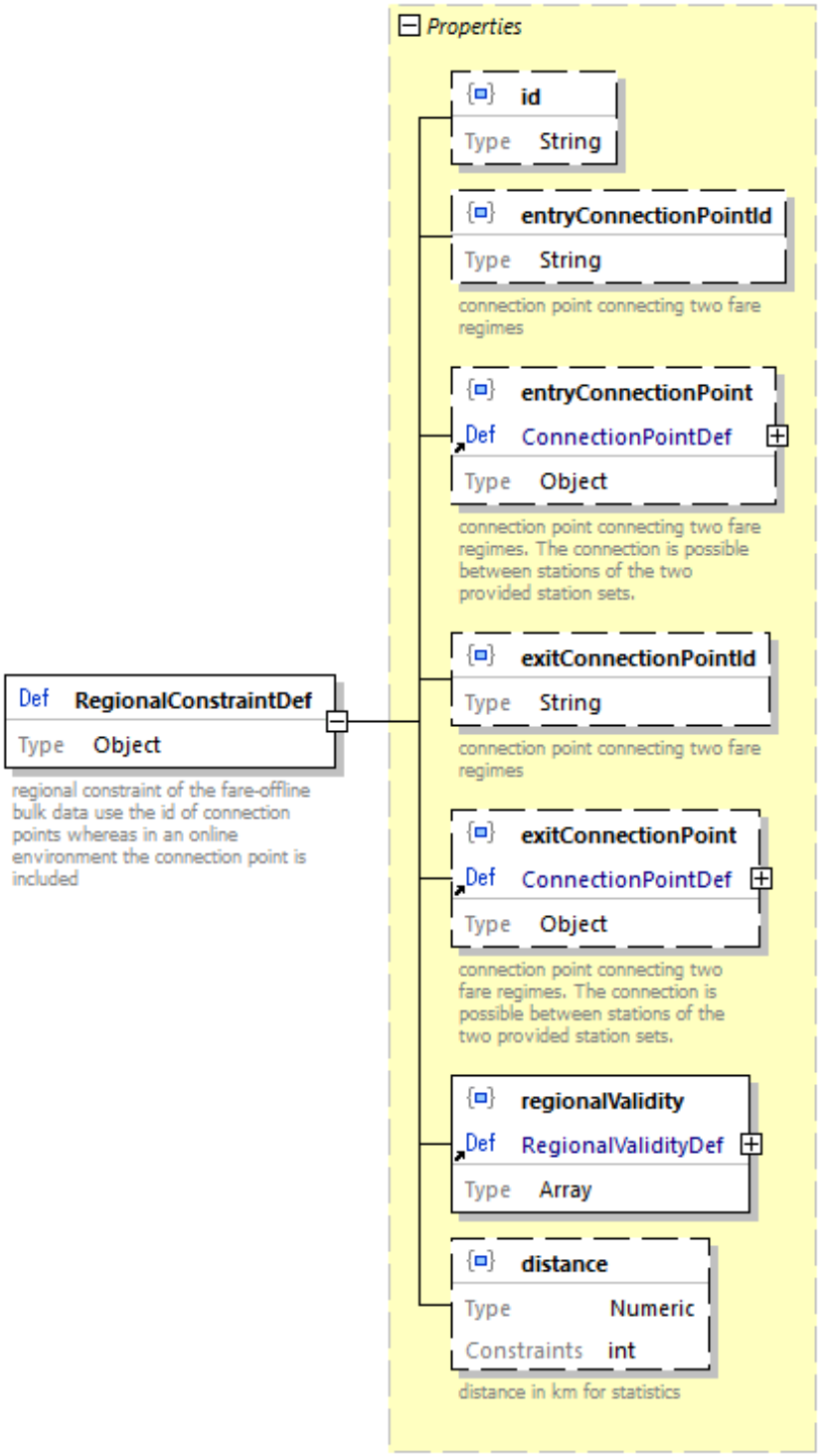
Connecting Regional Validity to Trips

The regional constraint is connected to the timetable via the regional validity, the connection points are used to combine regional constraints.

To support legacy implementations the connection points can provide a border point code linked with the timetable.



Connection Points and Timetable Routes

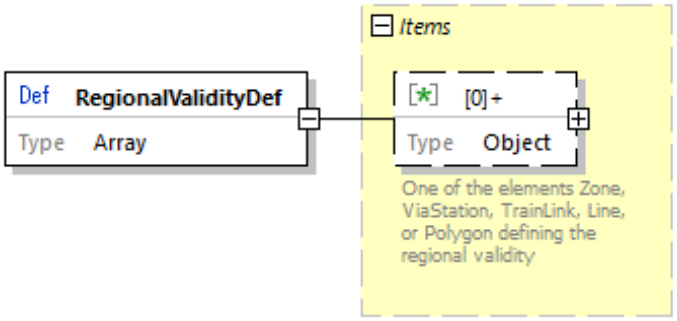


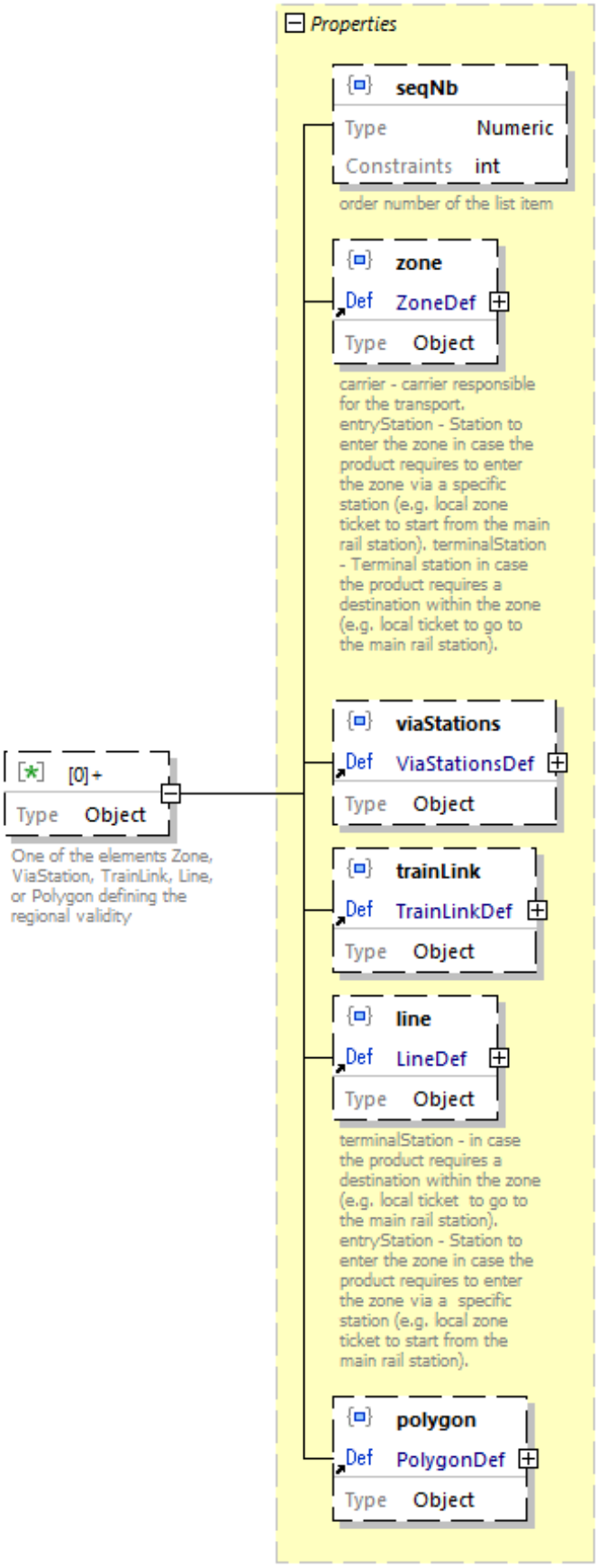
Regional Constraint

The online data structure will not use the id and will directly include the entry and exit connection point, whereas the offline structure will include the id of the connection point pointing to a connection point within the same data delivery.

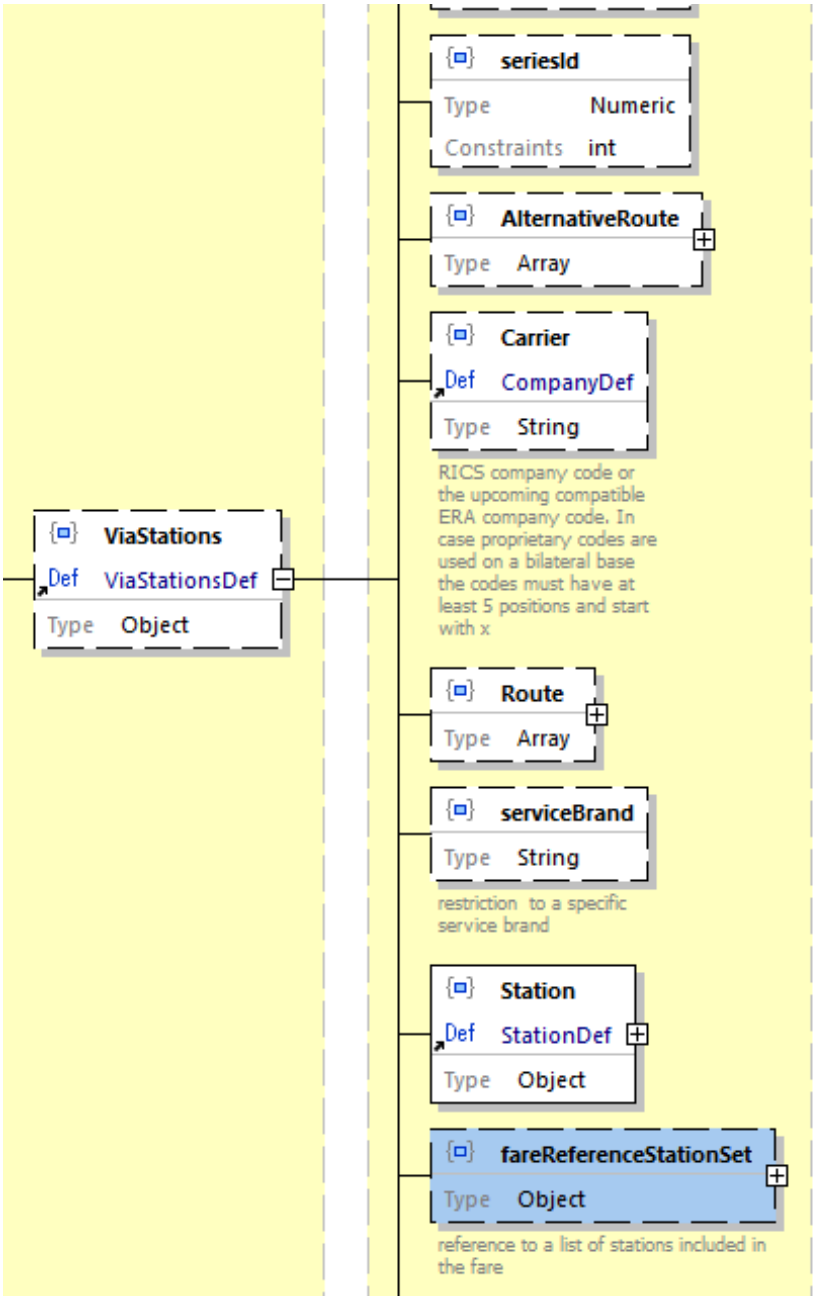
The regional validity contains also content that is applicable to synchronous data transfer only (e.g. train links for train bound offers).

The data structure `RegionalValidity` is defined in *IRS 90918-4* and included by reference only. It provides a sequential list of region definitions that can be defined as zones, lines, train links (online version only) geographical areas (polygons) and route descriptions (via-stations). The route description is extended to include fare reference station sets within the route.

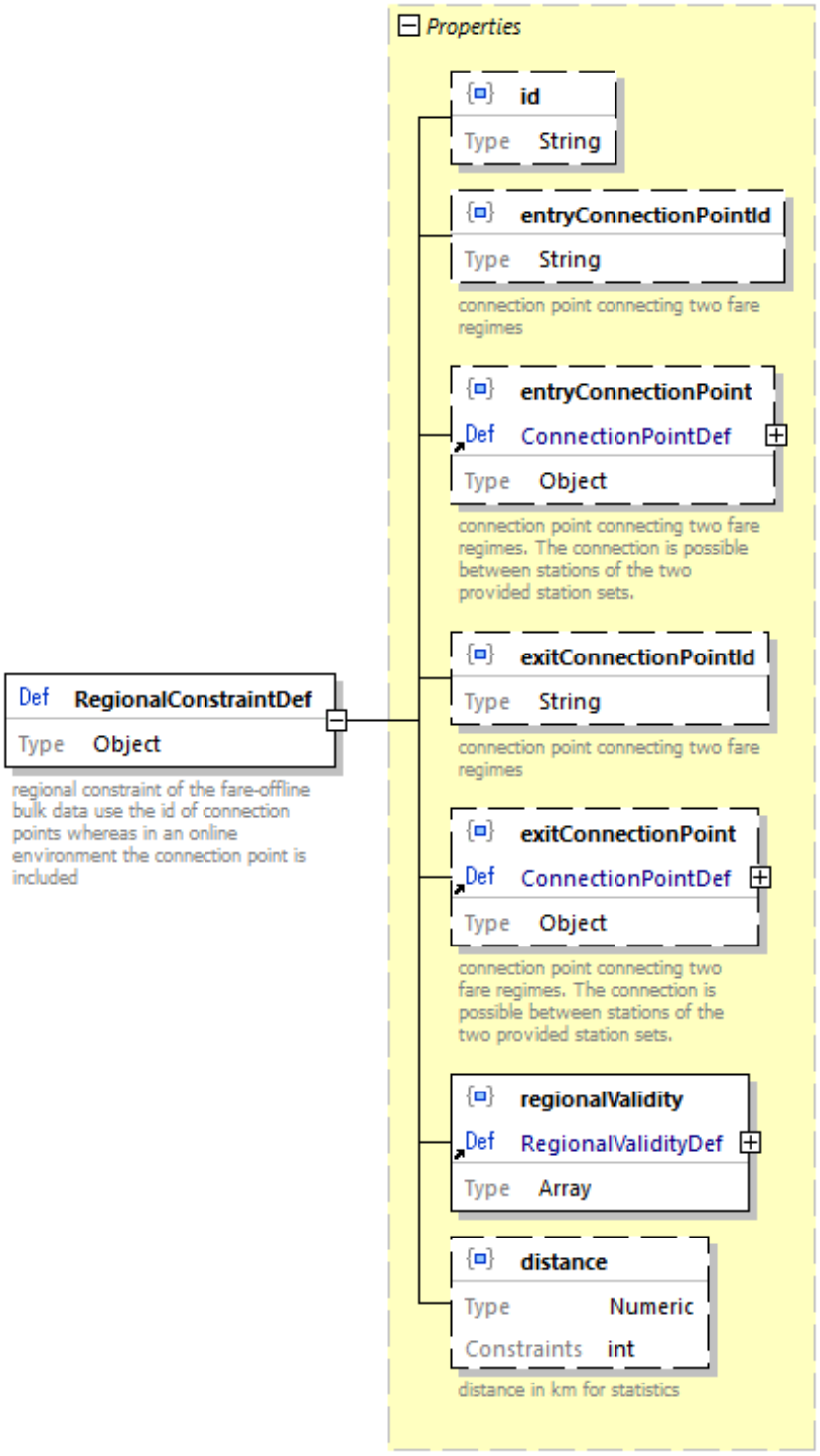

Def RegionalValidityDef
Type Array
Items
[*] [0]+
Type Object
One of the elements Zone, ViaStation, TrainLink, Line, or Polygon defining the regional validity


Properties
seqNb
Type Numeric
Constraints int
order number of the list item
zone
Def ZoneDef
Type Object
carrier - carrier responsible for the transport. entryStation - Station to enter the zone in case the product requires to enter the zone via a specific station (e.g. local zone ticket to start from the main rail station). terminalStation - Terminal station in case the product requires a destination within the zone (e.g. local ticket to go to the main rail station).
viaStations
Def ViaStationsDef
Type Object
trainLink
Def TrainLinkDef
Type Object
line
Def LineDef
Type Object
terminalStation - in case the product requires a destination within the zone (e.g. local ticket to go to the main rail station). entryStation - Station to enter the zone in case the product requires to enter the zone via a specific station (e.g. local zone ticket to start from the main rail station).
polygon
Def PolygonDef
Type Object
[*] [0]+
Type Object
One of the elements Zone, ViaStation, TrainLink, Line, or Polygon defining the regional validity

Extended route data structure including fare reference station sets.



Via Stations

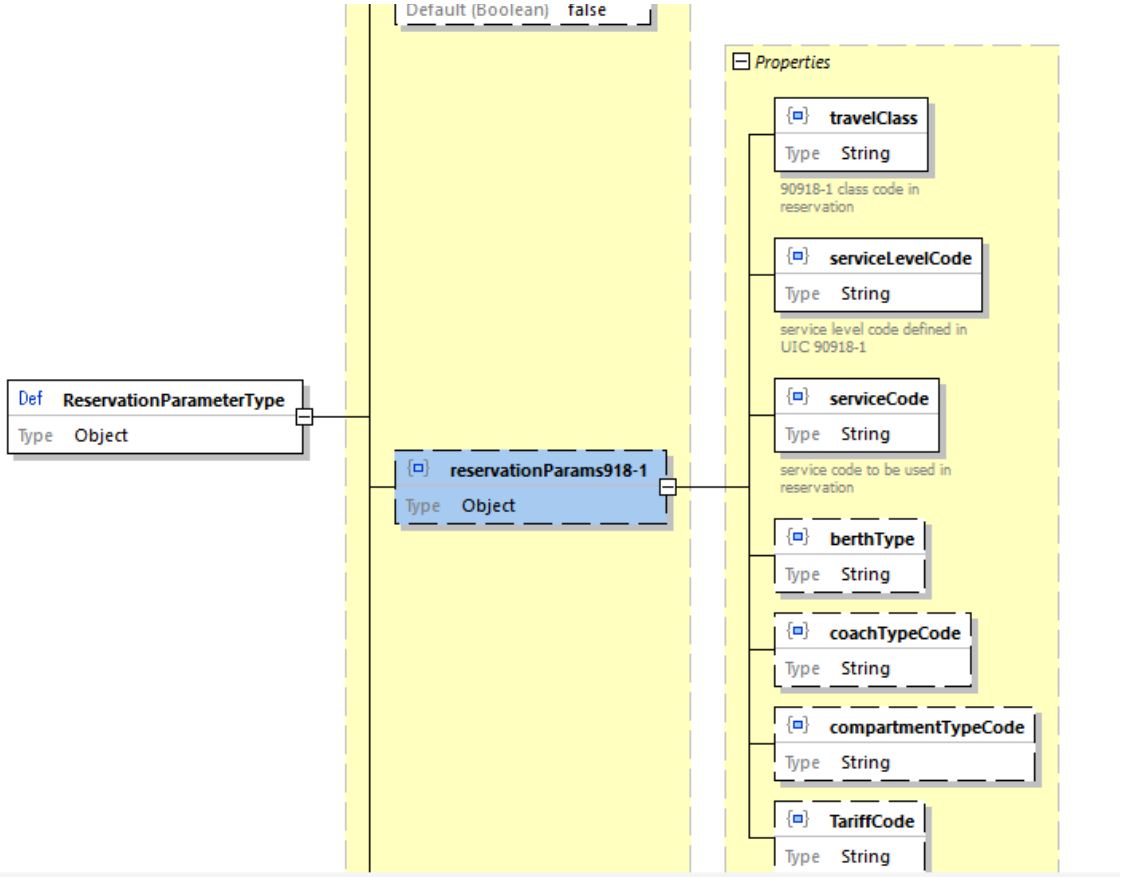


Regional Constraint

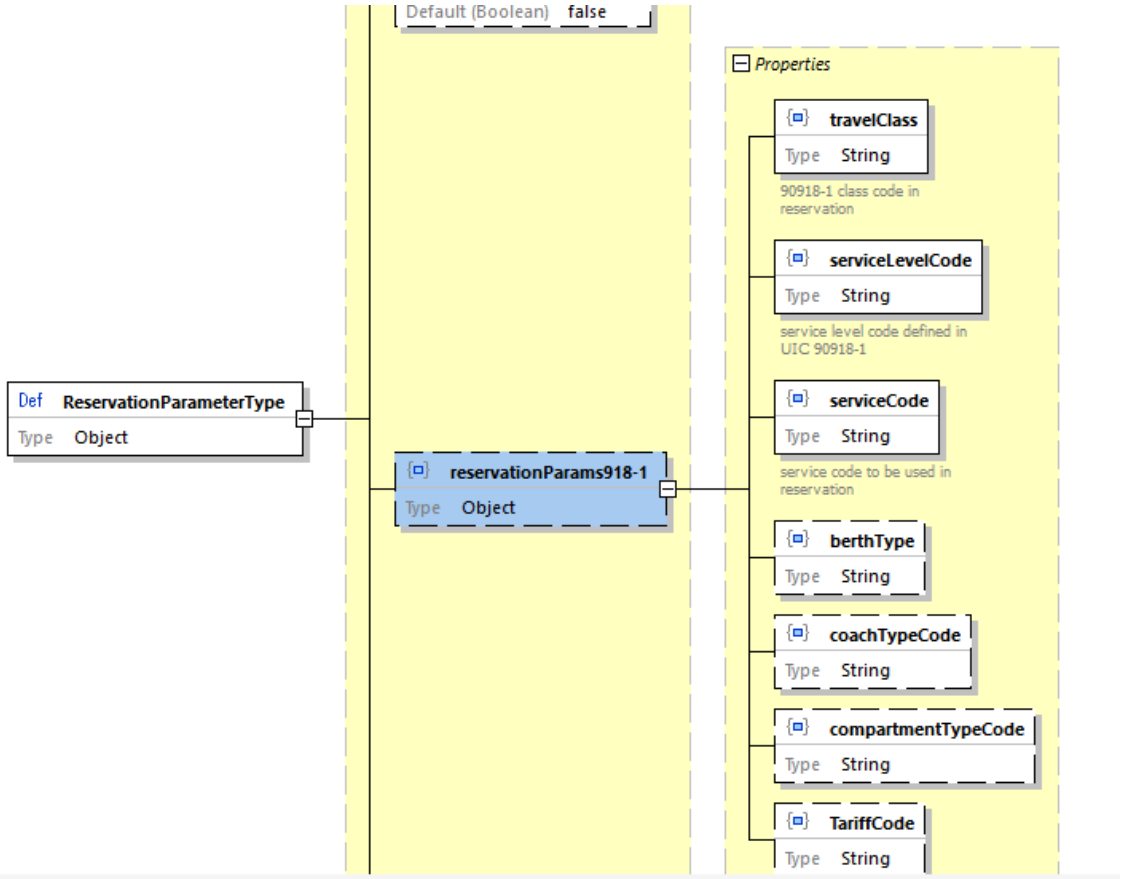
ReservationParameter

ReservationParameter provide data on how to combine reservations with NRT fares, how to book reservations via the *IRS 90918-1* interface and which options a passenger has for reservation.

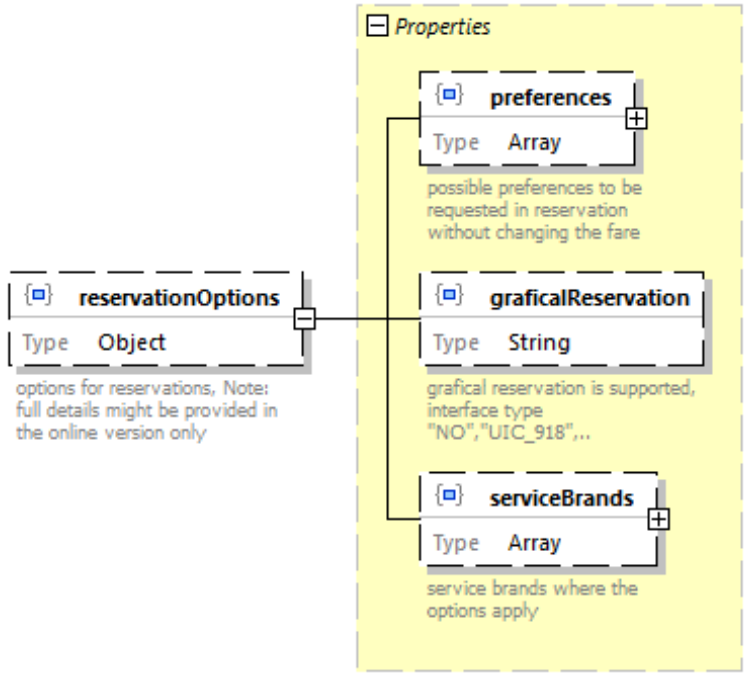
Code	Description
`reservationRequired`	A reservation must be made accompanying an NRT ticket.
`reservationParameters981-1`	Parameters to request the correct reservation using the interface according to *IRS 90918-1*.
`reservationOptions`	Reservation options available that would not change the offer (same price and conditions) (e.g. Aisle or Window). The information is static and does not mean that such an option is still available. The preferences are grouped in case a selection is required (Aisle or Window).



Reservation Parameter



Reservation Parameter - 90918-1 Parameters



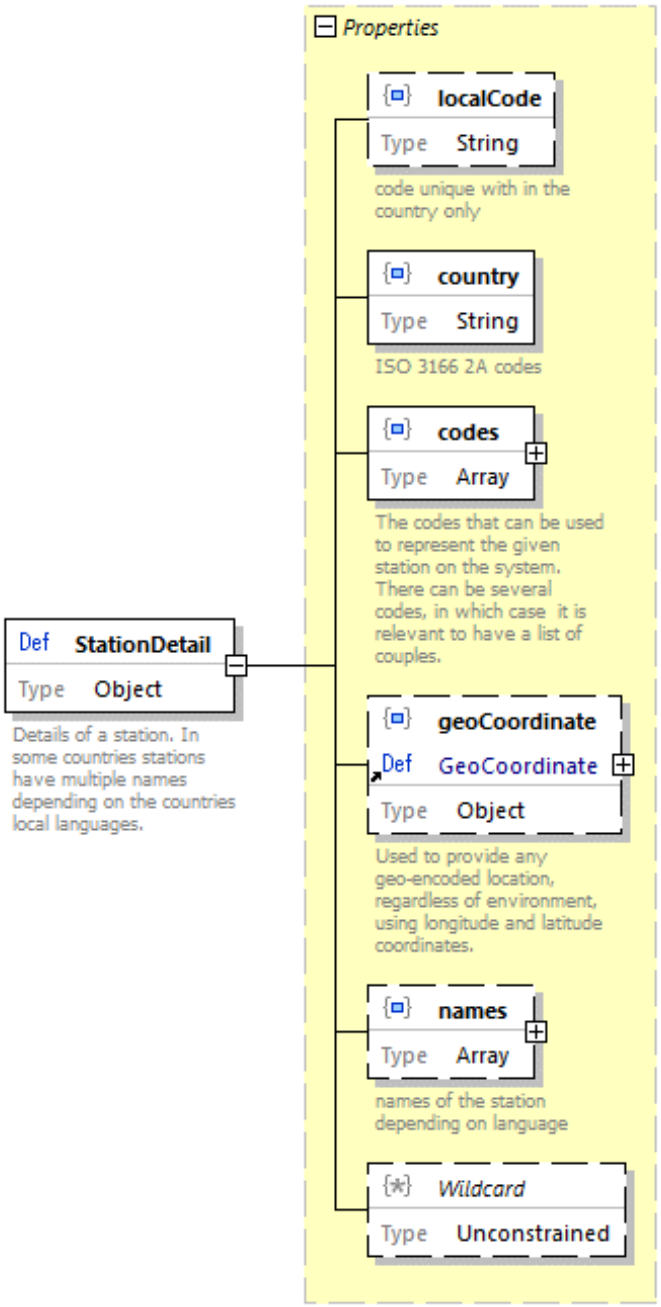
Reservation Parameter - Reservation Options

Code Lists

- Code list Preference Groups: see Preference groups
- Code list Preferences: see Preferences of places

StationDetail

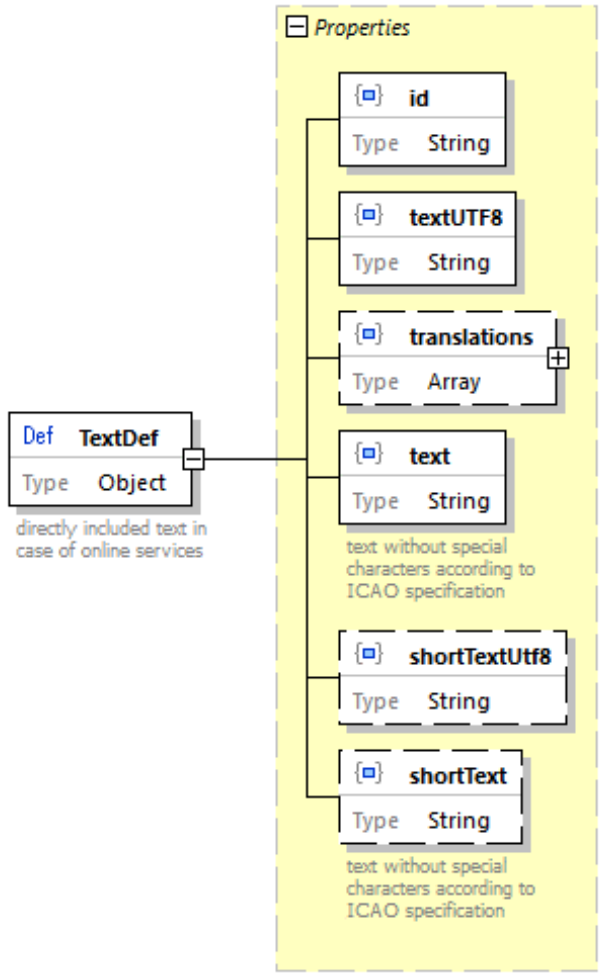
Details on stations including codes and names. Codes must include the MERITS code in case it is defined for a station.



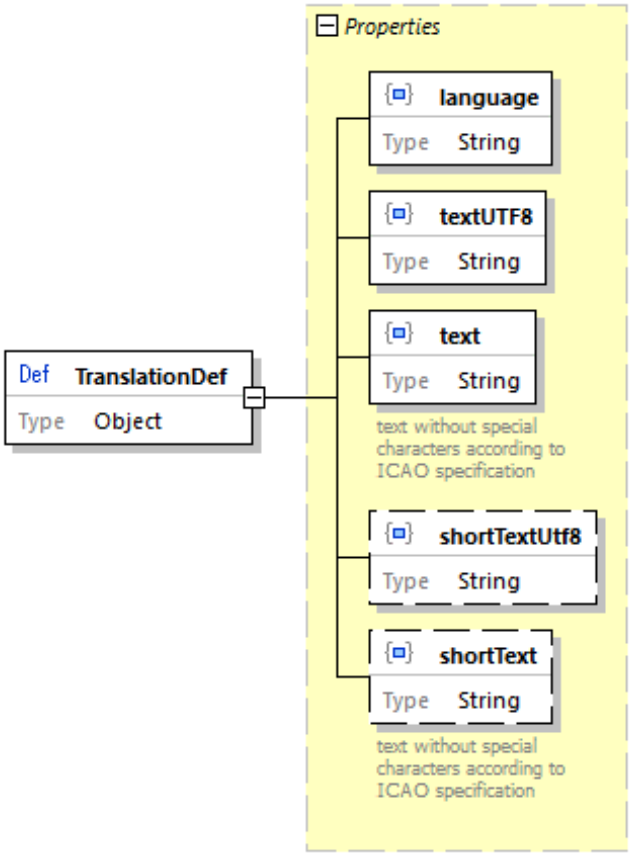
Station Detail

Text

Used for all textual descriptions where translations might be needed.



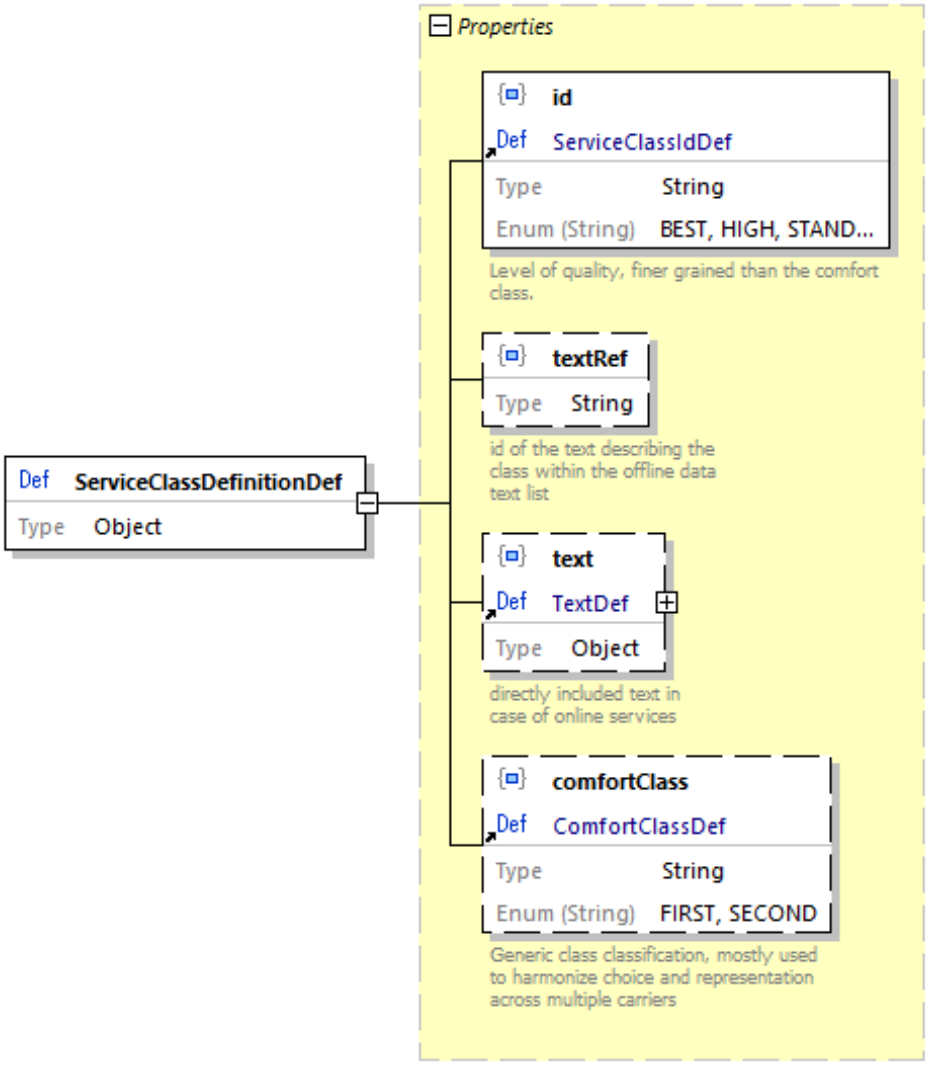
Text



Translation

ServiceClass

Service class provides textual descriptions for the predefined service classes.

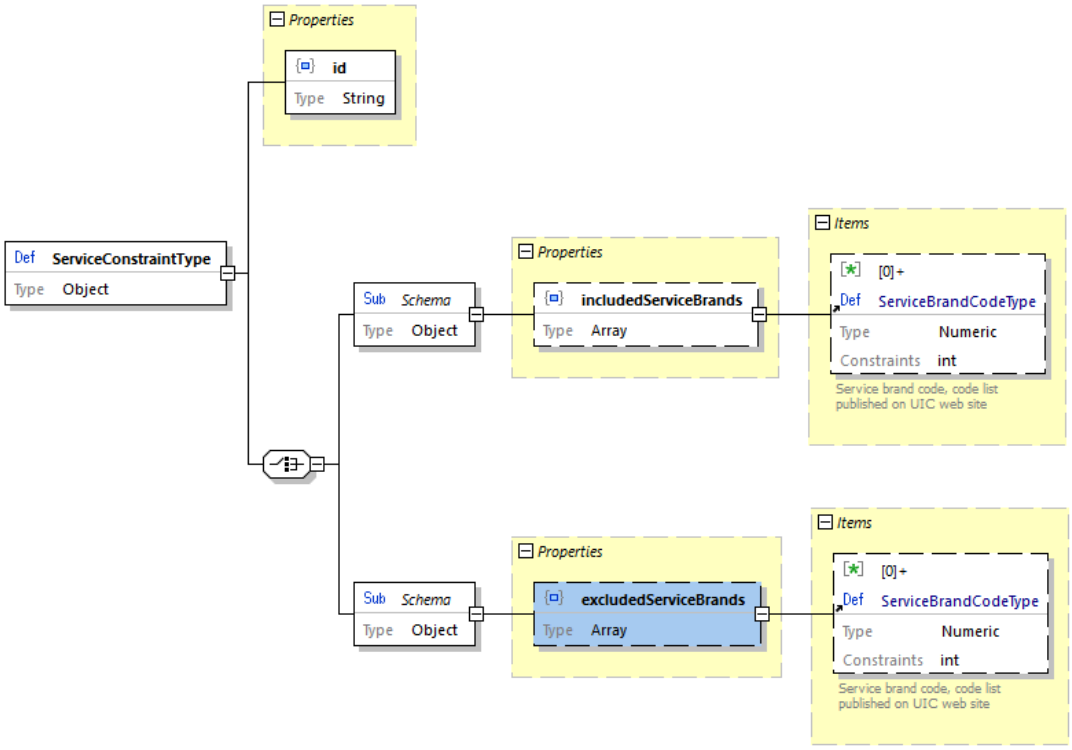


Service Constraint

ServiceConstraint

The service constraint limits a fare to specific service brands (train types). The constraint can either be defined as a list of service brands included or as a list of service brands excluded for the fare.

The online data structure will not provide the id.



Service Constraint

Data Constraints on ServiceConstraint

Code	Description
`includedServiceBrands`, `excludedServiceBrands`	Only one of the lists can be used. Using both lists is forbidden.

ServiceLevel

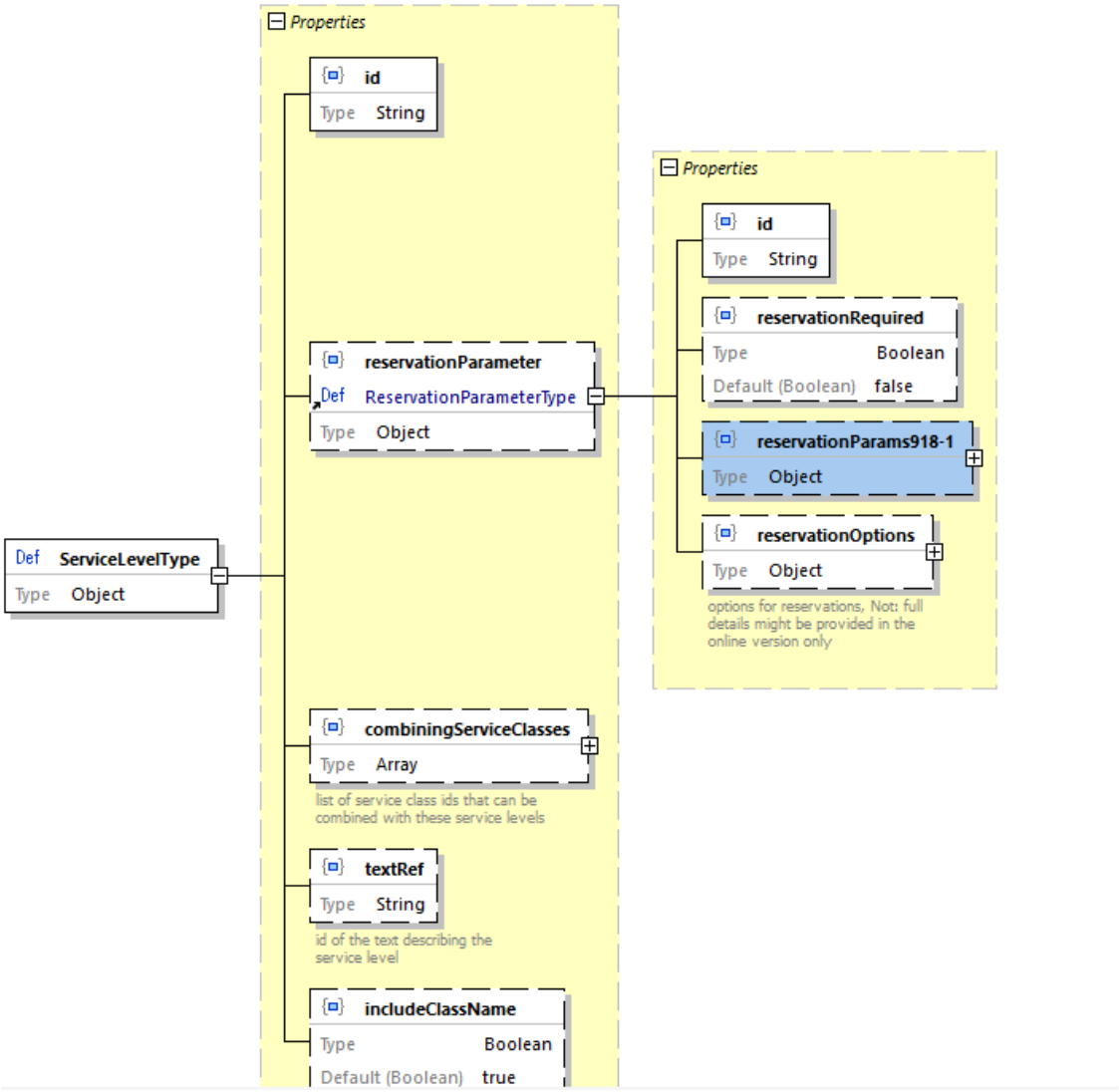
The service level data provide additional information (e.g. text) in the offline data exchange in case the reservation API of *IRS 90918-1* is used.

Description of a service level. The service level defines a specific product on a train which can have a price (e.g. Double places with shower, …). It is more specific than just the classic travel class.

The available service levels are defined in *IRS 90918-1* element 308 (Service level code). The data indicate the service class that needs to be booked in case the reservation is not an IRT and parameters needed for reservation via the *IRS 90918-1* interface.

Some service levels might require a mandatory reservation.

Additional to a service level there might be reservation options that do not affect the price. There are listed in reservation options. (e.g. Upper or lower berth in the service level for double Sleeper compartment).

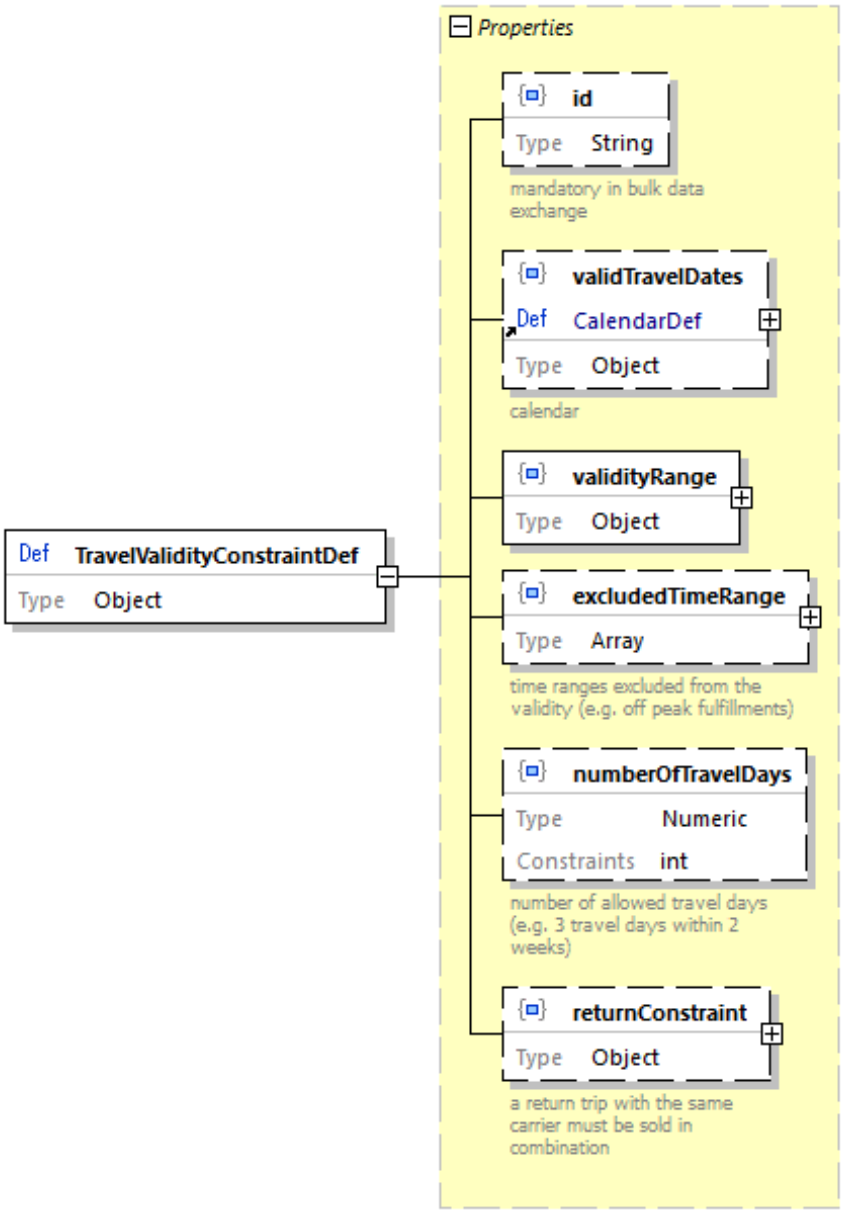


Service Level

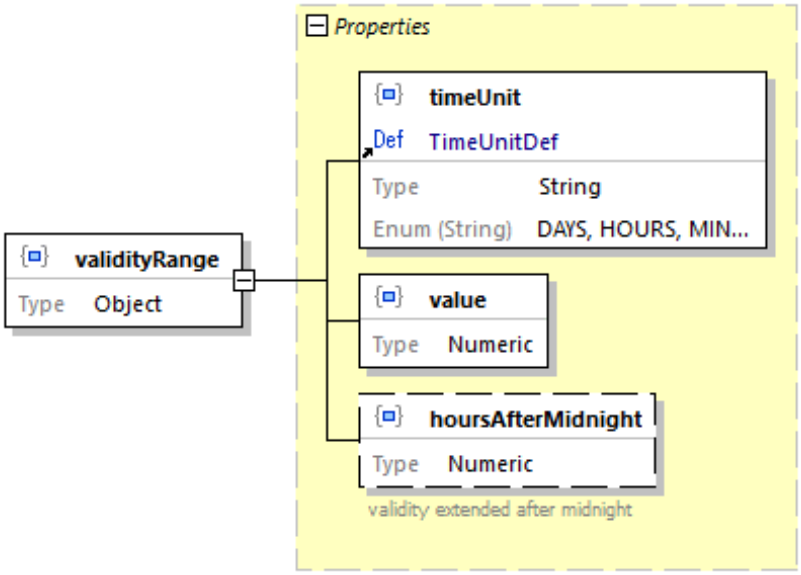
TravelValidityConstraint

The travel validity constraint defines at which times the passenger is permitted to travel.

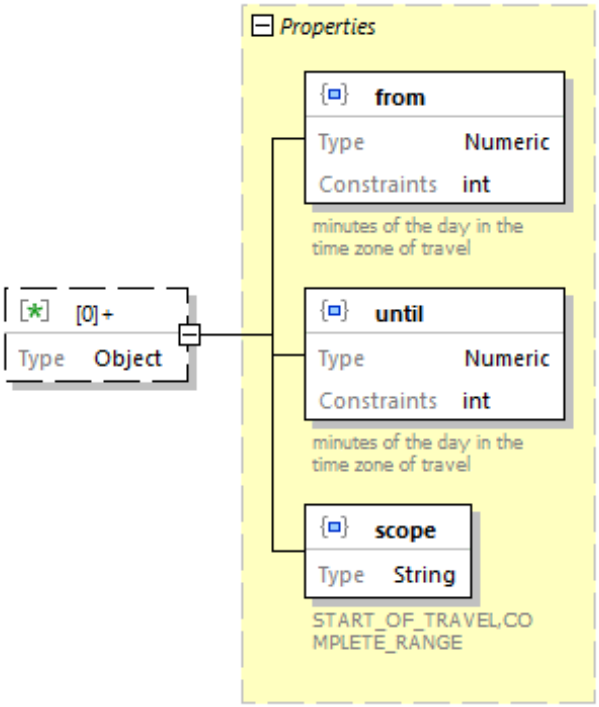
Data Constraints on TravelValidityConstraint



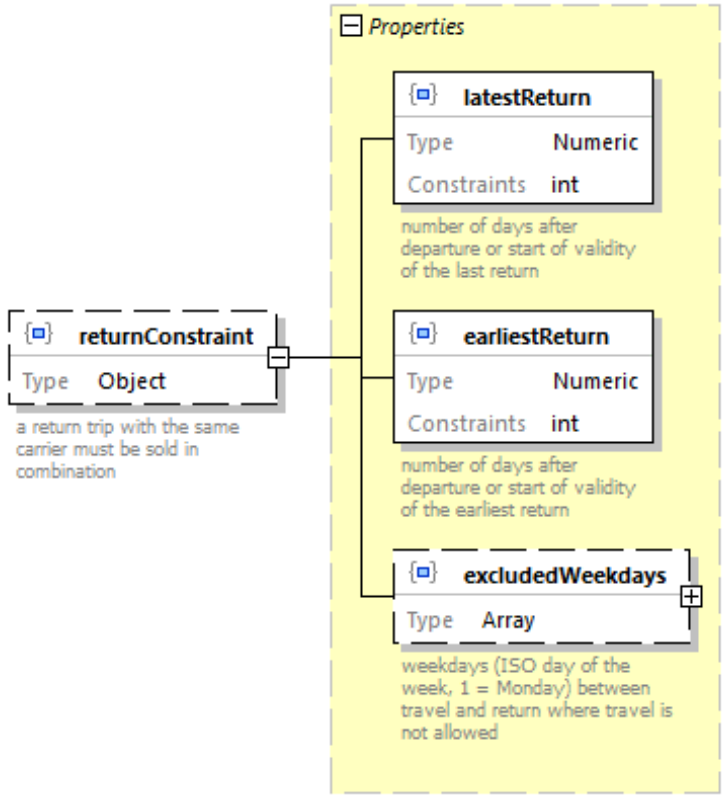
Travel Validity



Travel Validity - validity range



Travel Validity - excluded time range



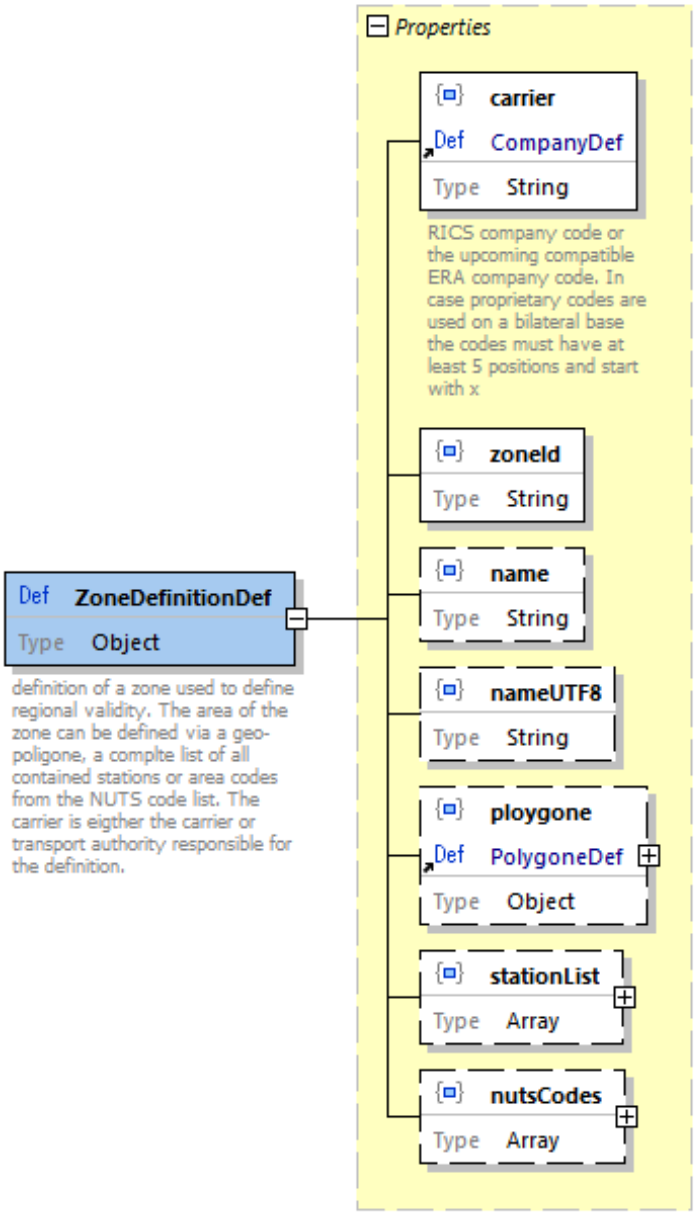
Travel Validity - return constraint

Code	Description
`excludedTimeRange`	`from` time < `until` time
`numberOfTravelDays`	A duration must be provided
`returnConstraint`	`earliestReturn` < `latestReturn`

ZoneDefinition

Definition of zones used in regional validity.

The area of a zone can be defined by either a list of stations, geographical polygon of a list of NUTS codes. Multiple definitions are allowed in case they define the same area.



Zone Definition

Offline Sale and Distribution

General Scenarios

Within the offline sales model the participating companies agreed to allow sales based on the provided fare data. The receiving company is responsible to apply the rules defined within the fare data. In case the implementation does not cover some features it is not allowed to sell fares that use these features.

Fare Exchange

Fares can be exchanged by bilateral file exchange, via a queue provided according to this specification or via some common exchange platform like the upcoming OSDM data exchange platform in case the company is a member of the platform.

Exchanged fare data deliveries can be defined to be implemented mandatory or to be optional thus allowing to continue the sales with the previous version. In case a mandatory version replaces a previous version it also replaces all previous optional version with-in the chain.

A data delivery might specify a minimal version number of the schema that needs to be supported to use the data.

Versioning of Data Delivery Schemas

The data delivery will contain the version number of the used json schema and the version number which is required to process the data. Also, a change in a minor version might restrict the usage of older version in case a carrier used a new optional feature which is mandatory to his fares.

Versioning of Data Delivery Data

The data delivery has a unique id. It can indicate that it replaces a previous delivery by indicating the data delivery id of the delivery to be replaced. Deliveries can be marked as optional. In this case a user of the data delivery might ignore the delivery. Deliveries marked as mandatory have to be used.

Automated Bulk Data Exchange

Automated asynchronous bulk data transfer is an option implemented by queues. The queues must implement the AMQP 1.0 specification.

On bilateral agreement other queue technologies might be used between two systems.

Queue authentication and encryption must use TLS version 1.2.

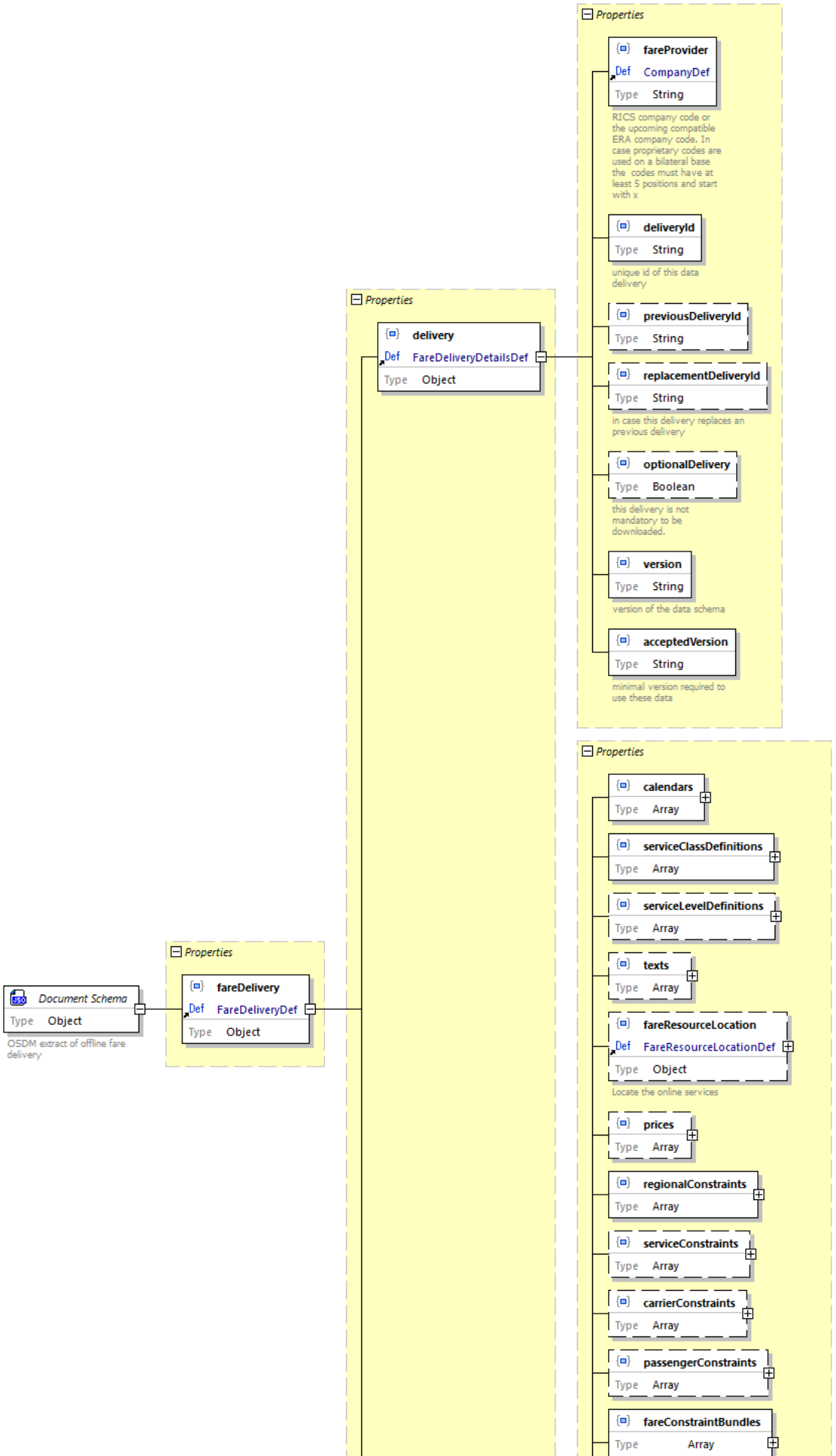
AMPQ Header Parameter

Parameter	Usage
`message-id`	Technical id of the data transfer, not the data delivery id in the data.
`user-id`	
`to`	
`subject`	„fare-data-delivery_“<version>
`reply-to`	N/A
`correlation-id`	N/A
`content-type`	`application/json`

Parameter	Usage
`absolute-expiry-time`	1 year ahead
`creation-time`	Time stamp when the data are put to the queue
`group-id`	
`group-sequence`	
`reply-to-group-id`	

Asynchronous Fare Data Delivery

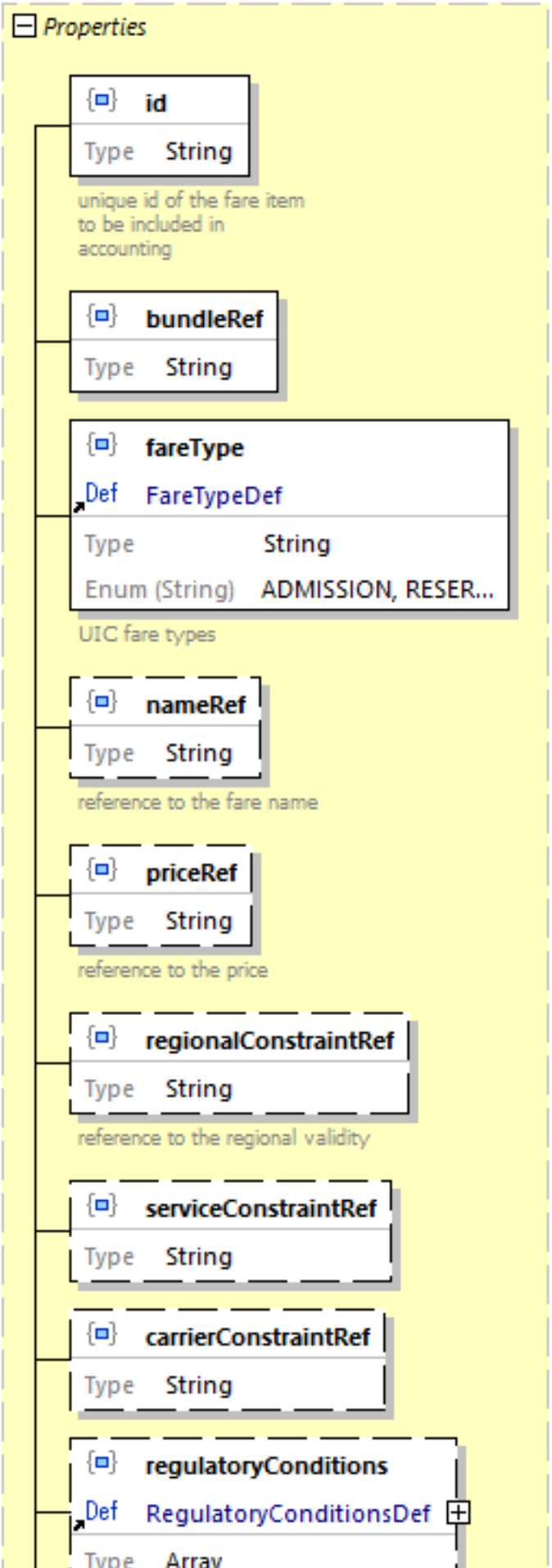
The fare structure delivery is the bulk data object collecting the fare data `fareStructure` of a delivery and the delivery meta data `delivery`.


Document Schema
Type Object
OSDM extract of offline fare delivery
Properties
fareDelivery
Def FareDeliveryDef
Type Object
Properties
delivery
Def FareDeliveryDetailsDef
Type Object
Properties
fareProvider
Def CompanyDef
Type String
RICS company code or the upcoming compatible ERA company code. In case proprietary codes are used on a bilateral base the codes must have at least 5 positions and start with x
deliveryId
Type String
unique id of this data delivery
previousDeliveryId
Type String
replacementDeliveryId
Type String
in case this delivery replaces an previous delivery
optionalDelivery
Type Boolean
this delivery is not mandatory to be downloaded.
version
Type String
version of the data schema
acceptedVersion
Type String
minimal version required to use these data
Properties
calendars
Type Array
serviceClassDefinitions
Type Array
serviceLevelDefinitions
Type Array
texts
Type Array
fareResourceLocation
Def FareResourceLocationDef
Type Object
Locate the online services
prices
Type Array
regionalConstraints
Type Array
serviceConstraints
Type Array
carrierConstraints
Type Array
passengerConstraints
Type Array
fareConstraintBundles
Type Array

Data Structure for Bulk Data

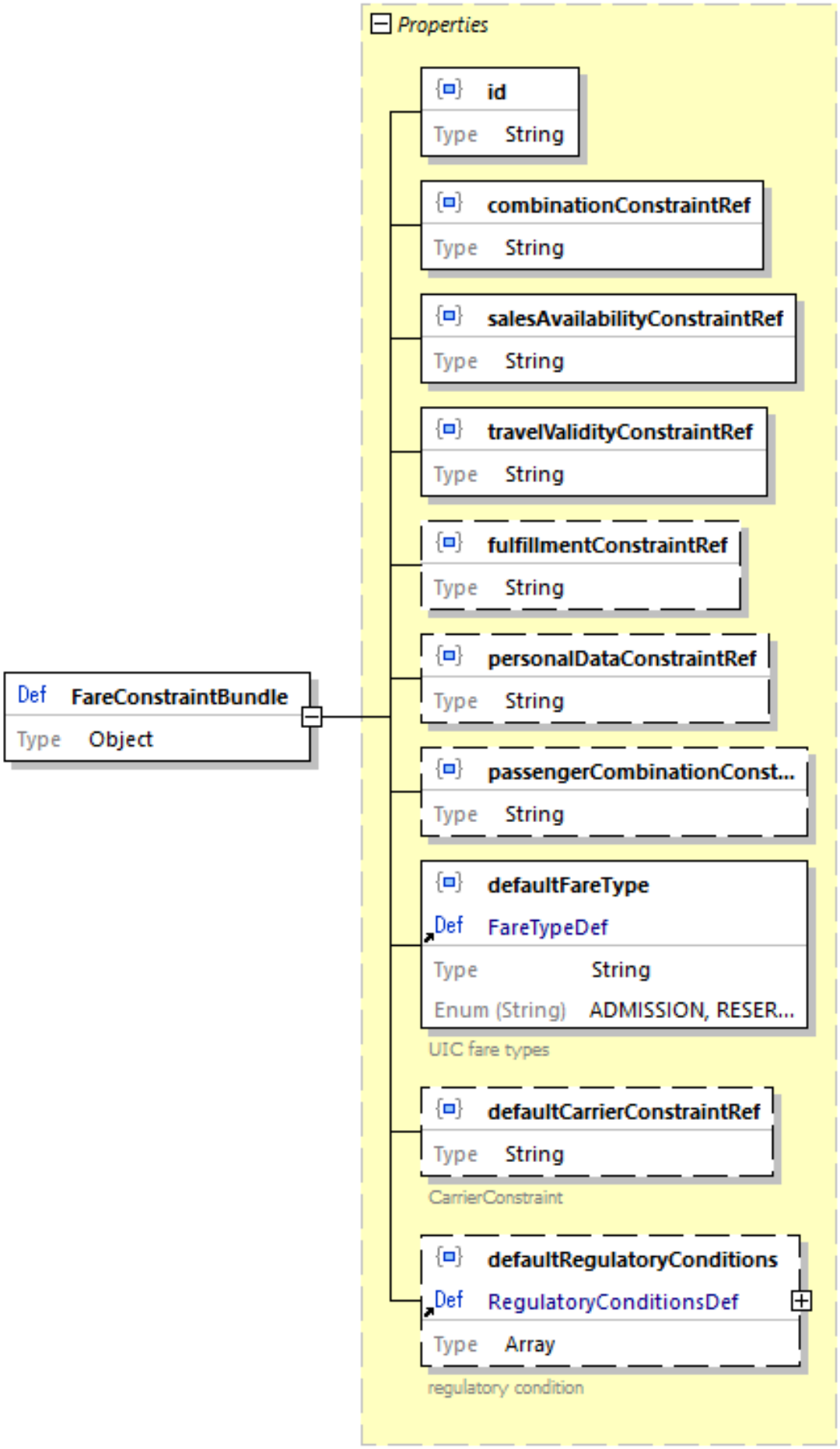
Definition of a Single Fare

The single fare represents the smallest unit to be integrated in an offer. Within the offline data the fare collects the references to the constraints that need to be applied and the price.


Properties
id
Type String
unique id of the fare item to be included in accounting
bundleRef
Type String
fareType
Def FareTypeDef
Type String
Enum (String) ADMISSION, RESER...
UIC fare types
nameRef
Type String
reference to the fare name
priceRef
Type String
reference to the price
regionalConstraintRef
Type String
reference to the regional validity
serviceConstraintRef
Type String
carrierConstraintRef
Type String
regulatoryConditions
Def RegulatoryConditionsDef
Type Array

Fare Structure

Some constraints are bundled within the fare constraint bundle to avoid repeating the same data too many times:

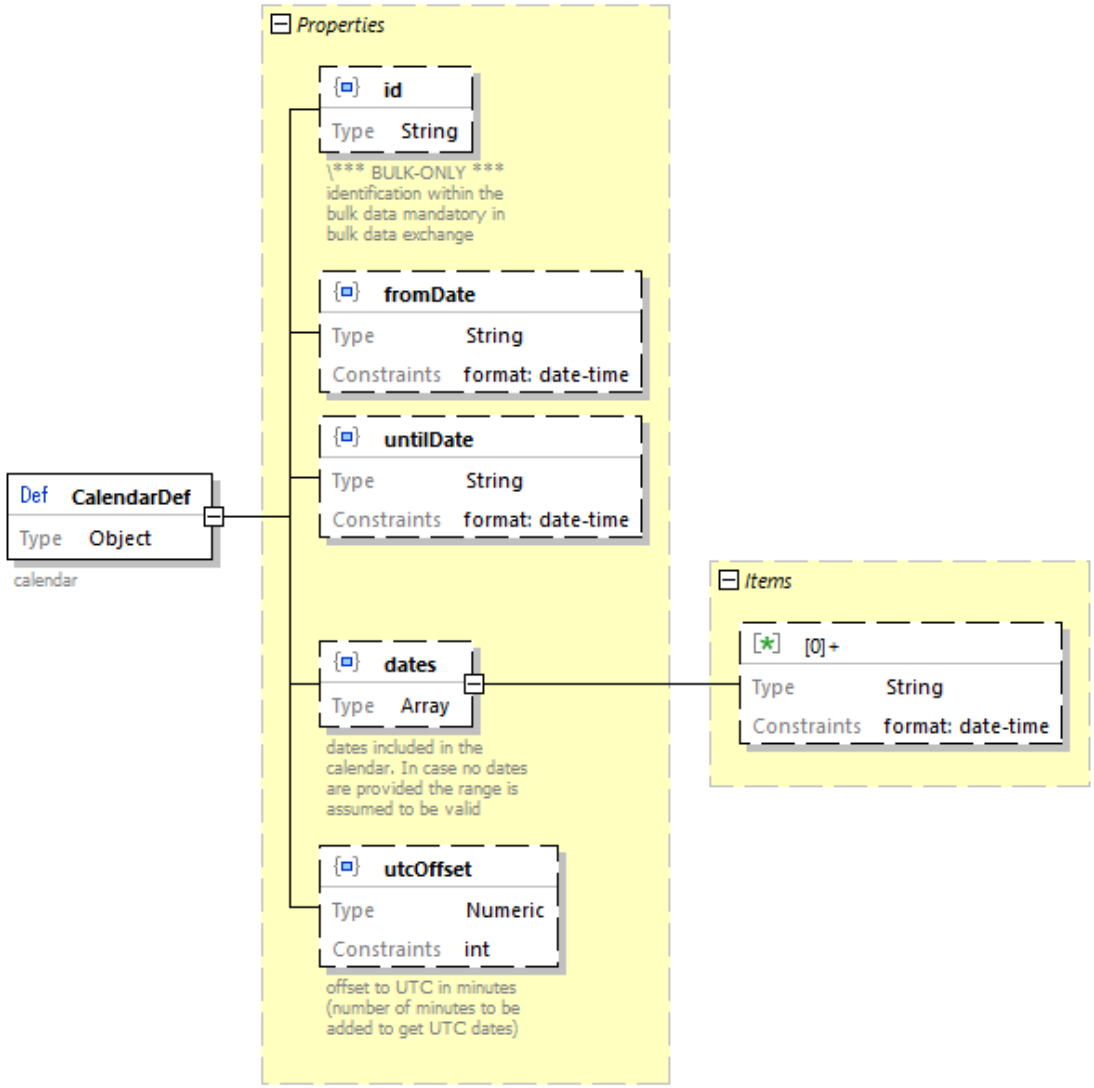

Properties
id
Type String
combinationConstraintRef
Type String
salesAvailabilityConstraintRef
Type String
travelValidityConstraintRef
Type String
fulfillmentConstraintRef
Type String
personalDataConstraintRef
Type String
passengerCombinationConst...
Type String
defaultFareType
Def FareTypeDef
Type String
Enum (String) ADMISSION, RESER...
UIC fare types
defaultCarrierConstraintRef
Type String
CarrierConstraint
defaultRegulatoryConditions
Def RegulatoryConditionsDef
Type Array
regulatory condition
Def FareConstraintBundle
Type Object

Basic definitions included in the data delivery

Basic definitions are provided within each data delivery. The basic definitions are included only once and are references within the data via their id.

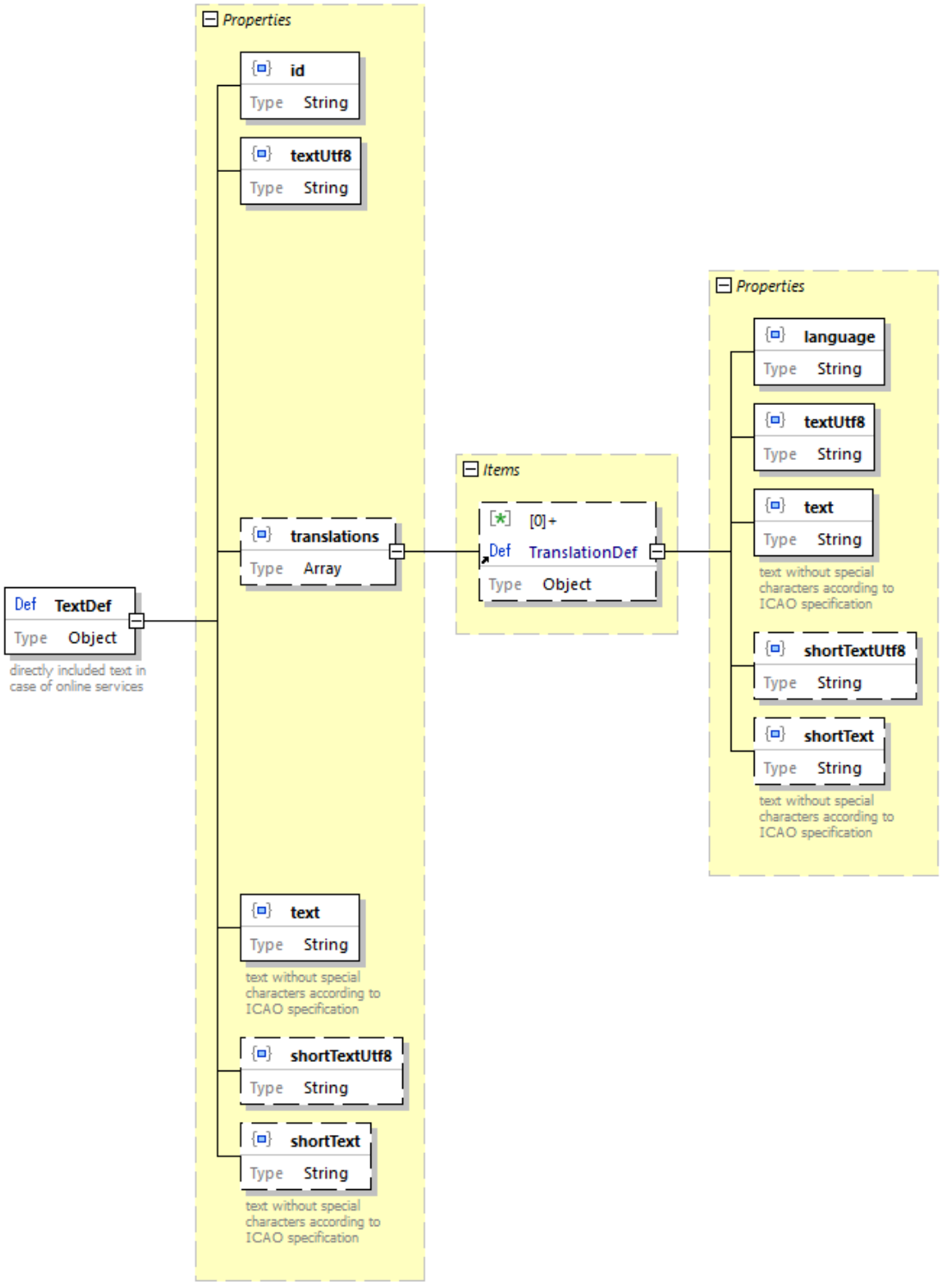
Calendar

A data structure to define a calendar e.g. used in sales availability.



Text

All texts provided with the data use the text data structure providing short and long texts and translations in different languages. To support legacy implementations and the conversion to the 108.1 specification additional texts without special characters can be defined.



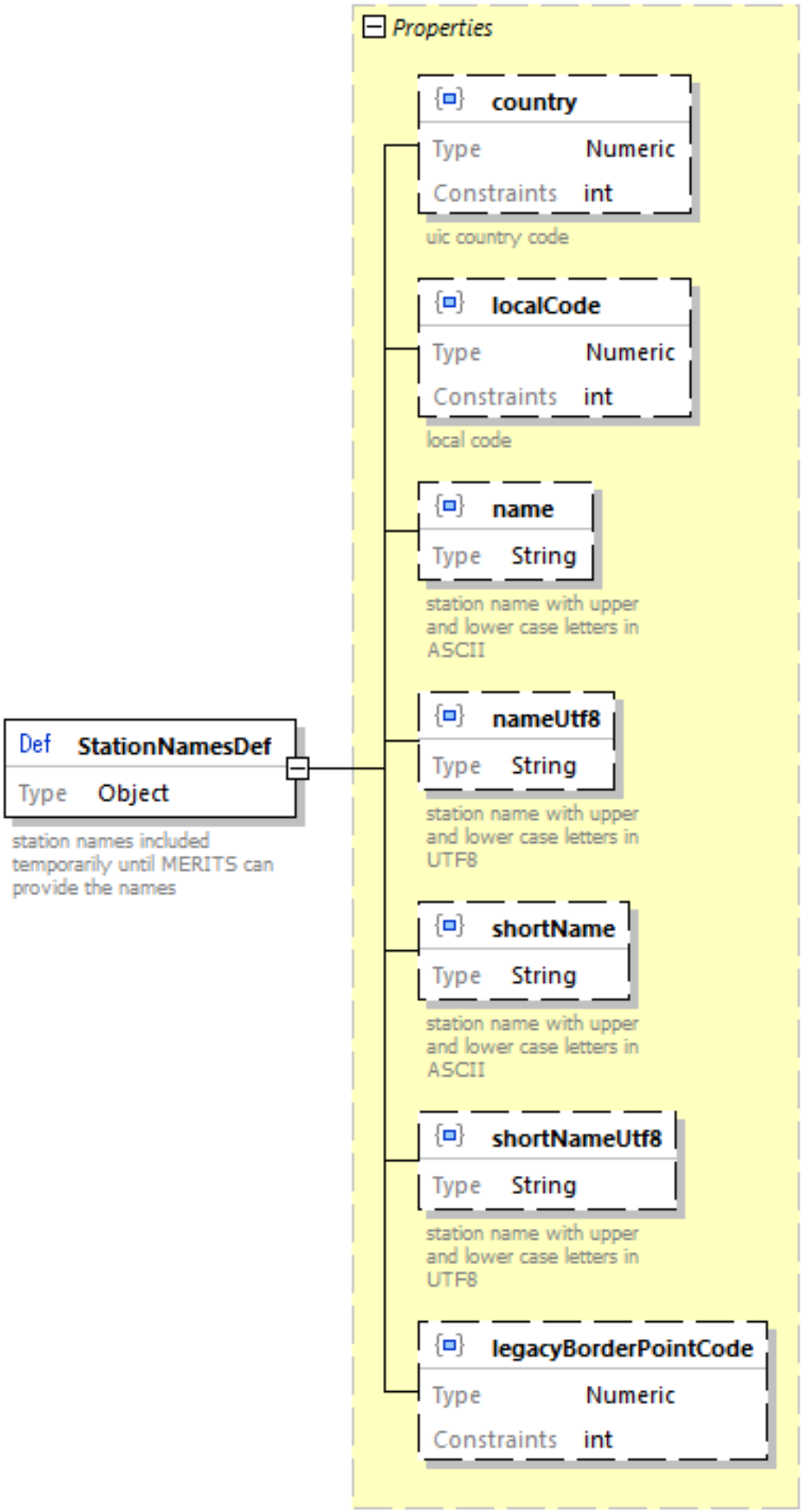
Fare Structure

Station Names

Station names have been included within the data exchange to support names including special characters and names of different length. If in the future the station data exchange of MERITS can provide these names they can be removed here. The station codes used must be codes as defined in MERITS / TAP-TSI.

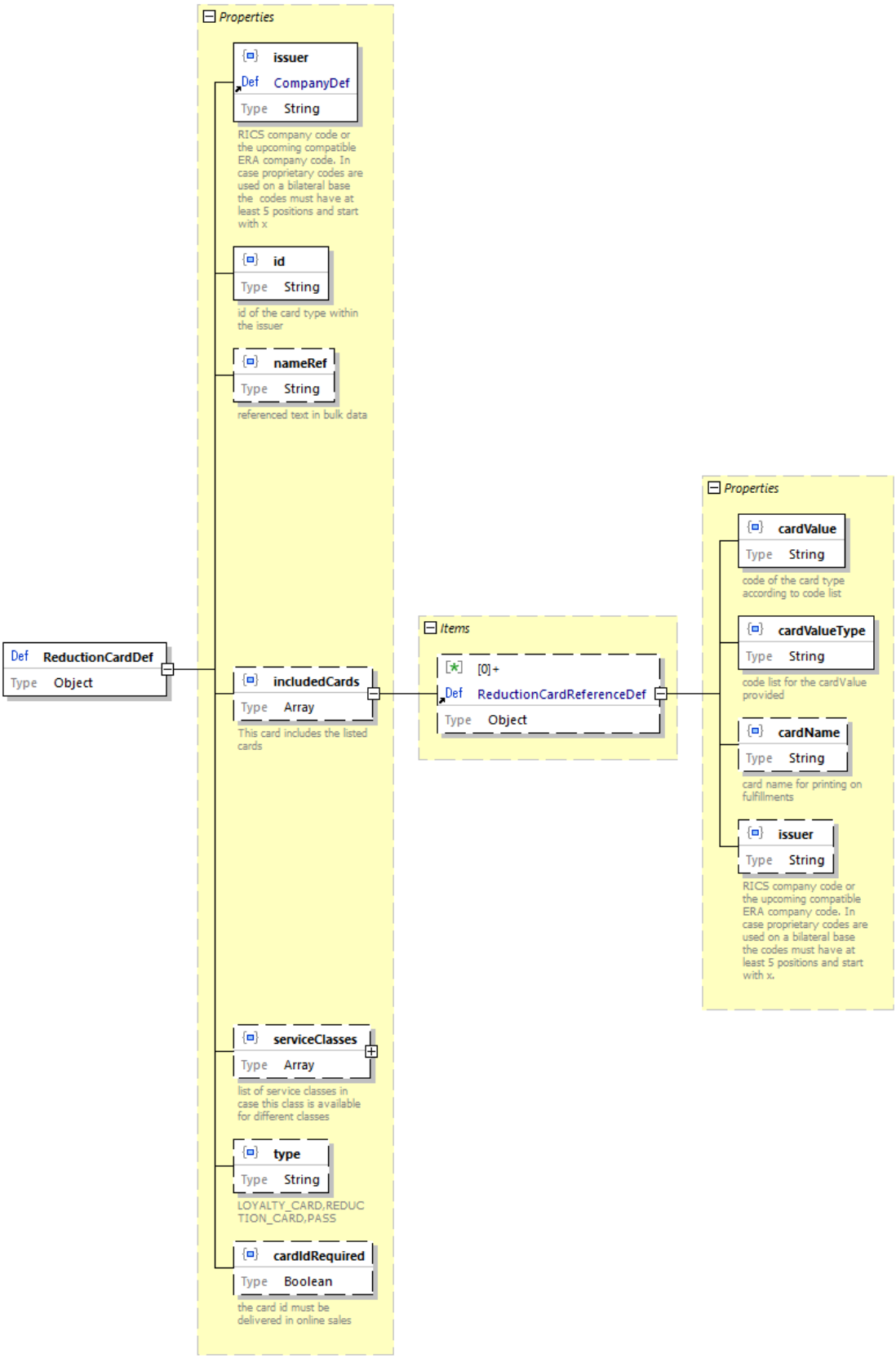
Station names provides multi language names in short and long form as currently no other data source can provide these names. Short names are used within the route descriptions whereas the long for is used for entry and exit stations.

A legacy border point code can be provided during the migration to the OSDM data model.


Properties
country
Type Numeric
Constraints int
uic country code
localCode
Type Numeric
Constraints int
local code
name
Type String
station name with upper and lower case letters in ASCII
nameUtf8
Type String
station name with upper and lower case letters in UTF8
shortName
Type String
station name with upper and lower case letters in ASCII
shortNameUtf8
Type String
station name with upper and lower case letters in UTF8
legacyBorderPointCode
Type Numeric
Constraints int
Def StationNamesDef
Type Object
station names included temporarily until MERITS can provide the names

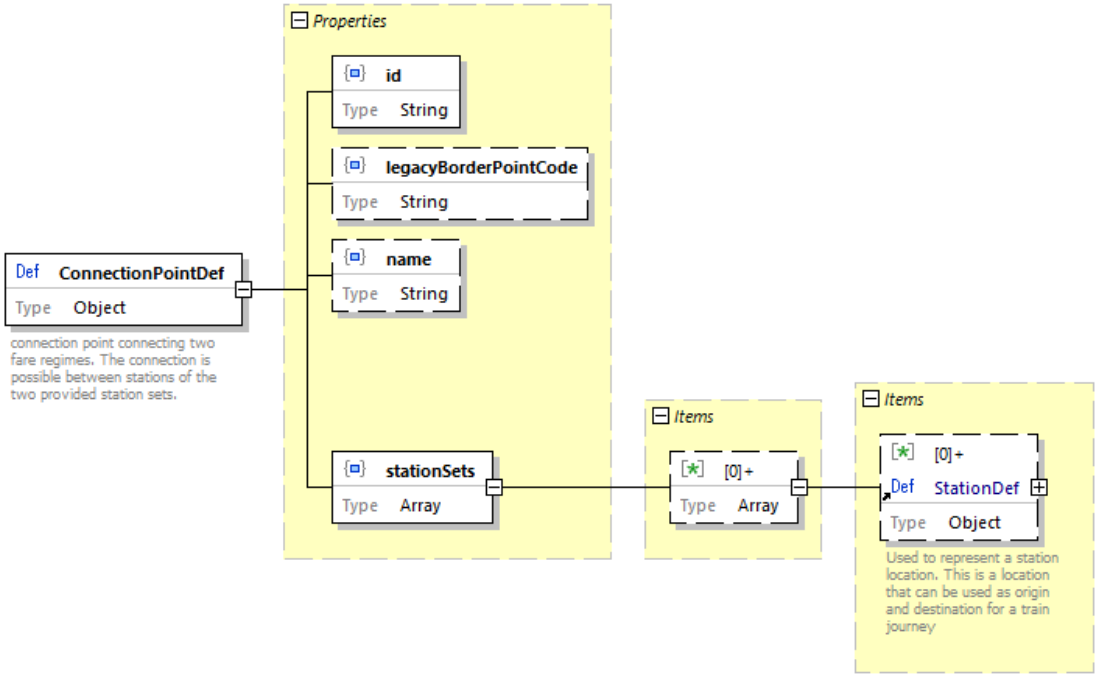
Reduction Cards

Tis covers the definition of reduction cards used in the fares. The name and some basic informations of the cards can be defined. The reduction itself (percentage) is not included as the fare price already provides the reduced price. Some provider specific cards are accepted by other carriers as a generic card. This can be expressed via the included cards feature. E.g. MyCard could be accepted as RailPlus card by others, so MyCard includes RailPlus.


Properties
issuer
Def CompanyDef
Type String
RICS company code or the upcoming compatible ERA company code. In case proprietary codes are used on a bilateral base the codes must have at least 5 positions and start with x
id
Type String
id of the card type within the issuer
nameRef
Type String
referenced text in bulk data
Def ReductionCardDef
Type Object
includedCards
Type Array
This card includes the listed cards
Items
[*] [0]+
Def ReductionCardReferenceDef
Type Object
Properties
cardValue
Type String
code of the card type according to code list
cardValueType
Type String
code list for the cardValue provided
cardName
Type String
card name for printing on fulfillments
issuer
Type String
RICS company code or the upcoming compatible ERA company code. In case proprietary codes are used on a bilateral base the codes must have at least 5 positions and start with x.
serviceClasses
Type Array
list of service classes in case this class is available for different classes
type
Type String
LOYALTY_CARD,REDUCTION_CARD,PASS
cardIdRequired
Type Boolean
the card id must be delivered in online sales

Connection Points

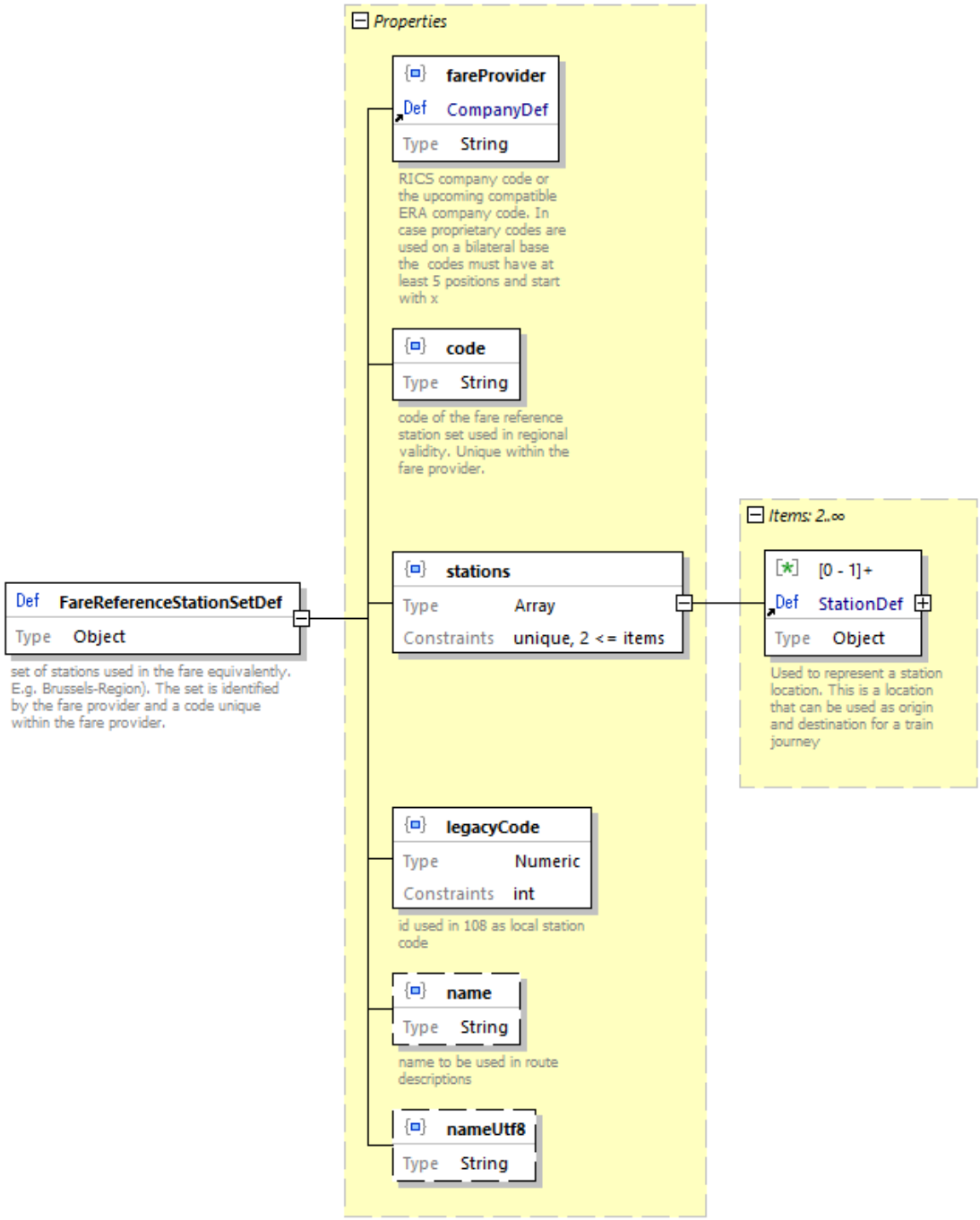
Connection points define the options to connect one fare with another fare a a point. In case the connectin point is a real station the connection point is defined by a set including just that station. In case the fares are connected inbetween two stations the connection point includes two sets each including the station on one side. There ight be cases where a connection is possible between more than two stations, in this rare case the set(s) might contain more than one station (e.g. Stations A and B for carrier 1 are connected to stations C and D of carrier 2 and allowed route go via A-C or B-D).



Fare Structure

Fare Reference Station Set

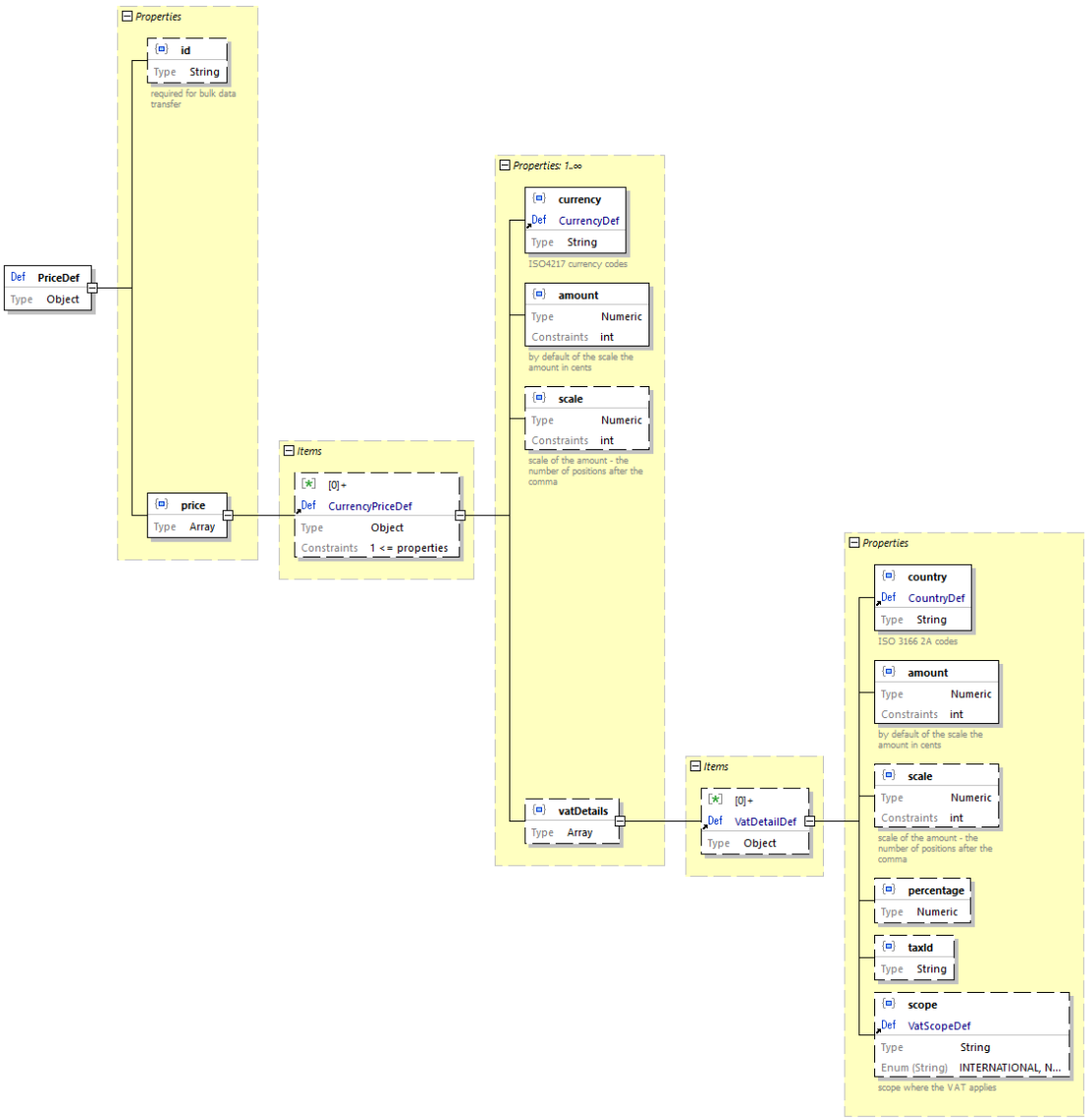
Fare reference station set defines a set of stations that can be used in a route. All station(s) of the set can be used by the traveler.



Fare Structure

Price

The price of a fare of the refund fee on an aftersale. VAT details can be provided for the price. Default currency is EUR, but other currencies might be used based on bilateral agreements.

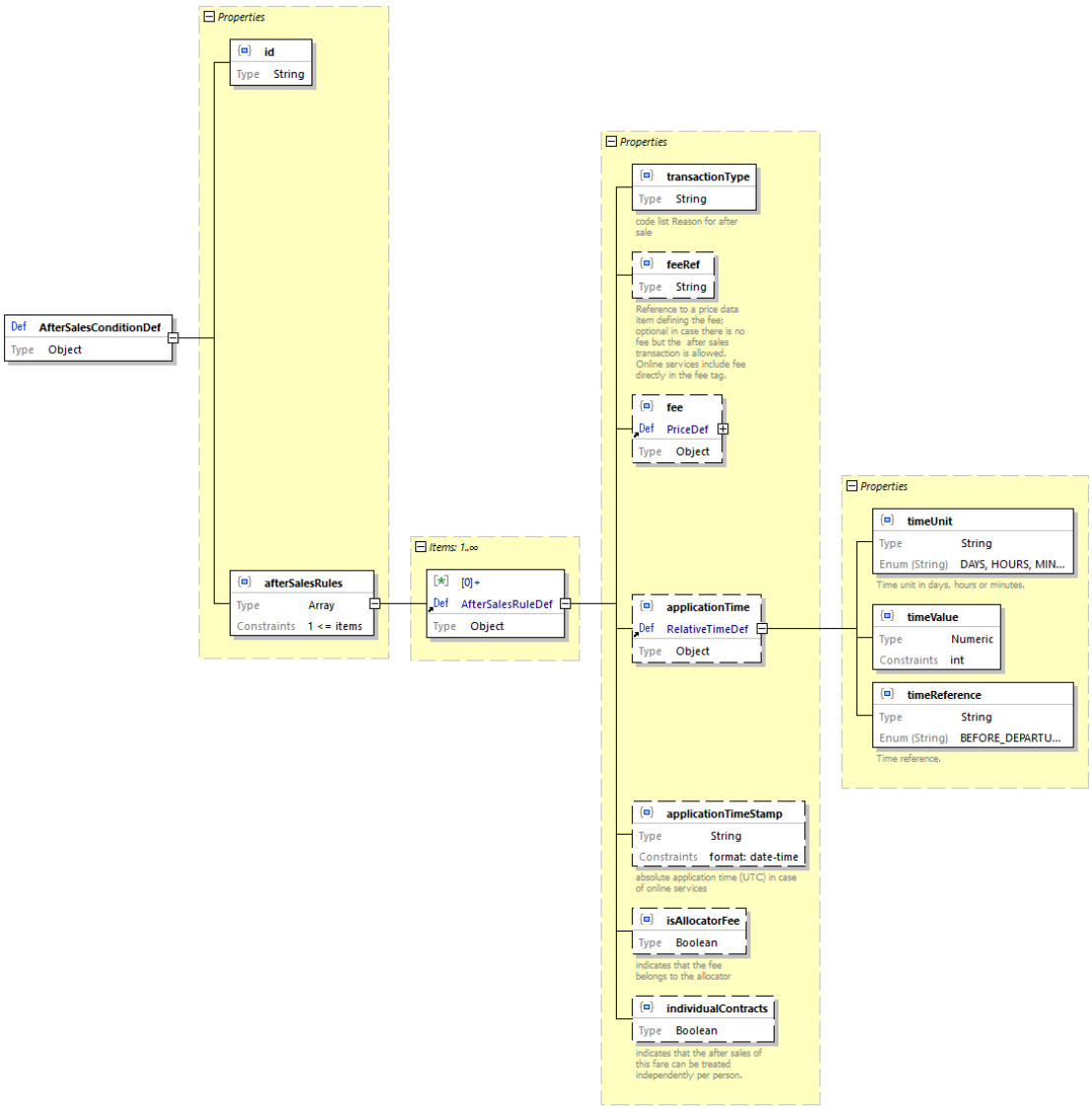


Fare Structure

Definitions of a different fare constraints

Fare After Sales Constraint

Definition of the after sales conditions to be applied. Depending on the fare combination mode the after sales constraint can be omitted in case the allocator is responsible for the after sales fees.



Fare Structure

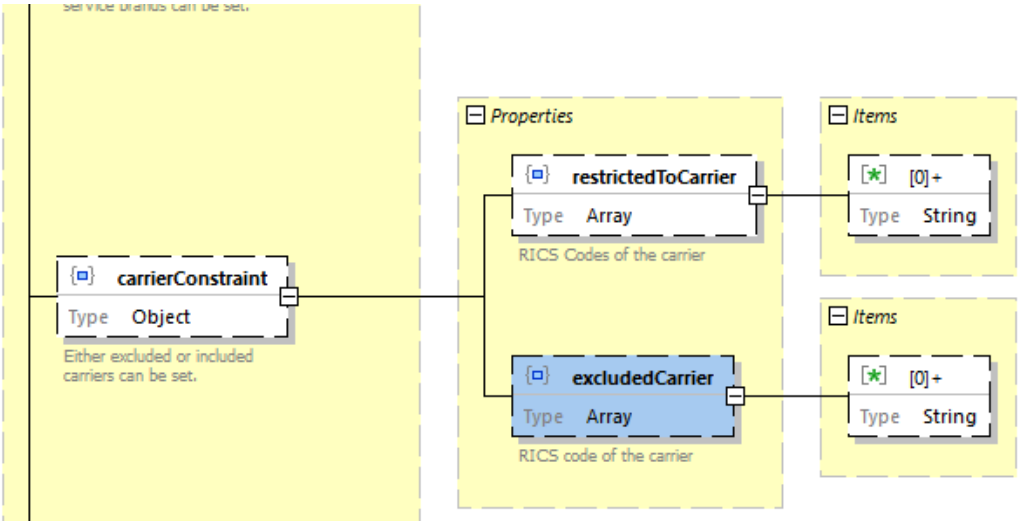
fare carrier constraint

The carrier constraint defines the carriers that can be used. Either a list of the allowed carriers can be provided or a list on excluded carriers. In the case of excluded carriers all carriers not listed can be used.

The carrier constraint can be referenced by a fare via the id.

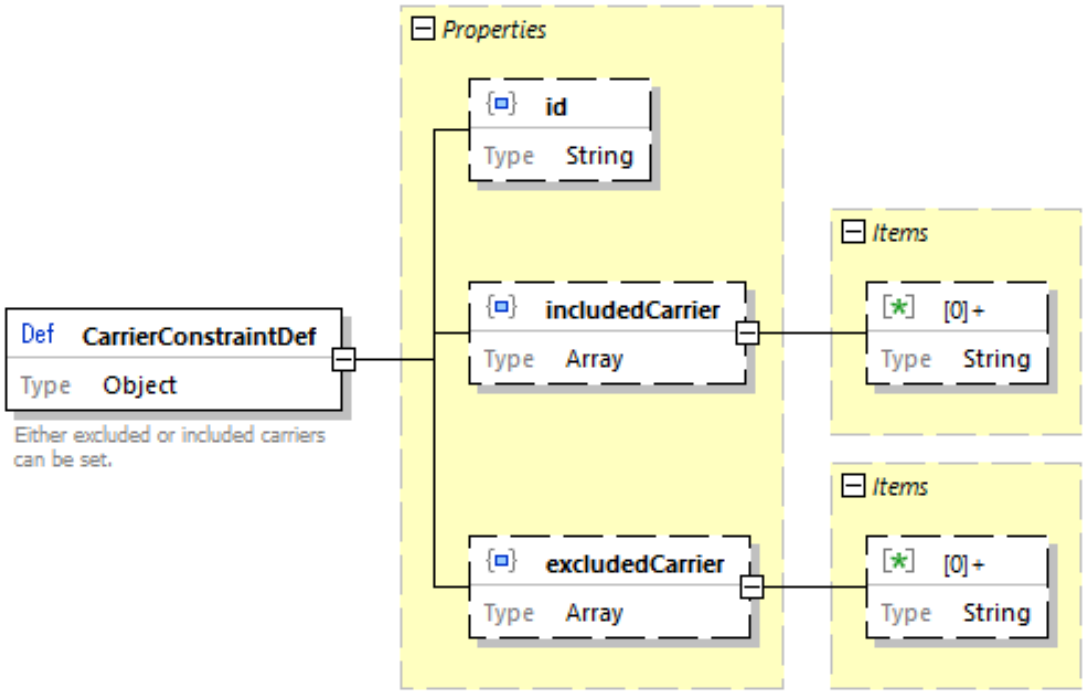
Carrier constraint limits an open fare - not linked to a train - to some carriers. The carriers can be specified either as exclusion list or alternatively as inclusion list.

Carriers are specified by their Company code (RICS code).



Carrier Constraint Type

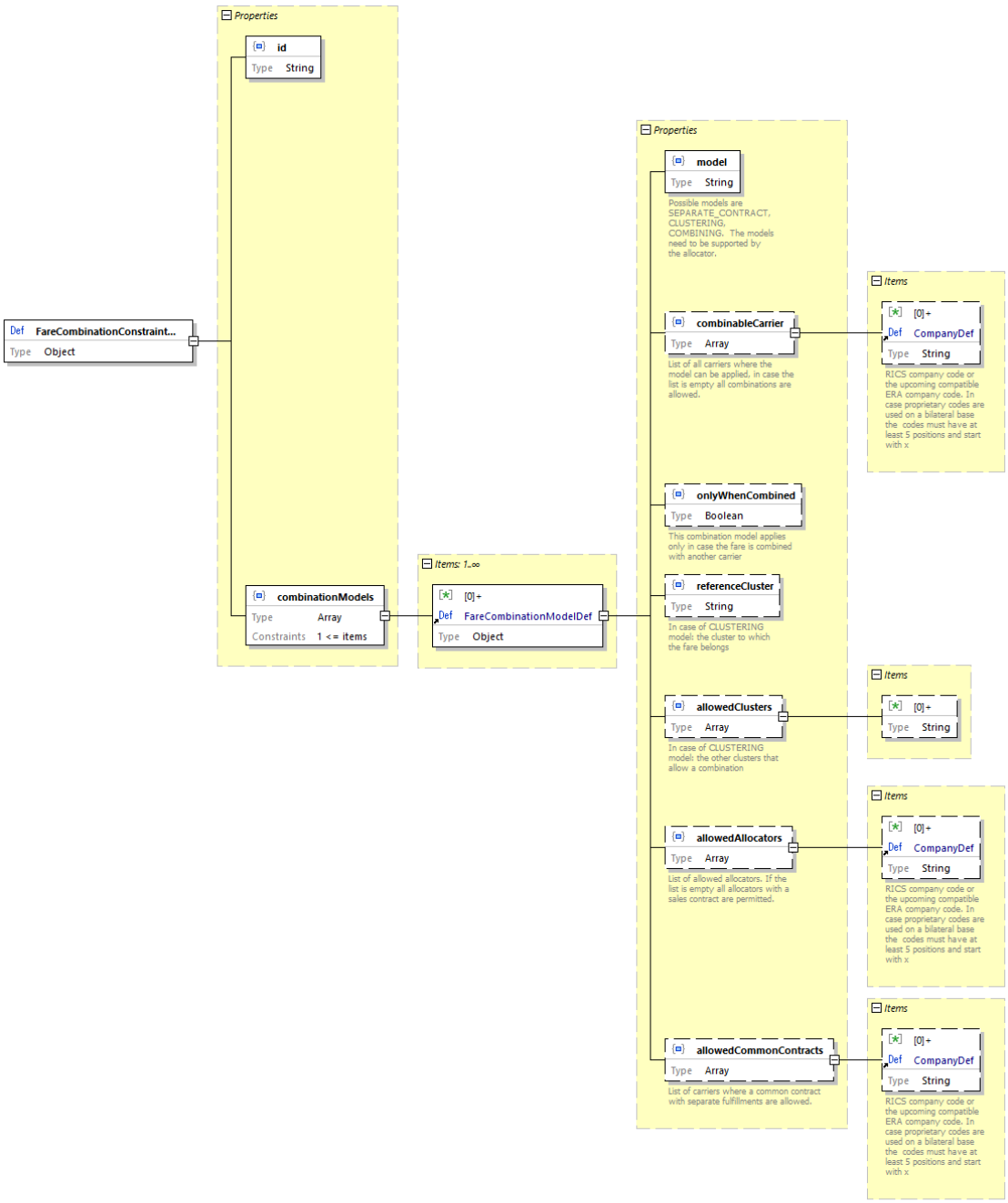
The included / excluded carriers are also part of the FCB barcode (*IRS 90918-4*) content and the ticket control data (*IRS 90918-9*).



Fare Structure

fare combination constraint

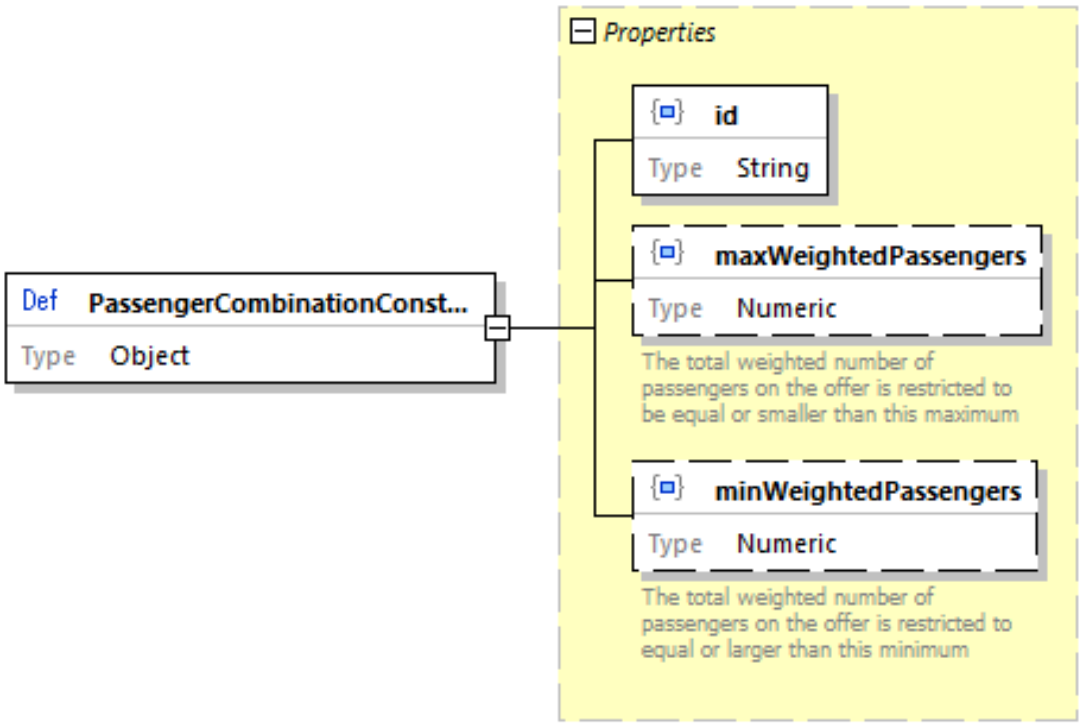
Constraints ruling the possible combinations with other fares of other providers.



Fare Structure

Fare Passenger Combination Constraint

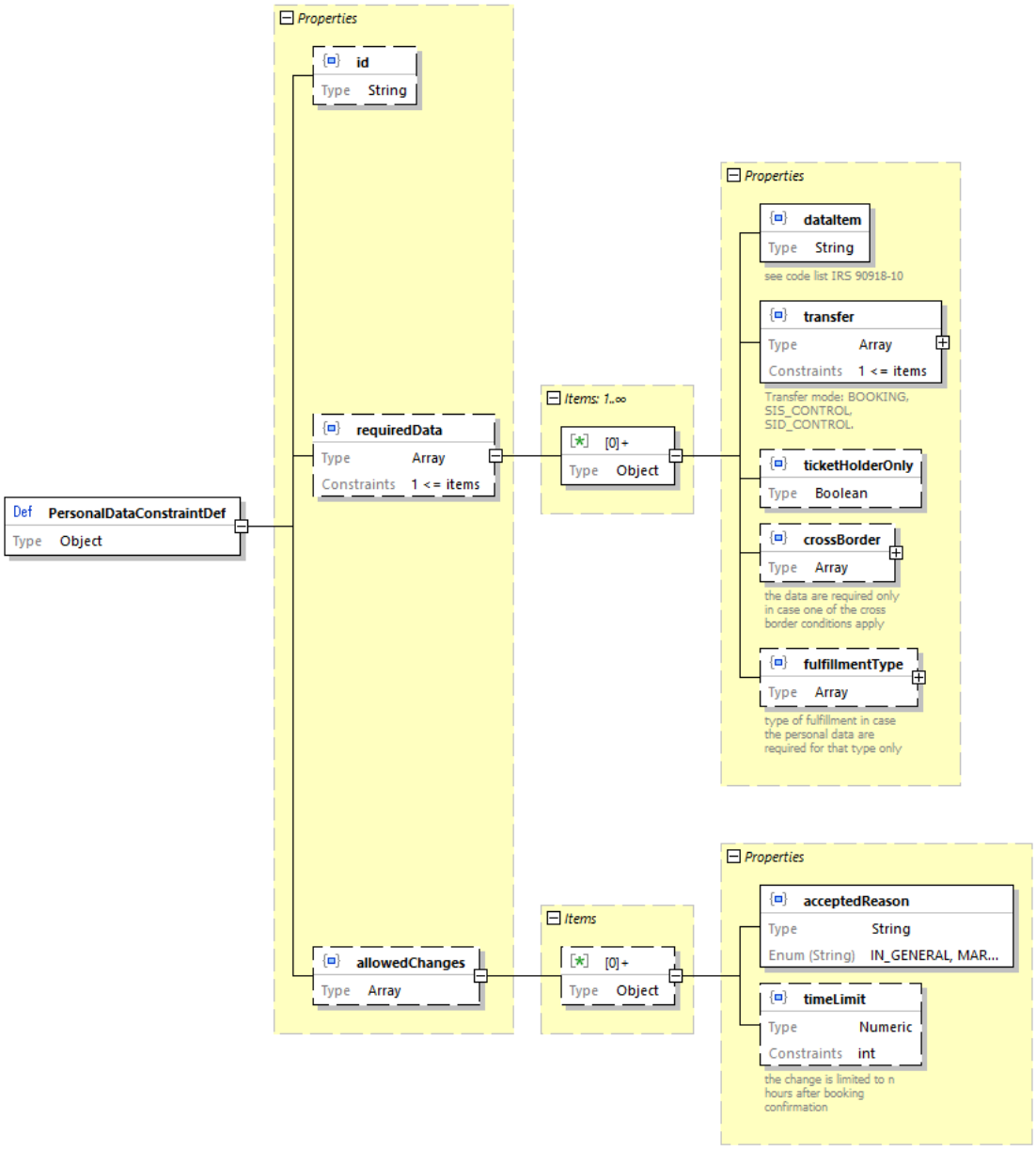
Constraints ruling the possible combinations of passengers for combination on a ticket.



Fare Structure

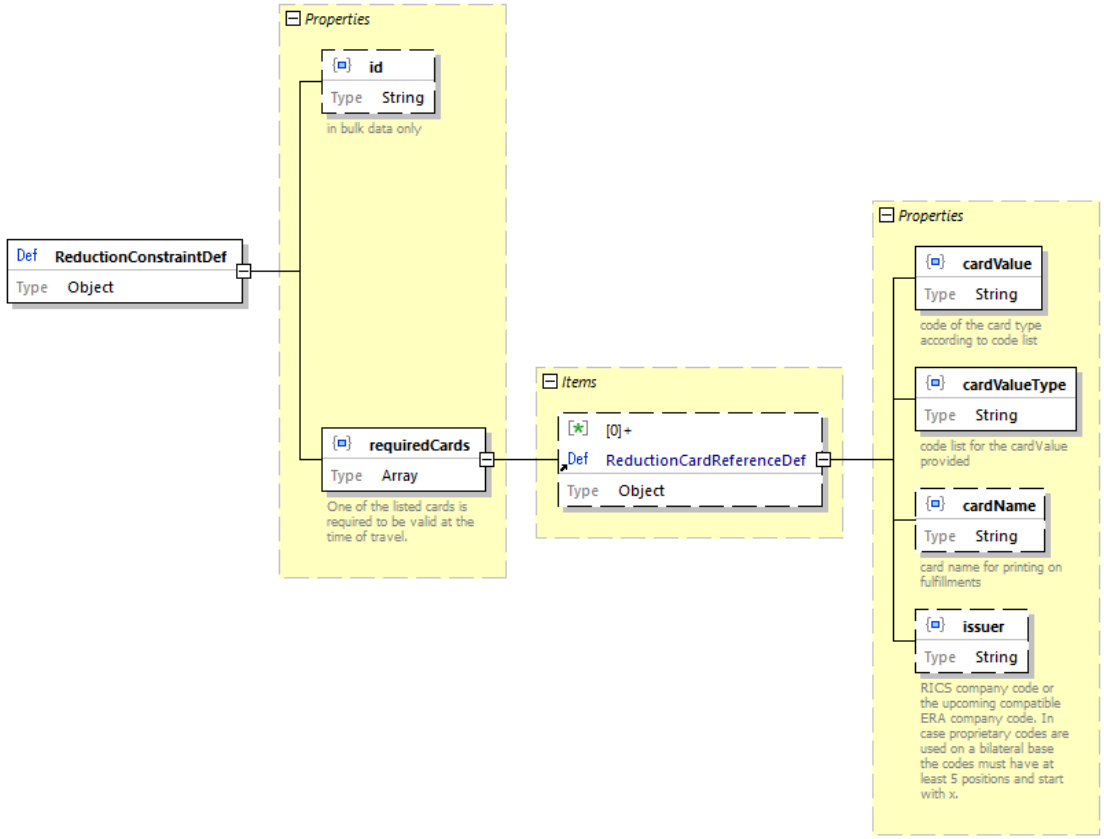
fare personal data constraint

Definition of the personal data required e.g. in a bar code of via online ticket control.



Fare Structure

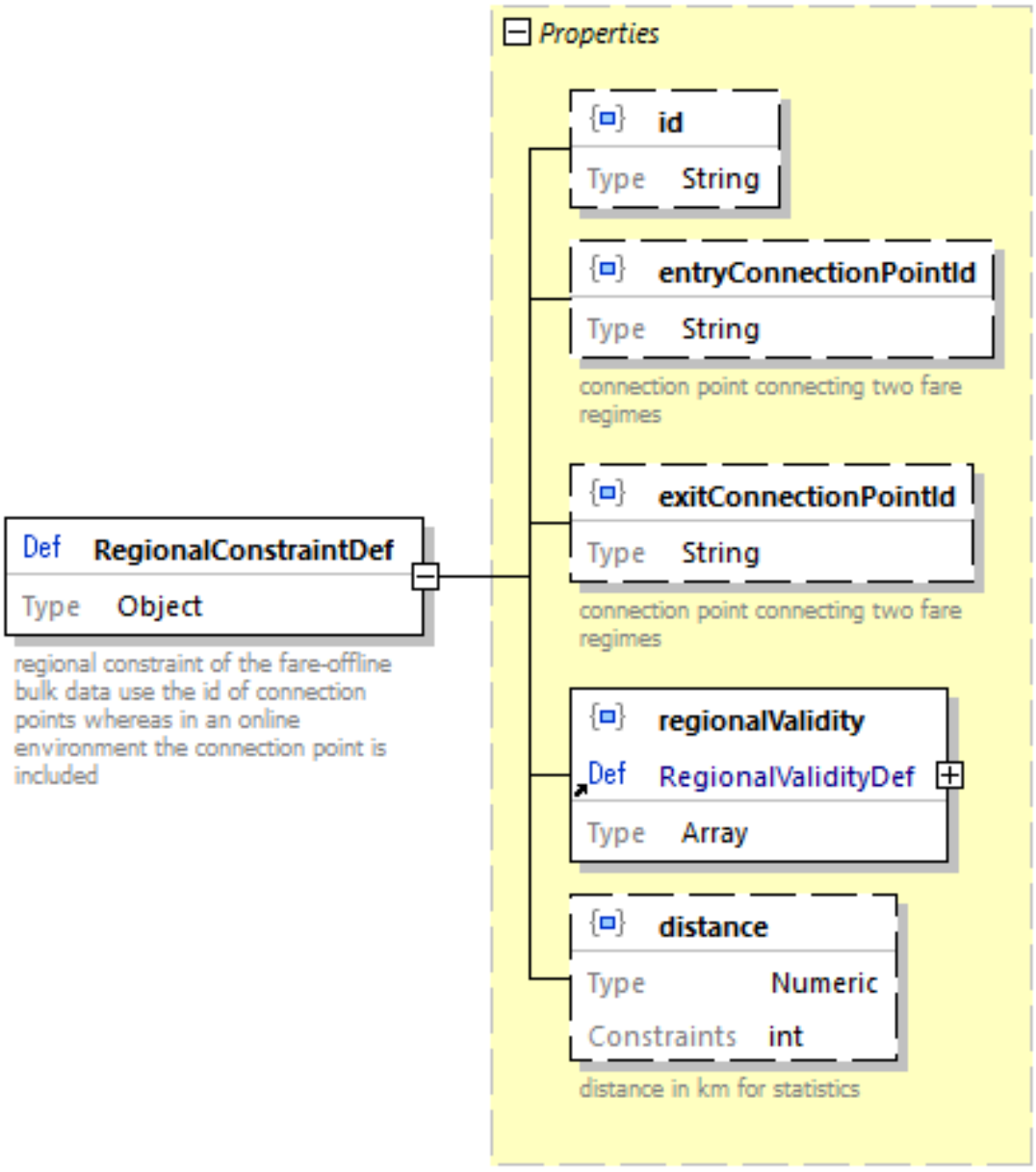
fare reduction constraint



Fare Structure

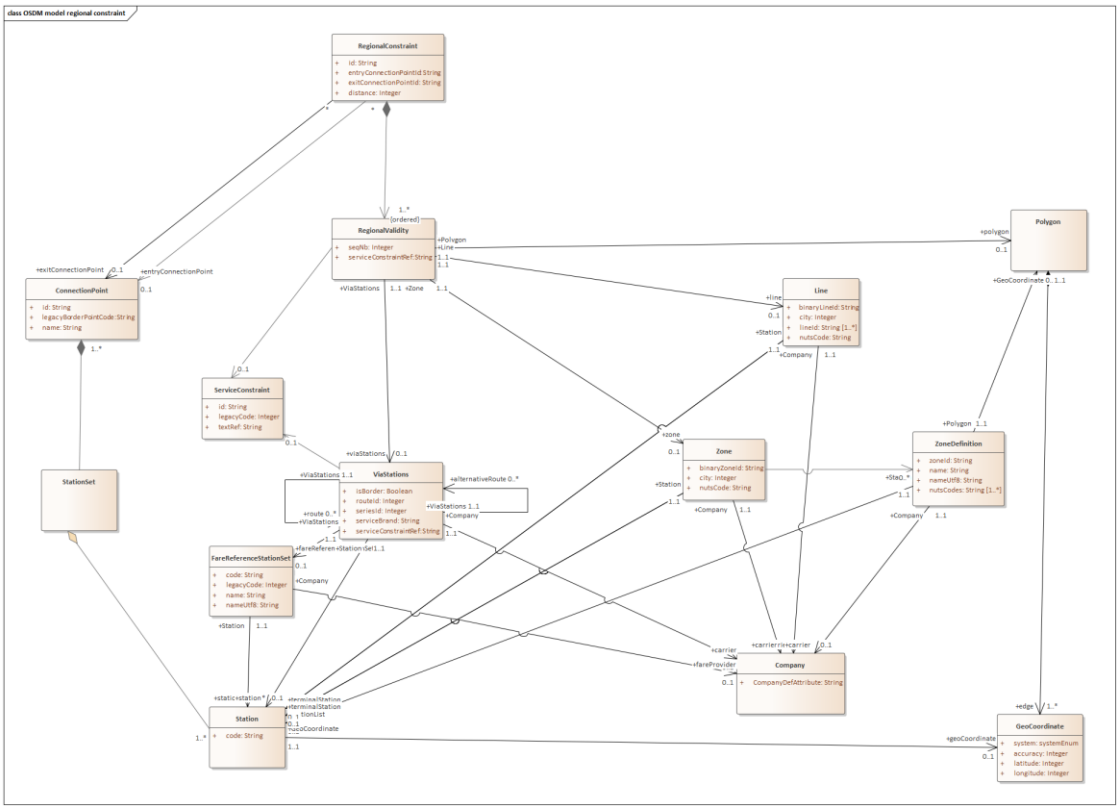
Fare Regional Constraint

The regional constraint defines the options to combine the fare at the start and end point via connection points.



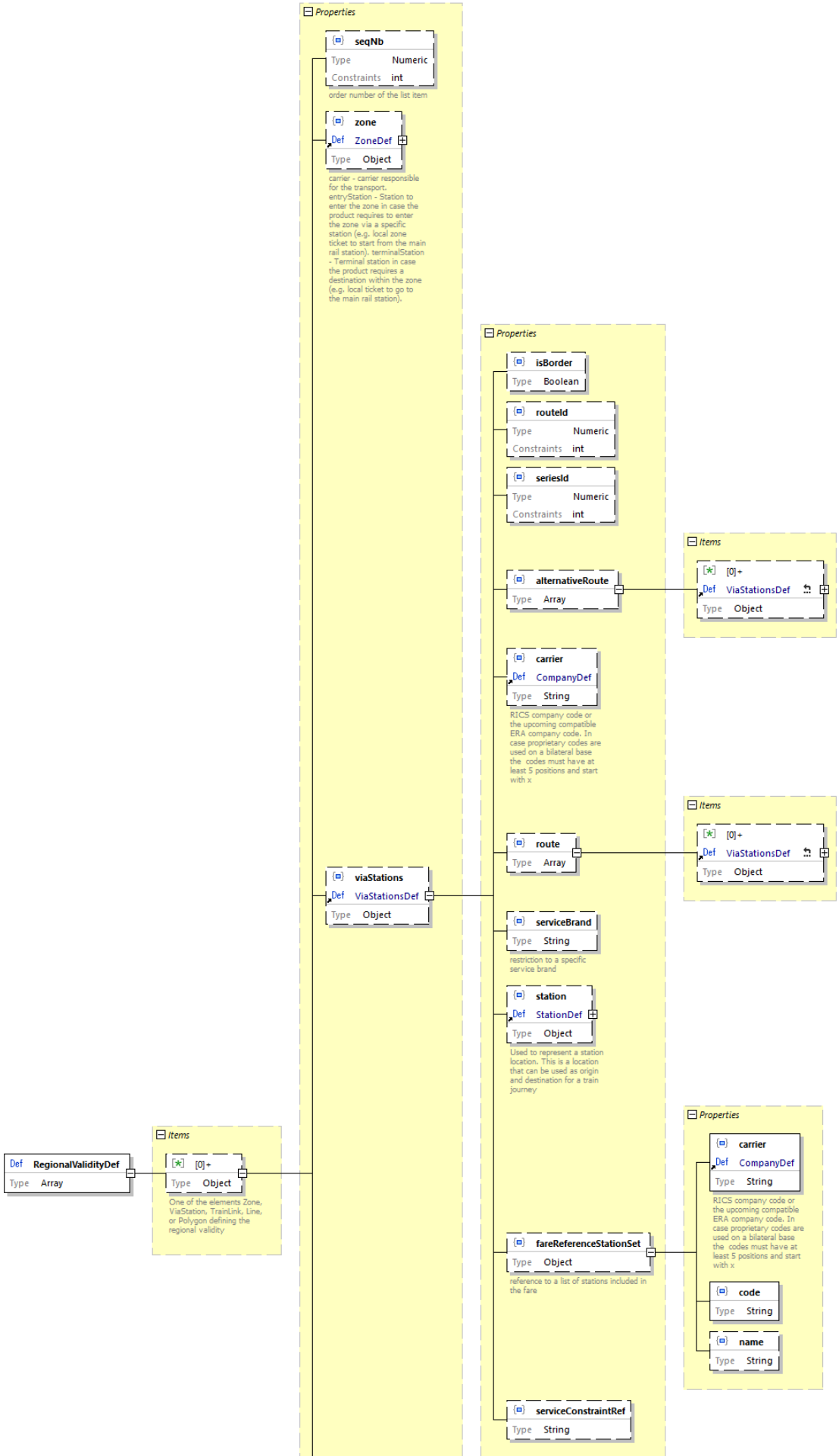
Fare Structure

Data model regional constraints:



Fare Structure

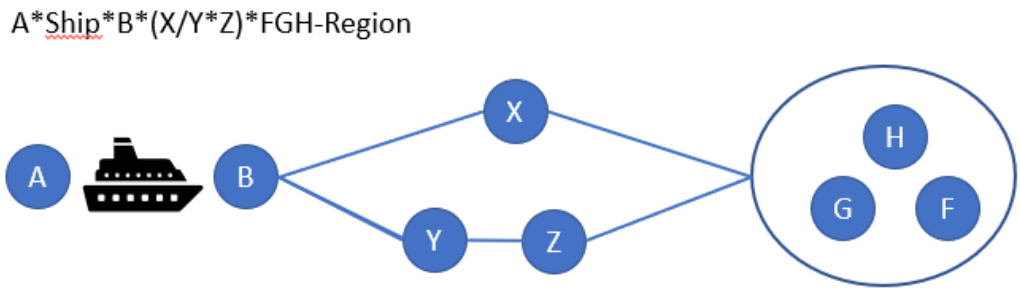
The regional validity defines the geographical validity of the fare. It is defined as an ordered list along the route. Options to define a part of the route include Zones (regional areas), Lines, route descriptions (viaStations) that can define sequences of stations, alternative routes and fare reference sets. Areas can also be defined by geo-coordinates.


Properties
seqNb
Type Numeric
Constraints int
order number of the list item
zone
Def ZoneDef
Type Object
carrier - carrier responsible for the transport. entryStation - Station to enter the zone in case the product requires to enter the zone via a specific station (e.g. local zone ticket to start from the main rail station). terminalStation - Terminal station in case the product requires a destination within the zone (e.g. local ticket to go to the main rail station).
viaStations
Def ViaStationsDef
Type Object
Properties
isBorder
Type Boolean
routeId
Type Numeric
Constraints int
seriesId
Type Numeric
Constraints int
alternativeRoute
Type Array
Items
[0]+
Def ViaStationsDef
Type Object
carrier
Def CompanyDef
Type String
RICS company code or the upcoming compatible ERA company code. In case proprietary codes are used on a bilateral base the codes must have at least 5 positions and start with x
route
Type Array
Items
[0]+
Def ViaStationsDef
Type Object
serviceBrand
Type String
restriction to a specific service brand
station
Def StationDef
Type Object
Used to represent a station location. This is a location that can be used as origin and destination for a train journey
fareReferenceStationSet
Type Object
reference to a list of stations included in the fare
Properties
carrier
Def CompanyDef
Type String
RICS company code or the upcoming compatible ERA company code. In case proprietary codes are used on a bilateral base the codes must have at least 5 positions and start with x
code
Type String
name
Type String
serviceConstraintRef
Type String
Def RegionalValidityDef
Type Array
Items
[0]+
Type Object
One of the elements Zone, ViaStation, TrainLink, Line, or Polygon defining the regional validity

Fare Structure

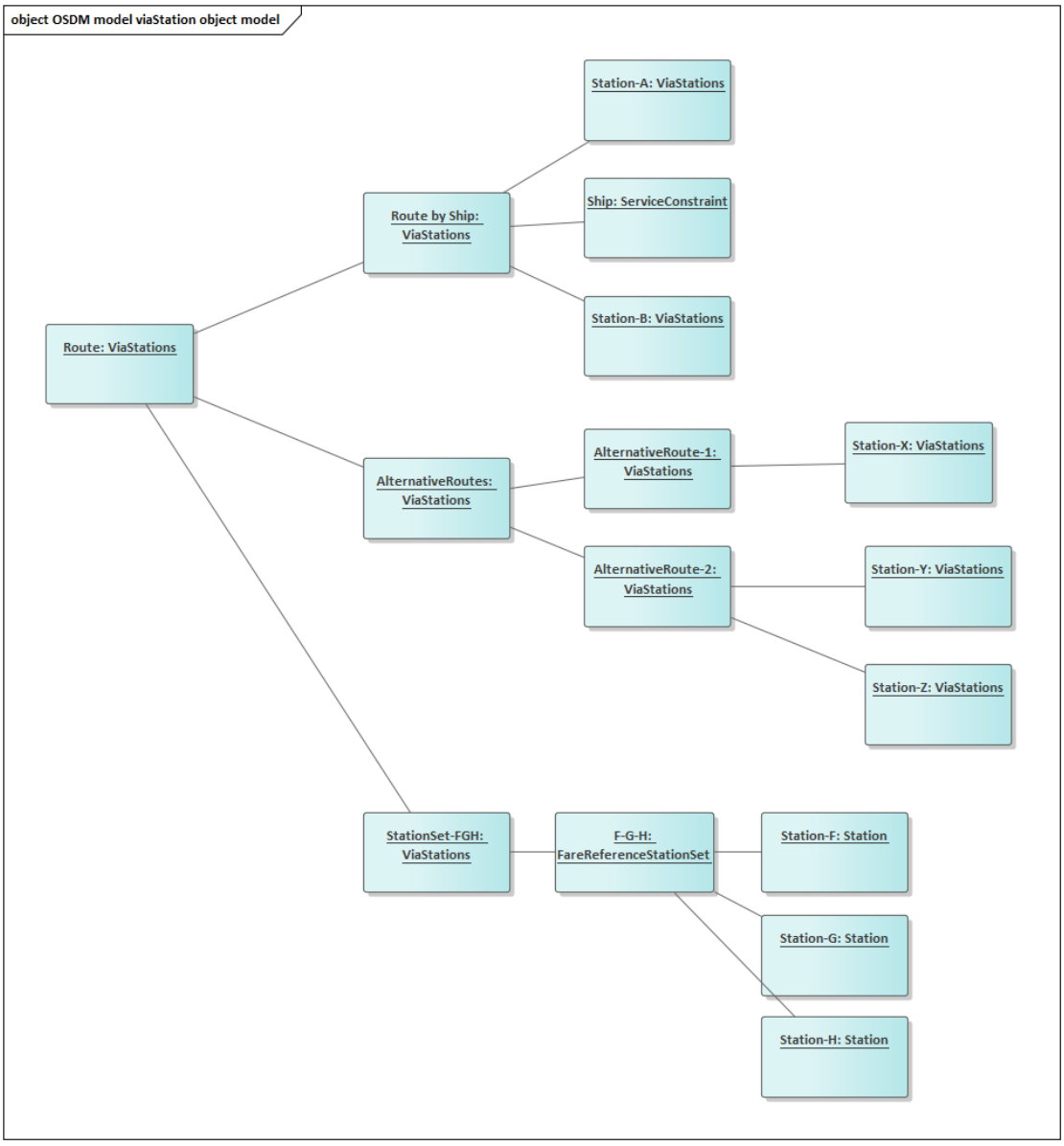
Route Description Example in the Regional Validity

route example:



Fare Structure

Object model:



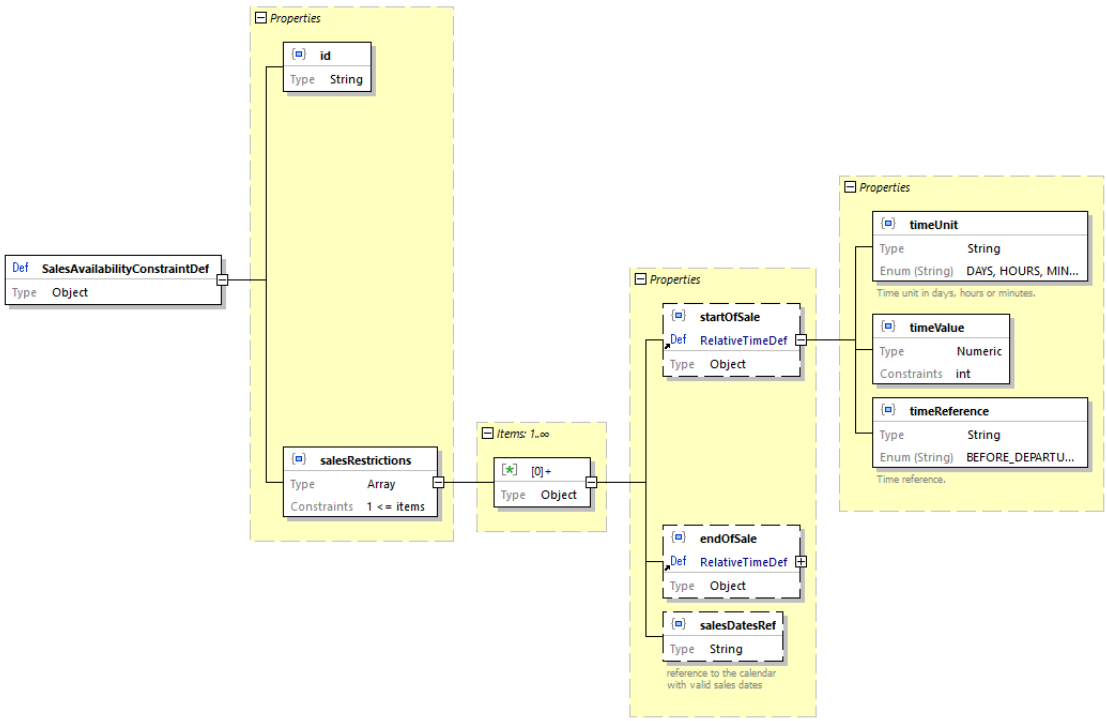
Fare Structure

Fare Sales Availability Constraint

Sales availability defines the constraints on the time when a sale of a fare can start or end. The sales availability is used in the offline data exchange only. A constraint is provided as a list of salesRestrictions that must be applied.

Sales restrictions can define a start and end of the sale relative to the date of sale or the date of travel.

A reference to a calendar can be provided to indicate all sales dates.



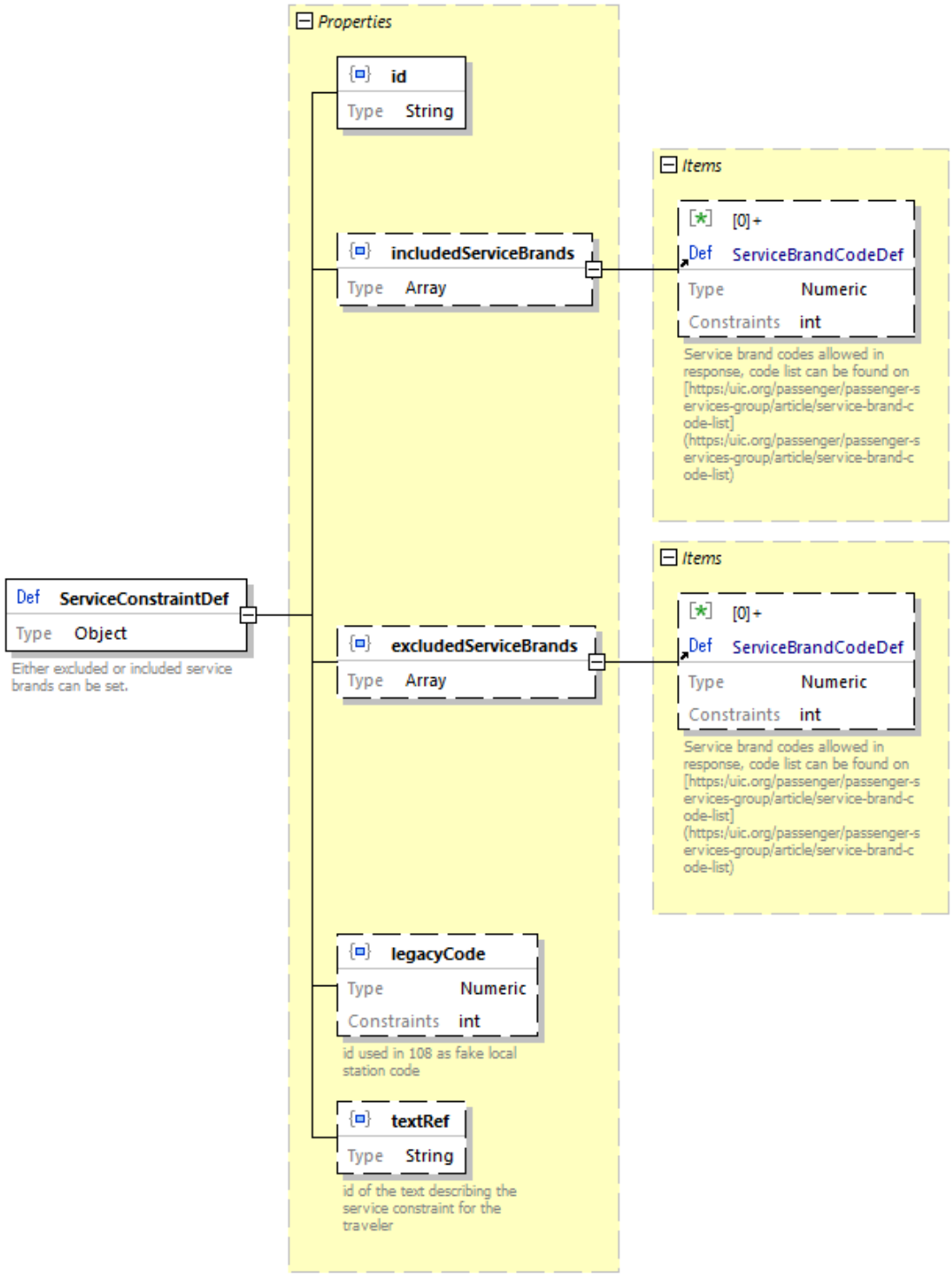
Fare Structure

Data Constraint on SalesAvailability

Code	Description
`startOfSale, endOfSale`	`startOfSale < endOfSale`

Fare Service Constraint

The service constraint defines restrictions to specific service brands. Either a list of service brands or a list of excluded service brands can be provided.



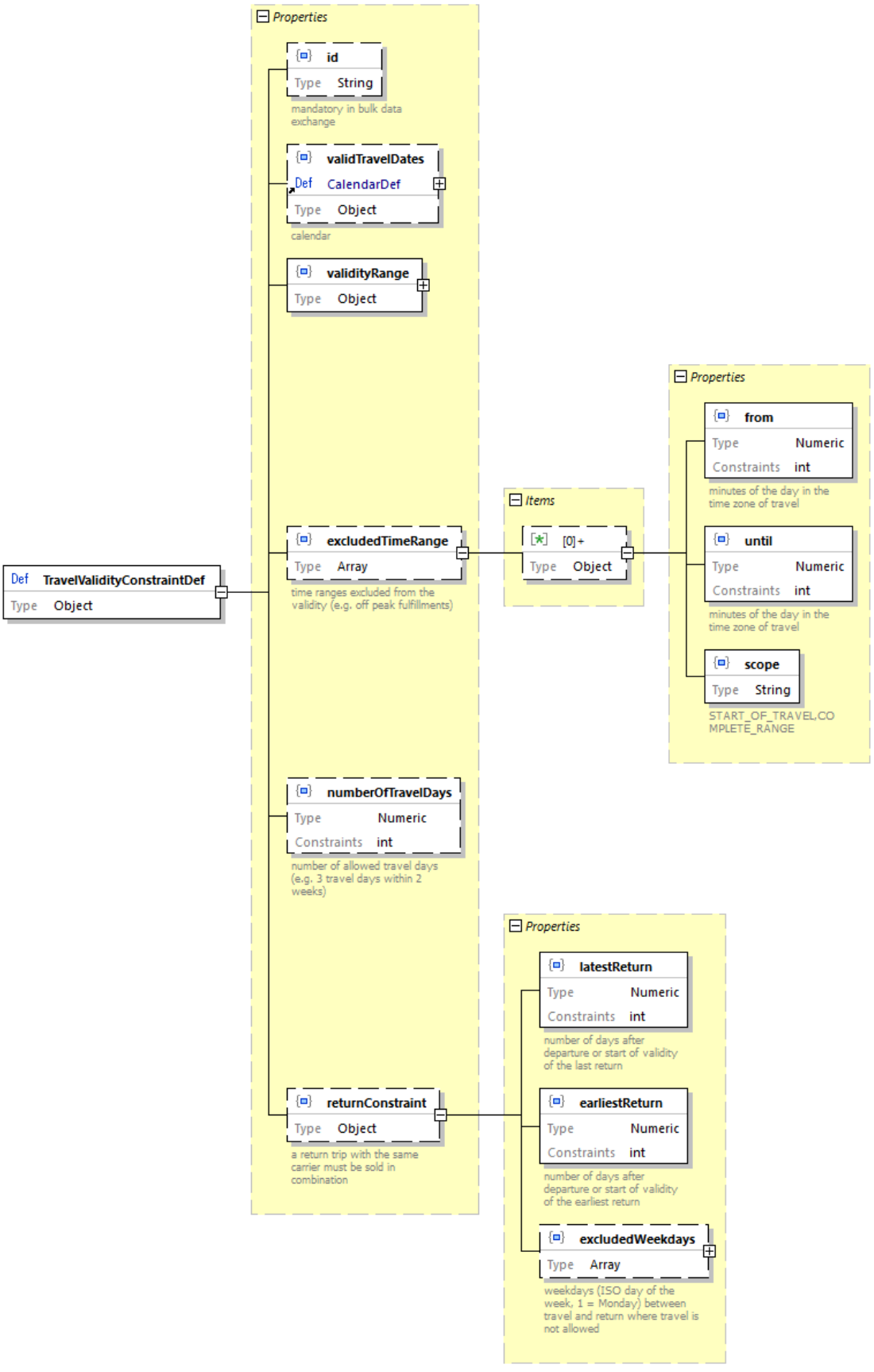
Fare Structure

Data Constraint on ServiceConstraint

Code	Description
`includedServiceBrands`, `excludedServiceBrands`	Only one of the lists can be used. Using both lists is forbidden.

Fare travel validity constraint

The travel validity defines the duration the traveler has to make his travel. Optionally time slots (e.g. peak hours) can be excluded.


Def TravelValidityConstraintDef
Type Object
Properties
id
Type String
mandatory in bulk data exchange
validTravelDates
Def CalendarDef
Type Object
calendar
validityRange
Type Object
excludedTimeRange
Type Array
time ranges excluded from the validity (e.g. off peak fulfillments)
numberOfTravelDays
Type Numeric
Constraints int
number of allowed travel days (e.g. 3 travel days within 2 weeks)
returnConstraint
Type Object
a return trip with the same carrier must be sold in combination
Items
[0] +
Type Object
Properties
from
Type Numeric
Constraints int
minutes of the day in the time zone of travel
until
Type Numeric
Constraints int
minutes of the day in the time zone of travel
scope
Type String
START_OF_TRAVEL,COMPLETE_RANGE
Properties
latestReturn
Type Numeric
Constraints int
number of days after departure or start of validity of the last return
earliestReturn
Type Numeric
Constraints int
number of days after departure or start of validity of the earliest return
excludedWeekdays
Type Array
weekdays (ISO day of the week, 1 = Monday) between travel and return where travel is not allowed

Fare Structure

Data Constraint on TravelValidity

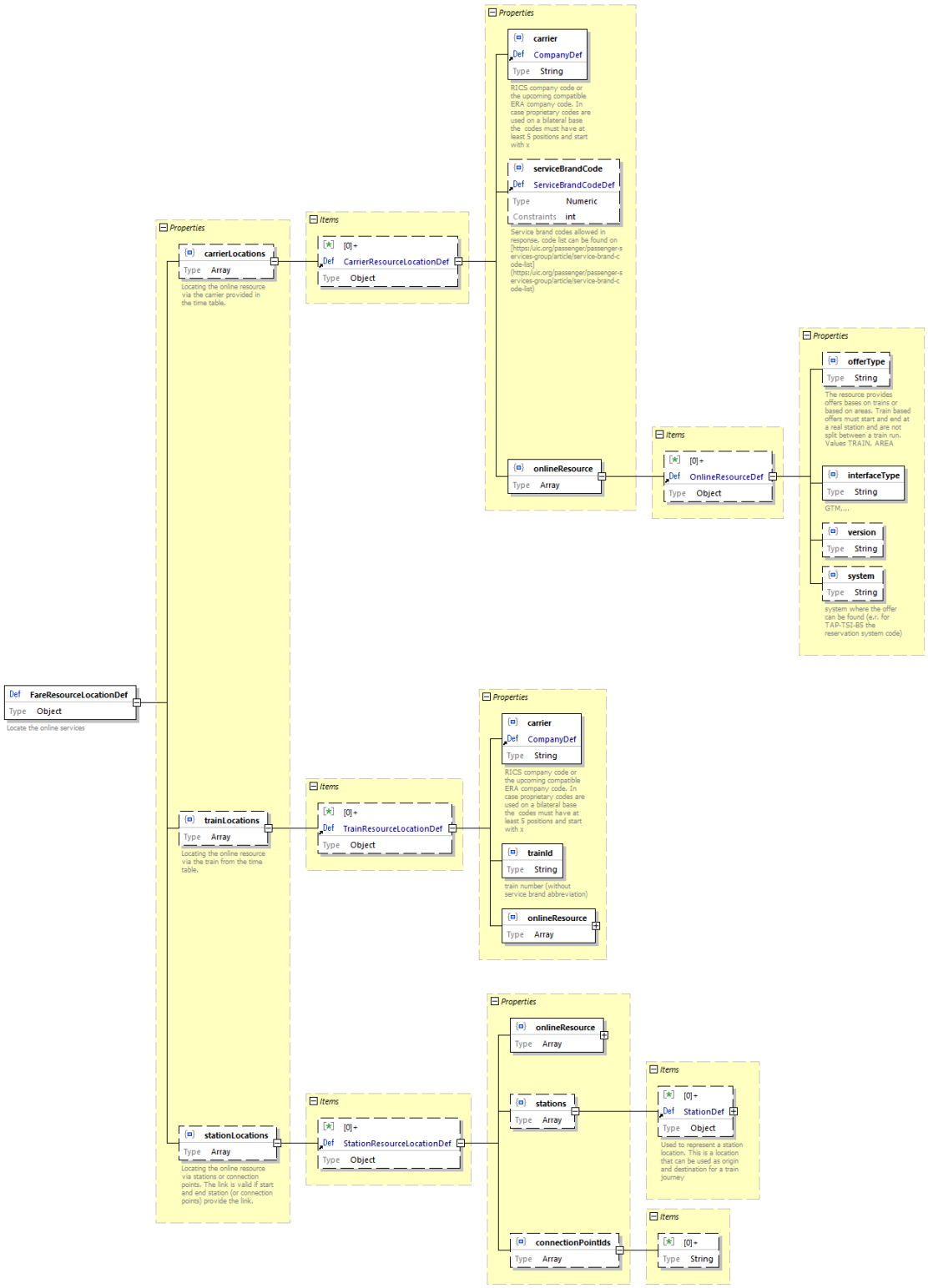
Code	Description
`excludedTimeRange`	`from` time < `until` time
`numberOfTravelDays`	A duration must be provided
`returnConstraint`	`earliestReturn` < `latestReturn`

Data Supporting Online Services

Additional data to support the online sales services can be exchanged.

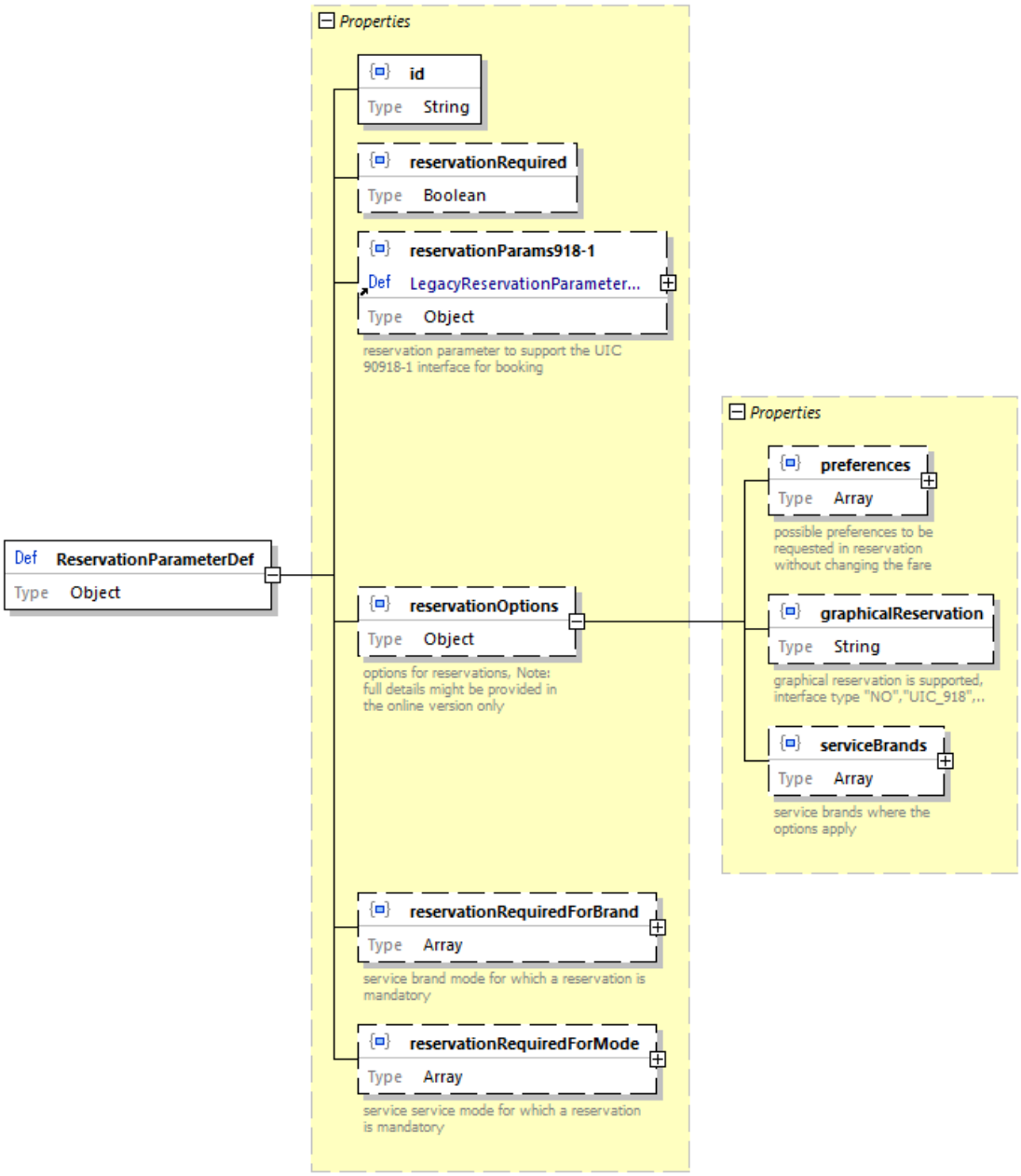
Fare Resource Locations

Information on where to fine resources for online services of OSDM online or via 90918-1 APIs


Def FareResourceLocationDef
Type Object
Locate the online services
Properties
carrierLocations
Type Array
Locating the online resource via the carrier provided in the time table.
Items
[0]+
Def CarrierResourceLocationDef
Type Object
Properties
carrier
Def CompanyDef
Type String
RICS company code or the upcoming compatible ERA company code. In case proprietary codes are used on a bilateral base the codes must have at least 5 positions and start with x
serviceBrandCode
Def ServiceBrandCodeDef
Type Numeric
Constraints int
Service brand codes allowed in response, code list can be found on [https://uic.org/passenger/passenger-services-group/article/service-brand-code-list] (https://uic.org/passenger/passenger-services-group/article/service-brand-code-list)
onlineResource
Type Array
Items
[0]+
Def OnlineResourceDef
Type Object
Properties
offerType
Type String
The resource provides offers bases on trains or based on areas. Train based offers must start and end at a real station and are not split between a train run. Values TRAIN, AREA
interfaceType
Type String
GTM,...
version
Type String
system
Type String
system where the offer can be found (e.r. for TAP-TSI-B5 the reservation system code)
trainLocations
Type Array
Locating the online resource via the train from the time table.
Items
[0]+
Def TrainResourceLocationDef
Type Object
Properties
carrier
Def CompanyDef
Type String
RICS company code or the upcoming compatible ERA company code. In case proprietary codes are used on a bilateral base the codes must have at least 5 positions and start with x
trainId
Type String
train number (without service brand abbreviation)
onlineResource
Type Array
stationLocations
Type Array
Locating the online resource via stations or connection points. The link is valid if start and end station (or connection points) provide the link.
Items
[0]+
Def StationResourceLocationDef
Type Object
Properties
onlineResource
Type Array
stations
Type Array
Items
[0]+
Def StationDef
Type Object
Used to represent a station location. This is a location that can be used as origin and destination for a train journey
connectionPointIds
Type Array
Items
[0]+
Type String

Fare Reservation Parameters

Data to define reservation requirements related to a fare.



Online Sale and Distribution

Roles: Fare Provider, Allocator & Distributor

A participant can play the following roles:

- **Fare Provider** – defining the fare and combination rules and providing them to allocators offline or online.
- **Allocator** – combining fares, defining after sales rules within the frames et by the fare provider, providing combined offers and managing the booking transaction, managing the ticket security (barcode, control processes), managing compensations processes, managing the stock control process.
- **Distributor** – selling tickets from one or more allocators to the customer. Selecting the allocators and joining multiple independent bookings.

A RU or system provider can support more than one role.

General scenarios

Fare Provider Role

The services defined to exchange fares online are designed to support general sales and after sales scenarios.

Here the general flow is listed, and the supporting services of the fare exchange are indicated as well as other services of UIC specifications.

Distribution Scenario – Sales

Timetable search

Timetable data are not in the scope of this specification. It is assumed, that the allocator has retrieved a valid travel solution from a timetable search engine before requesting fares.

Offer

Requesting fares of a carrier or train for a specified set of passengers. Splitting of the entire travel solution into appropriate parts is the task of the allocator. Data supporting the selection of the carriers/fare providers to be requested are part of this specification and can be transferred beforehand (see Fehler! Verweisquelle konnte nicht gefunden werden.).

The carrier should deliver all applicable fares for the requested offer and the rules for combining them.

The prices provided within the offer might be fixed for a specific time range depending on the fare, but this is not mandatory. Some carriers don't guarantee prices at all.

In case of offers with reservation the offer reply will contain the availability of the different fares and services, but no availability on other place features (e.g. window, aisle, ...) if they don't affect the price.

In case a trip description needs to be change as the carrier/ fare provider has more accurate data on the trip the reply contains a new trip and an indication of change.

Preliminary Booking

The preliminary booking allocates the fare for a period defined by the carrier. Technically it is implemented as a post /booking using the offerId.

For an intermediate time the booking and fulfillment of reservations might be implemented using IRS 90918-1 and not via 90918-10. In this case only the offer service is used.

In case of reservations the currently defined flow in IRS 90918-1 is different, as the preliminary booking must be implemented by the allocator receiving the reservation by cancelling the allocated fare and places in due time and with a specific reason for cancellation.

The current 90918-1 service require a detailed specification of fares and place features. The fare data of the offer defined in this specification will provide these data to allow an integration with the existing services of reservation systems.

Confirm Booking

The booking is confirmed by the allocator to the carrier. This is the trigger for the accounting processes between the allocator and the carrier.

Fulfillment

For combined tickets the allocator creates the ticket and is responsible to for the fulfilment. The fare provider might provide additional security features to be included within the fulfillment of the allocator.

The allocator is responsible to provide the ticket data for the control by the carriers. This is not in the scope of this specification but defined in IRS 90918-4.

Place Selection

Place selection is implemented as a patch to the selected offer.

Place selection does not allocate places.

For an intermediate time the booking and fulfillment of reservations might be implemented using IRS 90918-1 and not via 90918-10. In this case only the offer service is used.

The current 90918-1 service require a detailed specification of fares and place features. The fare data of the offer defined in this specification will provide these data to allow an integration with the existing services of reservation systems. (see Reservation Parameter).

Payment

Payment is not in the scope of this specification. The carrier/fare provider is not involved in this step.

After sales scenario – cancellation

Refund Offer

The fare description obtained with the original offer includes all information on cancellation fees in case the fees are not calculated by the allocator.

A refund offer from the carrier is therefore not required for the process.

A refund offer request can indicate a special reason for cancellation without fees due to an error of the allocator or unavailability of the service. The reason might not be accepted by the carrier.

The refund offer might indicate that the payment of the refund needs to be delayed checking whether the ticket has been used.

Confirm Refund Offer

A confirmed booking is cancelled.

After sales scenario - exchange

A cancellation offer is requested using special exchange reasons.

An offer for the new booking is requested with a reference to the old booking(s).

These covers:

- Exchange
- Upgrade
- Increase of passengers
- Decrease of passengers

Return Payment

No data exchange is foreseen in this step between allocator and carrier.

In case of a delayed payment of refunds the allocator needs to validate the ticket control data (IRS 90918-4) before the payment to the customer.

Change of personal data

Change personal data

The change of personal data can be provided as an optional feature.

Note: according to GDPR it must be possible to correct errors in personal data.

Reticket

The reticketing is not in the scope of this specification.

The allocator is responsible to provide the ticket data for the control by the carriers. This is not in the scope of this specification but defined in IRS 90918-4.

Information on personal data

In order to fulfill GDPR requirements information on stored personal data of the customer or passenger must be provided. As personal data are transferred from the allocator to the carrier the customer can ask at the issuer or allocator for information on the still stored personal data. The allocator then needs a possibility to request this information from the carrier.

To retrieve the stored personal data the booking has to be requested.

Allocator Role

Distribution Scenario – Sales

Timetable search

The allocator makes a time table search himself or retrieves the trip from a distributor. The allocator has to specify additionally for which part of the trip he requests the fares.

Offer

Requesting fares of a carrier or train for a specified set of passengers. Splitting of the entire travel solution into appropriate parts is the task of the allocator. Data supporting the selection of the carriers/fare providers to be requested are part of this specification and can be transferred beforehand (see Fehler! Verweisquelle konnte nicht gefunden werden.).

The prices provided within the offer might be fixed for a specific time range depending on the fare, but this is not mandatory. Some carriers don't guarantee prices at all.

In case of offers with reservation the offer reply will contain the availability of the different fares and services, but no availability on other place features (e.g. window, aisle, ...) if they don't affect the price.

In case the fare provider delivers a changed trip the allocator has to take this into account. The reply contains a new trip and an indication of change.

Preliminary Booking

The preliminary booking allocates the fare for a period defined by the carrier. Technically it is implemented as a post /booking using the offerId. The allocator is responsible to manage the transactions including multiple carriers/fare providers.

For an intermediate time the booking and fulfillment of reservations might be implemented using IRS 90918-1 and not via 90918-10. In this case only the offer service is used.

In case of reservations the currently defined flow in IRS 90918-1 is different, as the preliminary booking must be implemented by the allocator receiving the reservation by cancelling the allocated fare and places in due time and with a specific reason for cancellation.

The current 90918-1 service require a detailed specification of fares and place features. The fare data of the offer defined in this specification will provide these data to allow an integration with the existing services of reservation systems.

Confirm Booking

The booking is confirmed by the allocator to the carrier. This is the trigger for the accounting processes between the allocator and the carrier.

In case the confirmation of a booking fails the allocator is responsible to restore a consistent status of the booking either by retries of the failed confirmation or by deleting the confirmed booking.

The allocator is responsible to delete bookings in case of failures and to repeat delete requests until the request is successful of the departure date of the trip has passed. The repletion of delete requests should avoid network bottlenecks (e.g. one retry every hour).

Fulfillment

For combined tickets the allocator creates the ticket and is responsible for the fulfilment. The fare provider might provide additional security features to be included within the fulfillment of the allocator.

The allocator is responsible to provide the ticket data for the control by the carriers/fare providers. This is not in the scope of this specification but defined in IRS 90918-4.

Place Selection

Place selection is implemented as a patch to the selected offer.

Place selection does not allocate places.

For an intermediate time the booking and fulfillment of reservations might be implemented using IRS 90918-1 and not via 90918-10. In this case only the offer service is used.

The current 90918-1 service require a detailed specification of fares and place features. The fare data of the offer defined in this specification will provide these data to allow an integration with the existing services of reservation systems. (see Reservation Parameter).

Payment

Payment is not in the scope of this specification. The carrier/fare provider is not involved in this step.

After sales scenario – cancellation

Refund Offer

A refund offer from the carrier is required in case of online sales for the process

A refund offer request can indicate a special reason for cancellation without fees due to an error of the allocator or unavailability of the service. The reason might not be accepted by the carrier.

The refund offer might indicate that the payment of the refund needs to be delayed checking whether the ticket has been used.

Confirm Refund Offer

A confirmed booking is cancelled. In case after sales fees for the carrier are applied that need to be transferred in the booking confirmation.

Return Payment

In case of a delayed payment of refunds the allocator needs to validate the ticket control data (IRS 90918-4).

After sales scenario - exchange

A exchange offer is requested using special exchange reasons.

An offer for the new booking is requested with a reference to the old booking(s).

These covers:

- Exchange
- Upgrade
- Increase of passengers
- Decrease of passengers

Return Payment

No data exchange is foreseen in this step between allocator and carrier. The allocator hast to pass on information on delayed payment to the distributor.

In case of a delayed payment of refunds the allocator needs to validate the ticket control data (IRS 90918-4) before the payment to the customer.

Change of personal data

Change personal data

The change of personal data can be provided as an optional feature.

Note: according to GDPR it must be possible to correct errors in personal data.

Reticket

The reticketing is not in the scope of this specification.

The allocator is responsible to provide the ticket data for the control by the carriers. This is not in the scope of this specification but defined in IRS 90918-4.

Information on personal data

In order to fulfill GDPR requirements information on stored personal data of the customer or passenger must be provided. As personal data are transferred from the allocator to the carrier the customer can ask at the issuer or allocator for information on the still stored personal data. The allocator then needs a possibility to request this information from the carrier.

To retrieve the stored personal data the booking has to be requested.

Distributor Role

Distribution Scenario – sales

Timetable search

The distributor makes a time table search himself or retrieves the trip from an allocator.

Offer

Requesting offers of an allocator for a specified set of passengers and optionally for a trip.

The prices provided within the offer might be fixed for a specific time range depending on the offer, but this is not mandatory. Some carriers don’t guarantee prices at all.

In case of offers with reservation the offer reply will contain the availability of the different services, but no availability on other place features (e.g. window, aisle, ...) if they don't affect the price.

In case the allocator delivers a changed trip the distributor has to take this into account. The reply contains a new trip and an indication of change.

Preliminary Booking

The preliminary booking allocates the offer for a period defined by the allocator. Technically it is implemented as a post /booking using the offerId. The allocator is responsible to manage the transactions including multiple carriers/fare providers.

Confirm Booking

The booking is confirmed by the allocator to the allocator.

In case the confirmation of a booking fails the distributor is responsible to restore a consistent status of the booking either by retries of the failed confirmation or by deleting the confirmed booking.

The distributor is responsible to delete bookings in case of failures and to repeat delete requests until the request is successful of the departure date of the trip has passed. The repletion of delete requests should avoid network bottlenecks (e.g. one retry every hour).

Fulfillment

The distributor requests fulfillments from the allocator and hands them to the traveler.

Place Selection

Place selection is implemented as a patch to the selected offer.

Place selection does not allocate places.

Payment

Payment is not in the scope of this specification. The allocator is not involved in this step.

After sales scenario – cancellation

Refund Offer

The distributor needs to get a refund offer from the allocator to start the refund process. The refund offer is part of the booking to be refunded.

A refund offer request can indicate a special reason for cancellation without fees due to an error of the sales staff or unavailability of the service. The reason might not be accepted by the allocator.

The refund offer might indicate that the payment of the refund needs to be delayed checking whether the ticket has been used.

Confirm Refund Offer

A confirmed booking is cancelled.

Return Payment

The distributor needs to obey the delayed payment instruction provided by the allocator.

After sales scenario - exchange

An exchange offer is requested using special exchange reasons.

An offer for the new booking is requested with a reference to the old booking(s).

These covers:

- Exchange
- Upgrade
- Increase of passengers
- Decrease of passengers

Return Payment

The distributor needs to obey the delayed payment instruction provided by the allocator.

Change of personal data

Change personal data

The change of personal data can be provided as an optional feature.

Note: according to GDPR it must be possible to correct errors in personal data.

Reticket

The reticketing is not in the scope of this specification.

Information on personal data

In order to fulfill GDPR requirements information on stored personal data of the customer or passenger must be provided. As personal data are transferred to the allocator the customer can ask at the distributor for information on the still stored personal data. The distributor then needs a possibility to request this information from the carrier.

To retrieve the stored personal data the booking has to be requested.

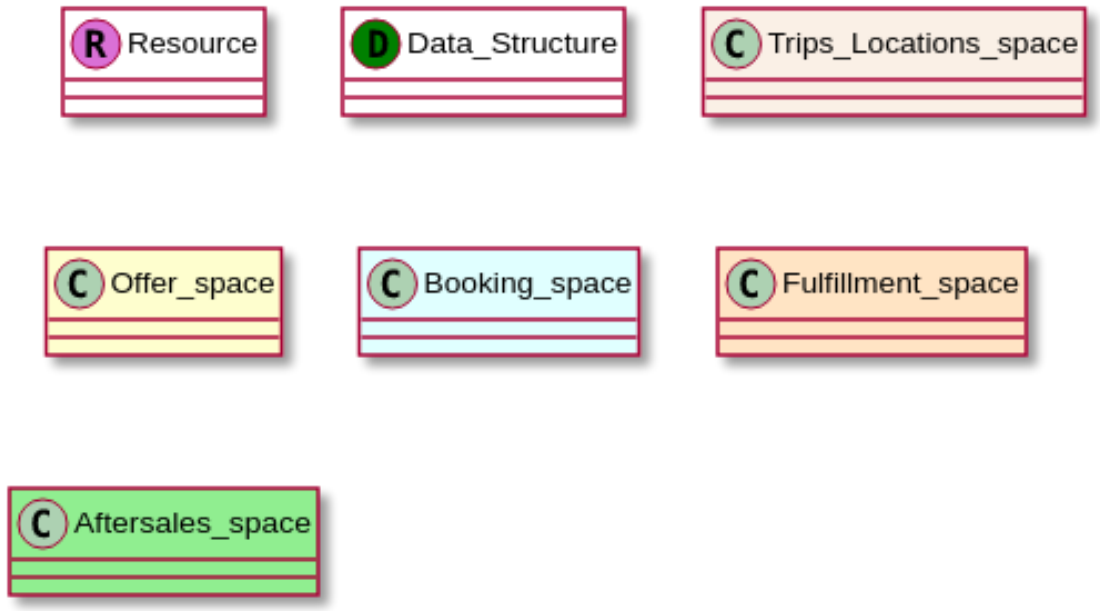
Data Structure – Online Models

Introduction

This page shows a representation of the data models underlying the API specifications. It is therefore not a strict representation of the resources themselves (those are self-represented in the OpenAPI specifications.)

As such, some of the details of how the information is structured in the API are not represented or simplified in the data models. The main purpose of this data model is therefore to help a quicker understanding of the API and its underlying concepts.

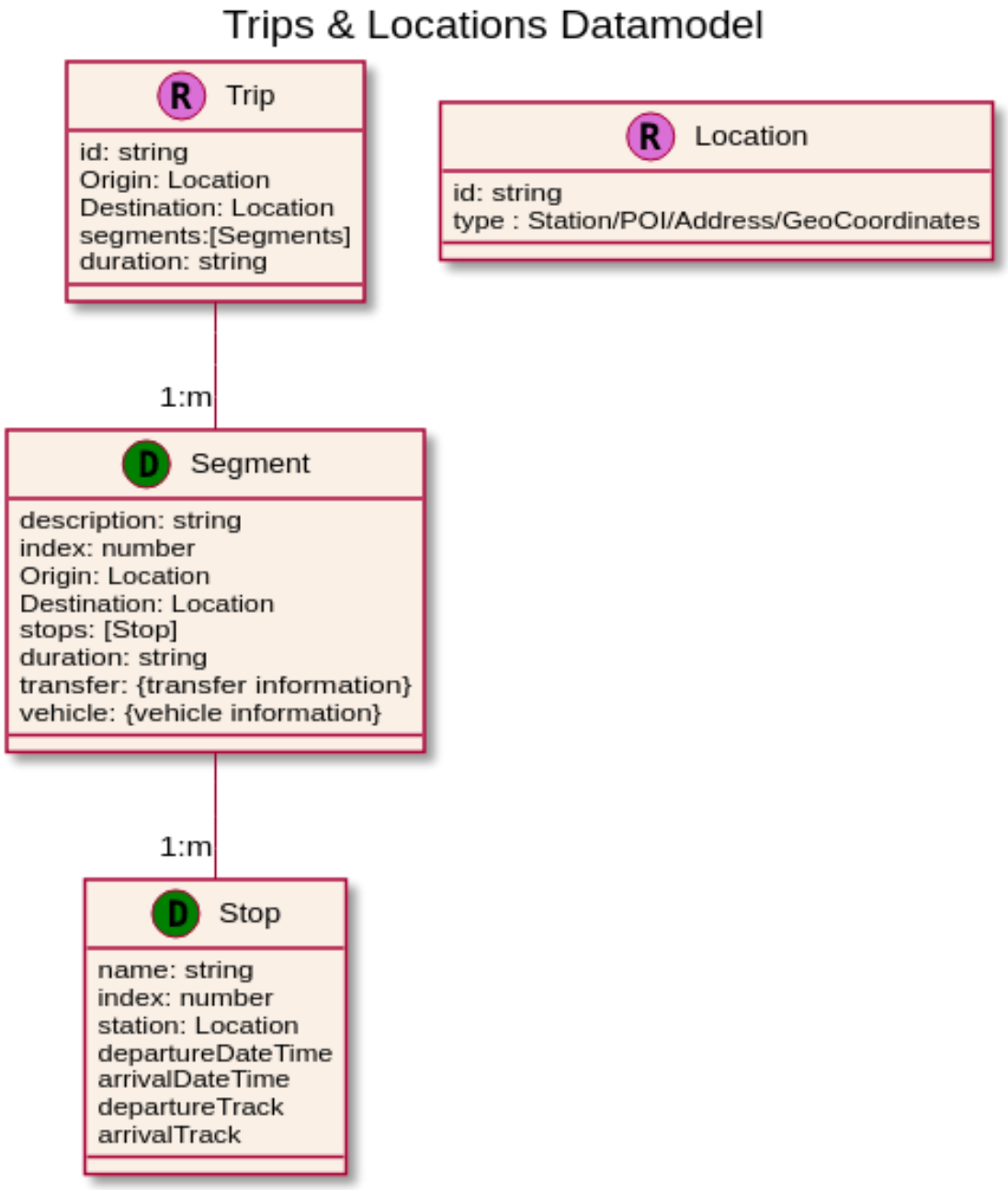
Legend



Legend

Trips and Locations

Trips and Locations Data Model



Trips and Locations Data Model

Main Resources

Locations

Locations are resources representing a specific location in a trip: departure, origin, intermediate stop or other. They can be of different types:

- **Station**: represent a train station. It is obviously the most relevant type for OSDM. Stations can be indicated as codes from different code sets. As with other code list based representations in the API, using the UIC code set is highly recommended.
- **Address**: any street address can be represented here. Is included to foresee extension towards multi modality and first/last miles solutions
- **POI**: used to represent a specific point of interest
- **GeoCoordinate**: allows providing any location on the globe using its geographical coordinates.
- **ConnectionPoint**: allows to model virtual border points by defining stations within the connection point lies.

Locations are modelled in the API as resources with a long time-to-live, which should allow efficient caching of this data, therefore removing the need of getting full location details in transactional operations.

Trips

Trips represent the concrete realization of a trip going from departure station to destination station. A trip is composed of one or more segments.

Each segment (also sometimes called legs) represent a connection between two locations where the traveller will either step in a transport or step out of a transport (most likely a train). 3 types can be distinguished:

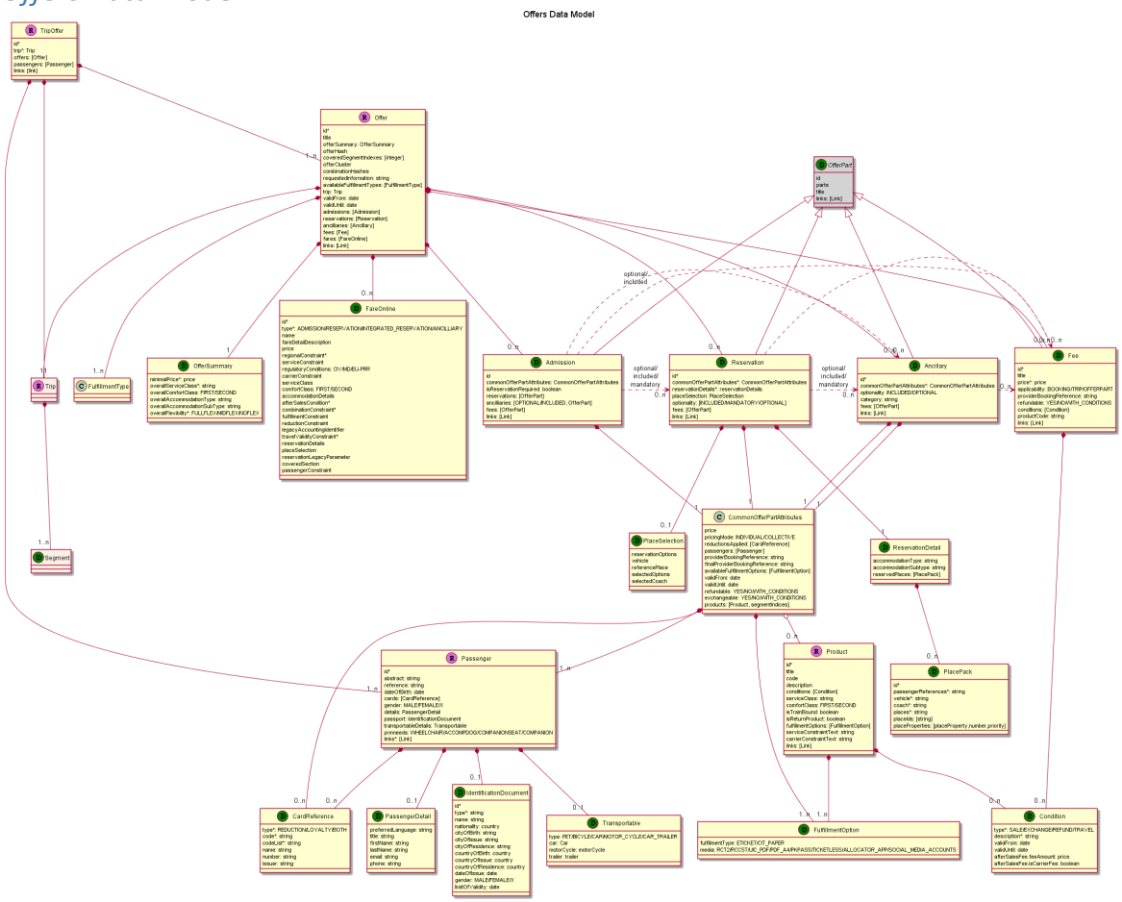
- **origin**: departure location of the segment
- **destination**: arrival location of the segment
- **stops**: intermediate locations encountered between origin and destination of the segment

Regardless of whether the products to travel these segments are train-bound, or based on with a validity period of any duration, segments (and by extension trips) are always train-bound and represent the realization of the travel wish using specific trains at a specific moment in time.

Trips can be retrieved with or without details of all intermediate stops on the way between departure and arrival of each segment

Offers

Offers Data Model



Offers Data Model

Main Resources

Offers

In the **Distributor Mode**, offers represent a collection of `OfferParts`, representing bookable elements that covers exactly one a specific trip (or the requested section of a trip in case of allocator request to an nTM Provider). Note that the offer contains a reference to the trip resource it is built for, although this reference can be redundant when the `TripOffer` the offer is part of is already known to the API consumer

Some of these elements can be optional (see further).

In the **Allocator Mode**, an offer will not contain offer parts but it will contain a fare element, that the allocator can use to build the final product to be distributed to travellers. There can also be hybrid situations where offers will contain both offer parts and fares if the provider offers product in the two flavors.

In some cases, API consumers will be required to provide some additional information in order to proceed with the provisional booking. In this case, the information needed will be

specified in the `requestedInformation` element using a notation akin to regular expressions.

Offers should always contain a `minimalPrice` (= the price of the offer without any of the optional offer parts), a global service class, service level and flexibility. Although the calculation rules for these global values are up to the OSDM provider, the following rules are recommended:

- `ServiceClass`: the lowest class of a significant offer part should be the service class of the offer (1st class + 2nd class = 2nd class)
- `ServiceLevel`: the highest service Level should be the service level of the offer (bed + berth in compartment of 2 + berth in compartment of 4 = berth in compartment of 2)
- `Flexibility`: the lowest flexibility of a significant offer part should be the service class of the offer (full flex + mid flex = mid flex)

Offers usually have a validity period, that is the period over which, from the fare conditions, the offer is likely to be proposed. It is not a guarantee that the offer remains available for that period

Offer resources and all related resources (`TripOffers` and all sub resources) should have a limited lifetime (recommended value 30 minutes) and be discarded when expired or at booking time.

TripOffers

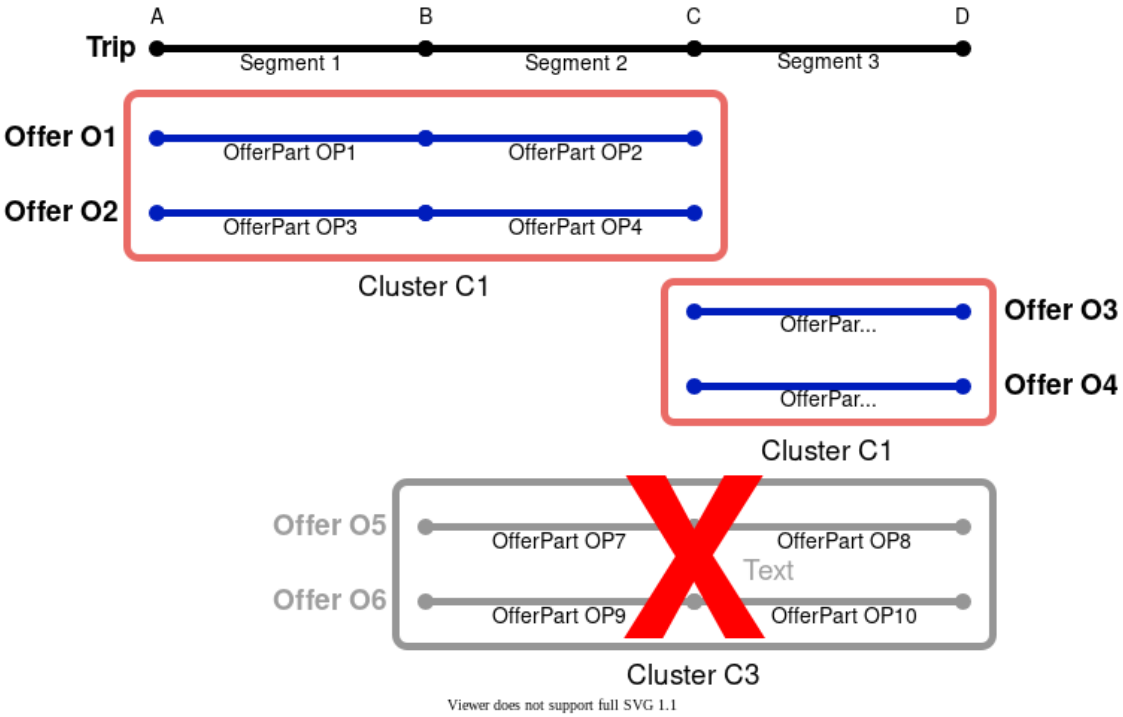
`TripOffers` are the resources grouping all the offers relating to one same trip. Indeed, in most cases the **Allocator** provider will propose several offers of different comfort and flexibility levels. In this resources, the trip resource representing the trip the offers are for and the passengers for the trip.

Offers with Partial Coverage

It is possible in OSDM to propose offers covering only a subset of the requested trip under specific conditions:

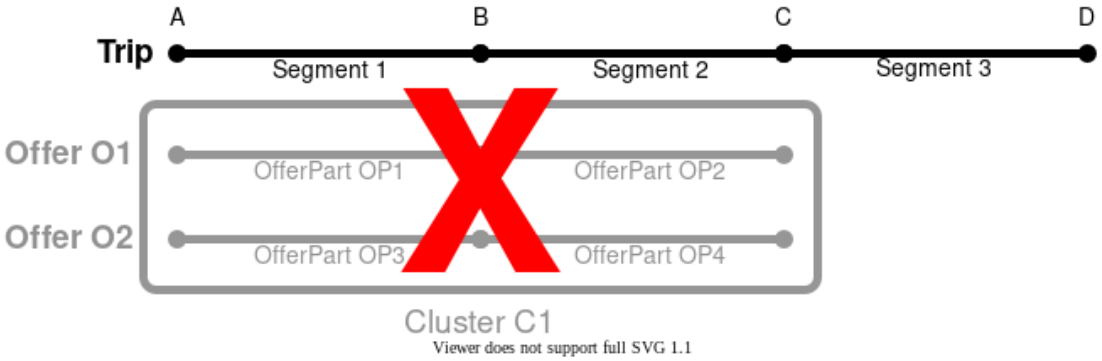
- the segments covered by a given offer are indicated through the `coveredSegmentIndexes` property
- all offers covering the same set of segments belong to the same `offerCluster`. All offers related to the same `offerCluster` therefore have an identical set of `coveredSegmentIndexes`
- a `segment` can only be covered in one `offerCluster` within a `tripOffer` (no overlap)
- each `segment` of the `trip` must be covered by at least one `offer` in each `TripOffer` (no gap)

Example with no overlap



Clusters-no-overlap

Example with no gap



Clusters-no-gap

OfferParts

Although `OfferParts` are by themselves not a resources, they deserve a separate section in order to for the reader to clearly understand the data model design. The idea is that `OfferParts` represent an instantiation of a product that can be sold.

Example:

- A carrier proposes an "Early bird Holiday Fare" product for all its high-speed trains riding towards the seaside of the country, offered when sales date is at least 15 days prior to travel.

- Whenever an offer request is received and this fare can apply, an offer part is created and proposed, specifically to the date, origin and destination of that specific request, and referencing this product. As such it is therefore the offer part that for example will carry the actual price.

These offer parts can be of different type, depending on what they represent:

- **Admissions**
- **Reservations**
- **Ancillaries**
- **Fees**

However, all these different type share a significant amount of characteristics: they all apply to a defined set of passengers, have a price (calculated individually or collectively), and a few additional attributes. They also fill in the same fundamental role in the offer, which is why they are represented here as an abstract parent class.

Multiplicity

In OSDM, offer parts are not normalized, but will reflect the reality of the products generated. This means that one offer part will almost always equal one fulfillment in the resulting booking, should it be completely realized and confirmed.

So, two passengers travelling together happen to get exactly the same product (because their profile is identical in terms of age, reductions etc), will still get two individual offer parts (one per passenger) if the product covered has individual pricing and fulfillment, while they would be grouped in one offer part in case of collective pricing and fulfillment. (see examples at the end of the offer section)

Offer Parts - Admissions

Admission offer parts represent a travel right, or the entitlement to travel onboard a train between the given origin and destination, following the given route, without a seat reservation. In most cases, these train products will not be train-bound either.

In some vehicles, seat reservations or an ancillary products (such as a WIFI connection or a meal onboard) can be associated with the admission for one or more of the segments. A link will in this case point from the admission to the reservations or ancillaries, and the link will be qualified. Ancillaries can be either included or optional, while reservation can also be mandatory to travel. Finally there can be a cases where all reservations associated are optional while it is mandatory to pick at least one (it can be the case for night trains for example). In this case the reservations will all be qualified as optional, but the reservationRequired flag of the admission will be set to true.

Offer Parts - Reservations

Reservation offer parts represent a seat (or other accommodation) reservation on the transportation. In contrast with admissions, a reservation is in essence bound to a specific train, although it normally does not include the entitlement to board the train. Travellers

therefore typically need an a associated admission offer part or other entitlement (such as a pass) in order to actually travel.

Note booking an offer will not book the reservations in the offer unless they have an `included` relationship with an admission of that offer. In order to add a non-included reservation to a booking, the reservation ids will have to be passed in.

Reservations have several additional attributes due to their specificities compared to admission products:

- Reservation Details provide additional information on the service Level and, once the offer will have been booked, the exact reserved places, with their properties and links to the concerned passengers
- Place selection Details: contains several elements related to the selection of places:
  - `ReservationOptions` show, at offer retrieval stag which options are available for this reservation.
  - `SelectedOptions` allows the API consumer to specify desired options.
  - `SelectablePlaces` and `SelectedPlaces` are only relevant to graphical selection of seats (seat map).

Modelling Lump Sum Reservations

For some trains, especially in Germany and Austria today, a specific form of reservation booking can be found where the price for adding an optional or mandatory (but not free) reservation remains the same regardless of the number of reservations actually booked. In order to represent this type of reservation with the current model, two approaches are proposed to implementers:

- Generate two distinct offers: one with all (available) reservations proposed as included, the lump sum for the reservations being integrated in the admission price. In this approach it is assumed that a passenger will always book all available reservation, since the price is the same anyway. This approach also allows to not propose a reservation if there is none available on one of the segment, while still offering the offer for the complete trip with reservations on all segments where it is available
- Propose all reservations as optional reservations with an identical unit price equals to 0 or to the reservation lump sum, associated with specific information in the product conditions or the offer messages. At booking time, a price update (increase or decrease) is then applied so that the lump sum is counted once and only once, associated with a booking message warning that the price update took place.

Offer Parts - Ancillaries

Ancillaries are used to represent non-transport products associated with the transportation request submitted. It could be onboard services such as a WIFI connection or a meal, or

services associated with one of the stops, or origin/destination, like a parking spot or lounge access.

This offer part is significantly simpler than those instantiating transport products, and only has one additional attribute, being the category of the ancillary.

Offer Parts - Fees

Fees are used to represent additional costs for services or products. Offer parts of type "fee" can be applied to the booking process (e.g. a service fee), the trip (e.g. a reservation fee which is applied to all reservations in trains running in the same direction, namely outward or inward travel) or other offer parts. In contrast to other offer parts in OSDM, the customer is not free whether to choose a fee or not: fees are generated and applied to other services or products by the provider system.

Products

Products are the products actually offered by the OSDM provider, either directly or either as distributor if the OSDM provider itself retrieves the products (or constitutive fares) from another provider. Products resources contain all the conditions and attributes of the product, regardless of the actual sale case. Typically this matches commercial products having the same name and recognizable common sales & after sales characteristics.

Although no manipulation is performed on products, it is nevertheless proposed as a resource mainly to allow caching of the information. Indeed, since product information usually does not change too frequently (and usually at well defined dates), those resources can then be exposed with a significantly longer time-to-live and save significant bandwidth. It also allows for a "product catalog" functionality to be built by the API consumer, should he want to do that.

Fares

Fares should be seen as the counter part of `OfferParts` in case of interactions between an allocator and a fare provider. The key difference here is that where offer parts are products defined by the provider and fulfilled by it as well, the fares do not constitute a distributable product. It is up to the allocator to build the distributable product (that he could then distribute as an offer part via an OSDM API), based on one single fare or by combining fares coming from different providers. In consequence, the fulfillment of the resulting product is the responsibility of the allocator as well.

For distribution systems also able and allowed to act as allocators, encapsulating both fares and offer product in offers allows to have a similar flow of interactions regardless of the type of provider.

Passengers

As the name suggests, passenger resources represent the passengers for whom the offers are proposed. All offers generated are always proposed for the complete set of passengers (no partial offers covering only a part of the passengers is generated). However, it is possible that because of age, reductions or other, some passengers are allowed to travel

some segments without actually needing a travel right or reservation. It is for example usually the case for infants travelling on their parents lap.

While a lot of attributes can be set for passengers, only a few are required at this stage (and even later). The key elements at offer stage are already specified in the offer request. The link between the possibly anonymous passenger profiles (in most basic form: a unique (in the booking) reference, age and reduction entitlement if any) created in the offer request and the passenger resources in the `TripOffers` can be made based on the passenger reference attribute.

The passenger resources created in the context of offers have their lifetime strictly limited to the lifetime of the offer resource they are part of. The resource and all local traces of it should be discarded once the offer has been booked or reached the end of the lifetime, in order to avoid any privacy concern.

Passengers Representation

In the railway world, several elements are used to define a passenger profile (mostly in order to define the products it is entitled to):

- the passenger's age
- the reduction cards the passenger owns
- whether the passenger is a reduced-mobility or otherwise disabled passenger
- other specific status entitling to specific fares (military, senator, journalist…)

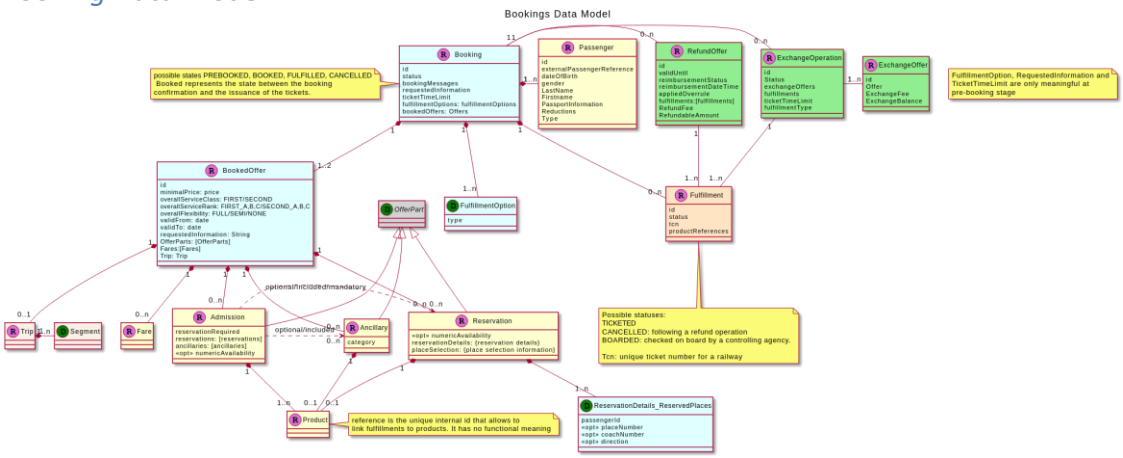
While in some systems, all the notions above are mixed into one "passenger type" notion, this approach is much more difficult, and cumbersome, to apply when multiple providers are involved, which is highly likely with OSDM. Indeed, different systems often have different age limits for types, and different ways to represent the other elements. For this reason, in OSDM we decide to map the elements above to two kinds of attributes:

- Passenger birth date, modelled as-is in the API. Note it could be a dummy birth date. Each implementer is then free to map this value to the age-related passenger types he is using internally
- Some attributes related to passengers disabilities (for accommodation purposes mainly)
- All other notions are modelled as reductions. Again, each implementer can map internally this clearly defined notion to the internal representation.

The presentation hereunder provides some additional examples of high-level offer modellings for pure-OSDM offers.

Booking

Booking Data Model



Bookings Data Model

Main Resources

Booking

The booking represents the local (to the OSDM provider) booking for the offers that have been selected. It contains a set of sub resources, most of which were encountered in the offer stage. but also adds a few specific attributes and information, the most important undoubtedly being the booking status (see for the state model below). The booking will indeed evolve over time based on API consumer actions, time elapsed or other business events.

The booking also contains additional attributes that are needed to manage and control the confirmation of the booking when it is in provisional state, such as the ticket time limit or the fulfillment options.The ticket time limit is the time during which the booking is guaranteed to remain available for confirmation for the price and possible reservations assigned at provisional booking time. Basically, it is the time given to the API consumer to perform all updates needed to confirm the booking, and trigger that confirmation.

At the root of the booking structure, Two balance elements are provided, in order to clarify the state of the financial exchange between an API consumer or booker and the OSDM:Distributor:

- conditional balance is the balance of the booking that is not confirmed. It is the amount that will be due to the provider if the booking is further confirmed.
- confirmed balance: is the balance of the booking that is confirmed. Unless after sales takes place on one or more fulfillments in the booking, this amount now must be paid to the provider.

Also located at the root of the booking structure is the ticket time limit. This is the time for which the provider will hold a booking in pre-booked state, waiting for the confirmation

while guaranteeing the booking for the given products, spaces at the announced price. Obviously, this value only has a meaning for a booking in pre-booked state. A commonly accepted value would be around 30 minutes, which is normally sufficient to allow finalizing the booking,while not monopolizing resources too long in case the booking is abandoned without properly cancelling it. However, some systems may decide a longer time. Obviously, the value for the booking ticket-time limit can never exceed the earliest ticket time limit of any of its offer parts.

`FulfillmentOptions` allows the API consumer to specify the format desired for the fulfillment. Only electronic fulfillment is considered in the MVP scope.

BookedOffers

`BookedOffers` are actually the same resources as the offers except that they are now booked. Most of the resource remains unchanged, except for the sections on reservation details (either in reservation `Offerparts`, or in fares), where but the sections related to the reserved places (in reservationDetails) will now be populated with the references to the space allocated by the provider system where the transport product is hosted.

Fulfillments

`Fulfillments` could once have been called tickets. But the evolutions in the industry have led this to be a limitative naming, as various kinds of ticketless onboard controls are rapidly taking over and become the norm rather than the exception. Since in OSDM only the distribution part of the process is in scope, the details of how to produce or control fulfillment are not covered. From a distribution standpoint, the only needs are

The possibility to point at a fulfillment representing an offer part (= the id) for after sales operations. The capability to link this fulfillment to that associated offer part they relate to. A business identifier that can be used in associated processes. For railways, that would be the Ticket Control Number (TCN).

Links to the documents or other security features that can be used to represent and control fulfillment status. In most case it is a PDF document and/or a barcode. These are all provided in the fulfillment sub resource.

Passengers

The passengers sub-resource in the booking is actually the same as the one in the tripOffers, but it is worth mentioning it separately here as

- being a sub-resource, it will have a different path
- as mentioned in the section about offers, the passengers in the `TripOffers` will disappear with the booking or the time-to-live expiry of the offers, and the passengers created in the booking will have a different id.

RefundOffers

Refund offers represent a provisional refund request that is made on all or a subset of the fulfillments contained in a booking.

ExchangeOperations

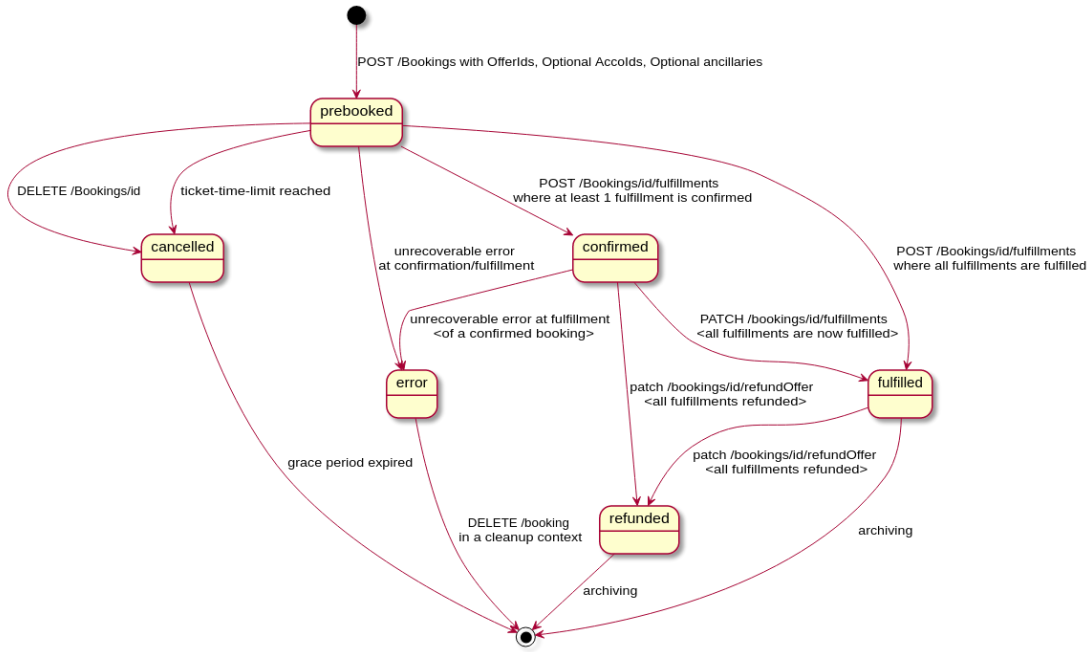
An exchange operations represent an ongoing exchange process, either in provisional state of in confirmed state (depending on its status) Much like a provisional booking, a provisional exchange contains the provisionally selected (new) Exchange Offer, a status and a ticket-time-limit. In addition, it also contains a reference to the fulfillments that are involved in the exchange, and will be cancelled as a result of its confirmation. Confirmed exchange operations are very similar, except for their status that will change, obviously, and the fact that the exchangeOffer is then transformed into a booked Offer in the booking and only referenced in the exchangeOperation

Exchange Offers

The exchange offers (and related models such as exchangeTripOffers) are totally similar to their offer counterpart, with the difference that ExchangeOffers also have a link to the fulfillments involved in the exchange operation, and also have 2 additional attributes for the exchange fee and exchange balance (= the difference between the value that can be returned form the fulfillment and the value of the current offers + the exchange fees = the total amount to be paid or refunded if/when confirming the exchange)

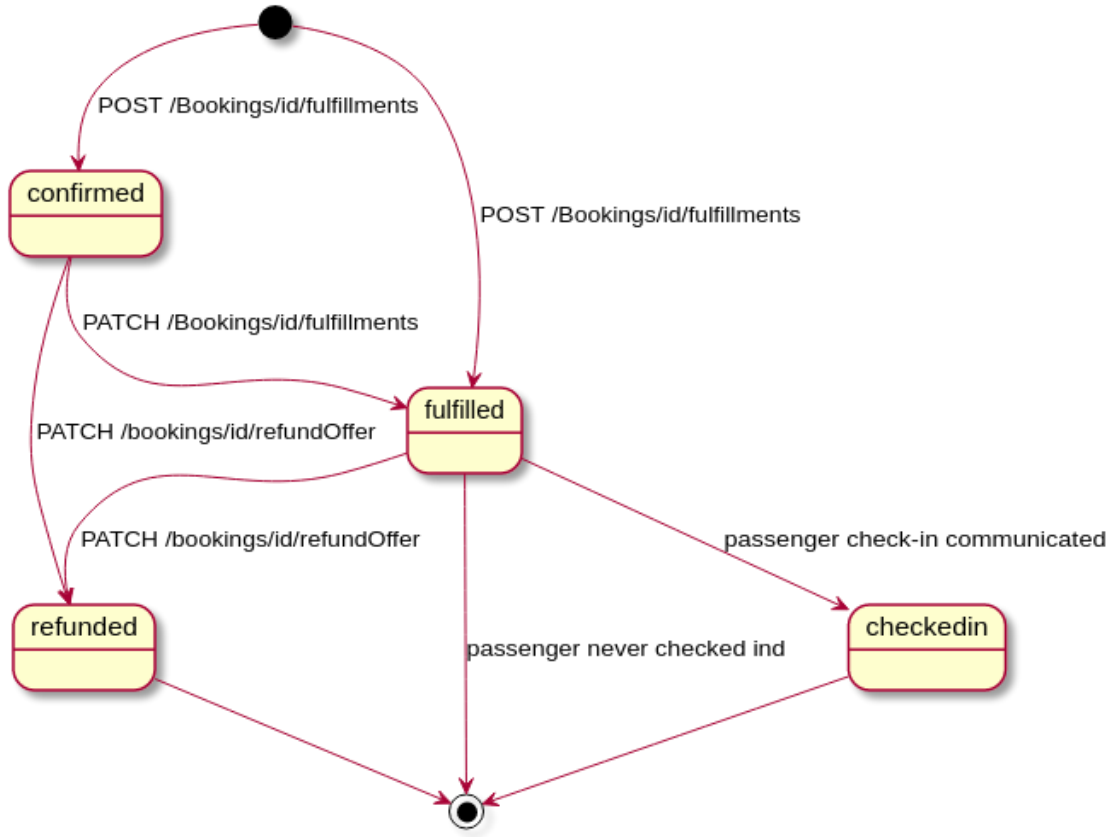
State Models

Booking State Model



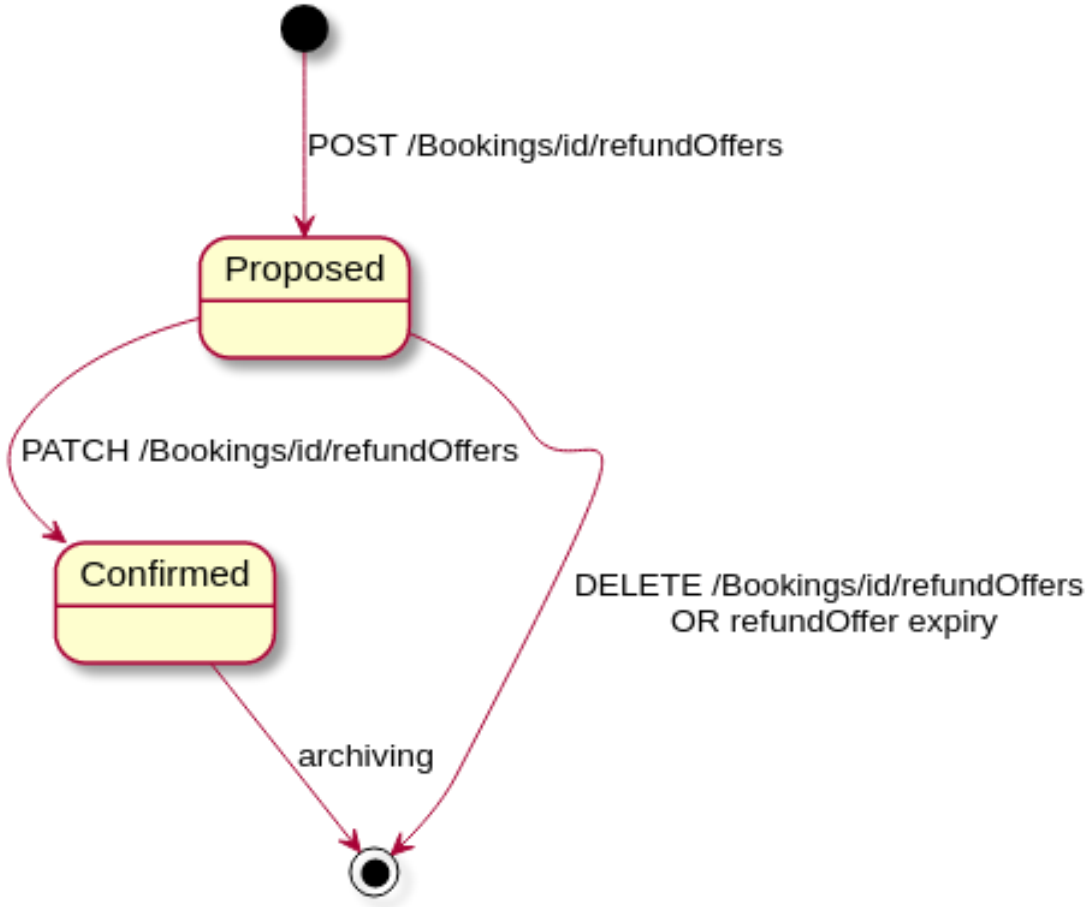
Booking State Model

Fulfillment State Model



Fulfillment State Model

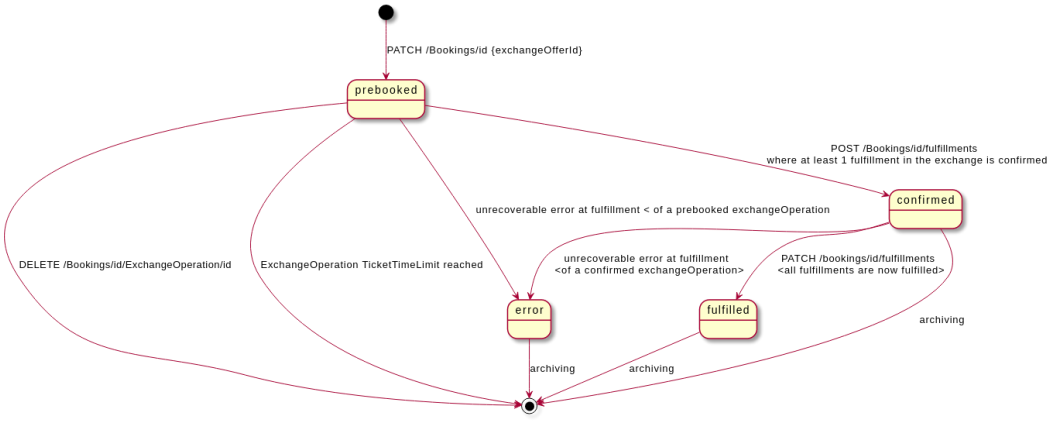
Refund State Model



Refund State Data Model

Exchange State Model

Values are a subset of the booking status values



Service Specification

Introduction

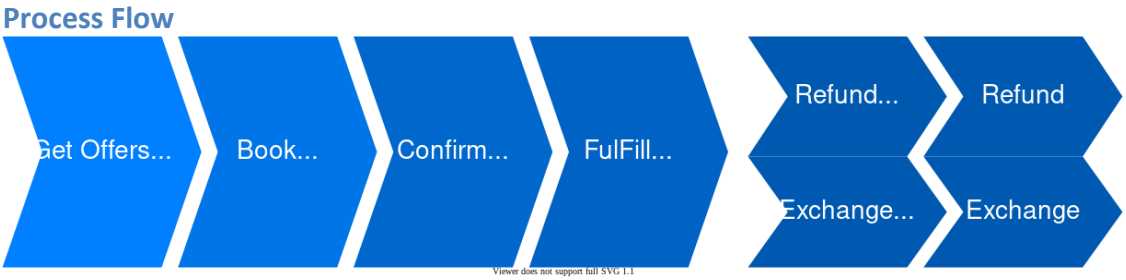
This page shows a representation of the data models underlying the API specifications. It is therefore not a strict representation of the resources themselves (those are self-represented in the OpenAPI specifications.)

The main purpose of this document is therefore to help a quicker understanding of the API and its underlying concepts. As such, some of the details of how the information is structured in the API are not represented or simplified in the data models.

Overview of Services

Resources	Description
`/locations`	Resources to search for locations
`/trips`	Resources to search for trips
`/trip-offers-collection`	Resources to get bookable offers
`/trip-offers/{tripOfferId}`	*dito*
`/offers/{offerId}`	*dito*
`/offer-collections`	Resources to get offers for non-journey based products
`/bookings`	Resources to manipulate bookings
`/offers/{id}/passengers`	Resources to manipulate a passenger's information at every stage of the flow
`/bookings/{bookingId}/passengers/{passengerId}`	*dito*
`/products`	Resources to retrieve products information

Resources	Description
	on one or more products
`/bookings/{bookingId}/fulfillments`	Resources to retrieve fulfillments, e.g. tickets
`/fulfillments`	*dito*
`/bookings/{bookingId}/refundOffers`	Resources to get and accept a refund offer
`/bookings/{bookingId}/refundOffers/{refundOfferId}`	*dito*
`/bookings/{bookingId}/exchangeOperations/{exchangerOperationId}`	Resources to get and accept a exchange offer
`/bookings/{bookingId}/exchange-trip-offers-collection`	*dito*
`/bookings/{bookingId}/exchange-trip-offers`	*dito*
`/coachLayouts`	Returns all coach layouts.
`/coachLayouts/{layoutId}`	Returns a coach layout for layout id



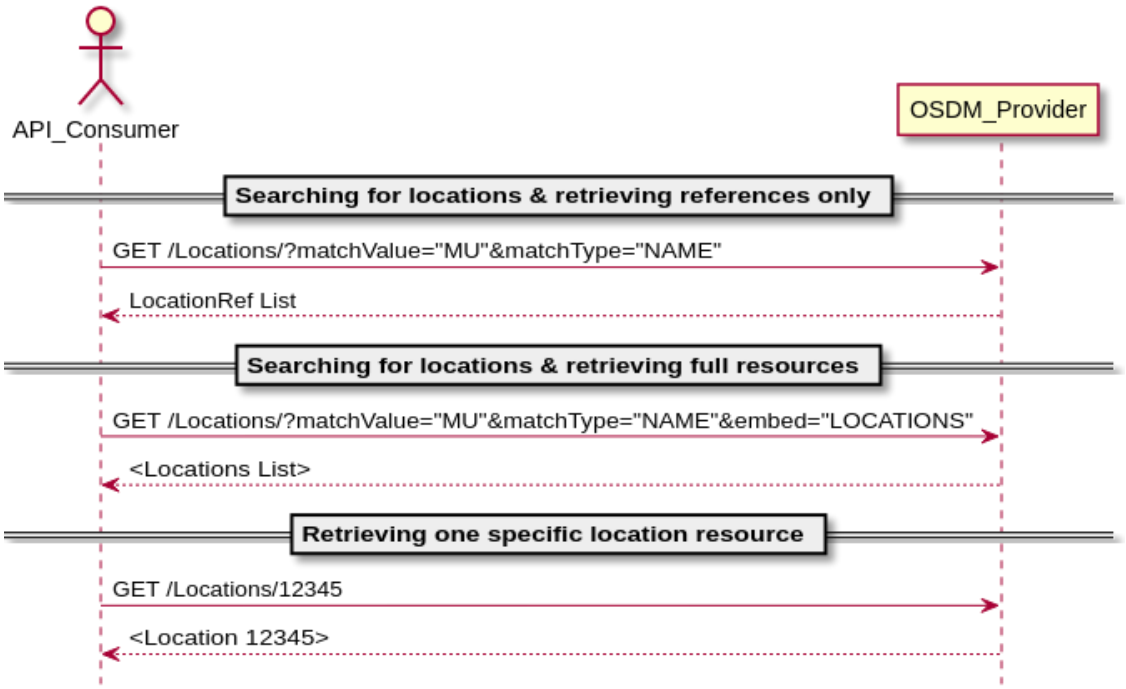
Process Flow

The process flow starts with getting offers which can be chosen by the customer. Once selected they can be pre-booked and after the payment process (which is outside of the scope of this document) they can be booked. The fulfillment of the booking can either be on paper or paperless.

If needed bookings can either be refunded or exchanged by providing the customer with a refund or exchange offer which can the be booked by the customer.

Trips and Locations Processes

Looking Up Locations



Looking Up Locations

The `\locations` Lookup can be used by an API provider in order to search for locations. Two typical uses cases would be

- getting a set of locations (in full or as reference) from a substring of the name
- getting full details on a location based on on of its codes

Note that the functionality is not intended to trigger a "dump" of the complete locations list or to build a full "browsing" functionality, hence the lack of pagination features here.

Given the high stability of this information, locations are given a long time to live and get responses can be cached for a long period, so these operations should not be too costly in terms of calls or bandwidth.

Error handling

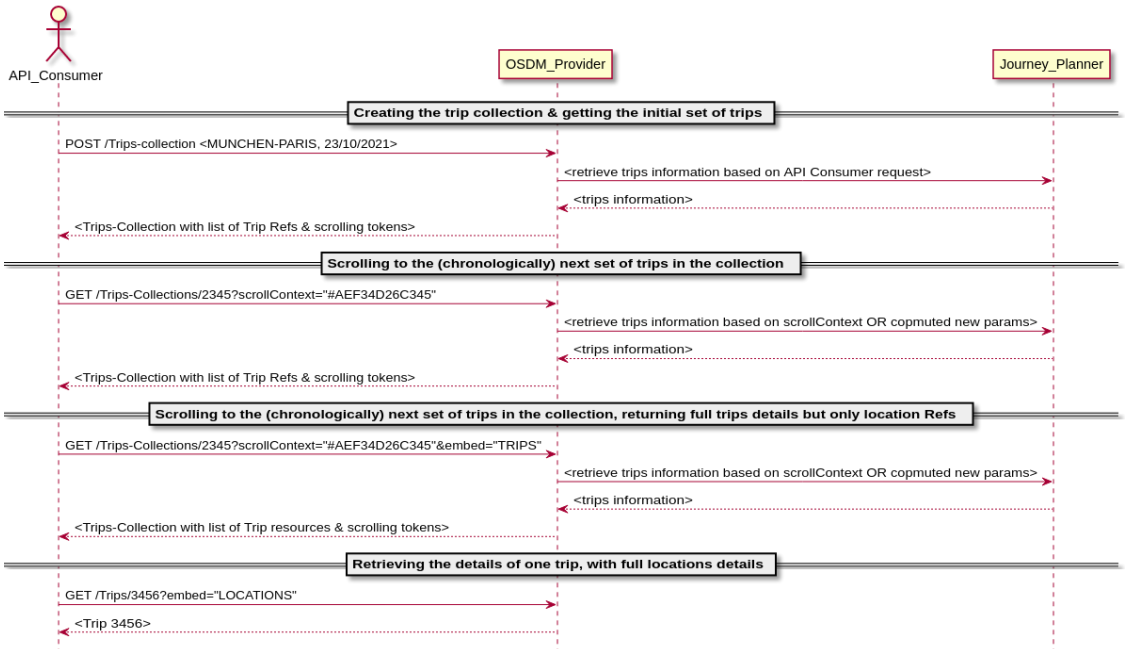
Error handling by the **Distributor** remains basic here as a handful of cases have to be handled:

- invalid characters in the search string
- no result found for the given criteria.
- The search did not return any result
- unknown error on server side

In all cases, the error handling starts and stops with the **Distributor** returning the appropriate JSON Problem element.

In case the error can apply to multiple fields, it is recommended to provide additional details such as the incriminated field in the detail property of the `Problem` element.

Getting and Browsing Trips



Getting and Browsing Trips

If the API consumer only needs a schedule, and no bookable offer, it has the possibility to create a trips collection using `POST /trip-collection`. If the query is successful, the initial response to this will be a set of trips matching the provided search criteria.

Please refer to the Yaml specifications for the list of search criteria available. Depending on their respective journey planner capabilities, it could be that some criteria cannot be supported by one or the other OSDM:Distributor In this case it is up to the implementing party to clearly document those limitations together with the publishing of its OSDM endpoints. In all cases, at least `origin`, `destination` and `travelDateTime` must be supported

Based on an initially returned trips collection, it is then possible to retrieve earlier or later trips using `GET the trip-collection` by specifying the appropriate scrolling-tokens. As with all cases where nested resources can be returned, individually or in list, the embed feature allows specifying whether complete trips should be returned or only a title and a link. A GET verb without any scrolling-token will simply return the last set of trips return.

It is important to ensure that once a trip has been generated, its id can be re-used in possible subsequent operations within a reasonable time-frame: - When scrolling back and forth over time, a same trip should maintain the same id, so the API consume can, if desired, expand the set of trips in its own context and have the guarantee that one same trip (in terms of content) will remain with the same id (in terms of resource id. - It could be used in a subsequent offer request, so that offers are now built for that specific trip

Error Handling

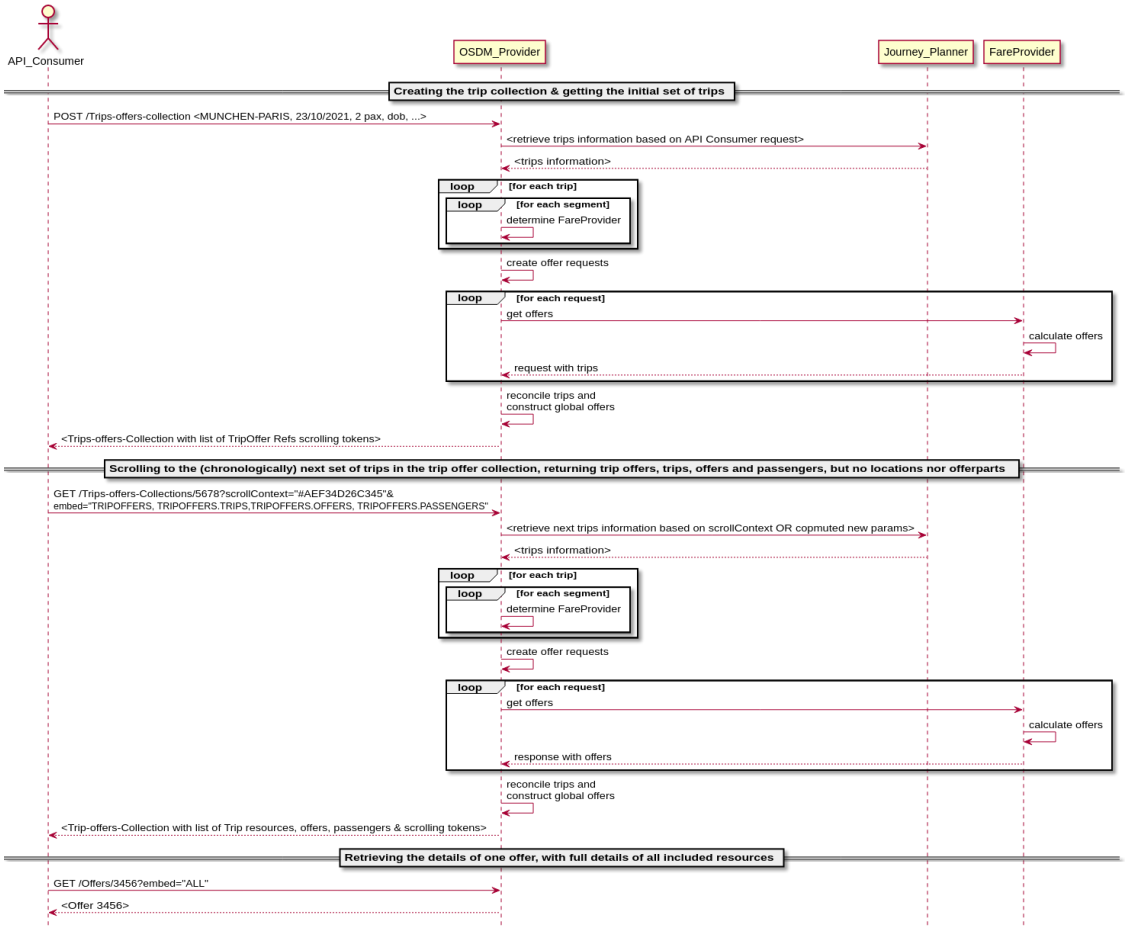
Since requesting trips still does not involve any transactional operation, the error handling is also limited to returning a JSON problem element. The following cases are to be considered:

- A search criteria value contains invalid value or invalid characters
- A search criteria lies outside accepted boundaries: it could be the date in the past, or too far in the future, or value outside bounds for the max number of changes
- The origin or destination is not known
- The search did not return any result
- Unknown error on server side

In case the error can apply to multiple fields, it is recommended to provide additional details such as the incriminated field in the detail property of the `Problem` element.

Offers

Getting and Browsing Offers



Getting and Browsing Offers

Requesting and browsing offers works a lot like the trips: the API consumer submits search criteria, and a collection of "trip offers" is returned. This collection can be browsed to earlier and later trips the same way as the trips collections.

The search criterias for offers extend the search criteria available for trips with additional criteria applicable to the fares and products that can be returned such as the fare flexibility, the service class or the currency the offers should be proposed in.

Although the trip-related search criteria are present and will likely be the easiest and most used option, there is an alternative way to search offers if a set of specific trips is already known: provide the complete trip structure for one or several trips. It is actually the only way to go for a request to a fare provider working according to nTM rules. In this case, the trips provided may be larger than the part for which fares are requested. For this reason, the requested section must then be provided so that the provider knows which portion to work on.

An offer request to an **Allocator**, **provider** or **fare provider** can lead to offers with multiple `OfferParts`, potentially coming from different sub-providers (OSDM compliant or not). However, in preparing offers with multiple offer parts for the API consumer, the **Distributors** must follow the following rules :

- The POST `/trip-offers-collection` only generates complete offers covering the complete trip (or complete section) requested.
- While the combination logic is left to the **Distributor**, it is recommended to only build and retain offers that are *homogeneous* (as much as possible) in terms of flexibility and comfort.
- As with the trips, it must remain possible to scroll forward or backwards over tripOffers based on their id and the scrollToken.

As described further on, any additional information required for the provisional booking can be provided in the booking operation itself

The resources used at offer steps optionally offer various *levels of embedding* (returning complete structure is the only mechanism made mandatory by the working group at the moment) and multiple granularity for the retrieval of information, so each implementing party can fine-tune the queries in order to get all the information needed for the processing at hand, and only that information.

Offer Messages

During the offer construction, the **Allocator** or **provider** can encounter events that, while not halting the process or constituting an error, may be relevant for handling of the response by the API consumer. These events can then be passed on using the offer `Message` element. The following events are identified and relevant to this section

- Overbooking
- Schedule correction applied

Round trip handling

We define a round trip as a mirrored couple of trips *(A-B B-A)*, each made of one or more segments.

The construction of a round trip in OSDM is always a two-step process, where the outward offers are requested separately from the inward offers.

Receiving offers with return products and fares

In order to indicate to the provider that the intention is to build a return trip, the `returnSearchParameters` are used:

When requesting offers for the outward travel, the API consumer has to provide a return date. The response will contain a set of offers. Each of these offers will have a `offerTag`. Usage of it is described further below.

To get offer for the inward travel, the API consumer will have to provide

- The id of the outward `tripCollectionID` (allows knowing the context in which the outward offers are made)
- Depending on the targeted fare provider, the `offerTag` for the selected outward offer, or the set of potential offers (as the `offerTag` does not have to be unique. E.g. all offers for a given date might have the same if the constraint is only on date) can or must be provided. Whether the `offerTag` is mandatory in the inward offer request is indicated by the "mandatory flag" that is provided in the outward offer response next to each offerHash. If the `offerTag` is provided in the inward offer request, the provider should then only return offers that are compatible with the indicated (set of) outward offers.
  Note that depending on whether the `offerTag` is mandatory or not and whether it is unique per outward offer, it may or may not be mandatory to select the outward offer before th inward offer request can be constructed.

Using returnTags

Besides the `offerTag` discussed above, some offers may have one or more `returnTag(s)` as well. As the name suggests, these can be used in order to determine how to combine offers in a return trip.

The idea is actually fairly simple: in case no filtering is applied on the inward offers using the `offerTag` filter mentioned above, the returned inward offers may not all be compatible with all outward offers. Identifying compatible pairs are simply identified by the fact that they have the same (set of) `returnTag(s)`. Offers with no return `returnTag` have no constraints.

Hereunder an example illustrating this concept:

Outward Offers

- Offer1: -

- Offer2: #123
- Offer3: #234, #123
- Offer4: -

Inward Offers

- Offer5: -
- Offer6: #123
- Offer7: #234
- Offer8: #123, #234

Valid Combinations

- Offer1 + Offer5 (no constraint on Tags)
- Offer4 + Offer5
- Offer2 + Offer6
- Offer3 + Offer8

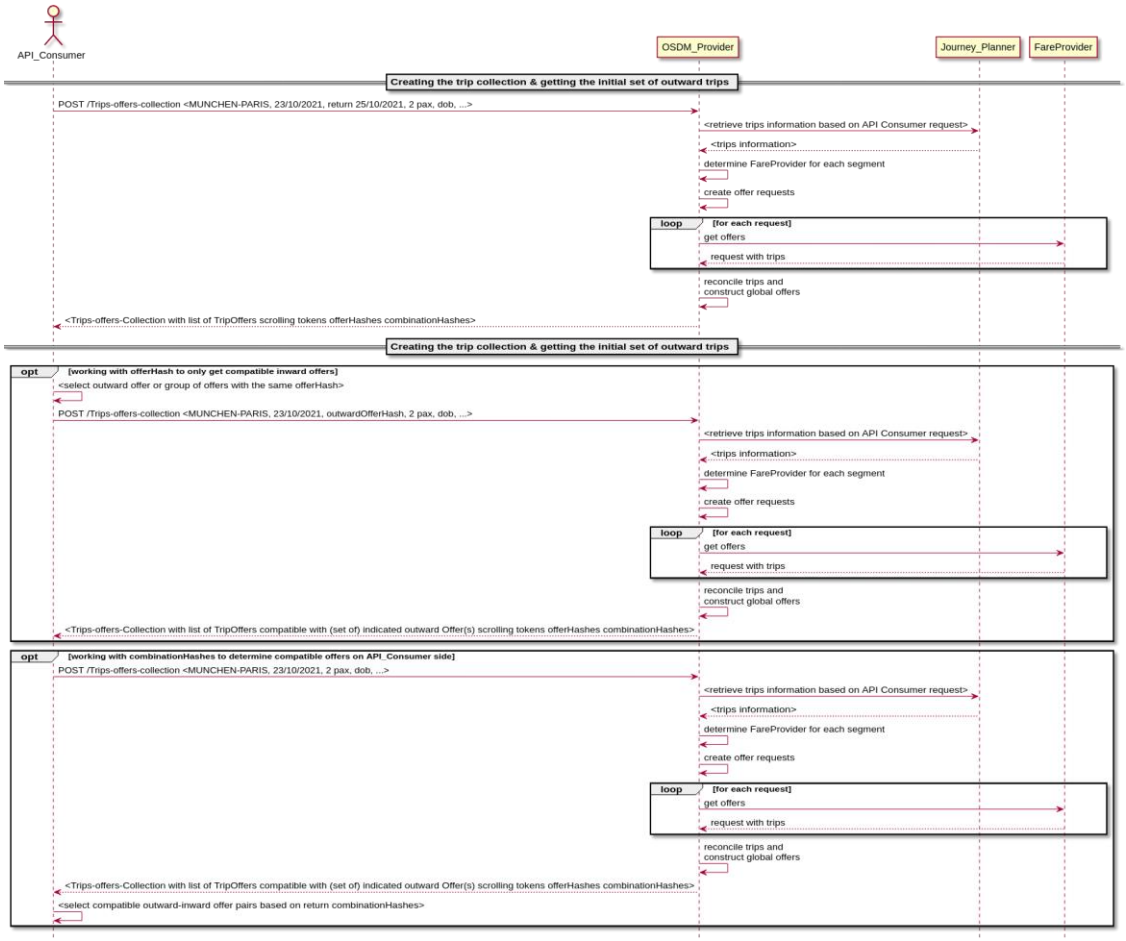
Offer7 cannot be combined with any offer on the outward set.

Products Covering Both Directions

While in most cases the two trips are materialized with distinct products/fares for the fare provider, there are fare providers still proposing unique products covering the outward as well as the return. In this case, the product element can be flagged as covering the mirrored segment as well. As for the offer construction process, the provider will simulate the two steps approach by using one of the following approach:

- The same product covering both outward and return is proposed in the offers for the two directions
- For one of the two directions, a dummy product is returned.

Regarding the price, it can either be placed in full on the offers in the two directions (but then the total price will be incorrect when looking at the complete return travel), or split in any way desired between the outward and the return.



Products Covering Both Directions

Error Handling

- the referenced trip cannot be found
- A search criteria value contains invalid value or invalid characters
- A search criteria lies outside accepted boundaries: it could be the date in the past, or too far in the future, or value outside bounds for the max number of changes
- The origin or destination is not known
- The trip search did not return any result
- No offer could be built for any of the discovered trips
- Schedule mismatch between systems
- Unknown error on server side

Getting Coach Layouts

Graphical seat reservation allows a customer to conveniently choose its preferred place. Therefore two resources are added: First, `GET /coachLayouts` to import all coach-layouts of an allocator. This service can be used periodically as master data service . Second, `GET /coachLayouts/{layoutId}` returns the information for a given `layoutId` and can be used during the on-line offering and booking process.

A Complex Example Mixing Offers and Fares

Request From Front-end

I want to go from Rotterdam to Wien Stephansplatz via Antwerp.

Request Submitted to SNCB

Proposed trip by timetable system:

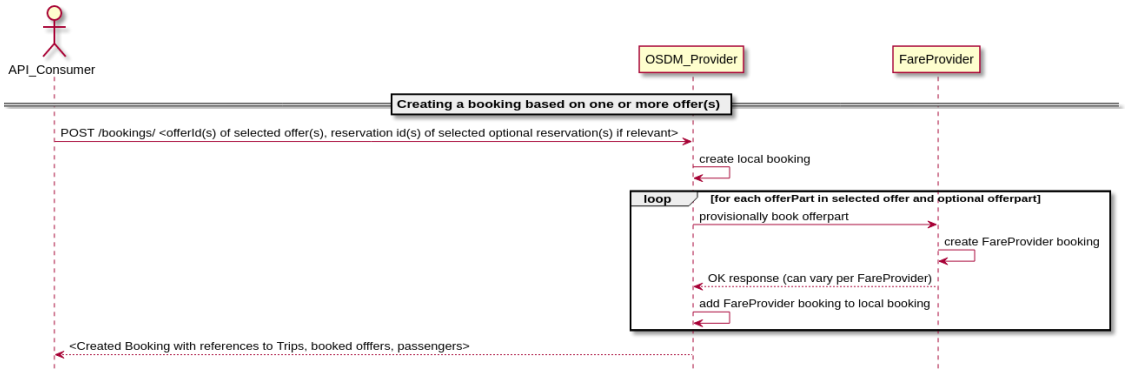
Origin - Destination	Train Number
Rotterdam → Antwerp	Thalys 9324 (integrated reservation)
Antwerp → Liège	IC 2345 + IR 5567
Liège → Frankfurt	ICE 122 (mandatory reservation)
Frankfurt → Wien Hbf	RailJet RJ 23 (optional reservation)
Wien Hbf → Wien Stephansplatz	Metro

Fare Provider Resolution returns

Origin - Destination	Train Number	Fare Provider	Consolidated
Rotterdam → Antwerp	Thalys 9324 (integrated reservation)	PAO	PAO
Antwerp → Liège	IC 2345 + IR 5567	Fare SNCB	Fare SNCB
Liège → Frankfurt	ICE 122 (mandatory reservation)	GUS	GUS
Frankfurt → Wien Hbf	RailJet RJ 23 (optional reservation)	Frankfurt → Salzburg (Border)	Fare DB
		Salzburg (Border) → WienHbf	Fare ÖBB
		Frankfurt → Wien Hbf (reservation)	Fare ÖBB
Wien Hbf → Wien Stephansplatz	Metro	Fare ÖBB	

Booking Processes

Creating a Booking Based on Offers



Creating a Booking Based on Offers

Once the offer has been selected, the API consumer can proceed to the booking of that offer. Along with the offer, optional or mandatory reservations, or ancillaries could be booked as well. those optional offer parts can be identified easily in the offers as they will always be linked with an admission product (in admission.reservations or admission.ancillaries). The link contains the relationType property, which indicates whether the pointed reservation is included (in which case it is not needed to explicitly add it in the booking request) , mandatory (the reservation must be added in the booking request) or optional (the reservation can be added in the booking request. Ancillaries are never mandatory (only included or optional). Adding optional or mandatory elements is simply done by adding the respective offer part in the booking request (cf YAML specifications) `POST /bookings`.

It is also possible to book several offers in one operation to the same booking. This is especially relevant to support return trips, where in most times it will be mandatory. If this is the case, a collection of offer ids (and associated reservations and ancillaries) is given instead of just one. However, note that in this case the passengers party for all booked offers needs to be the same. To ensure this, the passenger reference of each member of the passenger party must remain the same from one offer to the other.

If the booking succeeds, a new booking resource is created. In this booking, the booked offers can be found and should look a lot like the offers as they were in the offer responses, with the exception that for (integrated) reservations and fares, the reservedPlaces element will now be populated with the places that have actually be assigned to the passengers for this offer part.

Additional information in provisional booking step

In some cases, additional information must be provided before or at the provisional booking time in order to be taken into account, such as: - Additional passenger identity information - Additional accommodation preferences regarding the accommodation, or its exact location.

While providing accommodation preferences is often optional, some information (usually on passengers) may be mandatory in order to proceed with the booking. The

`RequestedInformation` property will provide the details of what needs to be specified in order to book a given offer. These details are provided under the form of a boolean expression, referring to the passenger model elements using dot notation (with the `TripOffer` as the root). For example, if it is required that name and first name are set to proceed `RequestedInformation` would be :

```
passenger[<uuid>].details.firstName AND passenger[<uuid>].details.name
```

Another example, if on top of first and last names, at least one email or one phone number is needed:

```
(passenger[0].details.firstName AND passenger[0].details.name AND
(passenger[0].details.eMail OR passenger[0].details.phone))
```

By parsing this structure, the API consumer is able to identify the elements that need to be filled-in to proceed. An initial version the grammar for required information is available for review.

The two types of information (accommodation preferences and passenger data updates) are both to be added in the POST /booking body: - passenger information can be specified in the passengers array: `bookingRequest.selectedOffers[].passengers` - seating preferences can be provided in `bookingRequest.selectedOffers[].placeSelections`

For passengers, all properties are updatable except - `id` - `reference` - `type`

Note however that updating a property that could have influenced the product in the offer (such as date of birth or reduction cards) will not influence the offer content anymore: the booked offer will be the offer initially generated, even though the products booked may be inconsistent with the new values of the passenger properties.

Reminder: the accommodation preferences can be found in the reservationOptions elements
`(offer.fare|integratedReservation|reservation.placeSelection.reservationOptions)`

The passengers in the booking resources are also the same type of resources as the ones present in offers. However, they could be different resources, with different ids (the passengers references do remain unchanged).

Initially, a booking will have the status `PREBOOKED` (see also the booking status model).

Error Handling

- The requested reservation Option is not available on this transport
- An invalid value is provided for a passenger property
- Referenced Offer or offer part not found (offer expired ?)
- No rights to access referenced offer
- Incompatible offer part with the offer
- Missing information
- Reservation to sub-system failed for one or more offer parts
- Insufficient availability for one of the requested products

- Requested place not available

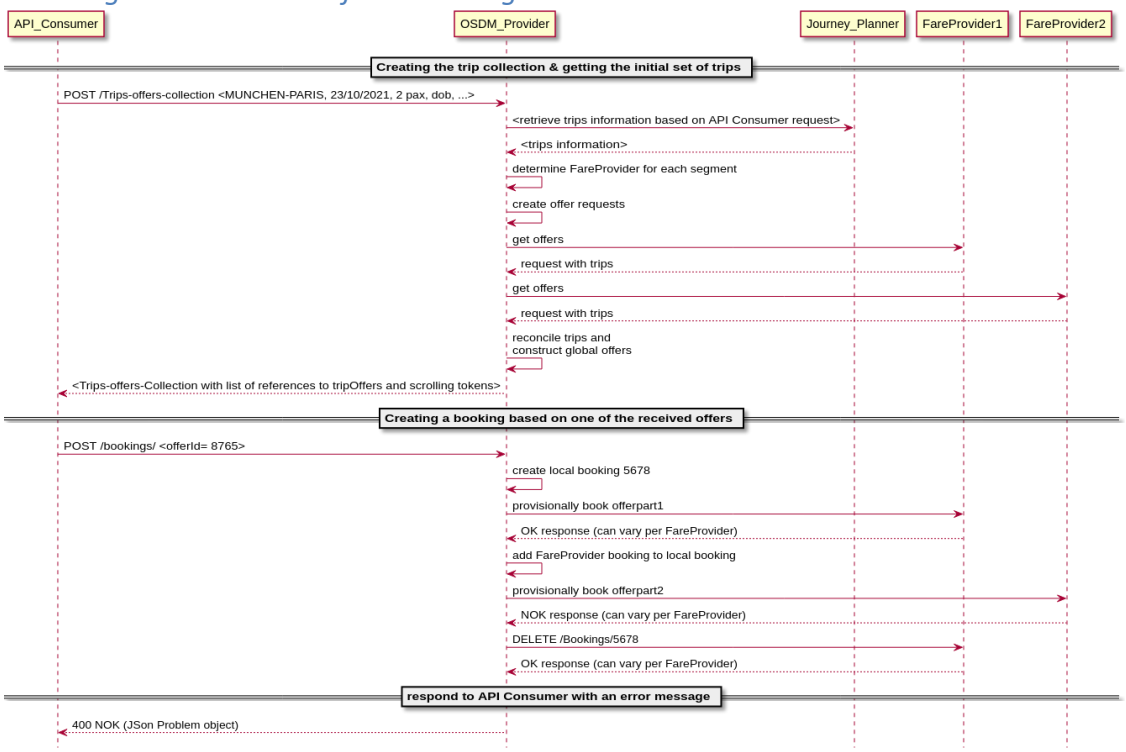
Provisionally Booking a Return Trip

While this may not be true for all providers, most of them require that the outward and the return parts of a return trips are booked together in order to actually book a return-specific product. Therefore, when building a return travel, the API consumer should always specify the outward offer(s) and return offer(s) in the same `POST /bookings` operation.

Provisionally booking a trip with offers clusters

When booking for a trip for which several offer clusters were provided (see offer clusters)), the API consumer must be careful to always select one and only one offer from each offer cluster in the tripOffer. This ensures that even though the selection is done per offer cluster, the complete trip is covered exactly without any gap nor overlap. However, the provider implementers must verify and validate the set of offers selected is valid. if the trip being booked is also a return trip, then the rule applies for each direction.

Handling Partial Success of Pre-Booking



Handling Partial Success of Pre-Booking

As a **Distributor**, partial pre-booking is not expected. As a consequence all pre-booking operations are either fully successful or not executed at all. However, as an allocator, An **Distributor** system may be configured in such ways that it is able to combine offers from different sub-providers (via an OSDM-compliant API or not) and propose them in turn as one offer to its API consumers, as one undividable product or as a bundled pack.

Unfortunately, when the booking is attempted, the process may encounter errors leading to the booking failing with some of the sub-providers, while it will have succeeded for other parts of the offer, directed to other sub-providers. The result is a partially pre-booked booking. Since this situation is not compliant with the OSDM specifications, this situation needs to be rolled back. This can be done by cancelling the pre-bookings that were successful (on an OSDM sub-provider, it would be performed using the `DELETE /booking/id` verb). An appropriate error message is then returned in the booking response, under the form of a JSON problem element.

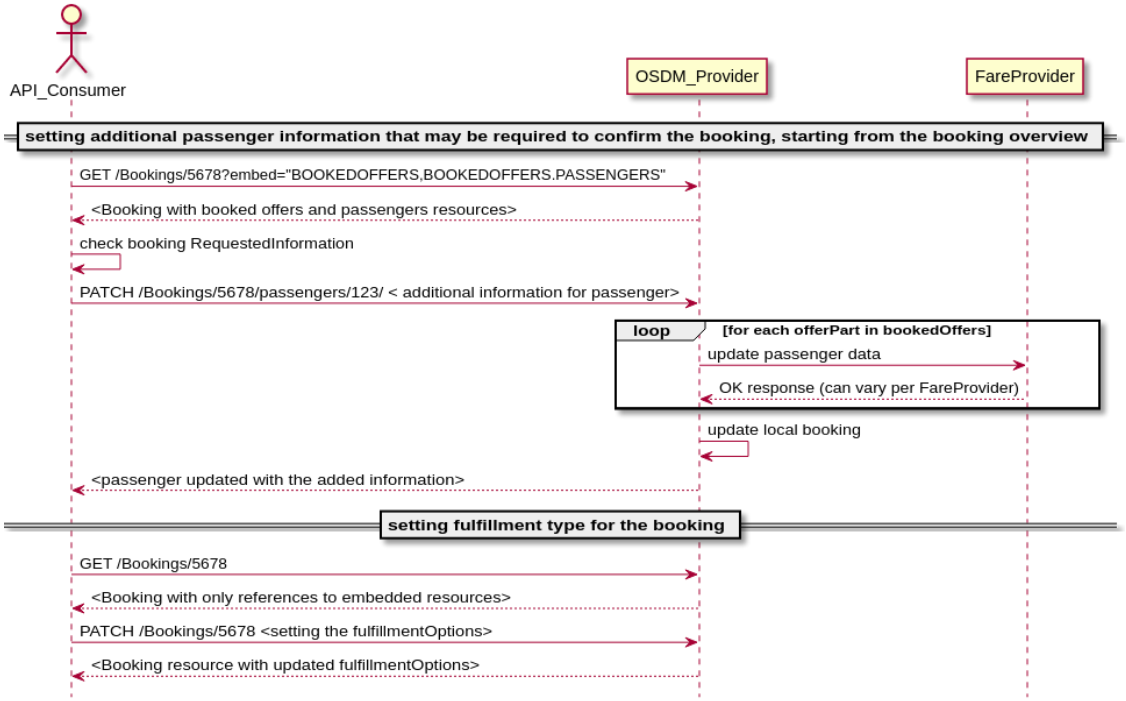
As it was the case with offers, during the booking process, some events may occur that are worth communicating to the API consumer, while they do not really constitute an error nor should interrupt the booking process. These events and situations can be communicated through the `Warning` messages:

- Price change: the booking succeeded, but the price of the offer has been modified between the offer generation and its actual booking
- Overbooking

Notes

- Booking an offer will not book the reservations in the offer unless they have an "included" relationship with an admission of that offer. In order to add a non-included reservation to a booking, the reservation ids will have to be passed additionally or it will not be booked.
- It is up to the OSDM API implementing party to decide whether booked offers can have the same resource ids as the offers in the shopping stage. However, it is assumed in the specifications that this is not the case, and the API Consumer should not rely on this possibility.
- In case the passengers details are different in the different offers added together in a booking, the passenger information of the first offer will be copied in the booking, and those of the following offers will be ignored.

Completing Booking for Confirmation and Fulfillment



Completing Booking for Confirmation and Fulfillment

When the booking has been successfully created, some additional changes may be desired or even required before the booking can be confirmed.

- As with offers, some passenger information may be required. If this is the case, the mechanism used is exactly the same as for offers: the `requestedInformation` property at booking level will indicate which information is needed to confirm using boolean expressions and dot notation. Updating the values is done via a PATCH on passenger sub-resources of the booking (as for the offer). Even if all the required data is already present, it could still be relevant to update these values. For example a dummy date of birth might, due to the selected fulfillment type now be requested to be the exact date and require an update, even though the property is already filled-in.

- It may be needed or desired to change or set fulfillment type and options. It is however recommended to the **Distributor** implementers to set a default value for these properties (especially if only one value is possible). Note that the choice of the fulfillment type & options may impact the requestedInformation. This property should therefore be re-evaluated whenever the fulfillment type is modified (both on the provider and on the consumer side).

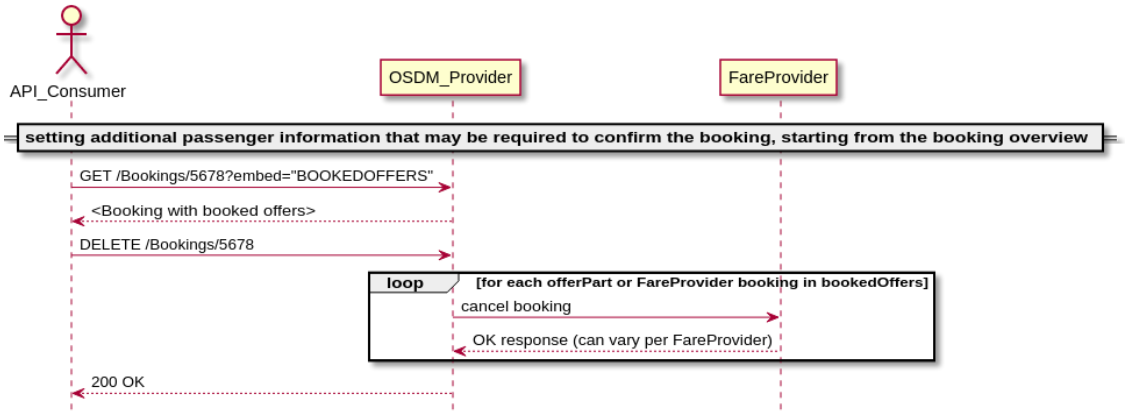
Notes

The modifications on the passenger's properties will never impact the products in the offer (thus also not the price), even if this leads to an inconsistency between the offered product and the updated passenger property.

Error handling

- An invalid value is provided for a passenger property
- Attempted to modify a read-only property
- The booking is confirmed/refunded/cancelled and does not allow modifications

Cancel a Not Confirmed Booking



Cancel a Not Confirmed Booking

In case a pre-booked booking is abandoned by its user, and this event is captured, it is recommended for the API consumer to properly cancel the booking on the **Distributor** side. In case this is not done the booking will be cancelled when the ticket time limit is reached, but in the meantime all related resources (seats etc) will remain unavailable for other requests. Upon receiving a `DELETE /bookings` for a given booking, the **Distributor** should obviously do its own cleaning as well, and if needed pass on the cancel to its sub-providers.

In case of a partial success for booking, the `DELETE /bookings` can also be used to clean-up the bookings on sub-providers where the pre-booking succeeded and who support the OSDM protocol.

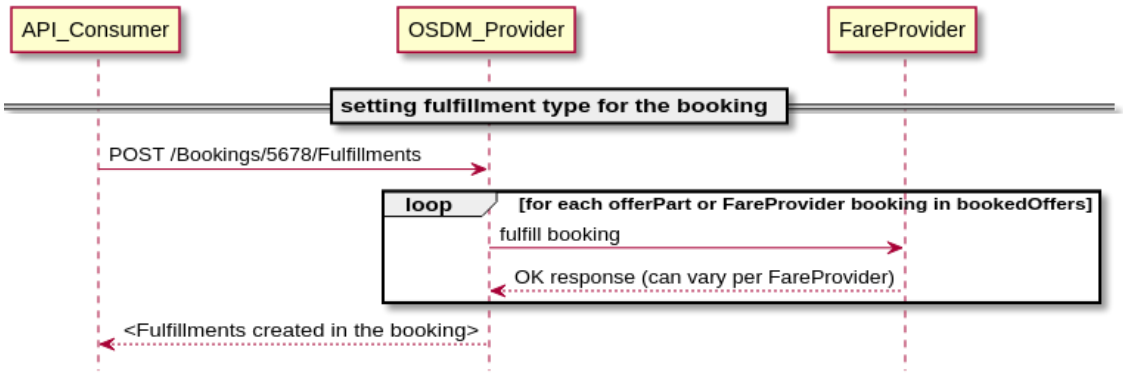
Regardless of whether the cancel occurred through an explicit `DELETE /bookings` or expiry of the ticket-time-limit, the booking state will then change to `CANCELLED` for a short "grace" period, before being completely cleaned-up (offer parts are well cleaned-up immediately). This grace period aims at ensuring that any ongoing operation with the booking is given sufficient time to get an explicit info on the cancelled status of the booking. The choice of the duration of that grace period is left to the implementor.

Error handling

- the booking is already confirmed
- the booking is already cancelled
- unknown error on the server side

Confirmation and Fulfillment Processes

Fulfillment Process



Fulfillment Process

The fulfillment is the final step of the booking. In most cases, the booking will be confirmed and fulfilled in one step from the API consumer standpoint:

- fulfillments elements are created with the appropriate status (see below)
- the provisional balance becomes confirmed
- the status of the booking changes to `FULFILLED` (for most systems) or `CONFIRMED` (see below)
- if relevant the documents elements in the fulfillment resources are created and linked

However, in case the **Distributor** acts as a distributor for products or fares actually hosted in sub-provider systems (OSDM compliant or not), a lot more takes place behind the scene. Indeed, the **Distributor** will have to

- confirm or fulfill the bookings towards all the sub-providers
- retrieve the fulfillment details to populate its own booking responses (and databases, most likely)
- build the fulfillments elements
- update relevant booking properties as described above.

Error handling

In the confirmation and fulfillment process, the following issues can arise:

- Unknown error on provider side
- Missing information in the booking
- No fulfillment type selected
- Booking already confirmed/fulfilled/cancelled

The Special Case of Partial Success

If a booking is composed of multiple offer parts, some of them potentially coming from sub-providers, it could be that at confirmation (or fulfillment) time, the operation only succeeds

for some of the bookings. Unfortunately, a clean roll back to the previous state is not possible here for the succeeded confirmation. The middle **Distributor** (combining offers of its sub-providers on request of its API consumer) has several options to handle the situation:

In all cases, the middle **Distributor** obviously has the option of proactively retrying to confirm on OSDM sub-providers where the confirmation failed. But this may keep on failing beyond a reasonable waiting time for the API consumer. A different strategy then needs to be applied:

The first possibility is to completely clean up the booking by:

- cancelling unconfirmed content
- refunding confirmed content (with overrule if needed)
- returning an error message to the API consumer

In this case, the specific error handling remains concealed for the API consumer, who only will be informed of the final result, being the the booking has failed and been completely cancelled.

The second option is to expose the situation to the API Consumer and let it decide of the course to be taken. In this case, the resulting partial booking is returned to the API consumer with an error state

The choice of the strategy to follow here is left to the implementers. However, the implementer who would choose to expose the situation and let the API consumer handle it, also needs to implement the logic described hereunder. This may be slightly more complex than proactively cleaning up the booking in its entirety.

If this strategy is chosen, the partial booking will then be returned with the following specific characteristics:

- the returned booking has an `ERROR` status
- fulfillment is available/fulfilled only for some of the `OfferParts`
- the confirmed balance amount only totals offer parts where the confirmation actually succeeded, while the provisional balance amounts to the total of the offer parts where the error occurred (or where the confirmation was never attempted because the error came too soon)

The following options are then available to the API Consumer:

- Explicitly request a retry on the confirmation, by re-triggering a POST or PATCH / Fulfillment. The **Distributor** will then re-attempt to confirm the not-yet confirmed content in the booking, while leaving the confirmed unchanged.

- Either directly, or after a few attempts on re-confirming, the booking needs to be cleaned-up so it can have a consistent status again (meaning the totality of the content is confirmed). To do so:

- The API consumer must start by cancelling the non-confirmed content. He can do so by sending a PATCH on the booking where the `cleanupPartialBooking` property set on TRUE. This will result in
  - the cancellation of all non confirmed content,
  - adaptation of the balance values (provisional balance = 0, confirm balance = sum of confirmed products)
  - a reset of the booking status to `FULFILLED` (or `CONFIRMED`, depending on the confirmed content fulfillment status)
- If deemed relevant, the API consumer can even completely remove the booking by refunding the confirmed part, if needed using an overrule code.

Confirm booking without fulfillment

For some providers or products, the booking confirmation and the fulfillment step are distinct steps, while for others/most, booking confirmation and fulfillment are performed together. For products where this is the case, the fulfillment item generated by the `POST fulfillment` will show several differences from those where the product is confirmed and fulfilled in one step:

- The most obvious difference is the status, that is set to `CONFIRMED` instead of `FULFILLED`
- No document nor fulfillment item will be provided
- The fulfillment may not have a controlNumber.

In terms of process, creating this fulfillment at this stage allows an uniform confirmation process (the totality of the booking is confirmed in one step) for bookings that would mix the two kinds of fulfillment processes. The fulfillments can later get PATCHed in order to trigger the actual fulfillment.

When a confirmation request is received by the **Distributor**, it should first ensure that the operation is indeed supported for all offer parts in the booking (whether the **Distributor** is hosting those or they are coming from sub-providers). Indeed, OSDM (in MVP phase at least) will not support partial confirmation or partial fulfillment.

If this check is successful, then the execution of the confirm can start:

- All offer parts will be confirmed (locally or via requests to sub-providers), in parallel or sequentially
- The ticket-time-limit is invalidated (set to 0)
- The state of the booking is set to `CONFIRMED`
- The provisional balance is set to 0
- The confirmed balance is set to the total amount of the booking
- Response is sent to the API consumer

As of that point, cancelling the order becomes impossible (except for cleaning up cases, cf below) and any subsequent change should be handled as an after sales operation. Once the booking is confirmed, it becomes also impossible to modify any element in the booking (such as fulfillment type or passenger information)

Interlude: Requested Information per Process Step

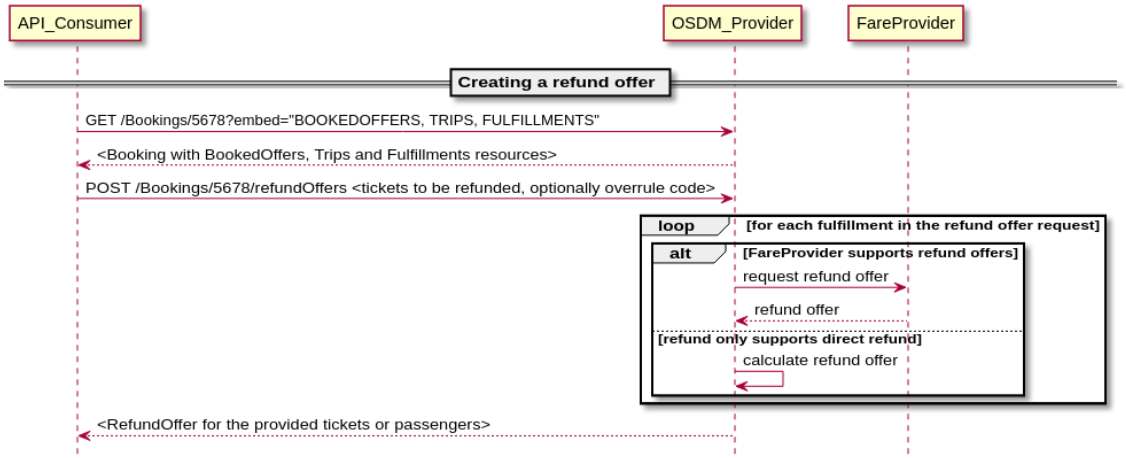
These are the required information needed per process step for major parties

Distributor	Pre-booking Step	Booking Step	Fulfillment Step
Bene		`firstName` and `lastName`	
DB	In general one `firstName` and `name`, regardless of the number of travelers. In case of regional trains, however, all names and sur names are needed, unless printed on security paper.		
öBB	Both `firstName` and `lastName` are needed. Birth date may be needed. Some reduction cards require the number to be provided at pre-booking time, in order to be pre-checked. In other cases, the cards are simply checked on-board `phoneNumber` or `eMail` (once per order - as contact information)	`phoneNumber` or `eMail` (once per order - as contact information)	
RENFE	Per passenger: `firstName`, `lastName`, surname document type and identity document (DNI, NIE or passport). A `phoneNumber` or `eMail`.	Per passenger: `firstName`, `lastName`, surname document type and Identity document. (DNI, NIE or passport) A `phoneNumber` or `eMail`.	
SBB	Per passenger: `name` and `first name` date of birth. Additional sales parameters for some, additional products		`eMail`
SNCF	`dateOfBirth` is mandatory, a fake date can be used at offer time, but the real one must be provided at pre-booking time		
Eurostar/Thalys	`firstName` and `lastName`	Thalys loyalty card number	

After Sales Processes

Refund

Request a Refund Offer

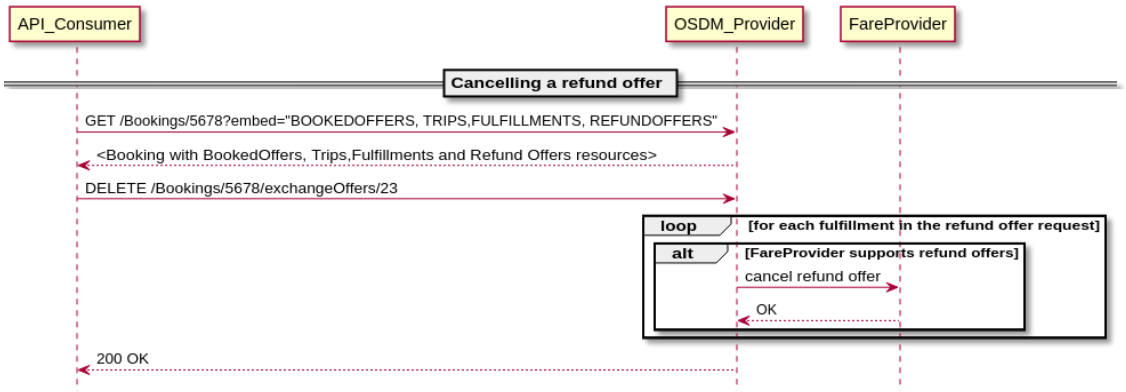


Request a Refund Offer

On a confirmed booking, and if it is allowed, after sales operations are also possible via the OSDM API. In OSDM, the refunds are taking place based on fulfillment resources. There is no partial refund of one fulfillment possible. This also means that in case of collective ticketing, all passengers will be refunded in one go.

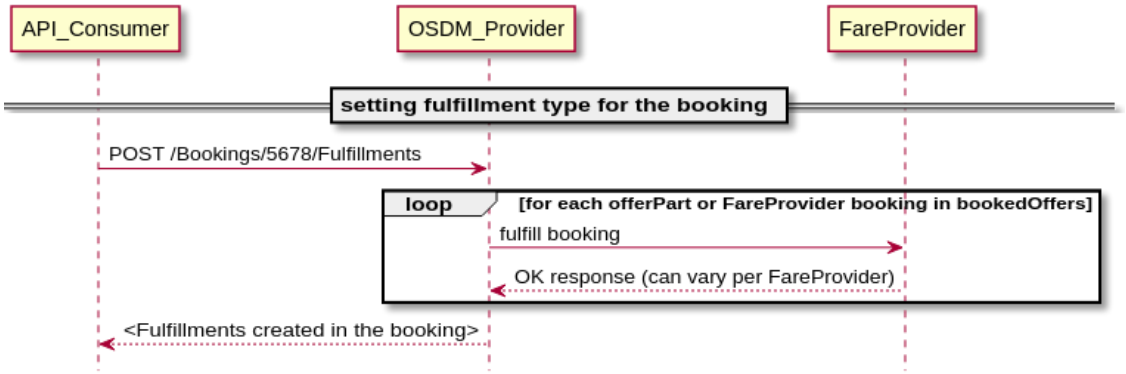
In order to perform a refund, the API consumer first has to create a refundOffer in the booking where the fulfillments to refund are located with a `POST refundOffer`. If the set of fulfillments provided is a valid set for refund, the operation creates a refundOffer that contains the information that is relevant to the refund operation at the moment the refund offer was created. This includes information such as the amount that will be refunded, any potential refund fee, etc (see the model for more details).

Cancel a Refund Offer



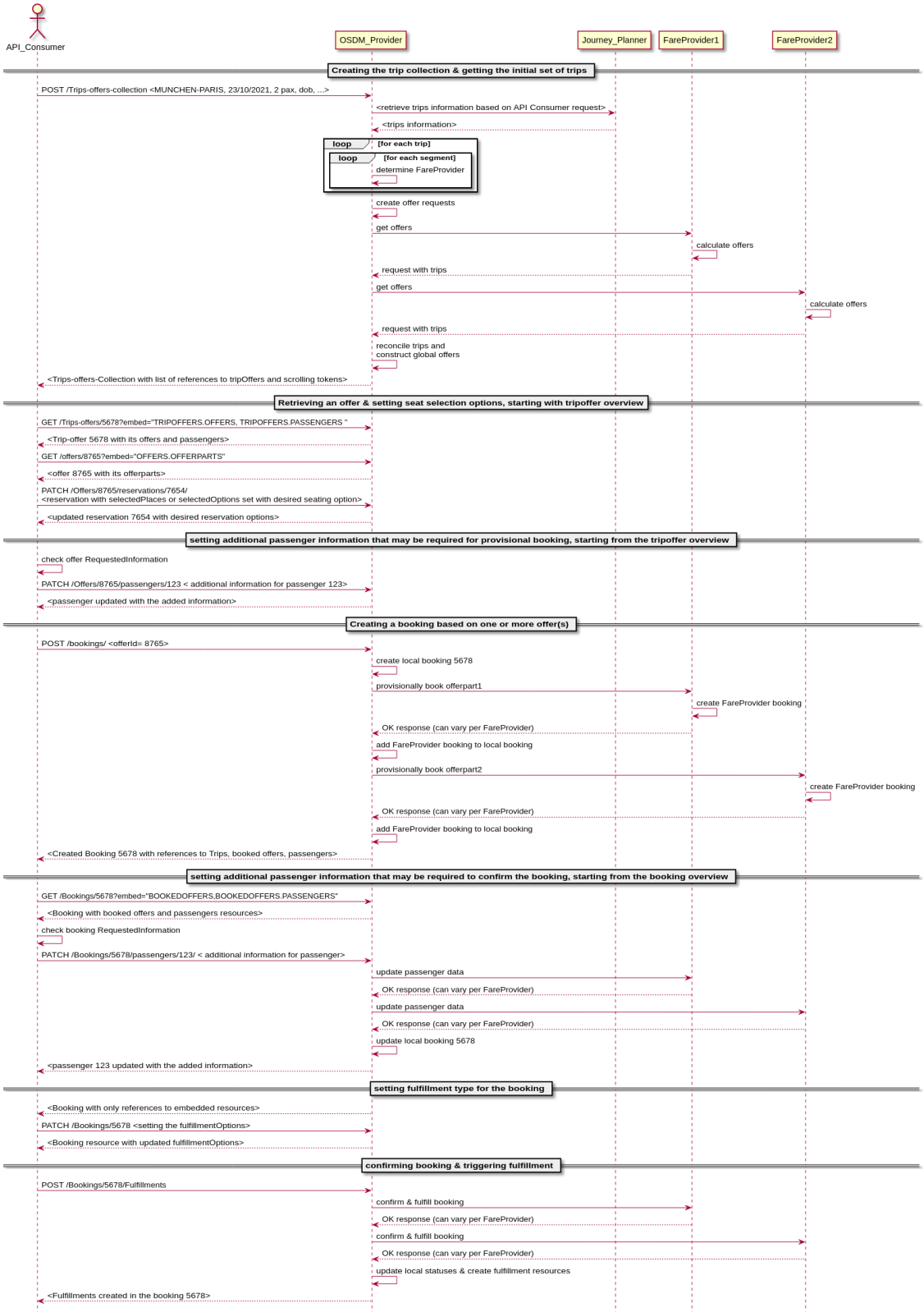
Cancel a Refund Offer

Confirm a Refund Offer



Confirm a Refund Offer

Example End-to-end Interaction



Example End to End Interaction

Exchange

Requesting an exchange offer

Requesting an exchange ffer is almost identical to requesting a standard offer. The only difference in the request is that the fulfillment that the API consumer wants to exchange, and an overrule code if relevant, are also provided.

Best Practices for Non-Functional Requirements

From a customer point of view, to book a trip he or she expects a seamless and fluid user experience. Fundamental to achieving this goal are fast responses for all requests triggered by the customer.

From a business point of view, the response time of a site directly correlates with the conversion rate. This means if a site takes too long to load, the customer will leave the site with out actually buying a ticket.

In order to achieve a seamless and swift user experience, all parties involved most play their part and provide fast adn predictable response times. Formally, by `95% Response Time` we denote the response time for 95% of all request. By `Max Response Time` we denote the maximum time a response can take before a time out must be expected.

For achieve a good customer experience, we need to define some response time for a each parties and we assume the fare providers and pricing engines can be called in parallel.

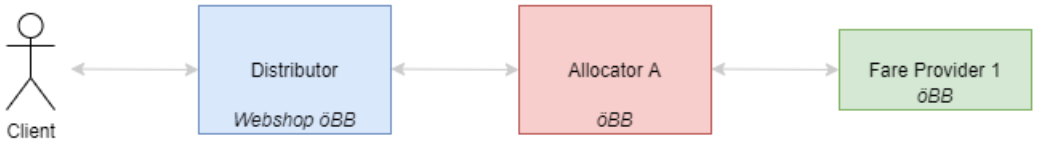
ToDo: Clarify Naming

Response time	Description
Fare Provider Response Time	Time to calculate/fares
Allocator Response Time	Time to calculate an offer from (remote) fare provider(s)
Distributor Response Time	Time to combine offers from
Pricing Engine Response Time	`Allocator Response Time + max(Fare Provider Response Times 1..m) + Communication Time 1`
Channel Response Time	`Distributor Response Time + max(Pricing Engine Response Time 1..n) + Communication Time 2`

The following illustration highlights the different response times:

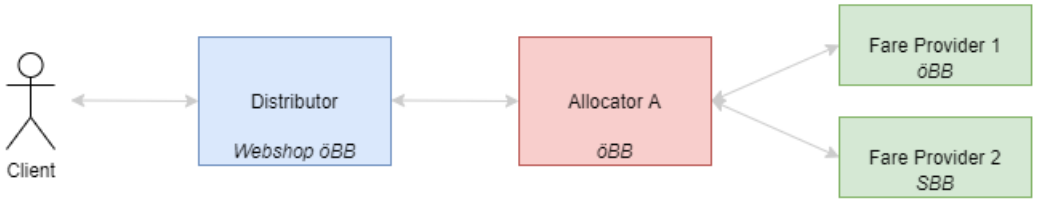
Scenario One Allocator - One Fare Provider

E.g:. öBB sells Garnisch-Partenkirchen - Innsbruck



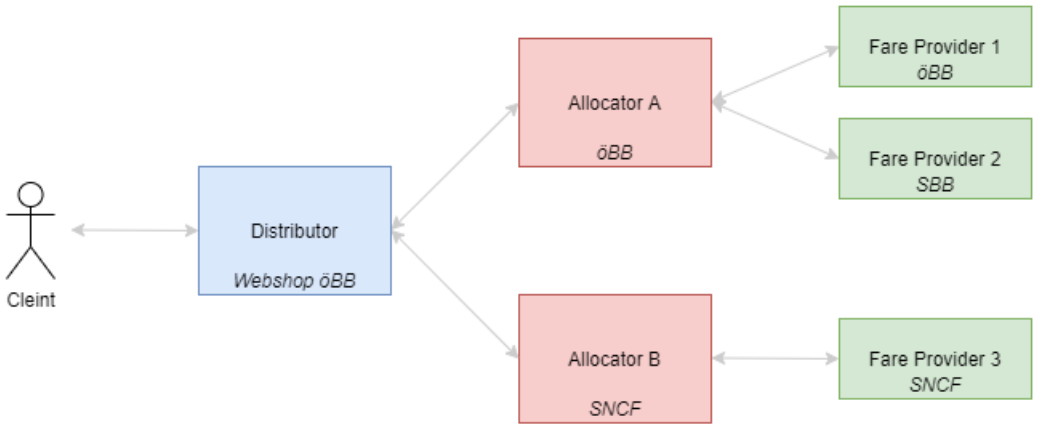
Scenario One Allocator - Multiple Fare Provider

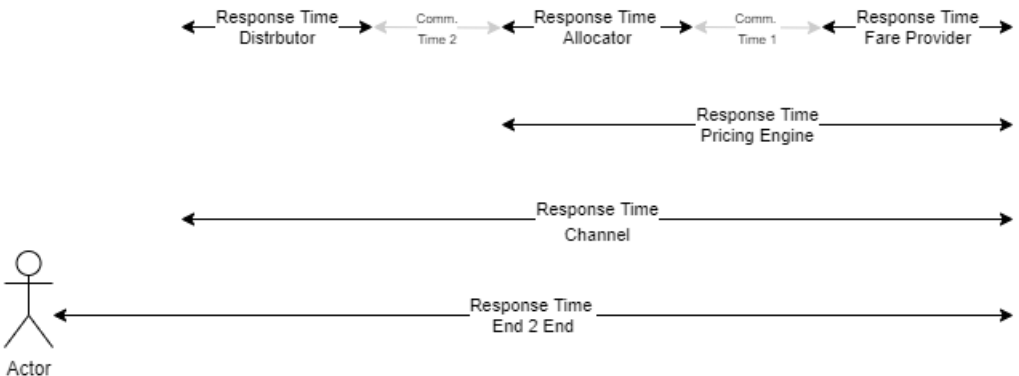
E.g:. öBB sells Garnisch-Partenkirchen - Innsbruck - Basel



Scenario Multiple Allocator - Multiple Fare Provider

E.g:. öBB sells Garnisch-Partenkirchen - Innsbruck - Basel - Colmar





Response Times

To achieve a good user experience with fast response time the following the three response times are crucial.

1. The longest response of any fare provider involved.
2. The longest response of any pricing engine involved.
3. The time it takes the distributor to render the content.

This observation leeds to the following non-functional requirements for a given role.

Non-Functional Requirements for the role “Channel”

Mandatory service level requirements to be fulfilled by a channel.

The Look-2-Book rate relates to the number of bookings created by the type of offer request. The expected response time in milliseconds that a service must provide includes the infrastructure of the provider of the server (firewalls, load balancer, circuit breaker and application) but not the network in-between the sender and receiver.

Resources	Look to Book Rate	95% Response Times (msec)	Max. Response Time (msec)	Required Error Handling
`/locations`	-	60	80	
`/trips`	-	400	600	
`/trip-offers-collection`	1000:1	1000	2000	
`/offers`	100:1	1000	2000	
`/offers/{offerId}/...`	5:1	800	1600	
`/bookings`	1:1	400	600	Retry of the booking request followed by a `DELETE /booking/{bookingId}` in case the booking is not needed any more. The error handling must be repeated for three days but no further than the train departure or until an appropriate reply was received indicating that the booking was not made.

Resources	Look to Book Rate	95% Response Times (msec)	Max. Response Time (msec)	Required Error Handling
`/bookings/{id}/passengers`	0.01:1	600	900	retry
`/bookings/{id}/fulfillments`	1:1	600	1200	
`/fulfillments`	1.1:1	600	1000	
`/bookings/{id}/refundOffers`	0,5:1	1000	2000	
`/bookings/{id}/exchangeOffers`	0.01:1	1000	2000	

Non-Functional Requirements for the role “Pricing Engine”

Mandatory service level requirements to be fulfilled by a pricing engine.

The Look-2-Book rate relates to the number of bookings created by the type of offer request. The expected response time in milliseconds that a service must provide includes the infrastructure of the provider of the server (firewalls, load balancer, circuit breaker and application) but not the network in-between the sender and receiver.

Resources	Look to Book Rate	95% Response Times (msec)	Max. Response Time (msec)	Required Error Handling
`/locations`	-	50	75	
`/trips`	-	300	500	
`/trip-offers-collection`	1000:1	800	1600	
`/offers`	100:1	800	1600	
`/offers/{offerId}/...`	5:1	600	1200	
`/bookings`	1:1	400	600	Retry of the booking request followed by a `DELETE /booking/{bookingId}` in case the booking is not needed any more. The error handling must be repeated for three days but no further than the train departure or until an appropriate reply was received indicating

Resources	Look to Book Rate	95% Response Times (msec)	Max. Response Time (msec)	Required Error Handling
				that the booking was not made.
`/bookings/{id}/passengers`	0.01:1	400	800	retry
`/bookings/{id}/fulfillments`	1:1	600	1200	
`/fulfillments`	1.1:1	400	800	
`/bookings/{id}/refundOffers`	0,5:1	800	1600	
`/bookings/{id}/exchangeOffers`	0.01:1	800	1600	
`/coachLayouts`	Once per day	10000	12000	
`/coachLayouts/{layoutId}`	2:1	300	450	

Non-Functional Requirements for the role “Fare Provider”

Mandatory service level requirements to be fulfilled by a fare provider / carrier.

The Look-2-Book rate relates to the number of bookings created by the type of offer request. The expected response time in milliseconds that a service must provide includes the infrastructure of the provider of the server (firewalls, load balancer, circuit breaker and application) but not the network in-between the sender and receiver.

Resources	Look to Book Rate	95% Response Times (msec)	Max. Response Time (msec)	Required Error Handling
`/locations`	-	50	75	
`/trip-offers-collection`	1000:1	400		
`/offers`	100:1	400		
`/offers/{offerId}/...`	5:1	400		
`/offers/{offerId}/fares/{fareId}`	5:1	300		
`/bookings`	1:1	200		Retry of the booking request followed by a `DELETE /booking/{bookingId}` in case the booking is not needed any more.

Resources	Look to Book Rate	95% Response Times (msec)	Max. Response Time (msec)	Required Error Handling
				The error handling must be repeated for three days but no further than the train departure or until an appropriate reply was received indicating that the booking was not made.
`/bookings/{id}/passengers`	0.01:1	200		retry
`/bookings/{id}/fulfillments`	1:1	200		
`/fulfillments`	1.1:1	400		
`/bookings/{id}/refundOffers`	0.5:1	400	800	
`/bookings/{id}/exchangeOffers`	0.01:1	400	800	
`/coachLayouts`	Once per day	8000	10000	
`/coachLayouts/{layoutId}`	2:1	200	300	

This code lists are provided for convenience only. The mandatory code lists are provided within the schema or within the IRS90918-10 specification.

Code List

Accommodation Type

Code	Description
SEAT	
COUCHETTE	Night trains only
BERTH	Night trains only
VEHICLE	

Accommodation Sub Type

IRS 90918-1 (Service Level).

Code	Description
AC	Seat near children's play area
AH	Seat in historic coach
AM	Seat in separate Compartment
AR	Wheel chair seat
AS	Quiet Compartment (Seat)
AV	Seat with front-view
BE	Restaurant (places in a dining car)
BP	Private compartment seats
D2	Cabin-couchette coach
D4	Couchette Four-berth
D5	Couchette Five-berth
D6	Couchette Six-berth
DP	Private compartment couchettes
DR	Wheelchair in sleeping car
E	Sleeperette
F4	Ladies compartment, 4-couchettes
F6	Ladies compartment, 6-couchettes
L	Single
M	Special
N	Double
O3	Vehicle parking place category 1-3
O4	Motorcycle
O5	Motorcycle with sidecar
O8	Vehicle parking place category 6-8
OB	Bicycle

Code	Description
OT	Tandem Bicycle
P	T2
P4	Private compartment four couchettes
PD	Private compartment berth deluxe
PS	Private compartment berth
Q	T3
R	T4
S	Single with shower & WC
SL	Single with shower & WC & double bed
T	Double with shower & WC
TL	Double with shower & WC & double bed
U	T3 with shower & WC
W	Double with shower

BarcodeType

Code	Description
FCB	Flexible Content Barcode - See IRS 90918-9
TLB	Ticket Layout Barcode - See IRS 90918-9
SBB	Small Structured Barcode - See IRS 90918-9

CardType

Code	Description
LOYALTY	Loyalty card
REDUCTION	Card providing reduction
CHIP_CARD	Chip card to load bookings/references onto it

Carrier

Carrier codes used in OSDM are based on the UIC RICS Company Code standard.

ControlDataExchangeType

Code	Description
REGISTRY	See IRS 90918-4, data are delivered to the UIC registry
PEER2PEER	See IRS 90918-4, data are exchange peer 2 peer

ControlSecurityType

Code	Description
SIP	Security in Paper -CIT secure background See IRS 90918-9 | |SID Security in Data (e.g. signed barcode) See IRS 90918-9

Code	Description
`SIS Security in System (Online control vs. Ticket registry) See IRS 90918-9/90918-4	

Currency

Currency codes used in OSDM are based on the ISO 4217 standard.

FareType

Code	Description
NRT	NRT
IRT	IRT
RES	RES (with or without supplement)
ANCILLARY	Ancillary

Fare CoachType

Legacy reservation code defined in UIC 90918-1.

Fare CompartementTypeCode

Legacy reservation code defined in UIC 90918-1.

FulfillmentType

Code	Description
ETICKET	Electronic ticket
CIT_PAPER	Value paper
PASS_CHIP	Fulfillment loaded on pass
PASS_REFERENCE	Reference to booking loaded on pass

Gender

Code	Description
MALE	Male
FEMALE	Female
X	Diverse

Graphics Items

icon	description	icon code	orientation used	mounting used
	seat	1	to right	-
	seat	1	to left	-

icon	description	icon code	orientation used	mounting used
	seat	1	up	-
	seat	1	bottom	-
	berth	2	to left	-
	berth	2	to right	-
	couchette	3	to right	-
	couchette	3	to left	-
	small table	20	-	top
	small table	20	-	bottom
	big table	21	-	top
	big table	21	-	bottom
	wall with angle to left, height covers three places	24	-	bottom
	wall with angle to right, height covers three places	25	-	bottom

icon	description	icon code	orientation used	mounting used
	wall with angle to left, height covers three places	24	-	top
	wall with angle to right, height covers three places	25	-	top
	small wall with angle to left, height covers two places	27	-	bottom
	small wall with angle to right, height covers two places	28	-	bottom
	small wall with angle to left, height covers two places	27	-	top
	small wall with angle to right, height covers two places	28	-	top
	wall between two compartments, height covers three places	23	-	bottom

icon	description	icon code	orientation used	mounting used
	wall between two compartments, height covers three places	23	-	top
	small wall between two compartments, height covers two places	26	-	bottom
	small wall between two compartments, height covers two places	26	-	top
	small wall between two compartments, height covers two places	29	-	bottom
	small wall between two compartments,height covers two places	29	-	top
	very small wall between two compartments, height covers one places	32	-	bottom
	Very small wall between two compartments, height covers one places	32	-	top
	end-to-end wall	30	-	top-to-bottom

icon	description	icon code	orientation used	mounting used
	Mobile wall between sleeping compartments, height covers three places	31	-	
	arrow indicating upper level	51	-	top-to-bottom
	arrow indicating lower level	52	-	top-to-bottom
	arrow indicating upper level	53	-	top-to-bottom

icon	description	icon code	orientation used	mounting used
	arrow indicating lower level	54	-	top-to-bottom
	1st class area	101	-	-
	2nd class area	100	-	-
	mobile phone area	103	-	-
	mobile phone forbidden area	104	-	-
	silence area	116	-	-
	bar area	102	-	-
	dining area	107	-	-
	bicycle area	108	-	-
	luggage area	109	-	-
	luggage locker	110	-	-
	conference compartment	111	-	-
	wardrobe	113	-	-
	dust bin	114	-	-

icon	description	icon code	orientation used	mounting used
	children play area	117	-	-
	Space for prams	112	-	-
	family area	106	-	-
	PRM area	105	-	-
	Priority Seats	120	-	-
	Non-smoker area	118	-	-
	WC	115	-	-
	power socket	119	-	-
	WiFi area	130	-	-
	PRM toilet	131	-	-
	Air condition	132	-	-
	USB ports for charging	133	-	-
	Reclining seat	134	-	-
	Window	135	-	-
	stairs upwards<span	136	-	-
	stairs downwards	137	-	-
	Working compartment	144	-	-
	Cabin for allergic passengers	145	-	-
	Meeting lounge for 7 persons (Pendolino)	150	-	-
	Meeting lounge for 12 persons	151	-	-

icon	description	icon code	orientation used	mounting used
	Space for skis	154	-	-
	Conductor working compartment	155	-	-
	Mobile phone booth	156	-	-
	T-loop (audio induction loop)	158	-	-
	Pets compartment	160	-	-
	Sleeping cabin with toilet and shower	161	-	-
	interconnectible sleeping compartments	162	-	-
	Shower	163	-	-
	Baby-care table	168	-	-
	push-button operated wheelchair ramp	170	-	-
	Sink / washbasin	171	-	-
	Ladies compartment	172	-	-
icons concerning the entire coach				
	1st class coach	121	-	-
	2nd class coach	122	-	-
	mobile phone coach	127	-	-
	mobile phone forbidden in the entire coach	128	-	-

icon	description	icon code	orientation used	mounting used
	1silence coach	126	-	-
	coffee bar	123	-	-
	dining car	124	-	-
	bicycle coach	125	-	-
	mixed group/individual coach	129	-	-
	WiFi area	139	-	-
	Air condition	140	-	-
	USB ports for charging	141	-	-
	business class	142	-	-
	panorama coach	143	-	-
	luggage coach	173	-	-
	sleeping car	174	-	-
	car-carrier	175	-	-

Interface Type

Code	Description
`IRS90918_1_RESERVATION_BINARY`	Reservation interface according to IRS90918-1 binary message format
`IRS90918_1_RESERVATION_XML`	Reservation interface according to IRS90918-1 XML message format
`OSDM`	OSDM API

Language

Language codes used in OSDM are based on the ISO 639-1 standard.

Nationality

Language codes used in OSDM are based on the ISO 639-1 standard.

NUTS codes

The common classification of territorial units in the EU (COMMISSION REGULATION (EU) 2016/2066) provides codes for different levels of geographical/political units. E.g.:

Code	Description
BE	BELGIUM
BE2	VLAAMS GEWEST
BE21	Prov. (2) Antwerpen
BE211	Arr. Antwerpen

OverRule Code

Code	Description
SALES_STAFF_ERROR	
PAYMENT_ERROR	
STRIKE	

Refund because of breakage of a vehicle is handled in a separate process.

Passport

Code	Description
ID_CARD	
PASSPORT	
DIPLOMATIC_PASSPORT	
REFUGEE_TRAVEL_DOCUMENT	
DRIVING_LICENCE	

Personal data items

Codes for personal data items that might be transferred to the carrier if required.

Code	Description
DATE_OF_BIRTH	Date of birth
E_MAIL	e-mail
PHONE	Phone number
FULL_NAME	Full name (first and last name)
LAST_NAME	Last name
SOCIAL_MEDIA_ACCOUNT	A social media account
LANGUAGE	Languages of the passenger

Code	Description
TITLE	Title of the passenger
DOC_TYPE	Type of the document if passport or id card are possible
DOC_ID	ID of the document
DOC_NAME	Name of the passenger as written on the document
DOC_CITY_OF_RESIDENCE	City of residence as written in the document
DOC_COUNTRY_OF_BIRTH	
DOC_COUNTRY_OF_ISSUE	
DOC_COUNTRY_OF_RESIDENCE	
DOC_DATE_OF_ISSUE	
DOC_GENDER	Gender as written in the document
GENDER	Gender to be used for special bookings
DOC_NATIONALITY	Nationality as given in the documen
DOC_LIMIT_OF_VALIDITY	Limit of validity as written on the document
DOC_CITY_OF_ISSUE	
DOC_CITY_OF_BIRTH	
DOC_TYPE_PASSPORT	Document provided must be a passport
CARD_ISSUER	Card issuer
CARD_NUMBER	Card identifier

Personal data transfer types

Code	Description
BOOKING	The data will be transfered via the booking services
PRE_BOOOKING	The data will be transfered via the pre-booking (offer) services
SIS_CONTROL	The data will be transfered via security in system control data exchange (IRS 90918-4)
SID	The data will be transfered via a barcode

Personal data change reasons

Code	Description
IN_GENERAL	No specific reason
MARRIAGE	
DOCUMENT_CHANGE	E.g. passport was lost and replaced
AGENT_ERROR	Personal data were enterd wronlgy by the sales agent

Place Property

Code	Description
ACC_BICYCLE	Place with bicycle

Code	Description
ACC_PRAM	Place with space for a pram
ACC_TANDEM	Place with tandem bicycle
AISLE	
AIR-CONDITIONED	
BICYCLE	Bicycle
BICYCLE_INCL_SEAT	Bicycle including seat
BISTRO	Places in a coach with self-service bistro
BUSINESS	Manager compartment/business
CABIN8	
CARRE	Carré (4 seats facing normally 2nd Class)
CLASSIC	Classic coach
CLUB	Club (RENFE)
CLUB_2	Club Duo (2 seats facing in a separate compartment)
CLUB_4	Club 4 (4 seats facing)
COMPARTMENT	
COMPARTMENT_SHOWER_WC	Compartment with shower and WC
COMPARTMENT_WC	Compartment with shower
CONFERENCE	Conference compartment
CONFERENCE_ROOM	Conference room
CONNECTING_DOOR	Compartments with connecting Door (in Sleepers)
DOUBLE_BED	Sleeper with double bed
DUO_F2F	Duo face to face (2 seats facing)
DUO_SBS	Duo side by side (2 seats side by side)
EASY_ACCESS	Place with easy access for PRMs
FAMILY	Places in family area
FEMALE	Female compartment
FRONT_VIEW	Places with view to the front
KIOSQUE	Kiosque (special seats in edge area)
LOWER_BED	
LOWER_COUCHETTE	
LOWER_DECK	
MANAGER	Manager compartment / business
MIDDLE_BED	
MIDDLE_COUCHETTE	
NEAR_ANIMALS	Places close to place with animals
NEAR_DINING	Places near the dining car

Code	Description
NEAR_PLAY_AREA	Places near a child play area
OFFICE	
OPEN_SPACE	
PANORAMA	Panorama coach
PHONE	Places in an area with mobile phone amplifier
POWER	Place with power socket
PRAM	Space for a pram
PRM	Places for passenger needing assistance / disabled
RESTAURANT	Places in the restaurant coach
SALON	Salon (6 seats facing in separate compartment)
SILENCE	Places in silence area
SLEEPERETTE	Sleeperette (reclining seat)
SOLO	Separate place
TABLE	Places at a table
TANDEM	Tandem bicycle
UPPER_BED	
UPPER_COUCHETTE	
UPPER_DECK	
VIDEO	Place with video entertainment
WHEELCHAIR	Wheelchair place with additional seat
WHEELCHAIR_WS	Wheelchair place without additional seat
WIFI	Places with WiFi access point
WINDOW	
WITH_ANIMALS	Place with animals (animals allowed)
WITH_SMALL_CHILDREN	Places for passengers with small children
WITHOUT_ANIMALS	Place in an area where animals are not allowed

Point of Interest (POI)

POICodeList: By default the code list is set to UIC.

Additional code lists can be defined by implementers. The code list name should then be prefixed by “X_<3 letters code for the provider>”. Example: “X_PAO_POIS”

POICode: Values are depending on code list and set is too large to be reproduced

Reduction cards

The following code lists defines the commonly used cards which are not provided by a specific carrier:

Predefined Card-Ids	Issuer	Description	Type	Included Cards
UIC_EURAIL	Eurail	Eurail Pass	PASS	
UIC_INTERRAIL	Eurail	Interrail Pass	PASS	
UIC_FIP_LEASURE_RED	FIP	FIP reduction (50%)	REDUCTION_CARD	
UIC_FIP_DUTY	FIP	FIP duty	PASS	
UIC_FIP_LEASURE_FREE	FIP	FIP free personal use	PASS	
UIC_RAILPLUS	*	A pure rail plus card	REDUCTION_CARD	
UIC_RIT_1	*	RIT reduction for RIT 1 members	REDUCTION_CARD	
UIC_RIT_2	*	RIT reduction for RIT 2 members	REDUCTION_CARD	
UIC_RIT_3	*	RIT reduction for RIT 3 members	REDUCTION_CARD	
UIC_EURAIL_1	Eurail	Eurail Pass First Class	PASS	
UIC_INTERRAIL_1	Eurail	Interrail Pass First Class	PASS	
UIC_FIP_LEASURE_RED_1	FIP	FIP reduction (50%) First Class	REDUCTION_CARD	
UIC_FIP_DUTY_1	FIP	FIP duty First Class	PASS	
UIC_FIP_LEASURE_FREE_1	FIP	FIP free personal use First Class	PASS	

Predefined Card-Ids	Issuer	Description	Type	Included Cards
UIC_RAILPLUS_1	*	A pure rail plus card First Class	REDUCTION_CARD	
UIC_RIT_1_1	*	RIT reduction for RIT 1 First Class members	REDUCTION_CARD	
UIC_RIT_2_1	*	RIT reduction for RIT 2 First Class members	REDUCTION_CARD	
UIC_RIT_3_1	*	RIT reduction for RIT 3 First Class members	REDUCTION_CARD	
UIC_EURAIL_2	Eurail	Eurail Pass Second Class	PASS	
UIC_INTERRAIL_2	Eurail	Interrail Pass Second Class	PASS	
UIC_FIP_LEASURE_RED_2	FIP	FIP reduction (50%) Second Class	REDUCTION_CARD	
UIC_FIP_DUTY_2	FIP	FIP duty Second Class	PASS	
UIC_FIP_LEASURE_FREE_2	FIP	FIP free personal use Second Class	PASS	
UIC_RAILPLUS_2	*	A pure rail plus card Second Class	REDUCTION_CARD	

Predefined Card-Ids	Issuer	Description	Type	Included Cards
UIC_RIT_1_2	*	RIT reduction for RIT 1 members Second Class	REDUCTION_CARD	
UIC_RIT_2_2	*	RIT reduction for RIT 2 members Second Class	REDUCTION_CARD	
UIC_RIT_3_2	*	RIT reduction for RIT 3 members Second Class	REDUCTION_CARD	
UIC_EU_DISABILITY_CARD	*	EU Disabled Card		
UIC_INT_DISABILITY_CARD	*	International Disabled Card	REDUCTION_CARD	UIC_EU_DISABILITY_CARD

Other cards should start with the RICS code of the issuer.

Refund Overrule Codes

Code	Description
STRIKE	
SALES_STAFF_ERROR	Error made by sales staff
PAYMENT-FAILURE	Cancellation made by the allocator due to a failed payment

Reservation Preference

Code	Group	Description
AISLE	PLACE_LOCATION	
WINDOW	PLACE_LOCATION	
UPPER_BED	BED_LOCATION	
LOWER_BED	BED_LOCATION	
MIDDLE_BED	BED_LOCATION	
UPPER_COUCHETTE	BED_LOCATION	

Code	Group	Description
MIDDLE_COUCHETTE	BED_LOCATION	
LOWER_COUCHETTE	BED_LOCATION	
UPPER_DECK	LEVEL	
LOWER_DECK	LEVEL	
COMPARTMENT	PLACE_GROUPING	
OPEN_SPACE	PLACE_GROUPING	
TABLE		Places at a table
BICYCLE	VEHICLE	Bicycle
TANDEM	VEHICLE	Tandem bicycle
PRAM	VEHICLE	Space for a pram
AIR-CONDITIONED		
PANORAMA		Panorama coach
MANAGER		Manager compartment / business
VIDEO		Place with video entertainment
CABIN8	PLACE_GROUPING	
DUO_F2F	PLACE_GROUPING	Duo face to face (2 seats facing)
DUO_SBS	PLACE_GROUPING	Duo side by side (2 seats side by side)
CLUB_2	PLACE_GROUPING	Club Duo (2 seats facing in a separate compartment)
CLUB_4	PLACE_GROUPING	Club 4 (4 seats facing)
CARRE	PLACE_GROUPING	Carré (4 seats facing normally 2nd Class)
SALON	PLACE_GROUPING	Salon (6 seats facing in separate compartment)
KIOSQUE	PLACE_GROUPING	Kiosque (special seats in edge area)
SOLO	PLACE_GROUPING	Separate place

Reservation Preference Group

Code	Description
ACC_VEHICLE	Different types of accompanying vehicles
BERTH_LOCATION	Location of a berth or couchette
FAMILY	Different types of places for families
LEVEL	Upper or lower deck
PLACE_GROUPING	Compartment / Open Space
PLACE_LOCATION	Place location (Aisle, Window)
USAGE	Different usage types for different coach areas
VEHICLE	Different types of vehicles

Service Brands

Snappshot, for the actual code list see https://uic.org/passenger/passenger-services-group/article/service-brand-code-list

Service Brand Code	Abbreviation	Reservation Ticket Text	MERITS Description
33		Ferry	Ship
37		normal train	Train
46	TAJ	TAJ	Day car train
47	TAC	TAC	Car sleeper train, motor rail (CST)
48	SAE	SAE	Unaccompanied car service, motor rail
49	EIC	ExpressIC	Fast and Comfortable Interregional trains
50	EC	EuroCity	EuroCity
51	ICE	ICE	ICE
52	AVE	AVE	AVE
53	EIL	EUROSTAR	Eurostar
54			Talgo
55	OTU	Oresundstog	Oresundstog
56	TGV	TGV	TGV Bruxelles à Lille / Province
58	TRN	Intercités	Intercités
59	AE	ALLEGRO	Allegro
60	ECB	EuroCityBrenner	EuroCityBrenner
62			Suburban service
63	IC	Intercity	Intercity
64			Hotel Train
65		Ferry	hydrofoil
66	IC	Intercity	Inter City Lyn
67			TRN
68			International
69			Express
70	EN	EuroNight	Euro Night
71	HST	High-speed train	High-speed train
72	TRN	TRAIN	Train SNCF
73	TGV	TGV	TGV Sud-Est

Service Brand Code	Abbreviation	Reservation Ticket Text	MERITS Description
74	TGV	TGV	TGV Atlantique
75	TGV	TGV	TGV Nord
76	TGV	TGV	TGV Lyria
77	TGV	TGV	TGV Duplex
79	TGV	TGV	TGV Est
80	TGV	TGV	TGV Interconnexion
82		THALYS	Thalys
83		Ferry	Hovercraft
84	RE	regional train	Regional
85	GPE	Gotthard Panorama Express	Gotthard Panorama Express
87		PENDOLINO	Pendolino
88			Suburban
89	ALV	Alvia	Alvia
90	AVN	Avant	Avant
91	TER	TRAIN	Regional TER
92	REG	Regiontog	Regiontog
93	FB	FRECCIABIANCA	FRECCIABIANCA
94	SC	SuperCity	Supercity
95	CNL	City Night Line (D)	DB Nachtzug
96	INI	InterCityNotte Italia	InterCityNotte
97	GB	ATOC MEMBER OPERATED SERVICE	ATOC MEMBER OPERATED SERVICE
98	ESI	ES Italia	Eurostar Italia
99			Funicular
100			Airport train
101			Night train
102			Touristic train
107			Historical train, steam engine train
108	IRE	IRE	Interregio-Express
109	RB	RB	Regionalbahn
110	RE	RE	Regional-Express
111	RT	RT	RegioTram
112			Shinkansen
113	THT	TrainHotel Talgo	Train hotel talgo

Service Brand Code	Abbreviation	Reservation Ticket Text	MERITS Description
114	EUR	Euromed	Euromed
115	ALR	Alaris	Alaris
116	ALT	Altaria	Altaria
117	ARC	Arco	Arco
119			S-Bahn
121		Night Train	Night Train
122	IR	Interregional	Interregional
123	IRN	Interregional Night Train	Interregional Night Train
124	NLT	TOLSTOI	Tolstoi
126			ARZ
128	AVE	RENFE SNCF EN COOPERATION	Renfe SNCF
129	TGV	TGV INOUI	Renfe SNCF
130	BUS	IC Bus	Bus
131	BUS	IC Bus International	Bus
153		special train	Sonderzug
154			InterCityRapid
155			InterPici
157			Fast train
158			Euregio
159		Bus	IC Ersatzbus
160		Bus	IP Ersatzbus
162		Bus	Replacement Bus
163	TGV	TGV	TGV Duplex Lyria
166	TGV	TGV INOUI	TGV Duplex France Allemagne
170	YHT	YHT	High speed train in Turkey
171	FA	FRECCIARGENTO	FRECCIARGENTO
172	FR	FRECCIAROSSA	FRECCIAROSSA
173	AP	Albula Panorama	Albula Panorama (Panoramic Car)
174	BEX	Bernina Express	Bernina Express (Panorama Train)
175	GEX	Glacier Express	Glacier Express (Panorama Train)
176	GP	Golden Pass	Golden Pass (Panorama Train)

Service Brand Code	Abbreviation	Reservation Ticket Text	MERITS Description
177	BNI	Bernina Panorama	Bernina Panorama (Panoramic Car)
178	zb	zb Zentralbahn AG	Luzern-Interlaken Express (Panorama Train)
179	BXB	Bernina Express Bus	Bernina Express (Panorama Bus)
200	GGB	Gornergrat Bahn	Mountain train
202	ICE	ICE-Allemagne France	ICE Allemagne-France
203		ÖBB-NIGHTLINE	ÖBB Night Line
205	ICP	Intercity Plus	Intercity Plus
206	RID	Riviera Day	Riviera day
207	RIN	Riviera Night	Riviera night
209	RJ	R A I L JET	Rail Jet
213	AZ	DB Autozug	DB Autozug
214		Berlin-Warszawa-Expresas	Berlin-Warszawa-Express
215		Railpromo Austria Express/Treski	Austria Express/Treski
216	PRECIOS	MERCADO	Precios Mercado
219	TGV	TGV	TGV
223	FB	FB	FernBus
224	ICB	Intercitybus	ÖBB-Intercitybus
225	TLK	TLK train	Yours Rail Lines
226	A	RailBus	RailBus
227	BUS	Replacement bus for Regional Train	Replacement bus for Regional Train
228	IR	InterREGIO train	InterREGIO train
229	IRB	Replacement bus for InterRegio train	Replacement bus for InterRegio train
230	MP	Fast International Train	Fast International Train
231	MR	musicREGIO train	musicREGIO train
232	OS	Stopping Train	Stopping Train
233	P	Fast Train	Fast Train
234	R	REGIO train	REGIO train
235	RE	REGIOekspres train	REGIOekspres train
236	VR	viaREGIO train	viaREGIO train

Service Brand Code	Abbreviation	Reservation Ticket Text	MERITS Description
237	TK	TurKol	TurKol
238	EIP	EIC Premium	High-speed train
239	SKM	PKP SKM w Trojmiescie	PKP SKM w Trojmiescie
240	SA	SAPSAN	High speed train
242	STR	STRIZH	Strizh night train
243	STR	STRIZH	Strizh interregional
244	NJ	NJ	NJ Night Jet
245	CAR	AUTOCAR	French regional buses (not sold via Hermes)
246	RJX	RJX	RJX railjet xpress
247	CJX	CJX	CJX cityjet xpress
248		Night train BC	Night train BC
249	TGV	TGV INOUI	TGV INOUI
250	TGV	TGV INOUI	TGV INOUI DUPLEX (double decker TGV)
251	ALI	Aare Linth	Aare Linth (Panorama Train)
252	TGO	Treno Gottardo	Treno Gottardo (Panorama Train)
253	VAE	Voralpen-Express	Voralpen-Express (Panorama Train)
254	LK	FRECCIALINK	FRECCIALINK

Service Class

Code	Description
BEST	
HIGH	Standard first class
STANDARD	
BASIC	Standard second class

Stations

codeList = UIC, ERA, HAFAS

Additional codelists can be defined by implementers. The codelist name should then be prefixed by “X_<3 letters code for the provider>”. Example: “X_PAO_STATIONS”

StationCode: Values are depending on codelist and set is too large to be reproduced.

Supported Online Services

Code	Description
OFFER	Offer service (without after sales offers)
BOOKING	Preliminary booking, confirm booking and cancellation
RESERVATION_LEGACY_918_1	Services according to the 90918-1 XML or binary specification
RESERVATION_PREF	Place allocation using preferences
RESERVATION_GRAPH	Place allocation using graphical place display
UPGRADE	Upgrade to an existing booking
INCREASE	Exchange with an increase of the number of passengers
DECREASE	Exchange with an decrease of the number of passengers
EXCHANGE	Exchange with the same number of passengers
FULFILLMENT	Provides an entire tickets
FULFILLMENT_ITEMS	Providing security items for a ticket (e.g. additional bar codes)

TaxScope

Code	Description
INTERNATIONAL	VAT applies in international tickets only. This needs to be applied in case the fare is integrated into an international ticket
NATIONAL	VAT applies in national tickets only
SHORT_DISTANCE	VAT applies in short distance tickets only
LONG_DISTANCE	VAT applies in long distance tickets only. This needs to be applied in case the fare is integrated in a longer journey.

Transfer Type

Code	Description
WALK	A walk
OTHER	Other types of transfer (e.g. taxi, local city transport not included in the offer,…)

Transport Mode

Corresponding to numerical codes in TAP-TSI / MERITS

Code	Description	TAP-TSI Code B.2.3 (MERITS)
HIGH_SPEED_TRAIN		8
HISTORIC_TRAIN		16
INTERCITY		9
REGIONAL		11

Code	Description	TAP-TSI Code B.2.3 (MERITS)
INTERREGIONAL		10
TRAIN		37
URBAN		12
TRAM		35
UNDERGROUND		36
NIGHT_TRAIN		13
SHARED_TAXI		34
MOTOR_RAIL	Car carriage trains	13
MOUNTAIN_TRAIN		15
PLANE		3
COACH_GROUP	Group of coaches included in multiple trains (through coaches)	31
SHIP		33
BUS		32

TimeReference

Code	Description
BEFORE_DEPARTURE	Time value calculated relative to the departure (subtract from departure). The time zone of the departure station applies.
AFTER_DEPARTURE	Time value calculated relative to the departure (add to depature). The time zone of the departure station applies.
AFTER_SALE	Time value calculated relative to the sates time (add to sales time). The time zone of the sale applies.
BEFORE_START_VALIDITY	Before the start of the validity. The time zone of the departure station applies.
AFTER_END_VALIDITY	After the start of the validity. The time zone of the departure station applies.

TimeUnit

Code	Description
DAY	
MINUTE	
HOUR	

TransactionType

Transaction type used in after sales rules for fares.

Code	Description
REFUND	
EXCHANGE	
CARRIER_CHANGE	Exchange with a new fare of another carrier
EXCHANGE	Exchange with a new fare of the same carrier
UPGRADE	

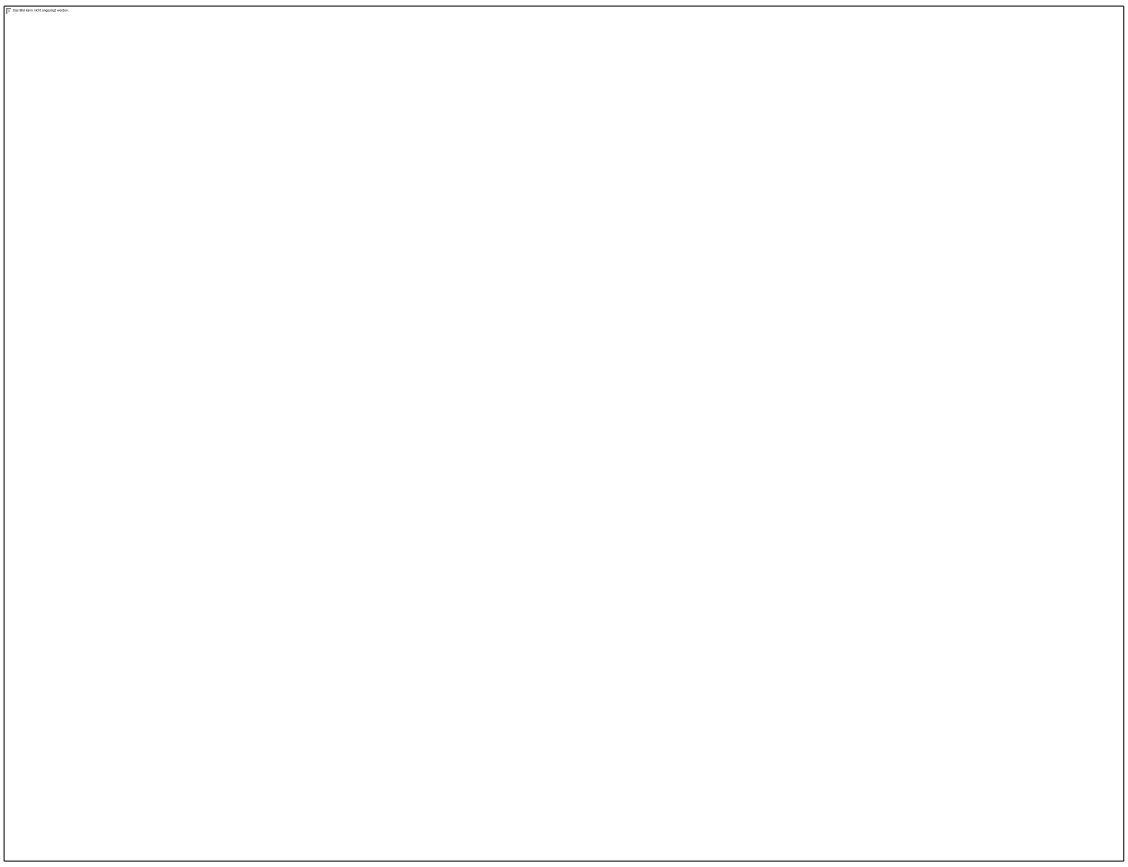
TravelerType

Code	Description	Transportable	Bulk (Offline)	Online Request	Online Reply
YOUNG_CHILD	Young child defined by the carrier depending on the age		X		X
CHILD	Child defined by the carrier depending on the age		X		X
YOUTH	Youth defined by the carrier depending on the age		X		X
ADULT	Adult defined by the carrier depending on the age		X		X
SENIOR	Senior defined by the carrier depending on the age		X		X
FAMILY_CHILD	Child associated with a family traveling together		X	X	X
ACCOMP_PRM	Accompanying Person for PRM		X		X
PRM_CHILD	Handicapped young child accompanied by one person where the usual child according to the age price would be zero and the accompanying person would also be free		X		X
WHEELCHAIR	Passenger with wheel-chair			X	
PERSON	Used in requests together with date of birth			X	
PRM	Person with reduced mobility - to be used in			X	

Code	Description	Transportable	Bulk (Offline)	Online Request	Online Reply
	case of accompanying person or dog, date of birth must be provided additionally				
DOG	A dog	X	X	X	X
PET	A pet but not a dog	X	X	X	X
LUGGAG	Over-size luggage	X	X	X	X
BICYCLE	A bicycle	X	X	X	X
ACCOMP_DOG	An accompanying dog for a PRM	X	X	X	X
CAR	A car for car-carriage trains	X	X	X	X
MOTOCYCLE	A motorcycle for car carriage trains	X	X	X	X
TRAILER	A trailer for car carriage trains	X	X	X	X

Compliance

To be compliant with the OSDM specification in total a party must be compliant with the offline as well as the online part of the specification. However, a party can decide based on their business need to implement the offline or the online part online based on the role they want to play in the distribution and sales process.



Compliance

Compliance with the Offline Part

An implementation of the bulk data exchange specification is compliant with the specification if

- A feature specified in the data structure is implemented

Or

- A fare providing the feature in its data is excluded from sale

A system receiving data for a fare must be able to understand all features and rules of the fare defined in the data and obey these features and rules or must not sell such a fare.

Compliance with the Online Part

Compliance as an Allocator

The following services/features are mandatory/optional to implement:

Resources	Description	Need to Support
`/locations` and `/trips`	Resources to search for trip and locations	**Mandatory** for train stations UIC code need to be supported.
`/trip-offers-collection` and `/trip-offers` and `/offers`	Resources to get bookable offers	**Mandatory** is to provide at least admission offers.
`/offers/{offerId}/admissions` and `/offers/{offerId}/reservations` and `/offers/{offerId}/ancillaries`	Resources to manipulate parts of an offer consisting of, e.g., admissions, reservations or ancillaries;	**Mandatory**
`/offers/{offerId}/reservations/{reservationId}`	Resources to manipulate seat assignment	*Conditional*; mandatory to be supported in case seat assignment is provided.
`/bookings`	Resources to manipulate bookings	**Mandatory**
`/bookings/{bookingId}/passengers`	Resources to manipulate passenger information at every stage of the flow	**Mandatory**
`/products`	Resources to retrieve products information on one or more products	**Mandatory**
`/bookings/{bookingId}/fulfillments` and `/fulfillments`	Resources to retrieve	**Mandatory** is to support

Resources	Description	Need to Support
	fulfillments, e.g. tickets	A4 PDF tickets.
`/bookings/{bookingId}/refundOffers`	Resources to get and accept a refund offer	**Mandatory** is to support full refund.
`/bookings/{bookingId}/exchangeOffers`	Resources to get and accept an exchange offer	*Optional*
`/coachLayouts`	Resources to get layouts of coaches	*Optional*

All non-functional requirements defined in the services must be fulfilled.

Especially all implementations most support the Tolerant Reader pattern. This integration pattern helps creating robust communication systems. The idea is to be as tolerant as possible when reading data from another service. This way, when the communication schema changes, the readers must not break.

Compliance as a Fare Provider

The following services/features are mandatory/optional to implement:

Resources	Description	Need to Support
`/locations` and `/trips`	Resources to search for trip and locations	*Optional*
`/trip-offers-collection` and `/trip-offers` and `/offers`	Resources to get bookable offers	**Mandatory** is to provide fare offers on a `/trip-offers-collection`. *Optional*: `/offers` for non trip based offers.
`/offers/{offerId}/admissions`and `/offers/{offerId}/reservations` and `/offers/{offerId}/ancillaries` and `/offers/{offerId}/fares`	Resources to manipulate parts of an offer consisting of,	**Mandatory** is to support pre-booking and booking of fares.

Resources	Description	Need to Support
	e.g., admissions, reservations or ancillaries; if permitted, also fares are offered.	
`/bookings`	Resources to manipulate bookings	**Mandatory** is to support bookings consisting of fares except in the special case of direct sale fare offers
`/offers/{offerId}/passengers` and `/bookings/{bookingId}/passengers`	Resources to manipulate passenger information at every stage of the flow	*Conditional*, mandatory to be supported in case personal data are required by the fare provider
`/products`	Resources to retrieve products information on one or more products	**Mandatory**
`/offers/{offerId}/fares/{fareId}` and `/offers/{offerId}/reservations/{reservationId}`	Resources to manipulate seat assignment	*Conditional*, to be supported in case seat assignment is provided.
`/bookings/{bookingid}/fulfillments` and `fulfillments`	Resources to retrieve fulfillments, e.g. tickets	*Conditional*, mandatory to be supported in case fulfillment items need to be provided

Resources	Description	Need to Support
`/bookings/{bookingId}/refundOffers`	Resources to get and accept a refund offer	**Mandatory** is to support for full refund, partial refund is optional. Not required in the special case of direct sale offers
`/bookings/{bookingId}/exchangeOffers`	Resources to get and accept an exchange offer	*Optional*
`/coachLayouts` and `/coachLayouts/{layoutId}`	Resources to get layouts of coaches	*Optional*

All non-functional requirements defined in the services must be fulfilled.

On a technical level the implementation must support the Tolerant Reader pattern. This integration pattern helps creating robust communication systems. The idea is to be as tolerant as possible when reading data from another service. This way, when the communication schema changes, the readers must not break.

An implementation of specification is compliant with the specification if for a given version

- A feature specified in the data structure is implemented

Or

- A fare providing the feature in its data is excluded from sale

A system receiving data for a fare must be able to understand all features and rules of the fare defined in the data and obey these features and rules or must not sell such a fare.