Data exchange in shipbuilding using XML

... data exchange between a cooling water configurator and a web-based equipment catalogue ...

20 december 2005

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Abraham Guyt (on behalf of SeaQuipment)


Procesmodel
XML
Integraal ontwerpen
Elektronische data uitwisseling
Productconfiguratie
?
Productmodel
STEP
Informatiemodel

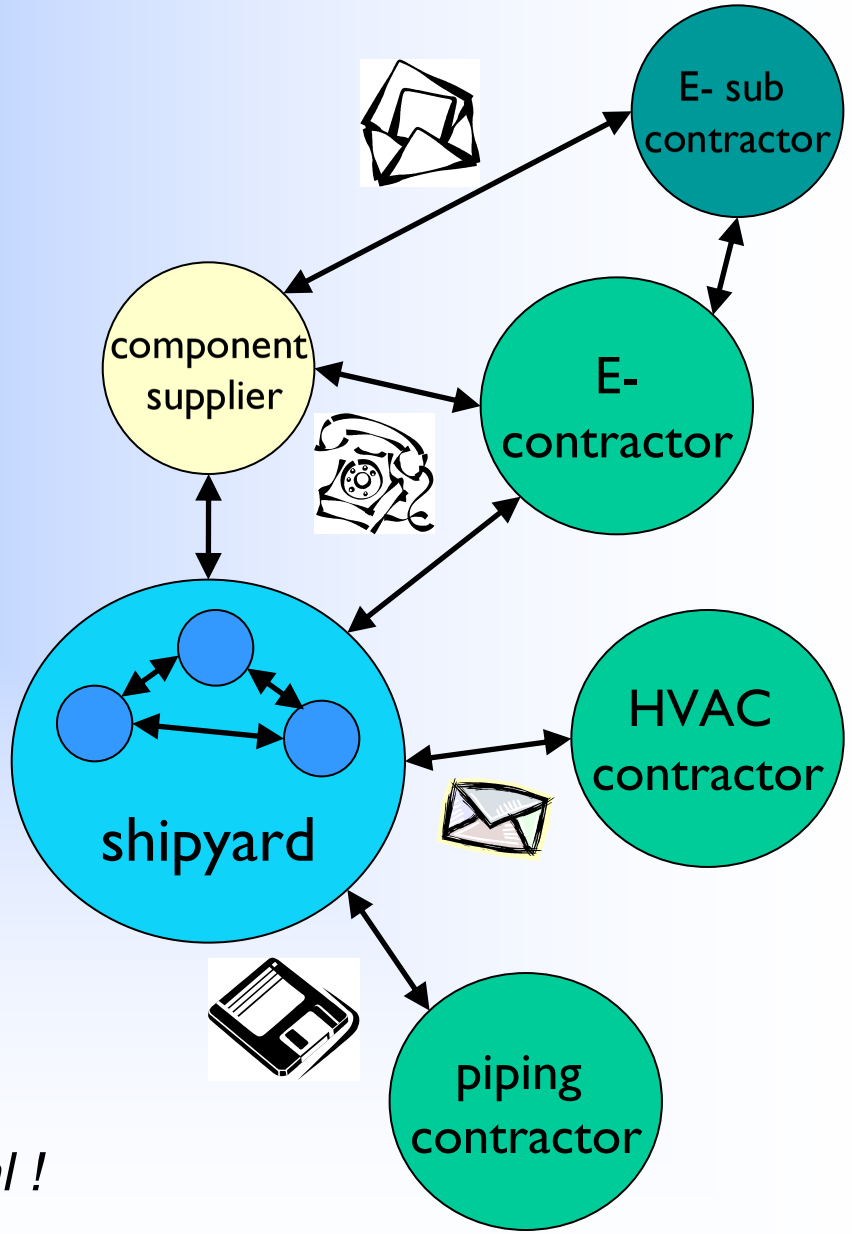
Open Mind … (2001 >)

info + process integration

- *integrated*
- *model based*
- *digital*
- *knowledge / data re-use*
- *chain spanning*

producing ships

- *efficiency / faster / better*
- *competitive advantage: survival !*

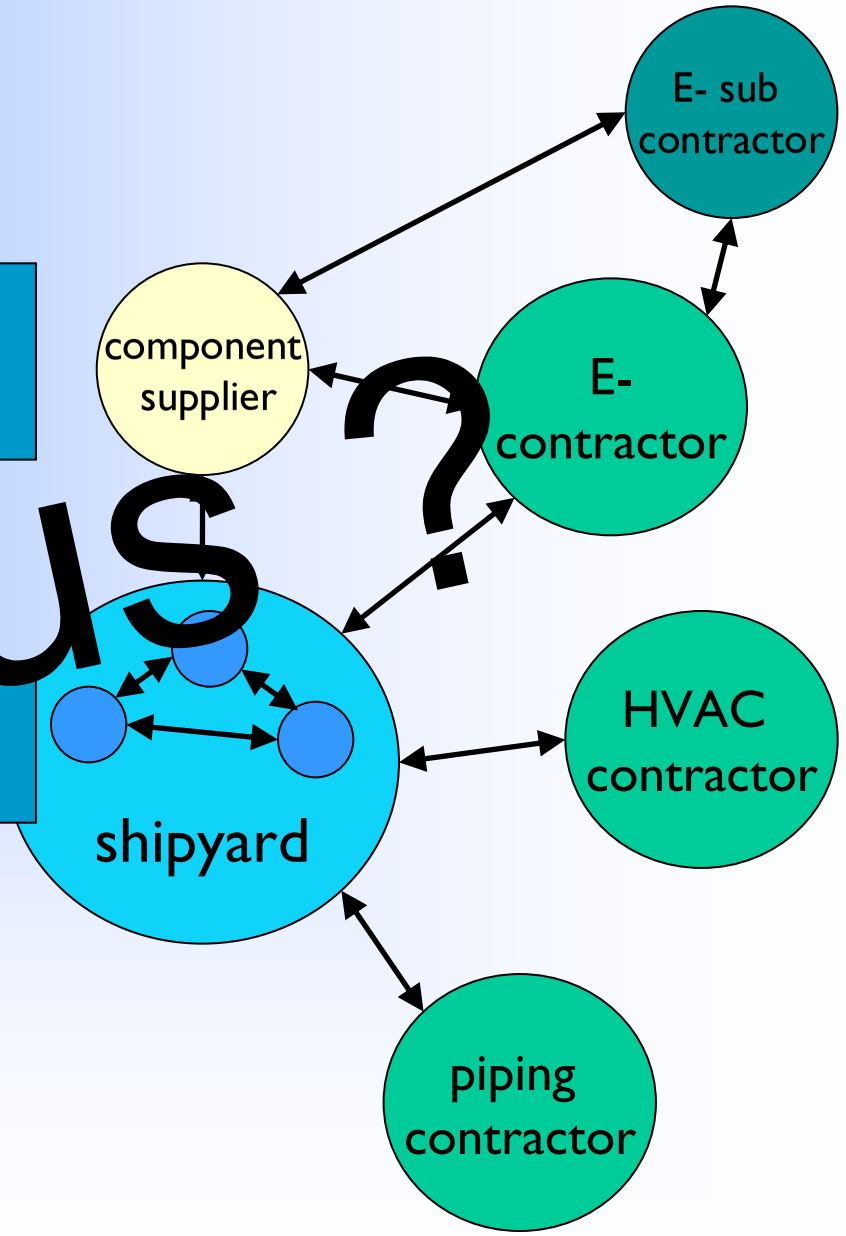


Open Mind … (2001 >)

- pilots
  - cooling water system configurator
    *Quaestor - **IHC***
  - cost estimation / parametric design tool
    *DelftPrice2 - **TUD***
  - marine equipment portal
    SeaEquipment

status ?

- deliverables (a.o.)
  - common product view & model for data exchange
  - common dictionary



Design process

- Different calculation tools
- Principal choices are made in pre-contracting phase
- Interaction
- Component data from suppliers
- Preliminary estimations
- Modifications

$\Rightarrow$ "The right preliminary estimation results in a smooth engineering process"

Objectives

Product configuration tool

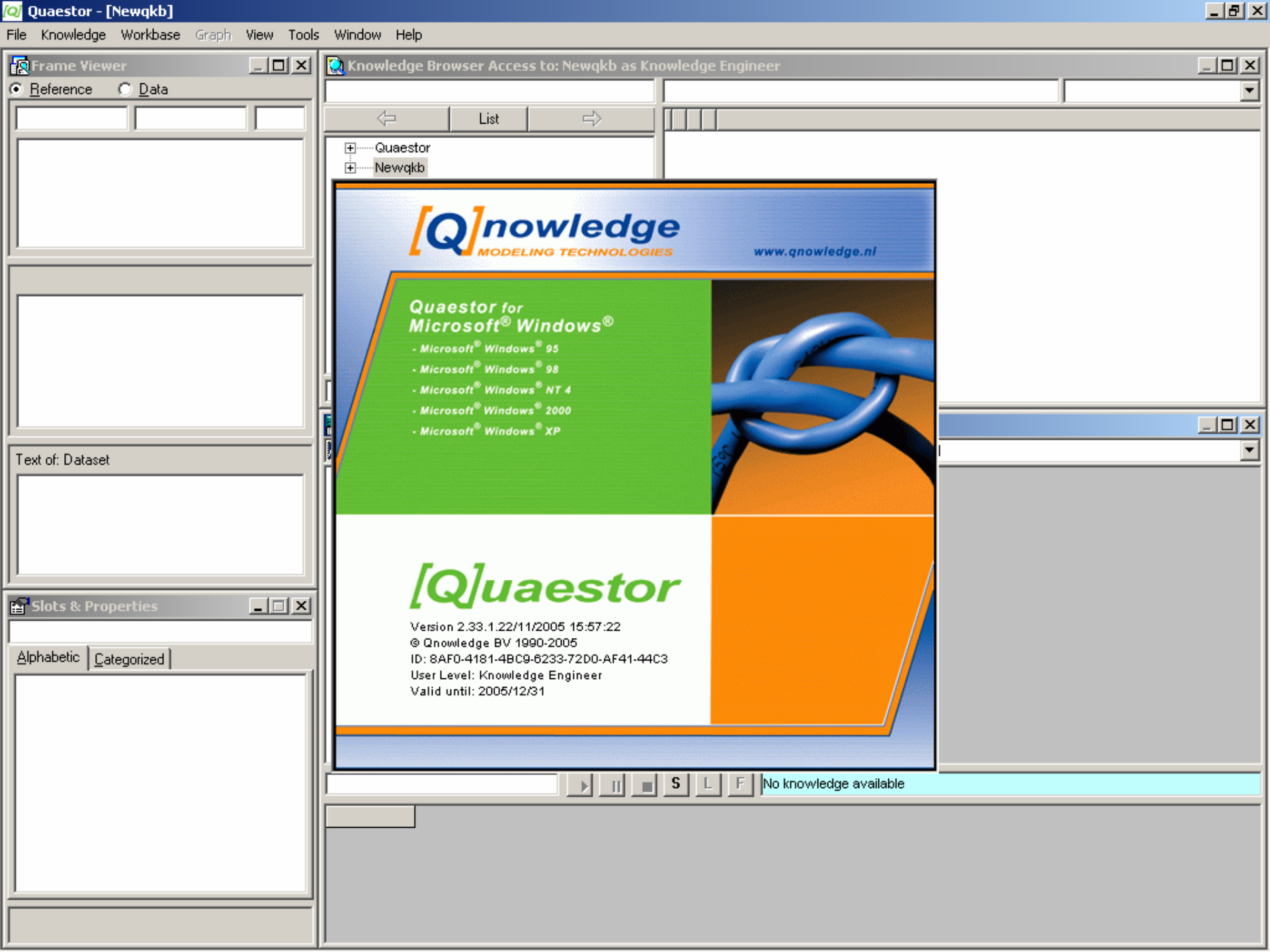
- Design and calculate alternatives faster
- Reuse of knowledge and experience

Project

- Method for building product configuration tools
- Benefits and bottlenecks of product configuration tools

Approach

1. Collect existing knowledge
2. Build models:
   - Productmodel
   - Processmodel
3. Define software specifications
4. Select software platform
5. Build product configuration tool
   - Demonstrator
   - Prototype
6. Test product configuration tool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www.qnowledge.nl
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- Microsoft® Windows® 95
- Microsoft® Windows® 98
- Microsoft® Windows® NT 4
- Microsoft® Windows® 2000
- Microsoft® Windows® XP
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ID: 8AF0-4181-4BC9-6233-72D0-AF41-44C3
User Level: Knowledge Engineer
Valid until: 2005/12/31
S L F
No knowledge available

Microsoft Excel - Decentraal.xls

File Edit View Insert Format Tools Data Window Help

Type a question for help

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COOLING WATER BALANCE

Shipnr.:	Schip 1
Date:	10/05/2005
File:	G:\2_Lopende Projecten\93.881 Open Mind\Decentraal
Printdate:	16/12/2005

Seawater temperature in:	**32,0**	°C
HT cooling water temperature out:	**90,0**	°C
LT cooling water temperature in:	**38,0**	°C

Main diesel 1

		Design						Sailing			Harbour duty		
ITEM NR. IHC	COMPONENTS	HEAT kW	dT K	Tin °C	Tout °C	FLOW m³/h	dP bar	Status on/off	HEAT kW	FLOW m³/h	Status on/off	HEAT kW	FLOW m³/h
	MainDiesel.1												
	LT_charge_air_cooler	**870,0**	6,5	38,0	44,5	**115,0**	**0,50**	1	870,0	115,0	0		
	LO_cooler	**705,0**	5,3	44,5	49,8	**0,0**	**0,50**	1	705,0		0		
	Total LT users:	**1575,0 kW**				**115,0 m³/h**			**1575,0 kW**	**115,0 m³/h**		**0,0 kW**	**0,0 m³/h**
	MainDiesel.1												
	HT_charge_air_cooler	**1268,0**	9,5	80,5	90,0	**0,0**	**0,50**	1	1268,0		0		
	HT_jacket_cooler	**690,0**	5,2	75,4	80,5	**115,0**	**0,50**	1	690,0	115,0	0		
	Total HT users:	**1958,0 kW**				**115,0 m³/h**			**1958,0 kW**	**115,0 m³/h**		**0,0 kW**	**0,0 m³/h**

Main diesel 2

		Design						Sailing			Harbour duty		
ITEM NR. IHC	COMPONENTS	HEAT kW	dT K	Tin °C	Tout °C	FLOW m³/h	dP bar	Status on/off	HEAT kW	FLOW m³/h	Status on/off	HEAT kW	FLOW m³/h
	MainDiesel.2												
	LT_charge_air_cooler	**870,0**	6,5	38,0	44,5	**115,0**	**0,50**	1	870,0	115,0	0		
	LO_cooler	**705,0**	5,3	44,5	49,8	**0,0**	**0,50**	1	705,0		0		

decentral

Ready NUM

Classification :
:
Service notation :

COOLING SYSTEM HT_cooling.Plate_cooler

Number of heat exch. : 1
Item nrs. HT :
Plate material :

All fresh water coolers are installed in

The HT cooler will serve 100 % of each engine total cooling requirements.
Data for each cooler as mentioned below.

COLD SIDE HT HEAT EXCHANGER

Medium : LT fresh water
Flow : 120.0 m^3/h
Inlet temp : 38.0 °C max.
Outlet Temp : 50.2 °C
Design Pressure :
Pressure drop, max. :
Heat exchange : 1,700.0 kW

HOT SIDE HT HEAT EXCHANGER

Medium : fresh water
Flow : 130.0 m^3/h
Inlet temp : 90.0 °C
Outlet Temp : 78.8 °C
Design Pressure :
Pressure drop, max. :
Heat exchange : 1,700.0 kW

Quaestor - [Qcoolpresentatie] - [Workbase[Options & Methods {HT_fresh in Telitab}]]

File Knowledge Workbase Graph View Tools Window Help

All | Reference only | Input Values

- Dataset[Qcoolpresentatie]
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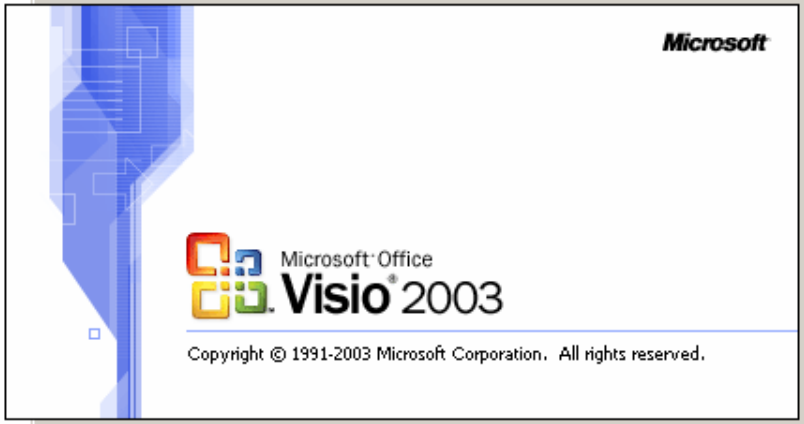
- Configurate[Combined]
- Configurate[LTcoolsHT]
- Configurate[Schipl]
  - Configurate
    - CoolingSystem
    - Design
    - Heatbalance
    - VisioComponents



Goal: Spacing

S L F

Running Visio script....

Schip1162424.vsd - Microsoft Visio

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Type a question for help

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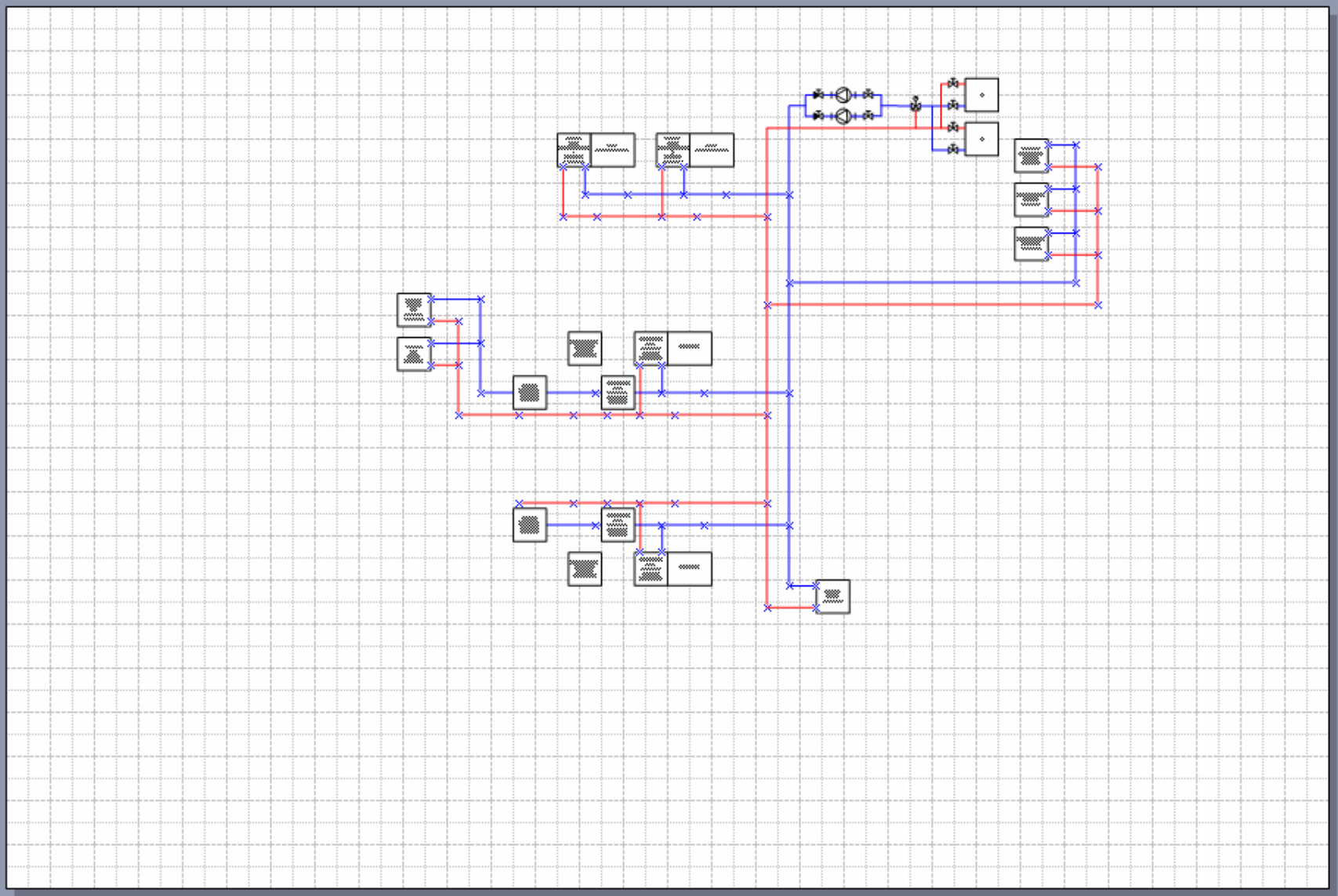

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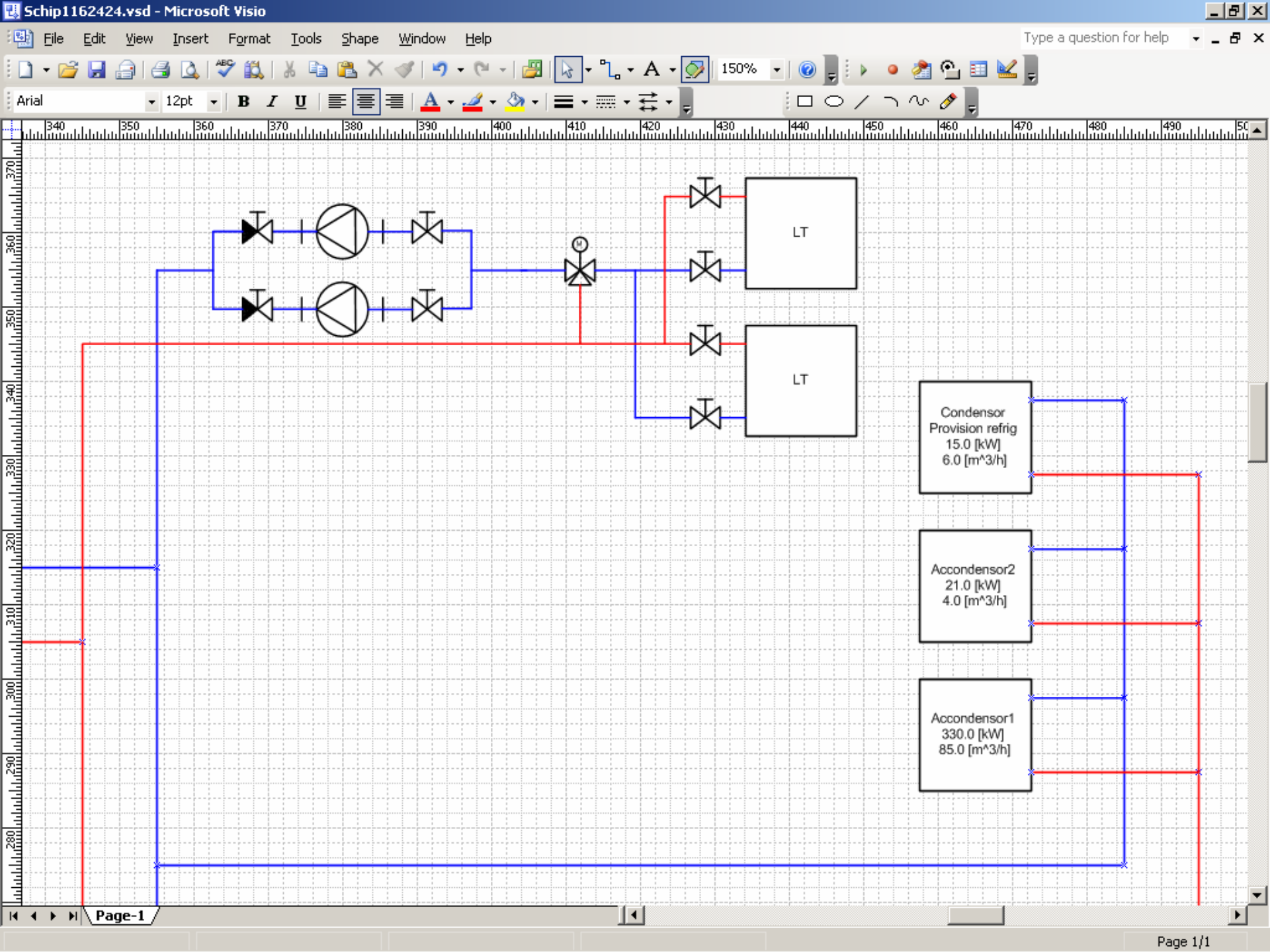
Page 1/1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4.0 [m^3/h]
Accondensor1
330.0 [kW]
85.0 [m^3/h]
Page-1
Page 1/1

Quaestor - [Qcoolpresentatie] - [Contents of View: CoolingSystemOverview#]

File Knowledge Workbase Graph View Tools Window Help

Views | Reference only | All

- Dataset[Qcoolpresen
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- Configurate[LTcools
- Configurate[Schip l
  - Configurate[De
    - CoolingS
    - Design
    - Heatbala

Configurate[Schip l] | S | L | F | Press Break button to return to previous View

Case/Parameters	EndBranch #6 component identifier [Str	Diameter of warm main line [mm	Diameter of cold main line [mm	ameter of warm component connector [mr	ameter of co
Main	Aux	200	200	40	
Main	Fore	200	200	65	
Main	PS	200	200	150	
Main	SB	150	150	100	
Main	FO_cooler	25	25	25	
Fore	ACBranch	65	65	65	
ACBranch	AC.ACcondensor	65	65	65	
ACBranch	Provision_refrig.Condensor	15	15	15	
Aux	Auxiliary.Generator.Diesel	40	40	0	
Aux	Auxiliary.Generator.Diesel.LT_cooler	40	40	40	
PS	Dredge.Pump.Gearbox.LO_cooler	150	150	50	
PS	HydPowerPack_cooler	150	150	50	
PS	MainDiesel.1	100	100	0	
PS	MainDiesel.1.LT_charge_air_cooler	100	100	100	
PS	MainDiesel.1.HT_charge_air_cooler	40	40	0	
PS	MainDiesel.1.HT_jacket_cooler	40	40	0	
PS	MainDiesel.1.LO_cooler	40	40	10	
PS	EndBranch	40	40	40	
EndBranch	CPP.1.HO_cooler	40	40	10	
EndBranch	CPP.1.Gearbox.LO_cooler	40	40	40	
SB	MainDiesel.2	100	100	0	
SB	MainDiesel.2.LT_charge_air_cooler	100	100	100	
SB	MainDiesel.2.HT_charge_air_cooler	40	40	0	
SB	MainDiesel.2.HT_jacket_cooler	40	40	0	
SB	MainDiesel.2.LO_cooler	40	40	10	
SB	EndBranch	40	40	40	

Benefits

- Maintainable
- Calculate more alternatives
- Reduce possible errors

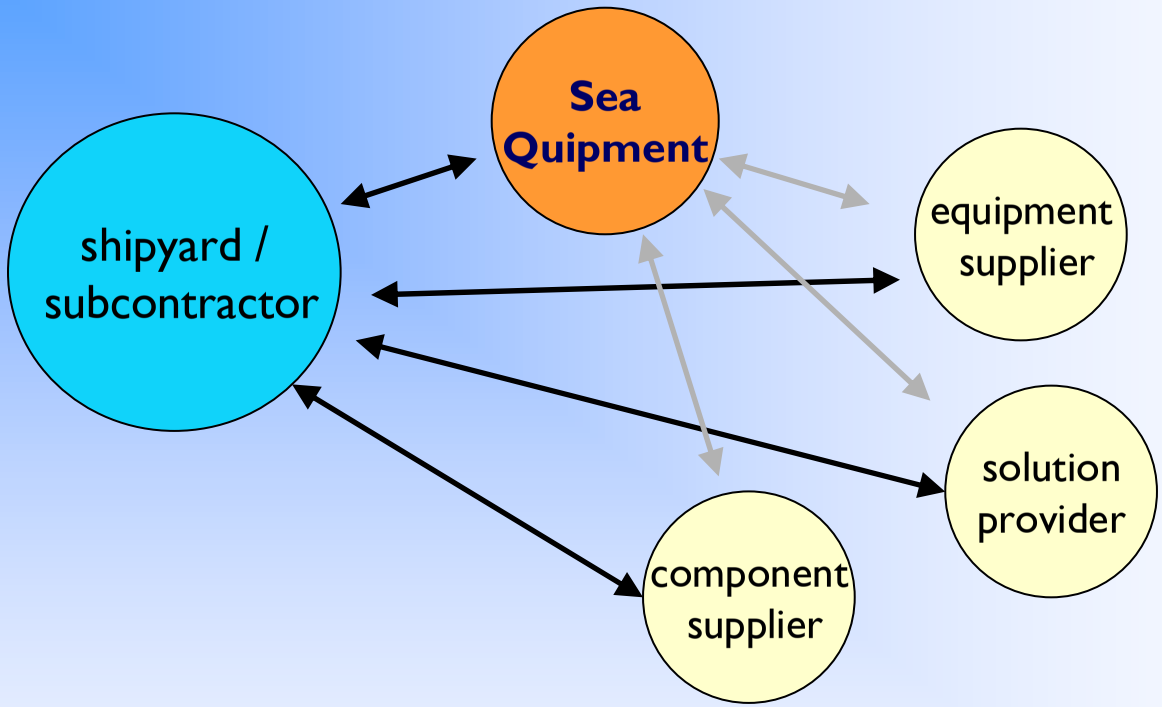
Bottlenecks

- Implementation in engineering proces
- Developing product configuration tools takes a lot of effort
  - Making knowledge explicit is time-consuming
  - Developing software platform and link with CAD

Further developments

- Prepare tool to be used in pre-contracting process
- Develop link with Nupas/Cadmatic - Quaestor
- Develop link with pipe routing system
- Develop more product configuration tools for more complicated systems

SeaQuipment Concept



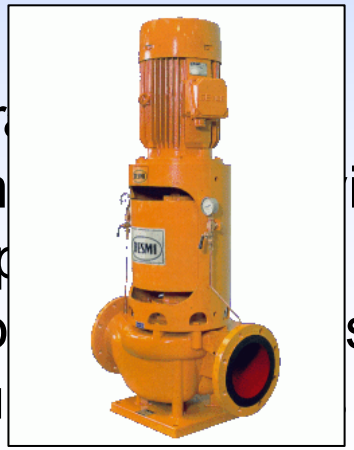
- suppliers' yellow pages
- marine equipment / component catalogue
- facilitating platform Request-For-Data (RFD) messaging
- just info brokerage, NO transactions

SeaQuipment UI

SeaQuipment Specials

'intelligent' equipment / component description

- precise component classification
- supplier info
- URL's for picture, 2D/3D drawing, documentation
- structured technical property data
  - e.g. mass, dimensions, E-power characteristics
  - search support



class: cooling water pump

type: Desmi NSL 150-330/A16

mass: 604 kg

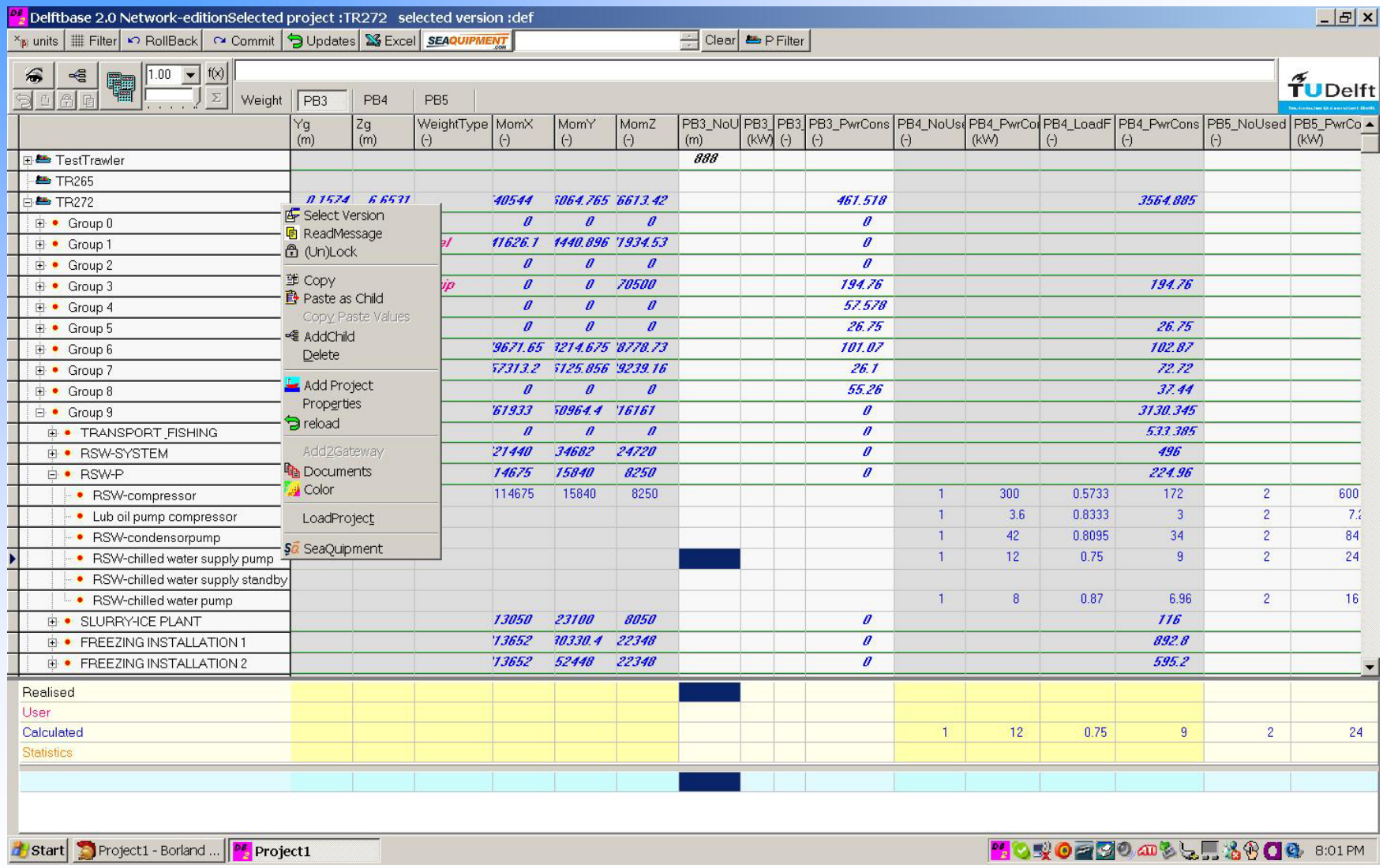
height: 1655 mm

power consumption: 27.39 kW

usage char

- 380 com
- 1400 sup
- each mo ews
- 70 % Eu

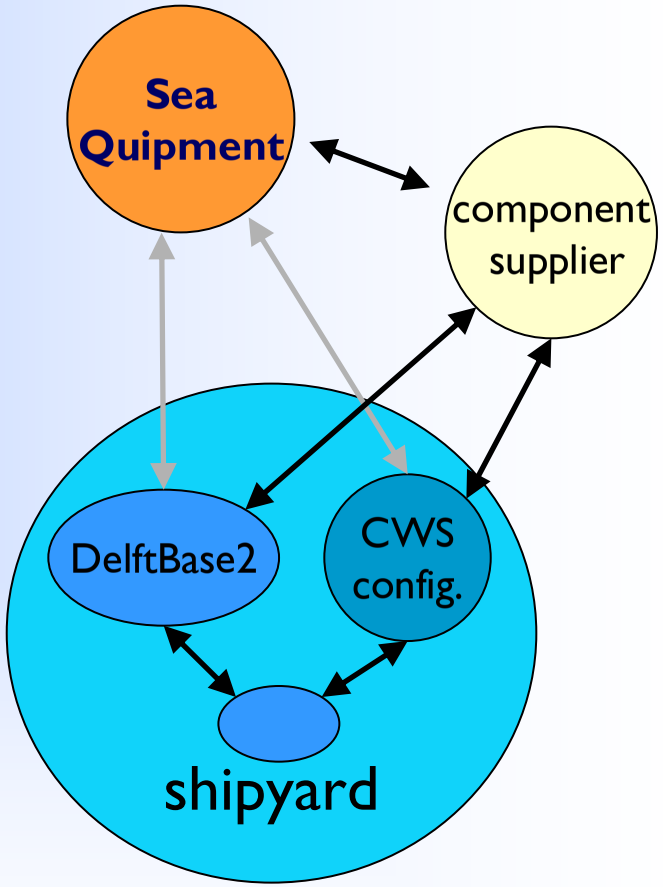
DelftBase2



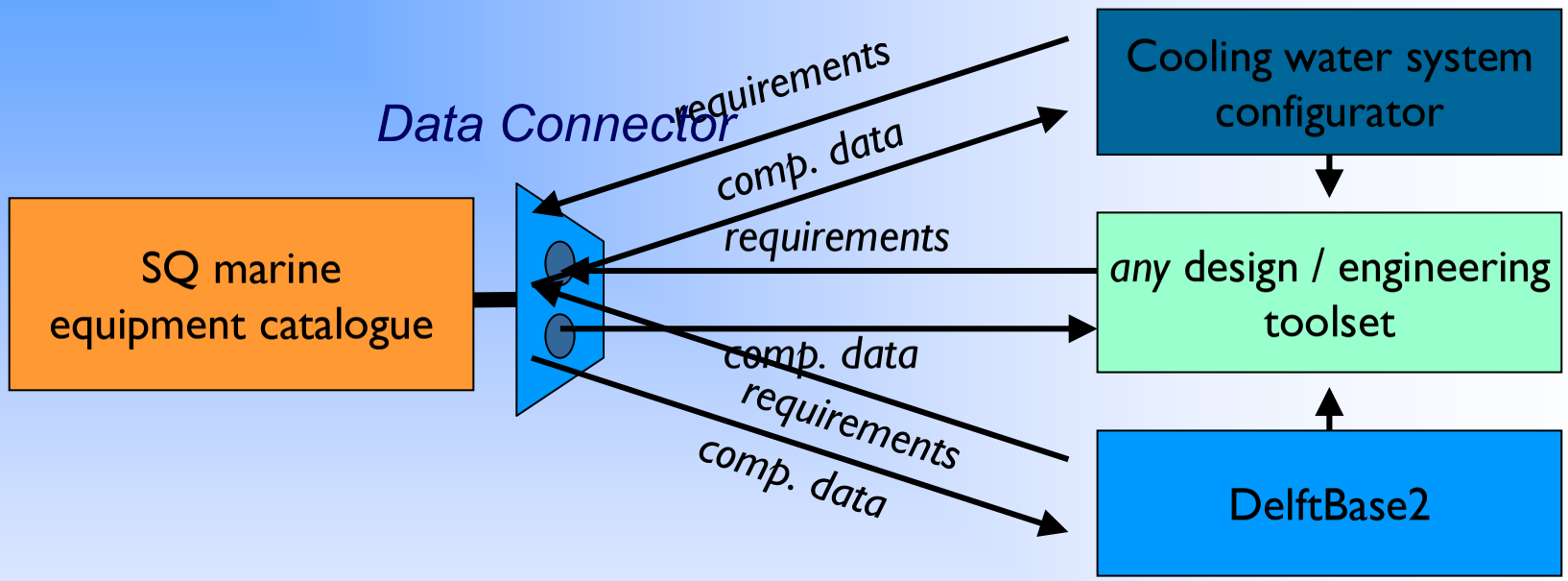
Data Exchange using XML

Open Mind pilot systems

- pilots
  - cooling water system configurator *Quaestor* - ***IHC***
  - cost estimation / parametric design tool *DelftBase2* - ***TUD***
  - marine equipment portal ***SeaQuipment***
- generic deliverables available
  - common product view & model for e-data exchange
  - common dictionary



SeaQuipment Data Exchange



automated interface advantage

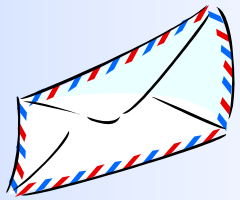
- fast / convenient
- avoid copying errors
- early availability data

features

- simple, open SQ SOAP interface
- VNSI/OM XML file format
- VNSI/OM dictionary

SQ Data Connector Usage Diagram

1. specification



SQ server

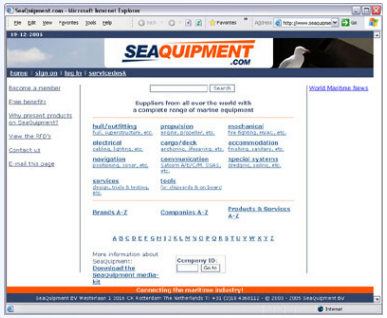
2. reqs. posting

class: rotating pump set
head: 2.4 – 3 bar
flow: 304 – 337 m3/h

SOAP / XML

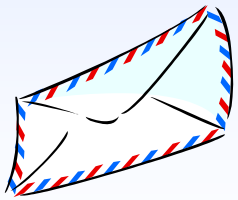
3. SQ refine + select

interactive / browsing



SOAP / XML

4. data retrieval

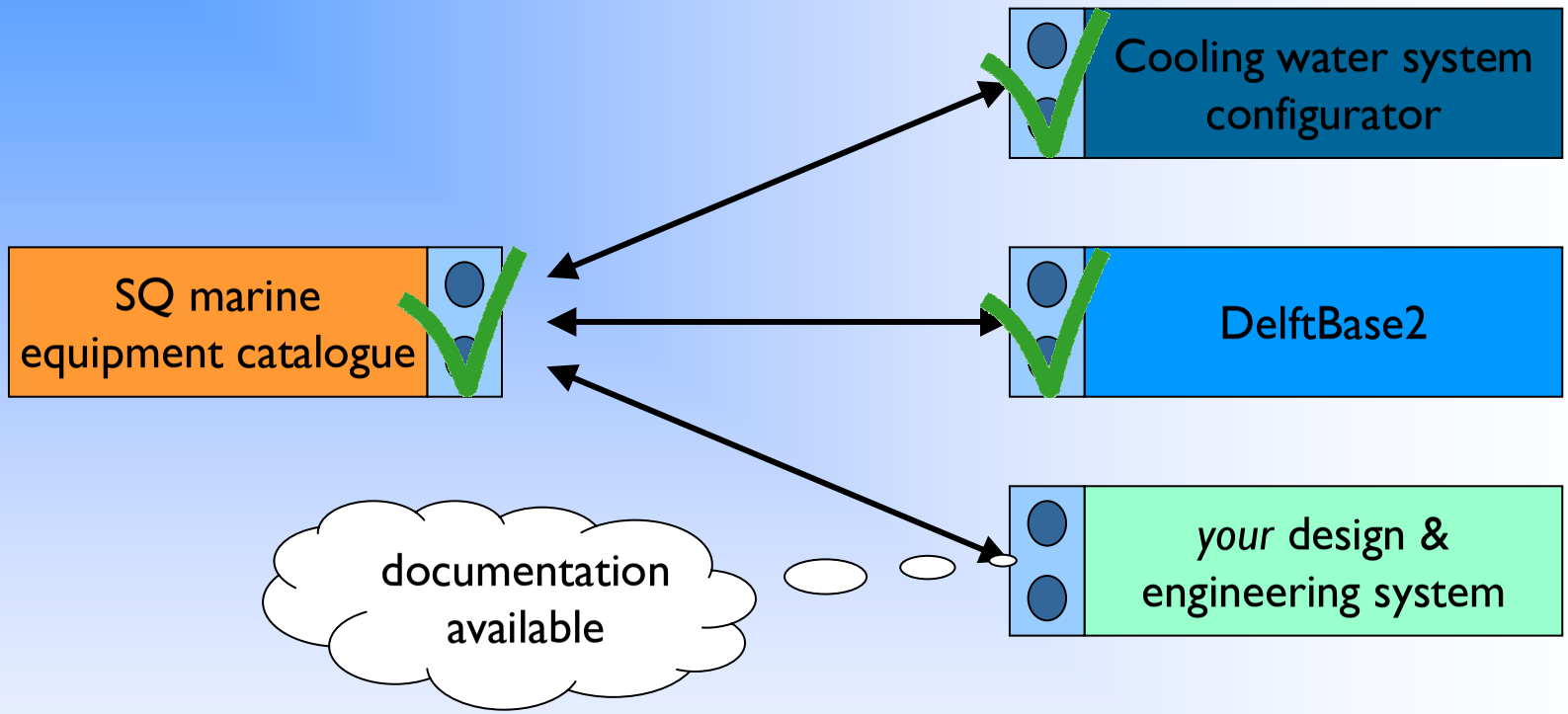


SQ return envelope

VNSI/OM XML file
<pump description>

5. engineering

SeaQuipment Data Exchange



implementation experience

- VNSI/OM file format updated
- 'proof-of-concept' partial demo dictionary

practical usability conditions

- substantial 'rich' equipment data available
- VNSI/OM dictionary completion

SQ Data Connector Demo

Work to be done

Near Term:

SeaQuipment Data Connector

- encourage / support suppliers to add ‘rich’ data (SQ)
- extend partial ‘demo dictionary’ to full dictionary *using proven principles* (VNSI)

Shipbuilding Industry

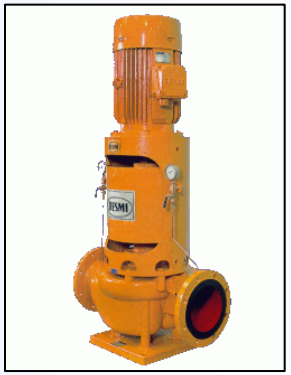
- put SQ Data Connector to work
- gather useful experience (pro’s / con’s)
- explore further goals for data exchange

Work to be done - Horizon

Now

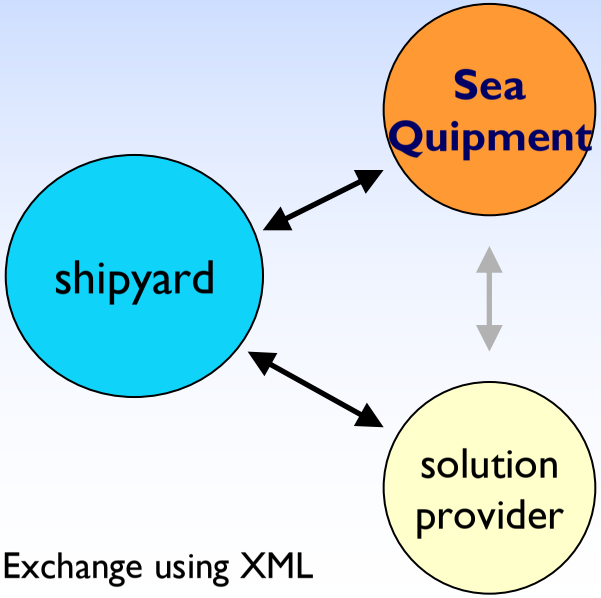
- single component download

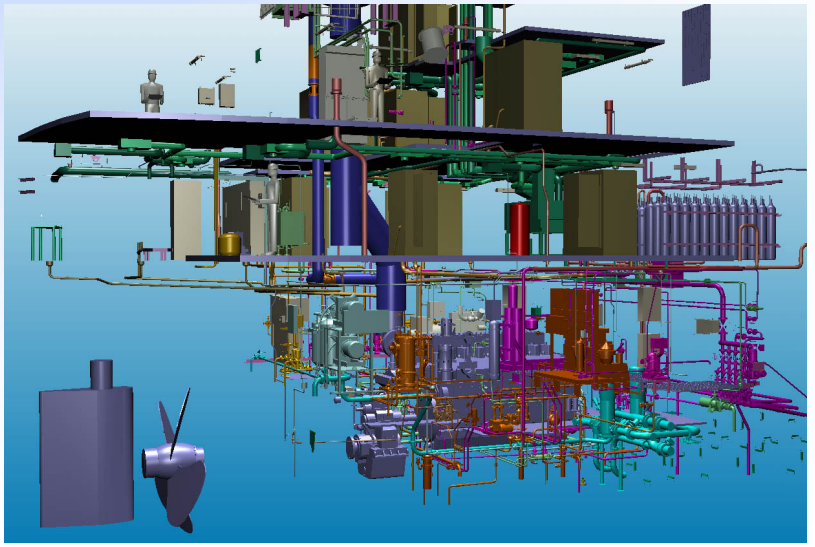
E - exchange



Future

- system configuration exchange
- ship configuration exchange





Work to be done - Horizon

we've only just started ….