Semantics of Business Vocabulary and Business Rules (SBVR), v1.4

Annex G - EU-Rent Example

Note: This SBVR Annex is published as a separate document solely for convenience and ease of use. The fact that it is published as a separate SBVR specification document makes no change to its status as part of the SBVR specification, or the way in which it can be updated under OMG Policies and Procedures.
Annex G - EU Rent Example

(informative)

G.1 General

This Annex presents an example of how the business vocabulary and business rules of EU-Rent (pronounced “you rent”), a fictional individual company, might be expressed using SBVR Structured English (SBVR SE). It is presented in four parts:

1. Introduction: an overview of the company, its communities and its adopted vocabularies.
2. The EU-Rent English Terminological Dictionary, in SBVR SE.
3. The EU-Rent Rulebook, in SBVR SE.
4. Local extensions of SBVR specific to EU-Rent’s requirements, including concepts adopted from the OMG’s Date-Time Vocabulary.

Sub part I - Introduction

G.2 Purpose

The primary audiences for the specification are (i) tool developers who want to implement SBVR, and (ii) consultants and trainers who want to develop SBVR methodology and training material. The purpose of this Annex is to provide an aid to help them understand the specification - a substantial example illustrating features of SBVR that might typically be used in developing vocabulary and rules for a business. It might also be developed into a test case.

This Annex is not intended to be a tutorial for SBVR users: business rule owners, vocabulary custodians, and business analysts. If they find it helpful, then that is an extra benefit. But, in getting started with SBVR, they will almost certainly be better served by training material from tool vendors and service providers, developed specifically for teaching how to use SBVR.

One aspect of this example that works against its being a user tutorial is that different ways of representing the same kinds of concepts are deliberately included, to illustrate SBVR features and capabilities. A real organization that used SBVR would probably develop a simpler and more uniform style for expressing its vocabulary and rules.

G.3 Scope

The scenario: EU-Rent is developing vocabulary and rules for its car rentals business. There is no existing in-house SBVR vocabulary and rules that can be used or must be complied with. EU-Rent does adopt some concepts from external vocabularies, including ISO standards, a (fictional) industry standard glossary, and the OMG’s Date-Time Vocabulary.

Other aspects of EU-Rent’s business (purchasing and sales, property management, HR, finance, IT systems and infrastructure, etc.) could follow later. The vocabulary and rules for them, of course, would have to be made consistent with the vocabulary and rules developed here.

Some entries have been left informal in order to limit the overall size of the case study. In an SBVR vocabulary and rules for a real company, they might have been expanded into substantial formal structures.
G.4   SBVR Structured English Style

SBVR SE supports multiple ways of representing some meanings and, in some parts of EU-Rent, different ways of representing similar concepts have been used in order to illustrate this. So, this Annex should be regarded as one way of representing EU-Rent’s vocabulary and rules in SBVR SE - not the only way, and not necessarily the best way.

In practice, a real company would probably develop or adopt a style guide that set out its requirements and preferences for use of options available in SBVR. This would increase consistency and, hence, ease of communication in SBVR SE within the company. The best style guide would be one which best fitted the communication style of the company - the one with which the employees were most familiar and most comfortable.

G.4.1   Commentary

Some comments about use of SBVR SE are included, in boxes with a lightly-shaded background color.

G.4.2   Content

The content presented here is an ‘output view’ as might be provided in a report from an SBVR-compliant tool. Given a tool with reasonable editing capabilities it would not be necessary to type in much of the text presented. In particular, the supporting descriptions for business rules (modified verb concept, supporting verb concepts and additional supporting vocabulary) would not need to be typed in; they would be side effects of constructing the rules, displayed if the tool had the capability to do so.

The case study was developed by following the ‘business rules mantra’ - that verb concepts are built on noun concepts and business rules are built on verb concepts - and recognizing that it’s easier with support from tools. Such support might include:

- Selecting items to fill places in templates by clicking and dragging, or selecting them from drop-down lists.
- An autocomplete capability offering existing entries as styled choices for writing definitions.
- Some validation, e.g., in a specialization of a verb concept, the noun concepts selected to fill the roles would be validated as specializations of the noun concepts in the general version (and the 'General Concept' entry generated automatically).
- A graphical interface that might offer, for example, an option to construct a rule from a tree structure of verb concepts.
- Flexible browsing and reporting options.

Capabilities will vary between tools, but the important message is: SBVR users who use a tool that supports SBVR SE will not have to type in much of the content presented here.
G.4.3 SBVR Features

The following table provides a brief overview of some SBVR capabilities particularly emphasized in sub clauses of this Annex.

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G.5 Introduction to EU-Rent

EU-Rent is a (fictional) international car rental business with operating companies in several countries. In each country it offers broadly the same kinds of cars, ranging from ‘economy’ to ‘premium’ although the mix of car models varies between countries. Rental prices also vary from country to country. EU-Rent seeks repeat business, and positions itself to attract business customers.

G.5.1 Overview of EU-Rent’s Business

EU-Rent rents cars to its customers. A rental customer may be an individual or an accredited member of a corporate customer (a company or similar organization).

A car rental is a contract between EU-Rent and one person, the renter, who is responsible for payment for the rental and any other costs associated with the rental (except those covered by insurance). This personal responsibility exists whether the renter is a private individual or a member of a corporate customer.

Different models of car are offered, organized into groups. All cars in a group are charged at the same rates within a country. Renters pick up their rented cars from, and return them to, EU-Rent branches. Branches may be operated by EU-Rent on sites that it owns or leases, or they may be third-party agencies in locations such as hotels and travel agents’ offices.
A car may be rented by a booking made in advance, or immediately by a ‘walk-in’ renter.

A rental booking specifies: the car group required; the start and end dates/times of the rental; the EU-Rent branch from which the rental is to start. Optionally, the booking may request a specific car model within the required group.

A rental may be ‘round-trip’ (in which case the car is returned to the branch from which it was picked up) or ‘one-way’ (in which case the car is returned to a branch different from the pick-up branch). The booking for a one-way rental must specify the return branch.

The renter of a rental (the person contractually responsible for the rental) must be authorized as a driver for that rental. Additional drivers may be authorized for the rental.

EU-Rent has a loyalty club. Customers who join accumulate points that they can use to pay for rentals.

EU-Rent from time to time offers discounts and free upgrades, subject to conditions.

EU-Rent records ‘bad experiences’ with customers (such as unauthorized late return from rental, damage to car during rental, unpaid parking and speeding tickets) and may bar such customers from having subsequent rentals.

G.5.2 Introductory Examples

Below are some elements of guidance, selected from the main part of the case study to illustrate how guidance is expressed and how verb concepts represented in the vocabulary support the formulation of guidance.

The intention is to provide an initial impression of what EU-Rent’s business rules look like and how they are supported by verb concepts as expressed in EU-Rent’s vocabulary, before going into the full detail of the case study. The examples also appear, with related elements of guidance, in the main body of the case study that follows this introduction.

There is some supporting detail below each element of guidance:

- ‘Modality qualifies’ indicates the verb concept that is central to the element of guidance, indicating the kind of situation that is obligatory, necessary, permitted or possible.
- ‘Supporting verb concepts’ are the additional verb concepts on which the guidance is directly based. They qualify or quantify the roles in the central verb concept
- ‘Referenced vocabulary’ indicates related semantic associations in EU-Rent’s body of shared meanings that would be of interest to a business person.

1 Behavioral business rule: It is obligatory that each driver who is authorized for a rental is qualified.
   Modality qualifies: driver is qualified
   Supporting verb concepts: person is authorized for rental
   Referenced vocabulary: The noun concept 'driver' is a facet of the noun concept 'person'.

2 Behavioral business rule: It is obligatory that a rental incurs a location penalty charge if the drop-off branch of the rental is not the return branch of the rental.
Modality qualifies: rental incurs penalty charge

Supporting verb concepts: rental has drop-off branch
rental has return branch

Referenced vocabulary: The noun concept 'drop-off branch' is a situational role that ranges over the noun concept 'branch'.

The noun concept 'return branch' is a situational role that ranges over the noun concept 'branch'.

The noun concept 'location penalty charge' is a category of the noun concept 'penalty charge'.

3 Behavioral business rule:
It is obligatory that the fuel level of the rented car of a rental is full at the actual pick-up date-time of the rental.

Modality qualifies: state of affairs 'the fuel level of the rented car of a given rental is full' occurs at the actual pick-up date-time of the rental.

Supporting verb concepts: rental has actual pick-up date-time
rental has rented car
rental car has fuel level
state of affairs occurs at date-time

Referenced vocabulary: The noun concept 'rented car' is a situational role that ranges over the noun concept 'rental car'.

fuel level is full or 7/8 or 5/8 or 1/2 or 3/8 or 1/4 or 1/8 or empty

The noun concept 'actual pick-up date-time is a situational role that ranges over the noun concept 'date-time'.

4 Behavioral business rule:
It is prohibited that the rental duration of a rental is greater than 90 rental days.

Modality qualifies: duration₁ is greater than duration₂

Supporting verb concepts: rental has rental duration

Referenced vocabulary: The noun concept 'rental duration' is a situational role that ranges over the noun concept 'duration'.

rental duration is measured in rental time unit [aka RTU].
The individual noun concept 'Rental Day specializes the noun concept 'rental time unit'.

Semantics of Business Vocabulary and Business Rules, Annex G, v1.4
5 Behavioral business rule: It is permitted that a rental is open only if an estimated rental price of the rental is provisionally charged to a credit card that is in the name of the renter who is responsible for the rental.

Modality qualifies: rental being open

Supporting verb concepts: rental has rental price
estimated rental price is provisionally charged to credit card
person is named on credit card
renter is responsible for rental

Referenced vocabulary: The noun concept 'estimated rental price' is a category of the noun concept 'rental price'.
The noun concept 'renter' is a situational role that ranges over the noun concept 'driver'.
The noun concept 'driver' is a facet of the noun concept 'person'.

6 Definitional business rule: It is necessary that the rental price has exactly one rental period.

Modality qualifies: rental has rental period

7 Definitional business rule: It is necessary that the rental price of a rental is calculated in the business currency of the rental.

Modality qualifies: rental price is calculated in business currency

Supporting verb concepts: rental has rental price
rental has business currency

8 Definitional business rule: It is necessary that at the drop-off date-time of an in-country car movement the local area that manages the receiving branch of the car movement becomes the rental car owner of the moved car that is included in the car movement.
Modality qualifies: state of affairs 'the local area that manages the receiving branch that is included in an in-country car movement becomes the rental car owner of the moved car that is included in the in-country car movement' occurs at the drop-off date-time of the in-country car movement

Supporting verb concepts: state of affairs occurs at date-time
individual noun concept changes unitary concept
car movement has drop-off date-time
car movement includes receiving branch
car movement includes moved car
local area owns rental car
local area manages branch

Referenced vocabulary: The noun concept 'rental car owner' is a situational role that ranges over the noun concept 'local area'.
The noun concept 'moved car' is a situational role that ranges over the noun concept 'rental car'.
The noun concept 'in-country car movement' is a category of the noun concept 'car movement'.
The individual noun concept 'the local area that manages the receiving branch of an in-country car movement' has an instance of the noun concept 'local area' as the thing in its extension.
The unitary concept 'the rental car owner of the moved car that is included in an in-country car movement' has an instance of the noun concept 'local area' as the thing in its extension.
The proposition 'the individual noun concept "the local area that manages the receiving branch of an in-country car movement" changes the unitary concept "the car owner of the moved car that is included in an in-country car movement" is based on the verb concept 'individual noun concept changes unitary concept'.

9 Advice of possibility: It is possible that the notification date-time of a bad experience is after the actual return date-time of the rental that includes the bad experience.

Modality qualifies: notification date-time is after actual return date-time

Supporting verb concepts: bad experience has notification date-time
rental has actual return date-time
rental includes bad experience
date-time2 is after date-time1

Referenced vocabulary: the noun concept 'notification date-time' is a situational role that ranges over the noun concept 'date-time'
the noun concept 'actual return date-time' is a situational role that ranges over the noun concept 'date-time'
Sub part II - EU-Rent English Terminological Dictionary

G.6 The EU-Rent Vocabulary Business Context

The entries in this sub clause define the business context of EU-Rent’s several vocabularies (i.e., its communities and subcommunities, its vocabularies and bodies of shared meanings, and how these elements inter-relate). Figure G1 presents a partial instance diagram of the noun and verb concepts that express EU-Rent’s vocabulary business context.
Figure G.1 - Concepts expressing EU-Rent's vocabulary business context
G.6.1 EU-Rent Communities

G.6.1.1 EU-Rent Semantic Communities

The Car Rental Industry
Definition: the semantic community that is the group of people who work in the business of renting cars

Car Rental Business
Definition: the body of shared meanings that is the set of meanings that are generally accepted as important across The Car Rental Industry

EU-Rent
Definition: the international car rental company that trades as 'EU-Rent'

The EU-Rent Community
Definition: the semantic community that includes all employees of EU-Rent and all others who share their body of meanings and use their vocabularies
Necessity: The EU-Rent Community is a subcommunity of The Car Rental Industry.

EU-Rent Car Rental Business
Definition: the body of shared meanings that is the set of meanings that are important to The EU-Rent Community
Necessity: EU-Rent Car Rental Business unites The EU-Rent Community.

EU-Rent HQ
Definition: the organization unit that is EU-Rent’s world headquarters and management company
Description: EU-Rent HQ sets global policy and owns EU-Rent’s worldwide reservations system.

EU-Rent HQ Staff
Definition: the community that is the set of employees of EU-Rent HQ
Necessity: EU-Rent HQ Staff is a subcommunity of The EU-Rent community.

G.6.1.2 EU-Rent Speech Communities

The EU-Rent English Community
Definition: the speech community that is a subcommunity of The EU-Rent Community and uses English as its primary natural language
Description: Most members of The EU-Rent English Community are employees of: EU-Rent HQ, EU-Rent CA, EU-Rent GB, EU-Rent IE, EU-Rent US; trading partners of those EU-Rent companies; other EU-Rent operating companies who interact in English with them.

The EU-Rent German Community
Definition: the speech community that is a subcommunity of The EU-Rent Community and uses German as its primary natural language
Description: Most members of The EU-Rent German Community are employees of: EU-Rent DE or EU-Rent CH; trading partners of EU-Rent DE; other EU-Rent operating companies who interact in German with EU-Rent DE.

G.6.2 EU-Rent Vocabularies

EU-Rent Vocabulary Registration Vocabulary

General Concept: Vocabulary
Language: English

G.6.2.1 Language-independent Vocabulary

ISO
Definition: International Organization for Standardization (www.iso.org)

ISO 3166
Source: http://www.iso.org/iso/home/standards/country_codes/iso-3166-1_decoding_table.htm
Definition: the vocabulary that is owned by ISO, to specify 2-character, 3-character and 3-digit codes that identify countries

ISO 3779:2009
Source: http://www.iso.org/iso/catalogue_detail?csnumber=52200
Definition: the vocabulary that is owned by ISO to specify the content and structure of a vehicle identification number (VIN) in order to establish, on a world-wide basis, a uniform identification numbering system for road vehicles.

ISO 7001
Definition: a vocabulary that is owned by ISO, to specify graphical symbols that have consistent meanings regardless of which natural languages they are used with
Source: http://www.iso.org/iso/catalogue_detail?csnumber=41081
Reference Scheme: ISO 7001 index entry
ISO 7010
Definition: a vocabulary that is owned by ISO, to specify graphical symbols that have consistent meanings regardless of which natural languages they are used with
Reference Scheme: ISO 7010 index entry

ISO 4217
Source: www.iso.org/iso/catalogue_detail?csnumber=46121
Definition: the vocabulary that is owned by ISO, to specify 2-character, 3-character and 3-digit codes that identify currencies

G.6.3 Language-specific Vocabularies

G.6.3.1 English Vocabularies

CRISG
Definition: (fictional) vocabulary that is owned by The Car Rental Industry
Synonym: Car Rental Industry Standard Glossary
Language: English
Reference Scheme: CRISG terms
Source: www.fictional-cri.org/crisg [not a real URI]

Car Rental Industry Standard Glossary
See: CRISG

MWU
Source: http://unabridged.merriam-webster.com
Definition: vocabulary that is known as ‘Merriam-Webster’s Unabridged Dictionary’
Language: English
Reference Scheme: MWU terms

EU-Rent English Vocabulary
Definition: vocabulary that is owned by The EU-Rent English Community and is applicable to EU-Rent’s car rental business
Necessity: CRISG has precedence over MWU.
EU-Rent English Vocabulary Extensions
Definition: a vocabulary that is owned by The EU-Rent English Community and has wider applicability than EU-Rent’s car rental business
Note: The EU-Rent English Vocabulary Extensions vocabulary is available for adoption by other speech communities.

EU-Rent Enforcement Levels
Definition: a vocabulary that is owned by The EU-Rent English Community for enforcement levels of behavioral business rules
Note: The EU-Rent Enforcement Levels vocabulary is available for adoption by other speech communities.

EU-Rent Language-Independent Vocabulary
Definition: a vocabulary that is owned by ISO

G.6.3.2 German Vocabularies

Deutsches Universalwörterbuch
Definition: vocabulary that is known as ‘the 2003 edition published by Duden’
Synonym: DUW
Reference Scheme: DUW terms
Language: German

DUW
See: Deutsches Universalwörterbuch

GFA
Definition: (fictional) vocabulary that is owned by The Car Rental Industry
Synonym: Glossar für Autovermietungsgeschäft
Reference Scheme: GFA terms
Language: German

Glossar für Autovermietungsgeschäft
See: GFA

EU-Rent German Vocabulary
Definition: vocabulary that is owned by the The EU-Rent German Community
Necessity: GFA has precedence over DUW

EU-Rent Language-independent Vocabulary
General Concept: vocabulary
Included Vocabulary: ISO-3166
Included Vocabulary: ISO 3779:2009
Included Vocabulary: ISO 7001
EU-Rent’s organization has two parts:

- Geography: the countries in which EU-Rent operates (from the perspective of geographical territory rather than nation-states) and the sites (locations) at which it operates;
- EU-Rent’s business operating and management-reporting structure.

### G.6.4.1 Geography

Most of the content of this section will eventually be available in an SBVR Foundation Vocabulary for Geography (analogous to the OMG Date Time vocabulary).

#### G.6.4.1.1 Countries

**country**

- **Definition:** the territory of a usually independent nation that is distinct as to name and the characteristics or attributes of its people
- **Source:** MWU (2b) ['country']
- **Reference Scheme:** ISO 3166 code

When using a *binary verb* concept in a *noun concept’s* Definition clause (such as *name references country* in the entry below), use of the quantifier ‘some’ or ‘a’ for one of the roles means that the *verb concept* acts as a *unary verb concept* – a *characteristic*.

Specifically, this Definition means that an ISO 3166 code is a *name* that has the *characteristic* ‘references a country’.
**ISO 3166 code**

**Synonym:** country code

**Definition:** name that references some country

**Description:** Two-character country identification code

**Source:** ISO 3166 code lists [http://www.iso.org/iso/home/standards/country_codes/country_names_and_code_elements_xml.htm](http://www.iso.org/iso/home/standards/country_codes/country_names_and_code_elements_xml.htm)

**ISO 3166 code references country**

Extensional definitions are often lists of individual noun concepts. This does not have to be so. The entry below includes two general concepts: Eurozone operating country and Nordic country.

**Definition:** operating country

**Concept Type:** situational role

**Definition:** country that contains some EU-Rent operating company

**Definition:** Eurozone operating country or Nordic country or [Canada](http://www.iso.org/iso/home/standards/country_codes/country_names_and_code_elements_xml.htm) or [Switzerland](http://www.iso.org/iso/home/standards/country_codes/country_names_and_code_elements_xml.htm) or United Kingdom or [United States](http://www.iso.org/iso/home/standards/country_codes/country_names_and_code_elements_xml.htm)

**EU country**

**Definition:** country of a nation-state that is a member of the European Union

**Note:** EU-Rent has adopted ‘territory’ (a geographical perspective) for its view of country. Membership of the EU is a political act by the nation that lives in the country.

*Country uses currency* is defined in the ‘Vocabulary Extensions’ sub clause

**Eurozone operating country**

**Definition:** operating country that is an EU country that has national currency ‘The Euro’

**Definition:** [Austria](http://www.iso.org/iso/home/standards/country_codes/country_names_and_code_elements_xml.htm) or [Belgium](http://www.iso.org/iso/home/standards/country_codes/country_names_and_code_elements_xml.htm) or [France](http://www.iso.org/iso/home/standards/country_codes/country_names_and_code_elements_xml.htm) or [Finland](http://www.iso.org/iso/home/standards/country_codes/country_names_and_code_elements_xml.htm) or [Germany](http://www.iso.org/iso/home/standards/country_codes/country_names_and_code_elements_xml.htm) or [Greece](http://www.iso.org/iso/home/standards/country_codes/country_names_and_code_elements_xml.htm) or [Hungary](http://www.iso.org/iso/home/standards/country_codes/country_names_and_code_elements_xml.htm) or [Ireland](http://www.iso.org/iso/home/standards/country_codes/country_names_and_code_elements_xml.htm) or [Italy](http://www.iso.org/iso/home/standards/country_codes/country_names_and_code_elements_xml.htm) or [Luxembourg](http://www.iso.org/iso/home/standards/country_codes/country_names_and_code_elements_xml.htm) or [Netherlands](http://www.iso.org/iso/home/standards/country_codes/country_names_and_code_elements_xml.htm) or [Portugal](http://www.iso.org/iso/home/standards/country_codes/country_names_and_code_elements_xml.htm) or [Spain](http://www.iso.org/iso/home/standards/country_codes/country_names_and_code_elements_xml.htm)

**Note:** EU-Rent has selected this subset of EU Eurozone countries, as countries it does business in.

**Nordic country**

**Definition:** country of a nation-state that is a member of the Nordic Council

**Definition:** [Denmark](http://www.iso.org/iso/home/standards/country_codes/country_names_and_code_elements_xml.htm) or [Finland](http://www.iso.org/iso/home/standards/country_codes/country_names_and_code_elements_xml.htm) or [Iceland](http://www.iso.org/iso/home/standards/country_codes/country_names_and_code_elements_xml.htm) or [Norway](http://www.iso.org/iso/home/standards/country_codes/country_names_and_code_elements_xml.htm) or [Sweden](http://www.iso.org/iso/home/standards/country_codes/country_names_and_code_elements_xml.htm)

A definite description in the style of the entry below could be provided for each country, but countries are probably well-enough understood from the names provided in the extensional definitions for this not to be necessary – they are implicitly-understood individual noun concepts.
Switzerland

Synonym: Switzerland
Synonym: Swiss Confederation
Synonym: Confoederatio Helvetica
Definition: the country that is situated in western Europe, bordered by Germany to the north, France to the west, Italy to the south, and Austria and Liechtenstein to the east.
Definition: the country that is referenced by ISO 3166 code ‘CH’

G.6.4.1.2 Sites

Location is an explicitly-understood concept - one whose meaning is taken to be the everyday meaning of the term. This means that the term ‘location’ can be used, with little or no risk of people in the business misunderstanding the meaning. Explicitly-understood concepts can just be used, unstyled, as needed, without creating vocabulary entries for them.

Creating a styled entry for the term, as in the entry below, can be useful if the concept is an important part of other concept definitions. It means, for example, that an SBVR editing tool can recognize the term and track where it is used.

site

Synonym: location
Concept Type: implicitly-understood concept
Reference Scheme: address

Below, address references location means that EU-Rent can reference locations that have addresses that match the implicitly understood meaning of ‘address’ (which may well be ‘postal address’). Unless other reference schemes (such as GPS coordinates) are added, EU-Rent can reference only locations that have addresses.

Address is also playing the role of name as SBVR defines it – verbal designation of an individual noun concept.

Note: defining address as an implicitly-understood concept is a gross oversimplification. Many businesses have substantial formal structures to define address for their purposes, but exploring this would be a digression from the purpose of this Annex.

address

Concept Type: implicitly-understood concept

address references site

The Necessity below says that EU-Rent takes a location to be in one country, even if (as is the case for some European airports) it actually straddles a national border.

Positioning the Necessity under the verb concept entry is an SBVR SE convenience. A Necessity is a free-standing definitional business rule that may be placed anywhere in the Terminological Dictionary.

Other organizing schemes include: positioning the Necessity under the entry of the noun concept that is the subject in the Necessity statement; grouping all the Necessities in a ‘Definitional Rules’ section.
**country contains site**

Synonymous Form: site is in country

Necessity: Each site is in exactly one country.

**EU-Rent site**

Concept Type: situational role

Definition: site that is used for rental business by EU-Rent

**EU-Rent-owned site**

Definition: EU-Rent site that is owned or leased by EU-Rent

Description: The site (as well as any organization unit that may be on it) is under EU-Rent’s control.

**non-EU-Rent location**

Definition: site that is of interest to EU-Rent and is not a EU-Rent site

G.6.4.2 EU-Rent Organization

EU-Rent’s organization is a single corporation with headquarters in Switzerland. It has an operating company in each country in which it operates (including Switzerland). Each operating company is organized in organization units: local areas, branches, and service depots. Each local area is an organization unit (not a physical territory) that manages a group of branches and service depots, and owns the rental cars used by its branches.

EU-Rent has a global web reservations center that runs the reservations web site and, in each operating company, a telephone reservations center. For management purposes, the web reservations center is an organization unit of the Swiss operating company.

G.6.4.2.1 Companies

**operating company**

Synonym: EU-Rent operating company

Definition: company that is a national business owned by EU-Rent

Reference Scheme: operating company name

Note: In each operating country, EU-Rent has an operating company that:

- adapts global policy to local regulation, custom, and practice
- selects which car models will be purchased for each car group
- sets rental tariffs

**operating company name**

Definition: name that references some operating company

**operating company name references operating company**

**operating company operates in operating country**

Concept Type: associative verb concept

Synonymous Form: operating country contains operating company

Necessity: Each operating company operates in exactly one operating country.

Necessity: Each operating country contains at least one operating company.
EU-Rent CH
Definition: the operating company that operates in Switzerland

There is no Necessity on the verb concept below for an operating company to have an insurer because it is not a definitional business rule – it is not true by definition.
EU-Rent does impose an obligation on each operating company to have at least one insurer. This is a behavioral business rule, and is in the Rulebook.

insurer
Concept Type: implicitly-understood concept

operating company has insurer

G.6.4.2.2 Organization Units
The definition below specializes the everyday meaning of ‘organization unit’ to a narrower, EU-Rent-specific meaning, by adding the characteristic that is part of some (EU-Rent) operating company. To indicate this, ‘organization unit’ is not styled.
The Reference Scheme uses operating country as the designation context of unit name. This allows EU-Rent to use the same unit name for organization units in different operating companies.

organization unit
Definition: organization unit that is part of some operating company
Reference Scheme: unit name (operating country)
Note: This reference scheme allows use of the same unit names in different countries (e.g., “Windermere (UK)” and “Windermere (USA)”). An operating company can name its organization units without having to be concerned about the unit names other operating companies use.

unit name (operating country)
Definition: name that references some organization unit

The Necessity subentry below ensures that a unit name in an operating country can reference only an organization unit that is part of the operating company in that country.
**unit name (operating country) references organization unit**

Necessity: The organization unit that is referenced by a representation 'unit name (operating country)' is part of the operating company that operates in the operating country that is the designation context of the representation.

Example: The branch that is referenced by the representation 'Windermere (UK)' is part of the operating company 'EU-Rent UK' that operates in the operating country 'UK'.

**organization unit is located at EU-Rent site**

Synonymous Form: EU-Rent site is location of organization unit

Necessity: Each organization unit is based at exactly one EU-Rent site.

The first synonymous form below has to be explicit. The implied reverse form is organization unit is included by operating company, whose meaning is a little different from organization unit is included in operating company.

**operating company includes organization unit**

Synonymous Form: organization unit is included in operating company

Synonymous Form: organization unit is part of operating company

Necessity: Each organization unit is part of exactly one operating company.

*Individual verb concepts (propositions)* such as the entry below are not very common in Terminological Dictionaries

**EU-Rent CH includes Web Reservations Center**

General Concept: operating company includes organization unit

The Necessity subentries below define:

1. That management of organization units is contained within operating companies.
2. That management of organization units is hierarchical.

**organization unit₁ manages organization unit₂**

Synonymous Form: organization unit₁ reports to organization unit₂

Necessity: Each organization unit₁ that reports to some organization unit₂ is part of the operating company that includes organization unit₂.

Necessity: Each organization unit₁ that is not a national HQ reports to exactly one organization unit₂.
Because EU-Rent HQ is an individual noun concept, the verb concept below is a characteristic – a verb concept with only one open role. The Necessity means that it is an essential characteristic – every national HQ must have it. The verb concept is not a specialization of organization unit2 reports to organization unit1. EU-Rent HQ is not part of an operating company, so does not fit EU-Rent’s definition of organization unit.

**EU-Rent Corporate HQ**
Definition: the headquarters of EU-Rent

**national HQ reports to EU-Rent corporate HQ**
Definition: the national HQ reports to EU-Rent corporate HQ
Necessity: Each national HQ reports to EU-Rent Corporate HQ

The example below illustrates categorization of a general concept using a categorization type. A concept can be classified by as many categorization types as the business finds useful. The Necessity makes the categorization a segmentation – all organization units are classified and each is classified as one organization function.

**organization function**
Concept Type: categorization type
Definition: concept that specializes the concept ‘organization unit’ and that classifies an organization unit by its functional role in EU-Rent
Necessity: Each organization unit is classified as exactly one organization function.

**national HQ**
Concept Type: organization function
Definition: organization unit that is the headquarters of some operating company

**Web Reservations Center**
Concept Type: organization function
Definition: the organization unit accepting rental bookings by internet

**telephone reservations center**
Concept Type: organization function
Definition: organization unit accepting rental bookings by telephone and not providing rental service

**local area**
Concept Type: organization function
Definition: organization unit that manages some branches and some service depots
branch
Concept Type: organization function
Definition: organization unit providing rental service and accepting rental bookings by telephone and accepting rental bookings in person

depot
Concept Type: organization function
Definition: organization unit servicing cars

G.6.4.2.3 Organization Unit characteristics
There are two ways of defining characteristics: one is to use thing as the noun concept, e.g., thing services cars, so that anything suitable could have the characteristic; the other is to use a specific concept that could have the characteristic, e.g., organization unit services cars.

There are also two ways of expressing the verb symbol: the active present, e.g. services cars, and the gerund, e.g., servicing cars, which avoids any confusion about the meaning of the characteristic: organization unit stores cars means ‘any given organization unit may or may not service cars’.

In the entries below, thing and the gerund are used, e.g., thing servicing cars.

Thing accepting rental bookings is a characteristic type (‘category of characteristic which serves as a criterion of subdivision when establishing concept systems’ - adopted from ISO 1087) with three characteristics of that type.

thing accepting rental bookings
Concept Type: characteristic type
Definition: the thing offers a rental in response to request from a potential renter

thing accepting rental bookings by internet
Concept Type: thing accepting rental bookings

thing accepting rental bookings by telephone
Concept Type: thing accepting rental bookings

thing accepting rental bookings in person
Concept Type: thing accepting rental bookings

thing providing rental service
Definition: the thing provides pick up and return service of rental cars by renters

thing servicing cars
Definition: the thing services rental cars

The following four noun concepts are categories of unit name. They have all the characteristics of unit name, which means that an individual name of any of them would reference a corresponding organization unit only within the country in which it is located. The ISO 3166 code of the country would also be needed to guarantee unique referencing across the whole of EU-Rent.
**HQ name**  
Definition: unit name of some national HQ

**area name**  
Definition: unit name of some local area

**branch name**  
Definition: unit name of some branch

**depot name**  
Definition: unit name of some service depot

---

Each of the following three verb concepts has all the characteristics of their more general concept organization unit1 manages organization unit2, including the necessities that each organization unit reports to exactly one organization unit, and both units are part of the same operating company.

**national HQ manages local area**  
General Concept: organization unit, reports to organization unit.

**local area manages branch**  
General Concept: organization unit, reports to organization unit.

**local area manages service depot**  
General Concept: organization unit, reports to organization unit.

---

**G.6.4.2.4 Branches**

**car storage capacity**  
Concept Type: situational role  
Definition: number of rental cars that can be stored at some EU-Rent site  
Note: Some of the capacity at a branch’s site might be assigned to cars that are not available for rental (e.g., cars awaiting service or transfer to other branches).

**EU-Rent site has car storage capacity**

**branch has car storage capacity**  
Concept Type: property association  
Necessity: The core storage capacity of a branch is the car storage capacity of the EU-Rent site that is location of the branch.

**hours of operation**  
Definition: the times during which a facility is open for business  
Example: 24 hours per day, 7 days a week; 7:00 am to 8:00 pm; on demand.
**branch** has hours of operation

Definition: property association

The entries below illustrate a simple way to define a segmentation of a concept, provided that the number of categories is small. Four categories would require 6 mutual-exclusion Necessities, six categories would require 15.

Note that this is a second definition of branch for purpose of illustration. The earlier definition (in G.6.4.2.2 Organization Units) was intentional - defining the characteristics of branch. The one below is extentional – enumerating the different kinds of branch. Both are valid and, in a ‘real’ Terminological Dictionary, they would be merged into a single entry.

---

**branch**

Definition: airport branch or city branch or agency

Necessity: No airport branch is a city branch.

Necessity: No city branch is an agency.

Necessity: No agency is an airport branch.

**airport branch**

Definition: branch that is located at a EU-Rent-owned site and has a car storage capacity that is at least 100 and has hours of operation that are 24 hours per day, every day

Note: This kind of branch is usually at or near a major airport or rail terminal and has sufficient staff to have specialized roles in the workflow.

**city branch**

Definition: branch that is located at a EU-Rent-owned site and has a car storage capacity that is at least 15 and has hours of operation that are long business days and (usually) some weekend hours

Note: This kind of branch is usually in a city center and has small numbers of staff who are interchangeable in the workflow.

**agency**

Definition: branch that is not located at a EU-Rent-owned site and is operated by some agent

Note: This kind of branch is located in the agent’s premises (e.g., hotel, travel agency) and has flexible hours of operation in response to customer demand.

**agent**

Definition: organization external to EU-Rent that carries out car rental business on behalf of EU-Rent

Example: Hotel, travel agent.

**agent operates agency**

Note: Operation is usually by part-time staff, who will carry out the entire workflows for rental and return.
G.6.5 Rental Cars

EU-Rent has a number of selected manufacturers from which it buys its rental cars. EU-Rent defines car models and buys only cars that meet their specifications. EU-Rent car models are specifications that are based on manufacturers’ standard models, customized with manufacturer-offered options such as engine size and fuel type. Purchasing of rental cars is outside the scope of this Annex.

Charging for rentals is based on car groups. Each car group is a set of car models that have similar specifications, and rentals of cars of all car models in a group are charged at the tariff for the group.

Routine servicing of rental cars is done by EU-Rent service depots, based on the mileage intervals given in manufacturers’ service instructions.

G.6.5.1 Identification and Ownership

The definitions for car and VIN are adopted, indicated by the Source entry. This means that people in the speech community understand the concept from the everyday meaning of the term, with little or no risk of misunderstanding.

If adopted definitions from standard sources (‘official’ or de-facto) are fit for purpose, the Definition clause text should not be reworked (i.e., to conform to SBVR SE or local style guide conventions). Keeping the original definitions reduces work for vocabulary development and maintenance and eases communication outside the organization.

Car has two reference schemes. A concept can have as many reference schemes as the business finds useful.

car

Definition: private passenger automobile as distinguished from a bus or truck
Source: MWU (1/1d) ['car']
Reference Scheme: VIN
Reference Scheme: national registration number and ISO 3166 code that references country of registration of car

VIN

Concept Type: name
Definition: unique serial number used by the automotive industry to identify individual motor vehicles, as defined in ISO 3779:2009
Source: CRISG ['vehicle identification number']
Synonym: vehicle identification number

vehicle identification number

See: VIN

The meaning of references is that each VIN identifies at most one car (it’s likely some VINS exist for cars that no longer exist). But VIN references car by itself does not constrain a car to having only one VIN; that is part of ISO 3779:2009.

When a concept is adopted, any relevant necessities are adopted with it. If the statements of these necessities are directly usable (even if the text is not well-suited to SBVR Structured English styling), they can be added in Necessity sub-entries. If not, equivalent Necessity statements have to be written, such as Each car is represented by exactly one VIN in the entry below.
**VIN references car**

General Concept: \textit{name references thing}

Necessity: Each \textit{car is represented by exactly one VIN}.

Creating a formal \textit{designation} entry for an \textit{implicitly-understood concept} such as \textit{country of registration} means that the \textit{designation} can be used formally in other entries, and that it will be recognized by software tools.

**country of registration**

Concept Type: \textit{implicitly-understood concept}

Concept Type: \textit{situational role}

General Concept: \textit{country}

The entry below illustrates one of SBVR Structured English’s options, with the semantics in country’s \textit{verb concept role} in the primary entry, and in the \textit{verb} in the synonymous form.

**car has country of registration**

Synonymous Form: \textit{car is registered in country}

Necessity: Each \textit{car has exactly one country of registration}.

Note: EU-Rent does not transfer ownership of cars between countries, so that a car owned by EU-Rent has only one country of registration. Any changes of country of registration when a car is not owned by EU-Rent are outside the scope of EU-Rent’s vocabulary and rules.

\textit{National registration numbers} are unique only within countries, so the \textit{country code} is also needed to provide unique referencing. One way of doing this is to use \textit{country} as the \textit{designation context} for \textit{national registration number}.

**national registration number (country)**

Concept Type: \textit{implicitly-understood concept}

General Concept: \textit{name}

Example: PK07-LVD (UK)

Example: PA-GBQ-7198 (US)

**country owns national registration number (country)**

Necessity: Each \textit{national registration number (country) is owned by exactly one country}.

The first Necessity below ensures that the \textit{country code} used in referencing a \textit{car} is the correct one.
**national registration number** *(country) references car*

General Concept: name references thing  
Necessity: The national registration number *(country) references a car that is registered in the country that is the designation context of the national registration number.

Necessity: Each car has exactly one national registration number *(country).*  
Necessity: Each national registration number *(country) is of at most one car.

**rental car**

Concept Type: situational role  
General Concept: car  
Definition: vehicle owned by EU-Rent [the Rental Company] for rental to its customers  
Source: CRISG ['rental car']  
Reference Scheme: car number

**car number**

Definition: unique identifier assigned to a rental vehicle by EU-Rent ['the Rental Company']  
Source: CRISG ['rental company’s car identifier']

References means that each car number identifies exactly one rental car. Name references thing is a synonymous form for thing has name; name is defined as verbal designation of an individual noun concept. So, car number references car (car reference scheme is car number) means that each individual car number is a ‘name’ (ISO 1087: appellation) of an instance in the extension of car - an actual car.

Within the scope of EU-Rent’s vocabulary and rules this is true. If another rental company coincidentally identified some of its rental cars with car numbers that were the same as some of EU-Rent’s, EU-Rent would not care, and probably would not know.

**car number references rental car**

General Concept: name references thing

**acquisition date**

Concept Type: situational role  
Definition: date on which EU-Rent took ownership of some thing

**rental car is acquired on date**

Synonymous Form: rental car has acquisition date  
Definition: EU-Rent took ownership of the rental car on the date  
Necessity: Each rental car is acquired on exactly one date.

**local area owns rental car**

Necessity: Each rental car is owned by exactly one local area.
**branch stores rental car**

Synonymous Form: rental car is stored at branch

Necessity: Each rental car is stored at at most one branch.

G.6.5.2 Specifications

G.6.5.2.1 Car Models

**car model**

Definition: Manufacturer’s model customized with standard options, such as engine size, number of seats, number of doors, transmission type, fuel type.

Source: CRISG ['car model']

Reference Scheme: model name

**model name**

Concept Type: implicitly-understood concept

General Concept: name

Note: EU-Rent bases its model names on those assigned by the car manufacturers, but sometimes has to extend them to distinguish models with different combinations of options.

**model name references car model**

**car model specifies rental car**

Definition: the rental car has the properties of the car model

Necessity: Each rental car is specified by exactly one car model.

G.6.5.2.2 Car model properties

**body style**

Definition: Style for the body of a car defined using industry standard criteria such as shape, number of doors, separate luggage and passenger compartments, removable roof, etc.

Source: CRISG ['body style']

Reference Scheme: convertible or coupe or hatchback or sedan

**convertible**

General Concept: body style

Definition: Has a removable roof, which may be hard (metal or plastic) or soft (fabric). Usually a ‘three box’ configuration, may have only two doors and two seats.

Source: CRISG ['convertible']
**coupé**
General Concept: body style
Definition: ‘3-box’ configuration with two doors. The rear may have small seats, and limited leg- and headroom.
Source: CRISG ['coupé']

**hatchback**
General Concept: body style
Definition: ‘Two box’ configuration with no separation between the passenger and luggage compartments. The luggage compartment is the full height of the car, and rear seats usually fold down for flexibility in carrying passengers or luggage.
Source: CRISG ['hatchback']

**sedan**
General Concept: body style
Definition: Conventional ‘3-box’ configuration of engine compartment, passenger compartment and trunk. Usually has four doors, may have two.
Source: CRISG ['sedan']

**car model has body style**
Concept Type: property association
Necessity: Each car model has exactly one body style.

**engine size**
Concept Type: situational role
General Concept: number
Definition: Car engine cylinder capacity in ccs
Source: CRISG ['engine size']

**car model has engine size**
Concept Type: property association
Necessity: Each car model has exactly one engine size.

**fuel type**
Concept Type: implicitly-understood concept
Definition: diesel or electricity or gasoline or LPG

**diesel**
Concept Type: implicitly-understood concept
General Concept: fuel type

**electricity**
Concept Type: implicitly-understood concept
General Concept: fuel type
gasoline
Concept Type: implicitly-understood concept
General Concept: fuel type
Synonym: petroleum
Synonym: petrol

LPG
Concept Type: implicitly-understood concept
General Concept: fuel type
Synonym: liquefied petroleum gas

car model has fuel type
Concept Type: property association
Necessity: Each car model has at least one fuel type.
Note: Some car models have more than one fuel – e.g., can switch between gasoline and LPG, or between electricity and gasoline.

large suitcase capacity and small suitcase capacity illustrate how an external definition can be adapted to meet EU-Rent’s requirements, using ‘Dictionary Basis’, rather than being directly adopted, using ‘Source’.

large suitcase capacity
Concept Type: situational role
Definition: number that is the maximum of large suitcases that will fit into the luggage compartment of a car
Dictionary Basis: Number of suitcases that will fit into the luggage compartment of a car [CRISG ‘luggage capacity’]

small suitcase capacity
Concept Type: situational role
Definition: number that is the maximum of small suitcases that will fit into the luggage compartment of a car
Dictionary Basis: Number of suitcases that will fit into the luggage compartment of a car [CRISG ‘luggage capacity’]

car model has large suitcase capacity
Concept Type: property association
Necessity: Each car model has at most one large suitcase capacity.

car model has small suitcase capacity
Concept Type: property association
Necessity: Each car model has at most one small suitcase capacity.
Necessity: Each car model has at least one large suitcase capacity or at least one small suitcase capacity.
**passenger capacity**

Concept Type: situational role

Definition: The count of adults, including the driver, that a car can comfortably hold

Source: CRISG ['passenger capacity']

**car model has passenger capacity**

Concept Type: property association

Necessity: Each car model has exactly one passenger capacity.

G.6.5.2.3 Body styles

Example of segmentation, a categorization scheme in which each instance of the categorized concept is in exactly one category.

Models by Body Style

Definition: segmentation that is for the concept 'car model' and subdivides car models based on industry standard criteria

Necessity: Models by Body Style contains the categories 'convertible model' and 'coupe model' and 'hatchback model' and 'sedan model'.

**convertible model**

Definition: car model that has body style 'convertible'

Necessity: The concept 'convertible model' is included in Models by Body Style.

**coupe model**

Definition: car model that has body style 'coupe'

Necessity: The concept 'coupe model' is included in Models by Body Style.

**hatchback model**

Definition: car model that has body style 'hatchback'

Necessity: The concept 'hatchback model' is included in Models by Body Style.

**sedan model**

Definition: car model that has body style 'sedan'

Necessity: The concept 'sedan model' is included in Models by Body Style.

G.6.5.2.4 Car Groups

Car group has six instances, listed in the extensional definition. Each of these is an individual set of car models.

The large suitcase capacity and small suitcase capacity of a car group define minimum values of these two properties for each car model in the car group; see the entry for car group includes car model, below.

These two properties are constrained by ‘at most one’ Necessities (rather than ‘exactly one’) in order to accommodate the Premium car group, which has a mix of models that do not share minimum values for luggage space.
**car group**
- General Concept: set
- Definition: group of car models that have similar specifications and share a single rental tariff
- Source: CRISG ['rate group']
- Definition: Economy or Compact or Intermediate or Standard or Full Size or Premium
- Reference Scheme: group name
- Description: Most car groups have properties that specify the minimum provided by each car model in the group. The Premium group includes a range of car models, including luxury sedans, SUVs, and two-seater convertibles; there are no properties common to all these models.

**group name**
- Definition: name that is assigned to a car group by EU-Rent

**group name references car group**

**car group has passenger capacity**
- Concept Type: property association
- Necessity: Each car group has exactly one passenger capacity.

**car group has large suitcase capacity**
- Concept Type: property association
- Necessity: Each car group has at most one large suitcase capacity.

**car group has small suitcase capacity**
- Concept Type: property association
- Necessity: Each car group has at most one small suitcase capacity.

**Economy**
- General Concept: car group
- Definition: Small cars that can accommodate the driver plus 3 additional passengers, and one large and one small suitcase.
- Source: CRISG ['Economy car group']
- Necessity: Economy has passenger capacity ‘4’ and large suitcase capacity ‘1’ and small suitcase capacity ‘1’.

**Compact**
- General Concept: car group
- Definition: Small cars – typically hatchbacks - that can accommodate the driver plus 4 additional passengers, and one large and one small suitcase.
- Source: CRISG ['Compact car group']
- Necessity: Compact has passenger capacity ‘5’ and large suitcase capacity ‘1’ and small suitcase capacity ‘1’.

**Intermediate**
- General Concept: car group
Definition: Medium-sized cars that can accommodate the driver plus 4 additional passengers, and one large and two small suitcases.
Source: CRISG ['Mid-size car group']
Necessity: Intermediate has passenger capacity 5 and large suitcase capacity 1 and small suitcase capacity 2.

**Standard**

General Concept: car group
Definition: Typical ‘family-sized’ cars that can accommodate the driver plus 4 additional passengers, and two large and one small suitcases.
Source: CRISG ['Standard car group']
Necessity: Standard has passenger capacity 5 and large suitcase capacity 2 and small suitcase capacity 1.

**Full Size**

General Concept: car group
Definition: Large cars that can accommodate the driver plus 4 additional passengers with comfortable head- and legroom, and two large and two small suitcases.
Source: CRISG ['Full-size car group']
Necessity: Full Size has passenger capacity 5 and large suitcase capacity 2 and small suitcase capacity 2.

**Premium**

General Concept: car group
Definition: ‘Prestige’ cars for which premium rates are charged.
Source: CRISG ['Premium car group']
Necessity: Premium has passenger capacity that is at least one.

**upgrade car group**

Concept Type: situational role
Definition: car group that replaces the car group that is reserved for some rental

**car group has upgrade car group**

Necessity: Each car group has at most one upgrade car group.

An upgrade car group may replace a car group only if no rental car of the specified car group is available. This is a behavioral business rule – i.e., it is not true by definition – so is in the Rulebook.

**upgrade car group replaces car group**

Definition: a rental car that is in the upgrade car group is assigned to a rental that reserved the car group
The passenger capacity and suitcase capacity properties of a car group provide a minimum specification for the car models included in the car group, as defined by the Necessities below.

**car group includes car model**

Concept Type: partitive verb concept
Necessity: Each car model is included in exactly one car group.
Necessity: The passenger capacity of a car model is not less than the passenger capacity of the car group that includes the car model.
Necessity: The large suitcase capacity of a car model is not less than the large suitcase capacity of the car group that includes the car model.
Necessity: The small suitcase capacity of a car model is not less than the small suitcase capacity of the car group that includes the car model.

**car model exemplifies car group in country**

Note: A car model with specification typical of the car group is used to represent the group when a renter is offered options for available cars, with a disclaimer that the actual car model provided will have a specification that is similar but may have some differences.

Example: In USA, exemplifying Standard: “Nissan Altima or similar. Specific makes/models within a car group may vary in features such as body style, luggage capacity, fuel type.”

The following is an example of a ‘convenience’ verb concept – part of a trade-off between ease of expression and size of vocabulary. It is redundant, in that it replicates a meaning that is already defined, but supports being able to say car group of rental car rather than having to say car group of car model that specifies rental car.

**rental car is included in car group**

General Concept: car group of rental car
Necessity: A rental car is included in a car group if and only if the rental car is specified by a car model that is included in the car group.

The following definition narrows the everyday meaning of ‘car manufacturer’, so ‘car manufacturer’ is left unstyled as the lead term in the Definition subentry.

The three examples are not formally recognized – i.e., they do not have to be in EU-Rent’s vocabulary (and may never be – they might be hypothetical ‘for instance’ examples).
**car manufacturer**

Definition: car manufacturer that [EU-Rent](#) does business with

Example: Ford Motor Company

Example: Volkswagen

Example: Toyota Corporation

**car manufacturer supplies car model**

Necessity: Each car model is supplied by exactly one car manufacturer.

G.6.5.3 Usage and Servicing

EU-Rent follows a common industry practice of charging for fuel ‘by the gauge’, rather than for exact quantities put into a car.

One reason for doing this is that a customer who returns a car less than full can be immediately charged for fuel: the branch agent checks the fuel gauge to the nearest listed measure and uses that and the fuel tank capacity of the car model to determine the charge, rather than waiting until the tank is actually topped up.

---

*Fuel level is an implicitly-understood concept.* This means that people in EU-Rent know that the measures given in the adopted extensional definition are for the fuel tank of a car.

---

**fuel level**

- Concept Type: implicitly-understood concept
- Necessity: full or 7/8 or 3/4 or 5/8 or 1/2 or 3/8 or 1/4 or 1/8 or empty
- Source: CRISG [‘fuel level’]

**full**

- Concept Type: implicitly-understood concept

**fuel level being full**

- Definition: the fuel level is full
- Description: A characteristic that is relevant to the fuel level of an individual car

**empty**

- Concept Type: implicitly-understood concept

**rental car has fuel level**

- Definition: property association
- Note: The fuel level of a car is checked when it is picked up or returned from a rental.

**odometer reading**

- Concept Type: implicitly-understood concept
- Concept Type: situational role
- General Concept: quantity
Although the same value may occur for more than one rental car’s odometer reading, each instance of that value is read from a different odometer.

### Rental Car Has Odometer Reading

**Concept Type:** property

**Definition:** Each odometer reading is of exactly one rental car.

### Service Mileage

**Concept Type:** situational role

**Definition:** number that equals the odometer reading that indicates that a rental car is due for service

**Note:** The service mileage for a rental car’s first service is 5000 miles (8000 km). At the completion of a service, the service mileage for the rental car’s next service is defined, according to the car manufacturer’s instructions.

Although the same value may occur for more than one rental car’s service mileage, each role played by that value as a service mileage is for one rental car.

### Rental Car Has Service Mileage

**Concept Type:** property association

**Definition:** Each service mileage is for exactly one rental car.

### Rental Car Being Due for Service

**Definition:** the odometer reading of the rental car is greater than (the service mileage of the rental car – 200)

### Maintenance Service

**Concept Type:** implicitly-understood concept

### Scheduled Service

**Definition:** maintenance service that is for some rental car and is performed by some service depot

**Reference Scheme:** service date and VIN that references the rental car that is scheduled for the scheduled service

**Scheduled Service Is for Rental Car**

**Synonymous Form:** rental car is scheduled for scheduled service

**Necessity:** Each scheduled service is for exactly one rental car.
**service depot performs scheduled service**
Necessity: Each scheduled service is performed by exactly one service depot.
Note: If the service depot assigned to carry out a scheduled service cannot do so, another scheduled service is arranged, preferably at the same service depot but at a different one if necessary.

**service date**
General Concept: situational role
Definition: date of some scheduled service

**scheduled service has service date**
Concept Type: property association
Necessity: Each scheduled service has at least one service date.

### G.6.6 Customers

**Car Rental Responsibility**
General Concept: subject field
Definition: Personal responsibility of the renter for complying with the terms of a rental contract and all payments due under the contract, except those covered by insurance
Source: CRISG ['rental responsibility']

**Vehicle Sales**
General Concept: subject field
Definition: Disposal by sale of rental cars at the end of their rental life
Source: CRISG ['vehicle sales']

In an actual business contact details would have a substantial formal definition. It is defined informally here in order to limit the case study size.

**person**
Concept Type: implicitly-understood concept

**contact details**
Definition: address, telephone number, and (if available) email address

**rental authorizes person**
Synonymous Form: person is authorized for rental
Definition: state of affairs 'the person is authorized to drive the rented car of the rental' occurs for the rental period of the rental

A recognized rental is one that was booked in the past 5 years (see 'Rentals' section).
**driver**
Concept Type: facet
Definition: person who is authorized for some recognized rental
Note: driver is a facet of person – someone who has been authorized as the driver of at least one rental in the past five years – and also fills a situational role of the person in each of the rentals.

**rental authorizes driver**
General Concept: rental authorizes person
Necessity: Each driver is authorized for at least one rental

**driver license**
Concept Type: implicitly understood concept

**driver has driver license**
Synonymous Form: driver license is for driver
Necessity: Each driver license is for exactly one driver.
Necessity: Each driver has at least one driver license.

---

It is not true by definition that a driver who is at fault for three bad experiences is barred. When a driver has three bad experiences, EU-Rent will decide whether to bar him/her. This is governed by a behavioral business rule in the Rulebook. There are no Necessities that each driver of a rental is qualified, and is not barred, during the period of the rental, because they are not true by definition. They are behavioral business rules, and are in the Rulebook.

**driver being barred**
Definition: the driver is prohibited from renting a rental car from EU-Rent
Note: A barred driver is a person known to EU-Rent as a driver (either a renter or an additional driver), who has at least 3 bad experiences.

**driver being qualified**
Definition: the driver is over 21 years old and has a current driver license and is not under any pending legal action that could adversely affect his driver license or insurability

**driver is responsible for rental**
Synonymous Form: rental is the responsibility of driver
Definition: the driver has personal contractual responsibility for the rental

**renter**
Synonym: customer (Car Rental Responsibility)
Synonym: primary driver
Definition: driver who is responsible for some recognized rental
Necessity: The renter who is responsible for a rental is authorized for the rental.
customer
Subject Field: Car Rental Responsibility
Concept Type: situational role
See: renter

primary driver
See: renter

renter provides contact details
Necessity: Each renter provides contact details for each rental that is the responsibility of the renter

customer
Subject Field: Vehicle Sales
Concept Type: facet
Definition: person who purchases a rental car from EU-Rent at the end of its rental life

definition
Concept Type: situational role
Definition: driver of a rental who is not the renter of the rental
Dictionary Basis: Driver who is authorized to drive a rental car under a rental contract but is not responsible for the rental [CRISG 'additional driver']

rental authorizes additional driver
General Concept: rental authorizes driver
Necessity: Each rental authorizes at most 3 additional drivers.

Corporate customer and corporate rental agreement are informally defined in order to limit the case study size.

corporate customer
Dictionary Basis: relating or belonging to a corporation MWU ['corporate']
Dictionary Basis: person or company who buys goods and services
Dictionary Basis: MWU ['customer']
corporate rental agreement
Definition: contract under which a corporate renter can rent a car at a negotiated set of rates
Note: Each rental under a corporate rental contract is an individual contract, and the corporate renter is personally responsible for it.
corporate customer contracts for corporate rental agreement

maximum rental period
Concept Type: situational role
Definition: duration that is the upper limit for the rental period of a rental
corporate rental agreement has maximum rental period

Concept Type: property association
Definition: Each corporate rental agreement has exactly one maximum rental period.

corporate customer accredits renter

Definition: the corporate customer permits the renter to rent cars under the terms of a corporate rental agreement.

corporate renter

Definition: renter who is accredited by some corporate customer.

corporate renter is authorized for corporate rental agreement

Synonymous Form: corporate rental agreement is available to corporate renter
Necessity: Each corporate renter is authorized for at least one corporate rental agreement.
Necessity: A corporate renter is authorized for a corporate rental agreement if and only if the corporate renter is accredited by the corporate customer that contracts for the corporate rental agreement.

Defining individual customer as the complement of corporate renter creates a segmentation of renter.

individual customer

Definition: renter who is not a corporate renter.

EU-Rent Club

Definition: EU-Rent’s loyalty club.

club member

Definition: renter who is included in the EU-Rent Club.

EU-Rent Club includes club member

Concept Type: partitive verb concept
Note: A club member accumulates points that s/he can use to pay for a rental.

G.6.7 Car Movements

Car movements meet the business requirement that a car of a given group has to be moved between branches (“we need to move a full-size car from the London City branch to the Heathrow Airport branch”). A specific car will be assigned to it at some time, not necessarily when the requirement is first identified.

There are two types of car movement:

1. Car movements that are planned in advance. These are used by managers in local areas to estimate rental commitments at branches, and to ensure that there are enough cars of the required groups at the branches to meet these commitments. There are two kinds:
• A rental movement, reserved by a rental booking. It may be round-trip (the car is returned to the branch it was picked up from) or one-way (the car is returned to a branch different from the one from which it was picked up).

• A car transfer, made by a EU-Rent employee. Car transfers are scheduled by local area managers after taking account of rental movements. All car transfers are one-way.

2. Car movements for walk-in rentals, which start immediately. They affect availability of cars at branches.

Note: EU-Rent, like all large car rental companies, has a sophisticated predictive model to support decisions on (i) whether a car can be offered in response to a customer request; and (ii) what car transfers should be made to meet rental commitments. This model is outside the scope of this Annex.

One-way car movements may be:

• Local: between branches managed by the same local area,
• In-country: between branches managed by different local areas in the same country
• International: between branches managed by local areas in different countries.

Rental cars are owned by local areas. If a rental car is moved by an in-country car movement, its ownership changes to the local area that manages the receiving branch. If a car is moved by an international movement, its ownership is not changed. This means that two kinds of international movement are needed:

• Outward: the receiving branch may be located in any EU-Rent operating country for which car movements are permitted.
• Inward: the receiving branch must be located in the car’s country of registration.

The second, third, and fourth definitions below illustrate the use of extensional definitions to categorize concepts in different dimensions.

car movement
Definition: movement of some rental car of a given car group from a given sending branch to some receiving branch
Definition: planned car movement or walk-in car movement
Definition: car transfer or rental movement
Definition: round-trip car movement or one-way car movement
Reference Scheme: movement-id

movement-id
General Concept: name
Definition: text assigned by EU-Rent as an identifier of car movement

movement-id references car movement

The moved car included in a car movement must be a rental car of the car group claimed by the car movement. This is not true by definition, so is included as a behavioral business rule in the Rulebook.
**car movement claims car group**

Synonymous Form: car group is claimed by car movement

Definition: the car movement makes a claim on some rental car of the car group

Necessity: Each car movement claims exactly one car group.

**moved car**

Concept Type: situational role

Definition: rental car that is assigned to some car movement

**car movement includes moved car**

Synonymous Form: moved car is included in car movement

Concept Type: partitive verb concept

Necessity: Each car movement includes at most one moved car.

Note: A car movement has a claim on some car of the claimed car group, but an individual car is not assigned to the car movement until a short time before the movement is scheduled to happen.

**sending branch**

Concept Type: situational role

Definition: branch from which the moved car that is included in some car movement is sent

**car movement includes sending branch**

Synonymous Form: sending branch is of car movement

Concept Type: partitive verb concept

Necessity: Each car movement includes exactly one sending branch.

**receiving branch**

Concept Type: situational role

Definition: branch to which the rental car that is included in some car movement is sent

**car movement includes receiving branch**

Synonymous Form: receiving branch is of car movement

Concept Type: partitive verb concept

Necessity: Each car movement includes exactly one receiving branch.

Each car movement has a movement date, but a planned car movement cannot have a pick-up date-time until the rental car is actually moved. And no car movement can have a drop-off date-time until the rental car is actually dropped off. The two corresponding Necessities below are ‘at most one’ rather than ‘exactly one’.

**movement date**

Concept Type: implicitly-understood concept

Concept Type: situational role

General Concept: date
**car movement has movement date**

Concept Type: property association
Necessity: Each car movement has exactly one movement date.

**pick-up date-time**

Concept Type: implicitly-understood concept
Necessity: Each car movement has at most one pick-up date-time

**car movement has pick-up date-time**

Concept Type: property association
Necessity: Each car movement has at most one pick-up date-time

**drop-off date-time**

Concept Type: implicitly-understood concept
Necessity: Each car movement has at most one drop-off date-time

**car movement has drop-off date-time**

Concept Type: property association
Necessity: Each car movement has at most one drop-off date-time

---

**G.6.7.1 Car transfers and rental movements**

**G.6.7.1.1 Car transfer**

Car transfer is included to complement contract car movement (used in rental) to support illustration of three things:

- Creating a substantial ‘building block’ that can be reused in more than one context.
- Defining local synonyms within a specialization (see rental in the ‘Rentals’ section).
- Defining different scheduling granularities in specializations: car transfers are scheduled by date, contract car movements (and, hence, rentals) are scheduled by date-time, which for EU-Rent is defined (in the ‘Vocabulary Extension’ section) with granularity of minute.

Car transfer is not developed further in this EU-Rent case study.

**car transfer**

Definition: planned car movement undertaken by EU-Rent
Description: ‘undertaken by’ means that EU-Rent plans the movement and a EU-Rent employee drives the car when it is moved.

**transfer date**

Concept Type: implicitly understood concept
Necessity: Each car movement has at most one drop-off date-time

Concept Type: situational role
General Concept: date
**car transfer has transfer date**

Necessity: The transfer date of a car transfer is the movement date of the car transfer.

Note: EU-Rent does not schedule pick-up and drop-off times within the day of a car transfer - it is interested only in the actual pick-up times and drop-off times.

G.6.7.1.2 Rental movement

**rental movement**

Definition: car movement that is contracted for some rental

**scheduled return date-time**

Concept Type: implicitly understood concept

Concept Type: situational role

General Concept: date-time

rental movement has scheduled return date-time

Concept Type: property association

Necessity: Each rental movement has exactly one scheduled return date-time.

G.6.7.2 Planned and walk-in car movements

Advance rental movement is listed in two categories, and has the characteristics of both - it is a planned car movement that is contracted for a rental.

**planned car movement**

Definition: car movement that is planned in advance

**advance rental movement**

General Concept: rental movement

General Concept: planned car movement

**scheduled pick-up date-time**

Concept Type: implicitly-understood concept

Concept Type: situational role

General Concept: pick-up date-time

Advance rental movement has scheduled pick-up date-time

Concept Type: property association

Necessity: Each advance rental movement has exactly one scheduled pick-up date-time.

Necessity: The movement date of an advance rental movement is the date in the scheduled pick-up date-time of the advance rental movement.

**walk-in car movement**

Description: rental movement that happens immediately
walk-in car movement has movement date

Necessity: The movement date of a walk-in car movement is the date in the pick-up date-time of the walk-in car movement.

Note: Since a walk-in car movement is not planned in advance, its movement date is the date on which the car is picked up.

G.6.7.3 Direction of car movements

round-trip car movement
Definition: car movement that includes a sending branch that is the receiving branch of the car movement

one-way car movement
Definition: car movement that includes a sending branch that is not the receiving branch of the car movement

local car movement
Definition: one-way car movement that includes a sending branch that is managed by a local area that is the local area that manages the receiving branch of the car movement
Description: The sending branch and the receiving branch report to the same local area.

in-country car movement
Definition: one-way car movement that is not a local car movement and is not an international car movement
Description: The sending branch and the receiving branch are managed by different local areas in the same country.

international car movement
Definition: one-way car movement that includes a sending branch that is managed by a local area that is located at a EU-Rent site that is included in an operating country that is not the operating country that contains the EU-Rent site that is location of the local area that manages the receiving branch of the car movement
Description: The sending branch and the receiving branch are in different countries.

outward international car movement
Definition: international car movement that includes a sending branch that is located at a EU-Rent site that is included in an operating country that is the country of registration of the rental car of the car movement
Description: The rental car is moved out of its country of registration.

inward international car movement
Definition: international car movement that includes a receiving branch that is located at a EU-Rent site that is included in an operating country that is the country of registration of the rental car of the car movement
Description: The rental car is returned to its country of registration.
G.6.7.3.1 Car ownership

The entries below illustrate one way to define a change and when it takes place - change of ownership of a rental car when it is moved between local areas in the same country.

It is defined as a Necessity, which means that it is true by definition that the car changes ownership. It might have been defined as a behavioral business rule with an enforcement level lower than strict, which would give EU-Rent flexibility to decide on exceptions to change of ownership. Whether to use a definitional or behavioral rule in this kind of situation is a choice of the semantic community. Methodologies for using SBVR will probably provide advice on making the choice. Local area owns rental car is defined in the ‘Rental Cars’ section.

rental car owner

Concept Type: situational role

Definition: local area that owns a given rental car

local area becomes rental car owner

General Concept: individual noun concept changes unitary concept

Definition: the local area that manages the receiving branch of a car movement becomes the rental car owner of the moved car that is included in the car movement

Description: When a rental car is moved with an in-country car movement (i.e., between branches in the same operating country that are managed by different local areas) ownership of the rental car passes to the local area that manages the receiving branch. When a rental car is moved with an inward international car movement (i.e., returning the rental car to its country of registration) if the local area that manages the receiving branch is not the rental car owner of the moved car, then it becomes the owner.

The two Necessities below are included to illustrate (on the same page) the relationships between the rules and the verb concept they are based on. In practice, they would probably be obligations Behavioral versions of them are included in the Rulebook.

The first Necessity below is a representation of: The state of affairs ‘the local area that manages the receiving branch of an in-country car movement becomes the rental car owner of the moved car that is included in the in-country car movement’ occurs at the drop-off date-time of the in-country car movement.

Necessity: At the drop-off date-time of an in-country car movement the local area that manages the receiving branch of the car movement becomes the rental car owner of the moved car that is included in the car movement

Necessity: If the local area that manages the receiving branch of an inward international car movement does not own the moved car that is included in the car movement then the local area becomes the rental car owner of the moved car at the drop-off date-time of the car movement.

G.6.8 Rentals

A rental is a contract with a renter for use (as defined in a rental movement) of a rental car, for an agreed rental price. Charges for optional extras, such as child seats, GPS (satellite navigation system), additional insurance, may be added to the basic price of the rental.
Rentals are categorized in several ways, including:

- Advance rental (booked some time before pick-up) or walk-in rental (requested at a branch for immediate pick-up).
- Cash rental (actually paid by credit card) or points rental (base rental price is paid with loyalty club points).
- By geography - round-trip, between different local areas in the same country, international, etc.
- By status - booked but no car yet assigned, car assigned but not yet picked up, open (car is in possession of the renter) etc. To limit the size of the case study, cancellations and no-shows have not been included.

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**Rental**

**Definition:** A rental is a contract with a renter for a rental movement at a rental price, perhaps including some optional extras.

**Source:** CRISG ['rental']

**Description:** A rental is a contract with a renter for a rental movement at a rental price, perhaps including some optional extras.

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**recognized rental**

**Definition:** A rental that was returned during the past 5 years or is reserved or is assigned or is open.

---

**rental contract document**

**Definition:** information artifact that is the manifestation of a rental

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**Synonymous Form:** rental is manifested in rental contract document

**Concept Type:** associative verb concept

**Necessity:** Each rental contract document is manifestation of exactly one rental.

---

**renter is responsible for rental**

**Synonymous Form:** rental is the responsibility of renter

**Necessity:** Each rental is the responsibility of exactly one renter.

---

**rental is for rental movement**

**Synonymous Form:** rental movement is contracted for rental

**Necessity:** Each rental movement is contracted for exactly one rental.

---

**Advance rental**

**General Concept:** rental
Definition: rental that is contracted with EU-Rent [the Rental Company] on or earlier than the day before the scheduled pick-up date-time of the rental

Source: CRISG ['advance rental']

Necessity: Each advance rental reserves exactly one car group at a given date-time.

Possibility: The car group that is reserved for an advance rental changes before the actual pick-up date-time of the advance rental.

Necessity: The car group that is reserved for an advance rental does not change after the actual pick-up date-time of the advance rental.

**walk-in rental**

General Concept: rental

Definition: rental that is contracted with EU-Rent [the Rental Company] in a branch for immediate pick-up

Source: CRISG ['walk-in rental']

Necessity: No walk-in rental is an advance rental.

**cash rental**

General Concept: rental

Definition: rental that is contracted with EU-Rent [the Rental Company] for payment with a credit card

Source: CRISG ['cash rental']

Note: ‘Cash rental’ is a historical term - a convenient short term for ‘rental that is paid for with a credit card’.

**points rental**

Definition: advance rental whose base rental price is redeemed with club points

Dictionary Basis: rental that is contracted with the Rental Company such that the base rental price is redeemed from credit accrued in a customer retention scheme, such as loyalty club points or air miles. Extra charges such as fuel, taxes, optional additions and penalties are usually paid with a credit or debit card.

Source: CRISG ['redeemed rental']

Necessity: No cash rental is a points rental.

**rental booking**

Synonym: reservation

Definition: acceptance by EU-Rent [the Rental Company] of a request from a renter for an advance rental

Source: CRISG ['reservation']

Note: The request informs EU-Rent of the car group required, the scheduled pick-up date-time and scheduled return date-time, and the pick-up branch and return branch, and provides details of the renter. Optionally, a specific car model within the required car group may be requested.

**reservation**

See: rental booking
rental booking establishes advance rental

Concept Type: associative verb concept
Necessity: Each rental booking establishes exactly one advance rental.
Necessity: Each advance rental is established by exactly one rental booking.

booking date-time

Concept Type: implicitly-understood concept
Concept Type: situational role
General Concept: date-time

rental booking has booking date-time

Concept Type: property association
Necessity: Each rental booking has exactly one booking date-time.

rental booking has scheduled pick-up date-time

Concept Type: property association
Necessity: Each rental booking has exactly one scheduled pick-up date-time.
Necessity: The booking date-time of the rental booking that establishes an advance rental is before the scheduled pick-up date-time of the rental.
Necessity: The booking date-time of the rental booking that establishes a points rental is at least 5 days before the scheduled pick-up date-time of the rental.

G.6.8.1 Customer-facing business vocabulary

The vocabulary used in the ‘Rental Cars’ section is the vocabulary of managers in local areas who are responsible for scheduling movements of rental cars between branches in order to meet rental commitments.

The ‘convenience’ verb concepts below support the customer-facing vocabulary of staff working in branches.

contract number

Definition: movement-id that references the rental movement that is contracted for some rental

contract number references rental

Necessity: The contract number of a rental is the movement-id that references the rental movement that is contracted for the rental.

rental reserves car group

Synonymous Form: car group is reserved for the rental
Necessity: The car group that is reserved for a rental is the car group that is claimed by the rental movement that is contracted for the rental.

advance rental requests car model

Concept Type: associative verb concept
Necessity: A car model that is requested by an advance rental is a car model that is included in the car group that is reserved for the rental.
Possibility: A car model that is requested by an advance rental changes before the actual pick-up date-time of the rental.
Necessity: A car model that is requested by an advance rental does not change after the actual pick-up date-time of the rental.

Note: EU-Rent will try to accommodate requests for specific car models, but makes no guarantees.

**pick-up branch**
Definition: sending branch that is included in the rental movement that is contracted for some rental

**rental has pick-up branch**
Necessity: The pick-up branch of a rental is the pick-up branch that is included in the rental movement that is contracted for the rental.
Necessity: The pick-up branch of a rental does not change.
Note: If the renter wishes to change the pick-up branch of a rental, EU-Rent regards it as a cancellation and a new rental.

**return branch**
Concept Type: situational role
Definition: drop-off branch that is included in the rental movement that is contracted for some rental

**rental has return branch**
Necessity: The return branch of a rental is the drop-off branch that is included in the rental movement that is contracted for the rental.
Note: If the renter does not return the car to the location of this branch, a penalty charge will be levied.
Necessity: Each rental has exactly one return branch at a given date-time.
Possibility: The return branch of a rental changes before the actual return date-time of the rental.

**advance rental has scheduled pick-up date-time**
Necessity: The scheduled pick-up date-time of an advance rental is the scheduled pick-up date-time of the advance rental movement that is contracted for the rental.

**actual pick-up date-time**
Definition: pick-up date-time of the rental movement that is contracted for some rental

**rental has actual pick-up date-time**
Necessity: The actual pick-up date-time of a rental is the pick-up date-time of the rental movement that is contracted for the rental.

**rental has scheduled return date-time**
Necessity: The scheduled return date-time of a rental is the scheduled return date-time of the rental movement that is contracted for the rental.

**actual return date-time**
Definition: drop-off date-time of the rental movement that is contracted for some rental
rental has actual return date-time
Necessity: The actual return date-time of a rental is the drop-off date-time of the rental movement that is contracted for the rental.

rented car
Concept Type: situational role
Definition: moved car that is included in the rental movement that is contracted for some rental.

rental has rented car
Necessity: The rented car of a rental is the moved car that is included in the rental movement that is contracted for the rental.

optional extra
Definition: Item that may be added to a rental at extra charge if the renter so chooses
Source: CRISG ['optional extra']
Example: Fuel pre-payment, additional drivers, fittings (child seats, satellite navigation system, ski rack), optional insurances

rental accepts optional extra
Concept Type: implicitly-understood concept

Rentals by Movement Type
Definition: segmentation that is for the concept 'rental' and subdivides rentals based on geographical movements
Necessity: Rentals by Movement Type contains the categories 'round-trip rental' and 'local rental' and 'in-country rental' and 'international outward rental' and 'international inward rental'.

round-trip rental
Definition: rental that is for a rental movement that is a round-trip car movement
Necessity: The concept 'round-trip rental' is included in Rentals by Movement Type.

local rental
Definition: rental that is for a rental movement that is a local car movement
Necessity: The concept 'local rental' is included in Rentals by Movement Type.

in-country rental
Definition: rental that is for a rental movement that is an in-country car movement
Necessity: The concept 'in-country rental' is included in Rentals by Movement Type.

international outward rental
Definition: rental that is for a rental movement that is an outward international car movement
Necessity: The concept 'international outward rental' is included in Rentals by Movement Type.

international inward rental
Definition: rental that is for a rental movement that is an inward international car movement
Necessity: The concept 'international inward rental' is included in Rentals by Movement Type.
G.6.8.2 Rental states

This sub clause introduces the use of characteristic type for defining states.

**thing being in state**
- Concept Type: characteristic type

**advance rental being reserved**
- Concept Type: thing being in state
- Definition: advance rental not having a rented car

**advance rental being assigned**
- Concept Type: thing being in state
- Definition: advance rental having a rented car that has not yet been picked up

**assigned rental**
- Definition: advance rental that is assigned

**open rental**
- Definition: rental that is open

**rental being open**
- Concept Type: thing being in state
- Definition: rental having a rented car that is in possession of the renter of the rental and a grace period that has an end date-time that is in the future

**rental being late**
- Concept Type: thing being in state
- Definition: rental having a rented car that is in possession of the renter of the rental and a grace period that has an end date-time that (is in the past and is not more than 24 hours in the past)

**rental being overdue**
- Concept Type: thing being in state
- Definition: rental having a rented car that is in possession of the renter of the rental and a grace period that has an end date-time that is more than 24 hours in the past

**rental being returned**
- Concept Type: thing being in state
- Definition: a rented car of a rental has been returned from rental to a branch

**renter has possession of rented car**
- Synonymous Form: rented car is in the possession of renter
- Definition: a renter has a rented car for use on rental
G.6.8.3 Rental period

**rental period**

- **Concept Type:** situational role
- **Definition:** period of some rental

**rental has rental period**

- **Necessity:** Each rental has exactly one rental period at a given date-time.
- **Necessity:** The rental period of an advance rental that is reserved or is assigned starts on the scheduled pick-up date-time of the rental and ends on the scheduled return date-time of the rental.
- **Necessity:** The rental period of an open rental starts on the actual pick-up date-time of the rental and ends on the scheduled return date-time of the rental.
- **Necessity:** The rental period of a rental that is overdue or is late starts on the actual pick-up date-time of the rental and ends on the current date-time.
- **Necessity:** The rental period of a rental that is returned starts on the actual pick-up date-time of the rental and ends on the actual return date-time of the rental.

**rental duration**

- **Concept Type:** situational role
- **Definition:** duration of the rental period of some rental

**rental has rental duration**

*Rental time units (RTU) are defined in the ‘Pricing’ section.*

**rental duration is measured in rental time unit**

- **Necessity:** Each rental duration is measured in a whole number of rental time units.
- **Example:** A rental with an end date-time that was 11 days and 7 hours after its start date-time would have a rental duration of 1 x 1-week RTU plus 5 x 1-day RTU.
- **Note:** If EU-Rent were to introduce a 3-day RTU, this would change to 1 x 1-week RTU plus 1 x 3-day RTU plus 2 x 1-day RTU.
- **Note:** EU-Rent uses hour as an RTU but uses it only for calculating late return penalties - see ‘Pricing’ section.

G.6.8.4 Rental pick-up request

The business scenario is that a renter walks into the pick-up branch of his rental and asks for his rented car.

The rules for ensuring that the pick-up is permitted are behavioral and are included in the Rulebook.

**request for pick-up**

- **Definition:** request from the renter responsible for a rental to pick up the rented car of the rental
request for pick-up is made at branch
Necessity: Each request for pick-up is made at exactly one branch.

person makes request for pick-up
Necessity: Each request for pick-up is made by exactly one person.

request for pick-up includes contract number
Necessity: Each request for pick-up includes exactly one contract number.

credit card
Concept Type: implicitly-understood concept

person is named on credit card
Synonymous Form: credit card is in the name of person
Necessity: Each credit card bears the name of exactly one person.

credit card is valid for rental
Definition: the credit card can guarantee the estimated rental price for the rental and is of a type that EU-Rent accepts and the expiry date on the credit card is after the scheduled return date-time of the rental and the cardholder name on the credit card is the name of the renter who is responsible for the rental.

driver license is valid for rental
Definition: The driver who has the driver license is authorized for the rental and the expiry date of the driver license is after the scheduled return date-time of the rental and the rented car of the rental falls within the vehicle types of the driver license and the driver license is legally acceptable in the country of the pick-up branch of the rental.

G.6.8.5 Rental Problems

Charge and rental price includes penalty charge are defined in the ‘Pricing’ section.

G.6.8.5.1 Car exchange

replacement car
Concept Type: situational role
Definition: rental car that replaces another rental car

rented car is replaced by replacement car

car exchange during rental
Definition: state of affairs ‘the rented car of a rental is replaced by a replacement car’ occurs during the rental period of the rental

rental receives car exchange during rental

rental car being in need of repair
Definition: rental car that has damage or breakdown that renders it unusable for rental
**breakdown during rental**

Definition: car exchange during rental of a rented car that is in need of repair

---

**service exchange**

Definition: car exchange during rental of a rented car that is due for service

---

**G.6.8.5.2 Penalties**

Penalty charge and rental has additional charge are defined in the ‘Pricing’ section. The rules for applying penalty charges are defined as behavioral business rules and included in the Rulebook. This supports allowing branch managers some discretion to waive the charges.

---

**rental incurs penalty charge**

General Concept: rental has additional charge

---

**G.6.8.5.3 Late return**

**grace period**

<table>
<thead>
<tr>
<th>Concept Type:</th>
<th>situational role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definition:</td>
<td>period that has a start date-time that is the scheduled return date-time of a rental and an end date-time that is (if the closing time of the return branch of the rental is before the scheduled return date-time of the rental plus one hour then the closing time of the return branch of the rental else the scheduled return date-time of the rental)</td>
</tr>
<tr>
<td>Description:</td>
<td>The grace period is from the rental’s scheduled return time for an hour or until closing time of the return branch, whichever happens earlier.</td>
</tr>
</tbody>
</table>

---

**rental has grace period**

<table>
<thead>
<tr>
<th>Concept Type:</th>
<th>property association</th>
</tr>
</thead>
<tbody>
<tr>
<td>Necessity:</td>
<td>Each rental has exactly one grace period.</td>
</tr>
<tr>
<td>Note:</td>
<td>Late return charges are not applied until after the grace period.</td>
</tr>
</tbody>
</table>

---

**late return charge**

<table>
<thead>
<tr>
<th>Concept Type:</th>
<th>situational role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definition:</td>
<td>penalty charge that is for a rental being late</td>
</tr>
<tr>
<td>Note:</td>
<td>The late return charge is calculated using the rental hour tariff for the car group to which the rented car belongs, for durations of up to 5 hours after the end of the grace period. Part-hours are rounded up. The rental day tariff is used for durations between 5 and 24 hours. If, after the end of the grace period, the renter contacts EU-Rent to extend the rental, the late return charge is calculated from the end of the grace period to the date-time when the rental extension is agreed.</td>
</tr>
</tbody>
</table>
Note: If the car is not returned within 48 hours after the end of the grace period, and the renter has not contacted EU-Rent to extend the rental, the insurance lapses and EU-Rent will report the car to the police as stolen and uninsured.

G.6.8.5.4 Rented car returned to a branch that is not the return branch of the rental

**drop-off branch**
- Concept Type: situational role
- Definition: branch where the rented car of a rental is dropped off

**rental has drop-off branch**
- Concept Type: associative verb concept
- Necessity: Each returned rental has exactly one drop-off branch.

**unauthorized return branch**
- Concept Type: situational role
- Definition: drop-off branch of a rental that is not the return branch of the rental
- Definition: A car may be returned to a branch other than the one agreed in the rental. EU-Rent will accept the car, but will charge a location penalty.

**location penalty charge**
- Definition: penalty charge that is made for a rental that has an unauthorized return branch

G.6.8.5.5 Recovery from a non-EU-Rent location

**recovery location**
- Concept Type: situational role
- Definition: site where the rented car of a rental is dropped off that is not a site that is location of a branch
- Example: Airport car park

**rented car is recovered from recovery location to branch**
- Definition: the rented car of a rental is recovered from the recovery location to the nearest convenient branch

**recovery charge**
- Definition: penalty charge that is made for a rental that has a recovery location
- Description: The recovery penalty charge is calculated in three parts: (i) the penalty; (ii) cost of retrieving the car if the location is a non-EU-Rent site (e.g., paying parking charges at an airport car park); (iii) cost of moving the car to the return branch specified in the rental. Car movement costs are taken from a standard scale based on the distance from the recovery location to the branch, and per-mile (or per-kilometer) costs for car groups.

G.6.8.5.6 Bad experience

**Bad experience** is informally defined in order to limit the case study size.

**bad experience**
- Definition: undesirable occurrence during a rental that is the fault of one of the drivers
Source: CRISG ['driver misbehavior']

Description: EU-Rent uses bad experiences to decide whether drivers should be barred

Example: Speeding offence, unpaid parking fine, damage to car caused by careless driving.

Note: EU-Rent uses bad experiences to decide whether a driver should be barred.

**bad experience occurs during rental**

Synonymous Form: rental includes bad experience

Necessity: Each bad experience occurs during exactly one rental.

**bad experience is the fault of driver**

Synonymous Form: driver is at fault for bad experience

Necessity: Each bad experience that occurs during a rental is the fault of a driver who is authorized for the rental that includes the bad experience.

**notification date-time**

Concept Type: situational role

Definition: date-time at which something is notified to EU-Rent

**bad experience has notification date-time**

Concept Type: property association

Necessity: Each bad experience has at least one notification date-time.

Possibility: A notification date-time of a bad experience is after the actual return date-time of the rental that includes the bad experience.

### G.6.9 Rental Pricing

This section defines the concepts used in rental pricing, such as RTU (rental time unit), base price, and penalty charge, but the calculation itself is defined in a separate entry that is not in SBVR Structured English. It is quite cumbersome to define the steps of a calculation in SBVR Structured English, so calculations beyond simple addition, subtraction, multiplication and (perhaps) division would probably:

- Either be defined in a procedural form (as illustrated in this section) or in formulae;
- Or, be supported by an existing function in an IT system.

To limit the size of the case study, the negotiated rates of corporate rental agreements are not included in this section.

Rental prices start with a base price, which may be calculated in money or in loyalty club points. These are based on rental time units (RTUs), which are related to, but not the same as, standard time units. For example, a rental day is 24 hours starting from the pick-up time of a rental. For each RTU there are rates (in currency and in points) for each car group in each operating country. The currency for calculating a rental price is the currency of the country where the pick-up branch is located.

There may be additional charges added to the base price. There are two kinds:

1. Penalty charges for non-compliance with rental terms and conditions, such as returning a car late, or dropping it off somewhere other than the return branch given in the rental contract.
2. Charges for extras that the renter has agreed to include in the rental contract. There are two kinds:
• Duration-based charges, for such items as additional drivers, rental of equipment (child seats, GPS), optional insurance. Each of these has a rate per rental day for each car group in each country.

• Non-duration-based charges, for such items as one-way rental, fuel prepayment, ‘deductible’ (the maximum cost to a renter if the car is damaged). Each of these has a per rental charge for each car group in each country.

EU-Rent uses the term ‘cash rental’ for a rental whose price is paid in money. This is a historical term; ‘cash rentals’ are paid with credit cards. But ‘cash rental’ is a convenient, short term.

G.6.9.1 Rental Time Units

<table>
<thead>
<tr>
<th>RTU</th>
<th>Definition: time unit used for calculating the price of a rental</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Definition: <strong>rental hour</strong> or <strong>rental day</strong> or <strong>rental 3 days</strong> or <strong>rental week</strong> or <strong>rental month</strong></td>
</tr>
<tr>
<td></td>
<td>Synonym: <strong>rental time unit</strong></td>
</tr>
<tr>
<td></td>
<td>Source: [CRISG (RTU)]</td>
</tr>
</tbody>
</table>

**rental time unit**

See: RTU

**rental hour**

Concept Type: implicitly-understood concept

General Concept: RTU

**rental day**

Definition: period that has duration '24 hours' and starts at the pick-up date-time of some rental

General Concept: RTU

Example: 24-hour period beginning at 3:45 p.m.

**rental 3 days**

Concept Type: 3 consecutive rental days

General Concept: RTU

**rental week**

Concept Type: 7 consecutive rental days

General Concept: RTU

**rental month**

Definition: 28 consecutive rental days

General Concept: RTU

G.6.9.2 Rental rates

**rental rate**

Concept Type: situational role

Definition: number of some currency unit that is used for calculating rental prices

Reference Scheme: RTU and ISO 3166 code and group name and rental rate type
A rental rate is of a given rental rate type (cash or points) for an RTU for a car group in an operating country.

Even though there are only two categories of rental rate (cash and points), it is useful to define rate type in order to simplify the definition of the reference scheme for rental rate.

rental rate type
- Concept Type: categorization type
- Definition: concept that specializes the concept 'rental rate' and that classifies a rental rate by its unit

The entry for cash rental rate is an example of a general concept that does not require an explicit definition. Its intension - the set of characteristics that define it unambiguously and distinguish it from other general concepts - is the combination of the characteristics of its two general concepts, and they are sufficient.

cash rental rate
- Concept Type: rental rate type
- General Concept: rental rate
- General Concept: currency amount

club point
- Definition: unit of credit in a customer loyalty scheme, which can be redeemed in lieu of payment for car rentals
- Source: CRISG ['loyalty scheme point']

points rental rate
- Concept Type: rental rate type
- Definition: rental rate that is a number of club points

club points balance
- Concept Type: situational role
- General Concept: integer
- Definition: balance of club points accumulated by a club member

club member has club points balance
- Concept Type: property association
- Necessity: Each club member has at most one club points balance.
- Necessity: Each club points balance is of exactly one club member.

RTU has rental rate
- Concept Type: property association
**car group has rental rate**

Concept Type: property association

**operating country has rental rate**

Concept Type: property association

### G.6.9.3 Base rental price and points rental cost

*Cash rental and points rental are defined in the ‘Rentals’ section.*

**cost**

Definition: the amount or equivalent paid or given or charged or engaged to be paid or given for anything bought or taken in barter or for service rendered

Source: MWU (1a) ['cost']

**base rental cost**

Definition: cost of some rental before any additional charges are added

**rental has base rental cost**

Concept Type: property association

Necessity: Each rental has exactly one base rental cost at a given date-time

Note: The base rental cost of a rental will change if the scheduled pick-up date-time or scheduled return date-time of the rental are changed so that the rental duration changes.

**base rental cost being calculated**

Definition: The base rental cost is calculated as described below

### Calculation of base rental cost
Semantics of Business Vocabulary and Business Rules, Annex G, v1.4

**RTU rental rates** may be in the [business currency of the rental](#) or in [club points](#).

They are the [RTU rental rates](#) for (i) the [car group](#) that is reserved by the [rental](#) and (ii) the [country](#) that contains the [site](#) that is location of the [pick-up branch of the rental](#).

---

Round the [rental period](#) of the [rental](#) up to whole [rental days](#), giving chargeable period.

1. Divide the [chargeable period](#) by 28 giving [rental months](#) and remainder. Multiply [rental months](#) by the [rental rate](#) for [rental month](#) giving [rental cost](#).
2. Divide the remainder from step 1 by 7 giving [rental weeks](#) and remainder. Multiply [rental weeks](#) by the [rental rate](#) for [rental week](#) and add the result to the [rental price](#).
3. Divide the remainder from step 2 by 3 giving [3-day durations](#) and remainder. Multiply [3-day durations](#) by the [rental rate](#) for [rental 3 days](#) and add the result to the [rental cost](#).
4. Divide the remainder from step 3 by 7 giving [rental weeks](#) and remainder. Multiply [rental weeks](#) by the [rental rate](#) for [rental week](#) and add the result to the [rental cost](#).
5. Divide the remainder from step 2 by 7 giving [rental months](#) and remainder. Multiply [rental months](#) by the [rental rate](#) for [rental month](#) giving [rental cost](#).
6. Divide the remainder from step 3 by 7 giving [rental weeks](#) and remainder. Multiply [rental weeks](#) by the [rental rate](#) for [rental week](#) and add the result to the [rental cost](#).
7. Divide the remainder from step 4 by 7 giving [rental weeks](#) and remainder. Multiply [rental weeks](#) by the [rental rate](#) for [rental week](#) and add the result to the [rental cost](#).

The rental cost after step 4 is the [base rental cost](#) of the [rental](#).

---

**base rental price**

Definition: [base rental cost](#) that is calculated with [cash rental rates](#).

---

**cash rental has base rental price**

Concept Type: [property association](#)

Necessity: Each [cash rental](#) has exactly one [base rental price](#) at a given [date-time](#).

---

**points rental cost**

Definition: [base rental cost](#) that is calculated with [points rental rates](#).

---

**points rental has points rental cost**

Concept Type: [property association](#)

Necessity: Each [points rental](#) has exactly one [points rental cost](#).

Necessity: The state of affairs ‘the [renter of a points rental](#) has a [club points balance](#) that is greater than the [points rental cost](#) of the [rental](#)’ occurs at the [booking date-time](#) of the [rental](#).

---

### G.6.9.4 Additional charges

*Rental accepts optional extra* is defined in the ‘Rentals’ section.

---

**charge**

Concept Type: [situational role](#)

General Concept: [currency amount](#)
Definition: the price demanded for a thing or service
Source: MWU (5b1) ['charge (noun)']

**additional charge**
Definition: charge that *is included in* a rental price
Definition: extras charge or penalty charge
Necessity: No extras charge is a penalty charge.

**additional charge rate**
Concept Type: situational role
Definition: currency amount that is used for calculating additional charges
Reference Scheme: ISO 3166 code and group name
Description: An additional charge rate is for a car group in an operating country.

**additional charge has additional charge rate**
Necessity: Each additional charge rate is for exactly one additional charge.

**extras charge**
Definition: additional charge that *is for* an optional extra that *is accepted by* a rental
Possibility: An advance rental may accept an optional extra at the booking date-time of the rental.
Possibility: A rental may accept an optional extra at the actual pick-up date-time of the rental.

**duration-independent additional charge**
Definition: extras charge that is independent of the duration of a rental
Example: Fuel prepayment, delivery/collection charge

**duration-dependent additional charge**
Definition: extras charge that is applied for each rental day of the duration of a rental
Example: Additional driver charge, optional insurance, equipment rental (child seat, ski rack, etc.)

**duration-dependent additional charge being calculated**
Definition: the duration-dependent additional charge is calculated as the additional charge rate of the duration-dependent additional charge for each rental day of the duration of the rental period of the rental that has the duration-dependent additional charge.

Incurred penalty charges are applied to a rental at the *actual return date-time* of the rental (or later). This is handled by behavioral business rules, which allow staff at branches some discretion in applying penalty charges.

**penalty charge**
Definition: additional charge that is for non-compliance with the terms of a rental
Example: Late return, recovery from non-EU-Rent location (e.g., airport car park), unpaid parking fine.

**rental has additional charge**
Synonymous Form: additional charge is for rental
G.6.9.5 Rental price

**price**
Definition: the amount of money given or set as the amount to be given as a consideration for the sale of a specified thing
Source: MWU 2b ['price']

**rental price**
Concept Type: situational role
General Concept: price
Definition: estimated rental price or actual rental price

**rental has rental price**
Synonym Form: rental price is for rental
Concept Type: property association
Necessity: Each rental has at least one rental price.
Necessity: Each rental price is for exactly one rental.

**rental price includes additional charge**
Necessity: additional charge is included in rental price

**rental price being calculated**
Definition: the rental price is calculated according to whether the rental is a points rental or a cash rental
Necessity: The rental price of a cash rental is calculated as the base rental price of the rental plus the sum of the additional charges that are included in the rental price.
Necessity: The rental price of a points rental is calculated as the sum of the additional charges that are included in the rental price.

**rental price calculation**
Definition: state of affairs ‘a rental price being calculated’

**estimated rental price**
Definition: rental price that is calculated at a date-time that is before the actual return date-time of the rental that has the rental price
Necessity: The state of affairs ‘the estimated rental price of an advance rental is calculated’ occurs at the booking date-time of the advance rental that has the rental price.
Necessity: The state of affairs ‘the estimated rental price of a rental is calculated’ occurs at the actual pick-up date-time of the rental that has the rental price.

**actual rental price**
Definition: rental price that is actually charged for a rental
Necessity: The state of affairs ‘the actual rental price of a rental is calculated’ occurs at the actual return date-time of the rental that has the rental price.
Semantics of Business Vocabulary and Business Rules, Annex G, v1.4
estimated rental price is provisionally charged to credit card
Synonymous Form: credit card is provisionally charged for estimated rental price

Sub part III - EU-Rent Rulebook

G.7 The EU-Rent Rulebook

This sub clause presents elements of guidance (business rules and advices) that accompany the “EU-Rent English Vocabulary”.

Note that much of the supporting detail for the entries should not have to be typed in. An SBVR-compliant rule editor should be able to build up this detail as the rules are developed, and produce it for an output report.

The guidance in this sub clause is expressed in the EU-Rent English Vocabulary; a working subset of this is provided in the preceding subclause. If the statements are difficult to understand at face value (e.g., seem ambiguous, or don’t quite fit everyday understanding of the words used) it is important to check the definitions before challenging the guidance statements.

Many of the guidance statements are supported by descriptions, which reflect EU-Rent users’ informal statements of the guidance.

The examples in this sub clause are generally presented in the form “It is obligatory that …,” “It is necessary that …,” etc. This emphasizes the application of the modal claim (obligation, necessity, etc.) to the underlying verb concept, but sometimes provides a cumbersome representation. SBVR Structured English (see Annex A) also supports more direct representation. For example, the behavioral business rule:

It is obligatory that each driver who is authorized for a rental is qualified.

can be represented as

Each driver who is authorized for a rental must be qualified.

A synonymous form in this style is provided for each element of guidance.

In the supporting detail below each element of guidance:

• ‘Modality qualifies’ indicates the verb concept that is central to the element of guidance, indicating the kind of situation that is obligatory, necessary, permitted, or possible.

• ‘Supporting verb concept’ is an additional verb concept on which the guidance is directly based. It qualifies or quantifies one or more roles in the central verb concept.

• ‘Referenced vocabulary’ indicates relevant semantic associations in EU-Rent’s body of shared meanings.

This supporting detail provides traceability from the Terminological Dictionary to the Rulebook. It does not have to be explicit in order to understand or use the business rules. It should not have to be typed in. An SBVR-compliant rule editor should be able to build up this detail as the rules are developed, and produce it for an output report.
EU-Rent Behavioral Elements of Guidance

General Concept: rule set
Language: English

G.7.1 Insurer Rule

It is obligatory that each operating company has at least one insurer.

Synonymous Statement: Each operating company must have at least one insurer
Guidance Type: behavioral business rule
Enforcement Level: strict
Modality qualifies: operating company has insurer

G.7.2 Rule Set -- Charging / Billing / Payment Rules

It is obligatory that an estimated rental price of an open rental is provisionally charged to a credit card that is in the name of the renter who is responsible for the rental.

Synonymous Statement: It is permitted that a rental is open only if an estimated rental price of the rental is provisionally charged to a credit card that is in the name of the renter who is responsible for the rental.
Synonymous Statement: A rental may be open only if an estimated rental price of the rental is provisionally charged to a credit card that is in the name of the renter who is responsible for the rental.
Synonymous Statement: It is prohibited that a rental is open if an estimated rental price of the rental is not provisionally charged to a credit card that is in the name of the renter who is responsible for the rental.
Synonymous Statement: If an estimated rental price of a rental is provisionally charged to a credit card that is in the name of the renter who is responsible for the rental then it is permitted that the rental is open.
Synonymous Statement: An estimated rental price of an open rental must be provisionally charged to a credit card that is in the name of the renter who is responsible for the rental.
Synonymous Statement: A credit card that is in the name of the renter who is responsible for an open rental must be provisionally charged for an estimated rental price of the rental.

Guidance Type: behavioral business rule
Description: While a renter has possession of a car, there is a provisional charge to EU-Rent against his credit card. This will be replaced by an actual charge at the end of the rental. The credit card must be in the name of the renter.
Enforcement Level: strict
Modality qualifies: estimated rental price is provisionally charged to credit card
Support verb concepts: rental has rental price
person is named on credit card

driver is authorized for rental

renter is responsible for rental

Referenced vocabulary: ‘being open’ is a characteristic of rental

The noun concept ‘open rental’ is a category of the noun concept ‘rental’.
The noun concept ‘estimated rental price’ is a category of the noun concept ‘rental price’.

Related vocabulary: The noun concept ‘renter’ is a situational role that ranges over the noun concept ‘driver’.

Related vocabulary: The noun concept ‘driver’ is a facet of the noun concept ‘person’.

If the renter who is responsible for a rental requests a price conversion for the rental then it is obligatory that the rental price of the rental is converted to the currency of the price conversion.

Synonymous Statement: If the renter who is responsible for a rental requests a price conversion for the rental then the rental price of the rental must be converted to the currency of the price conversion.

Synonymous Statement: The rental price of a rental must be converted to the currency of a price conversion that is requested by the renter who is responsible for the rental.

Note: The second synonymous statement could be understood as either of:

a. the price must be converted if a conversion is requested
b. a conversion must be requested so that the price can be converted

Guidance Type: behavioral business rule

Description: EU-Rent will provide the customer with a bill in another currency, but the actual billing is done in the business currency of the rental, and converted.

Enforcement Level: strict

Support verb concepts: rental price is converted to non-local currency

renter requests price conversion

renter is responsible for rental

Modality qualifies: rental has rental price

Referenced vocabulary: a price conversion is a state of affairs that a rental price is converted to a non-local currency

G.7.3 Rule Set -- Driver Rules

It is prohibited that a rental is open if a driver who is authorized for the rental is barred.

Synonymous Statement: It is permitted that a rental is open only if each driver who is authorized for the rental is not barred.

Synonymous Statement: A rental may be open only if each driver who is authorized for the rental is not barred.

Synonymous Statement: No rental may be open if a driver who is authorized for the rental is barred.

Synonymous Statement: It is permitted that a rental is open only if each driver who is authorized for the rental is not barred.

Synonymous Statement: No open rental may authorize a driver who is barred.
Guidance Type: behavioral business rule
Description: While a rented car is in possession of the renter, no driver for the rental can be a barred driver.
Enforcement Level: pre-authorized
Modality qualifies: rental being open
Support verb concepts: driver is authorized for rental
Referenced vocabulary: ‘being open’ is a characteristic of the noun concept ‘rental’

It is obligatory that each driver who is authorized for a rental is qualified.
Synonymous Statement: Each driver who is authorized for a rental must be qualified.
Guidance Type: behavioral business rule
Description: To be accepted as a driver on a rental, a person must comply with EU-Rent’s definition of “driver is qualified.”
Enforcement Level: strict
Modality qualifies: driver is qualified
Support verb concepts: driver is authorized for rental

G.7.4 Rule Set -- Car Movement Rules

The rules in this section apply whether the car movement is contracted for a rental or is a car transfer (a car movement driven by a EU-Rent employee).

It is obligatory that the moved car that is included in a car movement is included in the car group that is claimed by the car movement.
Synonymous Statement: The moved car that is included in a car movement must be included in the car group that is claimed by the car movement.
Enforcement Level: pre-authorized
Description: The car that is moved should be of the car group that is required (by the renter of a rental or the receiving branch of a car transfer) but, exceptionally, a car of a different group may be used.
Modality qualifies: rental car is included in car group
Support verb concepts: car movement includes moved car
Referenced vocabulary: The noun concept ‘moved car’ is a situational role that ranges over the noun concept ‘rental car’.

It is obligatory that the country that contains the EU-Rent site that is location of the receiving branch of each inward international car movement is the country of registration of the moved car of the car movement.
Synonymous Statement: The country that contains the EU-Rent site that is location of the receiving branch that is included in an inward international car movement must be the country of registration of the moved car that is included in the car movement.
Enforcement Level: pre-authorized
Modality qualifies: concept, is coextensive with concept.
Note: The coextensive concepts are ‘country (that contains site …)’ and ‘country (of registration …)’
At the drop-off date-time of an in-country car movement the local area that manages the receiving branch that is included in the car movement becomes the rental car owner of the moved car that is included in the car movement.

At the drop-off date-time of an in-country car movement the local area that manages the receiving branch that is included in the car movement must become the rental car owner of the moved car that is included in the car movement.

Enforcement Level: post-justified
Modality qualifies: local area becomes rental car owner
Support verb concepts: 

Referenced vocabulary:

The noun concept ‘rental car owner’ is a situational role that ranges over the noun concept ‘local area’.

The noun concept ‘moved car’ is a situational role that ranges over the noun concept ‘rental car’.

The noun concept ‘in-country car movement’ is a category of the noun concept ‘car movement’.

The individual noun concept ‘the local area that manages the receiving branch of an in-country car movement’ has an instance of the noun concept ‘local area’ as the thing in its extension.
The unitary concept ‘the rental car owner of the moved car that is included in an in-country car movement’ has an instance of the noun concept ‘local area’ as the thing in its extension.

The proposition ‘the individual noun concept “the local area that manages the receiving branch of an in-country car movement” changes the unitary concept ‘the car owner of the moved car that is included in an in-country car movement’ is based on the verb concept ‘individual noun concept changes unitary concept’.

If the local area that manages the receiving branch of an inward international car movement does not own the moved car that is included in the car movement then the local area becomes the rental car owner of the moved car at the drop-off date-time of the car movement.

Synonymous Statement: A local area that manages the receiving branch of an inward international car movement and does not own the moved car that is included in the car movement must become the rental car owner of the moved car.

G.7.5 Rule Set -- Rental Pick-up Rules

It is obligatory that the rented car of each assigned rental is stored at the pick-up branch of the rental.

Synonymous Statement: It is prohibited that the rented car of an assigned rental is not stored at the pick-up branch of the rental.

Synonymous Statement: The rented car of an assigned rental must be stored at the pick-up branch of the rental.

Guidance Type: behavioral business rule

Enforcement Level: pre-authorized

Description: A rental car must physically be at the pick-up branch when it is assigned to a rental.

Note: This is an example of a rule created to ensure that real-world influences do not cause problems in EU-Rent’s business. In this case, EU-Rent knows that sometimes cars are not brought to branches when they are supposed to be, so it insists that cars assigned to rentals are physically present. It does not permit cars that are “due to be returned to this branch tomorrow” to be assigned.

Note: After assignment to a rental, the car must stay at the branch until pick-up time.

Note: This doesn’t mean that the car can’t be moved. It means that if a car is to be moved, it must be unassigned from any rental and another car assigned in its place.

Modality qualifies: rental car is stored at branch

rental has rented car
ental has pick-up branch

Referenced vocabulary: the noun concept ‘rented car’ is a situational role that ranges over the noun concept ‘rental car’
A request for pick-up is a request from a renter at a branch to pick up the car he has rented.

It is obligatory that the **contract number** that is included in a request for pick-up references an **advance rental** that has a **pick-up branch** that is the **branch** at which the request for pick-up is made and a scheduled pick-up date-time that is included in the current day.

**Synonymous Statement:**
The contract number that is included in a request for pick-up must reference an advance rental that has a pick-up branch that is the branch at which the request for pick-up is made and a scheduled pick-up date-time that is included in the current day.

**Enforcement Level:**
**strict**

**Modality qualifies:**
contract number references rental

**Support verb concepts:**
request for pick-up includes contract number
request for pick-up is made at branch
rental has pick-up branch
advance rental has scheduled pick-up date-time
point in time is included in period

**Referenced vocabulary:**
The noun concept 'scheduled pick-up date-time' is a situational role that ranges over the noun concept 'point in time'.
The noun concept 'current day' is a situational role that ranges over the noun concept 'time period'.
The noun concept 'advance rental' is a category of the noun concept 'rental'.

At the actual pick-up date-time of a rental it is obligatory that the **renter** who is responsible for the rental is named on the **credit card** that is provisionally charged for the **estimated rental price** of the rental.

**Synonymous Statement:**
At the actual pick-up date-time of a rental the renter who is responsible for the rental must be named on the credit card that is provisionally charged for the estimated rental price of the rental.

**Enforcement Level:**
**strict**

**Modality qualifies:**
person is named on credit card
rental has actual pick-up date-time renter is responsible for rental rental has estimated rental price
credit card is provisionally charged for estimated rental price
state of affairs occurs at point in time

**Referenced vocabulary:**
The noun concept 'actual pick-up date-time' is a situational role that ranges over the noun concept 'point in time'.
The noun concept 'driver' is a situational role that ranges over the noun concept 'person'.
The noun concept ‘renter’ is a situational role that ranges over the noun concept ‘driver’.

At the actual pick-up date-time of a rental it is obligatory that each driver who is authorized for the rental has a driver license that is valid for the rental.

Synonymous Statement: At the actual pick-up date-time of a rental each driver who is authorized for the rental must have a driver license that is valid for the rental.

Enforcement Level: strict

Modality qualifies: driver has driver license

Support verb concepts: rental has actual pick-up date-time
driver is authorized for rental
driver license is valid for rental
state of affairs occurs at point in time

Referenced vocabulary: The noun concept ‘actual pick-up date-time’ is a situational role that ranges over the noun concept ‘point in time’

At the actual pick-up date-time of a rental it is obligatory that the fuel level of the rented car of the rental is full.

Synonymous Statement: At the actual pick-up date-time of a rental the fuel level of the rented car of the rental must be full.

Synonymous Statement: The fuel level of the rented car of a rental must be full at the actual pick-up date-time of the rental.

Guidance Type: behavioral business rule

Enforcement Level: post-justified

Description: A rented car must have a full tank of fuel at the rental pick-up time.

Note: This is an example of a rule created to ensure that real-world influences do not cause problems in EU-Rent’s business. In this case, two requirements are met. First, a car must have some fuel in it for the customer to drive it away.

Note: Second, starting fully-fuelled means that EU-Rent can easily estimate how much fuel is to be charged for at the end of the rental.

Modality qualifies: fuel level being full

Support verb concepts: rental has actual pick-up date-time
rental has rented car
rental car has fuel level
state of affairs occurs at date-time

Referenced vocabulary: the concept ‘rented car’ is a situational role that ranges over the noun concept ‘rental car’
G.7.6 Rule Set -- Return Rules

If the actual return date-time of a rental is after the end date-time of the grace period of the rental then it is obligatory that the rental incurs a late return charge.

Synonymous Statement: If the actual return date-time of a rental is after the end date-time of the grace period of the rental then the rental must incur a late return charge.

Synonymous Statement: A rental that has an actual return date-time that is after the end date-time of the grace period of the rental must incur a late return charge.

Guidance Type: behavioral business rule

Enforcement Level: pre-authorized

Note: The grace period of a rental ends one hour after the rental’s scheduled return date-time or at close of business of the return branch, whichever is earlier.

Modality qualifies: rental incurs late return charge

Support verb concepts:
- rental has actual return date-time
- rental has grace period
- period has end date-time
- date-time2 is after date-time1

Referenced vocabulary:
- The noun concept 'actual return date-time' is a situational role that ranges over the noun concept 'date-time'.
- The noun concept 'grace period' is a situational role that ranges over the noun concept 'period'.
- The noun concept 'end date-time' is a situational role that ranges over the noun concept 'date-time'.

It is obligatory that a rental incurs a location penalty charge if the drop-off branch of the rental is not the return branch of the rental.

Synonymous Statement: A rental must incur a location penalty charge if the drop-off branch of the rental is not the return branch of the rental.

Synonymous Statement: A rental that has a drop-off branch that is not the return branch of the rental must incur a location penalty charge.

Guidance Type: behavioral business rule

Description: If a rented car is returned to a branch that is not the specified return branch of the rental, that branch will accept the car but a location penalty charge will be applied to the rental.

Enforcement Level: pre-authorized

Modality qualifies: rental incurs location penalty charge

Support verb concepts:
- rental has drop-off branch
- rental has return branch

Referenced vocabulary:
- The noun concept 'drop-off branch' is a situational role that ranges over the noun concept 'branch'.
- The noun concept 'return branch' is a situational role that ranges over the noun concept 'branch'.
It is obligatory that a rental incurs a recovery charge if the rental has a recovery location.

Synonymous Statement: A rental must incur a recovery charge if the rented car of the rental is recovered from a recovery location to a branch.

Synonymous Statement: A rental that has a rented car that is recovered from a recovery location to a branch must incur a recovery charge.

Guidance Type: behavioral business rule
Description: If a rented car is left at a site that is not a EU-Rent site, the car will be recovered to the nearest branch, and a recovery penalty charge will be applied to the rental.
Enforcement Level: pre-authorized
Modality qualifies: rental incurs recovery charge
Support verb concepts: rented car is recovered from recovery location to branch
rental has rented car

G.7.7 Rule Set -- Rental Period Rules

It is prohibited that the duration of each rental period is more than 90 rental days.

Synonymous Statement: The duration of a rental period must not be more than 90 rental days.
Synonymous Statement: The duration of a rental period may be at most 90 rental days.
Synonymous Statement: No rental period may have a duration that is more than 90 rental days.
Guidance Type: behavioral business rule
Enforcement Level: post-justified
Description: EU-Rent doesn’t allow rentals to be reserved for longer than 90 days or be extended beyond 90 days.
Modality qualifies: duration₁ is greater than duration₂
Support verb concepts: period has duration
Referenced vocabulary: The noun concept 'rental period' is a situational role that ranges over the noun concept 'period'.

If the renter who is responsible for some rental₁, is responsible for another rental₂ then it is obligatory that the rental period of rental₁ does not overlap the rental period of rental₂.

Synonymous Statement: If the renter who is responsible for some rental₁, is responsible for another rental₂ then the rental period of rental₁ must not overlap the rental period of rental₂.
Synonymous Statement: A renter who is responsible for some rental₁, must not be responsible for another rental₂ that overlaps the rental period of rental₁.

Guidance Type: behavioral business rule
Enforcement Level: strict
Description: A renter can have many rentals booked, but can can have only one open rental at a time (i.e., can have only one rental car at a time).
Modality qualifies: period₁ overlaps period₂
Support verb concepts: renter is responsible for rental
rental has rental period
Referenced vocabulary: The noun concept 'rental period' is a situational role that ranges over the noun concept 'period'.

G.7.8 Rule Set -- Servicing Rules

If a rental car is due for service then it is obligatory that the rental car is scheduled for a scheduled service.

Synonymous Statement: A rental car that is due for service must be scheduled for a scheduled service.
Guidance Type: behavioral business rule
Description: A rental car that has is less than 200 miles short of its service mileage is in need of service and has to be scheduled for service.
Note: For countries that measure distance in kilometers, the figure is 300 km.
Enforcement Level: pre-authorized
Modality qualifies: rental car is scheduled for scheduled service
Referenced vocabulary: 'being due for service' is a characteristic of the noun concept 'rental'

It is obligatory that the odometer reading of a rental car is not greater than (the service mileage of the rental car + 500 miles).

Synonymous Statement: The odometer reading of a rental car must not be greater than (the service mileage of the rental car + 500 miles).
Guidance Type: behavioral business rule
Enforcement Level: strict
Description: A car must not be run for more than 500 miles beyond its service mileage without being serviced.
Note: For countries that measure distance in kilometers, the figure is 800 km
Modality qualifies: quantity, is greater than quantity,
Support verb concepts: rental car has service mileage
rental car has odometer reading
Referenced vocabulary: noun concept 'odometer reading' is a situational role that ranges over the noun concept 'quantity of miles'
Referenced vocabulary: the noun concept 'service mileage' is a situational role that ranges over the noun concept 'quantity of miles'

If the rented car of an open rental is due for service or is in need of repair then it is obligatory that the rental incurs a car exchange during rental.

Synonymous Statement: If the rented car of an open rental is due for service or is in need of repair then the rental must receive a car exchange during rental.
Synonymous Statement: An open rental that has a rented car that is due for service or is in need of repair must receive a car exchange during rental.
Guidance Type: behavioral business rule
Description: During a rental, if the rental car’s needs service or repair, the renter must take the car to a branch
Enforcement Level: pre-authorized
G.7.9 EU-Rent Advices expressed in EU-Rent’s English Vocabulary

It is possible that the notification date-time of a bad experience is after the actual return date-time of the rental that includes the bad experience.

Synonymous Statement: The notification date-time of a bad experience may be after the actual return date-time of the rental that includes the bad experience.

Guidance Type: advice of possibility

Note: This is an unconditional expression - “after” has no business intent to imply there is a prohibition on “on or before”

Description: A ‘bad experience’ may not be known at rental return.

The notification of, say, police action for a moving traffic offense may be received by EU-Rent some time after rental return.

Modality qualifies: date-time₂ is after date-time₁

Support verb concepts: bad experience occurs during rental

bad experience has notification date-time

rental has actual return date-time

Referenced vocabulary: the noun concept ‘notification date-time’ is a situational role that ranges over the noun concept ‘date-time’

the noun concept ‘return date-time’ is a situational role that ranges over the noun concept ‘date-time’

It is permitted that the moved car that is included in a car transfer is in need of service.

Synonymous Statement: The moved car that is included in a car transfer may be in need of service.

Guidance Type: advice of permission

Description: A car that is in need of service (i.e., has a service reading higher than 5000 miles) may be transferred between branches.

All relevant rules apply. One that is important is that the car’s odometer reading must not go more than 500 miles over its service reading. So, if the distance between the branches would take the mileage over this limit, the transfer would not be allowed.

Such a transfer would require that any service scheduled for the car be cancelled and a service scheduled at a service depot in the local area of the receiving branch.

Modality qualifies: moved car is included in car movement

Referenced vocabulary: the concept ‘car transfer’ is a category of the noun concept ‘car movement’

‘being in need of service’ is a characteristic of the concept ‘rental car’
It is permitted that a renter is responsible for more than one advance rental.

Synonymous Statement: A renter may be responsible for more than one advance rental.

Guidance Type: advice of permission

Description: A renter may make multiple rental bookings, each establishing an advance rental. There is a behavioral business rule that governs this permission. A renter is allowed to have only one car at a time in his possession, so the rental periods of his advance rentals must not overlap.

Modality qualifies: renter is responsible for rental

Referenced vocabulary: the concept 'advance rental' is a category of the concept 'rental'

It is permitted that the renter who is responsible for a rental, is an additional driver who is authorized for another rental.

Synonymous Statement: A renter who is responsible for a rental may be an additional driver who is authorized for another rental.

Guidance Type: advice of permission

Description: The person who is the renter for a rental may be an additional driver for another rental – even if both rentals are open at the same time.

Note: There is a behavioral business rule that governs this permission. A person cannot be the renter and an additional driver on the same rental.

Modality qualifies: concept, is coextensive with concept

Referenced vocabulary: the concept 'renter' is a situational role of the concept 'driver'

the concept 'additional driver' is a situational role of the concept 'driver'

It is permitted that the drop-off branch of a rental is not the return branch of the rental.

Synonymous Statement: The drop-off branch of a rental may not be the return branch of the rental.

Guidance Type: advice of permission

Description: There is no rule that allows a EU-Rent branch to refuse a rental return because it is not the return branch for the rental.

Note: EU-Rent wants its cars back at the end of rental. It will accept return at any branch. It will charge a location penalty if the branch is not the return branch of the rental -- but, in any case, it wants its car back.

Modality qualifies: concept, is coextensive with concept

Referenced vocabulary: the concept 'rental' has drop-off branch

the concept 'rental' has return branch
Sub part IV - Local Extensions

G.8 EU-Rent Vocabulary Extensions

This sub clause illustrates some common vocabulary that could be adopted by business-specific vocabularies. For example, EU-Rent might want to use it in SBVR Terminological Dictionaries for other parts of its business, such as Car Purchasing and Sales, Premises Management, and HR.

In a real business this vocabulary would probably be larger, containing many common terms and verb concept wordings useful in describing businesses. Here we have included some extracts that are directly relevant to the EU-Rent example as presented in this Annex.

G.8.1 Concepts from the normative SBVR Specification

EU-Rent uses concepts from the SBVR specification, including:

- instance, integer, integer, is less than integer, nonnegative integer, text, concept, is coextensive with concept

These do not need to be imported. All SBVR normative concepts are available to business-specific SBVR Terminological Dictionaries.

EU-Rent English Vocabulary Extensions

General Concept: vocabulary
Language: English
Included Vocabulary: EU-Rent Enforcement Levels

G.8.2 Derived Concepts

The implied inverse of concept includes concept is concept is included by concept. “Is included in” is often required, but its meaning is different from that of “is included by”. Adding the “is included in” synonymous form here saves having to add it to the entry of every verb concept of type concept includes concept.
**implicitly-understood concept**

<table>
<thead>
<tr>
<th>Concept Type:</th>
<th>concept type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definition:</td>
<td>concept that has a designation that is implicitly understood</td>
</tr>
</tbody>
</table>

### G.8.3 Reusable new concepts

Some concepts defined for the EU-Rent vocabulary are candidates for wider use.

#### G.8.3.1 Currency

**currency**

<table>
<thead>
<tr>
<th>Definition:</th>
<th>The currency or legal tender issued by a nation’s central bank or monetary authority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source:</td>
<td>MWUD 2a ['currency']</td>
</tr>
</tbody>
</table>

**national currency**

<table>
<thead>
<tr>
<th>Concept Type:</th>
<th>situational role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definition:</td>
<td>currency that is issued by the central bank or monetary authority of a given country</td>
</tr>
</tbody>
</table>

**country has national currency**

| Necessity: | Each country has exactly one national currency. |

**currency unit**

<table>
<thead>
<tr>
<th>Definition:</th>
<th>unit of some currency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example:</td>
<td>Euro, GB Pound, Dollar</td>
</tr>
</tbody>
</table>

**currency amount**

<table>
<thead>
<tr>
<th>Definition:</th>
<th>quantity of some currency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example:</td>
<td>10 Euros, 8 GB Pounds, 12 US Dollars</td>
</tr>
</tbody>
</table>

### G.8.4 Concepts derived from Annex A of the SBVR Specification

**state of affairs\textsubscript{1} occurs before state of affairs\textsubscript{2} occurs**

| Source: | SBVR Specification Annex A ['state of affairs\textsubscript{1} occurs before state of affairs\textsubscript{2} occurs'] |

**state of affairs occurs before point in time**

| Source: | SBVR Specification Annex A ['state of affairs occurs before point in time'] |

The related items below are also useful, although they are not described in Annex A. *State of affairs occurs at point in time* is useful for *states of affairs* that are events. *State of affairs occurs after point in time* can be defined from *state of affairs occurs before point in time* and *state of affairs occurs at point in time*.

**state of affairs occurs at point in time**

| Synonymous Form: | At point in time state of affairs occurs |

---

78 Semantics of Business Vocabulary and Business Rules, Annex G, v1.4
**state of affairs occurs at date-time**

General Concept: **state of affairs occurs at point in time**

**state of affairs occurs after point in time**

**individual noun concept changes unitary concept**

Definition: the thing that is the instance of the individual noun concept replaces the thing that is the instance of the unitary concept

**unitary quantity concept**

Definition: unitary concept that incorporates the characteristic of being a quantity

Source: **SBVR Specification Annex A** ['unitary quantity concept']

**unitary quantity concept increases by quantity**

Definition: a quantity equal to an initial quantity plus the quantity replaces the initial quantity as being the instance of the unitary quantity concept

Source: **SBVR Specification Annex A** ['unitary quantity concept* increases by quantity']

### G.8.5 Date and Time Concepts Adopted from the Date Time Vocabulary

The concepts in this sub clause are as defined in the Date Time Vocabulary (DTV); some have been given terms or synonyms that are more familiar in business, e.g., period as EU-Rent’s term for time interval.

**Time Axis**

Definition: mathematical representation of the succession in time of instantaneous events along a unique axis

Definition: the indefinite continued progress of existence and events in the past, present, and future, regarded as a continuum

Source: **DTV** ['Time Axis']

Necessity: There exists exactly one **Time Axis**.

**period**

Definition: segment of the **Time Axis**, a location in time

Source: **DTV** ['time interval']

Example: The lifetime of Henry V.

Example: The day whose Gregorian calendar date is September 11, 2001.

**period, overlaps period**

Source: **DTV** ['time interval₁ overlaps time interval₂']

**period, is before period**

Synonymous Form: **period₂ is after period₁**

Definition: period₁ ends before/when period₂ starts

Source: **DTV** ['time interval₁ is before time interval₂']
**period₁ equals period₂**

Synonymous Form: period₁ is the same as period₂

Synonymous Form: period₁ = period₂

Source: DTV ['time interval₁ equals time interval₂']

**period₁ meets period₂**

Synonymous Form: period₁ is met by period₁

Synonymous Form: period₁ immediately precedes period₂

Synonymous Form: period₂ immediately follows period₁

Source: DTV ['time interval₁ meets time interval₂']

**period₁ is part of period₂**

Synonymous Form: period₂ includes period₁

Definition: period₂ is a component of period₁

Necessity: Every instant in time interval₁ is also in time interval₂.

Necessity: Everything that happens in time interval₁ happens in time interval₂.

Source: DTV ['time interval₁ is part of time interval₂']

**period includes point in time**

Synonymous Form: point in time is included in period

Definition: period₁ is part of period₂

---

The DTV definition of *duration* is quite technical. If a dictionary definition will serve for most business discourse, it can be added as an additional, preferred (for business discourse). Provided that its business meaning is consistent with the DTV definition, concepts whose meanings depend on duration (such as *time interval has duration*) can also be adopted.

**duration**

Definition: a portion of time which is measurable or during which something exists, lasts, or is in progress

Source: **MWU** 2 ['duration']

**duration₁ equals duration₂**

Source: DTV ['duration₁ equals duration₂']

**duration₁ is less than duration₂**

Synonymous Form: duration₂ is greater than duration₁

Source: DTV ['duration₁ is less than duration₂']
duration\textsubscript{2} equals number times duration\textsubscript{1},

Source: DTV ['duration\textsubscript{1} equals number time duration\textsubscript{2}']

**duration value**

- Concept Type: implicitly-understood concept
- Example: 45 seconds, 1 year 3 days
- Note: Duration values can be either atomic (have just one component, such as 10 minutes) or be compound (a combination of multiple atomic duration values, such as 1 year 5 months). Atomic duration values consist of a number and a time unit, such as “4 weeks.” Compound duration values comprise multiple atomic duration values. For example, “3 years 5 months”.

**duration value set**

- Definition: set of duration values
- Possibility: The cardinality of a duration value set is 0
- Example: The duration value set that is quantified by {60 seconds, 64 seconds}.

**period has duration**

Source: DTV ['time interval\textsubscript{1} equals duration']

**period, is duration before period**\textsubscript{2}

Source: DTV ['time interval\textsubscript{1} is duration before time interval\textsubscript{2}']

**period, is duration after period**\textsubscript{2}

Source: DTV ['time interval\textsubscript{1} is duration after time interval\textsubscript{2}']

**time unit**

- Definition: precise time unit or nominal time unit
- Source: DTV ['time unit']

**measurement unit**

- Definition: quantity, defined and adopted by convention, with which any other quantity of the same kind can be compared to express the ratio of the two quantities as a number
- Example: week, day, hour, minute, second, kilogram, joule, meter
- Source: DTV ['measurement unit']

**precise time unit**

- Definition: measurement unit that is a duration
- Source: DTV ['precise time unit']
- Example: second, minute, hour
- Source: DTV ['duration value set']

**nominal time unit**

- Definition: duration value set that is defined and adopted by convention, whose purpose is to express duration values that vary over the duration value set
time scale
Definition: scale that has a granularity that is a time unit and that each member of the scale is a time point
Source: DTV ['time scale']

granularity
Synonym: resolution
Concept Type: situational role
General Concept: time unit
Definition: the smallest duration that can be distinguished with a given time scale
Source: DTV ['granularity']
Example: Second as the granularity for a time scale in which each time point has the duration '1 second'.

time scale has granularity
Definition: the granularity of the time scale is the duration of the time points of the time scale
Source: DTV ['time scale has granularity']

The synonym point in time has been added to time point.

time point
Synonym: point in time
General Concept: concept type
Definition: scale point that is in a time scale and that specializes the concept 'period'
Source: DTV ['time point']
Example: The Battle of Hastings was on “14 October 1066”. This gives the Julian date of the battle at a granularity of “day”. If desired, the battle could be given more precisely as a time period within that calendar day.

time point₁ precedes time point₂
Synonymous Form: time point₂ follows time point₁
Synonymous Form: point in time₁ is before point in time₂
Synonymous Form: point in time₂ is after point in time₁
Definition: the time scale of time point₁ is the time scale of time point₂ and the index of time point₁ is less than the index of time point₂

The specialization date-time₁ is before date-time₂ has been added.
date-time₁ is before date-time₂
General Concept: time point₁ precedes time point₂
Synonymous Form: date-time₂ is after date-time₁

period starts on time point
Synonymous Form: period starts at time point
Synonymous Form: time point is start of period
Source: DTV ['time interval starts on time point']

start date-time
Concept Type: situational role
Definition: date-time that is the time point that is start of some period

period has start date-time
General Concept: period starts on time point

period ends on time point
Synonymous Form: period ends at time point
Synonymous Form: time point is end of period
Source: DTV ['time interval ends on time point']

end date-time
Concept Type: situational role
Definition: date-time that is the time point that is end of some period

period has end date-time
General Concept: period ends on time point

period is past
Definition: period that is before some reference period that is defined by context
Source: DTV ['time interval is past']
Note: The reference period is sometimes called ‘now.’ The reference period is determined by the context of use of the "period is past" verb concept. For a business rule, the reference period is the period in which the decision to apply and comply with the rule is made. For facts, the reference period is one for which a consistent view of the state of the world of interest is to be used in making decisions. That is, ‘now’ is the time at which the fact or rule is used.
Example: The period identified by 'January 1, 1900' is past.

period is current
Synonymous Form: period is present
Synonymous Form: period is now
Definition: period that includes a period₁ that is past and that includes a period₂ that is not past
Source: DTV ['time interval is current']
**current time**

Synonym: present time

Definition: period that is current

Source: DTV ['current time']

Note: Every period that overlaps the “reference period” for period is past is a current time (one of many).

Example: If the “reference period” is the current hour, then the calendar day, calendar week, calendar month, calendar year (etc.) that overlap the current hour are all current times.

**current day**

Definition: current time that has granularity ‘day’

**period is future**

Definition: period that includes no period that is in the past

Source: DTV ['time interval is future']

Necessity: Each period that is future is after each period that is past.

The synonym date has been added to calendar date.

**calendar date**

Synonym: date

Definition: Gregorian year month date coordinate or Gregorian day of year coordinate or year weekday coordinate

Source: DTV ['calendar date']

Example: 1989 September 3, 2005 day 49

**time of day**

Definition: hour coordinate or hour-minute coordinate or hour minute second coordinate

Source: DTV ['time of day']

Example: 3 p.m. 15:00, 15:00:35

**date time**

Definition: compound time coordinate that combines the set of (a date, a time of day) and indicates the time point that is on the combined time scales of the time of day and the date, and the time scale of the time of day subdivides the time point that is indicated by the date

Definition: DTV ['date time']

Example: June 9, 1990 5:49:03 p.m., 13:00 on 1949 day 53, 6 p.m. on 2010 August 6

**date-time**

Definition: date time that has granularity ‘minute’
G.8.6 Enforcement Levels

*Enforcement Scheme* is a categorization scheme for business rules defined (or adopted) by the organization that owns the rules. EU-Rent’s categories are listed below.

_EU-Rent Enforcement Levels_

<table>
<thead>
<tr>
<th>General Concept:</th>
<th>vocabulary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Language:</td>
<td>English</td>
</tr>
</tbody>
</table>

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**Enforcement Scheme**

**Definition:** segmentation that is for the concept 'enforcement level' and subdivides enforcement level based on EU-Rent management policies

**Necessity:** *Enforcement Scheme contains the categories* strict and deferred and pre-authorized and post-justified and override and guideline.

**strict**

<table>
<thead>
<tr>
<th>General Concept:</th>
<th>enforcement level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definition:</td>
<td>strictly enforced: if the rule is violated, the sanction or other consequences always ensue.</td>
</tr>
<tr>
<td>Necessity:</td>
<td>The concept 'strict' is included in Enforcement Scheme.</td>
</tr>
</tbody>
</table>

**deferred**

<table>
<thead>
<tr>
<th>General Concept:</th>
<th>enforcement level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definition:</td>
<td>deferred enforcement: strictly enforced, but enforcement may be delayed — e.g., waiting for resource with required skills.</td>
</tr>
<tr>
<td>Necessity:</td>
<td>The concept 'deferred' is included in Enforcement Scheme.</td>
</tr>
</tbody>
</table>

**pre-authorized**

<table>
<thead>
<tr>
<th>General Concept:</th>
<th>enforcement level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definition:</td>
<td>pre-authorized override: enforced, but exceptions are allowed, with prior approval for actors with before-the-fact override authorization.</td>
</tr>
<tr>
<td>Necessity:</td>
<td>The concept 'pre-authorized' is included in Enforcement Scheme.</td>
</tr>
</tbody>
</table>

**post-justified**

<table>
<thead>
<tr>
<th>General Concept:</th>
<th>enforcement level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definition:</td>
<td>post-justified override: if not approved after the fact, the sanction or other consequences will ensue.</td>
</tr>
<tr>
<td>Necessity:</td>
<td>The concept 'post-justified' is included in Enforcement Scheme.</td>
</tr>
</tbody>
</table>
override
General Concept: enforcement level
Definition: override with explanation: comment must be provided when the violation occurs.
Necessity: The concept 'override' is included in Enforcement Scheme.

guideline
General Concept: enforcement level
Definition: guideline: suggested, but not enforced.
Necessity: The concept 'guideline' is included in Enforcement Scheme.

G.8.7 Extract from the OMG Date-Time Vocabulary of SBVR terminological entries for concepts adopted by EU-Rent

Concepts in the Date-Time Vocabulary (DTV) are defined formally to support automated reasoning by software. Business users of SBVR generally do not need to be concerned with this; for business discourse many of the DTV concepts (e.g., ‘calendar,’ ‘date,’ ‘year,’ ‘minute’) are implicitly understood as the everyday meanings of the terms. This sub clause lists DTV concepts that were judged essential for EU-Rent to take best advantage of DTV. Other businesses might adopt more.

DTV
Synonym: Date-Time Vocabulary
Definition: the vocabulary that is known as ‘Date-Time Vocabulary (DTV)’
Source: www.omg.org/spec/DTV/1.0/Beta1

Time Axis
Dictionary Basis: IEC 60050-111 (‘time axis’)  
Dictionary Basis: EC 8601 (2.1.1, ‘time axis’)  
General Concept: mathematical representation of the succession in time of instantaneous events along a unique axis  
Source: New Oxford Dictionary of English (‘time’)  
Definition: the indefinite continued progress of existence and events in the past, present, and future, regarded as a continuum  
Necessity: There exists exactly one Time Axis.

G.8.8 Time Interval

time interval
Definition: segment of the Time Axis, a location in time
Example: The lifetime of Henry V.
Example: The day whose Gregorian calendar date is September 11, 2001.
**time interval**, **overlaps** **time interval**,

**time interval**, **is before** **time interval**,

- Synonymous Form: **time interval**, **is after** **time interval**,
- Definition: **time interval** ends before/when **time interval** starts

**time interval**, **equals** **time interval**,

- Synonymous Form: **time interval**, **is the same as** **time interval**,
- Synonym: **time interval** = **time interval**.

**time interval**, **meets** **time interval**,

- Synonymous Form: **time interval**, **is met by** **time interval**,
- Synonymous Form: **time interval**, **immediately precedes** **time interval**,
- Synonymous Form: **time interval**, **immediately follows** **time interval**.

**time interval**, **is part of** **time interval**,

- Synonymous Form: **time interval**, **includes** **time interval**,
- Definition: **Time interval**₂ is a component of **time interval**₁. Every instant in **time interval**₁ is also in **time interval**₂. Everything that happens in **time interval**₁ happens in **time interval**₂.
- Note: Like the concept **time interval** itself, this relationship is also primitive – intuitive. It is a mathematical ordering of **time intervals** by containment.

### G.8.9 Duration

**duration**

- Synonym: **time**
- Definition: **base quantity** of the International System of Quantities, used for measuring **time intervals**
- Note: **Duration** is a **quantity kind**, whose instances are **quantities** of time. Each **duration** is an equivalence class of **particular durations**: a **duration** equals all the measurements for the same amount of time.
- Reference Scheme: **a precise atomic duration value** that **quantifies** the **duration**
- Source: [ISO/IEC 80000-3](https://www.iso.org/standard/14897.html) (‘duration’)

**duration₁**, **equals** **duration₂**

**duration₁**, **is less than** **duration₂**

- Synonymous Form: **duration₁**, **is greater than** **duration**

**duration₂**, **equals** **number** **times** **duration₁**

**duration value**

- Definition: **precise duration value** or **nominal duration value**
- Necessity: Each **duration value** has at least one **atomic duration value**.
Note: A duration value can be either atomic or compound (see sub clause 11.2.1) and either nominal or precise (sub clauses 11.2.2 and 11.2.3).

Example: 45 seconds, 1 year 3 days

Duration values can be either atomic (have just one component, such as 10 minutes) or be compound (a combination of multiple atomic duration values, such as 1 year 5 months). Atomic duration values consist of a number and a time unit, such as “4 weeks.” Compound duration values comprise multiple atomic duration values. For example, “3 years 5 months.” [From DTV 11.1.1 Atomic and Compound Duration Values]

duration value set
Definition: set of duration values
Possibility: The cardinality of a duration value set is 0.
Example: The duration value set that is quantified by {60 seconds, 64 seconds}.

G.8.9.1 Time interval duration

time interval has duration

time interval, is duration before time interval

time interval, is duration after time interval

G.8.9.2 Time Units

time unit
Definition: precise time unit or nominal time unit

measurement unit
Definition: quantity, defined and adopted by convention, with which any other quantity of the same kind can be compared to express the ratio of the two quantities as a number
Example: week, day, hour, minute, second, kilogram, joule, meter
Dictionary Basis: VIM 1.9 ‘measurement unit’

precise time unit
Definition: measurement unit that is a duration
Example: second, minute, hour

second
Synonym: s
Synonym: sec
Definition: the precise time unit that is equal to the amount of time required for 9 192 631 770 periods of the radiation corresponding to the transition between the two hyperfine levels of the ground state of the caesium 133 atom
Dictionary Basis: The International System of Units [SI] 2.1.1.3 ‘Unit of time (second)’
Note: The duration of a second is a constant. In 1972, the second broke with astronomy and went to an atomic clock standard.
**minute**

- Synonym: min
- General Concept: derived unit, precise time unit
- Source: ISO 31-1
- Definition: the precise time unit that is quantified by '60 seconds'

**hour**

- Synonym: h
- General Concept: derived unit, precise time unit
- Source: ISO 31-1
- Definition: the precise time unit that is quantified by '3600 seconds'

**day**

- Synonym: d
- Definition: the precise time unit that is the duration of a calendar day
- Definition: the precise time unit that is quantified by '86400 seconds'

**nominal time unit**

- Definition: duration value set that is defined and adopted by convention, whose purpose is to express duration values that vary over the duration value set
- Example: Month defined as {28 days, 29 days, 30 days, 31 days}. Each month on the Gregorian calendar is a choice of 28, 29, 30, or 31 days.

G.8.9.3 Points in time

**time scale**

- Definition: scale that has a granularity that is a time unit and that each member of the scale is a time point

**granularity**

- Synonym: resolution
- Concept Type: situational role
- General Concept: time unit
- Dictionary Basis: VIM (4.15, 'resolution (2)')
- Definition: the smallest duration that can be distinguished with a given time scale
- Example: Second as the granularity for a time scale in which each time point has the duration '1 second'.

**time scale has granularity**

- Definition: the granularity of the time scale is the duration of the time points of the time scale

**time point**

- General Concept: concept type
- Definition: scale point that is in a time scale and that specializes the concept 'time interval'
Example: The Battle of Hastings was on “14 October 1066”. This gives the Julian date of the battle at a granularity of “day”. If desired, the battle could be given more precisely as a time period within that calendar day.

**time interval** **starts on** **time point**

**time point** sub 1 precedes **time point** sub 2

Synonymous Form:  

**time point** sub 2 follows **time point** sub 1

Definition:  

the time scale of **time point** sub 1 is the time scale of **time point** sub 2 and the index of **time point** sub 1 is less than the index of **time point** sub 2

**time interval** **ends on** **time point**

**G.8.9.4** Past, present, and future

**time interval** is past

Definition:  

**time interval** that is before some reference **time interval** that is defined by context

Note:  

The reference **time interval** is sometimes called ‘now.’ The reference **time interval** is determined by the context of use of the ‘**time interval** is past’ verb concept. For a business rule, the reference **time interval** is the **time interval** in which the decision to apply and comply with the rule is made. For facts, the reference **time interval** is one for which a consistent view of the state of the world of interest is to be used in making decisions. That is, ‘now’ is the time at which the fact or rule is used.

Example:  

The **time interval** identified by ‘January 1, 1900’ is past.

**time interval** is current

Synonymous Form:  

**time interval** is present

Synonymous Form:  

**time interval** is now

Definition:  

**time interval** that includes a **time interval** sub 1 that is past and that includes a **time interval** sub 2 that is not past

**current time**

Synonym:  

**present time**

Definition:  

**time interval** that is current

Note:  

Every **time interval** that overlaps the “reference time interval” for ‘**time interval** is past’ is a **current time** (one of many).

Example:  

If the “reference time interval” is the **current hour**, then the calendar day, calendar week, calendar month, calendar year (etc.) that overlap the current hour are all current times.

**time interval** is future

Definition:  

**time interval** that includes no **time interval** that is in the past

Necessity:  

Each **time interval** that is future is after each **time interval** that is past.
G.8.9.5 Date and time coordinates

**calendar date**

Definition: **Gregorian year month date coordinate** or **Gregorian day of year coordinate** or **year weekday coordinate**

Dictionary Basis: ISO 8601 (2.1.9, ‘calendar date’)

Example: 1989 September 3

Example: 2005 day 49

**time of day**

Definition: **hour coordinate** or **hour-minute coordinate** or **hour minute second coordinate**

Example: 3 p.m.

Example: 15:00

Example: 15:00:35

**date time**

Definition: **compound time coordinate** that **combines** the set of (a **date**, a **time of day**) and **indicates** the **time point** that **is on** the combined **time scales** of the **time of day** and the **date**, and the **time scale** of the **time of day** **subdivides** the **time point** that **is indicated** by the **date**

Example: June 9, 1990 5:49:03 p.m.

Example: 13:00 on 1949 day 53

Example: 6 p.m. on 2010 August 6