A New Decision Support System Based on Agents Dedicated to Service-Oriented Architectures.

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Abstract. SOA architecture is more and more used in the companies, in counterpart, the company needs the decision-making processes which proceed with the processes trades, dimension is absent in this type of architecture. On the basis of these notes, we are interested, in this paper, on the development of a two-dimensional new architecture of integration of the decisional aspects in SOA architectures, so that they are used perfectly. The proposal takes support, mainly, on the use of a coupling MAS-SOA.

Keywords: SOA (Service Oriented Architecture), MAS (Multi Agents System), Decision Support System, Project Management, Evapo-transpiration.

1 INTRODUCTION

In a few years, service oriented architecture (SOA) became a major topic for the information systems of company. The decision support systems are present in many fields and aim to help the decision maker in his task by providing him all the relevant elements for decision making. However, the service oriented architecture adapted in companies do not reflect the reality accurately where various points of view divergent and often conflict must be considered to arrive at a compromise that gave rise to a new dimension: decisional. In this paper, we will present a proposal for a new architecture of decision based on the models. This proposal will be studied on two angles: The first relates to the definition of the agents implied in a decisional system based on models; where we will pass by a state of the art on the decision systems based on service oriented architecture, and then the proposal for a multi-agents system exploiting rules based decisions.

The second angle treats SOA architecture where we will put the point on the various layers which appear at the time of decision making, these can be the technical layers, or the data related on the trade processes and the decision-making processes. This architecture will be exploited thereafter in two cases, the first relates to the company it is “the Projects Management”, the second is intended for hydraulics it is “the Evapotranspiration”. At the end we will make a comparison between our proposal and the work presented in the state of the art.

2 STATE OF THE ART

It is to be announced that there are no so many works on the help making decision systems based on service oriented architecture. The first work is that proposed by “Xu Liyuan” and “Al” (XuLiyuana and all, 2011)], whose title is **“a decision support *system for a precise irrigation based on the* SOA”,** the decision support system select the adequate service according to the needs for the users of the different BPMs, and then it set up the model. At the end, it gives the exact instruction to the irrigation. The second architecture is proposed by the **author Vassilios Vescoukis** (Vassilios Vescoukis and all, 2011)**:** it’s a flexible SOA of planning and decision support for an environment of information management. Architecture uses a whole of géo-space data real-time and tools of presentation in 3D, integrated into the services with added-value for the modeling of the environment and operational logistics and decision-making aid taken in the event of urgency. Last work is that of **Neil Wheeler** (Neil

Wheeler and all, 2010), and which consists in proposing a SOA for an assistance system with the decision of treatment of fuels inter-agencies (Interagency Fuels Treatment Decision Support System (IFT-DSS)).

All the work presented in the state of the art, relates the application of the Decision making systems based on SOA architecture to a well defined field. The goal of our work is to give a decisional aspect to the SOA architectures, in any field. In this article we propose an approach supported on the SMA, dedicated to the decisions based on the models, in any field (undertaken, chemistry, physics, hydraulics… etc.).

3 Suggested architecture

The originality of our architecture is due to the simultaneous use of a multi agents system (MAS) and service orientated architecture (SOA). The literature offers few examples of coupling these two types of representations of reality.

3.1 Suggested MAS architecture

The agentification of a problem is an important aspect of the design of MAS. Our modeling agent is based on the methodology Aalaadin (MATHIEU Philippe and all,2002), which is based on the agent concepts, groups and role to define a real organization. In our work, there are three types of agent roles: the Supervisor, the Editor and the Arguer;

- **The Supervisory agent**: is responsible for the good progress of Process trade, thus the Decision-making process. This agent indicates all the anomalies in the course of the two processes.
- **The Editor agent**: makes it possible to edit the decisional models, to check the validity of the latter, and to record the models, the indicators and the indices.
- **The Arguer agent**: is the agent concerned by the decision, the role of this agent is to seek the adequate services to find the indicators, moreover, to present the decision indicators according to a mode of visualization (Gauge, Text, Histograms… .etc.) in the convenient moment.

3.2 Functioning

The decision maker introduces the indices and the decision models which must be defined and checked by the Editor agent (Fig.1). In the case of error, this last sends a message to the Supervisory agent. The indices will be recorded in the base of indices like services of low granularity (like trade services), in the same way, the models will be validated by the Editor agent, then recorded in the base of Models like services of average granularity (engineering service (Functional)), they are the high level services that mask the indices service to the composite applications. In the case of error the agent sends a message to the Supervisory agent. At the level of the models introduction, the Editor agent identifies the indicators of the system, and it records in the base of the indicators like services of large granularity (Applicative service).

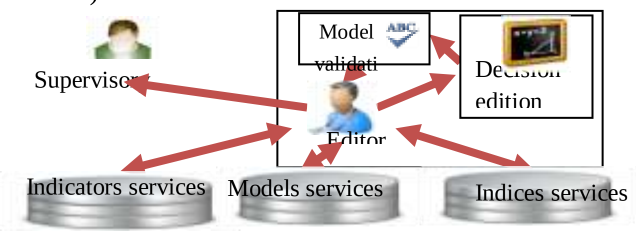


Fig. 1. The role of the Editor agent

The purpose of the arguer agent is to calculate the indicators requested from the decision, and to post them according to a mode of visualization (gauge, text, histogram… etc) to help the decision maker by a better view of the value and the importance of these indicators.

When the user selects the indicators that he needs, and the mode of visualization which is appropriate to him, this operation allows the arguer to launch out, this last calls the trades services, indices services and model services to have the indicators requested by the decision maker (fig.2).

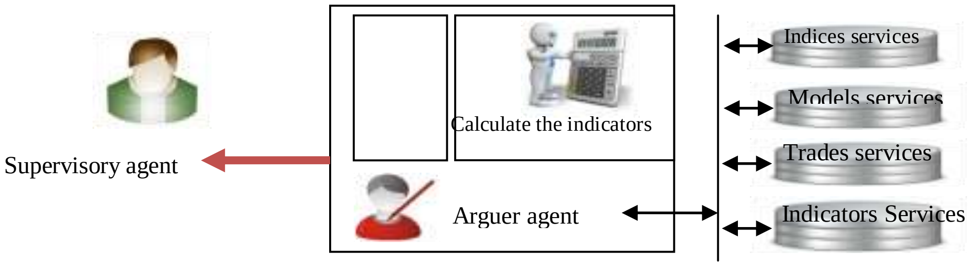


Fig. 2. The role of the arguer agent

3.4 SOA Architecture

Our architecture Decision-MAS -SOA illustrated by fig.3 is made up of four layers in accordance with the IBM model (Dodani,2006)] and the architecture of (Xavier and all, 2006), of (Cui Flax and all,2009)] and of , and of (Bonnet, 2005). The SOA-Decision-MAS must be able to make it possible to define specific indices to each company and to build indicators adapted to the needs for the company. The SOA-Decision-MAS is thus separated in four layers, as follows:

- The Layer 1 “**Data**”: it contains two under layers; the first is “Trade” which includes the services trade (CRUD) trade process carried out in the company. The second under layer is the “Indices”, its goal is to safeguard the indices services. The Editor agent intervenes on the level of this under layer, to guarantee the recording of these services.

- The Layer 2 “**Technique**”: it contains two under layers: under layer “Function” which represents the function services of the process trade. Under layer “Models”, which included model services recorded by the Editor agent.

- The Layer 3 “**Action**”: it contains two under layers: Applicative and Indicators. The first gathers the Applicative services of the process trade, and the second ensures the appreciation of the indicators, using the arguer agent, and a mode of visualization.

- The Layer 4 “**Presentation**”: it contains interfaces, and ensures the communication between the user and the system, that is to say to carry out the process trade, or to make a decision. The Supervisory agent intervenes in this layer.

Moreover, we conceived our approach so that it respects principle IDC of SIMON.

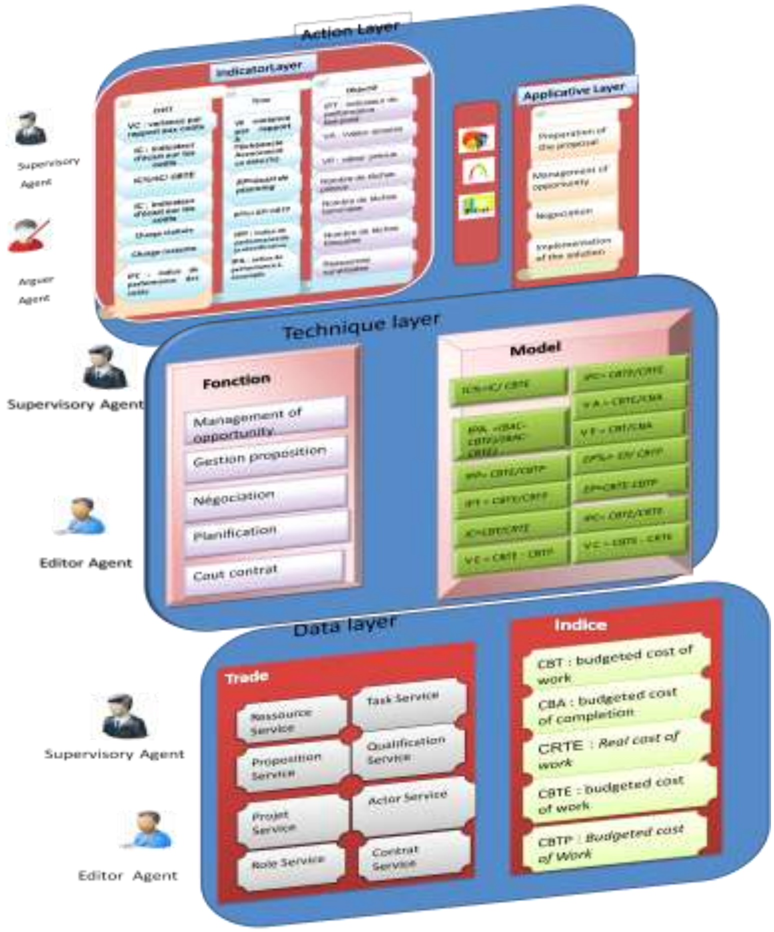
Fig. 3. Decision-MAS- SOA Architecture

4 VALIDATION OF THE SUGGESTED APPROACH

This part has as an ambition to validate the conceived approach. We will apply the present architecture to two cases.

4.1 The architecture applied in the Project management

The application of architecture implies the determination of indicators of piloting of the project which are tools of navigation and decision. They make it possible to measure a situation or a risk, to give an alarm or contrary to meaning the correct advance of the project.



The next figure explains how to apply architecture to the project management.

4.2 The architecture applied in the “hydraulic” field

We applied our architecture to calculate the evapotranspiration. The latter is an essential element to an adequate management of water on a catchment area (Carmen, 2007). We apply architecture to have the evapotranspiration of reference by various mathematical models, according to types of data which the user can have at his disposal. According to the Turkish model which is presented in the fig. 3.

Fig. 5. Application of the SOA-MAS decision approach to the project management

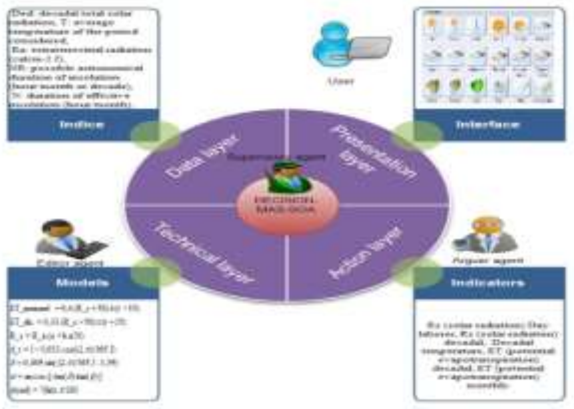


Fig. 6. Application of the SOA-MAS decision approach to the hydraulic field

4.3 Comparison between SOA architectures intended to make decisions

The following table shows a comparison between our suggested architecture and the work presented in the state of the art.

	Neil Wheeler (2010)	**Xu Liyuan (2011)**	**Vassilios (2011)**	**Boumahdi et al. SOA-MAS-decision**
Field	treatment of fuels inter-agencies	Irrigation	environment of information management	Company (Management project, stock… etc), Hydraulics (the evapotranspiration), Physics, Chemistry… etc
Technique of decision	Not	Not	Not	The Multi-Agents systems
Solution SOA	Divided into four levels defined by the author	Divided into four levels defined by the author	Divided into four levels defined by the author	Divided into four levels conform to other SOA standardized architectures
Data used	Geospatial Real	Reality	Geospatial Real	Real
The process of decision	Is not defined	Is not defined	Is not defined	Architecture follows model IDC of SIMON
Benefit	Decisional dimension	Decisional dimension	Decisional dimension	Two dimensions: decisional and SOA

5 Conclusions and Outlines

At the end of this article, we proposed an SOA decisional architecture based on one coupling MAS- SOA likely to bring an effective help to the decision makers, we proposed the interest of the decision-making aid like a new way of design of applications of the oriented service approach, while focusing us on models.

Thus, we proposed the definition of new service types intended to carry out the decision-making aid. Three service types were proposed: services of indices, services of model, and services of indicator.

In our future work, we envisage the enrichment of our architecture (MAS-SOA) to which we will add new modules and new classes which will allow to model the real systems more easily and to develop other computing systems of decision-making aid.

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