Send Orders for Reprints to reprints@benthamscience.ae

The Open Automation and Control Systems Journal, 2014, *6*, 1891-1895 1891

Open Access

A Method for Calculating the Reliability of Web Services

Hongxia Wang* and Yu Liu

School of computer science and engineering, Shenyang Ligong University, Shenyang 110159, P.R. China

Abstract: As the number of Web services on the network, a large number of functionally similar Web service appears, choose the best service has become a very difficult problem. According to the credibility of Web service QoS to select the service is a better solution. This paper puts forward a method of calculating the reliability of QoS information. Firstly, use the average value of all the credibility of Web services users have posted as an initial value, then use the weight function to calculate the reliability of QoS information, achieved the change of initial credibility of QoS information is smooth, solved the problems of unstable at the early stage of the algorithm based on statistical principle. The simulation results show that the change of the credibility of various service is relatively smooth, prove the validity of the algorithm.

Keywords: Web Service, QoS information, weight function, reliability.

1. INTRODUCTION

Web service is a platform-independent, low coupling, only contains a programmable Web-based applications, it as a remote call technology with its open, cross-platform features have been loved by the IT sector. However, a large number of Web services are published on the Internet will inevitably be several services with similar functions, such as several companies in the same industry are posted to the Internet service, which presents a problem, the caller needs are similar in function select a Web service best service. It was proposed based Web service QoS information to select the service, but this will bring new problems, on the one hand, due to the grade of equipment is also different between the complex changes in the network environment and consumer services will lead to practical the performance of the service exists and declared some differences, on the other hand, the service publisher might deliberately exaggerate the performance of services and mislead consumers.

So far, many scholars have credibility on the Web service QoS calculation madea positive study [1]. Beth and other first proposed the concept of trust and methods to quantify the trust into direct trust and recommendation trust, and then use statistical methods based on the probability of success and failure to calculate the trust, and gives synthetic methods trust. Document [2] proposed a system based on trust feedback PeerTrust, model distinguish the recommendation trust and transaction trust, and the degree of satisfaction with feedback on the transaction as a parameter to assess trust. Document [3] proposed property-based computing reputation credibility method, in essence, is based on the feedback of evaluation methods. Document [4] proposed the introduction of the "facts" of this concept, the credibility of the method to measure QoS statistical "facts". Document [5] raised from the publisher, monitoring information and user experience QoS indicators to consider evaluation methods, this method can truly reflect the QoS indicators web services. Document [6] proposed monitoring feedback based on statistical methods to calculate the probability of a given QoS information credibility WSrepu. The above methods are based on statistical methods, these methods have a common drawback is based on statistical methods in a smaller amount of data when it is not accurate enough in essence, as the credibility of the service call in the early stages when there is less than credible calculation may fluctuate too much, if the initial cause fluctuations in a particular service credibility is very low, this service may never be called, then the credibility of the services can never be correct calculation. This paper presents a reliability calculation method based on statistics, but the right to use the initial value of the function and reliability to improve statistical methods based on the initial fluctuations huge disadvantage, so that the credibility of the change smoother, guaranteed service in calculating the correct can be called before credibility.

2. THE WEB SERVICE DESCRIPTION MODEL AND QoS INFORMATION

OWL-S is the semantic W3C recommended Web service description language which description of the OWL-S service can be computer unambiguity interpretation and understanding, easy to realize dynamic web service discovery, dynamic scheduling and dynamic combination [7-9].

At present OWL-S is described mainly in the input and output parameters, service category, the premise and the results of static semantic information, Static semantic information which describe specific areas is still not perfect, that the dynamic characteristics of services describe the problem not fully consider the Qos dynamic characteristics; do not clearly distinguish between service providers and requesters etc. This will cause some problems, for example, when faced with the same input and output parameters, class of service, the premise and the results and the different functions of the services, the computer cannot distinguish; Some complex

RETRACTED ARTICLE

services may be dynamically interactive continued with the environment, leading to the status of the service constantly changing, this will have some effect on the process of implementation of the service; Some of the Qos attribute of service will show the dynamic characteristics with the change of time. Therefore, in this paper, based on the OWL-S syntax structure, through extension method improve the static semantic information and add dynamic semantic information, puts forward the service description framework as shown in Fig. (**1**), It mainly includes the basic information, function service information, executive information, collaborative information and quality information such as the static and dynamic properties, which can reflect more detailed, real-time, dynamic to describe service and some of the dynamic Qos properties.

In the service description framework, the information service quality is defined as the Qos three layer description model, namely the Qos metadata, general domain Qos and special field of Qos, as shown in Fig. (**2**). Among them, Qos element description is the base for defining the domain of quality of service, it appeared in the form of general domain ontology; Qos is not the functional attributes of Web services, common used mainly include: cost, efficiency, usability, reliability, credibility and safety; special field Qos is leading the no functional properties, common domain application to such as: accuracy, real-time, completeness, validity.

3. CALCULATION OF SERVICE QoS CREDIBILITY

Firstly, the definition of the algorithm needs, and then give the process of the algorithm. Web service QoS algorithm using information credibility and weight of the initial function of statistical methods to deal with severe jitter may occur early credibility.

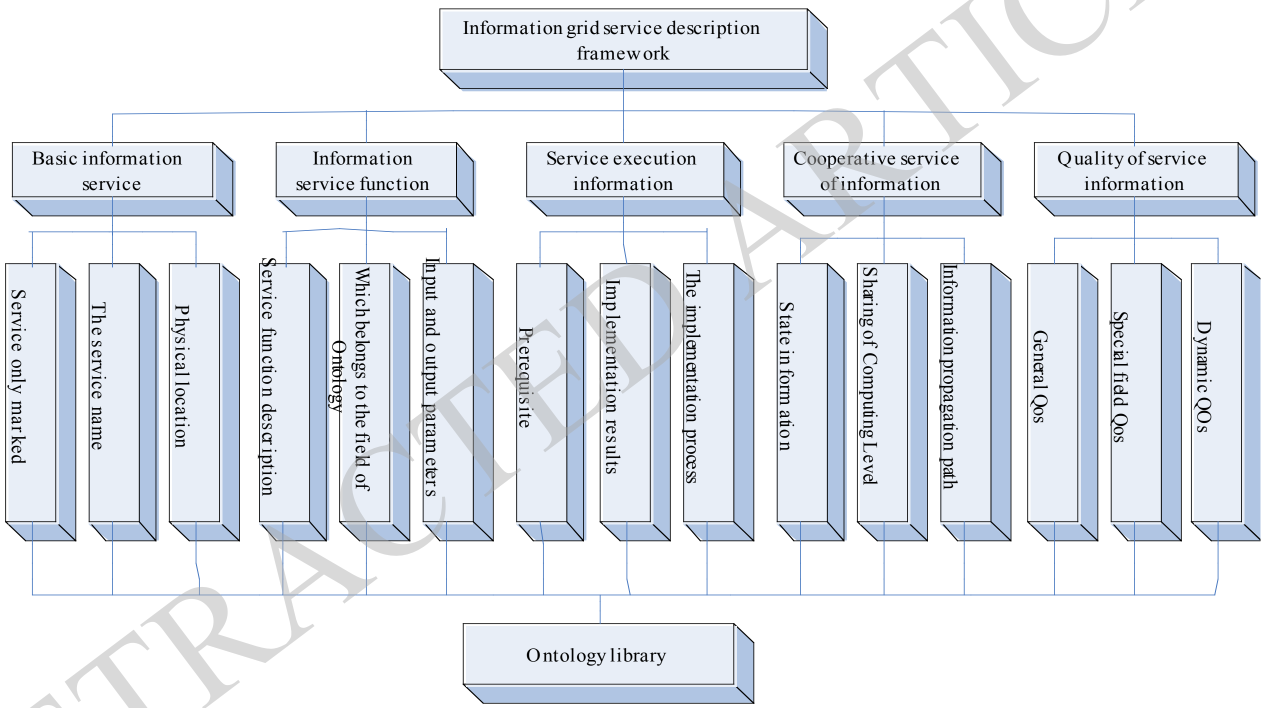

Fig. (1). The web service description framework.

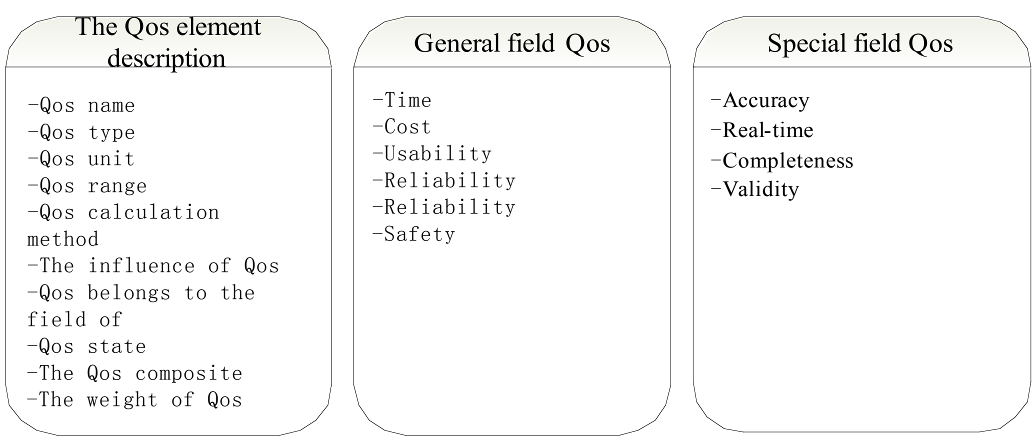

Fig. (2). The Web service description model of three layer QOS.

RETRACTED ARTICLE

3.1. Definition

Definition 1. Vector Web service QoS information released

Published every Web service may be many months QoS information, you need a QoS information vector $Q\,(q_1, q_2 ......q_n)$ to represent them and $q_k (1 \le k \le n)$ represents the k-th QoS information of Web services.

Definition 2. Real-time QoS information vector

After each Web service call, the monitor QoS information corresponding to each of the services is a real-time QoS information, which is represented by $Q\,'(q_1, q_2 ......q_n)$ and $q'_k (1 \le k \le n)$. Represents the k-th Real-time QoS information.

Definition 3. Web service QoS information dissemination credibility vector

QoS information corresponding to each Web service will have a credibility which is represented by $C(c_1, c_2, ..., c_n)$ and the credibility of the value is between 0 and 1 ,and $c_k (1 \le k \le n)$ represents the k-th credibility.

Definition 4. Post proportion Web QoS information services have been met

$$p = \frac{s}{n} (0 \le s \le n, n \ge 1) \tag{1}$$

n is the total number of the service invocation, s is n times a call release to meet the QoS information is the number of service calls, when p is stable and the QoS information corresponding to the reliability.

Definition 5. Weight function

$$b = \frac{1}{e^{-ax}} (x \ge 1) \tag{2}$$

Where x represents the first several times to call the Web service, a function used to adjust the shape of the weights b used to weigh four formulas in Definition 3 and

Definition 6. Weighted credibility

$$c_k = b \times c_k + (1 - b) \times p \tag{3}$$

Where c_k is the reliability of the k-th QoS information defined in Definition 3.

Definition 7. QoS information reliability and overall credibility of the weight vector

Due to the different services of different QoS for different degrees of information concerned, the reliability can give different weights to different, and even if an integrated reliability.

The credibility of the weight vector is represented by $W(w_1, w_2, ..., w_n)$, and $w_k (1 \le k \le n)$ represents the k-th weights QoS information credibility.

$$zc = \sum_{j=1}^{n} w_j \times c_j \tag{4}$$

in the formula (4), zc representative Comprehensive credibility.

3.2. Calculation Process

The reliability calculation process to the k-th calculation QoS information as an example.

When the publisher to publish a Web service, each Web service QoS information system will give the credibility of the initial value, the initial value is equal to the average of all the credibility of Web services publisher published. If the publisher before the release of this service has not released any of the services, then the credibility of this service QoS information initial value of one, because there is no reason to say that the service there is any credible, and can ensure that the calculation process in prior to the credibility of this service has been invoked convergence. When the service is released, for recording the number of times n the service call and invoke the QoS information satisfies the number of release are all initialized to 0 s.

But consumers select and successfully invoke a Web service, the monitor will automatically get the service call after the real-time QoS information vector q '.

First determine QoS information released to meet the real-time QoS information is satisfied.

For the release of the QoS information satisfies the two conditions.

In the first case, QoS information value as small as possible, such as the service response time, service price, but after the call to the real-time QoS information of a particular Web Service Monitor get smaller than the publication described the QoS information satisfies the call release QoS information.

The second situation is just the opposite, and the first case, is the value the better QoS information, the accuracy of services such as real-time QoS information obtained after calling the service monitor QoS information than the big release before the call to meet the published description QoS information, or is not satisfied.

However, when the call release to satisfy the QoS information, on the right of the formula (1), s and n plus one, and if not only the release of the QoS information is of the formula (1) plus one.

Then calculated using the formula (2) a weight b, the weights are changed with the number of calls is changed, when the right to determine the number of calls, the more value the closer to zero. The calculation of Web service QoS information call the credibility of the single ck with the formula (3). Finally, calculated using the formula (4) Comprehensive credibility after this call Web services.

4. ALGORITHM ANALYSIS AND SIMULATION EXPERIMENT

The simulation calculates values of the necessary parameters from a single integrated Qos information credibil-

RETRACTED ARTICLE

ity and the credibility of the calculation to validate the proposed algorithm.

4.1. Necessary Parameter Values

When using only the formula (1) to calculate the reliability is entirely based on statistical methods, this method when calculating the credibility of the initial volatility is likely very large, but found about statistics to call the service to post about 300 times when observed through simulation experiment (1) began to converge formula, to the 600 or so to a greater convergence in probability.

Formula (2) is the exponential function .If a value is too large, the formula weights b (2) in decline too quickly, leading to formula (3) premature dependent formula (1) so that the credibility of convergence has not yet appeared excessive volatility. If a value is too small weights b decline is too slow, resulting in formula (3) too late to rely on formula (1) so that the credibility of convergence slows down. After the experiment, the formula (3) in a value of 0.01 is more appropriate.

As shown, when a = 0.0001, the credibility of the function causes the function too dependent on the initial convergence is slow, when a = 0.1, the function of over-reliance on statistical formulas, making the credibility functions huge fluctuations.

4.2. Comparison of Experimental and Calculated Individual Credibility

First calculate the response time of credibility, said the response time of a random number of real-time QoS information to meet the expectations of two variance for a normal distribution, the service call 500 times. Response time is 3 QoS information dissemination, credibility initial value of 0.8. The experiment with the literature [4] proposed to compare the experimental method based on statistical WSrepuu. The theory is that all services meet the reliability requirements of the service Qos proportion.

As can be seen from the figure proposed algorithm is more stable than a simple algorithm based on preliminary statistics WSrepu credibility is too low will not happen.

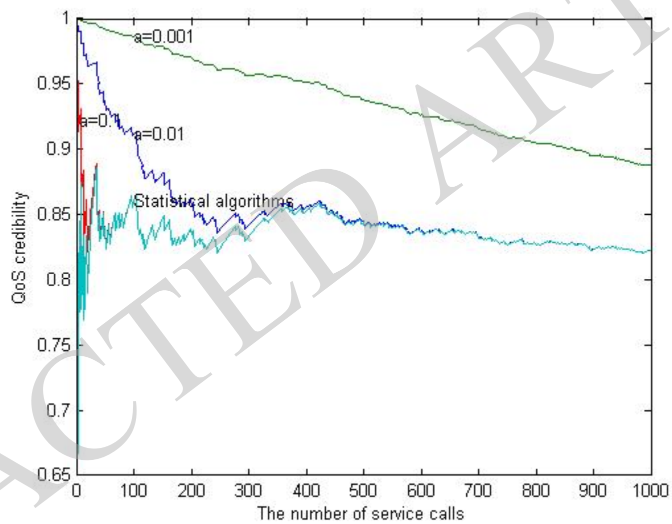

Fig. (3). Reliability curves for different values of a .

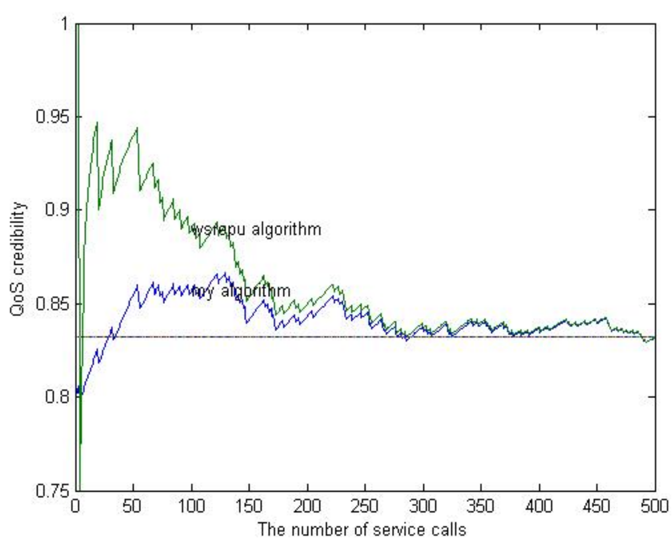

Fig. (4). Comparison of this method and WSrepu methods.

RETRACTED ARTICLE

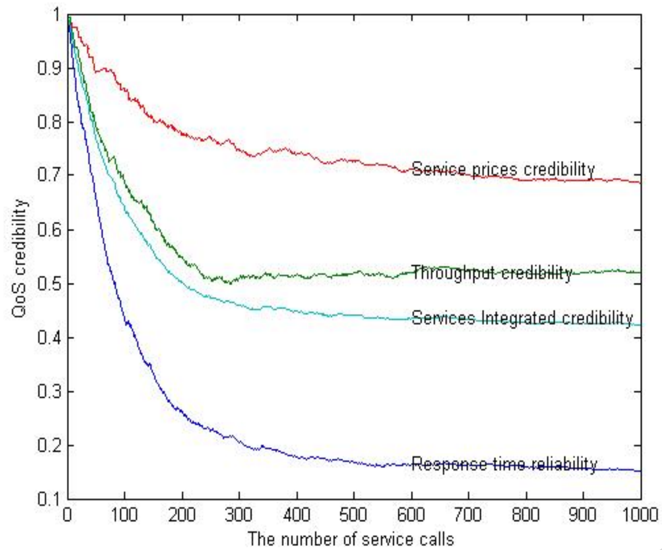

Fig. (5). Comprehensive credibility test of this method.

And the latter is consistent with the method based on the credibility of the statistics.

4.3. Comprehensive Reliability Calculation

Comprehensive credibility experimental experiments in Web services, including QoS information service price, throughput, and service response time, service prices and service response time is the small value of the type QoS information, the throughput is great value type QoS information, the initial value of a virtual service call 1000 times.

As can be seen from the figure, the credibility of each change in services is more smooth, and the call to 400 when the algorithm has converged, indicating that the proposed algorithm is correct.

5. CONCLUSION

According to the calculation method of reliability based on the principle of statistics at the early stage of the instability problem, this paper discusses the use of all the credibility of Web services users have posted average as an initial value, and use the weight function to make statistical algorithms can very smooth QoS information calculated to achieve credibility. Avoiding possible because credibility is too low to cause the credibility of pre-calculation difficulties can not be carried out. And preliminary experimental simulation verify the rationality of this paper algorithm.

CONFLICT OF INTEREST

The authors confirm that this article content has no conflicts of interest.

ACKNOWLEDGEMENTS

This research was partially funded by the National Natural Science Foundation of China (Grant No. 61301256), Supported by Program for Liaoning Excellent Talents in University (No. LJQ2013021).

REFERENCES

[1] T. Beth, M. Borcherding, and B. Klein, "Valuation of trust in open network", in Proceedings of the European Symposium on Research insecurity Conference, 1999, pp. 59-63.

[2] J. J. Zhou and C. D. Mu, "A kind of application-specific QoS control in wireless sensor networks", in Proceedings of the IEEE International Conferenceon Information Acquisition, 2006, pp. 456-461.

[3] H. H. Li, X. Y. Du, and X. Tian, "A capability enhanced trust evaluation model for web services", *Chinese Journal of Computers*, vol. 31, pp. 1471-1477, 2008.

[4] S. Kalepu, S. Krishnaswamy, and S. W. Loke, in Proceedings of the IEEE International Conference on Web Services, 2004, pp. 200-207.

[5] Y. Li, M. H. Zhou, and R. C. Li, "Service selection approach considering the trustworthiness of QoS data", *Journal of Software*, vol. 19, pp. 2620-2627, 2008.

[6] G. Q. Liu, Z. L. Zhu, and H. Wang, "Credibility of Web service QoS evaluation model", *Journal of Chinese Computer Systems*, vol. 30, pp. 2216-2221, 2009.

[7] F. Tao, D. M. Zhao, and L. Zhang, "Resource service optimal-selection based on intuitionistic fuzzy set and non-functionality QoS in manufacturing grid system", *Knowledge and Information Systems*, vol. 25, no. 1, pp. 185-208, 2010.

[8] J. Wang, W. D. Zhao, and Y. X. Cheng, "Restriction based battlefield information services matching algorithm", *Journal of Computer Applications*, vol. 33, pp. 76-81, 2013.

[9] Z. L. Liu, "*Should sustainable consumption and production be a policy priority for developing countries*", Natural Resources Forum, vol. 34, no. 1, pp. 85-89, 2010.

Received: September 16, 2014 Revised: December 23, 2014 Accepted: December 31, 2014

© Wang and Liu; Licensee *Bentham Open*.

This is an open access article licensed under the terms of the (https://creativecommons.org/licenses/by/4.0/legalcode), which permits unrestricted, non-commercial use, distribution and reproduction in any medium, provided the work is properly cited.

RETRACTED ARTICLE