

Preliminary Notice

This paper is freely downloadable (PDF) from www.conceptualheaven.com.

To appreciate its contents, you need to be aware of the purpose and the main principles of the "Semantics for Business Vocabulary and Rules" specification (SBVR) published by the Object Management Group (OMG) and freely downloadable (PDF) from www.omg.org/spec/SBVR/ at the time of writing. That information is available as part of that specification, notably in Clause 1 and Annex A.

This paper contains a formal specification of the diagramming technique used in SBVR and Conceptual Heaven documents alike. The diagrams aim to visualize a "concept map" that shows the existence of concepts in a specific vocabulary or subject field, with special attention paid to the relationships between these concepts.

This paper complements a sibling document entitled "Conceptual Heaven Vocabulary Documents".

More information about the purpose and content of this document and its relations to other materials can be found in the Introduction section and in Clause 1.

LICENSE

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Introduction to "Conceptual Heaven Concept Diagrams"

To locate the materials discussed in the following paragraphs, please refer to "Related documents" at the end of this section.

What is "Conceptual Heaven Concept Diagrams" ?

"Conceptual Heaven Concept Diagrams" is a formal specification of the diagramming technique used in the meta-model published by the Object Management Group (OMG) entitled "Semantics of Business Vocabulary and Rules" (SBVR).

Is this document for you ?

This document is for you if you are applying (or if you are interested in applying) SBVR for your own purposes and you are looking for a specification of the diagramming technique that is commonly associated with SBVR.

Purpose

The purpose of this paper and its sibling paper "Conceptual Heaven Vocabulary Documents" is to make SBVR more accessible to practitioners interested in modelling with SBVR who have a practical goal and limited theoretical concerns. For more information please read the introduction to "Conceptual Heaven Vocabulary Documents".

Relation to SBVR

Diagramming on the whole is not part of the SBVR formal specification. SBVR 1.1 includes informative sections on a variety of diagramming conventions (Clause 13, Annexes G-H, Annex E). In addition, the presentation of SBVR itself uses diagramming throughout as a reading aid. These various pieces of information lack consistency and rely unnecessarily on knowledge of UML.

This paper concentrates on the type of diagram used in the normative sections of SBVR and formalizes the diagram type as a practical aid. This formalization consists of selecting of a limited subset of symbols and specifying their meaning and use.

Version information

Conceptual Heaven 1.0

Version 1.0 of the "Conceptual Heaven Concept Diagrams" schema and version 1.0 of the "Conceptual Heaven EU-Rent Example Model" schema are compatible with this 1.0 paper.

SBVR 1.0 and 1.1

Version 1.0 of the Conceptual Heaven schemas is for version 1.1 of the SBVR specification as published by OMG. A final version of SBVR 1.1 became available to the general public in May 2013. This version is labeled "SBVR 1.1

Beta 2". An official non-Beta document is expected to be published in July 2013, but this version is not expected to contain any changes at the content level. SBVR 1.1 does not include major modifications relative to 1.0, although some key terminology was revised. Of particular importance to the Conceptual Heaven models is the 1.1 decision to use 'verb concept' as the primary term for what was usually called 'fact type' in SBVR 1.0 (where 'verb concept' was just a less-often-used synonym of 'fact type'), reserving 'fact type' as a more technical term for the area of logical formalization covered by Clause 10. This decision has an effect on neighboring terms with "verb". For example, 1.1 introduces "verb concept role" to clearly distinguish roles that are not situational roles.

Conceptual Heaven endorses these key terminology changes in its 1.0 schemas.

Related documents

1. "Semantics of Business Vocabulary and Rules" (SBVR), v. 1.0, formal OMG specification, freely downloadable from <http://www.omg.org/spec/SBVR/1.0/>.
2. "Semantics of Business Vocabulary and Rules" (SBVR), v. 1.1 Beta 2, OMG specification, freely downloadable from <http://www.omg.org/spec/SBVR/1.1/>.
3. "Conceptual Heaven Concept Diagrams v. 1.0", freely downloadable from www.conceptualheaven.com.
4. "Conceptual Heaven EU-Rent Example Model v. 1.0", freely downloadable from www.conceptualheaven.com.

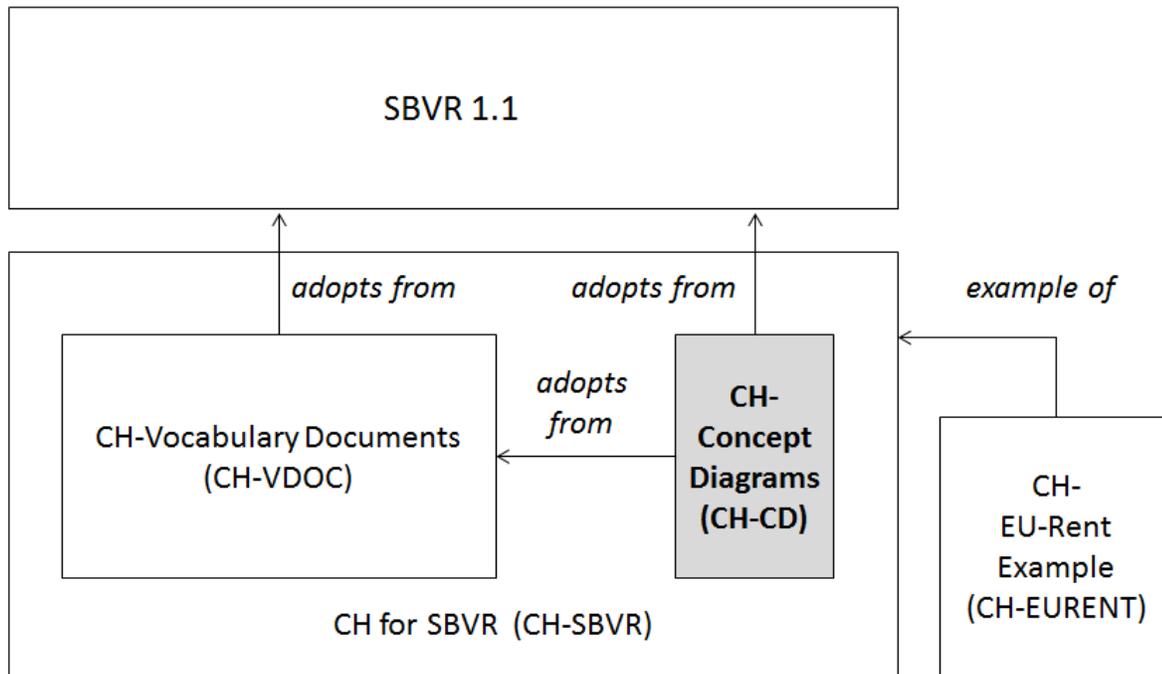
More Conceptual Heaven

If you use MS Word 2010 to draw up glossaries and rulebooks in the presentation format used in this document, Conceptual Heaven proposes freely downloadable tools that allow you to convert such specifications into:

- Alphabetical lists of terms and definitions in tabular presentation.
- Validation reports that give information about integrity of your glossaries and rulebooks.
- XML documents that allow you to exchange the information with tools, services and databases.

A Word template that gives you a jump-start in this area is also offered for free. In addition to click-and-use these tools, you can also join Conceptual Heaven's online community by simple and free registration. This allows you to download the XSLT Framework that the tools are based on so you can customize for yourself. Finally, you can also contribute actively by extending Conceptual Heaven's tool offerings.

1. Vocabulary registration



1.1. Subject vocabularies

Conceptual Heaven for SBVR 1.0

Definition: The combination of: [Conceptual Heaven Vocabulary Documents 1.0](#) and [Conceptual Heaven Concept Diagrams 1.0](#).

Synonym: [CH-SBVR 1.0](#)

Note: This vocabulary specifies the [terminology namespace](#) of this [vocabulary document's subject vocabulary](#).

Note: An example of the document format and diagram format specified by this vocabulary is offered in "Conceptual Heaven EU-Rent Example v. 1.0", freely downloadable from www.conceptualheaven.com.

Namespace URI: <http://www.conceptualheaven.com/spec/ch-sbvr10>

Conceptual Heaven Concept Diagrams 1.0

Definition: Version 1.0 of the specification of a diagramming technique applied in vocabulary documents published by [Conceptual Heaven](#) and known as "Conceptual Heaven Concept Diagrams".

Note: The [subject vocabulary described in](#) this [vocabulary document](#).

Note: This vocabulary is included in [Conceptual Heaven for SBVR 1.0](#).

Synonym: [CH-CD 1.0](#)

1.2. Other vocabularies

Conceptual Heaven Vocabulary Documents 1.0

Definition: Version 1.0 of the specification of an "SBVR-style" document format applied in vocabulary documents published by [Conceptual Heaven](#) and known as "Conceptual Heaven Vocabulary Documents".

Note: This vocabulary is included in [Conceptual Heaven for SBVR 1.0](#).

Synonym: [CH-VDOC 1.0](#)

Namespace URI: <http://www.conceptualheaven.com/spec/ch-vdoc10>

Longman Dictionary of Contemporary English

Definition: The publication ""Longman Dictionary of Contemporary English", © Longman Group Ltd 1978, Harlow, UK, Reprinted with corrections 1981, ISBN 0 582 52571 3.

Synonym: [LDCE](#)

Note: The vocabulary serving in this document as the common-language vocabulary.

Semantics of Business Vocabulary and Rules 1.1

Definition: Version 1.1 of the formal specification published by [OMG](#) known as the "Semantics for Business Vocabulary and Rules" (SBVR).

Synonym: [SBVR 1.1](#)

Namespace URI: <http://www.omg.org/spec/SBVR/20070901/SBVR.xml>

Semantics of Business Vocabulary and Rules 1.1, Annexes C-D-E

Definition: Non-normative annexes C, D and E of version 1.1 of the formal specification published by [OMG](#) known as the "Semantics for Business Vocabulary and Rules" (SBVR).

Synonym: [SBVR-Ann 1.1](#)

Namespace URI: <http://www.omg.org/spec/SBVR/20070901/SBVR.xml>

1.3. Vocabulary acronyms

CH-CD 1.0

See: [Conceptual Heaven Concept Diagrams 1.0](#)

CH-SBVR 1.0

See: [Conceptual Heaven for SBVR 1.0](#)

CH-VDOC 1.0

See: [Conceptual Heaven Vocabulary Documents 1.0](#)

LDCE

See: [Longman Dictionary of Contemporary English](#)

SBVR 1.1

See: [Semantics of Business Vocabulary and Rules 1.1](#)

SBVR-Ann 1.1

See: [Semantics of Business Vocabulary and Rules 1.1, Annexes C-D-E](#)

1.4. Communities and parties

CH

See: [Conceptual Heaven](#)

Conceptual Heaven

See: www.conceptualheaven.com

Abbreviation: [CH](#)

Object Management Group

See: www.omg.org

Abbreviation: [OMG](#)

OMG

See: [Object Management Group](#)

2. Auxiliary information

2.1. Special characters

In this document, the word "text" enclosed in less-than and greater-than symbols:

<text>

represents an instance of [text](#).

2.2. Metamodel concepts

This section declares metamodel concepts that are needed to account for meanings in concept diagrams.

binary verb concept

Source: [SBVR 1.1](#) ['binary verb concept']

category

Source: [CH-VDOC 1.0](#) ['category']

concept name

Source: [CH-VDOC 1.0](#) [5.2, 'concept name']

concept₁ specializes concept₂

Source: [SBVR 1.1](#) ['concept₁ specializes concept₂']

more general concept

Source: [CH-VDOC 1.0](#) ['more general concept']

n-ary verb concept

Source: [CH-VDOC 1.0](#) ['n-ary verb concept']

noun concept

Source: [SBVR 1.1](#) ['noun concept']

noun form

Source: [CH-VDOC 1.0](#) ['noun form' (5.2)]

partitive verb concept

Source: [SBVR 1.1](#) ['partitive verb concept']

preferred synonym

Source: [CH-VDOC 1.0](#) ['preferred synonym' (4.)]

role

Source: [CH-VDOC 1.0](#) ['role' (4.)]

segmentation

Source: [SBVR 1.1](#) ['segmentation']

term

Source: [CH-VDOC 1.0](#) ['term' (3.)]

term is for noun concept

Source: [CH-VDOC 1.0](#) ['term is for noun concept' (3.)]

term₁ is synonym of term₂

Source: [CH-VDOC 1.0](#) ['term₁ is synonym of term₂' (4.)]

ternary verb concept

Source: [CH-VDOC 1.0](#) ['ternary verb concept']

text

Source: [SBVR 1.1](#) ['text' (8.2)]

verb concept involves general concept in role

Source: [CH-VDOC 1.0](#) ['verb concept involves general concept in role']

verb form

Source: [CH-VDOC](#) ['verb form' (5.2)]

2.3. Underlying drawing concepts

This section declares drawing objects that do not in themselves carry meaning but that are needed to specify the meaning of drawing objects in section 3.

box

Necessity: Each box is either a labeled box or a named box.

diamond

Icon: 

Definition: A square form standing on one of its corners; a rhombus with four square angles.

drawing object

line

line connects drawing object₁ to drawing object₂

line end

line ends in lozenge

line is dashed

Necessity: A line is either *solid* or *dashed*

line is solid

Necessity: A line is either *solid* or *dashed*

lozenge

Icon:

Definition: A horizontally or vertically oriented rhombus of the shape shown here.

reading pointer

Icon: 

Definition: A small black arrowhead that helps identify the reading direction in an association.

Variants:   

text annotates drawing object

Definition: The text is written by the drawing object and gives information about the meaning of the drawing object.

3. Diagramming technique

3.1 Boxes

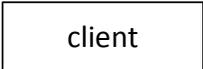
labeled box

Icon: 

Definition: A box that contains a text with no underlining

Represents: A general concept

Possibility: The text may be followed by a synonym mention

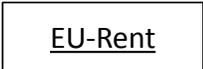
Example: 

named box

Icon: 

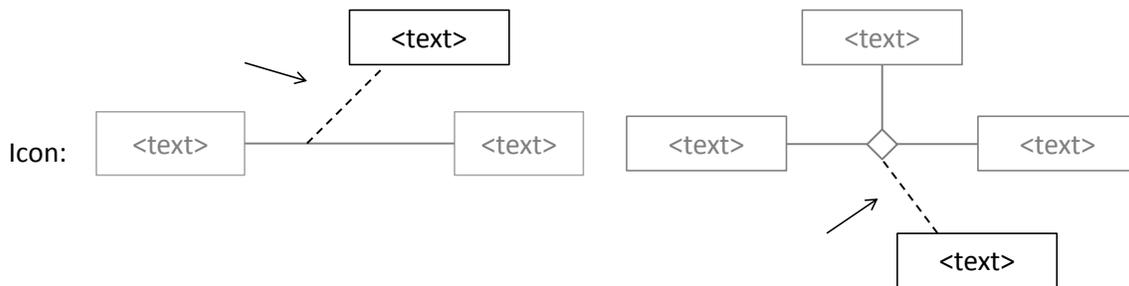
Definition: A box that contains underlined text

Represents: An individual concept

Example: 

3.2 Lines

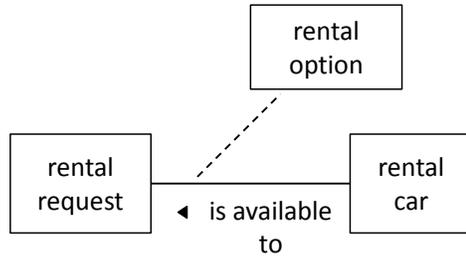
side connection



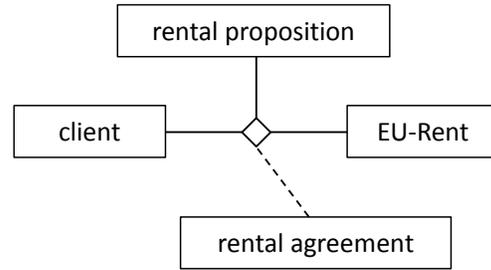
Definition: A dashed line that runs off to the side of a standard connection or constellation and that connects that standard connection or constellation to a labeled box.

Represents: A nominalization

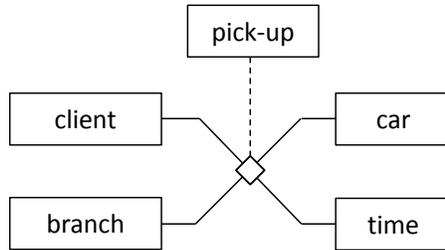
Note: The idea of "running off to the side" can be visually reinforced by drawing the dashed line diagonally. This creates a contrast with the solid lines if these are mostly drawn horizontally or vertically.



client agrees to rental proposition made by EU-Rent

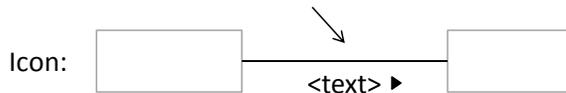


Examples:



client picks up car at branch on time

standard connection



Definition: A **solid line** that **connects two boxes** and that is optionally accompanied by a text annotating the line and by a **reading pointer**

Represents: A **binary verb concept**

Necessity: The line must be made up of one or more segments, each of which runs either horizontally or vertically.

Necessity: If a text is shown, it must demonstrate the **verb form** of the represented **binary verb concept**, for example, "employs" in: "company employs person".

Necessity: A reading pointer may be shown only if an annotating text is shown.

Necessity: If a reading pointer is shown, it must point in the appropriate reading direction (left-to-right, right-to-left, top-to-bottom, or bottom-to-top).

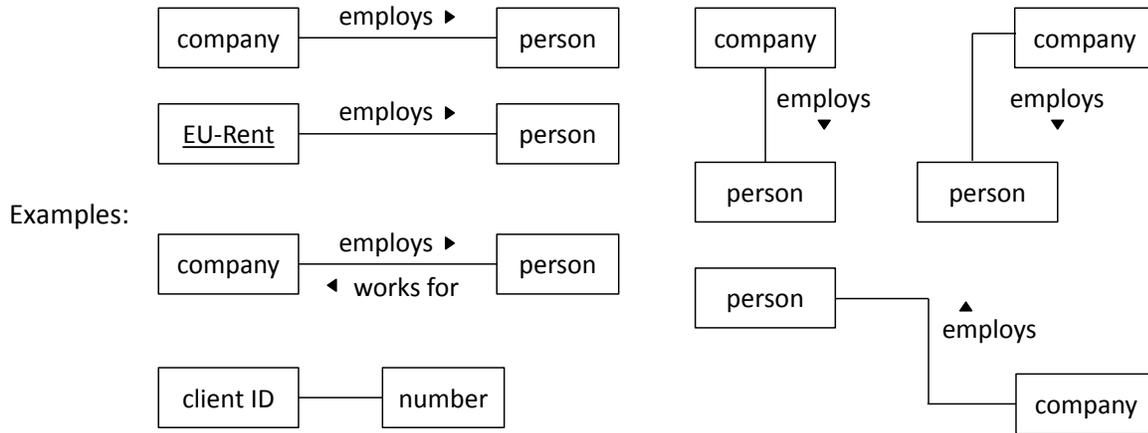
Necessity: If a reading pointer is shown, it must be positioned relative to the text in such a way that it points away from the text.

Possibility: It is preferred that the line has a single segment. To accommodate diagramming constraints, the line may have straight angles, i.e., be composed of multiple horizontal or vertical segments.

Possibility: If there is a second **term** that **is synonym of** the **term** for the verb concept demonstrated by the text, that second term may be shown by a second text and a second reading pointer pointing in the opposite direction from the first.

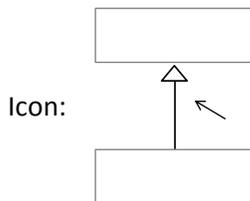
Note: Each box represents one of the **noun concepts** that **play a role in** the **verb concept**.

Note: The annotating text should be omitted only if the nature of the relationship between the two noun concepts is clear without it. This is the case in particular when one noun concept is a property of the other ('client has family name', in which case the verb form is often "has"), or if the verb concept is about representation or expression and one of the noun concepts is a concept such as 'text', 'number', 'date', 'amount' ('client ID is represented by number').



3.3 Arrows

arrow



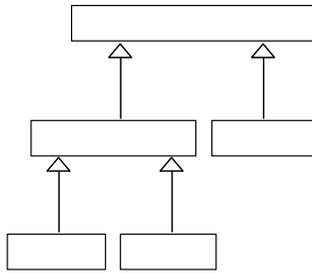
Definition: A straight horizontal or vertical line ending in a triangular, unfilled arrowhead and *connecting* two boxes

Represents: The fact that a concept *specializes* another concept

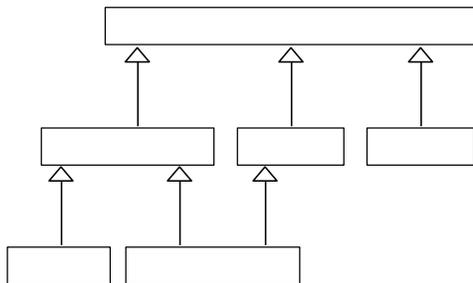
Note: The box that the arrow points away from represents the category. The box that the arrow points at represents the more general concept.



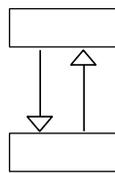
Note: It is legal to have tree structures of boxes connected by arrows; it is helpful to have the arrows point upward, with the root of the tree at the top of the page and the leaves at the bottom:



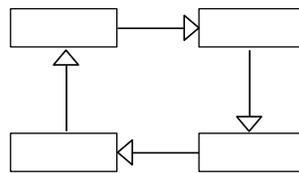
It is also legal to have multiple arrows point away from the same box to different "parents":



Note: It is NOT legal to create recursive structures where you can end up where you started by following the arrows, whether directly or indirectly:

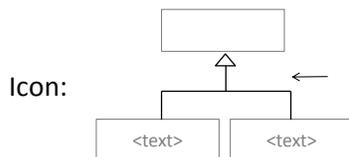


INCORRECT



INCORRECT

split arrow



Definition: An arrow that has two or more tail ends that merge in the middle so that there is a single line at the arrowhead end, with each tail end connected to a different box.

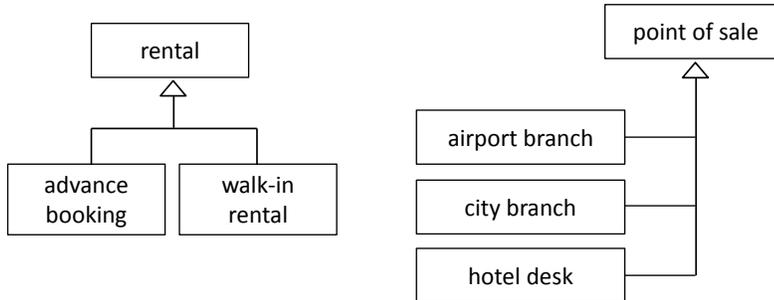
Represents: A segmentation

Note: In a segmentation, each instance of the more general concept belongs to exactly one of the categories. In the example below, each rental is either an advance booking or a walk-in rental; no rental is both and no rental is something else.

Note: In many other diagramming techniques, split arrows are also used for categorization schemes that are not segmentations, i.e., where the categories are not mutually exclusive.

Note: The box that a [split arrow](#) points at is always a [labeled box](#). The boxes that a [split arrow](#) points away from are usually [labeled boxes](#), too. To express that a set of named instances of individual concepts are in the same group (a [classification](#) [SBVR 1.1 (11.1.5.1)]), use a [caption](#) and not a [split arrow](#). This contrasts with [SBVR-Ann 1.1] that uses an arrow symbol to visualize classifications.

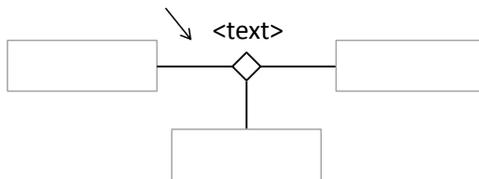
Examples:



3.4 Diamonds and lozenges

[constellation](#)

Icon:



Definition: The combination of a [diamond](#), [three](#) or more [lines](#) each of which connects the [diamond](#) to a [box](#), and a [text](#) that [annotates](#) the [diamond](#).

Represents: [Ternary verb concept](#) or [n-ary verb concept](#)

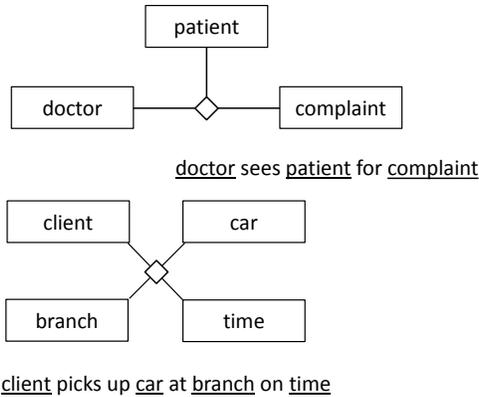
Necessity: The text that annotates the diamond must be the [term](#) *for* the [verb concept](#), with each of the [noun forms](#) underlined, for example: 'doctor sees patient *for* complaint'.

Possibility: The [verb forms](#) in the text that annotates the diamond may be in italic font, for example: 'doctor *sees* patient *for* complaint'.

Note: Each box represents one of the [noun concepts](#) that *play a role in* the [verb concept](#).

Note: The lines may go off in any direction. The points of attachment to the diamond may be the corners of the diamond, but also the sides. Often, straight horizontal and vertical lines are preferred, with the corners as preferred points of attachment.

Examples:



end diamond

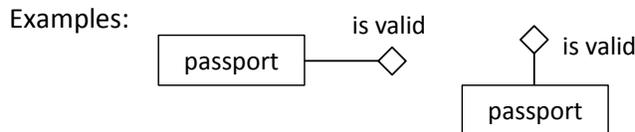


Definition: The combination of a diamond, one line that connects the diamond to a box, and a text that annotates the diamond

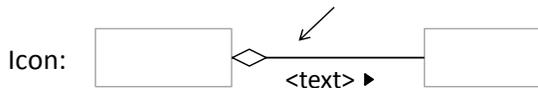
Represents: A unary verb concept

Necessity: The text annotating the diamond must demonstrate the verb form of the represented unary verb concept, for example, "is valid" in: "passport is valid".

Note: The box represents the noun concept that the verb concept involves in the role.



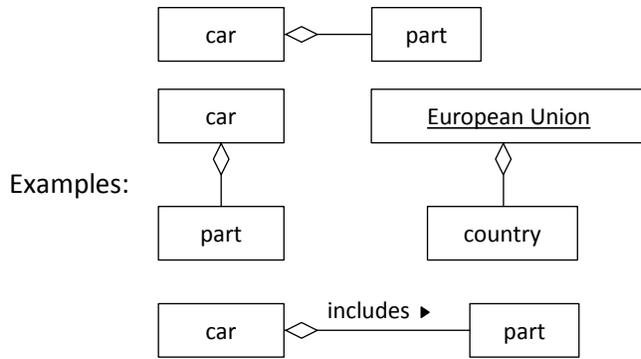
lozenge connection



Definition: A line that connects two boxes, ends in a lozenge at one of the ends, and is optionally accompanied by a text annotating the line and by a reading pointer

Represents: A partitive verb concept

Necessity: If a text is shown, it must demonstrate the verb form that is part of the concept name by which the represented partitive verb concept was declared, for example, "is made up of" in: "car is made up of part". Because partitivity has semantics of its own, text is less likely to be of added help than with non-partitive verb concepts. Because the lozenge is on one side, a reading pointer is also less likely to be of added help.



Note: The option to show lozenges for partitivity is only a reading aid. The same semantics can be expressed by a [standard connection](#) with annotating text.

3.5 Cardinality mentions

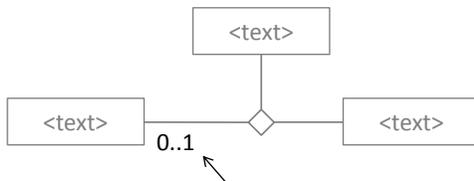
| Example | Meaning |
|---------|------------------|
| 0..1 | zero or 1 |
| ..1 | zero or 1 |
| 0..3 | zero, 1, 2, or 3 |
| ..3 | zero, 1, 2, or 3 |
| 1 | exactly 1 |
| 1..3 | 1, 2, or 3 |

| Example | Meaning |
|---------|------------------------------------|
| 0..* | zero, 1, or more (= unconstrained) |
| 1..* | 1 or more |
| 1.. | 1 or more |
| 3 | exactly 3 |
| 3..* | 3 or more |
| 3.. | 3 or more |

[cardinality mention](#)

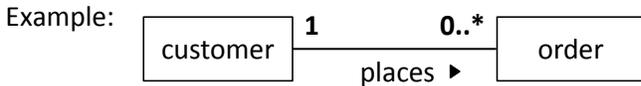


Icon:



Definition: A [text](#) that *annotates* a [line end](#) in a [standard connection](#), an [end diamond](#), or a [constellation](#), and that contains two consecutive full stops (..) or that consists of a single integer number

Represents: A [statement](#) expressing a constraint or absence of constraint on the minimum, the maximum, or both the minimum and maximum number of times that an instance of a [noun concept](#) is allowed to *be involved in* a [role by](#) a [verb concept](#).



The cardinality mention on the left represents the statement:
 "Each order must be placed by exactly one customer".

The cardinality mention on the right represents the statements:
 "A customer may place any number of orders."
 "A customer does not need to place an order."

Necessity: A cardinality mention must *annotate* a line end that *connects* to a box, not a line end that *connects* to a diamond.

Note: A line end connecting to a box does not need to be annotated by a cardinality mention. Such absence of cardinality mention means that the cardinality for the role is 'unspecified', implying nothing more than that the diagram does not give that information. This is NOT the same as the meaning of '0..*', which is 'unconstrained'. When a cardinality mention is absent, cardinality constraints may still be implied or known, maybe because they follow from the semantics of the concept model, or because they are stated in text outside the diagram.

Necessity: A cardinality mention must consist of two consecutive full stops (..) preceded by a symbol for lower boundary and followed by a symbol for upper boundary, except when the cardinality mention must be abbreviated.

Necessity: '1..1' must be abbreviated to '1', '2..2' to '2', and so on.

Necessity: Legal symbols for lower boundary are **0**, **1**, **<n>**, where **<n>** is an integer higher than 1.

Necessity: Legal symbols for upper boundary are **1**, **<n>** and ***** (an asterisk), where **<n>** is an integer higher than 1, and ***** is short for 'any number'.

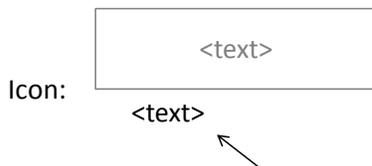
Necessity: The value for upper boundary must be higher than the value for lower boundary.

Possibility: The value '0' for lower boundary may be omitted if the value for higher boundary is not *.

Possibility: The value '*' for upper boundary may be omitted if the value for lower boundary is not 0.

3.6 Other

caption



Definition: A text that annotates a labeled box and is placed below that labeled box

Represents: A classification [SBVR 1.1 (11.1.5.1)] of individual concepts by the general concept that is represented by the labeled box, or list of one or more instances of the general concept given as examples.

Note: Each item in the text gives an example of the general concept.

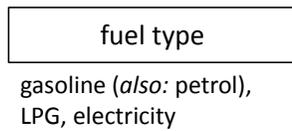
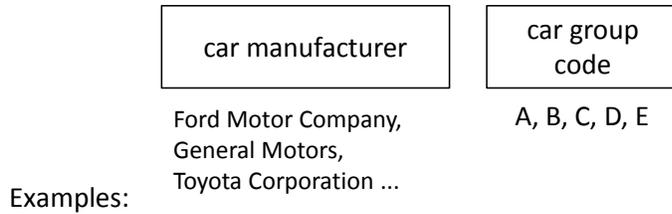
Necessity: The text must contain at least two items.

Necessity: Items in the text must be separated by commas (,).

Possibility: The text may end in an ellipsis symbol (...). An ellipsis symbol, if used, indicates that not all instances of the noun concept are shown.

Necessity: If no ellipsis symbol is used, the text must enumerate all the instances of the general concept.

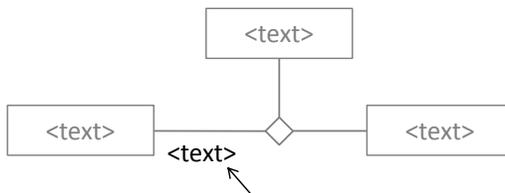
Possibility: An item may be extended by a [synonym mention](#).



end text



Icon:



Definition: A text that *annotates* a line end in a standard connection, an end diamond, or a constellation

Represents: A role

Necessity: The text must *annotate* a line end that *connects* to a box, not a line end that *connects* to a diamond.

Examples:



synonym mention

Definition: An addition to the text of a labeled box that consists of the text "*also*:" followed by a term for a noun concept, or an addition to the text of a named box that consists of the text "*also*:"

followed by a [term for](#) an [individual concept](#)

Represents: The fact that the [term](#) mentioned after the text "*also:*" *is synonym of* the [term](#) mentioned in the label itself.

Necessity: The text "*also:*" must appear in italic font.

Necessity: The text "*also:*" may appear in the equivalent in a different language, e.g., "*auch:*" in German.

Necessity: If one of the terms is the [preferred synonym](#), this is the term that must appear in the label itself, i.e., BEFORE the text "*also:*".

Examples:

| |
|---------------------------------|
| client <i>also:</i> customer |
|---------------------------------|

| |
|-----------------------------------|
| United Kingdom <i>also:</i> UK |
|-----------------------------------|

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