SLOVENSKI STANDARD

SIST EN 12896-3:2017

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Inteligentni transportni sistemi - Referenčni podatkovni model - 3. del: Časovne informacije in razporejanje vozil

Intelligent transport systems - Reference data model - Part 3: Timing information and vehicle scheduling

Öffentlicher Verkehr - Datenreferenzmodell - Teil 3: Taktinformationen und Fahrzeugdisposition

Télématique du transport routier et de la circulation - Modèle de données de référence - Partie 3 : Informations horaires et horaires des véhicules

Ta slovenski standard je istoveten z: **EN 12896-3:2016**

ICS:

35.240.60	Uporabniške rešitve IT v prometu	IT applications in transport

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EUROPEAN STANDARD

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EUROPÄISCHE NORM

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English Version

Public transport - Reference data model - Part 3: Timing information and vehicle scheduling

Télématique du transport routier et de la circulation - Modèle de données de référence - Partie 3 : Informations horaires et horaires des véhicules

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This European Standard was approved by CEN on 5 May 2016.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (EN 12896-3:2016) has been prepared by Technical Committee CEN/TC 278 "Transmodel", the secretariat of which is held by NEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by March 2017, and conflicting national standards shall be withdrawn at the latest by March 2017.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document together with documents EN 12896-1:2016 and EN 12896-2:2016 supersedes EN 12896:2006.

The series composed of the following documents:

Public transport - Reference data model - Part 1: Common concepts

Public transport - Reference data model - Part 2: Public transport network

Public transport - Reference data model - Part 3: Timing information and vehicle scheduling

Public transport - Reference data model - Part 4: Operations monitoring and control

Public transport - Reference data model - Part 5: Fare management

Public transport - Reference data model - Part 6: Passenger information

Public transport - Reference data model - Part 7: Driver management

Public transport - Reference data model - Part 8: Management information and statistics

Together these create version 6 of the European Standard EN 12896, known as "Transmodel" and thus replace Transmodel V5.1.

The split into several documents intends to ease the task of users interested in particular functional domains. Modularisation of Transmodel, undertaken within the NeTEx project, has contributed significantly to this new edition of Transmodel.

In addition to the eight Parts of this European Standard, an informative Technical Report (Public transport – Reference data model – Informative documentation) is also being prepared to provide additional information to help those implementing projects involving the use of Transmodel. It is intended that this Technical Report will be extended and republished as all the eight parts are completed.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

EN 12896-3 presents the following items:

— rationale for the Transmodel Standard;

— use of the Transmodel Standard;

— applicability of the Transmodel Standard;

— conformance statement;

— Transmodel origins;

— reference to the previous version and other documents.

The data structures represented in EN 12896-1 are generic patterns that are referenced by different other parts.

EN 12896-2 presents space-related data structures.

This European Standard presents time-related data structures and replaces the sections of EN 12896:2006 referring to the *time-related* tactical planning components and to vehicle scheduling.

1 Scope

1.1 General scope of the Standard

The main objective of the present standard is to present the reference data model for public transport, based on:

— the reference data model, EN 12896, known as Transmodel V5.1;

— EN 28701, known as IFOPT;

incorporating the requirements of:

— EN 15531-1 to –3 and CEN/TS 15531-4 and CEN/TS 15531-5, *Service interface for real-time information relating to public transport operations (SIRI)*;

— CEN/TS 16614-1 and CEN/TS 16614-2, *Network and Timetable Exchange (NeTEx)*, in particular, the specific needs for long distance train operation.

A particular attention is drawn to the data model structure and methodology:

— the data model is described in a modular form in order to facilitate the understanding and the use of the model;

— the data model is entirely described in UML.

In particular, a Reference Data Model kernel is described, referring to the data domain:

— network description: routes, lines, journey patterns, timing patterns, service patterns, scheduled stop points and stop places.

This part corresponds to the Transmodel V5.1 network description extended by the IFOPT relevant parts.

Furthermore, the following functional domains are considered:

— timing information and vehicle scheduling (runtimes, vehicle journeys, day type-related vehicle schedules);

— passenger information (planned and real-time);

— fare management (fare structure, sales, validation, control);

— operations monitoring and control: operating day-related data, vehicle follow-up, control actions;

— management information and statistics (including data dedicated to service performance indicators);

— driver management:

  — driver scheduling (day-type related driver schedules);

  — rostering (ordering of driver duties into sequences according to some chosen methods);

  — driving personnel disposition (assignment of logical drivers to physical drivers and recording of driver performance).

The data modules dedicated to cover most functions of the above domains will be specified.

Several concepts are shared by the different functional domains. This data domain is called “common concepts”.

1.2 Functional domain description

The different functional domains taken into account in the present standard and of which the data have been represented as the reference data model are described in “Public transport reference data model - part 1: Common concepts”.

They are:

— public transport network and stop description;

— timing information and vehicle scheduling;

— passenger information;

— fare management;

— operations monitoring and control;

— management information;

— personnel management: driver scheduling, rostering, personnel disposition.

The aspects of multi-modal operation and multiple operators’ environment are also taken into account.

1.3 Particular scope of this document

The present European Standard entitled “Reference data model for public transport – Part 3: Timing information and vehicle scheduling” incorporates:

— journey and journey times model: describes the time-related information at the level of vehicle journeys, i.e. planned timing for the vehicles at day-type level;

— dated journey model: describes the link of the timing information for a single operating day and the day type related timing;

— passing times model: describes all the different types of passing times for the day type related information;

— vehicle service model: describes the information related the work of vehicles as planned for days types. it constitutes the main part of the vehicle scheduling data domain;

— vehicle journey assignment model: describes operational assignments (advertised vehicle labels, stopping positions) related to particular vehicle journeys.

This document itself is composed of the following parts:

— main document (normative) representing the data model;

— Annex A (normative), containing the data dictionary and attributes tables, i.e. the list of all the concepts present in the main document together with the definitions;

— Annex B (informative), indicating the data model evolutions.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 12896-1:2016, *Public transport - Reference data model - Part 1: Common concepts*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 12896-1:2016 apply.

4 Symbols and abbreviations

AVM	Automated vehicle monitoring
AVMS	Automated vehicle management system
IFOPT	Identification of fixed objects in public transport
ISO	International standards organization
IT	Information technology
NeTEx	Network and Timetable Exchange
PT	Public transport
PTO	Public transport operator
SIRI	Service interface for real-time information
UML	Unified modelling language
URI	Uniform resource identifier
URL	Universal resource locator

5 Timing information and vehicle scheduling data domain

5.1 Introduction

The work of the vehicles necessary to provide the service offer advertised to the public consists of service journeys and dead runs (unproductive journeys are necessary to transfer vehicles where they are needed, mainly from the depot into service and vice versa). Vehicle journeys are defined for day types rather than individual operating days. A day type is a classification of all operating days for which the same service offer has been planned. The whole tactical planning process is seen on the level of day types in the reference data model, with all entities necessary to develop schedules. These include a series of entities describing different types of run times and wait times, scheduled interchanges, turnaround times etc.

Chaining vehicle journeys into blocks of vehicle operations, and cutting driver duties from the vehicle blocks, are parts of the main functions of vehicle scheduling and driver scheduling, respectively. The corresponding entities and relationships included in the reference data model allow a comprehensive description of the data needs associated with this functionality, independently of the particular methods and algorithms applied by the different software systems.

5.2 Overview

5.2.1 Model and document structure

The timing information model is splits into four main sub-models defined as UML packages.

— Journey and journey times model: describes the time-related information at the level of vehicle journeys, i.e. planned timing for the vehicles at day-type level. It splits into:

  — vehicle journey model;

  — service journey model;

  — time demand times model;

  — journey timing model ;

  — journey pattern times model;

  — vehicle journey times model;

  — interchange model;

  — interchange rule model;

  — coupled journey model;

  — flexible service model;

  — journey accounting model;

— dated journey model: describes the link of the timing information for a single operating day and the day type related timing;

— passing times model: describes all the different types of passing times for the day type related information;

— vehicle service model: describes the information related the work of vehicles as planned for days types. It constitutes the main part of the vehicle scheduling data domain.

5.3 Journey and journey times

5.3.1 Vehicle journey

5.3.1.1 VEHICLE JOURNEY – Conceptual model

5.3.1.1.1 General

The daily operation of a vehicle is described by VEHICLE JOURNEYs. A VEHICLE JOURNEY is the defined movement of a vehicle using a specified JOURNEY PATTERN on a particular ROUTE. This movement is made between the first and the last POINTs IN JOURNEY PATTERN. Being defined for a DAY TYPE (cf. [7]), a VEHICLE JOURNEY is a class of journeys that would take place at the same time on each day of a specific DAY TYPE.

5.3.1.1.2 Basic vehicle journey – Conceptual model

There are two different main types of VEHICLE JOURNEYs: passenger-carrying SERVICE JOURNEYs and non-service DEAD RUNs.

— A SERVICE JOURNEY is a VEHICLE JOURNEY on which passengers will be allowed to board or alight from vehicles at stops. These journeys are usually published and known by passengers.

— A DEAD RUN may be necessary for the vehicle to proceed from the PARKING POINT (cf. [7]) at which it was parked to the first SCHEDULED STOP POINT of the JOURNEY PATTERN (cf. [8]) where it will start its service operation. In the opposite direction, a DEAD RUN may relate the last SCHEDULED STOP POINT the vehicle has stopped at (finishing its service) to the PARKING POINT where it will be parked. A DEAD RUN may also occur when a vehicle changes from one ROUTE (cf. [8]) to another one in order to continue its service there, or for various other reasons.

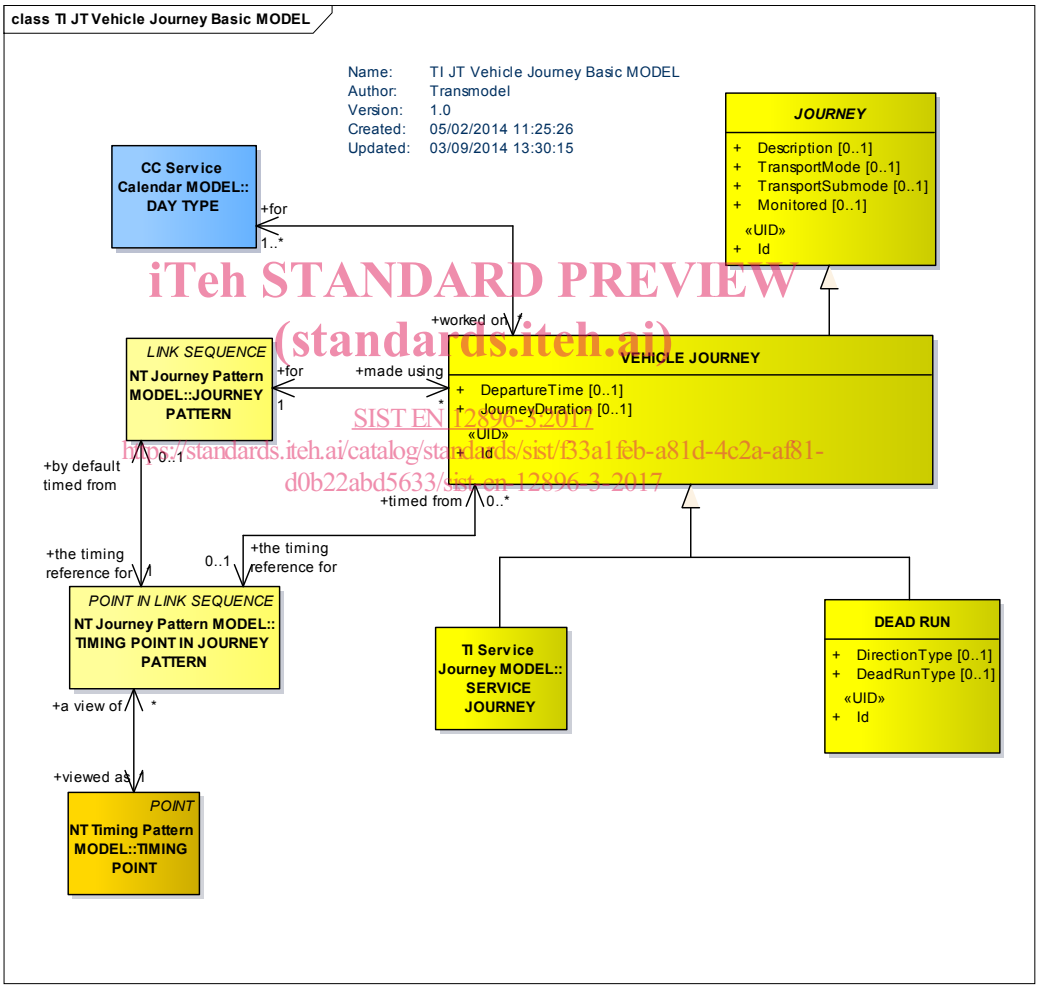

Figure 1 — Vehicle journey – Basic conceptual model (UML)

5.3.1.1.3 Vehicle journey details – Conceptual model

A VEHICLE JOURNEY may be further defined by a number of other elements, as shown in Figure 2. These include interactions with other journeys (JOURNEY PART, JOURNEY MEETING, etc.); temporal and other conditions (DAY TYPE, VALIDITY CONDITION, cf. [7]); further descriptive and classification

information (TRAIN NUMBER, PRODUCT CATEGORY, TYPE OF SERVICE, stops etc,); and operational data (BLOCK).

A TEMPLATE JOURNEY allows a set of VEHICLE JOURNEYs to be defined that follow a common temporal pattern.

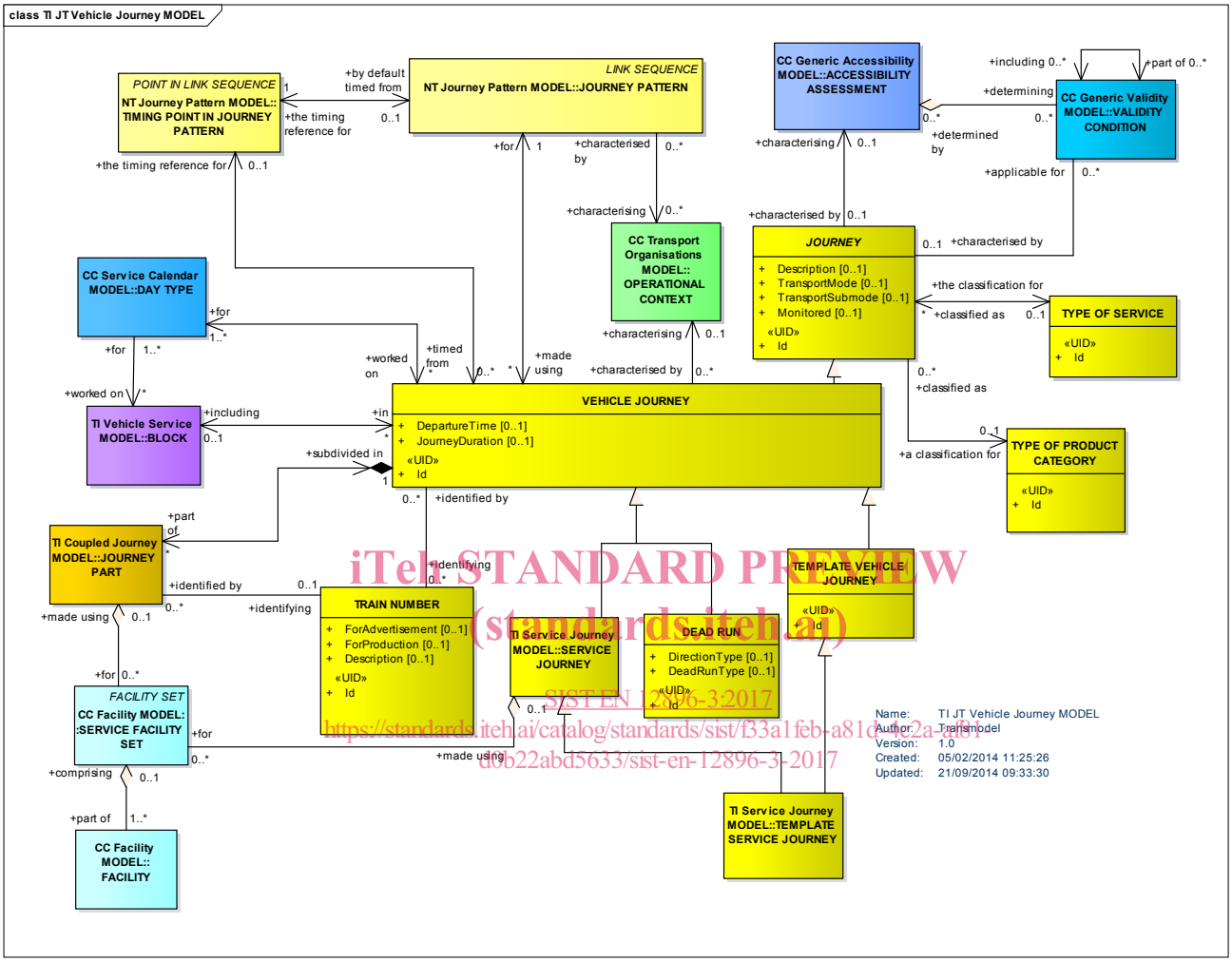

Figure 2 — Vehicle journey – conceptual model (UML)

5.3.1.2 Vehicle journey notice assignment

For passenger information (or sometimes driver information) purposes, it is often useful to attach remarks to various parts of the supply (a point, a line, a section, etc.). For instance, the fact that a shortened journey pattern is used exceptionally may be emphasized. Such remarks are usually printed as footnotes on public timetables at stops, timetable booklets or, for driver information, on driver cards.

The entity NOTICE (cf. [7]). describes such remarks. It may concern a whole LINE, or a GROUP OF POINTS, e.g. one or several STOP AREAs.

More frequently, a NOTICE will be assigned to a JOURNEY PATTERN, a COMMON SECTION (cf. [8]), or even a specific VEHICLE JOURNEY. In such a case, the same NOTICE often will be assigned to several objects (e.g. to several consecutive VEHICLE JOURNEYs).

Moreover, the validity of a NOTICE, for instance on a JOURNEY PATTERN or a COMMON SECTION, may be restricted from a POINT IN JOURNEY PATTERN, or to another POINT IN JOURNEY PATTERN.

The entity NOTICE ASSIGNMENT (cf. [8]) describes these spatial or operational assignments. Only the most frequent assignments are represented in the model. Other may be added using the same construction.

A NOTICE ASSIGNMENT may be subject to various other conditions of validity (such as DAY TYPE, TIME BAND), represented by VALIDITY CONDITIONs.

A NOTICE has a different meaning than a DESTINATION DISPLAY (cf. [8]). The first is designed to specify some characteristics of a journey or a journey pattern which are likely to evolve. They are in most cases printed in leaflets, but may also be queried by dynamic trip planning tools. A DESTINATION DISPLAY corresponds to stable information attached to a JOURNEY PATTERN, for instance the destination announcement displayed on bus headsigns.

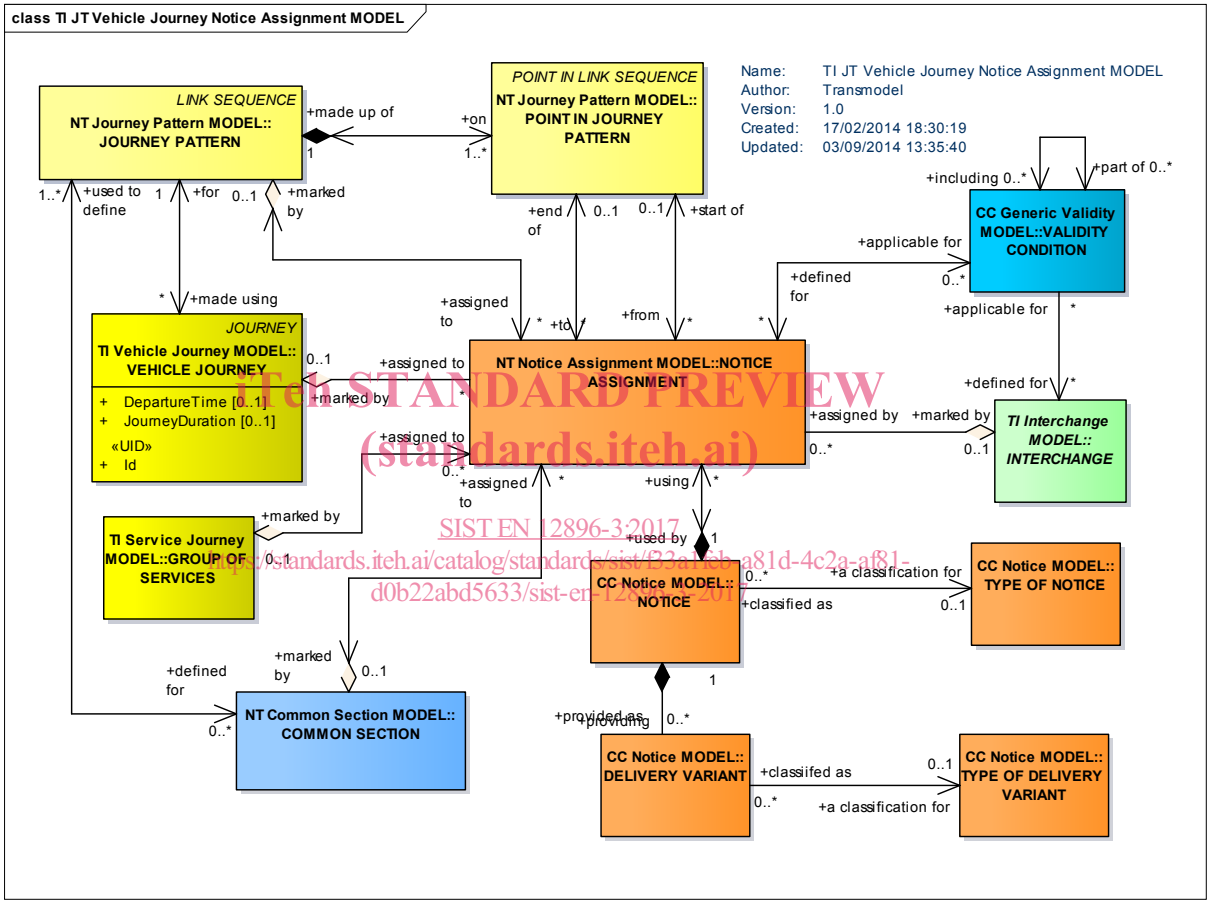

Figure 3 — Vehicle journey notice assignment – Conceptual model (UML)

5.3.2 Service journey

5.3.2.1 SERVICE JOURNEY – Conceptual model

A SERVICE JOURNEY is a VEHICLE JOURNEY on which passengers will be allowed to board or alight from vehicles at stops. There are several different possible ways to define SERVICE JOURNEYs, in particular the two following:

— as the service between an origin and a destination, as advertised to the public;

— as the longest service during which a passenger is allowed to stay on the same vehicle.

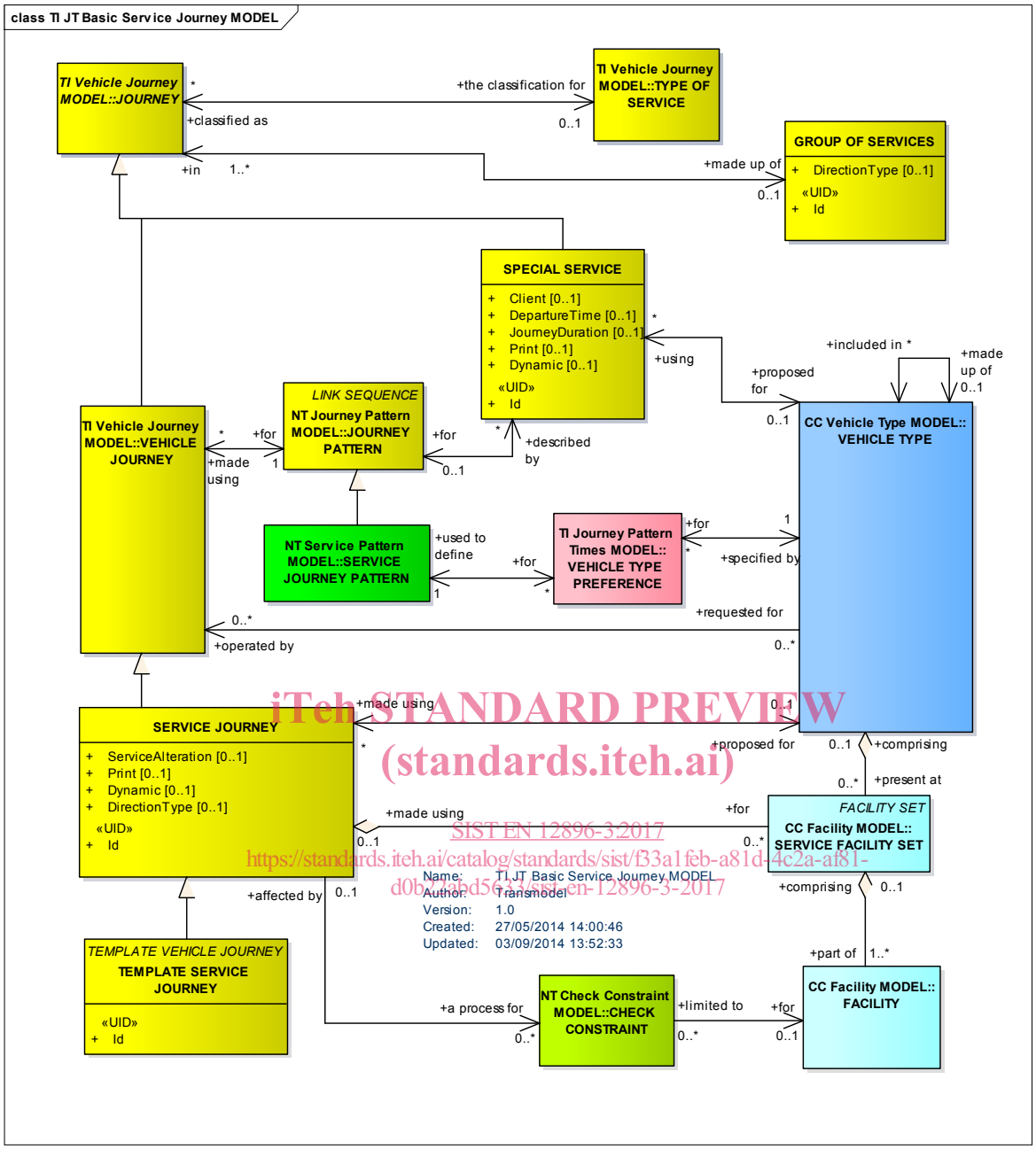

Figure 4 — Service journey – basic conceptual model (UML)

In addition to the distinction between SERVICE JOURNEYs and DEAD RUNs, operators may wish to classify VEHICLE JOURNEYs by further criteria. For these purposes a TYPE OF SERVICE may be assigned to a VEHICLE JOURNEY, which would express other common properties (e.g. “journey at the maximum load period”).

A default VEHICLE TYPE (cf. [7]) may be proposed for a journey, chosen according to the time of day at which a SERVICE JOURNEY takes place, and the ROUTE and JOURNEY PATTERN (cf. [8]) it covers. The proposed VEHICLE TYPE preferably will be taken into account by the scheduling algorithm used to compile blocks of vehicle operation. The choice of such a preference may take into account a ranked list of VEHICLE TYPEs for each SERVICE JOURNEY PATTERN. This is described by the class VEHICLE TYPE PREFERENCE, depending on a particular SERVICE JOURNEY PATTERN, for which a priority ‘rank’ is given for each VEHICLE TYPE, for each DAY TYPE and TIME DEMAND TYPE.

SERVICE JOURNEY INTERCHANGE (the scheduled possibility for transfer of passengers between two SERVICE JOURNEYs at the same or different SCHEDULED STOP POINTs) occurring on the SERVICE JOURNEY and facilities (grouped in a SERVICE FACILITY SET) available for the SERVICE JOURNEY, are also important related information, especially when advertising to the public.

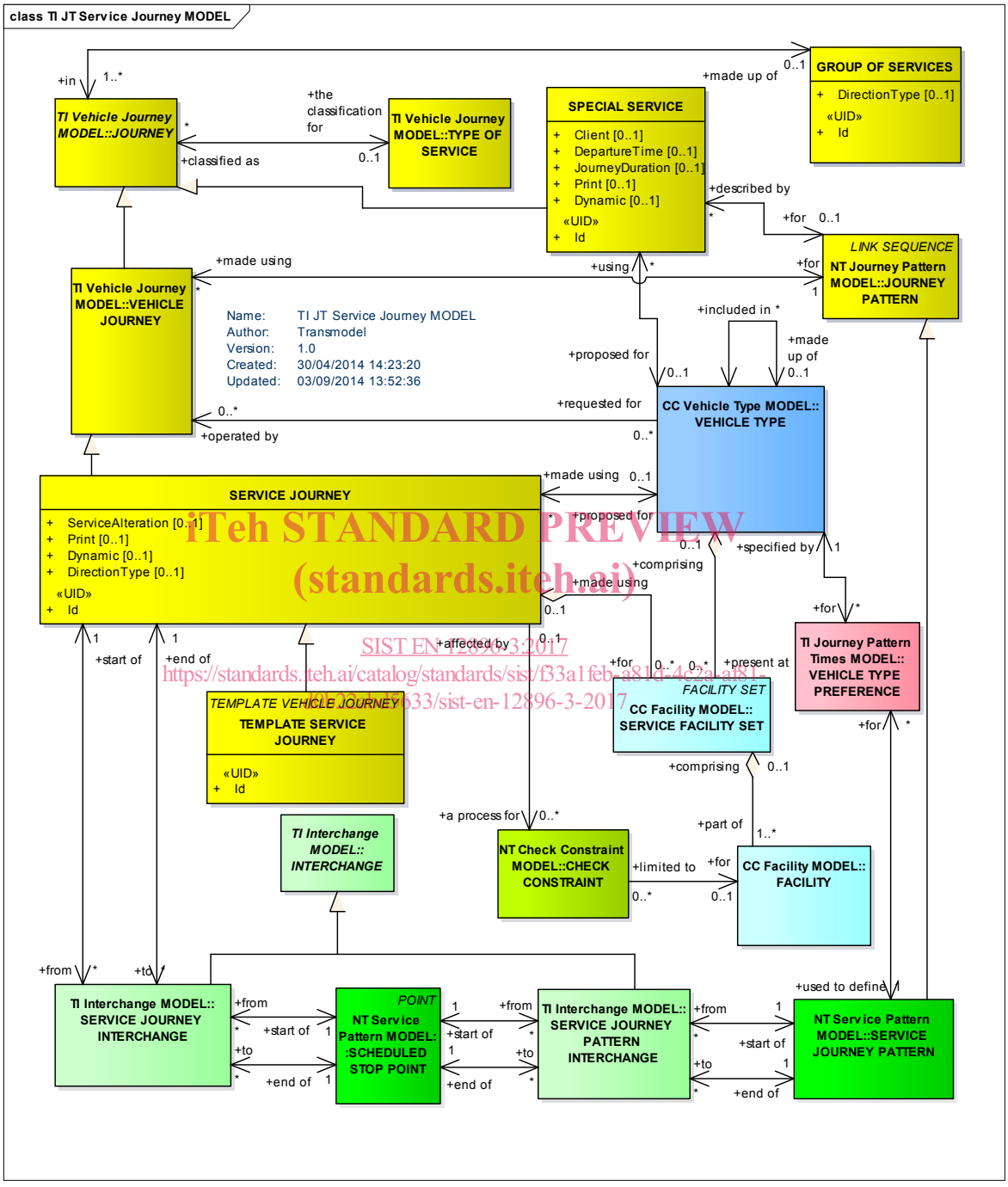

Figure 5 — Service journey – Conceptual model (UML)

5.3.2.2 Special services

Most public transport services are operated in a classical way, on a LINE grouping two or more SERVICE JOURNEY PATTERNs, along which passengers may board or alight at fixed stop points, paying fares