



## DA6.6: Implementation of the PLM Process model for the Demonstrator

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<b>ABSTRACT</b>	This deliverable (DA6.6) summarises the implementation of the PLM process model for the demonstrator, in terms of scenes, PROMISE components and technology implemented, as described in DA6.3 and DA6.4. The motivation for eventual discrepancies is given, together with the detailed results of the activities performed for the implementation.

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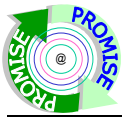
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## Abbreviations



Abbreviations used in this document:

BOL	Beginning Of Life
CNC	Computerized Numerical Control
DoW	Description of Work
DSS	Decision Support System
EOL	End Of Life
HW	Hardware
IT	Information Technology
LCC	Life Cycle Cost
LCRC	Life Cycle Residual Cost
MOL	Middle Of Life
PC	Personal Computer
PDKM	Product Data and Knowledge Management
PDS	Product Data Structure
PEID	Product Embedded Information Device
PM	Predictive Maintenance
PMI	Promise Messaging Interface
RFID	Radio Frequency Identification
SW	Software

# 1 Introduction

## 1.1 Purpose of this deliverable

Deliverable DA6.6 resumes the work done and results achieved in this last phase of WPA6 activities, where Fidia has tested the analyzed technologies to meet PROMISE requirements and has identified the critical issues for the specific predictive maintenance scenario of machine tools (Middle of Life).

The focus has been put on the final user, how development and implementation of PROMISE technologies on the defined cases for this demonstrator, guarantee optimal MOL processes.

This document is based on previous deliverables DA6.3 and DA6.4. The first one has described how the A6 demonstrator has been designed in order to fulfil the demonstration objectives using PROMISE explored technologies. The primary focus of DA6.3 is to create a storyboard for the demonstrator which highlights and proves the concept of the scenario.

Functional requirements of the components involved in the demonstrator were derived and documented starting from the informal description of the use cases.

DA6.4 aims to describe the workflow of the process model which is required for the demonstrator. It also proves the use of PROMISE technology in each step of the demonstrator workflow.

## 1.2 Objective of demonstrator

Fidia is a manufacturer of integrated systems for the machining of complex forms for the moulds and dies industry.

During the project, main interest has been the information management to realize predictive maintenance for machine tools. Aim is to enhance maintenance practices for machine tools, shifting from preventive maintenance and breakdown intervention to predictive maintenance approaches.

In fact our clients have evaluated that “maintenance” is very important in present industrial processes. A sudden interruption of the machine impacts on the competitiveness of the company and it is often the most important contribution of the “total production cost”.

Main objective of final demonstrator is showing that PM is a powerful tool to:

- Reduce the number of machine stops for maintenance
- Keep high the quality level of the products
- Minimise the overall lifecycle costs of the components
- Avoid component breakdowns
- Take into account machine availability while planning maintenance interventions

At the end of the project, the achieving of successful results is expected to improve the quality of our products and service, that will provide business opportunity to the company.

## 2 Description of the demonstrators

Demonstrator will be explained with reference to documentation provided in deliverables DA6.3 and DA6.4, specially outlining changes and deltas with previous descriptions.

As told before the main objective of the demonstrator is to develop a Predictive Maintenance framework.

Figure 1 shows the up-to-date architecture of the Fidia PROMISE demonstrator. The illustration shows as PROMISE components (PEID, Middleware, PDKM and DSS) are related to already existing parts of the product (CNC, mechanical/electrical components, backend, network, etc.).

Due to the complexity of the scenario, several architectures have been taken into account. The support of technology providers brought us to define the present solution.

In the first version of the architecture, middleware, that was the essential communication infrastructure between PEIDs and PDKM was thought to be installed at Fidia central location. CNC was treated as top-level PEID and RFID tags and sensors as low-level PEIDs. This means that CNC would have been treated as PEID and managed by remote middleware.

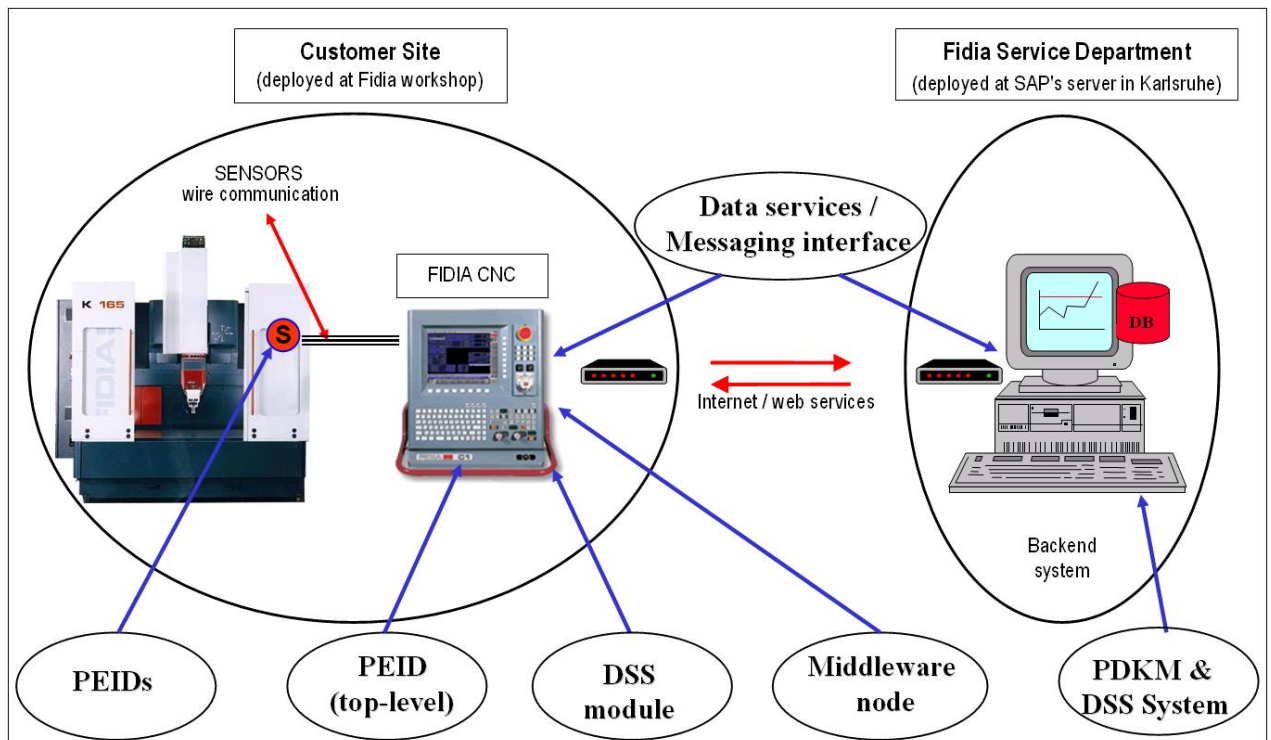
The final architecture uses subscriptions for information to go automatically from PEIDs to the PDKM. A subscription is a request for some data made by the PDKM system. The subscription is sent to the middleware (Trackway software in this case). The middleware keeps track of subscriptions from the PDKM and also keeps track of PEIDs. When a PEID has new data available, the middleware checks the subscriptions and if there is a request for this data, sends it to the PDKM system. The subscription and request communication is the core of the PMI (Promise Messaging Interface). In this case CNC is seen as a the top-level PEID.

PROMISE DSS was thought to run both locally on customer CNC (simplified version) and on Fidia central server because predictive maintenance actions could be done in both sites.

The final architecture confirms this solution, in fact PROMISE DSS is made of a module which runs locally on customer CNC (aging module) and a part (maintenance cost management module) installed on a central server. There will not be an on-board PDKM at Fidia premises, but one single, centralised PDKM system, residing on SAP's server in Karlsruhe accessible via a web browser.

Justification of this choice is that predictive maintenance actions could be done in both sites. Ageing DSS module runs on the local machine because customers have an easy way of checking the status of their machine, because they don't appreciate much a periodic visit of the maintenance crew due to the confidential nature of the work they do, because the amount of data to transmit is quite consistent and because the required computational power suggests to delocalize the module. The maintenance cost management module is on remote server to have an overall evaluation of costs of different maintenance actions and because it allows an aggregate management of machines for geographical areas. The maintenance cost management module is designed for the Fidia maintenance service to manage the interventions on all the machines under maintenance.

It follows the final solution that best fits Fidia demonstrator.



**Figure 1:** PROMISE architecture of A6 demonstrator

## 2.1 Scenes implemented

Referring to deliverables DA6.3 and DA6.4, in this section are explained changes occurred in A6 scenario. Clarifications are given if scenes have been modified or not implanted.

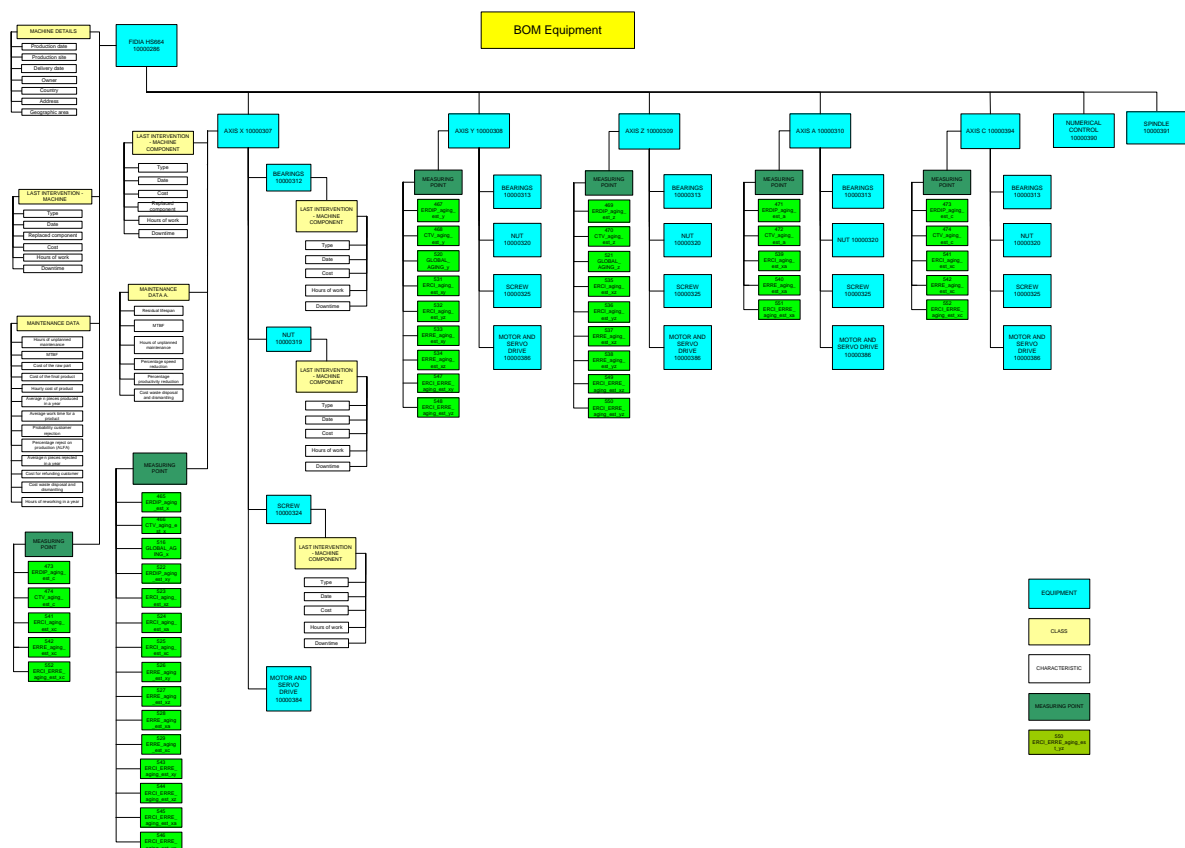
### 2.1.1 Scene 1: Fidia new machine assembly

The starting scene of Fidia application is at our assembly sites. Fidia produces standard machines but also customized solutions. After a machine has been assembled, Fidia personnel will take care of updating PDKM, creating a new record including all BOL data linked to that machine.

At the start we have thought to write preliminary data onto RFIDs to be applied on selected critical mechanical components.

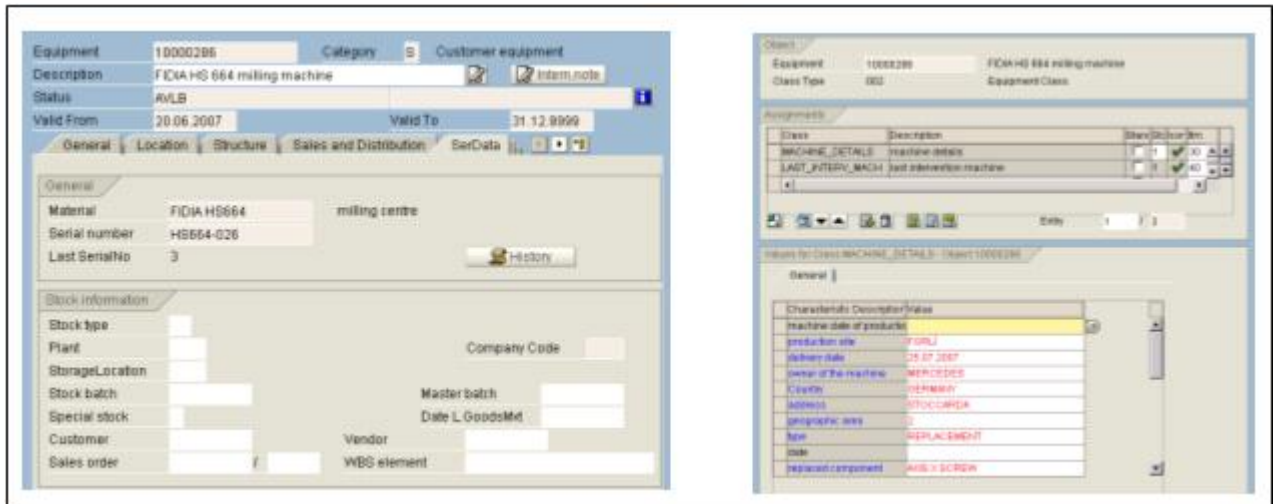
Subsequently, due to not applicability of tags on identified components, in order to keep trace of the product during its lifecycle, we decided to store all this data (e.g. manufacturer, serial number, size, weight, batch number, relationships with other components of the machine, etc.) into PDKM. This solution reaches the important result of tracing the machine working life in an efficient way without any additional cost due to HW/SW integration (e.g. RFIDs reader and SW interface).

To do this data/information was collected, filtered and organized in a tree level structure and each field was filled in with appropriate values to have the Product Data Structure (PDS).



**Figure 2:** Hierarchical Product Data Structure of a Fidia machine

After the end of the design phase, the data structure was implemented into PDKM. PDKM is made of two parts:



**Figure 3:** PDKM Back-End

- Back-end: structurization and management of the system, access reserved to authorized users
- Front-end: visualization of data contained in the system, accessible from all users

Accessing the back-end and following the logic information structure described in the hierarchycal diagram, the user has appropriately configured the system inputing BOL data. In the PDS also measuring points have been defined in order to import field data directly from machines.

### 2.1.2 Scene 2: Machine working life at customer site

Machine working life at customer site can be represented by the so called machine “aging”. This aging is affected from various parameters as: type of machining, number of hours worked, raw materials used, etc.

The aging of the machine is monitored by the DSS module installed on the CNC equipping each machine. Periodically dynamic tests executed on the machine allow to evaluate the “health state” of the machine.

DSS is able to automatically recognize the aging of the whole machine and of its sub parts (i.e. mechanical axes).

In the previous versions, data resulting from tests was supposed to be written in the CNC and partially on the PEIDs. In the final version data is written only in the CNC (that is seen as a top-level PEID).

Moreover PM tests were supposed to generate indicators of the machine mechanical axes (macro-component) and specific indicators about the behaviour of its sub components. In the final version aging of sub parts of mechanical axes is abandoned. In fact after an analysis of maintenance procedures it has been showed that, generally, when a replacing of the screw is needed, bearings and nut are also renewed without a big economical impact.



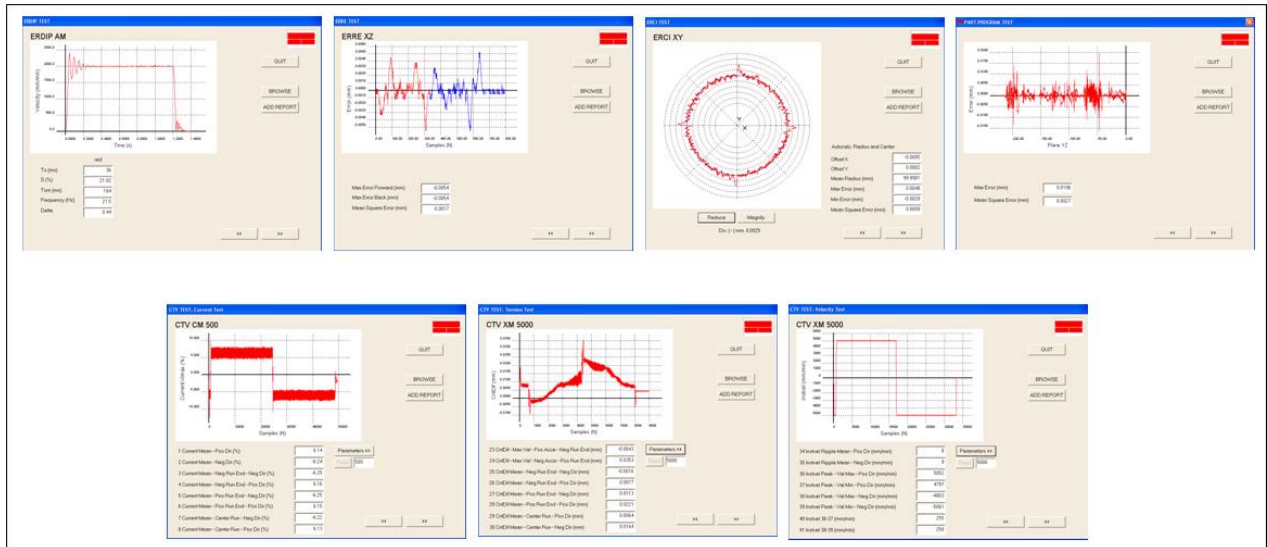


Figure 4: Predictive maintenance tests

### 2.1.3 Scene 3: Request of Service intervention

At the end of periodical machine tests, if a malfunction occurs DSS alerts the user to check the machine status. It starts automatically, it doesn't require any effort from the customer and the results are very easily understandable for the customer (green-yellow-red).

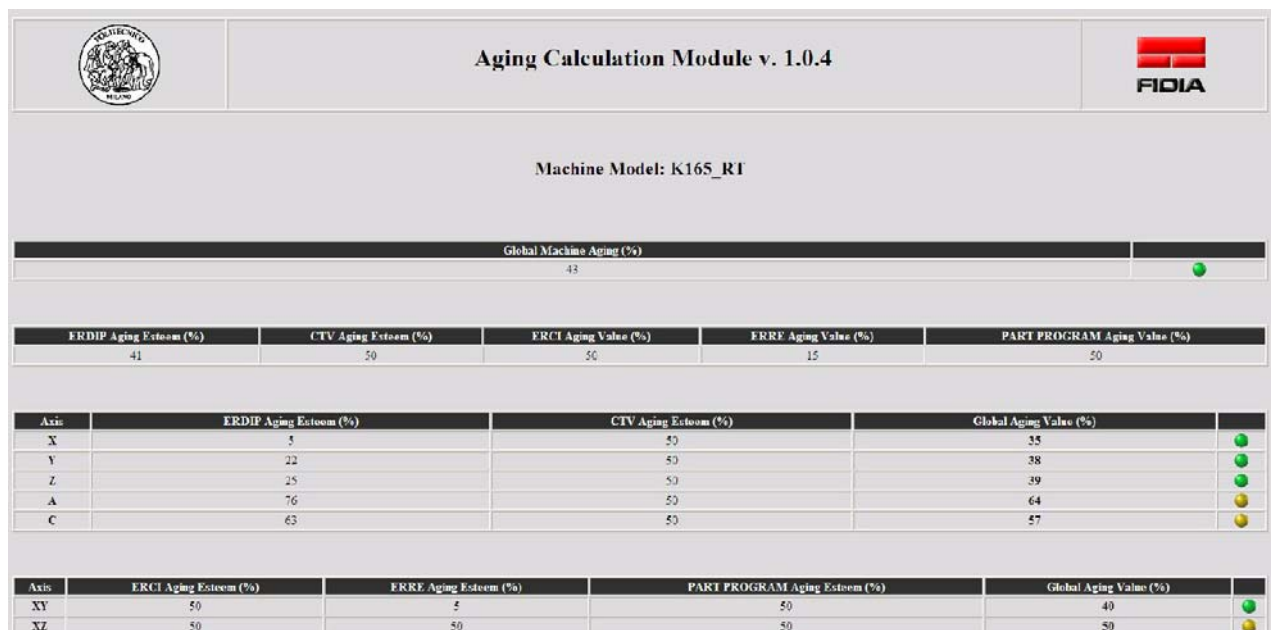


Figure 5: DSS Aging module results

If there is an incipient breakdown, the customer can contact Fidia service that can import data from CNC into PDKM using PROMISE PMI. Data on aging of the components and test results have been categorized as Measuring Points in the PDS. Field data related to the Measuring Points can be retrieved on the PDKM and historical analysis may be held with graphical representation.

Fidia service technician can access PDKM in order to collect all possible information about the machine history. This way the service technician can identify clearly the problem occurred on that machine.

Using DSS tab in PDKM front-end, maintenance cost management DSS module can be ran suggesting the most appropriate maintenance strategy to be applied.

This module of the DSS aims to the reduction of maintenance costs thanks to the implementation of an approach which defines maintenance strategies minimizing costs related not only to next maintenance intervention but also to the residual life of the component so that a long term view on the costs is guarantee.

The DSS is meant to provide a list of suggested interventions that can be performed on the machine when the monitored mechanical components fail or are expected to fail according to alarms from the aging module which gives in input the residual lifespan of the machine and components through the PDKM where these information are stored.

This DSS version has been extended compared to the previous one in DA6.4 because it does not manage only one machine, but the system allows the maintenance service provider to aggregate machines by location (according to geographical proximity) and calculates the number of intervention necessary on each geographical area. The maintenance provider can choose the area where to do intervention according to the most important criticalities identified by the system.

The methodology is based on the definition and evaluation of three main alternative actions (no intervention, tuning of parameters, replacement) for each monitored component of the machine tools. This module of the DSS compares the costs of the three alternative actions in order to manage the critical components according to estimated differential costs for the residual life maintenance defined for each action. Data are collected from all the machines and LCRC (Lifecycle Residual Cost) for each action, for each component is computed. The system minimizes the LCRC for each component considering that maintenance actions are independent from each other. Residual life of the machine may influence decision on the action to be taken at component level making LCRC for replacement not convenient in case of residual life of the machine lower than residual life of component.

#### **2.1.4 Scene 4: Post Service analysis**

After the restore, service technician updates the maintenance history writing data in the PDKM tables, filling-in them with the description of the problems encountered, the solutions he has provided, the components he has changed, etc.

After a repair intervention, Service and Design departments can analyse the enlarged amount of data available in the PDKM. Until now this data is always fragmented and not sistematically reported and archived.

Data enrichment of PDKM, enables Production department to identify the presence of defective stocks, allows the Design department to identify the weaknesses in the product and to improve it. Information exchanged, among departments, regarding malfunctions and breaks makes the identification of failures easier.

Final implementation presents no relevant changes of this scene.

## **2.2 PROMISE components used**

Referring to deliverables DA6.3 and DA6.4, in this section are explained changes occurred in A6 scenario and motivations if components have not been developed or integrated.

### **2.2.1 PEIDs**

Main changes in A6 scenario are related to PEID implementation.

## RFIDs

At the beginning RFID tags were thought to be placed on each critical machine component. RFIDs would have held BOL data and later MOL data.

During the project, passive RFID tags have been tested for reading/writing data by a reader/writer system equipped with an antenna. But it was difficult to apply tags on mechanical components identified. Reading distance is very short and components often are housed in metallic boxes that fold tags making the environmental conditions prohibitive.

The original idea was writing static and dynamic data on RFIDs to attach the history of the component on the component itself.

In fact residual life or better “working life”/ “history” of component is essential to reuse it after a repair intervention.

Storing this information on the backend system would have brought to a possible loss of data due to technicians lack of attention.

In final implementation, a detailed structurization of PDKM fields/tables and a definition of formal procedures to be used in maintenance actions from service personnel, have allowed to overcome this risk.

## Sensors

Specific machine sensors have been used to gain useful knowledge about the machine working condition. Position transducers, motor encoders and current sensors are always present on each machine axis. Without any additional cost, information provided from onboard sensors, has been used to monitor the machine status.

## CNC

From an architectural point of view, the sole PEID (Product Embedded Information Device) in A6 scenario is the CNC on board our milling centres. In fact an industrial PC running Windows operative system offers great resources to store and elaborate data about the product. CNC can be managed as a top-level device in the PROMISE context. Every CNC is associated to a milling machine. Sometimes it can be also completely integrated in its chassis.

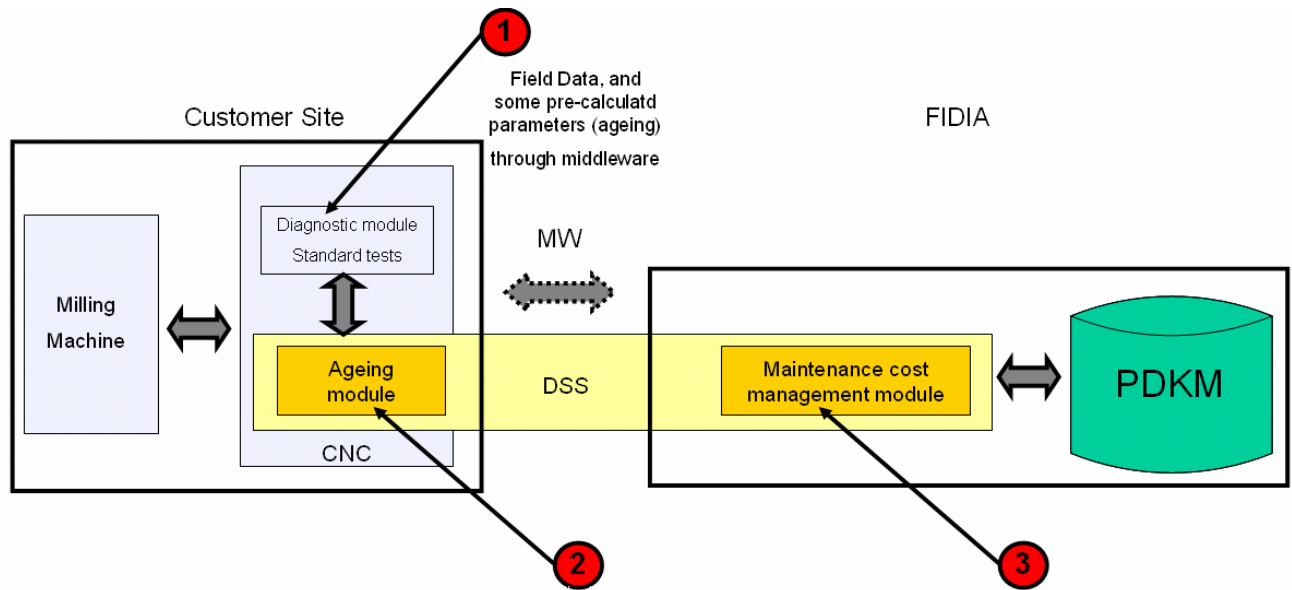
### 2.2.2 DSS

DSS is the central component of A6 demonstrator. Customer is responsible for the working condition of the machine; he will be supported from the DSS system to avoid production stoppages on unforeseeable breakdowns.

DSS will help also service technician to choose the kind of maintenance intervention to be performed on the machine according to the end user production planning.

The A6 DSS is made of three modules:

- the diagnostic module that transforms field data collected from sensors in useful indicators of the working condition of the machine
- the ageing module that transforms the previous indicators in an estimate of the wear and the “health state” of the machine
- the cost maintenance module that enables the service provider to interpret the aging data to plan maintenance actions (technical and economical).



**Figure 6:** DSS architecture of A6 scenario

Innovation proposed in this scenario is mainly linked to DSS developments. *DSS is not simply a tool used to manage “remotely” service of the milling centres (concept known as teleservice or telediagnostic), but innovation is reached when DSS predicts a possible incipient fault on the machine (i.e. ageing module) and suggests to the service technician the most appropriate service strategy to provide to the customer (i.e. maintenance cost management module).* These results are due to the implementation of complex algorithms (by means of analytical formulas and fuzzy logic computing) in the DSS.

Points of strength of algorithms developed in DSS are that, they have been developed using a methodology that allows to implement new algorithms on different machines without huge efforts; they didn't require an extensive data acquisition campaign since they are based half on data from machine tests and half from experience; they are ready to be fine-tuned when new data from the field will be available.

These algorithms obviously need as input data available from a diagnostic SW tool used in the project. This diagnostic module is strictly related to the “special” milling machine product.

Diagnostic is not a recent innovation in the field of the machine tools but the approach used in this case is new. Infact the diagnostic tool doesn't require any additional sensor, while in all the applications found in literature other sensors were mandatory (mainly vibration sensors). Instead it uses already installed sensors that record useful data during motion tests appropriately characterized. These tests can give information about the working conditions of the machine.

However both diagnostic and predictive data is used to minimize the lifecycle cost of the machine, so maintenance is viewed in a broader way and optimized not only by the technical factor.

The overall integrated DSS is innovative in the market of the milling centres because it allows communication and integration of the user and the maintenance provider, which can exchange and share data and information on the status of the machine and components. The approach proposes to delegate some maintenance actions to the user itself without the need of the maintenance provider on site, while other actions may be planned more efficiently for all the machines considering the impact of these actions on the residual life of the machine.

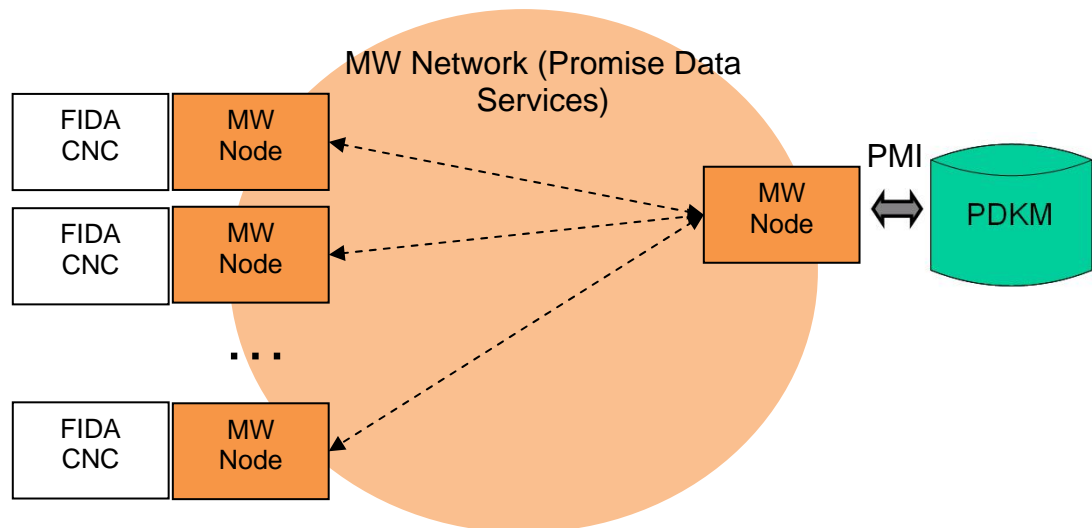
### 2.2.3 PMI

PMI is used for information to go automatically from PEIDs to the PDKM. The central concept of PMI is the subscription. A subscription is a request for some data (infoitems) made by the PDKM system. The subscription is sent to the middleware (Trackway software in this case). The middleware keeps track of subscriptions from the PDKM and also keeps track of PEIDs. When a PEID have new data available, the middleware checks the subscriptions and if there is a request for this data, sends it to the PDKM system (or to any system that creates a subscription). The subscription and request communication is the purpose of the PMI (Promise Messaging Interface).

The steps implemented for data import are the following:

1. The PDKM makes a subscription to Trackway SW.
2. Trackway SW keeps track of that subscription, what infoitems it includes, which PEIDs it concerns, etc.
3. When new data is available (after running application on the Numerical Control) Trackway SW imports this data, makes the PMI message, and sends it to the PDKM.
4. The PDKM updates the database based on the message from Trackway SW.

The use of a middleware allows for the PDKM to subscribe for data from N number of machines distributed around the world. The PDKM system has a dedicated middleware node for handling its subscriptions and does not have to keep track of all the URLs or locations of all the machines it is monitoring. (Keeping track of this information in the PDKM would be a big problem in a global installation.) The middleware part of the system handles the discovery of where to send the data from the machines. As the demonstrator installation only includes one machine the middleware functionality is hidden in a one node installation. The routing and discovery in the Trackway middleware is done using Trackway peer-to-peer discovery protocols, and communication is done using the PMI Web Service interface. The networking has been tested with secondary nodes hosted by Trackway and HUT.



**Figure 7:** Data Services architecture overview of A6.

### 2.2.4 PDKM

PROMISE PDKM is the necessary tool for data collection and management of all products and objects of which we want to store information. The system presents a front-end part accessible

from users who want to see and use product data and a back-end part accessible only from users allowed to manage and modify data and data structure.

The first task in PDKM implementation has been the fitting of Fidia structured data in mySAP system.

To structure all data and information necessary into the system, we used class diagrams in UML modeling. This is an object oriented modeling, particularly adequate to represent objects and logical links among them.

Entity in PDKM semantic model	Entity in mySAP PLM model
AS_DESIGNED_PRODUCT	Material
PHYSICAL_PRODUCT	Equipment
FIELD_DATA	Measurement Document
PART_OF	Installed Base

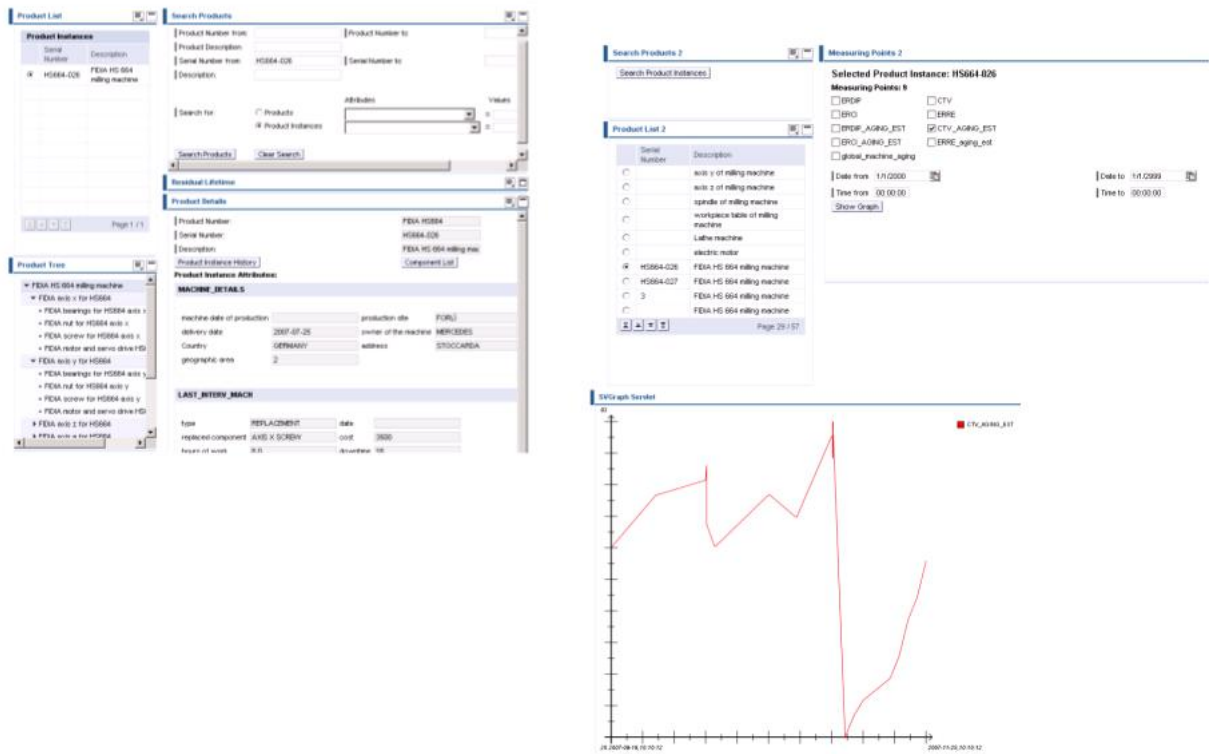
**Table 1:** Entity relation Fidia structured data/mySAP

The following step has been the customization of the PDKM fields.

Category	Entity example
MATERIAL	FIDIA HS664
CHARACTERISTIC MATERIAL	Weight
EQUIPMENT	FIDIA HS664-026
CHARACTERISTIC EQUIPMENT	Serial number

**Table 2:** Customization of Fidia structured data into mySAP

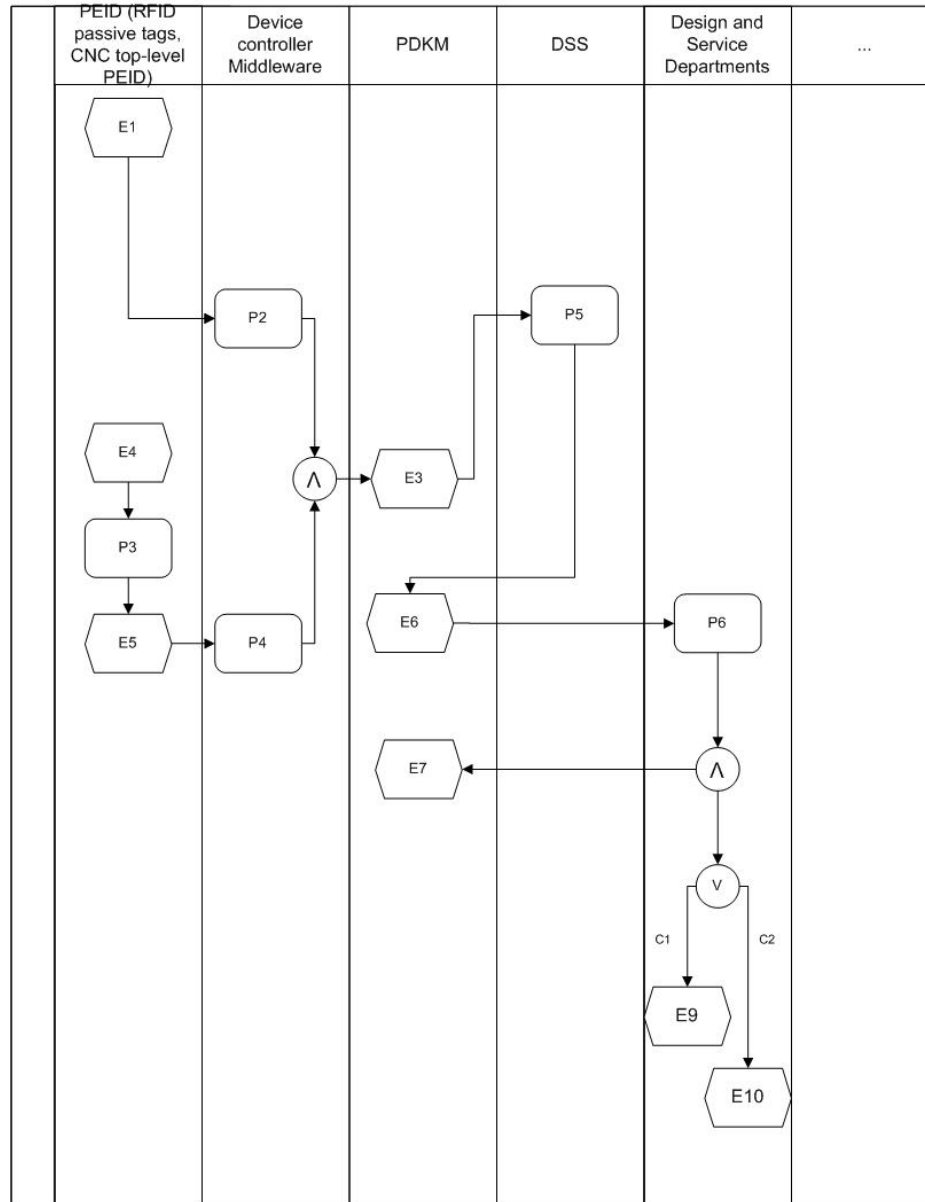
The fundamental structure defined in the project, includes physical or technical data but also information relative to different life phases of the product. In particular with reference to data recorded from the field during machine working life. Moreover PDKM stores data regarding working condition of products, and information about manufacturing process, maintenance activities and decommissioning.



**Figure 8: PDKM Front-End**

### 2.3 Eventual other modifications with respect to DA6.3 and DA6.4 (e.g. workflow)

With reference to deliverable DR2.5 the up-to-dated workflow is presented below.



**Figure 9:** Level 1: Workflow diagram (Overall) from DR2.5

Modeling components	Description	Remarks	
Process	P2	Uploading process of BOL data onto PDKM	
	P3	Process of execution of Predictive Maintenance tests	
	P4	Transfer process of MOL data onto PDKM by middleware	
	P5	DSS Predictive Maintenance analysis. The Fidia Predictive Maintenance DSS is divided into: 1) ageing module 2) maintenance cost management module	
	P6	Evaluation of maintenance actions, planning of service interventions, updating the PDKM	
Event	E1	BOL data extraction	



	E3	PDKM is updated with all BOL and MOL data	
	E4	Scheduled maintenance test on the machine	
	E5	CNC stores Predictive Maintenance test results	
	E6	DSS results are available on PDKM	
	E7	PDKM is updated	
	E9	Maintenance instruction transmission to the service personnel	
	E10	Maintenance program transmission to the service personnel and/or the customer	
Condition (at branching and merging)	C1	Immediate action	
	C2	Scheduled action	

**Table 3:** Description of Figure 1 diagram from DR2.5

With reference to the previous version of the workflow diagram, main changes occurred are: the deletion of processes P1(Updating process of BOL data) and P7(Transfer process of MOL data onto PEIDs by middleware); the modification of E1 description; the deletion of E2(RFIDs tags are updated with BOL data) and E8(PEIDs are updated).

Main causes of these changes are mainly due to the decision of not applying RFIDs tags on our demonstrator.

Minor refinements affect the remaining processes and events. In particular P5(DSS Predictive Maintenance analysis) has been further developed and explained in order to clarify the need of two different modules running on different machines.

### 3 Analysis of results obtained in the Activities A6.6.y

This chapter reports the description of the task, the technical problems raised, the limitations of the system found and the alternative solution provided, for each of the activities scheduled in Task TA6.6 from DoW.

#### 3.1 Test the stand-alone passive tags or possible alternative solutions

In A6 demonstrator we have selected and tested the following MicroSensys kit:

ISO 15693 RFID USB pen reader  
 HOST interface: USB 1.1  
 Pen size: app. Diameter 14 mm, Length 135 mm  
 Package: metal

ISO 15693 Transponders  
 Carrier Frequency: 13.56 MHz

Small size read write transponder, in plastic packaging lens or half lens form for using on metal  
 Chips: 2kbit read write EEPROM, 64 bit ReadOnly code, Diameter 14mm size, Thickness 1.7mm  
 Chips: 16kbit read write EEPROM, 64 bit ReadOnly code, Diameter 5mm size, Thickness 2.5mm

Flexy tags tested to survive industrial environments for using on metal and in presence of water and other liquids

Chips: 2kbit read write EEPROM, 64 bit ReadOnly code, Area 10cm<sup>2</sup> (approx.), Thickness 6mm

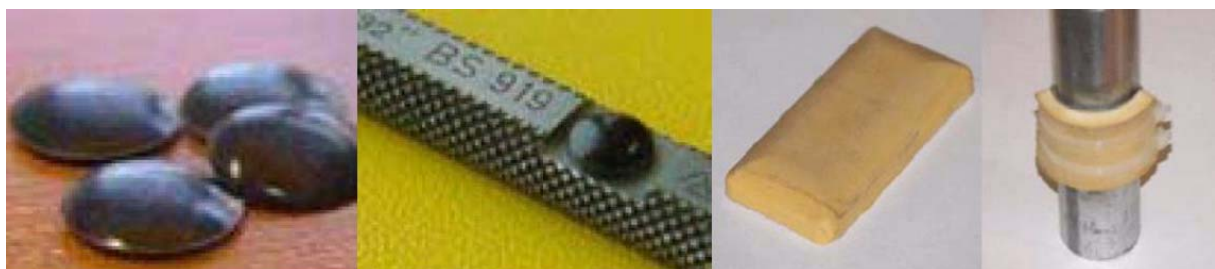
Software interface (programming languages available are C++, C#, Delphi e VC++), drivers, data sheets and documentation were also provided together with the HW.

After first tests in Fidia laboratories, technicians found difficult to attach RFIDs on the selected components. Reading distance is limited and it is difficult to bring the antenna near the components for reading.

After first tests we decided to not use RFIDs. BOL data planned to be attached on the tags will be fully implemented into PDKM. Therefore no substantial changes will affect the application scenario.



**Figure 10:** Testing of RFIDs on A6 demonstrator



**Figure 11:** Kinds of RFIDs tested

### 3.2 Development and test of the stand-alone DSS algorithms (v2)

The DSS has been further developed by ITIA and POLIMI from 3 to 5-axis machine type. Moreover the maintenance cost evaluation DSS is now able to manage a fleet of milling machines under maintenance. The system gives the possibility to the maintenance service provider of aggregating machines by location (according to geographical proximity) and of calculating the number of necessary interventions on each geographical area. The maintenance provider can choose the area where doing intervention according to the most important criticalities identified by the system.



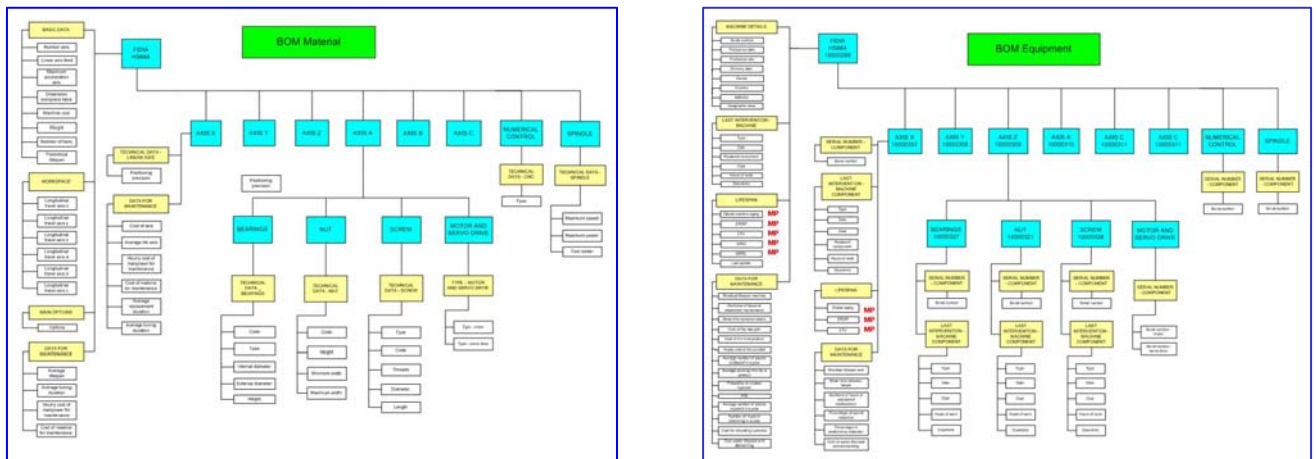
Figure 12: A6 DSS v2 screen-shots

### 3.3 Test the first integration Middleware – PDKM – DSS

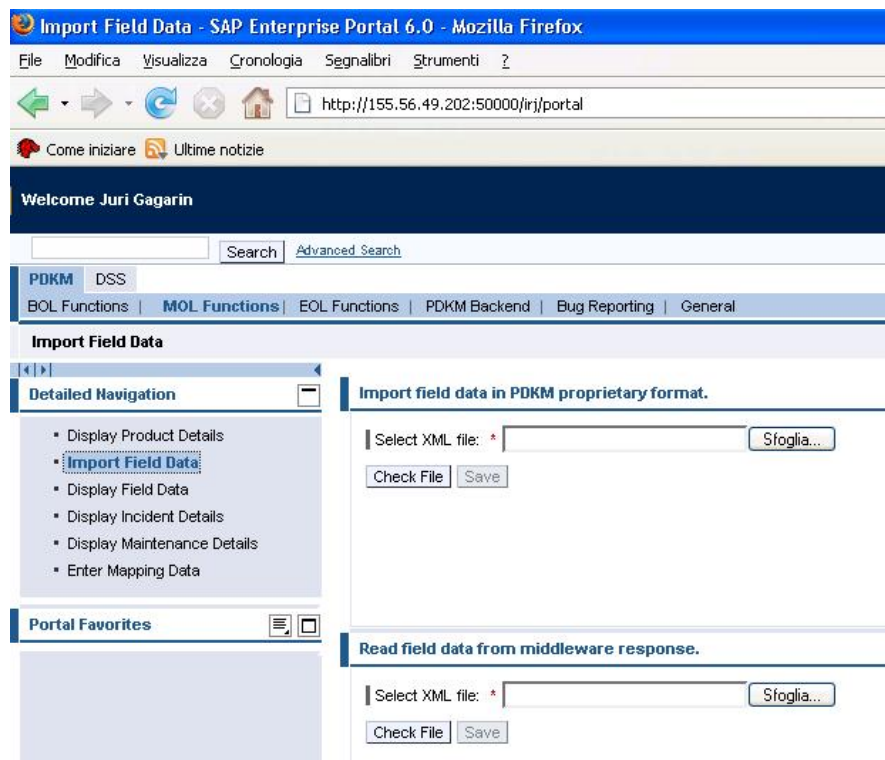
Middleware format of xml files for the communication between middleware and PDKM has been defined

PDKM has been customized by ITIA for A6 and filled-in with a first data set (BOL and MOL) according to the PDS defined with FIDIA (Fig.13). PDS has been formalized, for data integration reasons, according to procedures explained previously (Table 1 and 2). PDKM acquires data from xml files which are uploaded manually (Fig.14).

DSS screenshots and algorithms have been integrated into PDKM.



**Figure 13:** A6 data structure for PROMISE PDKM



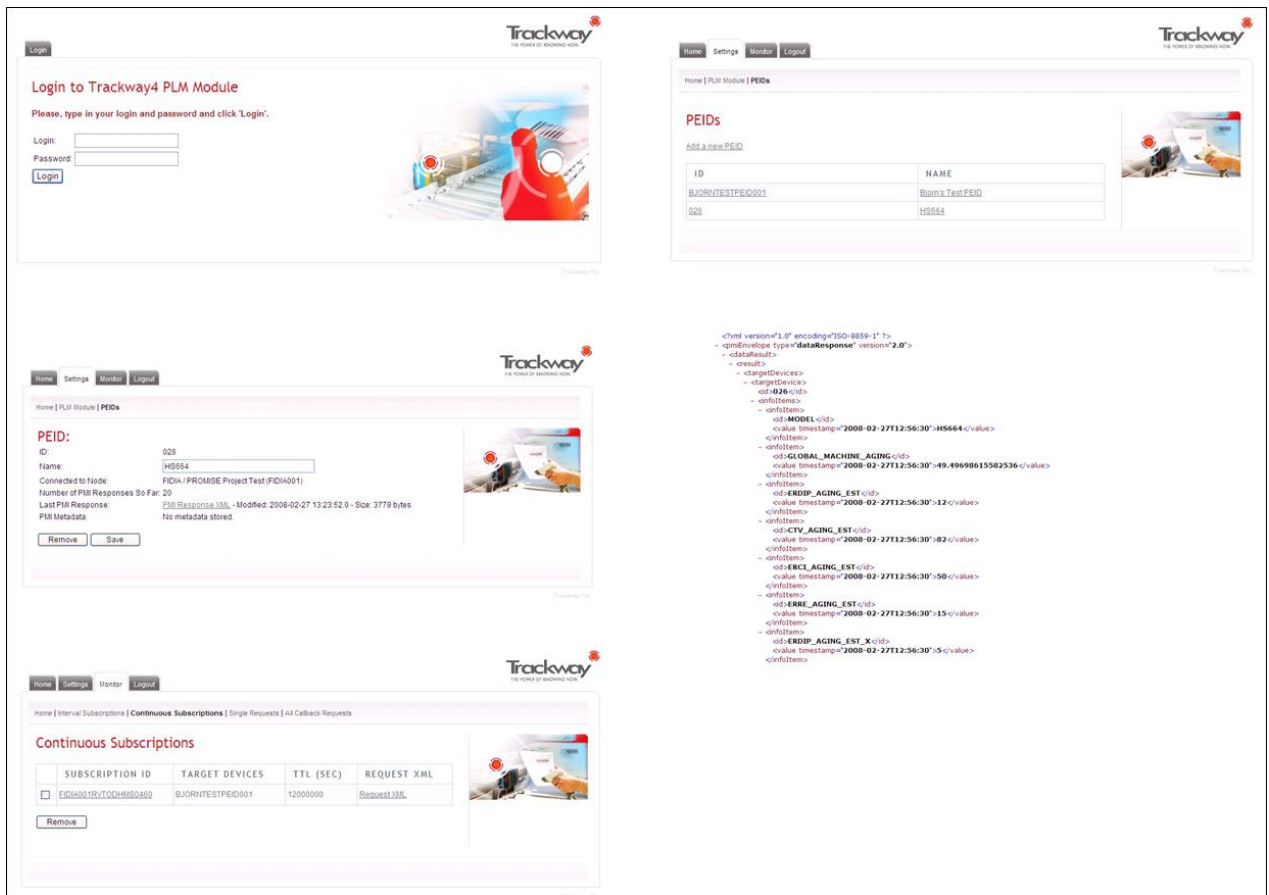
**Figure 14:** Manual import of A6 field data into PROMISE PDKM

### 3.4 First test of the tagging solution on-board of a demonstrator.

After first tests Fidia decided to not use RFIDs anymore. Therefore this activity has been deleted.

### 3.5 First test of the Middleware – PDKM – DSS architecture.

Trackway has installed a server that functions as connection point between numerical control and backend system. The Trackway server provides a connection point to the PDKM system using the PMI (Promise Messaging Interface).



**Figure 15:** Trackway PMI subscription management user interface screens.

PDS defined for A6 scenario has been implemented into PDKM. Back-end has been populated with BOL data and data can be displayed in the front-end also (Fig.3). MOL field data for machine ID026 has been imported automatically using PMI.

### 3.6 Implementation and test of the demonstrator including all PROMISE technology.

A final test of all PROMISE architecture has been made. A CNC in Fidia workshop is connected by PMI to the Karlsruhe server hosting mySap database. General functionalities are working correctly.

**Product List**

Serial Number	Description
HS664-026	FIDIA HS 664 milling machine

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**Search Products**

Product Number from:  Product Number to:

Product Description:

Serial Number from: HS664-026 Serial Number to:

Description:

Search for:  Products  Product Instances

Attributes:  Values:

---

**Residual Lifetime**

**Product Details**

Product Number: FIDIA HS664

Serial Number: HS664-026

Description: FIDIA HS 664 milling mac

**Product Instance Attributes:**

**MACHINE\_DETAILS**

machine date of production	<input type="text"/>	production site	FORLÌ
delivery date	2007-07-25	owner of the machine	MERCEDES
Country	GERMANY	address	STOCCARDA
geographic area	2		

**LAST\_INTERV\_MACH**

type	REPLACEMENT	date	<input type="text"/>
replaced component	AXIS X SCREW	cost	3500
hours of work	8.0	downtime	16

Figure 16: Display of “Product Details” item from Menu

**Search Products 2**

---

**Product List 2**

Serial Number	Description
<input type="radio"/>	axis y of milling machine
<input type="radio"/>	axis z of milling machine
<input type="radio"/>	spindle of milling machine
<input type="radio"/>	workpiece table of milling machine
<input type="radio"/>	Lathe machine
<input type="radio"/>	electric motor
<input checked="" type="radio"/>	HS664-026 FIDIA HS 664 milling machine
<input type="radio"/>	HS664-027 FIDIA HS 664 milling machine
<input type="radio"/>	3 FIDIA HS 664 milling machine
<input type="radio"/>	FIDIA HS 664 milling machine

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**Measuring Points 2**

**Selected Product Instance: HS664-026**

**Measuring Points: 9**

ERDIP  CTV

ERCI  ERRE

ERDIP\_AGING\_EST  CTV\_AGING\_EST

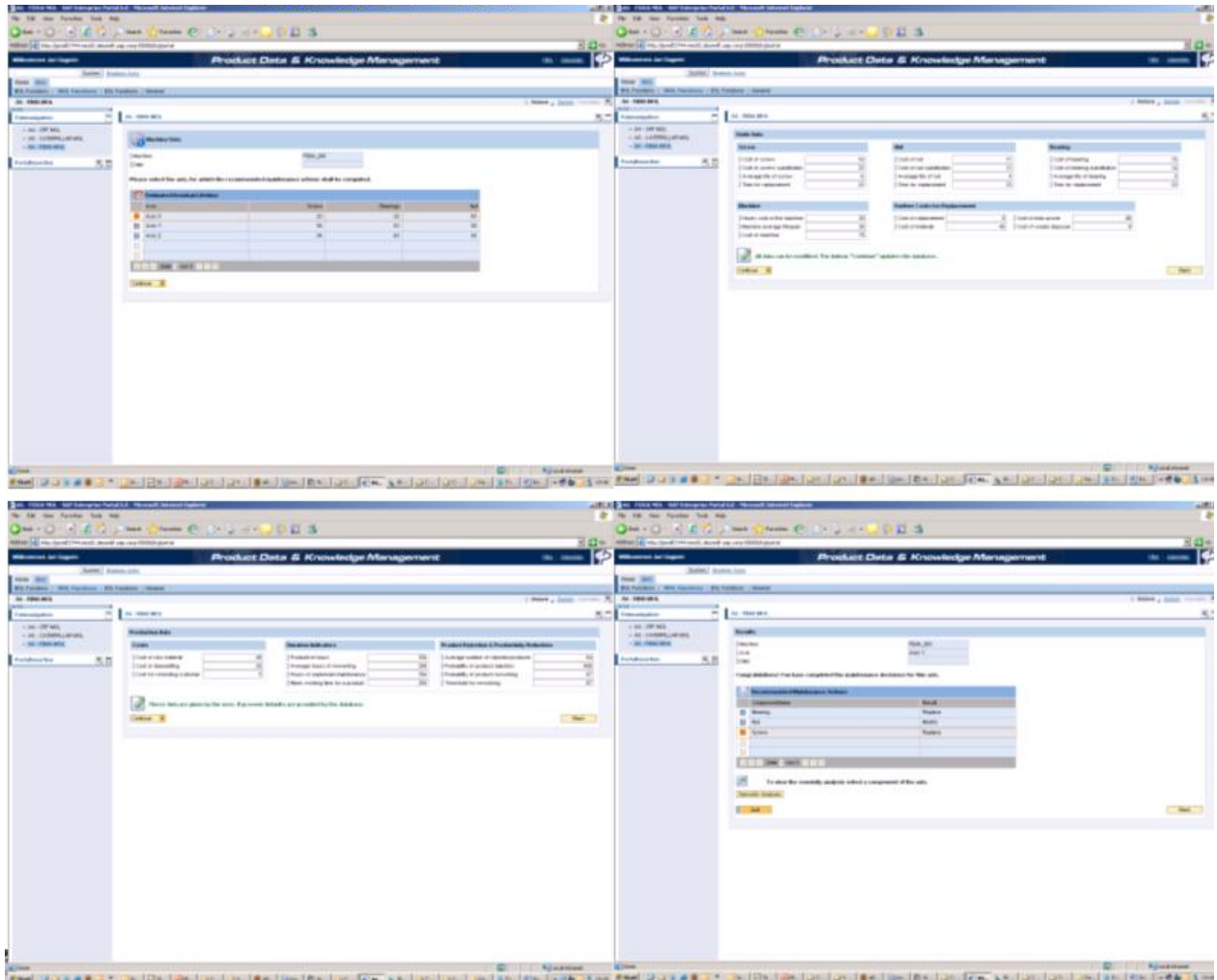
ERCI\_AGING\_EST  ERRE\_aging\_est

global\_machine\_aging

Date from: 1/1/2000 Date to: 1/1/2999

Time from: 00:00:00 Time to: 00:00:00

Figure 17: Display of “Field Data” item from Menu



**Figure 18:** Display of “DSS” Tab from Menu

## 4 Conclusion

Fidia final demonstrator meets all requirements presented at the beginning of the project. During this time, obviously, some changes have been done: architecture definition, hardware used and software algorithms implemented. But all changes done have improved our consciousness of proposed scenario, our knowledge of new technologies available in the market and our strategies to achieve expected results.

Fidia business model, mainly focused on MOL, has been finalized. In this phase products are delivered and used from customers, maintained and serviced from Fidria, fully responding to the closed-loop product lifecycle management.

Furthermore forced from making PROMISE a successful project, a deep analysis regarding exploitation of results, study of the potential market and the outcomes management have been carried out.

## 5 References

- DA6.3-Design of the A6 demonstrator on Predictive Maintenance v0.3
- DA6.4-Process model workflow description for the demonstrator v0.3