Choreography of intelligent e-Services

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ABSTRACT
Electronic Services (e-Services), referred to as a set of automated enterprise services using ICT to achieve a business goal, have significantly contributed to the growth of e-commerce, science, and telecommunications. However, applications that use e-Services seldom interoperate effectively, and this restricts the benefits they offer. The main purpose of e-Services is to have an anthology of network-resident software services accessed via standardised protocols whose meaning can be regularly discovered and integrated into applications. Our study supplements the definition provided for e-Service by complementing it with an intelligent capability for the purpose of effective and efficient choreography of processes, hence the term “intelligent e-Services”. The aim of the study is to propose the composition of intelligent e-Services in a manner which promotes the interoperability of autonomous virtual enterprises (VEs). It is expected that a framework that defines and supports the composition of intelligent e-Services will be formed. It is also anticipated that the study will play an important role in contributing to the formation of dynamic virtual enterprises (DVEs) as an application business scenario.

Categories and Subject Descriptors
D.2.12 [Interoperability]: Distributed objects, interface definition languages.

General Terms
Design, Experimentation, Theory.

Keywords
Choreography, composition, e-Services, interoperability.

1. BACKGROUND
The market has imposed a strain upon many companies to find innovative ways in order to cope with the increasing competitive pressures (i.e. to reduce costs, increase sales, and improve the quality of products and services). It was not long ago that these markets were controlled by a few traditional enterprises, and the interaction amongst participants was manual and awkward. These traditional enterprises are now being replaced by dynamic business networks (e.g. organisations that adopt a Web Service approach), where each participant offers specialised products and services to other participants [1].

Services are offered by different enterprises and are platform and network independent operations [3]. These enterprises must have the ability to make their offerings visible to other enterprises to conduct business. The interaction amongst these enterprises is known as interoperability; hence it must be convenient. Fluegge, dos Santos, Tizzo, and Madeira [2] contend that interoperability can be defined as “the ability of two or more systems or components to exchange information and to use the information that has been exchanged”.

Service Oriented Architecture (SOA) is considered to be the most affordable solution to promote interoperability [2]. This argument is supported by Dos Santos and Madeira [1], who believe that the requirements for interoperability among heterogeneous partners could be modelled and implemented through the use of SOA. SOA is the computing prototype that makes use of services as essential elements for developing applications to supply services either to end-user applications, or to other services distributed in a network, via published and discoverable interfaces [6].

Milanovic and Malek [5] state that “service composition accelerates rapid application development, service reuse, and complex service consumption”. There are two forms of service composition and collaboration which describe two facets of creating business processes. They are orchestration and choreography [1,2,3]. In orchestration, services can interact with each other at the message level, and all interactions that are part of a business process must be described, while choreography is more collaborative and addresses the interactions that implement the collaboration among component services. Choreography tracks the message sequences among multiple enterprises rather than a specific business process that a single enterprise executes [3]. This study will propose the composition of intelligent e-Services in a manner which promotes the interoperability of autonomous enterprises at the implementation level.

This short paper is organised as follows. Section 2 presents the problem statement for this study. Section 3 presents the
methodology that will be followed for this study. The conclusion appears in section 4.

2. PROBLEM STATEMENT
The research problem identified for this study is that the methods being employed to promote interoperability amongst multiple enterprises do not equip each enterprise/service with the necessary intelligence and ability to comprehend other enterprises. Moreover, these methods often do not define semantics well enough, and in many situations they are ambiguous, inconsistent, incomplete and very difficult to extend and to reuse. The study will thus propose the composition of intelligent e-Services in a manner which promotes the interoperability of autonomous enterprises at the implementation level. The four primary objectives of the study are: (1) to investigate the state of the art in the characterisation of e-Service, Web Services, and Semantic Web Services characterisation; (2) to provide an appropriate definition and characterisation of an intelligent e-Service (IeS); (3) to design and develop a framework that will facilitate the choreography of IeSs; and (4) to model and evaluate a real-life business scenario using IeSs.

In order to address this research problem, the study will attempt to answer the following research questions: (1) What is an IeS, and what are the fundamental attributes/properties that make up an IeS? (2) What is the appropriate approach for modelling the choreography of IeSs? (3) What is an appropriate technical environment for facilitating the choreography of IeSs? (4) How can a real-life business scenario be modeled and applied using the choreography of IeSs?

Furthermore, the study will have the following outcomes: (1) a model for the characterisation of intelligent e-Services; (2) a framework that supports the composition of an intelligent e-Service; (3) a prototype implementation of the framework as a proof of concept; and (4) an application of the prototype using e-Mentoring as a reference scenario. The next section looks at the methodology that will be used for the study.

3. METHODOLOGY
The study will explore the existing literature within the frameworks of the composition of e-Services, Web Services and the Semantic Web Services. This will be followed by the identification of current drawbacks with regards to e-Services, Web Services and Semantic Web Services compositions (incl. the study of AI-inspired content markup languages and standards/languages, such as OIL, DAML+OIL, UDDI, WSDL, DAML-L, and DAML-S). The above study will then be integrated to propose a proper characterisation and simulations of IeSs as well as the choreography thereof. In the role of the evidence and developmental explanation, this will form the basis for the construction of a framework that will facilitate the choreography of IeSs. As part of pragmatic steps, a specific realistic business scenario, such as e-Mentoring\(^2\), will be used to provide an application of the proposed framework, which will be evaluated in order to assess the efficiency and applicability. The pragmatic steps will consist of the following stages together with the integration of different methods in brackets: (1) the representation of e-Mentoring as components of IeSs (interpretation); (2) modelling e-Mentoring as a choreographed set of IeSs (experiment and interpretation using DAML-S, PDDL, and business-process modelling languages); (3) implementation of IeSs-based e-Mentoring scenario (observation using existing tools e.g. ebXML); and (4) evaluation of the implemented IeSs-based e-Mentoring scenario (observation). The next section concludes this short paper.

4. CONCLUSION
Services are platform and network independent operations that clients/enterprises or other services invoke. Hence, to function in SOA, services must clearly define their properties in a standard, machine-readable format. Since services are offered by different enterprises, they must be visible to other enterprises to conduct business. This is referred to as interoperability. Interoperability, which is important to the e-business community, can be achieved through Web Services and the Semantic Web / Ontologies since these tools are appropriate for the achievement of distributed applications over the Internet. However, this short paper has pointed out the key problems of these tools, for example, the automatic/dynamic composition of Web Services. It has to be noted that many e-business communities are embarking on announcing platforms that support some level of Web Service automation [4].

The paper has further motivated why choreography should be considered for a study rather than orchestration as a service composition, pointing out the challenges that enterprises are faced with, for example, heterogeneous services. This leads on to the proposed study of choreography of an intelligent e-Service to promote interoperability amongst different enterprises/e-Services intelligently. The study will consequently be an empirical research where a formal framework for the interaction and compositional construction of an intelligent e-Service will be proposed.

5. REFERENCES

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\(^2\) e-Mentoring can be explained as a process where a mentee and a mentor communicate via ICT technologies in order to solve certain problems.