



D6.2.1 Real Time Process Monitoring (Prototype I)

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This deliverable describes the first prototype implementation of task 6.2. As stated in the Description of Work (DOW), this deliverable is a prototype (software) deliverable. As such, this document is reduced in length and its only purpose is to briefly describe the prototype functionality as well as to give installation instructions and usage clarifications. This document will be shipped together with the software itself.



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Executive Summary

The prototype software deliverable D6.2.1 described in this document is the first of the two software deliverables of task T6.2 Process Monitoring (PM). The Real Time Process Monitoring was abbreviated to Process Monitoring (PM) since this component will cover a wider set of Business activity monitoring functionalities (KPI definition and analysis, rules and alerts, process analytics, etc.) as described in D3.2 – Functional Specification Deliverable. It will be at the HMI of the ADVENTURE, as it will make possible all interaction and monitoring during a virtual factory execution. Its purpose is to monitor Smart Processes, modelled in the Process Designer and orchestrated by the Smart Process Engine. The first prototype (Prototype 62.1) is built on top of the process designer selected in D3.3 – JBPM Process designer. This delivers a first implementation of three crucial parts:

- **Part 1:** Real Time Monitoring
- **Part 2:** Events Receiver
- **Part 3:** Events Storage at the cloud

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1. Introduction

ADVENTURE – ADaptive Virtual ENTERprise manufacTURING Environment – is a project funded in the Seventh Framework Programme by the European Commission. ADVENTURE creates a framework that enhances the collaboration between suppliers, manufacturers and customers for industrial products and services.

1.1 ADVENTURE Project Aims

The framework proposed by ADVENTURE provides mechanisms and tools that facilitate the creation and operation of manufacturing processes in a modular way. ADVENTURE combines the power of individual factories to achieve complex manufacturing processes. It provides tools for partner-finding, process creation, process optimization, information exchange as well as real-time monitoring combined with the tracking of goods and linking them to Cloud services.

There have already been several research projects that address the combination of different independent manufacturers to so-called virtual factories. Most of these research projects focus primarily on the business-side in general and on aspects like partner-finding and factory-building processes in special. However no proven tools or technologies exist in the market that provide the creation of virtual factories applying end-to-end integrated Information and Communication Technology (ICT). ADVENTURE is aiming to provide such tools and processes that will help to facilitate information exchange between factories and move beyond the boundaries of the individual enterprises involved. The collaborative manufacturing process will be optimised by enabling the integration of factory selection, forecasting, monitoring, and collaboration during runtime.

ADVENTURE builds on concepts and methods of Service-oriented Computing and benefits from the advancements in this field. The monitoring and governance of the collaborative processes will be supported by technologies from the Internet of Things such as wireless sensors. Existing tools and services that can be integrated will be considered during the development of the platform for ADVENTURE.

The increased degree of flexibility provided through ADVENTURE will benefit SMEs especially as it helps them to react quickly to changes and to participate in larger, cross-organizational manufacturing processes. Furthermore, ADVENTURE will help manufacturers in assessing the environmental friendliness of actual manufacturing processes and resulting products and services. Other objectives of ADVENTURE include research in areas such as service-based manufacturing processes, adaptive process management, process compliance, and end-to-end-integration of ICT solutions.

1.2 Deliverable Purpose, Scope and Context

The purpose of this deliverable is to accompany the prototype implementation of task 6.2. As such, its main purpose is to briefly clarify the scope of the prototype and to give download and installation instructions for the component.

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1.3 Document Status

This document is listed in the DOW as PP, which means ‘Restricted to other programme participants (including the Commission Services)’, primarily since the audience of the document is largely internal. It is true, of course, that the largest audience for dissemination itself is external, but this document covers only the planning around this and not the outputs of doing this and hence its non-public nature.

1.4 Target Audience

The target audience of this document are the ADVENTURE development teams as well as ADVENTURE user partners who are assessing how the Process Monitoring component enables the business activities monitoring on a virtual factory. It will also be interesting for members of other national and EU projects who want to re-utilize a lightweight, scalable and flexible Process Monitoring Engine to monitor collaborative projects as well as associated KPIs. The first prototype of ADVENTURE software components have been developed in parallel to technical specification. This was planned in order to use these first prototypes to verify and to validate the requirements and the technical choices made, rather than to provide a complete functionality solution. Hence, the first prototype provides a limited set of basic features, but no end-to-end complete functionality. The interactions between the different components are also not implemented yet, because as already noted the main objective of this prototype is to learn and adjust the interaction and calling points between the components, as well as gather information about the state of the art, technical alternatives, test of tools, etc. This first prototype will evolve over the time, taking into consideration aspects like common graphical design for ADVENTURE user interfaces, embedding the tools into the Dashboard framework, interactions between the implemented software components, etc.

1.5 Abbreviations and General Terms

A definition of general, common terms and roles related to the realization of ADVENTURE as well as a list of abbreviations is available in the supplementary document “Supplement: Abbreviations and General Terms” which is provided in addition to this deliverable.

Further information can be found at: <http://www.fp7-adventure.eu/glossary/>

1.6 Document Structure

This deliverable is broken down into the following sections:

Section 1 provides an overview about ADVENTURE and this deliverable.

Section 2 shows the connection of the Process Monitoring (PM) prototype to the other components and the importance of the finalized component.

Section 3 points out which requirements have to be taken into account when trying to use the prototype, and what has to be provided before using the prototype as a developer.

Section 4 describes the installation of the prototype.

Section 5 details what the prototype does, how the server works and how the course of action is when trying to use the prototype.

Section 6 provides the further changes that have to be implemented to advance to the next milestones.

Section 7 is a small summary of this deliverable.

2 Scope and Relationship

A short reminder of the functionalities of the ADVENTURE Process Monitoring:

- The Process Monitoring module is a process model graphical viewer that supports the monitoring and control of manufacturing processes. Together with the smart process engine which is behind all the logic, it is the key interface tool to manage Virtual Factories.
- In collaboration with the SPE and DPD component, the Process Monitor allows the complete business activity monitor engine, including partners' performance analysis.
- The Process Monitoring collaborates with assistive components like SPE, Message Routing, and cloud storage in order to provide ADVENTURE brokers with the core functionality to accomplish an effective VF management.

In the architecture picture below, the Process Monitoring is located in the Process layer, collaborating with the rest of the ADVENTURE modules (especially Process Execution, and Cloud Storage) through the Message Routing component. However all the Monitoring User interface was developed in the scope of PM. Then it will be included in the dashboard by means of an 'iframe' and single login technologies applied to dashboard platform. The Process Monitoring (PM) component realizes all the business activity monitoring functionalities that comprise a virtual factory.

D6.2.1 is the first prototype of the Process Monitoring component. It depicts basic real time monitoring functionalities, and technical decisions. It presents them in the format of a functional mock-up of the Process monitoring user interface, meaning, the user can interact with the user interface and explore its capabilities, but the results of this interaction are not exchanged with other modules and are not stored for further usage.

The prototype provides basic access to the two the real time process monitoring subcomponent. This a is a graphical display that by means of SVG graphic of an BPMN2.0 process diagram, allows the ADVENTURE broker to monitor the status of the manufacturing processes, that are being so executed by the ADVENTURE SPE. The PM is based on the technology selected at D3.3 Technical Specification that has been modified and integrated into a common "Process monitoring" environment for the purposes of the pilot.

As part of the first stages of the implementation of the pilot, and as part of the State Of the Art task realised for D3.3 Technical Specification, the pilot developers team were testing different technologies that could serve as basis for the Process Monitoring. After a first selection, first prototypes were developed in the basis of 3 Open Source projects:

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- WSO2 BAM
- jBPM web designer
- Performance Measurement Engine (VFF)

The objective of these advanced tests was to evaluate the code quality, viability and Open Source community interaction with regards of these tools. There's not one only project selected as a basis to the development of the ADVENTURE Process Monitoring component. Several functionalities (subcomponents will be utilized/adapted) in order to achieve a complete business activity monitor tool capable of monitor collaborative manufacturing processes in an effective and efficient way. The result should be aligned with dynamic community, good code and information, and a clear commitment with the Open Source strategy.

The main data incomes of the Process Monitoring are the events triggered by the smart process engine. When a process is executed (started), the Spe send a SVG file to PM, so it can work upon it, showing the real status of the process. The process models from Designer are BPMN2.0 xml compliant files, which are then converted to SVG files to be used by PM component in order to monitor it by providing visual feedback on the status of the process and activities to the users.. The Process Monitoring will include (in further development stages) also a process a KPI editors, KPI engine, process log search, rules editor and rules engine. Thus it will be possible to produce important aggregated information to be consumed by other components (e.g DPD).

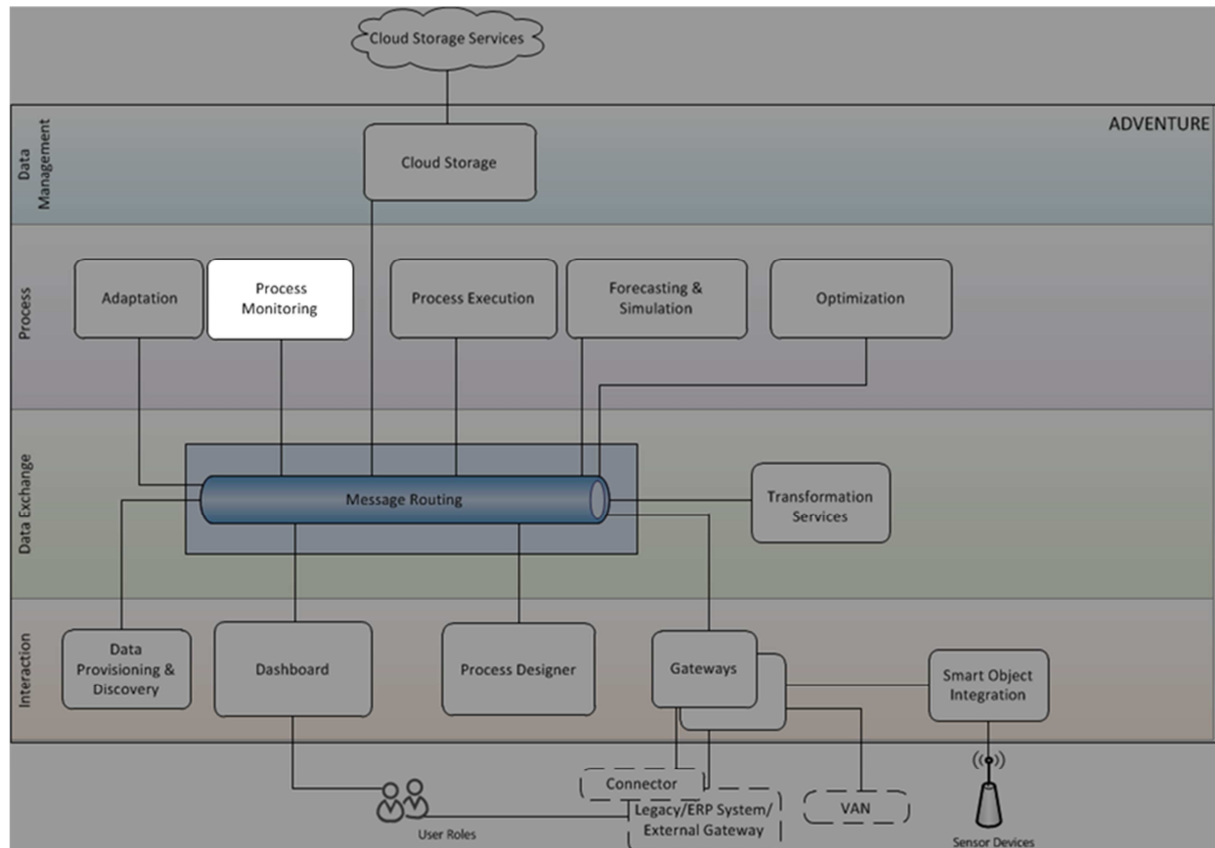


Figure 1 - Process Monitoring Scope

The scope of this first version of the prototype is three-fold:

- Integration with SPE components through the Events Receiver Component (using XMPP protocol):
 - Receive events that accrue from process execution and management.
- Real time view / update of the BPMN smart process diagram, as an holistic view of the process status as well as some attached details;
- A set of unit tests to test the basic functionality required for ADVENTURE.

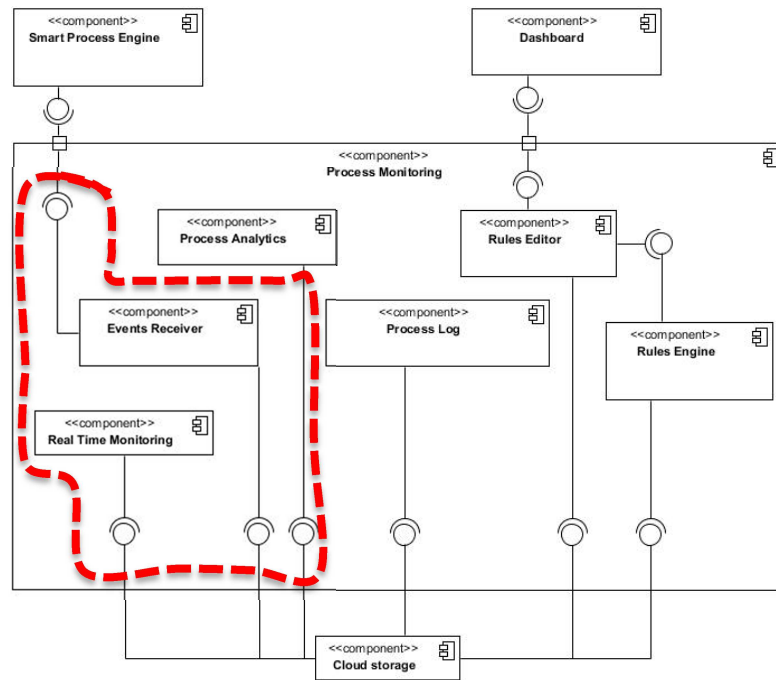


Figure 2: Scope of Prototype 6.2.1 Implementation

The Process Monitoring prototype is especially important to allow users to track their business, as it is the main UI component, users will interact with the adventure system mainly by the process monitoring component.

The PM has been deliberately decoupled from the Process Designer (PD). In order to achieve independence from the Process Description Language saved by the PD, the PM receives the diagram in a SVG format and applies transformations in order to tailor the diagram and show real time info about that. This way, the component can be exchanged anytime. Various additional elements to be used by ADVENTURE will be added in the next months.

3 Requirements & Preparations

3.1 For Users

Web server: the prototype has been confirmed to work with Tomcat 7 and Jetty 6 or later. In theory any Java 6 EE compliant web server should fit the purpose. The web server's role is to host and provide online access to the process monitoring application.

Web browser: the web browser has the traditional client role in the infrastructure map. The prototype has been tested and confirmed to work with Google Chrome. Internet Explorer and Firefox should not have major issues too, so there are no specific requirements in order to access the pilot in terms of technologies or installed software.

It is recommendable to have some knowledge about BPMN graphical notation in order to test the PM. Some quick reference resources can be found at bpmn.org (for quick guide BPMN 2.0 Poster) and www.businessprocessincubator.com. These are BPMN 2.0 generic resources and cover a wider area of BPMN than what it is planned to be covered in ADVENTURE, so only basic knowledge will be needed at this stage.

The online mock-up can be accessed at <http://www.fp7-adventure.eu:8080/monitor> (in a standalone version).

3.2 For Developers

In order to deploy and run the D6.2.1 prototype, the following software is needed:

- Java JSE6 or superior (<http://www.java.com/en/download/index.jsp>).
- Apache Tomcat (<http://tomcat.apache.org/>) application server.
- Eclipse 3.6 (Indigo) or later (<http://www.eclipse.org>) with the following features installed:
 - Java and JavaScript development profiles. There are pre-packaged Eclipse downloads for either of these.
 - SVN Team provider (<http://www.eclipse.org/subversive/>) for using the remote source code management system. Configure the team provider to use the ADVENTURE SVN repository for PM development branch: <http://fp7-adventure.eu/svn/repos/monitoring/trunk/>
 - m2eclipse (<http://eclipse.org/m2e/>) for integration with Maven (<http://maven.org>) build system.
- Mock-up pages are built in HTML, JQuery UI elements and JSON files.

4 Installation and Execution

The following steps are needed for a local deployment of the pilot software:

- Check the requirements for developers (3.2), so that an appropriate JSE version, and Application Server (AS) is installed in the computer.
- Monitoring deployment: Copy pm.dashboard.war it to the <TOMCAT>/webapps directory. After doing that, open the web browser and enter the address <http://localhost:8080/monitoring>. The Process Monitoring will show:

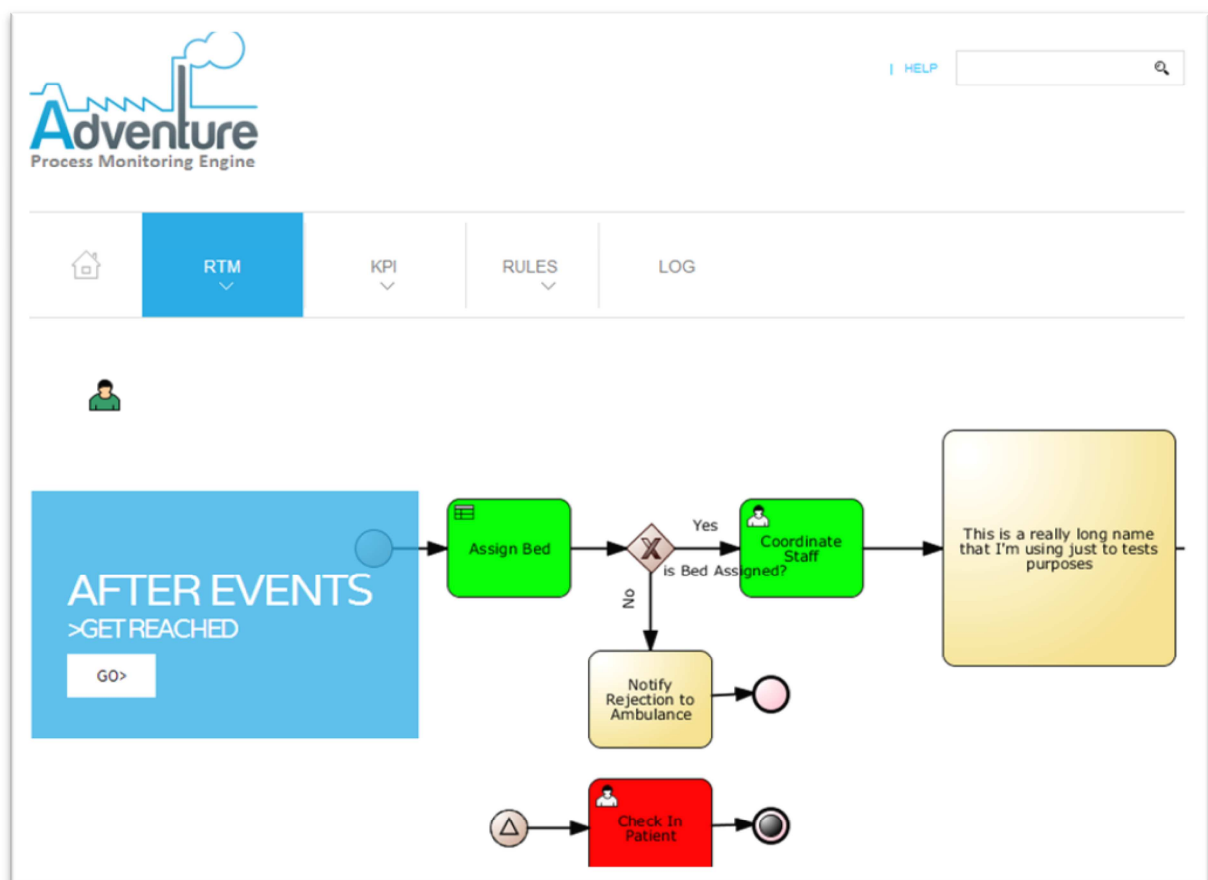


Figure 3: Real time Monitoring screen at localhost

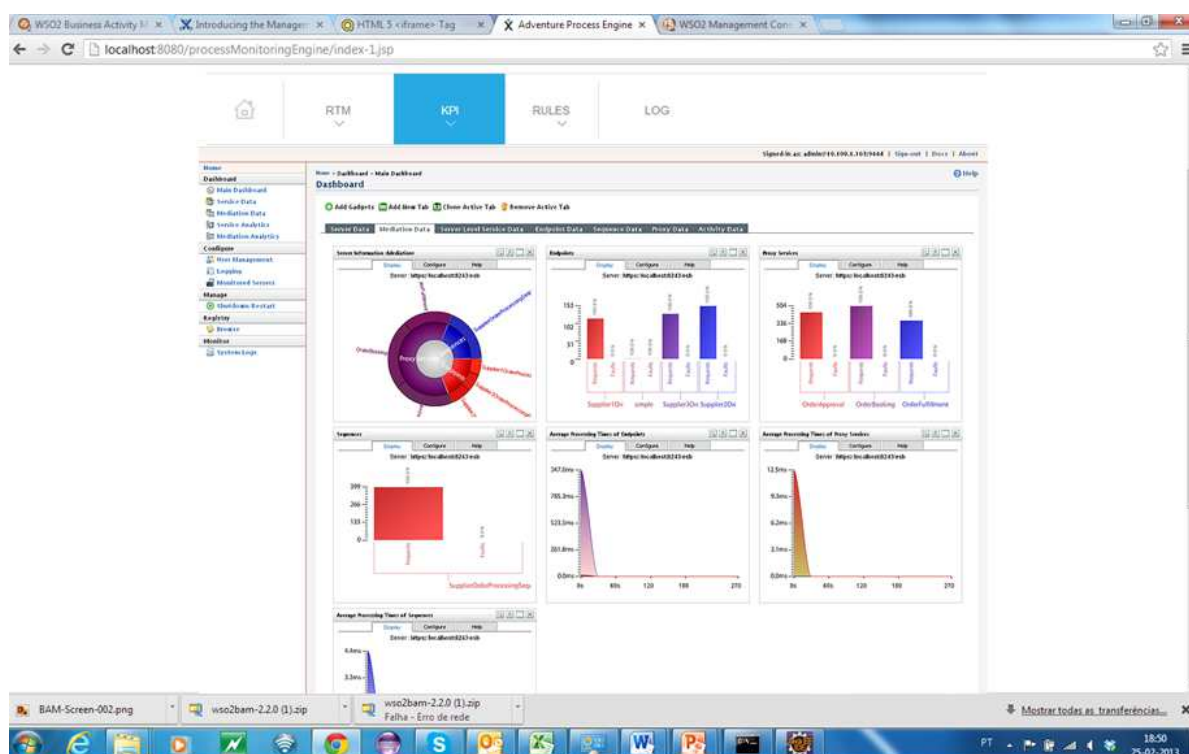


Figure 4 – KPI dashboard screenshot at localhost

Additionally to binary (war) deployment, the Process Monitoring can be downloaded and built from its source code from the ADVENTURE Subversion (SVN) server. The Process Monitoring project is a Maven project, so in order to build and deploy the source code, it is recommended to install the m2eclipse maven plug-in (<http://www.eclipse.org/m2e/>) for Eclipse. It is also recommended to have a Subversion (e.g. subversive - <http://www.eclipse.org/subversive/>) plug-in installed on Eclipse, or use an external Subversion client application (like tortoise-svn - <http://tortoisesvn.net>) to check-out the project code.

The detailed steps in order to download the code assume that m2eclipse and Subversive plug-ins are installed on Eclipse:

- Open Eclipse.
- Navigate to option File/Import/SVN/Checkout Projects from SVN

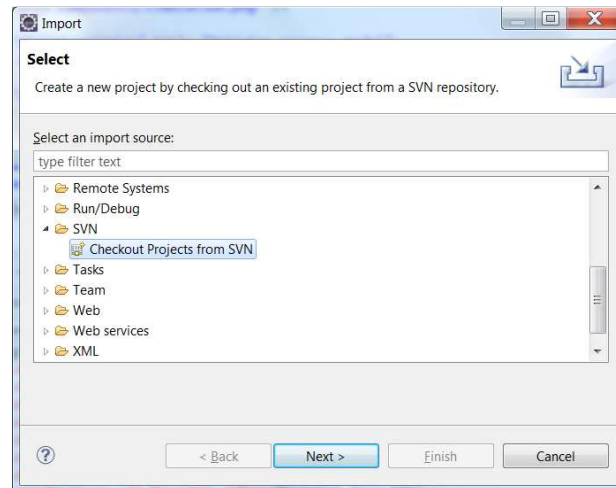


Figure 5: Checking out a SVN project on Eclipse

- Select create a new repository location, and introduce the address <http://fp7-adventure.eu/svn/repos/process-monitoring/pm.bam/>.
- Select create a new repository location, and introduce the address <http://fp7-adventure.eu/svn/repos/process-monitoring/pm.imageProcessor/>.
- Select create a new repository location, and introduce the address <http://fp7-adventure.eu/svn/repos/process-monitoring/pm.cep/>.
- Select create a new repository location, and introduce the address <http://fp7-adventure.eu/svn/repos/process-monitoring/pm.dashboard/>.
- Press the check-out button, and wait for the ckeck-out process to finish. The project process-monitoring will appear in the projects workspace.

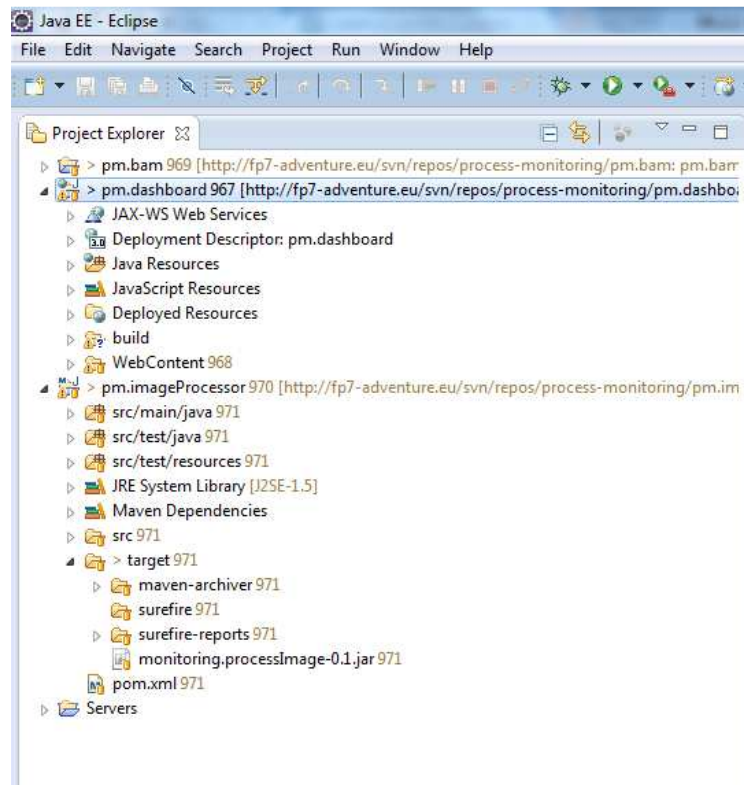


Figure 6: Imported project at Eclipse workspace.

- Right click the pom.xml archive and select Run As... / maven install. This will launch the repository installation procedure for Maven. After finishing it, the compiled war files can be found in the "target" directory.
- Select the appropriate war file (depending on the application server selected), and copy it to the deployment file (e.g. <TOMCAT>/webapps if the application server is Apache Tomcat).
- Start the application server, and write the application address in the browser (http://localhost:8080/monitoring). The Process Monitoring page will show up.

5 Limitations & Further developments

The current pilot has a limited functionality that will serve as basis for the further developments of the Process Monitoring. Based on the current implementation, different functionalities will be plugged into the ADVENTURE Dashboard, and integrated with the rest of the ADVENTURE components.

As a first prototype, it contains different known bugs and functionality flaws that will be solved during the development process, some of them are related to compatibility with web browsers, other are just related to the inclusion of new and improved ways for visualizing the information.

Many internal improvements at the Process monitoring are provisioned, the main ones are:

- Introduction of specific ADVENTURE monitoring widgets (including its interaction with the rest of graphical elements and attributes).
- Develop functionality for the broker not to be limited to only use a fixed set of predefined configuration attributes but has the flexibility to define the important for its specific case ones.

The current document will serve as a base for delivering the future iterations of the Process Monitoring Prototype. So, this document should be seen as a living document that evolves together with the prototype.

6 Conclusion

This deliverable describes the first pilot prototype of the ADVENTURE Process Monitoring component, developed in task T6.2 (Real Time Process Monitoring). As described in the specific sections for each of these different components, the objectives of the first prototype implementations have been achieved.

The first prototype of this ADVENTURE component implements the basic functionalities and tools to facilitate the monitoring and control of manufacturing processes.

The developers' team are hands on in the next stages of the development plan, improving the current prototype and evolving them to fulfil the requirements and specifications as described in the Functional Specification (D3.2) and Technical Specification (D3.3).

7 Summary

This document shows how the Process Monitoring prototype can be installed and provides insight how to test its capabilities.