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.

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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**


**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](http://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**


**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
1.4. Communities and parties

Conceptual Heaven

See: Conceptual Heaven

Abbreviation: CH

Object Management Group

See: Object Management Group

Abbreviation: OMG

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']

**concept \(_1\) specializes concept \(_2\)**

Source: [SBVR 1.1](#) ['concept\(_1\) specializes concept\(_2\)']

**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.)]
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 object \(_1\) to drawing object \(_2\)

**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:** client

**named box**

- **Icon:**
  
- **Definition:** A box that contains underlined text
- **Represents:** An *individual concept*
- **Example:** EU-Rent

3.2 Lines

**side connection**

- **Icon:**
  
- **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.
Examples:

client picks up car at branch on time

**standard connection**

Icon: 

<table>
<thead>
<tr>
<th>rental request</th>
<th>rental option</th>
<th>rental car</th>
</tr>
</thead>
<tbody>
<tr>
<td>rental proposition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>client</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EU-Rent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>rental agreement</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**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’).

Examples:

3.3 Arrows

Arrow

Icon:

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.

Examples:

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:

split arrow

Icon:

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:

```
<text>   <text>   <text>
```

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:**

```
Example 1:
doctor sees patient for complaint

Example 2:
client picks up car at branch on time
```

---

**end diamond**

**Icon:**

```
<text>
```

**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.

**Examples:**

```
Example 1:

is valid

Example 2:
```

---

**lozenge connection**

**Icon:**

```
<text>
```

**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.
3.5 Cardinality mentions

<table>
<thead>
<tr>
<th>Example</th>
<th>Meaning</th>
<th>Example</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0..1</td>
<td>zero or 1</td>
<td>0..*</td>
<td>zero, 1, or more (= unconstrained)</td>
</tr>
<tr>
<td>..1</td>
<td>zero or 1</td>
<td>1..*</td>
<td>1 or more</td>
</tr>
<tr>
<td>0..3</td>
<td>zero, 1, 2, or 3</td>
<td>1..</td>
<td>1 or more</td>
</tr>
<tr>
<td>..3</td>
<td>zero, 1, 2, or 3</td>
<td>3</td>
<td>exactly 3</td>
</tr>
<tr>
<td>1</td>
<td>exactly 1</td>
<td>3..*</td>
<td>3 or more</td>
</tr>
<tr>
<td>1..3</td>
<td>1, 2, or 3</td>
<td>3..</td>
<td>3 or more</td>
</tr>
</tbody>
</table>

**cardinality mention**

![Diagram of a cardinality mention]

**Icon:**

![Diagram of a 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.
Example:

```
  customer  1  0..*  order
  places ▶
```

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

<table>
<thead>
<tr>
<th>Icon:</th>
<th>&lt;text&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definition: A text that annotates a labeled box and is placed below that labeled box</td>
<td></td>
</tr>
<tr>
<td>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 of more instances of the general concept given as examples.</td>
<td></td>
</tr>
</tbody>
</table>
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.

**Examples:**

<table>
<thead>
<tr>
<th>car manufacturer</th>
<th>car group code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ford Motor Company, General Motors, Toyota Corporation ...</td>
<td></td>
</tr>
<tr>
<td>A, B, C, D, E</td>
<td></td>
</tr>
</tbody>
</table>

**fuel type**

gasoline (also: petrol), LPG, electricity

**end text**

**Icon:**

- A text that annotate a line end in a standard connection, an end diamond, or a constellation
- A role

**Possibility:**

- The text must annotate a line end that connects to a box, not a line end that connects to a diamond.

**Examples:**

- person
  - works for ➤ company
- person
  - smokes

**synonym mention**

- 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:

<table>
<thead>
<tr>
<th>client</th>
<th>United Kingdom</th>
</tr>
</thead>
<tbody>
<tr>
<td>also: customer</td>
<td>also: UK</td>
</tr>
</tbody>
</table>

Index

arrow, 12
binary verb concept, 7
box, 8
caption, 17
cardinality mention, 16
category, 7
CH, 6
CH-CD 1.0, 5
CH-SBVR 1.0, 5
CH-VDOC 1.0, 6
cost: specializes concept, 7
concept name, 7
Conceptual Heaven, 6
Conceptual Heaven Concept Diagrams 1.0, 4
Conceptual Heaven for SBVR 1.0, 4
Conceptual Heaven Vocabulary Documents 1.0, 5
costellation, 14
diamond, 9
drawing object, 9
draws to diamond, 15
draws to end text, 18
dot box, 10
LDCE, 6
line, 9
line connects drawing object 1 to drawing object 2, 9
line end, 9
line ends in lozenge, 9
line is dashed, 9
line is solid, 9
Longman Dictionary of Contemporary English, 5
lozenge, 9
lozenge connection, 15