Application Innovation Services Travel and Transportation

Making connections

Using SOA to enable collaboration in travel and transportation

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Using SOA to enable collaboration in travel and transportation

By Jeanette Caspersen and Jay DiMare

Heavy burdens are being placed on the travel and transportation industry as international travel and trade expand, influenced by increasing governmental regulation surrounding identity management, ports and border management and trade policy enforcement. Delays, consumer frustration, economic loss and security breaches are often the result. Among the challenges faced is how to reconcile profitable, yet secure and lawful, travel and trade with heightened information and enforcement needs. While many companies and nations are updating their systems to address local problems, effectiveness is often compromised because of the inability to communicate across platforms. Service-oriented architecture (SOA) can facilitate communication and collaboration among diverse and disparate systems and help create the opportunity to balance freely flowing travel and trade with security and legal issues.

Striking a balance
Travel and trade versus border management

Cross-border travel and trade has been rising steadily for the past decade. In 2007, for example, international tourism arrivals world-wide grew 6 percent to almost 900 million, and international air traffic grew 9.3 percent.[1] Further, global travel and tourism is expected to increase 4.3 percent per year over the next ten years.[2] In addition to tourism, migration of workers from one nation to another continues to increase and is helping many countries develop their economies. Global trade, which has averaged a healthy 6 percent growth rate per year since 1975, is expected to grow about 8 percent per year through 2012.[3]

The increase in global trade demands that the import and export process must better facilitate – rather than hinder – movement of goods. Delays in shipment as a result of the trade regulations of various nations, port congestion and customs inspections have a direct effect on the economies of nations.

But the governmental and congestion barriers are not the only looming threats. Illegal activity, in both travel and trade, is increasing. In international trade, for example, product transparency and traceability, counterfeit and illegal goods, tax fraud and smuggling continue to be major issues. The transportation infrastructure has become a target for terrorists and, unfortunately, also a weapon.

Correspondingly, the ability of travelers to journey unfettered from nation to nation, with a minimum of delay and an expectation of reasonable personal security, is in danger of becoming only a collective memory for millions of people worldwide. Likewise, the logjam at the world's busiest ports stretches customs authorities beyond their capabilities.

It is no surprise, then, that governments around the world are finding that balancing the need for the requirements of travel and commerce with effective border management to be an increasingly complex issue. Technology systems have been deployed by industry and governments alike to help address the challenge. But disparate systems in use from one nation to the next – and even within departments of a single agency – often cannot communicate efficiently or effectively, creating inconsistent application of local laws and standards, misidentification of innocent travelers, ignorance of potentially dangerous individuals and costly delays in business and commercial traffic. For the globally integrated enterprise, the challenge increases exponentially with every country entered.

As governments endeavor to strike a balance among security, trade regulations and convenience, travel and transportation companies often face the most exposure in terms of both potential customer dissatisfaction and revenue loss.

However, imagine a way exists to help companies collaborate with government to develop systems that address transportation security priorities and help manage the complex and changing requirements of international trade – a system that allows sharing of best practices and the preservation of useful legacy applications within a modern framework. We believe that service-oriented architecture (SOA) is an approach that achieves these benefits.

SOA, a software development approach supporting seamless communication among disparate systems, can help alleviate many of these communications challenges and work to ease the burden currently placed on border and port management systems.

What is SOA?

Service-oriented architecture (SOA) is a style of developing and integrating software. It involves breaking an application down into common, reusable "services" that can be used by other applications, both internal and external, in an organization – independent of the applications and computing platforms on which the business and its partners rely. Using this approach, enterprises can assemble and reassemble these open, standards-based services to extend and improve collaboration among existing applications, build new capabilities and drive innovation at every point in the value chain.

Making connections

Using SOA to enable collaboration in travel and transportation

In essence, SOA strips the verticality and rigidity out of different or proprietary IT systems and then bends them to the needs of the user.

An SOA approach to systems integration requires a collaborative design effort involving both business and technology. Statistics show, however, that only 68 percent of IT professionals have a basic understanding of SOA.[4] Their stakeholders are even less likely to understand how SOA can work for them. Our objective with this report is to provide an educational tool for both business and IT professionals and lower the gap between those who can benefit from SOA and those who understand its implementation.

To facilitate understanding of how SOA can be used to address issues in travel and transportation, we will examine how SOA can be used in two specific, strategic scenarios in the travel and transportation industries:

- Facilitating cross-border travel with collaborative advance passenger analysis (APA) systems

- Lowering the cost of cross-border trades by integrating customs with various transportation and trade stakeholders.

For each scenario, we will describe the business problem, how it can be addressed using SOA and the benefits derived from the solution. These solutions are not meant to be definitive or complete. Rather, they are designed to demonstrate the application of SOA to integrate the systems that support the travel and transportation industries.

Facilitating cross-border travel

Travel travails

With the projected increase in international travel, the problems faced by airlines, other carriers and governments are expected to rise exponentially. Rapid growth is creating obstacles in verifying the identity of travelers, screening for security, checking the admissibility of goods, enforcing national regulations and collecting revenues.

International air travel is a clear example of where security and border integrity conflicts with traveler convenience—and carrier cost of doing business. More security checks mean that an ever-growing number of passengers are facing ever-longer delays. Delays in security checks often result in flight delays, which compound to have detrimental impact on airline schedules throughout the world. Delayed schedules lead to increased costs – without the ability to easily absorb these costs in the price of travel. Besides coping with the increased costs, airlines must deal with declining customer satisfaction that impedes short-term sales.

Again, multiple solutions present themselves, such as the building of more airports, increasing the number of security gates and hiring more people. But these are often costly, environmentally unacceptable or may not fit in the available physical space.

Yet, many of these issues can likely be mitigated by the combination of the right policies, the right technology and increased collaboration. Governments are pursuing solutions that

permit increased throughput by early identification of travelers, early risk assessments and speeding low-risk passengers through automated checks wherever possible.

But we believe for these solutions to be truly effective – and to establish the groundwork for an effective system by collecting the necessary information – better sharing of information is required among governments, airlines, travel agents, hotels and other parts of the travel industry. To facilitate this sharing, a cost-effective and secure approach to technology integration is needed – one that will be attractive to all participants.

For the majority of travel today, information is routinely exchanged. The format and medium vary, and the use of such information varies even more. A typical process is shown in Figure 1.

Unfortunately, this system has some limitations in data exchange. As Figure 1 shows, passenger data gathered in the departure country is made available to the customs and immigration systems in the destination country no earlier than airport check-in and flight boarding, and sometimes considerably later, when the data is of limited practical use to the destination country. The only point of electronic interchange between the departure and desti-

FIGURE 1.
Representative international departure and arrival process.
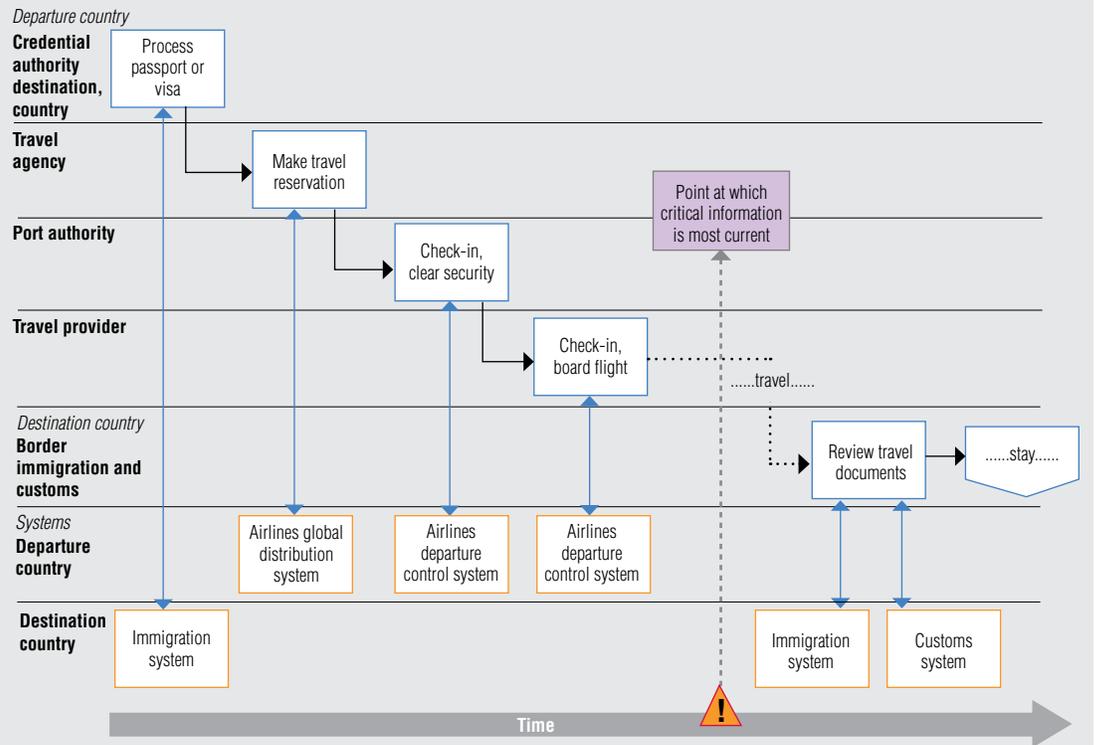
Source: IBM Institute for Business Value.

nation country is between the check-in system of the former and the travel documents review system of the latter.

Travel transformed

Some countries are using a combination of technologies to process incoming passengers and baggage, with sometimes-improved results over past solutions. However, many of these systems, by nature, require a high degree of system integration, both internally and externally, with older, less capable legacy systems. APA, for example, can provide authorities with a complete manifest of passengers on board a flight – along with input for procedures and resources to examine the data and analyze it before the flight arrives. It can also limit inspection time for passengers after arrival.

Figure 2 illustrates how, without changing the overall passenger and baggage procedure, applications can collaborate to enable the system to obtain information much sooner in the travel process, creating the potential for a more useful service for both the departure and destination countries.

The first thing to notice is that in both the departure and destination countries, the process is essentially the same. We propose an SOA-based interface between the airlines' global distribution systems (GDS) and departure control systems (DCS). These systems could interact using pre-defined SOA services to send data such as passenger lists to the destination country's APA systems.

FIGURE 2.
**Representative international departure and arrival process with SOA-enabled APA system.**
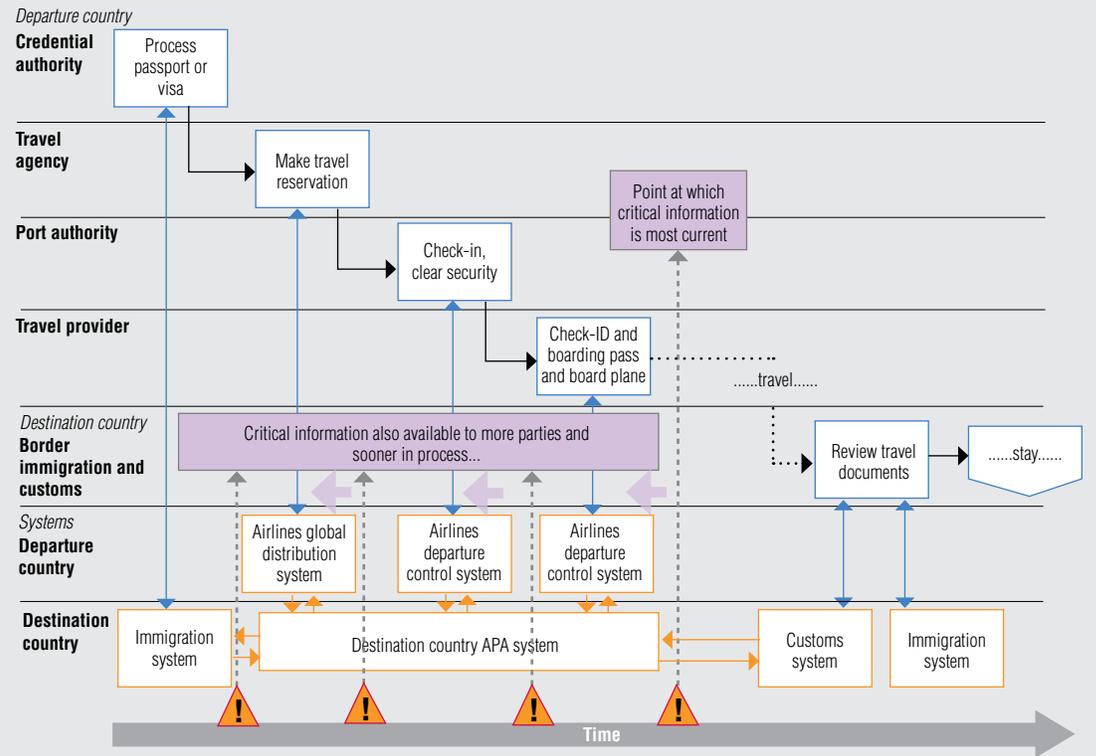
Source: IBM Institute for Business Value.

With an SOA-enabled system, information is available in realtime to *any* participating destination country. By using the same interfaces earlier in the process, information can be analyzed earlier in the process. The minute a traveler in the departure country takes a travel-related step, the information can be made available to *all* potentially interested parties. The implications for government security and control, as well as passenger speed and ease, are significant.

This process occurs today, but using different approaches. What is different in our recommended approach is the use of SOA to enable the APA system for realtime access to passenger information. Existing electronic methods of capturing data based on data file transfers are referred to as a "push" model, where the airlines push the data to the destination countries at specific times. These existing methods can continue. In fact, volume of flights and passengers would warrant careful systems analysis during the design process to help make sure that both batch and realtime data exchange is balanced against the ability to assess and analyze the information. What this solution suggests, however, is that SOA offers an alternative implementation that provides both the airlines and the destination countries advantages over the traditional file transfer methods.

Figure 3 shows how SOA integration between APA systems and other government and commercial travel systems can be implemented.

APA system using SOA for integration with supporting systems.

Source: IBM Institute for Business Value.
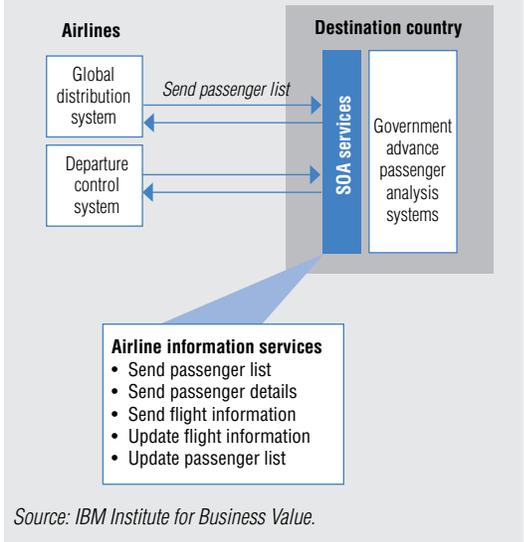
This solution shows the GDS and DCS systems using SOA services to collaborate with the APA systems in the destination country. This interface could be used in realtime or batch mode as appropriately determined during design. By interacting with the APA systems using SOA services, however, information potentially can be processed as it arrives, without waiting for data management and batch windows to load the data. The realtime nature of SOA services provides the ability to see changed information as soon as it is provided from the source system.

This SOA option is another implementation of the "push" model – where data is pushed from the airline to the destination country system – but with many advantages over file transfer approaches. For the airlines, file transfer approaches require software jobs to extract the data and additional jobs to send.

There is an impact on job scheduling and network management. The event-driven nature of sending this information often requires batch jobs to run against the same data-base systems as used by online applications, requiring careful management of job execution to minimize impact on online system performance. Last, error handling for file transfer approaches is fraught with challenges in problem identification, let alone addressing any issues. With an SOA interface to send or push this data out, much of this can be eliminated.

For the destination country, data is sent from multiple carriers at all times. These data files, regardless of how they are transported, require software jobs to load the data before the data can be used for any purpose. Depending upon the enterprise IT architecture and implementation, additional data management – movement or copying – may be needed to make the data available to the different analysis software that processes the data. These jobs take time – time that is not always as plentiful as needed. This data management also can be avoided.

Using the SOA interface shown in Figure 3, the data can be sent as the events (reservations, or flight closed for departure) occur directly into the destination systems. The call-return nature of the SOA interfaces, much like a telephone call, provides instant verification to the airlines that the data arrived and its status.

To create the solution detailed in Figure 3, the destination countries would build the layers of services to work with their existing systems.

The airline information services would be "exposed," or made available, to the airline GDS and DCS systems. The data content would align with current Advance Passenger Information (API)standards.[5] With industry and government collaboration, standard service models could be established to allow any airline to interact with any government implementing the standard.

SOA value: modularity and openness

Sharing passenger information in advance creates the potential for a number of benefits:

- The measurable improvement over existing flight clearance time performance

- The removal of low-risk passengers from primary inspection, allowing limited resources to be used for higher-risk passengers

- Improved cost efficiencies, achieved through reduced per-unit inspection costs and increased facility throughput

- Improved border control capabilities resulting from increased intelligence and data collection opportunities

- Lower costs associated with the removal of inadmissible passengers

- Easier, quicker travel for passengers.[6]

The advantage of SOA is its modularity and openness. New systems do not have to be "hard wired" to existing systems; the systems can exchange information through the SOA services layer. Correspondingly, a virtually limitless number of systems can connect – meaning that the travel systems of any country

can join the global system quickly and easily. And the more countries that participate in the process, the greater the potential benefits.

Should governments collaborate to extend current API standards for working with the travel industry, this would present a potential win-win solution for both the travel and transportation industry and governments. The travel providers have a single interface for all destination countries and an overall lower cost to meet regulation needs. Governments gain realtime information at a lower cost of operations.

As described previously, the SOA alternative outlined in this scenario can co-exist with current file transfer approaches. For both the destination country and the airline industry, a reduction in data management processing can occur as realtime SOA interfaces are used to send the data from the airlines to the destination countries. The realtime nature of this exchange makes the data immediately available to destination systems, increasing the time available for data analysis.

Still, consistent with security needs, countries that "expose" their travel systems through SOA services can keep a great deal of control. They can provide controlled access to a set of predefined, explicit services – protecting the information they wish to keep confidential. And since local systems sit behind the SOA services "wall," the systems can be updated or replaced without affecting interfaces to the other parties. It is the information that is exposed and provided, not the systems themselves.

Integrating customs and other trade stakeholders

Trade friction

Like travel, international trade is also often beset by the problems of rapid growth. The challenge for customs is how to effectively handle the increase in trade volume without becoming an impediment to the growth of trade. Global trade features complex transactions that include multiple stakeholders. A key stakeholder, customs, is the linchpin of these transactions. All other stakeholders must interact with governments through customs many times in executing a trade.

The complexity of trade regulations, documentation and reporting makes it difficult for importers, exporters and customs. The complexity increases risk of regulatory compliance infractions, adding cost and risk to trade transactions. The United States, European Union, Asia-Pacific Economic Cooperation (APEC) and the United Nations have recognized the impediments to trade, but have yet to resolve the regulatory complexity and harmonize security requirements.[7] This is more understandable when you consider the magnitude of the regulatory compliance problem. According to the UN Conference on Trade and Development, "… the *average* international transaction involves 27 to 30 different parties, 40 documents, 200 data elements (30 of which are repeated at least 30 times) and the re-keying of 60 to 70 per cent of the data at least once.[8] Obtaining the necessary permits can take weeks in some economies."[9]
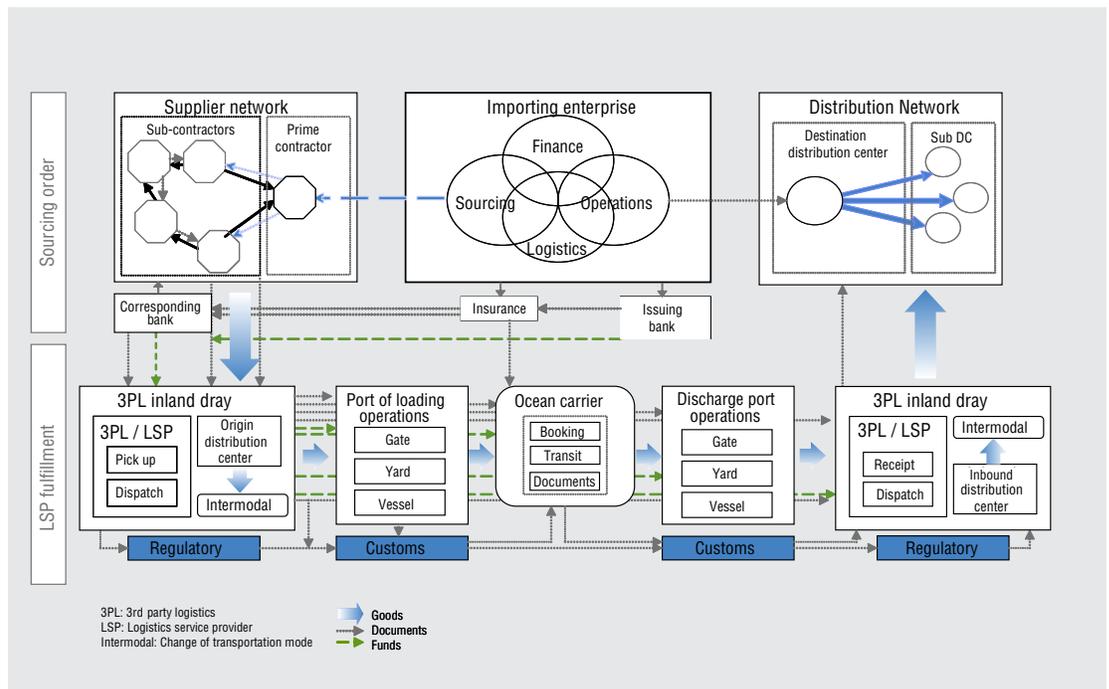
As a result of the complexity, the cost of compliance with customs policies is considerable. More specifically, the cost to comply with existing and emerging requirements of modernized border management grows with each required report, data element, document, permit, or regulation.

Customs agencies everywhere are challenged by the increased workload – which has become even greater with the additional demands of trade security. In response to these challenges, many countries are participating in a wave of customs modernization that spans the globe, with millions of dollars being spent on new processes, enhanced capabilities for customs officers and technology tools to support them. Figure 4 gives a graphic illustration of the complexity, both in participants and operations, of the global trading system.

The figure illustrates the trade process with its stakeholders and operations. A typical trade starts with the "importing enterprise," and the process proceeds counterclockwise around the diagram until the goods reach the "distribution network" and, eventually, the "importing enterprise."

Typically each disparate system maintains its own set of information, structured in ways to satisfy the individual business' need. Lack of standardized views on collections of information has caused the development of international standards. Two examples of this include the focusing of the World Customs Organization (WCO) on identification of individual shipments for the cargo clearance process and the UN e-Docs standards supporting the information structures used throughout the lifecycle of global trade.

Customs has worked to harmonize trade regulations and compliance processes, but with mixed success. According to the 2007 World Bank study of global logistics, both information and process barriers impede effective trade and economic growth: "Even where customs has been modernized, coordination of border procedures between customs and other agencies remains an important concern."[10]

The compliance and reporting processes are substantial contributors to the complexity of customs clearance. A simplified, collaborative approach, however, can help expedite trade as well as improve safety and compliance.

Open Trade

For customs to gain access to accurate, compliant and timely reporting data, and at a reasonable cost, it needs the cooperation of the trading community. And to achieve that cooperation, customs needs to continue to foster a collaborative environment, with integrated processes and compatible applications. The new regulatory and data reporting requirements and modernized trade management systems require more data and want that data earlier in the process.

On the industry side of the equation, multiple solutions have been developed to conduct a trade more efficiently. These solutions focus on transparent and integrated transaction processes supported by enterprise resource planning (ERP), Supply Chain Management (SCM), and other logistics systems. Customs faces several challenges in keeping pace with the growing sophistication of the trade community. One challenge is the collection of reporting data. For instance, there is reliance on and proliferation of electronic data interchange (EDI) and point-to-point systems. A second challenge is collaboration, which is necessary between government and the trade industry, but relies on voluntary participation. Not all trading partners are equally sophisticated or capable of collaboration. Modernization of national customs is a priority for a number of developed countries, but less-developed economies are finding trade is often retarded by outdated practices.[11]

Although both the trading community and customs organizations have recognized the importance of eliminating impediments to trade transaction efficiency, there are major political and practical barriers to shared technology and process collaboration between traders and customs. For example, the supply chain is fragmented, with no end-to-end view or "business owner," so that cooperation is voluntary and subject to each participant's view of the value of cooperating.

The continuing lack of process and technology standards impedes systemic collaboration. There have been some major accomplishments. The WCO SAFE Framework of Standards, for example, has established the basis for customs-to-customs and customs-to-business automated exchange of information. In addition, the UN e-Docs program and the related The United Nations Center for Trade Facilitation and Electronic Business (UN/CEFACT) Cross Border Reference Data Model (CBRDM) project are major initiatives to harmonize international trade practices focusing on data exchange models. However, in practice, there is no single international

standard, and the complexity of multiple inconsistent standards remains a huge burden and cost to international business.

We believe SOA offers an approach to overcome these barriers, and a start to building a collaborative platform between customs and the trading community. To illustrate how to apply SOA to some of these problems, we will examine a couple of the challenges faced by the trading community in obtaining regulation information and compliance reporting.

Consider the systems that support the process outlined in Figure 4 (see page 9). In this context, each of the stakeholders identified has their own supporting systems:

• The importing enterprise includes ERP and global sourcing support systems, as well as purchasing, finance and merchandising systems (buyer systems and retailer systems), all supporting the "buyer" responsibilities in the trading process.

• The supplier/distribution networks and third-party logistics (3PL) companies include those systems used by customs agents and other participants in the acquisition of goods and the movement of goods once they arrive at their destination. In our example, we will focus on the systems supporting the customs agents.

• Ports and carriers each have a number of systems that interact with customs, insurance, and banking participants

• Banking and insurance, each have their own systems. For the banks, in particular, there is a need to interact with almost all other parties participating in the process.

Customs has a number of systems to support regulations and policies, duties and tariffs and trade management. These regulations and polices are information that is needed by all stakeholders. Ideally, if customs could make the regulations and policies available electronically to the systems supporting the trading community, it would help traders address compliance needs as early in the process as possible. Electronic collection of such information would help with integrating information and, eventually, with combining information for submission when required. Figure 5 illustrates how SOA could be used to provide access to regulation information, as well as duty and tariff information needed by the trading community.

FIGURE 5.
SOA-enabled customs systems.
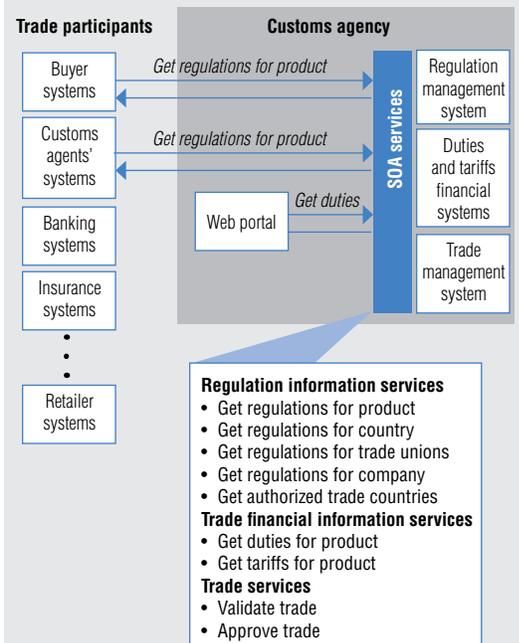
Source: IBM Institute for Business Value.

Figure 5 shows a number of different types of transactions that support several different processes. First, we show regulation and policy information available to systems that request them using regulation information services (such as "get regulations for product"). At this time, there are no standards for the format and content of these regulations, so for this example, assume these regulations are in the form of a text list that can be added to a bill of lading or other required document. Almost all participants in the trading process require access to this information provided by national customs agencies.

The entire set of regulation information services can operate in this manner – returning the requested information systematically in text format. As an example, buyers, customs agents and other participants in the trade process would be able to collect customs information electronically using the SOA services to "get regulations for country" and then, for the product being traded, "get regulations for product" specific to the country it is going to or coming from. Banks can access these regulations and include them in letters of credit. Insurance companies can include this information as part of a policy providing confirmation that policies are set for the correct coverage amounts. Even this most basic access to the information can lend value to the process.

Second, we show that tariffs and duties are made available in the same manner. The information requester would provide the needed input such as source and destination as well as the product being acquired, and get the tariff or duty information returned. This information is critical to retailers seeking goods from global sources, as duties and tariffs add to the landed costs and ultimately impact their profitability. But other parties, such as customs agents, also require access to this information.

Third, the same SOA services providing regulation and revenue information to trade participant systems are also used to provide this information to a customs Web portal. Internet-based information access is provided for the smaller trade participants or for those without systems connectivity. Regulations are available online and often as separate documents.

Last, we include a future possibility for the point when SOA infrastructure becomes more widely implemented. Using the same approach as the information services described previously, this approach positions trade participant systems to submit the full trading package to customs electronically, perhaps first requesting to "validate trade" and eventually requesting to "approve trade" by sending the required information directly with the approval request using the SOA service. This begins to paint the possibility of true, end-to-end transaction integration that exists in other industries. Only a few of the participants actually submit data to the governments, but volumes and complexity still present a strong case for future implementation once SOA infrastructure is in place and ready to be leveraged by increased use.

To build this solution, customs would build a set of services providing systematic access to the regulations, duties and tariffs, and trade management systems. While SOA provides the technology standards for such a solution, the content standards are still under development. Projects such as eDocs and CBRDM are attempting to define the standards needed at a transaction level. However, solutions such as described in our example are still possible today, and an SOA approach will position early movers for easier standard adoption in the future. For example, the EU eCustoms initiative provides a fertile ground for staging the development of these solutions. With such a contained scope, initial implementations could form the basis of future global industry standards.

Benefits of SOA

Figure 5 (see page 11) shows what we believe to be a more effective and efficient means of communications between customs agencies and all other trade participants. But it is important to note that the solution described in the last section would not be a practical and general solution for all. It will be most attractive to the largest and most significant traders, which represent a critical market segment with high value to their national economies. For this market segment, there are benefits to both the trade participants and the customs organizations.

Second, there are two areas of business processes touched in our scenario: supply chain information availability and integra-

tion, and the more visionary, future option of clearance data submission direct to customs organizations. For a more practical view, let's examine the benefits that surface strictly from the former, the ability for customs to openly share information needed to support the supply chain and all trade participants.

For customs organizations, an SOA approach can provide a single connection point for both external and internal access to customs systems. This technical strategy supports the "single window" initiatives recommended by the WCO SAFE Framework of Standards, providing an ideal technology platform for customs to integrate with other government agencies involved in international trade. Given that is impossible for customs to predict who will need to connect for information, the SOA approach allows a customs organization to build a single set of services for all participants. These services are "exposed" or made available on the Internet. Trade participants then can decide, based on a business case, whether it is of value for them to use these services.

In the example of Figure 5, customs has provided services to obtain regulation information, obtain duties and tariffs, and to validate and submit trade details for approval. With SOA-enabled systems, buyers, sellers and supporting players can access exposed services in a controlled manner. Customs has the ability to change or revise its systems without disruption to other players.

Countries can join the system over time, as agreements are established and resources become available. SOA technology standards can be complemented by existing (and future) international trade standards. And system-to-system communication can support integrated business processes, positioning the customs organization for several strategic benefits. With systematic access to regulations, the large sophisticated trader can integrate these regulations directly into their documentation process from the start of the trade. This presents customs with the opportunity to reduce inspection costs by pinpointing inspection on high-risk transactions, generate greater revenues and lower costs of collection.

If customs organizations were to build the SOA services for elective use, there is a strong case for trade participants to use the services. For consignees, the collaborative integration fostered by SOA-enabled logistics and customs systems can provide potentially significant strategic, operations and financial benefits. The strategic and operational benefits to this approach include:

- The potential for reduced delay and disruption in trade execution. By having realtime access to trade regulation information, compliance needs such as required documents or permits can be addressed when needed.

- Reduced costs, through improved inventory management, reduced losses and shorter cycle times all contribute to a lower cost of goods sold. The ability to collect information electronically contributes to lower compliance costs.

- Increased revenues, as goods that do not get held up for customs inspections can get to market more quickly

- Increased ability to anticipate and prevent disruption, as more information is available earlier in the process, in both realtime and electronically.

- Improved sourcing flexibility and better trade transaction management.

The financial benefits can vary by stakeholder, but overall, SOA can help create the environment in which trades can realize higher revenues and lower costs. In Figure 6, we show the different value propositions for each stakeholder group.

Each stakeholder has the opportunity to address a number of value levers through direct connectivity to customs and integrated systems. For the large, sophisticated, system-enabled trade participants, the ability to impact these metrics presents a compelling argument to pursue the type of integration described in this scenario.

SOA can be viewed as a complement to existing systems and does not fundamentally change those systems or mandate new systems. SOA offers a standards-based framework that can enable any participant in the process to connect to another without specific, point-to-point custom solutions. By increasing communication, connectivity and flexibility among existing systems, it liberates their potential to expedite, not retard, the system of global trade.

FIGURE 6.
Value proposition and key metrics for stakeholders in the global trade process.

Trade participant	Value propostion	Key metrics impacted
Importing enterprise	• Improve trade operations management and performance • Enhance risk and crisis management performance • Enhance trade and regulatory compliance (LSP) • Improve inventory management • Reduce asset theft, damage and loss • Improve business process performance (consignee) • Contribute to lower requirements for third party logistics providers • Improved end-to-end information management	
Supplier and supplier network	• Improve trade operations management and performance • Enhance trade and regulatory compliance (LSP) • Improve inventory management • Contribute to lower requirements for third party logistics providers	• Cost of goods sold (COGS) • Inventory financing costs • Insurance costs • Shrinkage measures • Transaction execution costs • Compliance costs (attributed to transaction visibility) • Asset utilization • Revenue from inventory turns
Third party logistics	• Improve trade operations management and performance • Enhance trade and regulatory compliance (LSP) • Improve asset and equipment management • Improve inventory management • Reduce asset theft, damage and loss • Improve business process performance (consignee) • Improve port and container terminal performance • Improved end-to-end information management	
Port operations	• Improve trade operations management and performance • Enhance risk and crisis management performance • Enhance trade and regulatory compliance (LSP) • Improve asset and equipment management • Reduce asset theft, damage and loss • Improve port and container terminal performance	
Carriers	• Improve trade operations management and performance • Enhance risk and crisis management performance • Enhance trade and regulatory compliance (LSP) • Improve asset and equipment management • Improve logistics service provider (3PL) performance • Improved end-to-end information management	

Source: IBM Institute for Business Value.

New standards will continue to be developed and existing standards will continue to evolve, but there is opportunity for immediate benefits to all participants in the international trade process. The current WCO SAFE Framework of Standards actually recommends for customs to offer more than one solution for electronic exchange of information. SOA offers a standards-based approach supporting sound software design principles.

Conclusion

We have presented two examples showing the use of SOA to address strategic industry problems in the travel and transportation industries. As we trust our discussion has shown, SOA allows fundamental improvement without fundamental restructuring. By exploiting the capabilities of SOA internally, as well as with external entities of all kinds, public and private travel and trade entities can create new connections and support new levels of collaboration and innovation. SOA can increase the number of connections and configurations possible – with benefits that can potentially reshape the global travel and trade industries. Technology is not the issue – SOA presents a compelling solution for systems integration in support of integrated borders.

But precisely because of its scope, SOA can be a little daunting to organizations that have yet to use it. Like anything else of this scale, it should be employed responsibly and intelligently – with a sense of vision, purpose and strategy. To get started with SOA, consider starting on a small scale and then expanding as needed to meet your individual requirements. A recent IBM Institute for Business Value study examined 35 large scale SOA projects and uncovered some common project design principles for those getting started with this technology:

- Focus on a business problem and use SOA to solve it. SOA is a means to an end – not an end in itself.

- Use your first SOA project to "learn the ropes." If it is successful, show it to other parts of the business to demonstrate what can be done with SOA.

- Begin to build new human capabilities. SOA requires some specialized skills that entail a learning curve. It is usually best to start instilling these skills in the beginning.

- Think long-term. The hardest, most prolonged and most expensive part of SOA is implementing the initial infrastructure. Once that is in place, additions or changes – new systems from new member countries, for instance – can be made much faster and less expensively. Over time, the return on this initial investment can be substantial.

Whether you build, buy or evolve to an SOA infrastructure, the time to start is now. With the plethora of content standards supporting international travel and trade already in progress, SOA presents a logical technology approach to enable these standards and further progress the safe, profitable, and progressive movement of people and goods across international borders.

Related Publications

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