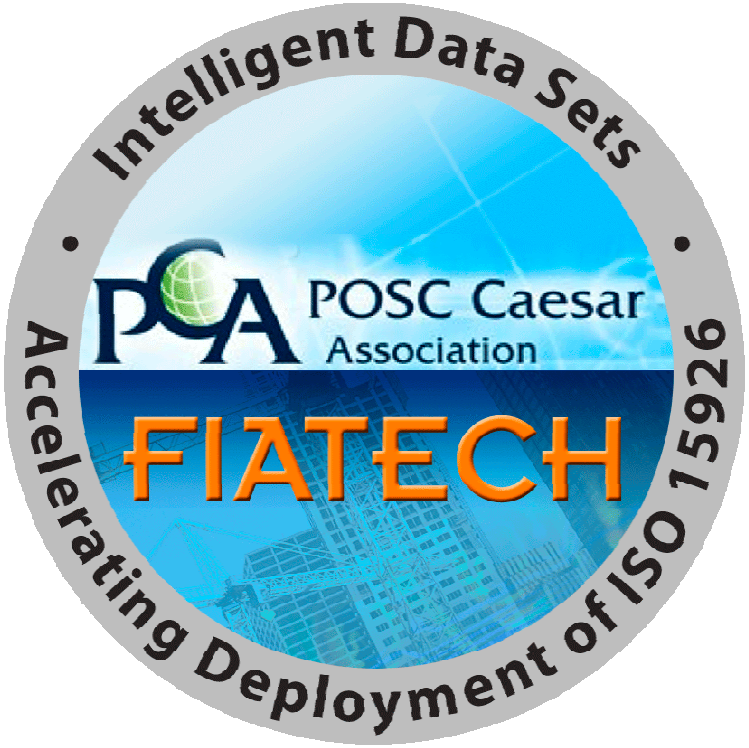



ids-adi.org

# ISO 15926 for interoperability

Onno Paap
Fluor Corporation

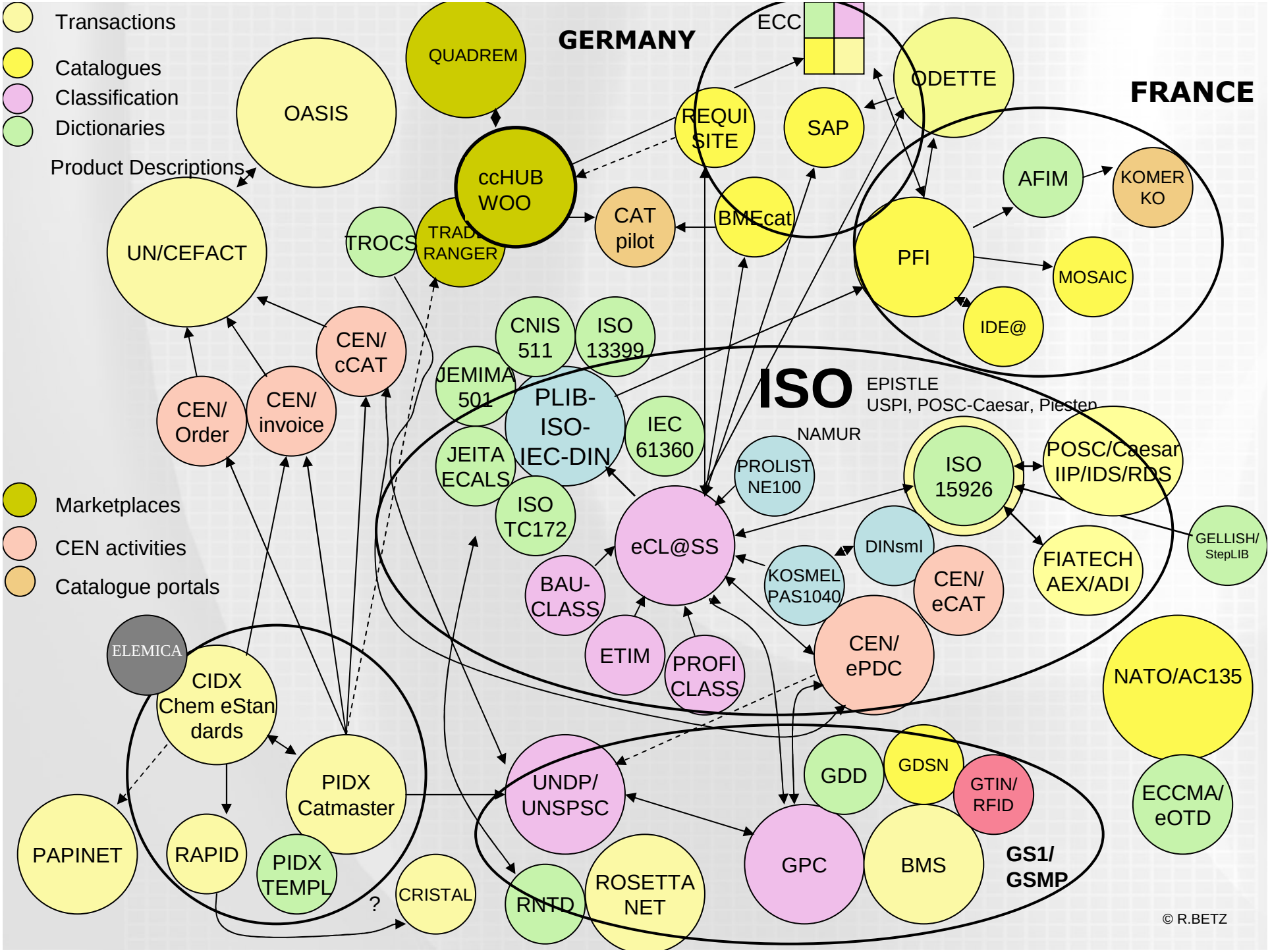
- Combined with “ISO 15926 templates and the Semantic Web” from DnV

“W3C Oil&Gas Workshop”

9-10 Dec 2008 – Houston TX USA

# ISO 15926

- Interoperability standard
  - Interoperability: the ability of different types of computers, networks, operating systems, and applications to work together effectively, without prior communication, in order to exchange information in a useful and meaningful manner.
- Neutral layer used for data integration


Transactions
Catalogues
Classification
Dictionaries
Product Descriptions
Marketplaces
CEN activities
Catalogue portals
GERMANY
FRANCE
ISO
EPISTLE
USPI, POSC-Caesar, Piesten
NAMUR
QUADREM
OASIS
ECC
ODETTE
REQUI SITE
SAP
ccHUB WOO
CAT pilot
BMEcat
AFIM
KOMER KO
PFI
MOSAIC
IDE@
TROCS
TRADE RANGER
UN/CEFACT
CEN/ cCAT
CEN/ Order
CEN/ invoice
CNIS 511
ISO 13399
JEMIMA 501
PLIB-ISO-IEC-DIN
IEC 61360
JEITA ECALS
ISO TC172
PROLIST NE100
ISO 15926
POSC/Caesar IIP/IDS/RDS
GELLISH/ StepLIB
eCL@SS
DINsml
KOSMEL PAS1040
CEN/ eCAT
FIATECH AEX/ADI
BAU-CLASS
ETIM
PROFI CLASS
CEN/ ePDC
ELEMICA
CIDX Chem eStan dards
PIDX Catmaster
PAPINET
RAPID
PIDX TEMPL
?
CRISTAL
UNDP/ UNSPSC
RNTD
ROSETTA NET
GDD
GDSN
GTIN/ RFID
GPC
BMS
GS1/ GSMP
NATO/AC135
ECCMA/ eOTD
© R.BETZ

# ISO 15926

- Chosen by FIATECH associated companies as **THE interoperability standard**
- Many companies worked on this standard
  - Estimated spent more than 50 man-years
- FIATECH ADI (Acceleration Deployment ISO 15926)
  - Total value $3.5 million
- POSC Caesar IDS (Intelligent data Sets)
  - Total value: $2.5 million


**20 ISO 15926 projects**


bp


Chevron


ConocoPhillips


DOW


DUPONT


GM


GSA


intel


P&G


Smithsonian Institution


TARGET CORPORATION


US Army Corps
of Engineers


AECL


BECHTEL


Burns and Roe


CH2MHILL


C
C
C


FLUOR


HATCH

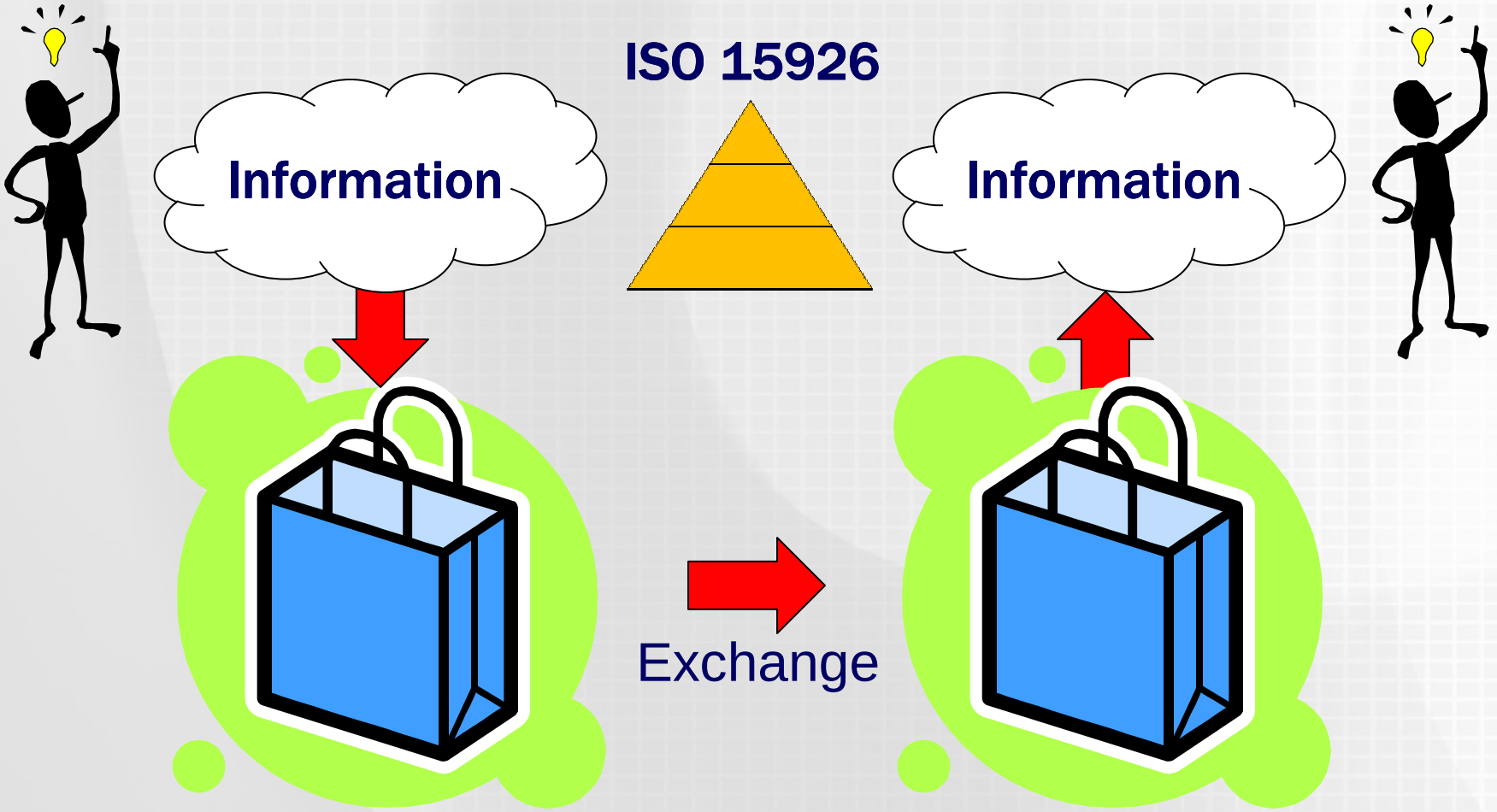

KBR


S&B


Shaw
a world of Solutions


ZACHRY

# RDL: reference data library

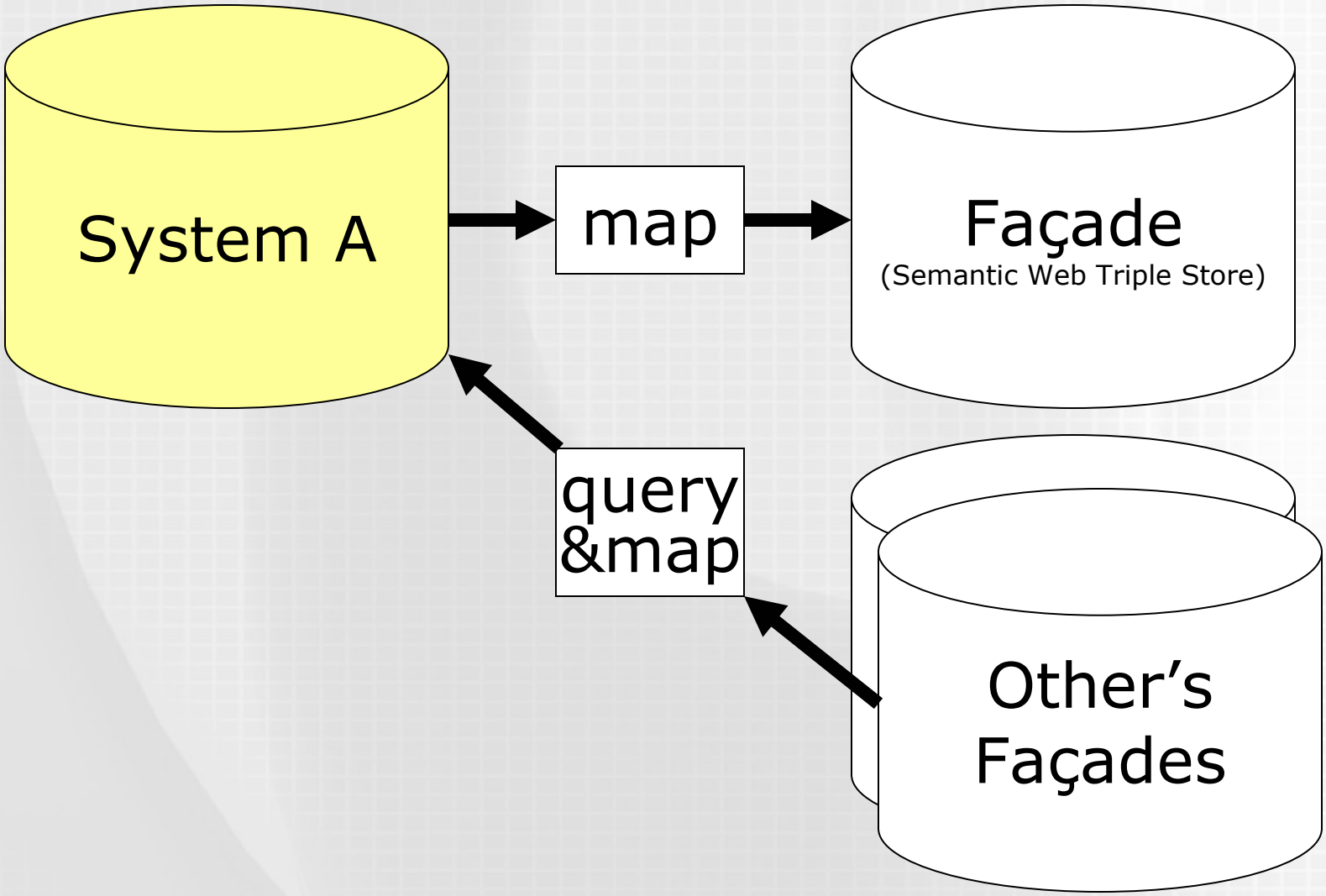



**The ISO 15926 provides the ability to build common data models**

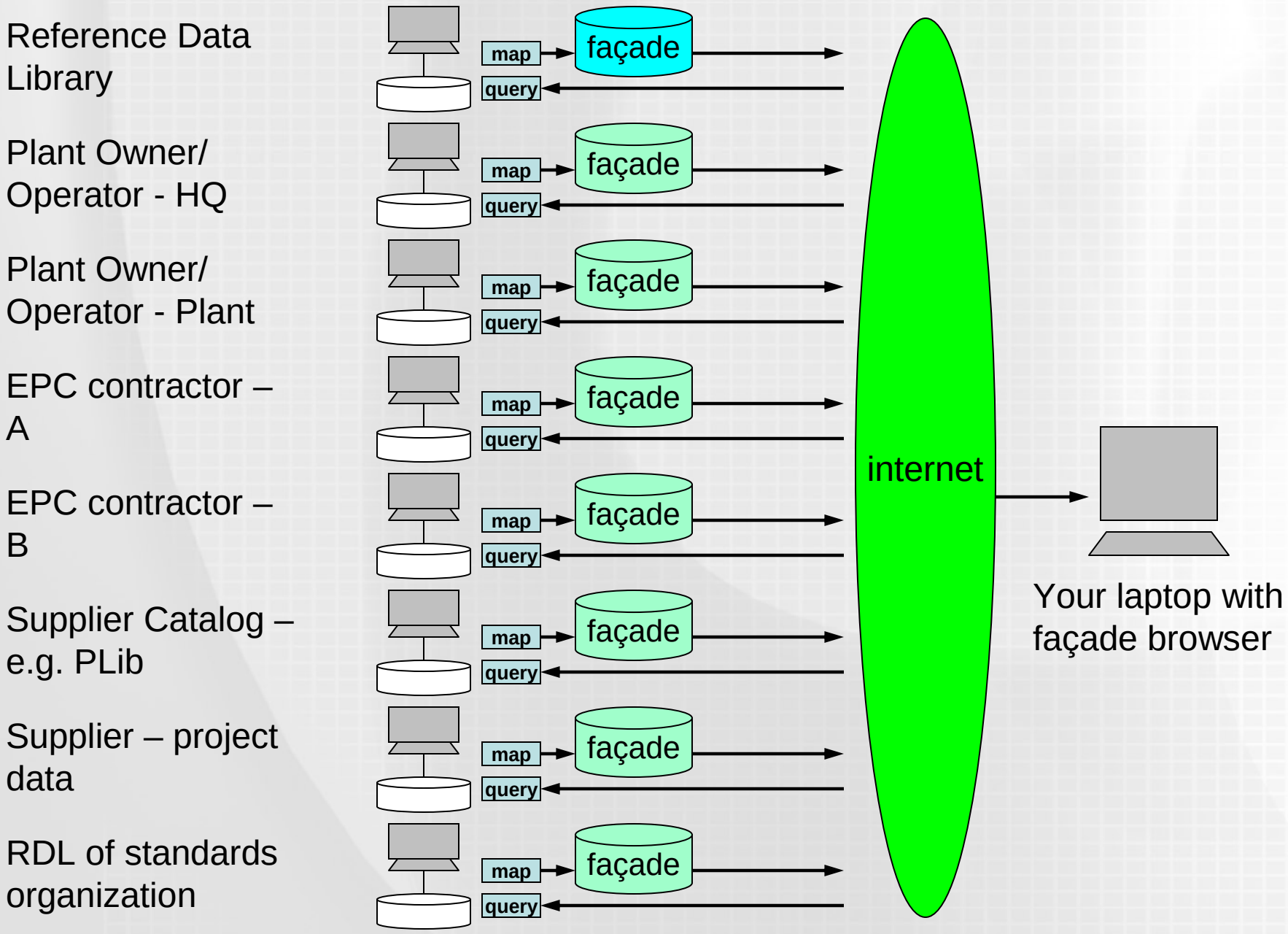
## ISO 15926 part 4 spreadsheets

| Spreadsheet | count | | Spreadsheet | count | |
|---|---|---|---|---|---|
| **basics.xls** | **108** | | **valves.xls** | **553** | |
| **core.xls** | **17** | | **connection_ material.xls** | **226** | |
| **uom.xls** | **1087** | | **mathematical_ objects.xls** | | |
| **information.xls** | **313** | | **rotating_equipment** | **1150** | |
| **properties.xls** | **1667** | | **activities.xls** | **1829** | |
| **class_of_class.xls** | **488** | | **functions.xls** | **80** | |
| **heat_transfer.xls** | **268** | | **solid_handling.xls** | **67** | |
| **encoded_ information.xls** | **38** | | **protection.xls** | **103** | |
| **electrical.xls** | **1465** | | **static_equipment.xls** | **637** | |
| **instrumentation.xls** | **724** | | **transport.xls** | **100** | |
| **piping.xls** | **704** | | Total | 11624 | |

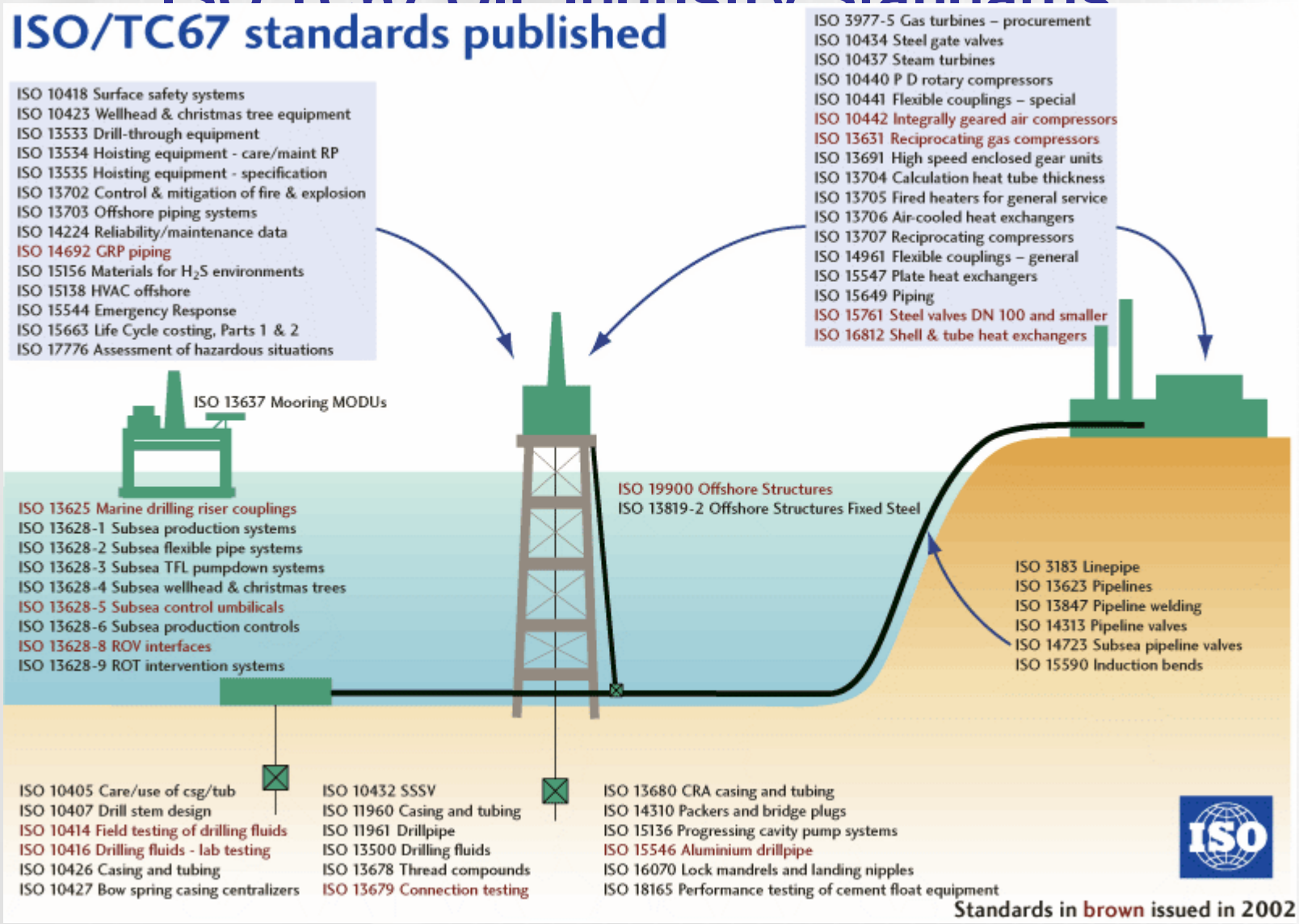
# Façades


System A
map
Façade
(Semantic Web Triple Store)
query
&map
Other's
Façades

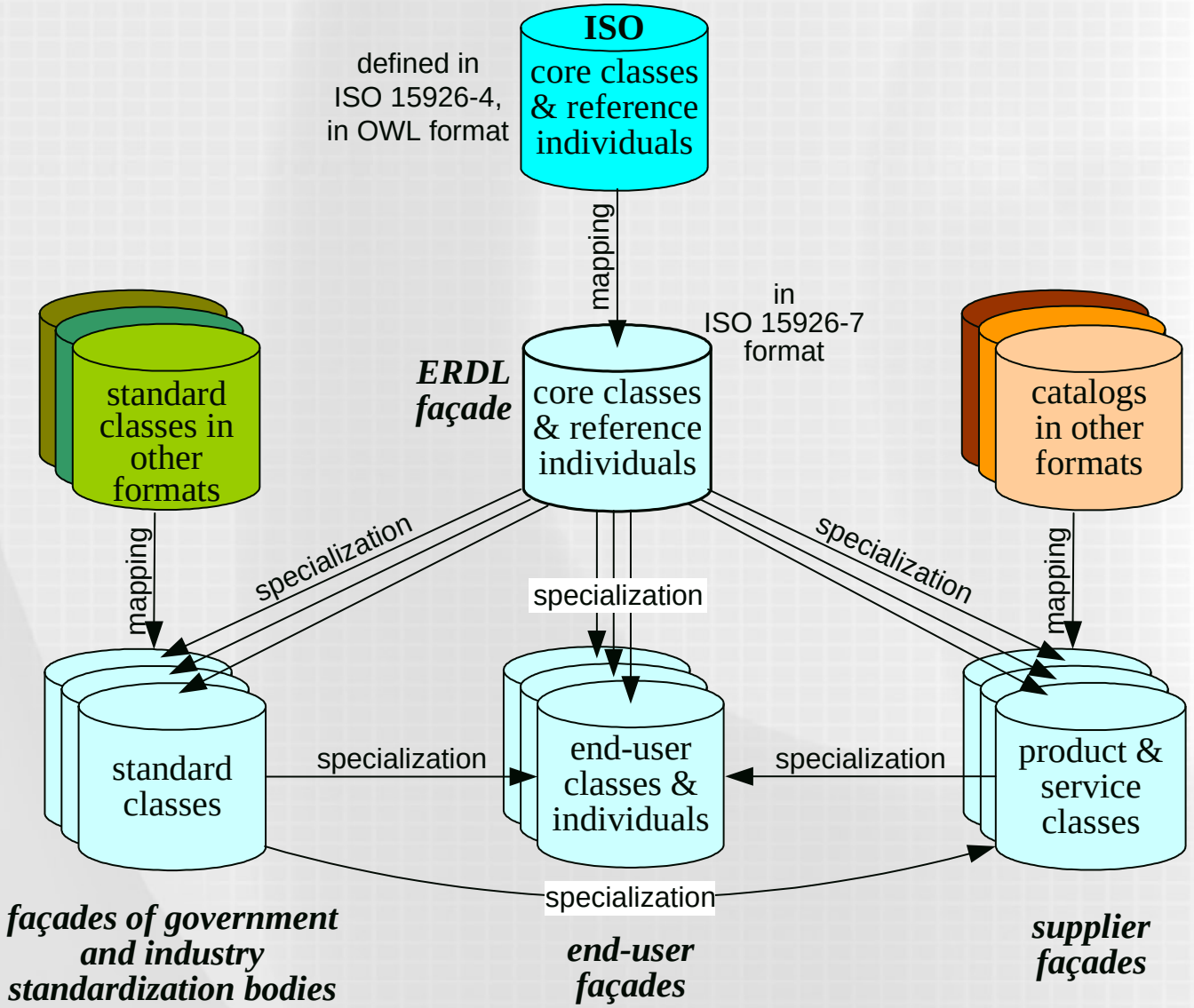
# Confederation of Participating Façades (CPF)



# ISO TC67 Oil Industry Standards



# Reference Data Libraries



# Wanted: A simple, compliant interface

- Standardized modelling practice
- Tools that are familiar to domain experts
  - Protégé, Reference Data Editor are out
- Tools that support the user and check correctness
  - Excel is out
- Tools that provide for working at a suitable level of abstraction
  - Most ontology editors expose the user to too much ”assembly code”

# Building domain ontologies with *templates*

- An ontology is used to record *statements.* That's semantics.
- To build the RDL, we need to represent facts about a given domain using the language of ISO 15926
- Ideally, a domain expert states the facts, and the machine interprets the facts automatically

# A template is a pattern for stating facts

- A Template for ISO 15926 is a *predicate*, a *statement form*, a *pattern for facts*
- A template has a *signature* defining the form of a statement
  - What arguments need to be given
  - What are their types
- Each template has an *interpretation rule* that interprets facts that fit the pattern
  - Reducing a complex statement into simpler ones
  - Eventually, to atomic statements in ISO 15926
  - Yielding an expression of the fact in the ontology language
- Logical methodology is rigorously defined in ISO 15926-7

# Template example I

- Constraint: A car has 3 or more wheels
- Express the constraint with a suitable template

  *Parts-at-least* ( Car, Wheel, 3 ) *!*
- Rules generate a set of ISO 15926 statements

" The statement

*Parts-at-least ( C, D, i )*

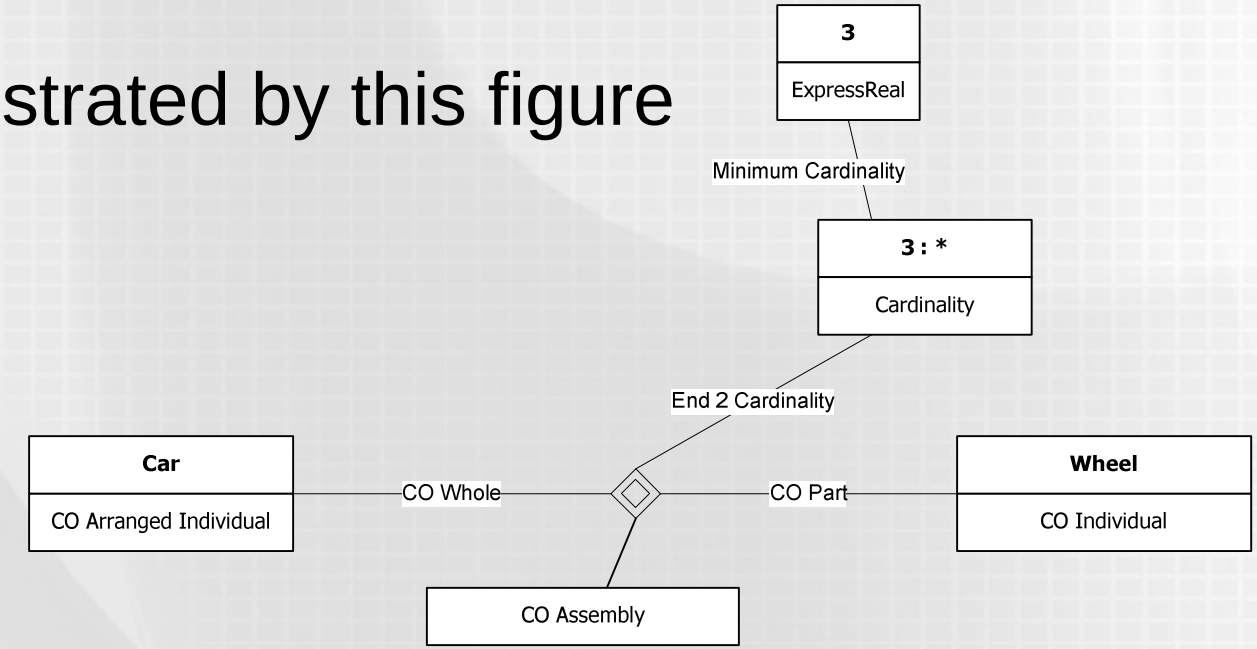
means that

Any *C* has at least *i D's* as parts "

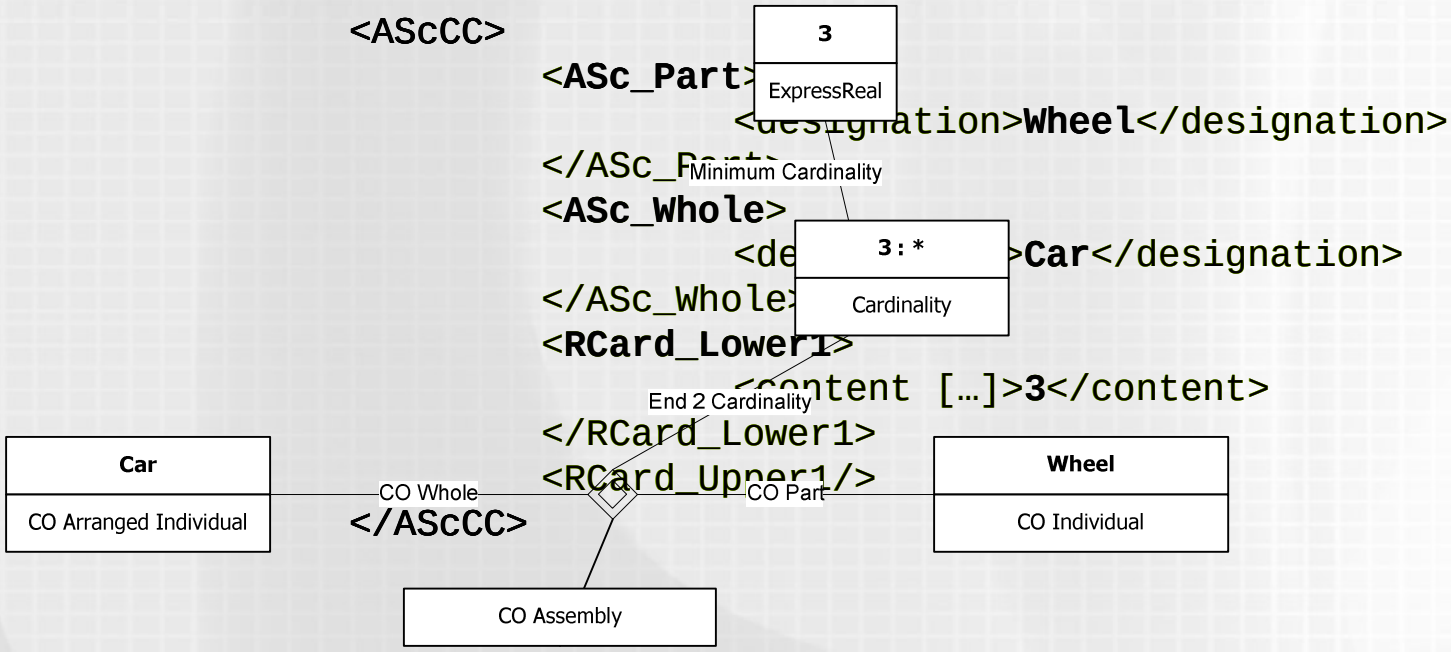
# Template example I

- Assume that any car has 3 or more wheels
- Expressed with a suitable template *Parts*

  *Parts-at-least* ( Car, Wheel, 3 ) *!*
- Rules generate a set of ISO 15926 statements
- … as illustrated by this figure



# Input in a straightforward XML format




*A car has at least three wheels.*

# A familiar interface

- Making the statement

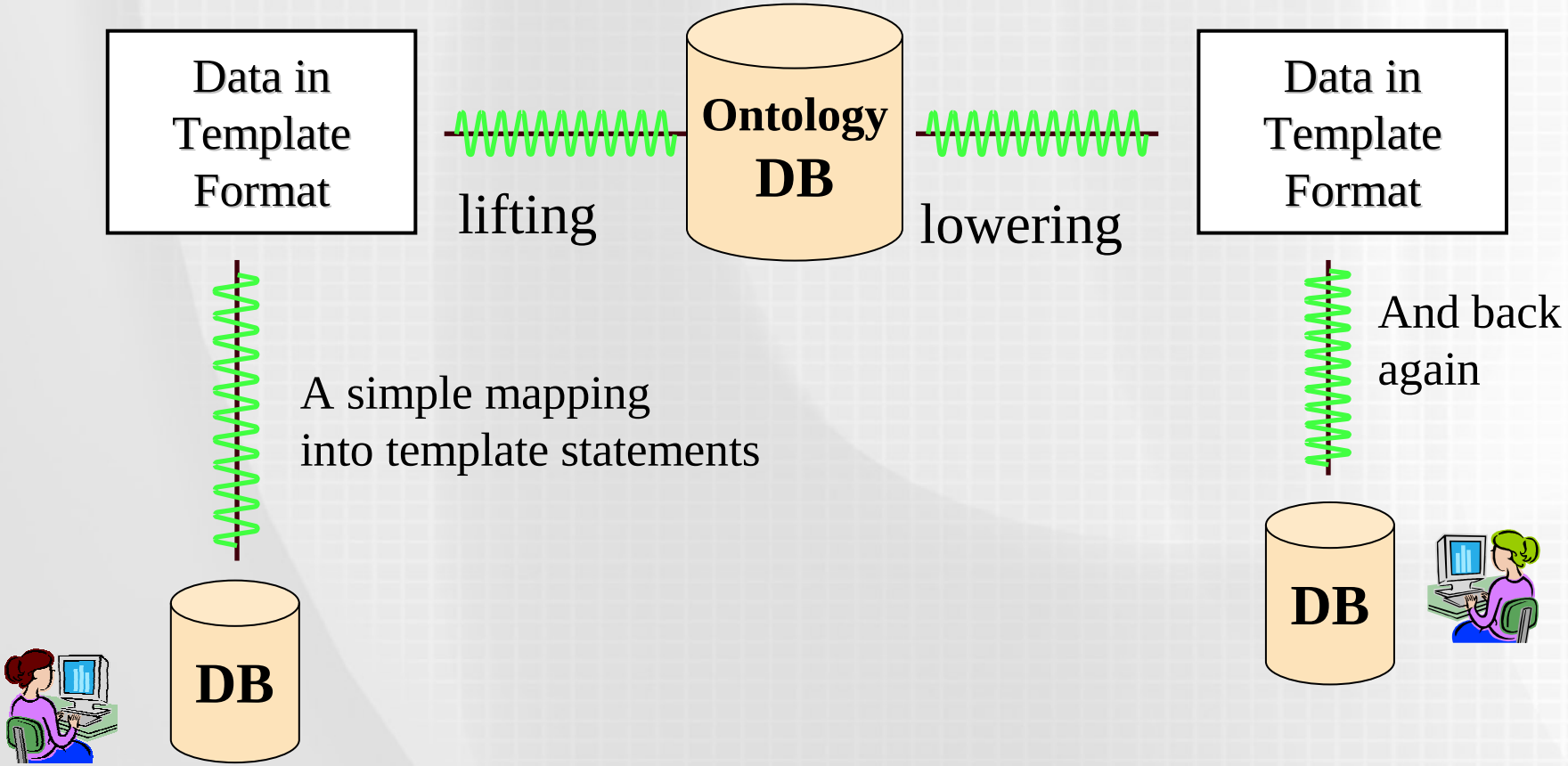
  *Parts-at-least* ( Car, Wheel, 3 )

  requires no detailed knowledge about modelling
- A list of arguments can easily be stored in a table (Excel!)

| **Equipment type** | **Part type** | **Min. number of parts** |
|---|---|---|
| Car | Wheel | 3 |
| Bicycle | Wheel | 1 |

- Correctness of the generated ontology structure can be checked using generic ontology tools

# Translation by means of templates



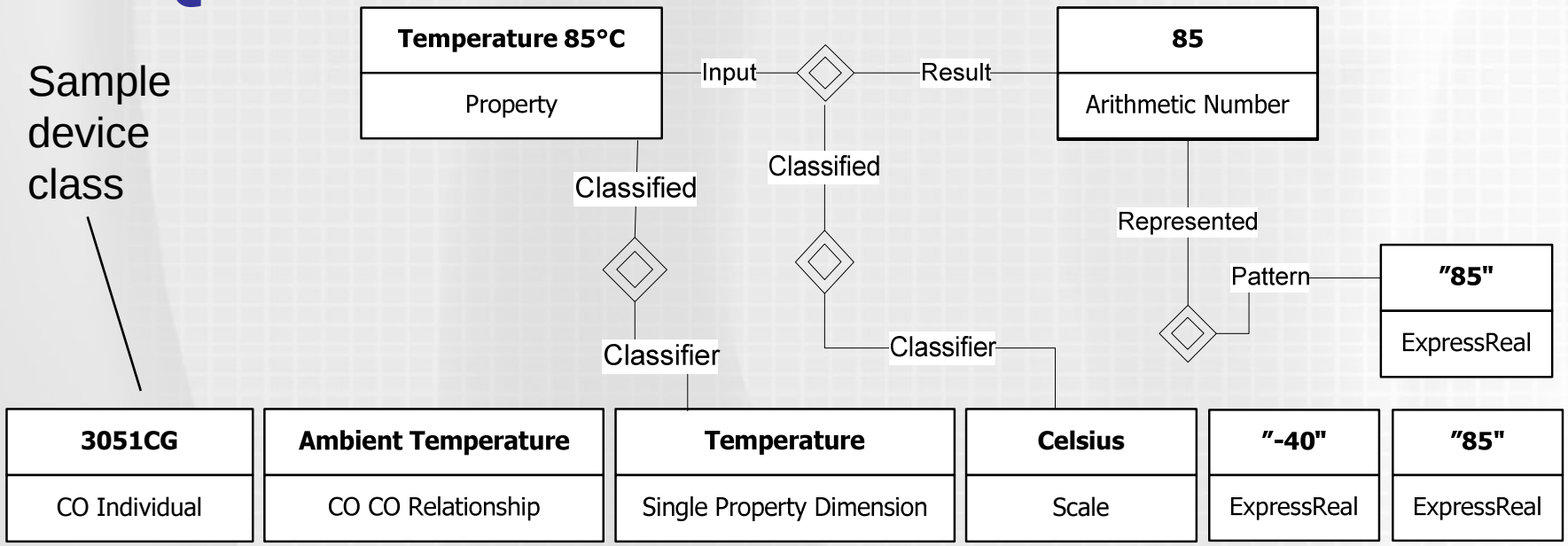
# Template example II

- A fairly complex claim

  “The ambient temperature during operation of a 3051CG pressure transmitter should be within -40 and 85 degrees Celsius.”
- Five arguments are required for a precise statement

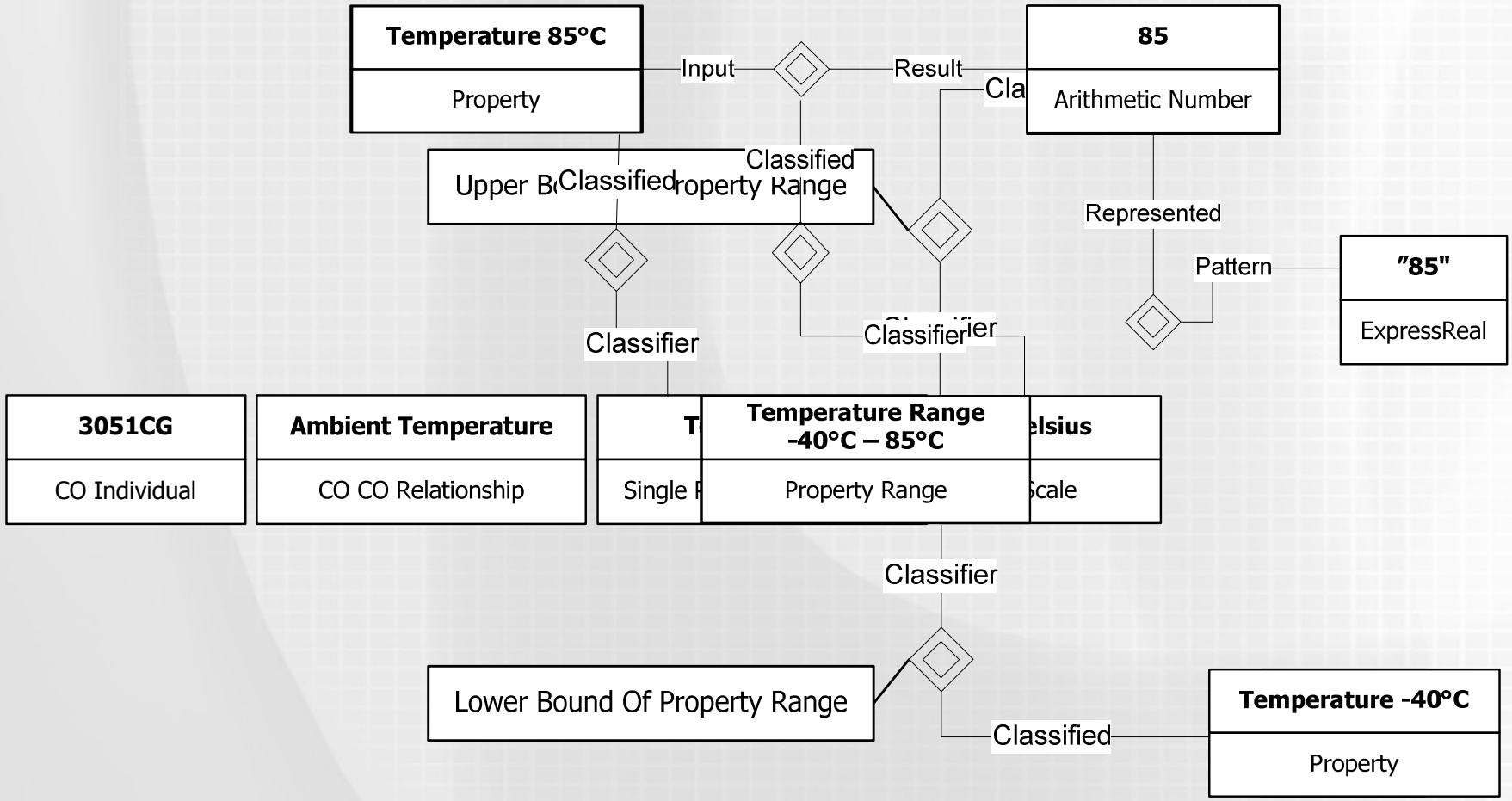
  “The *body height* of a *human* is a property which varies from *50* to *250* *cm*”

# Property with Scale and Quantification

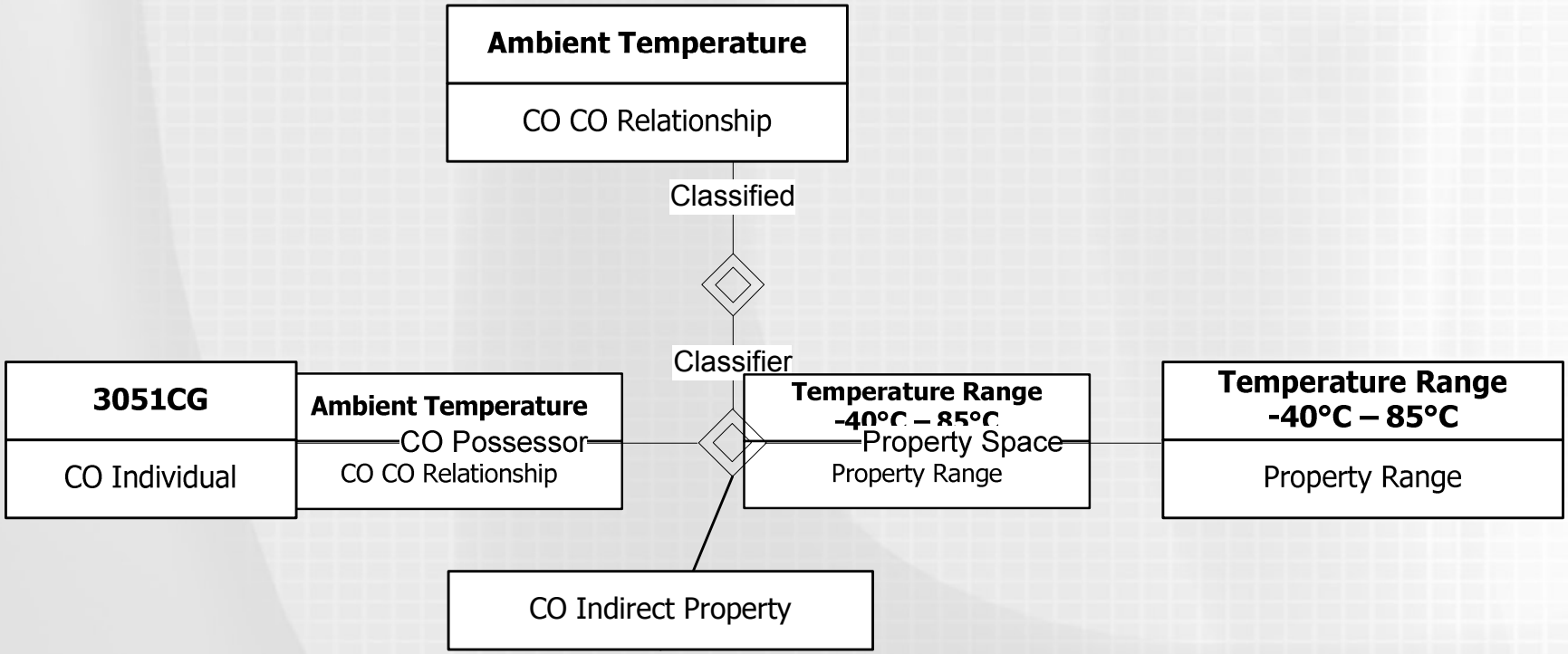



"The ambient temperature during operation of a 3051CG pressure transmitter should be within -40 and 85 degrees Celsius."

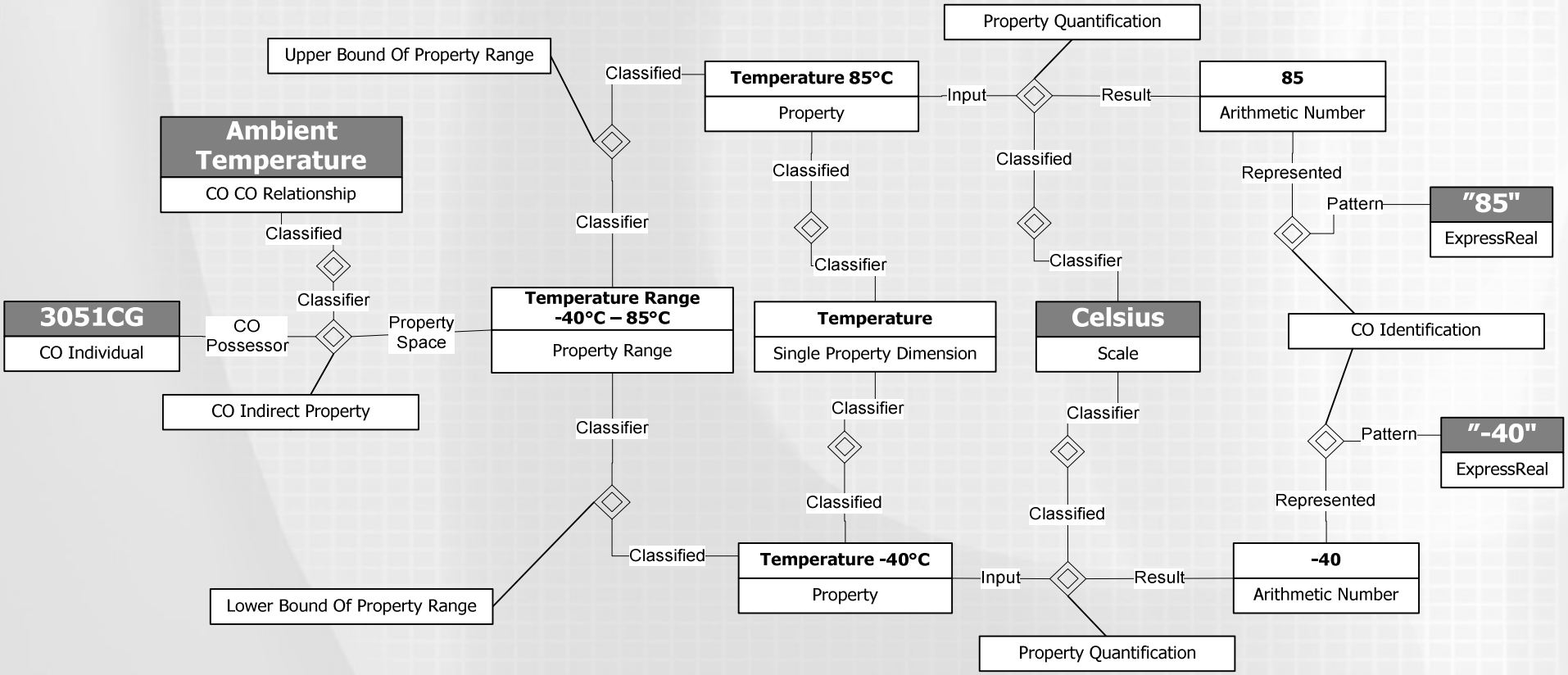
# Property Range



# Property Range Restriction



# Model: Ambient Temperature Range




*3051CG ambient temperature: -40°C – 85°C*

## OWL notation:

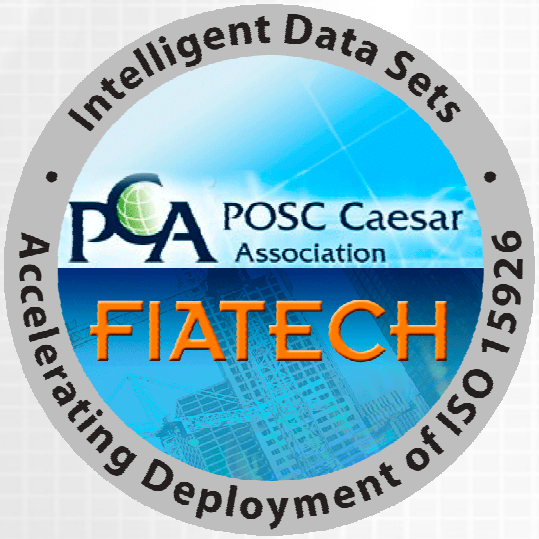
## Template showing temperature range

```
<part2:MultidimensionalObject rdf:ID="ST-593292">
    <rdf:type rdf:resource="http://tpl.rdlfacade.org/data#ST-4790"/>
    <part7:propertRangeRestrictedClass rdf:resource="#COI-439112"/>
    <part7:propertyRelation rdf:resource="http://rdl.rdlfacade.org/data#AmbientTemperature"/>
    <part7:propertyType rdf:resource="http://rdl.rdlfacade.org/data#Temperature"/>
    <part7:scale rdf:resource="http://rdl.rdlfacade.org/data#DegreesCelcius"/>
    <part7:upperReal>
       <part4:XmlSchemaReal>
          <part2:content rdf:datatype="http://www.w3.org/2001/XMLSchema#real">
                              -40
          </part2:content>
       </part4:XmlSchemaReal>
    </part7:upperReal>
    <part7:lowerReal>
       <part4:XmlSchemaReal>
          <part2:content rdf:datatype="http://www.w3.org/2001/XMLSchema#real">
                             85
          </part2:content>
       </part4:XmlSchemaReal>
    </part7:lowerReal>
</part2:MultidimensionalObject>
```

# Templates for ontology development

- A flexible and precise language for ontology building
- Let the compiler handle the “assembly language”
- Creating rich semantic structure becomes practical
- Standardization of templates makes standardized modelling patterns possible

# Information

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