

## A Software Standard and Metric Based Framework for Evaluating Service Oriented Architecture

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### Abstract—

The paper proposes a metric based framework for evaluating service oriented architecture. Different models and metrics have been proposed in different perspective for evaluating service oriented architecture, but it has been recognized that the available models and metrics are insufficient. This paper gives a software standard based way to identify measurable attributes to propose metrics. This paper proposes four steps. In the first step the attributes of qualities and characteristics of services are identified from software and service standards. In the second step, sets of attributes for each quality and characteristic which are not having metrics are formed by comparing with the available metrics. In the third step metrics and models have to proposed and validated for the sets which are identified in the second step. Finally, with the proposed metrics and models service oriented architecture can be evaluated. Thus this paper proposes a framework for proposing a complete set of metrics as a standard for evaluating service oriented architecture.

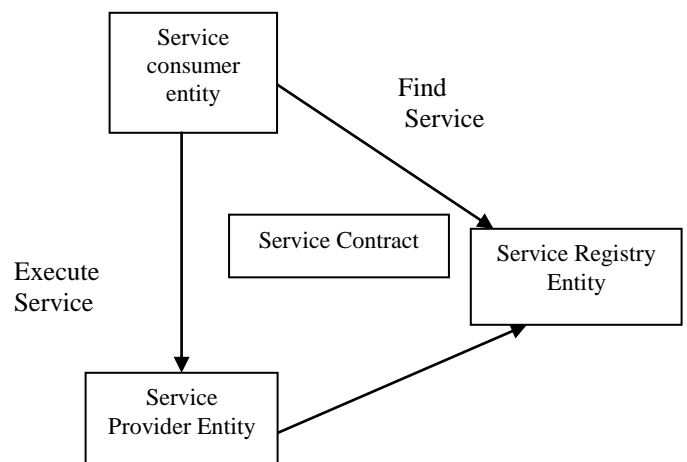
*Keywords-Standards, metric based framework, Service Oriented Architecture, SOA, evaluation*

### I. INTRODUCTION

The software architecture of a program or computing system is the structure or structures of the system, which comprise software components, the externally visible properties of those components, and the relationship among them[1]. The most fundamental truth about architecture evaluation is that “If architectural decisions determine a system’s quality attributes, then it is possible to evaluate architectural decisions with respect to their impact on those attributes. An unsuitable architecture will cause disaster on a system. In order to avoid disaster, we have to evaluate the architecture. So if we find any deviation at the early stage itself we can rectify it.

A service oriented architecture (SOA) is a collection of services which communicate each other by means of passing data. A service is a function that is well defined, self-contained and does not depend on the context or state of other services. SOA configures entities to maximize loose coupling and reuse[6]. Service oriented architecture mainly consists of three entities namely, Service consumer entity, Service provider entity and Service registry entity (Fig. – 1).

The consumer entity may be an application or a service or some software module which requires a service. It searches the service registry entity for finding an appropriate service. Once it found, the service consumer entity binds and execute the service by sending a formatted request as per given in the contract. The service provider entity is a network addressable entity and is a service that accepts and executes requests from consumer entity. The service provider entity publishes its contract in the registry for accessing by service consumer entity. A service registry entity accepts and store contracts from service providers and provides those to interested service consumer entity. It is a network based directory that contains available services.



Register Service

Figure.- 1

To construct the service oriented architecture mere having the services is not enough. Different service providers may provide services with same functionality. But we need right kind of services which are properly designed and built. So we need an evaluation method to assess services and their alignment need with business needs. In this we proposed a framework for evaluating SOA. The goal of the evaluation is to determine how well the service the follow the SOA principle or practices.

## II. RELATED WORKS

In various papers different models with metrics have been proposed for evaluating SOA/web services in different perspectives. Most of the work did not take into account the entire characteristics and quality of services. And also they did not consider the service with business alignment. Zain in [7] classified the QoS in three different perspectives: Developers qualities, Provider qualities and Consumer qualities. In paper [8]Si Won Choi has given a quality model for SOA taking the quality attributes, Availability, Performance, Reliability, Usability, Discoverability, Adaptability and Compos ability in consumer's perspective. The same author in [9] given a quality model in the

perspective of provider considering the quality attributes, Availability, Reliability, Performance, Dynamic Discoverability, Dynamic Adaptability, Dynamic compos ability. Bingu Shim in [10] suggested a quality model for SOA and considered some of the design properties of SOA: Coupling, Cohesion, Complexity, Design Size, Service Granularity and consumability. In [11]-[16], different attributes of SOA like Reusability, Complexity and Coupling, Reliability, Usability, Security and Performance are taken for evaluating SOA. Jing Wnag [17], presented an evaluation method for the services in SOA to promote business and IT alignment.

## III - THE PROPOSED FRAME WORK AND ANALYSIS

In this section we propose a framework for evaluating service oriented architecture. This framework divides the process in four steps (Fig.-2). The first step is the identification step. Here Design, Software and Business qualities of SOA are identified. In the second step measurable attributes but yet metricated are extracted. In the third step metrics are defined for the attributes extracted in the second step. Finally, in the last step the services of service oriented architecture is evaluated with the defined metrics.

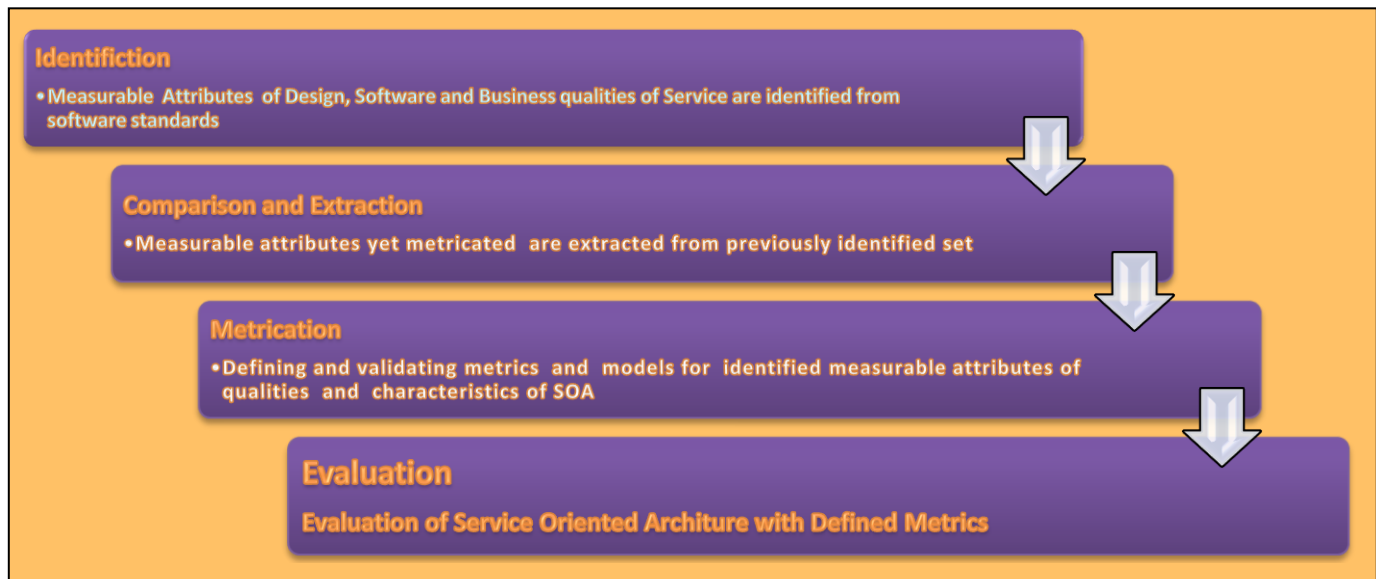


Figure – 2 Framework for Evaluating Service Oriented Architecture

### 1. Identification of Attributes of Qualities

The first step is the identification of attributes of the qualities of service oriented architecture. The qualities may divide into three categories viz. Design Quality, Software Quality and Business Quality.

In the service evolution process, first stage is the design stage. At the design stage the service has to design using modeling language. When service designed, it has to adhere the design qualities of SOA. A design characteristic of something is simply an attribute or quality. Any business solutions have unique design

characteristics. Service orientation also emphasizes the creation of very specific design characteristics which are attainable to a certain measure. This means that it is not about whether solution logic does or does not have certain characteristic; it is almost always about the extent to which a characteristic can or should be realized [2]. Since the proper design characteristics leads to the quality services, it is important to measure how extent the design characteristics were realized. Hence, here we have to identify the all measurable attributes of each design qualities.

The next is the development stage. The service must adhere the quality characteristics of software. A Software Quality model is a structured set of Quality Characteristics of Software. There exist several Quality models for Software Systems, one of the most relevant was established in ISO9126 [1], classifying the software quality in a structured set of characteristics and sub characteristics. However, all these software quality attributes are not applicable to Web Services. For instance, installability can obviously not be applied to a web service. The quality attributes which related SOA [4] are taken into account for evaluation.

The next is business alignment stage. One of the key principles is that services are aligned with business goals, strategies, and operation of an enterprise [5]. When services are evaluated, it is a good practice to evaluate the service's business alignment characteristics also. When making decisions on whether to deploy services in Service Oriented Architecture, it is necessary to have some quantitative measures on the effectiveness of the services to business goals [3]. The alignment characteristic allows us to assess how well the service fit for the business operations and future strategy. The various factors which are used to assess the consistency degree of business purposes have to be identified.

The attributes of qualities are identified from various standards like ISO, IEEE, OASIS, etc. at the first step, attributes of design, software and business qualities are identified.

## 2. Comparison and Extraction of measurable attributes

In this step the measurable attributes of qualities which are not having metrics are extracted from previously identified set. This can be done by comparing the attributes with the available metrics which are defined in the standards. By this we can get a set of attributes which are not having metrics.

## 3. Defining Metrics

In this step metrics have to be defined for the attributes we got in the second step. After defining the metrics, metrics should be properly validated using suitable mathematical models. And analyzed by taking proper examples.

## 4. Evaluating SOA

Now we are having a complete set of metrics for evaluating service oriented architecture. Since we have taken design, software, business qualities of service, this framework contains a complete set of metrics for evaluating service

oriented architecture. Since it is a complete set, we can also propose this as a standard for service oriented architecture.

## IV CONCLUSION AND FUTURE WORK

In this paper, different models for evaluating services are discussed. Most of the models did not consider all the dimensions of services. We presented a model for evaluating SOA/Web services which considers three dimensions viz. design characteristics, quality and business alignment of SOA/web service and four steps are given to derive measurable attributes. Our future work will be on proposing a suite of metrics for all these three dimensions of service which will be used for evaluating Service Oriented Architecture.

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