

SBVR - Semantics of Business Vocabulary and Business Rules

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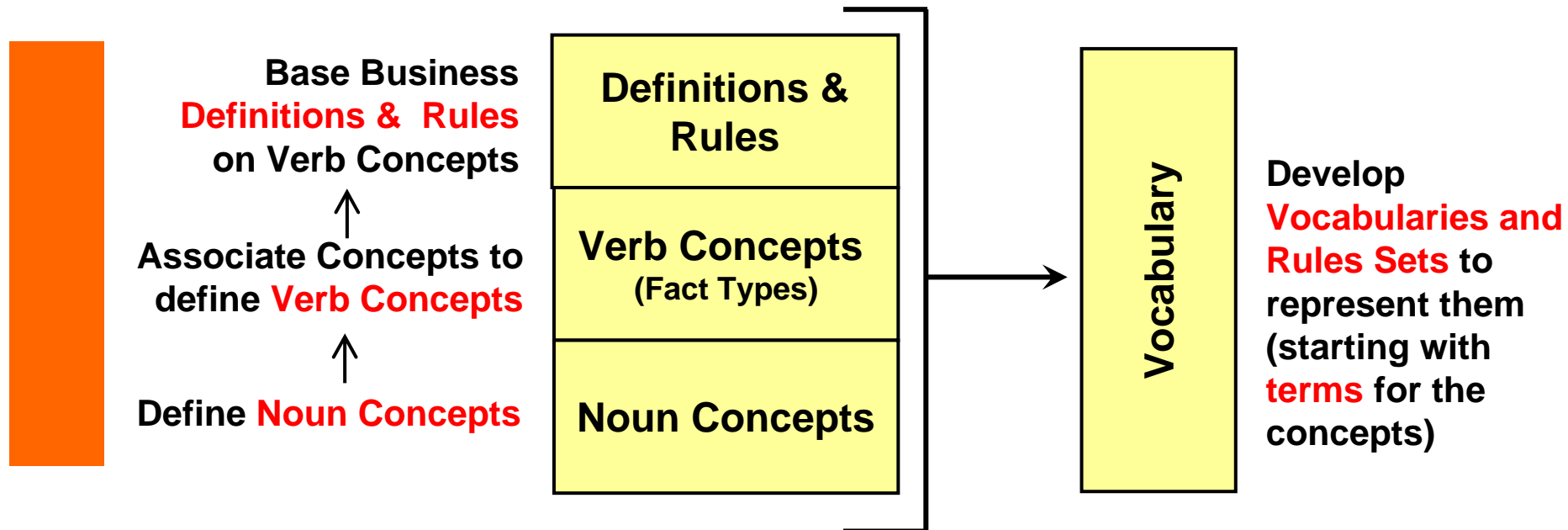
Content of the SBVR Standards

- SBVR is an OMG standard for formally describing business rules
- SBVR defines the vocabulary and rules for documenting the semantics of
 - ◆ business vocabularies (chapter 11)
 - ◆ business rules (chapter 12)
- The SBVR consists of a large number of definitions: What is
 - ◆ a business rule?
 - ◆ a rule statement?
 - ◆ level of enforcement?
 - ◆ a vocabulary?
 - ◆ a definition?
 - ◆ ...
- SBVR also specifies the logical semantics of expressions and rules (chapter 10)

What does SBVR do?

SBVR realizes the 'Business Rules Mantra':

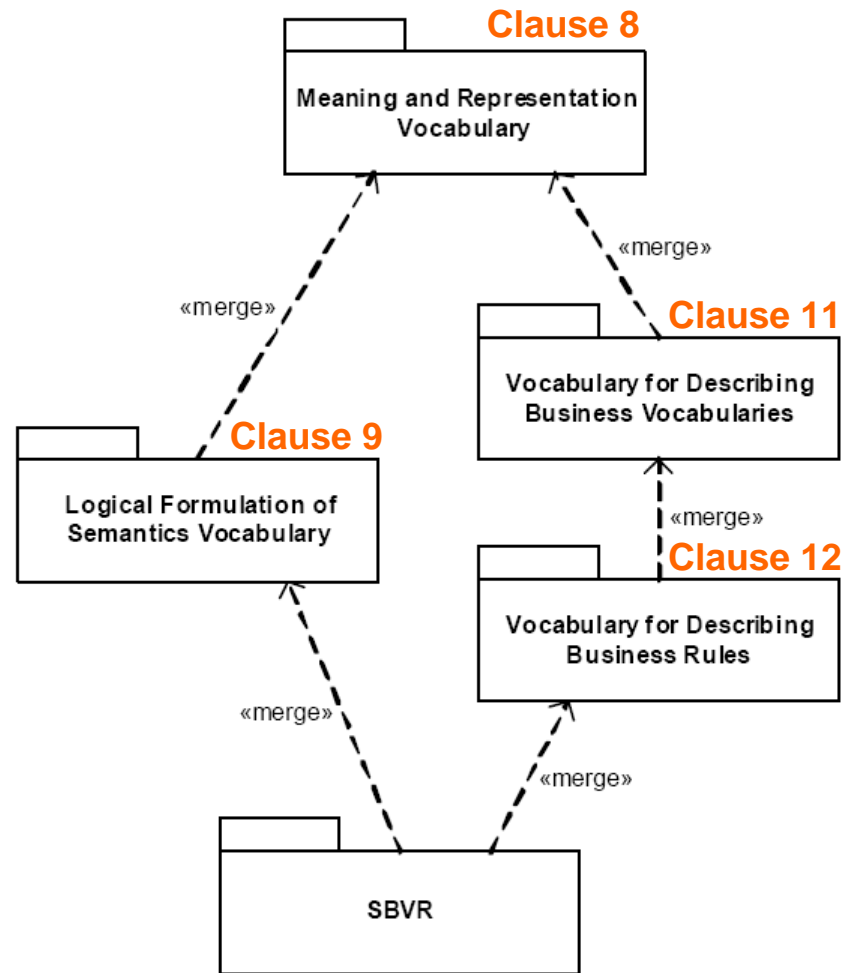
"Rules are built on Facts. Facts are built on Terms."



... to describe the business language of the activities of organizations

... in a way that is easily understandable by business people (Chapin et al. 2008)

SBVR is a Vocabulary, not a Language Standard



- SBVR is a vocabulary consisting of interrelated sub-vocabularies
 - ◆ meaning and representation vocabulary
 - ◆ vocabulary for describing business vocabularies
 - ◆ vocabulary for describing business rules
- The SBVR vocabulary permits to capture the semantics of sentences commonly used to express business rules
- SBVR-compliant tools capture the meaning of business vocabularies and rules

How to read the SBVR Specification

- The SBVR specification describes a vocabulary using terminological entries.

- Each entry includes a definition, along with other specifications such as notes and examples.

- Example:

concept type

Definition:

object type that specializes the concept 'concept'

Note:

A concept is related to a concept type by being an instance of the concept type.

Example:

fact type, role, concept type

- Often, the entries include rules (necessities) about the particular item being defined.

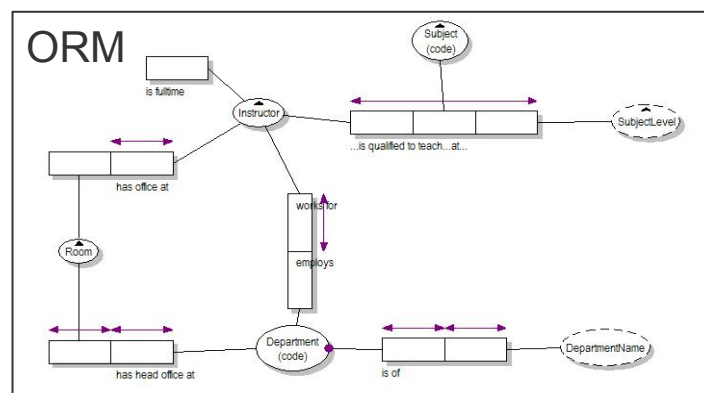
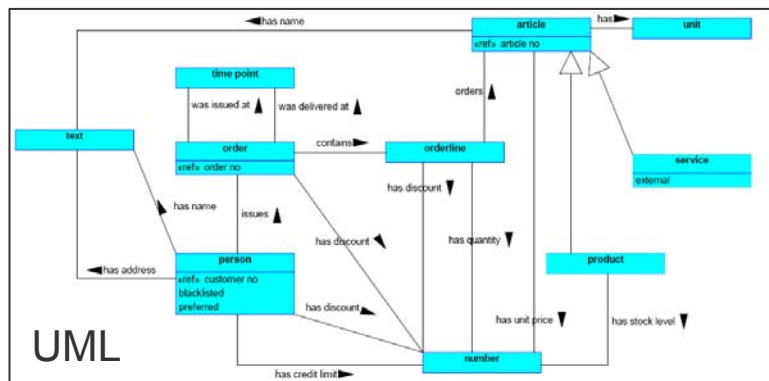
Notations for Business Rules

It is obligatory that each driver of a rental is *qualified*.

rental *has* driver

driver *is qualified*

The noun concept 'driver' is a facet of the noun concept 'person.'



- SBVR does not prescribe a specific language for terms, facts and rules
- Terms and facts can be represented, for example, in
 - ◆ SBVR Structured English
 - ◆ Unified Modelling Language (UML)
 - ◆ Object-Role Modeling (ORM)
- The SBVR specification itself uses SBVR Structured English to describe its vocabularies



Excursion: RuleSpeak

- RuleSpeak is another defacto standard for writing business rules
 - ◆ developed by Ron Ross at Business Rules Solution
 - ◆ widely used and understood by business rules practitioners
 - ◆ compatible with several business rules tools
 - ◆ consistent with SBVR Structured English

Structural business rule It is necessary that each rental has exactly one requested car group.

RuleSpeak version Each rental always has exactly one requested car group.

Operative business rule It is obligatory that the rental duration of each rental is at most 90 rental days.

RuleSpeak version The rental duration of a rental must not be more than 90 rental days.

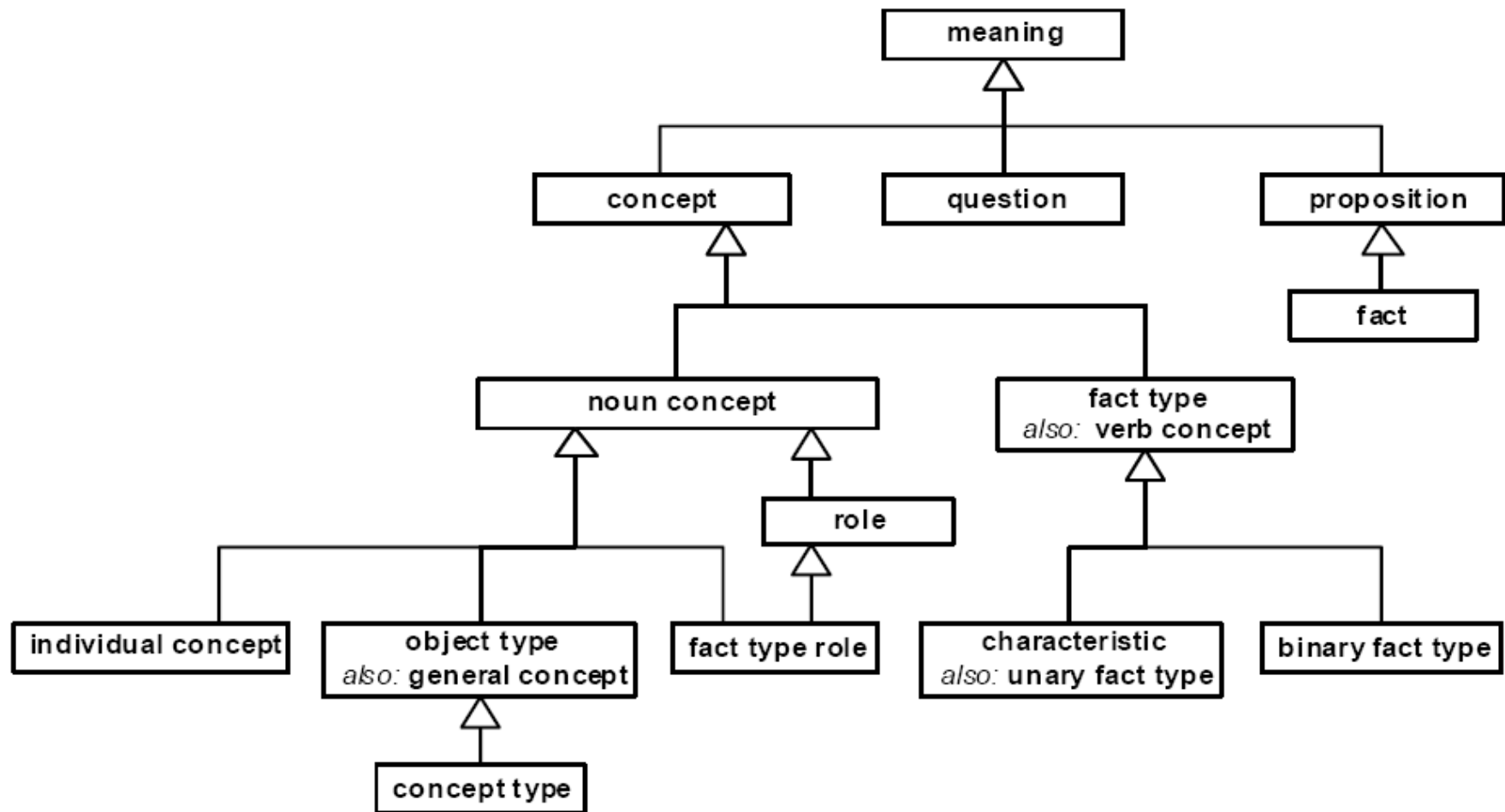
Operative business rule It is obligatory that each driver of a rental is qualified.

RuleSpeak version A driver of a rental must be qualified.



Clause 8: Meaning and Representation

Vocabulary



Some important definitions

meaning

Definition: what is meant by a word, sign, statement, or description; what someone intends to express or what someone understands

concept

Source: ISO 1087-1 (English) (3.2.1) ['concept']
 Definition: unit of knowledge created by a unique combination of characteristics
 General Concept: meaning
 Reference Scheme: a designation of the concept

noun concept

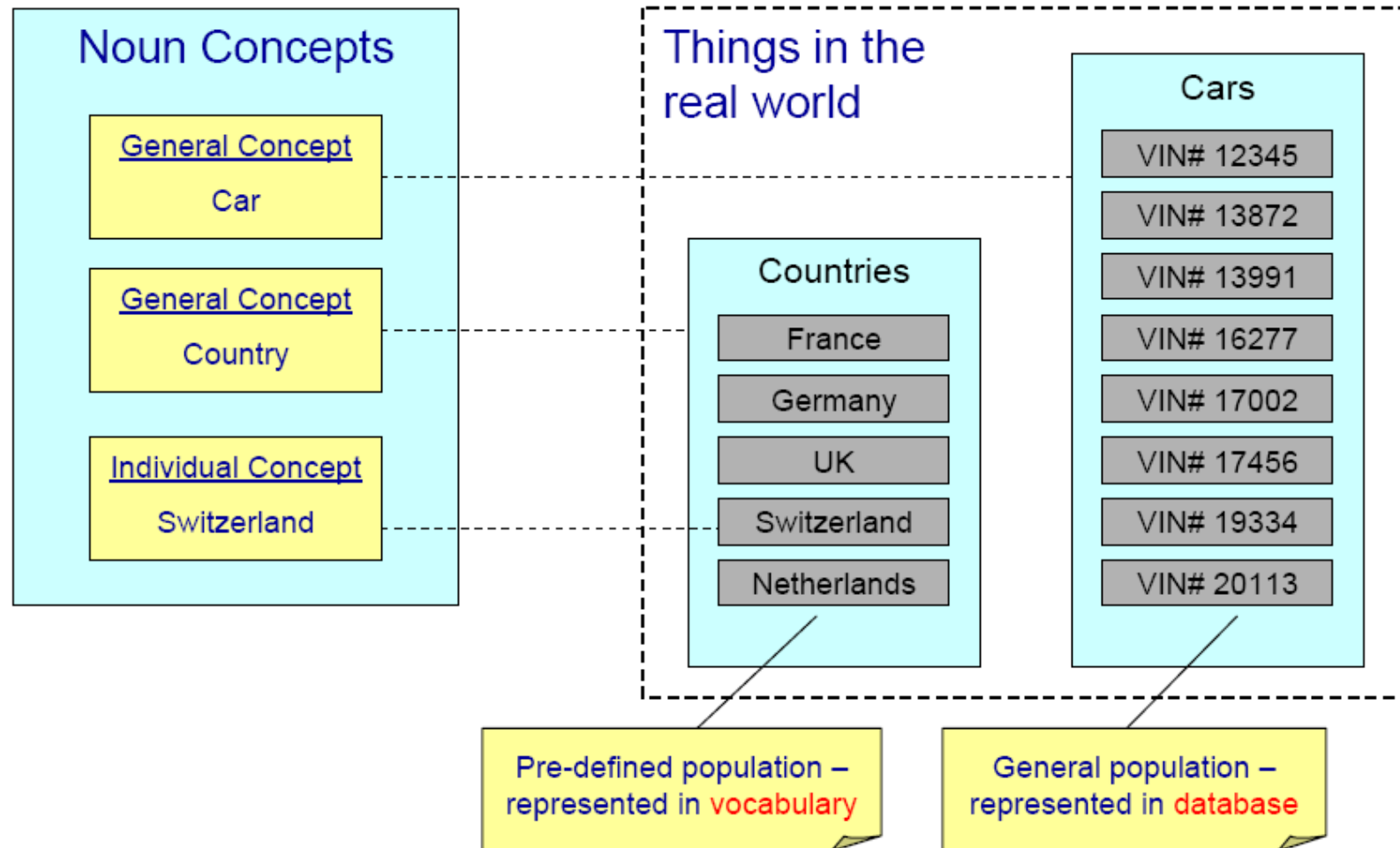
Definition: concept **that** is the meaning of a noun or noun phrase
 Concept Type: concept type
 Reference Scheme: a closed projection **that** *defines* the noun concept

fact type

Definition: concept **that** is the meaning of a verb phrase that involves one or more noun concepts and whose instances are all actualities
 Synonym: verb concept
 Note: For each instance of a fact type, each role of the fact type is one point of involvement of something in that instance.
 Concept Type: concept type
 Necessity: Each fact type *has at least one* role.



Noun Concepts: General and Individual



(Chapin & Hall 2006)

Noun Concepts

Examples:

- The '**general concept**' that denotes the set of countries in which EU-Rent does business

operating country

Concept Type:

role

Definition:

country in which EU-Rent does business

Necessity:

Each operating country has exactly one currency

- The '**individual concept**' that denotes the country Switzerland

Switzerland

Concept Type:

individual concept

General Concept:

country

Synonym:

CH



Object Type = General Concept

object type

Definition:	<u>noun concept</u> that classifies things on the basis of their common properties
Source:	based on <u>ISO 1087-1 (English)</u> (3.2.3) ['general concept']
Concept Type:	<u>concept type</u>
Synonym:	<u>general concept</u>
Necessity:	The <u>set of characteristics</u> that are incorporated by an <u>object type</u> is not the <u>set of characteristics</u> that are incorporated by another <u>object type</u> .
Note:	An object type incorporates a set of characteristics which are a unique combination that distinguishes that object type from all other object types. See ' <u>concept incorporates characteristic</u> '. If an object type A and an object type B have the very same incorporated characteristics, they are the same concept. If they have the very same necessary characteristics, they are logically equivalent and they denote the same things in all possible worlds.
Example:	the concept 'rental car' corresponding to cars that are rented
Example:	the concept 'car', the concept 'number', the concept 'person'

Individual Concept

individual concept

Source:	<u>ISO 1087-1 (English)</u> (3.2.2) ['individual concept']
Definition:	<u>concept</u> that corresponds to only one object [<u>thing</u>]
General Concept:	<u>noun concept</u>
Concept Type:	<u>concept type</u>
Necessity:	No <u>individual concept</u> is an <u>object type</u> .
Necessity:	No <u>individual concept</u> is a <u>fact type role</u> .
Note:	While each referring individual concept has exactly one and the same instance in all possible worlds, there can be multiple individual concepts that correspond to the same thing. Different definite descriptions of the same individual thing can represent different individual concepts that correspond to that thing.
Example:	The <u>individual concept</u> 'California' whose one <u>instance</u> is an individual state in the United States of America

Fact Types – Examples

■ Fact Types

- ◆ Unary (characteristic): flight *is full*
 - 1 placeholder, filled by 'flight'
- ◆ Binary: aircraft *is assigned to* flight
 - two placeholders, filled by 'aircraft' and 'flight'
- ◆ N-ary: reassigned flight *replaces* missed flight *after* late arrival
 - three placeholders representing roles, filled by 'flight', 'flight' and 'late arrival'

Role and Fact Type Role

role

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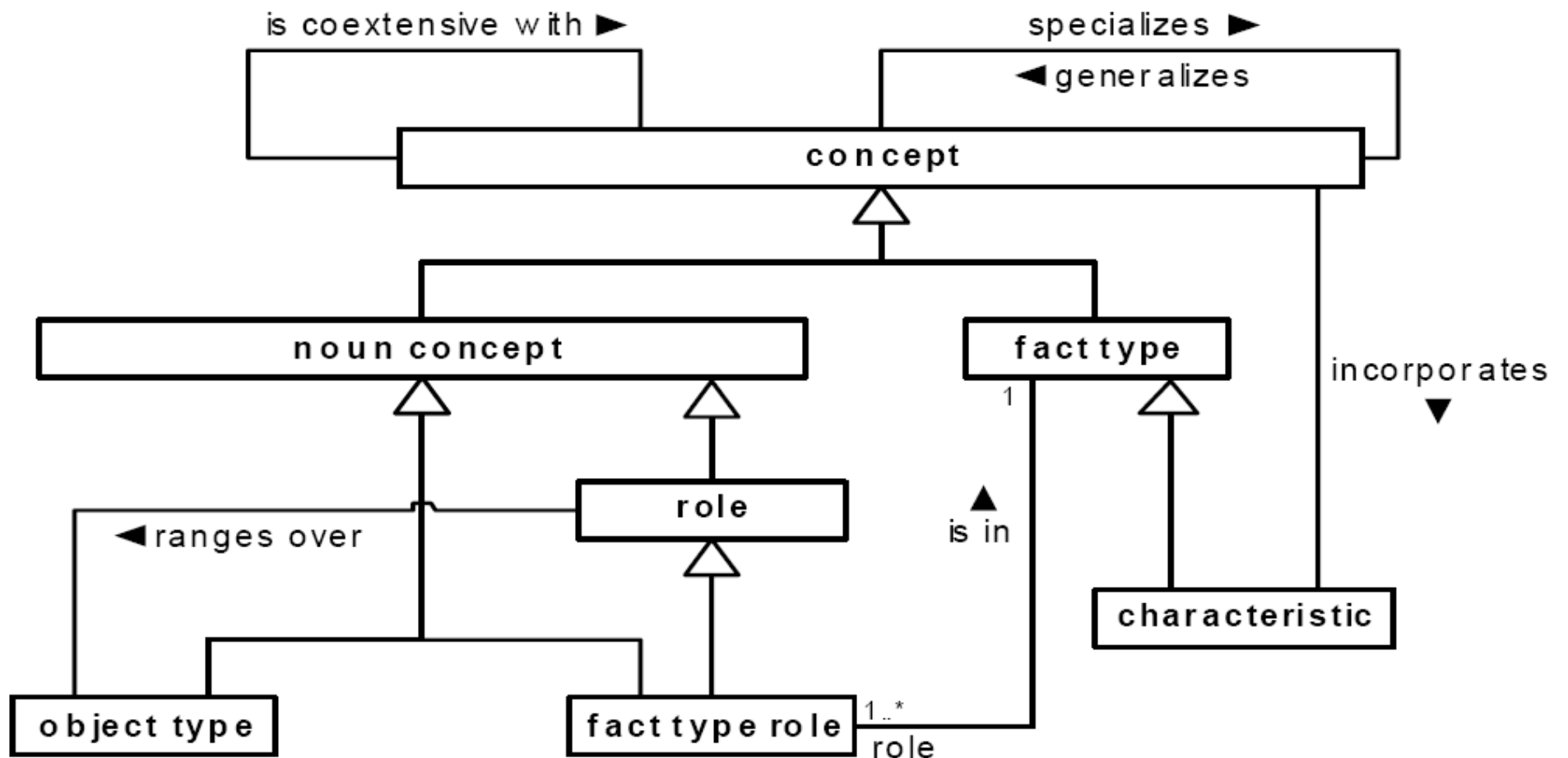
- Definition: noun concept **that** corresponds to things based on their playing a part, assuming a function or being used in some situation
- Concept Type: concept type
- Example: the role 'drop-off location' of the fact type 'shipment has drop-off location'
- Example: the role 'shipment' of the fact type 'shipment has drop-off location', which should not be confused with the general concept 'shipment' (which generalizes the role)
- Example: the role 'sum' – a role of a number in relation to a set of numbers
- Note: A role can be an object type or a fact type role. A role is always understood with respect to actualities of a particular fact type or to other particular situations.

fact type role

- Definition: role **that** specifically characterizes its instances by their involvement in an actuality that is an instance of a given fact type
- Concept Type: concept type
- Necessity: **Each** fact type role **is in exactly one** fact type.
- Necessity: **No** fact type role **is an** object type.
- Note: A fact type role is fundamentally understood as a point of involvement in actualities that correspond to a fact type. Its incorporated characteristics come from the fact type - what the fact type requires of instances of the role. It is possible that two fact type roles incorporate the same characteristics, such as when a binary fact type means the same thing when roles are reversed, as in 'person is married to person'.



Relations between Concepts



Examples of Relations

concept₁ specializes concept₂

FL

Definition: the concept₁ incorporates each characteristic that is incorporated by the concept₂ plus at least one differentiator

Synonymous Form: concept₂ generalizes concept₁

Example: The individual concept 'Los Angeles' specializes the concept 'city', the differentiator being that Los Angeles is one particular city in California.

concept₁ is coextensive with concept₂

Definition: the extension of the concept₁ is always the extension of the concept₂

Example: The individual concept defined as "the thirtieth president of the United States" is coextensive with an object type defined as "president of the United States in 1925." The two concepts have the same extension (which includes only Calvin Coolidge) but they are different concepts.

concept incorporates characteristic

FL

Definition: the characteristic is an abstraction of a property of each instance of the concept and is one of the characteristics that makes up the concept

Example: The concept 'qualified driver' incorporates the characteristic 'driver is licensed' because it is necessary (by the definition of 'qualified driver') that each qualified driver is licensed.

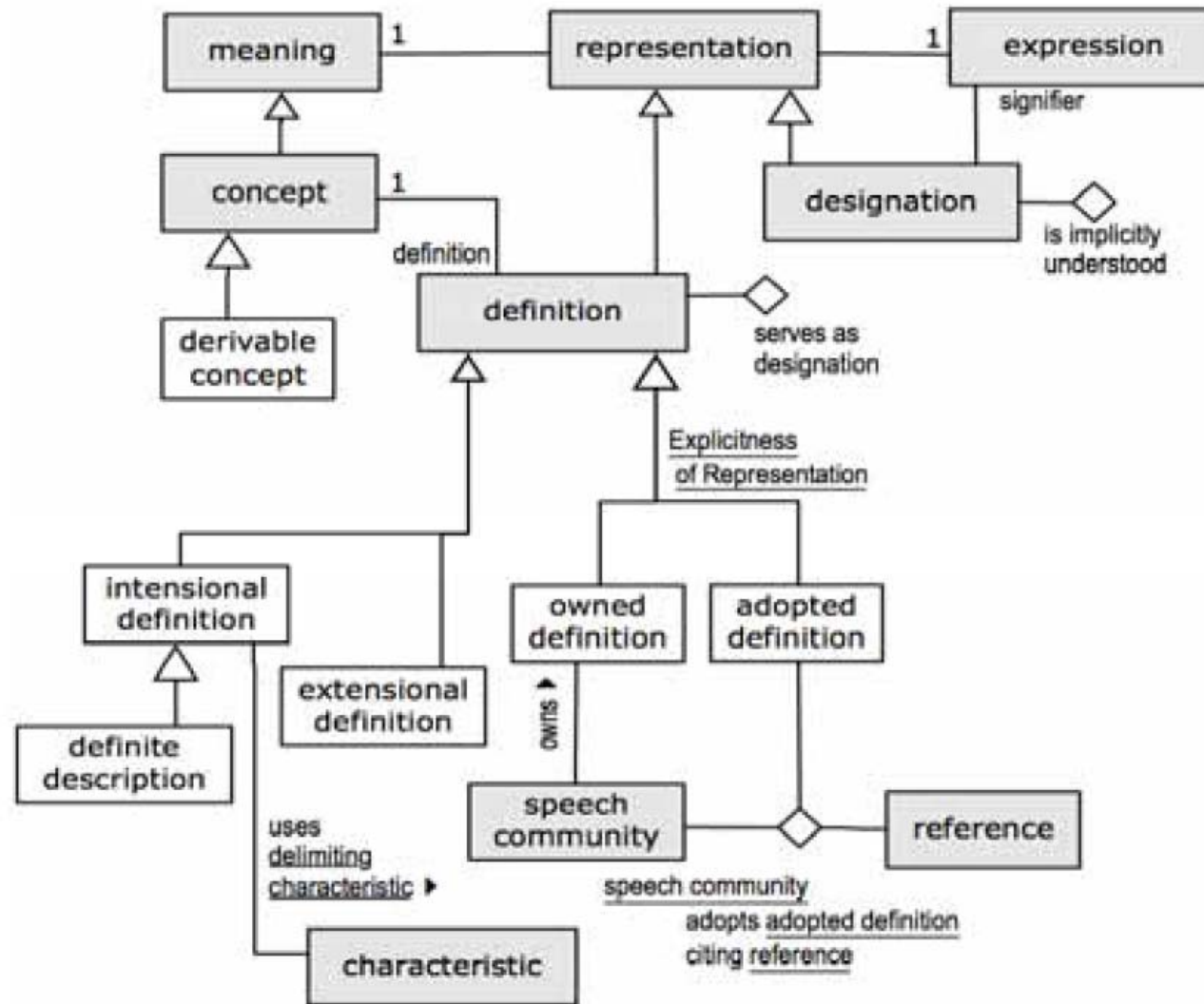
role ranges over object type

Definition: each characteristic that is incorporated by the object type is incorporated by the role

Example: The role 'company' of the fact type 'company employs person' ranges over the object type 'company'.



Kinds of Definition



Definition

intensional definition

Source:	<u>ISO 1087-1 (English)</u> (3.3.2) ['intensional definition']
Definition:	<u>definition</u> which describes the intension of a concept by stating the superordinate concept and the delimiting characteristics
General Concept:	<u>definition</u>
Necessity:	No <u>intensional definition</u> is an <u>extensional definition</u> .

definite description

Definition:	<u>intensional definition</u> of an individual
Example:	the car movement that has the movement id "UK-12345-abc-xyz"
Necessity:	Each <u>definition</u> of an <u>individual concept</u> is a <u>definite description</u> .
Necessity:	Each <u>definite description</u> is the <u>definition</u> of an <u>individual concept</u> .
Necessity:	Each <u>definite description</u> uses a <u>reference scheme</u> for the individual.

extensional definition

Source:	<u>ISO 1087-1 (English)</u> (3.3.3) ['extensional definition']
Definition:	description of a concept by enumerating all of its subordinate concepts under one criterion of subdivision
General Concept:	<u>definition</u>
Necessity:	No <u>extensional definition</u> is an <u>intensional definition</u> .



Expressing Definitions

One Definition Form (e.g. Intensional)

- The sales tax rate for a rental is the sales tax rate at the pick-up branch of the rental on the drop-off date of the rental.

can be expressed in many language, notation & speech community combinations:

- Expressed in English

- The sales tax rate for a rental is the sales tax rate at the pick-up branch of the rental on the drop-off date of the rental.

- Expressed in French

- Le taux de taxe de vente pour une location de voiture est le taux de taxe de vente à l'agence de départ de la location à la date de retour de la voiture

- Expressed in SBVR Structured English

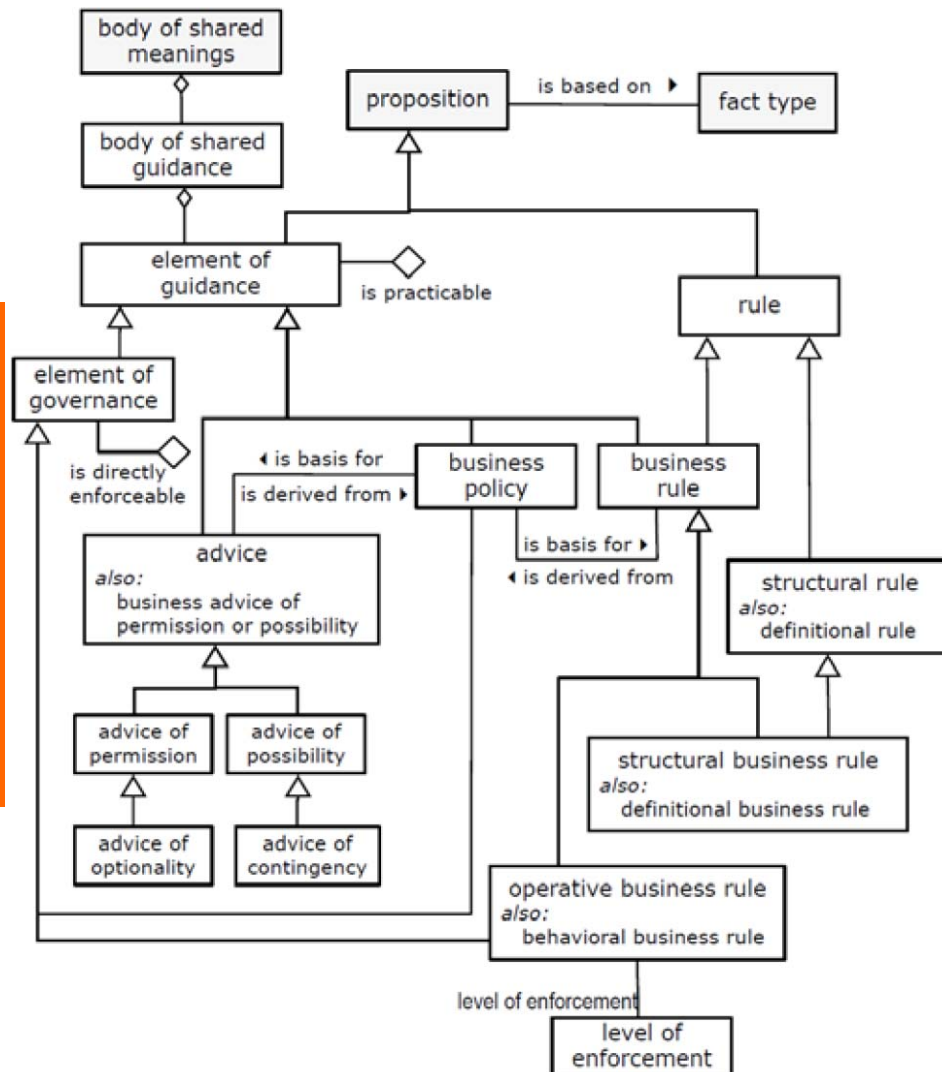
- The sales tax rate for a rental is the sales tax rate at the pick-up branch of the rental on the drop-off date of the rental.

– . . .

(Chapin & Hall 2006)



Clause 12: Business Rules



- (Surprisingly) small part of SBVR
- Contains definitions for
 - ◆ Business Rules
 - ◆ Level of Enforcement
 - ◆ Rule Statements

Business Rules

rule

Definition:

proposition **that** is a claim of obligation **or** of necessity

Dictionary Basis:

one of a set of explicit or understood regulations or principles governing conduct or procedure within a particular area of activity ... a law or principle that operates within a particular sphere of knowledge, describing, or prescribing what is possible or allowable. [ODE]

business rule

Definition:

rule **that is** under business jurisdiction

General Concept:

rule, element of guidance

Note:

A rule's being "under business jurisdiction" means that it is under the jurisdiction of the semantic community that it governs or guides - that the semantic community can opt to change or discard the rule. Laws of physics may be relevant to a company (or other semantic community); legislation and regulations may be imposed on it; external standards and best practices may be adopted. These things are not business rules from the company's perspective, since it does not have the authority to change them. The company will decide how to react to laws and regulations, and will create business rules to ensure compliance with them. Similarly, it will create business rules to ensure that standards or best practices are implemented as intended. See subclause A.2.3

business rule is derived from business policy

Synonymous Form:

business policy is basis for business rule



Kinds of Business Rules

structural rule

Definition: rule **that** is a claim of necessity.
Synonym: definitional rule

structural business rule

Definition: structural rule **that is a** business rule
Necessity: **Each** structural business rule **is** practicable.
Synonym: definitional business rule

operative business rule

Definition: business rule **that** is a claim of obligation
Definition: element of governance **that is** directly enforceable
Dictionary Basis: a prescribed, suggested, or self-imposed guide for conduct or action : a regulation or principle
<his parents laid down the rule that he must do his homework before going out to play> <a very sound rule for any hiker is to mind his own business [...] F.D.Smith & Barbara Wilcox>
<made it a rule never to lose his temper> [...] [MWU (1a) 'rule']

Dictionary Basis: a prescribed guide for conduct or action [MWCD 'rule']
Necessity: **No** operative business rule **is a** structural business rule.
Synonym: behavioral business rule



Kinds of Business Rules

Two kinds of business rule:

- **Operational**: govern what the business does
 - “It is obligatory that ...”
 - “It is permitted that ...” (and its negation, “It is forbidden that ...”)
- **Structural**: true by definition
 - “It is necessary that ...”
 - “It is possible that ...” (and its negation, “It is impossible that ...”)

(Chapin & Hall 2006)

Defining a Business Rule

- Start with a fact type, e.g.

rental *has* driver

- Apply an obligation or necessity to it, e.g.

it is obligatory that rental *has* driver.

- Add qualifications, quantifications and conditions, if necessary, e.g. =

it is obligatory that rental *has* at most 4 drivers

Levels of Enforcement

- Levels of Enforcement are separated from rules

level of enforcement

Definition:	a position in a graded or ordered scale of values that specifies the severity of action imposed in order to put or keep an <u>operative business rule</u> in force
Dictionary Basis:	a position on a real or imaginary scale of amount, quantity, extent, or quality [NODE 'level']
Dictionary Basis:	compel observance of or compliance with [NODE 'enforcement']

- Only operative rules have levels of enforcements

operative business rule *has* level of enforcement

- SBVR does not prescribe any enforcement levels. It only gives examples (the ones also mentioned in BMM):
strict, deferred, pre-authorized, post-justified, override, guidelins

Statements of Guidance

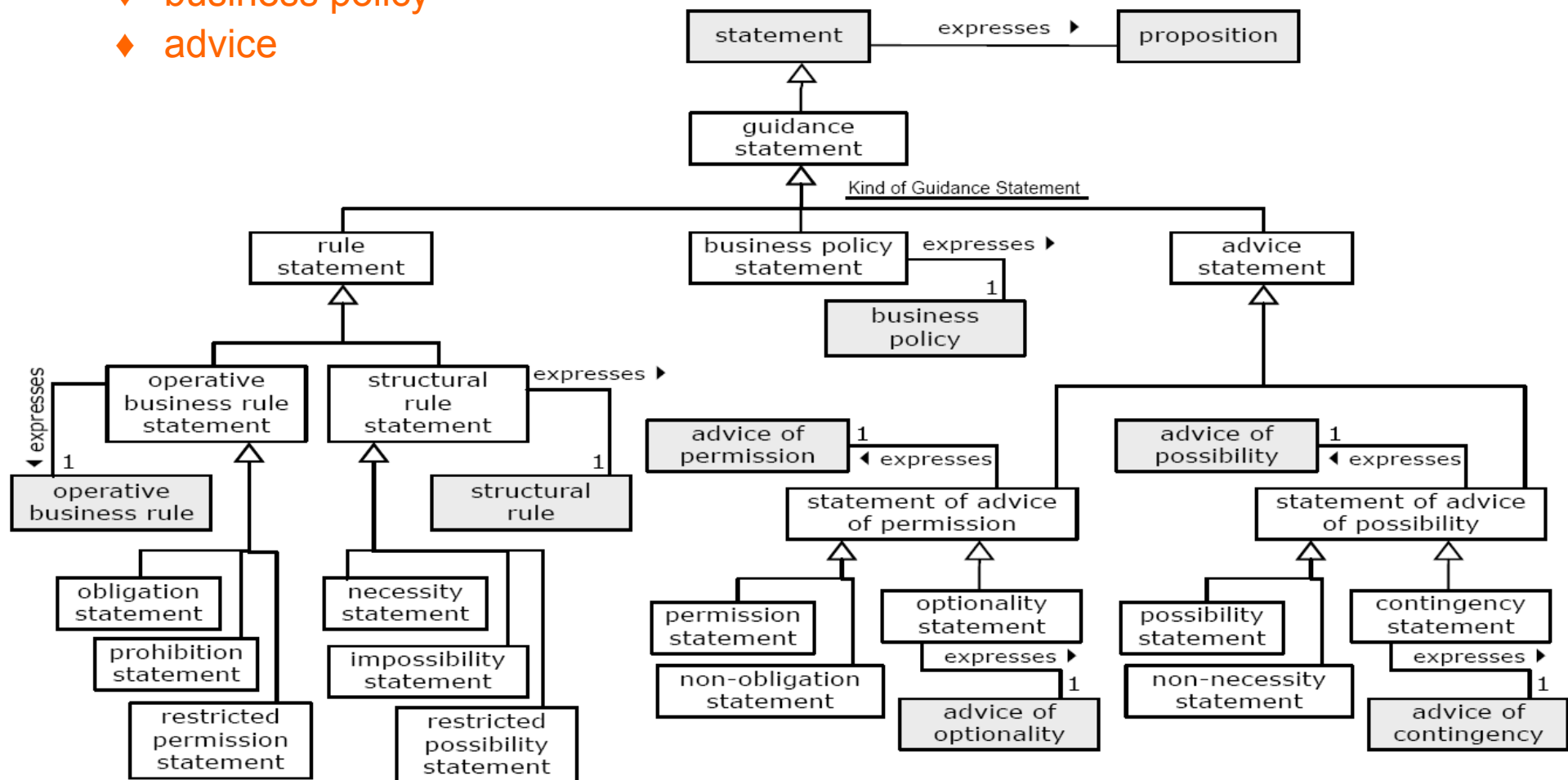
- There is a distinction between
 - ◆ rules
 - ◆ rule statements
- There are three kinds of statement to express operative business rules
 - ◆ obligation statement
 - ◆ prohibition statement
 - ◆ restricted permission statement
- There are also three kinds of statement to express structural business rules
 - ◆ necessity statement
 - ◆ impossibility statement
 - ◆ restricted possibility statement



Statements of Guidance

- Besides **rules** there are statements for other kinds of guidance

- ◆ **business policy**
- ◆ **advice**



Statements of Guidance

guidance statement

- Definition: statement that expresses an element of guidance
- Definition: statement that provides advice or information aimed at resolving a problem or difficulty, especially as given by someone in authority
- Dictionary Basis: a statement that provides advice or information aimed at resolving a problem or difficulty, especially as given by someone in authority [NODE 'guidance']

business policy statement

- Definition: guidance statement that expresses a business policy
- Necessity: The concept 'business policy statement' is included in Kind of Guidance Statement.

rule statement

- Definition: guidance statement that expresses an operative business rule or a structural rule
- Necessity: The concept 'rule statement' is included in Kind of Guidance Statement.

Rule Statements

structural rule statement

- Definition: rule statement that expresses a structural rule
- Note: One structural rule can be expressed as various equivalent kinds of statements by introducing or removing negation. The following are examples of the same rule, expressed in three forms.
- Example: [as a necessity statement] “It is necessary that the pick-up branch of a one-way rental is not the return branch of that rental.”
- Example: [as an impossibility statement] “It is impossible that the pick-up branch of a one-way rental is the return branch of that rental.”
- Example: [as a restricted possibility statement] “It is possible that the pick-up branch of a rental is the return branch of the rental only if the rental is not a one-way rental.”

operative business rule statement

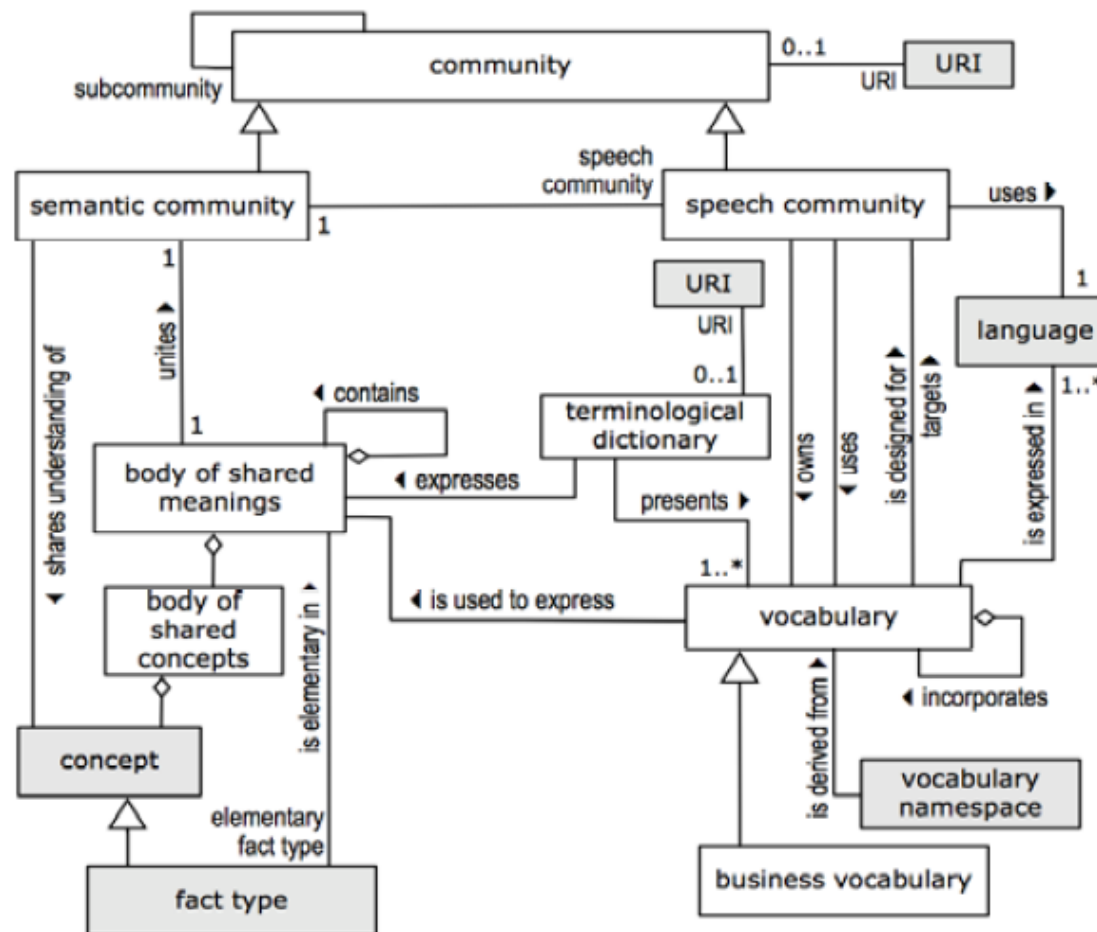
- Definition: business rule statement that expresses an operative business rule
- Necessity: No operative business rule statement is a structural rule statement.
- Note: One operative business rule can be expressed as various equivalent kinds of statements by introducing or removing negation. The following are examples of the same rule, expressed in three forms.
- Example: [as an obligation statement] “It is obligatory that a rental that is open has no driver that is a barred driver.”
- Example: [as a prohibition statement] “It is prohibited that a rental be open if a driver of the rental is a barred driver.”
- Example: [as a restricted permission statement] “It is permitted that a rental be open only if no driver of the rental is a barred driver.”



Clause 11: Business Vocabulary

- Clause 11 specifies a vocabulary providing words for describing business vocabularies along with the designations and fact type forms they contain.
- A full description of a business vocabulary involves
 - ◆ its relationship to semantic communities and speech communities,
 - ◆ its relationship to other vocabularies,
 - ◆ the concepts represented, their definitions and other information about them.

Communities, Meaning and Vocabularies



Community

community

Definition:	group of people having a particular unifying characteristic in common
Dictionary Basis:	group of people having a religion, race, profession, or other particular characteristic in common [NODE 'community']
Reference Scheme:	a <u>URI of the community</u>
Example:	The <u>Car Rental Community</u> -- people who work in the car rental business
Example:	The <u>EU-Rent Community</u> -- all EU-Rent employees
Example:	The <u>EU-Rent German Community</u> -- employees of EU-Rent's German division

NODE = The New Oxford Dictionary of English.



Semantic Community

semantic community

Definition: community whose unifying characteristic is a shared understanding (perception) of the things that they have to deal with

Example: The EU-Rent Community -- those who share the body of concepts about general and specific things of importance to the EU-Rent business.

- When you define rules, you do it from the perspective of the owning semantic community
- A semantic community defines the scope of an SBVR Body of Shared Meanings:
 - ◆ what concepts (both noun concepts and verb concepts) are to be included
 - ◆ what business rules it needs to build on them

Body of Shared Meanings

body of shared meanings

Definition: set of concepts and elements of guidance for which there is a shared understanding in **a given semantic community**

Example: The EU-Rent Car Rental Business has a body of shared meanings which contains the set of concepts of general and specific things of importance to the EU-Rent car rental business

body of shared meanings unites semantic community

Definition: **the** body of shared meanings **is** the set of concepts and elements of guidance for which there is a shared understanding in **the semantic community**

Necessity: **Each** semantic community **is united by exactly one** body of shared meanings.

Necessity: **Each** body of shared meanings **unites exactly one** semantic community.

Note: Understanding the body of shared meanings that unites a semantic community is an obligation for participation in the semantic community. Communication within the community is based on an assumption of mutual understanding of the body of shared meaning.

Speech Community

- A speech community is a subcommunity of a semantic community. It has the same “body of shared meanings”, but expresses them in a particular, shared vocabulary

speech community

- Definition: subcommunity of a given semantic community whose unifying characteristic is the vocabulary and language that it uses
- Dictionary Basis: group of people sharing a characteristic vocabulary, and grammatical and pronunciation patterns for use in their normal intercommunication [W3ID ‘speech community’]
- Example: The EU-Rent German Community shares the German-based vocabulary of designations used in EU-Rent’s business. The designations include German words for EU-Rent’s concepts plus designations adopted from other languages.

speech community uses language

- Definition: the speech community communicates in the language
- Necessity: Each speech community uses exactly one language.

semantic community has speech community

- Necessity: Each speech community is of exactly one semantic community.



Vocabulary

- A vocabulary is drawn from one shared language, which may be:
 - A natural language, such as English, German, Dutch
 - Specialised terminology such as that used by lawyers or engineers
 - A constructed language such as the UML (or SBVR Structured English)
- Each vocabulary expresses only one Body of Shared Meanings
- A vocabulary includes
 - terms and names for the noun concepts
 - ‘readings’ for the verb concepts
- SBVR users are strongly encouraged to limit the amount of internally managed vocabulary, and:
 - use everyday natural language as much as possible, backed up with a standard dictionary
 - adopt as much as possible from authoritative sources, such as ISO standards and industry standard glossaries.

(Chapin & Hall 2006)

Vocabulary

vocabulary

- Definition: set of designations and fact type forms primarily drawn from a single language to express concepts within a body of shared meanings
- Dictionary Basis: sum or stock of words employed by a language, group, individual, or work, or in a field of knowledge [MWCD 'vocabulary ']
- Example: The sets of designations represented in EU-Rent's internal glossaries, in the natural languages in which the company does business, together with the vocabularies it has adopted, including those defined in:
- * Industry standard glossaries for car rental business,
 - * Standard (e.g., ISO) glossaries of business terms,
 - * Authoritative dictionaries for the relevant natural languages.

vocabulary is designed for speech community

- Synonymous Form: vocabulary targets speech community
- Definition: the vocabulary is created for use by a speech community that does not own the vocabulary

vocabulary is expressed in language

- Definition: the designations of the vocabulary are primarily within the language
- Synonymous Form: language expresses vocabulary
- Synonymous Form: vocabulary uses language
- Necessity: Each vocabulary is expressed in at least one language.
- Note: Typically, the language would be a natural language, but not necessarily. See 'language'.



business vocabulary

Definition: vocabulary **that** is under business jurisdiction

vocabulary is used to express body of shared meanings

Definition: **the** vocabulary includes designations and fact type forms of the concepts in **the** body of shared meanings

References

- OMG (2008): Semantics of Business Vocabulary and Business Rules (SBVR), v1.0, URL: <http://www.omg.org/spec/SBVR/1.0> (17.10.2008)
- Chapin, Donald and Hall, John (2006): Semantics and Business Rules. Tutorial at the Semantic Technology Conference, March 2006, San Jose CA
- Chapin, Donald; Hall, John; Nijsson, Sjr; Piprani, Baba (2008): SBVR Tutorial. Open Forum 2008

Exercise: Definition

- Give definitions for the following concepts:
 - ◆ weekday
 - ◆ working day
 - ◆ weekend
- Are the definitions intensional or extensional?