

# Web Services Based On SOAP and REST Principles

Snehal Mumbaikar\*, Puja Padiya\*\*

\*Department of Computer Engineering, R. A. I. T.

\*\*Department of Computer Engineering, R. A. I. T.

**Abstract-** Interest in Web services is rapidly increased from their start of use. To exchange information among the application in standard way is the main goal of web services. This communication between the applications is based on SOAP and REST principle. SOAP communications causes network traffic, higher latency and processing delays. To overcome this limitations the REST'ful architecture is used. REST is a lightweight, easy and better alternative for the SOAP. In this paper comparison on performance of SOAP based and REST'ful web services based on different metric for mobile environment and multimedia conference is taken into consideration.

**Index Terms-** Web services, SOAP, REST, Multimedia Conferencing, Mobile Computing.

## I. INTRODUCTION

Previous technologies such as RMI, CORBA and DCOM were used to create client and server applications. These are used in highly coupled distributed systems, in which both server and client are dependent on each other. Compatibility and security problems arise when we use these technologies. This kind of traffic will block by firewall and proxy servers. Highly coupled systems are mostly used for intranet applications because platform and technology used is already known or same on both server and client side. Therefore we are using a web service which is standard way to distribute services over the internet. The clients don't have any prior knowledge of the web services before they actually use it, therefore WEB SERVICE are platform independent and loosely coupled. There are two types of web services based on SOAP principle and REST principle. Various applications such as conferencing, web application can be developed using SOAP and REST'ful web services. In SOAP based web services XML is used to define simple object access protocol (SOAP). REST'ful web services follows REST principle for distributed hypermedia systems. REST design style is defined as network architectural style because REST'ful web services depend on HTTP, HTML and other web technologies.

The goal of this paper is to make survey on SOAP and RESTful web services to show that RESTful web services having better performance. We give an overview of SOAP, REST, with multimedia conferencing, mobile computing services as an example for illustration. We then conclude the paper.

## II. RELATED WORK

The main purpose of web services is to create web applications. According to the geographic distribution in [1] most of the web services hosted in United States. This shows

the rapid acceptance of web service. To provide the infrastructure for the application distributed systems model uses web standards such as SOAP, WSDL, and UDDI. Web service uses xml for the communication as the XML language is worldwide accepted. The basic web service platform is XML + HTTP. To access the web service XML based SOAP communication protocol is used. Web service description is written in the web service description language. To publish and discover web service UDDI is used. These web standards and the use of the XML enables the systems to exchange information and interoperate at different location and in different environment. REST is becoming more popular now days due to its performance and ease of use as compare to SOAP web services. Because SOAP web service produces network traffic and causes higher latency. Research is going on to improve the performance of SOAP based web service. Because the SOAP follows the standard message format for communicate. The performance enhancement techniques are based on metrics in categories as throughput, network traffic, and response time [2]. The improving service execution time has been investigated in various aspects of SOAP processing addressing serialization, parsing and deserialization. There are few proposals which addressed the issue of improving SOAP security policy evaluation performance through improving underlying techniques such as parsing, caching, and multicasting. Numbers of alternatives are available for SOAP and REST'ful web service on principal level, conceptual level and technology level [3].

## III. SOAP

The SOAP based web service architecture is as shown in fig 3.1. Which defines 3 entities: - service provider, service registry, and service requester. The service provider is the service, the network addressable entity that accepts and executes request from consumer. The service consumer is an application, service or some other type of software module that requires a service. A service registry is a network- based directory that contains available services. The service consumer finds the service description in the registry which is published by the service provider. Using this description consumer starts interacting with the service. The communication among these entities is based on XML and SOAP protocol. SOAP messages composed by envelope, header and body [4]. The envelope element identifies the XML document as a SOAP message. A header element contains call and response information. Messages and method invocations are defined as XML documents and are sent over a transport protocol SMTP, FTP, HTTP.

#### IV. REST

The term representational state transfer was introduced by Roy Fielding. REST style architecture is client server architecture in which client sends request to server then server process the request and return responses. These request and responses build around the transfer of representations of resources. A resource is something that is identified by URI. Representation of resource is typically a document that captures the current or intended state of a resource. REST is less strongly typed than SOAP. The REST language is based on the use of nouns and verbs. REST does not require message format like envelope and header which is required in SOAP messages. So as XML parsing is also not required bandwidth requirement is less. Design principle of REST is as follows- addressability, statelessness and uniform interface. Addressability- REST models the datasets to operate on as resources where resources are marked with URI. A uniform and standard interface is used to access the rest resources i.e. using fixed set of HTTP methods. Every transaction is independent and unrelated to the previous transaction as all data required to process the request is contained in that request only, client session data is not maintained on server side therefore server responses are also independent. These principles make the REST application simple and lightweight. The web application which follows the REST architecture we call it as RESTful web service. Restful web services uses GET, PUT, POST and DELETE http methods to retrieve, create, update and delete the resources.

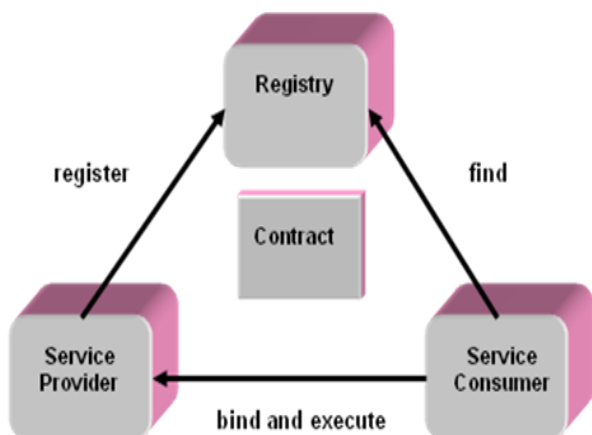


Figure 3.1: Web service architecture.

#### V. PERFORMANCE COMPARISON OF WEB SERVICES

Previously we are using the SOAP based web services in mobile computing environment, multimedia conferencing and many other applications. But the use of SOAP messages require large bandwidth, encoding and decoding of XML based SOAP messages consumes resources; these are the unacceptable performance overheads. Therefore we are using RESTful web services as an alternative to get better performance. For their performance comparison we are considering two applications such as multimedia conferencing and mobile computing.

The main requirement of mobile computing is connection of mobile system to a conventional distributed computing environment, for that we are using web services. Now

considering performance of SOAP and RESTful web service in mobile computing environment where the service client is mobile application. [5] Evaluates the performance of both web services which provides the same functionalities in mobile computing environment. Two benchmarks are implemented based on float and string data type as parameter to the web service. The service client runs on mobile emulator. Results are captured for SOAP and RESTful web services in terms of total response time and message size. Table I shows that,

1) Message size in RESTful web services (in both cases) is 9 to 10 times lesser than size of SOAP based web services message.

2) Similarly time required for processing and transmission is also 5 to 6 times lesser than SOAP based web services.

Now taking multimedia conferencing into consideration these are audio-video conferencing, distance learning, online games etc. we can develop SOAP based and REST based web services for such applications. Multimedia conferencing model (e.g. parlay-x's conferencing model) is based on 3 entities – conference, participants, and media [6]. Where participant is an entity which participate into the conference, conference is uniquely identified context to which we can add and remove participant. The media represents the media stream which support participant's communication. We can develop such multimedia conferences using web services based on SOAP and REST principle. Now comparing performance of SOAP and REST based web services in multimedia conferencing application. [7] Gives this performance evaluation by considering different scenario such as Get conference, Adding participant, removal of participant, Get participants, End of conference. For implementation of conferencing application API for web services conferencing gateway is used. The request handlers for both web services are part of this conferencing gateway to handle the SOAP and REST communications with their applications. Table II shows that Performance evaluation of all scenarios as:

1) End to end time delays of RESTful web services are 3 to 5 times less than the SOAP web services.

2) The network load for RESTful web services is nearly 3 times lesser than SOAP based web service.

Similarly in short messaging service (SMS) for sending and receiving a message RESTful web services are used rather than the SOAP [8]. This is because SOAP and RESTful web services provides same functionalities but request and responses of SOAP based web services are written in SOAP format and then enveloped in an HTTP message while RESTful web services not uses SOAP format and only uses HTTP as application layer protocol.

#### VI. CONCLUSION

As we know web services are widely used over internet. Web Service performance is became an important factor. From the above analysis we concluded a RESTful web service is a better alternative for SOAP based web services. SOAP based web services are produces considerable network traffic, high latency and the message size is also large this is not in the case of RESTful. The RESTful web services have better performance than SOAP based web services in wired and wireless communication network. The RESTful web services are lightweight, easy and Self-descriptive with higher flexibility and lower overhead.

**TABLE I :** PERFORMANCE RESULTS OF SOAP AND RESTFUL WEB SERVICES IN MOBILE COMPUTING [5].

Number of array elements	Message Size (byte)				Time (Milliseconds)			
	SOAP/HTTP		REST (HTTP)		SOAP/HTTP		REST (HTTP)	
	String Concatenation	Float Numbers Addition	String Concatenation	Float Numbers Addition	String Concatenation	Float Numbers Addition	String Concatenation	Float Numbers Addition
2	351	357	39	32	781	781	359	359
3	371	383	48	36	828	781	344	407
4	395	409	63	35	828	922	359	375
5	418	435	76	39	969	1016	360	359

**TABLE II:** PERFORMANCE RESULTS OF MULTIMEDIA CONFERENCING USING SOAP AND REST INTERFACES [8].

MULTIMEDIA CONFERENCING API	SOAP-based			REST-based		
	<i>Delay in a distributed environment (ms)</i>	<i>Delay on the same machine (ms)</i>	<i>Network load (bytes)</i>	<i>Delay in a distributed environment (ms)</i>	<i>Delay on the same machine (ms)</i>	<i>Network load (bytes)</i>
Create conference	848.4	381.7	767	171.4	102.7	273
Get conference information	818.6	335.3	546	172.3	98.6	177
Add participant	1325.3	334.2	578	368.8	103.3	200
Remove participant	1322.3	357	588	382.9	107.2	195
Get participants	787.1	342.7	615	197.8	104.8	195
Get participant information	766.2	346.7	619	169.8	105	204
End conference	1508.4	341.4	500	556.6	105.3	204

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## AUTHORS

**First Author** – SnehalMumbaikar, M.E.(Computer Pursuing), Department of Computer Engineering, R. A. I. T.  
Email: snehalmumbaikar1@gmail.com

**Second Author** –PujaPadiya,M.E.(Computer)  
Department of Computer Engineering, R. A. I. T.  
Email: puja.padiya@gmail.com