

# A Service Identification Model For Service Oriented Architecture

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**Abstract**— Service Oriented Architecture facilitates more feature as compared to legacy architecture which makes this architecture widely accepted by the industry. Service oriented architecture provides feature like reusability, composability, distributed deployment. Service of SOA is governed by SOA governance board in which they provide approval to create the services and also provide space to expose the particular services. Sometime many services are kept in a repository which creates service identification issue. Service identification is one of the most critical aspects in service oriented architecture. The services must be defined or identified keeping reuse and usage in different business contexts in mind. Rigorous review of Identified service should be done prior to development of the services. Identification of the authenticated service is challenging to development teams due to several reasons such as lack of business process documentation, lack of expert analyst, and lack of business executive involvement, lack of reuse of services, lack of right decision to choose the appropriate service. In some of the cases we have replica of same service exist, which creates difficulties in service identification. Existing design approaches of SOA doesn't take full advantage whereas proposed model is compatible more advantageous and increase the performance of the services. This paper proposes a model which will help in clustering the service repository based on service functionality. Service identification will be easy if we follow distributed repository based on functionality for our services. Generally in case of web services where service response time should be minimal, searching in whole repository delays response time. The proposed model will reduce the response time of the services and will also helpful in identifying the correct services within the specified time.

**Keywords:** *Service-oriented Architecture, Service Identification, Repository, Case Study, Model, Services, Microservices, Response Time.*

## I. INTRODUCTION

Service identification plays a vital role in design of service oriented architectural based project. The fault of service identification impact whole design and implementation activities. This article focus on activities which can optimize the service identification process for service oriented architectural projects. Development in Service oriented architecture includes some different phases like Service-oriented analysis, Service-oriented design, and Service oriented development, Service oriented testing, Service deployment and Service administration[1],[3]. However

researchers have found many concepts on service identification in service oriented architecture, a unique method has not been discovered yet. Instead, a variety of heterogeneous approaches have been proposed. Many methods has been suggested like bottom-up approach, top-down approach and hybrid approach. A hybrid approach consists the functionality of bottom-up and top down both so called as 'meet-in-the-middle' approach. The goal of this paper is to optimize service identification process of SOA lifecycle. This approach can be considered as research contribution in building conceptual design of a SOA. The identification of service functionality is a basic precondition based on which implementation is done in service oriented architecture. Systems based on SOA can deliver a decent improvement in flexibility, agility to the organization. This increase of flexibility is termed as services. In an ideal situation the services don't need to change. The problem arises in identifying these services in such a way that we get the flexibility without losing performance [2]. The response of service identification take a lot of time, also provide a lot of related service which create confusion in choosing the right service at right time. Our proposal to divide the service repository in different cluster keeping eyes on each cluster so that replica of services is not deployed on another cluster. This phase provide the services which provide guarantee to fit with an organization's requirements [4, 5, 6]. Distributed Deployment is one of the key feature used in service oriented architecture which allows each services to respond separately, which can be combined as per business requirements. But the entities that are used by the services within the network or outside the network was not distributed, So services are now replaced with Microservices[1]. Similarly the supported databases or the repository should be distributed, This paper proposed a model which will be based on distributed system which allows clustering in the databases or repository. The clustering of repository will be based on the similar functionality and requirement of the services. The clustering will be helpful when services are identified for further use.

Section 1 describes the requirement of service identification and its importance in building applications. Section 2 presents the work has been done by the researchers already. Section 3 present the a enhancement in the existing service oriented architectural model. Section 4 provide the case study and comparison between existing and proposed model. Last section 5 includes the conclusion of the research.

## II. RELATED WORK

The need of service identification approach is recognized by several authors. Many authors agree on the point that services should be identified according to organizational business requirement [6]. However their work is not sufficient to present detailed analysis on service identification. They proposed difficult principles which doesn't follow systematic processes. They focused more on implementation as compared to design which causes complex architecture and service identification became a difficult activity. A lot of work has been done already on service identification, which includes top-down and bottom-up. A good comparison of service identification approaches has been founded by Karsten et al who support SOA development which is based on stakeholder approach. Inaganti et al [7] explained in details about service identification approaches. Some of the dependency faced issue on functional domain cause's human involvement more in the identification of services. Some work has been done by Zisman et al [8] on service discovery framework based on UML. The UML based service discovery mechanism is one of the most trusted mechanism to identify services in service oriented architecture. Service oriented architectural concept has been debated many times in recent years but most appropriate approach has not been identified yet. A number of approaches have been suggested but most appropriate approach has not been finalized. Approaches may vary based on service hierarchies and analysis objectives. Commonly used methods includes top-down and bottom-up using different methodology. We includes both these functionality in hybrid strategy, called as 'meet-in-the-middle' approach. We are still lacking behind consolidated approach that becomes obvious in a deviant regard of service categories. On the other hand approaches may vary in forms of documentation and implementation of service identification process [1],[3],[7].

Service Oriented Computing (SOC) is another approach that is used to implement distributed systems. It is a set of components as services that can be invoked and whose interface descriptions are published and discovered [14]. This allows services to be consumed individually as separate component. This divides the services into separate entities but the component that is used by the services still remains undistributed causes delay in response from the service.

This paper focuses on optimizing the service identification process in the service oriented architecture. Different approaches is being combined to overheads of the strategies to help attain understanding of what constitutes contemporary SOA in their successful implementation. In development of application, these are the methodical approach for identifying services which can increase the performance in the identification process of services in service oriented architecture.

## III. SERVICE IDENTIFICATION MODEL FROM CATEGORIZED REPOSITORY

Service Identification from the repository is a challenge when we have a lot of services exists in the repository. Sometime result of required service from the repository comes in bulk number which crates confusion in choosing right

services. It is really difficult to identify which one is correct, reliable and authenticated service. Our approach consists of four steps as shown in Fig. 1:

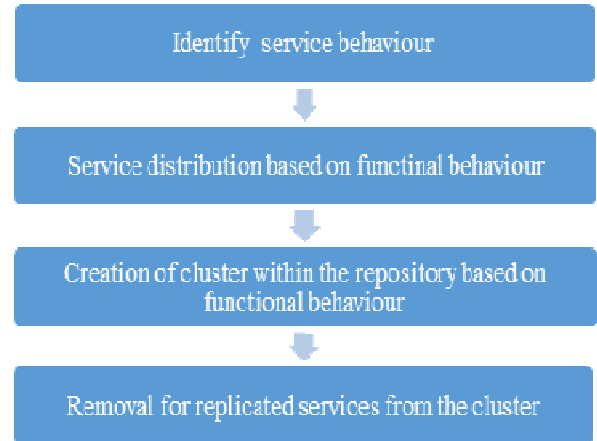


Fig 1. Service Identification Model

The first step of this model states the identification of similar services based on their functionality. The functional behavior will be based on SOA business model like services that performs transactions can be kept under a cluster and the services that handle error can be kept in another cluster. It has been analyzed that different services is being created for similar functionality, if services lies under different domain. Cluster based functional services will remove such redundancy. In the second step, we will create different chunks of services where services in each chunks performs similar behavior. Now the different set of the services will kept in different cluster within the repository in third step. Fourth step will check the replicated services inside each cluster, which will be an easy task to perform due to distributed architecture. All replicated services are removed to provide authorized and authenticated services to the consumer when services are searched within the repository. This will make the repository based distributed system which will reduce the response time of services when searched for future uses [9]. We can apply algorithm based on distributed system to choose the services based on similar functionality like less response time, transaction time, security etc.

The goal of our research is to understand and to explore how SOA development in its early stages and service identification in particular are performed in real-life projects. Due to this explorative objective, we consider case study research to be an appropriate method because a contemporary phenomenon is to be studied. The focus of proposed model is to create distributed service oriented architecture so that services can be identified from a particular branch which may save cost, effort and time [12]. The service identification will be easier as searched time will be decreased and authenticity of the services will be increased.

The proposed model has hierarchy states of advantages which have been shown in fig 2.

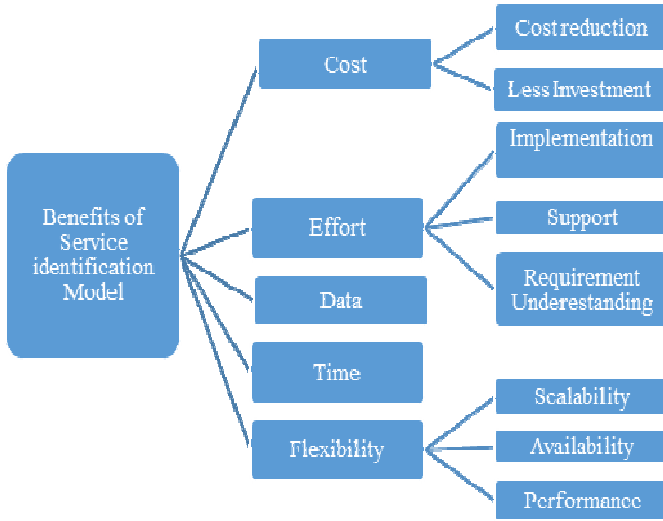


Fig. 2. Benefit from proposed service identification Model

#### A. Benefits of Distributed model for SOA repository

We have several benefits from distributed architecture. The Distributed architectural implementation in repository will be beneficial at several levels as described below:

- *Cost* – This is one of the most important factors which encourage adopting SOA based repository model. This will point to existing services and cost will be reduced.
- *Effort* – The second main criterion represents the effort required to enable the application. Efforts are required for the infrastructure setup, application setup and lastly to maintain the both. Major sub factors are as following.
  - *Implementation* – This sub factor represents the implementation effort required to install the hardware. The application, and customize the application as per business users.
  - *Support* – Each organization gets the support on its own way either by in-house resources or by sub-contracting to IT organizations. There are less organizations which does end to end support starting from infrastructure to application.
  - *Requirement Understanding* – It represents the understanding the business needs and map those needs to the application or solution.
- *Flexibility* – SOA based repository model shows the high level of flexibility to the organizations and its

users. Business and IT can take decisions and can help implementing those decisions in less time.

- *Scalability* – This sub factor represents the increase or decrease the usage of these resources such as RAM size, CPU, Storage etc. Based on the requirements, user can scale up or scale down the usage and pay accordingly.
- *Availability* – Most of the service providers offers more than 99.50% availability. Failure in provide the service level agreements leads to Penalty or deduction in amount payable for the month[<http://www.netmagicsolutions.com/service-level-agreements>]
- *Performance* – It is another sub factor, which represents the efficiency. Selecting the right service model, which offers the highest performance, is a challenging task. Evaluation of multiple performance areas, such as Performance of the application, hardware or Operating System, is required.
- *Application Type* – Application type is one of the most important factors. Based on the new business initiative one should select the right application and then right service model. Application can be used internally by the organization users or externally by the customers or the organization.
- *Data* – Storing and accessing the data safely in repository is always a question in the mind of organizations. What will happen to the data if an organization quits from their repository. Can anybody else access the data of the organization
  - *Data Security* – It is a sub factor, which requires deliberation at detail level. One should enquire about the reputation and level of security policies implemented in its data center. One needs commitment from the vendor as storing organization's data at some other premise can be harmful.
  - *Data Privacy* – Data Privacy is known as information privacy. Organization need to make sure that Data, stored in repository, is not shared with somebody else.
  - *Data Control* – Controlling data includes governance policies of the organization. Whatever data an organization's users are creating in the form documents or transaction is accessible to the users for update or delete. Data cannot be accessed by anybody else without the permission.

### B. Service distribution based on service type and functional behaviour

Our proposed model suggests a distributed architecture for repository or databases, which requires services to be classified based on their service type and functionality. Below we have classified some of the services and provided their functional scope:

Service Type	Functional scope based on Business
Master-data Service	Process fine grained services
Infrastructure Service (least granular)	Technical functionality
Process Service	Process predefined flow of business
Utility Service	Domain specific functionality
Composite Service	Services used to aggregate other services
Transactional-data Service	Process transactions
Business Service	Process business logic

Table 1: Distribution of services based on functional scope

## IV. CASE STUDY

We analyzed an existing service oriented architectural project and found the issues like delayed responses, errors in deliveries and higher cost. Customer was facing problems in monitoring and tracking the orders of customers as the process was complicated. A lot of confusion was created in placing the consumer order and delivering the order to the right place. Orders were tough to place, deliveries were delayed because stocks were not accounted for on time, shipments were delayed, and the whole experience had the customer service staff tearing at their hair. Due to the exchange of order, deliveries also moves to wrong places. The use of replicated service causes this type of issue. Service response also gets slow down causes decrease in the performance of a composite application. As part of case study we have analyzed the existing project in terms of time, cost, effort, performance, availability and security.

Before the proposed model all services was in a single repository which was not divided into cluster. The creation of cluster is done after the analysis of service behavior. If services functionality is same and it is not a replica of existing services which has been already chosen for a particular cluster then only we can choose a service as part of the cluster. If services seems to be the replica of the services which has been already chosen then we suggest SOA governance's board to remove the particular service from the repository itself. This removal of replicated service will help the consumer to connect with the correct services from the repository. Due to lack of satisfaction from existing service model of service

oriented architecture, a new technology based on distributed system know as service oriented computing(SOC) is replacing existing architectural model[13]. We implemented our proposed model in a project and found it's advantageous in several areas as shown in table 1:

Service Identification	Existing SOA repository Model	Proposed SOA repository Model
Time consumed in second	180	100
Cost involved in lacks	5	4
Effort in second	120	80
Performance in second	60	40
Availability in percentage	90	95
Security in percentage	90	95

Table 2: comparison of service identification before and after the implementation of Model

We can see the difference in result after the implementation of proposed model. Services are categorized based on their functionality which is kept under a cluster. This helps in service identification, consumer needs to traverse only in particular cluster rather to traverse the whole repository. Statistical analysis of the comparison has been shown in fig 3:

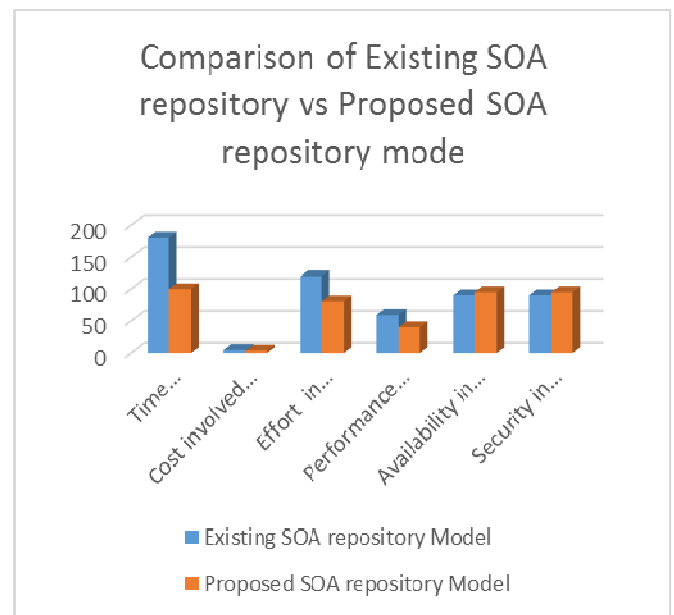


Fig 3. Comparison of service behavior before and after the implementation of Model

Service identification model will be useful for SOA based projects. It will save time, cost and will be more convenient to the user. Composite application requires several fine grain services. It was frustrating searching authenticated fine grain services from the repository as the result contains as large no of services fulfilling the same requirement. This model will not allow the existence of the services in the cluster which exactly behaves the same functionality which improves the reliability on the services.

#### V. CONCLUSION

This Service identification model propose an approach in which we can categorizes the services in cluster within the repository. Tracing of replicated services will also easy as we are clustering the services based on their functionality. When service identification is required, this approach will save time ,cost and will increase the performance .Services within the cluster will be authenticated service, as this model check the replication of the service within the repository .The existence of replicated service is not allowed in the cluster . The model will be helpful to SOA governance board as it is really difficult to track the services of whole repository .Service maintenance along with service identification will more easy and convenient . This model enhances the capability of SOA based project. It also ensures that service will be more authenticated, secure, and reliable.

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