Massachusetts Institute of Technology
Sloan School of Management

*Center for Information Systems Research*

# *The ACE Project*

Doug Browning smiled involuntarily as he thought of the pleasant side of his imminent retirement in April 2004: more time with his family. At age 53 Doug's retirement came after 28 years in government service and two years as Deputy Commissioner, second in command, of the United States Customs and Border Protection Service (CBP). Doug reflected on what should be the most important things he could tell his successor, Debbie Spero. Of all his CBP duties, he wanted to emphasize the importance and critical points for management's focus on the Automated Commercial Environment (ACE) project. Attention to the ACE project, which was integral to business change within CBP, had occupied a third of his time as its lead coordinator.

Doug was aware that the project was running over budget and had reset some of its release delivery dates, but in general he felt comfortable about its progress. At the same time he knew that ten years of effort by so many on one of the largest civilian systems projects in history would be for naught if there were problems with upcoming Releases 3 or 4. These would deploy key screens for use at points of entry on the Mexican and Canadian borders. In the fishbowl world of government, a glitch on the screen of a customs officer checking the electronic manifest

of a truck from Mexico could be front page news in the *Washington Post*.

## ACE: BIG, MANY PLAYERS, AND MORE THAN AN IT SYSTEM

Once installed and successfully running, ACE would be the central IT system for CBP operations and vital for a myriad of other stakeholders. ACE would be used by 42,000 CBP personnel, thousands of corporate import-export departments and freight-forwarders in the global trading network, and by dozens of other entities using and feeding data. ACE received its initial annual appropriation from Congress in 2000, at which time the total project was estimated at $1.5 billion over five years. This made it one of the largest software projects outside the Defense Department in U.S. federal government history.

The core of ACE's functionality was to support the work of customs officers and analysts, particularly the work in the field of inspection and duties-billing on commercial imports and exports. The system would replace the legacy system, the Automated Commercial System (ACS) and several others. Exhibit 1 shows the principle stakeholders with the information flows to and from ACE.

In addition to software replacement, ACE would enable and require a change in work practices by users. Customs inspection and billing would also change from transaction processing to "account management," moving from the historical method of processing individual transactions to an account-based approach for clearance and billing purposes. Thus, if Walmart were the recipient of ten thousand containers through twenty ports of entry in the month of April, half of them requiring some import duty and dozens targeted for inspection, Walmart could, under ACE, receive a single statement of duties owed for the month and a consolidated report on inspection rather than the thousands of electronic and paper documents under the old system.

The "trade," companies that depend on expeditious flow of goods into and out of the U.S., were critical stakeholders in ACE's success. In General Motors's supply chain, for example, there were hundreds of individuals managing the delivery of millions of parts and vehicles. Indeed, the trillion dollars of U.S. trade depended on CBP for the expeditious and accurate handling of goods. Starting from a history of conflict between the trade and Customs, the trade-CBP relationship in 2004 had evolved into a partnership whereby compliant traders were given a number of operational and business concessions that were designed to ease the burden of customs' activities on their operations. These improved processes were a new part of ACE's functionality.

As a result of the terrorism strikes of September 11, 2001, ACE had become a central part of the U.S. government's security efforts. Anticipating, tracking, monitoring and inspecting shipments into the U.S. all depended on a reliable computer system with a complex architecture enabling interconnections with legacy and new databases, and legacy and new applications systems. ACE had quickly become, as a result of 9/11, not just a replacement or modernization driver but an essential piece of national security. As a central system and for historical reasons as well, ACE required interfaces with systems and interchange of data with many other federal government systems,

such as those of the Food and Drug Administration, the Department of Agriculture, the State Department and others.

To achieve its intent and take advantage of current technology, the ACE project involved major technical innovations compared to its legacy systems. For example, the various on-line stakeholders would use a web-based platform and portal access. The basic technical architecture of the system and interfaces with key stakeholder groups is shown in Exhibit 2. Exhibit 3 shows the architecture in terms of technical features. One unusual feature of ACE compared to most government systems was the incorporation of some modules of a packaged Enterprise Resource Planning (ERP) system, namely SAP, which had been chosen from several qualified vendors.

The technical development and implementation of ACE was shared by CBP with a consortium of some 40 vendors led by IBM and known as the "e-Customs Partnership" (eCP). It was recognized as essential that these developers work closely with CBP's own technical staff in planning and executing the transition from the legacy infrastructure and applications to ACE.

In 2004, ACE system development was organizationally a key part of the Modernization Office within the Office of Information and Technology in CBP. CBP was a principle agency within the Department of Homeland Security. (See Exhibit 4 for the DHS structure, Exhibit 5 for the CBP structure, and Exhibit 6 for the OIT and Modernization structure.) In addition to Doug Browning, the lead coordinator for ACE Modernization, key players were Woody Hall, former Assistant Commissioner, Office of Information Technology; Charlie Armstrong, Assistant Commissioner, OIT; Sharon Mazur of ACE Modernization Office, who was the project manager for ACE; and Larry Rosenzweig, who had particular responsibility for liaison between CBP field users, trade stakeholders, and the development teams. Browning and others stressed that success of the ACE project would depend not only on technical development and

technical transition from the legacy system, but also on the understanding, support and willingness to change processes and procedures on the part of CBP field personnel and other stakeholders.

The timeline of ACE releases is shown in Exhibit 7, and consisted of the following completed and planned as of April, 2004:

*Release 1*, accomplished in 2000, six months after contracting with the vendor consortium, essentially built the fundamental technology platform and architecture for ACE and the portal technology, in preparation for Release 2.

*Release 2*, 18 months after contracting with vendors, opened the portal for use for account purposes, providing a test of access to all users via the web, particularly for importing companies to eventually see their account transactions with CBP.

*Release 3,* scheduled for June 2004, would transform billing and payments from a shipment-by-shipment or daily basis to a monthly basis via the portal. In addition, Release 3 would enable importers to make duty payments, currently paid on a port-by-port basis on a national basis, for all duties due from all ports. An important feature of ACE would be manifested for the first time: the use of SAP modules, in this instance particularly the finance modules.

*Release 4,* was scheduled for November and December of 2004, and would bring to CBP officers for the first time electronic access to manifests for trucking crossing from Canada and Mexico, the US's number one and number 3 world trading partners. CBP officers would have a portal that consolidated all enforcement and commercial information versus having to access multiple stovepipe systems. Observers noted this would be the biggest and potentially most vulnerable release of ACE in its long history.

Despite the importance and sensitivity of these releases, they accounted for only 30 to 40% of

the total functionality of ACE. Complete implementation was planned for 2008.

As of December 2003, the outsourcing costs by the e-Customs Partnership were running $46 million over budget, representing under 10% of the firm outsourcing commitments to the e-Customs Partnership of vendors, and the project was six months behind schedule. On March 23rd, CBP obtained approval for its request for funding to cover the overrun.

Project Manager Sharon Mazur reported in March 2004 that, in general, feedback from the field and other stakeholders had been very positive with respect to plans and testing of preliminary and limited versions of the system.

## A LONG TIME IN COMING: THE EVOLUTION OF CONTEXT AND COMPLEXITY

As Doug Browning contemplated the focal issues that would affect the success or failure of ACE, he believed issues and problems were rooted in the long history and increase in complexity of the project, and that understanding this evolution was important.

Since its creation as the fifth act of Congress in 1789, the rules and procedures of the Customs Service have been imbedded in legislation. The basic customs officer's work and the forms and type of data in 2004 would have been recognizable to a customs officer in New York Harbor in 1904 or to Nathaniel Hawthorne when he served as a customs inspector in Salem, Massachusetts around 1804. Mechanization had come with the typewriter and increasingly with several generations of computer-based automation beginning in the 1960s, but these changes essentially automated the traditional, legally-prescribed rules and procedures without changing the process or the work. By the late 1980s the U.S. Customs had become a bottleneck to trade. The value and volume of international trade had increased dramatically (see Exhibit 8); automated transportation and handling sped up as containers came into use. Change in the customs practices had not kept pace.

## TRADE RELATIONS: FROM "GOTCHA" TO COOPERATION

The customs bottleneck had serious impacts on the trade. Delays and uncertainty around timing the delivery of imported parts, for example, threw off companies' ability to make breakthrough improvements in supply chain management, such as allowing for "just-in-time" delivery of parts shipped from abroad. Transaction-by-transaction financial processing meant labor-intensive clerical costs. Lost savings and revenue in the billions of dollars were at stake for companies and the U.S. economy. The process generated confrontation, evasion and conflict between Customs and the private sector, described by one observer as Customs playing "gotcha" vs. the traders playing "catch us if you can."

Customs staff began to conceptualize new processes. A tone was set in the early 90s by Customs Commissioner Willy Von Raab's strong position, who said to importers that they and Customs must "automate or perish." These efforts formed the basis for ACE design:

> *Instead of looking at each import as "things" independent of the recipient we began to think of targeting (what to inspect) and billing in light of 'entities,' the companies that were benefiting. We designed a streamlined process by first looking at a company's compliance history in the same way a credit card company examines credit history and credit worthiness. We wanted to use that to become more selective in our targeting and more comprehensive in our billing. Instead of inspecting based on what was imported we would include who was importing it and what their compliance record had been. Instead of billing for the duties on each separate import we would bill monthly or quarterly. These approaches would eliminate a tremendous amount of paperwork.*
>
> *—Charlie Armstrong,*
> *Assistant Commissioner (Acting)*

With high expectations, in the mid 1990s Customs went to Congress for approval and funding of the early ACE project. At that time, however, some major and much publicized government systems failures were occurring, such as the Social Security system and the development of new Internal Revenue Service systems. The Customs project was rejected by Congress. Customs went back to the drawing board, confident their conceptual redesign was on the right track but needing new approaches to gain Congressional support. Meanwhile, the discontent was growing among traders dependent on getting goods through the bottleneck. The setting was right for a new approach. As one participant at the time put it:

> *We tried to get a project approved by Congress and it got blocked. So Commissioner Von Raab forced us to think of new approaches. We turned to importers and started to move away from the adversarial relationship with them.*
>
> *—Sam Banks, former CBP Manager*

Customs realized that they and the traders were in the same boat; trade companies were receptive to collaboration. A three-year discussion began that resulted in the Customs Modernization Act of 1993. Among other things, including regulations for the new North America Free Trade Association, the Act mandated that Customs and the importing community adopt shared responsibility for compliance. For Customs, this meant a policy of "informed compliance" by which they let the importing community know what was expected of them. For the trade it meant adopting "reasonable care" in their dealings with Customs, including doing their own audits, creating their own offices of compliance and offloading work previously done by Customs staff. Customs retained oversight and controlled the process with rewards and penalties.

In 1997 a trade group was formalized as the "Trade Support Network" (TSN), an association of 170 of the largest U.S.-based importers and exporters which would work in a cooperative

way as a partner to Customs, dealing with issues and problems in a spirit of complementarity. Representatives of the TSN began to work with Customs on the design of ACE, offering suggestions and ideas and taking back to their companies an understanding of what such a system, should it ever be approved and implemented, would mean in terms of their own processes and technical interfaces. The relationship resulted in some immediate improvements and enhancements to the design of ACE. Customs managers who had participated in this saw it as the culmination of an unusual evolution in the relationship of a regulatory governmental body with private business entities. One experienced outsider saw it as quite unique and as a "best practice" in government. As it turned out, improved system design and planning for implementation was just one of the benefits of the Trade Support Network.

## FUNDING ACHIEVED

Shortly after the Customs/TSN relationship was formed, Customs managers began to engage TSN committees and individual companies within it—like General Motors—which were critically dependent on an efficient trading system, to approach and lobby Congress to support ACE and Customs modernization. This led to an initial foundation funding appropriation in 2001 in the amount of $130 million. A program office was established and system design was begun.

## BEGINNINGS OF OVERSIGHT, BEYOND IT, AND IT OUTSOURCING

As TSN was partnering with Customs to fund ACE, the nature of the project was changing. The bad experience with systems development and systems failures elsewhere in the federal government led to the Clinger-Cohen Act in 1996. The act charged the General Accounting Office (GAO) with the responsibility of reviewing IT project proposals and imposed some specific principles for design and project management. These forces, plus advances and new opportunities in the technical environment, resulted in more enhancements to ACE design.

The GAO played a significant role. For one, it recommended that before the project begin there be an enterprise architecture approach, enabling the particular system to be designed and delivered in the context of other technical linkages. Also, as a result of the Modernization Act of 1994, the GAO and Customs came quickly to see that the "IT project" initially envisioned should be conceived of more as a business change or modernization project. Finally, the GAO also strongly recommended that Customs not attempt to build the system internally, but that it be outsourced.

In 2004 Charlie Armstrong reflected on the impact on IT staff in Customs of the project becoming a business process change project and on the audit and advisory role of GAO:

> In the early 90s we did not understand the scope and magnitude of this project. It took a while before we realized 'this is really big.' It was not just technical, it was business reprocessing. As technicians, there was intimidation because there was a huge stakeholder group, the trader, who understood some of the newer technologies. We did not want a repeat of what took place with ACS [the legacy system] where the stakeholders in the trade were screaming at us.
>
> We needed to completely change our orientation and come up with something that made business sense, or as we put it, 'A whole new way of getting the trade involved and getting trading done.'
>
> Then we had the GAO people saying about us, 'The folks in Customs do not have the bandwidth to get this done internally.' Our IT management went through a lot of soul searching...
>
> —Charlie Armstrong,
> Assistant Commissioner (Acting)

From a technical standpoint, Customs designers of ACE observed how the Web took off in general in the early 90s. They wanted to take advantage of the Web, but were concerned about the security issues.

*How do we take mission critical systems governed by laws and put them on the Web where people can see the information and manipulate it. This challenge was beyond our internal expertise and necessitated the need to have an integrator with that competence help us.*

—*Charlie Armstrong,*
*Assistant Commissioner (Acting)*

The decision to outsource led to an achievement of some importance for the ACE project. When the request for proposals (RFP) went out on December 18, 2000, vendors of considerable size and experience showed interest. These included IBM, Lockheed Martin, Computer Sciences Corporation, EDS and many others. Recognizing the urgency of getting the project underway, a few of the leading potential prime contractors got together and worked with Customs to form a large vendor consortium. The resulting e-Customs Partnership (eCP) was headed by IBM and governed by IBM and four other contractors. The time from letting the RFP to award of the contract was four months, an unprecedented short period. Customs received an award from the Interagency Resource Management Conference, an association of government agencies interacting around contract management issues, for the effectiveness and expeditious nature of the contract process.

## REVERBERATIONS OF 9/11

The scope and importance of ACE changed significantly as a result of the fallout from 9/11. The creation of the Department of Homeland Security resulted in the merging of the Customs Service, the Border Patrol and the inspection functions of the Immigration and Naturalization Service (INS) and of the Department of Agriculture (APHIS). Overnight, the number of potential users of ACE more than doubled, to 42,000 users. It was expected that Border Patrol officers and a host of other monitoring bodies would have access to ACE's information on goods crossing U.S. boundaries. In addition, the Trade Act of 2002, emphasizing security, moved the functions of security and "targeting," the identification of shipments entering the US which needed inspection, to the highest priority

for development and implementation. In particular, it was required that any trans-border shipment had to have its manifest information submitted electronically prior to arrival in or departure from the U.S. This put ACE in a central role at the heart of a key part of U.S. national security.

Collaboration across agencies within and outside of DHS for purposes of improved security checking became the highest priority. A "National Targeting Center" was announced for this purpose. Information and data from very different sources including other agencies—such as the Central Intelligence Agency (CIA), the Federal Bureau of Investigation (FBI) and the U.S. State Department—would have to be available and factored into the analysis of participants in the supply chain of imports.

The net effect of these changes did not increase the size of ACE *per se*, but shifted priorities and called for extensive reorganization, rescheduling and more coordination of work across agencies. Yet many saw the added urgency as a plus to the project:

*I don't see the security emphasis as a problem for us as contractors in the long run. Security as a priority will bring us together better with our CBP partners on the project and with all the other agencies' staff involved. It will still be difficult, as each agency is still charged with doing its own thing as well as now charged with sharing and collaborating. Those two directives can be very hard to reconcile.*

—*Brian Helmey,*
*Program Executive, IBM*

Despite the potential value of connecting ACE to other systems, by April of 2004 the Department of Homeland Security (DHS) had not settled on the development of the National Targeting Center database, nor where it would be housed organizationally, nor if there would be a central or peripheral role for ACE. ACE managers knew if new parameters for an overall DHS architecture were to emerge there could be added costs and delays in ACE.

## COMPLEXITY BEGETS GOVERNANCE BEGETS COMPLEXITY

These events, decisions and uncertainties had important effects on the ACE project as it was in 2004. The formation of the Trade Support Network had clear beneficial results in terms of collaboration with that group of key stakeholders, including not only systems design and potentially more effective implementation but quite directly in achieving Congressional funding. The collaboration among vendors in the e-Customs Partnership represented a significant improvement in time needed to line up outsourcers. The federal government's congressional stimulus in the form of the Modernization Act and the Clinger-Cohen Act created a basis for valuable oversight on the part of GAO and for thinking more broadly about ACE as a business process change program rather than strictly an IT systems upgrade.

At the same time, the several roles of TCN and government stakeholders and overseers, the outsourcing dependence, the criticality of ACE in national security, and the need for continued funding justification required more rigorous and reliable program and project management. In addition to tightening its own practices in these areas, OIT and the Modernization Office of CBP engaged Mitre Corporation to provide technical guidance, oversight and independent validation of the development work. Program management itself was enhanced by an engagement with the firm of Robbins-Qioia, particularly in helping to control requirements changes, dealing with vendors, and budget and time controls. A strong indication of the success of these efforts came with the achievement in 1993 of CMM Level 2 designation to CBP's OIT unit in the area of "software acquisition and repeatable process," the first of any US Federal Government agency so recognized.

When he became Deputy Commissioner of CBP in 2002, Doug Browning took actions intended to further engage Customs' leadership in ACE and to reinforce the project as one aimed at business change and not just IT replacement. In 2004 he reflected on what he found on taking on his senior position:

*When I looked closely I thought we in management were saying the right things about the importance of ACE and the need to change the way we do our work, but it still looked too much like an IT project. I wanted to make it clear that the ACE project was going to be the tool that would drive everything that takes place in dealing with the trade, including enforcement and security.*

Doug found that most of his direct reports, the Assistant Commissioners, were delegating their role of oversight of ACE to their staff assistants (see CBP organization chart, Exhibit 5). With the Commissioner's full support Doug revamped the governance process by abolishing what were then work teams cutting across the CBP organization and putting all CBP governance under the Modernization Board (see Exhibit 6). All Assistant Commissioners became Modernization Board members, and all ten were made to understand that the project was to be "strategic" in each of their areas of responsibility. Each was made accountable for the results of their aspects of the project, and such accountability became part of their performance reviews.

A second action taken by Doug was the creation of a "Business Executive" position in parallel with the ACE Executive Director on the IT side, reporting directly to him. He filled the position with Larry Rosenzweig, a manager with 31 years of Customs field experience. The job was created to insure that the business requirements were understood by the IT developers and that the business users were aware of the impact of releases on their work. Rozenzweig initiated a series of mechanisms to communicate, prepare and ensure a channel of mutual influence between the future users of ACE and the designers and developers. He created a team of "ACE Ambassadors," 105 people from the field who were trained in ACE and what it would do, who then went back and informed their colleagues. Larry shuttled regularly back and forth, providing input to the development people as well as the users.

Doug also created a position entitled "Organizational Change Management" but by April 2004 it had not been filled.

These decisions and impacts, ranging from the creation of the Trade group to changes wrought by 9/11 to governance reinforcement and leadership accountabilities, were seen by those in Customs as having accomplished positive results as intended. At the same time, each was also recognized as adding complexity to ACE program management and to the process of achieving coordination and approval toward progress. In 2004, leading stakeholder managers saw project governance and management of ACE as more complex and cumbersome than a similar project would have been even a few years earlier. Exhibit 9 shows the major governance structure and principal oversight bodies in 2004. Sharon Mazur, project manager, estimated that she spent on average a day a week in hearings and reviews, reporting on progress and answering questions from oversight bodies.

For Mazur and others in CBP the funding process had become more burdensome and difficult than before. The $46 million overrun by the outsourcers had resulted in a request for payment which CBP had submitted in August of 2003 through the payments process. The payment represented outlays already made by the vendors, and the delay in reimbursement had become a potentially serious bone of contention. The request was finally granted in late March 2004. It was estimated that the development and approval of the fiscal year 2004 expenditure plan, including coordination of external reviews and oversight questions had occupied some 5,000 man-hours, roughly equivalent to five people working full time for six months.

In addition, there was concern in 2004 over issues of collaboration between the outsource contractors and some of the technological staff within OIT in CBP. Eventual success with ACE depended critically on an evolutionary transition from the old system to the new; it was not to be a "big bang" cutover. This required highly effective planning, communications and motivated parties on both sides. Some observers noted that the potential effects of the new platform and the new ACE systems on jobs of the legacy technicians could be anything but positive, yet these experienced technicians were expected to help their private contractor counterparts, higher paid professionals who would go on to the next big contract job when ACE was completed.

Finally, the size, criticality and interconnections of ACE in the politically charged government environment of 2004 meant that events like terrorist threats, funding priority changes and economic news, all beyond ACE project and CBP control, could at any time have significant negative effects on project delivery and on the very scope and functionality of the project.

## DOUG BROWNING'S LEGACY?

Doug Browning wanted to do what he could to continue CBP's commitment and effort on ACE. He believed the results to date had been successful. Evidence from the field for the anticipated upcoming releases indicated there was acceptance and support and a desire to make the system work. He believed there were good communications between field personnel and the developers. Although the future of the IT staff in CBP was uncertain, Doug thought that success with the field would set the stage for those changes to be successful as well. He knew that much had to be done and that the implementation of Releases 3 and 4 was critical to long term success. As he put it: "Release 4…that's *huge*…"

Doug began to draft his memo to prioritize issues and critical success factors for his successor.

## QUESTIONS FOR PREPARATION FOR CASE DISCUSSION

1. What are the three most important issues facing the ACE Modernization project?
2. What actions and approaches would you recommend to Doug Browning's successor?
3. What other questions would you ask of CBP personnel to improve your understanding and recommendations?

**Exhibit 1: Stakeholder Information Flows**
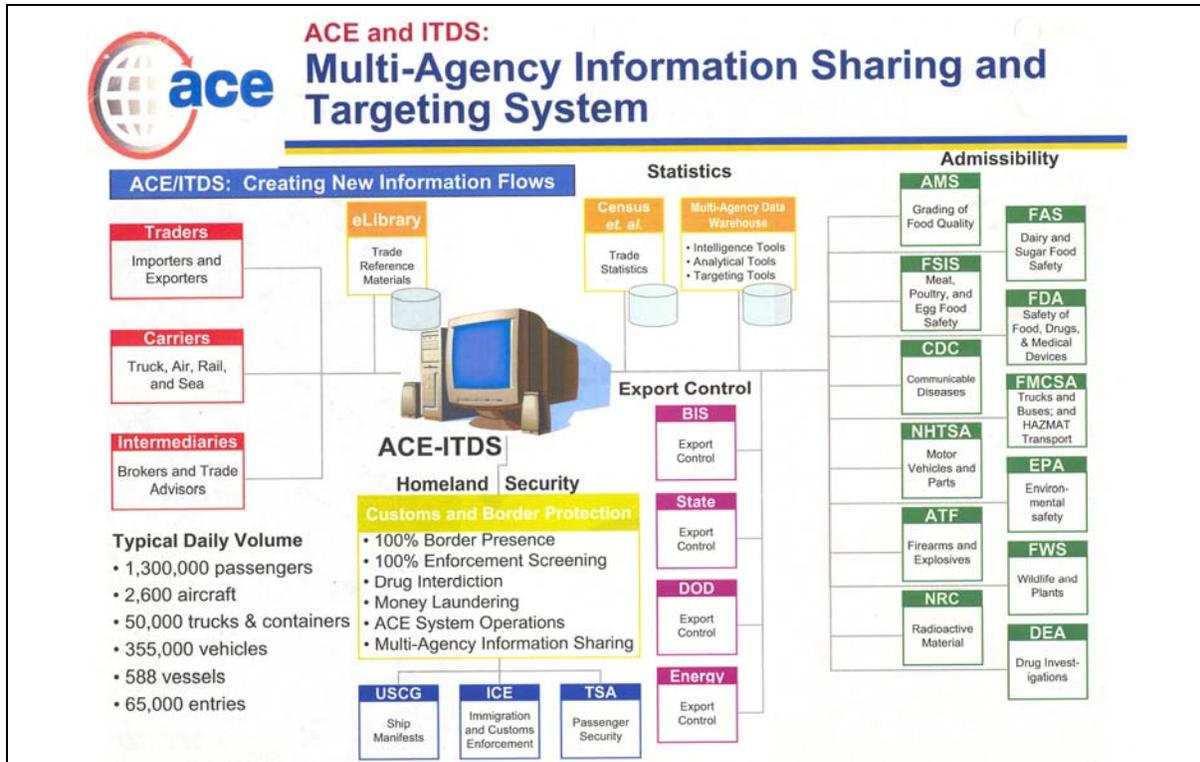


**Exhibit 2: Ace System Architecture—Functional View**
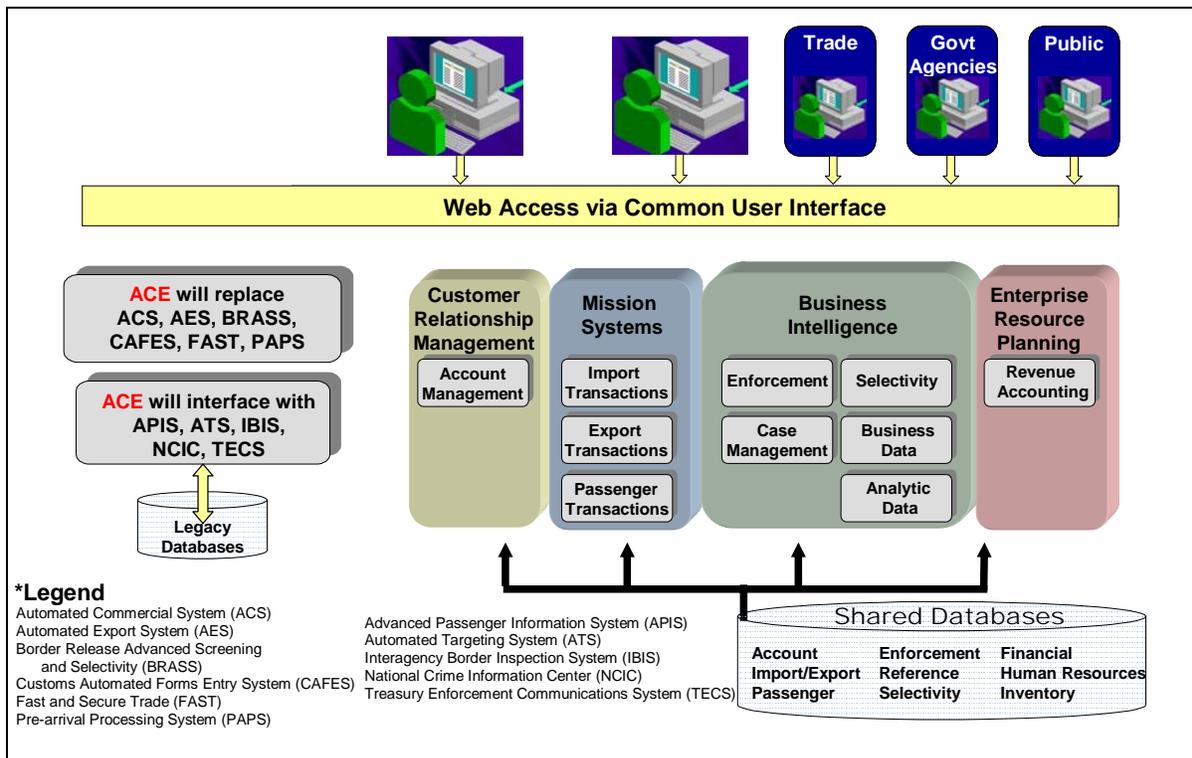
# Exhibit 3: ACE System Architecture—Technical View
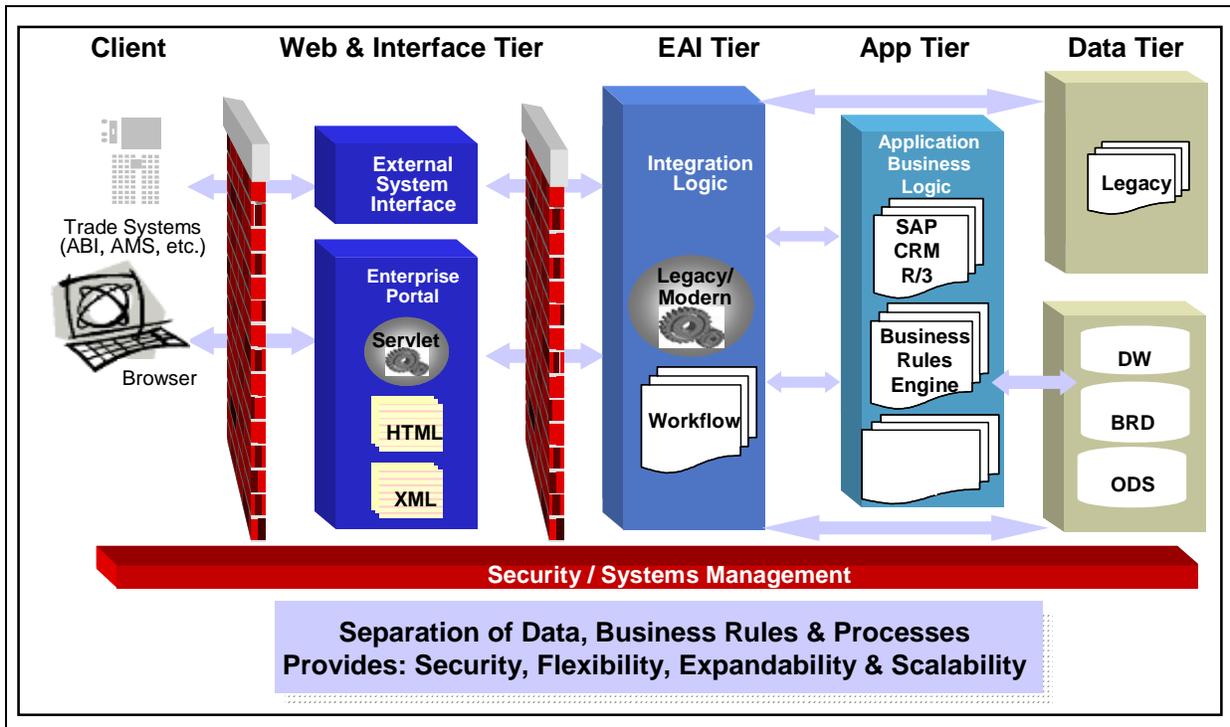


# Exhibit 4: U.S. Department of Homeland Security Organization



As of Thursday, August 14, 2003
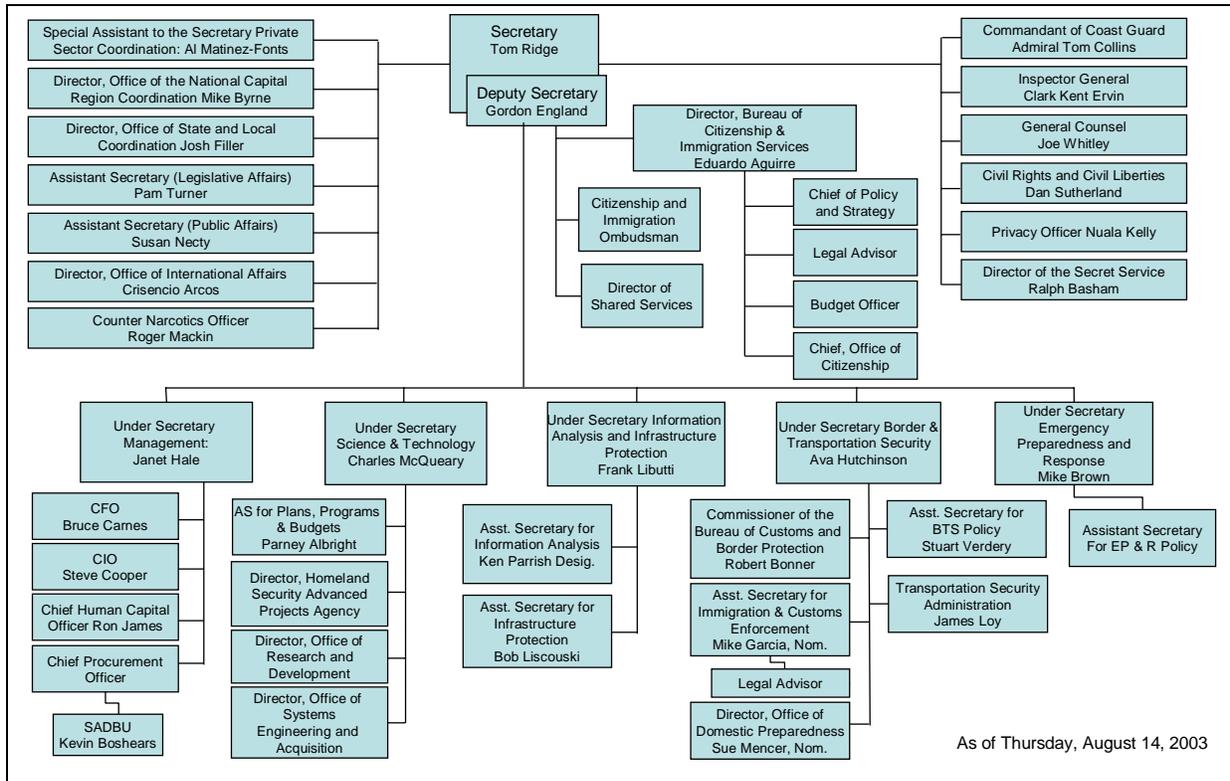
**Exhibit 5: U.S. DHS—Customs and Border Protection Organization**
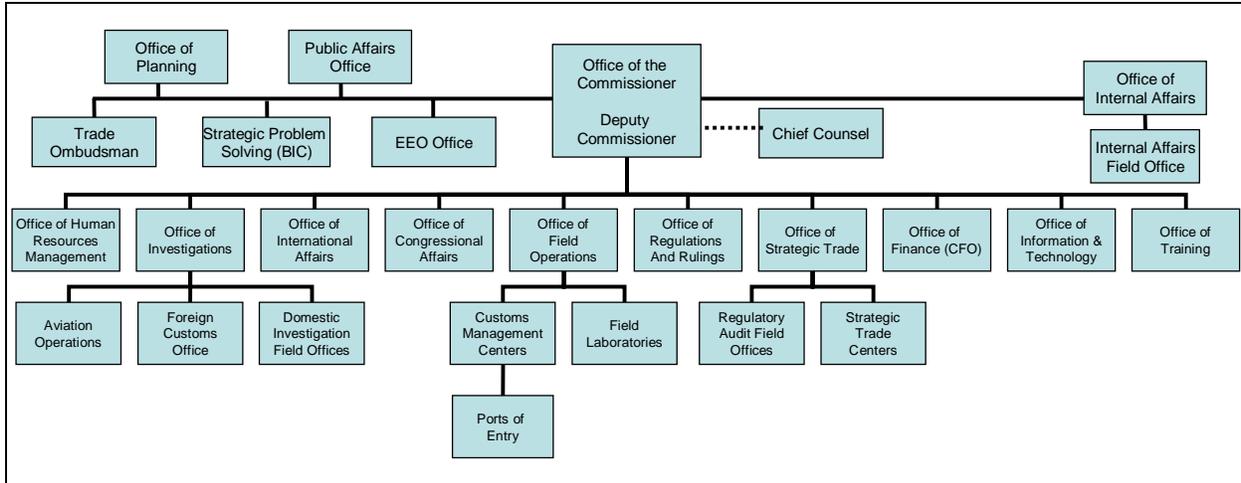


**Exhibit 6: CBP Modernization Office Organization Structure**
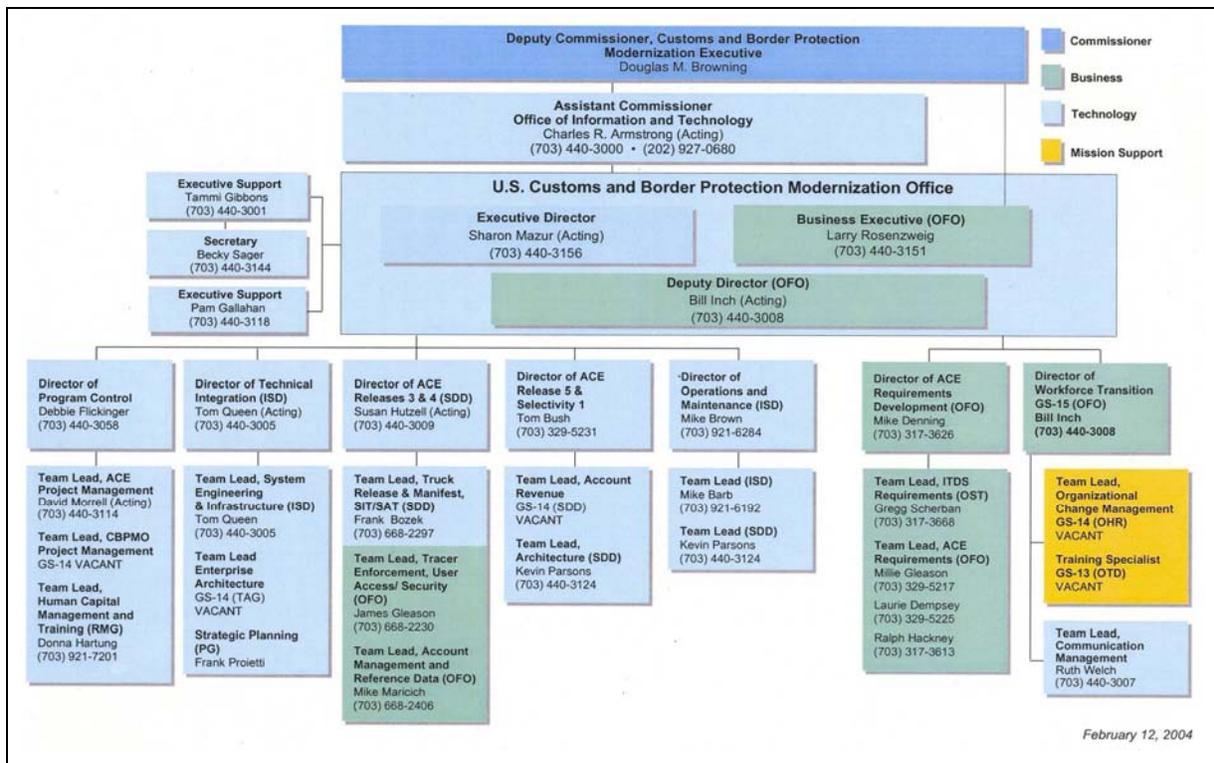
## Exhibit 7: The ACE Timeline
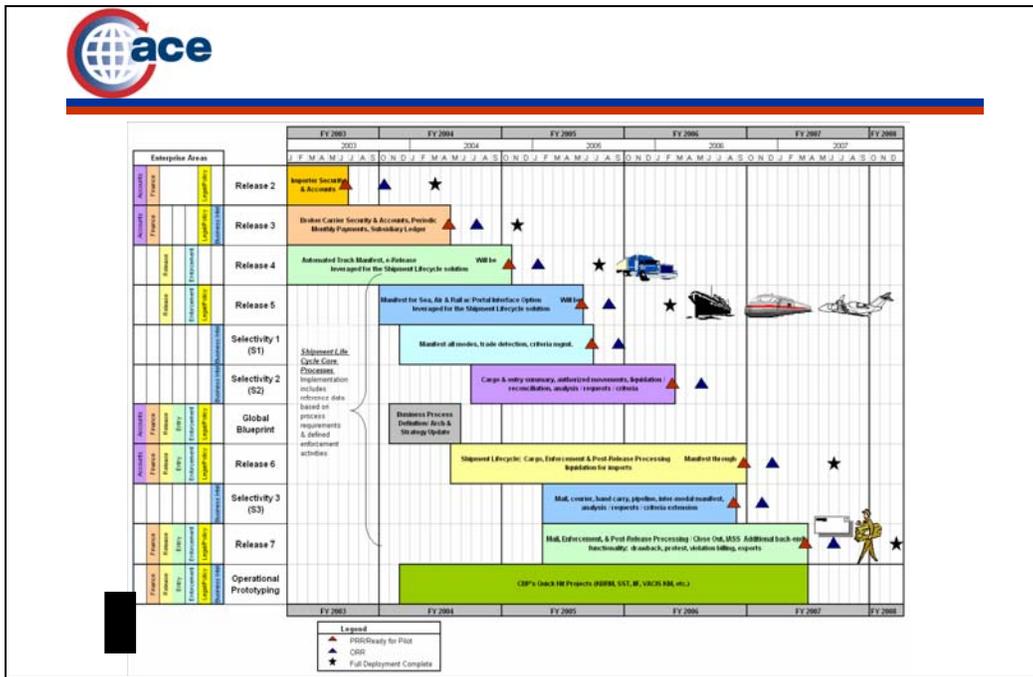


## Exhibit 8: U.S. International Trade Selected Data

| | 1970 | 1975 | 1980 | 1985 | 1990 | 1995 | 2000 |
|---|---|---|---|---|---|---|---|
| **Goods Imports (current US $BB)** | 39.9 | 98.2 | 249.8 | 338.1 | 499.1 | 749.4 | 1,224.4 |
| **Trade (as % of GDP)** | n/a | n/a | 17 | 14 | 16 | 18 | 21 |

**Exhibit 9: CBP Modernization Office Governance Framework**