

IMPROVING THE NON-FUNCTIONAL QUALITY OF SERVICE (QoS) ATTRIBUTES OF WEB SERVICES FOR TOURISM

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Abstract - The Quality of Service (QoS) non-functional model that compose of four criterions as parameter for the quality of web services model such as Service Cost, Service Response Time, Service Availability And Service Reputation. By improving the non-functional QoS attributes the performance of the web services could be improved. The performance of existing ones is not satisfactory, since it is implemented with either the improvement of Service Response Time or Service Availability. In this proposed model it deals about the improvement on both the Service Response Time (SRT) and Service Availability (SA) for tourism.

Index Terms: Service Response Time (SRT), Service Availability (SA), Service Cost (SC), Service Reputation (SR).

I. INTRODUCTION

QoS is defined as the ability of a web service to respond to expected invocations. A web service is a piece of software that is available over the internet and uses a standardized XML messaging system. Web service enables communication among various applications by using open standards such as HTML, XML, WSDL, and SOAP.

HTML (Hypertext Markup Language)

HTML is the collection of markup symbols or codes in a file for display on World Wide Web (WWW). Visually engaging interfaces for web application are created.

XML (Extensible Markup Language)

XML defines a set of rules for encoding documents in both the format human readable and machine readable

<? XML version = "1.0" encoding = "UTF_8"?>

WSDL (Web Services Description Languages)

WSDL is an XML based language and is used for describing the functionality offered by a web services. It provides a machine readable description of how the service can be called, what data structures it returns and what parameter it expects.

SOAP (Simple Object Access Protocol)

SOAP is a protocol description for exchanging structured information in the implementation of web services in computer networks. For its message format it uses XML information set.

II. RELATED WORKS

In [10], Web services are the collection of software components and standards for the next generation technologies. Web service is integration with GIS application, to produce cooperative interface for travel and Tourism Domain. GIS (Geographic Interface System) based technology integrates common database operations such as **query and statistical analysis** with the unique visualization and geographic analysis benefits offered by maps.

Service Availability is the probability that the service can be accessed and used. It is a role of the number of times the service responds to a request and the number of total requests made to the service. It can be expressed by

$$a_{ij} = \frac{req_{ij}}{tot_{ij}}, tot_{ij} \neq 0, i \in [1..m] \quad (1)$$

Service Response Time has been calculated using time quality **tij** measures the execution time between the instants the request is sent and the moment the results are received **j**

$$RT = \sum t_{ij}, i \in [1..n], j \in [1..m] \quad (2)$$

Quality of service (QoS) is a combination of several qualities or properties of a service, such as: Availability, Response Time, Throughput and Security. Some web services adopt a best policy but do not guarantee the requests for services will be accepted and no guarantees on response time, throughput, or availability are provided. For longer-term relationship with users of the services they [2] are going for Service Level Agreement (SLA).

Service Level Agreement (SLA) is referred as agreement between two or more parties, where one is the customer and the others are Service Provider. It is technically defined in terms of Mean Time between Failure (MTBF), Mean Time to Repair or Mean Time to Recovery (MTTR). In presence of any type of network failure it is necessary to have ACID property.

The **two-phase commit protocol** is used to assurance the ACID property in distributed database systems. It is a type of Atomic Commit Protocol (ACP). It works well even in temporary system failure and the drawback is that is a **blocking protocol**.

Response time of structured BPEL (Business Process Execution Languages) [12]. The constructor sequence corresponds to a sequential execution of s1 to sn elementary Web services. The analytical formulas of mean response time $E(T^{sequence})$ is given by [11].

$$E(T^{Sequence}) = \sum_{i=1}^n E(Ti) \quad (3)$$

Methods for web services performance optimization is SOAP Compression [5]

$$T = (E \div N) - (Z \div C)(second) \quad (4)$$

- Improve the performance of web services when T is positive.
- Does not improve the performance of web services when T is negative.

Scalability of web services can be improved by reducing the time spent at the slow server by Daniel A.Menasce in [4]. Where g is the slowdown factor of web services N and G is the overall slowdown factor.

$$G = \frac{T(g)}{T(1)} \quad (5)$$

Availability is a function A (t), which is the probability that the system is operational (i.e., distributes the correct service) at instant of time t. This function quantifies the alternation between deliveries of correct service and incorrect service. A system can fail to deliver a correct service due to the following reasons [3].

- The presence of faults, caused by system errors;
- The presence of overloading condition, i.e. the server is very busy that it is unable to deliver a correct service.

The maximum time elapses from the moment that a web service receives a SOAP request until it produces the corresponding SOAP response [8]. It is calculated as

$$R = T1 - T2 \quad (6)$$

Where T1 = Time at which web service produces soap response.

T2 = Time at which web service receives soap request

Availability of the web service is the probability of the service is accessible. It is calculated using the following expression,

$$q_{av}(s) = \frac{T_i(s)}{n} \quad (7)$$

In [9], it measure the overall response time taken using Automation testing tool which has the Data transfer time, Server Processing time and page rendering time.

$$\text{Overall Response time} = \text{Server processing time} + \text{Data transfer time} + \text{page rendering time} \quad (8)$$

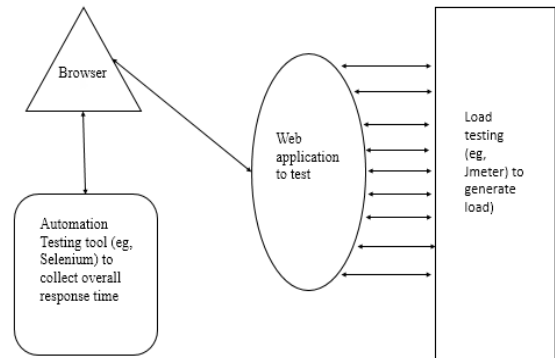


Fig: 1 Approach to get Overall response time using automation tool during load test

III. PROPOSED SYSTEM

The Quality of Service (QoS) non-functional model that compose of four criterion as parameter for the quality of web services model such as Service Cost, Service Response Time, Service Availability and Service Reputation. In this proposed model it deals about the improvement of Service Response Time (SRT) and Service Availability (SA). By improving this non-functional Quality of Service (QoS) attributes, the performance of the web services could be improved.

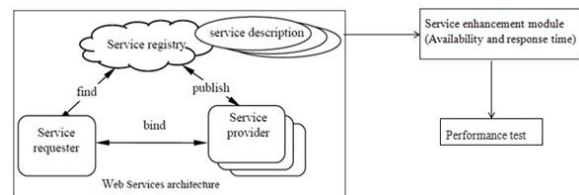


Fig: 2 Web Service Architecture

3.1 Web Services

Web Services are software components described via WSDL which are capable of being retrieved via standard network protocols such as SOAP over HTTP. Web services provided by different vendors have changeable characteristics. Different Web services with different QoS (Quality of Service) requirements will complete for system resources and (bandwidth, processing time). An enhanced QoS for Web services will bring competitive advantage to service providers.

3.2 Web Service Roles

- Service provider (or) Publisher
- Service Requestor (or) Consumer
- Service Registry

applications utilizing services. Overall response time of web services can be calculated using Jmeter. Summary report is shown by Fig 3

3.2.1 Service Provider

This is the provider of the web service. The service provider implements the service and makes it available on the internet or intranet.

3.2.2 Service Requester

The requestor utilizes an existing web services by opening a network connection and sending an XML request.

3.2.3 Service Registry

This is a logically integrated directory of services. The registry provides a central place where developers can publish new service or find existing ones. It therefore serves as a centralized clearing house for companies and their services.

IV. PSEUDO CODE

```
//Availability
long Total_msec= 30*24*3600*1000,
Total_upmsec,Total_downmsec;
float downtime_percent, uptime_percent;
int days,hours,mins,secs,msecs;
if(days > 0 || days < 30)
{
if(hours > 0 || hours < 24)
{
if(mins > 0 || mins < 60)
{
if(secs > 0 || secs < 60)
{
if(msecs > 0 || msecs < 1000)
{
Total_downmsec = (days*24*3600) + (hours*3600) +
(mins* 60) + (secs * 1000) +1000;
}
}
}
}
}
}
}
}
Total_upmsec = Total_msec -Total_downmsec;
downtime_percent = (Total_downmsec / Total_msec) * 100;
uptime_percent = 100 – downtime_percent;
```

V. RESULTS AND DISCUSSION

Service Response Time (SRT) can be calculated using Jmeter. It is an open source tool can be used to test

Label	# Samples	Average	Min	Max	Std. Dev.	Error%	Throughput	KB/sec	Avg. Bytes
/jmeter/ind...	500	260	236	1071	66.47	0.00%	3.1/sec	10.80	3635.9
/ads/hal/ba...	500	252	231	761	50.06	0.00%	3.1/sec	2.03	677.0
/jmeter/cha...	500	277	242	1408	102.13	0.00%	3.1/sec	20.06	6675.0
/jmeter/usa...	500	267	239	1017	95.51	0.00%	3.1/sec	14.58	4651.9
/jmeter/usa...	500	285	249	1519	105.40	0.00%	3.1/sec	31.11	10351.9
/jmeter/usa...	500	266	238	1106	94.11	0.00%	3.1/sec	10.45	3469.9
TOTAL	3000	268	231	1519	88.61	0.00%	18.3/sec	88.22	4943.6

Fig: 3 Summary using Jmeter

Availability of a web services can be calculated using the Pseudo code. In the existing system the availability is calculated in sec. In this proposed system the availability is calculated in msec (millisecond). When compared to sec in msec the availability will be more accurate. Fig 4 will describes the availability

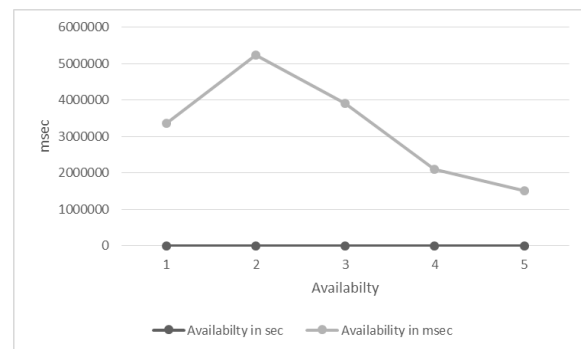


Fig: 4 Availability

VI. CONCLUSION AND FUTURE WORK

Tourism is a major revenue making domain globally. It is a kind of travel to gain leisure-time, spiritual-trip and family or job purposes, typically for a little span of duration. Here the major problem is lacking in obtaining the available tourism domain properties (Places to visit, Hotel, Pilgrims, and Airways etc). Web services are playing a vital role in the software industry. The proposed system improves the Service Response Time (SRT) using JMeter tool and Service Availability (SA) using the Pseudo code. Future work is by combing the Service Response Time (SRT) and Service Availability (SA) the performance could be improved.

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