

# A Study on Exploring Web Services Issues and Their Solutions

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## Abstract

Web Services are considered to be a promising technology to add a new level of functionality to the existing World Wide Web. However, despite the growing use of Web Services by many organizations, there are several issues that are slowing their deployment such as service discovery, recovery from faults and security. In this paper, we give a detailed overview of issues surrounding Web Services, discuss existing solutions and describe their limitations.

## 1. Introduction

Web Services are considered to be a promising technology to add a new level of functionality to the existing World Wide Web. However, despite the growing use of Web Services by many organizations, there are several issues that are slowing their deployment. First, different providers may offer the same service with similar functionalities, so the task of service discovery is becoming complicated. Second, the context of Web Service is dynamic and several kinds of changes and faults may arise after deploying them. Third, considering the untrusted communication environment in which Web Services operate, there are legitimate concerns on the security of the Web Services. In this paper, we first give a detailed overview of issues surrounding Web Service. Then we investigate the previous works that have been done for solving these issues and describe their limitations.

The rest of the paper is proceeds as follows. Chapter 2 discusses issues in Web Service. Chapter 3 presents existing solutions and their limitations. Chapter 4 highlights conclusions.

## 2. Web Service Issues

According to World Wide Web consortium (W3C) report on Web Services [8], there are several issues in Web Services. First, with the increasing amount of Web Services on the Web, the service consumers are always presented with a group of services offering similar or same functionalities. How to find out the appropriate one among the large numbers of Web Services is the challenging problem. It is important to provide service consumers with facilities for discovering an optimal Web Service according to their preferences.

Second, the context of Web Service is dynamic and several kinds of changes and faults may arise after deploying them. A recent investigation shows that among 5077 Web Services, only 4033 (approximately 79.4%) services can work correctly [8]. One of them is Quality of Service (QoS) faults which take place during the run time. The QoS is influenced by the parameters such as response time, availability, latency, throughput etc., which are calculated at runtime. As these parameters may change time to time, it leads to deviation in QoS which leads to various faults. The easy solution to the above problem is to reselect the services every time a change occurs. However, it is not feasible due to

the high complexity of the reselection, which will interrupt the execution of composite service, lead to an extra delay and influence the performance of the composite service [3]. Therefore, there is a need for performance prediction technique in order to minimize reselections by preventing future requesters to use the current service involved in the QoS parameter violations.

Third, considering the untrusted communication environment in which Web Services operate, there are legitimate concerns on the security of the Web Services. New survey results of senior Information Technology (IT) executives sponsored by Computer Associates [7] demonstrated that despite the growing use of Web Services by large corporations, security is still a major concern that is slowing their deployment, according to. One key finding in this survey was that 43 percent of the respondents felt that security was the most important issue surrounding the deployment of Web Service application. There are many security issues in Web Services. Among them, we will discuss XML Rewriting attack which is a class of attacks based on the malicious interception, manipulation and transmission of SOAP messages.

## 3. Related Studies

There have been numerous researches that have targeted service discovery, recovery from faults and security issues in Web Service (Table 1).

Reputation based methods are one of the latest measures for narrowing down the service discovery. In [1], authors proposed a model for reputation-enhances QoS-based Web Services discovery. It combines an augmented UDDI registry to publish the QoS information and a reputation manager to assign reputation scores to the services based on customer feedback of their performance. In [9], authors present a technique to calculate a reputation score per service using centrality measure of Social Networks. However, these reputation mechanisms are simple and not robust against various cheating behaviors, such as collusion among providers trying to boost the quality of their own services.

Reselection of failed services is one of the widely used mechanisms to guarantee the reliable execution of Web Service. In [7] authors address the issue of Web Service availability and present a framework, WS-Replication which uses multicast to communicate with the replicas of Web

&lt;Table 1&gt; Comparison of selected approaches

Approaches/ Requirements	Service Discovery Approaches [1, 9]	Recovery Approaches [7, 10]	Security Approaches [2, 4, 6]	WS-DIRECT [5]
Discoverability	Yes	No	No	Yes
Recoverability	No	Yes	Some	Yes
Performance Prediction	No	No	No	Yes
Security	No	Some	Yes	Yes

Service. In [10], authors proposed a QoS-driven transactional service reselection model for reliable replacement. The model reselects Web Services not only according to their QoS characteristics but also to their transactional properties. Mentioned approaches [7, 10] provide recoverability by reselecting the failed services. However, it is not feasible due to the high complexity of the reselection, which may lead to an extra delay and influence the performance of the services [3].

Different solutions have been proposed to protect Web Services from XML Rewriting attacks. For example, in [6] the authors proposed an inline approach that takes into account information about the structure of the SOAP message. In [2] the authors extended the inline approach by proposing to take into account new characteristics of SOAP message such as the depth information and parent elements of the signed node. In [4], we demonstrated that above mentioned methods [6, 2] cannot address all type of XML Rewriting attacks and proposed an ontology-based security detection mechanism. In that approach, ontology lets us build hierarchies and thesauri that show how elements within SOAP message relate to one another. So if the attacker modifies the SOAP message, it is detected by observing the change of the relationship of the signed elements.

The main limitation of discussed solutions is that they gave separate solutions to solve issues in Web Service. In order to overcome this limitation, in [5] we proposed the WS-DIRECT framework. In this framework, first, discoverability is provided through a Functional-Level Mediation which is semantic discovery mechanism. It discovers proper services by semantically describing customer's goals and provider's Web Service capabilities by means of carefully designed ontologies and logical expressions. Second, recoverability is handled through self-healing cycle, which has three phases such as monitoring, diagnosis and repair. Classifiability is provided by Decision Tree based Web Service classification mechanism, which is able to predict the performance and minimizes number of reselections. Fourth, trustworthiness is maintained through ontology-based security mechanism which is able to detect and recover from XML Rewriting attacks.

#### 4. Conclusion

In this paper, first, we gave a detailed overview to issues surrounding Web Service. Then we investigated the previous works that have been done for solving these issues and demonstrated their limitations. The main limitation of discussed solutions is that they gave separate solutions to solve different issues in Web Service. We believe that there should be a single, unified solution to deal with the issues discussed in this paper.

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#### Reference

- [1] Bansal, S. K., Bansal, A.: Reputation-based Web Services Selection for Composition. In: Proceeding of IEEE World Congress on Services, pp.95-96 (2011)
- [2] Benameur, A., Kadir, F. A., Fenet, S.: XML Rewriting Attacks: Existing Solutions and their Limitations. In: IADIS Applied Computing (2008)
- [3] Dai, Y., Yang, L., Zhang, B.: QoS-Driven Self-Healing Web Service Composition Based on Performance Prediction. In: Journal of Computer Science and Technology, pp.250-261, Vol.24, No.2 (2009)
- [4] Nasridinov, A., Hung, P. P., Qing, L., Byun, J.Y.: XaT-SOAP: XML-based Attacks Tolerant SOAP Messages. In: Journal of KIISE: Computing Practices and Letters, Vol.18, No.6 (2012)
- [5] Nasridinov, A., Byun, J.Y.: WS-DIRECT: Web Service – Discoverability, REcoverability, Classifiability and Trustworthiness. In: The 7th International Conference on Ubiquitous Information TEchnologies & Applications (CUTE 2012)
- [6] Rahaman, M. A., Rits, M., Schaad, A.: An Inline Approach for Secure SOAP Requests and Early Validation. In: OWASP Europe Conference, May (2006)
- [7] Sales, J., Perez-Sorrosal, F., Patino-Martinez, M., Jimenez-Paris, R.: WS-Replication: a Framework for Highly Available Web Services. In: Proceeding of the International Conference on World Wide Web, pp.357-366 (2006)
- [8] World Wide Web consortium (W3C): Web Services Architecture Requirements, <http://www.w3.org/TR/wsa-reqs/>
- [9] Xu, Z., Martin, P., Powley, W., Zulkernine, F.: Reputation-Enhanced QoS-based Web Service Discovery. In: Proceeding of IEEE International Conference on Web Services, pp.249-256 (2007)
- [10] Yin, Y., Zhang, B., Zhang, X.: QoS-Driven Transactional Web Service Reselection for Reliable Execution. In: Proceeding of International Conference of Information Science and Management Engineering, pp.79-82 (2011)