



# Prototype Environment

(v. 1.0)

“SmartResource prototype environment,  
v. 1.0, Adaptation Stage”

*SmartResource* Tekes Project  
Deliverable D 1.3

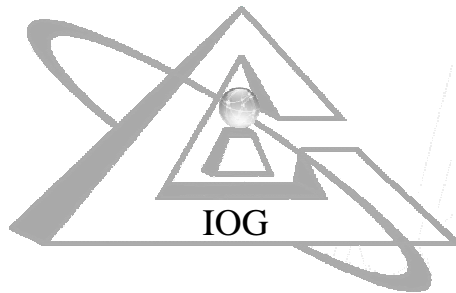
**Industrial Ontologies Group**

**Agora Center, University of Jyväskylä**

August – December, 2004  
Jyväskylä, Finland



INDUSTRIAL ONTOLOGIES GROUP



SMART RESOURCE PROTOTYPE ENVIRONMENT, V. 1.0,  
ADAPTATION STAGE

Technical report

SmartResource: Proactive self-maintained resources in Semantic Web

2/24/2005

University of Jyväskylä

Agora Center

**Author:** Industrial Ontologies Group

**Contact Information:** e-mail: [vagan@it.jyu.fi](mailto:vagan@it.jyu.fi)

**Title:** SmartResource prototype environment, v. 1.0, Adaptation Stage

**Work:** Technical report

**Status of document:** working draft

**Number of Pages:** 79

**Keywords:** Semantic Web, Agent, Device, Human, Expert, Service, Software Interface, Industrial Maintenance, Global Understanding Environment

.

## Abbreviations

J2EE – Java2 Enterprise Edition

EJB – Enterprise Java Beans

JSP – Java Server Pages

RDF – Resource Description Framework

RDFS – RDF Schema language

XML – eXtensible Markup Language

# Contents

<b>1</b>	<b>INTRODUCTION .....</b>	<b>1</b>
1.1	TASKS AND GOALS .....	2
1.2	BACKGROUND.....	3
1.2.1	Understanding adapters.....	3
1.2.2	Adapter context.....	4
<b>2</b>	<b>CORE OF DEVICE, SERVICE AND HUMAN ADAPTERS .....</b>	<b>5</b>
2.1	TRANSFORMATION PHASES .....	5
2.2	TEMPLATE METHOD .....	6
2.2.1	Structural template .....	6
2.2.2	Tag template .....	7
2.3	ADAPTER SPECIFICATION .....	8
2.3.1	RscDF structure classes .....	9
2.4	XML STRUCTURE CLASSES .....	10
2.5	RSCDF ENGINE CLASSES .....	11
2.6	DOM UTILITIES CLASSES .....	11
<b>3</b>	<b>TASK 4: IMPLEMENTATION OF THE SEMANTIC ADAPTER FOR DEVICE.....</b>	<b>13</b>
3.1	ORIGINAL DATA: .....	13
3.2	KF-330 SPECIFICATION:.....	13
3.3	MONITORING PARAMETERS (7 PARAMETERS): .....	14
3.4	DATA GENERATOR: .....	15
3.5	UML CLASS DIAGRAM OF THE GENERATOR .....	15
<b>4</b>	<b>TASK 5: IMPLEMENTATION OF THE SEMANTIC ADAPTER FOR (WEB) SERVICE.....</b>	<b>17</b>
4.1	AXIS .....	17
4.2	LOMBOZ.....	18
4.3	SOAP .....	18
•	WEB SERVICE AS A RESOURCE IN GUN.....	19
•	WEB SERVICE INSIDE .....	21
4.4	ADAPTATION FROM GUN TO WEB SERVICE .....	21
<b>5</b>	<b>TASK 6: IMPLEMENTATION OF THE SEMANTIC ADAPTER (RESOURCE BROWSER) FOR HUMAN.....</b>	<b>23</b>
5.1	INPUT DATA .....	23
5.2	EXPERT ANNOTATION .....	23
5.3	USER INTERFACE TEMPLATE .....	24
5.4	DEVICE ANNOTATION .....	24
5.5	TEMPLATE OF THE DIAGNOSIS STATEMENT .....	25
5.6	JFREECHART .....	25

<b>6</b>	<b>TASK 7: IMPLEMENTATION OF THE MAINTENANCE ENVIRONMENT PROTOTYPE V. 1.0.....</b>	<b>26</b>
<b>7</b>	<b>REFERENCES.....</b>	<b>42</b>
	<b>APPENDIX 1 – TOOLS USED FOR IMPLEMENTATION OF THE ADAPTERS .</b>	<b>43</b>
	<b>APPENDIX 2 – MAINTENANCE ONTOLOGIES SERIALIZED INTO XML.....</b>	<b>51</b>

# 1 Introduction

Data integration and transformation is common task for different companies. As the rule the business of such companies spreads to many domains and its scales is quite wide. That's why the task of data integration and transformation isn't trivial and quite often is a big challenge. As the result elaboration and implementation possible ways of transformation could be very expansive and resource consuming.

Global Understanding eNvironment (GUN) [1-3] is the ultimate goal of research and development efforts of the Industrial Ontologies Group<sup>1</sup> (IOG) in extending the current Semantic Web [4] to facilitate proactive, goal-driven, self-maintained behavior of all kinds of resources that can be adapted to the Web. To provide interoperability between heterogeneous resources different by structure and nature, the design of GUN-environment must be based on a universal methodology of resources' integration – General Adaptation Framework (see Deliverable 1.2). Adaptation in this context assumes elaboration of a common mechanism for transparent integration of new resource to the GUN environment, and provision of the resource with a unified way of interaction.

As a use case for detailed analysis of the GUN concept, industrial maintenance domain has been chosen. The related research and development have been performed by Industrial Ontologies Group within the SmartResource<sup>2</sup> project, funded by Tekes<sup>3</sup> and partner companies. Project goal is to combine the emerging Semantic Web, Web Services, Peer-to-Peer and Agent technologies for the development of a global and smart maintenance management environment, to provide Web-based support for the predictive maintenance of industrial devices by utilizing heterogeneous and interoperable Web resources, services and human experts [5].

The main idea of General Adaptation Framework is based on a concept of “adapter”, which plays role of a bridge between an internal representation of resource (SmartResource) and a unified environment (GUN). By Smart Resource we mean a

---

<sup>1</sup> Official website of the Industrial Ontologies Group, <http://www.cs.jyu.fi/ai/OntoGroup/>

<sup>2</sup> General presentation of the project: <http://www.cs.jyu.fi/ai/OntoGroup/SmartResource.ppt>

conjunction of Real World Resource (RWR), Adapter and Agent. By extending RWR within Adapter and Agent we make it GUN compatible, if to speak in terms of architectural modeling. General Adaptation includes development of Adapter for RWR - a software component, which provides a bidirectional link between a resource interface and an interface of the environment.

During the first year of the SmartResource project – year 2004, Adaptation Stage – it was intended to investigate and develop adaptation framework for extracting data and its transformation into a specific designated format. This objective includes the design of a generic approach for building resource adapters and development of appropriate ontologies for semantic adaptation.

Different techniques, and approaches have been developed already for performing transformation tasks such as Java Connector Architecture specification or CORBA, and same concept comes up upon these approaches. This concept is the meaning of adapter or resource adapter which plays the key role and adaptation mechanism. In the simplest definition adapter is the software component which connect two or more incompatible corporative application with the purpose of data exchange.

In fact the development of adapter is the main part of transformation task. Thus sufficient analysis and design of adapter's architecture is crucial.

## 1.1 Tasks and Goals

Tasks of stage:

- Analysis task and requirements
- Elaborating possible scenario of resources interaction
- Elaboration of architecture for pilot system
- Development of device, service and human adapters and their deployment to application server

---

<sup>3</sup> Official website of the Tekes organization, <http://www.tekes.fi/>



Goals of stage:

- To investigate and study various approaches of adapter's architecture and data transformation.
- Come up with possible use case of adaptation task
- Design, development and implementation of pilot resource adapter for adaptation of heterogeneous resources

Sections 3-6 describe the following tasks of the deliverable 1.3 accordingly:

- T4: Implementation of the semantic adapter for device
- T5: Implementation of the semantic adapter for web service
- T6: Implementation of the semantic adapter (resource browser) for human
- T7: Implementation of the maintenance environment prototype v1.0

## 1.2 Background

### 1.2.1 Understanding adapters

The meaning of adaptation doesn't arise until you deal with enterprise integration application which should combine different systems into one whole. The term adapter is that key word which constitutes the meaning of adaptation. As the rule it's insufficiently to describe any composed software concept by single definition. The same is true with term adapter. Adapter has been in use in the computer hardware and other industries, and the main idea of such adapters is to make different hardware devices compatible on the physical layer.

In our case to clarify the definition of adapter we assume the term adapter as software component design especially for heterogeneous sources of data to establish interaction between them. Data exchange during interaction can happen in various contexts. Some exchange is going between databases, whereas others are part of interaction of heterogeneous resources. Hence the definition of resource adapter should be enough generic to embrace various cases of resource integration and this is not easy, thus it's possible to encounter many other definitions.

In general, diversity of resources could be involved into integration schema with various data formats, connection methods and ways of communication.

### **1.2.2 Adapter context**

Adapters play an important part in three basic contexts or integration patterns. There can be numerous variations of these patterns. The three basic contexts could be assigned for adapter:

- Data synchronization
- Online services
- Process automation

#### **Data synchronization**

The main objective of this pattern is to ensure the data integrity for all resources participating in a business process. Resources are responsible for maintaining the data integrity of their own data storages. Thus the main role of adapter in this context is to provide a mechanism for opening the resource transaction to the outside world.

#### **Online services**

The online service context is useful for exposing application function in the form of easy accessible service. Application functions encapsulate business rules and business logic automated by the application. However, these functions are typically available only to the direct users of the applications. Therefore to get access to that set of services from outside, adapter context could be viewed as “online services”. Generally, there are two types of services: a services that is part of an application and runs in the same address space, and remote service accessible by an API or a message based interface.

#### **Process Automation**

Adapters can provide an event/trigger-handling mechanism as well as maintaining the appropriate state of related business events. Event adapter essentially wrap the target application and extend its functionality to include event handling and processing capability. The adapter can map inbound events to specific application actions. These event-action mappings enhance the success of process automation.

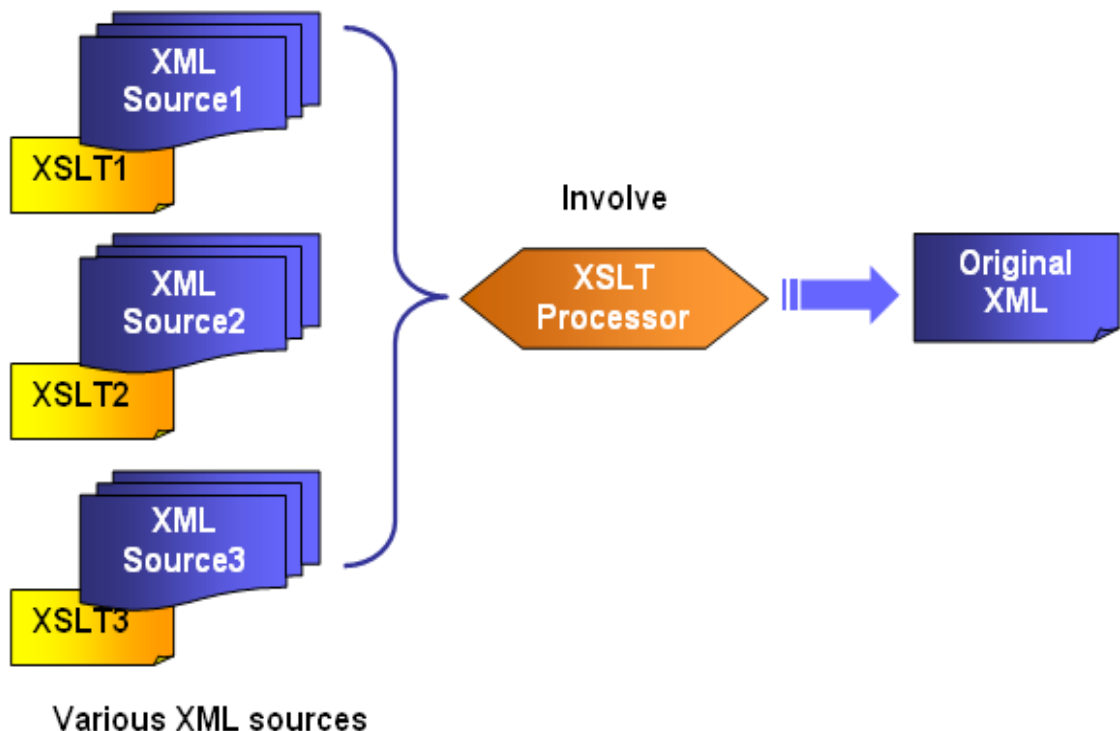
## 2 Core of device, service and human adapters

### 2.1 Transformation phases

The stage of transformation is divided onto two phases:

- Syntactical transformation
- Semantic transformation

Such technique has some advantages during transformation. First of all it divided into two independent phases and it's possible to facilitate the whole transformation process. On the first phase you have to fulfill syntactical transformation form any data source to original XML document. It's possible to use many ready-made tools and APIs for this phase. For instance variety of XML files could be transform to original XML with XSLT technique. Map Force for example provide easy to use and friendly graphical interface to fulfill this task.



**Figure 1.** Syntactical transformation

In our case of adaptation it was generated corresponding XSLT transformation schemas for different XML files, than XSLT processor load XML files with corresponding XSLT and produce original XML document.

On the second phase of transformation performs so called semantic transformation. The data for semantic transformation is data obtained on the phase of syntactical transformation. Adapter load original XML file, involve the rules of transformation and process the RscDF document. To elaborate RscDF adapter uses the method of templates, which constitute RscDF document.

## 2.2 Template method

Template method makes the process of transformation easier. During the analysis of RscDF document it was distinguished two types of templates – structural template (or pattern) and tag templates. Structural templates reflect the structure of RscDF graph. And depending on the original XML document some branches of RscDF graph have the same structure and could be cloned with appropriate node's values.

### 2.2.1 Structural template

In the Figure 2 graph structure of RscDF document is depicted. It could be recognized two structural templates from this graph. By red color it is circled the “measurement” concept and by blue color it is circled the “state” concept which are originally implied in the RscDF schema

There are iterators on the nodes 7 and 4 which repeat the templates structure depending on the context of original XML document. So if in original XML document will be tree measurements the iterator in node 7 will repeat the template circled by red color 3 times. The same is going with “state” concept which repeats on the node 4.

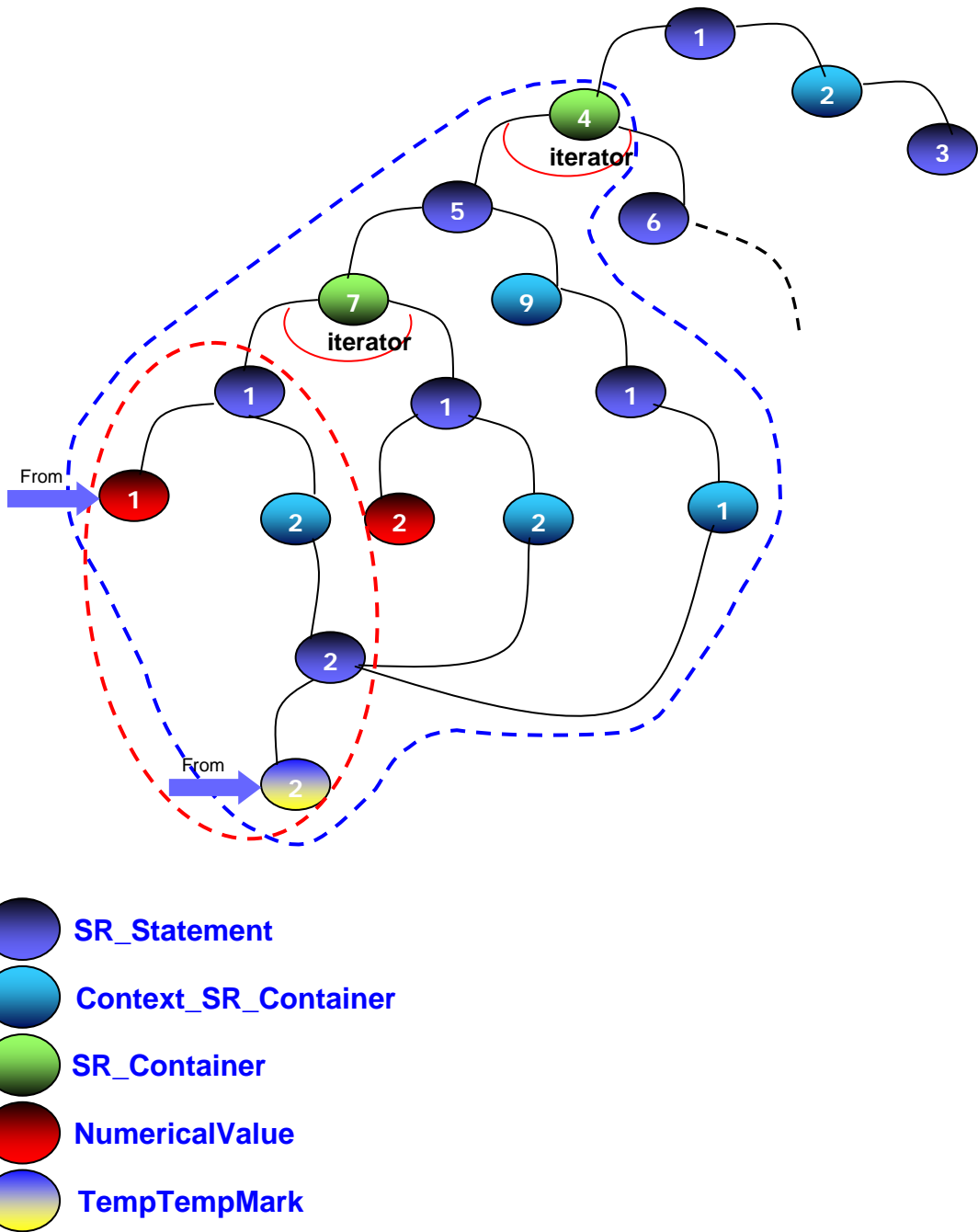


Figure 2. Graph structure of RscDF document

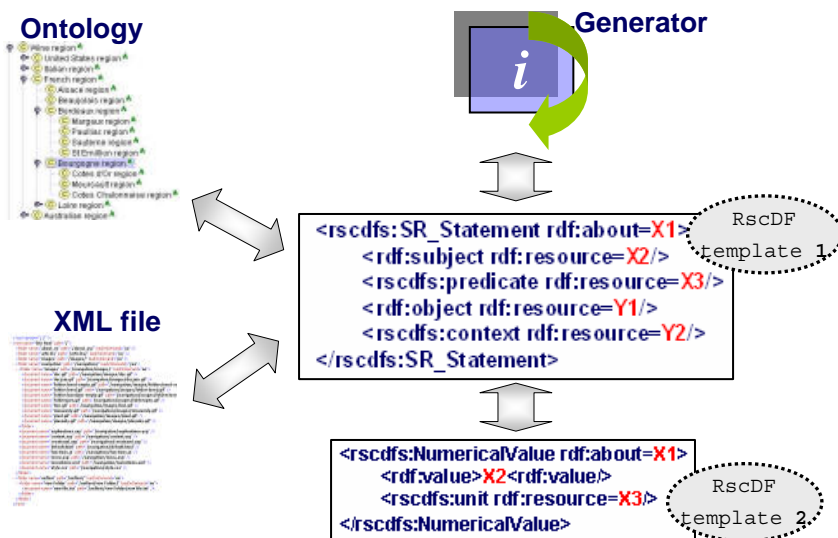
### 2.2.2 Tag template

Tag template corresponds to the RscDF classes. In fact tag template represents one of the fives classes from RscDF schema. There are **SR\_Statement**, **Context\_SR\_Container**,

**SR\_Container**, **NumericalValue**, **TempTempMark** different classes and corresponding tags for them. Tag templates are “bricks” which used by adapter to produce RscDF document. Tag template has body and changing part, which could be different types:

- link to other pattern
- link to XML data
- link to ontology data
- generated value

In the Figure 3 example of tag template is depicted. The variable Xn is obtained in run time either form ontology or XML file or generated by generator. The variable Yn is obtained from the identifier of other template, thus the RscDF tag which is depended on other RscDF tags will be generated after them. So adapter recursively calls methods of template creation until reach the leaf nodes.



**Figure 3** - Template-based transformation

### 2.3 Adapter specification

All classes which constitute adapter are packaged into template package. By applied logic classes could be divided into four parts. The first part of classes corresponds to the logic

which reflects the structure of RscDF document, the second reflect the structure of original XML document and encapsulate the logic of processing this structure, the third represents the engine which plays the role of RscDF document builder, and fourth is the set of reusable utilities for DOM processing.

### 2.3.1 RscDF structure classes

The diagram of RscDF structure classes is depicted in the Figure 4. The “core” class is TemplateAbs abstract class which encapsulates all logic of RscDF class structure. The variable templateContext represent the body of RscDF tag. Variables subject, about, predicate reflects the RDF statement. The container childTemplates supposes to store all child nodes of given node. The TemplateAbs abstract class implements TemplateFactory interface with only method createTemplate. All concrete subclasses of TemplateAbs class realize this method. TemplateAbs class has printTemplate method which recursively called to print the context of template tag.

From TemplateAbs class is subclassed five concrete classes which correspond to the RscDF classes. There are ContextSR\_Container, SR\_StatementTime, NumericalValue, TempMark, SR\_StatementMeasureItem classes. Every such class implements logic of crateTemplate method. The common implementation of this method is constricting the context of tag and calling the same method for all ancestors.

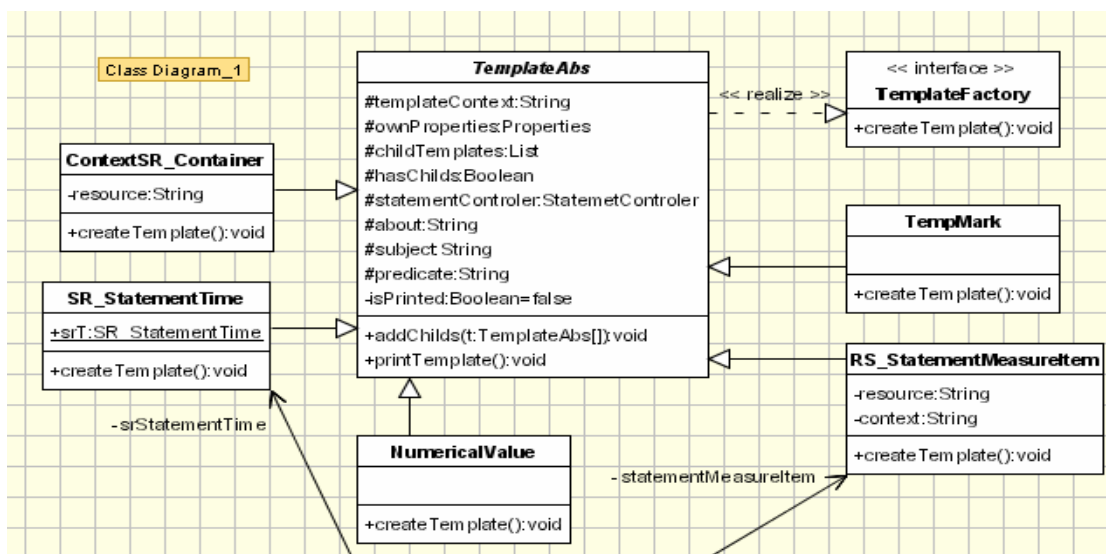


Figure 4 - RscDF structure classes

## 2.4 XML structure classes

Figure 5 depicts the class diagram of those classes which reflect the logic of original XML message. Original XML message consists of states which include arbitrary measurements from device. The class MeasureConcept represents the concept of measure in XML file. Some fields from this class correspond to the enclosed tags of XML document. For example fields sensor, value and units correspond to the <Sensor>, <Value>, <Units> tags in XML document. Methods getValue and getMeasureType obtain the values of measurement and type of measurement correspondingly.

The class StateConcept represent the meaning of State from XML document. Also this class is container for measurements and it has the ArrayList container (measureConcept field ) for corresponding measurements. The primary method of this class is getTimeValue which returns the time snap of measurement.

StateConceptWrapper is the wrapper for XML states. It implements logic to represent XML document structure in Java class model. It keeps tracks for all states form XML and has methods to abstain reference on the current state and measurement during transformation.

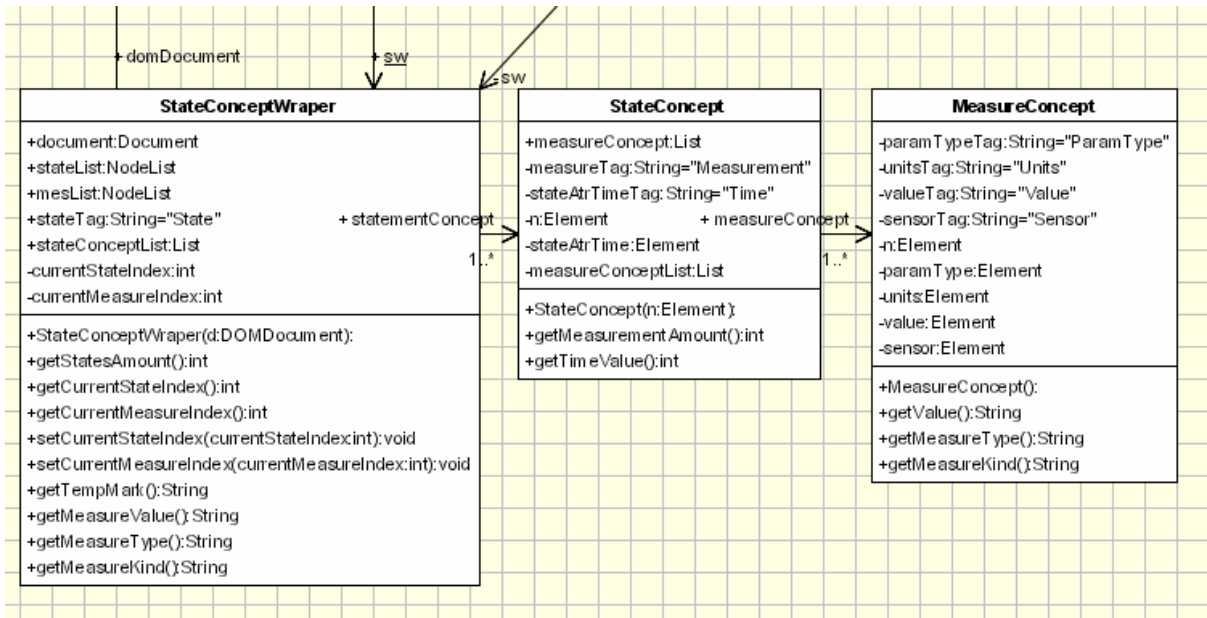


Figure 5 - Original XML file structure classes



## 2.5 RscDF engine classes

Figure 6 shows the diagram of RscDF engine classes. RootRSCDFDocument class is manager which drives the whole process of transformation. First of all it obtains the DOM model of original XML document, passes it to parse in StateConceptWrapper class, then takes back the reference to parsed model and then start the transformation. In its constructor it calls sequentially three methods: precreateStatement, createState and printStatement to build RscDF document.

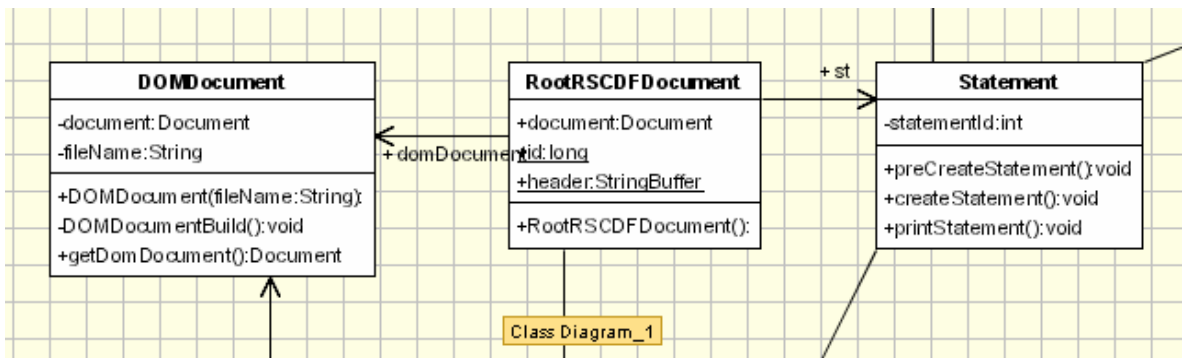


Figure 6 - RscDF engine classes

## 2.6 DOM utilities classes

Figure 7 shows the set of reusable utilities to process XML files. The static methods from this class are used to produce Java model from XML files. These utilities may be used with any XML files. The Figure 8 depicts the whole class diagram of adapter.

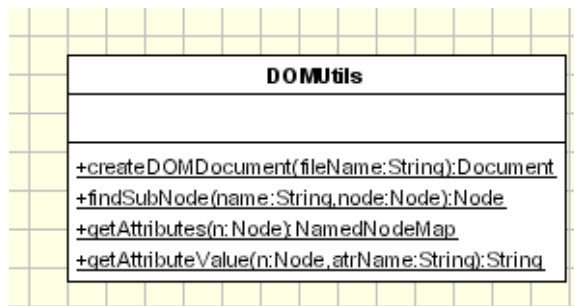


Figure 7 - DOM utilities class

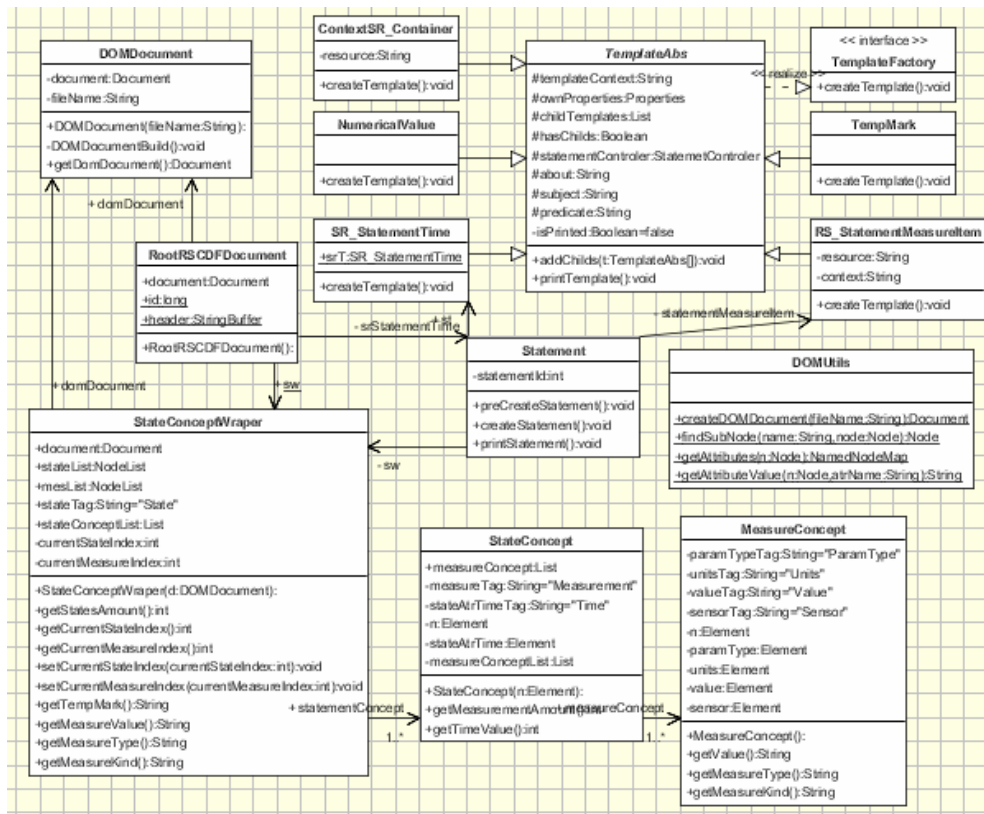


Figure 8. Whole class diagram

### 3 Task 4: Implementation of the semantic adapter for device

#### 3.1 Original Data:

- There is need for set of original data to simulate the device's behavior
- KF – 330 blow molding machine<sup>4</sup> was chosen as device
- It has seven parameters for monitoring



Figure 9 - KF-330 blow molding machine

#### 3.2 KF-330 specification:

Specification	Datum
Resin	PE
Product max capacity (c.c)	50 - 1000
Dry cycle (sec/cycle)	2.1 - 2.3
Mould clamping force (ton)	2.6
Extruding capacity (kg/hr)	20
EXTRUSION SYSTEM	
Screw diameter (mm)	45
L/D ratio	22
Screw turning speed (r.p.m)	20 - 80
Drive motor (HP VS)	10
Barrel heating zone	3
Barrel heating capacity (KW)	3.6

<sup>4</sup> [http://www.kunfong.ru/eng/prod4\\_1.htm](http://www.kunfong.ru/eng/prod4_1.htm)

HEAD & ACCUMULATOR	
Head heating zone	3
Head heating capacity (KW)	2.3
Die outside diameter (mm)	46
Product min/max diameter (mm)	20 - 110
MOULD SYSTEM	
Mould clamping force (ton)	2.6
Clamping mould stroke (mm)	250
Open/close stroke (mm)	330 - 80
Mould dimension L ´ W (mm)	320 ´ 280
Working mould pressure (kg/cm <sup>2</sup> )	7.5-9.0

HYDRAULIC SYSTEM	
Hydraulic pump power (HP)	10
Air pressure (kg/cm <sup>2</sup> )	4 - 6
Air compressor (HP)	2
Oil tank working range (liter)	230-240
Cooling water (liter/minute)	40
Electricity consumption (KW)	23.5
Thermo liquid level (mm)	> 45
WATER COOLING REFRIGERATION	
Compressor horsepower	7.5 hp, 160 l/min
Water temperature	5°C - 30°C
Refrigerating energy	23886 kcal/h
Refrigerating cap	94700 btu/h

PACKING	
Machine dimension (cm)	230 ´ 170 ´ 240
Net weight (ton)	2.5
Gross weight (ton)	3.1
Packing dimension (cm)	246 ´ 189 ´ 225

### 3.3 Monitoring parameters (7 parameters):

Parameter name	Units	Sensor description
Screw turning speed	rpm	Rotation speed sensor
Open-close stroke	mm	Gap sensor
Working module pressure	kg/cm <sup>2</sup>	Pressure sensor
Air pressure	kg/cm <sup>2</sup>	Pressure sensor
Oil tank range	liter	Volume measurement sensor
Oil tank temperature	Celsius	Temperature sensor
Thermo liquid level	mm	Level measurement sensor

### 3.4 Data generator:

To generate original data of device as input data for adapter it was chosen Java API for random generation

Some data vectors of particular parameter were obtained as arguments of functions

- Screw turning speed parameter follows to sinusoidal distribution
- Oil tank range parameter follows to the linear distribution
- Other parameters follow to the random distribution

Generator produces the set of seven parameters with 10 seconds time interval

Parameters are stored to the collection

The original (canonical) XML file is generated as a input for the device adapter

### 3.5 UML class diagram of the generator

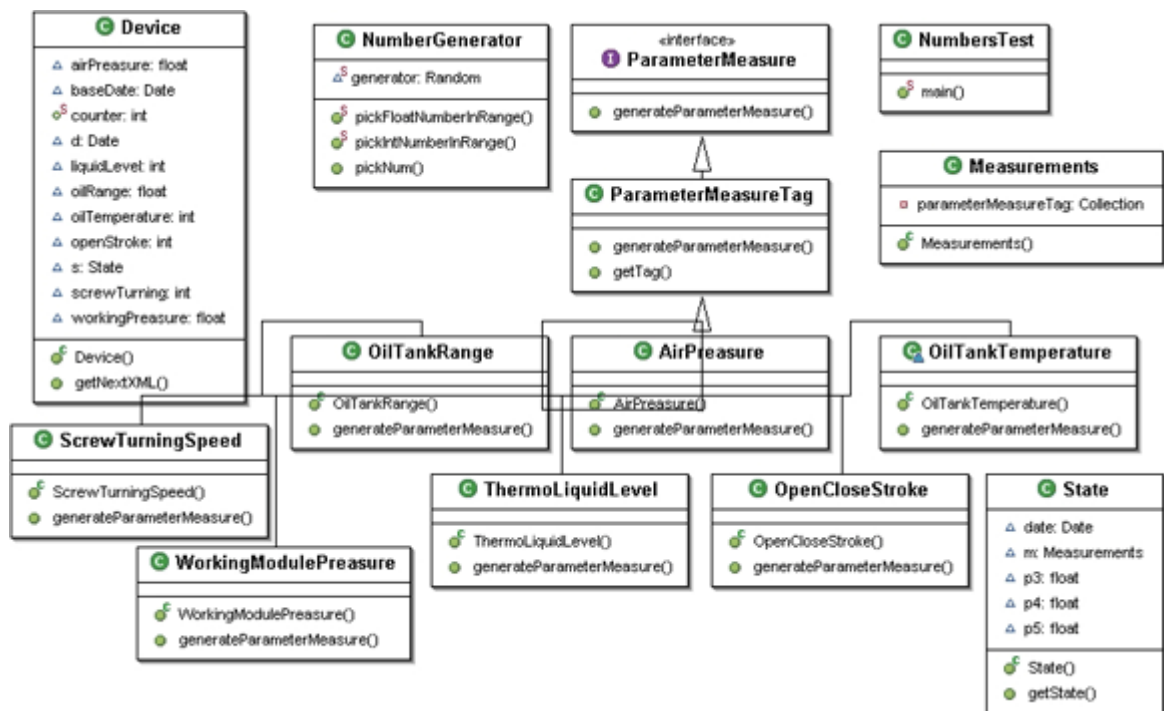
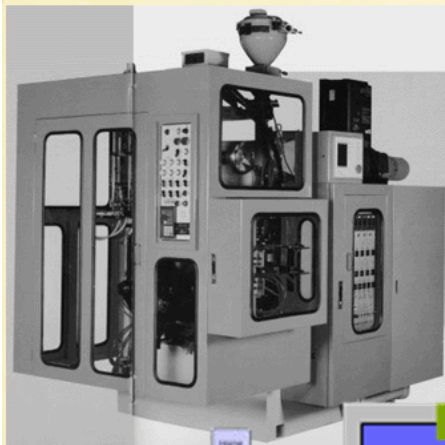


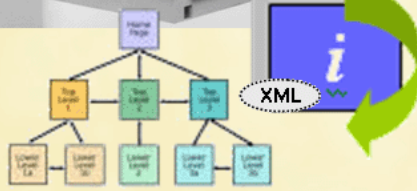
Figure 10 - UML class diagram



➤ Specification of the KF-330 blow molding machine was used for simulation of the device data (7 device parameters);

➤ Corresponding XML-schema and XML-generator have become more sophisticated;

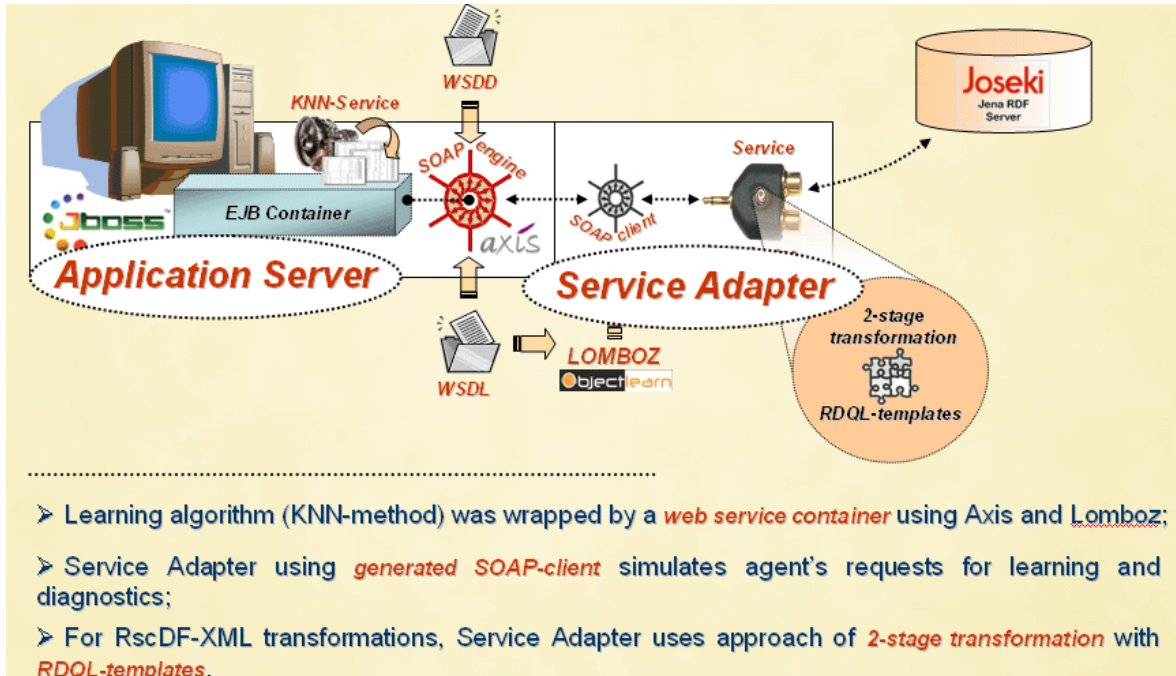
➤ Maintenance ontology has been extended by specific classes related to the machine.



☐ *These device data allowed deeper analysis of human adapter (data visualization),*

☐ *... and better analysis of the Web Service learning process.*

## 4 Task 5: Implementation of the semantic adapter for (web) service



### Development tools used:

- Eclipse IDE
- Lomboz plugin for Eclipse
- Apache Axis (SOAP engine)
- JBoss application server

### 4.1 Axis



Axis is essentially a *SOAP engine* -- a framework for constructing SOAP processors such as clients, servers, gateways, etc. The current version of Axis is written in Java, but a C++ implementation of the client side of Axis is being developed.

But Axis isn't just a SOAP engine - it also includes:

- a simple stand-alone server,
- a server which plugs into servlet engines such as Tomcat,

- extensive support for the *Web Service Description Language (WSDL)*,
- emitter tooling that generates Java classes from WSDL.
- some sample programs, and
- a tool for monitoring TCP/IP packets.

## 4.2 Lombok



- Fully integrated with eclipse and **eclipse Java Development Tool, JDT**.
- Launch any J2EE based application server in debug or run modes.
- Work with any J2EE based application server during development. Ability to deploy to multiple targets from the same project.
- Provides **wizards** to create J2EE and Web services applications with EJB™, servlet, JSP™, HTML, and Web services all in one development environment.
- Special editors to increase developer productivity with Editor for JSPs, Jasper aided code assist.
- JSP compilation and syntax checking without the need for server deployment.
- JSP debugging if the servers allows it (Tomcat/BEA WLS).
- Support for Web services using open standards such **WSDL via Web services Client Wizard using Apache Axis**.
- Increase EJB developer productivity with wizards, code annotation and generation using XDoclet and end-to-end testing with wizard-driven EJB Testing Client

## 4.3 SOAP

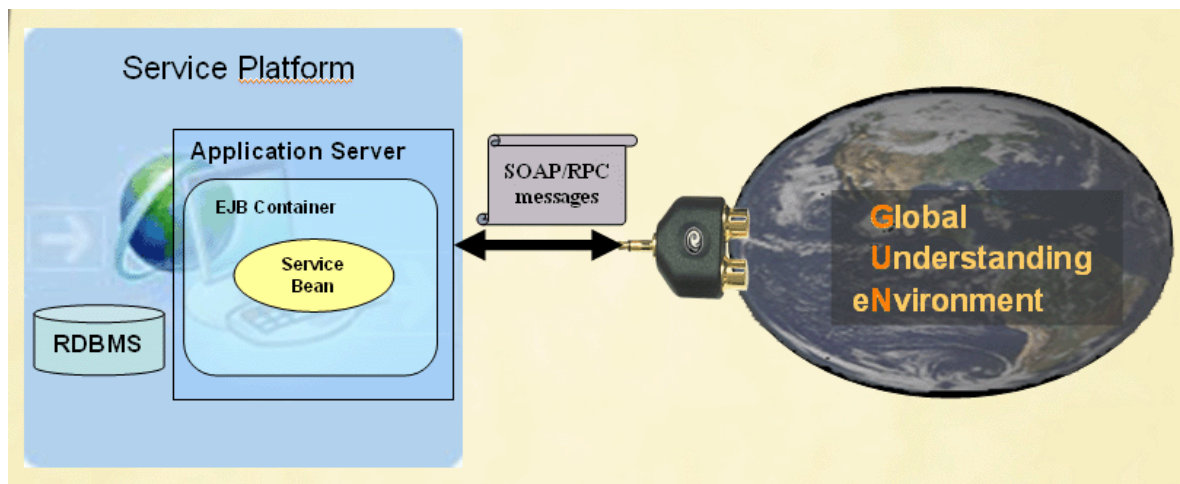
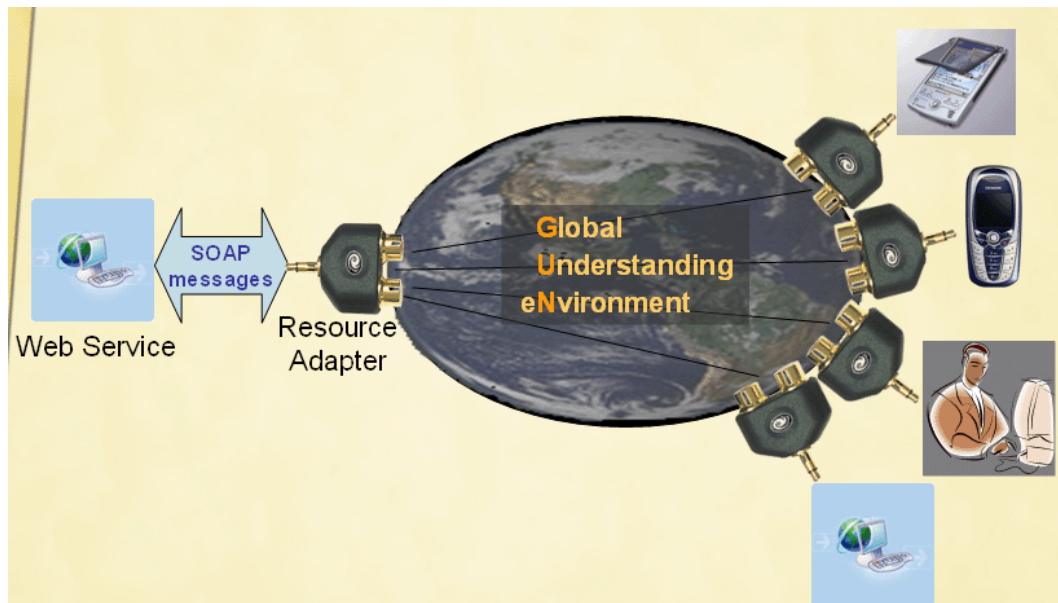
### Simple Object Access Protocol

- Lightweight protocol to exchange information in a decentralized, distributed environment.



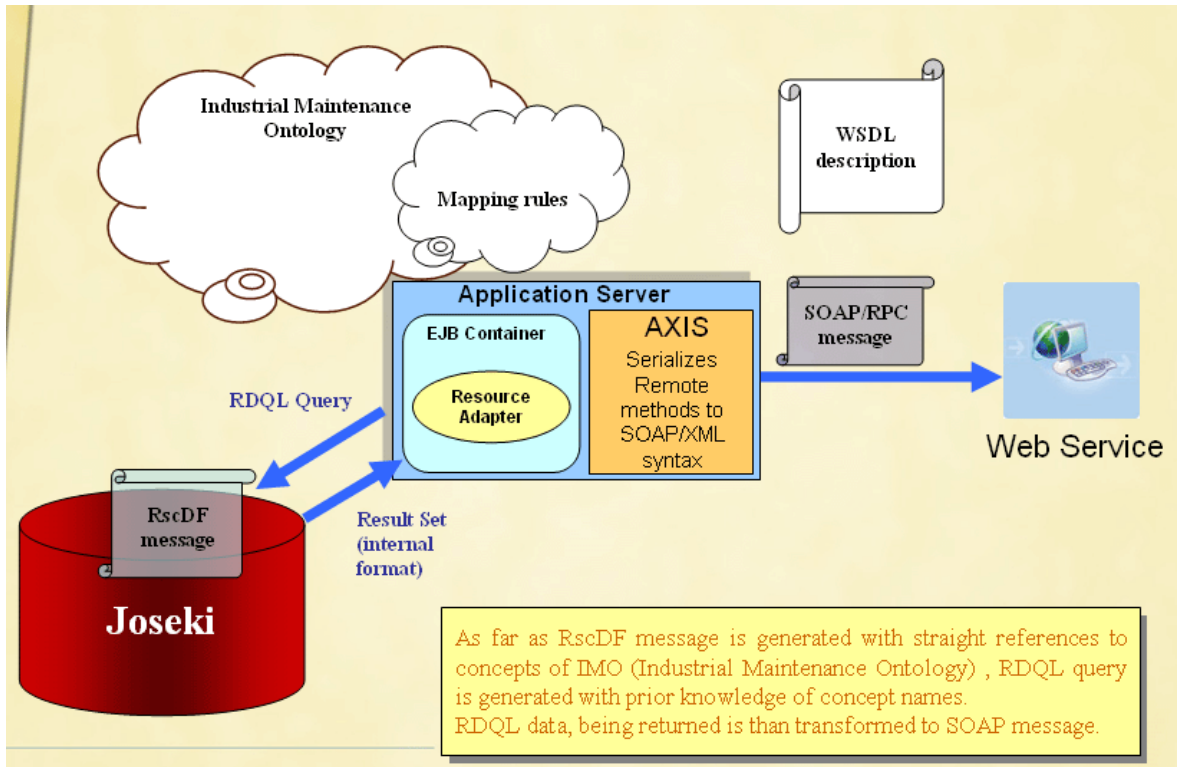
- SOAP messages are combined to perform request/response patterns.
- SOAP is transport protocol independent
- SOAP can be run over existing Internet infrastructure (over HTTP)

- Web Service as a Resource in GUN

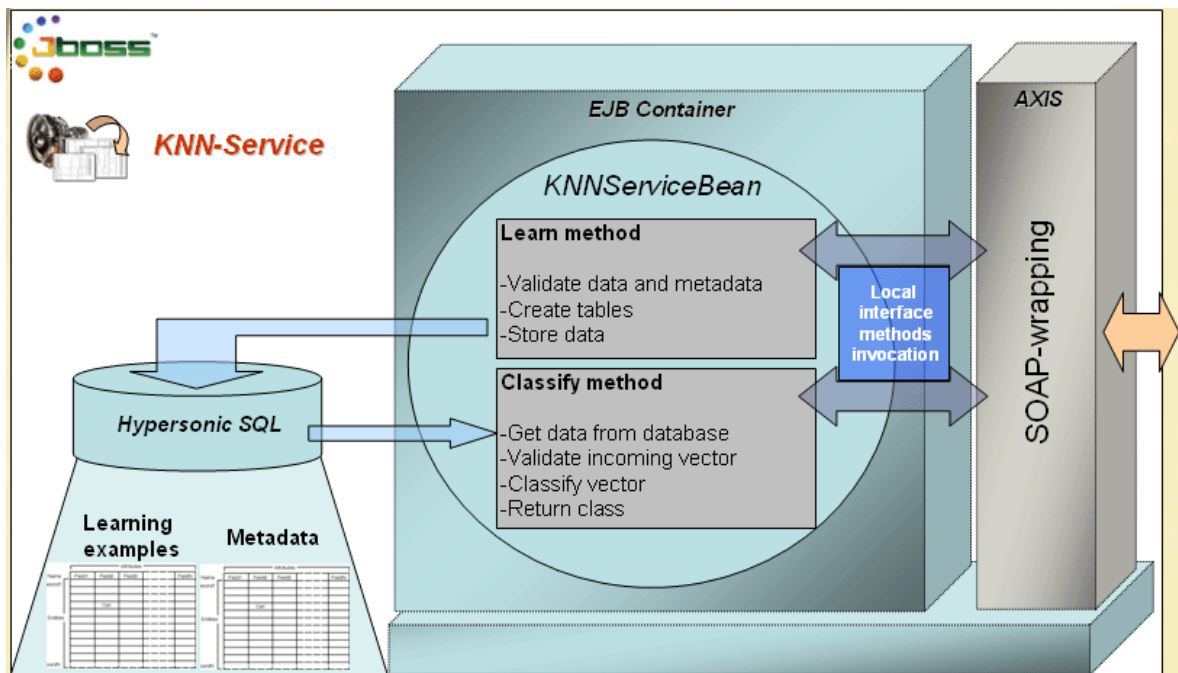


- Functions
  - Learning on examples
  - Classification
- Logic

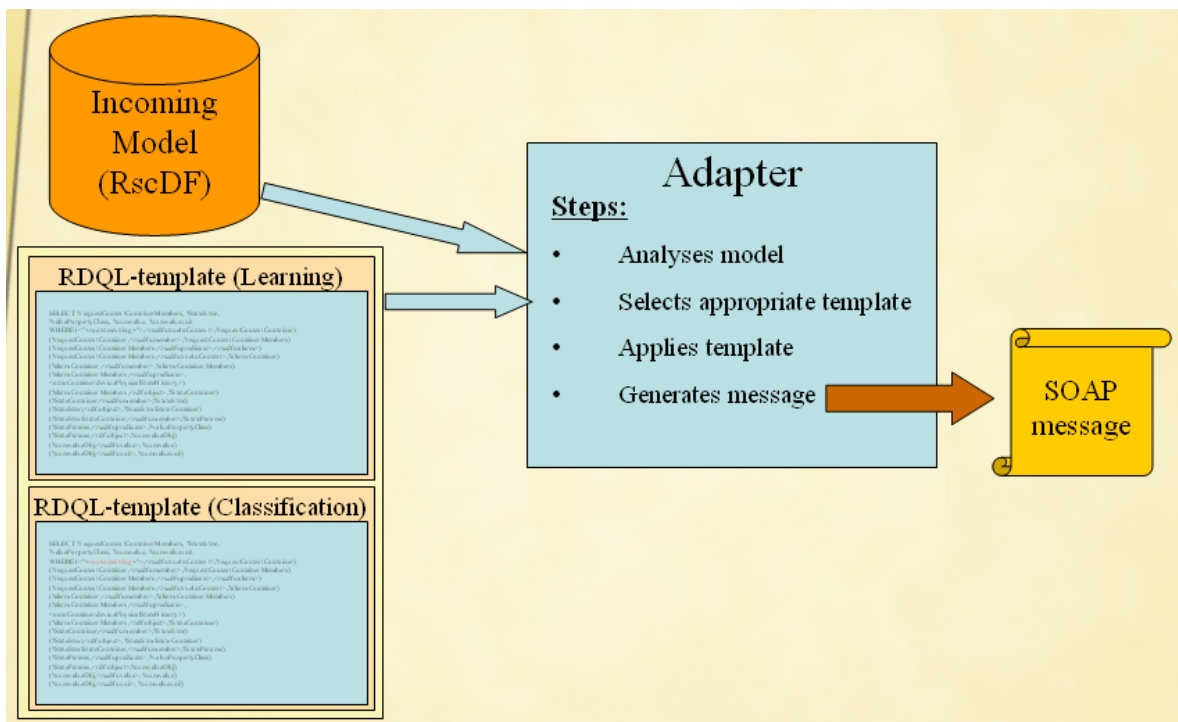
- ❑ k-Nearest Neighbors Algorithm
- ❑ Learning examples are stored in a database
- Interface
  - ❑ SOAP protocol

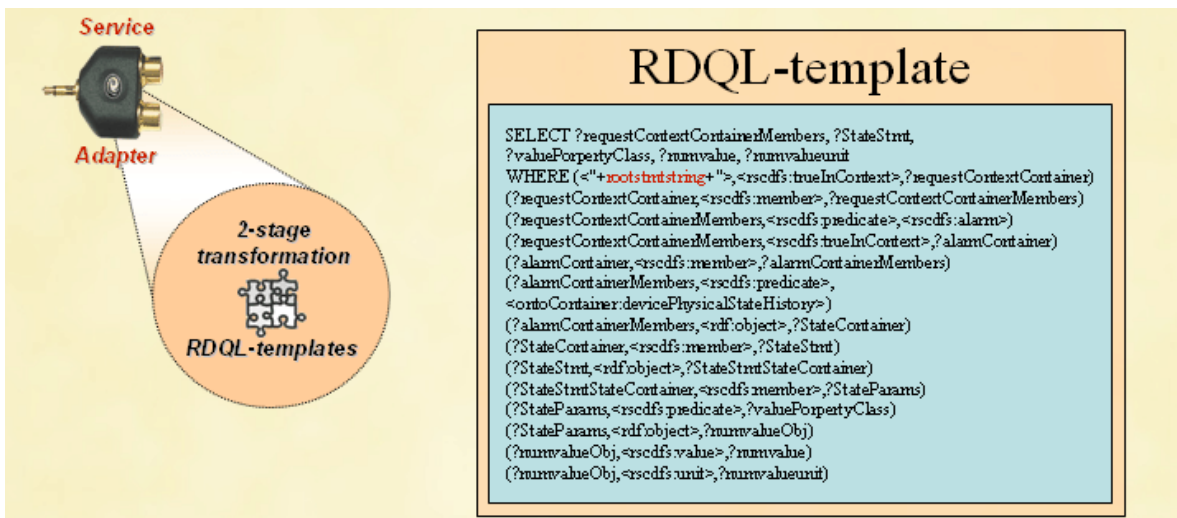
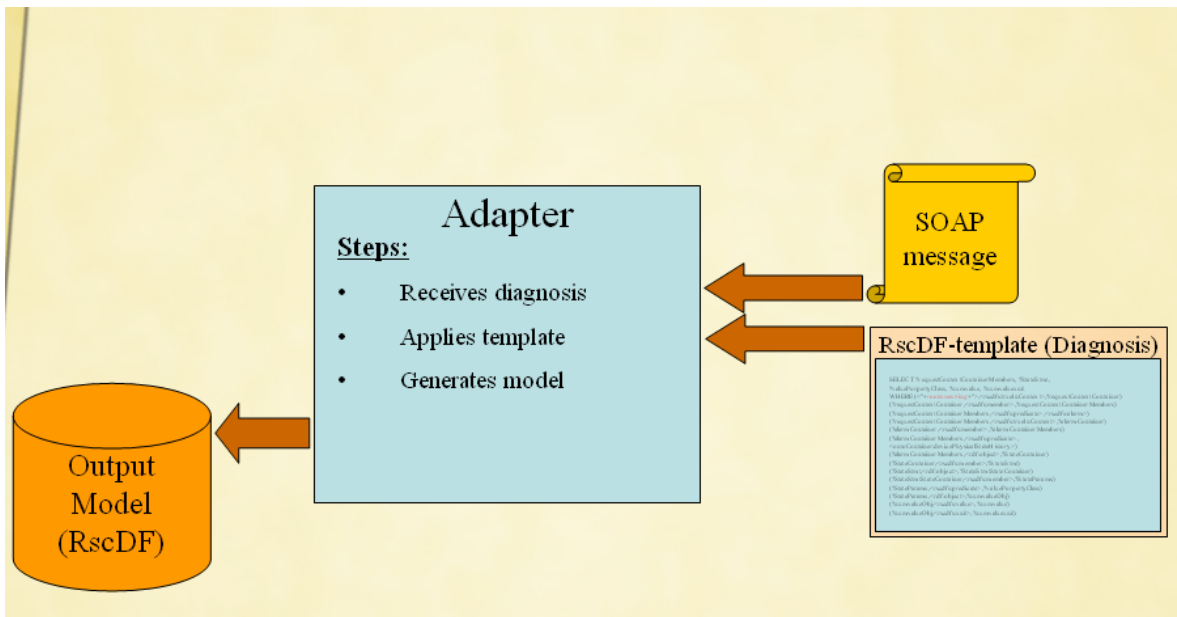


- Web Service inside



#### 4.4 Adaptation from GUN to Web Service

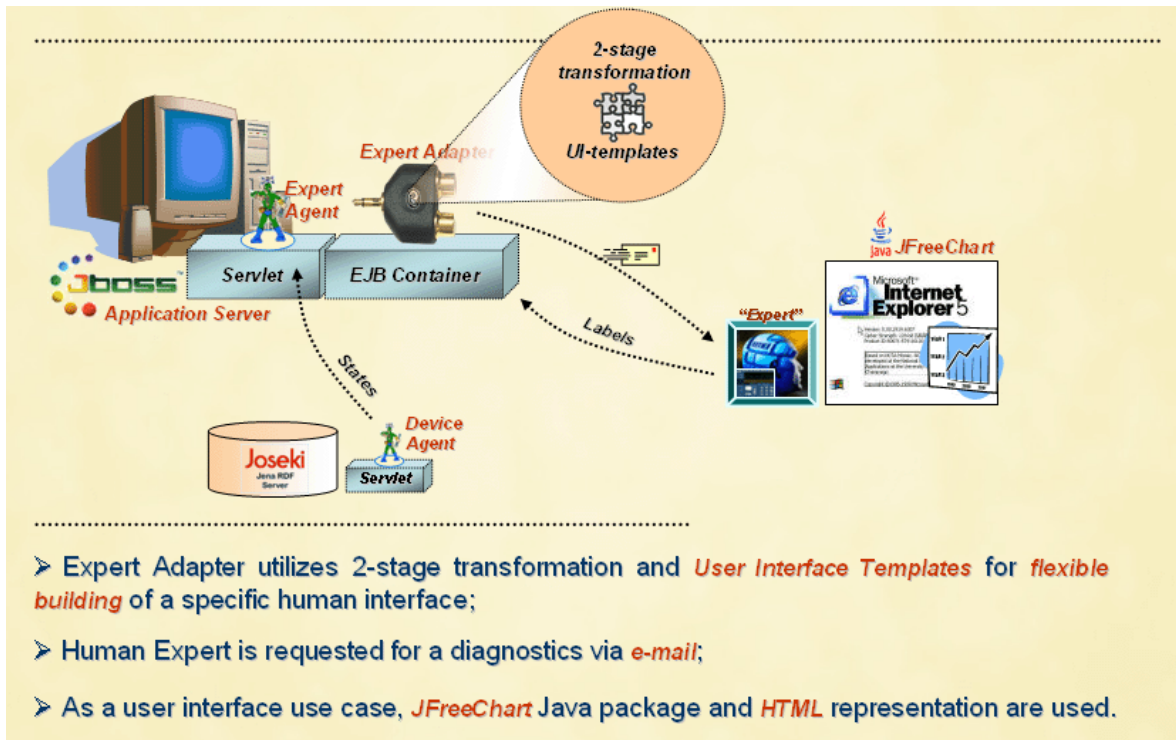




RDQL templates are bound to types of messages:

- Template for Learning message
- Template for Classification message

## 5 Task 6: Implementation of the semantic adapter (resource browser) for human



### 5.1 Input data

- Template of WEB UI
- Template of Diagnostics response
- Possible diagnoses for the Device from ontology
- Email of Expert from ontology
- Annotation of Device
- Request for Diagnostics with Device subhistory for generation of charts

### 5.2 Expert annotation

```
<rscdfs:Expert rdf:about="&expert;expert1"  
  rdfs:comment="Expert"  
  rdfs:label="Expert "  
  rscdfs:email="annaumen@cc.jyu.fi" />
```

### 5.3 User interface template

```
<html>
<p>
<center>
<b>ANNOTATION</b>
</center>
<b>{v:annotation}</b>
</p>

<t:chart>

</t:chart>

<t:diagnoses>
<form action="http://chitradurga:8080/WebPrototype/controller" method="post">
<select name="diagnoses">
<t:diagnosis>
<option value="{v:diagnosisURI}">{v:diagnosis}</option>
</t:diagnosis>
</select><br/>
<input type="submit" name="useraction" value="MakeDiagnosis"/>
</form>
</t:diagnoses>
</html>
```

Sample of e-mail:

```
Hello You have got request for diagnostic from 123456XZ24
which has unique identifier as
http://ohcejohka.ad.jyu.fi:2020/SmartResource#123456XZ24
you can do diagnostics by this link:
http://chitradurga:8080/WebPrototype/controller?useraction=GetUI
```

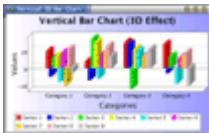
### 5.4 Device annotation

```
<ontoDevice:PaperMachineSeries60
  rdf:about="&device;123456XZ24" rdfs:label="123456XZ24">
  <rdfs:comment>
  Device KF-330 blow molding machine
  </rdfs:comment>
  <rdfs:comment> The manufacture of machine is KUN
  FONG Machinery Co.,LTD </rdfs:comment>
  <rdfs:comment>E-mail of manufacture is &lt;A
  HREF="mailto:kunfong9@ms49.hinet.net"&gt;kunfong9@
  ms49.hinet.net &lt;/A&gt;</rdfs:comment>
  .....
```

## 5.5 Template of the diagnosis statement

```
<rscdfs:SR_Statement rdf:about="{v:diagID}">
  <rdf:subject rdf:resource="{v:device}" />
  <rscdfs:predicate
    rdf:resource="http://www.cc.jyu.fi/~olkhriye/rscdfs/0.3/ontologi
es/conditionOntology#devicePhysicalDiagnosis" />
  <rdf:object rdf:resource="{v:diagURI}" />
  <rscdfs:truelnContext rdf:resource="{v:diagconID}" />
</rscdfs:SR_Statement>
```

## 5.6 JFreeChart



JFreeChart is a free Java class library for generating charts

- complete source code is included, under the terms of the GNU Lesser General Public License;
- access to data from any source via dataset interfaces;
- support for multiple secondary axes and datasets;
- tool tips, zooming, printing;
- direct export to PNG and JPEG;
- export to PDF via iText and SVG via Batik (both described in the JFreeChart Developer Guide).
- support for servlets, JSP (thanks to Cewolf), applets or client applications;
- comprehensive Javadocs;

## 6 Task 7: Implementation of the maintenance environment prototype v. 1.0

The prototype of Maintenance Environment System is based on J2EE platform. And as implementation of J2EE platform it uses JBoss application server. The pilot Maintenance Environment System involves JSP, Servlets and EJB techniques and uses MVC pattern. Resource adapter is deployed as enterprise java bean on the application server. The control servlet gets requests from clients and redirect it to adapters. Then different java server pages are generated as response for client (see Figure 11).

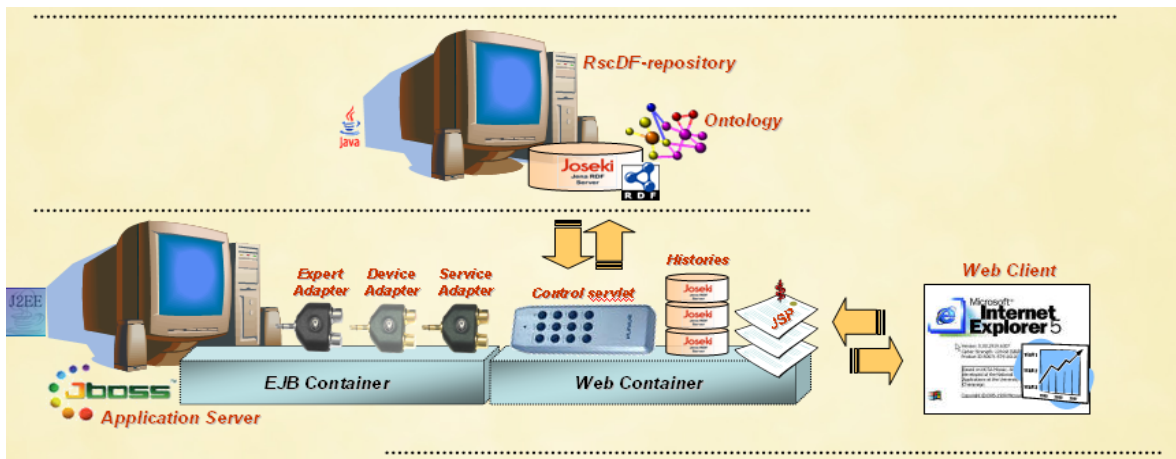
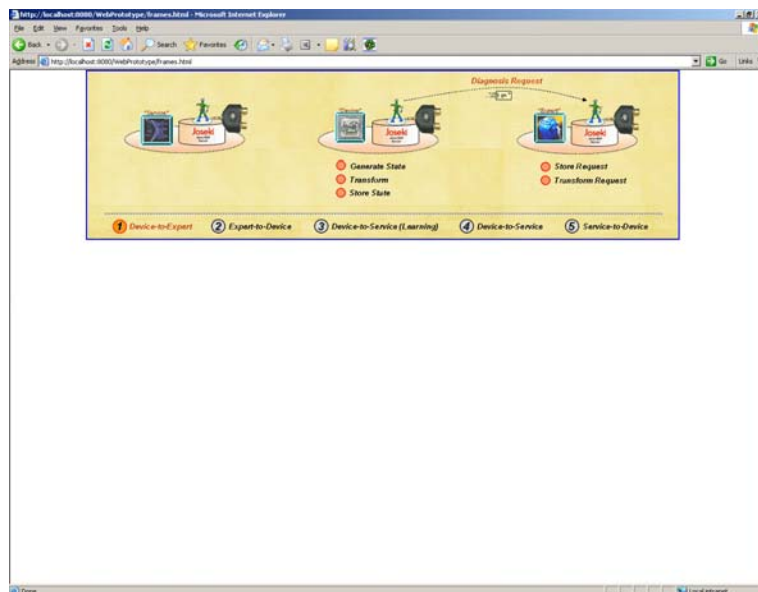


Figure 11 - Maintenance environment system





http://localhost:8080/WebPrototype/frames.html - Microsoft Internet Explorer

Address http://localhost:8080/WebPrototype/frames.html

[Jena and Joseki Tools](#)  
[RDQL](#)  
[Jena - Semantic Web Framework for Java](#)  
[Joseki - The Jena RDF Server](#)

Done

http://localhost:8080/WebPrototype/frames.html - Microsoft Internet Explorer

Address http://localhost:8080/WebPrototype/frames.html

[Jena and Joseki Tools](#)  
[RDQL](#)  
[Jena - Semantic Web Framework for Java](#)  
[Joseki - The Jena RDF Server](#)

State of Device at 2004-12-19T19:20:26.893  
[View XML](#)

Time	Cyan Series	Yellow Series	Red Series	Green Series
1	240	240	70	80
2	325	240	70	70
3	175	240	65	60
4	270	240	70	40

http://localhost:8080/WebPrototype/frames.html - Microsoft Internet Explorer

Address http://localhost:8080/WebPrototype/frames.html

```

<?xml version="1.0" encoding="UTF-8" ?>
- <st:State xmlns:st="http://www.metso.com/Alarm" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation="http://www.metso.com/Alarm
file:/C:/MYTEMP/berg/SR/XML/work/StateMessage/StateMessage.xsd" Time="2004-12-19T19:27:56.093">
- <Measurement>
- <ParamType>Screw turning speed</ParamType>
- <Units>rpm</Units>
- <Value>79</Value>
- <Sensor sensorID="KS20-S">Rotation speed sensor</Sensor>
- </Measurement>
- <Measurement>
- <ParamType>Open close stroke</ParamType>
- <Units>mm</Units>
- <Value>244</Value>
- <Sensor sensorID="I112-D7">Gap sensor</Sensor>
- </Measurement>
- <Measurement>
- <ParamType>Oil tank temperature</ParamType>
- <Units>celsius</Units>
- <Value>70</Value>
- <Sensor sensorID="KX2034-S">Temperature sensor</Sensor>
- </Measurement>
- <Measurement>
- <ParamType>Thermo liquid level</ParamType>
- <Units>mm</Units>
- <Value>58</Value>
- <Sensor sensorID="L1Q-23M1">Level sensor</Sensor>
- </Measurement>
- <Measurement>
- <ParamType>Working module pressure</ParamType>
- <Units>kg/cm2</Units>
- <Value>0.300126</Value>
- <Sensor sensorID="PI01-1">Pressure sensor</Sensor>
- </Measurement>
- </Measurements>

```

Done

http://localhost:8080/WebPrototype/frames.html - Microsoft Internet Explorer

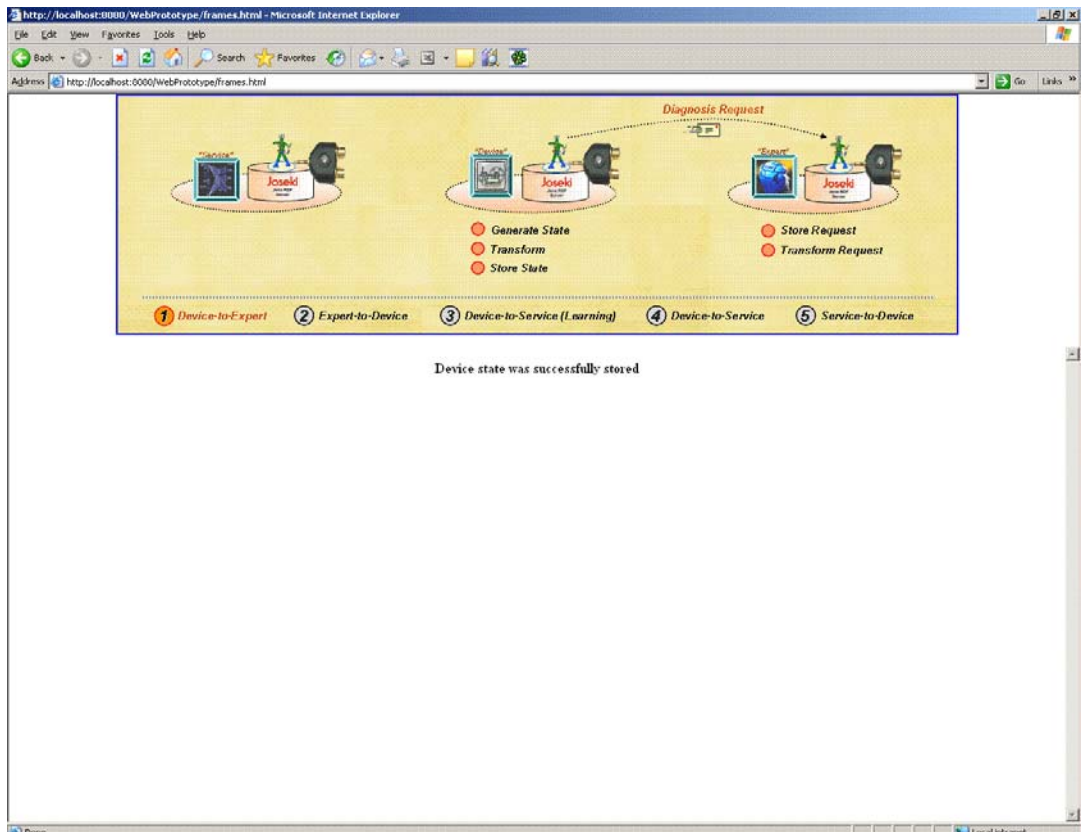
Address http://localhost:8080/WebPrototype/frames.html

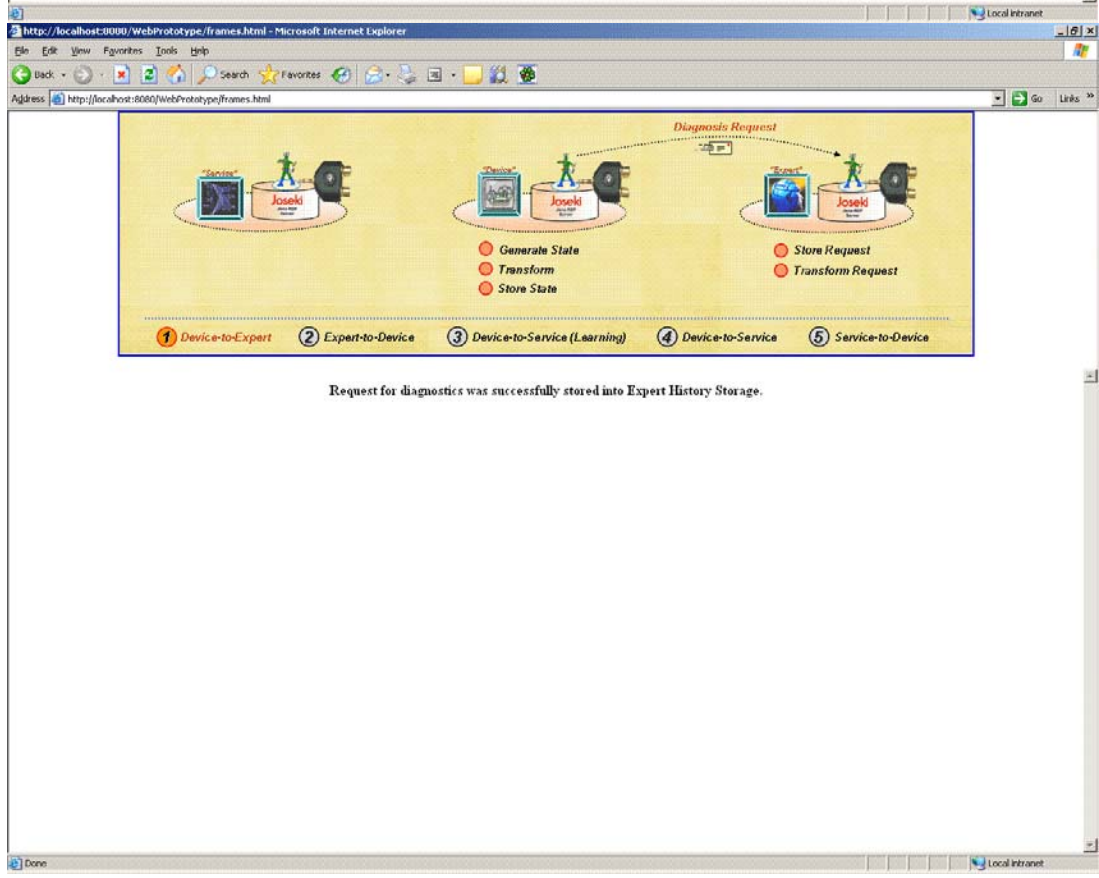
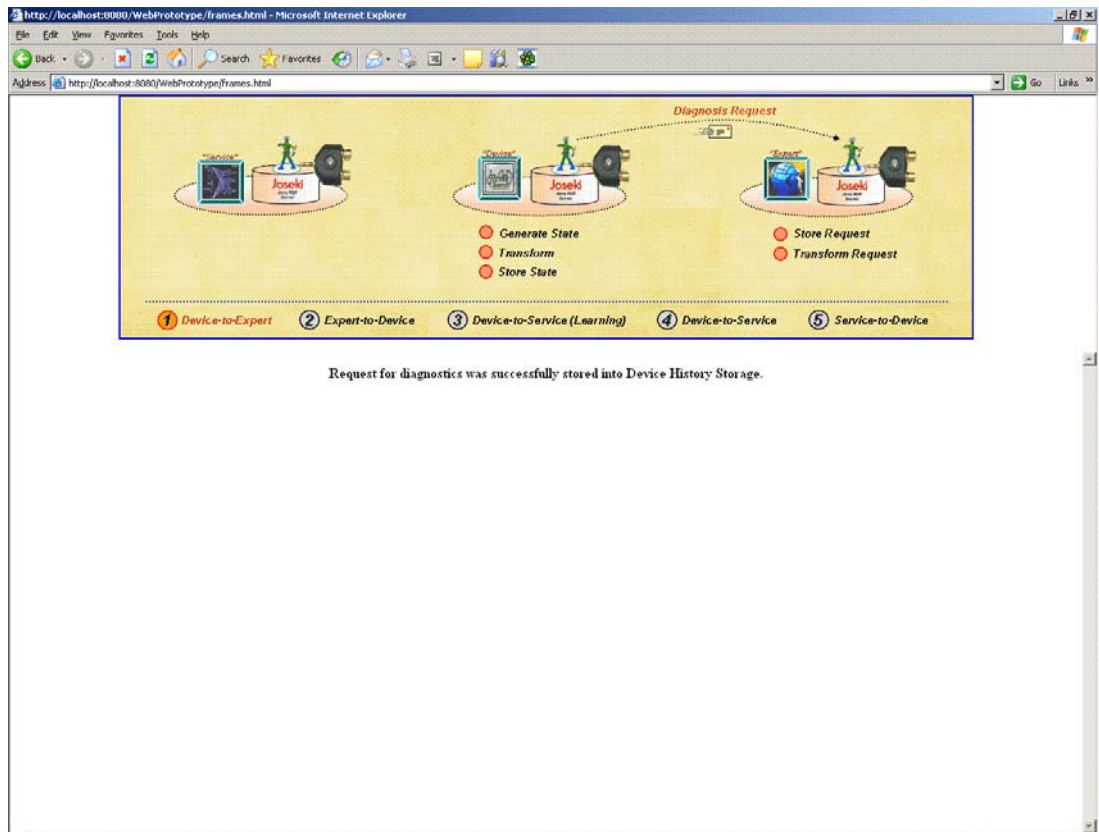
```

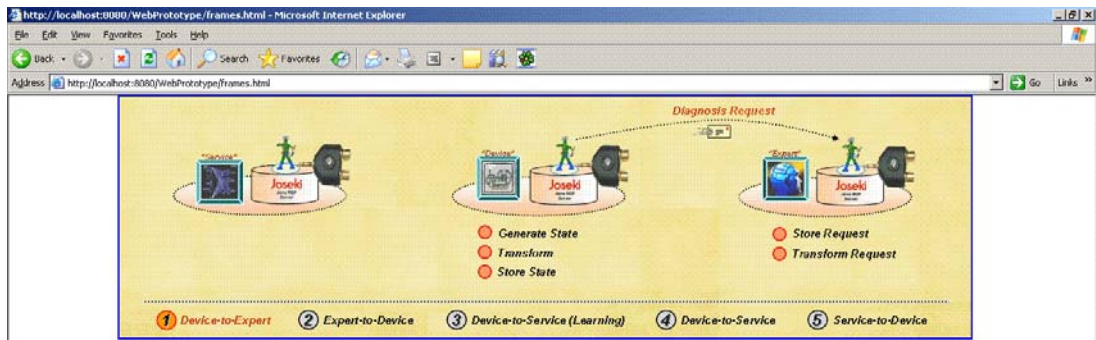
<?xml version="1.0" ?>
- <IDOCTYPE rdf:RDF (View source for full doctype...)>
- <rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#" xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
xmlns:rscdfs="http://www.cc.jyu.fi/~olkhriye/rscdfs/0.3/rscdfs#"
xmlns:ontoMeasurement="http://www.cc.jyu.fi/~olkhriye/rscdfs/0.3/ontologies/measurementOntology#"
xmlns:ontoEnumerativeValue="http://www.cc.jyu.fi/~olkhriye/rscdfs/0.3/ontologies/enumerativeValueOntology#"
xmlns:ontoTempMark="http://www.cc.jyu.fi/~olkhriye/rscdfs/0.3/ontologies/tempMarkOntology#"
xmlns:ontoDevice="http://www.cc.jyu.fi/~olkhriye/rscdfs/0.3/ontologies/deviceOntology#"
xmlns:ontoContainer="http://www.cc.jyu.fi/~olkhriye/rscdfs/0.3/ontologies/containerOntology#"
xmlns:ontoDiagnosis="http://www.cc.jyu.fi/~olkhriye/rscdfs/0.3/ontologies/diagnosisOntology#"
xmlns:ontoCondition="http://www.cc.jyu.fi/~olkhriye/rscdfs/0.3/ontologies/conditionOntology#"
xmlns:expert="http://chitradurga.ad.jyu.fi:2020/SmartResource#" xmlns:service="http://pilot.ad.jyu.fi:2020/SmartResource#"
- <rscdfs:SR_Statement rdf:about="http://ohcejohka.ad.jyu.fi:2020/SmartResource#StateStatement85">
- <rdf:subject rdf:resource="http://ohcejohka.ad.jyu.fi:2020/SmartResource#123456XZ24" />
- <rdf:predicate rdf:resource="http://www.cc.jyu.fi/~olkhriye/rscdfs/0.3/ontologies/containerOntology#devicePhysicalState" />
- <rdf:object rdf:resource="http://ohcejohka.ad.jyu.fi:2020/SmartResource#StateContainer81" />
- <rscdfs:trueInContext rdf:resource="http://ohcejohka.ad.jyu.fi:2020/SmartResource#StateFilterContainer84" />
- </rscdfs:SR_Statement>
- <rscdfs:SR_Container rdf:about="http://ohcejohka.ad.jyu.fi:2020/SmartResource#StateContainer81">
- <rscdfs:member rdf:resource="http://ohcejohka.ad.jyu.fi:2020/SmartResource#statement56" />
- <rscdfs:member rdf:resource="http://ohcejohka.ad.jyu.fi:2020/SmartResource#statement60" />
- <rscdfs:member rdf:resource="http://ohcejohka.ad.jyu.fi:2020/SmartResource#statement64" />
- <rscdfs:member rdf:resource="http://ohcejohka.ad.jyu.fi:2020/SmartResource#statement68" />
- <rscdfs:member rdf:resource="http://ohcejohka.ad.jyu.fi:2020/SmartResource#statement72" />
- <rscdfs:member rdf:resource="http://ohcejohka.ad.jyu.fi:2020/SmartResource#statement76" />
- <rscdfs:member rdf:resource="http://ohcejohka.ad.jyu.fi:2020/SmartResource#statement80" />
- </rscdfs:SR_Container>
- <rscdfs:SR_Statement rdf:about="http://ohcejohka.ad.jyu.fi:2020/SmartResource#statement56">
- <rdf:subject rdf:resource="http://ohcejohka.ad.jyu.fi:2020/SmartResource#123456XZ24" />
- <rscdfs:predicate rdf:resource="http://www.cc.jyu.fi/~olkhriye/rscdfs/0.3/ontologies/measurementOntology#KF330_param1" />
- <rdf:object rdf:resource="http://ohcejohka.ad.jyu.fi:2020/SmartResource#numValue53" />
- <rscdfs:trueInContext rdf:resource="http://ohcejohka.ad.jyu.fi:2020/SmartResource#container55temp" />
- </rscdfs:SR_Statement>

```

Done

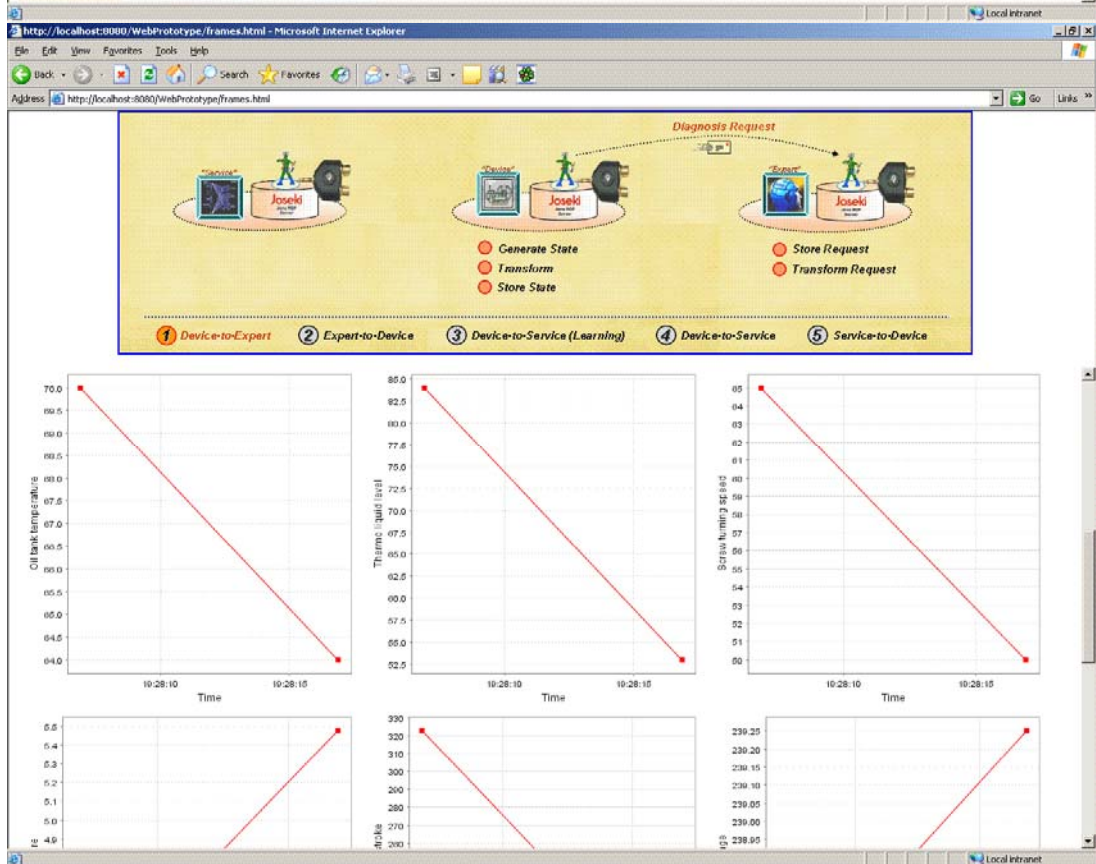






ANNOTATION

Diagnostics for 123456XZ24  
 The manufacture of machine is KUN FONG Machinery Co., LTD  
 The Contact person is Mr. Chan Tong  
 Device KF-330 blow molding machine  
 Mail address of manufacture is 14, LANE 108, YU-MEN ROAD, TAICUNG CITY, TAIWAN  
 The manufacture's phone and fax 886-4-24610589, 886-4-24631205



http://localhost:8080/WebPrototype/frames.html - Microsoft Internet Explorer

Address http://localhost:8080/WebPrototype/frames.html

Diagnosis Request

Generate State  
Transform  
Store State

Store Request  
Transform Request

1 Device-to-Expert 2 Expert-to-Device 3 Device-to-Service (Learning) 4 Device-to-Service 5 Service-to-Device

Working module pressure

Passages plugging of the lubricating system  
Leakage of oil in the oil tank  
Oil tank thermometer probe break-age  
Disturbance of the drive shaft of the gear  
Kinks in the main drive engine  
Disturbance of physical diagnosis  
Passages plugging of the lubricating system

MakeDiagnosis

Diagnosis has unique identifier: [http://www.cc.jyu.fi/~ollkuije/rscdfs0.3/ontologies/diagnosisOntology#DeviceDiagnosis\\_4](http://www.cc.jyu.fi/~ollkuije/rscdfs0.3/ontologies/diagnosisOntology#DeviceDiagnosis_4)

http://localhost:8080/WebPrototype/frames.html - Microsoft Internet Explorer

Address http://localhost:8080/WebPrototype/frames.html

```

<?xml version="1.0" encoding="UTF-8" ?>
<!DOCTYPE rdf:RDF [View Source for full doctype...]>
<rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#" xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
xmlns:rscdfs="http://www.cc.jyu.fi/~olkhriye/rscdfs/0.3/rscdfs#"
xmlns:ontoTempMark="http://www.cc.jyu.fi/~olkhriye/rscdfs/0.3/ontologies/tempTempMarkOntology#">
<!-- Response -->
<!-->
<rscdfs:SR_Statement rdf:about="http://chitradurga.ad.jyu.fi:2020/SmartResource#250">
<rdfs:subject rdf:resource="http://chitradurga.ad.jyu.fi:2020/SmartResource#expert1" />
<rscdfs:predicate rdf:resource="http://www.cc.jyu.fi/~olkhriye/rscdfs/0.3/ontologies/messageContentOntology#devicePhysicalDiagnosticResponse" />
<rdfs:object rdf:resource="http://ohcejohka.ad.jyu.fi:2020/SmartResource#123456X724" />
<rscdfs:trainContext rdf:resource="http://chitradurga.ad.jyu.fi:2020/SmartResource#250" />
</rscdfs:SR_Statement>
<rscdfs:Context_SR_Container rdf:about="http://chitradurga.ad.jyu.fi:2020/SmartResource#250">
<rscdfs:member rdf:resource="http://ohcejohka.ad.jyu.fi:2020/SmartResource#Message_for_Diagnosis253" />
<rscdfs:member rdf:resource="http://chitradurga.ad.jyu.fi:2020/SmartResource#257" />
</rscdfs:Context_SR_Container>
<!-- Diagnosis Statement -->
<!-->
<rscdfs:SR_Statement rdf:about="http://chitradurga.ad.jyu.fi:2020/SmartResource#257">
<rdfs:subject rdf:resource="http://ohcejohka.ad.jyu.fi:2020/SmartResource#123456X724" />
<rscdfs:predicate rdf:resource="http://www.cc.jyu.fi/~olkhriye/rscdfs/0.3/ontologies/conditionOntology#devicePhysicalDiagnosis" />
<rdfs:object rdf:resource="http://www.cc.jyu.fi/~olkhriye/rscdfs/0.3/ontologies/diagnosisOntology#DeviceDiagnosis_4" />
<rscdfs:trainContext rdf:resource="http://chitradurga.ad.jyu.fi:2020/SmartResource#256" />
</rscdfs:SR_Statement>
<rscdfs:Context_SR_Container rdf:about="http://chitradurga.ad.jyu.fi:2020/SmartResource#256">
<rscdfs:member rdf:resource="http://chitradurga.ad.jyu.fi:2020/SmartResource#255" />
<rscdfs:member rdf:resource="http://ohcejohka.ad.jyu.fi:2020/SmartResource#subhistory253" />
<rscdfs:member rdf:resource="http://ohcejohka.ad.jyu.fi:2020/SmartResource#rootalarmstatement253" />
<rscdfs:member rdf:resource="http://chitradurga.ad.jyu.fi:2020/SmartResource#expert2WorldStatement" />
</rscdfs:Context_SR_Container>
<!-- Time -->
<!-->

```

Done

http://localhost:8080/WebPrototype/frames.html - Microsoft Internet Explorer

Address http://localhost:8080/WebPrototype/frames.html

Response with diagnostics was successfully stored into Expert History Storage.

http://localhost:8080/WebPrototype/frames.html - Microsoft Internet Explorer

Address http://localhost:8080/WebPrototype/frames.html

```

<?xml version="1.0" encoding="UTF-8" ?>
<!DOCTYPE rdf:RDF [View Source for full doctype...]>
<rdf:RDF xmlns:rdfs="http://www.w3.org/1999/02/22-rdf-syntax-ns#" xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
xmlns:rscdfs="http://www.cc.jyu.fi/~olkhriye/rscdfs/0.3/rscdfs#"
xmlns:ontoTempMark="http://www.cc.jyu.fi/~olkhriye/rscdfs/0.3/ontologies/tempTempMarkOntology#">
<!-- Response -->
<!-->
<rscdfs:SR_Statement rdf:about="http://chitradurga.ad.jyu.fi:2020/SmartResource#259">
<rdfs:subject rdf:resource="http://chitradurga.ad.jyu.fi:2020/SmartResource#expert1"/>
<rscdfs:predicate rdf:resource="http://www.cc.jyu.fi/~olkhriye/rscdfs/0.3/ontologies/messageContentOntology#devicePhysicalDiagnosticResponse"/>
<rdfs:object rdf:resource="http://ohcejohka.ad.jyu.fi:2020/SmartResource#123456X724"/>
<rscdfs:trainContext rdf:resource="http://chitradurga.ad.jyu.fi:2020/SmartResource#258"/>
</rscdfs:SR_Statement>
<rscdfs:Context_SR_Container rdf:about="http://chitradurga.ad.jyu.fi:2020/SmartResource#259">
<rscdfs:member rdf:resource="http://ohcejohka.ad.jyu.fi:2020/SmartResource#Message_for_Diagnosis253"/>
</rscdfs:Context_SR_Container>
<!-- Diagnosis Statement -->
<!-->
<rscdfs:SR_Statement rdf:about="http://chitradurga.ad.jyu.fi:2020/SmartResource#257">
<rdfs:subject rdf:resource="http://ohcejohka.ad.jyu.fi:2020/SmartResource#123456X724"/>
<rscdfs:predicate rdf:resource="http://www.cc.jyu.fi/~olkhriye/rscdfs/0.3/ontologies/conditionOntology#devicePhysicalDiagnosis"/>
<rdfs:object rdf:resource="http://www.cc.jyu.fi/~olkhriye/rscdfs/0.3/ontologies/diagnosisOntology#DeviceDiagnosis_4"/>
<rscdfs:trainContext rdf:resource="http://chitradurga.ad.jyu.fi:2020/SmartResource#256"/>
</rscdfs:SR_Statement>
<rscdfs:Context_SR_Container rdf:about="http://chitradurga.ad.jyu.fi:2020/SmartResource#257">
<rscdfs:member rdf:resource="http://chitradurga.ad.jyu.fi:2020/SmartResource#255"/>
<rscdfs:member rdf:resource="http://ohcejohka.ad.jyu.fi:2020/SmartResource#subhistory253"/>
<rscdfs:member rdf:resource="http://ohcejohka.ad.jyu.fi:2020/SmartResource#rootalarmstatement253"/>
<rscdfs:member rdf:resource="http://chitradurga.ad.jyu.fi:2020/SmartResource#expert2WorldStatement"/>
</rscdfs:Context_SR_Container>
<!-- Time -->

```

Done

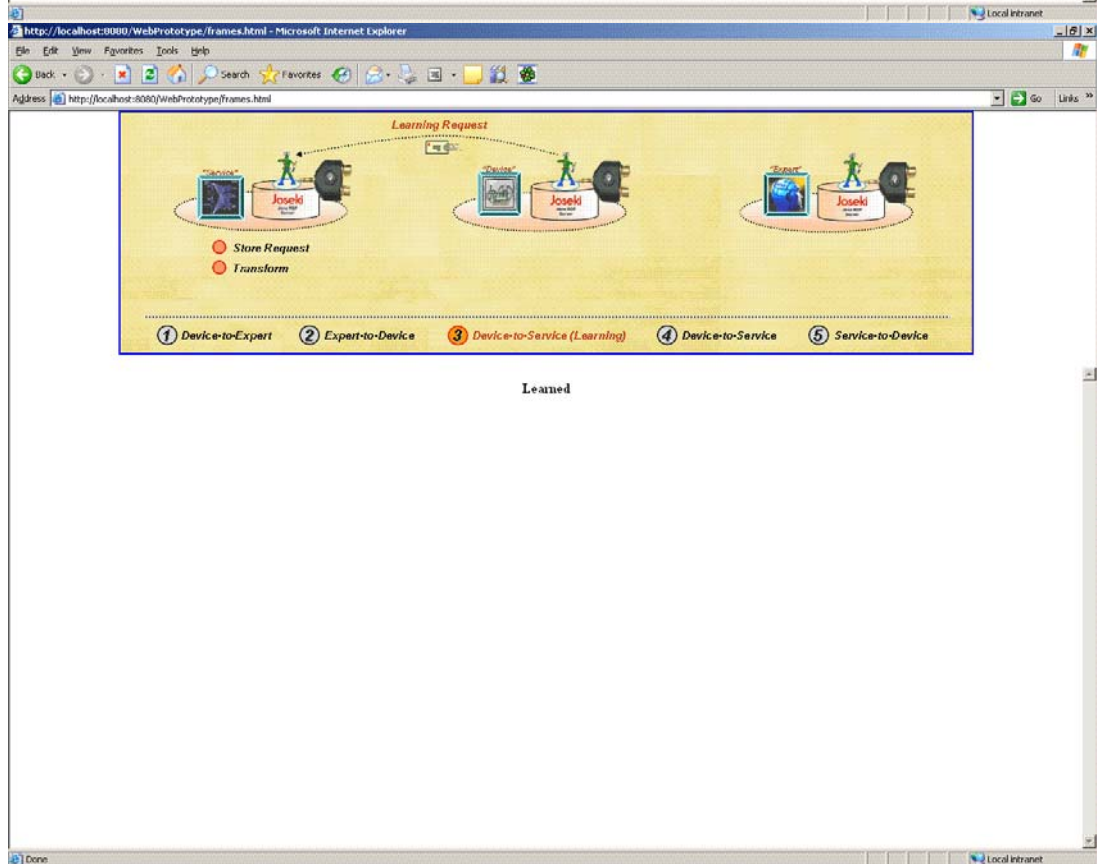
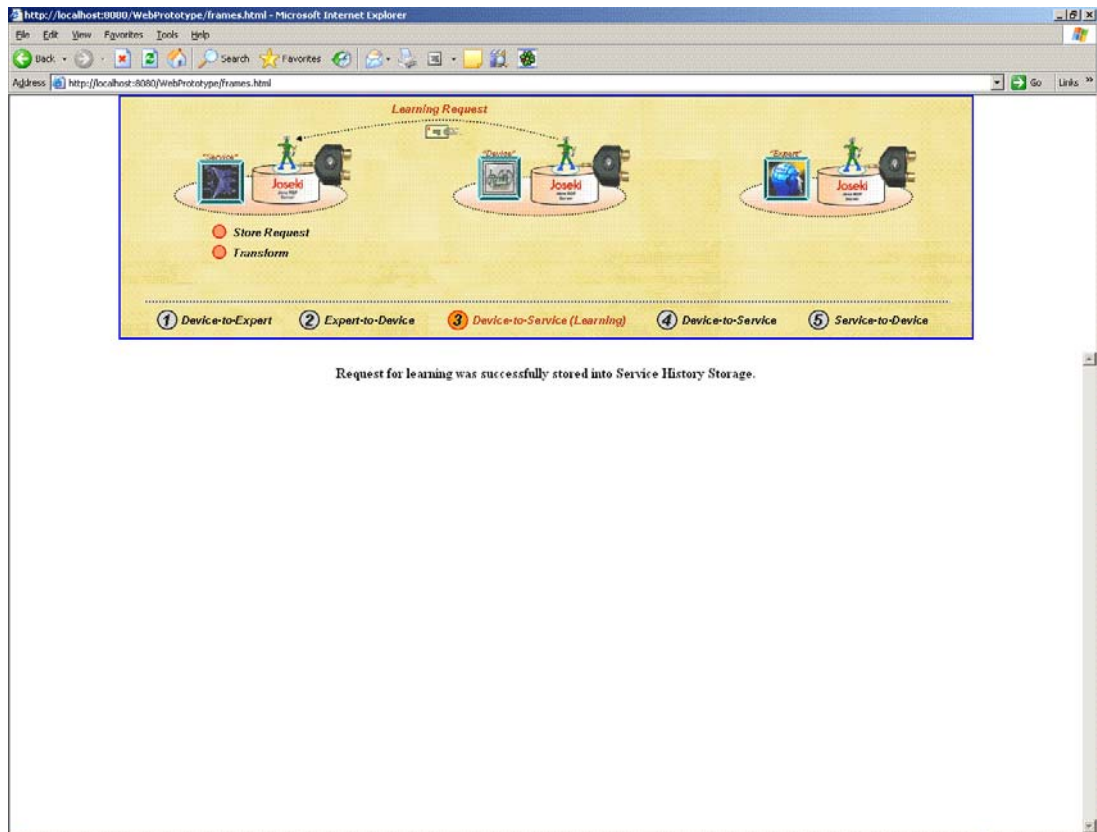
http://localhost:8080/WebPrototype/frames.html - Microsoft Internet Explorer

Address http://localhost:8080/WebPrototype/frames.html

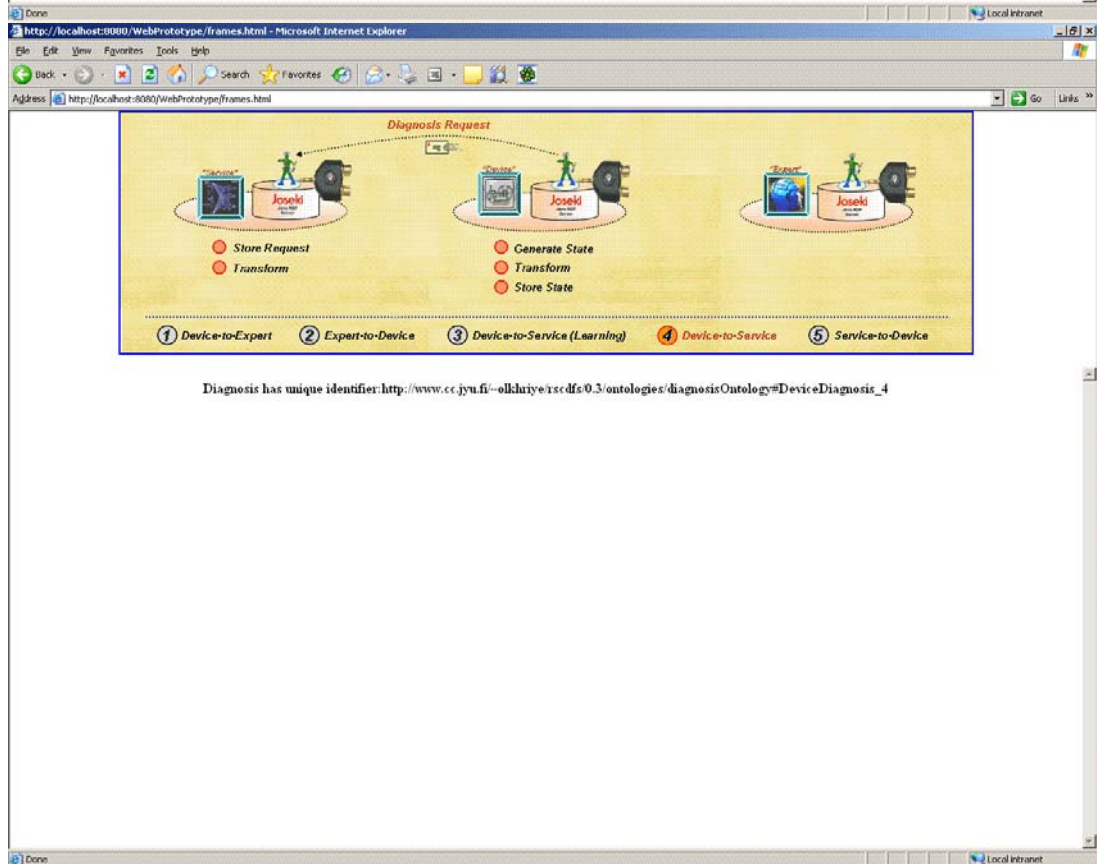
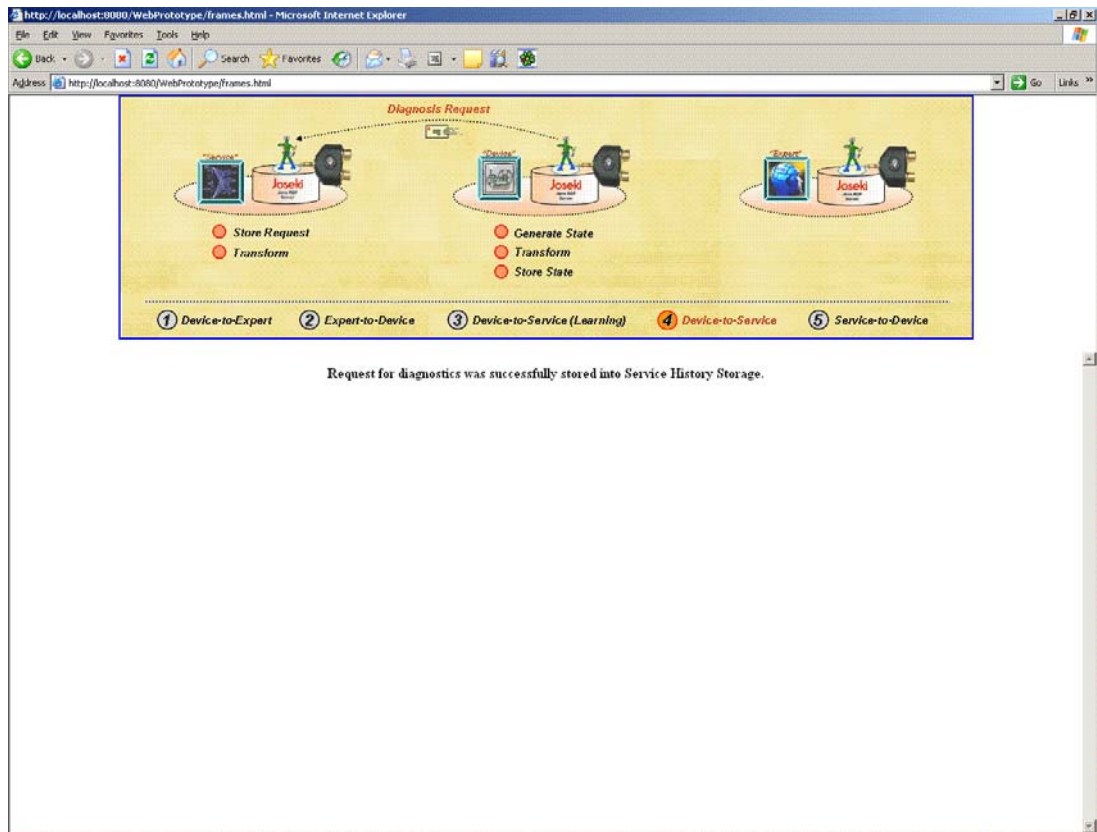
Response with diagnostics was successfully stored into Device History Storage.

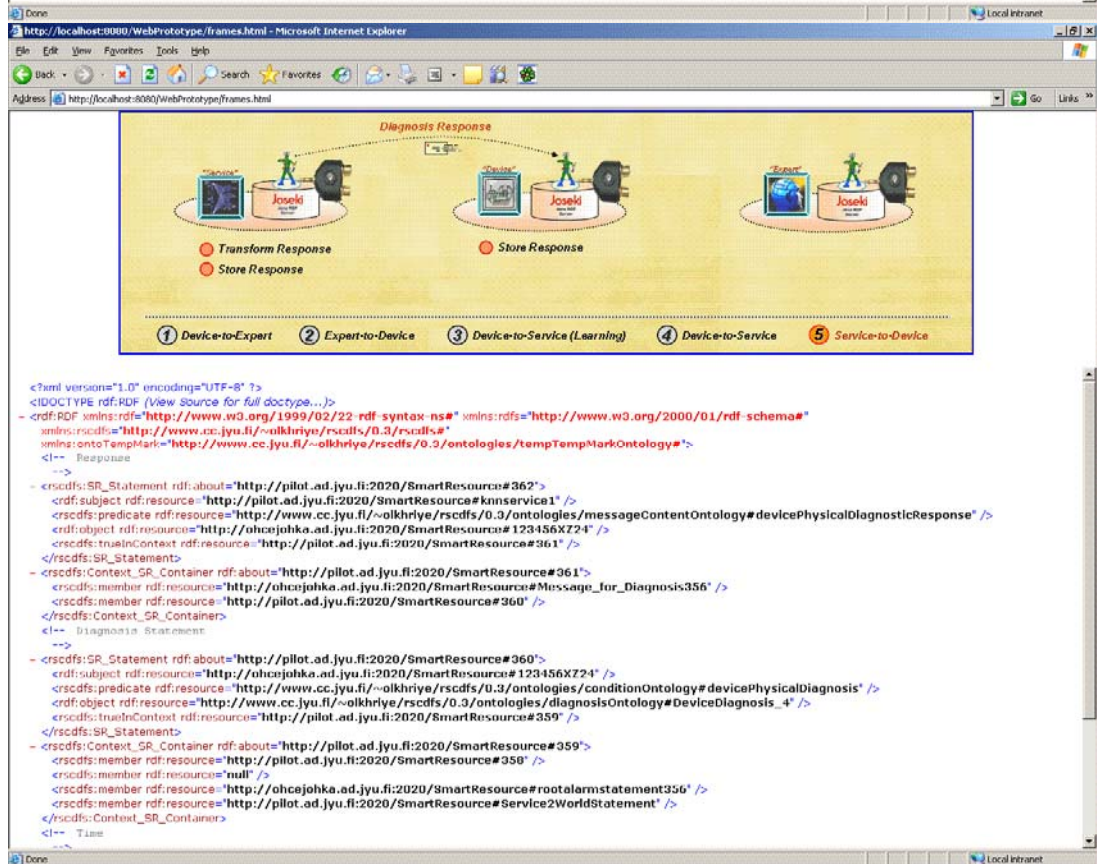
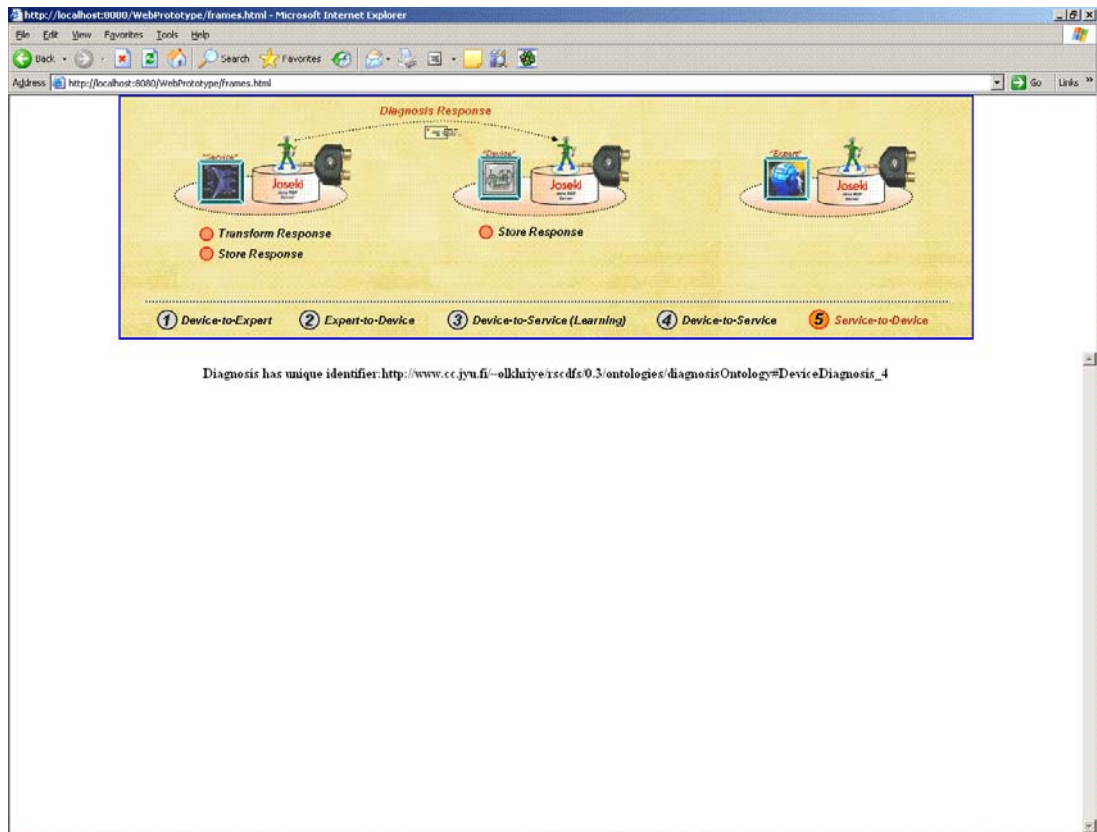


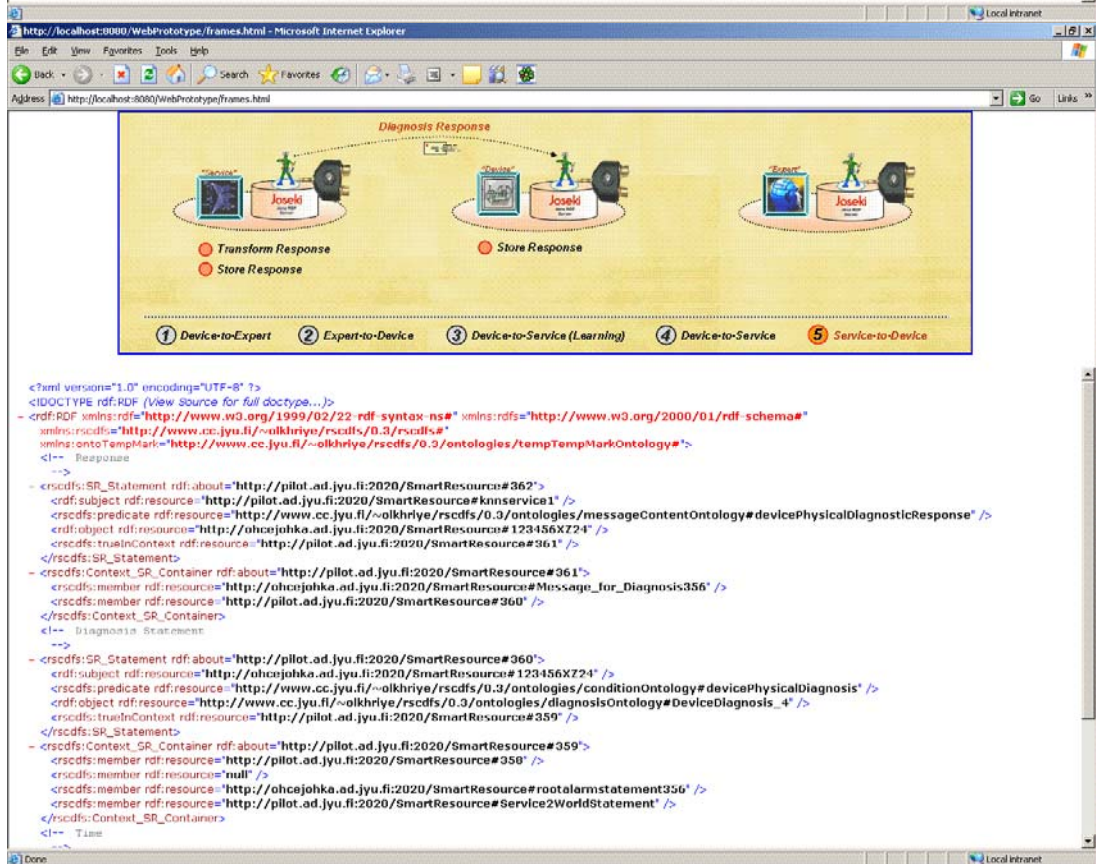
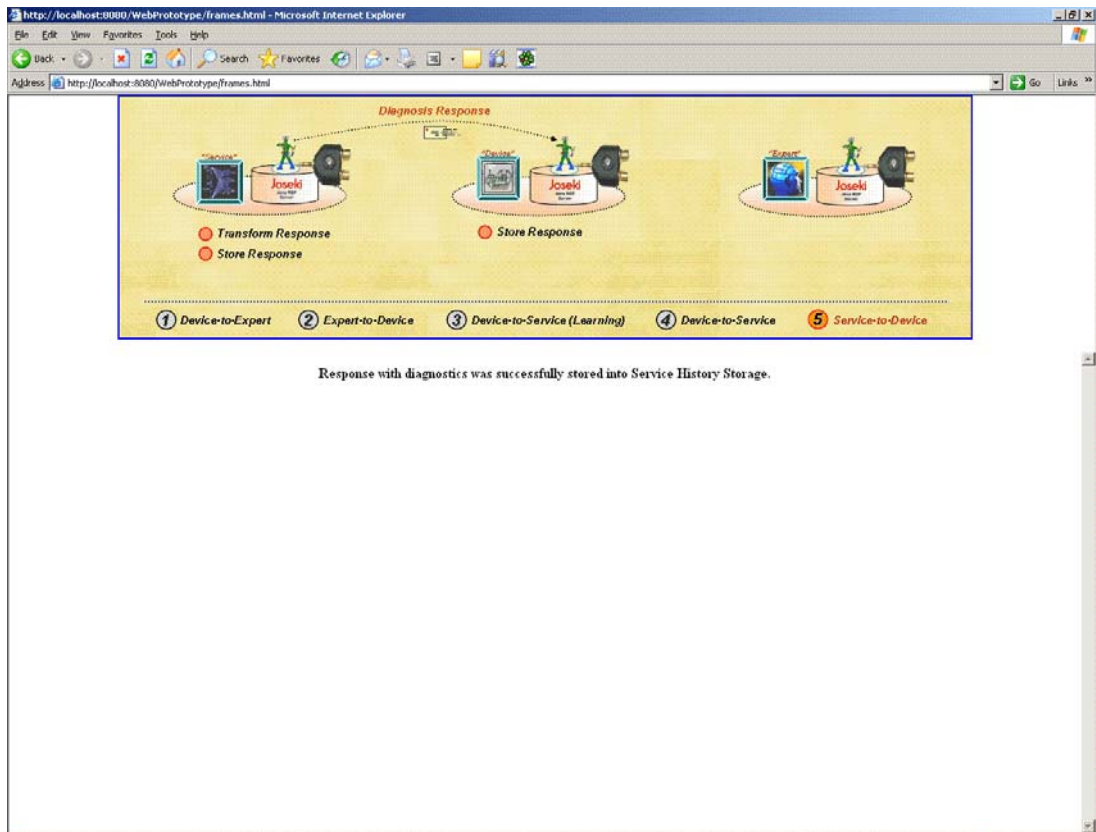












http://localhost:8080/WebPrototype/frames.html - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Search Favorites

Address http://localhost:8080/WebPrototype/frames.html Go Links

*Diagnosis Response*

● Transform Response  
● Store Response

① Device-to-Expert   ② Expert-to-Device   ③ Device-to-Service (Learning)   ④ Device-to-Service   ⑤ Service-to-Device

Response with diagnostics was successfully stored into Device History Storage.

Local intranet

## 7 References

1. Kaikova H., Khriyenko O., Kononenko O., Terziyan V., Zharko A., Proactive Self-Maintained Resources in Semantic Web, Eastern-European Journal of Enterprise Technologies, Vol. 2, No. 1, 2004, ISSN: 1729-3774, Kharkov, Ukraine, pp. 4-16.
2. Terziyan V., Semantic Web Services for Smart Devices Based on Mobile Agents, In: J. Marx Gomez (ed.), Intelligent Mobile Agents in Peer-to-Peer Networks: Proceedings of the Forth International ICSC Symposium on Engineering Intelligent Systems (EIS-2004), Madeira, Portugal, February 29 – March 2, 2004, ICSC Academic Press, Canada, ISBN: 3-906454-35-5, pp. 10-16.
3. Terziyan V., Semantic Web Services for Smart Devices in a “Global Understanding Environment”, In: R. Meersman and Z. Tari (eds), On the Move to Meaningful Internet Systems 2003: OTM 2003 Workshops, Lecture Notes in Computer Science, Vol. 2889, Springer-Verlag, 2003, pp.279-291.
4. Semantic Web Activity of W3C, <http://www.w3.org/2001/sw/>.
5. Kaikova H., Khriyenko O., Kononenko O., Terziyan V., Zharko A., Proactive Self-Maintained Resources in Semantic Web, Eastern-European Journal of Enterprise Technologies, Vol. 2, No. 1, 2004, ISSN: 1729-3774, Kharkov, Ukraine, pp. 4-16.



## Appendix 1 – Tools used for implementation of the adapters



### Jena Semantic Web Framework

- Jena is a Java framework for building [Semantic Web](#) applications. It provides a programmatic environment for [RDF](#), [RDFS](#) and [OWL](#), including a rule-based inference engine.
- Jena is [open source](#) and grown out of work with the [HP Labs Semantic Web Programme](#).
- The Jena Framework includes:
  - A RDF API
  - Reading and writing RDF in RDF/XML, N3 and N-Triples
  - An OWL API
  - In-memory and persistent storage
  - RDQL – a query language for RDF




- Joseki is a server for publishing RDF models on the web. Models have URLs and they can be accessed by query using HTTP GET. Joseki is part of the [Jena](#) RDF toolkit.
- Joseki provides a coarse-grained [RDF WebAPI](#) that is based on extracting a subgraph from the published RDF. The extracted RDF can then be processed locally with the fine-grained API provided by Jena.
- There are operations for adding and removing subgraphs from the target RDF source, allowing collaborative applications based on shared models.
- Joseki is extensible: new query languages and new operations can be added without modifying the core system.
- Joseki is open source and has a BSD license.




## Protégé

- Protégé is an ontology editor and a knowledge-base editor.
- Protégé is also an open-source, Java tool that provides an extensible architecture for the creation of customized knowledge-based applications.
- Protégé's [OWL Plug-in](#) now provides support for editing Semantic Web ontologies.






## Java technology




- Java technology readily harnesses the power of the network because it is both a programming language and a selection of specialized platforms. As such, it standardizes the development and deployment of the kind of secure, portable, reliable, and scalable applications required by the networked economy. Because the Internet and World Wide Web play a major role in new business development, consistent and widely supported standards are critical to growth and success

---



## Java 2 Enterprise Edition



- The Java 2 Platform, Enterprise Edition (J2EE) defines the standard for developing multitier enterprise applications. The J2EE platform simplifies enterprise applications by basing them on standardized, modular components, by providing a complete set of services to those components, and by handling many details of application behavior automatically, without complex programming.

---



## J2EE Connector Architecture

- The J2EE Connector architecture is based on the technologies defined and standardized in the [Java 2 Platform, Enterprise Edition \(J2EE\)](#) and is part of the J2EE platform.

As more businesses move towards an e-business strategy, integration with existing enterprise information systems (EIS) becomes the key to success. Enterprises with successful e-businesses need to integrate their existing EIS systems with new web-based applications. They also need to extend the reach of their EIS systems to support business-to-business (B2B) transactions.

Before the J2EE Connector architecture was defined, no specification for the Java platform addressed the problem of providing a standard architecture for integrating heterogeneous EIS systems. Most EIS vendors and application server vendors use non-standard vendor-specific architectures to provide connectivity between application servers and enterprise information systems. The following diagram illustrates the complexity of a heterogeneous environment



The Eclipse Platform is designed for building integrated development environments (IDEs) that can be used to create applications as diverse as web sites, embedded Java™ programs, C++ programs, and Enterprise JavaBeans™.

- Support the construction of a variety of tools for application development.
- Support an unrestricted set of tool providers, including independent software vendors (ISVs).
- Support tools to manipulate arbitrary content types (e.g., HTML, Java, C, JSP, EJB, XML, and GIF).
- Facilitate seamless integration of tools within and across different content types and tool providers.
- Support both GUI and non-GUI-based application development environments.
- Run on a wide range of operating systems, including Windows® and Linux™.
- Capitalize on the popularity of the Java programming language for writing tools.



## JBOSS Application Server

- Now in its 4th generation, JBoss Application Server has become a recognized leader in the Java application server market and is to date the only major application server on the market to deliver a production-ready J2EE 1.4 certified product. With well over 5 million downloads to date, JBoss Application Server has become the most popular product among Java developers and independent software vendors alike.



- The XSLT and XQuery Processor,
- Saxon-B implements the "basic" conformance level for XSLT 2.0 and XQuery.



## Omondo

Omondo EclipseUML is a visual modeling tool, natively integrated with Eclipse and CVS.

- Team support
- Live bidirectional synchronization
- Native CVS integration
- Class and sequence diagram reverse engineering from the byte-code (worldwide premier)
- Modeling, mapping and deploying Databases
- Modeling and deploying J2EE (Ejb and Servlet)
- UML Profiles



poseidon for uml

## Poseidon

Poseidon for UML is a popular, full-fledged UML tool. It evolved from the open-source project ArgoUML, and has turned into a world class modeling tool. Today it has the fastest growing user community and is famous for its superior usability. Poseidon for UML is delivered in several editions to meet the needs of different users



## JBYTE

---

- JBYTE - JavaBY Template Engine is a Java-based template engine.
  - JBYTE is a general template engine used for generating any type of text document from a template.
  - JBYTE is used mostly for generating HTML from JSP or servlets but it can also be used for generating XML, RTF, WML, e-mail text, source code and configuration files. Template has existed in different forms for several years, its concepts are proven, its implementation is robust and it performs well.
- 



Concurrent Versions System  
The open standard for version control

## CVS

---

- CVS is the Concurrent Versions System, the dominant open-source network-transparent version control system. CVS is useful for everyone from individual developers to large, distributed teams:
  - Its client-server access method lets developers access the latest code from anywhere there's an Internet connection.
  - Its unreserved check-out model to version control avoids artificial conflicts common with the exclusive check-out model.
  - Its client tools are available on most platforms.
-

## Appendix 2 – Maintenance ontologies serialized into XML

```
<?xml version='1.0' ?>

<!DOCTYPE rdf:RDF [
  <!ENTITY rdf 'http://www.w3.org/1999/02/22-rdf-syntax-ns#'>
  <!ENTITY rdfs 'http://www.w3.org/2000/01/rdf-schema#'>
  <!ENTITY rscdfs 'http://www.cc.jyu.fi/~olkhriye/rscdfs/0.3/rscdfs#'>
    <!ENTITY ontoAlarm
'http://www.cc.jyu.fi/~olkhriye/rscdfs/0.3/ontologies/alarmOntology#'>
    <!ENTITY ontoCondition
'http://www.cc.jyu.fi/~olkhriye/rscdfs/0.3/ontologies/conditionOntology#'>
    <!ENTITY ontoContainer
'http://www.cc.jyu.fi/~olkhriye/rscdfs/0.3/ontologies/containerOntology#'>
    <!ENTITY ontoDiagnosis
'http://www.cc.jyu.fi/~olkhriye/rscdfs/0.3/ontologies/diagnosisOntology#'>
    <!ENTITY ontoMeasurement
'http://www.cc.jyu.fi/~olkhriye/rscdfs/0.3/ontologies/measurementOntology#'>
    <!ENTITY ontoDevice
'http://www.cc.jyu.fi/~olkhriye/rscdfs/0.3/ontologies/deviceOntology#'>
    <!ENTITY ontoEnumerativeValue
'http://www.cc.jyu.fi/~olkhriye/rscdfs/0.3/ontologies/enumerativeValueOntolog
y#'>
    <!ENTITY ontoPartOf
'http://www.cc.jyu.fi/~olkhriye/rscdfs/0.3/ontologies/partOfOntology#'>
    <!ENTITY ontoMeasurementUnit
'http://www.cc.jyu.fi/~olkhriye/rscdfs/0.3/ontologies/measurementUnitOntology
#'>
    <!ENTITY ontoMessageContent
'http://www.cc.jyu.fi/~olkhriye/rscdfs/0.3/ontologies/messageContentOntology#
'>
    <!ENTITY ontoModel
'http://www.cc.jyu.fi/~olkhriye/rscdfs/0.3/ontologies/modelOntology#'>
    <!ENTITY ontoTempTempMark
'http://www.cc.jyu.fi/~olkhriye/rscdfs/0.3/ontologies/tempTempMarkOntology#'>
    <!ENTITY device 'http://ohcejohka.ad.jyu.fi:2020/SmartResource#'>
    <!ENTITY expert 'http://chitradurga.ad.jyu.fi:2020/SmartResource#'>
    <!ENTITY service 'http://pilot.ad.jyu.fi:2020/SmartResource#'>

]>

<rdf:RDF
  xmlns:rdf="&rdf;"
  xmlns:rdfs="&rdfs;"
  xmlns:rscdfs="&rscdfs;"
  xmlns:ontoAlarm="&ontoAlarm;"
  xmlns:ontoCondition="&ontoCondition;"
  xmlns:ontoContainer="&ontoContainer;"
  xmlns:ontoDiagnosis="&ontoDiagnosis;"
  xmlns:ontoMeasurement="&ontoMeasurement;"
  xmlns:ontoDevice="&ontoDevice;"
  xmlns:ontoEnumerativeValue="&ontoEnumerativeValue;"
  xmlns:ontoPartOf="&ontoPartOf;"
  xmlns:ontoMeasurementUnit="&ontoMeasurementUnit;"
  xmlns:ontoMessageContent="&ontoMessageContent;"
  xmlns:ontoModel="&ontoModel;"
  xmlns:ontoTempTempMark="&ontoTempTempMark;"
  xmlns:device="&device;"
  xmlns:expert="&expert;"
  xmlns:service="&service;"
```



```

>
<!-- RSCDFS -->

<rscdfs:SmartResource rdf:about="&rscdfs;SmartResource">
  <rdfs:comment>Type of itself</rdfs:comment>
  <rdfs:label>SmartResource</rdfs:label>
  <rdfs:subClassOf rdf:resource="&rdfs;Class"/>
</rscdfs:SmartResource>

<rscdfs:SR_Model rdf:about="&rscdfs;SR_Model">
  <rdfs:comment>Type of itself</rdfs:comment>
  <rdfs:label>SmartResource Model</rdfs:label>
  <rdfs:subClassOf rdf:resource="&rdfs;Class"/>
</rscdfs:SR_Model>

<rscdfs:Environment rdf:about="&rscdfs;Environment">
  <rdfs:comment>Type of itself</rdfs:comment>
  <rdfs:label>Environment</rdfs:label>
  <rdfs:subClassOf rdf:resource="&rscdfs;SmartResource"/>
</rscdfs:Environment>

<rscdfs:Environment rdf:about="&rscdfs;DecideSR">
  <rdfs:comment>Type of itself</rdfs:comment>
  <rdfs:label>DecideSR</rdfs:label>
  <rdfs:subClassOf rdf:resource="&rscdfs;SmartResource"/>
</rscdfs:Environment>

<rscdfs:Device rdf:about="&rscdfs;Device">
  <rdfs:comment>Type of itself</rdfs:comment>
  <rdfs:label>Device</rdfs:label>
  <rdfs:subClassOf rdf:resource="&rscdfs;SmartResource"/>
</rscdfs:Device>

<rscdfs:Service rdf:about="&rscdfs;Service">
  <rdfs:comment>Type of itself</rdfs:comment>
  <rdfs:label>Service</rdfs:label>
  <rdfs:subClassOf rdf:resource="&rscdfs;DecideSR"/>
</rscdfs:Service>

<rscdfs:Expert rdf:about="&rscdfs;Expert">
  <rdfs:comment>Type of itself</rdfs:comment>
  <rdfs:label>Expert</rdfs:label>
  <rdfs:subClassOf rdf:resource="&rscdfs;DecideSR"/>
</rscdfs:Expert>

<rscdfs:SmartMessage rdf:about="&rscdfs;SmartMessage">
  <rdfs:comment>Type of itself</rdfs:comment>
  <rdfs:label>SmartMessage</rdfs:label>
  <rdfs:subClassOf rdf:resource="&rscdfs;SmartResource"/>
</rscdfs:SmartMessage>

<rscdfs:ResourceAgent rdf:about="&rscdfs;ResourceAgent">
  <rdfs:comment>Type of itself</rdfs:comment>
  <rdfs:label>ResourceAgent</rdfs:label>
  <rdfs:subClassOf rdf:resource="&rscdfs;SmartResource"/>
</rscdfs:ResourceAgent>

<rdfs:Class rdf:about="&rscdfs;SR_Container">
  <rdfs:comment></rdfs:comment>
  <rdfs:label>SR_Container</rdfs:label>
  <rdfs:subClassOf rdf:resource="&rdfs;Container"/>

```

```

</rdfs:Class>

<rdfs:Class rdf:about="&rsdofs;Context_SR_Container">
  <rdfs:comment></rdfs:comment>
  <rdfs:label>Context_SR_Container</rdfs:label>
  <rdfs:subClassOf rdf:resource="&rsdofs;SR_Container"/>
</rdfs:Class>

<rdfs:Class rdf:about="&rsdofs;SR_Statement">
  <rdfs:comment></rdfs:comment>
  <rdfs:label>SR_Statement</rdfs:label>
  <rdfs:subClassOf rdf:resource="&rdf;Statement"/>
</rdfs:Class>

<rdfs:Class rdf:about="&rsdofs;DParamDescription">
  <rdfs:comment></rdfs:comment>
  <rdfs:label>DParamDescription</rdfs:label>
</rdfs:Class>

<rsdofs:QuantityValue rdf:about="&rsdofs;QuantityValue">
  <rdfs:comment>Type of itself</rdfs:comment>
  <rdfs:label>QuantityValue</rdfs:label>
  <rdfs:subClassOf rdf:resource="&rdfs;Class"/>
</rsdofs:QuantityValue>

<rsdofs:NumericalValue rdf:about="&rsdofs;NumericalValue">
  <rdfs:comment>Type of itself</rdfs:comment>
  <rdfs:label>NumericalValue</rdfs:label>
  <rdfs:subClassOf rdf:resource="&rsdofs;QuantityValue"/>
</rsdofs:NumericalValue>

<rsdofs:EnumerativeValue rdf:about="&rsdofs;EnumerativeValue">
  <rdfs:comment>Type of itself</rdfs:comment>
  <rdfs:label>EnumerativeValue</rdfs:label>
  <rdfs:subClassOf rdf:resource="&rsdofs;QuantityValue"/>
</rsdofs:EnumerativeValue>

<rsdofs:MeasurementUnit rdf:about="&rsdofs;MeasurementUnit">
  <rdfs:comment>Type of itself</rdfs:comment>
  <rdfs:label>MeasurementUnit</rdfs:label>
  <rdfs:subClassOf rdf:resource="&rdfs;Class"/>
</rsdofs:MeasurementUnit>

<rsdofs:TempMark rdf:about="&rsdofs;TempMark">
  <rdfs:comment>Type of itself</rdfs:comment>
  <rdfs:label>TempMark</rdfs:label>
  <rdfs:subClassOf rdf:resource="&rsdofs;EnumerativeValue"/>
</rsdofs:TempMark>

<rsdofs:SR_Property rdf:about="&rsdofs;SR_Property">
  <rdfs:comment>Type of itself</rdfs:comment>
  <rdfs:label>SR_Property</rdfs:label>
  <rdfs:subClassOf rdf:resource="&rdfs;Class"/>
  <rdfs:subClassOf rdf:resource="&rdf;Property"/>
</rsdofs:SR_Property>

<rsdofs:SR_Property rdf:about="&rsdofs;maintenance">
  <rdfs:label>maintenance</rdfs:label>
  <rdfs:domain rdf:resource="&rsdofs;SmartResource"/>
  <rdfs:range rdf:resource="&rsdofs;QuantityValue"/>
</rsdofs:SR_Property>

<rsdofs:SR_Property rdf:about="&rsdofs;transformation">

```

```

        <rdfs:label>transformation</rdfs:label>
        <rdfs:domain rdf:resource="&rsdafs;SR_Statement"/>
        <rdfs:range rdf:resource="&rsdafs;SR_Statement"/>
</rsdafs:SR_Property>

<rsdafs:SR_Property rdf:about="&rsdafs;has_Container">
    <rdfs:label>has_Container</rdfs:label>
    <rdfs:domain rdf:resource="&rsdafs;SmartResource"/>
    <rdfs:range rdf:resource="&rsdafs;SR_Container"/>
</rsdafs:SR_Property>

<rdf:Property rdf:about="&rsdafs;predicate">
    <rdfs:label>predicate</rdfs:label>
    <rdfs:domain rdf:resource="&rsdafs;SR_Statement"/>
    <rdfs:range rdf:resource="&rsdafs;SR_Property"/>
    <rdfs:subPropertyOf rdf:resource="&rdf;predicate"/>
</rdf:Property>

<rdf:Property rdf:about="&rsdafs;value">
    <rdfs:label>value</rdfs:label>
    <rdfs:domain rdf:resource="&rsdafs;NumericalValue"/>
    <rdfs:range rdf:resource="&rdfs;Literal"/>
    <rdfs:subPropertyOf rdf:resource="&rdf;value"/>
</rdf:Property>

<rdf:Property rdf:about="&rsdafs;hasParameter">
    <rdfs:label>hasParameter</rdfs:label>
    <rdfs:domain rdf:resource="&rsdafs;Device"/>
    <rdfs:range rdf:resource="&rsdafs;DParamDescription"/>
</rdf:Property>

<rdf:Property rdf:about="&rsdafs;measureName">
    <rdfs:label>measureName</rdfs:label>
    <rdfs:domain rdf:resource="&rsdafs;DParamDescription"/>
    <rdfs:range rdf:resource="&rsdafs;SR_Property"/>
</rdf:Property>

<rdf:Property rdf:about="&rsdafs;minValue">
    <rdfs:label>minValue</rdfs:label>
    <rdfs:domain rdf:resource="&rsdafs;DParamDescription"/>
    <rdfs:range rdf:resource="&rdfs;Literal"/>
</rdf:Property>

<rdf:Property rdf:about="&rsdafs;maxValue">
    <rdfs:label>maxValue</rdfs:label>
    <rdfs:domain rdf:resource="&rsdafs;DParamDescription"/>
    <rdfs:range rdf:resource="&rdfs;Literal"/>
</rdf:Property>

<rdf:Property rdf:about="&rsdafs;unit">
    <rdfs:label>unit</rdfs:label>
    <rdfs:domain rdf:resource="&rsdafs;NumericalValue"/>
    <rdfs:range rdf:resource="&rsdafs;MeasurementUnit"/>
</rdf:Property>

<rdf:Property rdf:about="&rsdafs;member">
    <rdfs:label>member</rdfs:label>
    <rdfs:domain rdf:resource="&rsdafs;SR_Container"/>
    <rdfs:range rdf:resource="&rsdafs;SR_Statement"/>
    <rdfs:subPropertyOf rdf:resource="&rdfs;member"/>
</rdf:Property>

<rdf:Property rdf:about="&rsdafs>trueInContext">

```

```

        <rdfs:label>trueInContext</rdfs:label>
        <rdfs:domain rdf:resource="&rsdcds;SR_Statement"/>
        <rdfs:range rdf:resource="&rsdcds;Context_SR_Container"/>
</rdf:Property>

<rdf:Property rdf:about="&rsdcds;falseInContext">
    <rdfs:label>falseInContext</rdfs:label>
    <rdfs:domain rdf:resource="&rsdcds;SR_Statement"/>
    <rdfs:range rdf:resource="&rsdcds;Context_SR_Container"/>
</rdf:Property>

<rsdcds:SR_Property rdf:about="&rsdcds;contextProbability">
    <rdfs:label>contextProbability</rdfs:label>
    <rdfs:domain rdf:resource="&rsdcds;Context_SR_Container"/>
    <rdfs:range rdf:resource="&rdfs;Literal"/>
    <rsdcds:context rdf:resource="&rsdcds;has_Container"/>
</rsdcds:SR_Property>

<rdf:Property rdf:about="&rsdcds;context">
    <rdfs:isDefinedBy
rdf:resource="http://www.cc.jyu.fi/~olkhriye/rsdcds/0.3/rsdcds#" />
    <rdfs:label>context</rdfs:label>
    <rdfs:comment>A context of the subject property.</rdfs:comment>
    <rdfs:range rdf:resource="&rsdcds;SR_Property"/>
    <rdfs:domain rdf:resource="&rsdcds;SR_Property"/>
</rdf:Property>

<rsdcds:SR_Property rdf:about="&rsdcds;sysTime">
    <rdfs:label>sysTime</rdfs:label>
    <rdfs:domain rdf:resource="&rsdcds;Environment"/>
    <rdfs:range rdf:resource="&rsdcds;TempMark"/>
    <rdfs:subPropertyOf rdf:resource="&rsdcds;time"/>
</rsdcds:SR_Property>

<rsdcds:SR_Property rdf:about="&rsdcds;measurement">
    <rdfs:label>measurement</rdfs:label>
    <rdfs:domain rdf:resource="&rsdcds;SmartResource"/>
    <rdfs:range rdf:resource="&rsdcds;QuantityValue"/>
    <rsdcds:context rdf:resource="&rsdcds;sysTime "/>
</rsdcds:SR_Property>

<rsdcds:SR_Property rdf:about="&rsdcds;condition">
    <rdfs:label>condition</rdfs:label>
    <rdfs:domain rdf:resource="&rsdcds;SmartResource"/>
    <rdfs:range rdf:resource="&rsdcds;QuantityValue"/>
    <rsdcds:context rdf:resource="&rsdcds;sysTime"/>
    <rsdcds:context rdf:resource="&rsdcds;decideSR_PartOf"/>
    <rsdcds:context rdf:resource="&rsdcds;model"/>
    <rsdcds:context rdf:resource="&rsdcds;sr_StateHistory"/>
</rsdcds:SR_Property>

<rsdcds:SR_Property rdf:about="&rsdcds;diagnosis">
    <rdfs:label>diagnosis</rdfs:label>
    <rdfs:domain rdf:resource="&rsdcds;SmartResource"/>
    <rdfs:range rdf:resource="&rsdcds;QuantityValue"/>
    <rsdcds:context rdf:resource="&rsdcds;sysTime"/>
    <rsdcds:context rdf:resource="&rsdcds;decideSR_PartOf"/>
    <rsdcds:context rdf:resource="&rsdcds;model"/>
    <rsdcds:context rdf:resource="&rsdcds;alarm"/>
    <rsdcds:context rdf:resource="&rsdcds;sr_StateHistory"/>
    <rdfs:subPropertyOf rdf:resource="&rsdcds;condition"/>
</rsdcds:SR_Property>

```

```

<rscdfs:SR_Property rdf:about="&rscdfs;alarm">
  <rdfs:label>alarm</rdfs:label>
  <rdfs:domain rdf:resource="&rscdfs;SmartResource"/>
  <rdfs:range rdf:resource="&rscdfs;QuantityValue"/>
  <rscdfs:context rdf:resource="&rscdfs;sysTime"/>
  <rscdfs:context rdf:resource="&rscdfs;decideSR_PartOf"/>
  <rscdfs:context rdf:resource="&rscdfs;model"/>
  <rscdfs:context rdf:resource="&rscdfs;sr_StateHistory"/>
  <rdfs:subPropertyOf rdf:resource="&rscdfs;condition"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&rscdfs;sr_State">
  <rdfs:label>sr_State</rdfs:label>
  <rdfs:domain rdf:resource="&rscdfs;SmartResource"/>
  <rdfs:range rdf:resource="&rscdfs;SR_Container"/>
  <rscdfs:context rdf:resource="&rscdfs;measurement"/>
  <rdfs:subPropertyOf rdf:resource="&rscdfs;has_Container"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&rscdfs;sr_StateHistory">
  <rdfs:label>sr_StateHistory</rdfs:label>
  <rdfs:domain rdf:resource="&rscdfs;SmartResource"/>
  <rdfs:range rdf:resource="&rscdfs;SR_Container"/>
  <rscdfs:context rdf:resource="&rscdfs;sr_State"/>
  <rdfs:subPropertyOf rdf:resource="&rscdfs;has_Container"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&rscdfs;sr_ConditionHistory">
  <rdfs:label>sr_ConditionHistory</rdfs:label>
  <rdfs:domain rdf:resource="&rscdfs;SmartResource"/>
  <rdfs:range rdf:resource="&rscdfs;SR_Container"/>
  <rscdfs:context rdf:resource="&rscdfs;condition"/>
  <rdfs:subPropertyOf rdf:resource="&rscdfs;has_Container"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&rscdfs;sr_DiagnosisHistory">
  <rdfs:label>sr_DiagnosisHistory</rdfs:label>
  <rdfs:domain rdf:resource="&rscdfs;SmartResource"/>
  <rdfs:range rdf:resource="&rscdfs;SR_Container"/>
  <rscdfs:context rdf:resource="&rscdfs;diagnosis"/>
  <rdfs:subPropertyOf rdf:resource="&rscdfs;sr_ConditionHistory"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&rscdfs;sr_AlarmHistory">
  <rdfs:label>sr_AlarmHistory</rdfs:label>
  <rdfs:domain rdf:resource="&rscdfs;SmartResource"/>
  <rdfs:range rdf:resource="&rscdfs;SR_Container"/>
  <rscdfs:context rdf:resource="&rscdfs;alarm"/>
  <rdfs:subPropertyOf rdf:resource="&rscdfs;sr_ConditionHistory"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&rscdfs;partOf">
  <rdfs:label>partOf</rdfs:label>
  <rdfs:domain rdf:resource="&rscdfs;SmartResource"/>
  <rdfs:range rdf:resource="&rscdfs;SmartResource"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&rscdfs;decideSR_PartOf">
  <rdfs:label>decideSR_PartOf</rdfs:label>
  <rdfs:domain rdf:resource="&rscdfs;DecideSR"/>
  <rdfs:range rdf:resource="&rscdfs;SmartResource"/>
  <rdfs:subPropertyOf rdf:resource="&rscdfs;partOf"/>
</rscdfs:SR_Property>

```

```

<rscdfs:SR_Property rdf:about="&rscdfs;device_PartOf">
  <rdfs:label>device_PartOf</rdfs:label>
  <rdfs:domain rdf:resource="&rscdfs;Device"/>
  <rdfs:range rdf:resource="&rscdfs;SmartResource"/>
  <rdfs:subPropertyOf rdf:resource="&rscdfs;partOf"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&rscdfs;service_PartOf">
  <rdfs:label>service_PartOf</rdfs:label>
  <rdfs:domain rdf:resource="&rscdfs;Service"/>
  <rdfs:range rdf:resource="&rscdfs;SmartResource"/>
  <rdfs:subPropertyOf rdf:resource="&rscdfs;decideSR_PartOf"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&rscdfs;partOfWorld">
  <rdfs:label>partOfWorld</rdfs:label>
  <rdfs:domain rdf:resource="&rscdfs;SmartResource"/>
  <rdfs:range rdf:resource="&rscdfs;Environment"/>
  <rdfs:subPropertyOf rdf:resource="&rscdfs;partOf"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&rscdfs;decideSR_partOfWorld">
  <rdfs:label>partOfWorld</rdfs:label>
  <rdfs:domain rdf:resource="&rscdfs;DecideSR"/>
  <rdfs:range rdf:resource="&rscdfs;Environment"/>
  <rdfs:subPropertyOf rdf:resource="&rscdfs;decideSR_PartOf"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&rscdfs;atomOf">
  <rdfs:label>atomOf</rdfs:label>
  <rdfs:domain rdf:resource="&rscdfs;SmartResource"/>
  <rdfs:range rdf:resource="&rscdfs;SmartResource"/>
  <rdfs:subPropertyOf rdf:resource="&rscdfs;partOf"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&rscdfs;model">
  <rdfs:label>model</rdfs:label>
  <rdfs:domain rdf:resource="&rscdfs;SmartResource"/>
  <rdfs:range rdf:resource="&rscdfs;SR_Model"/>
  <rscdfs:context rdf:resource="&rscdfs;sysTime"/>
  <rscdfs:context rdf:resource="&rscdfs;sr_ConditionHistory"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&rscdfs;time">
  <rdfs:label>time</rdfs:label>
  <rdfs:domain rdf:resource="&rscdfs;SmartResource"/>
  <rdfs:range rdf:resource="&rscdfs;TempMark"/>
</rscdfs:SR_Property>

<!-- end of RSCDFS -->

<!-- AlarmOntology -->

<ontoAlarm:DeviceAlarm rdf:about="&ontoAlarm;DeviceAlarm">
  <rdfs:comment>Type of itself</rdfs:comment>
  <rdfs:label>DeviceAlarm</rdfs:label>
  <rdfs:subClassOf rdf:resource="&rscdfs;EnumerativeValue"/>
</ontoAlarm:DeviceAlarm>

<ontoAlarm:DevicePhysicalAlarm rdf:about="&ontoAlarm;DevicePhysicalAlarm">
  <rdfs:comment>Type of itself</rdfs:comment>
  <rdfs:label>DevicePhysicalAlarm</rdfs:label>

```

```

        <rdfs:subClassOf rdf:resource="&ontoAlarm;DeviceAlarm"/>
</ontoAlarm:DevicePhysicalAlarm>

<ontoAlarm:DeviceLogicalAlarm rdf:about="&ontoAlarm;DeviceLogicalAlarm">
  <rdfs:comment>Type of itself</rdfs:comment>
  <rdfs:label>DeviceLogicalAlarm</rdfs:label>
  <rdfs:subClassOf rdf:resource="&ontoAlarm;DeviceLogicalAlarm"/>
</ontoAlarm:DeviceLogicalAlarm>

<ontoAlarm:DeviceAlarm_1 rdf:about="&ontoAlarm;DeviceAlarm_1">
  <rdfs:comment>Type of itself</rdfs:comment>
  <rdfs:label>DeviceAlarm_1</rdfs:label>
  <rdfs:subClassOf rdf:resource="&ontoAlarm;DevicePhysicalAlarm"/>
</ontoAlarm:DeviceAlarm_1>

<ontoAlarm:DeviceAlarm_2 rdf:about="&ontoAlarm;DeviceAlarm_2">
  <rdfs:comment>Type of itself</rdfs:comment>
  <rdfs:label>DeviceAlarm_2</rdfs:label>
  <rdfs:subClassOf rdf:resource="&ontoAlarm;DevicePhysicalAlarm"/>
</ontoAlarm:DeviceAlarm_2>

<ontoAlarm:DeviceAlarm_3 rdf:about="&ontoAlarm;DeviceAlarm_3">
  <rdfs:comment>Type of itself</rdfs:comment>
  <rdfs:label>DeviceAlarm_3</rdfs:label>
  <rdfs:subClassOf rdf:resource="&ontoAlarm;DevicePhysicalAlarm"/>
</ontoAlarm:DeviceAlarm_3>

<!-- end of AlarmOntology -->

<!-- ConditionOntology -->

<rscdfs:SR_Property rdf:about="&ontoCondition;deviceDiagnosis">
  <rdfs:label>deviceDiagnosis</rdfs:label>
  <rdfs:domain rdf:resource="&rscdfs;Device"/>
  <rdfs:range rdf:resource="&ontoDiagnosis;DeviceDiagnosis"/>
  <rscdfs:context rdf:resource="&rscdfs;sysTime"/>
  <rscdfs:context rdf:resource="&rscdfs;model"/>
  <rscdfs:context rdf:resource="&rscdfs;servicePartOf"/>
  <rscdfs:context rdf:resource="&ontoContainer;deviceStateHistory"/>
  <rdfs:subPropertyOf rdf:resource="&rscdfs;diagnosis"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&ontoCondition;serviceDiagnosis">
  <rdfs:label>serviceDiagnosis</rdfs:label>
  <rdfs:domain rdf:resource="&rscdfs;Service"/>
  <rdfs:range rdf:resource="&rscdfs;EnumerativeValue"/>
  <rscdfs:context rdf:resource="&rscdfs;sysTime"/>
  <rscdfs:context rdf:resource="&rscdfs;servicePartOf"/>
  <rscdfs:context rdf:resource="&ontoContainer;serviceStateHistory"/>
  <rdfs:subPropertyOf rdf:resource="&rscdfs;diagnosis"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&ontoCondition;devicePhysicalDiagnosis">
  <rdfs:label>devicePhysicalDiagnosis</rdfs:label>
  <rdfs:domain rdf:resource="&rscdfs;Device"/>
  <rdfs:range rdf:resource="&ontoDiagnosis;DevicePhysicalDiagnosis"/>
  <rscdfs:context rdf:resource="&rscdfs;sysTime"/>
  <rscdfs:context rdf:resource="&rscdfs;model"/>
  <rscdfs:context rdf:resource="&rscdfs;servicePartOf"/>
  <rscdfs:context
rdf:resource="&ontoContainer;devicePhysicalStateHistory"/>
  <rdfs:subPropertyOf rdf:resource="&ontoCondition;deviceDiagnosis"/>

```

```

</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&ontoCondition;deviceLogicalDiagnosis">
  <rdfs:label>deviceLogicalDiagnosis</rdfs:label>
  <rdfs:domain rdf:resource="&rscdfs;Device"/>
  <rdfs:range rdf:resource="&ontoDiagnosis;DeviceLogicalDiagnosis"/>
  <rscdfs:context rdf:resource="&rscdfs;sysTime"/>
  <rscdfs:context rdf:resource="&rscdfs;model"/>
  <rscdfs:context rdf:resource="&rscdfs;servicePartOf"/>
  <rscdfs:context
rdf:resource="&ontoContainer;deviceLogicalStateHistory"/>
  <rdfs:subPropertyOf rdf:resource="&ontoCondition;deviceDiagnosis"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&ontoCondition;servicePhysicalDiagnosis">
  <rdfs:label>servicePhysicalDiagnosis</rdfs:label>
  <rdfs:domain rdf:resource="&rscdfs;Service"/>
  <rdfs:range rdf:resource="&rscdfs;EnumerativeValue"/>
  <rscdfs:context rdf:resource="&rscdfs;sysTime"/>
  <rscdfs:context rdf:resource="&rscdfs;servicePartOf"/>
  <rscdfs:context
rdf:resource="&ontoContainer;servicePhysicalStateHistory"/>
  <rdfs:subPropertyOf
rdf:resource="&ontoCondition;serviceDiagnosis"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&ontoCondition;serviceLogicalDiagnosis">
  <rdfs:label>serviceLogicalDiagnosis</rdfs:label>
  <rdfs:domain rdf:resource="&rscdfs;Service"/>
  <rdfs:range rdf:resource="&rscdfs;EnumerativeValue"/>
  <rscdfs:context rdf:resource="&rscdfs;sysTime"/>
  <rscdfs:context rdf:resource="&rscdfs;servicePartOf"/>
  <rscdfs:context
rdf:resource="&ontoContainer;serviceLogicalStateHistory"/>
  <rdfs:subPropertyOf
rdf:resource="&ontoCondition;serviceDiagnosis"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&ontoCondition;pinnankorkeus">
  <rdfs:label>pinnankorkeus</rdfs:label>
  <rdfs:domain rdf:resource="&rscdfs;Device"/>
  <rdfs:range rdf:resource="&rscdfs;ComplexEnumerativeValue"/>
  <rscdfs:context rdf:resource="&rscdfs;sysTime"/>
  <rscdfs:context rdf:resource="&rscdfs;servicePartOf"/>
  <rscdfs:context
rdf:resource="&ontoContainer;devicePhysicalStateHistory"/>
  <rdfs:subPropertyOf
rdf:resource="&ontoCondition;devicePhysicalDiagnosis"/>
</rscdfs:SR_Property>

<!-- end of ConditionOntology -->

<!-- ContainerOntology -->

<rscdfs:SR_Property rdf:about="&ontoContainer;deviceState">
  <rdfs:label>deviceState</rdfs:label>
  <rdfs:domain rdf:resource="&rscdfs;Device"/>
  <rdfs:range rdf:resource="&rscdfs;SR_Container"/>
  <rscdfs:context rdf:resource="&ontoMeasurement;deviceMeasurement"/>
  <rdfs:subPropertyOf rdf:resource="&rscdfs;sr_State"/>
</rscdfs:SR_Property>

```



```

<rscdfs:SR_Property rdf:about="&ontoContainer;serviceState">
  <rdfs:label>serviceState</rdfs:label>
  <rdfs:domain rdf:resource="&rscdfs;Service"/>
  <rdfs:range rdf:resource="&rscdfs;SR_Container"/>
  <rscdfs:context
rdf:resource="&ontoMeasurement;serviceMeasurement"/>
  <rdfs:subPropertyOf rdf:resource="&rscdfs;sr_State"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&ontoContainer;devicePhysicalState">
  <rdfs:label>devicePhysicalState</rdfs:label>
  <rdfs:domain rdf:resource="&rscdfs;Device"/>
  <rdfs:range rdf:resource="&rscdfs;SR_Container"/>
  <rscdfs:context
rdf:resource="&ontoMeasurement;devicePhysicalMeasurement"/>
  <rdfs:subPropertyOf rdf:resource="&ontoContainer;deviceState"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&ontoContainer;deviceLogicalState">
  <rdfs:label>deviceLogicalState</rdfs:label>
  <rdfs:domain rdf:resource="&rscdfs;Device"/>
  <rdfs:range rdf:resource="&rscdfs;SR_Container"/>
  <rscdfs:context
rdf:resource="&ontoMeasurement;deviceLogicalMeasurement"/>
  <rdfs:subPropertyOf rdf:resource="&ontoContainer;deviceState"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&ontoContainer;servicePhysicalState">
  <rdfs:label>servicePhysicalState</rdfs:label>
  <rdfs:domain rdf:resource="&rscdfs;Service"/>
  <rdfs:range rdf:resource="&rscdfs;SR_Container"/>
  <rscdfs:context
rdf:resource="&ontoMeasurement;serviceMeasurementOfPhysicalDevice"/>
  <rdfs:subPropertyOf rdf:resource="&ontoContainer;serviceState"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&ontoContainer;serviceLogicalState">
  <rdfs:label>serviceLogicalState</rdfs:label>
  <rdfs:domain rdf:resource="&rscdfs;Service"/>
  <rdfs:range rdf:resource="&rscdfs;SR_Container"/>
  <rscdfs:context
rdf:resource="&ontoMeasurement;serviceMeasurementOfLogicalDevice"/>
  <rdfs:subPropertyOf rdf:resource="&ontoContainer;serviceState"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&ontoContainer;deviceStateHistory">
  <rdfs:label>deviceStateHistory</rdfs:label>
  <rdfs:domain rdf:resource="&rscdfs;Device"/>
  <rdfs:range rdf:resource="&rscdfs;SR_Container"/>
  <rscdfs:context rdf:resource="&ontoContainer;deviceState"/>
  <rdfs:subPropertyOf rdf:resource="&rscdfs;sr_StateHistory"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&ontoContainer;serviceStateHistory">
  <rdfs:label>serviceStateHistory</rdfs:label>
  <rdfs:domain rdf:resource="&rscdfs;Service"/>
  <rdfs:range rdf:resource="&rscdfs;SR_Container"/>
  <rscdfs:context rdf:resource="&ontoContainer;serviceState"/>
  <rdfs:subPropertyOf rdf:resource="&rscdfs;sr_StateHistory"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&ontoContainer;deviceDiagnosisHistory">
  <rdfs:label>deviceDiagnosisHistory</rdfs:label>

```

```

        <rdfs:domain rdf:resource="&rscdfs;Device"/>
        <rdfs:range rdf:resource="&rscdfs;SR_Container"/>
        <rscdfs:context rdf:resource="&ontoCondition;deviceDiagnosis"/>
        <rdfs:subPropertyOf rdf:resource="&rscdfs;sr_DiagnosisHistory"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property
rdf:about="&ontoContainer;devicePhysicalDiagnosisHistory">
    <rdfs:label>devicePhysicalDiagnosisHistory</rdfs:label>
    <rdfs:domain rdf:resource="&rscdfs;Device"/>
    <rdfs:range rdf:resource="&rscdfs;SR_Container"/>
    <rscdfs:context
rdf:resource="&ontoCondition;devicePhysicalDiagnosis"/>
        <rdfs:subPropertyOf
rdf:resource="&ontoContainer;deviceDiagnosisHistory"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&ontoContainer;devicePhysicalStateHistory">
    <rdfs:label>devicePhysicalStateHistory</rdfs:label>
    <rdfs:domain rdf:resource="&rscdfs;Device"/>
    <rdfs:range rdf:resource="&rscdfs;SR_Container"/>
    <rscdfs:context
rdf:resource="&ontoMeasurement;devicePhysicalState"/>
        <rdfs:subPropertyOf
rdf:resource="&ontoContainer;deviceStateHistory"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&ontoContainer;deviceLogicalStateHistory">
    <rdfs:label>deviceLogicalStateHistory</rdfs:label>
    <rdfs:domain rdf:resource="&rscdfs;Device"/>
    <rdfs:range rdf:resource="&rscdfs;SR_Container"/>
    <rscdfs:context
rdf:resource="&ontoMeasurement;deviceLogicalState"/>
        <rdfs:subPropertyOf
rdf:resource="&ontoContainer;deviceStateHistory"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&ontoContainer;servicePhysicalStateHistory">
    <rdfs:label>servicePhysicalStateHistory</rdfs:label>
    <rdfs:domain rdf:resource="&rscdfs;Service"/>
    <rdfs:range rdf:resource="&rscdfs;SR_Container"/>
    <rscdfs:context
rdf:resource="&ontoMeasurement;servicePhysicalState"/>
        <rdfs:subPropertyOf
rdf:resource="&ontoContainer;serviceStateHistory"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&ontoContainer;serviceLogicalStateHistory">
    <rdfs:label>serviceLogicalStateHistory</rdfs:label>
    <rdfs:domain rdf:resource="&rscdfs;Service"/>
    <rdfs:range rdf:resource="&rscdfs;SR_Container"/>
    <rscdfs:context
rdf:resource="&ontoMeasurement;serviceLogicalState"/>
        <rdfs:subPropertyOf
rdf:resource="&ontoContainer;serviceStateHistory"/>
</rscdfs:SR_Property>

<!-- end of ContainerOntology -->

<!-- DeviceOntology -->

<ontoDevice:Sensor rdf:about="&ontoDevice;Sensor">

```

```

        <rdfs:comment>Type of itself</rdfs:comment>
        <rdfs:label>Sensor</rdfs:label>
        <rdfs:subClassOf rdf:resource="&rscdfs;Device"/>
</ontoDevice:Sensor>

<ontoDevice:Mill rdf:about="&ontoDevice;Mill">
    <rdfs:comment>Type of itself</rdfs:comment>
    <rdfs:label>Mill</rdfs:label>
    <rdfs:subClassOf rdf:resource="&rscdfs;Device"/>
</ontoDevice:Mill>

<ontoDevice:Module rdf:about="&ontoDevice;Module">
    <rdfs:comment>Type of itself</rdfs:comment>
    <rdfs:label>Module</rdfs:label>
    <rdfs:subClassOf rdf:resource="&rscdfs;Device"/>
</ontoDevice:Module>

<ontoDevice:AtomicModule rdf:about="&ontoDevice;AtomicModule">
    <rdfs:comment>Type of itself</rdfs:comment>
    <rdfs:label>AtomicModule</rdfs:label>
    <rdfs:subClassOf rdf:resource="&ontoDevice;Module"/>
</ontoDevice:AtomicModule>

<ontoDevice:SensorKX2834-S rdf:about="&ontoDevice;SensorKX2834-S">
    <rdfs:comment>Type of itself</rdfs:comment>
    <rdfs:label>SensorKX2834-S</rdfs:label>
    <rdfs:subClassOf rdf:resource="&ontoDevice;Sensor"/>
</ontoDevice:SensorKX2834-S>

<ontoDevice:SensorRP2345-M rdf:about="&ontoDevice;SensorRP2345-M">
    <rdfs:comment>Type of itself</rdfs:comment>
    <rdfs:label>SensorRP2345-M</rdfs:label>
    <rdfs:subClassOf rdf:resource="&ontoDevice;Sensor"/>
</ontoDevice:SensorRP2345-M>

<ontoDevice:PaperMachine rdf:about="&ontoDevice;PaperMachine">
    <rdfs:comment>Type of itself</rdfs:comment>
    <rdfs:label>PaperMachine</rdfs:label>
    <rdfs:subClassOf rdf:resource="&rscdfs;Device"/>
</ontoDevice:PaperMachine>

<ontoDevice:PaperMachineSeries60
rdf:about="&ontoDevice;PaperMachineSeries60">
    <rdfs:comment>Type of itself</rdfs:comment>
    <rdfs:label>PaperMachineSeries60</rdfs:label>
    <rscdfs:hasParameter rdf:resource="&ontoDevice;DParam1"/>
    <rscdfs:hasParameter rdf:resource="&ontoDevice;DParam2"/>
    <rscdfs:hasParameter rdf:resource="&ontoDevice;DParam3"/>
    <rscdfs:hasParameter rdf:resource="&ontoDevice;DParam4"/>
    <rscdfs:hasParameter rdf:resource="&ontoDevice;DParam5"/>
    <rscdfs:hasParameter rdf:resource="&ontoDevice;DParam6"/>
    <rscdfs:hasParameter rdf:resource="&ontoDevice;DParam7"/>
    <rdfs:subClassOf rdf:resource="&ontoDevice;PaperMachine"/>
</ontoDevice:PaperMachineSeries60>

<rscdfs:DParamDescription rdf:about="&ontoDevice;DParam1">
    <rscdfs:measureName rdf:resource="&ontoMeasurement;KF330_param1"/>
    <rscdfs:maxValue>80</rscdfs:maxValue>
    <rscdfs:minValue>20</rscdfs:minValue>
</rscdfs:DParamDescription>

<rscdfs:DParamDescription rdf:about="&ontoDevice;DParam2">
    <rscdfs:measureName rdf:resource="&ontoMeasurement;KF330_param2"/>

```

```

        <rscdfs:maxValue>330</rscdfs:maxValue>
        <rscdfs:minValue>80</rscdfs:minValue>
</rscdfs:DParamDescription>

<rscdfs:DParamDescription rdf:about="&ontoDevice;DParam3">
    <rscdfs:measureName rdf:resource="&ontoMeasurement;KF330_param3"/>
    <rscdfs:maxValue>9.0</rscdfs:maxValue>
    <rscdfs:minValue>7.5</rscdfs:minValue>
</rscdfs:DParamDescription>

<rscdfs:DParamDescription rdf:about="&ontoDevice;DParam4">
    <rscdfs:measureName rdf:resource="&ontoMeasurement;KF330_param4"/>
    <rscdfs:maxValue>6</rscdfs:maxValue>
    <rscdfs:minValue>4</rscdfs:minValue>
</rscdfs:DParamDescription>

<rscdfs:DParamDescription rdf:about="&ontoDevice;DParam5">
    <rscdfs:measureName rdf:resource="&ontoMeasurement;KF330_param5"/>
    <rscdfs:maxValue>240</rscdfs:maxValue>
    <rscdfs:minValue>230</rscdfs:minValue>
</rscdfs:DParamDescription>

<rscdfs:DParamDescription rdf:about="&ontoDevice;DParam6">
    <rscdfs:measureName rdf:resource="&ontoMeasurement;KF330_param6"/>
    <rscdfs:maxValue>70</rscdfs:maxValue>
    <rscdfs:minValue>60</rscdfs:minValue>
</rscdfs:DParamDescription>

<rscdfs:DParamDescription rdf:about="&ontoDevice;DParam7">
    <rscdfs:measureName rdf:resource="&ontoMeasurement;KF330_param7"/>
    <rscdfs:maxValue>100</rscdfs:maxValue>
    <rscdfs:minValue>45</rscdfs:minValue>
</rscdfs:DParamDescription>

<!-- end of DeviceOntology -->

<!-- DiagnosisOntology -->

<ontoDiagnosis:DeviceDiagnosis rdf:about="&ontoDiagnosis;DeviceDiagnosis">
    <rdfs:comment>Type of itself</rdfs:comment>
    <rdfs:label>DeviceDiagnosis</rdfs:label>
    <rdfs:subClassOf rdf:resource="&rscdfs;EnumerativeValue"/>
</ontoDiagnosis:DeviceDiagnosis>

<ontoDiagnosis:DevicePhysicalDiagnosis
rdf:about="&ontoDiagnosis;DevicePhysicalDiagnosis">
    <rdfs:comment>Type of itself</rdfs:comment>
    <rdfs:label>DevicePhysicalDiagnosis</rdfs:label>
    <rdfs:subClassOf rdf:resource="&ontoDiagnosis;DeviceDiagnosis"/>
</ontoDiagnosis:DevicePhysicalDiagnosis>

<ontoDiagnosis:DeviceLogicalDiagnosis
rdf:about="&ontoDiagnosis;DeviceLogicalDiagnosis">
    <rdfs:comment>Type of itself</rdfs:comment>
    <rdfs:label>DeviceLogicalDiagnosis</rdfs:label>
    <rdfs:subClassOf rdf:resource="&ontoDiagnosis;DeviceDiagnosis"/>
</ontoDiagnosis:DeviceLogicalDiagnosis>

<ontoDiagnosis:DeviceDiagnosis_1
rdf:about="&ontoDiagnosis;DeviceDiagnosis_1">
    <rdfs:comment>Type of itself</rdfs:comment>
    <rdfs:label>Oil tank thermometer probe breakage</rdfs:label>

```

```

        <rdfs:subClassOf
rdf:resource="&ontoDiagnosis;DevicePhysicalDiagnosis"/>
</ontoDiagnosis:DeviceDiagnosis_1>

<ontoDiagnosis:DeviceDiagnosis_2
rdf:about="&ontoDiagnosis;DeviceDiagnosis_2">
    <rdfs:comment>Type of itself</rdfs:comment>
    <rdfs:label>Leakage of oil in the oil tank </rdfs:label>
    <rdfs:subClassOf
rdf:resource="&ontoDiagnosis;DevicePhysicalDiagnosis"/>
</ontoDiagnosis:DeviceDiagnosis_2>

<ontoDiagnosis:DeviceDiagnosis_3
rdf:about="&ontoDiagnosis;DeviceDiagnosis_3">
    <rdfs:comment>Type of itself</rdfs:comment>
    <rdfs:label>Disbalansing of the drive shaft of the
gear</rdfs:label>
    <rdfs:subClassOf
rdf:resource="&ontoDiagnosis;DevicePhysicalDiagnosis"/>
</ontoDiagnosis:DeviceDiagnosis_3>

<ontoDiagnosis:DeviceDiagnosis_4
rdf:about="&ontoDiagnosis;DeviceDiagnosis_4">
    <rdfs:comment>Type of itself</rdfs:comment>
    <rdfs:label>Passages plugging of the lubricating
system</rdfs:label>
    <rdfs:subClassOf
rdf:resource="&ontoDiagnosis;DevicePhysicalDiagnosis"/>
</ontoDiagnosis:DeviceDiagnosis_4>

<ontoDiagnosis:DeviceDiagnosis_5
rdf:about="&ontoDiagnosis;DeviceDiagnosis_5">
    <rdfs:comment>Type of itself</rdfs:comment>
    <rdfs:label>Kinks in the main drive engine</rdfs:label>
    <rdfs:subClassOf
rdf:resource="&ontoDiagnosis;DevicePhysicalDiagnosis"/>
</ontoDiagnosis:DeviceDiagnosis_5>

<!-- end of DiagnosisOntology -->

<!-- EnumerativeValueOntology -->

<ontoEnumerativeValue:PinnanRange
rdf:about="&ontoEnumerativeValue;PinnanRange">
    <rdfs:comment>Type of itself</rdfs:comment>
    <rdfs:label>PinnanRange</rdfs:label>
    <rdfs:subClassOf rdf:resource="&rsctdfs;EnumerativeValue"/>
</ontoEnumerativeValue:PinnanRange>

<ontoEnumerativeValue:PinnanRange_20-40
rdf:about="&ontoEnumerativeValue;PinnanRange_20-40">
    <rdfs:comment>Type of itself</rdfs:comment>
    <rdfs:label>PinnanRange_20-40</rdfs:label>
    <rdfs:subClassOf rdf:resource="&ontoEnumerativeValue;PinnanRange"/>
</ontoEnumerativeValue:PinnanRange_20-40>

<ontoEnumerativeValue:PinnanRange_40-60
rdf:about="&ontoEnumerativeValue;PinnanRange_40-60">
    <rdfs:comment>Type of itself</rdfs:comment>
    <rdfs:label>PinnanRange_40-60</rdfs:label>

```

```

        <rdfs:subClassOf rdf:resource="&ontoEnumerativeValue;PinnanRange" />
</ontoEnumerativeValue:PinnanRange_40-60>

<ontoEnumerativeValue:PinnanRange_60-80
rdf:about="&ontoEnumerativeValue;PinnanRange_60-80">
    <rdfs:comment>Type of itself</rdfs:comment>
    <rdfs:label>PinnanRange_60-80</rdfs:label>
    <rdfs:subClassOf rdf:resource="&ontoEnumerativeValue;PinnanRange" />
</ontoEnumerativeValue:PinnanRange_60-80>

<ontoEnumerativeValue:FailureStatus
rdf:about="&ontoEnumerativeValue;FailureStatus">
    <rdfs:comment>Type of itself</rdfs:comment>
    <rdfs:label>FailureStatus</rdfs:label>
    <rdfs:subClassOf rdf:resource="&rsdcds;EnumerativeValue" />
</ontoEnumerativeValue:FailureStatus>

<ontoEnumerativeValue:LOW_LOW rdf:about="&ontoEnumerativeValue;LOW_LOW">
    <rdfs:comment>Type of itself</rdfs:comment>
    <rdfs:label>LOW_LOW</rdfs:label>
    <rdfs:subClassOf
rdf:resource="&ontoEnumerativeValue;FailureStatus" />
</ontoEnumerativeValue:LOW_LOW>

<ontoEnumerativeValue:LOW rdf:about="&ontoEnumerativeValue;LOW">
    <rdfs:comment>Type of itself</rdfs:comment>
    <rdfs:label>LOW</rdfs:label>
    <rdfs:subClassOf
rdf:resource="&ontoEnumerativeValue;FailureStatus" />
</ontoEnumerativeValue:LOW>

<ontoEnumerativeValue:OK rdf:about="&ontoEnumerativeValue;OK">
    <rdfs:comment>Type of itself</rdfs:comment>
    <rdfs:label>OK</rdfs:label>
    <rdfs:subClassOf
rdf:resource="&ontoEnumerativeValue;FailureStatus" />
</ontoEnumerativeValue:OK>

<ontoEnumerativeValue:HIGH rdf:about="&ontoEnumerativeValue;HIGH">
    <rdfs:comment>Type of itself</rdfs:comment>
    <rdfs:label>HIGH</rdfs:label>
    <rdfs:subClassOf
rdf:resource="&ontoEnumerativeValue;FailureStatus" />
</ontoEnumerativeValue:HIGH>

<ontoEnumerativeValue:HIGH_HIGH rdf:about="&ontoEnumerativeValue;HIGH_HIGH">
    <rdfs:comment>Type of itself</rdfs:comment>
    <rdfs:label>HIGH_HIGH</rdfs:label>
    <rdfs:subClassOf
rdf:resource="&ontoEnumerativeValue;FailureStatus" />
</ontoEnumerativeValue:HIGH_HIGH>

<ontoEnumerativeValue:FailureEnumerativeValue
rdf:about="&ontoEnumerativeValue;FailureEnumerativeValue">
    <rdfs:comment>Type of itself</rdfs:comment>
    <rdfs:label>FailureEnumerativeValue</rdfs:label>
    <rdfs:subClassOf rdf:resource="&rsdcds;EnumerativeValue" />
</ontoEnumerativeValue:FailureEnumerativeValue>

<rdf:Property rdf:about="&ontoEnumerativeValue;value">
    <rdfs:label>complexEValue</rdfs:label>
    <rdfs:domain
rdf:resource="&ontoEnumerativeValue;FailureEnumerativeValue" />

```

```

        <rdfs:range rdf:resource="&ontoEnumerativeValue;PinnanRange" />
        <rdfs:subPropertyOf rdf:resource="&rdf;value" />
</rdf:Property>

<rdf:Property rdf:about="&ontoEnumerativeValue;status">
    <rdfs:label>status</rdfs:label>
    <rdfs:domain
rdf:resource="&ontoEnumerativeValue;FailureEnumerativeValue" />
        <rdfs:range rdf:resource="&ontoEnumerativeValue;FailureStatus" />
</rdf:Property>

<!-- end of EnumerativeValueOntology -->

<!-- MeasurementOntology -->

<rscdfs:SR_Property rdf:about="&ontoMeasurement;deviceMeasurement">
    <rdfs:label>deviceMeasurement</rdfs:label>
    <rdfs:domain rdf:resource="&rscdfs;Device" />
    <rdfs:range rdf:resource="&rscdfs;QuantityValue" />
    <rscdfs:context rdf:resource="&rscdfs;sysTime" />
    <rdfs:subPropertyOf rdf:resource="&rscdfs;measurement" />
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&ontoMeasurement;decideSR_Measurement">
    <rdfs:label>decideSR_Measurement</rdfs:label>
    <rdfs:domain rdf:resource="&rscdfs;DecideSR" />
    <rdfs:range rdf:resource="&rscdfs;QuantityValue" />
    <rscdfs:context rdf:resource="&rscdfs;sysTime" />
    <rscdfs:context rdf:resource="&rscdfs;sr_State" />
    <rdfs:subPropertyOf rdf:resource="&rscdfs;measurement" />
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&ontoMeasurement;expertMeasurement">
    <rdfs:label>expertMeasurement</rdfs:label>
    <rdfs:domain rdf:resource="&rscdfs;Expert" />
    <rdfs:range rdf:resource="&rscdfs;QuantityValue" />
    <rscdfs:context rdf:resource="&rscdfs;sysTime" />
    <rscdfs:context rdf:resource="&rscdfs;sr_State" />
    <rdfs:subPropertyOf
rdf:resource="&ontoMeasurement;decideSR_Measurement" />
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&ontoMeasurement;serviceMeasurement">
    <rdfs:label>serviceMeasurement</rdfs:label>
    <rdfs:domain rdf:resource="&rscdfs;Service" />
    <rdfs:range rdf:resource="&rscdfs;QuantityValue" />
    <rscdfs:context rdf:resource="&rscdfs;sysTime" />
    <rscdfs:context rdf:resource="&rscdfs;sr_State" />
    <rscdfs:context rdf:resource="&rscdfs;model" />
    <rdfs:subPropertyOf
rdf:resource="&ontoMeasurement;decideSR_Measurement" />
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&ontoMeasurement;devicePhysicalMeasurement">
    <rdfs:label>devicePhysicalMeasurement</rdfs:label>
    <rdfs:domain rdf:resource="&rscdfs;Device" />
    <rdfs:range rdf:resource="&rscdfs;QuantityValue" />
    <rscdfs:context rdf:resource="&rscdfs;sysTime" />
    <rscdfs:context rdf:resource="&ontoPartOf;deviceAtomOfDevice" />
    <rdfs:subPropertyOf
rdf:resource="&ontoMeasurement;deviceMeasurement" />
</rscdfs:SR_Property>

```

```

<rscdfs:SR_Property rdf:about="&ontoMeasurement;deviceLogicalMeasurement">
  <rdfs:label>deviceLogicalMeasurement</rdfs:label>
  <rdfs:domain rdf:resource="&rscdfs;Device"/>
  <rdfs:range rdf:resource="&rscdfs;EnumerativeValue"/>
  <rscdfs:context rdf:resource="&rscdfs;sysTime"/>
  <rscdfs:context rdf:resource="&ontoCondition;deviceCondition"/>
  <rscdfs:context rdf:resource="&rscdfs;devicePartOf"/>
  <rdfs:subPropertyOf
rdf:resource="&ontoMeasurement;deviceMeasurement"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property
rdf:about="&ontoMeasurement;serviceMeasurementOfPhysicalDevice">
  <rdfs:label>serviceMeasurementOfPhysicalDevice</rdfs:label>
  <rdfs:domain rdf:resource="&rscdfs;Service"/>
  <rdfs:range rdf:resource="&rscdfs;EnumerativeValue"/>
  <rscdfs:context rdf:resource="&rscdfs;sysTime"/>
  <rscdfs:context rdf:resource="&ontoContainer;devicePhysicalState"/>
  <rscdfs:context rdf:resource="&rscdfs;model"/>
  <rdfs:subPropertyOf
rdf:resource="&ontoMeasurement;serviceMeasurement"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property
rdf:about="&ontoMeasurement;serviceMeasurementOfLogicalDevice">
  <rdfs:label>serviceMeasurementOfLogicalDevice</rdfs:label>
  <rdfs:domain rdf:resource="&rscdfs;Service"/>
  <rdfs:range rdf:resource="&rscdfs;EnumerativeValue"/>
  <rscdfs:context rdf:resource="&rscdfs;sysTime"/>
  <rscdfs:context rdf:resource="&ontoContainer;deviceLogicalState"/>
  <rscdfs:context rdf:resource="&rscdfs;model"/>
  <rdfs:subPropertyOf
rdf:resource="&ontoMeasurement;serviceMeasurement"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property
rdf:about="&ontoMeasurement;expertMeasurementOfPhysicalDevice">
  <rdfs:label>expertMeasurementOfPhysicalDevice</rdfs:label>
  <rdfs:domain rdf:resource="&rscdfs;Expert"/>
  <rdfs:range rdf:resource="&rscdfs;EnumerativeValue"/>
  <rscdfs:context rdf:resource="&rscdfs;sysTime"/>
  <rscdfs:context rdf:resource="&ontoContainer;devicePhysicalState"/>
  <rdfs:subPropertyOf
rdf:resource="&ontoMeasurement;expertMeasurement"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property
rdf:about="&ontoMeasurement;expertMeasurementOfLogicalDevice">
  <rdfs:label>expertMeasurementOfLogicalDevice</rdfs:label>
  <rdfs:domain rdf:resource="&rscdfs;Expert"/>
  <rdfs:range rdf:resource="&rscdfs;EnumerativeValue"/>
  <rscdfs:context rdf:resource="&rscdfs;sysTime"/>
  <rscdfs:context rdf:resource="&ontoContainer;deviceLogicalState"/>
  <rdfs:subPropertyOf
rdf:resource="&ontoMeasurement;expertMeasurement"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&ontoMeasurement;temperature">
  <rdfs:label>temperature</rdfs:label>
  <rdfs:domain rdf:resource="&rscdfs;Device"/>
  <rdfs:range rdf:resource="&rscdfs;NumericalValue"/>
  <rscdfs:context rdf:resource="&rscdfs;sysTime"/>

```



```

        <rscdfs:context rdf:resource="&ontoPartOf;deviceAtomOfDevice" />
        <rdfs:subPropertyOf
rdf:resource="&ontoMeasurement;devicePhysicalMeasurement" />
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&ontoMeasurement;rotationSpeed">
    <rdfs:label>rotationSpeed</rdfs:label>
    <rdfs:domain rdf:resource="&rscdfs;Device" />
    <rdfs:range rdf:resource="&rscdfs;NumericalValue" />
    <rscdfs:context rdf:resource="&rscdfs;sysTime" />
    <rscdfs:context rdf:resource="&ontoPartOf;deviceAtomOfDevice" />
    <rdfs:subPropertyOf
rdf:resource="&ontoMeasurement;devicePhysicalMeasurement" />
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&ontoMeasurement;volume">
    <rdfs:label>volume</rdfs:label>
    <rdfs:domain rdf:resource="&rscdfs;Device" />
    <rdfs:range rdf:resource="&rscdfs;NumericalValue" />
    <rscdfs:context rdf:resource="&rscdfs;sysTime" />
    <rscdfs:context rdf:resource="&ontoPartOf;deviceAtomOfDevice" />
    <rdfs:subPropertyOf
rdf:resource="&ontoMeasurement;devicePhysicalMeasurement" />
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&ontoMeasurement;KF330_param1">
    <rdfs:label>Screw turning speed</rdfs:label>
    <rdfs:domain rdf:resource="&rscdfs;Device" />
    <rdfs:range rdf:resource="&rscdfs;NumericalValue" />
    <rscdfs:context rdf:resource="&rscdfs;sysTime" />
    <rscdfs:context rdf:resource="&ontoPartOf;deviceAtomOfDevice" />
    <rdfs:subPropertyOf
rdf:resource="&ontoMeasurement;devicePhysicalMeasurement" />
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&ontoMeasurement;KF330_param2">
    <rdfs:label>Open-close stroke</rdfs:label>
    <rdfs:domain rdf:resource="&rscdfs;Device" />
    <rdfs:range rdf:resource="&rscdfs;NumericalValue" />
    <rscdfs:context rdf:resource="&rscdfs;sysTime" />
    <rscdfs:context rdf:resource="&ontoPartOf;deviceAtomOfDevice" />
    <rdfs:subPropertyOf
rdf:resource="&ontoMeasurement;devicePhysicalMeasurement" />
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&ontoMeasurement;KF330_param3">
    <rdfs:label>Working module pressure</rdfs:label>
    <rdfs:domain rdf:resource="&rscdfs;Device" />
    <rdfs:range rdf:resource="&rscdfs;NumericalValue" />
    <rscdfs:context rdf:resource="&rscdfs;sysTime" />
    <rscdfs:context rdf:resource="&ontoPartOf;deviceAtomOfDevice" />
    <rdfs:subPropertyOf
rdf:resource="&ontoMeasurement;devicePhysicalMeasurement" />
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&ontoMeasurement;KF330_param4">
    <rdfs:label>Air pressure</rdfs:label>
    <rdfs:domain rdf:resource="&rscdfs;Device" />
    <rdfs:range rdf:resource="&rscdfs;NumericalValue" />
    <rscdfs:context rdf:resource="&rscdfs;sysTime" />
    <rscdfs:context rdf:resource="&ontoPartOf;deviceAtomOfDevice" />
    <rdfs:subPropertyOf
rdf:resource="&ontoMeasurement;devicePhysicalMeasurement" />

```

```

</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&ontoMeasurement;KF330_param5">
  <rdfs:label>Oil tank range</rdfs:label>
  <rdfs:domain rdf:resource="&rscdfs;Device"/>
  <rdfs:range rdf:resource="&rscdfs;NumericalValue"/>
  <rscdfs:context rdf:resource="&rscdfs;sysTime"/>
  <rscdfs:context rdf:resource="&ontoPartOf;deviceAtomOfDevice"/>
  <rdfs:subPropertyOf
rdf:resource="&ontoMeasurement;devicePhysicalMeasurement"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&ontoMeasurement;KF330_param6">
  <rdfs:label>Oil tank temperature</rdfs:label>
  <rdfs:domain rdf:resource="&rscdfs;Device"/>
  <rdfs:range rdf:resource="&rscdfs;NumericalValue"/>
  <rscdfs:context rdf:resource="&rscdfs;sysTime"/>
  <rscdfs:context rdf:resource="&ontoPartOf;deviceAtomOfDevice"/>
  <rdfs:subPropertyOf
rdf:resource="&ontoMeasurement;devicePhysicalMeasurement"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&ontoMeasurement;KF330_param7">
  <rdfs:label>Thermo liquid level</rdfs:label>
  <rdfs:domain rdf:resource="&rscdfs;Device"/>
  <rdfs:range rdf:resource="&rscdfs;NumericalValue"/>
  <rscdfs:context rdf:resource="&rscdfs;sysTime"/>
  <rscdfs:context rdf:resource="&ontoPartOf;deviceAtomOfDevice"/>
  <rdfs:subPropertyOf
rdf:resource="&ontoMeasurement;devicePhysicalMeasurement"/>
</rscdfs:SR_Property>

<!-- end of MeasurementOntology -->

<!-- MeasurementUnitOntology -->

<ontoMeasurementUnit:TemperatureMeasure
rdf:about="&ontoMeasurementUnit;TemperatureMeasure">
  <rdfs:comment>Type of itself</rdfs:comment>
  <rdfs:label>TemperatureMeasure</rdfs:label>
  <rdfs:subClassOf rdf:resource="&rscdfs;MeasurementUnit"/>
</ontoMeasurementUnit:TemperatureMeasure>

<ontoMeasurementUnit:Celsius rdf:about="&ontoMeasurementUnit;Celsius">
  <rdfs:comment>Type of itself</rdfs:comment>
  <rdfs:label>Celsius</rdfs:label>
  <rdfs:subClassOf
rdf:resource="&ontoMeasurementUnit;TemperatureMeasure"/>
</ontoMeasurementUnit:Celsius>

<ontoMeasurementUnit:RotationSpeedMeasure
rdf:about="&ontoMeasurementUnit;RotationSpeedMeasure">
  <rdfs:comment>Type of itself</rdfs:comment>
  <rdfs:label>RotationSpeedMeasure</rdfs:label>
  <rdfs:subClassOf rdf:resource="&rscdfs;MeasurementUnit"/>
</ontoMeasurementUnit:RotationSpeedMeasure>

<ontoMeasurementUnit:PromptnessPerMinute
rdf:about="&ontoMeasurementUnit;PromptnessPerMinute">
  <rdfs:comment>Type of itself</rdfs:comment>
  <rdfs:label>Promptness Per Minute</rdfs:label>

```

```

        <rdfs:subClassOf
rdf:resource="&ontoMeasurementUnit;RotationSpeedMeasure"/>
</ontoMeasurementUnit:PromptnessPerMinute>

<ontoMeasurementUnit:PressureMeasure
rdf:about="&ontoMeasurementUnit;PressureMeasure">
    <rdfs:comment>Type of itself</rdfs:comment>
    <rdfs:label>Pressure Measure</rdfs:label>
    <rdfs:subClassOf rdf:resource="&rsdcdfs;MeasurementUnit"/>
</ontoMeasurementUnit:PressureMeasure>

<ontoMeasurementUnit:KG_CM2 rdf:about="&ontoMeasurementUnit;KG_CM2">
    <rdfs:comment>Type of itself</rdfs:comment>
    <rdfs:label>kg/cm^2</rdfs:label>
    <rdfs:subClassOf
rdf:resource="&ontoMeasurementUnit;PressureMeasure"/>
</ontoMeasurementUnit:KG_CM2>

<ontoMeasurementUnit:XMLSchemaDateTime
rdf:about="&ontoMeasurementUnit;XMLSchemaDateTime">
    <rdfs:comment>Type of itself</rdfs:comment>
    <rdfs:label>XMLSchemaDateTime</rdfs:label>
    <rdfs:subClassOf rdf:resource="&rsdcdfs;MeasurementUnit"/>
</ontoMeasurementUnit:XMLSchemaDateTime>

<ontoMeasurementUnit:EngineeringUnit
rdf:about="&ontoMeasurementUnit;EngineeringUnit">
    <rdfs:comment>Type of itself</rdfs:comment>
    <rdfs:label>EngineeringUnit</rdfs:label>
    <rdfs:subClassOf rdf:resource="&rsdcdfs;MeasurementUnit"/>
</ontoMeasurementUnit:EngineeringUnit>

<ontoMeasurementUnit:EU1 rdf:about="&ontoMeasurementUnit;EU1">
    <rdfs:comment>Type of itself</rdfs:comment>
    <rdfs:label>1</rdfs:label>
    <rdfs:subClassOf
rdf:resource="&ontoMeasurementUnit;EngineeringUnit"/>
</ontoMeasurementUnit:EU1>

<ontoMeasurementUnit:DistanceMeasure
rdf:about="&ontoMeasurementUnit;DistanceMeasure">
    <rdfs:comment>Type of itself</rdfs:comment>
    <rdfs:label>Distance Measure</rdfs:label>
    <rdfs:subClassOf rdf:resource="&rsdcdfs;MeasurementUnit"/>
</ontoMeasurementUnit:DistanceMeasure>

<ontoMeasurementUnit:MM rdf:about="&ontoMeasurementUnit;MM">
    <rdfs:comment>Type of itself</rdfs:comment>
    <rdfs:label>mm</rdfs:label>
    <rdfs:subClassOf
rdf:resource="&ontoMeasurementUnit;DistanceMeasure"/>
</ontoMeasurementUnit:MM>

<ontoMeasurementUnit:VolumeMeasure
rdf:about="&ontoMeasurementUnit;VolumeMeasure">
    <rdfs:comment>Type of itself</rdfs:comment>
    <rdfs:label>Volume Measure</rdfs:label>
    <rdfs:subClassOf rdf:resource="&rsdcdfs;MeasurementUnit"/>
</ontoMeasurementUnit:VolumeMeasure>

<ontoMeasurementUnit:Liter rdf:about="&ontoMeasurementUnit;Liter">
    <rdfs:comment>Type of itself</rdfs:comment>
    <rdfs:label>liter</rdfs:label>

```

```

        <rdfs:subClassOf
rdf:resource="&ontoMeasurementUnit;VolumeMeasure"/>
</ontoMeasurementUnit:Liter>

<!-- end of MeasurementUnitOntology -->

<!-- MessageContentOntology -->

<rscdfs:SR_Property rdf:about="&ontoMessageContent;messageTo">
    <rdfs:label>messageTo</rdfs:label>
    <rdfs:domain rdf:resource="&rscdfs;SmartResource"/>
    <rdfs:range rdf:resource="&rscdfs;SmartResource"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&ontoMessageContent;deviceDiagnosticRequest">
    <rdfs:label>deviceDiagnosticRequest</rdfs:label>
    <rdfs:domain rdf:resource="&rscdfs;Device"/>
    <rdfs:range rdf:resource="&rscdfs;DecideSR"/>
    <rscdfs:context rdf:resource="&rscdfs;alarm"/>
    <rscdfs:context rdf:resource="&ontoContainer;deviceStateHistory"/>
    <rdfs:subPropertyOf rdf:resource="&ontoMessageContent;messageTo"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property
rdf:about="&ontoMessageContent;devicePhysicalDiagnosticRequest">
    <rdfs:label>devicePhysicalDiagnosticRequest</rdfs:label>
    <rdfs:domain rdf:resource="&rscdfs;Device"/>
    <rdfs:range rdf:resource="&rscdfs;DecideSR"/>
    <rscdfs:context rdf:resource="&rscdfs;alarm"/>
    <rscdfs:context
rdf:resource="&ontoContainer;devicePhysicalStateHistory"/>
    <rdfs:subPropertyOf
rdf:resource="&ontoMessageContent;deviceDiagnosticRequest"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&ontoMessageContent;deviceLearningRequest">
    <rdfs:label>deviceLearningRequest</rdfs:label>
    <rdfs:domain rdf:resource="&rscdfs;Device"/>
    <rdfs:range rdf:resource="&rscdfs;DecideSR"/>
    <rscdfs:context
rdf:resource="&ontoContainer;deviceDiagnosisHistory"/>
    <rdfs:subPropertyOf rdf:resource="&ontoMessageContent;messageTo"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property
rdf:about="&ontoMessageContent;devicePhysicalLearningRequest">
    <rdfs:label>devicePhysicalLearningRequest</rdfs:label>
    <rdfs:domain rdf:resource="&rscdfs;Device"/>
    <rdfs:range rdf:resource="&rscdfs;DecideSR"/>
    <rscdfs:context
rdf:resource="&ontoContainer;devicePhysicalDiagnosisHistory"/>
    <rdfs:subPropertyOf
rdf:resource="&ontoMessageContent;deviceLearningRequest"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&ontoMessageContent;deviceDiagnosticResponse">
    <rdfs:label>deviceDiagnosticResponse</rdfs:label>
    <rdfs:domain rdf:resource="&rscdfs;DecideSR"/>
    <rdfs:range rdf:resource="&rscdfs;Device"/>
    <rscdfs:context
rdf:resource="&ontoMessageContent;deviceDiagnosticRequest"/>
    <rscdfs:context rdf:resource="&ontoCondition;deviceDiagnosis"/>

```

```

        <rdfs:subPropertyOf rdf:resource="&ontoMessageContent;messageTo"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property
rdf:about="&ontoMessageContent;devicePhysicalDiagnosticResponse">
  <rdfs:label>devicePhysicalDiagnosticResponse</rdfs:label>
  <rdfs:domain rdf:resource="&rscdfs;DecideSR"/>
  <rdfs:range rdf:resource="&rscdfs;Device"/>
  <rscdfs:context
rdf:resource="&ontoMessageContent;devicePhysicalDiagnosticRequest"/>
  <rscdfs:context
rdf:resource="&ontoCondition;devicePhysicalDiagnosis"/>
  <rdfs:subPropertyOf
rdf:resource="&ontoMessageContent;deviceDiagnosticResponse"/>
</rscdfs:SR_Property>

<!-- end of MessageContentOntology -->

<!-- ModelOntology -->

<ontoModel:KNN_Model rdf:about="&ontoModel;KNN_Model">
  <rdfs:comment>Type of itself</rdfs:comment>
  <rdfs:label>KNN Model</rdfs:label>
  <rdfs:subClassOf rdf:resource="&rscdfs;SR_Model"/>
</ontoModel:KNN_Model>

<rscdfs:SR_Property rdf:about="&ontoModel;modelDescription">
  <rdfs:label>modelDescription</rdfs:label>
  <rdfs:domain rdf:resource="&ontoModel;KNN_Model"/>
  <rdfs:range rdf:resource="&rdfs;Resource"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&ontoModel;knnModel">
  <rdfs:label>knnModel</rdfs:label>
  <rdfs:domain rdf:resource="&ontoModel;KNN_Model"/>
  <rdfs:range rdf:resource="&rscdfs;SR_Container"/>
  <rscdfs:context rdf:resource="&rscdfs;condition"/>
  <rdfs:subPropertyOf rdf:resource="&ontoModel;modelDescription"/>
</rscdfs:SR_Property>

<rdf:Property rdf:about="&ontoModel;k_equal">
  <rdfs:label>k_equal</rdfs:label>
  <rdfs:domain rdf:resource="&ontoModel;KNN_Model"/>
  <rdfs:range rdf:resource="&rdfs;Literal"/>
</rdf:Property>

<rscdfs:SR_Property rdf:about="&ontoModel;serviceModel">
  <rdfs:label>serviceModel</rdfs:label>
  <rdfs:domain rdf:resource="&rscdfs;Service"/>
  <rdfs:range rdf:resource="&rscdfs;SR_Container"/>
  <rscdfs:context rdf:resource="&rscdfs;sysTime"/>
  <rscdfs:context rdf:resource="&ontoModel;modelDescription"/>
  <rdfs:subPropertyOf rdf:resource="&rscdfs;model"/>
</rscdfs:SR_Property>

<!-- end of ModelOntology -->

<!-- PartOfOntology -->

<rscdfs:SR_Property rdf:about="&ontoPartOf;devicePartOfDevice">
  <rdfs:label>devicePartOfDevice</rdfs:label>

```

```

        <rdfs:domain rdf:resource="&rscdfs;Device"/>
        <rdfs:range rdf:resource="&rscdfs;Device"/>
        <rdfs:subPropertyOf rdf:resource="&rscdfs;devicePartOf"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&ontoPartOf;servicePartOfService">
  <rdfs:label>servicePartOfService</rdfs:label>
  <rdfs:domain rdf:resource="&rscdfs;Service"/>
  <rdfs:range rdf:resource="&rscdfs;Service"/>
  <rdfs:subPropertyOf rdf:resource="&rscdfs;servicePartOf"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&ontoPartOf;devicePartOfWorld">
  <rdfs:label>devicePartOfWorld</rdfs:label>
  <rdfs:domain rdf:resource="&rscdfs;Device"/>
  <rdfs:range rdf:resource="&rscdfs;Environment"/>
  <rdfs:subPropertyOf rdf:resource="&rscdfs;partOfWorld"/>
  <rdfs:subPropertyOf rdf:resource="&rscdfs;devicePartOf"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&ontoPartOf;servicePartOfWorld">
  <rdfs:label>servicePartOfWorld</rdfs:label>
  <rdfs:domain rdf:resource="&rscdfs;Service"/>
  <rdfs:range rdf:resource="&rscdfs;Environment"/>
  <rdfs:subPropertyOf rdf:resource="&rscdfs;partOfWorld"/>
  <rdfs:subPropertyOf rdf:resource="&rscdfs;servicePartOf"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&ontoPartOf;deviceAtomOfWorld">
  <rdfs:label>devicePartOfWorld</rdfs:label>
  <rdfs:domain rdf:resource="&rscdfs;Device"/>
  <rdfs:range rdf:resource="&rscdfs;Environment"/>
  <rdfs:subPropertyOf rdf:resource="&rscdfs;partOfWorld"/>
  <rdfs:subPropertyOf rdf:resource="&rscdfs;atomOf"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&ontoPartOf;serviceAtomOfWorld">
  <rdfs:label>servicePartOfWorld</rdfs:label>
  <rdfs:domain rdf:resource="&rscdfs;Service"/>
  <rdfs:range rdf:resource="&rscdfs;Environment"/>
  <rdfs:subPropertyOf rdf:resource="&rscdfs;partOfWorld"/>
  <rdfs:subPropertyOf rdf:resource="&rscdfs;atomOf"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&ontoPartOf;deviceAtomOfDevice">
  <rdfs:label>deviceAtomOfDevice</rdfs:label>
  <rdfs:domain rdf:resource="&rscdfs;Device"/>
  <rdfs:range rdf:resource="&rscdfs;Device"/>
  <rdfs:subPropertyOf rdf:resource="&rscdfs;atomOf"/>
  <rdfs:subPropertyOf rdf:resource="&rscdfs;devicePartOfDevice"/>
</rscdfs:SR_Property>

<rscdfs:SR_Property rdf:about="&ontoPartOf;serviceAtomOfService">
  <rdfs:label>serviceAtomOfService</rdfs:label>
  <rdfs:domain rdf:resource="&rscdfs;Service"/>
  <rdfs:range rdf:resource="&rscdfs;Service"/>
  <rdfs:subPropertyOf rdf:resource="&rscdfs;atomOf"/>
  <rdfs:subPropertyOf rdf:resource="&rscdfs;servicePartOfService"/>
</rscdfs:SR_Property>

<!-- end of PartOfOntology -->

```

```

<!-- TempTempMarkOntology -->

<ontoTempTempMark:TempTempMark rdf:about="&ontoTempTempMark;TempTempMark">
  <rdfs:comment>Type of itself</rdfs:comment>
  <rdfs:label>TempTempMark</rdfs:label>
  <rdfs:subClassOf rdf:resource="&rsctdfs;TempTempMark"/>
  <rdfs:subClassOf rdf:resource="&rsctdfs;NumericalValue"/>
</ontoTempTempMark:TempTempMark>

<!-- end of TempTempMarkOntology -->

<!--Device-->

  <ontoDevice:PaperMachineSeries60 rdf:about="&device;123456XZ24"
    rdfs:label="123456XZ24">
    <rdfs:comment>Device KF-330 blow molding machine</rdfs:comment>
    <rdfs:comment>The manufacture of machine is KUN FONG Machinery Co.,
LTD</rdfs:comment>
    <rdfs:comment>Mail address of manufacture is 14, LANE 108, YU-MEN
ROAD, TAICUNG CITY, TAIWAN</rdfs:comment>
    <rdfs:comment>E-mail of manufacture is <A
HREF="mailto:kunfong9@ms49.hinet.net">kunfong9@ms49.hinet.net
</A></rdfs:comment>
    <rdfs:comment>Official WEB page is <A
HREF="http://www.kunfong.ru">http://www.kunfong.ru</A></rdfs:comment
>
    <rdfs:comment>The manufacture's phone and fax 886-4-24610589, 886-
4-24631205</rdfs:comment>
    <rdfs:comment>The Contact person is Mr. Chan Tong</rdfs:comment>
    <rdfs:comment>Device WEB page is <A
HREF="http://www.kunfong.ru/eng/prod4_1.htm">http://www.kunfong.ru/eng/pro
d4_1.htm</A></rdfs:comment>
    <rdfs:comment><IMG
SRC="http://www.kunfong.ru/pic/prod4_1_1.jpg"></rdfs:comment>

  </ontoDevice:PaperMachineSeries60>
  <rsctdfs:SR_Statement rdf:about="&device;device2WorldStatement">
    <rdf:subject rdf:resource="&device;123456XZ24"/>
    <rsctdfs:predicate rdf:resource="&ontoPartOf;devicePartOfWorld"/>
    <rdf:object rdf:resource="&device;WorldEnvironment"/>
  </rsctdfs:SR_Statement>

  <rsctdfs:Environment rdf:about="&device;WorldEnvironment"/>
  <ontoDevice:Mill rdf:about="&device;123456"
    rdfs:comment="Factory ID" rdfs:label="FactoryNo123456"/>
  <ontoDevice:Module rdf:about="&device;RTDmodule"
    rdfs:comment=" RTD Module" rdfs:label="RTD Module"/>
  <ontoDevice:AtomicModule rdf:about="&device;IP23553"
    rdfs:comment="TAG element" rdfs:label="IP23553 TAG"/>
  <ontoDevice:SensorKX2834-S rdf:about="&device;SensorKX2834-Sinstance"
    rdfs:comment="Sensor class instance"
    rdfs:label="SensorKX2834-S"/>
  <ontoDevice:SensorRP2345-M rdf:about="&device;SensorRP2345-Minstance"
    rdfs:comment="Sensor class instance" rdfs:label="SensorRP2345-M"/>

  <rsctdfs:SR_Statement rdf:about="&device;millPartOfWorldStatement">
    <rdf:subject rdf:resource="&device;123456"/>
    <rsctdfs:predicate rdf:resource="&ontoPartOf;devicePartOfWorld"/>
    <rdf:object rdf:resource="&device;WorldEnvironment"/>
  </rsctdfs:SR_Statement>
  <rsctdfs:SR_Statement rdf:about="&device;machinePartOfMillStatement">
    <rdf:subject rdf:resource="&device;123456XZ24"/>
    <rsctdfs:predicate rdf:resource="&ontoPartOf;devicePartOfDevice"/>

```

```

        <rdf:object rdf:resource="&device;123456"/>
    </rscdfs:SR_Statement>
    <rscdfs:SR_Statement rdf:about="&device;modulePartOfMachineStatement">
        <rdf:subject rdf:resource="&device;RTDmodule"/>
        <rscdfs:predicate rdf:resource="&ontoPartOf;devicePartOfDevice"/>
        <rdf:object rdf:resource="&device;123456XZ24"/>
    </rscdfs:SR_Statement>
    <rscdfs:SR_Statement
rdf:about="&device;atomicmodulePartOfModuleStatement">
        <rdf:subject rdf:resource="&device;IP23553"/>
        <rscdfs:predicate rdf:resource="&ontoPartOf;deviceAtomOfDevice"/>
        <rdf:object rdf:resource="&device;RTDmodule"/>
    </rscdfs:SR_Statement>
<!--end of Device-->

<!--Expert-->
    <rscdfs:Expert rdf:about="&expert;expert1"
        rdfs:comment="Expert "
        rdfs:label="Expert"/>
    <rscdfs:SR_Statement rdf:about="&expert;expert2WorldStatement">
        <rdf:subject rdf:resource="&expert;expert1"/>
        <rscdfs:predicate rdf:resource="&ontoPartOf;expertPartOfWorld"/>
        <rdf:object rdf:resource="&expert;WorldEnvironment"/>
    </rscdfs:SR_Statement>
<!--end of Expert-->

<!--Service-->
    <rscdfs:Service rdf:about="&service;knnservice1"
        rdfs:comment="Web Service with 1NN model"
        rdfs:label="WebService"/>
    <rscdfs:SR_Statement rdf:about="&service;Service2WorldStatement">
        <rdf:subject rdf:resource="&service;knnservice1"/>
        <rscdfs:predicate rdf:resource="&ontoPartOf;servicePartOfWorld"/>
        <rdf:object rdf:resource="&service;WorldEnvironment"/>
    </rscdfs:SR_Statement>
<!--end of Service-->
</rdf:RDF>

```