



# Semantics of Business Vocabulary and Business Rules (SBVR), v1.3

## *Annex G - EU-Rent Example*

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**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.

Sub clause	SBVR capabilities
Sub part I - Introduction	A few introductory examples of business guidance; communities; vocabularies.
G.6.4 EU-Rent Organization	Simple example of fitting geographical and organization structures together; extensional definitions; designation context; characteristics; specialization of verb concepts; inheritance of characteristics and necessities in concept hierarchies.
G.6.5 Rental Cars	Identification and ownership; designation context; options for categorization; multiple categorization; specification of products and service; properties.
G.6.6 Customers	Subject field, facet, individual organization.
G.6.7 Car Movements	Creating a substantial structure that can be used in more than one context; planned and actual activities; using states of affairs to define changes.
G.6.8 Rentals	Customizing parts of vocabularies for different purposes; states; scheduling; problems and penalties.
G.6.9 Rental Pricing	Concepts used to support tariffs and price calculations across multiple categories (actual calculations are not specified with SBVR SE).
G.7 The EU-Rent Rulebook	Behavioral rules with supporting elements of vocabulary; multiple representations; advice of possibility and permission.
G.8 EU-Rent Vocabulary Extensions	Local concepts derived from the normative specification; concepts derived from Annex G; concepts adopted from the Date-Time Vocabulary.

## 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 <u>driver</u> who is authorized for a <u>rental</u> is qualified.   |
|   | Modality qualifies:       | <u>driver is qualified</u>   |
|   | Supporting verb concepts: | <u>person is authorized for rental</u>   |
|   | Referenced vocabulary:    | The <u>noun concept 'driver'</u> is a <u>facet of the noun concept 'person'</u> .  |
| 2 | Behavioral business rule: | It is obligatory that a <u>rental</u> incurs a <u>location penalty charge</u> if the <u>drop-off branch of the rental is not the return branch of the rental</u> . |

	Modality qualifies:	<u>rental</u> <i>incurs</i> <u>penalty charge</u>
	Supporting verb concepts:	<u>rental</u> <i>has</i> <u>drop-off branch</u> <u>rental</u> <i>has</i> <u>return branch</u>
	Referenced vocabulary:	The <u>noun concept 'drop-off branch'</u> <i>is a</i> <u>situational role</u> <i>that ranges over</i> the <u>noun concept 'branch'</u> .  The <u>noun concept 'return branch'</u> <i>is a</i> <u>situational role</u> <i>that ranges over</i> the <u>noun concept 'branch'</u> .  The <u>noun concept 'location penalty charge'</u> <i>is a</i> <u>category of</u> the <u>noun concept 'penalty charge'</u> .
3	Behavioral business rule:	It is obligatory that the <u>fuel level of the rented car of a rental</u> <i>is full at</i> the <u>actual pick-up date-time of the rental</u> .
	Modality qualifies:	<u>state of affairs 'the fuel level of the rented car of a given rental is full'</u> <i>occurs at</i> the <u>actual pick-up date-time of the rental</u>
	Supporting verb concepts:	<u>rental</u> <i>has</i> <u>actual pick-up date-time</u> <u>rental</u> <i>has</i> <u>rented car</u> <u>rental car</u> <i>has</i> <u>fuel level</u> <u>state of affairs</u> <i>occurs at</i> <u>date-time</u>
	Referenced vocabulary:	The <u>noun concept 'rented car'</u> <i>is a</i> <u>situational role</u> <i>that ranges over</i> the <u>noun concept 'rental car'</u> . <u>fuel level</u> <i>is full or 7/8 or 5/8 or 1/2 or 3/8 or 1/4 or 1/8 or empty</i> The <u>noun concept 'actual pick-up date-time'</u> <i>is a</i> <u>situational role</u> <i>that ranges over</i> the <u>noun concept 'date-time'</u> .
4	Behavioral business rule:	It is prohibited that the <u>rental duration of a rental</u> <i>is greater than</i> <u>90 rental days</u> .
	Modality qualifies:	<u>duration<sub>1</sub></u> <i>is greater than</i> <u>duration<sub>2</sub></u>
	Supporting verb concepts:	<u>rental</u> <i>has</i> <u>rental duration</u>
	Referenced vocabulary:	The <u>noun concept 'rental duration'</u> <i>is a</i> <u>situational role</u> <i>that ranges over</i> the <u>noun concept 'duration'</u> . <u>rental duration</u> <i>is measured in</i> <u>rental time unit</u> [aka RTU]. The <u>individual noun concept 'Rental Day'</u> <i>specializes</i> the <u>noun concept 'rental time unit'</u> .

- 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-time<sub>2</sub> *is after* date-time<sub>1</sub>

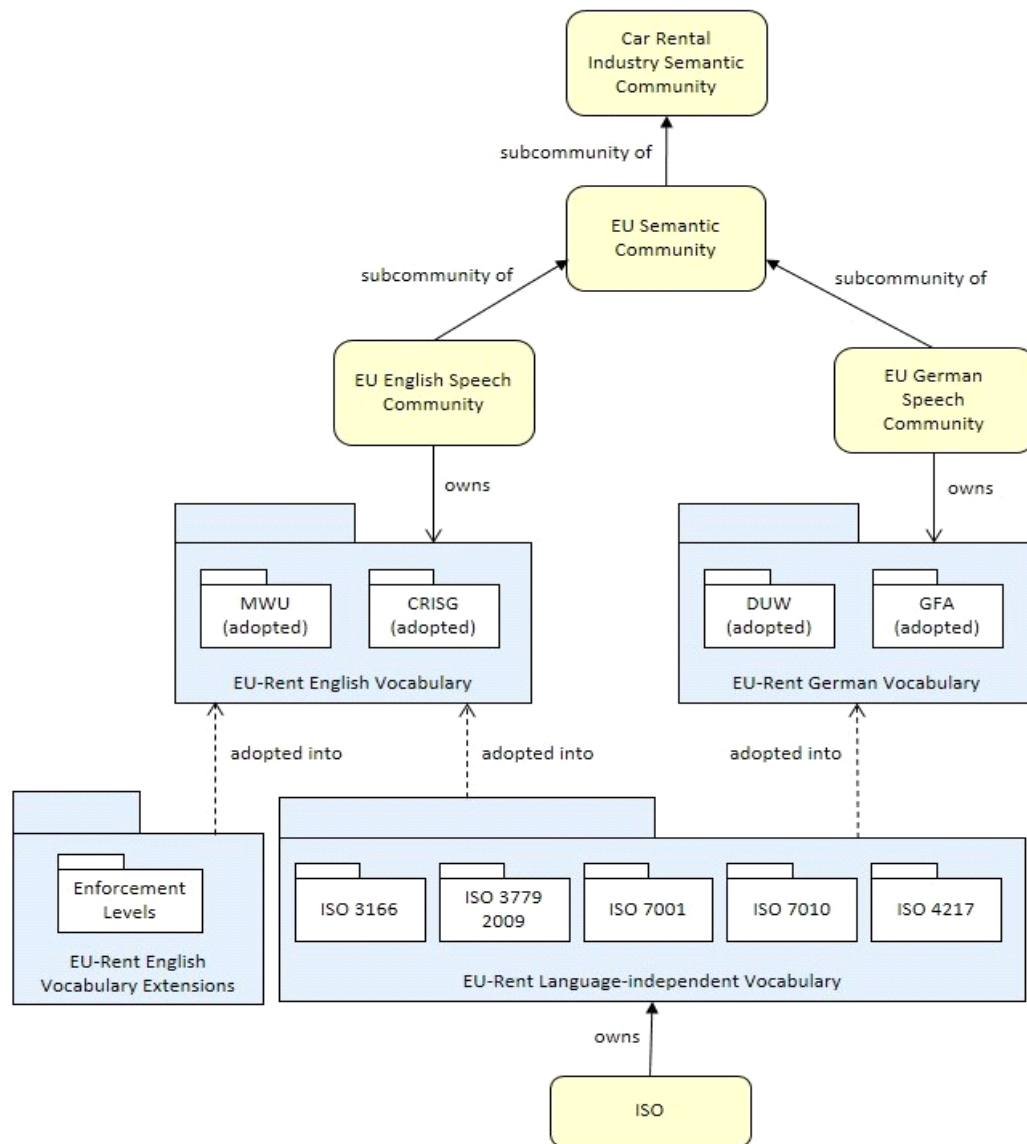
Referenced vocabulary: the noun concept *“notification date-time” is a situational role that ranges over the noun concept “date-time”*  
the noun concept *“actual return date-time” is a situational role that ranges over the noun concept “date-time”*

10	Advice of permission:	It is permitted that the <u>drop-off branch</u> of a <u>rental</u> is not the <u>return branch</u> of the <u>rental</u> .
	Modality qualifies:	<u>drop-off branch</u> is not <u>return branch</u>
	Supporting verb concepts:	<u>rental</u> has <u>drop-off branch</u> <u>rental</u> has <u>return branch</u> <u>concept<sub>1</sub></u> is coextensive with <u>concept<sub>2</sub></u>
	Referenced vocabulary:	the <u>noun concept</u> ' <u>drop-off branch</u> ' is a <u>situational role</u> that ranges over the <u>noun concept</u> ' <u>date-time</u> ' the <u>noun concept</u> ' <u>return branch</u> ' is a <u>situational role</u> that ranges over the <u>noun concept</u> ' <u>branch</u> '

## ***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**

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## EU-Rent English Vocabulary

General Concept: vocabulary  
Language: normal

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### 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

Necessity: Car Rental Business *unites* 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

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### EU-Rent Vocabulary Registration Vocabulary

General Concept: Vocabulary

Language: English

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### G.6.2.1 Language-independent Vocabulary

#### ISO

Definition: International Organization for Standardization ([www.iso.org](http://www.iso.org))

#### ISO 3166

Source: [http://www.iso.org/iso/home/standards/country\\_codes/iso-3166-1\\_decoding\\_table.htm](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](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](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

Source: [http://www.iso.org/iso/home/store/catalogue\\_tc/catalogue\\_detail.htm?csnumber=54432](http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=54432)

Reference Scheme: ISO 7010 index entry

### ISO 4217

Source: [www.iso.org/iso/catalogue\\_detail?csnumber=46121](http://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](http://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

Reference Scheme:	The Necessity <i>CRISG has precedence over MWU</i> , below, means that if a <i>signifier</i> used in the <i>EU-Rent English Vocabulary</i> does not have an owned or explicitly adopted <i>definition</i> , and is not implicitly understood (i.e., is not consistently understood from the everyday meaning of the <i>signifier</i> ) it should first be looked up in CRISG, and if it is not there, then in MWU.
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#### 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 Enforcements 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

Included Vocabulary: [ISO 7018](#)

Included Vocabulary: [ISO 4217](#)

### [EU-Rent German Vocabulary](#)

General Concept: [vocabulary](#)

Language: [German](#)

Included Vocabulary: [EU-Rent Language-independent Vocabulary](#)

Included Vocabulary: [DUW](#)

Included Vocabulary: [GFA](#)

### [EU-Rent English Vocabulary](#)

General Concept: [vocabulary](#)

Language: [English](#)

Included Vocabulary: [EU-Rent Language-independent Vocabulary](#)

Included Vocabulary: [MWU](#)

Included Vocabulary: [CRISG](#)

Included Vocabulary: [EU-Rent English Vocabulary Extensions](#)

## **G.6.4 EU-Rent Organization**

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](#) or [Switzerland](#) or [United Kingdom](#) or [United States](#)

## 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](#) or [Belgium](#) or [France](#) or [Finland](#) or [Germany](#) or [Greece](#) or [Hungary](#) or [Ireland](#) or [Italy](#) or [Luxembourg](#) or [Netherlands](#) or [Portugal](#) or [Spain](#)  
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](#) or [Finland](#) or [Iceland](#) or [Norway](#) or [Sweden](#)

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:

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.

Definite descriptions in the style of the entry below could be added for all 19 *operating companies*, but it's more likely that this population would be defined in the information system that will support EU-Rent's rental business.

*EU-Rent CH* is included here because it is the *operating company* that includes the *web reservations center*.

### 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 unit<sub>1</sub> manages organization unit<sub>2</sub>

- Synonymous Form: organization unit<sub>2</sub> reports to organization unit<sub>1</sub>
- Necessity: Each organization unit<sub>1</sub> that reports to some organization unit<sub>2</sub> is part of the operating company that includes organization unit<sub>2</sub>.
- Necessity: Each organization unit<sub>2</sub> that is not a national HQ reports to exactly one organization unit<sub>1</sub>.

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 unit<sub>2</sub> reports to organization unit<sub>1</sub>. 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](#)

## **service 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<sub>1</sub> reports to organization unit<sub>2</sub>

### local area manages branch

General Concept: organization unit<sub>1</sub> reports to organization unit<sub>2</sub>

### local area manages service depot

General Concept: organization unit<sub>1</sub> reports to organization unit<sub>2</sub>

#### 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 extensional – 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: name references thing  
Necessity: Each car is represented by exactly one VIN.

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

### country of registration

Concept Type: implicitly-understood concept  
Concept Type: situational role  
General Concept: country

The entry below illustrates one of SBVR Structured English's options, with the semantics in country's *verb concept role* in the primary entry, and in the *verb* in the synonymous form.

### car has country of registration

Synonymous Form: car is registered in country  
Necessity: Each 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.

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

### national registration number (country)

Concept Type: implicitly-understood concept  
General Concept: name  
Example: PK07-LVD (UK)  
Example: PA-GBQ-7198 (US)

### country owns national registration number (country)

Necessity: Each national registration number (country) is owned by exactly one country.

The first Necessity below ensures that the *country code* used in referencing a *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']  
Definition: 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']

### coupe

General Concept: [body style](#)  
Definition: '3-box' configuration with two doors. The rear may have small seats, and limited leg- and headroom.  
Source: [CRISG](#) ['coupe']

### 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:	<u>implicitly-understood concept</u>
General Concept:	<u>fuel type</u>
Synonym:	<u>petroleum</u>
Synonym:	<u>petrol</u>

### LPG

Concept Type:	<u>implicitly-understood concept</u>
General Concept:	<u>fuel type</u>
Synonym:	<u>liquefied petroleum gas</u>

### car model has fuel type

Concept Type:	<u>property association</u>
Necessity:	Each <u>car model</u> <i>has</i> at least one <u>fuel type</u> .
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:	<u>situational role</u>
Definition:	<u>number</u> <i>that</i> 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 <u>[CRISG 'luggage capacity']</u>

### small suitcase capacity

Concept Type:	<u>situational role</u>
Definition:	<u>number</u> <i>that</i> 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 <u>[CRISG 'luggage capacity']</u>

### car model has large suitcase capacity

Concept Type:	<u>property association</u>
Necessity:	Each <u>car model</u> <i>has</i> at most one <u>large suitcase capacity</u> .

### car model has small suitcase capacity

Concept Type:	<u>property association</u>
Necessity:	Each <u>car model</u> <i>has</i> at most one <u>small suitcase capacity</u> .
Necessity:	Each <u>car model</u> <i>has</i> at least one <u>large suitcase capacity</u> or at least one <u>small suitcase capacity</u> .

### passenger capacity

Concept Type: situational role  
Concept Type: integer  
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:	<u>set</u>
Definition:	group of car models that have similar specifications and share a single rental tariff
Source:	<u>CRISG</u> ['rate group']
Definition:	<u>Economy</u> or <u>Compact</u> or <u>Intermediate</u> or <u>Standard</u> or <u>Full Size</u> or <u>Premium</u>
Reference Scheme:	<u>group name</u>
Description: :	Most <u>car groups</u> have properties that specify the minimum provided by each <u>car model</u> in the group. The <u>Premium</u> group includes a range of <u>car models</u> , including luxury sedans, SUVs, and two-seater convertibles; there are no properties common to all these models.

### group name

Definition:	<u>name</u> that is assigned to a <u>car group</u> by <u>EU-Rent</u>
-------------	--

### group name references car group

### car group has passenger capacity

Concept Type:	<u>property association</u>
Necessity:	Each <u>car group</u> has exactly one <u>passenger capacity</u> .

### car group has large suitcase capacity

Concept Type:	<u>property association</u>
Necessity:	Each <u>car group</u> has at most one <u>large suitcase capacity</u> .

### car group has small suitcase capacity

Concept Type:	<u>property association</u>
Necessity:	Each <u>car group</u> has at most one <u>small suitcase capacity</u> .

### Economy

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

### Compact

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

### Intermediate

General Concept:	<u>car group</u>
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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 <u>EU-Rent</u> does business with
Example:	Ford Motor Company
Example:	Volkswagen
Example:	Toyota Corporation

### car manufacturer **supplies** car model

Necessity:	Each <u>car model</u> <b>is supplied by exactly one</b> <u>car manufacturer</u> .
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### 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:	<u>implicitly-understood concept</u>
Necessity:	<u>full</u> or <u>7/8</u> or <u>3/4</u> or <u>5/8</u> or <u>1/2</u> or <u>3/8</u> or <u>1/4</u> or <u>1/8</u> or <u>empty</u>
Source:	<u>CRISG</u> [ <u>‘fuel level’</u> ]

### full

Concept Type:	<u>implicitly-understood concept</u>
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### fuel level **being full**

Definition:	the <u>fuel level</u> <b>is</b> <u>full</u>
Description: :	A characteristic that is relevant to the fuel level of an individual car

### empty

Concept Type:	<u>implicitly-understood concept</u>
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### rental car **has** fuel level

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

### odometer reading

Concept Type:	<u>implicitly-understood concept</u>
Concept Type:	<u>situational role</u>
General Concept:	<u>quantity</u>

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

Necessity: 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

Necessity: 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

### additional driver

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](#)

Concept Type: [situational role](#)

General Concept: [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](#)

Concept Type: [situational role](#)

General Concept: [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](#)

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.

*Rental price* is defined in the 'Pricing' section.

### rental

- Definition: contract for use of a rental car by a renter for an agreed period under EU-Rent's [the Rental Company's] terms and conditions for rental.
- Source: [CRISG](#) ['rental']
- Definition: [advance rental](#) or [walk-in rental](#)
- Definition: [cash rental](#) or [points rental](#)
- Description: : A [rental](#) is a contract with a [renter](#) for a [rental movement](#) at a [rental price](#), perhaps including some [optional extras](#).

### recognized rental

- Definition: [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](#)

### rental contract document is manifestation of rental

- 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](#).
- Necessity: *Each* [rental](#) *is for exactly one* [rental movement](#).

### 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

*Rental car being due for service* is defined in the ‘Rental Cars’ section.

### 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

Concept Type: situational role

Definition: 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)

Description: : 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.

### rental has grace period

Concept Type: property association

Necessity: Each rental has exactly one grace period.

Note: Late return charges are not applied until after the grace period.

### late return charge

Concept Type: situational role

Definition: penalty charge that is for a rental being late

Note: 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.



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

#### RTU

Definition: time unit used for calculating the price of a rental  
 Definition: rental hour or rental day or rental 3 days or rental week or rental month  
 Synonym: rental time unit  
 Source: CRISG [‘RTU’]

#### 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

Description: : 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

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
3. rental weeks and remainder. Multiply rental weeks by the rental rate for rental week and add the result to the rental price.
4. Divide the
5. 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.
6. Multiply the
7. remainder from step 3 by the rental rate for rental day 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

Incurring *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

Concept Type: property association  
Necessity: Each additional charge *is for exactly one* 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

Synonymous 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.



Currency, country has currency, and currency amount are defined in the ‘Vocabulary Extensions’ section.

### **business currency**

Concept Type: [situational role](#)  
Definition: [currency of an operating country](#).  
Description: : [currency](#) in which EU-Rent undertakes financial transactions

### **rental has business currency**

Necessity: The [business currency](#) of a [rental](#) is the [national currency](#) of the [operating country](#) of the [operating company](#) that [includes](#) the [pick-up branch](#) of the [rental](#).

### **rental price is calculated in business currency**

Necessity: Each [rental price](#) of a [rental](#) is calculated in the [business currency](#) of the [rental](#).

### **non-local currency**

Concept Type: [situational role](#)  
Definition: [currency](#) that is not the [business currency](#) of a given [rental](#)

### **rental price is converted to non-local currency**

Definition: the [rental price](#) of a given [rental](#) is converted to a [currency](#) that is not the [currency](#) of the [rental](#)  
Description: : If a [renter](#) requests it, the [rental price](#) of a [rental](#) can be shown on the [contract](#) and/or the invoice in a [currency](#) other than the [currency](#) in which it is calculated. This is done by converting the [rental price](#) to the non-local currency, so that the converted price may change over time as exchange rates change. The price charged is the [rental price](#) in the [currency](#) of the [rental](#).

### **price conversion**

Definition: [state of affairs](#) that a [rental price](#) is converted to a [non-local currency](#)

### **price conversion is for rental**

Definition: Each [price conversion](#) is for exactly one [rental](#).

### **price conversion has currency**

Necessity: Each [price conversion](#) is to exactly one [currency](#).

### **renter requests price conversion**

Necessity: Each [price conversion](#) is requested by exactly one [renter](#).

EU-Rent requires that the *estimated rental price* of a rental, calculated at the *actual pick-up date* of the rental, is provisionally charged during the *rental period* to a *credit card* in the name of the *renter*. This is handled as a *behavioral business rule* in the Rulebook.

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.

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## EU-Rent Behavioral Elements of Guidance

General Concept: rule set

Language: English

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### 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’](#)  
[‘being barred’ is a characteristic of the noun concept ‘driver’](#)

**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](#)  
[car movement](#) [claims car group](#)  
 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<sub>1</sub>](#) [is coextensive with concept<sub>2</sub>](#)  
 Note: The coextensive concepts are ‘country (that contains site ...)’ and ‘country (of registration ...)’

Support verb concepts: country contains site

EU-Rent site is location of organization unit

car movement includes receiving branch

car movement includes moved car

car has country of registration

Referenced vocabulary: The noun concept 'branch' is a category of the noun concept 'organization unit'.

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

The noun concept 'inward international car movement' is a situational role that ranges over the noun concept 'car movement'.

There are definitional equivalents of the two rules below included (for illustration) in the 'Car Movements' section. Having them as behavioral rules gives *local area* staff some flexibility in deciding on car ownership.

**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.**

Synonymous Statement: 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: 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

moved car is included in car movement

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’

The rule below has the same supporting detail as the one above, except that *in-country car movement* is replaced by *inward international car movement*.

**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.**

Enforcement Level: post-justified

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

rental has pick-up branch

Referenced vocabulary: the noun concept ‘rented car’ is a situational role that ranges over the noun concept ‘rental car’



*'being assigned' is a characteristic of the noun concept 'advance rental'*  
*the noun concept 'advance rental' is a category of the noun concept 'rental'*  
*the noun concept 'pick-up branch' is a situational role that ranges over the noun concept 'branch'*

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-time<sub>2</sub> is after date-time<sub>1</sub>
- 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 <u>rental</u> must <i>incur</i> a <u>recovery charge</u> if the <u>rented car</u> of the <u>rental</u> is <i>recovered from</i> a <u>recovery location</u> to a <u>branch</u> .
Synonymous Statement:	A <u>rental</u> that <i>has</i> a <u>rented car</u> that is <i>recovered from</i> a <u>recovery location</u> to a <u>branch</u> must <i>incur</i> a <u>recovery charge</u> .
Guidance Type:	<u>behavioral business rule</u>
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:	<u>pre-authorized</u>
Modality qualifies:	<u>rental</u> <i>incurs</i> <u>recovery charge</u>
Support verb concepts:	<u>rented car</u> <i>is recovered from</i> <u>recovery location</u> to <u>branch</u> <u>rental</u> <i>has</i> <u>rented car</u>

### 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 <u>duration</u> of a <u>rental period</u> must not be more than <u>90 rental days</u> .
Synonymous Statement:	The <u>duration</u> of a <u>rental period</u> may be at most <u>90 rental days</u> .
Synonymous Statement:	No <u>rental period</u> may <i>have</i> a <u>duration</u> that is more than <u>90 rental days</u> .
Guidance Type:	<u>behavioral business rule</u>
Enforcement Level:	<u>post-justified</u>
3Description:	EU-Rent doesn't allow rentals to be reserved for longer than 90 days or be extended beyond 90 days.
Modality qualifies:	<u>duration</u> <sub>1</sub> <i>is greater than</i> <u>duration</u> <sub>2</sub>
Support verb concepts:	<u>period</u> <i>has</i> <u>duration</u>
Referenced vocabulary:	The noun concept ' <u>rental period</u> ' is a <u>situational role</u> that <i>ranges over</i> the noun concept ' <u>period</u> '.

**If the renter who is responsible for some rental<sub>1</sub> is responsible for another rental<sub>2</sub> then it is obligatory that the rental period of rental<sub>1</sub> does not overlap the rental period of rental<sub>2</sub>.**

Synonymous Statement:	If the <u>renter</u> who is responsible for some <u>rental</u> <sub>1</sub> is responsible for another <u>rental</u> <sub>2</sub> then the <u>rental period</u> of <u>rental</u> <sub>1</sub> must not <i>overlap</i> the <u>rental period</u> of <u>rental</u> <sub>2</sub> .
Synonymous Statement:	A <u>renter</u> who is responsible for some <u>rental</u> <sub>1</sub> must not be responsible for another <u>rental</u> <sub>2</sub> that <i>overlaps</i> the <u>rental period</u> of <u>rental</u> <sub>1</sub> .
Guidance Type:	<u>behavioral business rule</u>
Enforcement Level:	<u>strict</u>
Description: :	A renter can have many rentals booked, but can have only one open rental at a time (i.e., can have only one rental car at a time).
Modality qualifies:	<u>period</u> <sub>1</sub> <i>overlaps</i> <u>period</u> <sub>2</sub>
Support verb concepts:	<u>renter</u> <i>is responsible for</i> <u>rental</u> <u>rental</u> <i>has</i> <u>rental period</u>

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<sub>1</sub> is greater than quantity<sub>2</sub>

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

Support verb concepts: rental *has* rented car

rental *receives* car exchange during rental

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

*'being open'* *is a* characteristic of the concept 'rental'

*'being due for service'* *is a* characteristic of the noun concept 'rental car'

*'being in need of repair'* *is a* characteristic of the noun concept 'rental car'

### 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-time<sub>2</sub> *is after* date-time<sub>1</sub>

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<sub>1</sub> is an additional driver who is authorized for another rental<sub>2</sub>.**

Synonymous Statement: A renter who is responsible for a rental<sub>1</sub> may be an additional driver who is authorized for another rental<sub>2</sub>.

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<sub>1</sub> is coextensive with concept<sub>2</sub>

Note: The coextensive (individual noun) concepts are a given renter and a given additional driver.

Support verb concepts: renter is responsible for rental

additional driver is authorized for rental

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<sub>1</sub> is coextensive with concept<sub>2</sub>

Note: The (non) coextensive (individual noun) concepts are the drop-off branch and the return branch of a given rental.

Support verb concepts: rental has drop-off branch

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<sub>1</sub> is less than integer<sub>2</sub>](#), [nonnegative integer](#), [text](#), [concept<sub>1</sub> is coextensive with concept<sub>2</sub>](#)

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

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#### EU-Rent English Vocabulary Extensions

General Concept:	<a href="#"><u>vocabulary</u></a>
Language:	<a href="#"><u>English</u></a>
Included Vocabulary:	<a href="#"><u>EU-Rent Enforcement Levels</u></a>

---

#### G.8.2 Derived Concepts

The implied inverse of *concept<sub>1</sub> includes concept<sub>2</sub>* is *concept<sub>2</sub> is included by concept<sub>1</sub>*. ‘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<sub>1</sub> includes concept<sub>2</sub>*.

[concept<sub>1</sub> includes concept<sub>2</sub>](#)

Concept Type:	<a href="#"><u>partitive verb concept</u></a>
Synonymous Form:	<a href="#"><u>concept<sub>2</sub> is included in concept<sub>1</sub></u></a>

### implicitly-understood concept

Concept Type: concept type

Definition: concept that has a designation that is *implicitly understood*

## 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

Definition: The currency or legal tender issued by a nation's central bank or monetary authority

Source: MWUD 2a ['currency']

#### national currency

Concept Type: situational role

Definition: currency that is issued by the central bank or monetary authority of a given country

Example: The Euro, The GB Pound, The US Dollar

#### country has national currency

Necessity: Each country has exactly one national currency.

#### currency unit

Definition: unit of some currency

Example: Euro, GB Pound, Dollar

#### currency amount

Definition: quantity of some currency

Example: 10 Euros, 8 GB Pounds, 12 US Dollars

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

#### state of affairs<sub>1</sub> occurs before state of affairs<sub>2</sub> occurs

Source: SBVR Specification Annex A ['state of affairs<sub>1</sub> occurs before state of affairs<sub>2</sub> 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



### 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<sub>1</sub> overlaps period<sub>2</sub>

Source: DTV ['time interval<sub>1</sub> overlaps time interval<sub>2</sub>']

### period<sub>1</sub> is before period<sub>2</sub>

Synonymous Form: period<sub>2</sub> is after period<sub>1</sub>

Definition: period<sub>1</sub> ends before/when period<sub>2</sub> starts

Source: DTV ['time interval<sub>1</sub> is before time interval<sub>2</sub>']

### period<sub>1</sub> equals period<sub>2</sub>

- Synonymous Form: period<sub>1</sub> *is the same as* period<sub>2</sub>  
Synonymous Form: period<sub>1</sub> = period<sub>2</sub>  
Source: DTV ['time interval<sub>1</sub> equals time interval<sub>2</sub>']

### period<sub>1</sub> meets period<sub>2</sub>

- Synonymous Form: period<sub>2</sub> *is met by* period<sub>1</sub>  
Synonymous Form: period<sub>1</sub> *immediately precedes* period<sub>2</sub>  
Synonymous Form: period<sub>2</sub> *immediately follows* period<sub>1</sub>  
Source: DTV ['time interval<sub>1</sub> meets time interval<sub>2</sub>']

### period<sub>1</sub> is part of period<sub>2</sub>

- Synonymous Form: period<sub>2</sub> *includes* period<sub>1</sub>  
Definition: period<sub>2</sub> is a component of period<sub>1</sub>  
Necessity: Every instant in time interval<sub>1</sub> is also in time interval<sub>2</sub>.  
Necessity: Everything that happens in time interval<sub>1</sub> happens in time interval<sub>2</sub>  
Source: DTV ['time interval<sub>1</sub> is part of time interval<sub>2</sub>']

### period includes point in time

- Synonymous Form: point in time *is included in* period  
Definition: period<sub>1</sub> *is part of* period<sub>2</sub>

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']

### duration<sub>1</sub> equals duration<sub>2</sub>

- Source: DTV ['duration<sub>1</sub> equals duration<sub>2</sub>']

### duration<sub>1</sub> is less than duration<sub>2</sub>

- Synonymous Form: duration<sub>2</sub> *is greater than* duration<sub>1</sub>  
Source: DTV ['duration<sub>1</sub> is less than duration<sub>2</sub>']

### duration<sub>2</sub> equals number times duration<sub>1</sub>

Source: DTV ['duration<sub>1</sub> equals number time duration<sub>2</sub>']

### 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<sub>1</sub> equals duration']

### period<sub>1</sub> is duration before period<sub>2</sub>

Source: DTV ['time interval<sub>1</sub> is duration before time interval<sub>2</sub>']

### period<sub>1</sub> is duration after period<sub>2</sub>

Source: DTV ['time interval<sub>1</sub> is duration after time interval<sub>2</sub>']

### 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

Source: DTV ['nominal time unit']  
 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.

### 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 point<sub>1</sub> precedes time point<sub>2</sub>

Synonymous Form: time point<sub>2</sub> *follows* time point<sub>1</sub>  
 Synonymous Form: point in time<sub>1</sub> *is before* point in time<sub>2</sub>  
 Synonymous Form: point in time<sub>2</sub> *is after* point in time<sub>1</sub>  
 Definition: *the time scale of time point<sub>1</sub> is the time scale of time point<sub>2</sub> and the index of time point<sub>1</sub> is less than the index of time point<sub>2</sub>*

The specialization *date-time<sub>1</sub> is before date-time<sub>2</sub>* has been added.

### date-time<sub>1</sub> is before date-time<sub>2</sub>

General Concept: time point<sub>1</sub> precedes time point<sub>2</sub>

Synonymous Form: date-time<sub>2</sub> is after date-time<sub>1</sub>

### 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 period<sub>1</sub> that is past and that includes a period<sub>2</sub> that is not past

Source: DTV ['time interval is current']

### current time

Synonym:	<u>present time</u>
Definition:	<u>period</u> that is <i>current</i>
Source:	<u>DTV</u> ['current time']
Note:	Every <u>period</u> that overlaps the “reference period” for ‘ <u>period is past</u> ’ is a <u>current time</u> (one of many).
Example:	If the “reference period” is the <u>current hour</u> , then the <u>calendar day</u> , <u>calendar week</u> , <u>calendar month</u> , <u>calendar year</u> (etc.) that overlap the current hour are all current times.

### current day

Definition:	<u>current time</u> that has granularity ‘day’
-------------	--

### period is future

Definition:	<u>period</u> that includes no <u>period</u> that is in the past
Source:	<u>DTV</u> ['time interval is future']
Necessity:	Each <u>period</u> that is future is after each <u>period</u> that is past.

The synonym *date* has been added to *calendar date*.

### calendar date

Synonym:	<u>date</u>
Definition:	<u>Gregorian year month date coordinate</u> or <u>Gregorian day of year coordinate</u> or <u>year weekday coordinate</u>
Source:	<u>DTV</u> ['calendar date']
Example:	<u>1989 September 3</u> , <u>2005 day 49</u>

### time of day

Definition:	<u>hour coordinate</u> or <u>hour-minute coordinate</u> or <u>hour minute second coordinate</u>
Source:	<u>DTV</u> ['time of day']
Example:	<u>3 p.m.</u> , <u>15:00</u> , <u>15:00:35</u>

### date time

Definition:	<u>compound time coordinate</u> that combines the set of {a <u>date</u> , a <u>time of day</u> } and indicates the <u>time point</u> that is on the combined <u>time scales</u> of the <u>time of day</u> and the <u>date</u> , and the <u>time scale</u> of the <u>time of day</u> subdivides the <u>time point</u> that is indicated by the <u>date</u>
Definition:	<u>DTV</u> ['date time']
Example:	<u>June 9, 1990 5:49:03 p.m.</u> , <u>13:00 on 1949 day 53</u> , <u>6 p.m. on 2010 August 6</u>

### date-time

Definition:	<u>date time</u> that has granularity ‘minute’
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## 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.

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### EU-Rent Enforcement Levels

General Concept: vocabulary  
Language: English

---

#### 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 'post-justified' and 'override' and 'guideline'.

#### strict

General Concept: enforcement level  
Definition: strictly enforced: if the rule is violated, the sanction or other consequences always ensue.  
Necessity: The concept 'strict' is included in Enforcement Scheme.

#### deferred

General Concept: enforcement level  
Definition: deferred enforcement: strictly enforced, but enforcement may be delayed — e.g., waiting for resource with required skills.  
Necessity: The concept 'deferred' is included in Enforcement Scheme.

#### pre-authorized

General Concept: enforcement level  
Definition: pre-authorized override: enforced, but exceptions are allowed, with prior approval for actors with before-the-fact override authorization.  
Necessity: The concept 'pre-authorized' is included in Enforcement Scheme.

#### post-justified

General Concept: enforcement level  
Definition: post-justified override: if not approved after the fact, the sanction or other consequences will ensue.  
Necessity: The concept 'post-justified' is included in Enforcement Scheme.

### override

General Concept:	<a href="#">enforcement level</a>
Definition:	override with explanation: comment must be provided when the violation occurs.
Necessity:	The <a href="#">concept</a> <a href="#">‘override’</a> <i>is included in</i> <a href="#">Enforcement Scheme</a> .

### guideline

General Concept:	<a href="#">enforcement level</a>
Definition:	guideline: suggested, but not enforced.
Necessity:	The <a href="#">concept</a> <a href="#">‘guideline’</a> <i>is included in</i> <a href="#">Enforcement Scheme</a> .

## **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:	<a href="#">Date-Time Vocabulary</a>
Definition:	the <a href="#">vocabulary</a> <i>that</i> is known as ‘Date-Time Vocabulary (DTV)’
Source:	<a href="http://www.omg.org/spec/DTV/1.0/Beta1">www.omg.org/spec/DTV/1.0/Beta1</a>

### Time Axis

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

## **G.8.8 Time Interval**

### time interval

Definition:	segment of the <a href="#">Time Axis</a> , a location in time
Example:	The lifetime of Henry V.
Example:	The day whose Gregorian calendar date is September 11, 2001.



time interval<sub>1</sub> **overlaps** time interval<sub>2</sub>

time interval<sub>1</sub> **is before** time interval<sub>2</sub>

Synonymous Form: time interval<sub>2</sub> **is after** time interval<sub>1</sub>

Definition: time interval<sub>1</sub> ends before/when time interval<sub>2</sub> starts

time interval<sub>1</sub> **equals** time interval<sub>2</sub>

Synonymous Form: time interval<sub>1</sub> **is the same as** time interval<sub>2</sub>

Synonym: time interval<sub>1</sub> = time interval<sub>2</sub>

time interval<sub>1</sub> **meets** time interval<sub>2</sub>

Synonymous Form: time interval<sub>2</sub> **is met by** time interval<sub>1</sub>

Synonymous Form: time interval<sub>1</sub> **immediately precedes** time interval<sub>2</sub>

Synonymous Form: time interval<sub>2</sub> **immediately follows** time interval<sub>1</sub>

time interval<sub>1</sub> **is part of** time interval<sub>2</sub>

Synonymous Form: time interval<sub>2</sub> **includes** time interval<sub>1</sub>

Definition: Time interval<sub>2</sub> is a component of time interval<sub>1</sub>. Every instant in time interval<sub>1</sub> is also in time interval<sub>2</sub>. Everything that happens in time interval<sub>1</sub> happens in time interval<sub>2</sub>

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 ('duration')

duration<sub>1</sub> **equals** duration<sub>2</sub>

duration<sub>1</sub> **is less than** duration<sub>2</sub>

Synonymous Form: duration<sub>2</sub> **is greater than** duration<sub>1</sub>

duration<sub>2</sub> **equals number times** duration<sub>1</sub>

### 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<sub>1</sub> is duration before time interval<sub>2</sub>

time interval<sub>1</sub> is duration after time interval<sub>2</sub>

### 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</sub> precedes time point<sub>2</sub>

Synonymous Form: time point<sub>2</sub> follows time point<sub>1</sub>

Definition: the time scale of time point<sub>1</sub> is the time scale of time point<sub>2</sub> and the index of time point<sub>1</sub> is less than the index of time point<sub>2</sub>

### 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</sub> that is past and that includes a time interval<sub>2</sub> 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

