SOA Practitioners’ Guide
Part 4
Integration: Yesterday, Today and Tomorrow

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SOA Practitioners Blog: http://entarch.blogspot.com
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ABOUT THIS DOCUMENT

ABSTRACT

SOA is relatively new, so companies seeking to implement it cannot tap into a wealth of practical expertise. Without a common language and industry vocabulary based on shared experience, SOA may end up adding more custom logic and increased complexity to IT infrastructure, instead of delivering on its promise of intra and inter-enterprise services reuse and process interoperability. To help develop a shared language and collective body of knowledge about SOA, a group of SOA practitioners created this SOA Practitioners' Guide series of documents. In it, these SOA experts describe and document best practices and key learnings relating to SOA, to help other companies address the challenges of SOA. The SOA Practitioners' Guide is envisioned as a multi-part collection of publications that can act as a standard reference encyclopaedia for all SOA stakeholders.

INTENDED AUDIENCE

This document is intended for the following audience:

- Business and IT leaders, who need to start and manage an SOA strategy across the enterprise/LOB
- Enterprise Architects who need to drive the vision and roadmap of the SOA program and the architecture of each implementation that falls under it
- Program Managers who need to manage a portfolio of sub-projects within an overall SOA business strategy
- Project Team Members, who need to map dependencies and develop a timeline that meets the business expectations
- Vendors who provide solutions and tools for new business capabilities to the business and IT
- Standards bodies which need a better understanding of use cases of how business and IT plan to leverage technology to meet their objectives.

BENEFITS OF THE SOA PRACTITIONERS’ GUIDE

This document helps readers to:

- Learn from others: Early adopters of SOA share their best practices, insights, and views on the state of SOA adoption across the industry
- Compare alternatives: Identify and define the key technology components of SOA to establish a baseline reference for comparison of options
- Improve collaboration: A common language clarifies the nature of SOA components defined in this document
Accelerate implementations: This guide defines the services lifecycle along with the requirements, recommended tools, and best practices for each of the stages.

Understand the value of standards: This document recommends standards for aspects of SOA

Avoid potential risks: The guide identifies some problem areas not yet addressed by the vendor community.

SOA PRACTITIONERS’ GUIDE: PARTS

There are three separate parts that make up the SOA Practitioners’ Guide.

This document is Part 1, Why Services-Oriented Architecture? It provides a high-level summary of SOA.

Part 2: SOA Reference Architecture provides a worked design of an enterprise-wide SOA implementation, with detailed architecture diagrams, component descriptions, detailed requirements, design patterns, opinions about standards, patterns on regulation compliance, standards templates, and potential code assets from members.

Part 3: Introduction to Services Lifecycle provides a detailed process for services management though the service lifecycle, from inception through to retirement or repurposing of the services. It also contains an appendix that includes organization and governance best practices, templates, comments on key SOA standards, and recommended links for more information.

Part 4: Integration: Yesterday, Today and Tomorrow details the integration reference architecture, how SOA enables integration and what the industry is expected to deal with Integration by 2010
Integration of business systems is one of the key capabilities that should be provided by IT to enable business agility. This has been the primary objective of all integration effort to-date, however, due to various factors most of the integration efforts have not achieved the expected business benefit. Of course projects with the right executive backing have been quite successful but have never reached their full potential. The objective of this article is to demonstrate how adopting SOA enables achieving business agility and flexibility.
INTEGRATION YESTERDAY

Following is a brief overview of the traditional integration best practices adopted by the industry. Typically majority of the integration efforts follow the hub and spoke pattern; with the hub bridging the gap between two or more business applications. In addition, this approach relies either on an Enterprise Application Integration (EAI) or an Extract Transform Load (ETL) tools to move data from the transactional systems to the Operational Data Stores (ODS) and/or Data Warehouses. The Executive Dashboard is developed on top of these databases using a Business Intelligence (BI) tools. Due to the processing time required for moving and aggregating the data, it is next to impossible for the decision makers to get real-time analysis of the current state of their business. As the accuracy of all major business decisions is directly proportional to quality of data and with most of the business systems still being siloed (the enterprise data such as Customers, Products, and Orders are typically entered in multiple systems) it is very unlikely that the decision makers are getting an accurate view. One could potentially resolve this architecturally by resorting to custom development of all of the business systems. This may not, however, be practical for enterprises.

Business does also play an important role in driving IT in this direction. As time-to-market is key for each of the business silos, IT organization are directed to invest heavily on implementing packaged applications and later expected to stitch them together. An additional drawback of the traditional approach was due to the lack of available infrastructure - IT organizations were forced to procure each of the technology components such as EAI, ETL, BI, Data Quality tools separately and custom develop the infrastructure.

In short, IT organizations were spending most of their effort in developing the infrastructure, instead of working on enabling business agility.

INTEGRATION YESTERDAY: TRADITIONAL PATTERN

Following is the traditional integration pattern implemented at most of the integration solution as well as the traditional CRM/ERP vendors for providing integration solutions to their end-customers. Following is the high-level architecture of the traditional integration pattern – generally referred to as the Integration Hub or Integration Server style.

![Diagram of Integration Pattern]

Adapter  | Transformation  | Business Process  | Transformation  | Adapter
---|---|---|---|---
Messaging Layer

ADAPTER

The connectivity adapter between the messaging layer and the application is typically provided by either the EAI or the Application vendor. As these adaptors are generic in nature and invoke the application views (code) of the target applications – they use the generic user id and password to connect to the
applications. This creates a security loophole and to overcome this, IT organizations need to develop code to pass and manage the user credentials across all the systems.

MESSAGING LAYER

This is the backbone of the traditional reliable and scalable EAI tools which needs to integrate with disparate technologies (CORBA, JMS, RMI, MQ, etc.) and applications. (ERP, CRM, Mainframes, etc.). As the integration pattern for EAI based solution is the hub and spoke model – all messages from the endpoint (applications) are transformed into a common business object model (such as customers, orders, products, etc.) on which the integration business logic is applied. Examples of such business logic are: scoring leads from campaign data prior to populating the Sale Force Automation Software, validation of order prior to sending it to Shipping. Etc. Once the business logic is applied the message is again transformed prior to sending it to the destination applications.

Following are some of the best practices/key learnings of leveraging this integration pattern.

- These patterns have been widely adopted and extensively used, especially for manufacturing, B2B supply chain, banking, etc.
- Requires standardization of the message format – header and payload section
- Source and target applications need to develop code (using their own proprietary code and interface) to integrate with the Adapter
- Business process adopted using proprietary workflow solutions - not necessarily standards based. However, the latest versions allow for BPEL, XPDL, JPD import/export, etc.
- Generally result in implementing point-to-point solution on the hub and vendor lock-in (due to the proprietary nature of the EAI tool)
- Reliable and scalable to support mission critical applications
- Modification of the canonical model may require redeployment of the entire application resulting in complex regression and integration testing which can make it difficult to deploy the refactored solution without shutting down the system
- IT organizations spend a lot of effort in integrating the technologies instead of focusing on delivering new business behaviour that enables business agility

As the EAI tool typically gets implemented as a point-to-point solution on a centralized server, it is not convenient to leverage this approach to provide the decision makers with real-time information. One of the best practices of leveraging the EAI tool is to pass all the relevant data over the messaging layer to populate the Operational Data Store and/or the data warehouse. However, due to the high development costs, it rarely ever happens. Instead the data team implements a parallel integration effort using ETL tool to copy all the data to an ODS/DW for aggregation and reporting purpose.
This results in the same business logic implemented in multiple applications and technologies resulting in increased Total Cost of Ownership. In addition to this redundancy, as the Executive Dashboards and reports for the decision makers are provided with information based on the data from the ODS/DW or from the so called master data stores where the data is not entirely accurate and nor is it in real-time. However, there is still a potentially large business benefit for implementing this approach for the enterprise. It at least provides a view into the state of the enterprise whether accurate and real-time or not, when compared to not having any view enterprise data at hand at all.

Majority of the enterprises that have implemented an EAI solution with the right executive backing have been successful, especially in the area of supply-chain, B2B, manufacturing, integrating eBusiness applications to the CRM and/or ERP systems, etc. However, there have been many cases of disastrous implementations of large ODS/DW solutions, especially as this effort attempts to standardize and cleanse the data after all the data is copied from the transaction systems.
INTEGRATION YESTERDAY: CASE STUDIES

Following are two distinct case studies where IT organizations have leveraged their existing investments to provide integration flexibility.

CASE STUDY 1

- Customer enters order on the eBusiness site which is validated and submitted to the system of record. In this case, the EAI tool responsible for order validation and for ensuring that the transaction is submitted to the packaged applications.
- Provide customer the ability to review the product status as well as track the shipped packages. EDI integration with third party for logistics and Web Service to track packaged
- Periodic (nightly) scheduled batch processes, powered by ETL to populate master data information into the packaged product repository, operations data stores and data warehouse.
- A change notification listener on the EAI is leveraged to capture any product changes in the system of record (packaged application) to populate the local product details for the eBusiness portal.

The following function / features were leveraged from the EAI tool:

- Adaptors to connect to packaged applications
- B2B connectors for EDI and ebXML
- Workflow engines are utilized for service orchestration with partner applications
- Worklist features are employed for managing human interaction process
• Job Scheduler is leveraged to invoke periodic file transfer to third party applications

**CASE STUDY 2**

Business runs their core business applications on legacy infrastructure (mainframe)

Majority of the business is through channels that leverages messaging services to interface with them (EDI, ebXML, File Transfers, etc.)

Leveraged EAI tool to expose business services to partners to support their eBusiness applications. As exposing existing fine grain services from the mainframe did not make sense, they leveraged initially an application server and later an EAI tool to expose services that made sense at the business level.

Later developed these same services to create their own customer eBusiness site – not with the intent of selling directly to them (avoid channel conflict) but more of a tool to know and understand their customer base better.

The following function / features were leveraged from the EAI tool:

• JMS to connect to the messaging services

• Workflow (service orchestration) to compose business services consisting of multiple fine grained services exposed from the main frame.

• Worklist for managing human interaction process with the portal

• Long term plan is to migrate the EDI, ebXML, File transfer interface to the EAI tools
INTEGRATION TODAY

One of the reasons why SOA is gaining such a momentum is because it is clearly not a technology solution; rather it is a way of aligning IT closer to the business and vice versa. The SOA published the SOA definition in the SOA Practitioners Guide Part 1 which is as follows:

*SOA is the business operations strategy for leveraging information to meet their objectives, such as increasing overall revenue, increasing customer satisfaction, improving product quality, etc.*

In order to ensure that there is a common vocabulary, the SOA Practitioners developed the SOA Reference Architecture (illustrated above) which is well understood by the contributors and documented in the SOA Practitioners Guide Part 2. The primary principle of SOA is that all services developed should map back to business requirements, i.e. IT should be not be developing any infrastructure or services that are not yet on linked to the business requirement. The right ways to capture these requirements are to first map the business process and later drill down to understand the business services required to fulfil the business process.
The above diagram illustrated how business alignment and flexibility in achieved by adopting SOA for integration. On the business side most business processes have just grown and evolved over time and it is a fact that many enterprises do not precisely understand their processes and bottlenecks. This makes it very hard to make improvements, gain operational efficiency, and react quickly to the marketplace. So businesses are looking to achieve flexibility by being able to describe their business processes as a flow of discrete business activities, and this flow or process can be optimized and changed.

On the IT side, analogous to the business side, most of IT is a set of applications, interfaces and data that have evolved and grown over time. Early SOA efforts have even exposed some of these applications and data as services. But the issue on the IT side is that these applications, interfaces and services do not quite match what the business process needs, and a lot of time and effort is spent in coding and development to try and achieve this alignment. What is needed is a services layer that is aligned with business activities that support business processes. It is the provisioning of this layer that enterprise integration and SOA addresses.

One way to create a business services is using a data integration pattern, where in one aggregates disparate data from multiple applications. For example, customer’s account information may be fragmented across different accounts that the customer holds with the enterprise. So, one might need an account service that aggregates fragments of account information from multiple data sources and applications. Another way to create a business services is the service orchestration pattern. Here the system is orchestrating across a set of finer grained services or application interfaces. In the illustrated example, there is an order fulfillment business service, which does an inventory check – if there’s an inventory it initiates shipment, otherwise notifies the customer when delivery is possible. This is implemented by a process service within an EAI tool. A process service in an EAI tool can be implemented with process technology and can be augmented by business logic in Java. There are other ways too. For example, a customer may write a custom application on an Application Server.
In the illustrated example the overall order management process is implemented in a BPM tool. Now the notion of a process is present in both BPM and EAI, but as you can see the use of this technology is in different contexts and the two technologies are optimized for different use cases.

The final component for achieving flexibility is the service integration layer. Service integration mediates across different types of services, whether business services or applications or other types of services that an enterprise may have in its system landscape and exposes them via proxy services in a format that’s consumable by any other service in the enterprise. This layer is typically implemented by an Enterprise Service Bus (ESB).

INTEGRATION APPROACH

This section describes the best practices for integrating the various silos within an enterprise based on BPM and SOA. Both these approaches are complementary and one could choose to adopt one or both the approaches. For example: business may decide to adopt BPM for modeling, simulating and reviewing their business processes and implement the entire process using a packaged application. Alternately, IT could leverage SOA at the infrastructure or platform level for integration without business adopting BPM.

Based on our experience and key learnings, the SOA Practitioners recommends that enterprise adopt both BPM and SOA to achieve Business agility and flexibility. The following section describes at a high level how they would work together.

Note: Even though this is also defined in the SOA Practitioners Guide Part 3: Introduction to the Services Lifecycle this focuses primarily on the integration aspects.

The following diagram illustrates the SOA Integration pattern, independent of the products of the business problem being solves and in the following section we shall address each of the components.
PRESENTATION SERVICES

Traditionally the IT organizations are responsible for developing or implementing eBusiness solutions. Most have been based on portal technology (addition details available in SOA Practitioners Guide Part 2: SOA Reference Architecture). For a long time business has been requesting/demanding that they need the ability to access all the relevant data, on-demand, without IT involvement. Unfortunately, this was not possible until recently, especially with Web 2.0 products now available for the Enterprises. These new types of products enable business users to compose presentations that leverage one or more services. Of course business will need to access the catalog (Service Registry/Repository), understand in business terms what they do to be able to utilize them. Typically these services are exposed as Web Services based on SOAP and lately (and preferable) on REST. SOA Practitioners recommends using REST whenever it is possible.

In case of IT developing the presentation services, the Enterprise Architecture team needs to make a judgment call on where the service should reside. For example; third party services such as Export Compliance service could be directly invoked form the presentation tier, Service mediation layer (ESB) or Business Service.

BUSINESS PROCESS MANAGEMENT

The diagram represents a sample business process

Business can focus on managing and improving the performance of the business through modeling, execution and measurement of processes. When large enterprise leverage modeling tools to design and develop aircrafts, automobiles, etc. it is time for business to leverage readily available tools to the same
for their business. This model becomes the de-facto lingo of communications between business and IT resulting in better alignment.

IT needs to partner with business and educate them on the various implementations available such as Integrate existing portal with BPM tools – where the BPM runtime engine manages and provides measurement matrices about the process

- Leverage a pre-integrated Portal and BPM tool for user interaction based business processes
- Leverage a BPM tool for user interaction processes as well as service orchestration
- Leverage existing EAI tool for service orchestration
- Leverage existing portal with existing EAI tool for user interaction processes as well as service orchestration
- Leverage existing EAI tools for connectivity with packaged and legacy systems

The Enterprise Architecture, in collaboration with the LOB and IT, shall be able to evaluate and provide the recommendations. The key learning from the SOA Practitioners Guides is that adopting SOA for implementing these options provides flexibility.

In short: BPM provides better alignment and SOA provides better flexibility.

**SHARED DATA SERVICES**

The following diagram illustrates the shared data services.

As enterprise applications are developed in silos, the data is also stored in each of these silos; typically the same data is in multiple systems. Enterprise needs access to these silos of enterprise data such as
customers, products, orders, and the best way to provide such capability to develop a uniform data access layer. This layer could be implemented using one or more technologies and the enterprise data architects (part of the Enterprise Architecture team) need to partner with business to define and expose these services.

These data services could be accessed by any client such as portals, partners, BPM, EAI/ESB, BI tools,. One of the key criteria is that these tools support multiple protocols to access the data services. The clients should be able to access these shared data services as Web Services, XQuery, SQL, etc. Supporting SQL interface shall enable business to point their BI tools to these data services, instead of the traditional ODS/DW, enabling them to get real-time information. Ability to cache the data over a period of time is a additional benefit of such tools.

**SERVICE INTEGRATION**

The following diagram illustrates the service mediation layer (ESB).

![Service Integration Diagram](image)

The Enterprise Service Bus pattern is already well understood and documented and the only point the SOA Practitioners would like to point is that it is not always necessary that one needs to use a service bus for decoupling services. Sometimes it is ok for enterprise applications to go from point-to-point, instead of through the service bus.
BUSINESS INTEGRATION

In conclusion, Business Agility = Alignment + Flexibility = BPM + SOA.

This pattern is independent of the products or the tools used to integrate the enterprise and can easily be explained to the business. In addition, this also enables the decision makers (by leveraging any reporting or BI tool) to review their business real-time. One final comment, integration now no longer means IT infrastructure but **NOW** it means business integration at all levels.

INTEGRATION TODAY: CASE STUDIES

Following are two distinct case studies where IT organizations have leveraged their existing investments to provide business alignment and flexibility. The first two case studies are transformation of the two case studies listed in “Integration Yesterday” and the third case is a new one.
CASE STUDY 1

The diagram below illustrates the transformation made by the organization listed in case study 1 in the previous section.

Following are the high-level architecture overview of this approach:

- The EAI tools was still used for managing connectivity with the existing packaged applications, data bases and third party services
- The message broker within the EAI tool was leveraged to listen to any types of message and transform them to the standard messaging format required by the User Interaction and Service Orchestration components developed on the EAI
- Continue leveraging the EAI tool for handling distributed transactions as well as for managing state
- Worklist for managing user interaction states
• The Enterprise Service Bus (ESB) was introduced to decouple the service consumers from the EAI tool (promotes loose coupling)
• The top three reasons for leveraging the ESB was for service routing, message transformation and security.

This approach made it easier for IT Operations to manage load as well the LOB-IT development teams in focusing on the business logic.

CASE STUDY 2:

The diagram below illustrates the transformation made by the organization listed in case study 1 in the previous section.

As the business wanted to develop better relationship with the end customer, it decided to develop a lot of programs for the customers. As making any changes to the existing legacy systems (mainframe applications) was a very tedious and took a long time the following approach was adopted:

• A complete parallel deployment model was developed based on open standards to enable business to rapidly deploy new services and programs to their end customers
• The Enterprise Service Bus would listen to all messages and apply only the relevant (customer) transactions to the database
• Business leveraged the BPM tool to develop and deploy new programs
• A new universal portal was developed with the same landing page for Customers and Employees
• Benefits were time-to-market of new programs, better customer satisfaction, increased the ability to learn more about their best customers as well as to target programs appropriately, ability to rapidly react to any competitive changes.
CASE STUDY 3

This is a real-life case study where one of the large financial institutions spanning the Nordics, Baltics and Poland with 10+ million customers has successfully adopted such as approach across the enterprise. This institution grew by mergers and acquisitions of multiple companies over last 10 years. It was interested in creating new opportunities by launching e-services to provide a 24x7 servicing model, improve cross-sell rates, streamline front-end processes, etc. and mask complexity of core systems in different countries.

The financial institution adopted SOA to integrate their entire business based on an open, service-centric infrastructure which enables them to build and launch new services and processes rapidly.

The above diagram illustrates the high-level integration approach which enabled the large financial institution in Europe to reduce production cost immediately by 55% in the first country they implemented it as well as drive new annual net revenue counted in millions of € by effective channel utilization.
INTEGRATION: TOMORROW

FUTURE OF IT

The IT organization of the future shall be substantially different than what it is today. An IT organization shall be used as a change agent by business executives to transform their business. Only those IT organizations that are able to transform themselves shall survive and the other shall either perish or be outsourced.

Following are the two important factors that shall impact the IT organizations:

- Even though BPM + SOA enable business alignment and flexibility, they also create a lot of interdependencies between systems, services, etc. and if not properly managed this environment could be very brittle leading to disaster. It is for this reason it is important for IT organizations to put in place a robust and reliable SOA governance process right from the beginning.

- Most of the IT organizations, especially the small and medium enterprises, shall primarily focus their effort on the integration. Ideally, these organizations would no longer host any packaged applications in house, instead they would recommend business to leverage an application from one of the software as a service (SaaS) providers. The primary task of the IT organizations would be to implement business processes across these solutions, manage enterprise data such as customers, products, orders, and so on; basically focus on integrating the enterprise.

SOA GOVERNANCE

There are two aspects associated with SOA Governance; one is the funding model and other is the management/operations model. It is very important for IT organizations, especially the enterprise architects, to focus on developing and demonstrating the potential business value of SOA prior to being funded. This includes putting together an easy, simple to understand funding model for the business executives. Following is one of the successful approaches leveraged by IT organizations.
This is basically a three layered model, where the lowest level is the most universal and generic infrastructure which is funded as tax or charge-back across all the business units (similar to the networks, email, etc.). The second level is the shared set of business services that is funded jointly by one or more organizations. The important thing to remember is that even though one of the business units may not use the shared business services right up-front, it has been observed that the second business unit would be willing to fund it, provided they know that one of their business applications shall require that service (recommend that this horizon be less than one year). The top most level is the least universal or a set of services that specific only to one of the business units and shall also be funded by that business unit. Evangelizing such as model during the annual budget planning cycle shall increase the success of getting the SOA projects funded.

Once the funding is approved, it is important that the organizations focus on managing the SOA program. This shall require organizations to adopt SOA Governance tools that include both the BPM and Repository capability. This is to enable organizations to fine tune their governance processes as well as reduce/eliminate deployment of redundant services. Most of the major software vendors already have SOA Governance tools and have also published their best practices and common patterns. The recommendation for IT organizations would be to leverage these patterns as a base and customize it to meet their specific requirements.

Following are some of the high-level requirements for an SOA Governance tool:

- Ability to customize the governance process, preferably using a browser
- Governance process engine should be independent of the repository
- Federation is key, as large enterprises shall potentially have multiple instances
- Meta data repository, especially one based on Meta-Object Facility (OMG Standard)
- Ability to map dependencies between the various metadata schemas and artifacts
- Ability to manage multiple versions of the metadata and artifacts
- Ability to create and manage assets
- Integration with financial applications, application portfolio management systems and CMDB

FACTORS IMPACTING BUSINESS INTEGRATION

Following are the list of factors that shall impact the business integration in the future:

EXPONENTIAL EXPLOSIONS OF EVENTS

As enterprises start adopting SOA and new technologies such as RFID, location based services, Web 2.0 and multimedia; these systems shall continuously generate a lot of events. In today’s integration efforts most of the business rules could be captured and automated. However, this approach shall not be sufficient in the future, especially as business would want to interact to any environmental change rapidly.

Enterprises need to start looking at adopting Event Servers to handle some existing events and as the number of events increase, the Event Server should be able to detect various patterns and proactively recommend action without the business having to spell out every scenario possible to IT (which would be next to impossible to do). Multiple standards groups are currently working on the standards for the Event
Driven Architecture but are still a year or two away from defining them. In short, pick a vendor/product that meets your specific needs expecting the vendor to support the standard in a few years.

**COMMODITIZATION OF TECHNOLOGY**

Today large eBusiness and Search engine sites develop specialized software to handle large volumes and run on high-end hardware. Over the period of time the software vendors are expected to develop software that shall run on low-end commodity servers (x86 based server); basically a grid of commodity servers. It would be important to watch the progress made by The Open Grid Forum and potentially adopt some of their recommendations.

**SOFTWARE AS A SERVICE (SAAS)**

Enterprises shall not only leverage SaaS for business application but shall do so, on a periodic basis, for processor power, disk spaces, etc. Business Applications such as ERP, CRM and eBusiness suites have been provided by the SaaS vendors for quite a while and integrating with them is straightforward. Enterprises have to be watchful of how these business application oriented SaaS providers incorporate the changing privacy rules and regulatory policies in times of globalization. On the other hand enterprises would have to exercise caution before leveraging on-demand infrastructure providers, especially due to lack of standardization. Some concerns could include metering for usage of these infrastructure services.

**MAPPING DEPENDENCIES**

As IT organizations shall be leveraging SaaS for infrastructure too, it becomes very important for them to map the dependencies right from the business process to the set of services all the way down to the servers and disks used that support these business capabilities. This basically makes it necessary for IT organizations to adopt a metadata repository to map the entire grid such as the ones provided by Asset Management Tools. Once again, monitoring The Open Grid Forum would be beneficial.

An analysis effort has to be undertaken by IT to help with the mapping exercise and to keep this up to date. In addition, it is imperative that the business services (components) are built modular in nature and limit their dependencies to each other. This not only involves work in the analysis of the core business functions and business process but also an understanding of how these would be deployed and utilized within the various business units. Parameters such as availability, variability, regulatory influences upon the operations of each business unit have an impact on the modularity and reusability of these services.
CONCLUSION

Business integration is a difficult problem when the business environment and business operating models are changing. The best way to deal with this is to identify the most granular reusable business functions that can be effectively assembled by the business users and the knowledge workers. This requires that IT not only engages with the business in strategic discussions but is also involved with identifying the core business activities that remain stable and unchanged across the life of an enterprise. These core business activities are encapsulated into reusable business functions. IT will also need to evaluate and provide tools to the business user to offer the ability to assemble new business capabilities and also tools that allow the business user to simulate novel business scenarios. These types of tools that enable the business user to become self-reliant also reduce the “lost in translation” syndrome for the business capabilities in the deployment of these solutions. Finally, a word on governance. The business user and IT have to be participants in the governance and oversight models for governance successful integration of enterprise information into knowledge.