



Reference Designation Systems

It's all about creating a common language™

INCOSE Webinar

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AGENDA

1. RDS & SYSTEMS ENGINEERING

2. RDS FUNDAMENTALS

3. RDS EXAMPLES

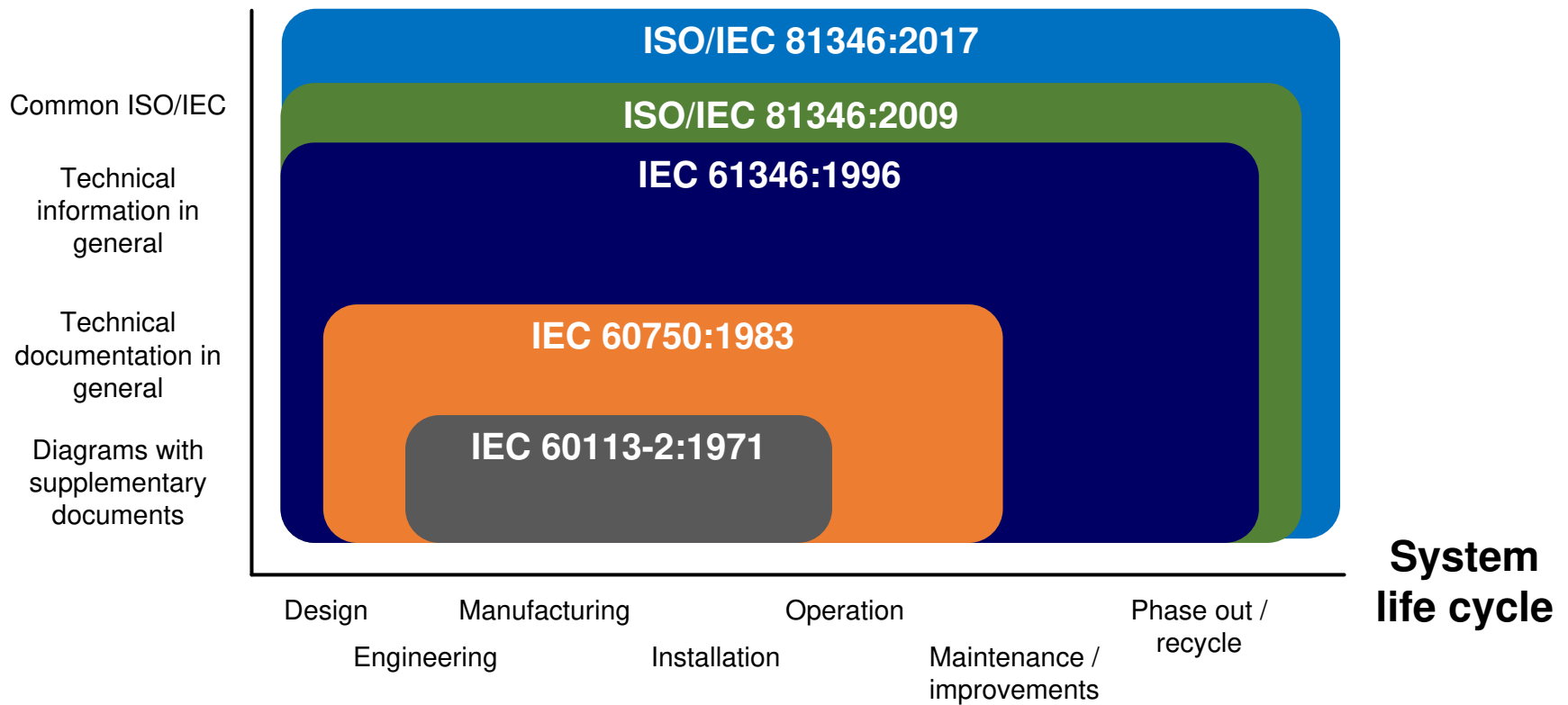


1. RDS AND SYSTEMS ENGINEERING

The ISO/IEC 81346 series

Industrial systems, installations and equipment and industrial products

Application domain



The ISO/IEC 81346 series

Industrial systems, installations and equipment and industrial products

RDS

Reference Designation System



International principles



Not stakeholder specific



IT compatible



Scalable for small and large projects



Life-cycle stable code



Easy to understand and implement

The ISO/IEC 81346 series

Industrial systems, installations and equipment and industrial products

RDS is a **common naming convention** for systems and their elements

RDS is a **system of its own** which is used to **designate systems** and their elements

The output from RDS is a **reference designation**, also known as a TAG number



Part 1+2:

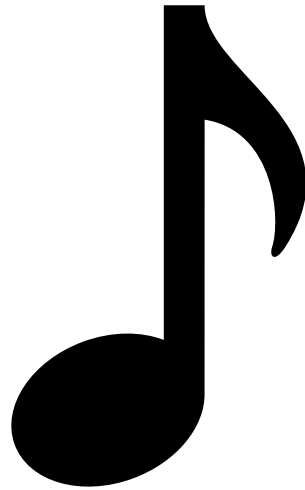
Fundamental rules

Part 10+12:

Industry specific applications

The mission

a common language





RDS and ISO/IEC/IEEE 15288

Technical processes



Business or mission analysis process	<input type="checkbox"/> OFF
Stakeholder requirements definition process	<input type="checkbox"/> OFF
System requirements definition process	<input type="checkbox"/> OFF
Architecture definition process	<input type="checkbox"/> OFF
Design definition process	<input type="checkbox"/> OFF
System analysis process	<input type="checkbox"/> OFF
Implementation process	<input type="checkbox"/> OFF
Integration process	<input type="checkbox"/> OFF
Verification process	<input type="checkbox"/> OFF
Transition process	<input type="checkbox"/> OFF
Validation process	<input type="checkbox"/> OFF
Operation process	<input type="checkbox"/> OFF
Maintenance process	<input type="checkbox"/> OFF
Disposal process	<input type="checkbox"/> OFF

Technical management processes



Project planning process	<input type="checkbox"/> OFF
Project assessment and control process	<input type="checkbox"/> OFF
Decision management process	<input type="checkbox"/> OFF
Risk management process	<input type="checkbox"/> OFF
Configuration management	<input type="checkbox"/> OFF
Information management process	<input type="checkbox"/> OFF
Measurement process	<input type="checkbox"/> OFF
Quality assurance process	<input type="checkbox"/> OFF

Agreement processes



Acquisition process	<input type="checkbox"/> OFF
Supply process	<input type="checkbox"/> OFF

Organisational project-enabling processes



Life cycle model management process	<input type="checkbox"/> OFF
Infrastructure management process	<input type="checkbox"/> OFF
Portfolio management process	<input type="checkbox"/> OFF
Human resources management process	<input type="checkbox"/> OFF
Quality management process	<input type="checkbox"/> OFF
Knowledge management process	<input type="checkbox"/> OFF

RDS and ISO/IEC/IEEE 15288

Technical processes



Business or mission analysis process	<input type="checkbox"/> OFF
Stakeholder requirements definition process	<input type="checkbox"/> OFF
System requirements definition process	<input type="checkbox"/> OFF
Architecture definition process	<input checked="" type="checkbox"/> ON
Design definition process	<input checked="" type="checkbox"/> ON
System analysis process	<input type="checkbox"/> OFF
Implementation process	<input type="checkbox"/> OFF
Integration process	<input checked="" type="checkbox"/> ON
Verification process	<input type="checkbox"/> OFF
Transition process	<input type="checkbox"/> OFF
Validation process	<input type="checkbox"/> OFF
Operation process	<input type="checkbox"/> OFF
Maintenance process	<input type="checkbox"/> OFF
Disposal process	<input type="checkbox"/> OFF

Technical management processes



Project planning process	<input type="checkbox"/> OFF
Project assessment and control process	<input type="checkbox"/> OFF
Decision management process	<input type="checkbox"/> OFF
Risk management process	<input type="checkbox"/> OFF
Configuration management	<input type="checkbox"/> OFF
Information management process	<input type="checkbox"/> OFF
Measurement process	<input type="checkbox"/> OFF
Quality assurance process	<input type="checkbox"/> OFF

Agreement processes



Acquisition process	<input type="checkbox"/> OFF
Supply process	<input type="checkbox"/> OFF

Organisational project-enabling processes



Life cycle model management process	<input type="checkbox"/> OFF
Infrastructure management process	<input type="checkbox"/> OFF
Portfolio management process	<input type="checkbox"/> OFF
Human resources management process	<input type="checkbox"/> OFF
Quality management process	<input type="checkbox"/> OFF
Knowledge management process	<input type="checkbox"/> OFF

[Source: ISO/IEC/IEEE 15288]

RDS and ISO/IEC/IEEE 42010

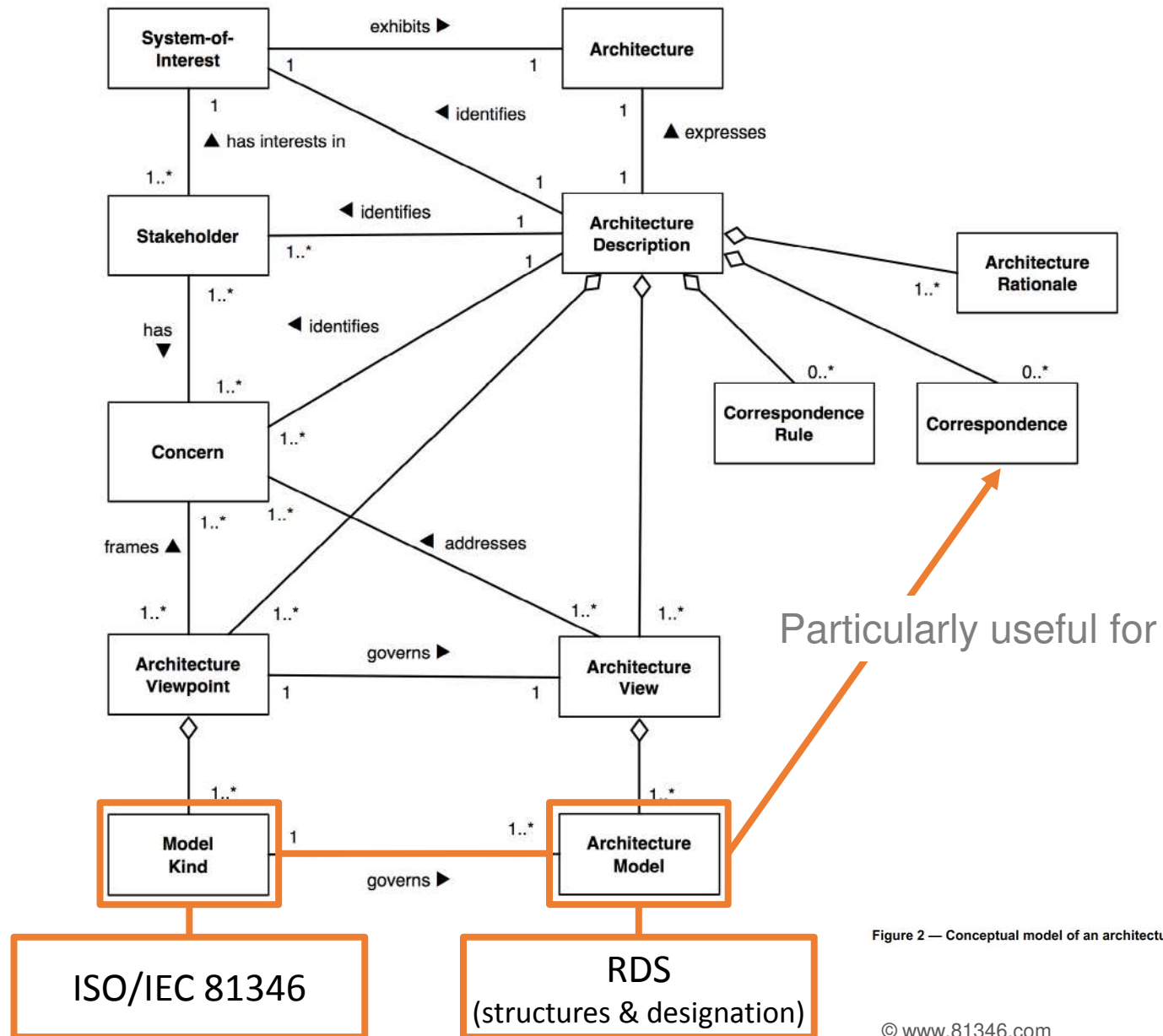
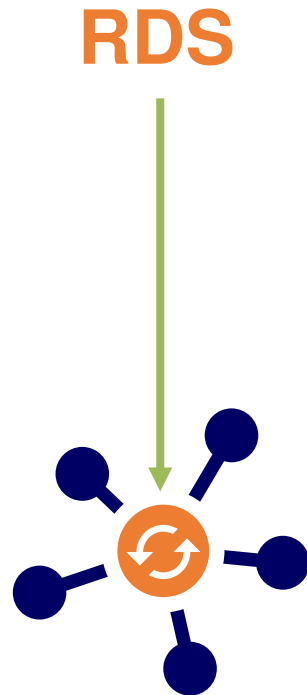


Figure 2 — Conceptual model of an architecture description

Model Correspondance



Point of synchronization across...

- ... data sources & models
- ... life cycle
- ... stakeholders

Model Correspondance

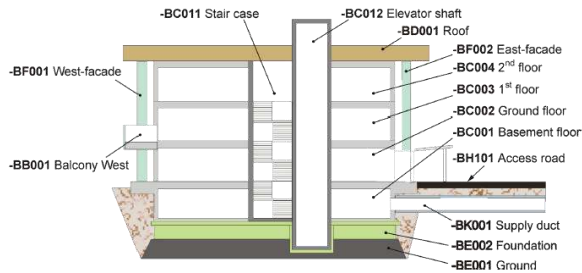
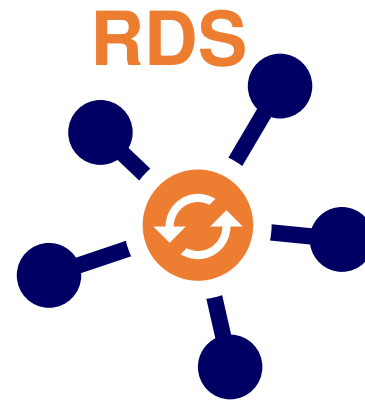
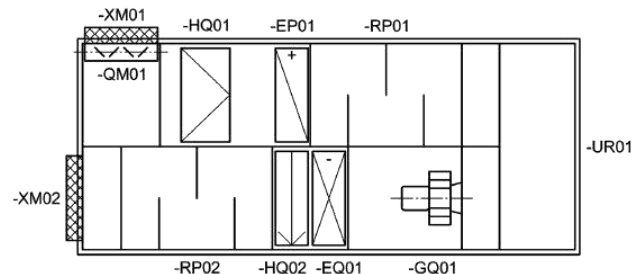
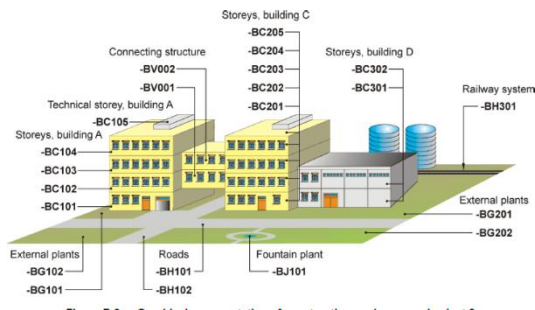


Figure B.1 — Graphical representation of construction works, example plant 1

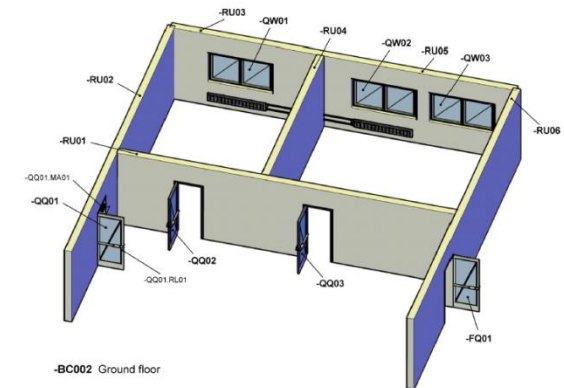


Der er i CCS valgt en klassificering, der har til formål at kunne skelne bygningsdele fra hinanden i en form for "grovsortering", fx kunne skelne mellem dør, vindue, kabel, rør etc. Dette medvirker dels til at lave en enkelt og stabil klassifikation, dels at begrænse antallet af nødvendige klasser betragteligt.

Inddelingskriteriet i CCS klassifikationen er den egenfunktion, som en given bygningsdel har "indbygget". Ved egenfunktion forstås i praksis "hvad et objekt egentlig gør, isoleret set", eller mere teknisk korrekt "objektets iboende tekniske funktion". Egenfunktionen af et objekt anses for stabil, set over livscyklus.

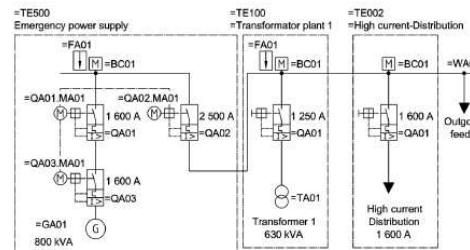
Øvrige egenskaber, fx type af materiale (stål, træ, beton), form ("Dannebrogsvindue", "Sadeltag", "Spidstag") etc. håndteres i CCS som selvstændige egenskaber, og medtages ikke som en del af den klassificerende kode. Det gør klassificeringen mere enkel og frem for alt stabil.

Fordelen ved en helt stabil klassifikationskode er, at koden ikke skal ændres undervejs. Det betyder i praksis, at alle objekter kan kodes på forhånd i et objektbibliotek, og at CCS objektklassen altid er kendt, når et objekt vægtes og indsættes i et projekt.

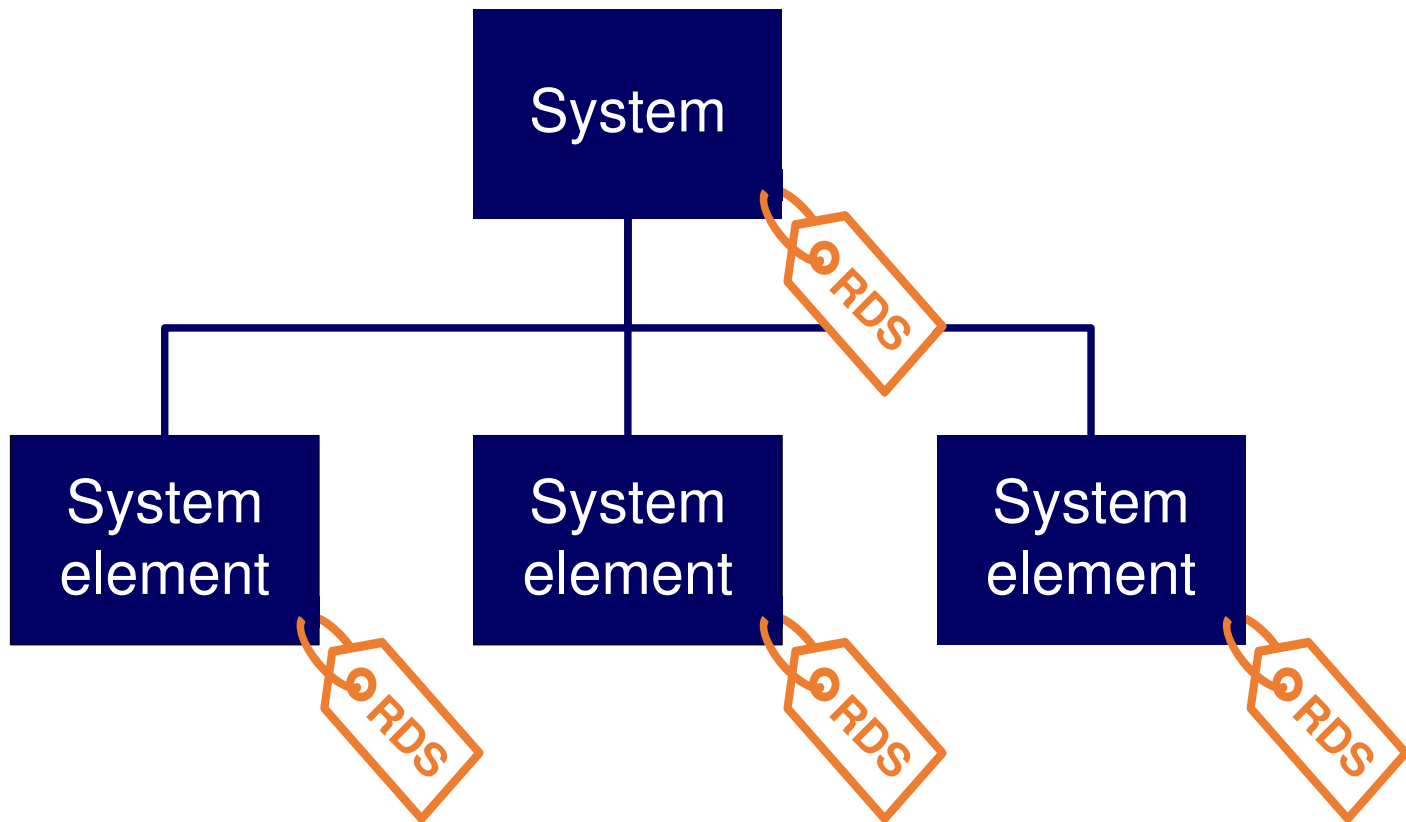


Discharge ←

Cooling & Heating System	Cooling Heating	Design parameters	Status signals
Design parameters	Ventilation System	Design parameters	Status signals
Power supply	Power supply	Electrical System	Power supply, Status
Control signals	Control signals	N/A	Control System



RDS designates systems



2. RDS FUNDAMENTALS

Objects and relations

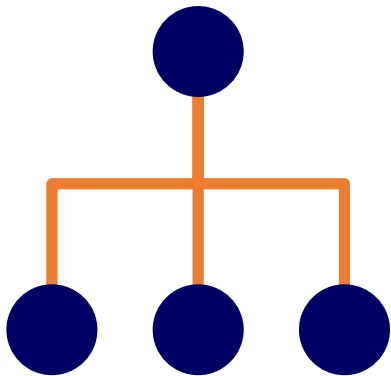
Hierarchical

Part-of

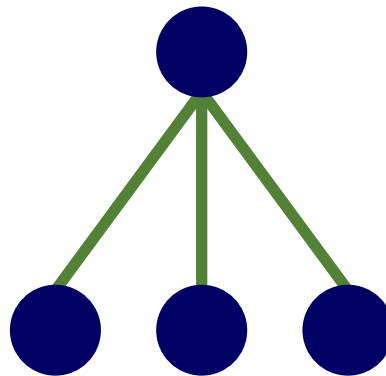
Type-of

Non-hierarchical

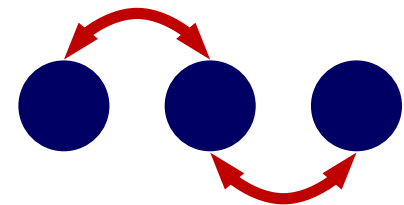
Pragmatic



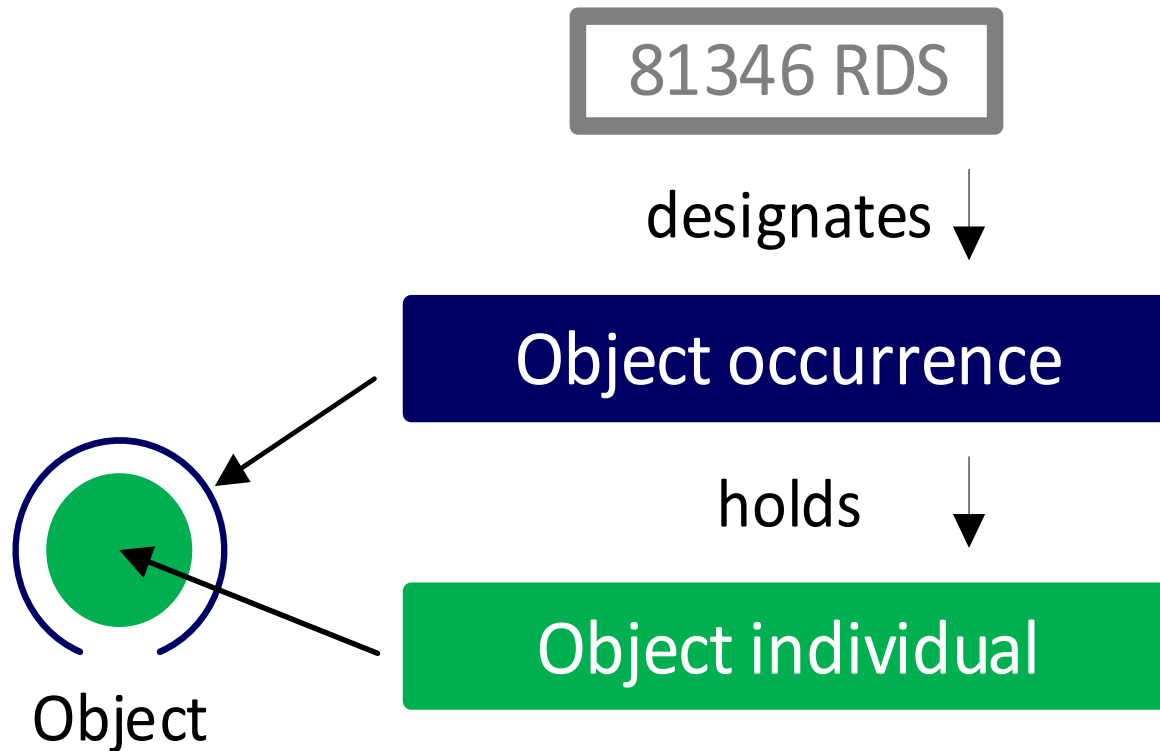
ISO/IEC 81346-1



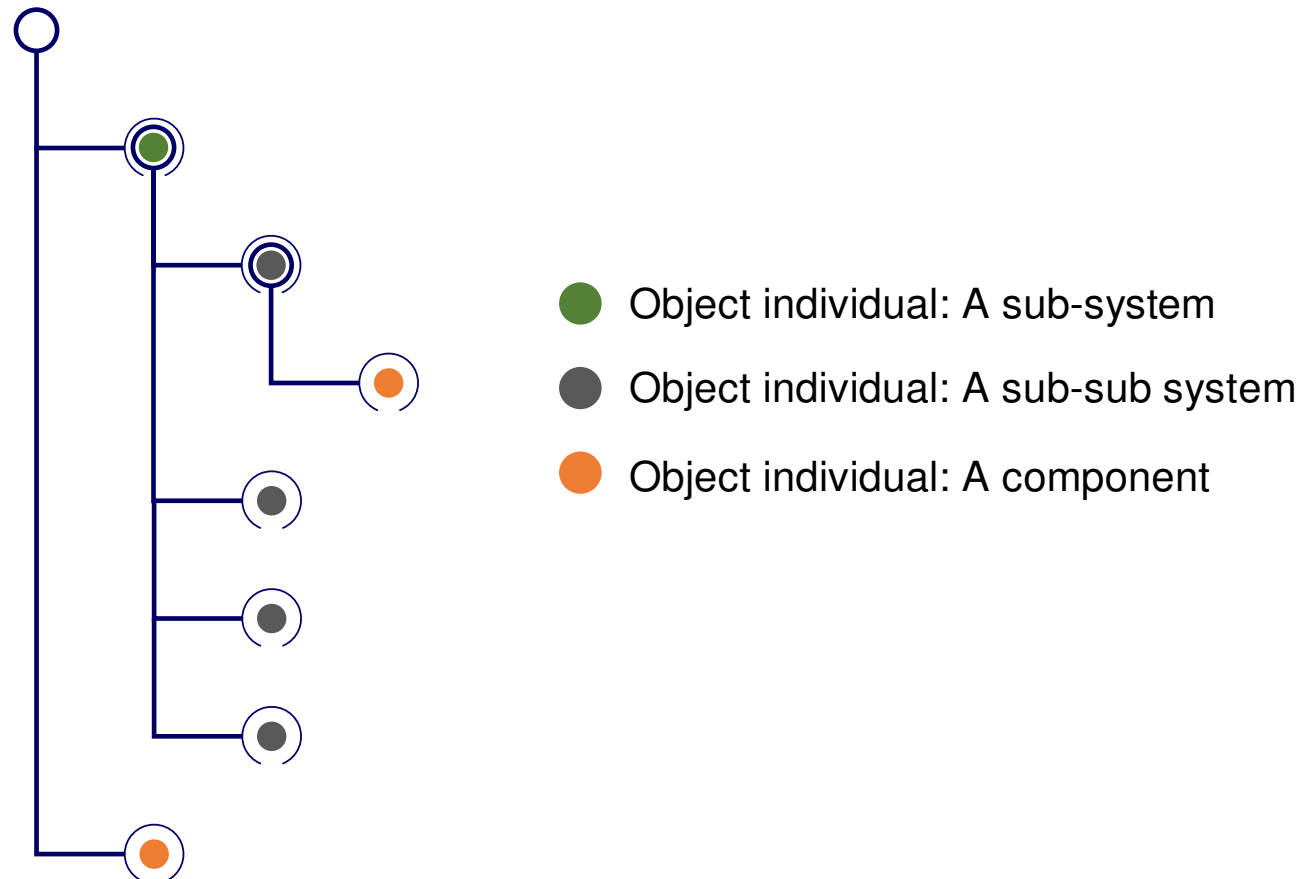
ISO/IEC 81346-2



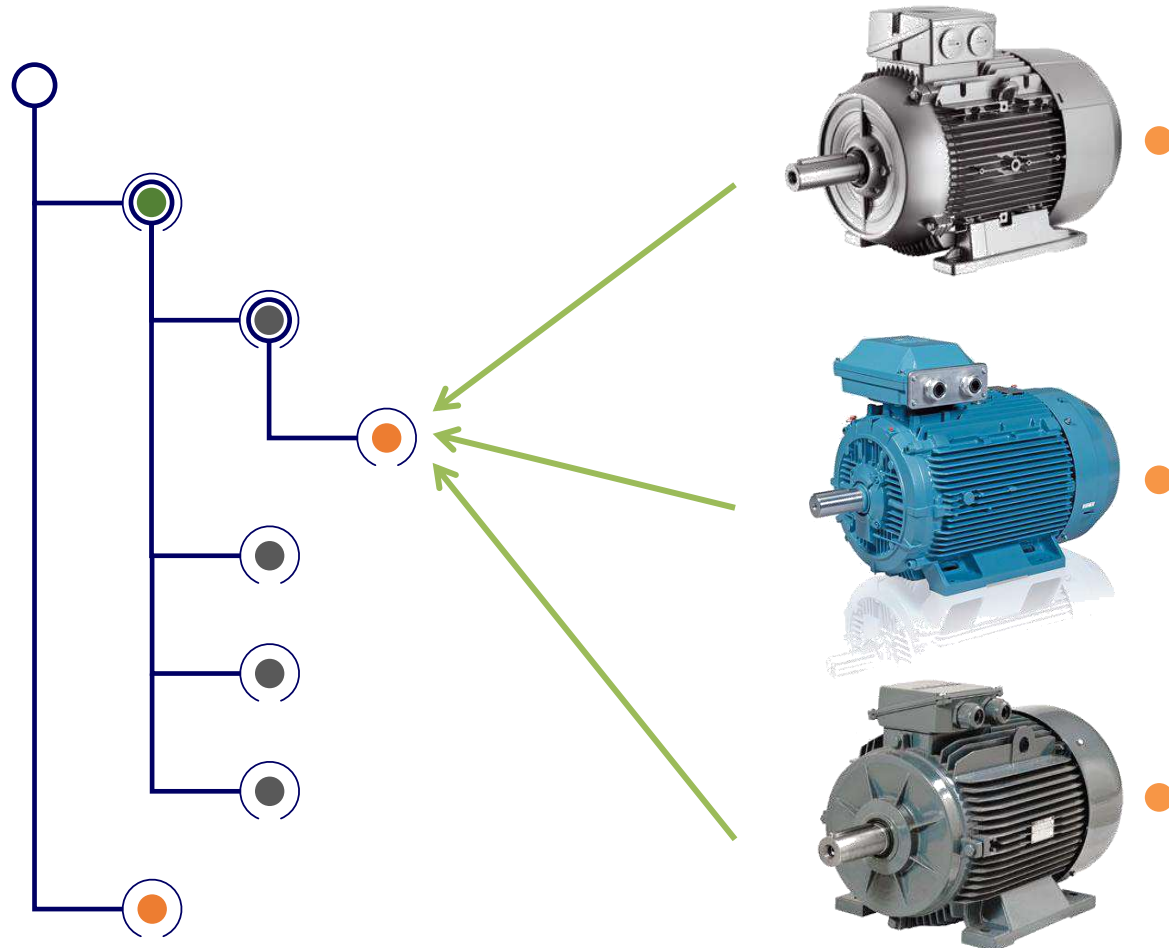
RDS Designates Object Occurrence



Object occurrences & individuals



Object occurrences & individuals



Object occurrences & individuals

Context	Types	Occurrences	Individuals
Component manufacturer's engineering and support	OEM manufacturer's type designation Article (part) number	Reference designation	Order number OEM manufacturer's serial number
Component manufacturer's sales organisation	Internal type designation Article (part) number	Not applicable	Internal serial number
Technical system planner (investigator, surveyor, etc)	Letter codes for generic types	Reference designation	Not applicable
	Identifier of typicals		
Technical system assembler (contractor)	Manufacturer's type designation	Reference designation	Order number Manufacturer's serial number
Technical system user	Manufacturer's type designation, User's internal article (part) number	Reference designation	Manufacturer's serial number User's inventory number
NOTE The shaded areas show the context of reference designations and the classification provided by the letter codes.			

[ISO/IEC 81346-1, Table 1]

The **three** core elements of RDS

Aspect

How the system is viewed

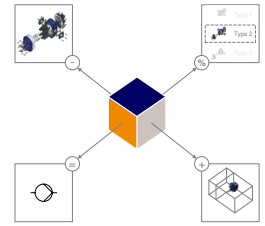
Structure

How system elements are related
(part-of relations)

Classification

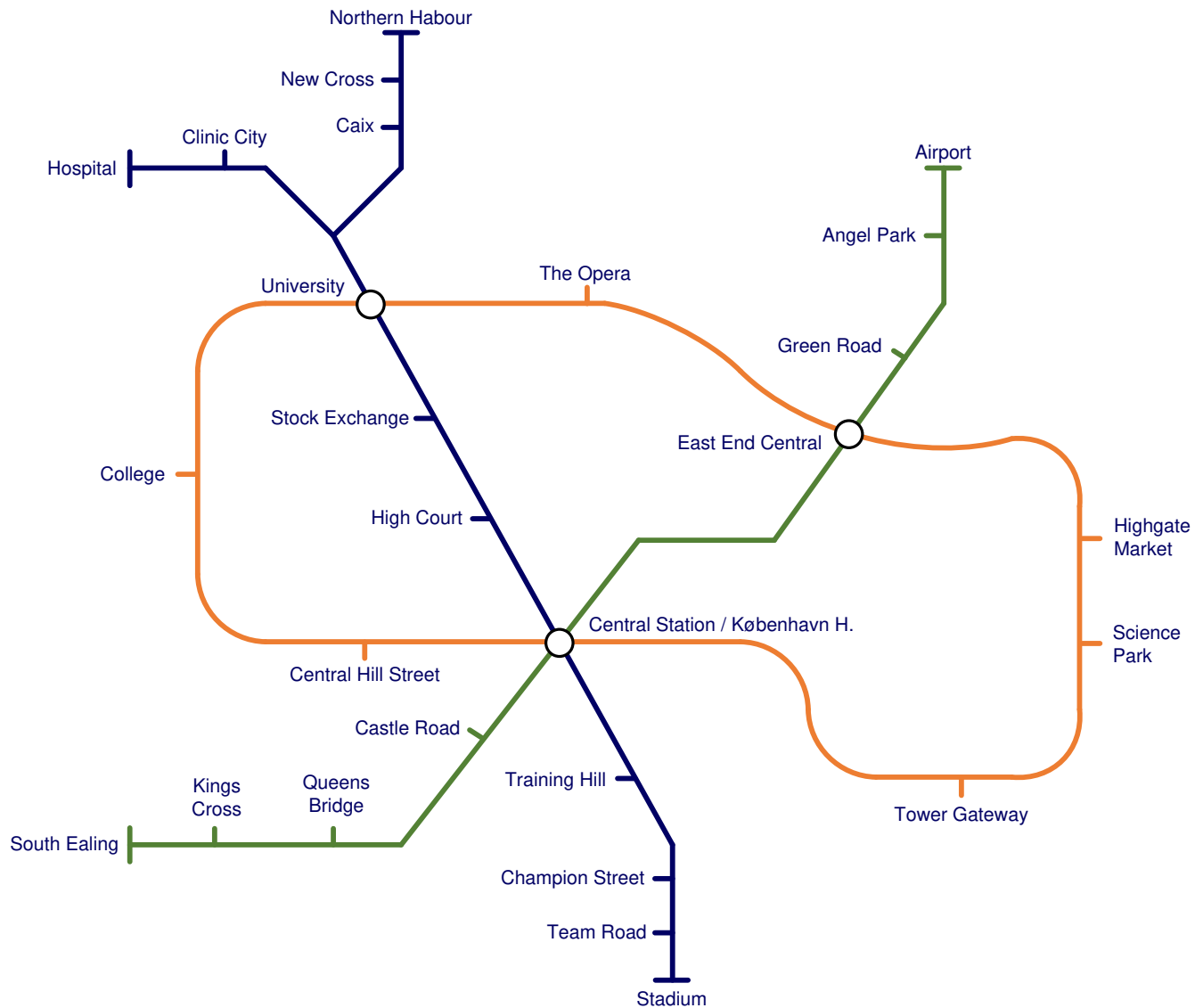
What kind of system elements
(type-of relations)

RDS is Aspects & Structure & Classification



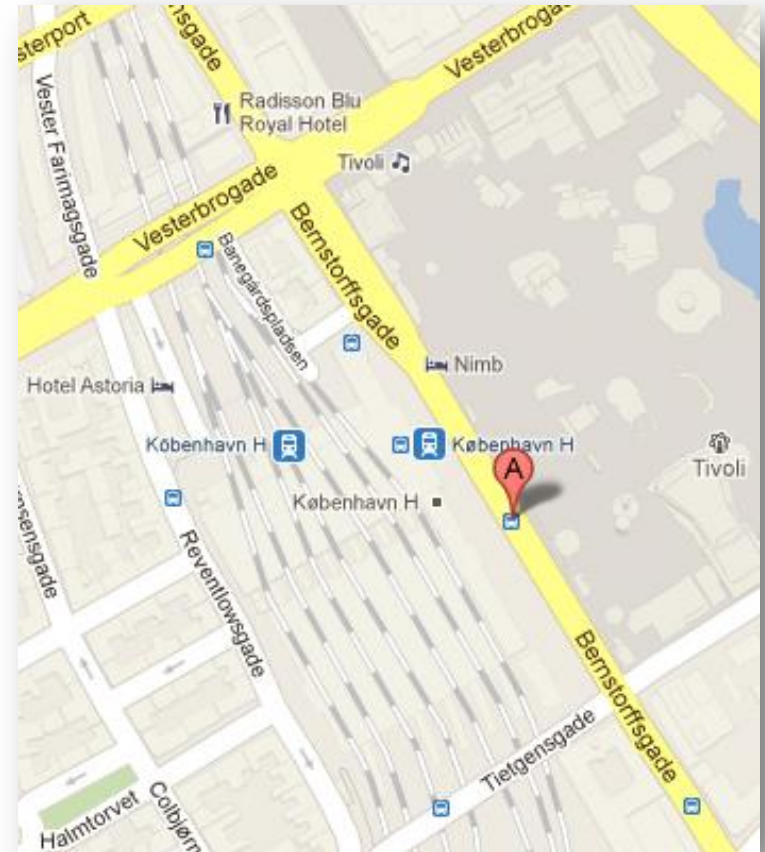
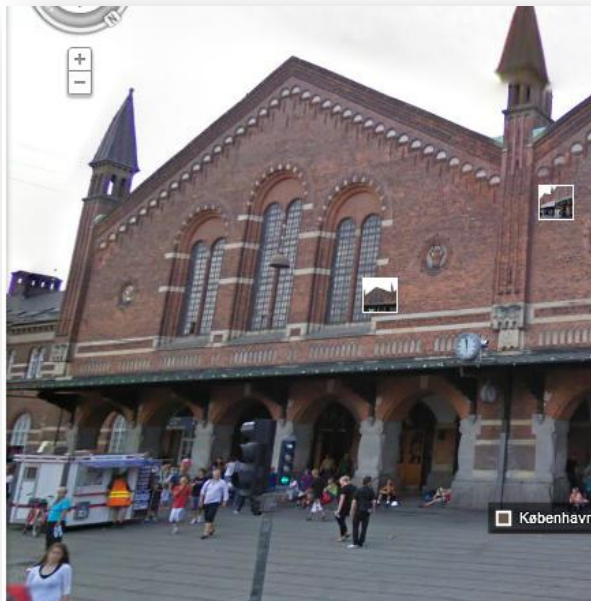
ASPECTS

Aspects – a way of viewing the world



Aspects – a way of viewing the world

C Klampenborg		
06 16 26 36 46 56	Klampenborg	49 59 09 19 29 39
08 18 28 38 48 58	Ordrup	46 56 06 16 26 36
10 20 30 40 50 00	Charlottenlund	44 54 04 14 24 34
14 24 34 44 54 04	Hellerup	41 51 01 11 21 31
16 26 36 46 56 06	Svanemøllen	39 49 59 09 19 29
18 28 38 48 58 08	Nordhavn	37 47 57 07 17 27
21 31 41 51 01 11	Østerport	35 45 55 05 15 25
23 33 43 53 03 13	Nørreport	32 42 52 02 12 22
25 35 45 55 05 15	Vesterport	30 40 50 00 10 20
28 38 48 58 08 18	København H	29 39 49 59 09 19
29 39 49 59 09 19	Dubblshavn	25 35 45 55 05 15



The four RDS aspects

Structuring based on..

Function

what a system is designed to do

Product

how the system is built

Location

the intended or actual location of the system

Type

the commonality of systems with common properties

Typical terminology

Function

System, Function, Functional system

Product

System, Product, Module, Assembly, Unit, Plant

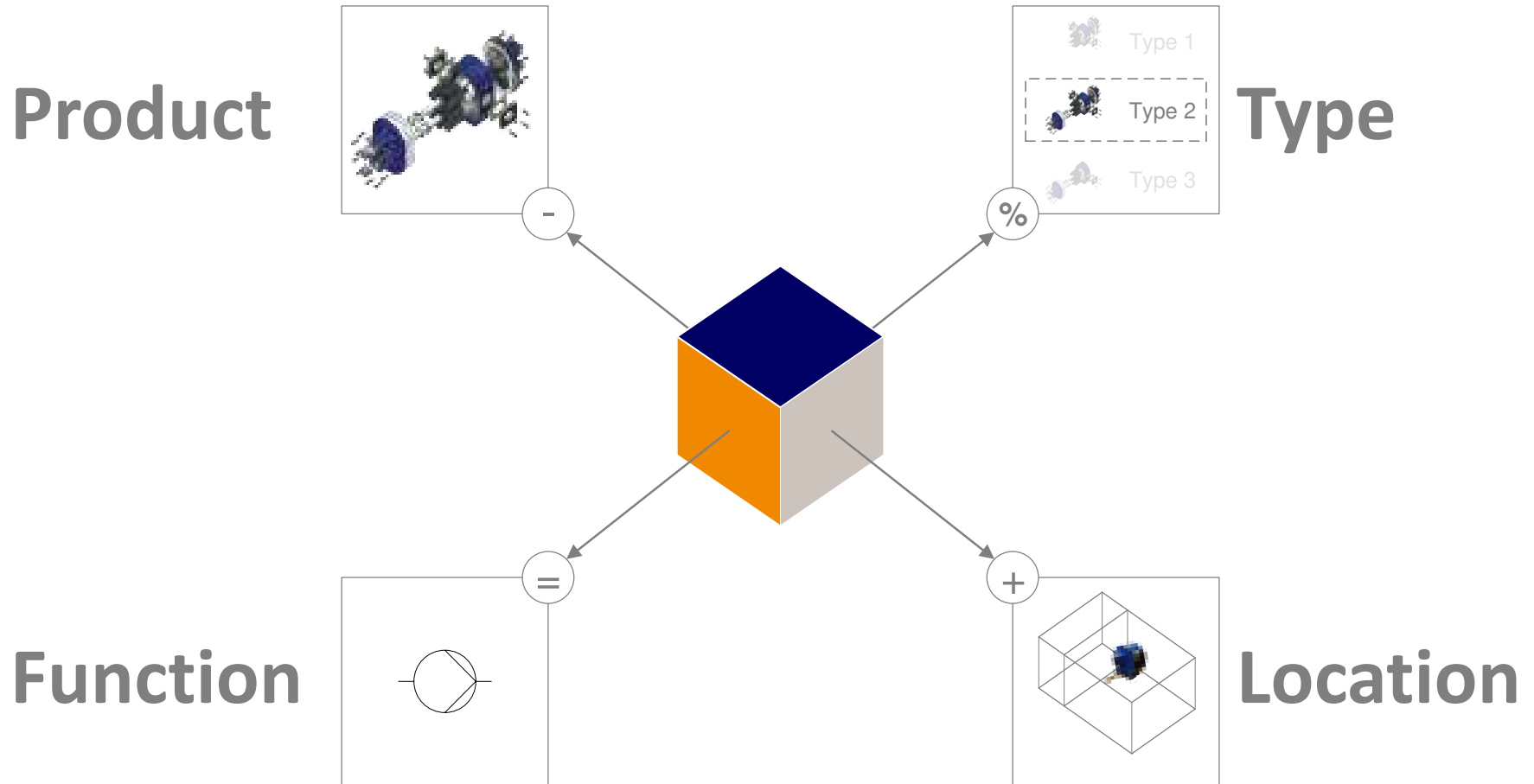
Location

Space, Area, Volume, Section, Floor, Room

Type

Type, Design type, Group, Master, Family, Platform

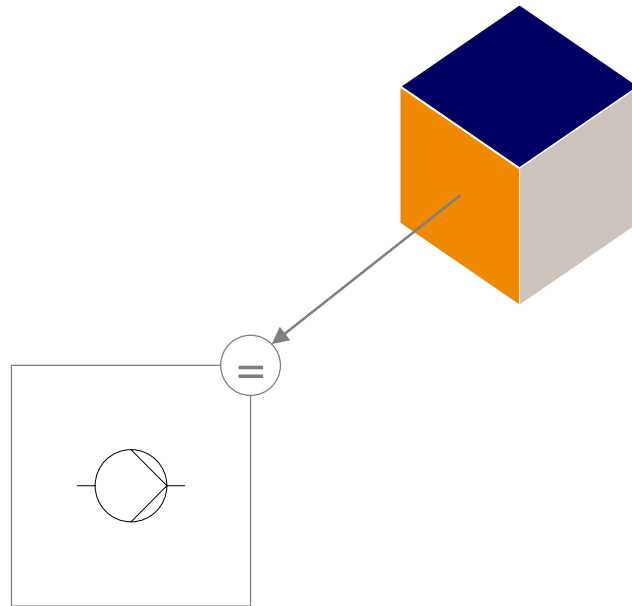
The four RDS aspects



RDS aspects

Function

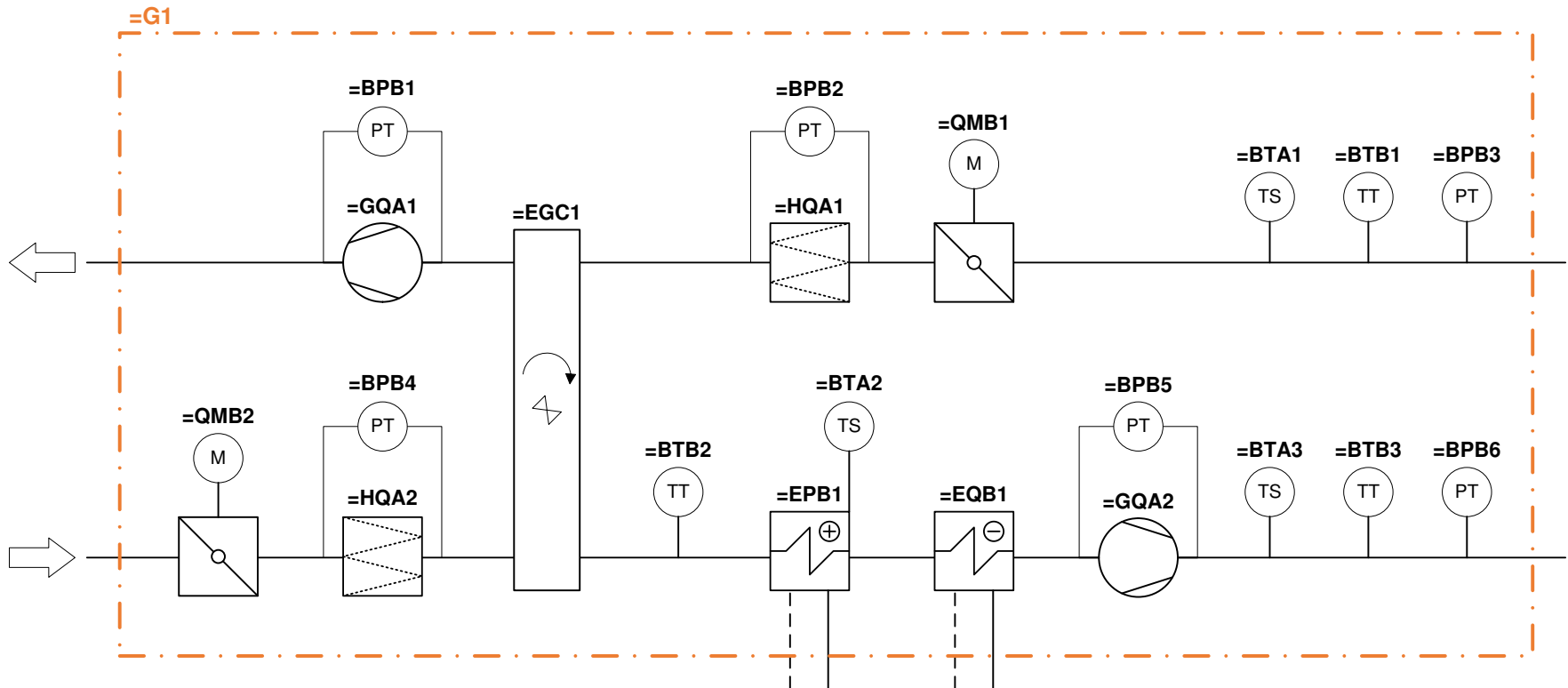
what a system is designed to do



RDS aspects

Function

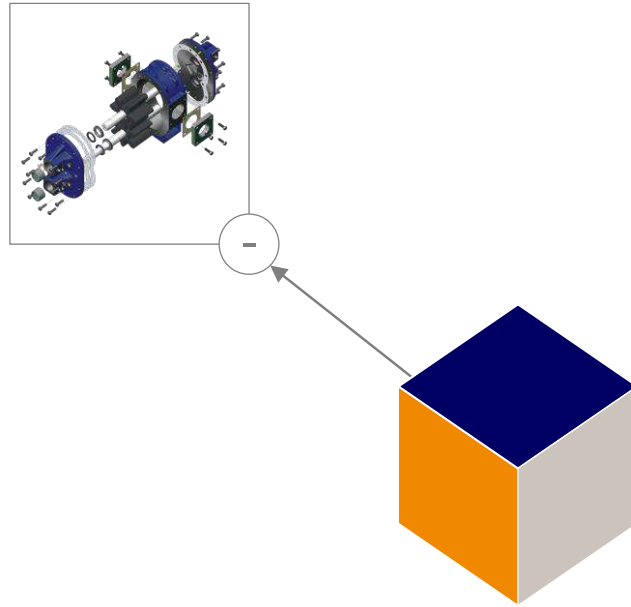
what a system is designed to do



RDS aspects

Product

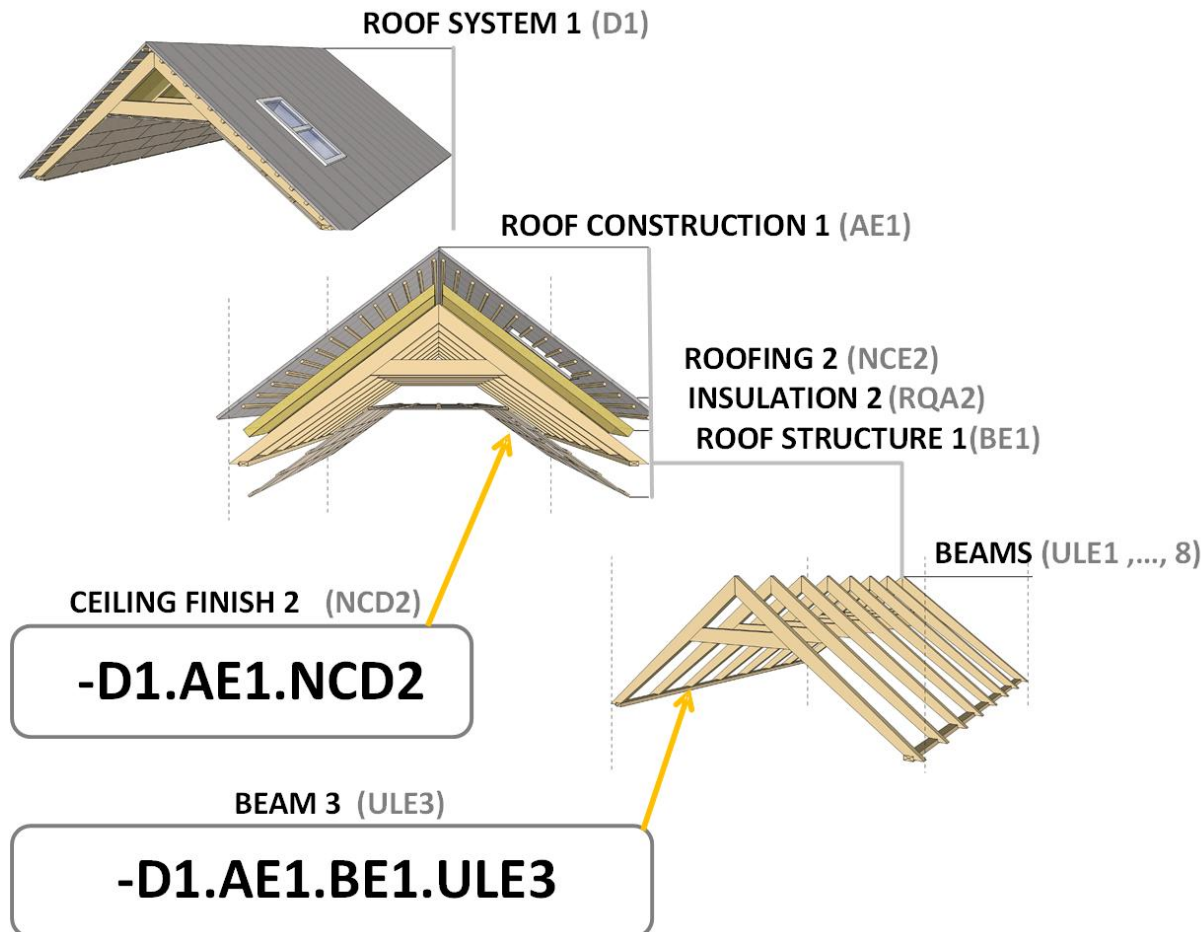
How the system is built



RDS aspects

Product

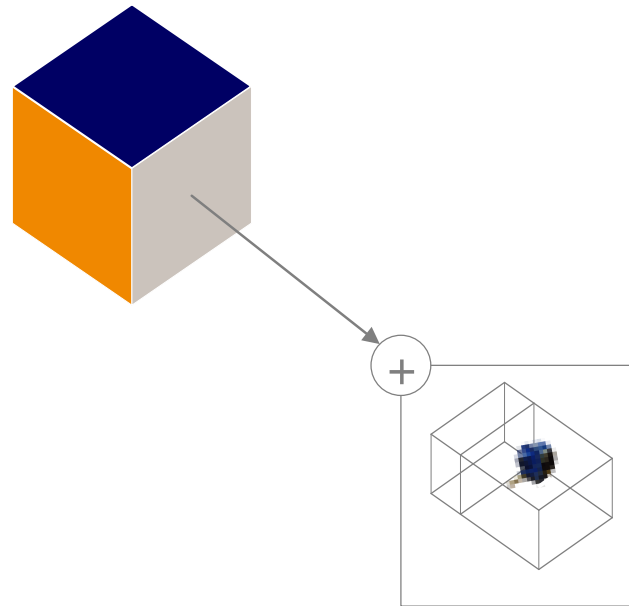
How the system is built



RDS aspects

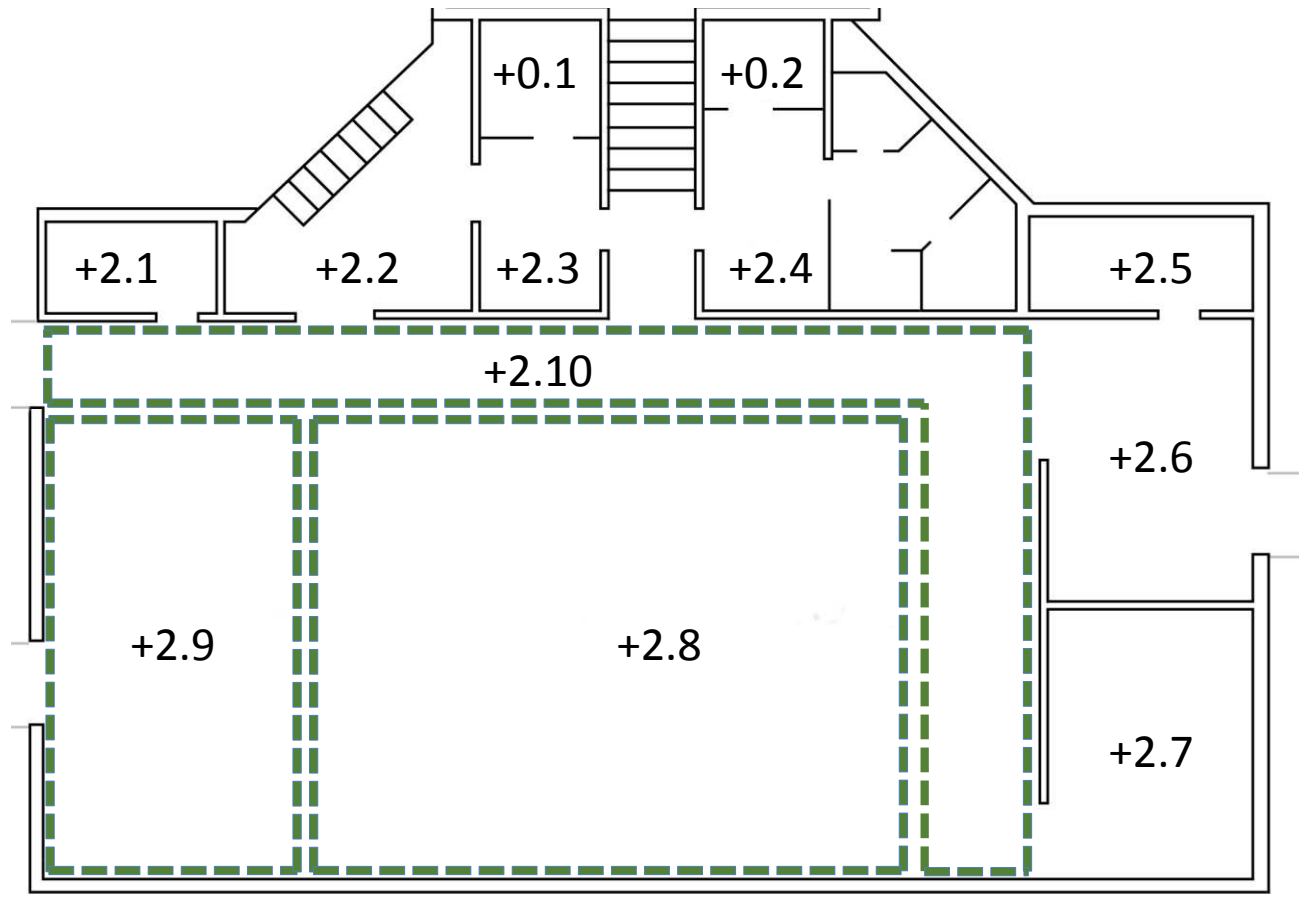
Location

the intended or actual location of the system



RDS aspects

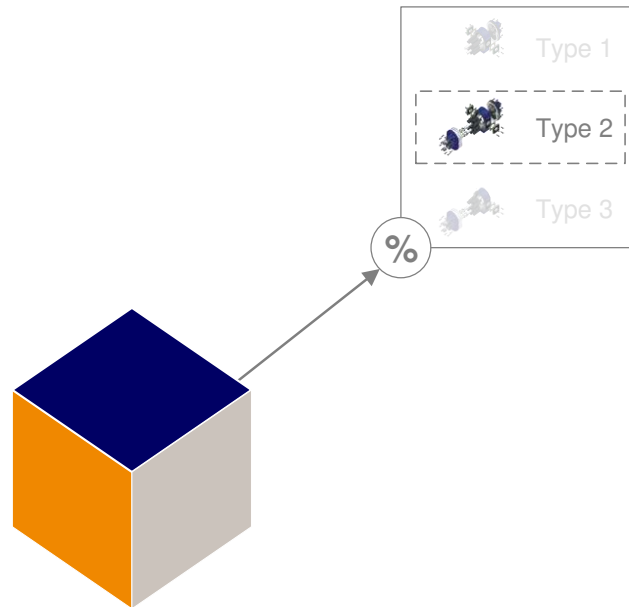
Location the intended or actual location of the system



RDS aspects

Type

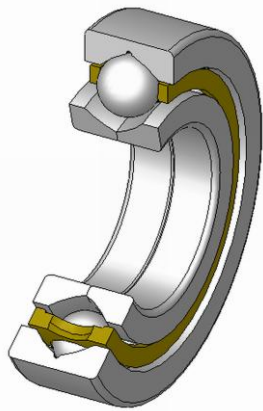
the commonality of systems with common properties



RDS aspects

Type

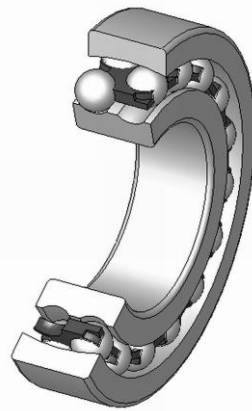
the commonality of systems with common properties



%UPA1

Bearing type
no. 1

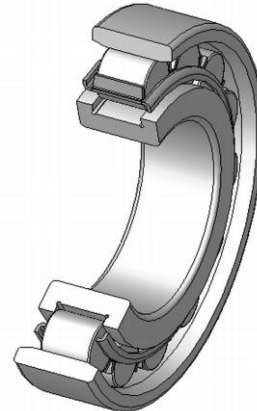
Four point
contact bearings



%UPA2

Bearing type
no. 2

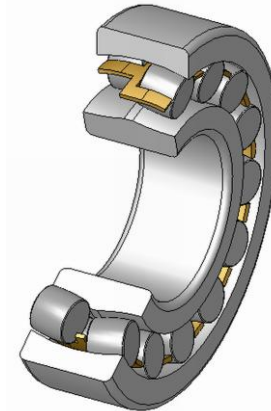
Spherical ball
bearings
(double row)



%UPA3

Bearing type
no. 3

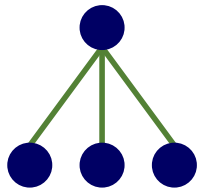
Cylindrical
roller bearings



%UPA4

Bearing type
no. 4

Spherical roller
bearings
(double row)



Classification A, B, C...

... so you can recognize objects within and across aspects

Other classification systems

OmniClass 211

18 doors in Elements
66 doors in Products
127 doors in Work result

Unifomat 29

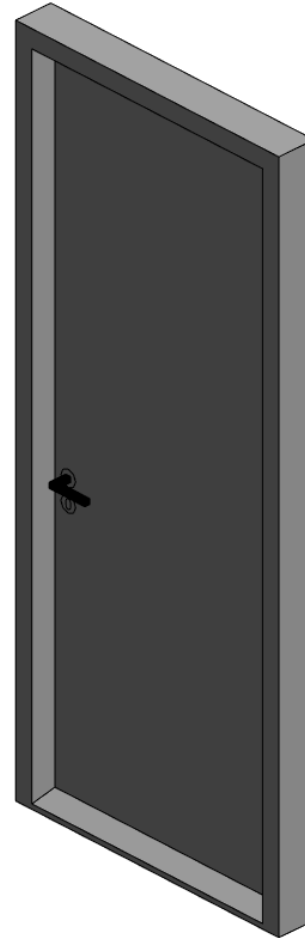
Unifomat Classification	Revit Category
No classification	
B - Shell	
B20 - Exterior Enclosure	
B2030 - Exterior Doors	
B2030100 - Glazed Doors & Entrances	Doors
B2030110 - Exterior Glazed Doors - Aluminum	Doors
B2030120 - Exterior Glazed Doors - Steel	Doors
B2030130 - Exterior Glazed Doors - Wood	Doors
B2030200 - Solid Exterior Doors	Doors
B2030210 - Exterior Solid Doors - Aluminum	Doors
B2030220 - Exterior Solid Doors - Steel	Doors
B2030230 - Exterior Solid Doors - Wood	Doors
B2030300 - Revolving Doors	Doors
B2030400 - Overhead Doors & Roll-up Grilles	Doors
B2030410 - Overhead Doors	Doors
B2030420 - Roll-up Grilles	Doors
B2030500 - Door Wall Opening Elements	Doors
B2030900 - Other Exterior Doors	Doors
C - Interiors	
C10 - Interior Construction	
C1020 - Interior Doors	
C1020100 - Interior Doors	Doors
C1020110 - Interior Doors - Metal	Doors
C1020120 - Interior Doors - Wood	Doors
C1020200 - Interior Door Frames	Doors
C1020210 - Interior Door Frames - Metal	Doors
C1020220 - Interior Door Frames - Wood	Doors
C1020300 - Interior Doors with Frames	Doors
C1020310 - Interior Metal Doors with Metal Frames	Doors
C1020320 - Interior Wood Doors with Metal Frames	Doors
C1020330 - Interior Wood Doors with Wood Frames	Doors
C1020400 - Interior Door Hardware	Doors
C1020410 - Door Hardware	Doors
C1020500 - Interior Door Wall Opening Elements	Doors
C1020600 - Interior Door Sidelights & Transoms	Doors
C1020700 - Interior Hatches & Access Doors	Doors

RDS Classification System

A door is a door!

1

... with many properties!



Classification by Inherent Function

some benefits...



a lifecycle stable code



all objects can be pre-coded

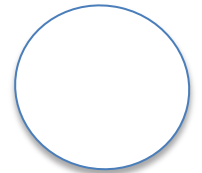


simple coding – easy for humans to recognise

Classification – “A door is a door”

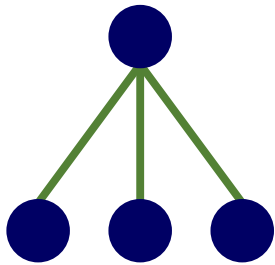
81346-2
(2017)

Class	QQC
Definition	<i>space access object</i> for use by persons
Class name	Door
Synonyms	entrance, exit, ...
Properties	Material: Glass, wood, steel, ... Width: 600...2500mm Height: 2000...2500mm



User
specified

Classification: type-of relations









Entry class IEC 81346-2:2017 table 1

Sub-class IEC 81346-2:2017 table 2
(option)







Sub-class IEC 81346-2:2017 table 3
(option)

Q Q C






Entry classes

	Code	Class definition (ISO/IEC 81346-2 2017-edition)	Class name
	B	<i>object for</i> picking up information and providing a representation	sensing object
	C	<i>object for</i> storing for subsequent retrieval	storing object
	E	<i>object for</i> emitting	emitting object
	F	<i>object for</i> protecting against the effects of dangerous or undesirable conditions	protecting object
	G	<i>object for</i> providing a controllable flow	generating object
	H	<i>object for</i> treating matter	matter processing object

Entry classes

	Code	Class definition (ISO/IEC 81346-2 2017-edition)	Class name
	K	<i>object for</i> treating input signals and providing an appropriate output	information processing object
	M	<i>object for</i> providing mechanical movement or force	driving object
	N	<i>object for</i> enclosing partly or fully another object	covering object
	P	<i>object for</i> providing perceptible information	presenting object
	Q	<i>object for</i> controlling access or flow	controlling object
	R	<i>object for</i> restricting or stabilising	restricting object

Entry classes

Code	Class definition (ISO/IEC 81346-2 2017-edition)	Class name
	S <i>object for detecting a manual action and providing an appropriate response</i>	manual interacting object
	T <i>object for transforming</i>	transforming object
	U <i>object for structural positioning of other objects</i>	holding object
	W <i>object for leading from one place to another</i>	guiding object
	X <i>object for interfacing an object</i>	interfacing object

=QMA5 **%ULE4**
-RNC2 **+8**

RDS SYNTAX

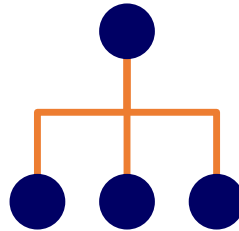
Creating reference designations

Prefix ▼	Class ▼	Number ▼
-	X	1
=	XX	2
+	XXX	3
%		...

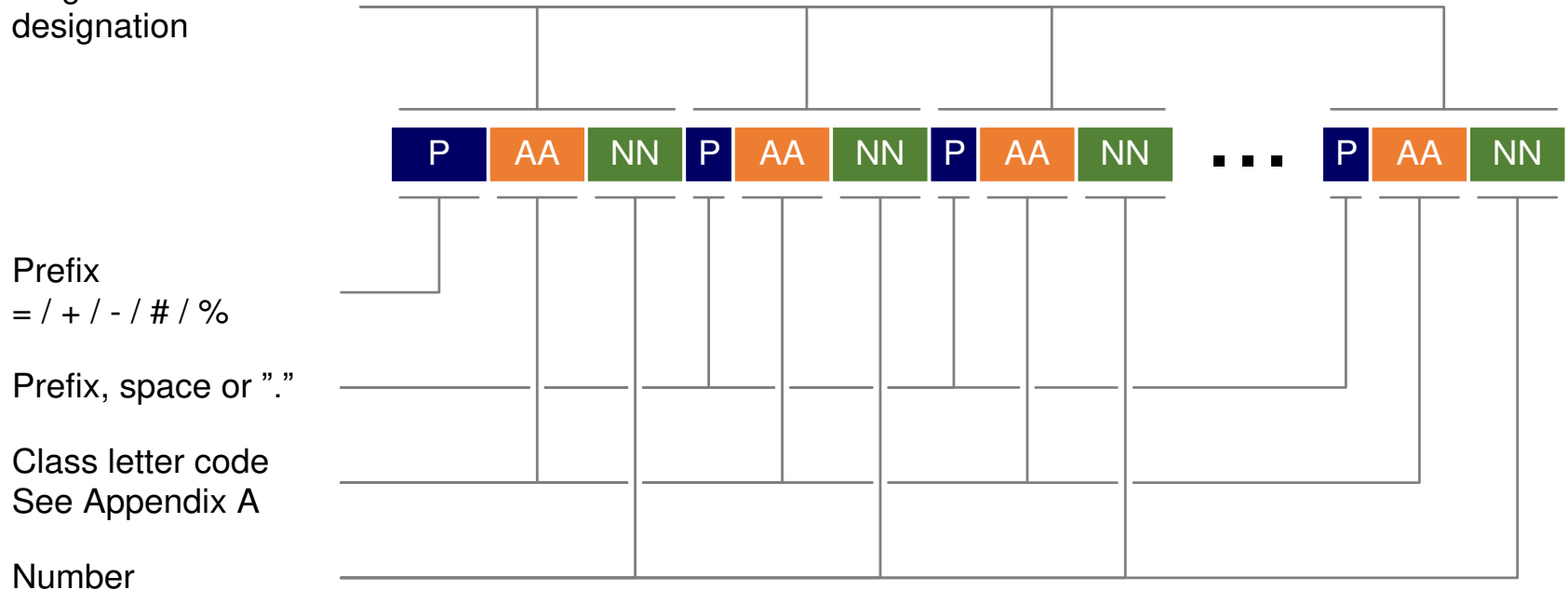
Reference
designation

= QM 3

Multi-level reference designation



Single-level reference designation



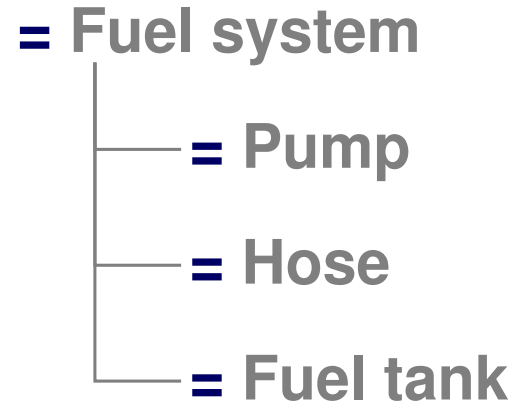
RDS reflects the system breakdown – this means no FIXED RDS structure!

3. RDS EXAMPLES

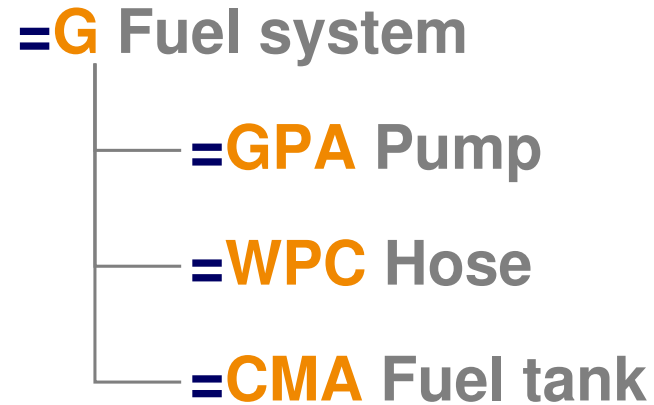
Aspect selection

= Function

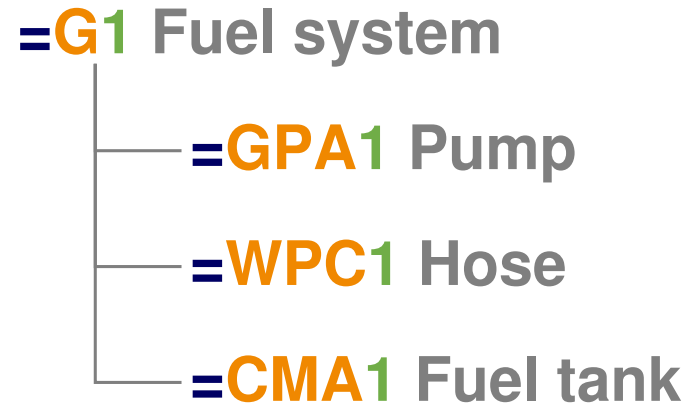
Structuring in part-of



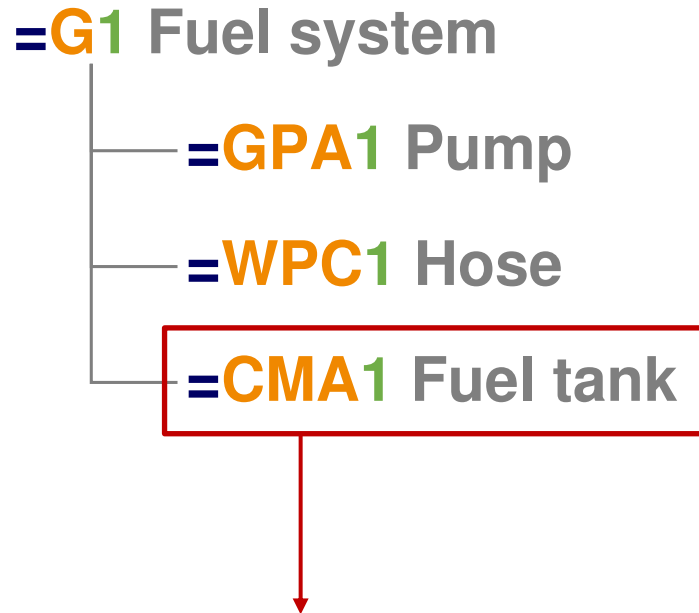
Classification from type-of



Numbering



The Reference Designation



Reference Designation =G1=CMA1
Meaning Fuel tank no. 1 part-of Fuel system 1

ISO/IEC 81346 and SysML

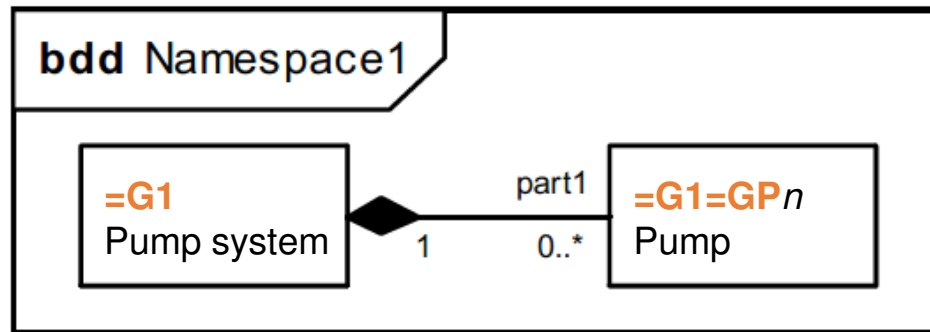


81346

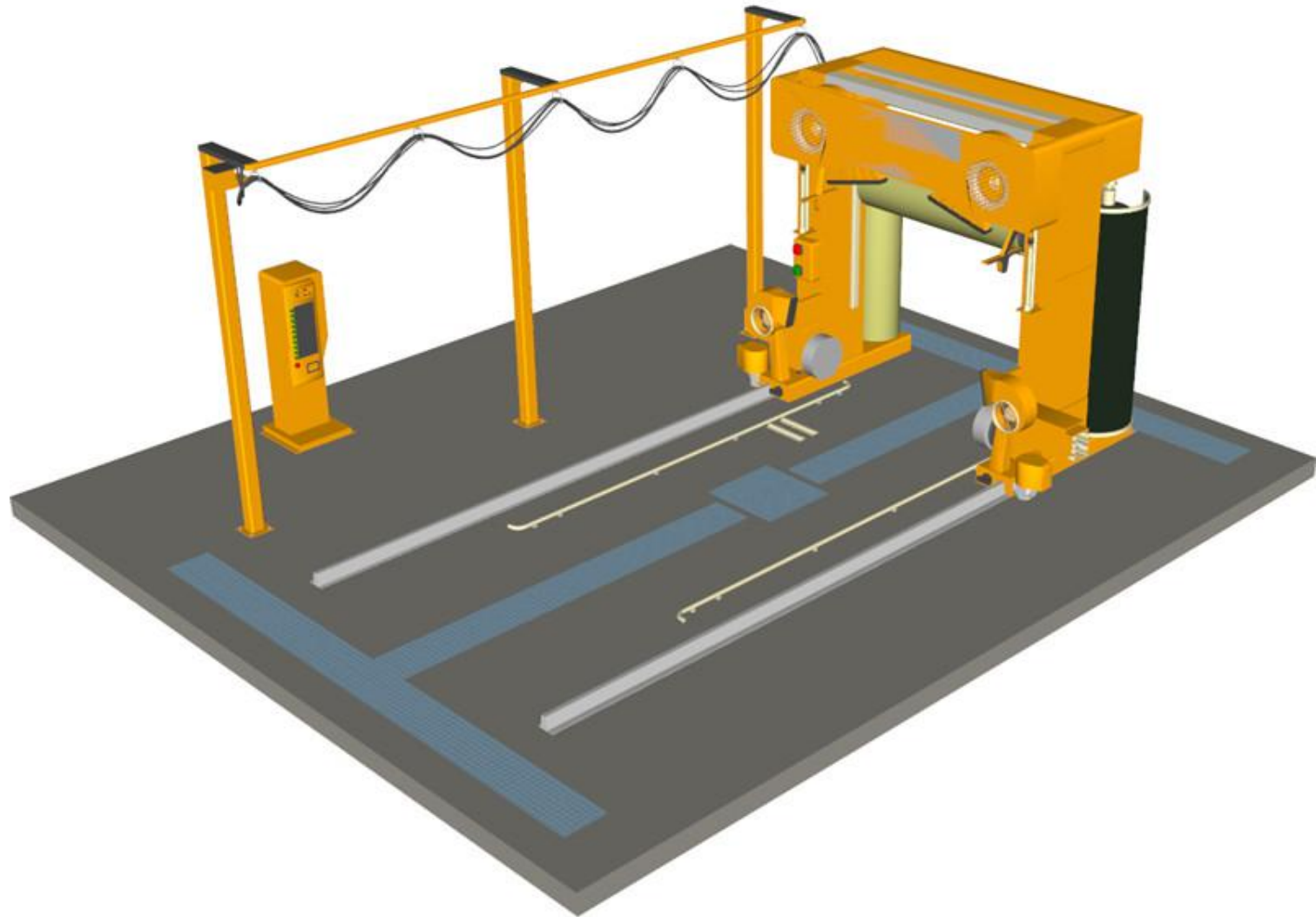
&



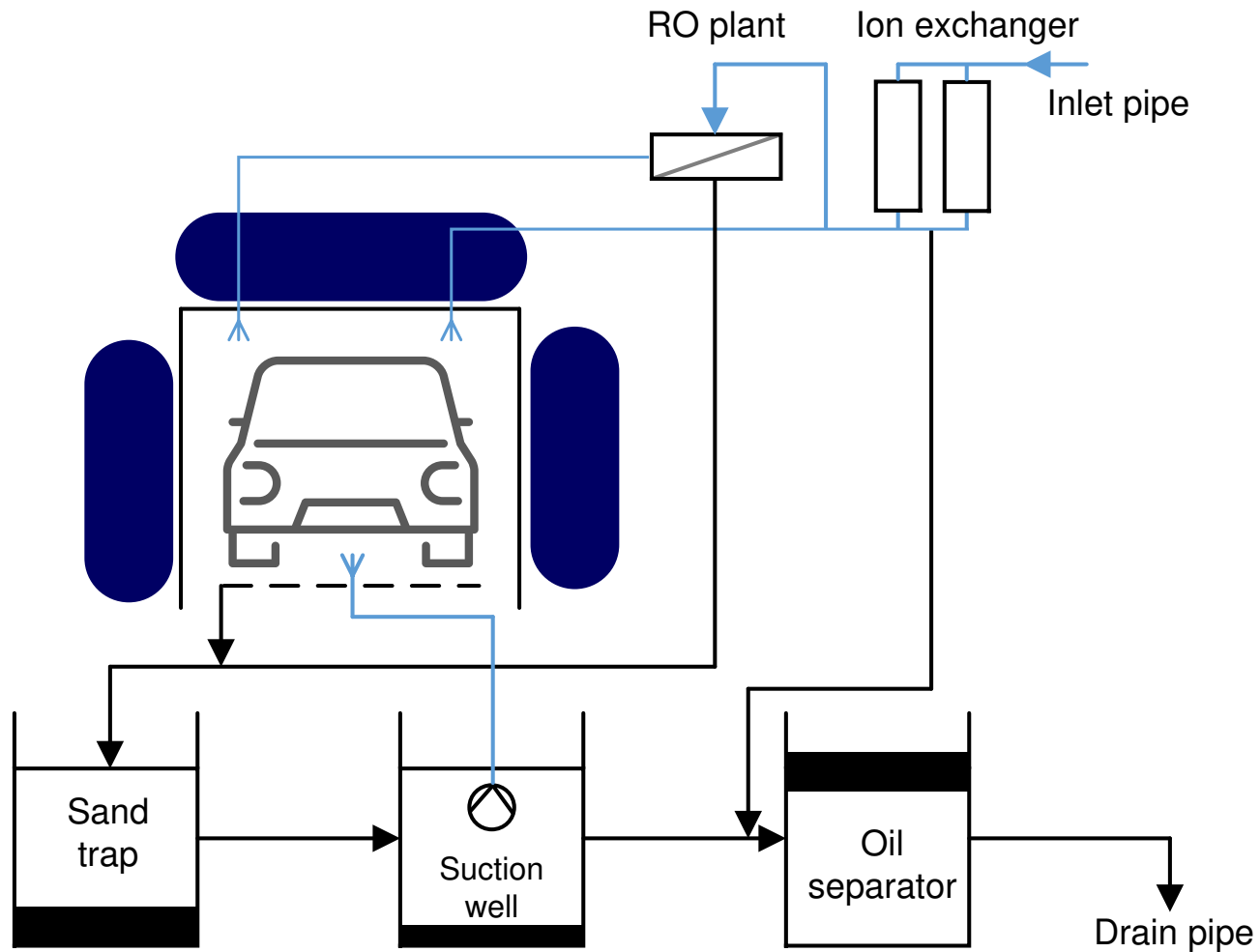
ISO/IEC 81346 offers a means of establishing a namespace for model elements based on system structures and element classification



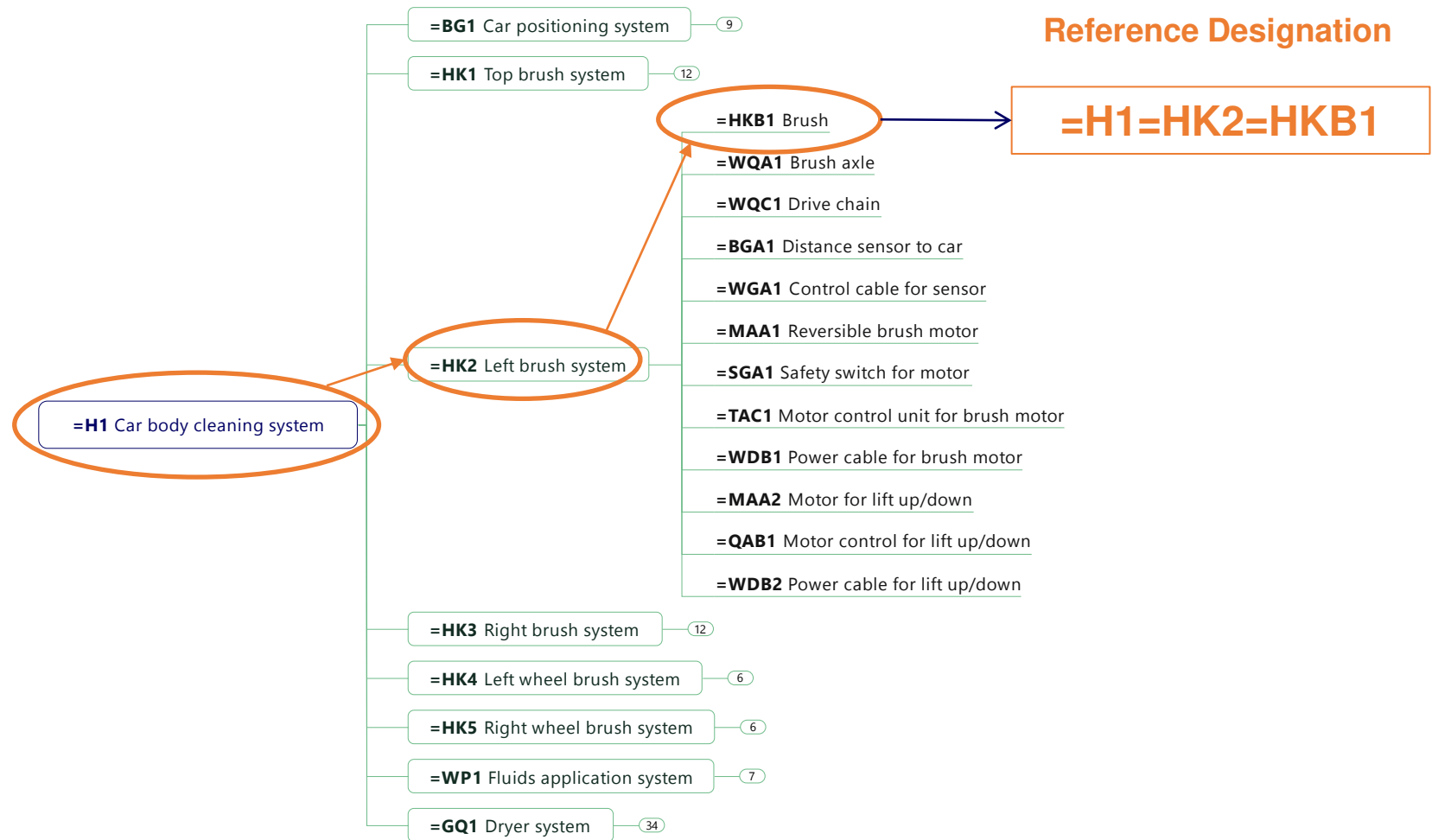
Portal Car Wash 3D Model



Portal Car Wash Water Diagram

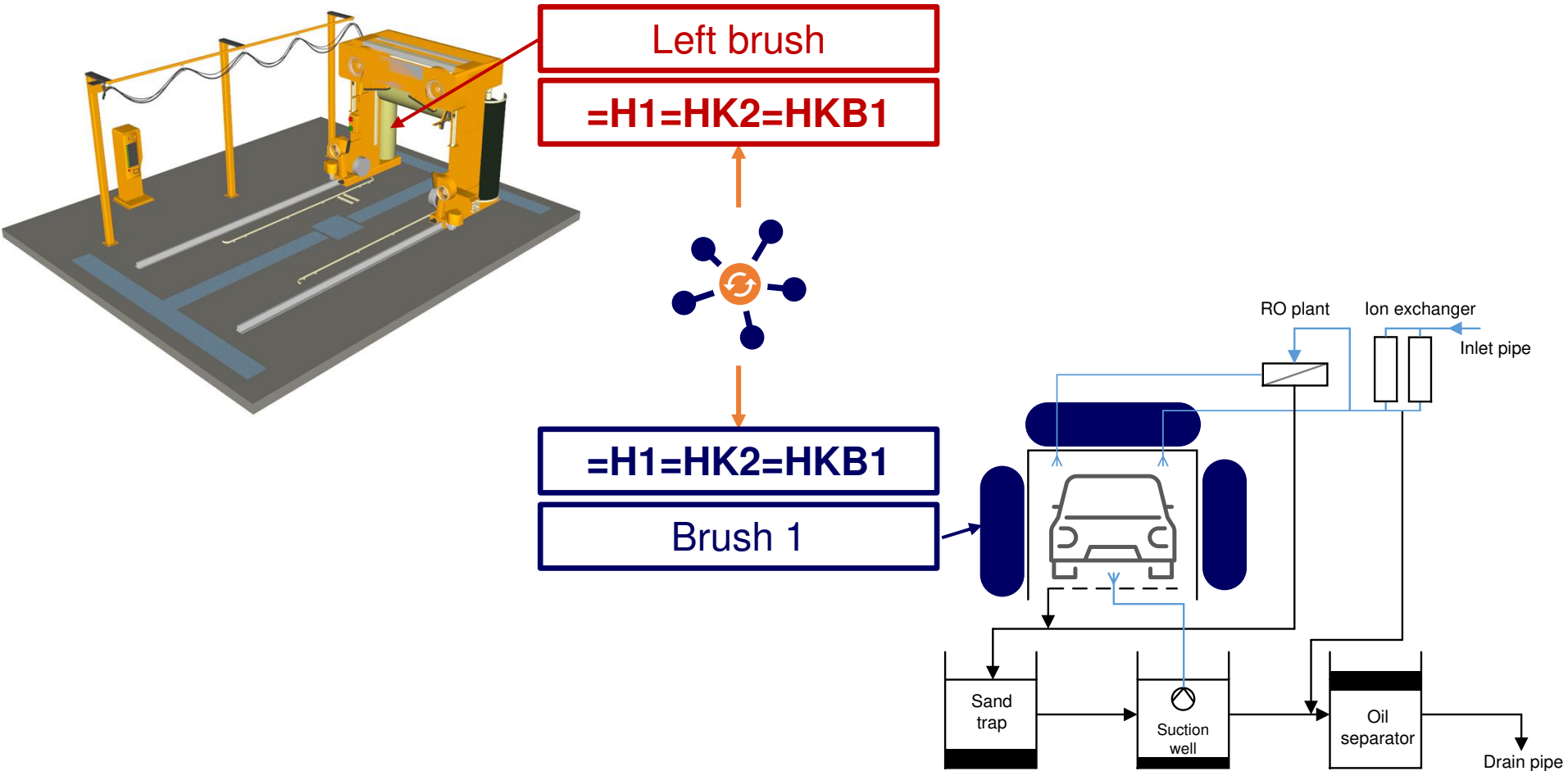


RDS Functional Structure





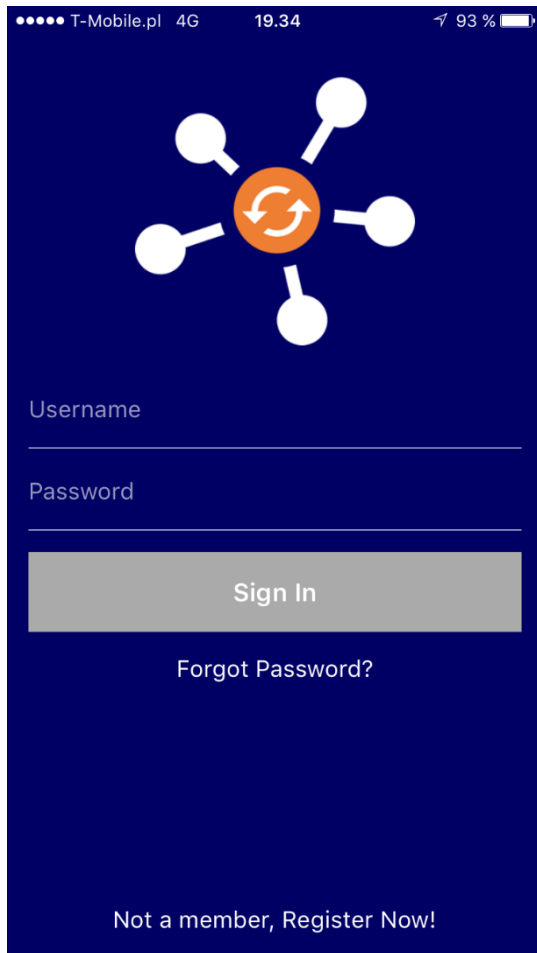
Model Correspondence





EXPLORE RDS

The RDS 81346 app



Free to use!

ISO/IEC 81346-2 (system classification)

IEC 61355 (document classification)



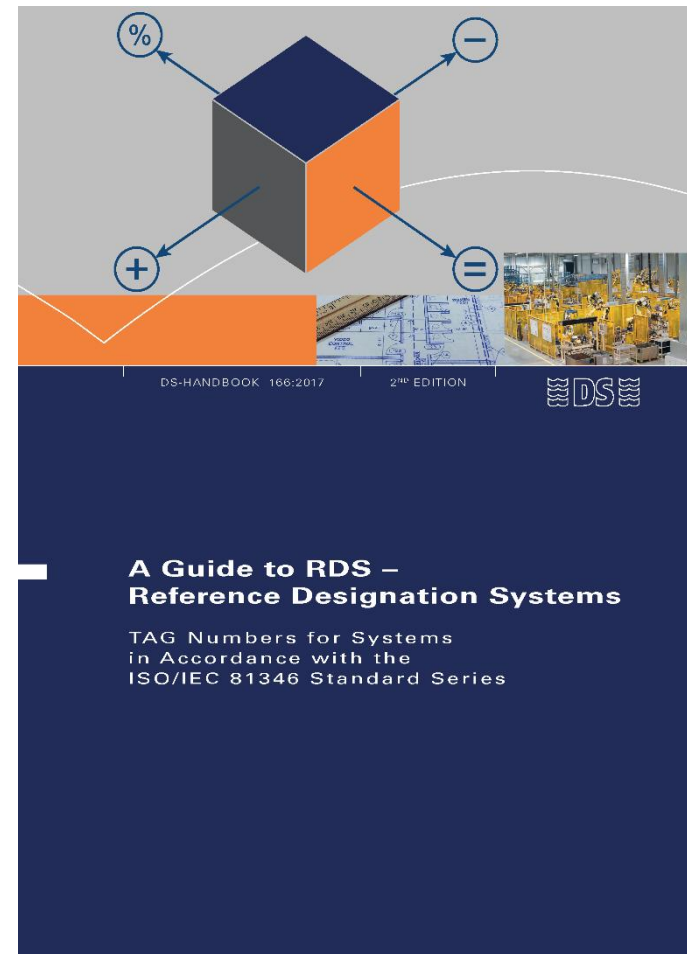
The 81346 Handbook

Complements the 81346 series

A guide on how to establish system awareness and subsequently prepare reference designations, structuring, and modularization.

Free downloads and newsletter!

Please visit www.81346.com



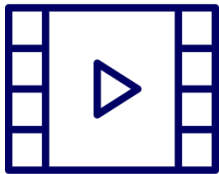
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And see the

81346 movie

on YouTube!

“It’s all about creating a common language”