Virtual Organization Management eServices

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ABSTRACT

This demonstration concentrates on eServices (supporting electronic services) for Virtual Organization (VO) management support. The eServices are provided by the VOM toolkit (a suite of VO management tools), which was developed to support the VO manager in managing the VO throughout its life-cycle. In this demo the eServices related to all phases of the VO life-cycle are demonstrated together with the toolkit and benefits identified during pilot testing.

Categories and Subject Descriptors

[**DEMO**]: Industrial Software

Keywords

Virtual Organization, distributed process management

1. INTRODUCTION

The target of our work was to elaborate and define concepts and methods supporting Virtual Organization (VO) management. Having succeeded in the theoretical approach [2] our aim was then to proof these concepts by developing an integrated set of software tools supporting major VO management tasks [1].

The developed VOM toolkit as it is consists of different tools providing specific functionalities for VO management. In addition the tools can be configured in a way that they collaborate and exchange data to fulfil higher needs of VO management. These higher needs, i.e. business processes, can be described as VOM eServices (supporting electronic services). The eServices are business oriented views of how specific activities of the VO business processes are implemented. The eServices can support the processes by interaction between different tools, automatic communication and data collection, or by supporting the collaboration between VO manager and other VO members. The eServices are independently deployable in different VO contexts and they can cover different VO management aspects.

The VOM toolkit consists of distributed and mutually independent tools built upon SOA. The tools may be utilized separately but only if connected together they provide their full functionality. From the design point of view the toolkit may be seen as a community of dedicated agents but the multi-agent based design is applied in the individual components as well. For example, the distributed data collection is provided by the components deployed on site of VO partners and that act as simple representatives of the the partners. Another example of the multi-agent design is an agent based simulation of the VO, where each of the VO members is represented by an agent with its own resources and behavioral model.

The toolkit consists of five components:

VO-Model Wizard (VO-MOD Wiz) provides a unified access point to the entire platform. Single activities with similar functionalities are collected in macro processes representing the main phases of the VO life-cycle.

Supporting Indicator Definition (SID) supports VO indicators management: definition of VO indicators to be monitored as well as corresponding indicator values, calculates number of values, mean, maximum, minimum and standard deviation.

Distributed Indicator Information Integrator (DI3) is a measurement system based on interacting components situated at the locations of the VO members in a configurable way as defined by the SID. Information that is retrieved from the member locations is gathered and integrated into indicator values.

Monitor and Finance (MAF) is a tool used by the VO manager to monitor the VO activities, maintain updated VO management situation, monitor the KPIs status, and provide an proactive alerting system.

Decision Support System (DSS) provides the what-if analysis based on a future performance simulation. As an input for the simulation the actual state of the VO, which is represented by a VO configuration and schedule, and to be simulated occurrences influencing them are used.

2. E-SERVICES

The eServices cover VO management during the whole VO life-cycle through VO instantiation, value-adding operation, perturbation management (if necessary), and (finally) dissolution of the VO. The set of eServices as we have defined them consists of:

VO management workflow support – This eService is implemented to enable integration of all the tools for the VO management within a single process based tool. The VO manager has the possibility to be supported not only by single functionalities and tools but in a holistic method.

VO model development and management – The VO

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manager uses this eService in order to define models of the VOs to be managed. It provides instruments to collect each single VO information in a structured and reusable way, and to import data from external tools and applications. This eService provides support for the definition of the basic VO information: VO topology, Work Breakdown Structure, Budget, Selection and setup of Performance Indicators, and it also defines acceptable value range for the indicators.

Identification and definition of VO-indicator – The VO manager may need a support to identify the most appropriate performance indicators. It is provided by a catalogue of pre-defined indicators, from that the VO manager can search for indicators that match the specific requirements of his VO and select them for application in the VO. According to given application parameters the eService provides a suggestion of potentially suitable pre-defined indicators. The second service that supports the initiation management is a configuration of selected generic indicators.

VO automatic integrated performance measurement – During the operation phase the required data to calculate the defined indicators has to be measured as close to their sources as possible (on side of the VO member) and provided to the other eServices.

VO monitoring and exception management support – An active monitoring support is provided to the VO manager by a set of tools able to provide specific instruments for exploitation of raw performance data collected directly from the VO partners in order to obtain a complete overview of the actual VO situation. This global overview feeds a proactive monitoring system which support actively the VO manager in the monitoring activities. All the alerts and warnings are collected in a coherent way and have been used to increase the knowledge base about each single VO and to engage automatically the partners involved in these problematic situations.

VO simulation and decision support – The simulation supports the VO manager by the what-if analysis in case of need of VO evolution. It also discovers potential bottlenecks and helps in search for ways of their removing.

VO inheritance support – When a VO is created from some cluster there should a feed-back of relevant information from the VO. This data can be used by future VOs for partner selection, as a basis for planning, or for other task where it is important to regard experiences from past VOs. The VO indicators have to be defined by the VO manager in the indicator management. Then he can start the inheritance procedure that collects all stored values of the corresponding indicators.

3. BENEFITS OF VOM E-SERVICES

The networks involved in pilot testing of the VOM eServices are Supply Network Shannon[1], Orona Innovation Network[2], and Virtuelle Fabrik[3]. The demonstration is provided for the case of Virtuelle Fabrik, therefore benefits discovered by them during the testing are presented here. For the Virtuelle Fabrik the set of eServices and toolkit provided them offers the end-users benefits such as: (i) A crucial value of the toolkit can be found in the ability to monitor the specific VO processes. The tools provide the VO management with methodologies and techniques to accomplish VO projects. These VO projects mostly contain a big amount of uncertainty. Trough methodologies like the "what-if analysis" the VO manager has a tool to minimize these risks. (ii) The web based approach of the toolkit is for the Virtuelle Fabrik a big chance to establish a flexible toolkit which can cover the different and specific needs of a VO without excessively influencing the remaining system environment. This aim is realized trough modular software tools, which however distinguish through the achieved avoidance of media disruptions. (iii) By the use of the workflow-based VO Mod Wiz tool the VO manager has the instrument to include all the relevant information which has to be considered in the VO set-up phase. Hence, a VO configuration can be achieved that is enough significant to act as roadmap over the whole VO life-cycle. Only a reliable configuration can withstand unforeseen incidents. (iv) In form of predefined indicator sets, VO managers get the chance to embed upcoming VO projects in an approved controlling environment. Thus a "best-practice" controlling procedure can be manifold re-mapped in a structured way.

The main advantage for the Virtuelle Fabrik can be found in the structuring of the different VO processes. Unlike the actual situation, sophisticated system-driven processes enable management activities which are based on reliable and automatically gathered information. This is also the basis for an authentic and fact-based communication policy during the whole VO life-cycle. Thereby one core activity of VO management, the decision-making, can remarkably be improved through software-based planning algorithms and simulation devices within the toolkit.

[1] `http://www.snshannon.com/`
[2] `http://www.orona.es/`
[3] `http://www.virtuelle-fabrik.com/`

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