A EFFICIENT BUSINESS PROCESS INTEGRATION AND QUALITY SERVICE FOR SERVICE-ORIENTED ARCHITECTURES

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ABSTRACT

Agile integration satisfies the business agility and provides solutions for maintaining business changes and ensures that the enterprise survives in the current competition. Any business should be robust enough to respond to end user request. Existing traditional enterprise application is in-capable of integrating with different business silos, lacks to improve the business agility. To address this issue, this paper is about the agile integration of different business silos using "Service Oriented Architecture" and its core technology enable the business enterprise systems flexible, loosely coupled and improve agility. Enterprise business systems have to adopt Service Oriented Architecture (SOA) as it promises to help them respond more rapidly to changing business requirements by composing new solutions from existing business services. Here we have discussed about definition of SOA, its layers, the core technologies.

Keywords: SOA (Service Oriented Architecture), ESB (Enterprise Service Bus), BPEL (Business Process Execution Language), BRE (Business Rules Engine), WSDL (Web Service Description Language), QoS (Quality of Service)

I. INTRODUCTION

Current business systems are developed monolithically which is difficult to integrate with other business systems and lacks in co-ordination. The redundant information is resided in each of these monolithic systems and consolidation of this information from these systems is horrendous. Along with the rapid, worldwide development of information technology, information systems for all purposes is needed everywhere. The existing business systems have failed to meet the rapid development changes required, but also that these systems possibly will not be able to adapt in fiercely changing market and correspondingly changing business. It need to build a system which provides us the loose coupling, platform independent, language independent architecture which improves agility and act in response to the speed of a business enterprise. To overcome this problem, Service Oriented Architecture (SOA) provides an agile based architecture towards integrating these monolithic silos which address the technology agility to achieve the business agility by operational efficiency, cost and time-to-market and unified view of information across silos.

II. BACKGROUND

In SOA, the services and workflows have a close relationship. A number of services can constitute workflows and the service itself can be achieved based on workflows. Because of dynamic changes of the organization and service, the distributed computing method is quiet different with the traditional workflow management model in service-oriented workflow definition, management and operation. Also, the architecture of SOA system also embodies the characteristics of distributed computing. So in order to resolve the service oriented workflow management system across different organizations, systems service-oriented workflow management system based on the structure of a service-oriented workflow management system in a number of services and the workflow management, and their communications standards and Major distributed systems, such as educational system, are difficult to develop due to their complex and decentralized nature. Service Oriented Architecture (SOA) is a new form of distributed software architecture. The Service Oriented Architecture facilitates the development of such systems by supporting modular design, application integration and interoperation, and software reuse. With open standards, such as XML, SOAP, WSDL and UDDI, the Service Oriented Architecture supports interoperability between services operating on different platforms and between applications implemented in different programming languages. Maintainability of educational services is easier than before because educational services are divided with respect to category and

functions. SOA can be used with GIS applications too. In which it consists of a reference model, conceptual model, and a design method. Reference model shows roadmap of any future architectural and design efforts. Conceptual model introduces a conceptual service oriented solution for reference model. Finally, service oriented design method leads organizations to reach the solution through specific process. As a result, it provides general software architecture, which covers both real enterprise requirements and GIS concerns. It is an agile model with proper patterns which increases interoperability and reusability across the enterprise. Also the model can adopt itself with any organizations and can be customized to any specific GIS applications.

There are various frameworks developed with SOA for different enterprises. Few of the frameworks developed are as follows. Service-oriented architectures support distributed heterogeneous environments where business transactions occur among loosely connected services. Ensuring a secure infrastructure for this environment is challenging. There are various approaches to addressing information security, each with its own set of benefits and difficulties. Additionally, organizations can adopt vendor-based information security frameworks to assist them in implementing adequate information security controls. Unfortunately, there is no standard information security framework that has been adopted for service-oriented architectures. Information security components for a service-oriented architecture environment are proposed based on the analysis of information security challenges faced by service-oriented architectures. SOA has created opportunities to improve agility and speeds in aligning business needs with information technology infrastructure. Most of the organizations in the process of applying this technology encounter with challenges and may have failure despite spending a lot of energy and huge investments. Hence they need to implement a service oriented framework for SOA governance maturity. The organizations require a framework to assess their current status of SOA governance, determine their SOA governance requirements and then offer a suitable model for their SOA governance. Three dimensions identify for the framework: SOA maturity levels, SOA governance maturity levels and SOA adoption domains. SOA governance status can be determined considering the organization's SOA maturity using a framework and this shows better picture of SOA governance in the organization. Through a good framework, organization can recognize its current situation better and determine its future status easier. SOA is an architectural pattern providing agility to align technical solutions to modular business services that are decoupled from service consumers. Service capabilities such as interface options, quality of service (QoS), throughput, security and other constraints are described in the Service Level Agreement (SLA) that would typically be published in the service registry (UDDI) for use by customers and/or mediation mechanisms. For mobile data streaming applications, problems arise when a service provider's SLA attributes cannot be mapped one-to-one to the service consumers (i.e. 150MB/sec video stream service provider to 5MB/sec data consumer). Hence a generic framework prototype for managing and disseminating streaming data within a SOA environment as an alternative to custom service implementations based upon specific consumers or data types can be obtained. Based on that

Table 1. SOA Layers

QoS, Security, Management and Monitoring	7
Integration Architecture (Enterprise Service Bus)	6
Presentation	5
Business Process (Process choreography)	4
Services (Composite Services)	3
Component-based (Project or Enterprise Components)	2
Operational Systems	1

2.1 Why and When SOA?

SOA is the existing technology which is implemented in industry. The technical characteristics are focused on the distributed technology, loosely coupled interfaces using open standards and driven through the process, message centric solutions. Web services are a common channel of integration across platforms in SOA which works on common communication transportation standards like XML, SOAP, and HTTP.

The subsequent circumstances demand a need of SOA;

1. When there is a demand for high availbility of business function.
2. Demand for Unified Information view.
3. Data is not shared across channels.
4. Mutiple applications need re-usable functions and data.
5. Increased operational cost.
6. Business merger and acqustions to expand there core business.
7. Increased business competation.
8. Demand for more rapid business models, process across silos.

2.2 Why Not SOA?

The following situations do not require a SOA solution;

1. When the business demands need to be developed as simple as possible.
2. When the business cost does not reduce by operations by 10% or High.
3. When there is no improvement in customer satisfaction by 20%
4. If the project demands only to integrate the technologies.
5. When the opertaional infrastructure must be as simple as possible.
6. When the service needs to provide a required unit of business functonality that supports business process and goals
7. When the existence of the service help in eliminating redundant implementations, i.e., promote reuse.

III. CORE INTEGRATION TECHNOLOGIES

3.1 Enterprise Service Bus (ESB)

Enterprise Service Bus is the channel for communication between parts, between applications which is accomplished by using messaging, transformation and routing. ESB providers provide adapters for interacting SOAP services, file systems, databases, FTP servers, Java Messaging Services (JMS), legacy systems, etc. Typically the services which are offered by ESB are messaging services, management services, Interface services, Mediation and Security services.

3.2 Business Process Exceution Language (BPEL)

BPEL is a language for orchestrating web services to automate business process. It is evolved as the leading standard for web service integration and business process co-ordination. BPEL Follows three fundamental principles, asynchrony, flow co-ordination and exception management. Several Java Integrated Development Environments (IDEs) on the market offer extensive tool support for BPEL. These IDEs offer GUI based tools that allows the developer to drag and drop services and activities from a palette onto a graphical representation of the business process.

3.3 Business Rules Engine (BRE)

Business rules engine separates the key deciding logic of a process. This is an abstraction layer which enables to change the rules faster and easier without affecting the business logic. The defined rules are available through a centralized syntactic layer, which are spread throughout the business process. BRE provides an ability to modify the execution of processes that will ultimately enhance the viability of each process solution.

IV. SYSTEM ARCHITECTURE BASED ON SOA CORE TECHNOLOGIES

The model architecture comprises of Delivery channel Layer, Business Process Layer, Integration Service Layer and Information Solutions Layer. A delivery channel provides a seamless integration with different enterprise application systems. Generally it provides services via portals, application programs, web service, ATM, Call Center etc. Business Process Layer is mainly focused on orchestration to provide value to the respective business function both in respect to business and IT. Process is focused on organizing the service by connecting the coarse grained service to fine grained service for fulfillment of the business needs and routes to the respective services. This act as an accelerator through the collaboration of undergoing business and services.

Integration Services Layer can be segregated as business service, information service, data service which connects to respective information resources for a particular business function is expecting. Usually the communication across the enterprise business information solutions is very exigent and difficult to re-use and co-ordinate in terms of functions and data.

In SOA, messages are critical to delivering end to- end services. Messages must be guaranteed a quick and correct delivery. To enhance messages transportation between services, we can use a core management service solution the enterprise service bus (ESB), which is the back bone of SOA architecture and helps in integrating with various enterprise business information solutions. ESB is a special layer that runs on top of the network that provides a guaranteed messaging service for most of the important messages on the network. This makes the Integration service layer and Information solutions layer playing a vital role in SOA. Ideally the business process are isolated from business services which makes these layers agile and helps in changing the business requirements and its process rapidly without having an impact on the other services.

4.1 Quality of Service (QoS)

Mission critical enterprise systems require an essential and additional basic requirement of addressing the Quality of Service (QoS) requirements by adopting security, reliability and transactions. In general, security is one of the key environments, special concerns and considerations of every organization to protect business information, sensitive user data and establish trust relationships with organization business systems. As any business needs a flexible, customizable infrastructure, so that it can adapt to new requirements and regulations, as business needs a dynamic trust relationships with partners' customers and employees. To meet these business needs we need to leverage a security services infrastructure.

SOA environment should emphasize on some of thefollowing key security challenges;

(a) Need for user and service identities so that appropriate security controls are applied across the organization.

(b) Need seamless connection to other organizations on real-time, transactional basis.

(c) The need to manage identity and security across a range of systems and services that are implemented in a diverse mix of new and old technologies.

(d) Need to protect the business data during transit and at rest.

(e) Need for demonstrable compliance with a growing set of corporate, industry, and regulatory standards.

To address the above risks the main goals of SOA security are Confidentiality, Integrity, and Availability and in addition we have Authentication, Authorization, Auditing / Monitoring, Policy driven, and Hack proof. Authentication allows access only to the intended application that invokes the application. Authorization controls access to defined set of services and /or operations within a service. Auditing maintains a history of service calls and of all activities within the SOA infrastructure. Integrity ensures that data which is entered is not corrupted. The Policy dictates the capability of the service provider by specifying web service's conditions under which the service is provided. Hack proof ensures that the service boundaries are not crossed to prevent several web service specific attacks such as XML Manipulation, schema attacks etc. The following are the industry standards for SOA Security which can be understood by every vendors and organizations that follows a common approach, so that the solutions are re-used which benefits the parties by reducing the time, effort and investment and avoids them in re-inventing.

Table 2. Industry Standards for SOA Security

SOA SECURITY	STANDARDS
Authentication	WS-Security, WS-Trust, WS-Secure Conversation
Authorization	XACML (eXtensible Access Control Markup Language
Federation	SAML (Single Sign-On)
Policy	WS-Policy, WS-Security Policy, WSMetadata Exchange
Confidentiality	XML-Encrypt, SSL, XML-Signature
Reliability	WS-Reliability, WS-eliable Messaging

Enterprise Service Bus (ESB) also allows the security and monitoring to be applied to services without modifying their core functionality. BAM (Business Activity Monitoring) is used to monitor the business process and end-to-end transactions.

V. ENTERPRISE BUSINESS INFORMATION SOLUTIONS REALIZATION USING SOA CORE TECHNOLOGIES

In this section focused about realization of enterprise business information solutions using core technologies of SOA. Legacy systems are computer systems that have been in operation for a long time, and whose functions are too essential to be disrupted by upgrading or integration with another system despite its poor competitiveness. Legacy systems compatibility with modern equivalents has been facilitated via wrapper services. Wrapper service is a type of integration service that encapsulates and exposes logic residing within a legacy system via standard Web services interface to be integrated in the new SOA based systems. Utilizing SOA, can realize to build a new applications within enterprises exposes the ease of integration capabilities between new adapted/developed applications and existing applications. The use case "New Credit Card Request" starts as follows, Existing end user requests for a "New Credit Card" online through the financial business portal. The submitted request by channel is sent as SOAp over HTTP request which is processed by the SOA server. The location of the web service and WSDL information is sent to the application server. The request submitted by the user is executed asynchronously and the response will be sent to end user. The business information is processed by BPEL engine to execute the specific business process which is requested by the end user. The process executes sequential tasks to fulfill the requirement. As part of the process first the "User Information is captured from one of the business silo "SAP CRM", based on the user information, the external "Credit Score System" is connected by the service to decide whether the user is eligible for credit card or not. Next based on the user profile and credit score information the respective financial supervisor will approve or reject. After the approval, the request will be placed to create a credit card for the customer and his information will be maintained in the "Card Management System" which is a legacy system, which is hosted in Mainframe environment. Once the card is created the customer will be notified through the mail communication. The mail server is hosted as part of IT Infrastructure. On the realization of SOA system, it helps to adapt to business agility and response to the speed of enterprise business.

The model, assemble, deploy, manage, and governance activities of Service-Oriented Architecture (SOA) development can be time consuming and expensive when delivering new solutions from scratch. Adhering to industry standards is also challenging. This article series explains the end-to-end development of composite business services (CBSs) that leverage assets in the Business Services Fabric.

Reusing existing assets speeds the development of high-quality business solutions and reduces the cost and time involved in building highly customizable and adaptable CBSs. WebSphere Business Services Fabric provides an SOA platform to model, assemble, deploy, manage, and govern business services and to deliver dynamic and flexible business process management (BPM) capabilities to the enterprise. It provides the design-time tooling, runtime environment, and optional prebuilt industry SOA content to build more flexible and responsive business solutions based on BPM. WebSphere Business Services Fabric also supports externalizing business policies and metadata from the business processes and associating them to reusable business services that are easy to publish, discover, and modify.

One of the major components of WebSphere Business Services Fabric is the industry content pack, which consists of prebuilt assets that you can use as is or for building solutions or assets. Using these assets facilitates reuse and serves as an accelerator to develop, deploy, and manage business services. Moreover, these assets are built on industry standards and industry best practices. They provide a framework to build industry-specific and standards-compliant SOA solutions. The key asset types of industry content packs are:

- Capability and process maps
- Business service templates
- Service interfaces
- Business glossary
- Common services
- Business object model
- Knowledge assets

The following list describes the tasks involved in the different phases of the SOA Business life cycle

which is illustrated in Figure 1. In this case, these phases are applied in the CBS development:

- **Model:** Gather and analyze business requirements. Design, simulate, and optimize the business processes.
- **Assemble:** Assemble new and existing services to form the business processes and optimize them.
- **Deploy:** Deploy the business processes.
- **Manage:** Manage and monitor these business processes from both an IT and business perspective.

Governance: Feed information gathered during the manage phase back into the life cycle to enable continuous process improvement.

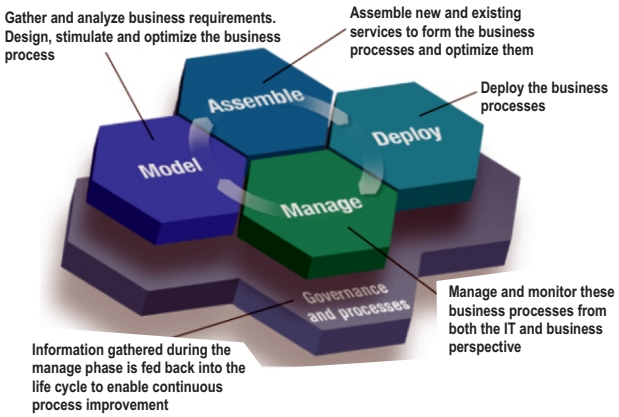

Fig 1. SOA Business Life Cycle

VI. CONCLUSION

SOA is much more flexible, when compared to EAI and other architectures. It mainly focuses on the technological problem, system integration and service encapsulation, and BPM takes charge of the change of management mode, BPM requires enterprise build definite process system and have effective management. The enterprise application integration based on SOA core technology can effectively improve the systems' response speed, and realize the complementary advantages of them. Therefore, from the aspects of the management and technology, the combining of enterprise information systems using SOA enhances the flexibility and responsiveness in the enterprise application systems, and ultimately recognizes the business agility.

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