Building a Collaboration Architecture for a Global Supply Chain

Introduction
Companies around the globe are shifting to global value chains, extending work across time zones, languages, and cultural barriers. This geographic dispersion allows companies to source materials and manufacture products more cost-effectively. But a reliance on a global supply chain also introduces new challenges - making it more difficult to connect with the right people, resolve concerns, and respond quickly to changes and unexpected events.

Many enterprises have made major investments in communication and productivity tools aimed at helping employees work more efficiently. The problem is that, historically, most of these efforts were designed to address computing problems. The problems that companies with large global supply chains face today are human problems - delays and inefficiencies around person-to-person communications.

It is not that technology tools do not exist to address collaboration. Indeed, just the opposite is true: Web 2.0 tools such as video portals, podcasts, blogs, wikis, and discussion forums are changing the way information is created, published, managed, and consumed. Meanwhile, technology advances, and the need to work outside of normal business hours and locations, are creating an increasingly mobile and distributed workforce. To respond to these demands, employees are supplementing standard corporate communications with a variety of new consumer-based tools and applications. But these changes place new demands on the corporate IT environment.

Too often, information remains in silos - tied to a distinct system, application, back-end server, or individual. To navigate all this information, employees throughout the global supply chain need a new generation of collaboration capabilities. They need an IT foundation built with a broader scope in mind - that can encompass an ever-expanding number of intra- and intercompany stakeholders, and collaborative tools and communication formats. This collaboration foundation must combine document- and text-centric collaboration - such as email, instant messaging, team workspaces, and conferencing - with voice, video, and context.

To facilitate this new paradigm of global supply chain collaboration, enterprises must do more than optimize individual business processes. They must enable new and better experiences that translate into tangible and differentiated business value. Enterprise architects (EAs) will play a crucial role in creating this new collaboration environment.

This paper describes Cisco’s strategy for enabling collaboration in supply chain organizations. It provides an overview of Cisco’s vision for collaboration and of the conceptual architecture necessary to enable it, including guidelines to consider when implementing your own collaboration architecture. Finally, the paper highlights how Cisco’s own IT organization put these architectural principles into practice to address several business use cases presented by our own global supply chain organization.

Setting the Stage for a New Vision of Collaboration
Cisco’s global supply chain has largely been viewed as an industry success story, but over time it has become extremely complex. With 8,000 products and 95 percent of production outsourced, Cisco works with hundreds of suppliers and several contract manufacturers at any given time, producing, assembling, and transporting components and finished products at more than 90 locations around the world. Today, the Cisco supply chain organization encompasses 2,400 internal supply chain employees and more than 30,000 individuals overall involved in the end-to-end supply chain.
The scale and complexity of this supply chain presents several challenges. First, Cisco’s global manufacturing footprint is far from static. Relationships with suppliers and manufacturers are constantly changing, and logistics are always in flux. (For example, when energy prices rise, costs of delivery rise as well, and executives making supply chain decisions need to be able to respond.) Like all large enterprises, Cisco manufacturing operations also must contend with a growing number of environmental regulations, which can vary from country to country. And ultimately, a supply chain with hundreds of interconnected parts means hundreds of different areas where Cisco must strive to optimize performance and quality - and decrease costs.

To address these concerns, Cisco has an extensive supply chain organization called Cisco® Value Chain Management (VCM). Cisco VCM collaborates with other Cisco teams and external partners to oversee planning, design, manufacture, and delivery of customer orders, and ensure the quality of Cisco products and solutions. Cisco VCM carefully measures supply chain metrics such as overall on-time shipments and percentage of perfect orders to track the performance of the global supply chain and all supply chain partners. In analyzing these metrics and Cisco’s global growth trends, the team identified several opportunities to improve supply chain operations. Cisco VCM sought to:

- Enhance collaboration across supply chain partners
- Build trust-based relationships with suppliers
- Accelerate time to market of new products
- Improve product quality
- Lower costs
- Reduce risk and manage crises more effectively

To address these concerns, Cisco VCM needed to extend collaboration outside the walls of the enterprise, and find ways to optimize relationships with a constantly changing ecosystem of external suppliers and manufacturers, as well as diverse internal teams. The problem was too complex to solve with any single application or collaboration tool. Instead, Cisco needed to reassess our overarching approach to collaboration, and put in place a flexible framework for enabling and optimizing a variety of collaboration experiences. Fortunately, Cisco has a mature, structured evolution path for undertaking this process.

Our evolution path to a collaborative supply chain organization encompassed:

- **An overarching strategic framework**: The first step in implementing a more collaborative organization is identifying the requirements that must be met to enable collaborative experiences.
- **A detailed collaboration architecture**: After identifying the overarching capabilities that are required, the next step is identifying the specific network architecture that will best instantiate those capabilities.
- **Collaboration solutions**: Finally, we isolated the specific solutions and technologies (including both new and existing applications) that would enable collaboration in the supply chain.

Let’s explore how this evolution path unfolded during our supply chain planning - and how enterprise architects can follow the same evolution path as they assess their own collaboration projects.

**A Strategic Framework for Optimizing Collaboration**

Cisco has long been an innovator in enabling connectivity and communications between organizations, including global supply chains. As we approached the task of enabling greater collaboration in the supply chain, we turned to a broad strategic model to guide our focus in constructing the future of collaboration.
Cisco’s strategic framework for collaboration helped guide our efforts to optimize the supply chain, but it is applicable to any other part of the enterprise where collaboration occurs. It is based on viewing collaboration capabilities in a new way, and integrating a variety of previously separate elements into a single conceptual architecture that is capable of delivering a series of integrated collaboration experiences for end users (Figure 1).

At the highest level, the Cisco strategic framework encompasses:

- **An open, interoperable architecture**: The goal of interoperability means enabling any device or application to draw from the same core of collaborative services. Enterprises should be able to extend the same collaborative services across collaborative applications, business applications, custom applications built by customers or developers, and, of course, a broad range of devices, including third-party devices such as smartphones. It also means that products purchased from Cisco should work with existing investments in collaboration technology, whether through the use of standards, gateway technologies, or open published application programming interfaces (APIs).

- **Flexible consumption models**: Architects should consider a variety of possible consumption models, based on your specific company and its IT resources and priorities. The key is not to make decisions in the context of on-premises versus on-demand services, but to blend the best of both service types. Enterprise and IT architects need to find ways to couple the robustness, security, and performance of the enterprise network with the openness and flexibility of collaboration through the cloud.

- **Enterprise social software**: Consumer social networks have set the standard for delivering ease of use, speed, and ubiquity of access to people and information. Indeed, social networking has surpassed personal email as the fourth most popular online activity. The key for EAs is to combine the tools and benefits of consumer social networks with the security, availability, quality of service (QoS), and reliability required by the enterprise. Such social capabilities can profoundly affect the breaking down of information silos and helping users find the right answer right away - even when that answer lies in another employee’s head. For example, future enterprise social networking platforms could encompass dynamic tagging of employees with specific expertise, based on their activity in the network; that is, which applications they work in, which websites they visit, etc.

- **Intercompany collaboration**: It is not enough to enable collaboration solely among corporate employees, especially within supply chain organizations that can encompass thousands of users and hundreds of independent organizations outside the corporate network. Any foundation for supply chain collaboration must allow users to securely collaborate with partners, suppliers, and customers as if they were behind their own firewall.

- **Video**: Video is fast becoming a transformative element in corporate communications, as collaboration moves from focusing primarily on text- and document-centric tools to include applications that more naturally focus on human communication. Next to a face-to-face meeting, video is the most natural way for human beings to communicate. Collaboration platforms should be built for a future in which video content is as easy to use as documents are today - easy to create, publish, search, and repurpose.
The Cisco Collaboration Architecture

The strategic principles articulated previously lay the groundwork for optimizing a variety of collaboration experiences in a variety of contexts. To translate these ideas into real-world collaboration experiences in our supply chain, however, we needed to instantiate them within a concrete operations and technology model. Fortunately, we had a clear blueprint for achieving this evolution: the Cisco Collaboration Architecture.

The Cisco Collaboration Architecture is designed to ensure interoperability among existing and new forms of communication and collaboration technologies, further enabling both structured and temporary business processes. It allows you to modularly deploy “building blocks” - broad-based collaboration capabilities that you can reuse to support multiple specific collaboration applications - within your organization. You can implement these capabilities on site using existing infrastructure, offer them as hosted software-as-a-service (SaaS) capabilities, or deploy them as a combination of the two. In all cases, however, the architecture encompasses the following layers:

- **Network Services** provide the foundation for network-enabled collaboration with end-to-end connectivity, protocol support, signal management, and QoS for rich-media streams.
- **Medianet Services** use the network to format video and other media types to best match the characteristics and limitations of your specific situation. Medianet Services go beyond QoS to focus on quality of experience (QoE) for video and other forms of rich media.
- **Collaboration Services** streamline collaboration-enabled business processes and break down application silos with open, secure, reusable capabilities that are interoperable across applications and platforms. Collaboration services focus on either enhancing communications or enriching content.
- **Client Services** provide programmatic access to collaboration services for custom development and integration with older environments to further increase interoperability.
- **Collaboration applications** streamline workflow and optimize decision making with software and hardware that facilitate robust communications. They allow the creation of dynamic teams and communities inside and outside the organization.
- **Devices** provide freedom and flexibility in accessing collaboration tools and services by allowing teams to work in the manner and location that suits them best.
Two overarching sets of services (depicted as vertical stripes in Figure 2) offer capabilities that span all layers:

- Security Services protect all layers of the architecture from constantly evolving threats and assure identity to enforce policies for intercompany collaboration.
- Management Services streamline management across operations, administration, maintenance, and provisioning to enable more flexible consumption models.

**Figure 2.** Cisco Collaboration Architecture

The services outlined in the Cisco Collaboration Architecture are in turn instantiated by products that work together to deliver end-to-end capabilities. A variety of solutions and devices can then draw on these capabilities to create discreet collaborative experiences in support of business objectives.

**Implementing Collaboration Solutions**

The collaboration architecture described previously provides a robust and versatile collaboration core for binding together all network-enabled collaboration services (presence, mobility, policies, etc.) into a single conceptual platform. Such a platform is capable of breaking down silos between content formats, technologies, devices, and people to enable collaboration without boundaries. It allows an organization to further automate, integrate, and optimize the kinds of ongoing human interactions that supply chain users might have - with each other, with external channel partners, and with customers.

However, an architecture alone does not enable collaboration. Implementing collaboration capabilities requires a variety of collaboration solutions and devices. (The specific solutions depend on the specific organization and needs...
of the supply chain.) A flexible collaboration model should also efficiently integrate existing collaboration solutions and applications, and be versatile enough to accommodate solutions from multiple providers.

As we considered specific collaboration capabilities for our supply chain, we explored a variety of solutions from Cisco, including:

- Conferencing solutions that combine premises-based and SaaS offerings to deliver flexible, cost-effective rich-media conferencing experiences that combine voice, video, and data applications
- IP communications solutions that improve employee productivity, mobility, and responsiveness
- Messaging solutions that accelerate business processes by enabling employees to access and deliver messages through any medium, anywhere, on any device
- Mobile applications that increase employee productivity and collaboration by making mobile devices extensions of the enterprise network
- Enterprise social software such as discussion forums, expert locator tools, online collaborative workspaces, and other Web 2.0 applications that connect employees and enable productive virtual workgroups across geographic boundaries
- Telepresence, which provides immersive, face-to-face collaboration without travel, anytime, anywhere
- Customer care and contact center solutions that proactively connect people with the information, expertise, and support they need

As might be expected, the range of collaborative possibilities available depends upon the underlying network infrastructure. End-user QoE begins with ensuring a disciplined approach to network architecture end to end. In constructing such a collaborative network infrastructure, proper planning for sufficient bandwidth availability, proper use of available QoS technologies and techniques, and multicast enablement and multipoint control (for video streams in particular) must be accounted for.

**Aligning Collaboration with Business Objectives**

Any new collaboration efforts must be carefully aligned with business goals. By establishing a clear 3- to 5-year vision for new collaboration efforts and explicit 1- to 2-year strategic plans for implementing them, you can successfully identify, prioritize, and sequence the initiatives necessary for establishing new business and management processes.

In order to ensure that concrete business value was guiding the planning and implementation of our collaboration project, our efforts proceeded along the following path:

**Step 1. Identify pain points:** The first step in integrating new collaboration tools into your supply chain is to understand the specific pain points of your users. Because supply chains are typically process- and metrics-directed organizations, identifying areas for improvement should be a relatively straightforward process. At Cisco, our collaborative supply chain initiatives began with an exhaustive internal research process, working with constituents throughout the supply chain to identify pain points and gather feedback on proposed solutions.

**Step 2. Identify and prioritize solutions:** After we isolated the pain points, we mapped them to specific solutions. We identified 24 business capabilities that were necessary to enable collaboration among supply chain stakeholders. Capabilities cover a wide range, including collaborative calendars for project teams, instant-messaging capabilities that extended across internal and external partners, and marketplaces to track and share capital equipment. The value of each solution - reduced costs, improved efficiency, and faster time to market - could then be quantified and prioritized.
Step 3. **Isolate technology services needed to support the solutions:** From an architectural standpoint, we could then begin to isolate the technology services that the supply chain collaboration solutions would use - services that could ultimately be employed in multiple applications. Services included:

- Notification service
- Workflow service
- Content services
- Search services

During this process we also developed the security framework for policy and business rules for accessing these services.

Step 4. **Combine all the pieces:** At this point, we could envision what the collaborative capabilities we were building would look like for the end user. For example, one critical initiative that the Cisco supply chain organization identified was a personalized collaboration workspace that employs the right services for each user, according to policies and business rules, to provide all of the supply chain content, services, and Web 2.0 and collaboration capabilities that employees will need to perform their specific jobs - ideally available across multiple devices.

Figure 3 highlights the system-level architecture Cisco IT developed in support of the supply chain collaboration initiative. As the figure shows, a new collaboration solution need not encompass only new applications and technologies. Indeed, it should use existing solutions and applications - mapping some capabilities onto existing technologies one-to-one, and in this particular case, porting information from other existing technologies directly into the target collaboration workspace.

**Figure 3.** Envisioning a Collaborative Cisco Supply Chain
In this case, not all capabilities and integration were completed immediately. Many of the capabilities incorporated into the collaboration platform - instant messaging, email, and borderless capabilities that allow users outside the Cisco firewall to access content - were straightforward initiatives. Others required more extensive integration (for example, integrating systems to alert stakeholders of a line stop or line alert at a manufacturing site). But after the architecture was solidified, Cisco had a plan in place to build all the capabilities that had been identified - as well as the ability to support new capabilities in the future. For example, as Cisco moves away from portals and toward enterprise social software (Cisco Quad), the deployment is simplified and time to availability shortened by using the capabilities already provided in the enterprise collaboration platform.

The following sections explore some of the specific business use cases that resulted from these efforts, and ultimately enabled enhanced collaboration experiences in the Cisco supply chain.

Principles in Practice: Cisco Supply Chain Use Cases

Drawing on the Cisco Collaboration architectural principles described previously, Cisco was able to implement important new collaboration capabilities that realized real business results, in an efficient and repeatable manner. The following use cases describe some of these efforts.

New Product Introductions

The process for introducing a new Cisco product is inherently complex, involving collaboration among thousands of Cisco employees, often spread across multiple countries and time zones, as well as constant coordination with external suppliers and manufacturers. Each stage of the product lifecycle - architecting the solution, isolating functional specifications, development and testing, etc. - demands extensive internal and external collaboration. Internally, Cisco must support cross-functional collaboration among engineering, manufacturing, marketing, finance, and other Cisco teams. External collaboration involves development partners, contract manufacturers, suppliers, and customers. With so many processes and stakeholders involved, there are many places where collaboration and communication can break down. Such breakdowns can translate to extremely costly problems, including launch delays, budget overruns, and dissatisfied employees and customers.

The Cisco VCM team recognized that new product introductions represented an excellent opportunity to use collaboration tools to improve supply chain communication and team engagement. The team decided to test the viability of using particular collaboration solutions to accelerate time to market during the introduction of the Cisco ASR 9000 Series Aggregation Services Router, a carrier-class edge routing platform. Given the broad scope of technologies and teams that would be involved in developing and launching the product, the launch presented an excellent opportunity for optimizing inherently collaborative processes by using technology.

The Collaboration Solution

With a broad-based collaboration platform in place, Cisco integrated a variety of existing applications and services with new collaborative tools to create a highly effective collaboration experience in support of the product launch. Important capabilities and solutions included:

- **Cisco WebEx™ Connect**: Cisco WebEx Connect provided a globally accessible online workspace available to both internal Cisco employees and external partners and suppliers. The workspace included:
  - Content specifications, market data, customer input, and other product information
  - Links to internal and external data sources
  - Rich Web 2.0 tools to support the product launch, such as wikis, video-on-demand (VoD) training modules, and product and technology discussion forums
  - Real-time presence information and instant connectivity to internal and external stakeholders
- **Rich-media conferencing:** The Cisco ASR 9000 teams used Cisco TelePresence™ and Cisco WebEx™ meeting applications to host program reviews, stage reviews, and staff meetings, accelerating the project management process. The solutions helped ensure that internal and external teams located anywhere in the world could meet virtually and more frequently, keeping all stakeholders better connected.

With an open, interoperable architecture in place, Cisco rapidly integrated content, services, and applications into a unified end-user experience.

**Results**

The collaboration initiative allowed the Cisco ASR 9000 team to effectively take advantage of all available expertise worldwide, internal and external, to engineer this extremely complex product. By enabling close collaboration among 400 engineers and multiple partners located across seven locations, Cisco introduced this major new edge routing platform in multiple global regions at one-tenth the cost of a typical product launch. By exploiting innovative Cisco Collaboration tools, global engineering and development teams were able to improve knowledge transfer, reduce rework, and reduce design iterations - all while exceeding target product quality specifications.

Critical to this success was creating a single, shared pool of experts to guide the development and engineering process, and using collaboration tools to extend that expertise to all global sites. Cisco VCM estimates that this effort saved at least US$10 million in prototype costs alone, simply by reducing the need to staff high-level experts at all seven locations. Cisco realized additional savings by manufacturing this high-end router in China at a lower production cost - instead of first producing the product in the United States and later shifting production overseas, as had been done with new products in the past. The Cisco Collaboration tools enabled this process by allowing stakeholders in China, the United States, and India to maintain close communication throughout the development and manufacturing process. The new collaboration tools also allowed the Cisco ASR 9000 team to house all information for all stakeholders in a single place, work collaboratively across multiple time zones, and develop more effective testing and debugging tools that could be applied globally across the launch. From that point forward, use of these tools has become a best practice for new product introduction for the company.

**Localized Crisis Response**

With hundreds of supplier and partner facilities dispersed around the world, major disruptions are an inevitable reality of doing business - whether they are due to natural disasters, political upheaval, or other unexpected crises. An unforeseen problem such as a natural disaster that damages a manufacturing facility can significantly affect Cisco and our customers.

To mitigate these threats, Cisco maintains supply chain crisis-management teams that can be called into action to rapidly respond to such crises. Organized by geography and function, these teams monitor the hundreds of Cisco suppliers and partners, assess the effect on Cisco of a disruption in our operations, and evaluate each partner's ability to withstand such disruptions. They also step in to make real-time decisions if a crisis occurs (for example, switching production to a new site, moving to a secondary supplier, etc.).

Cisco crisis response teams follow a six-step path in responding to a crisis or potential crisis:

1. Monitor the situation.
2. Assess the potential disruption to the Cisco supply chain, and the actions that need to be taken.
3. Activate the appropriate teams and response plans, including both internal and external parties.
4. Manage the crisis response.
5. Resolve the problem.
6. Recover from the crisis and revert to stable and permanent operations.
Clearly, a great deal of collaboration is required in each of these crisis response phases. And because these problems can affect global supply chains, the ability of stakeholders to quickly and easily share information can directly affect Cisco’s profitability.

The Collaboration Solution
To help this team communicate and respond more effectively, Cisco VCM deployed a variety of collaboration capabilities, both internal and external. To support the monitoring and assessment stages, Cisco employees throughout the enterprise collaborate through a common intranet portal. Through this portal, they can access crisis response email lists, messaging and Really Simple Syndication (RSS) subscriptions, dashboards, videos, and communication services, including phone and Cisco WebEx conferences.

To obtain information about potential crises, Cisco uses a third-party service that specializes in collecting and correlating events from around the world that could affect the supply chain. The service monitors thousands of sources for a variety of information, including natural disasters, weather, news services, financial news services, and more. The Cisco Safety, Security, Business Resiliency (SSBR) group receives this raw data feed, and parses it for display on the portal. When a crisis event is triggered, the team sends notifications to all relevant parties, and to the Cisco Safety Facility Operations Center (SFOC). SFOC then maps the event location to Cisco physical assets to determine the potential effect. It also identifies the severity of the crisis, and sends notifications by phone, email, Short Message Service (SMS) or pager, and web-based portals and dashboards.

At this point, all potentially affected parties are brought together to determine the actual effect and next steps for the situation using a variety of conferencing and collaboration methods. Then the team moves on to team activation, management, and resolution of the crisis using the Cisco centralized Risk Management Practice Dashboard.

This online application provides a universally accessible workspace that team members can access at any time to view incidents and potential incidents anywhere in the world, and coordinate a response. It employs the same communication and collaboration tools used in the early stages of crisis response, but extends these efforts from intracompany to intercompany, including supply chain partners, shipping, manufacturing, and more. The system correlates information about all Cisco suppliers, manufacturing partners, and logistics providers with maps and real-time information. Crisis response team members can log onto the dashboard and see where the problem is occurring and how serious the risk may be (that is, how much revenue is at stake, whether the partner is the sole source for the component or product, how long it will take to switch to a secondary source, etc.). The team can then take rapid action.

After the crisis is over, Cisco does a post-mortem of the resolve and recover stages, once again bringing together all links in the supply chain to determine what worked, what requires improvement, and what the early signs of crisis were. This information is presented in a Cisco WebEx conference and then integrated into newly revamped and updated processes based on the post-mortem. These changes are then added to training tools, which take the form of web-based classes and VoDs, as well as live virtual teams meetings. Virtual teams meetings used to be an in-person event, but with current collaboration technologies, they can now be held globally without requiring extensive travel to a single location.

Results
Cisco’s process of mitigating crisis and risk using collaboration has enabled us to not only be much more reactive to a specific event, but also to be more proactive in noting trends that are indicative of an upcoming event - and taking action before the event occurs. Some types of crises, such as natural disasters, cannot be predicted, but many other events can. Thanks to Cisco Collaboration capabilities, the crisis management team can now prepare for action and make preemptive adjustments to the supply chain - often before an event occurs.

One recent example of collaboration-enabled crisis response occurred during the political unrest in Thailand in November 2008. Thousands of protestors flooded Suvarnabhumi International Airport, shutting down all inbound and
outbound flights. Because Thailand is a major hub of printed circuit boards and finished products for Cisco, the event represented a major disruption - potentially delaying circuit-board deliveries to other Cisco manufacturing sites and orders to hundreds of customers.

Fortunately, the shutdown of the airport was not a surprise to the Cisco crisis management team. The team had been monitoring the region using the online dashboard for several days prior to the shutdown, and had already assessed the risk, assembled a response team, and begun implementing contingency plans. Using Cisco’s extensive crisis response collaboration capabilities, team members worldwide kept in close contact with each other and with contacts on the ground in Thailand, as well as with secondary suppliers in Asia to coordinate contingency-plan logistics. Within 2 days of the shutdown, Cisco was shipping orders from Thai suppliers by truck to Penang, Malaysia, and airlifting them out from there. The process added 3 days to the transportation of the orders, but the team was able to compress build times at other sites to make up for the delay. Ultimately, the vast majority of customers and manufacturers relying on components from Thailand received their shipments on time - realizing no noticeable effect from the airport shutdown at all.

Conclusion

There are many types of collaborative applications that supply chain organizations can employ, and there will be many more in the future. Wikis, blogs, virtual workspaces, video presentations, instant messaging, social networking sites, and web conferencing are just a start. Therefore, enterprise architects need to build a comprehensive foundation to support those applications.

Organizations can build efficiency into collaborative tool development by defining critical building blocks that can be repurposed for a wide range of business scenarios. On top of such a core foundation, EAs can look for ways to integrate such capabilities into discreet solutions that meet particular business needs. That could mean building a collaborative workspace that pulls desktop sharing, video sharing, wikis, blogs, and forums onto a single intranet portal, or deploying conferencing solutions that bring disparate teams together across distances and time zones. In all cases, these tools should take advantage of the capabilities of a collaborative network infrastructure to best support their unique needs. As this paper has shown, the Cisco Collaboration Architecture provides an ideal strategic framework for effectively implementing collaboration capabilities.

Many of the architectural principles expressed in the Cisco Collaboration Architecture became crucial tenets in crafting our supply chain workspace solution. The broad principles that shaped the solution included:

- **Flexibility and reusability are critical**: Supply chains are far from static. In an organization where the stakeholders, partners, and applications are constantly changing, you need to be able to easily and continually integrate new services. It is therefore vital to avoid hard-coding aspects of the platform (policy management, identification, entitlement, etc.) in a way that requires IT integration. Whenever possible, the collaboration platform should use standard protocols and open APIs.

- **Account for collaboration inside and outside the corporate network**: By their nature, supply chains extend beyond the corporate firewall. In an environment that can include thousands of constituents among suppliers, manufacturers, logistics providers, and others, it is essential to understand who all the users are and what each of them is allowed to access. Strong access and identity management and business policy management that extends across all collaboration services is essential. Recognizing that supply chains are fluid, these mechanisms must be implemented in a way that allows for constant change. If a problem arises with a particular component, for example, the collaboration platform must be able to dynamically recognize all people inside and outside the organization who are associated with that component and need that information.

- **Focus on the end-user experience**: Ideally, the collaborative environment you create will be the place where supply chain employees spend most of their workdays. Supporting these users means much more
than just deploying some new Web 2.0 applications and asking people to use them. Indeed, the most successful collaboration initiatives focus on integration, not replacement: bringing existing content, services, and applications into a more cohesive and easy-to-access experience for each user. Just as important as what you do, is what you do not do:

- Do not attempt to re-architect data or databases that are firmly ingrained into supply chain processes.
- Do not build applications - aggregate and incorporate existing technologies whenever possible.
- Do not try to redesign end users’ work processes around new technologies; focus instead on making it easier for users to do what they are already doing.

Of course, beyond this one application, there are many other collaborative solutions that employ the Cisco Collaboration Architecture model, and have helped take the efficiency of Cisco supply chain operations to the next level. By clearly defining capabilities, services, and policies necessary for effective collaboration, the Cisco Collaboration Architecture provides an ideal starting point for conceptualizing and pursuing the journey toward achieving differentiated business value through collaboration.