Collaborative Business Applications: Part I – Architectural Foundations

Globalization and new business models are breaking down traditional enterprise boundaries. At the same time Google, Facebook, Wikipedia and other internet capabilities and technologies are raising customer expectations and demands on user interaction. Business must respond with a new generation of collaborative applications built for today’s realities, delivering business value and leveraging the latest technologies. In this two part series, we’ll look at an SOA approach to building collaborative applications, examine the kinds of new services needed for them, and how to use those services to extend business processes.

Collaboration may be the latest buzz, but what will the next new thing be? How do we create new applications now that can evolve with changing technology, requirements and business? The answer is to have a sound architectural foundation based on principles such as the separation of concerns. Next generation applications require an architecture that enables the next generation workspace, a workspace that accommodates the desktop, laptop, mobile devices, dedicated devices, disconnected operations, and all of the work styles and interactions that go with them. How and where do these capabilities belong? In Part I we’ll look at the architectural foundations for this next generation of applications.

Tiered Architectures

Traditional internet applications relied on the 3-tiered architecture shown in Figure 1.
The three-tier architecture applies the important concept of separation of concerns to separate presentation for logic, and logic from data. This was the predominate architectural style for early web applications, but it ran into problems with the need for better scalability and support of multiple devices. The problem was that the architecture did not separate out the logic used by a single user during their interactive session from the shared logic used to implement business functions and manage resources. Correct isolation of responsibilities is key to flexible applications. To support the next generation workspace, an additional tier is required, as shown in Figure 2.

Let’s look into the idea of tiers more thoroughly. Tiers have the general responsibility for mediating the flow of data into and out of the system and through the components that make it up. However, each tier has a specific set of roles and responsibilities. Furthermore, the boundaries between tiers are carefully constructed to achieve the overall architectural goals, such as support for multiple devices and channels, collaborative workspaces, scalability, qualities of service, etc. The responsibilities of the tiers in the n-tiered architecture are:

- The User Tier is where the system interacts with a single use of the system through a specific presentation. The user tier is responsible for device-specific presentation such as that needed for a web browser. The boundary between the user and workspace tier provides for device independence, allowing the application to support multiple devices such as a Web browser and a smart mobile telephone, each of which would have its own user tier. The user tier:
  - Manages user interface details for a single presentation
• The Workspace Tier is responsible for user interaction and the application experience. It is where the system provides the virtual workspace and supports multiple interactions with a single user. It is responsible for application level logic such as coordinating and maintaining a user session, manipulating the user data associated with that session, and for interactions with the enterprise tier. The workspace tier:
  o Coordinates and maintains integrity of multiple, concurrent activities for the same user
  o Provides a user experience that is consistent across virtual workspaces and different devices
  o Maintains the user session
  o Executes application logic that does not require access to enterprise resources
  o Puts and gets data to and from the enterprise.

The boundary between the user tier and workspace tier provide another advantage. It not only provides a consistent user experience across devices, but also allows the same workspace processing to be used with multiple different devices. In other words, by moving device specifics into a separate tier, we can achieve reuse of application level logic, and just as important, consistency of operation across multiple devices. The workspace tier will take the most advantage of collaboration and communication capabilities.

• The Enterprise Tier is responsible for implementing business processes and entities, and for making their functions available via service-oriented interfaces. The enterprise tier:
  o Maintains the integrity of enterprise resources
  o Enforces system level business rules
  o Provides the scope and control for two-phase commit transactions
  o Provides enterprise services to requestors

The boundary between the workspace and enterprise tier provides a clear separation between the resources of the enterprise and the resources required to support a single user. This break allows enterprise resources to be better managed and protected. It also provides a clear access point for all enterprise services so that they can be shared and reused by multiple applications and users.

• The Resource Tier is responsible for the management and access of shared enterprise resources. The resource tier:
  o Provides access to shared resources of the enterprise
  o Provides access to enterprise data and databases
  o Provides access to legacy systems

The boundary between the resource and enterprise tier provides a separation between the technology specifics of the resources and the enterprise’s use (as well as the service’s
representation) of them. This allows changes in the resources or enterprise tiers to occur independently, without disruption of the other.

**Tiers and SOA Services**

With the introduction of SOA and collaboration services, it is important to understand the relationship between architectural styles. SOA is an architectural style where services are the fundamental concept for the design, implementation and deployment of enterprise solutions. N-tier architectures describe the overall, end-to-end function of an enterprise solution in terms of the logical distribution of responsibilities. These two concepts are compatible and complementary. Services can be present in most of the tiers of the n-tier architecture. However, a common mistake in SOA circles is to focus only on business services and business processes. In contrast, Figure 3 illustrates how the different types of services line up with the tiers of an n-tiered architecture.

![Figure 3 - Services in an n-tier Architecture](image)

The business services that SOA traditionally focuses on support the construction of business processes in the enterprise tier. But new collaborative applications will also rely on a collection of services in the workspace tier. Let’s look at each tier, and the types of services that are used to implement them. Starting at the top, the presentation tier is not implemented with services. Next is the workspace tier. This tier is responsible for coordinating and maintaining all activities for a single user, and being the intermediary between the presentation channel and the enterprise. In other words, the tier is responsible for coordinating and presenting business capabilities through a virtual workspace. It will fulfill a user request in the most effective manner based on presentation device, user role, user context, and user preferences. The workspace tier is responsible for providing a rich user experience using a combination of application, communication and collaboration services:
Application Services

Services that provide common application level capabilities to support collaborative, as well as other applications. Services include:

- Identity – Provides a secured, identity and role of each participant
- Presence – Provides current information about location and status of participants
- Security – Provides authentication, authorization, encryption, auditing, etc.
- File Share – The ability for participants to share files with other members of the community, and to apply entitlements, and reporting to the file access
- Presentation and editing – A framework of common presentation components for building user interfaces, including common editing, spell checking, and other capabilities that can be shared across applications such as a blog and wiki.
- Search – Integrated search capabilities that allow search across all of the different community features, storage and media types.
- Mashups – The facilities needed to design and combine different capabilities into composite applications (mashups).
- Personalization – Customization of personal preferences.

Communications Services

Communications capabilities are integral to collaboration. Standard communications capabilities include:

- IM - Instant messaging provides the ability to send brief, asynchronous messages to others, and through the use of presence services, to know whether the recipient is online or not.
- Video – Allows for the display of video information, and the use of real time video to enable video conferencing, web cams, etc.
- Voice – Synchronous verbal communications, Includes traditional telephones and newer Voice-over-IP systems.
- Conferencing – The use of voice and video to create a virtual conference between two or more participants. Also includes aspects such as whiteboards, presentations, and desktop and application sharing.
- Email – Email services, including the tracking, indexing, and archiving of emails.
- Address book – Keeps a list of contacts. Integrated with IM and other applications and with administration of groups
- Calendar – Personal and group calendars.

Collaboration Services

These capabilities support different formats for publication and exchange of ideas and discussion. Mechanisms include:

- Forums – Discussion forums allow members to post information and comment on it. The forum maintains a history of postings and comments.
- Blogs – Allow members to post information and comment on it. Blogs go beyond forums in that they are intended to foster a community, and have specific capabilities for linking to other blogs and related information.
- Wikis – provide an environment for collaborative knowledge exchange and harvesting. Wikis are intended to produce a single version of common knowledge that is based on the combined contributions of community members.
• Groups – The creation of groups of selected members and the definition of roles and entitlements within the group.
• Moderation – Features to support the oversight and moderation of publication mediums.
• Administration – The ability to manage and report on all aspects of the community and resource utilization of collaborative features.
• Compliance – The ability to manage and monitor compliance of publications, etc. with specific policies.

Returning to figure 3, the enterprise tier is where we traditionally think of SOA capabilities. It is responsible for the implementation of enterprise capabilities and processes, and for the enforcement of enterprise rules and policy. This is where traditional business processes are executed, and where the services that compose them are located. Here, we will see a variety of business-oriented services.

Finally, the resource tier is responsible for the shared resources, and for presenting those resources to the enterprise tier. In SOA, we want those resources presented as services, so this is where integration services are generally implemented.

SOA is an architectural style for structuring logic through the use of composable services, but it is not an end-to-end architecture. Currently, it is mostly used to compose business services and enterprise processes, but this limitation is self imposed. When combined with an understanding of n-tier architectures, we see that services and SOA can also provide the capabilities that we need to create a new generation of applications that support both flexible business processes and rich, collaborative user interactions. In Part II of this series, we’ll look at an example, next generation collaborative business process.