

Nature-Inspired Self-Organizing Service Oriented Architecture: a Proposal

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Abstract - *Implementation of Service-Oriented Computing and Service-Oriented Architecture (SOA) brings about challenges which include service discovery, service interaction, service composition, robustness, Quality of Service, security, etc. These challenges are mainly due to the dynamic nature of SOA. SOA may often to dynamically organizing and re-organizing its topologies of interactions between the services. The dynamic characteristic of SOA is quite similar with the characteristic of self-organizing system, in the way that they are able to organize elements (services in the case of SOA) in order to change their functions or create new functions on higher levels (emergence). Therefore, we believe that the dynamic nature of SOA can benefit from the use of self-organization primitives found in nature. We propose to investigate how we can adapt self-organizing systems and mechanisms found in nature used to ensure robust SOA. This will be achieved by mapping nature-inspired self-organizing models and algorithms into SOA domain.*

Keywords: Service-oriented architecture, service-oriented computing, autonomic computing, self-organizing.

1 Introduction

The development of internet and World Wide Web technologies has enabled access to many types of services over the web. Furthermore, on the base of existing services, large distributed computational units can be built, by composing complex compound services out of simple atomic ones [1]. This type of concept and architecture is called Service-Oriented Computing (SOC) and Service-Oriented Architecture (SOA).

Service-oriented computing is an emerging computing paradigm that utilizes services as the basic constructs to support the development of rapid and easy composition of distributed applications – even in heterogeneous environments. The visionary promise of SOC is to assemble application components with little effort into a network of services that can be loosely coupled and used

to create flexible dynamic business processes and applications that may span organizational boundaries and computing platforms.

The subject of service-oriented computing is vast and enormously complex, spanning many concepts and technologies that find their origins in diverse disciplines that are woven together in an intricate manner. In addition, there is a need to merge technology with an understanding of business processes and organizational structures, a combination of recognizing an enterprise's problem points and the potential solutions that can be applied to correct them. Thus, many challenges and issues arise on the subject.

On the other hand, self-organizing is one of the emerging concepts in autonomic computing, along with others such as self-healing, self-protection, and self-optimization. Self-organizing systems have been discovered in nature and they may offer computational systems that are robust, secure, self-organizing, and self-healing [2]. As SOA has some similar characteristics of self-organizing systems, e.g. dynamic and flexible, it is visionary promising to adapt nature-inspired self-organizing systems into service-oriented computing.

2 Service Oriented Architecture

Service-Oriented Architecture is the main architectural concept in the field of Service-Oriented Computing. In this kind of architecture, all functions, or services, are defined using a description language and have invokeable, platform-independent interfaces that are called to perform business processes. Each service is the endpoint of a connection, which can be used to access the service, and each interaction is relatively independent of each and every other interaction.

Service-oriented architecture is a method for systems development and integration where functionality is grouped around business processes and packaged as interoperable services. SOA is a design for linking computational resources (principally applications and data) on demand to achieve the desired results for service consumers (which can be end users or other services).