

Service Oriented Architecture in Enterprise Integration

Meeraa Shahibo Faathima Fayaza

Department of Information and Communication Technology,
South Eastern University of Sri Lanka
fayaza@seu.ac.lk

Abstract. Today in the on demand market, organizations try to achieve competitive advantages using information technology (IT). Nowadays organizations in addition to managing their internal operations use information technology to collaborate with their clients and suppliers. Organizations try to use enterprise applications for these. Moreover organizations expect technology to cooperate with their changing on demand needs. IT faces challenges in integrating different systems into functions that can address organizations' needs on demand and span across organizational boundaries. Service Oriented Architecture (SOA) as architectural frame work addresses the problems in the previous enterprise applications. This paper discusses the key challenges experienced by enterprise applications during its development and necessities of Service Oriented Architecture in the enterprise integration. This paper also discusses service-oriented architecture implementation challenges in enterprise integration.

Keywords: Service Oriented Architecture, Enterprise Application, Business processes, integration

1 Introduction

Today's fast-moving on demand global economy need agile and flexible architecture framework. Service Oriented Architecture (SOA) is becoming a serious and more popular subject in the enterprise arena because SOA answers to the upcoming demand of enterprises faster and more efficient. SOA supports end-to-end business integration and virtualized IT services.

Maurizio et al. [1] describe SOA as model witch is establishing and using distributed capabilities that may be under govern of different ownership domains.

Enterprise applications are huge commercial extremely complex systems which want to fulfill hundreds or thousands of distinct requirements. Enterprise applications are distributed, scalable, component-based, data-centric, user-friendly, and mission-critical. Enterprise applications can be installed on a range of platforms through the Internet, intranets or corporate networks [2]. Generally complete enterprise is pictured by Enterprise Architecture. Enterprise Architecture including business, IT architecture and their interrelations. IT-architecture comprises the software and infrastructure architecture.

Enterprise applications are quickly expanding but earlier Enterprise Integration technology unable adapt revolution, because legacy systems typically function as independent application and mostly concentrate on point-to-point connectivity and barely concentrate on other enterprise applications. Traditional Enterprise systems are complex because they require their specific programs interface. Also it can't provide the adequate agility too. As a result, SOA has been introduced and SOA's primary concept is to provide agility by filling the gap

between the IT applications, business process layer. The previous IT applications developed as functional feed store but varying business processes frequently required totally different IT alignment. Therefore service layer introduced [3].

Currently industries experience numerous complex problems like distributed software, many platforms, application integration, various protocols, the Internet, several devices, etc. Hence Enterprise applications require interoperable solutions. However prior to SOA, applications didn't support open interoperable solutions and depend on proprietary APIs and required a high degree of coordination.

However, applications did not support open interoperable solutions prior to Service-Oriented Architecture. Those applications mainly rely on proprietary APIs and requiring a high degree of coordination. SOA growing as the main framework for integration and architecture and eliminates the difficulties of protocol and platforms. By allowing rapid development and modification SOA supports the business to streamline processes. This helps companies to adapt more easily to changing on-demand needs.

To reduce the rework developers introduce the modular design. But they find issue when they try to use modules in other applications. Therefore developers move to classes and object-oriented software design. But after sometime software gets more complex so developers want a way to reuse and maintain the functionalities not just source code. Consequently the component-based software comes into play. But it fails to solve all of the problems developers faced. Currently applications face various challenges. These can currently be eradicated by Service-oriented Architecture. [4].

SOA create applications using services and loosely-coupled mechanism. Therefore they can be used again. A key benefit of SOA is bringing enterprise agility, by allowing rapid development and modification.

2 Enterprise Application

Enterprise application can be defined as “big business application with set of integrated software modules and a central database that enables data to be shared by many different business operations and functional areas throughout the enterprise” [2]. Enterprise applications are user-friendly, distributed, complex, data-centric, component-based, mission-critical and scalable. Simply say extremely complicated applications [2].

These days an application carries out several business functions such as production planning, procurement, managing customer information and so on. And corporate systems have many values for companies, such as improving operational productivity, providing corporate information on decision-making, enabling customer requests quickly to answer, including analytical tools for assessing total corporate performance and so on. Finally, the application improves productivity and output with the supporting functionality in business level.

The enterprise application development requisites study thousands of distinct requirements. These requirements are interoperable. So having the whole picture is must to succeed. So enterprise needs a system more capable to adjust on demand requirement. But earlier to SOA applications not support these features. SOA develop as key integration and architecture framework in the enterprise application arena. SOA allow reprocess existing applications and bring enterprise agility.

3 Evolution of Enterprise Architectures and its Challenges

Throughout the enterprise application development several ideas presented by the researchers but all of them are only address a particular issue and after sometime it's not adequate support the needs, so they go for next approaches. This section explains the different concept the issues address by them.

3.1 Monolithic Applications

This approach introduces to improve the efficiency. In monolithic applications system developers and client of the system are same or closely related. Here system has strong connections. But with time enterprise need application that support dynamic requirement. Here main challenge is when a change happened in the application whole system need to re test. That makes maintenance of the system very difficult. Also update management also vey challenge. So bearing maintenance cost make researchers to thing another approach [5].

3.2 Component Based Architecture

Similar function of an application put together and components created. Every component uses an interface to connect with other components. These approaches reduce the maintenance effort. Even though components are tightly coupled since its using proprietary interface [5].

Business processes need to be integrated with various applications over time. In this case, it has always been a serious cost problem to implement a new interface with new technologies. It therefore leads to n various interfaces implementing each of the n components in n different technologies. Use it simply 1: n rather than n: n method. n method. The middleware come to play for these problems. To every component, Middleware provides an interface that lets to collaborate with all other applications [5].

3.3 Enterprise Application Integration (EAI)

EAI is main task to integrate a number of different applications. This is promising by middleware technology like “*Common Object Request Broker Architecture (CORBA)*” or MQSeries. These technologies make easy the integration process in the enterprise systems. Also decrease the human efforts in retrieving the information. EIA eliminate the possible mistakes in a business process [5].

Older applications provide their functionality by a graphical user interface however middleware not able to adapt. GUI design modifications are needed to overcome these types of problems [5].

3.4 Separation Of GUI

Separates GUI enhances it flexibly. Despite this, design and implantation effort is significantly increased. GUI uses middleware to connect the application [7]. But lifespan of business operations gradually decreased and flexible demands increased. The requirements for the flexibility yet to be satisfy. This may be the basis for service focus [5].

The systems that align business and IT are anticipated by business experts. The notion of service is started. Service is an IT-implemented business function and is not linked with a given application [5]. Yahoo pipe is example for this approach.

3.5 Business- IT Alignment - Basic Services

The Service Registry concept has been established. All service information on services is stored in the Service Registry. Service representation has both plus and minus. Service can use by many applications and create the business IT alignment. However, recognizing, implement and maintain services as well as the corresponding Service Registry related work increases [5]. However, GUI also needs to be changed for changing business processes. To do this, web-based interfaces are implemented with portal and portlet technology. But until this point, a new process did not reach its peak, as the process control is distributed across humans and the entire application.

3.6 Hard-Wired Service Orchestration

Simple business functionalities are presented by basic services. Services orchestrating is the method of automate and create them accessible in a comparatively pure form. If done by service itself its hard wired service orchestration.

3.7 Soft-Wired Service Orchestration

Present novel element of SOA, the Orchestration Engine [5]. Process control flow is included inside service code in the hard-wired service orchestration. The soft-wired orchestration process control flow made clear in an orchestration engine.

4 Limitations and Requirements for Service Oriented Architecture in Enterprise Integration

The concepts of SOA originate to enterprise for several motives. SOA utilize by experts to resolve the difficult problems arising from enterprise applications. These days enterprise requirements are rapidly growing. However traditional enterprise application systems are not able to adjust moving requirements. Since traditional enterprise applications typically execute as self-governing application systems and focus on point-to-point interconnection. Traditional applications hardly consider other applications and cooperation between them. Traditional Enterprise Applications are complex since wants specific interface programs and not able deliver essential agility [3].

Cost reduction and reusability is main courser to move to the EAI. But there flexibility cannot achieve. To overcome the growing need of enterprise landscape researchers go for SOA. Subsequently that, the talk about cost reduction and reusability became meaningless. SOA deliver an excessive promising to raise enterprise agility [6]. SOA provides better version of enterprise information systems to modify business processes and business process support in overall.

Schelp et al. [6] argue that flexibility is one portion of agility only. Agility is capability to adjust to unexpected changes, but flexibility adjusts to expected changes only [6]. Flexibility come from traditional design practices and focuses only on expected changes and cannot to contribute to unexpected changes. SOA provides some added advantages like technology independence, suitable enterprise infrastructure and etc.

Service-oriented architecture (SOA) is a way of creating applications based on distributed components. Reuse, agility and richness are the primary advantages of SOA. SOA offers an outstanding enterprise applications platform. Using Web services, enterprise applications can be easily, safely and efficiently integrated [3].

5 Service Oriented Architecture

Nowadays enterprise expects flexibility to address their changing requirements of business process. Hence Enterprise systems are desires interoperable results. However prior to the SOA, system didn't allow interoperable open resolutions; on the other hand, system depended on original APIs and essential a great degree of coordination between systems. Today enterprise use Service Oriented Architecture to get the virtualized IT service and end-to-end enterprise integration [3]. SOA defined in various ways, for example Gartner define as, "Client/Server design methodology in that an application consists of software services and software service clients SOA varies from the more general client/server model in its definitive emphasis on loose coupling between software components, and in its use of separately standing interfaces"

In the current heterogeneous and complex computing situation Service-Oriented Architecture is evolving as the leading integration and Architecture framework and eliminates the difficulties on various devices, application integration, distributed software, varying platforms, and varying protocol. Also Service-Oriented Architecture enable flexible, Combined Business Processes, and business process optimization and the Real Time Enterprise (RTE)

The concepts associated with SOA are already developed on CORBA, DCOM and others [2]. Agility is the most importance delivers of Service Oriented Architecture, by allowing modification and rapid development of programs delivers the agility to business processes. [7] SOA handles application and infrastructure. All functionality is design as services that can access via network and they flow the public standards for communication. Service-Oriented Architecture is an architectural approach that allows distributed deployment by expose enterprise data and business logic as loosely coupled, discoverable, structured, standards-based, coarse-grained, stateless units of functionality called services. Furthermore allows reusability by choose a services provider and access to existing resources exposed as services. By allowing reusing the existing applications Service-Oriented Architecture enables enterprise to influence existing investments. Another importance is compos ability by allowing assemble new processes from existing services that are exposed at a desired granularity through well defined, published and standards complaint interface. Also provide interoperability by share capabilities and reuse shared services across a network irrespective of underlying protocols or implementation technology. A SOA has three major parts; service provider, service consumer, and service directory. Service providers are the parties who build service and make available service. Service consumers are the clients who consume services. Service directory is the place where service providers register the services and consumer search for services. Service directory provide following services:

1. Scalability
2. Decoupling
3. Hot updates
4. Look-up service.
5. Runtime selection of providers.

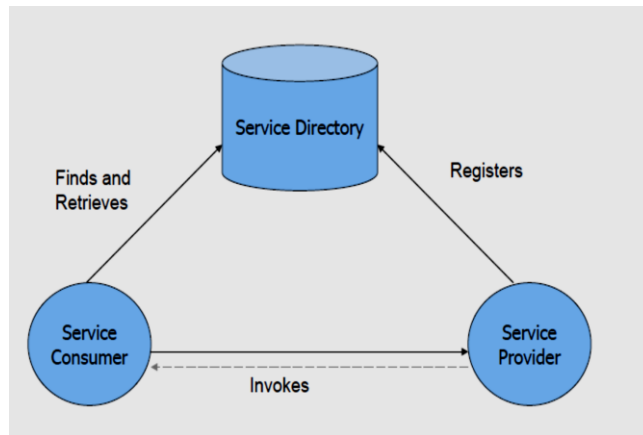


Fig.1. Service Oriented Architecture Model [5]

5.1 Service

Building block of SOA is autonomous services. Service is a reusable component. Service are not homogeneous they are divers they can include old systems and new systems. Service comes into the data and can change the data according to business need from one state to another. Services remains stable but its configuration will be changed. A service is the way how date is accessed. But all the services are not a web service.

A service exposed it functionality using three characteristics,

- Interface agreement to service is platform- independent
- Can dynamically located and invoked
- Service has its own states, so autonomous

When model service it's essential distinguish consistent interface, need to be public standard. Client from any language, any Operating System (OS) and anywhere can get the service by the interface agreement on platform independents. Service providers are published their service on service registry. Services are available on service registry. Clients can find the services by look-up mechanism from the service registry. According to the client need client can select the services.

In a service life cycle have 3 stages.

Expose – how service is implemented

Compose- created services are combined into business process

Consume –make available to end user

Service has boundaries. Boundary denotes the border between interface and implementation. WSDL used to publish the boundary.

5.2 Messages

Services are interacting through the messages. On service interface agreement is defined the message return and accept. Service provider and customers interact through the message so message structure is importance. Messages are building using XML because it does provide scalability, all the functionality and granularity request by message.

6 Challenges in the Implantation of Service Oriented Architecture in Enterprise Integration

Today enterprise applications used Service Oriented Architecture to meet they are shifting needs. But when implementing Service Oriented Architecture need to face many challenges. For some challenges there are some ongoing researches and for some challenges some researchers suggested some results by researches.

When implementing the Service-Oriented Architecture Service identification is the very first challenge. Today same business function is provides by multiple service providers. So when selecting the service needs to answer the question like what business functionality needed and what is provided by service? [8]

Service location is another challenge. Services operate on business entities, occupant within system records. Ideal location of service execution is system record. In distributed architecture business data spread across multiple applications. So service location is challenge. In addition to that service orchestration, service domain definition, service packaging, service routing service governance and service messaging standards adoption also some challenges of Service Oriented Architecture. [8]

“There are many researches going on functional layers of SOA. In the basic service layer service definitions addressing, functional, non-functional aspects associated with services are related problems and they address by many researches” [9].

“Services are in addition to its specific function support for sets of protocols and formats addressing extra-functional concerns such as transaction processing and reliable messaging. Transactional coordination in service-oriented computing is address by Tai et al” [9]. “The authors claim for the use of declarative policy statements to advertise and match support for different transaction styles (direct transaction processing, queued transaction processing, and compensation-based transaction processing) and introduce the concept of and system support for transaction coupling modes as the policy-based contracts guiding transactional business process execution” [9].

At the development time SOA requires service description in (Universal, Description, Discovery, integration) UDDI repository system by using this client can develop program that can bind to and interact with service of specific type. On that understanding the execution semantic is a weight task [9]. For this quality of service management framework based on user expectations suggested by Deora et al [9]. This framework collects expectations as well as ratings from the users of a service and then the quality of the service is calculated only at the time a request for the service is made and only by using the ratings that have similar expectations [9].

SOA UDDI (Universal, Description, Discovery, integration) delivers business-category browsing mechanism for review and select services to developers. It works based on keyword-search might be upgraded by introducing more powerful matching approaches. “By combining syntactic and semantic comparison algorithms of *Web Services Description Language* (WSDL) document hybrid matching approach suggested.”[9]. “In a peer-to-peer based framework is examined that allows advertising and finding services using keyword-based search, ontology-based search and behavior-based search in a highly decentralized and dynamic environment. In addition, the framework provides mechanisms so that users may express and query the quality of services”. [9]

7 Conclusions

This paper discusses the evaluation of enterprise applications and introduction of SOA in enterprise application landscape. To compete competitive world market organization try to

use technology to perform their end to end workflow. Enterprises try to use SOA since its providing interoperable solution with public stand with expectable cost. SOA targeting to reduce the gap between business process layer and the IT application layer. While developing the SOA developers face many challenges. Regarding these challenges there are many research going on and some challenges already addressed by some researches. SOA create systems using services and loosely-coupled architecture. Therefore it can be reuse. A key benefit of SOA is enterprise agility, by allowing rapid development and modification of the software that supports the business processes.

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