



Reference Data in action



An overview of ISO 15926 representation and (possible) operation

Tore R. Christiansen
Vestforsk, Sogndal, Friday 12 September 2008

This presentation has five parts

- Motivation for Information Standards and Reference Data
- Structure of the ISO 15926 standard
- Operation and Maintenance of Reference Data Libraries
- Reference Data in Offshore Field Development and Operation
- Reference Data in Concurrent Space Engineering

This presentation is an informal and enjoyable (?) tour

There will be more formal tours (?) in subsequent presentations

Please ask and give feedback underways

Information integration in action

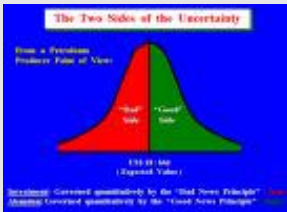
- Complex installations with long life-times
 - Large cost of production and operation
 - Large volume and cost of documentation
-
- Many interdependent players
 - Cost effective cooperation requires correct information
 - Great demands for and coordination and collaboration
-
- Demand for effective information exchange
 - Demand for accurate description
 - **Great need for common languages**



The challenge is to (know how to) do the right thing



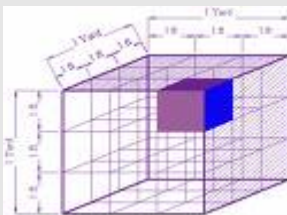
The ambiguity of learning



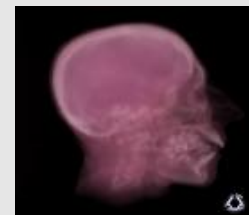
The uncertainty of knowledge



The complexity of information



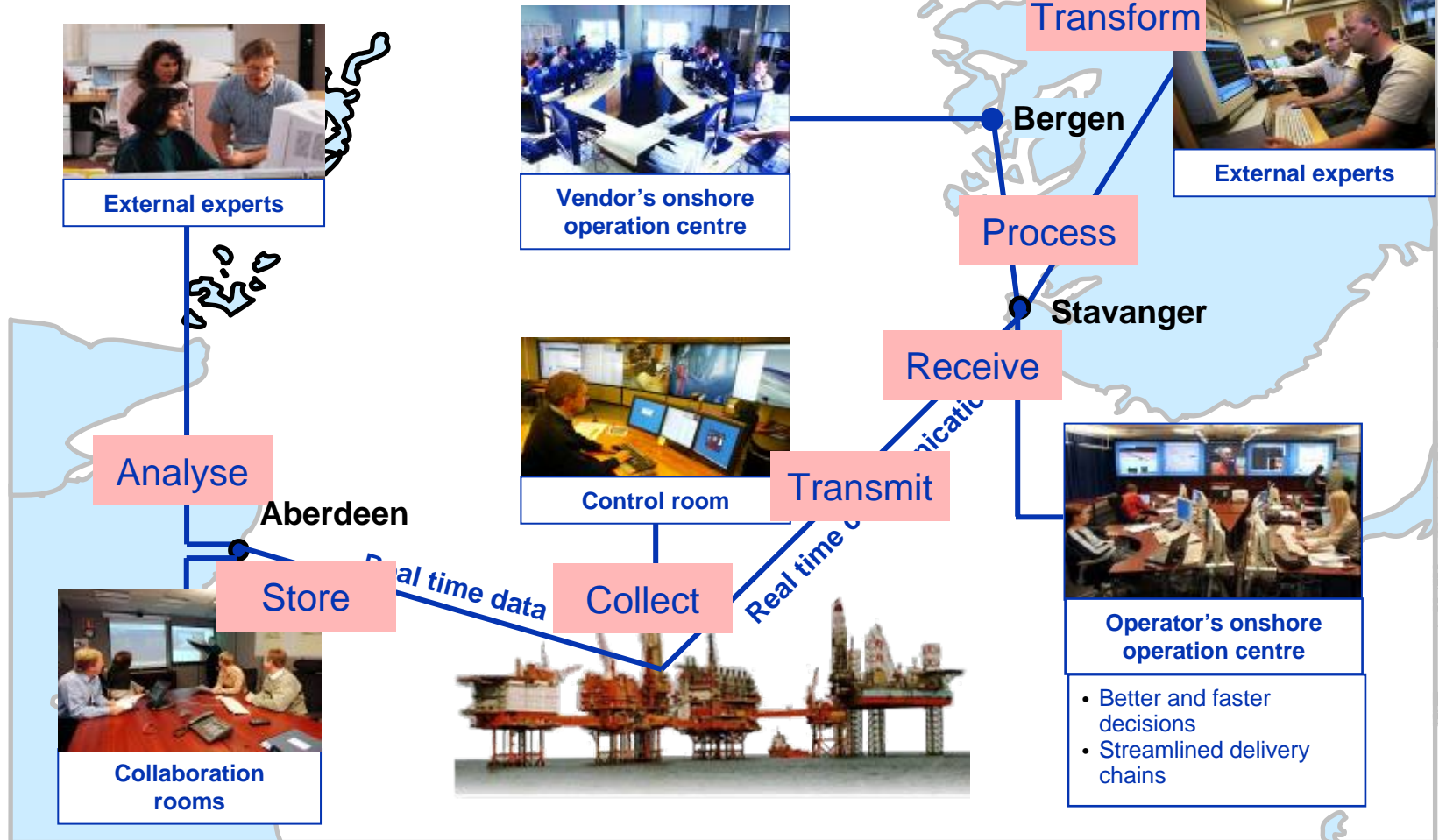
The volume of data



Data exchange and integration



How can we be sure that we send and receive correct data and understand it in the way it was intended?



Ambiguity starts in requirement specification

Owner



I need a "pipeline"
with these functional
characteristics

Send XML-message specifying "pipeline"



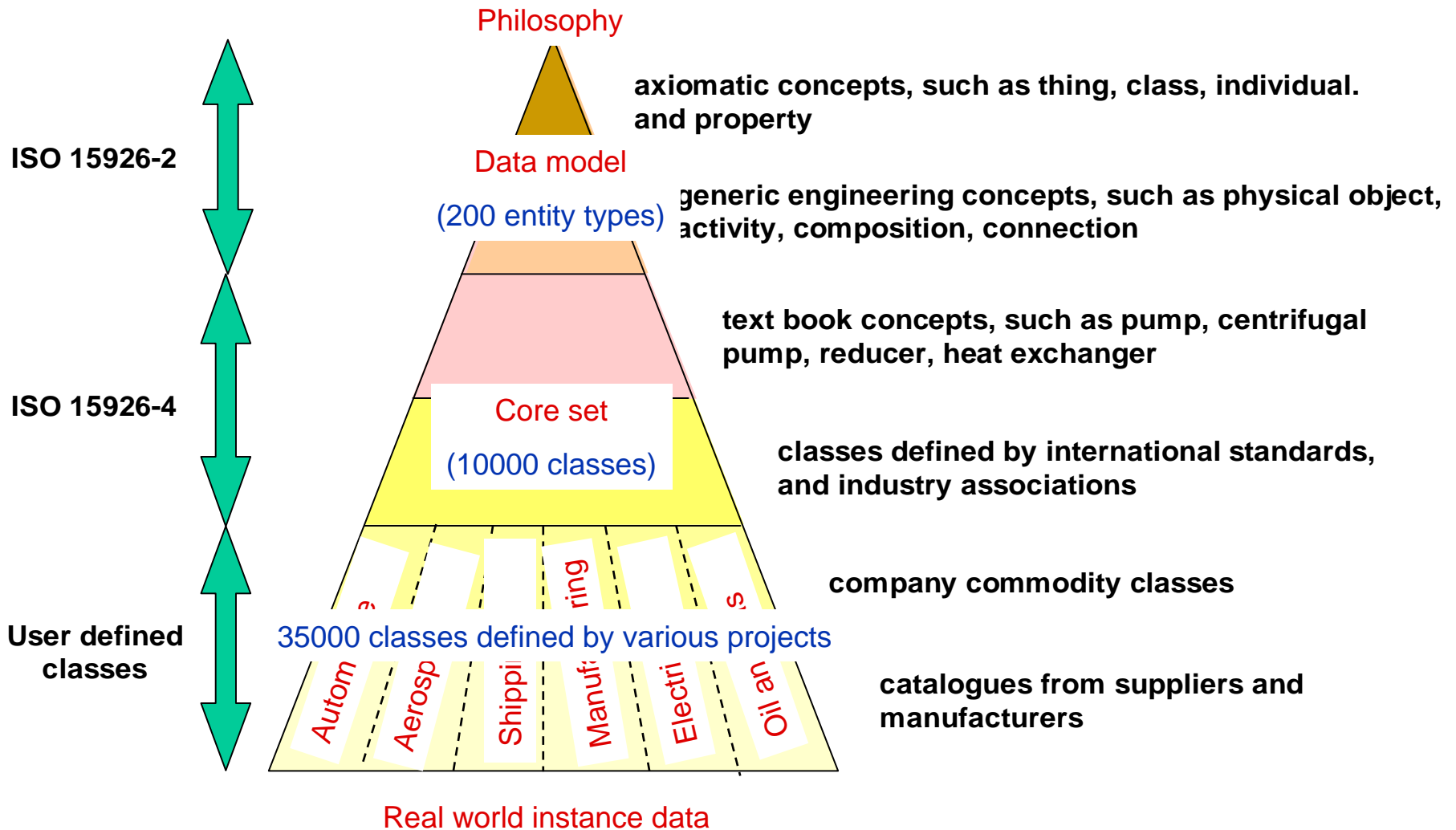
Designer



What does he actually mean
by the word "pipeline"?

Agreement about terms and definitions is required

The POSC/Caesar RDL



The structure of the ISO 159256 standard



User system (proprietary format) and Users

Per User

Instances in Facades

Per User

Proprietary Data Model

ISO 159256

ISO 159256

ISO 159256

Reference Data

ISO 159256

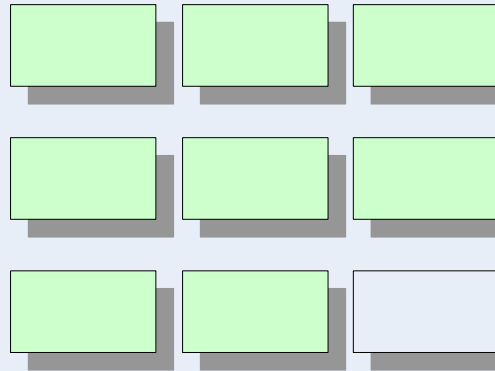
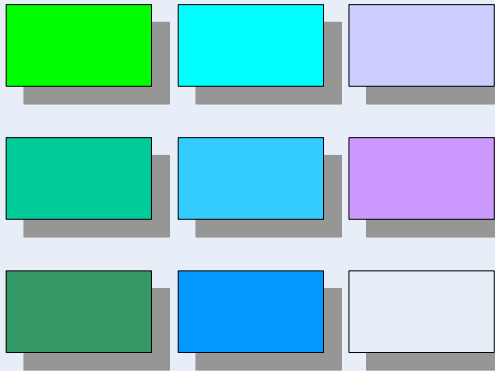
Data Model

ISO 10303
Express

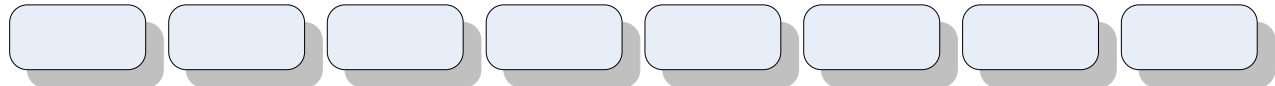
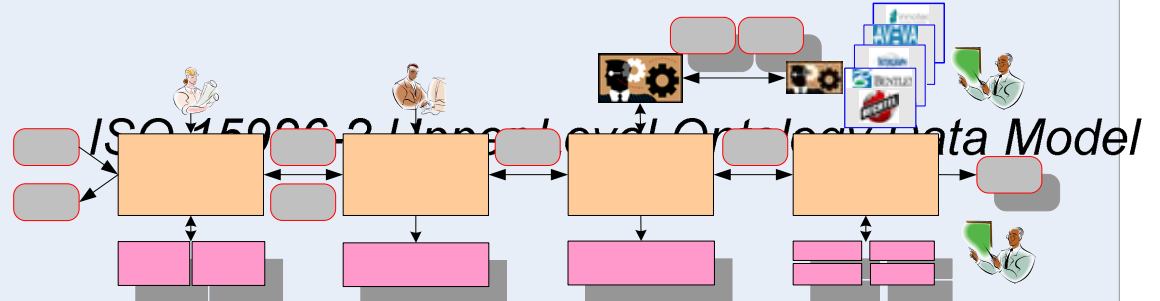
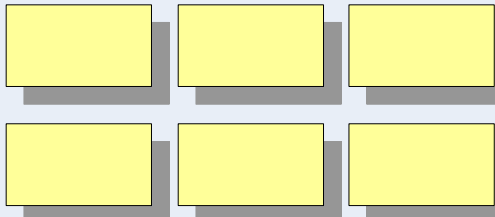
Implementation model



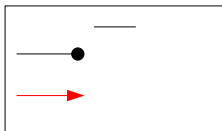
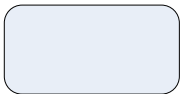
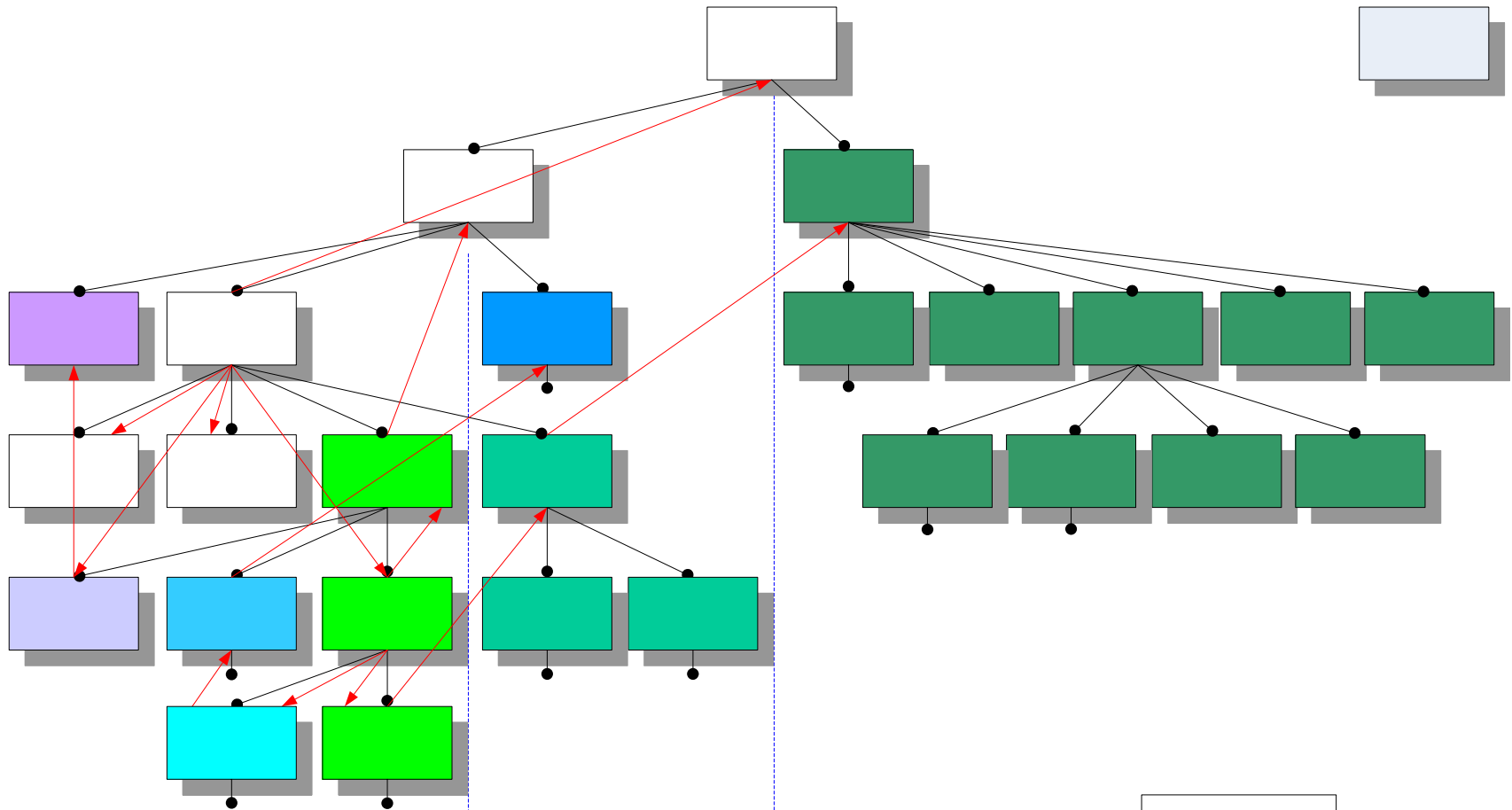
Standardization



S/O



Level 2 entity types



RD 4 Browser - Microsoft Internet Explorer provided by Det Norske Veritas

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites Refresh Print Mail Stop RSS Bluetooth People

Address http://projects.dnv.com/reference_data/RD4Browser/default.aspx?RDLDesignation=ISO-IS+15926-2+CLASS+OF+CLASS+OF+INDIVIDUAL Go Links

RD Browser

POSC Cancer Associates

DNV

Enter Reference Data Name in the textbox (use '%' as wildcard), press the the 'Get Tree'-button and use the tree to browse the hierarchy. By clicking the underlined Reference Data Name in the tree, detail information is displayed with options for searching relations and meta-data (in the righthand side of the screen).

Reference Data name:

- ISO-IS 15926-2 CLASS OF CLASS OF INDIVIDUAL
 - CLASS_OF_DESCRIPTION
 - CLASSIFICATION
 - CLASSIFIER
 - ISO-IS 15926-2 CLASS OF CLASS
 - CLASSIFIED
 - SPECIALIZATION
 - SUPERCLASS
 - ISO-IS 15926-2 CLASS OF CLASS
 - SUBCLASS
 - ISO-IS 15926-2 CLASS OF CLASS OF INFORMATION REPRESENTATION
 - ISO-IS 15926-2 CLASS OF PROPERTY
 - ISO-IS 15926-2 CLASS OF STATUS
 - ISO-IS 15926-2 SHAPE DIMENSION

Select relations to search

1. Search relations for each class in selected tree

APPROVAL
 ARRANGEMENT_OF_INDIVIDUAL
 ASSEMBLY_OF_INDIVIDUAL
 BEGINNING
 BOUNDARY_OF_NUMBER_SPACE
 BOUNDARY_OF_PROPERTY_SPACE
 CAUSE_OF_EVENT
 CLASS_OF_APPROVAL
 CLASS_OF_ARRANGEMENT_OF_INDIVIDUAL
 CLASS_OF_ASSEMBLY_OF_INDIVIDUAL
 CLASS_OF_CAUSE_OF_BEGINNING_OF_CLASS_OF_INDIVIDUAL

2. Search classes in relation tree

APPROVAL
 ARRANGEMENT_OF_INDIVIDUAL
 ASSEMBLY_OF_INDIVIDUAL
 BEGINNING
 BOUNDARY_OF_NUMBER_SPACE
 BOUNDARY_OF_PROPERTY_SPACE
 CAUSE_OF_EVENT
 CLASS_OF_APPROVAL
 CLASS_OF_ARRANGEMENT_OF_INDIVIDUAL
 CLASS_OF_ASSEMBLY_OF_INDIVIDUAL
 CLASS_OF_CAUSE_OF_BEGINNING_OF_CLASS_OF_INDIVIDUAL

ISO-IS 15926-2 CLASS OF CLASS OF INDIVIDUAL

P/C ID: RDS404546321
 Entity Type: CLASS_OF_CLASS
 Registration Status: Qualified
 RDL Definition: A class_of_class whose members are instances of class_of_individual.

[show all](#) [hide all](#)

CLASS_OF_DESCRIPTION

PATTERN

-

CLASSIFICATION

CLASSIFIER

- [ISO-IS 15926-2 CLASS OF CLASS](#)

CLASSIFIED

- [ISO 15926-4 INDIVIDUAL CLASS](#)
- [ISO 15926-4 INFORMATION REPRESENTATION CLASS](#)
- [ISO-IS 15926-2 CLASS OF ACTIVITY](#)
- [ISO-IS 15926-2 CLASS OF ARRANGED INDIVIDUAL](#)
- [ISO-IS 15926-2 CLASS OF ATOM](#)
- [ISO-IS 15926-2 CLASS OF BIOLOGICAL MATTER](#)
- [ISO-IS 15926-2 CLASS OF COMPOSITE MATERIAL](#)
- [ISO-IS 15926-2 CLASS OF COMPOUND](#)
- [ISO-IS 15926-2 CLASS OF EVENT](#)
- [ISO-IS 15926-2 CLASS OF FEATURE](#)
- [ISO-IS 15926-2 CLASS OF INANIMATE PHYSICAL OBJECT](#)

RD 4 Browser - Microsoft Internet Explorer provided by Det Norske Veritas

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites Refresh Print Mail Stop RSS Bluetooth People

Address http://projects.dnv.com/reference_data/RD4Browser/default.aspx?RDLDesignation=ISO-IS+15926-2+CLASS+OF+ARRANGED+INDIVIDUAL

RD Browser

POSC Cancer Association

Enter Reference Data Name in the textbox (use '%' as wildcard), press the 'Get Tree'-button and use the tree to browse the hierarchy. By clicking the underlined Reference Data Name in the tree, detail information is displayed with options for searching relations and meta-data (in the righthand side of the screen).

Reference Data name:

- ISO-IS 15926-2 CLASS OF ARRANGED INDIVIDUAL
 - CLASS_OF_DESCRIPTION
 - CLASSIFICATION
 - SPECIALIZATION
 - SUPERCLASS
 - SUBCLASS
 - ISO 15926-4 INFORMATION REPRESENTATION CLASS
 - ISO-IS 15926-2 CLASS OF ACTIVITY
 - ISO-IS 15926-2 CLASS OF ATOM
 - ISO-IS 15926-2 CLASS OF BIOLOGICAL MATTER
 - ISO-IS 15926-2 CLASS OF COMPOSITE MATERIAL
 - ISO-IS 15926-2 CLASS OF COMPOUND
 - ISO-IS 15926-2 CLASS OF FEATURE
 - ISO-IS 15926-2 CLASS OF INANIMATE PHYSICAL OBJECT
 - ISO-IS 15926-2 CLASS OF INFORMATION OBJECT
 - ISO-IS 15926-2 CLASS OF INFORMATION PRESENTATION
 - ISO-IS 15926-2 CLASS OF MOLECULE
 - ISO-IS 15926-2 CLASS OF ORGANISM
 - ISO-IS 15926-2 CLASS OF ORGANIZATION
 - ISO-IS 15926-2 CLASS OF PARTICULATE MATERIAL
 - ISO-IS 15926-2 CLASS OF SUB ATOMIC PARTICLE
 - ISO-IS 15926-2 PHASE

Select relations to search

1. Search relations for each class in selected tree

APPROVAL

ARRANGEMENT_OF_INDIVIDUAL

ASSEMBLY_OF_INDIVIDUAL

BEGINNING

BOUNDARY_OF_NUMBER_SPACE

BOUNDARY_OF_PROPERTY_SPACE

CAUSE_OF_EVENT

CLASS_OF_APPROVAL

CLASS_OF_ARRANGEMENT_OF_INDIVIDUAL

CLASS_OF_ASSEMBLY_OF_INDIVIDUAL

CLASS_OF_CAUSE_OF_BEGINNING_OF_CLASS_OF_INDIVIDUAL

2. Search classes in relation tree

APPROVAL

ARRANGEMENT_OF_INDIVIDUAL

ASSEMBLY_OF_INDIVIDUAL

BEGINNING

BOUNDARY_OF_NUMBER_SPACE

BOUNDARY_OF_PROPERTY_SPACE

CAUSE_OF_EVENT

CLASS_OF_APPROVAL

CLASS_OF_ARRANGEMENT_OF_INDIVIDUAL

CLASS_OF_ASSEMBLY_OF_INDIVIDUAL

CLASS_OF_CAUSE_OF_BEGINNING_OF_CLASS_OF_INDIVIDUA

ISO-IS 15926-2 CLASS OF ARRANGED INDIVIDUAL

P/C ID: RDS429259241
 Entity Type: CLASS_OF_CLASS_OF_INDIVIDUAL
 Registration Status: Recorded
 RDL Definition: A class_of_individual whose members have a distinct form that may arise from the arrangement of their parts.

[show all](#) [hide all](#)

CLASS_OF_DESCRIPTION

PATTERN

-

CLASSIFICATION

CLASSIFIER

- [ISO-IS 15926-2 CLASS OF CLASS OF INDIVIDUAL](#)

CLASSIFIED

- [ISO-IS 15926-2 ARRANGED INDIVIDUAL](#)

SPECIALIZATION

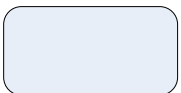
SUPERCLASS

- [ISO 15926-4 INDIVIDUAL CLASS](#)

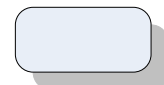




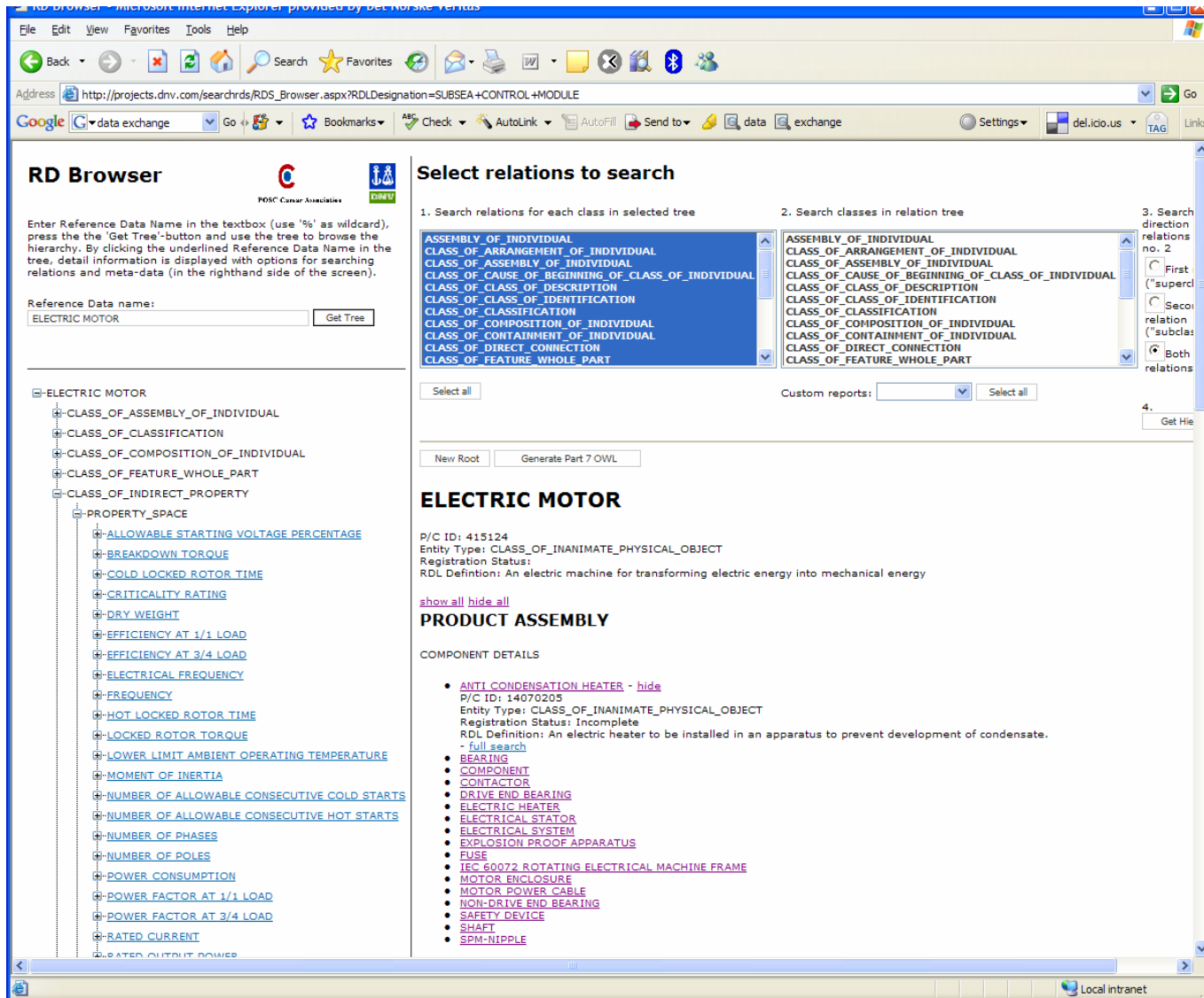
ISO



Organization



ISO TS
(2007) I
CLA



RD Browser

Enter Reference Data Name in the textbox (use '%' as wildcard), press the the 'Get Tree'-button and use the tree to browse the hierarchy. By clicking the underlined Reference Data Name in the tree, detail information is displayed with options for searching relations and meta-data (in the righthand side of the screen).

Reference Data name:

Select relations to search

1. Search relations for each class in selected tree
2. Search classes in relation tree
3. Search direction relations no. 2
 - First ("superd")
 - Secor relation ("subclas")
 - Both relations
4.

ELECTRIC MOTOR

P/C ID: 415124
Entity Type: CLASS_OF_INANIMATE_PHYSICAL_OBJECT
Registration Status:
RDL Definition: An electric machine for transforming electric energy into mechanical energy

[show all](#) [hide all](#)

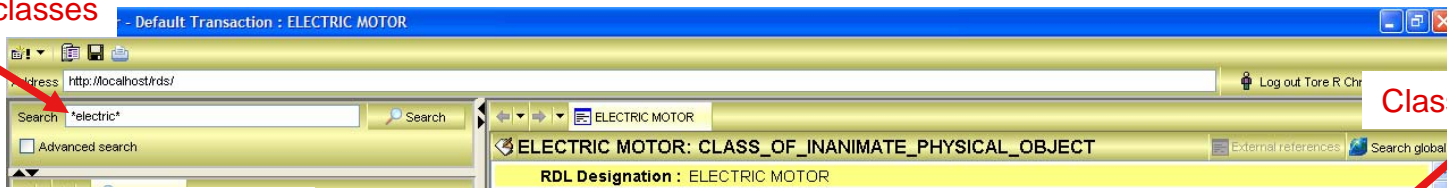
PRODUCT ASSEMBLY

COMPONENT DETAILS

- [ANTI CONDENSATION HEATER - hide](#)
P/C ID: 14070205
Entity Type: CLASS_OF_INANIMATE_PHYSICAL_OBJECT
Registration Status: Incomplete
RDL Definition: An electric heater to be installed in an apparatus to prevent development of condensate.
- full search
- BEARING
- COMPONENT
- CONTACTOR
- DRIVE END BEARING
- ELECTRIC HEATER
- ELECTRICAL STATOR
- ELECTRICAL SYSTEM
- EXPLOSION PROOF APPARATUS
- FUSE
- IEC 60072 ROTATING ELECTRICAL MACHINE FRAME
- MOTOR ENCLOSURE
- MOTOR POWER CABLE
- NON-DRIVE END BEARING
- SAFETY DEVICE
- SHAFT
- SPM-NIPPLE

Reference Data Editor

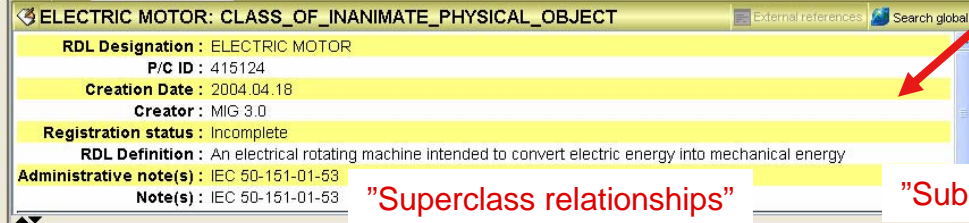
Search for classes



Classes matching search criteria

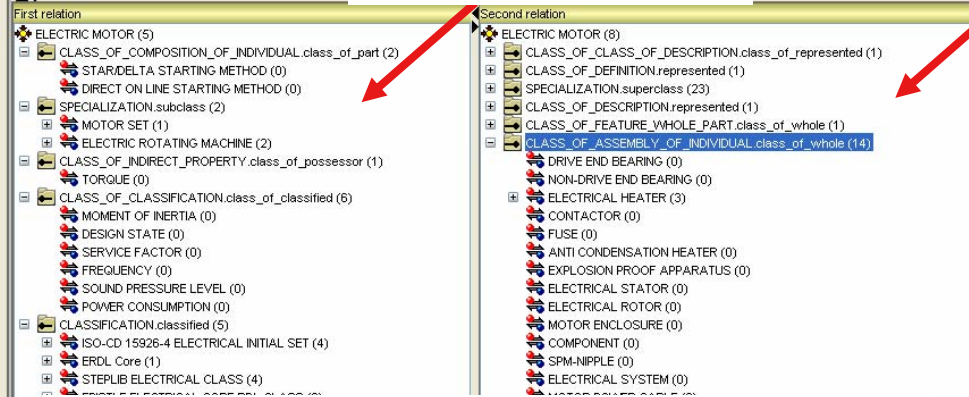
RDL Designation	Entity type
28 ELECTRIC CABLE_UPPER LIMIT DE...	CLASS_OF_INDIRECT_PROPERTY
29 ELECTRIC CHARGE	SINGLE_PROPERTY_DIMENSION
30 ELECTRIC CONVERTER	CLASS_OF_FUNCTIONAL_OBJECT
31 ELECTRIC COUPLING	CLASS_OF_INANIMATE_PHYSICA...
32 ELECTRIC CURRENT	SINGLE_PROPERTY_DIMENSION
33 ELECTRIC CURRENT DENSITY	SINGLE_PROPERTY_DIMENSION
34 ELECTRIC DIPOLE MOMENT	SINGLE_PROPERTY_DIMENSION
35 ELECTRIC DIPOLE MOMENT OF MO...	SINGLE_PROPERTY_DIMENSION
36 ELECTRIC FIELD STRENGTH	SINGLE_PROPERTY_DIMENSION
37 ELECTRIC FLUX	SINGLE_PROPERTY_DIMENSION
38 ELECTRIC FLUX DENSITY	SINGLE_PROPERTY_DIMENSION
39 ELECTRIC FUEL HEATER	CLASS_OF_INANIMATE_PHYSICA...
40 ELECTRIC GENERATOR	CLASS_OF_INANIMATE_PHYSICA...
41 ELECTRIC HAND DRILL	CLASS_OF_INANIMATE_PHYSICA...
42 ELECTRIC HORSEPOWER	SCALE
43 ELECTRIC HYDRAULIC ACTUATOR	CLASS_OF_INANIMATE_PHYSICA...
44 ELECTRIC INDUSTRIAL MOTOR	CLASS_OF_INANIMATE_PHYSICA...
45 ELECTRIC INSULATION	CLASS_OF_INANIMATE_PHYSICA...
46 ELECTRIC INSULATION LIQUID	CLASS_OF_INANIMATE_PHYSICA...
47 ELECTRIC LINE	CLASS_OF_FUNCTIONAL_OBJECT
48 ELECTRIC LOG	CLASS_OF_INFORMATION_OBJECT
49 ELECTRIC MACHINE	CLASS_OF_INANIMATE_PHYSICA...
50 ELECTRIC METER	CLASS_OF_INANIMATE_PHYSICA...
51 ELECTRIC MOTOR	CLASS_OF_INANIMATE_PHYSICA...
52 ELECTRIC MOTOR COUPLING FAN ...	CLASS_OF_INANIMATE_PHYSICA...
53 ELECTRIC MOTOR COUPLING FAN ...	CLASS_OF_INANIMATE_PHYSICA...
54 ELECTRIC MOTOR COUPLING FAN ...	CLASS_OF_INANIMATE_PHYSICA...
55 ELECTRIC MOTOR FOR PURCHAS...	ENUMERATED_SET_OF_CLASS
56 ELECTRIC MOTOR FOR T...	ENUMERATED_SET_OF_CLASS

Class meta-data



"Superclass relationships"

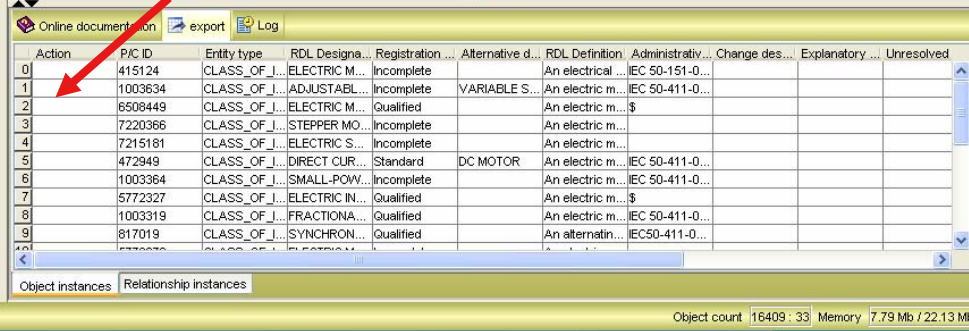
"Subclass relationships"



Custom search and display

Search in	Entity types	Columns
0	Entity types	#
0	<input checked="" type="checkbox"/> CLASS_OF_INANIMATE_PHYSICAL_OBJECT	6869
1	<input checked="" type="checkbox"/> CLASS_OF_ACTIVITY	2157
	OLECULE	1542
	FUNCTIONAL_OBJECT	935
	SET_OF_CLASS	589
3	<input checked="" type="checkbox"/> CLASS_OF_SHAPE_DIMENSION	562
6	<input checked="" type="checkbox"/> SINGLE_PROPERTY_DIMENSION	545
7	<input checked="" type="checkbox"/> DOCUMENT_DEFINITION	483
8	<input checked="" type="checkbox"/> CLASS_OF_FEATURE	406
9	<input checked="" type="checkbox"/> CLASS_OF_COMPOUND	370
10	<input checked="" type="checkbox"/> CLASS_OF_CLASS_OF_INDIVIDUAL	281
11	<input checked="" type="checkbox"/> CLASS_OF_ATOM	181
12	<input checked="" type="checkbox"/> CLASS_OF_ARRANGED_INDIVIDUAL	85
13	<input checked="" type="checkbox"/> ROLE	48

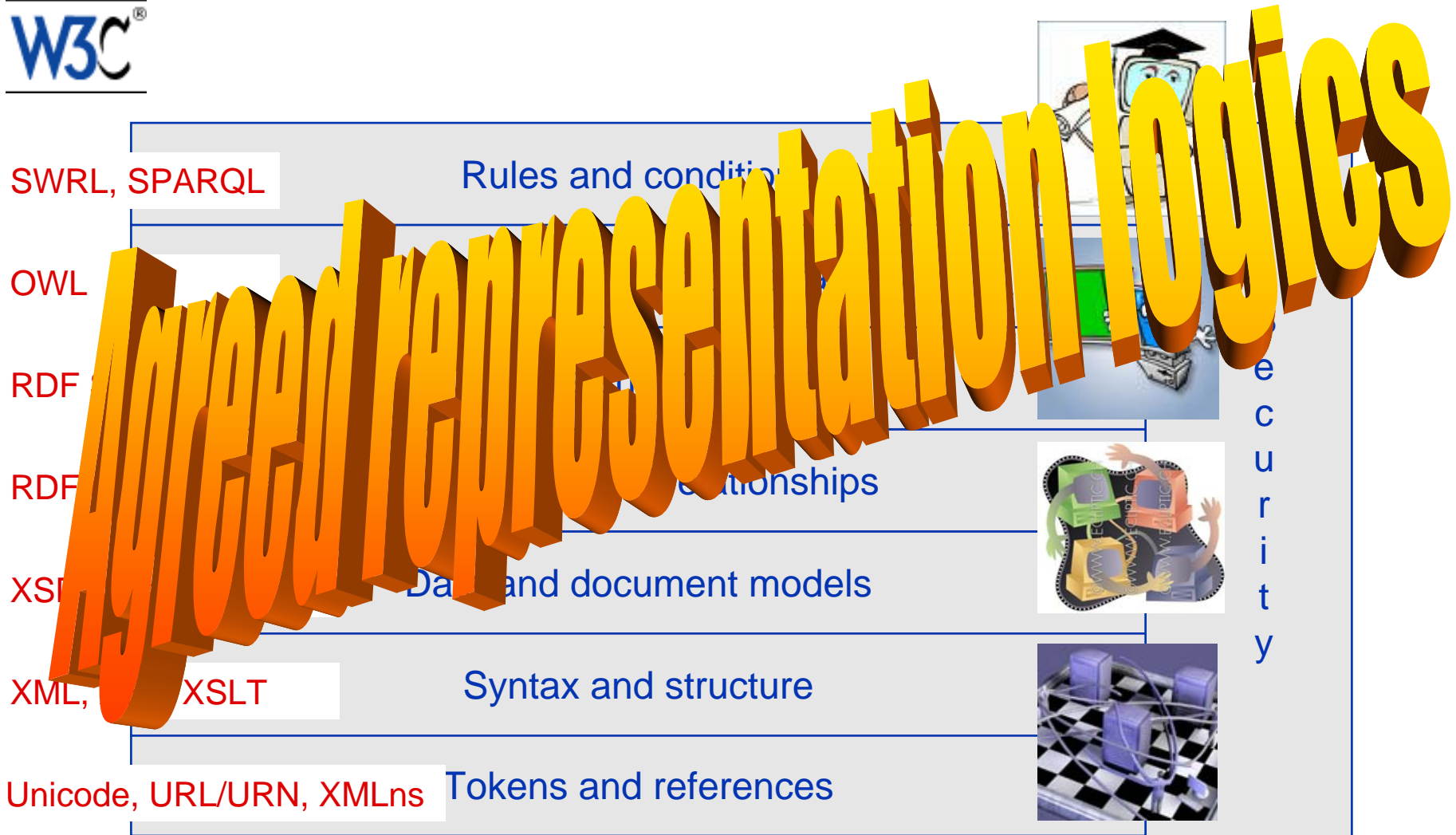
Format for exporting and importing classes and relationships



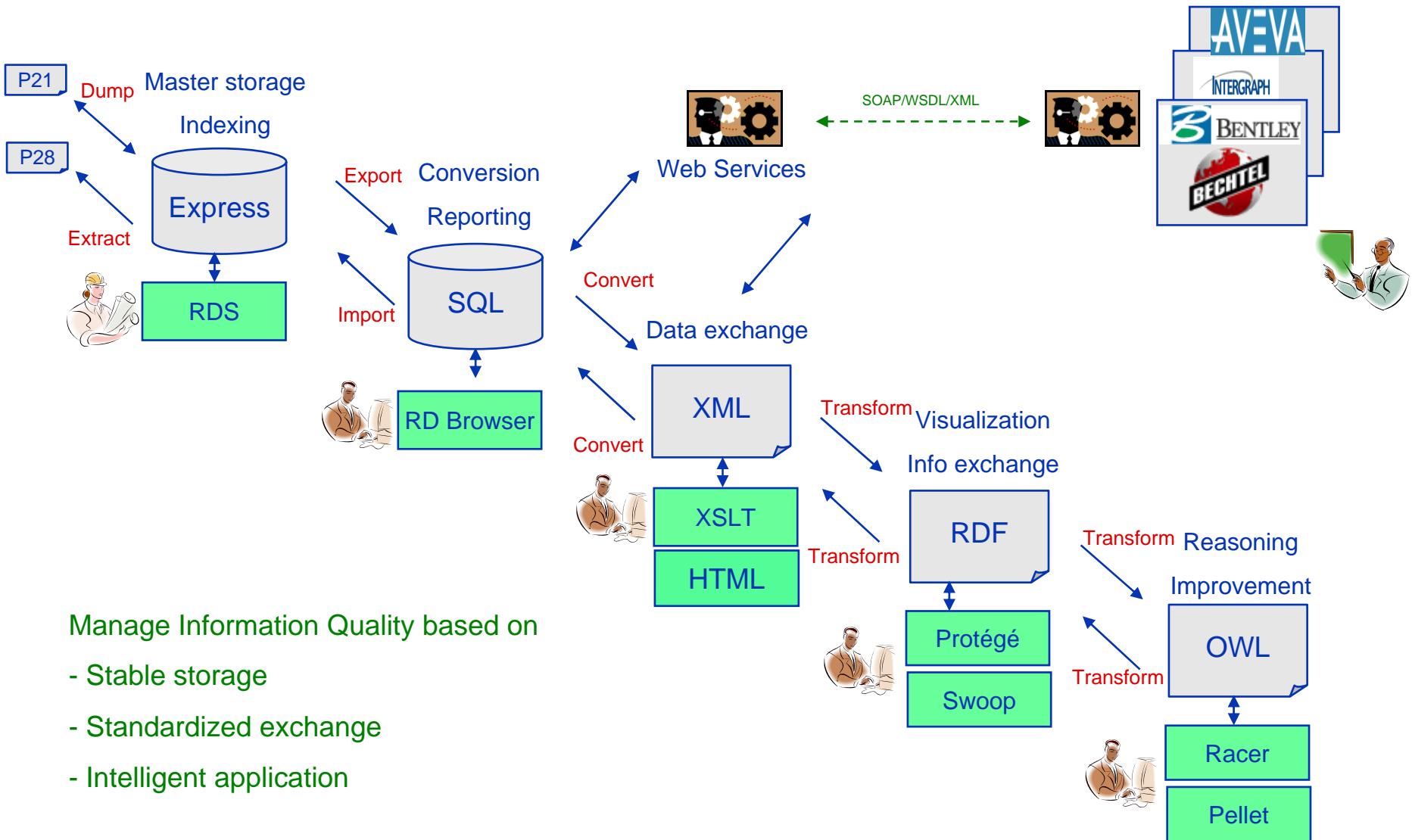
Action	P/C ID	Entity type	RDL Designa...	Registration...	Alternative d...	RDL Definition	Administrativ...	Change des...	Explanatory ...	Unresolved
0	415124	CLASS_OF_I...	ELECTRIC M...	Incomplete		An electric m...	IEC 50-151-0...			
1	1003634	CLASS_OF_I...	ADJUSTABL...	Incomplete	VARIABLE S...	An electric m...	IEC 50-411-0...			
2	6508449	CLASS_OF_I...	ELECTRIC M...	Qualified		An electric m...				
3	7220366	CLASS_OF_I...	STEPPER MO...	Incomplete		An electric m...				
4	7215181	CLASS_OF_I...	ELECTRIC S...	Incomplete		An electric m...				
5	472949	CLASS_OF_I...	DIRECT CUR...	Standard	DC MOTOR	An electric m...	IEC 50-411-0...			
6	1003364	CLASS_OF_I...	SMALL-POW...	Incomplete		An electric m...	IEC 50-411-0...			
7	5772327	CLASS_OF_I...	ELECTRIC IN...	Qualified		An electric m...				
8	1003319	CLASS_OF_I...	FRACTIONA...	Qualified		An electric m...	IEC 50-411-0...			
9	817019	CLASS_OF_I...	SYNCHRON...	Qualified		An alternatin...	IEC50-411-0...			

Directory of classes

The semantic technology stack



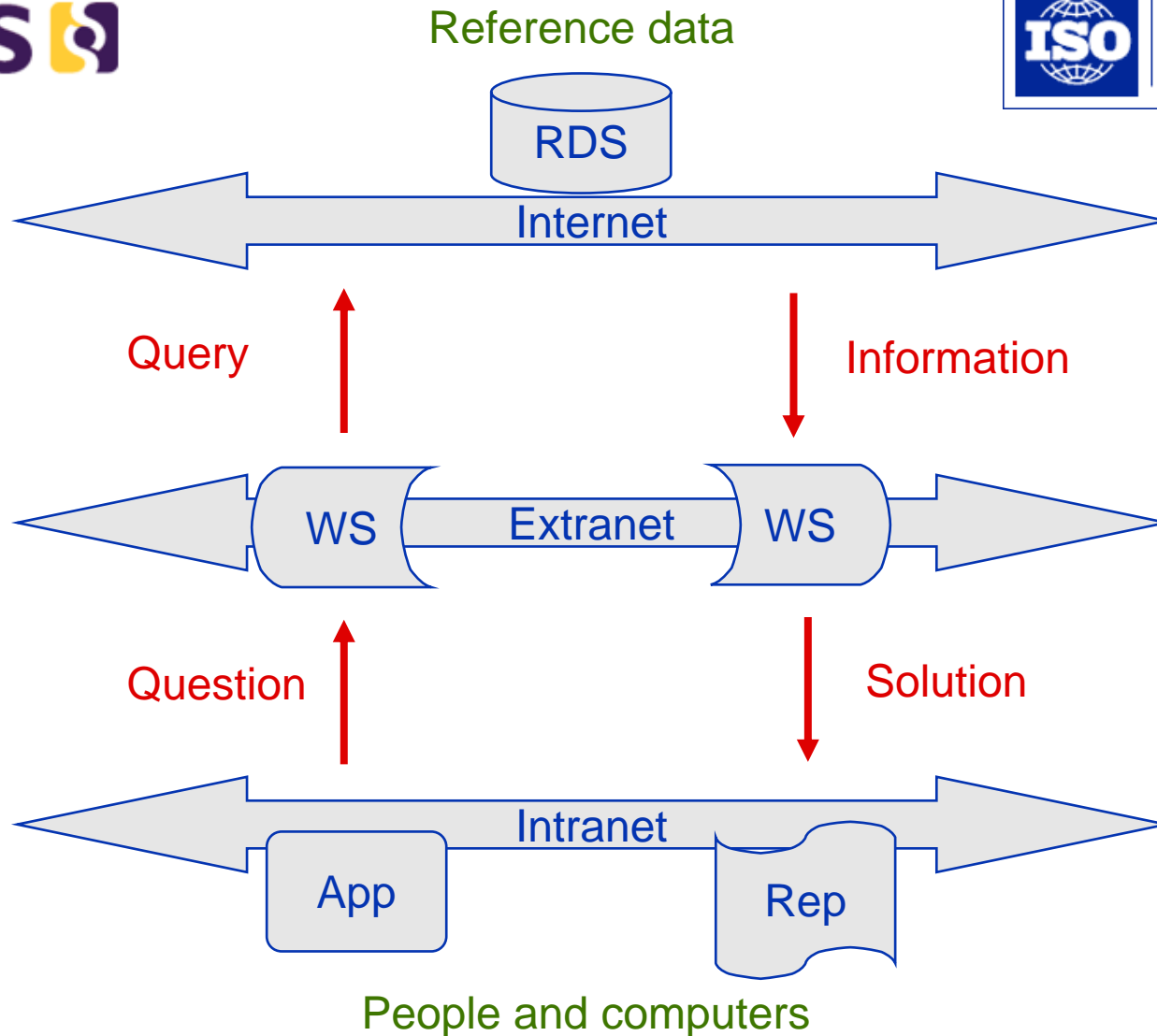
Reference Data Services - representation and conversion

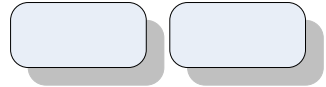
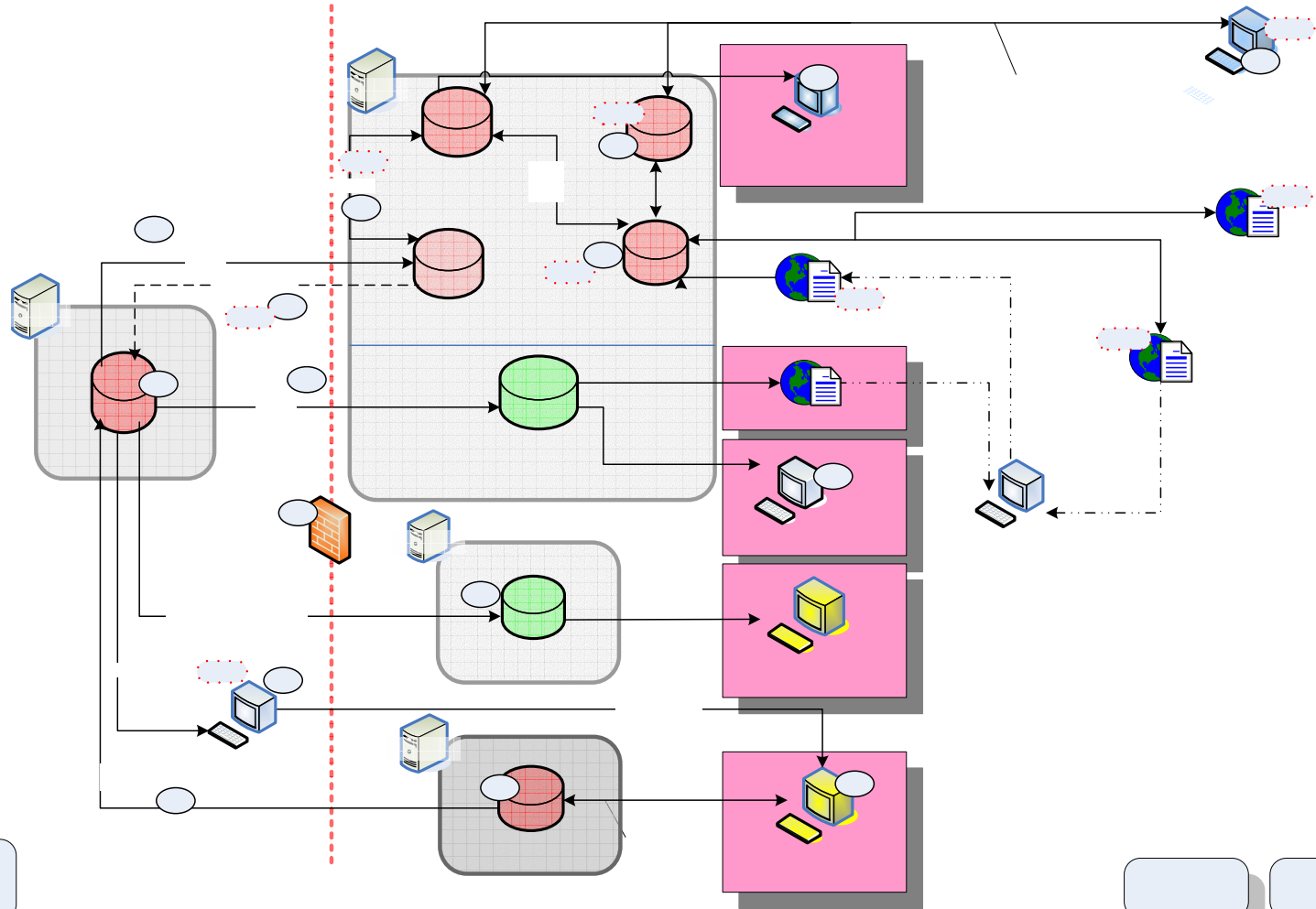


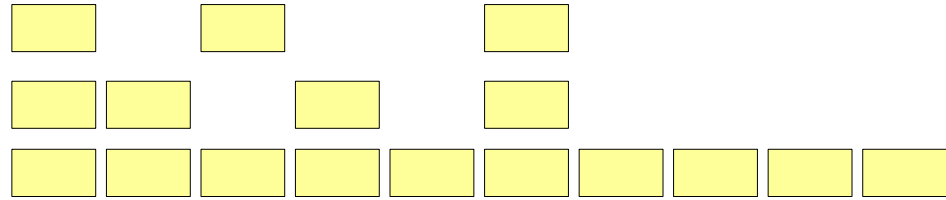
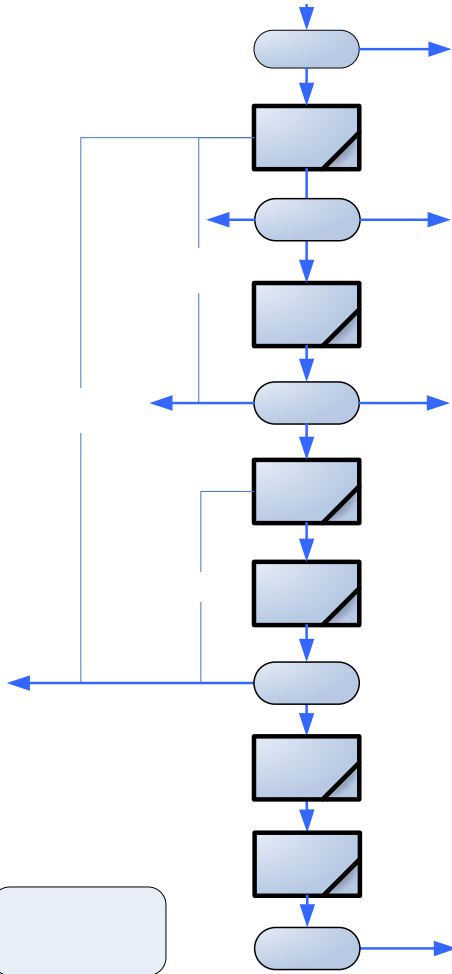
Manage Information Quality based on

- Stable storage
- Standardized exchange
- Intelligent application

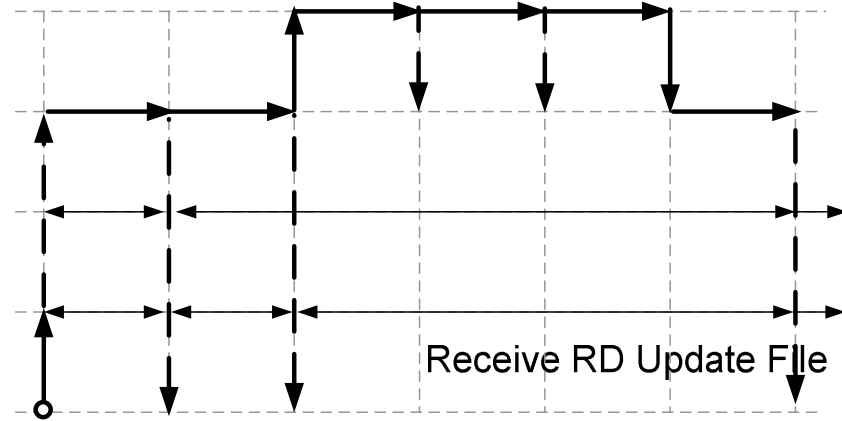
Semantic web Reference Data Services







RD



Receive RD Update File

Initiation of CR



Enter CR in PC
Set status of C

Forward CR to

The objective of this example is to illustrate how ...

- ... definition of Reference Data allows representation of product information with enough detail and breadth of scope for **accurate description** of real world technical artifacts and installations
- ... extension of Reference Data with relations and properties allows construction of product models that can serve as a mechanism for **information exchange** between application programs used throughout the product lifecycle
- ... representation of Reference Data and relations in formal logic-based knowledge bases allows **information integration** between sources with different coverage and consistency
- ... grounding of Reference Data in a standardized upper ontology (meta-model) allows development of formal processes and procedures for **lifecycle management** of change in structure and behaviour engineering artifacts

The Sakhalin 1 project



The image shows a screenshot of a web browser displaying the Sakhalin-1 Project website. The browser's address bar shows 'http://www.sakhalin1.com/'. The website has a red header with the project name and navigation links. The main content area includes a map of Sakhalin Island with labels for 'Okha', 'Sakhalin I', 'Yuzhno-Sakhalinsk', 'Vladivostok', 'Sapporo', 'Niigata', and 'Osaka'. Text on the page describes the project as an oil and gas development on the northeast shelf of Sakhalin, comprising the Chayvo, Odoptu, and Arkutun-Dagi fields. It mentions that Exxon Neftegas Limited is the operator and that the project will be executed in phases, with the initial phase starting in 2005. A 'What's New' section lists two press releases from April 2006 and March 2006. To the right of the browser screenshot is a larger map of Sakhalin Island, colored in pink, with labels for 'Odoptu', 'Arkutun-Dagi', 'Chayvo', and 'Dekastri Marine Terminal'.

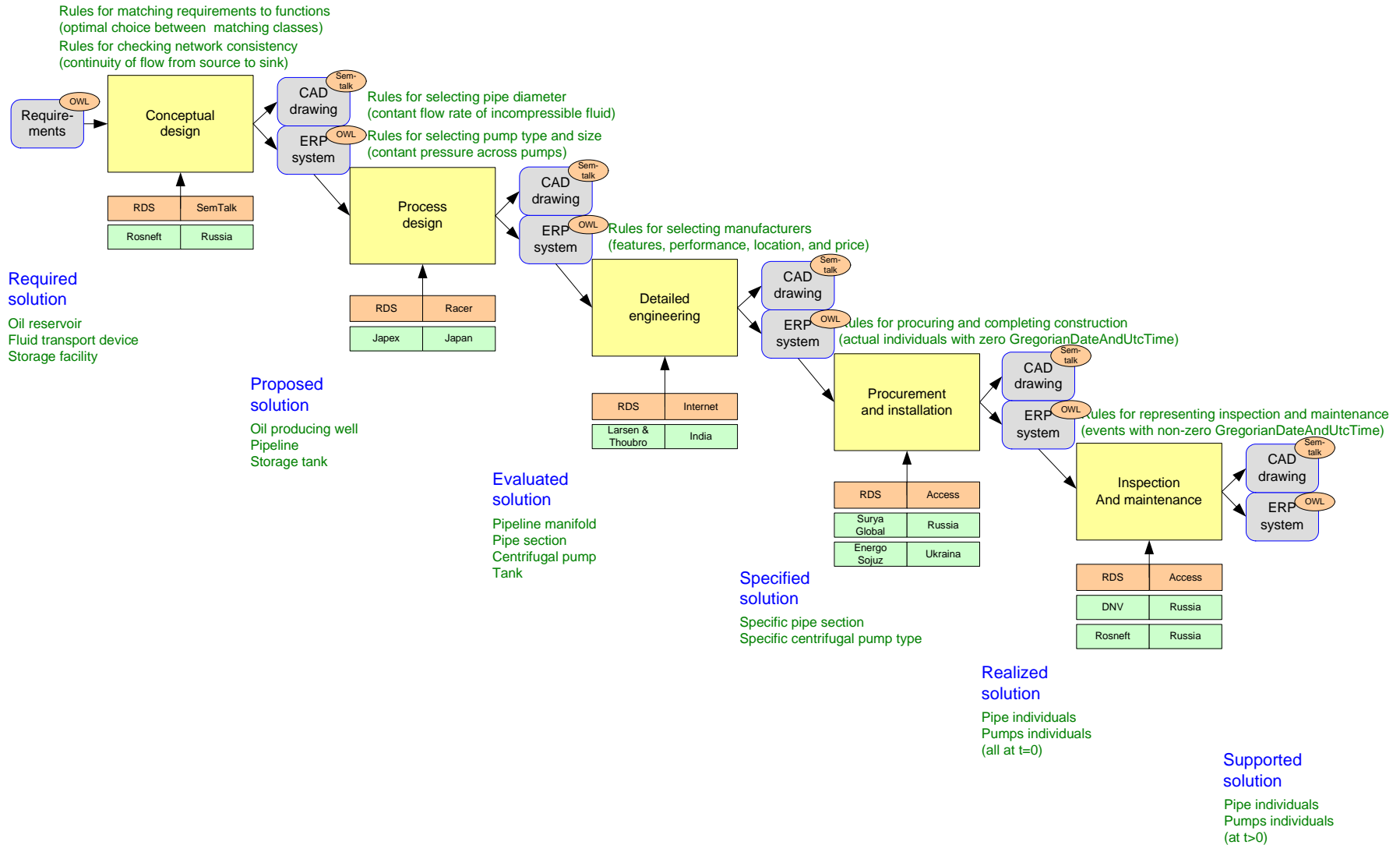
This demo illustrates field development and operation

- Offshore oil field development east of Sakhalin island
- Requirement from Russian owner for pipeline transport to loading facility on the Siberian mainland
- Process design of pipeline by Japan oil company in Tokyo
- Detailed engineering by engineering contractor in Mumbai, India
- Procurement of pumps from manufacturer near Kiev, Ukraine
- Procurement of pipe from manufacturer near Delhi, India
- Transportation from manufacturer to site
- Installation on site by local project team from Russian owner
- Inspection of pipe wall thickness on site by surveyor from DNV Vladivostok office
- Procurement and replacement of corroded pipe section

The scenario uses terms and definitions from the Reference Data Library to

- **Identify** design objects
- **Represent** design alternatives
- **Exchange** data between a set of (mock-up) engineering applications
- **Manage** all real-world artifacts
- **Ensure** information quality across all life-cycle phases

The lifecycle activities and artifacts



The Real World Web

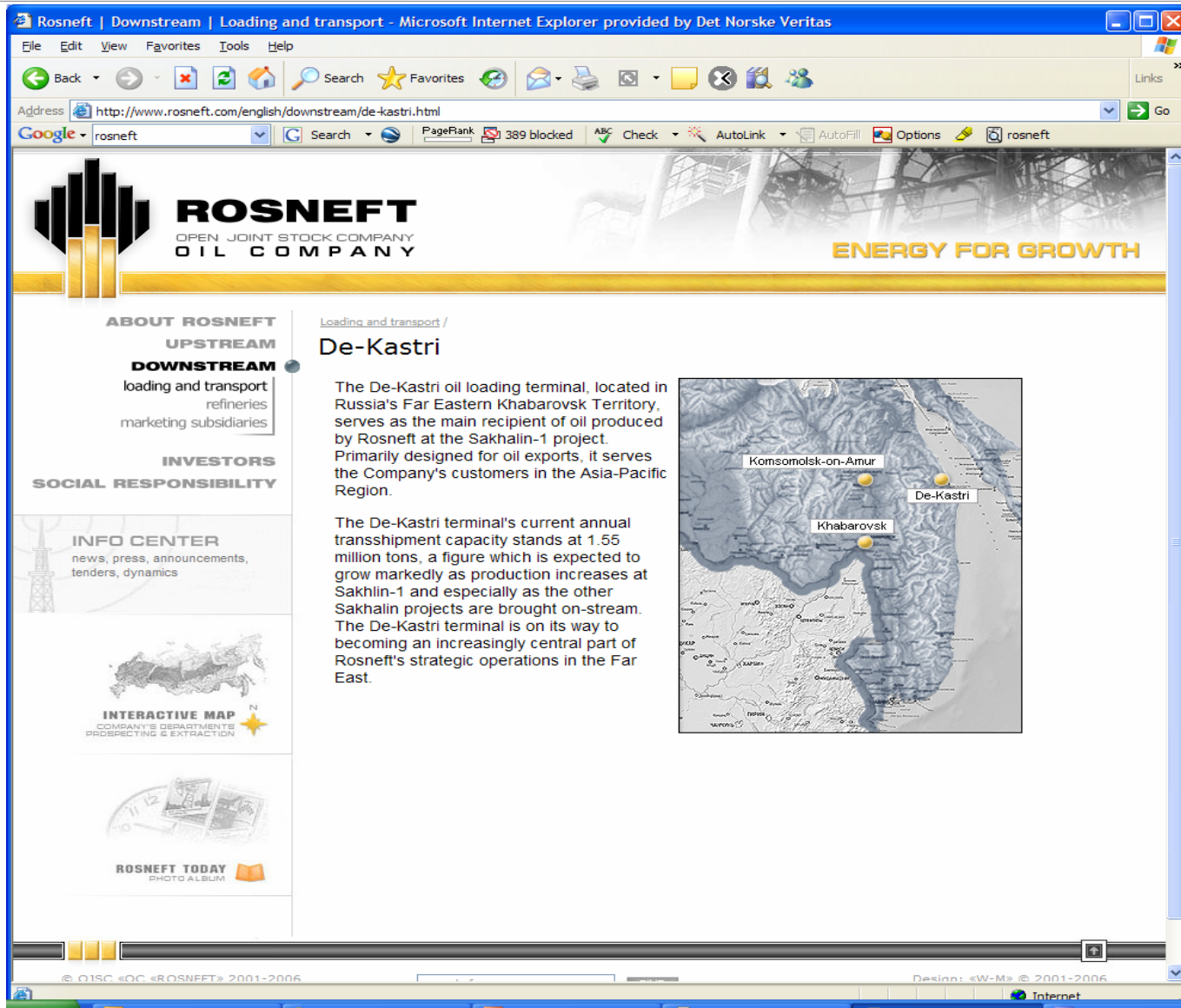


Google Earth interface showing a project lifecycle diagram overlaid on a map of Russia. The diagram includes nodes for:

- Information Quality Management
- Pump manufacturer
- Pipe manufacturer
- Detailed engineering
- Replacement pipes
- Inspection
- Local office finds corroded pipe
- Termination
- Pipeline
- Field
- Concept design
- Installation and operation

The interface includes a search bar, a 'Places' list on the left, and a 'Layers' panel at the bottom left. The map shows the Sakhalin Island region with various project-related labels and arrows indicating the flow of information and materials.

Owner of transport solution



ROSNEFT
OPEN JOINT STOCK COMPANY
OIL COMPANY

ENERGY FOR GROWTH

ABOUT ROSNEFT
UPSTREAM
DOWNSTREAM
loading and transport
refineries
marketing subsidiaries
INVESTORS
SOCIAL RESPONSIBILITY

INFO CENTER
news, press, announcements,
tenders, dynamics

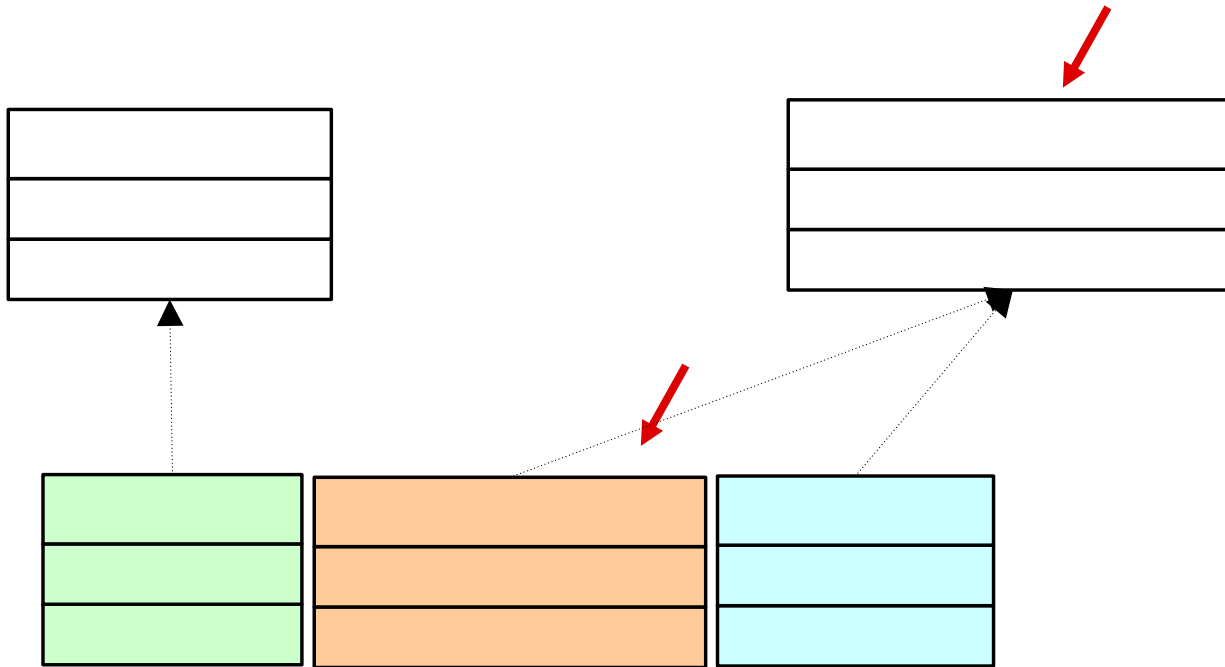
INTERACTIVE MAP
COMPANY'S DEPARTMENTS
PROSPECTING & EXTRACTION

ROSNEFT TODAY
PHOTO ALBUM

© OJSC «OC «ROSNEFT» 2001-2006

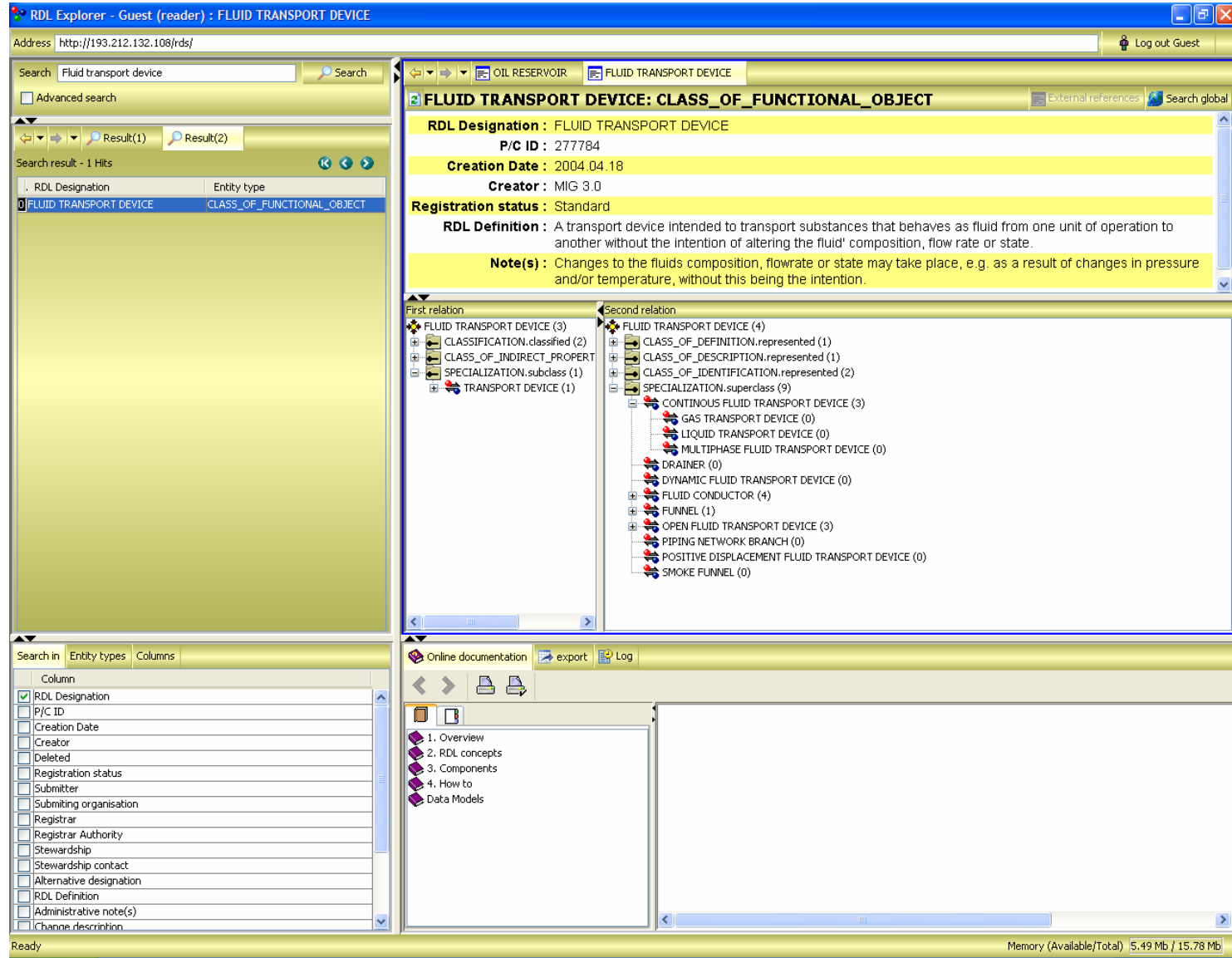
Design: «W-M» © 2001-2006

Reference Data for owner requirements



ClassOfIndividual

Fluid transport device in the RDL



The screenshot displays the RDL Explorer interface. The main window title is "RDL Explorer - Guest (reader) : FLUID TRANSPORT DEVICE". The address bar shows "http://193.212.132.108/rds/". The search bar contains "Fluid transport device" and shows "Result(1)" and "Result(2)". The search results table has one entry: "FLUID TRANSPORT DEVICE" with entity type "CLASS_OF_FUNCTIONAL_OBJECT".

The details pane for "FLUID TRANSPORT DEVICE: CLASS_OF_FUNCTIONAL_OBJECT" shows the following information:

- RDL Designation :** FLUID TRANSPORT DEVICE
- P/C ID :** 277784
- Creation Date :** 2004.04.18
- Creator :** MIG 3.0
- Registration status :** Standard
- RDL Definition :** A transport device intended to transport substances that behaves as fluid from one unit of operation to another without the intention of altering the fluid' composition, flow rate or state.
- Note(s) :** Changes to the fluids composition, flowrate or state may take place, e.g. as a result of changes in pressure and/or temperature, without this being the intention.

The "First relation" pane shows a tree structure with "FLUID TRANSPORT DEVICE (3)" expanded to show "CLASSIFICATION.classified (2)", "CLASS_OF_INDIRECT_PROPERTY", "SPECIALIZATION.subclass (1)", and "TRANSPORT DEVICE (1)".

The "Second relation" pane shows a tree structure with "FLUID TRANSPORT DEVICE (4)" expanded to show "CLASS_OF_DEFINITION.represented (1)", "CLASS_OF_DESCRIPTION.represented (1)", "CLASS_OF_IDENTIFICATION.represented (2)", "SPECIALIZATION.superclass (9)", "CONTINUOUS FLUID TRANSPORT DEVICE (3)", "GAS TRANSPORT DEVICE (0)", "LIQUID TRANSPORT DEVICE (0)", "MULTIPHASE FLUID TRANSPORT DEVICE (0)", "DRAINER (0)", "DYNAMIC FLUID TRANSPORT DEVICE (0)", "FLUID CONDUCTOR (4)", "FUNNEL (1)", "OPEN FLUID TRANSPORT DEVICE (3)", "PIPING NETWORK BRANCH (0)", "POSITIVE DISPLACEMENT FLUID TRANSPORT DEVICE (0)", and "SMOKE FUNNEL (0)".

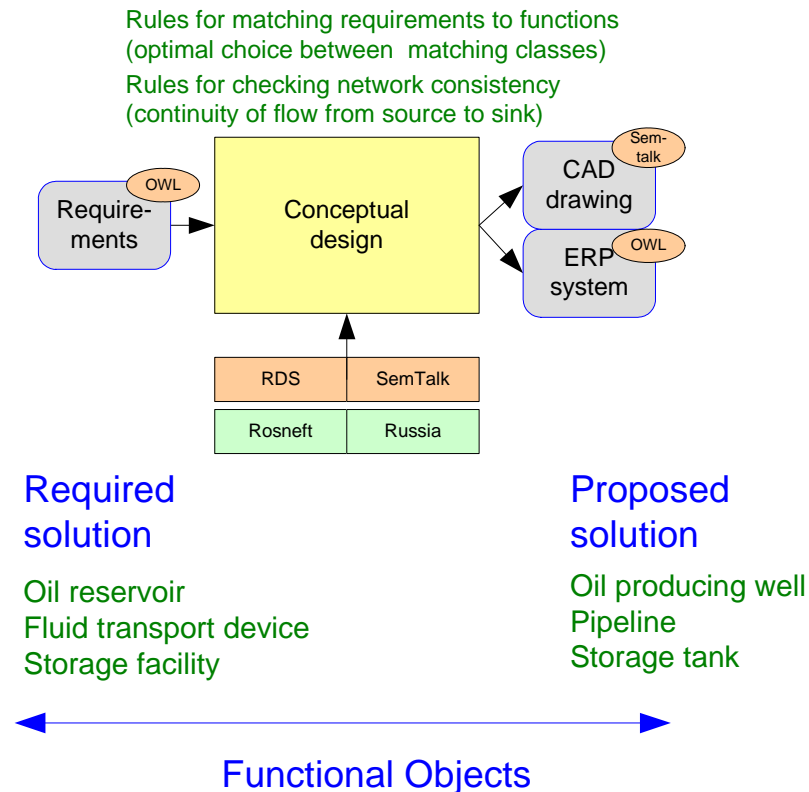
The bottom left pane shows a table with columns "Search in", "Entity types", and "Columns". The "Columns" column is expanded to show a list of fields with checkboxes, including "RDL Designation", "P/C ID", "Creation Date", "Creator", "Deleted", "Registration status", "Submitter", "Submitting organisation", "Registrar", "Registrar Authority", "Stewardship", "Stewardship contact", "Alternative designation", "RDL Definition", "Administrative note(s)", and "Channel description".

The bottom right pane shows "Online documentation" with a list of items: "1. Overview", "2. RDL concepts", "3. Components", "4. How to", and "Data Models".

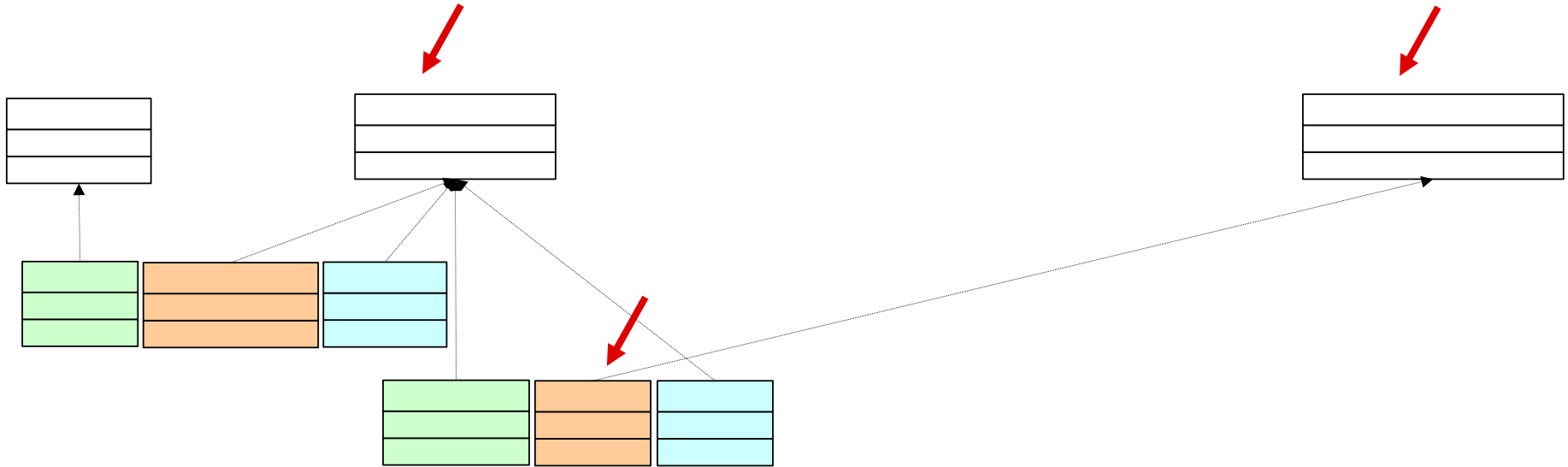
The status bar at the bottom indicates "Ready" and "Memory (Available/Total) 5.49 Mb / 15.78 Mb".

The conceptual design phase

- Given need to transport oil from reservoir to loading facility
- Given that offshore loading is not practical
- Specify use of a pipeline as fluid transport device (pumping oil through pipelines to loading and storage facilities)



Reference Data for conceptual design



ClassOfIndividual

ClassOf

Pipeline in the RDL



RDL Explorer - Guest (reader) : PIPELINE

Address: <http://193.212.132.108/rdsl/> Log out Guest

Search: Search

Advanced search

Result(2) Result(3) Result(4) Re <>

Search result - 1 Hits

RDL Designation	Entity type
PIPELINE	CLASS_OF_INANIMATE_PHYSICAL...

PIPELINE: CLASS_OF_INANIMATE_PHYSICAL_OBJECT

RDL Designation : PIPELINE
P/C ID : 275399
Creation Date : 2004.04.18
Creator : MIG 3.0
Registration status : Qualified
RDL Definition : A device which is a line of pipe, possibly also including pumps, valves, and control devices, intended for conveying liquids, gases, or finely divided solids. Pipelines starts and ends with objects connecting the line to another unit, including another pipeline.
Note(s) : WWWebster

First relation

- PIPELINE (5)
 - CLASSIFICATION.classified (4)
 - CLASS_OF_CLASSIFICATION.class_of_classi...
 - CLASS_OF_COMPOSITION_OF_INDIVIDUAL...
 - CLASS_OF_INDIRECT_PROPERTY.class_of_p...
 - SPECIALIZATION.subclass (1)
 - SERVICE LINE (1)

Second relation

- PIPELINE (5)
 - CLASS_OF_DEFINITION.represented (1)
 - CLASS_OF_DESCRIPTION.represented (1)
 - CLASS_OF_FEATURE_WHOLE_PART.class_of_whole (1)
 - PIPELINE SECTION (0)
 - CLASS_OF_IDENTIFICATION.represented (2)
 - SPECIALIZATION.superclass (6)
 - FLEXIBLE PIPELINE (0)
 - GAS EXPORT PIPELINE (0)
 - LIQUID EXPORT PIPELINE (0)
 - PIPELINE BUNDLE (0)
 - RIGID PIPELINE (0)
 - SUBSEA FLOWLINE (3)

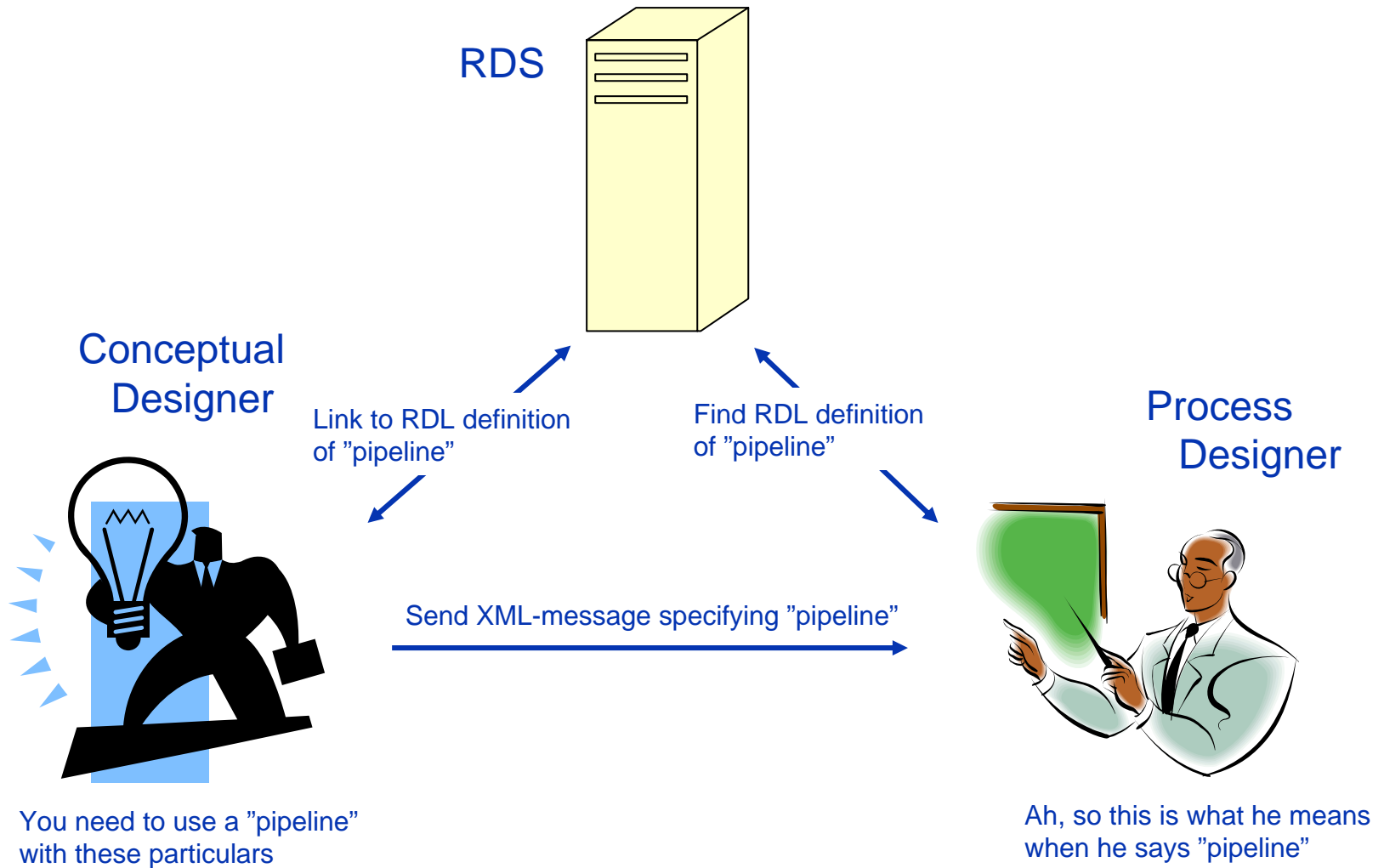
Search in: Entity types Columns

Column
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<input type="checkbox"/> P/C ID
<input type="checkbox"/> Creation Date
<input type="checkbox"/> Creator
<input type="checkbox"/> Deleted
<input type="checkbox"/> Registration status
<input type="checkbox"/> Submitter
<input type="checkbox"/> Submitting organisation
<input type="checkbox"/> Registrar
<input type="checkbox"/> Registrar Authority
<input type="checkbox"/> Stewardship
<input type="checkbox"/> Stewardship contact
<input type="checkbox"/> Alternative designation
<input type="checkbox"/> RDL Definition
<input type="checkbox"/> Administrative note(s)
<input type="checkbox"/> Change description

Online documentation export Log

- 1. Overview
- 2. RDL concepts
- 3. Components
- 4. How to
- Data Models

Ready Memory (Available/Total) 5.86 Mb / 17.85 Mb



Process design of pipeline



JAPEX - Microsoft Internet Explorer provided by Det Norske Veritas

Address: <http://www.japex.co.jp/en/overseas/cis.html#1>

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Overseas Operations

CIS · MIDDLE EAST

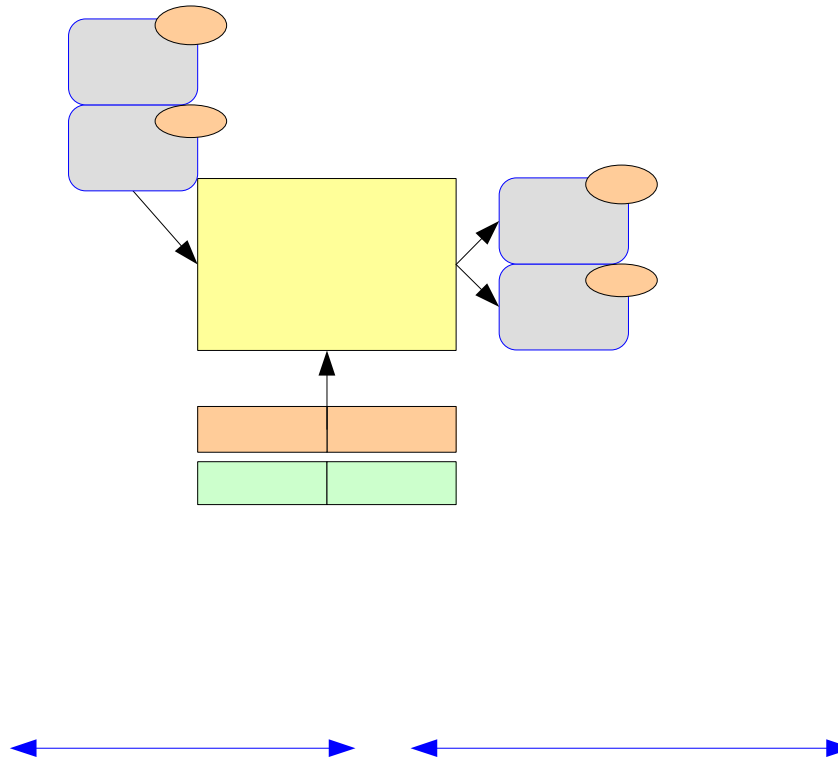
● Overseas Projects ● Representative Office

- Asia**
 - [Japex New Nanhai Ltd.](#)
 - [Universe Gas & Oil Company, Inc.](#)
 - [Jawa Oil Co., Ltd.](#)
 - [Malaysia LNG III Project.](#)
- Americas**
 - [Canada Oil Sands Co., Ltd. \(CANOS\)](#)
 - [Japex Canada Limited](#)
 - [Japex \(U.S.\) Corp.](#)
 - [Japex Gulf Producing Corp.](#)
- CIS · Middle East**
 - [Sakhalin Oil and Gas Development Co., Ltd.](#)
 - [JJI S&N B.V.](#)

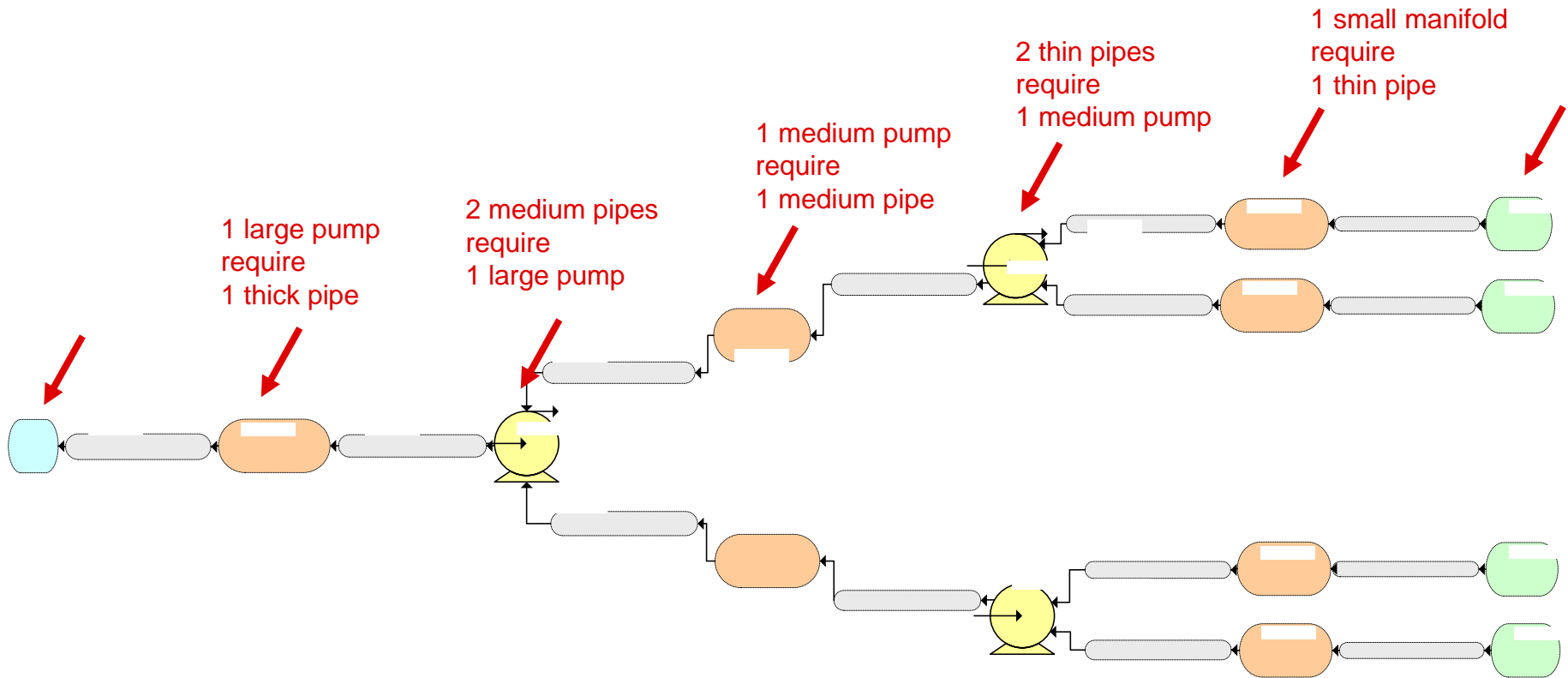
RUSSIA		MAP
Block Name	Odoptu, Chayvo, Arkutun Dagi fields, offshore Sakhalin, Russia (Sakhalin I Project)	
Japex Affiliate	Sakhalin Oil and Gas Development Co., Ltd.	
Participating Interest	30%	
Activities	Phase 1 development activities ongoing.	

The process design phase

- Given required flow rate
- Dimension pipe diameters
- Given allowable pressure range
- Determine pump capacity and pipe dimensions



Process design analysis for pipeline solution



Pipe section 12 NPS ID in the RDL



The screenshot shows the RDL Explorer interface. The title bar reads "RDL Explorer - Guest (reader) : PIPE SECTION 12 NPS ID". The address bar shows "http://193.212.132.108/rdsl". The search bar contains "*Pipe section*". The main content area displays the details for "PIPE SECTION 12 NPS ID: CLASS_OF_INANIMATE_PHYSICAL_OBJECT".

RDL Designation: PIPE SECTION 12 NPS ID
P/C ID: 16555758
Creation Date: 2004.04.18
Creator: MIG 3.0
Registration status: Standard
RDL Definition: A pipe section with a nominal inner diameter of 12 inches

The interface also shows a search result table with 9 hits, a list of relations for the selected item, and a sidebar with a table of columns and a list of navigation options.

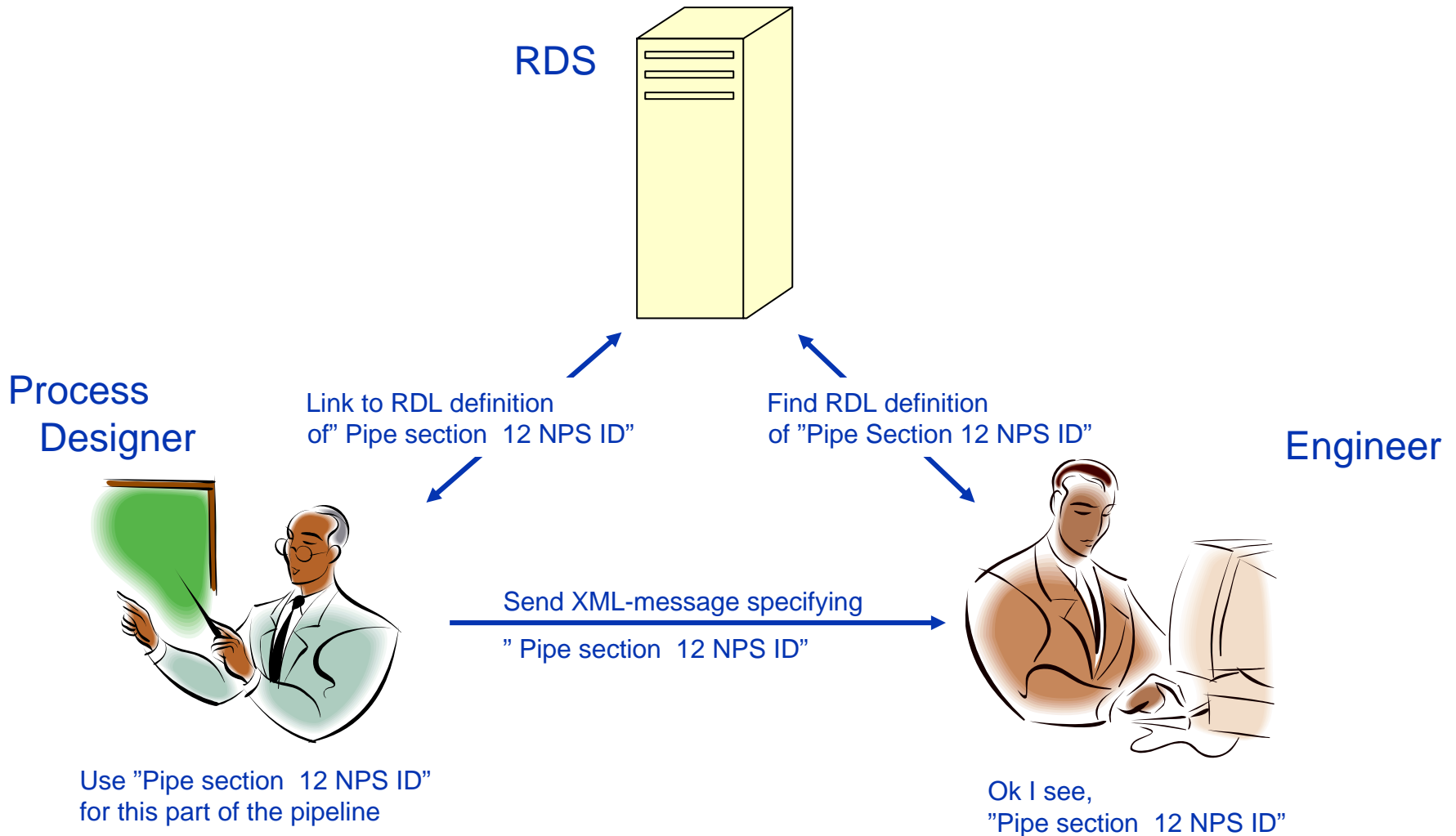
RDL Designation	Entity type
0) PIPE SECTION 18 NPS ID	CLASS_OF_INANIMATE_PHYSICAL...
1) PIPE SECTION 20 NPS ID	CLASS_OF_INANIMATE_PHYSICAL...
2) PIPE SECTION 30 INS ID	CLASS_OF_INANIMATE_PHYSICAL...
3) PIPE SECTION 16 NPS ID	CLASS_OF_INANIMATE_PHYSICAL...
4) PIPE SECTION 8 INS ID	CLASS_OF_INANIMATE_PHYSICAL...
5) PIPE SECTION 8 INS ID	CLASS_OF_INANIMATE_PHYSICAL...
6) PIPE SECTION 10 NPS ID	CLASS_OF_INANIMATE_PHYSICAL...
7) PIPE SECTION 14 NPS ID	CLASS_OF_INANIMATE_PHYSICAL...
8) PIPE SECTION 12 NPS ID	CLASS_OF_INANIMATE_PHYSICAL...

Column
<input checked="" type="checkbox"/> RDL Designation
<input type="checkbox"/> P/C ID
<input type="checkbox"/> Creation Date
<input type="checkbox"/> Creator
<input type="checkbox"/> Deleted
<input type="checkbox"/> Registration status
<input type="checkbox"/> Submitter
<input type="checkbox"/> Submitting organisation
<input type="checkbox"/> Registrar
<input type="checkbox"/> Registrar Authority
<input type="checkbox"/> Stewardship
<input type="checkbox"/> Stewardship contact
<input type="checkbox"/> Alternative designation
<input type="checkbox"/> RDL Definition
<input type="checkbox"/> Administrative note(s)
<input type="checkbox"/> Channel description

- 1. Overview
- 2. RDL concepts
- 3. Components
- 4. How to
- Data Models

Memory (Available/Total) 5.08 Mb / 19.12 Mb

Reference Data Services in handover to engineering



Detailed engineering contractor

MANAGING RISK



Capabilities - Engineering and Construction Division of Larsen & Toubro Limited - Microsoft Internet Explorer provided by De

Address: <http://www.epcworldwide.com/capabilities/>

Engineering and Construction Division

Larsen & Toubro Limited

Capabilities

- Technology Innovation
- Design & Engineering
- Front End Engineering and Design
- Engineering and Execution
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- Fabrication
- Project Planning, Progress Monitoring & Control
- IT Resources & Communication

The International Business development draws on L&T's in-house strengths & expertise in Front-End Engineering, Design Capabilities, and World-Class Manufacturing Facilities, to offer engineering solution on EPC basis. Due stress on Local fabrication and Global Procurement with tie-ups on case to case basis helps it to be price competitive. Modular Fabrication ensures that the delivery takes place in time and with the least possible time. The E&C division has a Technology Innovation Centre that has the ability to carry out process engineering, product development, mechanical design and analysis, process evaluation, computer-aided design and simulation.

L&T is one of the first companies in the world to implement the Enterprise Resource Planning (ERP) software SAP R/3 in the E&C business application. The company's IT Resources & Communication Facilities is amongst the best and most advanced in the country. The IT system integrates the execution processes for the project and also provides to the Project team the unique access to information at all stages of the project from proposal stage to the project handing over stage by leveraging the features of the SAP R/3 package. The Monitoring of the Project Progress at various stages is done through established and proven project management software like PRIMAVERA and other software duly incorporated in our ERP (SAP R/3) package.

The Company has proved its financial soundness by successfully raising USD 234 million finance through International markets by availing loan from Chase Manhattan Bank, ANZ Grindlays. The company has successfully adopted various structures like BOO, BLO, BOOST in the past. It has made Strategic alliances with world leaders enable L&T to access the technical know how and execute process intensive large scale turnkey projects.

The E&C Division offers a complete range of project services ranging from Basic Engineering, Detailed Engineering, Project Management, Procurement & Construction to Commissioning for Oil & Gas, Petroleum Refining, Chemical & Petrochemical, Fertilizer, Captive & Utility Power, Cement & Food, and Pharmaceutical Sectors.

Contact Details

Company Name :	Larsen & Toubro Limited- Chemical Plants
Address1 :	Powai Works(West),G3 Building
Address2 :	Gate No. 1,P.O. Box 8901,Saki Vihar Road.
City, Zip :	Mumbai, 400 072
Country :	India
Tel. No. :	+91-22-55051644
Fax No. :	+91-22-55051890
E-Mail :	kr@Intenc.com

Company Name :	Larsen & Toubro Limited- Oil & Gas & Special Projects-Domestic
Address1 :	EPC Block, 3rd Floor
Address2 :	Gate No.1, Powai Works (West),Saki Vihar Road
City, Zip :	Mumbai, 400 072
Country :	India
Tel. No. :	+91-22-55051928
Fax No. :	+91-22-55051951
E-Mail :	dkg@Intenc.com

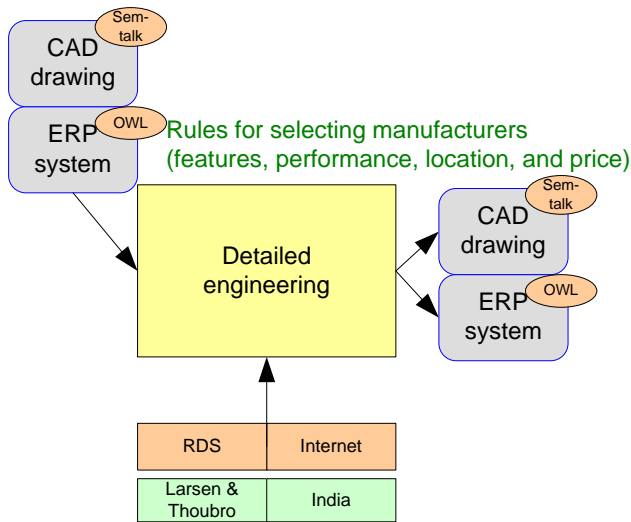
Company Name :	Larsen & Toubro Limited- Cement & Allied Machinery
Address1 :	Powai Works (West), G3 Building
Address2 :	Gate No. 1, Post Box 8901,Saki Vihar Road
City, Zip :	Mumbai, 400 072
Country :	India
Tel. No. :	+91-22-55051745
Fax No. :	+91-22-55051126/633
E-Mail :	prvp@Intenc.com

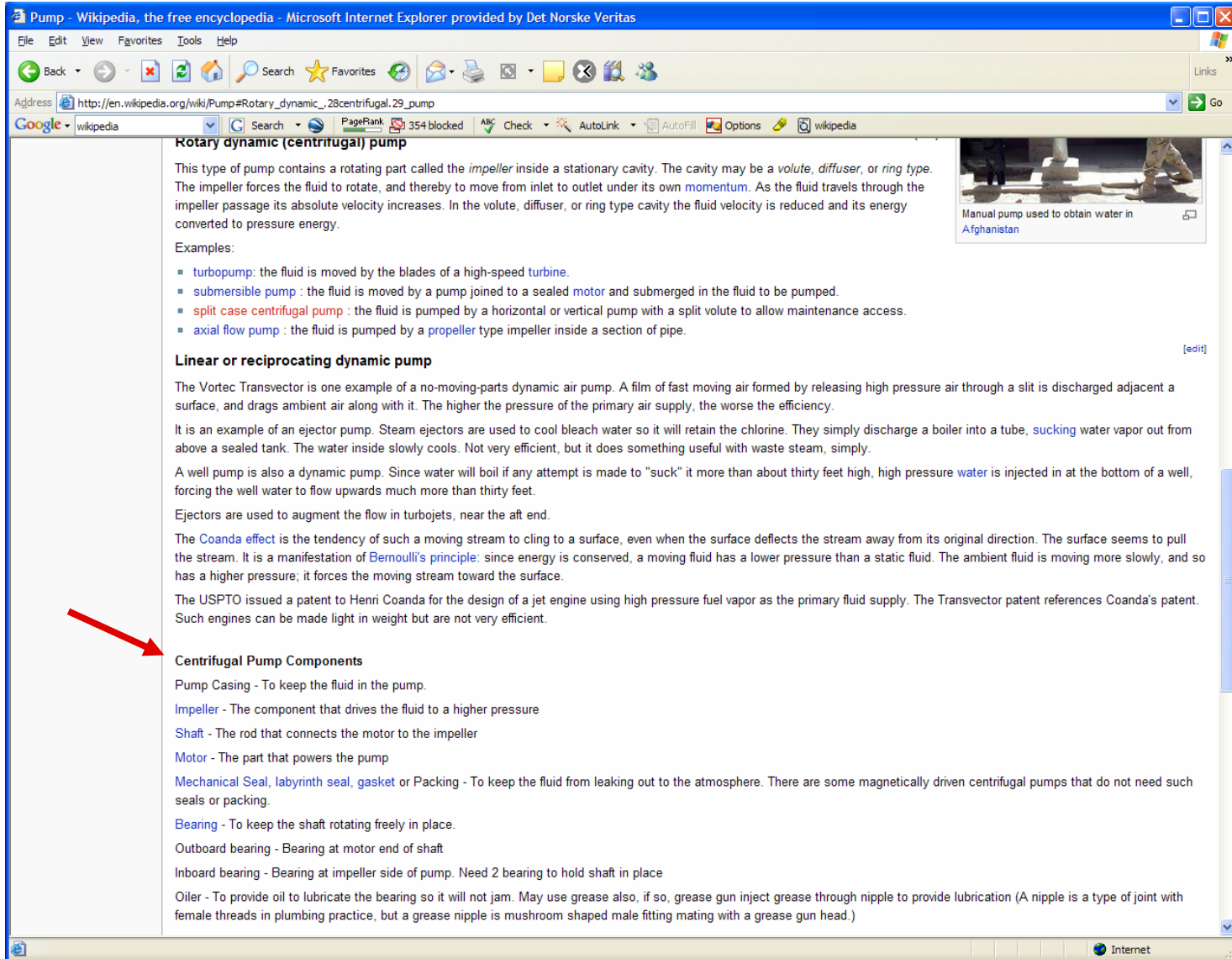
Company Name :	Larsen & Toubro Limited- EPC Power Projects
Address1 :	EPC Block, 6th floor, Gate No. 1
Address2 :	Powai (West)
City, Zip :	Mumbai, 400 072
Country :	India
Tel. No. :	+91-22-55051032
Fax No. :	+91-22-55051549
E-Mail :	sn@Intenc.com

Company Name :	Larsen & Toubro Limited - Power Projects Development
Address1 :	EPC Block, 6th floor, Gate No. 1
Address2 :	Powai (West)
City, Zip :	Mumbai, 400 072
Country :	India
Tel. No. :	+91-22-55052562, 55051061
Fax No. :	+91-22-55051549/124
E-Mail :	skn@Intenc.com

The detail engineering phase

- Given pump capacity
- Select specific pump products according to performance (and price)
- Given pipe diameters
- Select specific pipe products according to price (and performance)





Rotary dynamic (centrifugal) pump

This type of pump contains a rotating part called the *impeller* inside a stationary cavity. The cavity may be a *volute*, *diffuser*, or *ring type*. The impeller forces the fluid to rotate, and thereby to move from inlet to outlet under its own *momentum*. As the fluid travels through the impeller passage its absolute velocity increases. In the volute, diffuser, or ring type cavity the fluid velocity is reduced and its energy converted to pressure energy.

Examples:

- **turbopump**: the fluid is moved by the blades of a high-speed turbine.
- **submersible pump**: the fluid is moved by a pump joined to a sealed **motor** and submerged in the fluid to be pumped.
- **split case centrifugal pump**: the fluid is pumped by a horizontal or vertical pump with a split volute to allow maintenance access.
- **axial flow pump**: the fluid is pumped by a **propeller** type impeller inside a section of pipe.

Linear or reciprocating dynamic pump

The Vortec Transvector is one example of a no-moving-parts dynamic air pump. A film of fast moving air formed by releasing high pressure air through a slit is discharged adjacent a surface, and drags ambient air along with it. The higher the pressure of the primary air supply, the worse the efficiency.

It is an example of an ejector pump. Steam ejectors are used to cool bleach water so it will retain the chlorine. They simply discharge a boiler into a tube, **sucking** water vapor out from above a sealed tank. The water inside slowly cools. Not very efficient, but it does something useful with waste steam, simply.

A well pump is also a dynamic pump. Since water will boil if any attempt is made to "suck" it more than about thirty feet high, high pressure **water** is injected in at the bottom of a well, forcing the well water to flow upwards much more than thirty feet.

Ejectors are used to augment the flow in turbojets, near the aft end.

The **Coanda effect** is the tendency of such a moving stream to cling to a surface, even when the surface deflects the stream away from its original direction. The surface seems to pull the stream. It is a manifestation of **Bernoulli's principle**: since energy is conserved, a moving fluid has a lower pressure than a static fluid. The ambient fluid is moving more slowly, and so has a higher pressure; it forces the moving stream toward the surface.

The USPTO issued a patent to Henri Coanda for the design of a jet engine using high pressure fuel vapor as the primary fluid supply. The Transvector patent references Coanda's patent. Such engines can be made light in weight but are not very efficient.

Centrifugal Pump Components

Pump Casing - To keep the fluid in the pump.

Impeller - The component that drives the fluid to a higher pressure

Shaft - The rod that connects the motor to the impeller

Motor - The part that powers the pump

Mechanical Seal, labyrinth seal, gasket or Packing - To keep the fluid from leaking out to the atmosphere. There are some magnetically driven centrifugal pumps that do not need such seals or packing.

Bearing - To keep the shaft rotating freely in place.


Outboard bearing - Bearing at motor end of shaft

Inboard bearing - Bearing at impeller side of pump. Need 2 bearing to hold shaft in place

Oiler - To provide oil to lubricate the bearing so it will not jam. May use grease also, if so, grease gun inject grease through nipple to provide lubrication (A nipple is a type of joint with female threads in plumbing practice, but a grease nipple is mushroom shaped male fitting mating with a grease gun head.)

"Energo-Sojus" - All we do we do for you - Microsoft Internet Explorer provided by Det Norske Veritas

Address: http://www.pumpsland.com/data_e/index.php?url=about_e.htm



Monday
June 12, 2006

GENERAL PUMPING CATALOGUE

- Search
- Thermal power stations
- Nuclear electric generation
- Heating plants
- Petroleum industry
- Oil refineries
- Chemical and petrochemical industries
- Hydraulic control, fuel oil & lube oil systems
- Coal & ore mining
- Sugar industry
- General industry
- Sewage disposal & water treatment
- Vacuum & pneumatic plants and systems

SERVICES MEMBER MORE


Pipeline Pumps

Multistage Segmental

Designed for transporting crude oil and refined oil products at pumping temperature up to 80°C through long-distance pipelines and products lines and can be installed at oil pumping plants to generate the required head in the long-distance pipelines to match the system requirements. Electrically driven horizontal multistage ring-section centrifugal pumps. Single flow impeller arrangement, with all the impellers facing the same way.

The pump rotor is carried by the plain bearings with forced oil lubrication. Shaft sealing: mechanical seals.

The pumping units are made either in the climatic version Y (for areas with a temperate climate), the location category 2 (under roof) at the lowest ambient temperature of minus 29°C or in the climatic version YX.II (for areas with a temperate and cold climate), the location category 4 (in case of II 500-800, NM 1250-400) according to GOCT 15150-69.



NM


Pump make	Capacity, m ³ /h	Head, m	Rotational speed, rpm	Power of motor, kW
NM 125-550	125	550	3000	315
NM 125-550	125	550	3000	400
NM 180-500	180	500	3000	400
NM 180-500	180	500	3000	500
NM 250-475	250	475	3000	500
NM 250-475	250	475	3000	630
NM 360-460	360	460	3000	630
NM 360-460	360	460	3000	500
NM 360-460	360	460	3000	800
NM 500-300	500	300	3000	630
NM 500-300	500	300	3000	500
NM 500-300	500	300	3000	800
NM 710-280	710	280	3000	800
NM 710-280	710	280	3000	1000

Radially Split Barrel

Electrically driven horizontal multistage radially split diffuser barrel-casing centrifugal pumps with a withdrawable cartridge of ring-section type. Single flow impeller arrangement, with all the impellers facing the same way. The pump rotor is carried by the plain bearings with forced oil lubrication. Shaft sealing: mechanical seals.

Pump make	Capacity, m ³ /h	Head, m	Rotational speed, rpm	Power of motor, kW
NM 500-800	500	300	3000	1600
NM 1250-400	1250	400	3000	1600

Turbine- or motor-driven horizontal barrel-casing centrifugal pumps with a withdrawable cartridge of multistage ring-section type. Single flow impeller arrangement, with all the impellers facing the same way. The pump rotor is carried by the pressure oil lubricated plain bearings. Shaft sealing: mechanical seals with external heat exchangers. By providing an inducer upstream of the first stage impeller a high suction capacity is



Pipe specifications



Nominal Pipe Size - Wikipedia, the free encyclopedia - Microsoft Internet Explorer provided by Det Norske Veritas

http://en.wikipedia.org/wiki/Nominal_pipe_size

Nominal Pipe Size

From Wikipedia, the free encyclopedia
(Redirected from *Nominal pipe size*)

Nominal Pipe Size (NPS) is a set of standard pipe sizes used for pressure piping in North America. The same pipe dimensions are used with different names in Europe. It is often incorrectly called National Pipe Size, due to confusion with *National pipe thread*. For other pipe size standards, see *pipe (material)*.

Pipe size is specified with two non-dimensional numbers: a Nominal Pipe Size (NPS) and a schedule. (SCH) The relationship between these numbers and the actual pipe dimensions is a bit strange. The NPS is very loosely related to the inside diameter in inches, but only for NPS 1/8 to NPS 12. For NPS 14 and larger, the NPS is equal to the outside diameter (OD) in inches. For a given NPS, the OD stays constant and the wall thickness increases with larger SCH. For a given SCH, the OD increases with increasing NPS while the wall thickness increases or stays constant. Pipe sizes are documented by a number of standards, including API 5L, *ANSI/ASME B36.10M* in the US, BS 1600 and BS 1387 in the United Kingdom, and *DIN 2448* in Europe. The European standard uses the same pipe ID's and wall thicknesses, but labels them with a Diametre Nominal (DN) instead of NPS. For NPS larger than 14, the DN is equal to the NPS multiplied by 25. (Not 25.4)

The most commonly used schedules today are 40, 80, and 160. There is a commonly held belief that the schedule number is an indicator of the service pressure that the pipe can take. For example, the McGraw Hill Piping Handbook say the schedule number can be converted to pressure by dividing the schedule by 1000 and multiplying by the allowable stress of the material. (Ref. #2) However, this is not true. Pressure rating goes down with increasing NPS and constant schedule.

The various standards for pipe schedule are not identical. Frequently some sizes, or even entire schedules, are present in some standards but not others. When different standards do overlap, they usually have the same dimensions. For this reason, the source of the schedules is not distinguished in the table below. Beyond NPS 8, however, there are differing version of schedules 5, 10, 40, and 80. There variations are distinguished by the presence or absence of an 'S' suffix after the schedule number.

Some specifications use pipe schedules called Standard Wall, (STD) Extra Strong, (XS) and Double Extra Strong (XXS), although these actually belong to an older system called *Iron pipe size* (IPS). The IPS number is the same as the NPS number. STD is identical to SCH 40s, and 40s is identical to 40 for NPS 1/8 to NPS 10, inclusive. XS is identical to SCH 80s, and 80s is identical to 80 for NPS 1/8 to NPS 8, inclusive. Different definitions exist for XXS, but it is generally thicker than schedule 160.

Copper **plumbing tube** for residential plumbing follows an entirely different size system; see *domestic water system*. PVC is available in two forms: PVC, which is made in NPS sizes, and CPVC, which is the same material but made in copper plumbing tube sizes. (CTS)

Wikipedia

Links

Go

160

5

9

8

[edit]

[edit]

Internet

NPS	DN	OD (inches)	Wall Thickness (inches)														
			SCH 5s	SCH 5	SCH 10s	SCH 10	SCH 20	SCH 30	SCH 40s	SCH 40	SCH 60	SCH 80s	SCH 80	SCH 100	SCH 120	SCH 140	SCH 160
10	250	10.75	.134	.134	.165	.165	.250	.307	.365	.365	.500	.500	.593	.718	.843	1.000	1.125
12	300	12.75	.156	.165	.180	.180	.250	.330	.375	.406	.500	.500	.687	.843	1.000	1.125	1.312
14	350	14.00	.156		.188	.250	.312	.375	.375	.437	.593	.500	.750	.937	1.093	1.250	1.406
16	400	16.00	.165		.188	.250	.312	.375	.375	.500	.656	.500	.843	1.031	1.218	1.437	1.593
18	450	18.00	.165		.188	.250	.312	.437	.375	.562	.750	.500	.937	1.156	1.375	1.562	1.781
20	500	20.00	.188		.218	.250	.375	.500	.375	.593	.812	.500	1.031	1.280	1.500	1.750	1.968
24	600	24.00	.218		.250	.250	.375	.562	.375	.687	.968	.500	1.218	1.531	1.812	2.062	2.343

References

- Oberg, Erik; Franklin D. Jones, Holbrook L. Horton, and Henry H. Ryffel (2000). ed. Christopher J. McCauley, Riccardo Heald, and Muhammed Iqbal Hussain *Machinery's Handbook*, 26th edition, New York: Industrial Press Inc., ISBN 0-8311-2635-3.
- Nayyar, P.E., Mohinder L. (2000). "A1", Mohinder L. Nayyar, P.E. *Piping Handbook*, 7th, New York: McGraw-Hill. ISBN 0-07-047106-1.

Categories: Piping | Engineering

Pipe Manufacturer's website



Steel Pipes Manufacturers, Steel Tubes Suppliers, Steel Pipes Suppliers, Steel Tubes Manufacturers - Microsoft Internet Explorer p

Address: http://www.suryaglobal.com/

pipe manufacturer oil

SURYA GLOBAL

cold rolled steel pipe, steel tubes exporter

Surya Roshni Launches Utility Range of E

SGS CERTIFIED

Excellence through Quality

Surya Global is the international business gateway of the Surya Roshni Group. We are one of the fastest growing industrial groups in India with strength of over 10,000 skilled employee and an annual turnover of over US \$ 600 Million. The group started its operation two decades back as a **steel pipe & tubes** manufacturing unit at Bahadurgarh (Haryana), North India. It has now become a multi-national, multi-product steel conglomerate. Today it has one of the largest **steel tubes** manufacturing plant in the world. Surya Group is also reputed as India's second largest manufacturer of lighting products and exports fluorescent tubes in more than 40 countries around the globe. We are also involved in the business of natural herbal health care products and Information Technology.

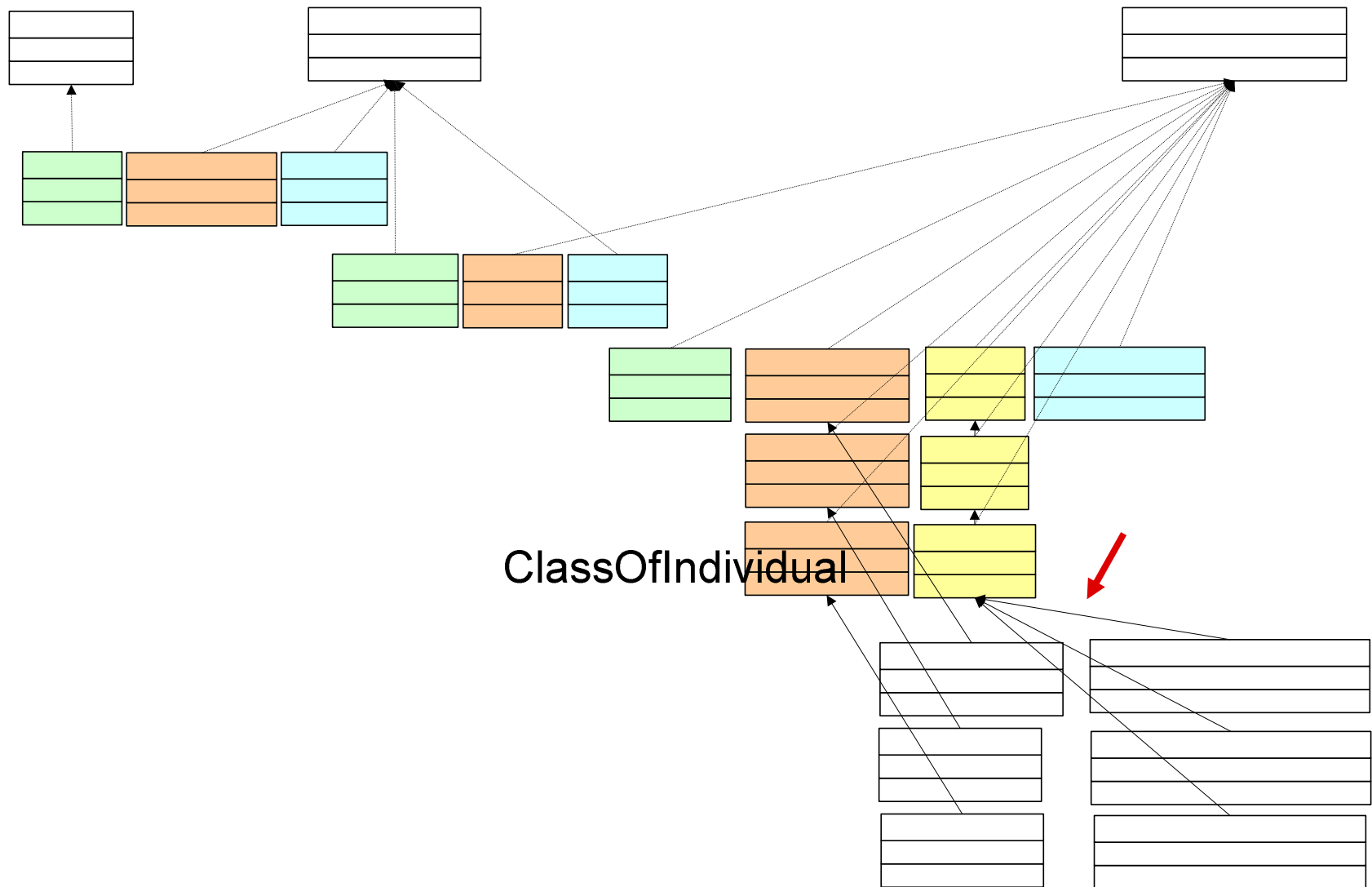
- Steel Pipes & Tubes**
In 1973, the Surya group set up its first venture - a **steel pipe** plant at Bahadurgarh (Haryana) North India. Today, this plant is one of the largest of its kind in Asia!..... [more](#)
- Lighting Products**
Surya Roshni has grown phenomenally within a short period of time to become one of India's largest manufacturers of lighting products. [more](#)
- Herbal**
Surya Herbal believes in an integrated approach to healthcare. The present day disease management has well recognized its limitations and alternative modes are being sought. Ayurveda has much to the healthcare needs of the world..... [more](#)
- Cold Rolled Steel**
Cold Rolled Strips/Sheets serve as critical inputs for a wide range of applications in a wide spectrum of industries. Considering the sophisticated applications[more](#)

Software Solutions
Surya is a global software services company providing digital technology solutions to the enterprises worldwide. Combining proven expertise in technology, and.....[more](#)

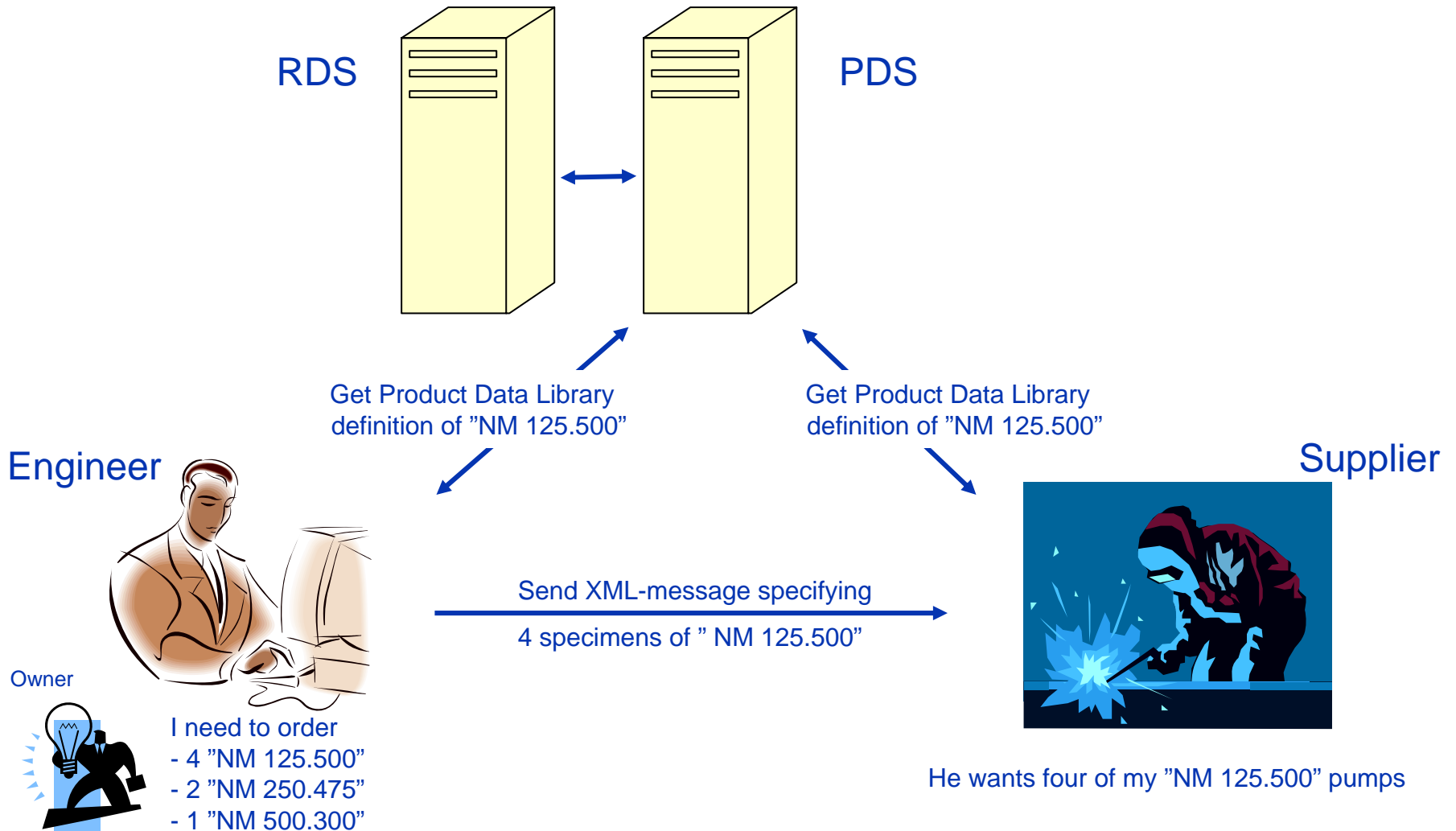
Chairman's Message
I feel that the company's strong brand, large size plants, integrated facilities, operational economies, vast network, skilled manpower, market-oriented product range and strict adherence to quality standards are its ticket to more competitive business world.

Fluorescent Tube Lamps
GLS Lamps

SURYA
STEEL PIPES & C.R. STRIPS

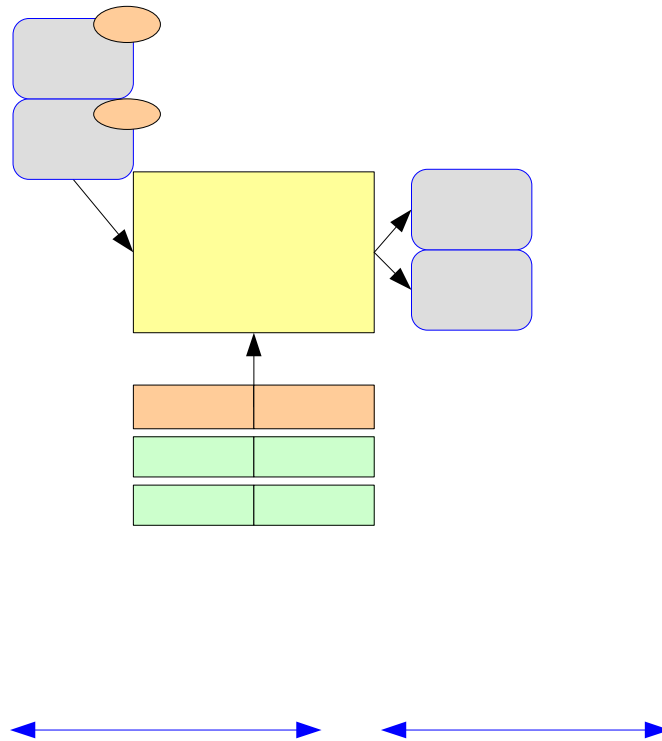


Reference Data Services in hand-over to production

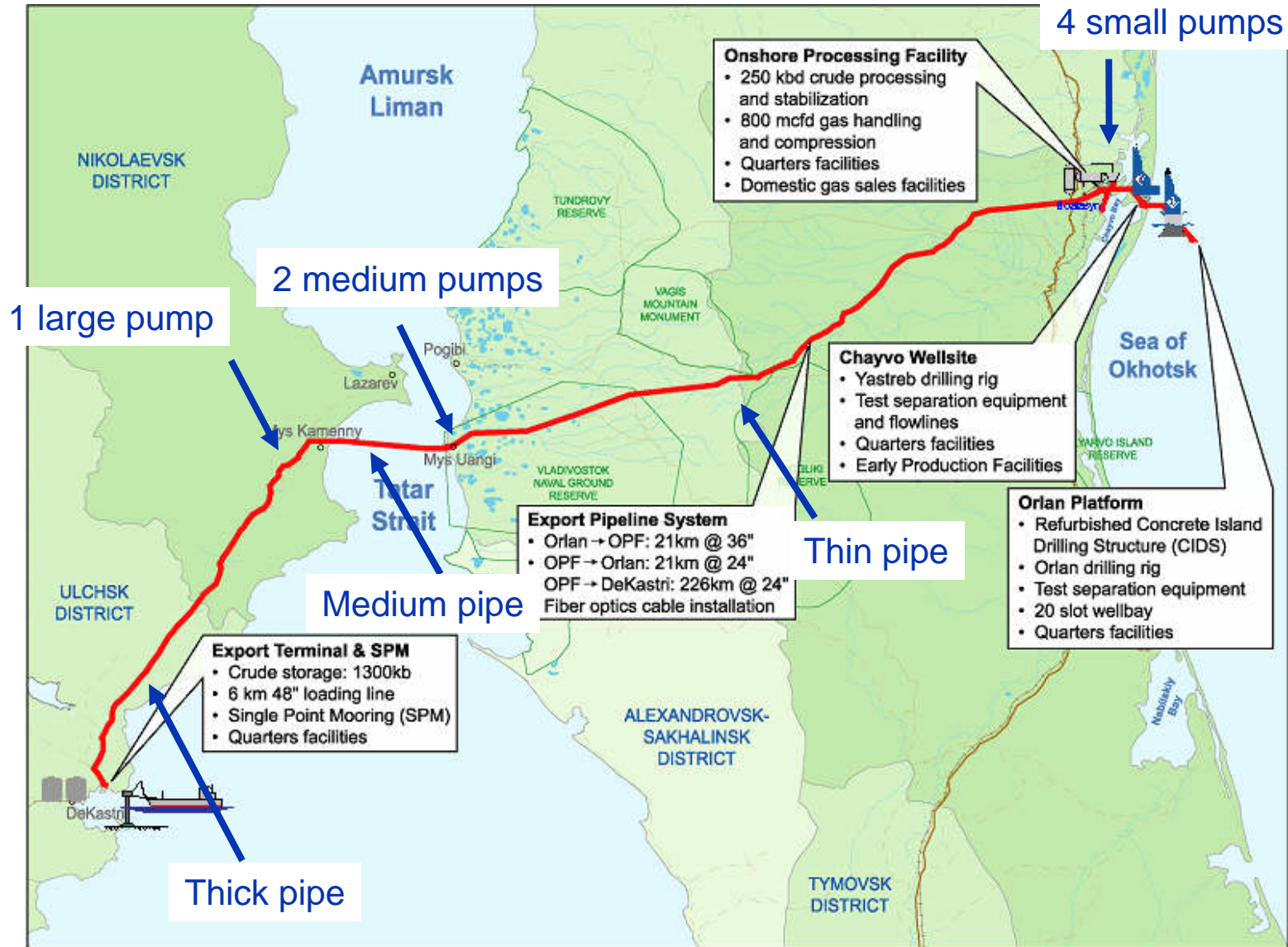


The production and installation phase

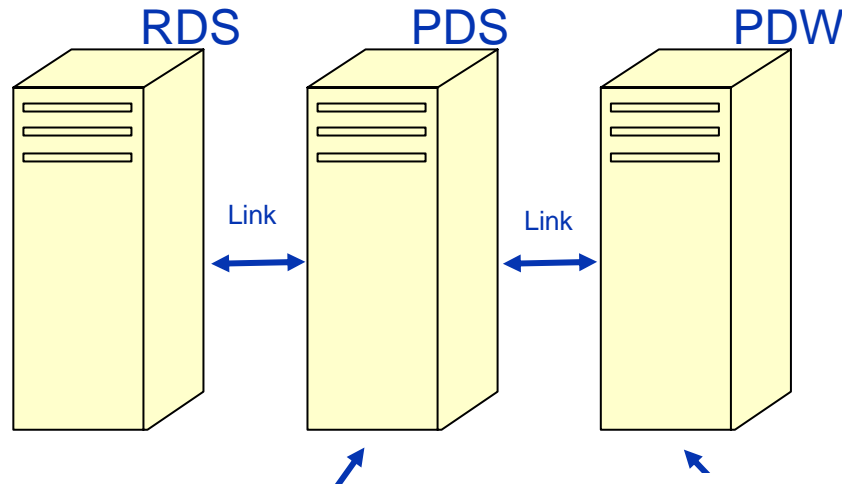
- Given order for specific pipes and pumps
- Produce and deliver pipes and pumps
- Given delivery of acquired product
- Install pipes and pumps



The Sakhalin island pipeline



Reference Data Services in hand-over to commissioning



Get Product Data Library
definition of "NPS 16 OD 16 SCH 60"

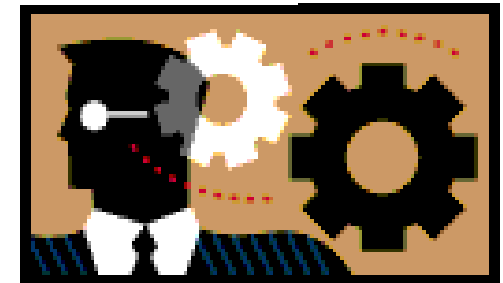
Link to Product Data Library
definition of " NPS 16 OD 16 SCH 60"
Write pipe data into Project Data Warehouse
for locations "position 0" to "position 1500"

Supplier



Send XML-message specifying 30.000 pieces of
"NPS 16 OD 16 SCH 60" pipe
from "position 0" to "position 1500"

Operator



We have delivered 30.000 pieces of
"NPS 16 OD 16 SCH 60" pipe.
Installed from "position 0" to "position 1500"

I need to document the pipeline in the PDW
with 30.000 pieces of "NPS 16 OD 16 SCH
60" pipe from "position 0" to "position 1500"



The screenshot shows two overlapping browser windows. The top window displays the DNV website's main navigation and a sidebar for 'ASSET OPERATIONS'. The bottom window shows an 'Inside DNV' page for Vladivostok, featuring a navigation menu, a 'DNV Korea' header, and a 'Vladivostok Station' section with contact information. A red arrow points to the 'Vladivostok' text in the 'Vladivostok Station' section.

ASSET OPERATIONS

- services
 - Maintenance optimisation and maintenance management
 - Inspection (RBI) optimisation and inspection management
 - Reliability and availability optimisation
 - Fitness-for-service and lifetime extension
 - Inspection services
 - list of detailed references

Inspection (RBI) and inspection

Inspection planning risk-based inspection the core competence of Operations services

Optimise without compromise!

It ensures that the optimised without environmental performance

Our approach includes:

- Preparation of inspection plan
- Data collection
- RBI analysis
- Development of inspection plan
- Implementation support.

We have developed tools (including C levels) to assist us in inspection optimisation

top of page

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Inside DNV

Welcome Tore R. Christiansen

Go to Advanced Search >>

Go to Directory >>

Home | **DNV Common** | **DNV Local / Korea** | Organisational Unit

News and events | Working in DNV | **Our organisation** | Support | Customers & relations

DNV Korea

History RK

- Our employees
- Travel and office information
 - Jinhae
 - Koje
 - Mokpo
 - Pusan
 - Seoul
 - Tongyeong
 - Ulsan
 - Vladivostok**

Vladivostok

Vladivostok Station

Address : Room 612, Vladivostok Business Cent
29 Semenovskaya Street
690010 Vladivostok, Russia
Tel : +7 4232 40 7083
Fax : +7 4232 40 7082

Date: 2004-12-15

Contacts

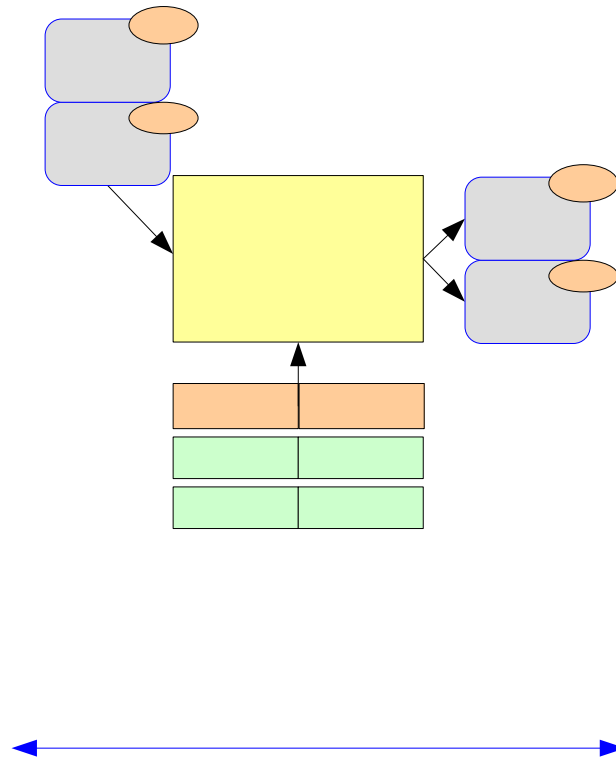
- [Vladivostok Station \(MKORU131\)](#)

[Confidentiality statement](#) | © Det Norske Veritas |

start | Calendar - Microsoft... | Microsoft PowerPoint... | Local intranet

The operational phase

- Given installed pipelines in operation
- Perform DNV inspection of pipe to verify wall thickness
- Replace corroded pipe



Maintenance in the RDL



The screenshot shows the RDL Explorer application interface. The top navigation bar includes 'File', 'Edit', 'View', 'Favorites', 'Tools', and 'Help'. The address bar shows the URL 'http://193.212.132.108/rds/'. The search bar contains '*maintain*'. The search results table is as follows:

RDL Designation	Entity type
0 TO MAINTAIN	CLASS_OF_ACTIVITY
1 PRESSURE MAINTAINING VALVE	CLASS_OF_INANIMATE_PHYSICAL...

The main content area displays details for 'TO MAINTAIN: CLASS_OF_ACTIVITY':

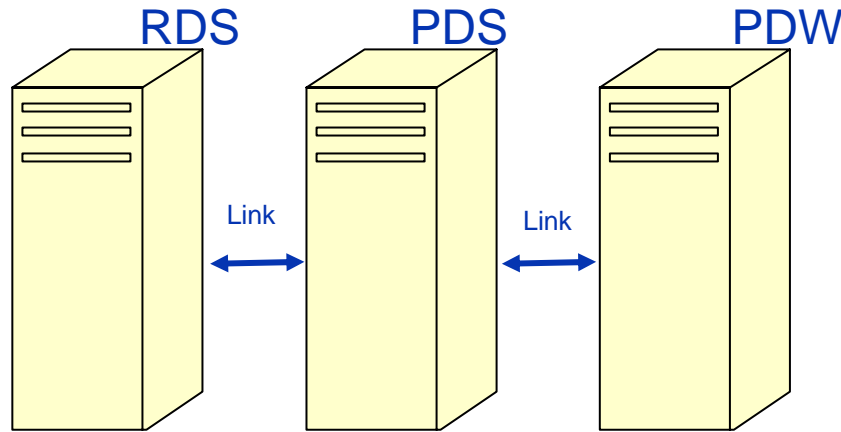
- RDL Designation:** TO MAINTAIN
- P/C ID:** 9661742
- Creation Date:** 2004.04.18
- Creator:** MIG 3.0
- Registration status:** Qualified
- RDL Definition:** To keep in state of repair, efficiency, or validity, preserving from failure or decline
- Note(s):** changed classification

Below the details are two relation trees:

- First relation:** TO MAINTAIN (2) - CLASSIFICATION.classified (6), SPECIALIZATION.subclass (1), TO RESTORE (1), TO ACT (1), TO HAPPEN (1), ISO-IS 15926-4 ACTIVITY (0)
- Second relation:** TO MAINTAIN (4) - CLASS_OF_DEFINITION.represented (1), CLASS_OF_DESCRIPTION.represented (1), CLASS_OF_IDENTIFICATION.represented (2), SPECIALIZATION.superclass (6), BOILER MAINTENANCE (0), CONDITION-BASED MAINTENANCE (0), CORRECTIVE MAINTENANCE (0), PREVENTIVE MAINTENANCE (0), TO INCUBATE (0), TROUBLESHOOTING (0)

The bottom left shows a table with columns for 'Search in', 'Entity types', and 'Columns'. The bottom right shows a navigation menu with items like '1. Overview', '2. RDL concepts', '3. Components', '4. How to', 'Data Models', and 'System Documentation'. The status bar at the bottom indicates 'Ready' and 'Memory (Available/Total) 9.03 Mb / 33.57 Mb'.

Reference Data Services in product support



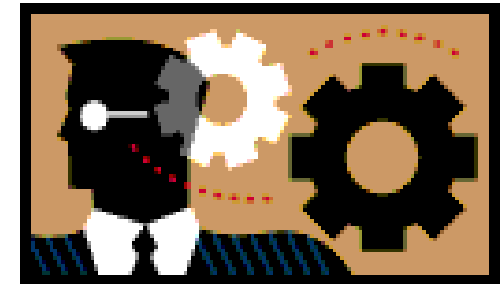
Access Project Data Warehouse
get product data for location "position 125"
Link to Product Data Library
definition of "NPS 16 OD 16 SCH 60"

Link to Project Data Warehouse
definition of "NPS 16 OD 16 SCH 60"
Update Project Data Warehouse
for location "position 125"

Inspector



Operator



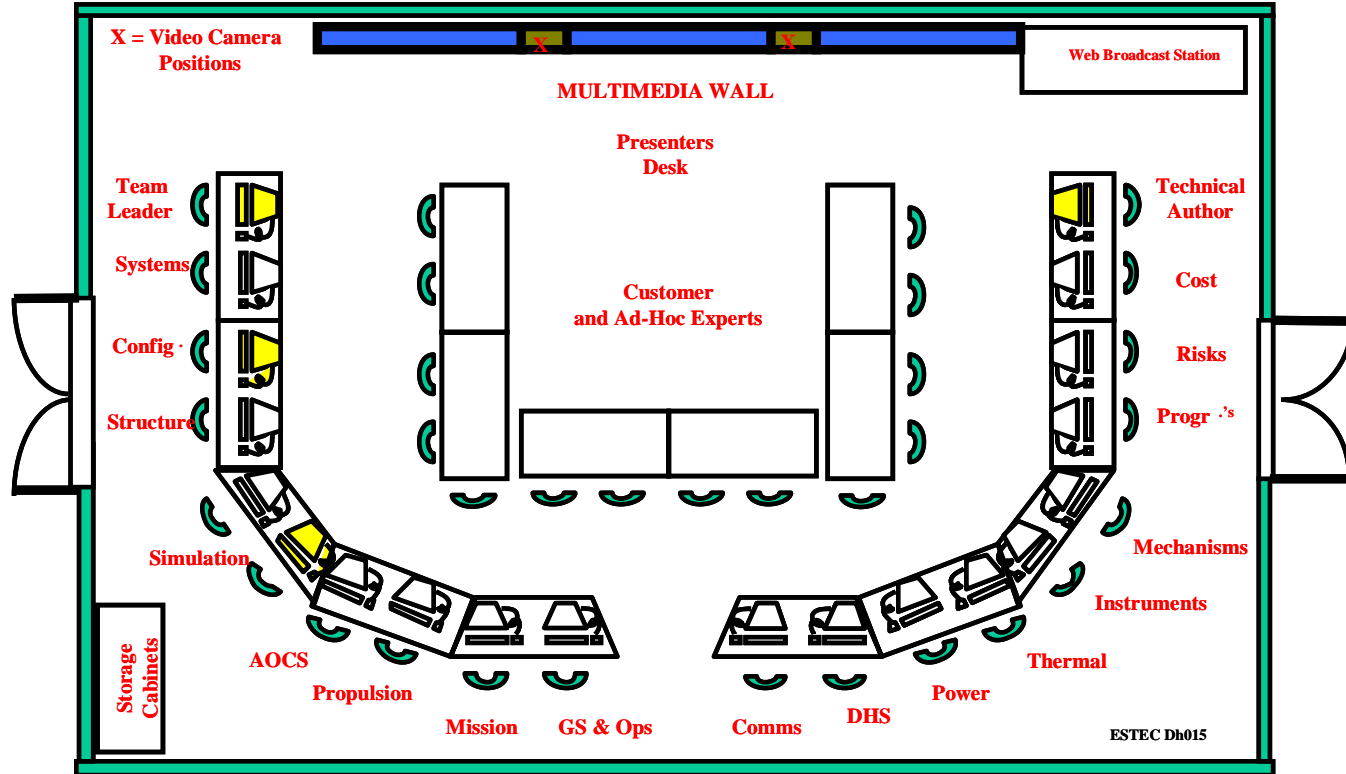
Send XML-message specifying 200 meters of
"NPS 16 OD 16 SCH 60" pipe at "position 125"

The inspection shows a need to replace
200 meters of "NPS 16 OD 16 SCH 60"
pipe at "position 125"

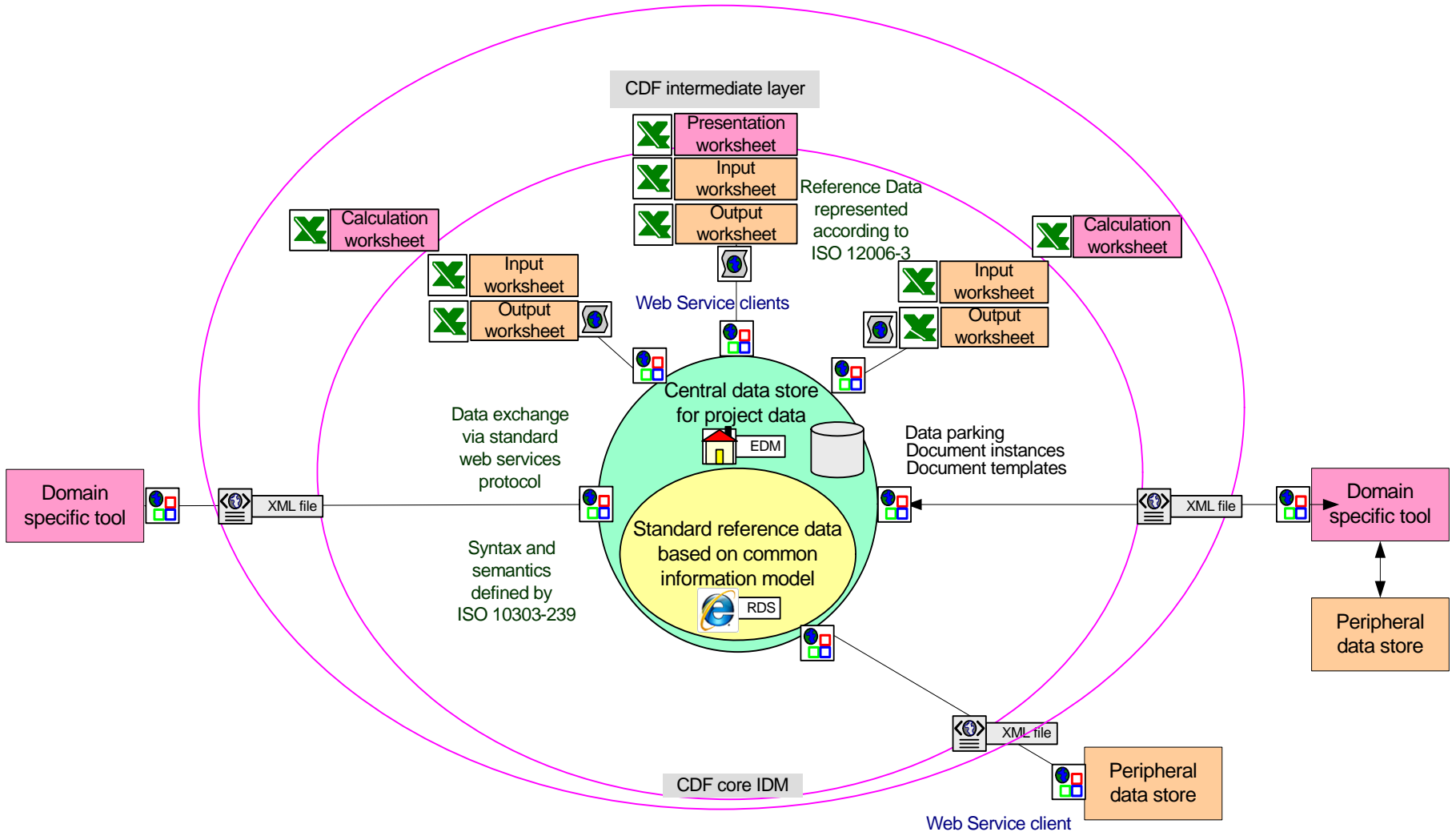
I need to place an order for 200 meters of
"NPS 16 OD 16 SCH 60" with the supplier and
prepare my team for installation at "position 125"

- The European Space Agency studies many potential space missions
- Early phase engineering Space Mission involves feasibility and functionality
- More than twenty disciplines are mutually dependent
- Need to develop and use advanced collaboration tools
- ESTEC hosts the ESA Concurrent Design Facility
- Currently based on linked set of Excel workbooks
- Currently requires simultaneous on-site presence
- ESA wants to distribute design and work with national partners
- An Open Concurrent Design Server (OCDS) based on Web Services
- **Common** Space Engineering Information Model (SEIM)
- **Shared** Space Engineering Reference Data Library (SERDL)

The Concurrent Design Facility at ESTEC



The Open Concurrent Design Server

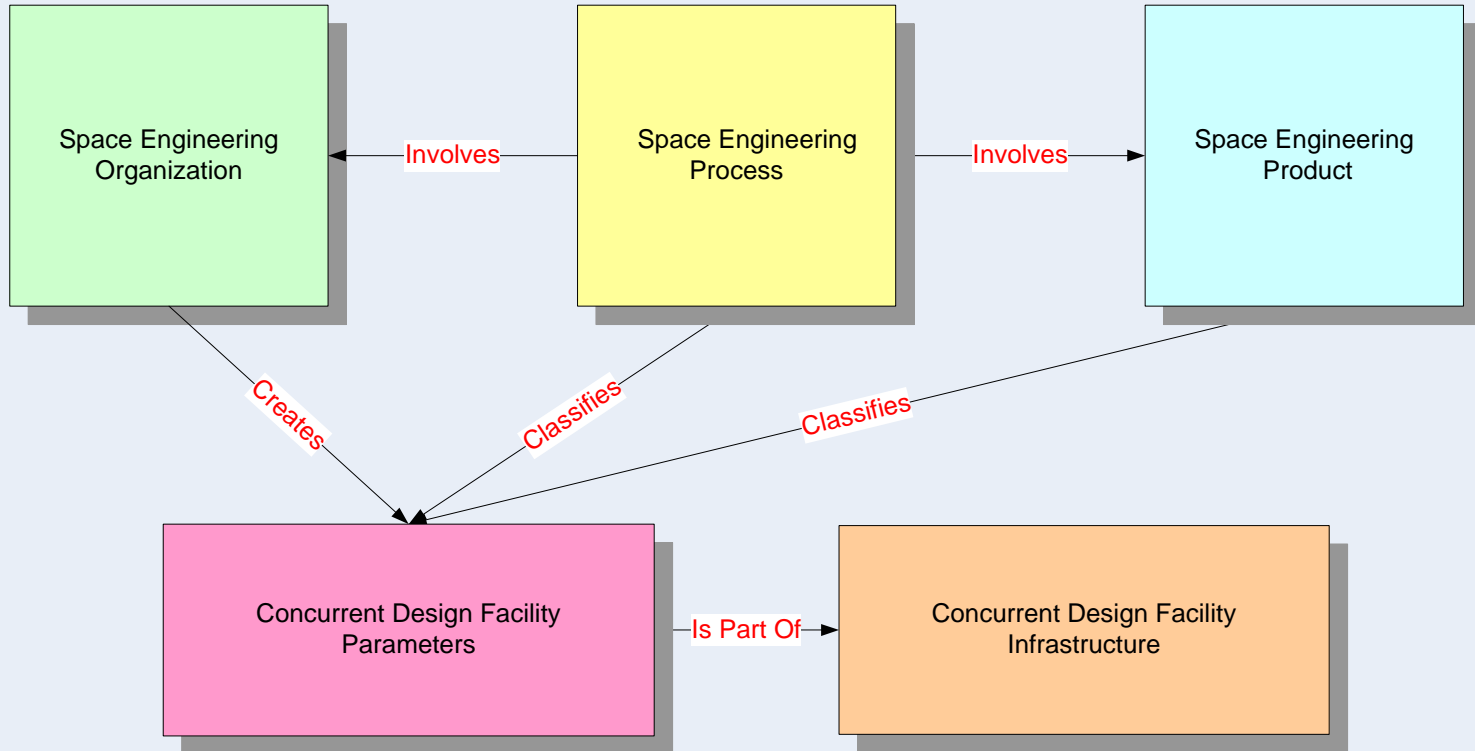


The ESA Space Engineering Information Model



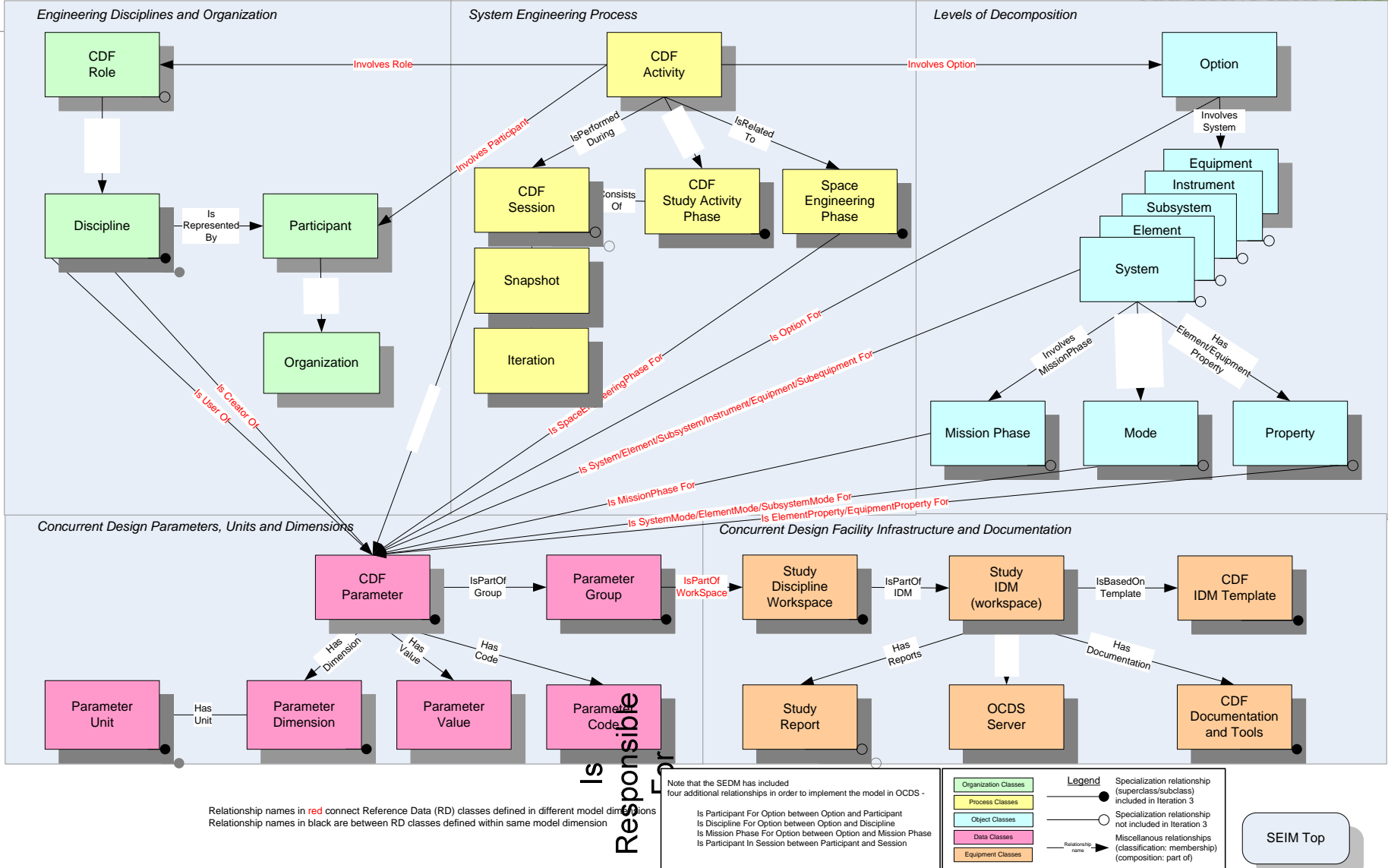
MANAGING RISK

SEIM Main Information Objects and Relationships



- ECSS Standards
- ISO 10303-239 Standard
- ISO 12006 Standard
- OCDS Web Services
- SEDM Documentation
- SERDL Documentation
- SERDL Iteration 3

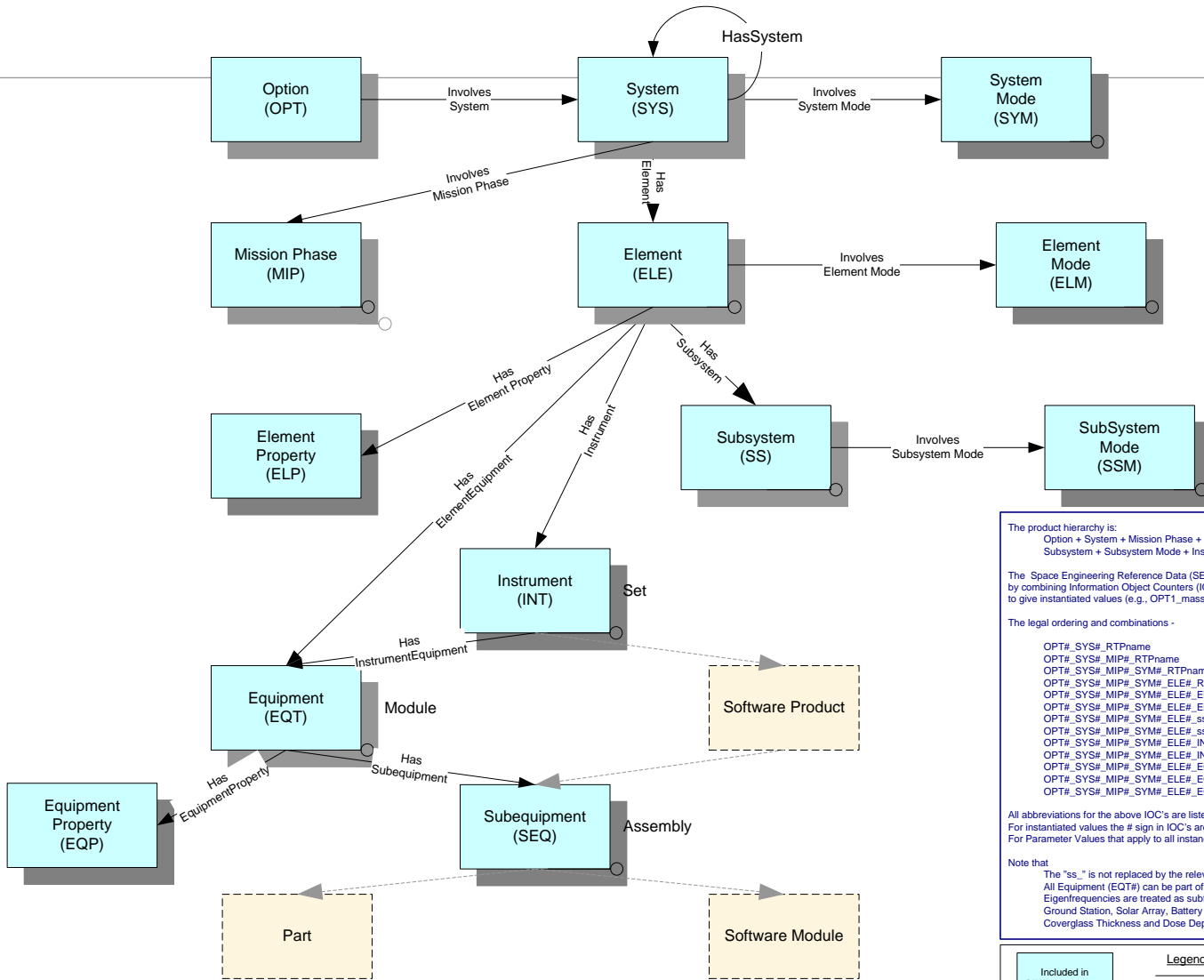
Main Relationships in the ESA Space Engineering Information Model



Levels of Decomposition in Space Engineering



MANAGING RISK



The product hierarchy is:
 Option + System + Mission Phase + System Mode + Element + Element Mode + Element Property + Subsystem + Subsystem Mode + Instrument + Equipment + Equipment Property + Subequipment

The Space Engineering Reference Data (SERD) values are created from CDF Reference Parameter Types (RTP) by combining Information Object Counters (IOC - e.g., ELE# with value ELE1, etc.) and RTP Names (e.g., mass) to give instantiated values (e.g., OPT1_mass).

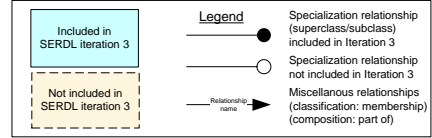
The legal ordering and combinations -

```

    OPT#_SYS#_RTPname
    OPT#_SYS#_MIP#_RTPname
    OPT#_SYS#_MIP#_SYM#_RTPname
    OPT#_SYS#_MIP#_SYM#_ELE#_RTPname
    OPT#_SYS#_MIP#_SYM#_ELE#_ELM#_RTPname
    OPT#_SYS#_MIP#_SYM#_ELE#_ELP#_RTPname
    OPT#_SYS#_MIP#_SYM#_ELE#_ss#_RTPname
    OPT#_SYS#_MIP#_SYM#_ELE#_ss#_SSM#_RTPname
    OPT#_SYS#_MIP#_SYM#_ELE#_INT#_RTPname
    OPT#_SYS#_MIP#_SYM#_ELE#_INT#_EQT#_RTPname
    OPT#_SYS#_MIP#_SYM#_ELE#_EQT#_RTPname
    OPT#_SYS#_MIP#_SYM#_ELE#_EQT#_EQP#_RTPname
    OPT#_SYS#_MIP#_SYM#_ELE#_EQT#_SEQ#_RTPname
    
```

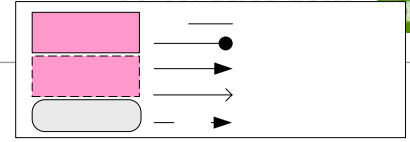
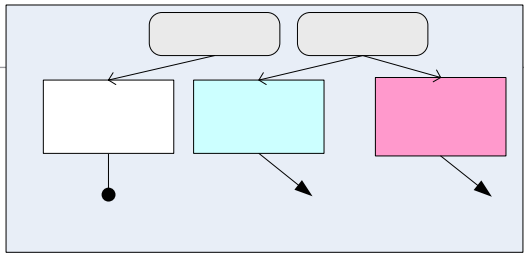
All abbreviations for the above IOC's are listed in the SERDL Documentation (which is linked from the SEIM top page)
 For instantiated values the # sign in IOC's are replaced by the relevant number for the Information Object
 For Parameter Values that apply to all instances the IOC is dropped (most often for OPT# and SYS#)

Note that
 The "ss_" is not replaced by the relevant Discipline (instead the SERD instance has Discipline as its Creator)
 All Equipment (EQT#) can be part of Elements (ELE#) as well as Instruments (INT#)
 Eigenfrequencies are treated as subtypes of Element Property (ELP#)
 Ground Station, Solar Array, Battery and Antenna are treated as subtypes of Equipment (EQT#)
 Coverglass Thickness and Dose Depth are treated as subtypes of Equipment Property (EQP#)

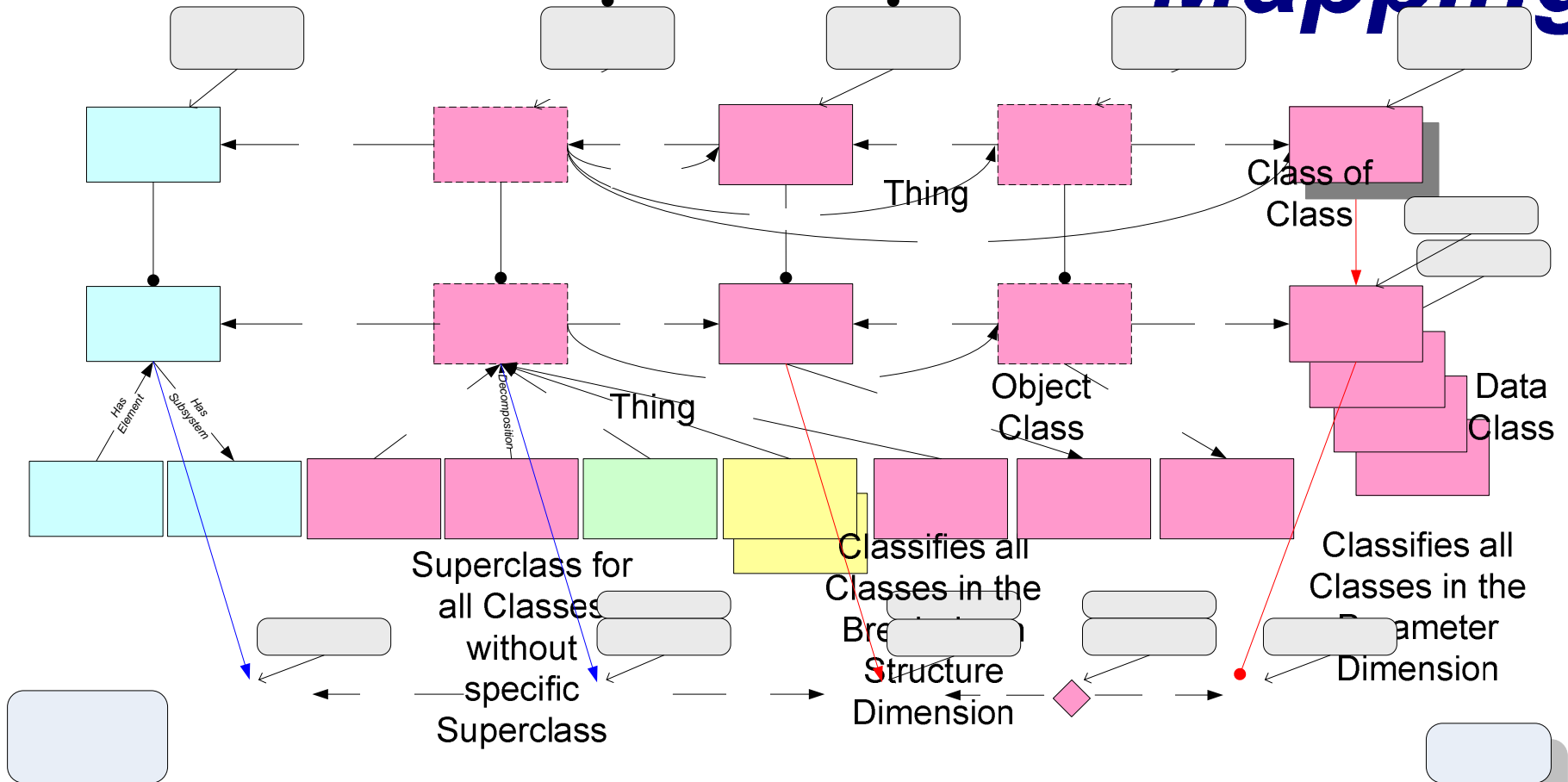


SEIM Relationships

Note that only parts of the Product break-down structure is in scope for Concurrent Design in the CDF IDM (and thus not all parts of the break-down structure has been included in SERDL Iteration 3)




Mapping



SERDL Browser - Microsoft Internet Explorer provided by Det Norske Veritas

File Edit View Favorites Tools Help del.icio.us TAG



SERDL Browser

Enter Reference Data Name in the textbox (use '%' as wildcard), press the 'Get Tree'-button and use the tree to browse the hierarchy. By clicking the underlined Reference Data Name in the tree, detail information is displayed with options for searching relations and meta-data (in the righthand side of the screen). There is also a [graphical presentation of the model](#) which may be a good starting point for browsing through the Information Model.

Reference Data name:

- [-] AEROCAPTURE VEHICLE FRONT CURVATURE ANGLE
 - [+] CLASS_OF_COMPOSITION_OF_INDIVIDUAL
 - [+] CLASSIFICATION
 - [+] OTHER_RELATIONSHIP
 - [+] SPECIALIZATION

Select relations to search

1. Search relations for each class in selected tree

CLASS_OF_COMPOSITION_OF_INDIVIDUAL
 CLASS_OF_IDENTIFICATION
 CLASS_OF_INDIRECT_PROPERTY
 CLASSIFICACIÓN
 INDIRECT_PROPERTY
 OTHER_RELATIONSHIP

2. Search classes in relation tree

CLASS_OF_COMPOSITION_OF_INDIVIDUAL
 CLASS_OF_IDENTIFICATION
 CLASS_OF_INDIRECT_PROPERTY
 CLASSIFICATION
 INDIRECT_PROPERTY
 OTHER_RELATIONSHIP

3. Search direction for the relations in list no. 2

First relation ("superclasses")

Second relation ("subclasses")

Both relations

4.

Custom reports:

AEROCAPTURE VEHICLE FRONT CURVATURE ANGLE

P/C ID: CDF4784
 Entity Type: CLASS_OF_INDIRECT_PROPERTY
 Registration Status: OCDS ITERATION 3
 RDL Definition: Aerocapture vehicle front curvature angle.

PROPERTY SPACE: [Dimensionless](#)
 POSSESSOR: [Element](#)
[show all](#) [hide all](#)

DECOMPOSITION

PART

- [Element - Aerocapture](#)
- [Element - Vehicle Geometry](#)

CLASSIFICATION

CLASSIFIER

- [Aerothermal Discipline](#)
- [Data Class](#)
- [Physical Property](#)

CLASSIFIED

- [My Aerocapture Vehicle Front Curvature Angle](#)

OTHER RELATIONSHIP

END 2

- [Degrees](#)