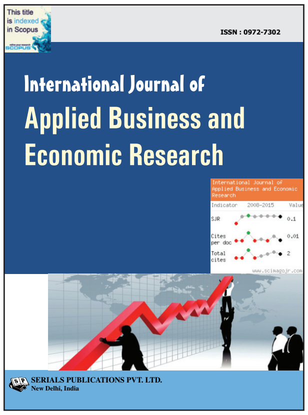

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A Survey on QoS of Real World Web Services

S. Maheswari[1] and Justus Selwyn[1]

[1] *School of Computing Science and Engineering, VIT University, Chennai, TN. Email: maheswari.s@vit.ac.in, justus.s@vit.ac.in*

ABSTRACT

Web benefit revelation is the essential procedure and conventional technique that uses watchword based pursuit to find the suitable web service. This strategy may not produce more good results. However, the non-real Quality of Service (QoS) parameters of the network benefits assume an essential part of locating the network's benefits. For example, UDDI, WSDL, and SOAP have the ability to provide QoS -based web benefits exposure. Various research works are going on in the field of failure probability but there are also some other aspects which need to be taken care of like response time, throughput and quality of service among others. Hence research in these fields may prove to be more efficient if done in sophisticated manner. This paper presents the survey conducted on earlier works on the QoS of web services in four different aspects.

Keywords: Web service, quality of service, service evaluation, Failure dataset, Quality of Service data set.

1. INTRODUCTION

Web services are open standards (XML, SOAP, HTTP, etc.). Web application that work with other Web application, with the ultimate goal of transaction information[3]. UDDI has given a stage to both requesters and distributers to discover and distribute web administrations of their advantage. Web administration and production is sought through the UDDI Business Registry (UBR). UBR does not give enough innovation / support to find important network benefits, for a variety of reasons .One critical among a few purposes behind the above issue is that current APIs just adventure watchword based seeking systems.

This is not appropriate for every one of the applications the same number of web administrations share regular functionalities. By utilizing proper web administrations, client can get to savvy homer (*e.g.* real world web services invocation). The aim of this paper is investigate the QoS of Real-World Web Services. We will take a lot of statistical datasets and evaluate the performance of different selection methods that require realistic QoS values for web services. Finally, some interesting discoveries and useful suggestions are given to the world.

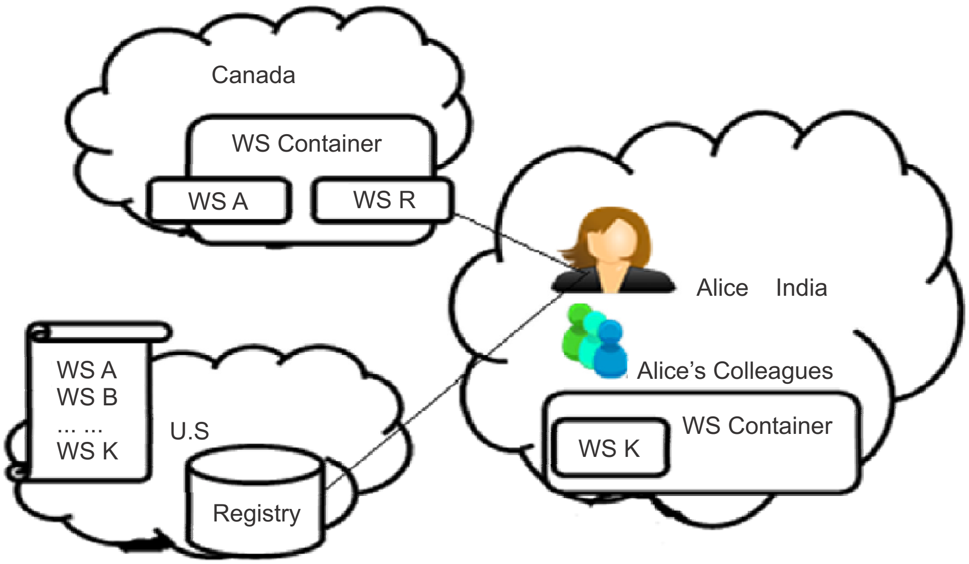

Figure 1: Web Service interaction

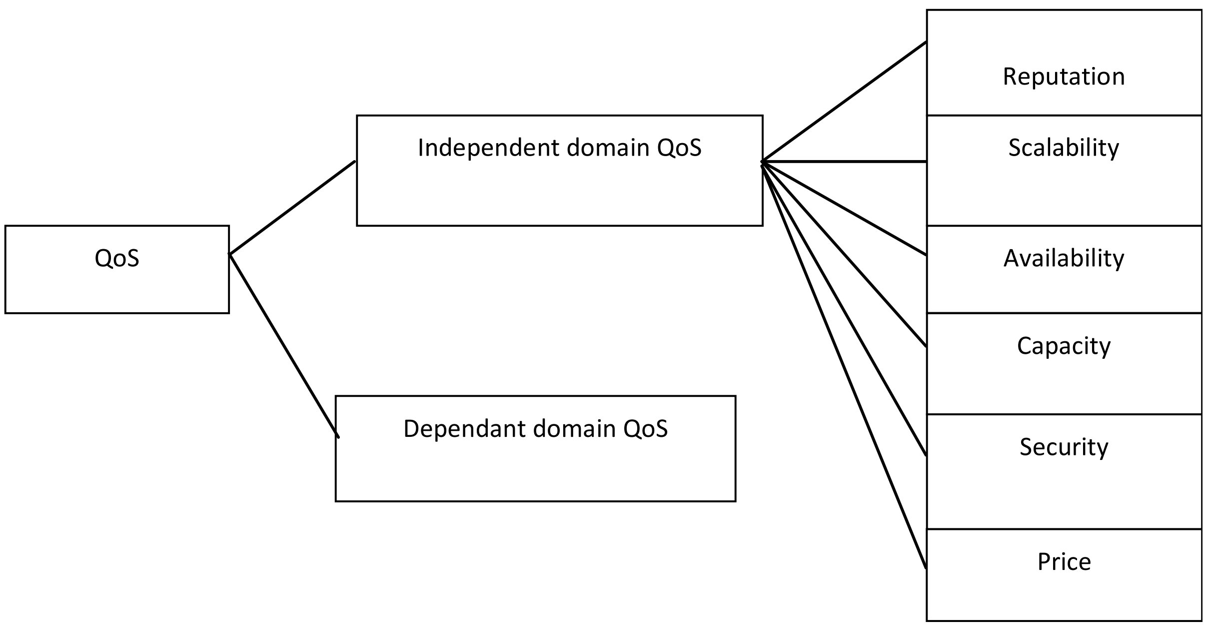

Figure 2: Services offered by Web services

Throughput : Web administration's capacity to handle most extreme demand at a given time.

Availability : Web services opportunities to respond

Response time : Represents the unit of time in milliseconds for sending requests and receiving responses

Interoperability : Web services compatibility to incorporate a given set of standards

Accessibility : The probability of a normal response to a request without any delay

2. A SURVEY ON THE WEB SERVICES

In this section we have presented the survey we have conducted on the web services for its QoS.

2.1. Quality of Service

In[3], Quality of service is to be identified in several stages of providing the service as a service provider, assessing the service as a user or the consumer and during the phase of monitoring the web service. We can measure the quality of service either only by functionality or only by non-functional factors of response time likewise. But both the ways of measuring the web service is more effective and also it is difficult to do that. Web Service Description Language describes almost all of the basic properties in the format of metadata. [Table 1] shows different aspects of Quality of service. More quality parameters are introduced by constructing the model of ontological structure.

Table 1
Quality of Service

Author, year	*Technique*	*Merits*	*Dataset*	*Suggestions*
M. Ahmadi Oskooei and S. Mohd Daud,2014	QoS attributes and metrics is used	Instrument decreases the many-sided quality of neighborhood and worldwide limitations set by the administration client.	Ontology web service	In this paper we can easily get conclusion using any web service example.
Z. Zheng, Y. Zhang and M. R. Lyu,2014	Service evaluation	By using larger datasets will help us achieve near to accurate results	Number of web service	Probability of the service can be considered and it is easy to find conclusion if taken data were large.
E. Khanfir, C. E. Hog,et al 2014	QoS Adaptive Selection Method	There are two stages, the first is QoS-based administration sifting The second step is to choose the administration from the initial step, which fulfills the client's specific situation and his inclination	AWS-Q Registry data structure	Knowledge representation of data to be used for the user preferences
Z. Zheng, X. Wu et al ,2013	Quality of Service ranking prediction framework	Using this method we can save time and reduce the cost of invocation of web service	Quality of Service values on real-world Web services	We can use these techniques (information smoothing, irregular walk, lattice Factorization) for improve ranking accuracy

In[4], the authors propose many evaluation approaches for a service to produce the best effective web service with the help of real world data. Using real world data, finding the quality of web service is rare. They give experimented data for future research to find more quality parameters other than response time, failure rate probability and throughput.

In[5], the paper introduces context aware approach for the user to better understand and selecting of the service. Zibin Zheng[12] suggested the invocation of web services in cloud environment to predict the quality of the service using ranking of web services and rating of web services. We need to detect and false Qos values for improving the quality.

2.2. Application Aspects of Web Services

ZhiJun Ding et el[1] Commonly web services performance to be measured at server as a provider perspective or as a client perspective. In middle we obviously need to know the transactional properties of the service selection. While the selection of a suitable web service the occurrence of the problems could be solved by using of genetic algorithm. They discussed complexity analysis of the transactional properties of the web service.

In paper[2] it is proposed that systematic service selection approach for certain real time services to measure the cost and the time. More qualities of services suggested making the service as effective. Some of the different applications that can be done with web services are presented in [Table 2].

Table 2
Application aspects of Web services

Author, year	*Technique*	*Merits*	*Dataset*	*Suggestions*
Z. Ding, J. Liu et al, 2015	Transaction and QoS-Aware service selection.	It can figure the execution time of Composite Web Service and can ensure the productivity and exactness	Concrete and abstract web services	Experiments can be done with real time data
P. Khullar, D. Panwar and A. Sharma, 2015	Systematic service selection approach	This approach Introduced QoS of composite web services and probability of each path in the web services.	Online reservation, online shopping, on line Library management.	Availability of the service can be considered

2.3. Web Service Deployment and Assessment Strategy

In ARIMA model[6] the work for predicting the resources for effective utilization of the available resources in the cloud environment proposed. Dynamic work load distribution handles the problem of load balancing and prediction of the workload. Reactive module added with architecture in future. In CASP method[7] describe about the assessment of web services in productive way based on the user's service plan.

Compared with the greedy algorithm and CASP gives more accuracy of the user dependent and independent properties. They proposed effective web service selection for sequential structure. STFC[8] gave framework for allocating the resources in remote locations using virtual machines. Paper[8] presents the designed fuzzy controller for tuning the adaptable web service. Based on the benchmark RUBiS worked for analysis of fluctuations in three types of server namely web server, application server and database server[9].

In database server found as more fluctuation with respect to response time in cloud based environment. The different aspects are presented in [Table 3].

Table 3
Web Service deployment and assessment strategy

Author,Year	*Technique*	*Merits*	*Dataset*	*Suggestions*
R.N. Calheiros et al , 2015	Autoregressive Integrated Moving Average (ARIMA) model.	Using this method we can get up to 91% accuracy.	A real-world request from the Wikimedia Foundation to the Web server	In this paper they find approx. median if they find accurate median conclusion will be more effective.
S. Deng, H. Wu,et al ,2016	Correlation-Aware Service Pruning method	Tests demonstrate that this strategy can deal with the mind boggling connection amongst administrations and enhance the QoS of composite administrations.	Customized services	We can extend work to administration arranges with more perplexing structures later on.
J. Rao, Y. Wei,et al, 2013	Self-tuning fuzzy control (STFC) approach	Using this approach we can get better versatility and security	Dataset of real time web service	If Taken data set was large they can easily get conclusion.
] S. Guo, L. Cui,et al,2015	Cross-tier-proportion methods	Booking to smooth reaction time variances in multi-level brought on by long or blend exchange simultaneous	multi-tier systems	Throughput of the service can be considered

2.4. Web Service Provisioning

TSSA[10] says about the provisioning of web service based on the transactional properties based on an individual and grouping of candidate services. During the evaluation of transaction mechanism some failure occurs. Then cost of the web service increased the failure stage. In paper[11] it is discussed to provide the expected services for the users based on the user's location and network conditions. Online and offline complexity measured using the number of services and the involved users for invoking the services. Grouping the related users gives more adaptable services. Sometimes the region users get slight dissimilarity in response time. Suggested future works for embedding the google map services for finding the more related users to improve the accuracy for service recommendation. Paper[12] proposes the prediction of quality in service by comparing the previous history of the consumers. Gives the prediction values based on item based, user based and the combination of item and user based categories. Graph based search algorithm gives more controls over the execution of the services are given in [13]

Test set is used in PlanetLab. In [14], the redundancy of unused services removed for improving the execution cost of the service is discussed. Consider dataset as a WSDL file and analyzed whole service set for removing failure mode services and also unused services. In [15], presents the analysis based on large amount of data to produce reasonable response time and throughput of the service. Collaborative filtering approach[16] generates the report to the active users by comparing the past history parameters with respect to the existing users of the same service. The provisioning aspects with its limitations are presented in [Table 4].

In the above discussed survey, the four dimensions of QoS of web services are very much important for finding a better web services for the end-user to invoke. These dimensions did throw some light on the works done earlier in the QoS aspect of real-time web services.

Table 4
Web Service Provisioning

Author,Year	*Technique*	*Merits*	*Dataset*	*Suggestions*
J. Cao, G. Zhu et al, 2012	Global optimization service selection algorithm (TSSA)	This method can solve all the problem of transactional property.	Comparison between TSSA and MCSP-K Algorithm	We can consider the recovery cost of the failed organization to decrease the compensation cost and restart incident in organization decision
X. Chen et al, 2013	Novel collaborative filtering algorithm	This approach fundamentally enhances the expectation precision than the current techniques paying little respect to the scantiness of the preparation lattice.	Real time QoS's performance dataset	Workload of the server and network conditions can also be considered
Z. Zheng et al ,2013	Quality of Service ranking prediction framework	Using this method we can save time and reduce the cost of invocation of web service	Quality of Service values on real-world Web services	We can use these techniques (information smoothing, irregular walk, lattice Factorization) for improve ranking accuracy
P. Wang et al, 2014	Novel preprocessing and Graph search-based algorithm	This technique can be connected to the general WSC issue, and produces all the conceivable Solutions	Test set ICEBE05	Experiments can be done with real time data
M. Chen et al, 2012	QoS-aware service composition algorithms	This strategy demonstrated to have preferable execution over a standard whole number programming solver.	WSC09 datasets	You can expel superfluous administrations from the arrangement, which lessens the execution cost.
Z. Zheng et al, 2013	Collaborative Quality-of-Service prediction approach	This methods makes conditions time saving and cheap.	Number of Real time web services and its invocations	Real-world Web service QoS datasets can be used
] Z. Zheng et al, 2010	Collaborative filtering approach	This algorithm achieves better prediction accuracy than other approaches	Number of Real time web services and its invocations	Probability, availability of the service can be considered and it is easy to find conclusion if taken data were large.

3. FINDINGS FROM THE SURVEY

The paper has made an extensive study of different aspects of web services. Some of the findings we could point out are given in Table 5. The WSDL download failure rates are calculated with some preliminary experiments using real-time web services. The most common failures is 404-file not found. 31.2% of failures from 1579 web services. The QoS of WS is affected by network is about 15% which is often the failures of network gateway, timed-out on read or on connection. The hosting web server's internal error contributes to 9.86% for 499 WSs.

Table 5
WSDL Download Failures

Codes	*Descriptions*	*#WS*	*Percentage*
404	Failures of File Not Found	1579	31.20%
504	Failures of Gateway timeout	801	15.83%
N/A	Failures of Read Timed Out	778	15.37%
N/A	Failures of Connection Timed out	771	15.23%
500	Failures of Internal Server Error	499	9.86%
400	Failures of Bad Request	265	5.23%
403	Failures of Forbidden	174	3.43%
401	Failures of Unauthorized Access	111	2.19%
502	Failures of Bad Gateway	62	1.22%.
N/A	Failures of Unknown Host	13	0.25%
N/A	Failures of Redirect Too Many Times	4	0.07%
503	Failures of Service Unavailable	2	0.3%
505	Failures of HTTP version Not Support	1	0.01%
405	Failures of Method Not Allowed	1	0.01%

Error codes 400, 403, 401 and 502 amounts to a total of 12% approximately that are due to authorization and bad requests. Not able to find a host, this means discovering a WS accounts to only 0.25% which is very minimal in our experiment with 13 WS. Availability of WS is one of the key-factors in the QoS dimensions. It is only 0.3% for 2 WS which is negligible even when the WS increases in number. The other failures of method failure of HTTP request failure are very negligible in real time scenarios.

[Table 6] shows Generation failures which happen after the invocation of the WS. The highest being the invalid file format of WSDL which often ends in termination of the WS. Then the invocation has to start as a separate new thread. Parsing WSDL error is another common error that amounts of 32.78% for 1246 WSs. Invocation target error mostly occurs due to technical faults (TF) like non-availability of resources or infrastructures that amounts to 22.13% failures. The rest of the types of failures occur due to runtime external parameters, and their failure rate is very less compared to other failures. The different findings from our survey study and a few experiments with real-time web services are presented in [Table 5], [Table 6] and [Table 7].

Table 6
Generation Failures

Failure Types	*#WS*	*Percentage*
Invalid File Format	1354	35.63%
Error Parsing WSDL	1246	32.78%
Invocation Target	841	22.13%
Empty File	323	8.50%
Null Q Name	32	0.84%
Data binding Unmatched Type	4	0.10%

While the invocation of web services all around the world from different locations, failures occur in code. In[4] used java code for invoking all the real time services from the various sources of webservicex.net, seekda.com, xmethods.net, webservicelist.com. The types of the failures predicted and represented in the [Table 6].

The QoS metrics used for evaluating the web services are:

$$\text{Mean} = \frac{\text{No. of Web Service Failure}}{\text{Types of Failure}}$$

$$\text{Standard Deviation} = \frac{\sqrt{\sum(x - x)^2}}{\text{N} - 1}$$

$$\text{Quartile Deviation} = \frac{\text{Q3} - \text{Q1}}{\text{Q3} + \text{Q1}}$$

Table 7
Statistics of real time web services assessment

Statistics	*Values*
Invocations of Web Service	1682684
Service Users	200
Web Service	150
User Countries	34
Web Service Countries	30
Quartile Deviation of Failure Probability	0.738%
Standard Deviation of Failure Probability	17.98%
Failure Probability(of Mean)	4.43%

In PlanetLab[4] conducted experiments with remote computers of 200 users for invoking 150 web services available from the collected dataset from the sources of all the service providers like "webservicex. net","seekda.com", "xmethods.net","webservicelist.com". The involved countries are 34. Assessing the service in countries are 30. From the available data, we can find the quartile deviation of failure probability as 0.738%, standard deviation of the failure probability as 17.98% and mean of failure probability as 4.43% [Table 7].

4. CONCLUSIONS

This paper evaluates the QoS observed by Web service users. A large number of Web services are executed by the service user in different environments of the actual Web service. In our future work, failure probability, response time and throughput, guaranteed, availability of more QoS attributes will be checked. We can measure the data through skewness, t -test, f-test, z-test and chi square test for evaluating the QoS of web services. The study has revealed that the web service challenges are dependent on the type of application for which it is being developed and the nature of users.

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