Service-oriented Computing (SOC) in Engineering Practice

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Keywords: Service-oriented computing (SOC), Web-services, Cloud Computing, Engineering Design Platform

1. Introduction

The Service-Oriented Computing (SOC) paradigm refers to the set of concepts, principles and methods that represent computing in Service-Oriented Architecture (SOA) in which software applications are constructed based on independent component services with standard interfaces [1,2]. SOC represents a new generation distributed computing platform for programing distributed applications by means of the composition of services. The visionary promise of SOC is a world-scale network of loosely coupled services that can be assembled with little effort in agile applications that may span organizations and computing platforms. Since services may be offered by different enterprises and communicate over the Internet, they provide a distributed computing infrastructure for both intra- and cross-enterprise application integration and collaboration. Service clients (end-user organizations that use some service) and service aggregators (organizations that consolidate multiple services into a new, single service offering) utilize service descriptions to achieve their objectives. So, Service-Oriented Computing is a paradigm and Service Oriented Architecture is an architectural model which allows interoperability, re-usability, loose-coupling of its components and provides mechanisms to describe publish and discover available services. The distinction between SOC and traditional computing (say, object-oriented computing) is that application builders no longer construct software from scratch using a programing language. Instead, they specify the application logic in a high-level specification language, utilizing standard services as components. As of today the most prominent technology based on SOC is Web Services, a set of open specifications that focuses on interoperability and compatibility with existing infrastructures. A Web service is a specific kind of service that is identified by a URI, whose service description and transport utilize open Internet standards.

2. Description of a problem solution

The IASA (Institute of Applied System Analysis) of NTUU "Kiev Polytechnic Institute" is conducting the following research and development activities in the domain of SOC target:

- Investigating Engineering Design procedures together with partners as possible services in distributed environments instead of present attempts to migrate monolithic large CAE/CAD software systems into the grid/cloud infrastructure as it is done in [3-6].
- Extending of service management and monitoring facilities in a cloud computing environment by making these services to be more centralized and allowing them to use interconnected multiple distributed services databases.
- Using of service metadata for service. Inference of machine-interpretable information about what the service can do and what it can provide remains an open issue. Syntactic interpretation of service-based information lacks the confidence to perform this function well because the meaning of underlying information is missing. Semantic

approaches that allow meaningful definitions of information in cloud environments offer solutions for many service providers who may reside within the same infrastructure by agreement on linked ontology.

- Performing semantic approach with help of novel RESTful Web services which are alternative to SOAP- and Web Services Description Language (WSDL)-based Web services. REST (Representational State Transfer) defines a set of architectural principles by which Web services can be designed with focus on a system's resources, including how resource states are addressed and transferred over HTTP by a wide range of clients written in different languages. It is planned to use LinkedData technology [7] for combining Web services, RESTful services and Semantic Web-Services on the base of known SPARQL, RDF and other standards.
- Re-engineering the existing service workflow tools (Taverna, Kepler or Askalon) for cases of orchestrating web-services of different types, including RESTful services, Semantic web-services and traditional WS* services by using orchestration capabilities of standardized WS-BPEL engines, Linked Data Services (LIDS) and WSMX (the prototype of Semantic Web-Services workflow).
- Demonstrating the effectiveness of the Service-oriented computing (SOC) in a cloud computing environment by developing Engineering Design Platform, in particular, for modeling and optimization of Nonlinear Dynamic Systems, based on components of different physical nature and being widely spread in different scientific and engineering fields. It seems to be very useful for people who have needs to use applications composed by SOC, as well as for the people who can design sophisticated applications using services.

3. Conclusion and future work

Solution in hand is designed primarily to meet the needs of small and medium enterprises in the modern toolkit design of complex technical objects and technological processes, as well as the small research laboratories to perform complex computational experiments. A long-term strategy for the Engineering Design is to create flexible networked simulation and modelling tools for "bottom-up" or "top-down/ bottom-up". This original conception of Engineering SOC with Design procedures as web-services has no complete competitor worldwide [8]. Achieved results can be shifted to other subject areas if necessary additional web-services are developed together with applied engineers with the possibility of their replenishment and editing.

References

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