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Synergy of Services within SOA

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Abstract

The enterprises need to react promptly and efficiently to any technological or economical demand, despite the fact that globalization causes different-nature challenges nowadays. One of the main technical issues is complicated heterogeneous systems. Mainly, these systems have grown over years, and caused different technological and economic problems. With introducing Service Oriented Architecture (SOA) and its services, it started to be possible for companies to operate against these complications. For this reason, we investigate in this paper the synergy challenges within SOA services, including Web-, Grid-, Peer-to-Peer-, and Cloud-related ones.

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Keywords: Synergy; IT Services; SOA; Web Services; Grid Services; Peer-to-Peer Services; Cloud Services.

1. Introduction

Modern companies have to face many different challenges nowadays because of globalization of business. They have to react quickly and effectively to all kind of requests, whether they are technical or economic nature. A reason, what it makes so difficult for companies to meet the requirements, from a technical standpoint from, are complicated heterogeneous systems. In most cases, these systems have grown over years, and caused a lot of technical and economic problems. Service Oriented Architecture (SOA) came as an approach to help companies

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operate against these problems[1,2,3]. Besides, SOA is an application architecture, in which all functions are defined as independent services with well-defined invocable interfaces, which can be called in defined sequences to form business processes. Thus, in SOA: all functions are defined as services, including business functions, business transactions and system service functions; all services are independent; and, interfaces are invocable, whether the services are local or remote. Furthermore, interworking is one of the main benefits of SOA. But, the vast amount of emerging standards makes it difficult to understand and utilize the potentials of eServices technologies those enabling interworking[34,36].

Thus, we study in our paper eServices, such as - Web, Grid, Peer-to-Peer and Cloud ones. The first description of them was done briefly described below[4,5].

Web services assure standards and tools to simplify the integration of information systems and services within the company or with business partners. Acronyms such as SOAP, WSDL and UDDI are the terms when it comes to the integration of information systems[6,7].

Grid Computing is an attempt to use heterogeneous resources across administrative domains[8,9]. Grid technologies enable the sharing and coordinated use of resources in dynamic virtual organizations. They perform not only file exchange, but also access to computers, software, data and other resources. There are various possible forms of virtual organizations. What unites them is an approach to computing and problem solving based on collaboration in computation and data rich environments[10, 11].

The Peer-to-Peer (P2P) technologies are still not well defined field[4]. It is difficult to describe P2P and delineate it from Client/Server networking. Efforts for defining specifications are made by the P2P Working Group, whereas two standardization initiatives are Jabber and JXTA[4,12].

The Cloud computing supports both - hardware and system software as well as the use of services over the Internet. There are advantages for both, end users and providers. End users can access the service anytime and anywhere they want. Providers are able to simplify software installation, maintenance and have centralized control over versioning. Furthermore application providers can deploy their product without operating a data-center[13,14]. Cloud computing allows enterprises to share computing resource globally through the Internet, it involves a set of key technologies to address resource sharing based on business requirements[15,16].

2. Synergy or Interworking of eServices within SOA

The synergy or interworking is an ability of systems, applications and services, to communicate, exchange data and files, work together or operate on behalf of one another[4,17]. In the next subsections we analyze in detail the synergy within Web, Grid, P2P and Cloud Services.

2.1. Web Services Interworking

There are currently three initiatives, the World-Wide Web Consortium (W3C) initiative, the semantic web services (SWS) initiative and the ebXML[37] initiative working on web services standards. They conform to the same basic operations (publish, find and bind)[18,19,20]. Umapathy and Purao[18] identify the following Web Service standards: WSDL for publishing; UDDI for finding; and SOAP for binding, see Fig. 1. These web service standards and enabling technologies address interworking/interoperability on a technical level. The issue of web service interoperability is addressed at a conceptual level by the W3C's Web Services Architecture shown in the graphic on the next page[4]. The web service architecture involves many stepped and interrelated technologies. There are many ways to visualize these technologies[21]. Based on this web service architecture Tsalgatidou and Koutrouli[4] identified a need for enhanced interoperability in all web service operations. Potential for improvement has been identified is mainly:

- Description should also include semantic information; this would improve interoperability between different web services.
- Management should likewise have a common semantic, which should be understood by the requester and provider entities.

- Security, the wide range of protocols that have been proposed for security hinder interoperability.

Further research on how to improve the interoperability of web services operated by the OASIS Web Services Interoperability Community[22] develops advances best practices for selected groups of standards, across platforms, operating systems, and programming languages. WS-I provides guidelines to assist the Web services community in developing and deploying interoperable Web services.

2.2. Grid Services Intersections

Interoperability between different distributed resources in a Grid application is a main objective of Grid projects. The Open Grid Services Architecture (OGSA), Open Grid Services Infrastructure (OGSI) and Web Services Resource Framework (WSRF) models deliver a framework for Service Oriented Grids with the goal to support interoperability of distributed services and resources[4], see Fig. 2.

All services in OGSI are first of all Web Services. They must also support some basic functions that are defined in the Open Grid Services Infrastructure (OGSI) standard. These include aspects such as: machine-readable interface, definition of services (functions, data elements), extensibility of services, lifetime of services, locating and referencing of services, consistent error handling of services, notification of changes to services, instantiation of services and the management of groups of services[8].

As the successor of OGSI standard WSRF has been proposed, which, in a contrast to OGSI waived structural changes in the WSDL and instead implemented the same functionality as OGSI using other means. The problem is still the same. Stateless Web services alone are not enough for the grid computing. Too often, state information is needed outside of the controlling web services. Therefore WSRF should provide a service independent concept[8].

It has also been made progress with interoperability between different grid applications. A notable development is Semantic Grid[4]. But there are still many significant research challenges to solve[20,34].

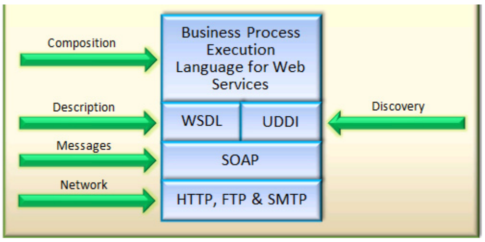

Fig. 1. Web services interoperability architecture[23].

Fig. 2. Framework for Service-oriented Grids[24].

2.3. Peer-to-Peer Services Interoperability

Peer-to-Peer services interoperability, can be viewed either as interoperability between different peers in a P2P network, or between different P2P applications. Interoperability between different peers needs advanced interoperability, supported by semantic routing which is recently addressed by researchers in the Edutella project[4,25,35]. The Edutella project is a peer to peer network for searching semantic web metadata, the data is not actually shared in the network rather than the information that describes what the data is about. Edutella is not a single network, rather it enables various systems to form networks for exchange of metadata according to semantic web standards[25].

Efforts towards improved interoperability have been made also by the P2P Working Group[26]. It is an attempt to assemble the community of P2P developers together and establish common ground by writing reports that would enable common understanding among P2P developers[27], see Fig. 3.

Currently, only a few P2P systems can interoperate, such as Magi with JXTA[4]. JXTA[29] approaches interoperability as an open source effort, to impose a de facto standard.

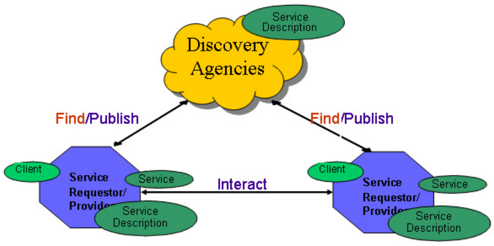

Fig. 3. SOA Derivative Patterns Peer-to-Peer[28].

Fig. 4. Cloud platform Interoperability Elements[24].

2.4. Cloud Services Interoperability

Parameswaran and Chaddha[30] claim the following: "With the presence of numerous vendors, the need is emerging for interoperability between clouds so that a complex and developed business application on clouds is interoperable".

It is very important to enable the information representation and message exchange on clouds, specifically for collaboration, and an effective use of features of cloud computing, see Fig. 4. There is ongoing research, solving that problem by providing a Cloud Computing Open Architecture (CCOA). In CCOA, the cloud information architecture module enables representation of those cloud entities (business entities and supporting resources) in a unified Cloud Computing entity description framework. Technologies such as Resource Description Framework (RDF), Web Services Resource Framework (WSRF), and XML are implementing this unified framework. The messages exchanged between cloud entities form the message exchange patterns. The message format and message exchange patterns can be reused to support various business scenarios. The message routing and exchange protocols as well as message transformation capability form a foundation for cloud information architecture[15].

Further emerging approach for interoperability is Unified Cloud Interface. The Cloud Computing Interoperability Forum (CCIF) was formed in order to enable a global cloud computing ecosystem. This ecosystem allows organizations to interact seamlessly together for the wider industry adoption of cloud computing technologies and related services. A key focus is placed on the creation of a commonly agreed framework that enables the ability of two or more cloud platforms to exchange information in a unified manner[31].

Besides, Enterprise Cloud Orchestration Platform/Layer is similar to the way that the Internet is a network of networks, there are many cloud available full of applications and services used by companies. It will not be possible to use these clouds without some type of orchestration. There are vendors those offering such solutions, like Cordys[32], who delivers an enterprise cloud orchestration platform helping enterprises to adopt quickly new ways of running their business and reaching their customers. Another provider of an orchestration layer/cloud management platform is Rightscale[33]. A single management platform is provided to manage conveniently multiple clouds[30].

3. Conclusions

We explored in this paper standards, trends and current research relating to SOA Services synergy with different paradigms. The focus was to classify requirements, existing and possible solutions concerning interworking of eServices. As discovered in this research, there are many different approaches to increase interoperability. But due to lack of standards and the variety and diversity of implementations and interpretations of SOA, which could be observed in this work through the recherché within available scientific literature, an efficient synergy seems still to be far away from a practical solution.

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