NEWSLETTER

eScop

Welcome

Welcome to the fifth edition of the eScop Newsletter!

eScop project has proceeded to its final half a year, thus we will inform the project news in this autumn edition of our newsletter. During the summer and autumn the Consortium mainly focused on development of simulators, MES functions design and key performance indicators. The project has reached its fifth milestone, when the FASTory demonstrator was ready to run with the eScop architecture.

eScop project has also been active in disseminating the results. INDIN'15 conference brought researchers and experts from around the globe to Cambridge, UK, in order to discuss advances of industrial informatics. eScop project organized a special session at the conference entitled "Open, Knowledge-Driven Manufacturing Execution Systems". There were six papers presented in the session. The scope of the papers has revealed from different angles the eScop architecture integrating factory floor devices, which functionality encapsulated as a service, into knowledge-driven and orchestrated processes.

eScop project was also presented in the first Artemis Technology Conference, in Turin, Italy in October 2015. Project researcher Sergii Iarovyi presented eScop project with the title "Integration for manufacturing - eScop Approach". The event focused on deep technological presentations, both on project achievements and state-of-the-art technology.

In October, the project partners came together in the 6th consortium meeting in Rimini, Italy. One full day and two half days were spent on the premises of SCM, discussing current items in the project. Technical workshops focused on core system development, MES function design and implementation. In addition to the technical themes the consortium also addressed sustainability and future potential of

Figure 2. Consortium meeting participants in Rimini

the project results. The participants went deeper into the business possibilities of eScop solution in a business model workshop and discussed agreements on intellectual property rights.

Regarding the newsletter, we would especially like to draw your attention to the section about eScop simulators on page 2. Two simulators are freely available at the eScop website for you to use. In this edition we also share several stories about dissemination. As usual, current events and contact details can be found on the last page.

The goal of the newsletter is to inform you on the major project activities and to highlight the project achievements. You can also follow the project via the web site
www.escop-project.eu
and via our Facebook pages
https://www.facebook.com/EscopProject.

Figure 1. The eScop book has been published

Project Details:

The **eScop**, "Embedded systems for Service-based control of Open Manufacturing and Process Automation", develops a core of the Manufacturing Execution System (MES) that overcomes current problems of system integration from shop-floor control to factory management levels by merging the power of knowledge representation, service orientation and embedded systems.

Duration
March 2013 – February 2016

Total Costs
5,82 M€

Participating Countries
Czech Republic, Finland, Italy and Poland

Participating Organisations
10

Inside this Issue

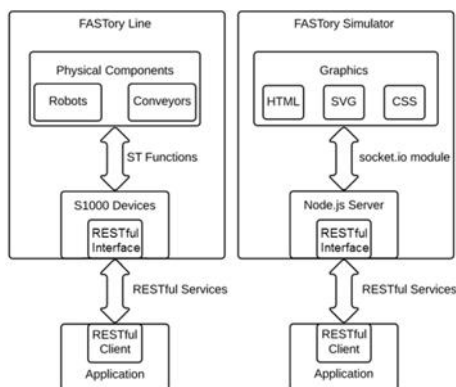# FASTory simulator and Oil Lubricaton System Simulator

Figure 3. FASTory line and FASTory simulator structures

Tampere University of Technology has been developing two simulators for the purposes of the eScop project. Simulators can be used as development and testing environment for components being developed in the project as educational material.

The FASTory simulator is a simulator for a real assembly line (FASTory) that is used to assemble electronic devices. The FASTory research laboratory is located in Tampere University of Technology, and it is used to demonstrate the assembly of mobile phones by drawing mobile phone's main parts (case, screen and keyboard) with different colours and different shapes. The line includes the main components of a production line; robots, transportation system, tools, end-effectors, raw material, working stations, loading and unloading stations and a buffer station. The FASTory simulator is replica for the real assembly line.

As with any simulator, the FASTory simulator is made to make life easier for the users of the real line. Hence there are no physical problems that could occur such as power shutdown
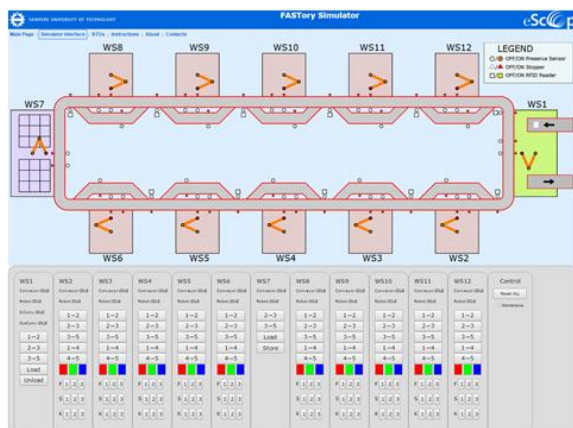

Figure 4. FASTory simulator interface

or mechanical issues, which continuously affect the real assembly lines. The FASTory simulator is built by the research team working in the eScop-project in Tampere University of Technology. The simulator can be used by other partners in the eScop project to test their tools on the line, and use it as workbench for the development process. It can also be used for educational purposes by university students rather than using the real assembly line. As developers sometimes make errors during their experiments, harming the facility can be avoided by using the simulator. The FASTory simulator is intended to be simple to use. It can be opened using web browsers for monitoring the line. For invoking operations, a RESTful client is used. It can be a stand alone web application or it can be a part of the OKD-MES components. The simulator has been used as a server, installed on a TUT server for project partners to use. In addition it has been used locally by developers installing it on their own local machines. FASTory simulator enables involvement of remote teams in development of the MES functionality.

The Oil Lubrication System Simulator is a simulator for an Circulating Oil Lubrication System, which is used to lubricate heavy machinery available in process industries like the pulp and paper industry. The simulator allows the user to simulate the maintenance and monitoring features for a lubrication system. The Oil Lubrication System Simulator was developed as part of the eScop project by researchers in FAST-Laboratory at Tampere University of Technology, with contributions from Fluidhouse Oy. The simulator can be used by partners in the eScop project to test their tools and use it as workbench for the development process. The simulator can also be used for educational purposes.

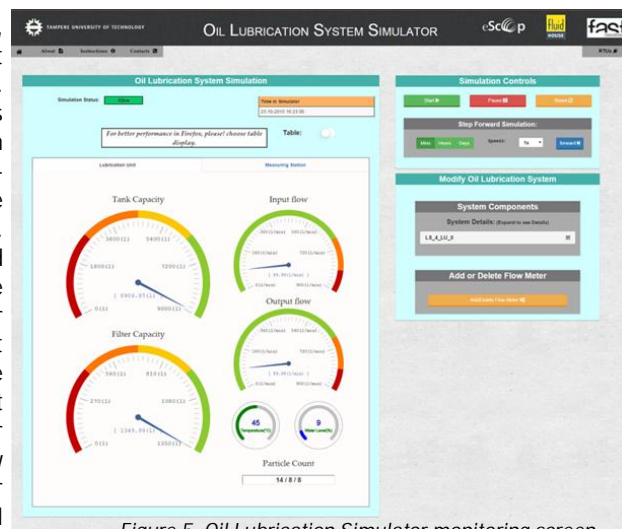The simulator was built to simulate the behaviour of FluidCirc

Figure 5. Oil Lubrication Simulator monitoring screen

systems, which is a Circulating Oil Lubrication Systems developed by Fluidhouse Oy. Fluidhouse offers advanced hydraulic and oil lubrication solutions and services. The FluidCirc system mainly consists of three components:
1) Lubrication Units which contain the lubrication oil in a tank, supply them to the machines and filter the returning oil from machines
2) Measuring Stations which group the list of flow meters to the machine at a particular section and
3) Flow Meters which measure the flow of lubrication oil to the machine.

Like the real system, the simulator allows the user to configure and create the system according to individual requirements. Once created, the user can monitor several system factors such as oil quality, consumption, etc. It is possible to speed forward simulation during the monitoring, and also to add or remove flow meters to observe the changes to the system. The simulator also provides RESTful client based RTU's with events and services, which can be used for implementing other higher level monitoring systems. The simulator is available as open source.
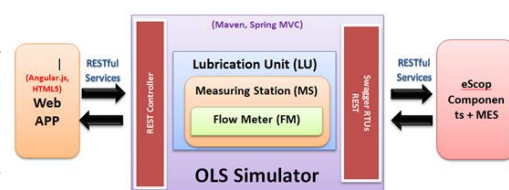

Figure 6. Oil Lubrication Simulator architecture

Both simulators are available online at **http://www.escop-project.eu/tools/**

XX Summer School "Francesco Turco" in Naples, Italy

Figure 7. Elisa Negri from POLIMI presenting

The 2015 edition of the XX Summerschool Francesco Turco was held between 16th to 18th September 2015 in the beautiful scenery of the Santa Chiara Monumental Complex in Naples, Italy. It has taken place with the title "Operational Excellence Experience".

Politecnico di Milano, as eScop member, presented a paper, entitled "Approach for the use of ontologies for KPI calculation in the manufacturing domain". The concept presented in the paper was to present the ontological basis of an industry 4.0 manufacturing system as a decision support technology. In particular, the example of decision that could be supported by the use of ontologies of the manufacturing domain is the calculation of production-related KPIs, for which ontologies are more suitable than the relational databases.

The presented work was a follow-up of a previous research work focused on ontologies for the manufacturing domain, that had investigated the role of ontologies and the best languages in which they should be represented in order to reach their full potential in the manufacturing domain. The work provided an insight of the possible use of ontologies as information support to decision making in the control and management of production systems. This is done with the use of queries to retrieve information stored in the ontology knowledge base as a support to decision making and to the computation of numerical KPIs (Key Performance Indicators) related with production with an ontology-based approach to the automated computation of KPIs considering the different levels of granularity and aggregation of the manufacturing system.

The idea of the KPI calculation of the paper springs from the fact that ontologies not only offer a way to store data but also a way to structure them, with the characteristics that it is aware of the data structure it is offering. In fact, ontologies are not the only alternative to store knowledge, e.g. the well-known and spread databases could also have the same role. However, the object orientation and the inheritance typical of the ontologies allow them to offer more than databases. In fact, databases represent data; while ontologies represent objects and the relationships among them. This means that ontologies

XX Summer School "Francesco Turco"
September 16-18, 2015
Monastero di Santa Chiara-Naples(Italy)

do not rely on availability of information because the relationships between concepts are already predefined. Moreover, decision makers in manufacturing companies may not be aware of the structure of the knowledge stored in the knowledge base: in databases, to query it you must be completely aware of it, in ontologies you do not need it because the ontology itself is aware of the knowledge structure and may be able to navigate the different granularity levels of a plant without requiring decision maker's knowledge (examples of different granularity levels are: plant, department, line, workstation...).

The presented paper shows an industrial example of this KPI calculation approach taking as reference a manufacturing and assembly plant department. During the presentation at the Summerschool, also the development in one of the use cases of the KPI-calculation eScop MES function has been presented: the SCM case, for which the first outcomes of this ongoing development have been presented, as an additional dissemination element for eScop outcomes.

Science in the streets in Pilsen, Czech Republic

Science on the Streets is held each year at the beginning of the September (8 - 12 .9.2015) in Pilsen. This event is organized by the Pilsen city with cooperation of the Pilsen region and it is mainly focused on the promotion and popularization of technical science

Figure 8. Explaining eScop

among the general public. The event is held on the main Pilsen square. The University of West Bohemia is a traditional exhibitor with several faculties and many departments. The exhibition presented advanced robots, smart electronics, electric vehicles and other interesting exhibits from different fields like chemistry, physics, mathematics, etc. Current results of the eScop project were presented at the booth of the Department of Cybernetics, Faculty of Applied Sciences, University of West Bohemia (UWB). The UWB team is looking forward to the next year when the

Figure 9. Interested audience from all age groups

final results of the eScop project will be presented.

APMS 2015, Tokyo

The International Conference "Advances in Production Management Systems" 2015 has been held in Tokyo, Japan from 5th to 9th September 2015. The conference is organized by the Working Group 5.7 in the IFIP community (International Federation of Information Processing). The title of the conference was: "Innovative production management towards sustainable growth: Service, Manufacturing, and Resilient value-chain", with a special session entitled "Ontology-aided industrial engineering". This session was chaired by Prof. Stanisław Strzelczak of the Warsaw University of Technology, who is an active member of the eScop consortium. The session has been thought as a good opportunity to present eScop outcomes to a large and high-level international audience at the cutting-edge research in the production and engineering management fields.

The members of the eScop consortium have taken the opportunity to send their contributions to present the different eScop outcomes: in particular, POLIMI, WUT and TUT have sent some papers and made presentations on the topic of ontologies in the industrial engineering.

Regarding POLIMI, the contribution dealt with the illustration of a production systems ontology that models the discrete manufacturing, process production and the logistics domains. This ontology is used to allow semantic interoperability within a control architecture based on semantically-enriched Web Services with the aim to facilitate the responsiveness and agility of the manufacturing companies, helping them to be more competitive thanks to the higher flexibility and re-configurability of their production systems. The title of the contribution was "Ontology for Service-Based Control of Production Systems" and presented the MSO (Manufacturing Systems Ontology) as an evolution of the P-PSO (Politecnico di Milano – Production Systems Ontology), by underlining the differences between them and the structure of the former: divided into Physical, Technological, Control and Visualization Aspects. It also showed the role of the presented ontology in the eScop architecture, and the benefits in terms of production system flexibility and even agility, by allowing a more rapid reconfiguration and an easier integration of production system elements at shop-floor control level, thanks to the inclusion of semantic content into the control level of the devices and applications through the use of the MSO ontology, that allows interoperability among devices from different vendors.

Current Events

October 2015

ICT 2015 Event —Networking session Industrial Internet as a Facilitator for Knowledge-Driven Manufacturing, October 20-22, Lisbon, Portugal
The eScop Consortium is hosting a net-working session, utilizing the technique called Six Thinking Hats.
https://ec.europa.eu/digital-agenda/events/cf/ict2015/item-display.cfm?id=15823

November 2015

12th European Workshop on Advanced Control and Diagnosis, November 19-20, Pilsen, Czech Republic
The UWB organizes the 12th European Workshop on Advanced Control and Diagnosis (ACD2015, Pilsen, CZ). The discussion about results of eScop project and utilization of knowledge during control will be opened as a part of the poster session.
http://acd2015.zcu.cz/

Knowledge-Driven Systems
From Enterprise Solutions to Embedded Devices

Contact

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