FEDERAL ENTERPRISE ARCHITECTURE: A BLUEPRINT FOR IMPROVED FEDERAL IT INVESTMENT MANAGEMENT AND CROSS-AGENCY COLLABORATION AND INFORMATION SHARING

HEARING

BEFORE THE

SUBCOMMITTEE ON TECHNOLOGY, INFORMATION POLICY, INTERGOVERNMENTAL RELATIONS AND THE CENSUS

OF THE

COMMITTEE ON GOVERNMENT REFORM

HOUSE OF REPRESENTATIVES

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WEDNESDAY, MAY 19, 2004

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON TECHNOLOGY, INFORMATION POLICY,
INTERGOVERNMENTAL RELATIONS AND THE CENSUS,
COMMITTEE ON GOVERNMENT REFORM,
Washington, DC.

The subcommittee met, pursuant to notice, at 2:35 p.m., in room 2154, Rayburn House Office Building, Hon. Adam Putnam (chairman of the subcommittee) presiding.

Present: Representatives Putnam and Clay.

Staff present: Bob Dix, staff director; John Hambel, senior counsel; Shannon Weinberg, professional staff member and deputy counsel; Juliana French, clerk; Felipe Colon, fellow; Kaitlyn Jahrling, intern; David McMillen, minority professional staff member; and Cecelia Morton, minority office manager.

Mr. PUTNAM. A quorum being present, this hearing of the Subcommittee on Technology, Information Policy, Intergovernmental Relations and the Census will come to order. A little bit late, but we are in order. I apologize for the delay; we have just finished a long series of votes on the House floor.

Good afternoon and welcome to the subcommittee's hearing entitled, "Federal Enterprise Architecture: A Blueprint for Improved Federal IT Investment & Cross-Agency Collaboration and Information Sharing."

The purpose of this hearing is to provide congressional oversight on the progress being made by the Office of Management and Budget and the Federal agencies to develop and implement a Federal Enterprise Architecture. The subcommittee will also examine the progress, success, and continuing hurdles facing various agencies and departments in integrating their individual agency enterprise architecture with the FEA initiative.

This hearing is a continuation of the series of oversight hearings conducted by the subcommittee during the 108th Congress to keep Federal Government agencies and decisionmakers aggressively focused on meeting the key goals of the E-Government Act of 2002: greater accessibility to government by citizens and businesses; improving government efficiency and productivity; enhancing customer service; facilitating cross-agency coordination; and tangible

cost savings to taxpayers through the use of 21st century technology and proven "best practices" throughout the Federal Government.

During the 1st session of the 108th Congress, this subcommittee focused a great deal of attention on the oversight of the Federal Government's E-Government element of the President's management agenda. With a commitment to an aggressive effort, the launch of the President's management agenda in August 2001 established a strategy for transforming the Federal Government in a manner that produces measurable results that matter in the lives of the American people.

One of the five components of the PMA is Electronic Government, intended to utilize the power and creativity of information technology to produce a more citizen-centric government, as well as one that is more efficient, productive, and cost-effective on behalf of the taxpayers. E-Government provides a platform to establish cross-agency collaboration and a rapid departure from a stovepipe approach to government operations to an approach that facilitates coordination, collaboration, communication, and cooperation.

With Federal Government expenditures on IT products and services projected to close in on $60 billion in fiscal year 2005, the Federal Government will be the largest IT purchaser in the world. For too long, and even continuing in some places today, individual agencies have pursued their own IT agendas that focus solely on mission rather than emanating from a commitment to customer service or sound business processes. Without a system of checks and balances built into the investment process to compare IT needs with mission goals, the potential for waste is great.

As a first step to a meaningful coordination of IT expenditures governmentwide, Congress passed the Clinger-Cohen Act of 1996, which included the Information Technology Management Reform Act and the Federal Acquisition Reform Act. This legislation sets forth requirements for Federal Government IT investment management decisionmaking and corresponding responsibility. It requires agencies to link IT investments to agency strategic planning, including the linkage to an enterprise architecture.

Under Clinger-Cohen, each individual Federal Government agency must create and implement an enterprise architecture. An EA is a tool that defines the structure of any activity or mission within a single organization or across multiple organizations. It allows organizations to then apply IT resources to accomplish those activities identified. An EA also helps an organization identify the relationships between business operations and the underlying infrastructure and applications that support those operations. The purpose of the development of agency EAs is to facilitate cross-agency analysis of the business or purpose of government and to make possible the identification of duplicative investments, gaps, and prospects for cross-agency collaboration. The goal, as with all e-Gov initiatives, is to make the Federal Government more efficient and customer-focused.

An enterprise architecture, developed and implemented based on the FEA framework, is an essential tool in guiding IT investments. A recent GAO study reports that "that investing in IT without defining these investments in the context of an architecture often re-

sults in systems that are duplicative, not well integrated, and unnecessarily costly to maintain and interface."

While the utility of EAs in the Federal Government is promising, the progress of the Federal Government in completing the agency EA initiative is less than promising. In 2001 and 2003, GAO assessed the progress of agencies' efforts to develop and implement EAs. In 2003, overall, GAO found the state of EA governmentwide is not mature, with approximately 79 percent of agencies at stage 1 of GAO's five-stage assessment framework and 21 percent were at stage 2. Only one agency, the Executive Office of the President, reached stage 5, the final stage of maturity.

The E-Government Act of 2002 makes oversight of the agencies' EA efforts the responsibility of OMB's Administrator of E-Government and Information Technology. As a result of a combination of OMB's oversight responsibilities under the E-Gov Act of 2002 and the disappointing results of GAO's 2001 governmentwide EA maturity assessment, OMB identified a need for a common framework for agencies to use in facilitating the EA effort. OMB cited the lack of a Federal EA as an impediment to achievement of the e-Government initiatives. So OMB began work on creating the FEA in 2002. This effort appears to be initially successful as a tool for recognizing commonalities and inefficiencies. OMB used the FEA during its review of the agency's 2004 budget submissions and found numerous common government functions and consequently numerous redundant efforts in spending. Out of those numerous common functions, OMB selected five core government functions and created the next phase of the e-Government initiative. This new phase, called the Lines of Business Initiative, specifically targets duplicative effort in spending. Despite this development, I still find cause for concern. According to a November 2003 GAO report, the self-reported costs by agencies in developing their individual EAs are close to $600 million. Those same agencies report more than $805 million will be necessary to complete their EAs. What the vast majority of government agencies' EA maturity assessed at the stage 1 level, we still have a long way to go before we fully realize the benefits of effective EA management. In the course of this hearing, my hope is that we will be able to determine the anticipated cost savings in light of the significant investment already made in the efforts to develop EAs governmentwide.

Today's hearing is an opportunity to examine both the progress and success of OMB's FEA initiative as well as explore the obstacles faced both by agencies and departments in integrating their EAs into the FEA. As we have heard in previous hearings, many of the impediments are cultural and people-based, rather than being attributable to the technology itself or available resources. Case in point, in GAO's 2003 assessment of governmentwide EA efforts, more agencies reported a lack of agency executive understanding of EA and the scarcity of skilled architecture staff as significant challenges than was reported in 2001.

I eagerly look forward to the testimony of our distinguished panel of leaders in various agencies in an industry who will also give us the opportunity to demonstrate the progress that has been made thus far with the FEA initiative, while acknowledging the magnitude of the challenge that lies ahead.

Today's hearing can be viewed live via Webcast by going to reform.house.gov and clicking on the link "Live Committee Broadcast."

[The prepared statement of Hon. Adam H. Putnam follows:]

SUBCOMMITTEE ON TECHNOLOGY, INFORMATION POLICY, INTERGOVERNMENTAL RELATIONS AND THE CENSUS
Congressman Adam Putnam, Chairman

OVERSIGHT HEARING
STATEMENT BY ADAM PUTNAM, CHAIRMAN

Hearing topic: *"Federal Enterprise Architecture: A Blueprint for Improved Federal IT Investment & Cross-Agency Collaboration and Information Sharing."*

Wednesday, May 19, 2004
2:00 p.m.
Room 2154, Rayburn House Office Building

OPENING STATEMENT

Good afternoon and welcome to the Subcommittee's hearing on the "Federal Enterprise Architecture: A Blueprint for Improved Federal IT Investment & Cross-Agency Collaboration and Information Sharing."

The purpose of this hearing is to provide Congressional oversight on the progress being made by the Office of Management and Budget and the federal agencies to develop and implement a Federal Enterprise Architecture (FEA). The Subcommittee will also closely examine the progress, success factors, and continuing hurdles facing various federal agencies and departments in integrating their individual agency enterprise architecture with the FEA initiative.

This hearing is a continuation of the series of oversight hearings conducted by the Subcommittee during the 108th Congress to keep federal government agencies and

decision-makers aggressively focused on meeting the key goals of the E-Government Act of 2002: greater accessibility to government by citizens and businesses; improving government efficiency and productivity; enhancing customer service; facilitating cross-agency coordination; and tangible cost savings to taxpayers through use of 21st century technology and proven "best practices" throughout the federal government.

During the 1st session of the 108th Congress, this Subcommittee focused a great deal of attention on the oversight of the federal government's E-Government element of the President's Management Agenda (PMA). With a commitment to an aggressive and sustained effort, the launch of the President's Management Agenda in August 2001 established a strategy for transforming the federal government in a manner that produces measurable results that matter in the lives of the American people.

One of the five components of the PMA is Electronic Government, intended to utilize the power and creativity of information technology (IT) to produce a more citizen-centric government, as well as one that is more efficient, productive, and cost-effective on behalf of the American taxpayer. E-Government provides a platform to establish cross-agency collaboration and a rapid departure ***from*** a stovepipe approach to government operations ***to*** an approach that facilitates coordination, collaboration, communication, and cooperation.

With federal government expenditures on IT products and services projected to close in on $60 billion dollars in FY05, the federal government will be the largest IT purchaser in the world. For too long, and even continuing in some places today, individual agencies have pursued their own IT agendas that focus solely on mission rather than emanating from a commitment to customer service or sound business processes. Without a system of checks and balance built into the investment process to compare IT needs with mission goals, the potential for waste is excessive.

As a first step to a meaningful coordination of IT expenditures government-wide, Congress passed the *Clinger-Cohen Act of 1996*, which included the *Information Technology Management Reform Act and the Federal Acquisition Reform Act*. This legislation sets forth requirements for federal government IT investment management decision-making and corresponding responsibility and accountability. It requires agencies to fundamentally link IT investments to agency strategic planning, including the linkage to an enterprise architecture.

Under the *Clinger-Cohen Act*, each individual federal government agency or department must create and implement an enterprise architecture (EA). An EA is a tool that defines the structure of any activity or mission within a single organization and across multiple organizations. It allows organizations to then apply IT resources to accomplish those activities or missions identified. An EA also helps an organization identify the relationships between business operations and the underlying IT infrastructure and applications that support those operations. The purpose of the development of agency EAs is to facilitate cross-agency analysis of the business or purpose of government and to make possible the identification of duplicative IT investments, gaps, and prospects for cross-agency collaboration. The goal, as with all e-Government initiatives, is to make the federal government more efficient, citizen-centric, and customer-focused.

An EA, developed and implemented based on the FEA framework, is an essential tool in guiding IT investments. A recent GAO study reports "that investing in IT without

defining these investments in the context of an architecture often results in systems that are duplicative, not well integrated, and unnecessarily costly to maintain and interface."

While the utility of EAs in the federal government is promising, the progress of the federal government in completing the agency EA initiative is less than promising. In 2001 and 2003, GAO assessed the progress of the agencies' efforts to develop and implement EAs. In 2003, overall, GAO found the state of EA government-wide is not mature, with approximately 79 percent of agencies at Stage 1 of GAO's five-stage assessment framework and 21 percent were at Stage 2. Only one agency, the Executive Office of the President, reached Stage 5, the final stage of maturity.

The *E-Government Act of 2002* makes oversight of the agencies' EA efforts the responsibility of OMB's Administrator of E-Government and Information Technology. As a result of a combination of OMB's oversight responsibilities under the *E-Government Act of 2002* and the disappointing results of GAO's 2001 government-wide EA maturity assessment, OMB identified a need for a common framework for agencies to use in facilitating the EA effort. OMB cited the lack of a federal EA as an impediment to achievement of the e-Government initiatives. Thus, OMB began work on creating the FEA in 2002. This effort appears to be initially successful as a tool for recognizing commonalities and inefficiencies. OMB used the FEA during its review of the agencies' FY 2004 budget submissions and found numerous common government functions and consequently numerous redundant efforts and spending. Out of those numerous common functions, OMB selected five core government functions and created the next phase of the e-Government initiative. This new phase, called the "Lines of Business" initiative, specifically targets duplicative effort and spending. Despite this promising development, I still find cause for concern. According to a November 2003 GAO report, the self-reported costs by agencies in developing their individual EAs are close to $600 million. Those same agencies report more than $805 million will be necessary to complete their EAs. With the vast majority of government agencies' EA maturity assessed at the Stage 1 level, we still have a long way to go before we fully realize the benefits of effective EA management. In the course of this hearing, my hope is that we will be able to determine the anticipated cost savings in light of the significant investment already made in the efforts to develop and implement EAs government-wide.

Today's hearing is an opportunity to examine both the progress and successes of OMB's FEA initiative as well as explore the continuing obstacles faced both by federal agencies and departments in integrating their EAs into the FEA. As we have learned in previous hearings, many of the impediments are cultural and people-based, rather than being attributable to the technology itself (or even available resources). Case in point, in GAO's 2003 assessment of government-wide EA efforts, more agencies reported a lack of agency executive understanding of EA and the scarcity of skilled architecture staff as significant challenges than was reported in 2001.

I eagerly look forward to the expert testimony our distinguished panel of leaders in various federal agencies and in industry will provide today as well as the opportunity to demonstrate the progress that has been made thus far with the FEA initiative, while acknowledging the magnitude of the challenge that continues to lie ahead.

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Mr. PUTNAM. I want to welcome the distinguished ranking member from Missouri who has been a partner in these oversight efforts, Mr. Clay. I recognize you for your opening remarks.

Mr. CLAY. Thank you, Mr. Chairman. Thank you for calling this hearing, and I want to thank the witnesses for appearing before us today.

The implementation of enterprise architectures throughout the agency community has altered the methods employed by the Government beyond what used to be little more than the procurement and maintenance of computers and software. That concept, however, became outdated as the Government sought to integrate both business functions and agency goals with information technology. By serving as a blueprint for integration among an agency's core components, enterprise architectures soon enabled an agency to improve its services by optimizing its performance.

It did not take long for Congress to determine that such efficiency would prove beneficial in both economic and qualitative terms. Through legislative efforts such as the Paperwork Reduction Act, the Clinger-Cohen Act, and the E-Government Act, Congress established a framework for agencies to facilitate effective management of enterprise architectures governmentwide. Along with the efforts of the CIO Council and OMB's Federal Enterprise Architecture Program Management Office, the Government has successfully laid a foundation for effective coordination among agencies for business operations, information flow, and IT investment management.

I remain concerned, however, that the agency community is not meeting all of its obligations for effectively managing the development and utilization of enterprise architectures, as only half of all agencies are meeting such standards according to GAO. Further, there seems to be no improvement in the number of agencies performing a full complement of management practices for the effective oversight of architectures. If the Federal Government is to continue to appropriate its annual $60 billion investment in IT systems, we must demand better implementation and management practices for enterprise architectures throughout the agency community.

I look forward to our discussion today and ask that my statement be submitted for the record.

[The prepared statement of Hon. Wm. Lacy Clay follows:]

STATEMENT OF THE HONORABLE WM. LACY CLAY
AT THE HEARING ON
ENTERPRISE ARCHITECTURE

May 19, 2004

Thank you Mr. Chairman for calling this hearing, and I thank the witnesses for appearing before us today.

The implementation of enterprise architectures throughout the agency community has altered the methods employed by the government beyond what used to be little more than the procurement and maintenance of computers and software. That concept, however, became outdated as the government sought to integrate both business functions and agency goals with information technology. By serving as a blueprint for integration among an agency's core components, enterprise architectures soon enabled an agency to improve its services by optimizing its performance.

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I look forward to our discussion today, and ask that my statement be submitted for the record.

Mr. PUTNAM. Without objection.

We will move directly to the testimony. If all the witnesses and any of your supporting cast who will be providing you answers would please rise and raise your right hands for the administration of the oath.

[Witnesses sworn.]

Mr. PUTNAM. Note for the record that all of the witnesses responded in the affirmative.

I would like to recognize our first witness, Ms. Karen Evans. On September 3, 2003, Karen Evans was appointed by President Bush to be Administrator of the Office of Electronic Government and Information Technology at the Office of Management and Budget. Prior to joining OMB, Ms. Evans was Chief Information Officer at the Department of Energy, and served as vice chairman of the CIO Council, the principal forum for agency CIOs to develop IT recommendations. Prior to that she served at the Department of Justice as Assistant and Division Director for Information System Management. She is a frequent guest of this subcommittee.

We are delighted to have you. Welcome, Ms. Evans. You are recognized for your 5-minute statement.

STATEMENTS OF KAREN S. EVANS, ADMINISTRATOR OF E-GOVERNMENT AND INFORMATION TECHNOLOGY, OFFICE OF MANAGEMENT AND BUDGET; RANDOLPH C. HITE, DIRECTOR, INFORMATION TECHNOLOGY ARCHITECTURE AND SYSTEMS, U.S. GENERAL ACCOUNTING OFFICE; DANIEL MATTHEWS, CHIEF INFORMATION OFFICER, DEPARTMENT OF TRANSPORTATION; AND KIM NELSON, CHIEF INFORMATION OFFICER, ENVIRONMENTAL PROTECTION AGENCY

Ms. EVANS. Good afternoon, Mr. Chairman and Ranking Member Clay. Thank you for inviting me to speak with you today and discuss the administration's Federal Enterprise Architecture Program.

The FEA provides a strategic model and a plan to improve the Federal information technology investment management, create cross-agency collaboration, and enhance governmentwide information sharing. My remarks will provide an update on key enterprise architecture developments across the Federal Government specifically focusing on the value of the FEA program and its support of individual agency EA initiatives in using IT to achieve results for the American citizens.

The administration is working to ensure the Government as a whole and the agencies in particular integrate resource decisionmaking with discipline planning activities to yield better program performance in managing our IT resources and assets, and EA is the information asset that defines the mission program, the information and technologies needed to perform the mission, and the transitional processes for implementing new technologies when needs change.

The goals of the Federal Enterprise Architecture are to enable the Federal Government to identify opportunities to leverage technology and alleviate redundancy, or to highlight where agency overlap limits the value of information technology investments; facilitate horizontal, cross-Federal, and vertical Federal, State, local, and tribal integration of IT resources; establish a direct relation-

ship between IT and mission program performance; and support citizen-centered customer-focused government to maximize IT investments to better achieve mission outcomes.

Whether at the Federal, agency, or program level, a mature and continually utilized EA helps in the management of resources by plainly organizing the enterprise IT assets within an understandable strategic framework. This enables agency leaders to develop a clear road map for future investments while ensuring a more effective IT portfolio supports the delivery of faster and better program performance.

In addition to supporting agencies' EA efforts, the Federal Government is using the FEA to identify numerous cross-agency opportunities to cut costs and increase efficiencies through sharing common business functions and technology applications. Specifically, we are enhancing the FEA to maximize the performance of the Federal Government's $60 billion IT portfolio by: identifying opportunities to develop common solutions within Lines of Business [LOBs] resulting in increased government effectiveness and taxpayer savings; linking agency performance to strategic IT investment decisions through agency enterprise architectures; and using EA-related budget requirements to ensure security and privacy considerations are integrated as agencies make strategic IT investment choices.

The FEA framework has yielded results demonstrating a new ability for the Federal Government to drive collaboration and accelerate consolidation of redundant activities, saving taxpayer dollars. One example of this is the concept of Lines of Business [LOBs], a functional representation of the overall business requirements of government. In response to our preliminary review of fiscal year 2004 and 2005 FEA budget data, OMB launched a governmentwide effort in February 2004 to analyze the first set of LOB initiatives. The LOB Task Forces are now using EA-based principles and proven best practices to identify business-driven common solutions to transform government by breaking down traditional agency silos and increasing collaboration. The FEA structure and analysis are foundational to the LOB initiatives. This activity provides a glimpse of how we can use the FEA as transformational framework to accelerate the delivery of services and truly achieve the 21st century e-Government. Implementation of these LOB common solutions will begin in fiscal year 2005, leading to significant improvements in process efficiency, system interoperability, and data sharing.

OMB has developed an EA Assessment Framework to help agencies improve their EA programs and benefit from the results of using EA as a strategic planning tool. OMB's EA Assessment Framework is designed to help each agency assess the capability of its EA program and is intended to compliment the GAO EA management maturity framework which assesses the EA program capacity.

The EA Assessment Framework will be used annually by OMB and the agencies to identify opportunities and facilitate the discussion of EA performance and use. This ongoing collaboration between OMB and the agencies removes the discussion of EA from the current budget cycle and allows us to engage when results can

be used by agencies during the development of their request instead of after the fact when they submit the information to OMB.

OMB continues helping agencies align their efforts with the FEA program, and toward this goal Federal Enterprise Architecture Management System [FEAMS], is ready for agencies to use for the fiscal year 2006 budget process. This will be the first time ever that agencies will be able to use this Web-based tool to look across the Government and identify potential collaboration partners and share technology components as they develop their own IT investments.

As part of our commitment to strengthen our agency security, OMB and the CIO Council are developing the FEA Security and Privacy Profile, an overlay to assist Federal managers in discovering early on where risk exposures exist, the potential range for controls needed to address such risks, and the potential cost of those controls. The FEA program is helping agencies to identify, understand, and integrate security and privacy issues in the earliest stages of planning and development, promoting the efficient operation, and preventing unintended consequences which may require costly corrections at the end of the development.

In short, we are looking to evolving the FEA reference models and further enhancing resources such as FEAMS and the EA Assessment Framework for agencies. OMB seeks to develop the Government-wide practice of enterprise architecture so that agencies can proactively collaborate to make investment decisions prior to submitting their budgets to OMB.

In the longer term, the administration will continue to create opportunities for transforming government delivery of service to the citizens, working to fully integrate performance measurement concepts throughout the FEA reference models to ensure agencies are considering outcomes in all aspects of IT portfolio planning.

The administration will continue to collaborate with agencies and with Congress, State, local, and tribal governments to ensure the promise of the enterprise architecture is fully realized across government. I look forward to working with you on these matters and will be happy to take questions.

[The prepared statement of Ms. Evans follows:]

STATEMENT OF
THE HONORABLE KAREN EVANS
ADMINISTRATOR FOR ELECTRONIC GOVERNMENT AND
INFORMATION TECHNOLOGY
OFFICE OF MANAGEMENT AND BUDGET
BEFORE THE
SUBCOMMITTEE ON TECHNOLOGY, INFORMATION POLICY,
INTERGOVERNMENTAL RELATIONS AND THE CENSUS
U.S. HOUSE OF REPRESENTATIVES
May 19, 2004

Mr. Chairman and Members of the Subcommittee:

Thank you for inviting me to speak with you today to discuss the Administration's Federal Enterprise Architecture (FEA) Program.

The FEA provides a strategic model and plan to improve federal information technology (IT) investment management, create cross-agency collaboration, and enhance government-wide information sharing. My remarks will provide an update on key enterprise architecture (EA) developments across the federal government, specifically focusing on the value of the FEA Program and its support of individual agency EA initiatives in using IT to achieve results for the American people.

Overview

An objective of the Government Performance and Results Act (GPRA); the Clinger-Cohen Act; the E-Government Act of 2002; and the President's Management Agenda (PMA) is to integrate resource decision-making with disciplined planning activities to yield better program performance. The Administration is working to ensure the government as a whole and the agencies in particular apply and implement this objective in managing our IT resources and assets.

From this perspective, we are approaching the challenge on a dual track. First, we are focusing on developing a strategic framework. The goals of the Federal Enterprise Architecture are to:

- Enable the federal government to identify opportunities to leverage technology and alleviate redundancy, or to highlight where agency overlap limits the value of information technology (IT) investments;
- Facilitate horizontal (cross-federal) and vertical (federal, state and local) integration of IT resources;
- Establish a direct relationship between IT and mission/program performance; and
- Support citizen-centered, customer-focused government to maximize IT investments to better achieve mission outcomes.

Achieving these goals ensures the government makes the most efficient application of limited resources to fulfill its important responsibilities and obligations to the American people.

Second, the FEA is supporting the maturation of enterprise architecture efforts being developed and implemented in agencies and departments. Through the Federal Enterprise Architecture, agencies are able to characterize each of their IT investments by:

- The business line the investment supports;
- The performance the agency seeks to achieve; and
- The components and supporting technology that comprise the investment.

Whether at the federal, agency, or program level, a mature and continually utilized EA helps in the management of resources by plainly organizing the enterprise's IT assets within an understandable strategic framework. This framework not only shows the current baseline of an organization's IT assets, but more importantly, it enables agency leaders to develop a clear roadmap for future investments while ensuring a more efficient IT portfolio. This roadmap directly supports the delivery of faster and better program performance, resulting in the fulfillment of an agency's core mission. The EA ties IT to business processes and results. It serves as a consistent, comprehensive analytical structure giving federal managers valuable information to make better IT investment decisions. These decisions lead to smarter, more efficient technology use, resulting not only in cost savings, but over time, in measurably improved program performance across government.

Directly supporting the E-Government initiative of the PMA, the FEA Program was established by OMB in February 2002 to build a comprehensive business-driven blueprint of the entire federal government. The FEA framework and four of its supporting reference models (Performance, Business, Service Component and Technical) are now used by agencies in developing their budgets and setting strategic goals. The fifth and final reference model (the Data Reference Model) is currently under OMB review and will be released soon for agency comment. With the completion of the five FEA reference models, the FEA will evolve into the "common language" for diverse agencies to use while communicating with each other and with state and local governments seeking to collaborate on common solutions.

In addition to supporting agencies' EA efforts, the federal government is using the FEA to identify numerous cross-agency opportunities to cut costs and increase efficiency through sharing common business functions and technology applications to achieve results for the taxpayer. In contrast to planning methods of the past, EA is a business-driven – not technology-driven – approach to creating "best-practice" E-Government solutions to bring faster, better and more cost-effective services to citizens. Specifically, we are enhancing the FEA to maximize the performance of the Federal government's $60 billion IT portfolio by:

- Identifying opportunities to develop common solutions within Lines of Business (LoBs), resulting in increased government effectiveness and taxpayer savings;
- Linking agency program performance to strategic IT investment decisions through agency enterprise architectures; and

- Using EA-related budget requirements to ensure security and privacy considerations are integrated as agencies make strategic IT investment choices.

There is significant work needed to be completed to achieve the full potential existing within the FEA. We are aware of the gaps existing within our emerging activities and will develop the remaining elements to complete the framework, for example, the Data Reference Model and integration of the CIO Council's security and privacy profile into the framework. We are emphasizing the establishment of common language and taxonomy to represent the FEA, so stovepipes continue to fall. Agency alignment with the FEA needs to be transparent and incorporated into agency EA programs. The FEA continues to provide a transformational opportunity to better enable collaboration across the federal government, within and between agencies, and with state and local governments.

FEA Implementation

The FEA is being implemented in various ways. The framework has yielded results demonstrating a new ability for the federal government to drive collaboration and accelerate consolidation of redundant activities, saving taxpayer dollars. The FEA has been involved by providing analytical underpinning for the 24 E-Gov initiatives and the Line of Business (LoB) activities and is being incorporated into agency guidance and policy for use during budget formulation activities. In addition, we have been meeting with all agencies and have established a dialogue around the FEA information supplied to OMB as part of the FY05 budget process. OMB has been able to take advantage of FEA data for the development of the FY04 and FY05 President's Budgets. This year will be the first time agencies have access to and use of the same data to accomplish some of the objectives outlined earlier. Some specific examples of both federal and agency applications follow:

Lines of Business

"Line of Business" (LoB) is a functional representation of the overall business responsibilities of government. Our analysis of LoB data is a prime example of the FEA's value in using architecture to identify new efficiencies in government. Rather than identifying collaboration or consolidation opportunities up front, and then building architectures to implement them (as was done with the selection of the 24 E-Gov initiatives), the LoB analysis effort is a *product* of architecture.

Specifically, FEA review of information collected from agencies in the FY04 and FY05 budget processes revealed five government-wide LoB collaboration opportunities to reduce redundant investments and improve efficiencies. In response to this preliminary review, OMB launched a government-wide effort in February 2004 to analyze the first set of LoB initiatives. The LoB Task Forces are now using EA-based principles and proven best practices to identify business-driven, common solutions to transform government by breaking down traditional agency silos and increasing collaboration. These five LoBs and their agency task-force leads are:

Financial Management (FM) – The Departments of Energy and Labor
Human Resources Management (HR) – The Office of Personnel Management

Grants Management (GM) – The National Science Foundation and the Department of Education
Federal Health Architecture (FHA) – The Department of Health and Human Services
Case Management (CM) – The Department of Justice

The LoB Task Forces will identify common solutions and collaborate with participating agencies to complete joint business cases by early September 2004. Implementation of these solutions will begin in FY05, leading to significant improvements in process efficiency, system interoperability, and data sharing.

EA Assessment Framework

Recently, OMB developed an EA Assessment Framework to help agencies improve their EA programs and benefit from the results of using EA as a strategic planning tool. The EA Assessment Framework will be used annually by OMB and agencies to identify opportunities and facilitate the discussion of EA performance objectives. This ongoing collaboration between OMB and agencies will facilitate year-round architectural improvements. These improvements will lead to better resource allocation decisions and enhanced efficiency and effectiveness of a wide range of government programs.

OMB's EA Assessment Framework is designed to help each agency assess the *capability* of its EA program. For our purposes, capability refers to the overall maturity of the EA's work products; the ability to identify specific IT investment recommendations; the reflection of the FEA reference models; and the potential for intergovernmental collaboration on IT solutions. The OMB framework complements the General Accounting Office (GAO) EA Management Maturity Framework, which assesses EA program *capacity*.

Results from agency EA assessment meetings have been encouraging. In general, most agencies have developed the methodologies and processes necessary to support their EA programs, and have solid descriptions of their baseline environments. In the coming months, OMB will work closely with agencies to integrate performance objectives and measures into their EAs and to develop detailed target architectures and supporting transition plans.

In support of agency enterprise architecture efforts, OMB's EA Assessment Framework was recently added as a requirement to the Scorecard of the President's Management Agenda (PMA). By institutionalizing the annual review of agency enterprise architectures, improvements and savings can be better targeted and results measured.

Agency Enterprise Architectures

OMB continues helping agencies align their efforts with the FEA Program, ensuring EAs across government are consistent in terms of language, structure, and general approach. We are also working with agencies to use EA information to identify areas for interagency collaboration. Toward this goal, OMB started the second-phase pilot of the Federal Enterprise Architecture Management System (FEAMS), a web-based tool allowing agencies access to government-wide architecture data organized around the FEA. FEAMS is ready for agencies to use in the FY06 budget process. For the first time ever, agencies can look across government and identify

potential collaboration partners and shared technology components to utilize in developing their own plans for IT investments.

EA and Improved Program Performance

Agency enterprise-architecture data is now being used in IT. For instance, the Department of Homeland Security (DHS) is making substantial progress in eliminating redundant, non-integrated operations, systems, and processes for IT infrastructure and mission areas. DHS consolidated business cases submitted for the FY05 budget listed relevant systems for consolidation, reported plans for migration and elimination, and identified an integrated business process. The benefits of successfully implementing these efforts include improved capabilities to safeguard our nation, and taxpayer savings through the prevention of unnecessary investments.

Another example is Federal Student Aid (FSA), which manages a $321 billion loan portfolio within the Department of Education. FSA used the FEA to baseline its enterprise architecture program, which includes business process modeling; Capital Planning and Investment Control (CPIC); and IT infrastructure. FSA's EA program is enabling the consolidation of approximately 14 major stove-piped systems down to eight integrated systems.

At the Department of the Interior, the Recreation.gov E-Gov initiative is using the FEA reference models to collaborate with the Forest Service and U.S. Army Corps of Engineers. The end result is better delivery of recreation-related information and services to citizens.

EA Community of Practice

Collaboration among agency leaders in business operations and technology, including the Federal Chief Information Officers (CIO) Council and its Architecture and Infrastructure Committee (AIC), is serving to "operationalize" EA activities and the FEA. This is beginning to result in tangible improvements in strategic planning and IT portfolio management.

To support rapid improvement in agency EA practices, OMB supported the AIC in establishing the Chief Architects Forum (CAF) in April 2004. The forum assists Chief Architects by sharing EA best practices and addressing the challenges agencies they face in developing their EAs and in using architecture information for key decision-making processes. The Chief Architects meet quarterly and maintain an ongoing dialogue on best practices and key issues.

We are also strengthening our relationship with state and local governments through the National Association of State Chief Information Officers (NASCIO) and other organizations. These partnerships will increase the coordination and integration of intergovernmental IT resources.

Security and Privacy

One of our strongest areas of emphasis is on developing an FEA security and privacy profile – an overlay to assist federal managers in discovering early-on where risk exposure exists, the potential range of controls needed to address such risk, and the potential costs of those controls. Using the FEA privacy and security profile as a reference in the development of agency EAs is

fundamental to strong security and privacy. Since an EA helps to inventory agency systems and identify the dependencies and relationships among them, the need for security and privacy exists in virtually every agency program and within every EA layer, including data, business process, and technology. These needs can have a profound impact on process and system design and must be fully identified, understood, and integrated at the earliest stages of planning and development. The FEA Program is helping agencies to achieve this type of early integration, promoting efficient operations and preventing unintended consequences which may require costly corrections at the end of development.

Future Outlook

Short Term
In the short term we will focus on evolving the FEA reference models and further enhancing resources for agencies, such as FEAMS and the EA Assessment Framework. These efforts will directly result in more mature architectures and reveal increasingly useful data on federal IT investments. In addition, OMB seeks to develop the government-wide practice of enterprise architecture so agencies can proactively collaborate together to make investment decisions *prior to* submitting their agency's budget to OMB.

Long Term
In the longer term, the Administration will continue to create opportunities for transforming government's delivery of service to citizens. This may include identifying additional lines of business through FEA data and developing common solutions to be shared for improved efficiency and to produce results. Second, we will work to fully integrate performance measurement concepts throughout the FEA reference models to ensure agencies are considering outcomes in all aspects of IT portfolio planning. This will begin to demonstrate the return on investment for EA and more clearly illustrate the direct relationship of IT to program performance. The Administration will continue building relationships with state, local, and tribal governments in order for federal efficiencies to be extended vertically to help in technology transformation and information sharing at all levels of government.

Conclusion

The Administration will continue to collaborate with agencies and with Congress, state, local, and tribal governments to ensure the promise of enterprise architecture is fully realized across government. The FEA Program and agency EA programs are starting to achieve strong results. Through technical development, outreach, information sharing and analysis, the FEA Program will continue to focus on improving program performance throughout government to deliver services and produce results for the citizens. I look forward to working with you on these matters.

Mr. PUTNAM. Thank you, Ms. Evans.

Our next witness is Mr. Randolph Hite. Mr. Hite is the Director of Information Technology Architecture and Systems Issues at the U.S. General Accounting Office. During his 25 year career with GAO, he has directed reviews of major Federal investments in information technology such as IRS's tax systems modernization and DOD's business systems modernization. Mr. Hite is a principal author of several information technology management guides such as GAO's Guide on System Testing, the Federal CIO Council Guide on Enterprise Architectures, and GAO's Enterprise Architecture Management Maturity Framework. He frequently testifies before Congress on such topics and is an ex-officio member of the Federal CIO Council. He has received a number of awards throughout his career, including being a 2003 Federal 100 Award winner.

Welcome to the subcommittee. You are recognized for 5 minutes.

Mr. HITE. Thank you, Mr. Chairman. First let me commend you for holding this hearing. You know, it wasn't too long ago that enterprise architecture in the Federal Government was a lot like what Mark Twain said about the weather: everybody talks about it, but nobody does anything about it. Fortunately, this has changed in a lot of corners of the Government, and I am cautiously optimistic about what the future holds in this area.

Nevertheless, we are clearly not where we need to be when it comes to developing and using enterprise architectures across the entire Federal Government, as your statement recognized. What I would like to do is make two brief points, one dealing with the Federal Enterprise Architecture [FEA], and one dealing with Federal agencies' enterprise architecture maturity.

Point one, OMB is making progress on the FEA, but it is still a work in process, and what I mean by that is it is still evolving both in terms of content and in use. In my view, this evolution is not a negative, but rather a reasonable and expected phenomenon given the broad-based purpose and scope of such a framework. For example, the FEA is intended to facilitate the development of agency enterprise architectures, no trivial feat in and of itself; promote the reuse of common IT components across agencies; and identify opportunities for interagency collaboration on common IT solutions. We support these goals and believe that the FEA can be an integral part of a transparent means to accomplish this.

Now, having said this, we nevertheless have questions about the FEA at this juncture, which, if addressed, we believe will increase the understanding about the tool and thus facilitate its extension and use. One question is should the FEA be represented as an enterprise architecture. Our reading of it suggests it is more akin to a classification scheme or a taxonomy, rather than a true enterprise architecture.

A closely related question is whether the expected relationship between the agencies' enterprise architectures and the FEA have been clearly defined. In this regard, OMB talks about agencies mapping and aligning their architectures with the FEA, but what this really entails is not well defined, and such ambiguity leads to assumptions which in turn increases the risk that expectations don't get met, and this is particularly true in the enterprise architecture arena.

Still another question is how will security be introduced into the FEA. OMB has stated that it plans to address security in the FEA through a security profile, but our reading of the FEA shows that this profile is not yet part of the FEA. And, in my view, whether we are talking about enterprises or we are talking about systems, security should permeate every element of the architecture and shouldn't be an afterthought, again, whether we are talking about systems or enterprises.

Point two, like the FEA, enterprise architecture programs in the individual agencies are still maturing. Using our framework as a benchmarking tool, as you alluded to, Mr. Chairman, we reported in September 2003 that Federal agencies' collective progress toward effective management of architectures was limited: 22 agencies increasing their levels, 24 agencies decreasing their levels, and 46 agencies remaining basically the same. We further reported that only 20 of the agencies that we looked at had established the foundation needed for effective enterprise architecture when you compare them against our most recent maturity model, which raised the bar on what constitutes effective architecture management. This governmentwide state of affairs can be attributed to several longstanding challenges which were the basis of some recommendations that we made to OMB in 2001, and then we reiterated those recommendations in 2003.

In summary, development and use of architectures in the Federal Government are maturing, but they are not mature. Progress is being made, but the progress is uneven and much remains to be accomplished. I will say the recent steps by OMB and the CIO Council to assume stronger leadership roles in this area are encouraging signs; however, hard work lies ahead to clarify and evolve the FEA and to ensure that well-managed architecture programs are actually established and executed, underscore executed, across the Government.

As our maturity framework emphasizes, the goal is not merely to check the box on some form, but rather to make enterprise architecture an integral and useful part of informing government transformation and achieving breakthrough performance. That is the end game.

Mr. Chairman, that concludes my testimony. I would be happy to answer any questions you have.

[The prepared statement of Mr. Hite follows:]

United States General Accounting Office

GAO

Testimony

Before the Subcommittee on Technology, Information Policy, Intergovernmental Relations and the Census, Committee on Government Reform, House of Representatives

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INFORMATION TECHNOLOGY

The Federal Enterprise Architecture and Agencies' Enterprise Architectures Are Still Maturing

Statement of Randolph C. Hite
Director, Information Technology Architecture and Systems Issues

GAO-04-798T

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Highlights

Highlights of GAO-04-798T, a testimony before the Subcommittee on Technology, Information Policy, Intergovernmental Relations and the Census, Committee on Government Reform, House of Representatives.

Why GAO Did This Study

The concept of enterprise architecture emerged in the mid-1980s as a means for optimizing integration and interoperability across organizations. In the early 1990s, GAO research of successful public and private sector organizations led it to identify enterprise architecture as a critical success factor for agencies that are attempting to modernize their information technology (IT) environments. Since then, GAO has repeatedly identified the lack of an enterprise architecture as a key management weakness in major modernization programs at a number of federal agencies. It has also collaborated with the Office of Management and Budget (OMB) and the federal Chief Information Officers (CIO) Council to develop architecture guidance. In 2002, OMB began developing the Federal Enterprise Architecture (FEA), an initiative intended to guide and constrain federal agencies' enterprise architectures and IT investments.

GAO was asked to testify on the status of the FEA and on the state of federal agencies' development and use of enterprise architectures.

www.gao.gov/cgi-bin/getrpt?GAO-04-798T.

To view the full product, including the scope and methodology, click on the link above. For more information, contact Randy Hite at 202-512-6256 or hiter@gao.gov.

May 19, 2004

INFORMATION TECHNOLOGY

The Federal Enterprise Architecture and Agencies' Enterprise Architectures Are Still Maturing

What GAO Found

OMB has made progress on the FEA, but it remains very much a work in process and is still maturing. Its stated purposes include facilitating (1) the development of agencies' enterprise architectures, (2) the reuse of common IT components across agencies, and (3) the identification of opportunities for interagency collaboration in developing common IT solutions. Currently, the FEA is made up of five parts known as reference models, four of which have been issued in at least initial form (see table). OMB reports that the FEA has been used to help identify potentially redundant agency IT investments, choose five lines of business (e.g., grants management) in which to pursue opportunities for agency collaboration, and begin to develop the architectural foundation for some of these business lines. GAO supports the FEA as a framework for achieving these ends, but raises questions whose answers are important to the its future. For example: Should the FEA be described as an enterprise architecture? GAO's reading of its content suggests that it is more akin to a classification scheme for government operations than a true enterprise architecture. Further, OMB requires agencies to "map" and "align" their architectures with the FEA. However, since these terms are not well-defined, GAO asks if the expected relationship between the FEA and agencies' architectures is clear enough.

Like the FEA, agencies' enterprise architectures are still maturing. GAO recently reported (GAO-04-40) that agencies' management of architecture programs was generally not mature. Using its Enterprise Architecture Management Maturity Framework as a benchmark, GAO found little change in overall maturity between 2001 and 2003. Only 20 of 96 agencies examined had established at least the foundation for effective architecture management. Further, while 22 agencies increased in maturity since 2001, 24 agencies decreased and 47 agencies remained the same. Recently, OMB and the federal CIO Council initiated actions to advance agency architecture programs that are consistent with many of GAO's recommendations.

FEA Reference Models

Reference model	Description	Release date
Performance	Provides a common set of general performance outputs and measures for agencies to use to achieve business goals and objectives.	V 1.0, September 2003
Business	Describes the hierarchy of federal business operations independent of the agencies that perform them, including defining the services provided to state and local governments.	V 2.0, June 2003
Service component	Identifies and classifies IT service (i.e., application) components that support federal business operations and promotes the reuse of components across agencies	V 1.0, June 2003
Data and information	Is intended to describe, at an aggregate level, the types of data and information that support program ad business line operatin and the hierarchical relationships among them.	Planned for 2004
Technical	Describes how technology is supporting the delivery of service components, including relevant implementation standards.	V 1.1, August 2003

Source: GAO analysis of OMB data.

Mr. Chairman and Members of the Subcommittee:

I appreciate the opportunity to participate in the Subcommittee's hearing on the status of the Federal Enterprise Architecture (FEA) and on the state of federal agencies' development and use of enterprise architectures—two topics that are closely related.

An enterprise architecture can be viewed as a link between an organization's strategic plan and the program and supporting system implementation investments that it intends to pursue to systematically achieve its strategic goals and outcomes. As such, the architecture is basically a blueprint, defined largely by interrelated models, that describes (in both business and technology terms) an entity's "as is" or current environment, its "to be" or future environment, and its investment plan for transitioning from the current to the future environment. The use of such a blueprint is a recognized hallmark of organizations that effectively leverage technology in the transformation and modernization of business operations and supporting systems. Further, it is recognized in legislation and related Office of Management and Budget (OMB) implementing guidance. The FEA is intended to provide a governmentwide framework to guide and constrain federal agencies' enterprise architectures and information technology (IT) investments.

My testimony today is drawn largely from our 2003 report on federal agencies' development and use of enterprise architectures, which was based on work conducted in accordance with generally accepted government auditing standards.[1] We augmented the results in this report with available information on the recent actions of OMB and the federal Chief Information Officers (CIO) Council to address the recommendations that we made in the report. This testimony is also based on discussions with and information from

[1] U.S. General Accounting Office, *Information Technology: Leadership Remains Key to Agencies Making Progress on Enterprise Architecture Efforts*, GAO-04-40 (Washington, D.C.: Nov. 17, 2003).

OMB on the FEA, as well as discussions with GAO's Executive Council on Information Management and Technology.[2]

Results in Brief

The FEA continues to evolve in both content and use, which is both reasonable and expected, in our view, for such a broad-based framework. Through the FEA, OMB is attempting to provide federal agencies and other decision-makers with a common frame of reference or taxonomy for informing agencies' individual enterprise architecture efforts and their planned and ongoing investment activities, and to do so in a way that identifies opportunities for avoiding duplication of effort and launching initiatives to establish and implement common, reusable, and interoperable solutions across agency boundaries. We support this goal, and the development and use of the FEA as part of the means to accomplish it. We nevertheless observe that development and use of the FEA is but the first step in a multistep process needed to realize the promise of such interagency solutions. Because the FEA is still maturing both in content and in use, we have a number of questions that we believe OMB needs to address to maximize understanding about the tool and thus facilitate its advancement.

1. Should the FEA be described as an enterprise architecture?
2. Is the expected relationship between agencies' enterprise architectures and the FEA clearly articulated?
3. How will the security aspects of the FEA be addressed?

Like the FEA, the enterprise architecture efforts of individual federal departments and agencies are also still maturing. In September 2003, we reported that federal agencies' collective

[2] GAO's Executive Council on Information Management and Technology is composed of senior level officials from the public sector, private sector, and academia. Members include former CIOs for government agencies, professors of information technology, presidents of private businesses, and information technology consultants.

progress toward effectively managing enterprise architectures was limited, with much work remaining.[3] In particular, the percentage of agencies that had established at least the foundation for effective enterprise architecture management was virtually unchanged from where it was in 2001 (about 50 percent). We further reported that when the state of enterprise architecture is considered in relation to a more recent and demanding benchmark, this percentage dropped to about 20 percent (in round terms), although some agencies did do well against this benchmark and were thus role models for other agencies to follow. This composite picture of immature enterprise architecture management can be attributed to several long-standing challenges, which were the basis for the recommendations that we made to OMB in 2001 and reiterated in 2003. Recently, OMB and the CIO Council took steps that are consistent with many of our recommendations. We support these steps, and we are working collaboratively with both organizations to maximize their effectiveness. However, the fact remains that until agencies have and use well-defined enterprise architectures, they will be severely challenged in their ability to effectively leverage IT in transforming their operations.

Background

The concept of using an architecture to describe an enterprise emerged in the mid-1980s, and over the years, the field of enterprise architecture has continued to evolve and mature. In the early 1990s, we identified an architecture as a critical success factor in allowing organizations to effectively apply IT to meet mission goals. Since then, we have worked with the Congress, OMB, and the CIO Council to promote the importance of architectures and assist agencies in developing, maintaining, and using them. In our reviews of selected agency IT management practices and major systems modernization programs, we have consistently identified the lack of an architecture as a major management weakness and made recommendations to address this important area.

[3] GAO-04-40.

To help oversee and budget for federal IT investments, OMB began developing the FEA in 2002, and has since issued versions of four of its five major parts. According to OMB, the FEA is to provide a common, governmentwide framework for agency enterprise architectures and IT investments. Thus far, OMB reports that it has begun using the FEA to identify and address interagency duplication of effort and to launch interagency projects.

What Is an Enterprise Architecture?

In simplest terms, an enterprise is any purposeful activity, and an architecture is the structural description of an activity. Building on this, we can view enterprise architectures as systematically derived and captured structural descriptions—in useful models, diagrams, and narrative—of the mode of operation for a given enterprise, which can be either a single organization or a functional or mission area that transcends more than one organizational boundary (e.g., financial management, homeland security).

The architecture can also be viewed as a blueprint that links an enterprise's strategic plan to the programs and supporting systems that it intends to implement to accomplish the mission goals and objectives laid out in the strategic plan. As such, the architecture describes the enterprise's operations in both logical terms (such as interrelated business processes and business rules, information needs and flows, and work locations and users) and technical terms (such as hardware, software, data, communications, and security attributes and performance standards). Moreover, it provides these perspectives both for the enterprise's current (or "as-is") environment and for its targeted future (or "to-be") environment, as well as for the transition plan for moving from the "as-is" to the "to-be" environment.

Importance of Enterprise Architectures

The importance of enterprise architectures is a basic tenet of IT management, and their effective use is a recognized hallmark of successful public and private organizations. For over a decade, we have promoted the use of architectures, recognizing them as a crucial means to a challenging goal: that is, agency operational structures that are optimally defined, in terms of both business and

technology. The alternative, as our work has shown, is perpetuation of the kinds of operational environments that saddle most agencies today, in which the lack of integration among business operations and the IT resources that support them leads to systems that are duplicative, not well integrated, and unnecessarily costly to maintain and interface.

Managed properly, an enterprise architecture can clarify and help optimize the interdependencies and relationships among an organization's business operations and the underlying IT infrastructure and applications that support these operations. Employed in concert with other important IT management controls (such as portfolio-based capital planning and investment control practices), architectures can greatly increase the chances that organizations' operational and IT environments will be configured so as to optimize mission performance. Enterprise architectures are integral to managing large-scale programs in federal departments and agencies, as well as initiatives that span several agencies, such as those currently being undertaken to support OMB's electronic government (e-government)[4] and "Line of Business"[5] efforts.

Brief History of Enterprise Architecture Frameworks and Management Guidance

During the mid-1980s, John Zachman, widely recognized as a leader in the field of enterprise architecture, identified the need to use a logical construction blueprint (i.e., an architecture) for defining and controlling the integration of systems and their components.[6] Accordingly, Zachman developed a structure or framework for defining and capturing an architecture, which provides for six

[4] According to OMB, e-government is a mode of operations (using people, process, and technology—particularly Web-based Internet technology) to enhance access to and delivery of government information and service to citizens, business partners, employees, other agencies, and other levels of government. U.S. General Accounting Office, *Electronic Government: Initiatives Sponsored by the Office of Management and Budget Have Made Mixed Progress*, GAO-04-561T (Washington, D.C.: March 24, 2004).

[5] According to OMB, the "Lines of Business" efforts will entail reviewing proposed investments in five areas (financial, human resources, grants, health, and case management systems) to identify common solutions and reduce costs.

[6] J.A. Zachman, "A Framework for Information Systems Architecture," *IBM Systems Journal*, vol. 26, no. 3 (1987).

"windows" from which to view the enterprise.[7] Zachman also proposed six abstractions or models associated with each of these perspectives.[8] Zachman's framework provides a way to identify and describe an entity's existing and planned component parts, and the relationships between those parts, before the entity begins the costly and time-consuming efforts associated with developing or transforming itself.

Since Zachman introduced his framework, a number of frameworks have emerged within the federal government, beginning with the publication of the National Institute of Standards and Technology (NIST) framework in 1989. Since that time, other federal entities have issued enterprise architecture frameworks, including the Department of Defense (DOD) and the Department of the Treasury. In September 1999, the federal CIO Council published the Federal Enterprise Architecture Framework, which was intended to provide federal agencies with a common construct for their architectures, thereby facilitating the coordination of common business processes, technology insertion, information flows, and system investments among federal agencies. The Federal Enterprise Architecture Framework describes an approach, including models and definitions, for developing and documenting architecture descriptions for multiorganizational functional segments of the federal government.[9]

In February 2002, OMB established the Federal Enterprise Architecture Program Management Office to develop the FEA, which, according to OMB, is intended to facilitate governmentwide improvement through cross-agency analysis and identification of duplicative investments, gaps, and opportunities for collaboration,

[7] The windows provide the viewpoints of (1) the strategic planner, (2) the system user, (3) the system designer, (4) the system developer, (5) the subcontractor, and (6) the system itself.

[8] The models cover (1) how the entity operates, (2) what the entity uses to operate, (3) where the entity operates, (4) who operates the entity, (5) when entity operations occur, and (6) why the entity operates.

[9] Similar to the Zachman framework, the Federal Enterprise Architecture Framework's proposed models describe an entity's business, data necessary to conduct the business, applications to manage the data, and technology to support the applications.

interoperability, and integration within and across agency programs. The FEA is composed of five "reference models" describing the federal government's (1) business (or mission) processes and functions, independent of the agencies that perform them, (2) performance goals and outcome measures, (3) service delivery means, (4) information and data definitions, and (5) technology standards. The reference models are intended to inform agency efforts to develop their agency-specific enterprise architectures and enable agencies to ensure that their proposed investments are not duplicative with those of other agencies and to pursue, where appropriate, joint projects. The FEA reference models are summarized in table 1.

Table 1: FEA Reference Models

Reference model	Description	Status
Performance reference Model	Provides a common set of general performance outputs and measures for agencies to use to achieve business goals and objectives.	Version 1.0 released in September 2003
Business reference model	Describes the hierarchy of federal business operations independent of the agencies that perform them, including defining the services provided to state and local governments.	Version 2.0 released in June 2003
Service component reference model	Identifies and classifies IT service (i.e., application) components that support federal business operations and promotes the reuse of components across agencies.	Version 1.0 released in June 2003
Data and information reference model	Is intended to describe, at an aggregate level, the data and information types that support program and business line operations and the hierarchical relationships among these types.	Release planned in 2004
Technical reference model	Describes technology that is to support the delivery of service components, including relevant standards for implementing the technology.	Version 1.1 released in August 2003

Source: GAO analysis based on OMB data.

Although these post-Zachman frameworks differ in their nomenclatures and modeling approaches, most provide for defining an enterprise's operations in both logical terms and technical terms, provide for defining these perspectives for the enterprise's current and target environments, and call for a transition plan between the two.

Several laws and regulations have established requirements and guidance for agencies' management of architectures, beginning with

the Clinger-Cohen Act in 1996,[10] which directs the CIOs of major departments and agencies to develop, maintain, and facilitate the implementation of IT architectures as a means of integrating agency goals and business processes with IT. OMB Circular A-130, which implements the Clinger-Cohen Act, requires that agencies document and submit their initial enterprise architectures to OMB and updates when significant changes to their architectures occur. The circular also directs the OMB Director to use various kinds of reviews to evaluate the adequacy and efficiency of agency compliance with the circular.

OMB was given explicit responsibility for overseeing government enterprise architectures by the E-Government Act of 2002,[11] which established the Office of Electronic Government within the office. More specifically, it gives OMB the responsibility for facilitating the development of enterprise architectures within and across agencies and supporting improvements in government operations through the use of IT.

Prior Work Indicates Opportunities for Improving Enterprise Architectures

We began reviewing federal agencies' use of architectures in 1994, initially focusing on those agencies that were pursuing major systems modernization programs that were high risk. These included the National Weather Service systems modernization,[12] the Federal Aviation Administration air traffic control modernization,[13] and the Internal Revenue Service tax systems modernization.[14]

[10] Public Law 104-106, 40 U.S.C. 11315.

[11] Public Law 107-347.

[12] U.S. General Accounting Office, *Weather Forecasting: Systems Architecture Needed for National Weather Service Modernization*, GAO/AIMD-94-28 (Washington, D.C.: Mar. 11, 1994).

[13] U.S. General Accounting Office, *Air Traffic Control: Complete and Enforced Architecture Needed for FAA Systems Modernization*, GAO/AIMD-97-30 (Washington, D.C.: Feb. 3, 1997).

[14] U.S. General Accounting Office, *Tax Systems Modernization: Blueprint Is a Good Start but Not Yet Sufficiently Complete to Build or Acquire Systems*, GAO/AIMD/GGD-98-54 (Washington, D.C.: Feb. 24, 1998).

Generally, we reported that these agencies' enterprise architectures were incomplete, and we made recommendations that they develop and implement complete enterprise architectures to guide their modernization efforts.

Since then, we have reviewed architecture efforts at other federal agencies, including the Department of Education,[16] the former Customs Service,[17] the former Immigration and Naturalization Service,[17] the Centers for Medicare and Medicaid Services,[18] the Department of Defense (DOD),[19] the Federal Bureau of Investigation,[20] and the National Aeronautics and Space Administration.[21] These reviews have identified the absence of complete and enforced enterprise architectures, which has led to agency business operations, systems, and data that are not integrated and that are duplicative and incompatible. These conditions, in turn, have either prevented agencies from sharing data or forced them to do so through inefficient manual processes or costly, custom-developed system interfaces.

[16] U.S. General Accounting Office, *Student Financial Aid Information: Systems Architecture Needed to Improve Programs' Efficiency*, GAO/AIMD-97-122 (Washington, D.C.: July 29, 1997).

[17] U.S. General Accounting Office, *Customs Service Modernization: Architecture Must Be Complete and Enforced to Effectively Build and Maintain Systems*, GAO/AIMD-98-70 (Washington, D.C.: May 5, 1998).

[17] U.S. General Accounting Office, *Information Technology: INS Needs to Better Manage the Development of Its Enterprise Architecture*, GAO/AIMD-00-212 (Washington, D.C.: Aug. 1, 2000).

[18] U.S. General Accounting Office, *Medicare: Information Systems Modernization Needs Stronger Management and Support*, GAO-01-824 (Washington, D.C.: Sept. 20, 2001).

[19] U.S. General Accounting Office, *DOD Business Systems Modernization: Important Progress Made to Develop Business Enterprise Architecture, but Much Work Remains*, GAO-03-1018 (Washington, D.C.: Sept. 19, 2003).

[20] U.S. General Accounting Office, *Information Technology: FBI Needs an Enterprise Architecture to Guide Its Modernization Activities*, GAO-03-959 (Washington, D.C.: Sept. 25, 2003).

[21] U.S. General Accounting Office, *Information Technology: Architecture Needed to Guide NASA's Financial Management Modernization*, GAO-04-43 (Washington, D.C.: Nov. 21, 2003).

Our Enterprise Architecture Management Maturity Framework

To contribute to the evolution and maturity of the enterprise architecture discipline, in 2002, we published version 1.0 of our *Enterprise Architecture Management Maturity Framework* (EAMMF) as an extension of *A Practical Guide to Federal Enterprise Architecture, Version 1.0*, published by the CIO Council. By arranging core elements from the practical guide into a matrix of five hierarchical stages and four critical success attributes, this framework provides a common benchmarking tool for planning and measuring enterprise architecture efforts.[22] In April 2003, we published version 1.1 of this framework,[23] which reflects changes and additions that are based on comments we received on the initial version, as well as on our experiences in reviewing enterprise architecture programs.

The EAMMF Version 1.0

EAMMF version 1.0 is made up of five stages of maturity, each of which includes an associated set of elements along with all the elements of the previous stages. In addition to the maturity stages, each core element is associated with attributes that are critical to the successful performance of any management function. Figure 1 shows a summary of version 1.0 of the framework and shows the key elements with the associated stages and attributes.

[22]U.S. General Accounting Office, *Information Technology: Enterprise Architecture Use across the Federal Government Can Be Improved*, GAO-02-6 (Washington, D.C.: Feb. 19, 2002).

[23]U.S. General Accounting Office, *Information Technology: A Framework for Assessing and Improving Enterprise Architecture Management (Version 1.1)*, GAO-03-584G (Washington, D.C.: April 2003).

Figure 1: EAMMF (Version 1.0)

	Stage 1: Creating EA awareness	Stage 2: Building the EA management foundation	Stage 3: Developing architecture products	Stage 4: Completing architecture products	Stage 5: Leveraging the EA for managing change
Attribute 1: Demonstrates commitment	Agency is aware of EA.	Committee or group representing the enterprise is responsible for directing, overseeing, or approving EA.	Written/approved policy exists for EA development.	Written/approved policy exists for information technology investment compliance with EA.	Written/approved policy exists for EA maintenance.
Attribute 2: Provides capability to meet commitment		Program office responsible for EA development exists. Chief architect exists. EA being developed using a framework and automated tool.	EA products are under configuration management.		
Attribute 3: Demonstrates satisfaction of commitment		EA plans • call for describing enterprise in terms of business, data, applications, or technology; • call for describing "as is" environment, "to be" environment, or sequencing plan.	EA products • describe or will describe enterprise's business—and the data, applications, and technology that support it; • describe or will describe "as is" environment, "to be" environment, and sequencing plan. EA scope is enterprise-focused.	EA products • describe enterprise's business—and the data, applications, and technology that support it; • describe "as is" environment, "to be" environment, and sequencing plan. Agency chief information officer has approved EA.	Either EA steering committee, investment review board, or agency head has approved EA.
Attribute 4: Verifies satisfaction of commitment					Metrics exist for measuring EA benefits.

Maturation

Source: GAO.

Note: Each stage includes all elements of the previous stages.

EAMMF Version 1.1

Version 1.1 of this framework was released in April 2003. Like the initial version, Version 1.1 is based on the CIO Council guidance,[24] augmented by our experience in reviewing agency architecture

[24] CIO Council, *A Practical Guide to Federal Enterprise Architecture, Version 1.0* (February 2001).

programs. Changes and additions to the framework were also based on comments received from federal agencies on the initial version. Figure 2 shows a summary of Version 1.1.

Figure 2: EAMMF (version 1.1)

	Stage 1: Creating EA awareness	Stage 2: Building the EA management foundation	Stage 3: Developing EA products	Stage 4: Completing EA products	Stage 5: Leveraging the EA to manage change
Attribute 1: Demonstrates commitment		Adequate resources exist. Committee or group representing the enterprise is responsible for directing, overseeing, or approving EA.	Written and approved organization policy exists for EA development.	Written and approved organization policy exists for EA maintenance.	Written and approved organization policy exists for IT investment compliance with EA.
Attribute 2: Provides capability to meet commitment		Program office responsible for EA development and maintenance exists. Chief architect exists. EA is being developed using a framework, methodology, and automated tool.	EA products are under configuration management.	EA products and management processes undergo independent verification and validation.	Process exists to formally manage EA change. EA is integral component of IT investment management process.
Attribute 3: Demonstrates satisfaction of commitment		EA plans call for describing both "as-is" and "to-be" environments of the enterprise, as well as a sequencing plan for transitioning from the "as-is" to the "to-be." EA plans call for describing both "as-is" and "to-be" environments in terms of business, performance, information/data, application/service, and technology. EA plans call for business, performance, information/data, application/service, and technology descriptions to address security.	EA products describe or will describe both "as-is" and "to-be" environments, as well as a sequencing plan. Both "as-is" and "to-be" environments are described or will be described in terms given in Stage 2. These descriptions (see Stage 2) address or will address security.	EA products describe both "as-is" and "to-be" environments, as well as a sequencing plan. Both "as-is" and "to-be" environments are described in terms given in Stage 2. These descriptions (see Stage 2) address security. Organization CIO has approved current version of EA. Committee or group representing the enterprise or the investment review board has approved current version of EA.	EA products are periodically updated. IT investments comply with EA. Organization head has approved current version of EA.
Attribute 4: Verifies satisfaction of commitment		EA plans call for developing metrics for measuring EA progress, quality, compliance, and return on investment.	Progress against EA plans is measured and reported.	Quality of EA products is measured and reported.	Return on EA investment is measured and reported. Compliance with EA is measured and reported.

Maturation

Source: GAO.

Note: Each stage includes all elements of the previous stages.

Key Differences between EAMMF Versions 1.0 and 1.1

Overall, version 1.1 is more demanding (i.e., sets a higher standard) than version 1.0 because version 1.1 adds content and links the framework to related IT management guidance, such as our IT investment management framework.[25] Key differences in version 1.1 of the framework appear first in stage 2 and affect later stages either explicitly or implicitly. That is, some planning elements associated with stage 2 now propagate explicitly through later stages as plans are executed and architecture products are developed, completed, and implemented. For example:

- Version 1.1 includes "performance" among the models that are needed to describe the "as-is" and "to-be" environments; these models are introduced into the planning elements in stage 2 and built upon as plans are executed: that is, as architecture products are developed and completed in stages 3 and 4, respectively.
- Version 1.1 explicitly recognizes the need to address security in the descriptions of the "as-is" and "to-be" environments; this element is introduced in stage 2 and reiterated in stages 3 and 4.
- Version 1.1 introduces the need to plan for metrics in stage 2 and to measure different aspects of enterprise architecture development, quality, and use in stages 3, 4, and 5.

OMB Has Made Progress on FEA, but Questions Remain

In 2001, the lack of a federal enterprise architecture was cited by OMB's E-Government Task Force as a barrier to the success of the administration's e-government initiatives.[26] In response, OMB began developing the FEA, and over the last 23 months it has released various versions of all but one of the five FEA reference models. According to OMB, the purpose of the FEA, among other things, is

[25] U.S. General Accounting Office, *Information Technology Investment Management: A Framework for Assessing and Improving Process Maturity*, GAO-04-394G (Washington, D.C.: March 2004).

[26] OMB's E-Government Task Force identified 23 initiatives (two additional initiatives were subsequently added) aimed at improving service to individuals, service to businesses, intergovernmental affairs, and federal agency-to-agency efficiency and effectiveness.

to provide a common frame of reference or taxonomy for agencies' individual enterprise architecture efforts and their planned and ongoing investment activities.

OMB reports that it first began using the FEA in 2002 as part of the fiscal year 2004 budget cycle to identify duplicative investments, gaps, and opportunities for collaboration, interoperability, and integration within and across government agency programs. OMB has since required agencies to use the FEA in developing their fiscal year 2005 budget submissions.[27] Despite OMB's progress, however, questions remain about the FEA.

OMB Has Cited a Number of Broad Purposes for the FEA

OMB has identified multiple purposes for the FEA. One purpose cited is to inform agencies' individual enterprise architectures and to facilitate their development by providing a common classification structure and vocabulary. Another stated purpose is to provide a governmentwide framework that can increase agencies' awareness of IT capabilities that other agencies have or plan to acquire, so that they can explore opportunities for reuse. Still another stated purpose is to help OMB decision-makers identify opportunities for collaboration among agencies through the implementation of common, reusable, and interoperable solutions. To this end, the business reference model states that OMB will use the FEA to analyze agency IT investments to identify

- which agencies share common business functions, processes, and activities;
- which budget requests support duplicative business functions and information systems; and
- where the government is investing money on redundant capabilities.

According to OMB, still another purpose of the FEA is to provide the Congress with information that it can use as it considers the authorization and appropriation of funding for federal programs.

[27] *Additional Guidance on the FEA-related Requirements in OMB Circular A-11*, Office of Management and Budget, Federal Enterprise Architecture Program Management Office.

OMB Has Released Versions of Four of Five FEA Reference Models

OMB has issued at least initial versions of four of the five reference models and plans to issue the fifth in the near future (see table 1). The following summarizes the purpose, content, and status of each reference model.

Performance reference model. According to OMB, the performance reference model is intended to produce IT performance information, articulate the contribution of IT to business outputs and outcomes, and identify performance improvement opportunities that cross organizational boundaries.

To accomplish these purposes, the model specifies measurement areas (e.g., mission and business results), measurement categories (e.g., services for citizens), and generic measurement indicators (e.g., delivery time) that agencies are to use to organize their respective measurement indicators. It also describes a process for agencies to use to identify and define these measurement indicators. Version 1.0 of the model was released in September 2003.

Business reference model. OMB characterizes the business reference model as being the foundation of the FEA. It describes the businesses of the federal government, independent of the agencies that perform them. According to OMB, the purpose of the business reference model is to provide the basis for analyzing IT investments and associated budget requests relative to whether they support common business functions, processes, and activities. OMB expects agencies to use the model as part of their capital planning and investment control processes to help identify opportunities for consolidating IT investments across the federal government.

The model consists of four *business areas*: (1) services for citizens, (2) mode of delivery, (3) support delivery of services, and (4) management of government resources. These four business areas are decomposed into 39 *lines of business*, which are made up of 153 *subfunctions*. Examples of lines of business under the "services for citizens" business area are homeland security, law enforcement, and economic development. For the homeland security line of business, an example of a subfunction is border and transportation security; for law enforcement, a subfunction example

is citizen protection; and for economic development, a subfunction example is financial sector oversight. Version 1.0 of the model was released to agencies in July 2002. In June 2003, version 2.0 was released.

Service component reference model. According to OMB, the service component reference model identifies and classifies IT service (i.e., application) components that support federal agencies so that OMB can identify, among other things, agencies that are building or have already built similar components that can be reused. Agencies are expected to use the service reference model to do the same.

The model is organized as a hierarchy, beginning with seven *service domains.* These service domains are decomposed into 29 *service types* (see table 2), which are further broken down into 168 *components.* For example, the customer services domain is made up of three service types: customer relationship management, customer preferences, and customer-initiated assistance. Components of the customer relationship management service type include call center management and customer analytics; components of the customer preferences service type include personalization and subscriptions; and components of the customer-initiated assistance service type include on-line help and on-line tutorials. Version 1.0 of the service component reference model was released in June 2003.

Table 2. Service Domains, the Capabilities That They Describe, and Associated Service Types

Service domain	Description	Service types
Customer services	Interaction between the business and the customer, including customer-driven activities (directly related to the end customer)	Customer preferences, customer relationship management, and customer-initiated assistance
Process automation services	Automation of processes and activities that support managing the business	Tracking and workflow, and routing and automation
Business management services	Management and execution of business functions and organizational activities that maintain continuity across the business	Management of process, organizational management, supply chain management, and investment management
Digital asset services	Generation, management, and distribution of intellectual capital and electronic media across the business	Content management, knowledge management, document management, and records management
Business analytical services	Extraction, aggregation, and presentation of information to facilitate decision analysis and business evaluation	Analysis and statistics, business intelligence, visualization, and reporting
Back office services	Management of transaction-based functions	Data management, human resources, financial management, assets/materials management, development and integration, and human capital/workforce management
Support services	Cross-functional capabilities that are independent of service domains	Security management, systems management, forms, communication, collaboration, and search

Source: OMB.

Data and information reference model. The data and information reference model is intended to help define the types of interactions and information exchanges that occur between the government and its customers. According to OMB, the model will describe data and information types that support program and business line operations and the relationships among these types. According to OMB officials, the model's release is imminent.

Technical reference model. The technical reference model is intended to help agencies define their respective target technical architectures. It describes the standards, specifications, and technologies that collectively support the secure delivery, exchange, and construction of service components. OMB describes the model as being made up of the following four core service areas:

- *Service access and delivery:* the collection of standards and specifications that support external access, exchange, and delivery of service components.
- *Service platform and infrastructure:* the delivery platforms and infrastructure that support the construction, maintenance, and availability of a service component or capability.
- *Component framework:* the underlying foundation, technologies, standards, and specifications by which service components are built, exchanged, and deployed.
- *Service interface and integration:* the collection of technologies, methodologies, standards, and specifications that govern how agencies will interface internally and externally with a service component.

Each of these four core service areas is made up of *service categories*, which identify lower levels of technologies, standards, and specifications; *service standards*, which define the standards and technologies that support the service category; and the *service specification*, which details the standard specification or the provider of the specification. For example, within the first core service area (service access and delivery), an example of a service category is *access channels*, and service standards are *Web browsers* and *wireless personal digital assistants*. Examples of *service specifications* for the Web browser service standard are Internet Explorer and Netscape Navigator. Version 1.0 of the technical reference model was released in January 2003 and then revised in August 2003 to incorporate minor revisions that were based, in part, on agencies' reviews. This version—version 1.1—was used during the 2005 budget process.

OMB Has Used the FEA to Identify Five Areas for Interagency Collaboration

As part of the fiscal year 2004 budget cycle, OMB required agencies to align business cases for their proposed IT investments to the business reference model; beginning with the fiscal year 2005 budget cycle, agencies were required to align their business cases to all the available reference models (i.e., the business, performance, technical, and service component reference models). This alignment activity was intended to result in the identification of redundancies and opportunities for collaboration. According to OMB, the fiscal

year 2004 IT investment budget review process identified potential redundancies in six lines of business. Further analysis of these six lines of business as part of the fiscal year 2005 IT budget process resulted in OMB settling on five lines of business in which to pursue opportunities for collaboration (i.e., financial management, human resources, grants, health, and case management).

Since then, OMB initiated a governmentwide analysis of these five lines of business to examine business and IT data and best practices for each. According to OMB, over the next several months, agency-led teams will identify common solutions and define a target architecture that is to be reflected in a business case for proposed IT investments for each line of business. The business cases are to be submitted for review in the fiscal year 2006 budget process. To this end, on April 15, 2004, OMB issued a formal request for information, seeking information from industry and government service providers on common solutions and target architectures for three of the five lines of business: financial management, human resources, and grants management.

OMB Plans to Improve the FEA and Expand Its Use

According to OMB officials, the FEA is in the early stages of its development and use, with future development and uses planned. OMB's plans for improving the FEA include releasing the previously mentioned data and information reference model, creating a plan for FEA management and maintenance, revising and consolidating reference models, and expanding use of the automated tool for collecting FEA data from agencies. Each is discussed below.

First, OMB plans to develop a formalized Management and Maintenance Plan that it says will provide explicit instructions to agencies on the roles, responsibilities, standards, and expectations for the management and upkeep of the FEA. Second, according to OMB, another planned activity is annually revising the reference models and consolidating all five reference models into one document. Specifically, it plans to (1) release a new version of the business reference model in mid-spring of each year, so that agencies will be able to use it when setting strategic budget priorities, and (2) create a consolidated set of models that,

according to OMB, will facilitate integration of the reference models and changes across all the models as they are updated. Finally, it is expecting agencies to expand their use of the Federal Enterprise Architecture Management System, so that agencies themselves, rather than OMB, will have the means to identify opportunities for collaboration internally as well as across agency boundaries.

Agencies Have Expressed High Levels of FEA Understanding and Support

As part of our governmentwide report on enterprise architecture maturity, we reported on federal agency views on the FEA, particularly agencies' understanding of and support for it and agencies' assessment of the impact of it on their respective enterprise architectures.[28] In general, we reported that most agencies understood and supported the FEA, although a handful did not. More specifically, of the 96 agencies that we contacted, about 80 percent told us that they understood the goals and objectives of the FEA (about 8 percent did not). Additionally, about 67 percent said that they understood the approach OMB was following to develop the FEA (about 13 percent did not).

Regarding agency support for the FEA, about 80 percent of the agencies said that they supported its goals and objectives (about 6 percent did not); about 63 percent stated that they supported OMB's approach to developing the FEA (about 10 percent did not). Further, about 72 percent told us that their respective architectures were traceable to the FEA (about 6 percent were not). With respect to its impact, about 61 percent of the agencies said that their respective enterprise architectures would change as a result of the FEA (about 8 percent did not). (See table 3.)

[28] GAO-04-40.

Table 3: Summary of Agencies' Positions on the FEA

Statement	Percentage of agencies that agreed	Percentage of agencies that disagreed	Percentage of agencies that neither agreed nor disagreed
Understand the goals and objectives	80	8	12
Understand OMB's approach to development	67	13	20
Support the goals and objectives	80	6	14
Support OMB's approach to development	63	10	27
Can trace enterprise architecture to the FEA	72	6	22
Will change enterprise architecture as a result of the FEA	61	8	31

Source: GAO.

As the FEA Continues to Evolve, Questions Need to Be Addressed

Despite OMB progress in developing the FEA, questions remain. We raise these questions in an effort to enhance agency understanding of the FEA and facilitate its use. As OMB continues to mature the FEA, these questions should be addressed.

Should the FEA be described as an enterprise architecture? As discussed earlier in this statement, a true enterprise architecture is intended to provide a blueprint for optimizing an organization's business operations and implementing the IT that supports them. Accordingly, well-defined enterprise architectures describe, in meaningful models, both the enterprise's "as-is" and "to-be" environments, along with the plan for transitioning from the current to the target environment. To be meaningful, these models should be inherently consistent with one another, in view of the many interrelationships and interdependencies among, for example, business functions, the information flows among the functions, the security needs of this information, and the services and applications that support these functions.

Our reading of the four available reference models does not demonstrate to us that this kind of content exists in the FEA, and thus we believe that the FEA is more akin to a point-in-time framework or classification scheme for federal government operations. Our discussions with OMB officials confirmed our

reading of the FEA. Accordingly, if agencies use the FEA as a model for defining the depth and detail for their own architectures, the agencies' enterprise architectures may not provide sufficient content for driving the implementation of systems.

Is the expected relationship between agencies' enterprise architectures and the FEA clearly articulated? According to OMB, the FEA is to inform agency enterprise architectures. For example, OMB has stated that although it is not mandating that the business reference model serve as the foundation for every agency's business architecture, agencies should invest time mapping their respective business architectures to the FEA. Similarly, OMB has stated that agencies' alignment of their respective architectures to the service component reference model and the technical reference model will enable each agency to categorize its IT investments according to common definitions.

Such descriptions of the agency enterprise architecture/FEA relationship, in our view, are not clear, in part because definitions of such key terms as *alignment*, *mapping*, and *consistency* were not apparent in the FEA. As with any endeavor, the more ambiguity and uncertainty there is with requirements and expectations, the greater the use of assumptions and thus deviation from the intended course of action. This is particularly true in the area of enterprise architecture.

How will the security aspects of the FEA be addressed? Our work has found that a well-defined enterprise architecture should include explicit discussion of security, including descriptions of security policies, procedures, rules, standards, services, and tools.[29] Moreover, security is an element of the very fabric of architecture artifacts and models and thus should be woven into them all. As our experience in reviewing agency security practices and research of

[29] U.S. General Accounting Office, *DOD Business Systems Modernization: Important Progress Made to Develop Business Enterprise Architecture, but Much Work Remains*, GAO-03-1018 (Washington, D.C.: Sept. 19, 2003).

leading practices shows, security cannot be an afterthought when it comes to engineering systems or enterprises.[30]

OMB has stated that it plans to address security through what it terms a "security profile" to be added to the FEA. However, OMB officials could not comment on the profile's status or development plans, beyond stating that the CIO Council is taking the lead in developing the profile.

Overall, Federal Agency Architecture Management Is Not Mature, but Some Agencies Are Doing Well and Efforts Are under Way to Advance Governmentwide Maturity

As we reported in 2003, while some agencies have made progress in improving their enterprise architecture management maturity, progress for the federal government as a whole has not occurred.[31] In particular, the percentage of agencies that had established at least the foundation for effective enterprise architecture management was virtually unchanged from where it was in 2001 (about 50 percent). Further, we reported that when the state of enterprise architecture is considered in relation to a more recent and demanding benchmark, this percentage dropped to about 20 percent (in round terms), even though some agencies fared favorably against this benchmark and were role models for others to follow. This composite picture of immature enterprise architecture management can be attributed to several long-standing challenges, which were the basis for the recommendations that we made to OMB in 2002 and reiterated in 2003. Recently, OMB and the federal CIO Council began to take steps that are consistent with many of our recommendations.

[30] U.S. General Accounting Office, *Information Security Management: Learning From Leading Organizations*, GAO/AIMD-98-86 (Washington, D.C.: May 1998).

[31] GAO-04-40.

Governmentwide Progress in Managing Enterprise Architecture Has Been Limited

Between 2001 and 2003, little substantial change was revealed in agencies' collective enterprise architecture maturity, when this is compared against version 1.0 of our framework.[32] Of the 93 agencies that we reported on in 2001 and 2003,

- 22 agencies (24 percent) increased their maturity,
- 24 agencies (26 percent) decreased their maturity, and
- 47 agencies (51 percent) remained the same.[33]

Agencies' progress between 2001 and 2003 is similarly limited when we consider the total number of EAMMF core elements satisfied. Specifically, the 93 agencies satisfied about 57 percent of all possible framework elements in 2001 and about 60 percent in 2003. Upon further inspection, these data show that agencies improved in satisfying certain core elements, but these improvements were offset by declines in satisfaction of other core elements. The following are examples of elements where agency satisfaction significantly improved:

- "Metrics exist for measuring enterprise architecture benefits" (about a 38 percent increase),
- "Chief architect exists" (about a 23 percent increase), and
- "Enterprise architecture products are under configuration management" (about an 18 percent increase).

The following are examples of core elements where agency satisfaction significantly declined:

- "Enterprise architecture products describe 'as-is' environment, 'to-be' environment, and sequencing plan" (about a 39 percent decrease),

[32] GAO-04-40.

[33] Numbers do not add to 100 percent due to rounding.

- "Enterprise architecture products describe enterprise's business—and the data, applications, and technology that support it" (about a 36 percent decrease),
- "Either enterprise architecture steering committee, investment review board, or agency head has approved enterprise architecture" (about a 25 percent decrease), and
- "Program office responsible for enterprise architecture development exists" (about a 23 percent decrease).

For the 22 agencies that advanced one or more maturity stages from 2001 to 2003, completion of no single core element accounted for these advancements. That is, for the 22 agencies, increases in maturity stages are most often attributable to the fulfillment of 7 core elements spanning 3 stages of maturity. Table 4 shows those newly satisfied core elements that most often accounted for an increase in a maturity stage.

Table 4: Core Elements That Most Frequently Contributed to Maturity Stage Increases

Agencies increasing maturity stage	Core elements whose fulfillment most frequently contributed to increase	Number of agencies fulfilling element
12 agencies increased maturity from stage 1 (6 to stage 2, 6 to stage 3)	Stage 2 elements:	
	Chief architect exists	6 of 12
	Program office responsible for enterprise architecture development exists	6 of 12
	Committee or group representing the enterprise is responsible for directing, overseeing, or approving enterprise architecture	6 of 12
	Enterprise architecture being developed using framework and automated tool	4 of 12
8 agencies increased maturity from stage 2 (6 to stage 3, 1 to stage 4, 1 to stage 5)	Stage 3 elements:	
	Enterprise architecture products are under configuration management	7 of 8
	Written and approved policy exists for enterprise architecture development	5 of 8
2 agencies increased maturity from stage 4	Stage 5 element:	
	Metrics exist for measuring enterprise architecture benefits	2 of 2

Source: GAO analysis of survey data.

As with increases in agency maturity levels, no single core element accounted for the decreases in agency maturity between 2001 and 2003. However, as shown in table 5, the stage 2 framework element requiring a program office was the most significant newly

unsatisfied element for the 24 agencies that had decreased maturity levels.

Table 5: Core Elements That Most Frequently Contributed to Maturity Stage Decreases

Agencies decreasing maturity stage	Core elements whose fulfillment most frequently contributed to decrease	Number of agencies not fulfilling element
16 agencies decreased maturity to stage 1 (12 from stage 2, 4 from stage 3)	Stage 2 elements:	
	Program office responsible for enterprise architecture development exists	13 of 16
	Chief architect exists	4 of 16
7 agencies decreased maturity to stage 2 (6 from stage 3, 1 from stage 4)	Stage 3 elements:	
	Written and approved policy exists for enterprise architecture development	6 of 7
	Enterprise architecture products are under configuration management	3 of 7
1 agency decreased maturity to stage 3 (from stage 4)	Stage 4 elements:	
	Enterprise architecture products describe 'as-is' environment, 'to-be' environment, and sequencing plan	1 of 1
	Enterprise architecture products describe enterprise's business—and the data, applications, and technology that support it	1 of 1

Source: GAO analysis of survey data.

One factor contributing to the decreases in maturity between 2001 and 2003 is improved accuracy in agencies' responses to our data collection instrument. Improved accuracy is a function of (1) improved agency familiarity with and understanding of enterprise architecture management and our framework and (2) the requirement in our 2003 work for documentation to support certain agency responses.

Overall, the State of Architecture Development and Use in Federal Agencies Is Uneven and Needs to Improve

When compared against version 1.1 of our framework, the state of enterprise architecture management across the federal government is not mature. In particular, about 21 percent of federal agencies (20 of 96) have the stage 2 management foundation that is needed to begin successfully developing, implementing, and maintaining an enterprise architecture, and about 79 percent of agencies (76 of 96) have not yet advanced to this basic stage of maturity. (One agency, the Executive Office of the President, was at a stage of maturity that can be considered effective.) This overall state of maturity is

consistent for each of the three agency groups surveyed: departments, component agencies, and independent agencies.

No single core element that was added to our framework contributed significantly to this current state, but the "methodology" subelement of the stage 2 element "Enterprise architecture is being developed with a framework, methodology, and automated tool" was the most significant factor that kept agencies from achieving stage 2. The absence of a "methodology" kept seven agencies from attaining stage 2 status.

Nevertheless, certain core elements of version 1.1 of our framework were frequently not satisfied by agencies. Of the 31 core elements in version 1.1, 17 were not satisfied by more than 50 percent of the agencies. Further, 8 elements associated with stages 4 and 5 were not satisfied by about 80 percent of the agencies.

Although significant gaps existed across federal agencies in meeting the core elements of version 1.1 of the framework, at least 80 percent of the agencies reported performing 8 core elements that were related to stages 2 and 3. The most often satisfied elements included the following stage 2 elements:

- "Enterprise architecture plans call for describing both the 'as-is' and the 'to-be' environments of the enterprise, as well as a sequencing plan for transitioning from the 'as-is' to the 'to-be'"(about 94 percent);
- "Enterprise architecture plans call for describing both the 'as-is' and the 'to-be' environments in terms of business, performance, information/data, application/service, and technology" (about 90 percent); and
- "Enterprise architecture plans call for business, performance, information/data, application/service, and technology descriptions to address security" (about 86 percent).

The most often satisfied elements also included the stage 3 element

- "Enterprise architecture products describe or will describe both the 'as-is' and the 'to-be' environments of the enterprise, as well as a

sequencing plan for transitioning from the 'as-is' to the 'to-be'" (about 88 percent).

In addition, although only one agency has achieved stage 5, many agencies reported satisfying the stage 5 core elements requiring that IT investments comply with their enterprise architecture (about 80 percent) and that enterprise architecture is an integral component of their IT investment management process (about 69 percent).

Departments, component agencies, and independent agencies had varying degrees of success satisfying certain core elements within individual stages. In general, departments had more success satisfying lower stage elements than did components and independent agencies. In stage 2, for example, while 69 percent of departments reported using a framework, methodology, and automated tool to develop their enterprise architecture, only 29 percent of components and 50 percent of independent agencies reported the same. Additionally, in stage 3, while 81 percent of departments reported that progress against plans is measured and reported, only 25 percent of components and 25 percent of independent agencies reported the same. One possible reason for this situation is that OMB's oversight of agency enterprise architecture efforts focuses on departments and major independent agencies—not on component agencies.

Although, as a whole, departments satisfied more lower-level framework elements than did component agencies and independent agencies, departments generally still would need to satisfy several lower-level framework elements to achieve a stage 3 maturity level. On average, each department needs to satisfy 2 core elements to satisfy all stage 2 and 3 framework elements.

The maturity stage of a department generally was not indicative of the maturity of its component agencies. For example, the Departments of Health and Human Services and Transportation reached stage 2, while their component agencies averaged stage 1.

Also, DOD's Global Information Grid architecture[34] was at stage 3, while its business enterprise architecture was at stage 1, as were its components, in general. Conversely, the Departments of Commerce, Justice, and the Treasury were at stage 1, with their component agencies averaging higher maturity levels; the component agencies of Commerce showed a slightly higher maturity level than did component agencies of all other departments. That is, the average maturity level of all component agencies we surveyed was 1.23, but the Commerce component agencies averaged 1.80, largely owing to the maturity levels for the Bureau of the Census (stage 3), the U.S. Patent and Trademark Office (stage 2), and the National Oceanic and Atmospheric Administration (stage 2). The Department of Agriculture's maturity level (stage 1) was the same as the average maturity level of its component agencies.

Eight Agencies Were Well Positioned to Achieve Stage 5 Maturity, and Many Agencies Were Performing Core Elements beyond Their Assigned Maturity Stages

Although the Executive Office of the President was the sole stage 5 agency, seven other agencies were close to becoming models of enterprise architecture management. For example, the Office of Personnel Management (OPM), which achieved stage 1 of version 1.1, needed to satisfy only five more elements to become a stage 5 agency. OPM needed to satisfy one stage 2 element ("Enterprise architecture plans call for developing metrics for measuring enterprise architecture progress, quality, compliance, and return on investment"), one stage 3 element ("Progress against enterprise architecture plans is measured and reported"), two stage 4 elements ("Enterprise architecture products and management processes undergo independent verification and validation" and "Quality of enterprise architecture products is measured and reported"), and one stage 5 element ("Return on enterprise architecture investment is measured and reported").

[34]The GIG architecture describes the globally interconnected, end-to-end set of information capabilities, associated processes, and personnel for collecting, processing, storing, disseminating, and managing information on demand to war fighters, policy makers, and support personnel.

Ninety-six percent of agencies in stages 1 through 4 were performing at least one core element above their current maturity stage,[35] which means that as a whole, agencies are, to varying degrees, performing above their assigned maturity stages. Specifically, of the 76 agencies at stage 1, about 95 percent were performing at least one core element in a higher maturity stage. About 35 percent of agencies need to satisfy only one additional core element to advance to at least the next maturity stage. Two of these agencies, Commerce and the U.S. Mint, could advance two stages by satisfying just one additional core element. Commerce, currently a stage 1 agency, could advance to stage 3 by satisfying the framework element "Program office responsible for development and maintenance exists." The Mint, also currently a stage 1 agency, could advance to stage 3 by satisfying the framework element "Adequate resources exist."

Agencies Identified Enterprise Architecture Management Challenges

Agencies continue to face the same management challenges that we identified in 2001—that is, obtaining top management support and commitment, overcoming parochialism, and having the requisite resources (financial and human capital) to accomplish the work. Moreover, the prevalence of these challenges has grown. For example, getting top management to understand the purpose, content, and value of architectures was seen as a challenge by about 50 percent of agencies—up from 39 percent in 2001. As our framework recognizes, obtaining executive understanding and support is essential to having an effective enterprise architecture program. Without it, agencies will have increased difficulty in addressing other challenges such as overcoming parochialism among organizational components and obtaining requisite resources (funding and human capital). Our work in 2003 bears this out—at the same time that the percentage of agencies identifying top management understanding and support as a challenge rose, the percentage of agencies identifying these other challenges almost all

[35]One agency—the Executive Office of the President—is currently performing at stage 5 and cannot perform above its current maturity stage. As a result, it is excluded from this analysis.

rose. For example, the percentage that identified parochialism as a challenge grew from about 39 to 47 percent. Also, while about 50 percent of agencies continued to report funding as a significant challenge, the percentage of agencies that reported obtaining skilled staff as a challenge grew from about 32 to 49 percent. (See table 6.)

Table 6: Change in Prevalence of Enterprise Architecture Management Challenges

	Percentage of agencies that frequently identified management challenge	
Management challenge	2001 survey	2003 survey
Fostering top management understanding	39	50
Overcoming parochialism	39	47
Ensuring adequate funding	50	50
Obtaining skilled staff	32	49

Source: GAO analysis of survey data.

Agencies have also reported mixed levels of satisfaction with OMB's efforts to address these management challenges. Specifically, just over half of the agencies were satisfied with OMB's efforts to foster top management understanding and to overcome agency component organization parochialism (about 58 and 53 percent, respectively). Moreover, fewer than half of the agencies (40 percent) were satisfied with OMB's actions to address their enterprise architecture funding and staffing challenges. (See table 7.)

Table 7: Percentage of Agencies Satisfied with OMB's Efforts to Address Various Management Challenges

Management challenge	Percentage of agencies satisfied*	Percentage of agencies dissatisfied*	Percentage of agencies neither satisfied nor dissatisfied*
Fostering top management understanding	58	14	27
Overcoming parochialism	53	10	37
Ensuring adequate funding	40	26	34
Obtaining skilled staff	40	15	45

Source: GAO analysis of survey data.

*Numbers do not add to 100 percent due to rounding.

OMB and the Federal CIO Council Have Recently Acted to Strengthen Agency Enterprise Architecture Maturity

Both OMB and the federal CIO Council have long been advocates of enterprise architecture. For example, in collaboration with others and us, OMB issued guidance on the purpose and use of enterprise architectures shortly after passage of the Clinger-Cohen Act of 1996.[36] Subsequently, it incorporated enterprise architecture considerations into its oversight processes and issued guidance directing that agency IT investments be based on agency enterprise architectures.[37] Further, OMB collaborated with the CIO Council and us on the *Practical Guide to Federal Enterprise Architecture, Version 1.0.* As a means of promoting agencies' enterprise architecture use, OMB has also included requirements for having and using enterprise architectures as part of the budget process, which began with the fiscal year 2002 budget cycle and, according to OMB officials, has continued since then. OMB has also worked through the CIO Council, which is chaired by OMB, to improve enterprise architecture management and use.

Despite OMB's longstanding advocacy and support for enterprise architecture, we reported in 2002 that OMB needed to advance the level of enterprise architecture management maturity by exercising stronger leadership and improved oversight and by identifying governmentwide solutions to common enterprise architecture management challenges facing agencies. Accordingly, we recommended that the OMB Director, in collaboration with the federal CIO Council, use our maturity framework and the agency baseline information provided in our February 2002 report as the basis for helping agencies to advance the state of their respective enterprise architecture development, implementation, and maintenance efforts, and for measuring agency progress. We further recommended that in doing so, the OMB Director require agencies to (1) submit to OMB an annual update of the agency's satisfaction of each of the core elements contained in our maturity framework

[36] OMB, *Information Technology Architectures*, Memorandum M-97-16 (June 18, 1997); rescinded with the update of OMB Circular A-130 (Nov. 28, 2000).

[37] OMB, *Management of Federal Information Resources*, Circular No. A-130 (Nov. 28, 2000).

and (2) have this update verified by the agency's inspector general or comparable audit function before it is submitted to OMB. Additionally, we recommended that the OMB Director, in collaboration with the CIO Council, develop and implement a plan to address the governmentwide impediments to greater agency use of enterprise architectures. We recommended that, at a minimum, this plan should include the two primary challenges identified in our 2002 report—that is, agency executive management understanding of enterprise architectures and the availability of enterprise architecture human capital expertise. Finally, we recommended that the director report annually to the Senate Committee on Governmental Affairs and the House Committee on Government Reform on the results of OMB's annual update of the state and progress of federal agencies' enterprise architecture efforts. OMB officials generally agreed with the findings and conclusions of our report and stated that they would consider using our framework.

As previously noted, we reported in 2003 that agencies had collectively made little progress toward improving their enterprise architecture maturity. In commenting on this report, OMB officials told us that they were still considering using our framework as a basis for evaluating agencies' progress in developing and implementing their architectures, but had not committed to doing so because they were still reviewing options. Additionally, these officials did not have any plans to address governmentwide impediments to greater agency use of architectures. Further, they said that OMB has provided and plans to continue to provide information to the Congress on the state of agency enterprise architecture efforts and on progress in implementing the FEA. As a result, we again called for stronger leadership and reiterated the recommendations we made in our February 2002 report, with the modification that OMB use version 1.1 of our framework and the baseline data from our 2003 report. Additionally, we recommended that the OMB Director, in developing and implementing the plan we previously recommended to address governmentwide impediments to greater agency use of enterprise architectures, ensure that the plan provides for identifying agencies that have effectively overcome enterprise architecture management challenges and sharing those and other lessons learned and best practices. Also, we recommended that the director, in annually reporting to the Senate

Committee on Governmental Affairs and the House Committee on Government Reform, as we previously recommended, include in the report what steps have been taken to implement our recommendations, including reasons for not adopting our maturity framework.

OMB and the CIO Council have recently initiated actions consistent with many of our recommendations. For example, the council established a Chief Architect Forum, the first meeting of which was held on April 5, 2004, and in which we participated. This forum has created a means for chief architects across federal agencies to systematically collaborate on matters of mutual concern and interest. Vehicles for this collaboration include periodic meetings, a listserve to share information and ideas, and special gatherings that focus on specific issues. As another example, OMB recently released for comment version 1.0 of an agency enterprise architecture assessment tool. The tool is intended to help individual agencies assess their enterprise architecture programs. According to OMB, this initial version will be revised to reflect comments it receives.

In summary, enterprise architecture development and use in the federal government are maturing, but they are not mature. Given that effective development and use of enterprise architectures are critical to federal agencies achieving breakthrough levels of performance, senior leadership across the government needs to elevate its attention to this essential transformation and modernization tool. While progress on this front has occurred over the last few years, it has been spotty, and in our view, considerable maturation is needed before the federal government will be positioned to reap the rewards that others have reported from effective architecture development and use. The fact remains that until agencies have and use well-defined enterprise architectures, they will be severely challenged in their ability to effectively leverage IT in transforming their operations. Recent steps by OMB and the CIO Council to assume stronger leadership roles are encouraging. However, hard work lies ahead to clarify and evolve the FEA, and to ensure that well-managed architecture programs—

ones that produce architecture blueprints that can be implemented and become integral parts of the fabric of institutional strategic planning, investment decision-making, and budget execution—are actually established across the government. These are important goals, which we support, and we will continue to work with OMB and the CIO Council throughout the multistep process needed to ensure that the FEA is appropriately described, matured, and used, and to advance the state of agency enterprise architecture efforts.

Mr. Chairman, that concludes my testimony. I would be pleased to answer any questions that you and the other Members of the Subcommittee may have.

Contact and Acknowledgements

For further information, please contact Randolph C. Hite at (202) 512-6256 or by e-mail at *hiter@gao.gov*. Other key contributors to this testimony included Shannin Addison, Mark Bird, Barbara Collier, Nancy Glover, Anh Le, Nnaemeka Okonkwo, Randolph Tekeley, and William Wadsworth.

Mr. PUTNAM. Thank you very much, sir.

Our next witness is Mr. Daniel Matthews. Mr. Matthews was appointed Chief Information Officer for the U.S. Department of Transportation in March 2003. As CIO, he serves as the principal advisor to the secretary on matters involving information resources and information services management, and provide leadership in using IT to achieve the Department's goals and objectives. Prior to his appointment at DOT's CIO, Mr. Matthews served as senior vice president of Savantage Financial Services from July 2002, where he was responsible for efforts to modernize the financial management systems of a number of Federal agencies. He spent most of the previous 22 years at Lockheed Martin, most recently as vice president.

You are recognized for 5 minutes. Welcome to the subcommittee.

Mr. MATTHEWS. Mr. Chairman and members of the committee, thank you for the opportunity to appear today to discuss the Department of Transportation's implementation of the Federal Enterprise Architecture Program.

The Department of Transportation Office of the CIO has operational responsibility for departmental network and communications infrastructure, as well as providing shared services for the Office of the Secretary and several operating agencies currently engaged in the Department's Information Technology services consolidation.

It is my observation and experience at DOT that the Federal Enterprise Architecture initiative is working well to focus on business-based, results-oriented, information technology best practice investments, their common infrastructure and external information services delivery. This drive is beginning to deliver results that will expedite our ability to improve cyber security, mine data, enhance information sharing, eliminate redundancies, and to document our IT costs and performance.

Our enterprise architecture provides a clearer understanding of where IT dollars are being spent, what technologies support our business processes, who is responsible for and impacted by process and technology changes, and what technology standards we should employ today as well as in the future.

The DOT's enterprise architecture can be described as a federated model composed of smaller segments that are distinct areas of mission activity carried out from within each of the Department's operating agencies, yet they are all linked to the overall DOT enterprise architecture. It de-emphasizes organizational structure and shifts that emphasis to DOT missions, in particular safety and mobility. It promotes an end-to-end consideration of business process needs across the operating agencies, a focus that is at the heart of Clinger-Cohen Act compliance at Department of Transportation. Implementing architectural segments is important because the large scope of the DOT enterprise makes it difficult to effectively fund and successfully manage a large number of enterprise architecture activities simultaneously. By taking a phased approach to the development of our enterprise architecture, the Department is able to determine a prioritized sequence of activities that takes into account urgency, maturity of solution, and stakeholder support for future phases. This sequencing approach also

improves the likelihood of successful implementations of IT solutions and it optimizes IT spending across the Department.

Examples of the DOT's emphasis on enterprise architecture begin with my own CIO organization, where an Enterprise Architecture Program Management Office team is dedicated to full-time leadership and continuity in the development, implementation, and maintenance of a single DOT enterprise architecture.

A Departmental Investment Review Board, chaired by the Department's Deputy Secretary, reviews proposed IT investments from across DOT and decides their appropriate disposition based on project assessments performed using standardized investment review criteria, including enterprise architecture alignment.

The Department's Architectural Review Board is the governance body charged with evaluating and recommending changes to the DOT enterprise architecture and ensuring that investments in IT comply with established departmental policies for enterprise architecture, capital planning, security standards and processes. The DOT's Enterprise Architecture Technology Reference Model provides the Architectural Review Board with information on specific technologies, hardware, and software used throughout the Department of Transportation enterprise. These activities reduce security vulnerabilities, they wean out duplicative IT spending within our operating agencies, and they hasten the delivery of successful IT solutions. When taken together, elements of this governance model gracefully implement the investment review requirements of the Clinger-Cohen Act.

Building on our current efforts at DOT, we recently published an updated version of our modernization blueprint and developed several documents to aid in inculcating enterprise architecture understanding and use.

The Federal Enterprise Architecture implementation, while viewed as fairly successful thus far, does have its issues. In several instances the time allowed between budgetary guidance and/or changes and expected agency execution has been constricted. Other expectations, such as a full-time program manager for each initiative, is unrealistic for many small agencies with limited staff. These shortcomings are being reviewed and the Federal CIO Council is working with OMB to ensure a workable Federal Enterprise Architecture process is rapidly adopted and implemented.

This concludes my testimony. Again, I thank you for the opportunity to discuss this important topic and, Mr. Chairman, I look forward to answering any questions you may have. Thank you.

[The prepared statement of Mr. Matthews follows:]

U.S. DEPARTMENT OF TRANSPORTATION
CHIEF INFORMATION OFFICER TESTIMONY
BEFORE THE
HOUSE COMMITTEE ON GOVERNMENT REFORM'S
SUBCOMMITTEE ON TECHNOLOGY, INFORMATION POLICY,
INTERGOVERNMENTAL RELATIONS AND THE CENSUS

Mr. Chairman and members of the committee, thank you for the opportunity to appear today to discuss the Department of Transportation's implementation of the Federal Enterprise Architecture program.

I serve as the Department's Chief Information Officer (CIO), and I also currently serve as the vice-chair of the Federal CIO council.

The DOT Office of the Chief Information Officer (OCIO) has operational responsibility for Departmental network and communications infrastructure, as well as providing shared services for the Office of the Secretary and several Operating Agencies (OAs) currently engaged in the Department's Information Technology (IT) services consolidation.

It is my observation and DOT experience that the Federal Enterprise Architecture initiative begun little more than two years ago is working well in driving previously introspective government entities with a diversity of IT initiatives and agendas to focus on business based, results oriented, best practices integration of information technology investments, their common infrastructures, and external information services delivery. This drive is beginning to deliver results that will expedite our ability to improve cyber security, mine data, enhance information sharing, eliminate redundancies, and document IT costs and performance.

The Department of Transportation's (DOT) Enterprise Architecture (EA) actively supports the Department's core mission goals of Safety, Mobility, Global Connectivity, Environmental Stewardship, and Security by providing a framework for mapping and relating the elements that comprise the Department IT environment in a single location. The goals of the DOT Enterprise Architecture Program are to:

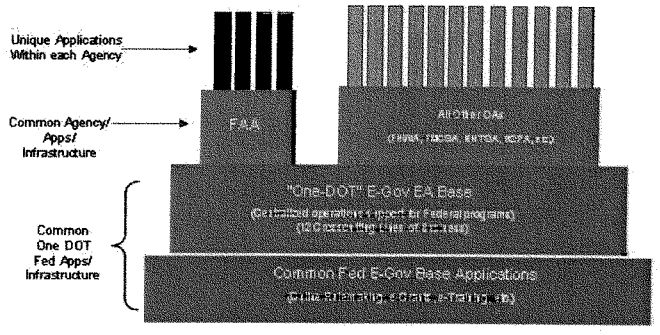
- Reduce Redundancy and Overlap of Applications and Systems
- Increase System Integration and Correlation to Business Processes
- Improve data quality and timeliness for use in the CPIC process
- Optimize Data Collection and Management
- Improve Access to Information
- Guide and Coordinate Technology Investments
- Leverage Economies of Scale
- Promote Current and Flexible Technologies
- Satisfy Legal and Regulatory Requirements

Like most, the DOT's Enterprise Architecture consists of a current baseline and target architecture; a gap analysis between the two; a project sequencing plan to close the gap; and a standards profile to help guide standardization. Our Enterprise Architecture provides a clearer understanding of where IT dollars are being spent; what technologies support our business processes; who is responsible for and impacted by process or technology changes; and what technology standards we should employ today as well as in the tactical and strategic future.

At the DOT, Enterprise Architecture motivated changes are evidenced by an aggressive implementation and methodology responsive to OMB's IT portfolio investment direction and concurrent support of our Department's strategic plan. We see Enterprise Architecture as both a management program and a documentation methodology that together provides an actionable, coordinated view of an enterprise's strategic direction, business processes, information flows, and resource utilization.

The DOT's Enterprise Architecture can be described as a Federated model composed of smaller segments that are distinct areas of mission activity carried out from within each of the Department's Operating Agencies, yet linked to the overall DOT Enterprise Architecture. This federated view of the Department's Enterprise Architecture represents a carefully considered definition of DOT's organizational structure, business processes, information needs, application systems and technology. The Enterprise Architecture emphasizes the DOT's focus on implementing business needs-driven IT solutions that contribute to and improve the Department's mission performance and service delivery across all lines of business. It deemphasizes organizational structure and shifts that emphasis to DOT missions, in particular safety and mobility. It promotes an end-to-end consideration of business process needs across the operating agencies, a focus that is at the heart of Clinger-Cohen Act compliance at DOT.

As captured in the graphic below,

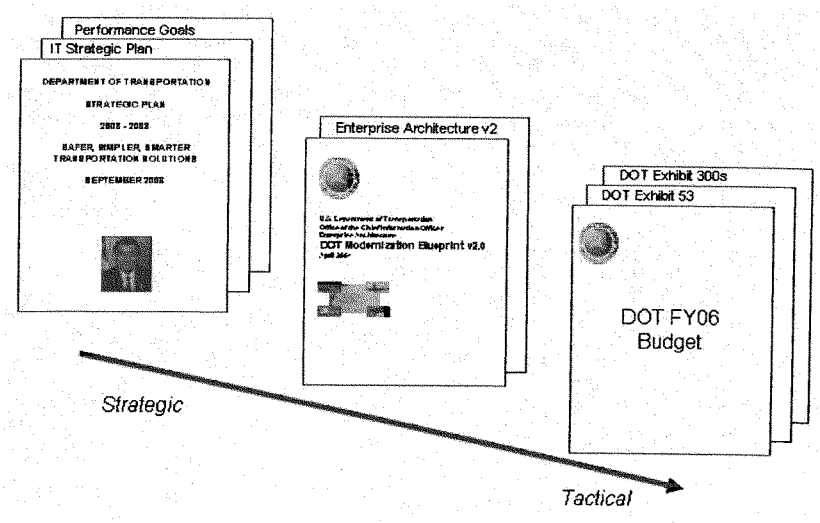


implementing architectural segments is important because the large scope of the DOT enterprise makes it difficult to effectively fund and successfully manage a large number of Enterprise Architecture activities simultaneously. By taking a phased approach to the development of our Enterprise Architecture, the Department is able to determine a prioritized sequence of activities that takes into account urgency, maturity of solution, and stakeholder support for future phases. This sequencing approach also improves the likelihood of successful implementations of IT solutions and optimizes IT spending across the Department.

Under a federated approach, DOT:

- Defines the core set of rules and approach for Enterprise Architecture;
- Applies a standard framework for the entire organization;
- Allows for flexibility by each Operating Administration to further refine their vertical Enterprise Architectures;
- Ensures that Operating Administration verticals are compliant and consistent with the core model; and,
- Focuses Departmental efforts on cross-cuts and eGov initiative coordination as well as Operating Administration efforts on core processes.

The graphic below highlights the continuity, or traceability from strategy to tactical, of our Department's Enterprise Architecture evolution.



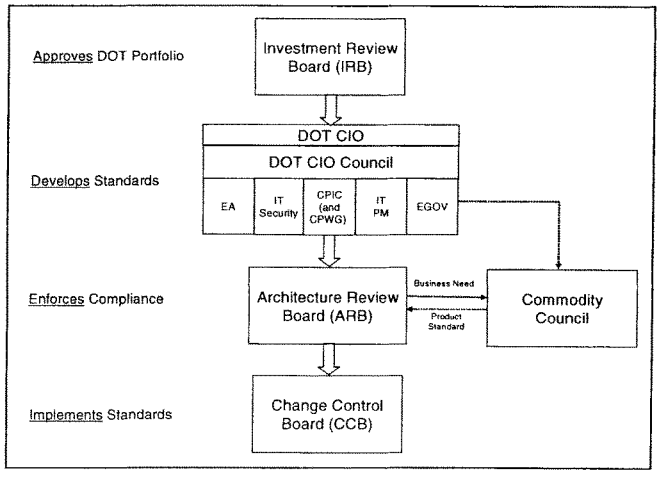
Examples of the DOT's emphasis on Enterprise Architecture begin within my own CIO organization, where an Enterprise Architecture Program Management Office team is dedicated to full time leadership and continuity in the development, implementation, and

maintenance of a single DOT Enterprise Architecture. The team supports the Departmental CIO Council's Enterprise Architecture subcommittee, Operating Administration level working groups, and related activities. The team defines formal Enterprise Architecture standards, processes and practices. The team develops, manages, and maintains the DOT Enterprise Architecture Portal/Repository and the DOT's IT Capital Planning and Investment Control (e-CPIC) environment.

A Departmental Investment Review Board (IRB), chaired by the Department's Deputy Secretary, reviews proposed IT investments from across DOT and decides their appropriate disposition based on project assessments performed using standardized investment review criteria, including enterprise architecture alignment.

The Department's Architectural Review Board (ARB) is the governance body charged with evaluating and recommending changes to the DOT Enterprise Architecture and ensuring that investments in IT comply with established Departmental policies for enterprise architecture, capital planning and security, standards, and processes. The DOT's Enterprise Architecture Technology Reference Model provides the ARB with information on specific technologies, hardware, and software used throughout the DOT enterprise. These activities reduce security vulnerabilities, wean out duplicative IT spending within our Operating Agencies and hastens the delivery of successful IT solutions. While the initial stage is to identify "standards" for the Technical Reference Model, another effort is underway to identify products/services which are needed by individual organizations. These "authorized products" will be products that work in the COE and have been approved by the Architectural Review Board for inclusion in the DOT's Enterprise Architecture Technical Reference Model. The rigor will be less than "standards," but their inclusion in the Technical Reference Model is meant to further the need for interoperability within DOT and with our business partners.

The DOT's Integrated Governance Structure is highlighted in the diagram presented below.



When taken together, elements of this governance model gracefully implement the investment review requirements of the Clinger-Cohen Act at DOT.

In support of our Enterprise Architecture, the DOT has complemented its team and committee activities by implementing support tools such as the DOT Enterprise Architecture Portal/Repository, a baseline and future Federal Enterprise Architecture Reference Model data repository, or Enterprise Architecture Portal, for use by DOT architects, capital planners and decision makers. The Portal is a custom-developed database with a web-interface front end, allowing for easy viewing of Enterprise Architecture data. The Enterprise Architecture Portal & Repository allows the Enterprise Architecture information to be captured for each of the sub-architecture levels and related both within and across the levels in a single, on-line location. DOT Enterprise Architecture Repository contains current and future configurations of the information and allows for capture of the information in a Federated view. We also leverage full advantage and implementation of government-wide tool sets, such as the electronic Capital Planning and Investment Control web-ware to document business cases and support OMB IT investment reporting.

Building on our current efforts the DOT recently published an updated version of our Modernization Blueprint that reflects current (baseline) business and technology operating environment and a future (target) state that encompasses the goals of the DOT IT Strategic Plan, Annual Performance Plan, E-Transportation and the President's Management Agenda. This Modernization Blueprint documents continued progress in the re-direction of the DOT Enterprise Architecture program to further incorporate the Federal Enterprise Architecture Framework, embrace the e-Government initiatives, align our mission processes, and gain buy-in from the Operating Administrations.

The DOT has developed several documents to aid in the inculcating Enterprise Architecture understanding and use, such as the "DOT Enterprise Architecture Methodology" and "DOT Enterprise Architecture Primer" respectively.

The Federal Enterprise Architecture implementation, while viewed as fairly successful thus far, does have its issues. In several instances the time allowed between budgetary guidance and/or changes and expected Agency execution has been constricted. Other expectations, such as a full time program manager for each initiative is unrealistic for many small agencies with limited staff. These short-comings are being reviewed and the Federal CIO Council is working with OMB to ensure a workable federal Enterprise Architecture process is rapidly adopted and implemented.

In summary, let me again state the Department of Transportation's support for and use of the Federal Enterprise Architecture instrument in identifying, relating and managing IT portfolio investments, OMB proactive sponsorship of the FEA initiative. I thank the committee for the opportunity to speak with you regarding this matter and answer any questions that you may have.

Mr. PUTNAM. Thank you very much.

Our next witness is Kim Nelson. In November 2001, Ms. Nelson was sworn in as Assistant Administrator for Environmental Information and CIO of the Environmental Protection Agency. Prior to joining EPA, Ms. Nelson served the Commonwealth of Pennsylvania for 22 years. During her career, she worked in the Senate of Pennsylvania, the Public Utility Commission, and the Departments of Aging and Environmental Protection. For the past 14 years Ms. Nelson held a number of positions in the Pennsylvania Department of Environmental Protection. She was the first Director of the Program Integration and Effectiveness Office, the first executive to hold the position of CIO, and most recently served as Executive Deputy Secretary. She was primarily responsible for managing department-wide projects with a goal toward improving processes and integrating programs and functions. She was recognized for outstanding service on three occasions during her career with the Department of Environmental Protection.

Welcome to the subcommittee. You are recognized.

Ms. NELSON. Thank you, Chairman Putnam, for the opportunity today to testify about the progress being made by OMB and Federal agencies to develop and implement the Federal Enterprise Architecture, and some of the challenges that the agencies are facing in aligning their own architectures with that of the Federal enterprise.

Today my testimony is going to reflect my dual role, as you mentioned, as CIO at the Environmental Protection Agency, but also as Co-Chair of the Federal CIO Council's Architecture and Infrastructure Committee.

We live in a point and click culture that has incredibly high expectations for government. In the past, when governments wanted to improve service delivery, the typical response was to move some boxes on an organization chart and the reassignment of people. But today it is possible to improve our government services through the alignment of our information systems by looking at our common business functions from across different organizations.

The FEA provides that ability, the ability to look across the Federal departments, the agencies, to look at their missions, to look at their strategic goals, their programs, their data, and their information technology, and using it as a planning tool which allows the Federal Government to take advantage of the IT revolution and ensure the responsible spending of over $60 billion of the Federal IT budget. It is the one blueprint that will lead to a more efficient delivery of services and is key to the citizen-centric government that we all seek.

In the last year I would say I have seen what I consider to be very significant progress in the implementation of the FEA. OMB has completed work on all major components of the FEA reference model and they are giving the Federal agencies a common way to look at their business functions and align our investments appropriately. EPA, like a lot of other Federal agencies, is now mapping our own architecture and our own blueprint to those in IT investments under the Federal model.

A couple of other examples of some progress are the CIO Council's development of a reusable component strategy. That strategy

will enable an IT service built by one agency to be used by others, and the development of a draft security and privacy profile.

The 24 e-Gov initiatives and the five Lines of Business are proving to be what I consider to be real-life laboratories that highlight for OMB and the Federal CIOs the critical Federal Architectural design decisions needed to achieve both information integration and information sharing throughout all levels of government.

As for some of the challenges, I think your charts up there speak well to some of those we are facing. The General Accounting Office recently reported that most of the Federal agencies are still in the development stages of building their architectures. To quickly increase that capacity, OMB and the CIO Council have created a Chief Architects Forum, where all the chief architects can leverage their efforts in addressing the specific strategic management and operational challenges that were noted in that report.

Frankly, I think our challenge with enterprise architecture is that it is still a relatively new discipline to a lot of people, and like all new disciplines, it is going to require an acculturation process. Each Federal agency has to integrate enterprise architecture into the fabric of its strategic management culture before that agency can begin to eliminate redundancies, target citizen services, and integrate the information for improved decisionmaking. It is not an IT tool, it has to become part of the strategic management process of the organization; and that is not an easy process to change.

Finally, I would like to address the issue of interoperability as it relates to the Federal Enterprise Architecture and networks that are currently being built by governments.

Within EPA, we are using the enterprise architecture to design and implement services for environmental decisionmakers across the country. Approximately 95 percent of all of the information in EPA's major systems come from State and tribal governments. With that being the case, and also understanding that all of our major air, water, and waste laws are heavily delegated to the States, we have to work with those partners on the exchange of information. This practical business reality drives the approach we are taking to enterprise architecture. We have to have a collaborative effort with our States and tribes to implement common data standards; we have to implement something that we have called our Central Data Exchange for reporting purposes; and we are designing and implementing our environmental exchange network.

This network, which is becoming a reality as we speak, we have 10 States with operational nodes on the network, is due in large part to the $25 million State and tribal grant program begun by President Bush and funded by Congress the last 3 years. Our strong partnership with our State co-regulators will continue to drive our innovation at EPA and is going to require EPA to work not just vertically with environmental agencies, but horizontally. We have to work across the Federal Government, particularly with health and resource agencies, to better demonstrate results in protecting human health and safeguarding the natural environment.

So I thank you for the opportunity to appear here today, both representing EPA as well as the Federal CIO Council's Architecture Committee.

[The prepared statement of Ms. Nelson follows:]

Testimony of Kimberly T. Nelson

Assistant Administrator for Environmental Information and Chief Information Officer
U.S. Environmental Protection Agency

before the
Subcommittee on Technology, Information Policy, Intergovernmental Relations and the Census
U.S. House of Representatives

May 19, 2004

Good afternoon. Thank you for the opportunity to testify about the progress being made by the Office of Management and Budget (OMB) and federal agencies to develop and implement a Federal Enterprise Architecture (FEA) and the challenges of aligning an individual agency's Enterprise Architecture with the FEA. This testimony reflects my roles as the Chief Information Officer (CIO) at the U.S. Environmental Protection Agency (EPA) and as Co-chair of the Federal CIO Council's Architecture and Infrastructure Committee. I appreciate having this opportunity to appear before this subcommittee today to discuss this important issue.

With the rapid advances in information technology, the expectation that the government's vast supply of information and myriad services be delivered on demand is ever-increasing. We live in a point-and-click culture and the expectation that government should and can adapt is understood by the Federal CIO Council. In the past, when government wished to improve its services, the typical response was to reorganize the boxes on an organization chart and move the people. Today, it is possible to improve government services through carefully aligning the information systems of common

business functions from different organizations. We saw this happen with the recent rollout of various E-government initiatives.

The FEA creates the ability to look across federal departments and agencies at their missions and strategic goals, programs, and their supporting data and information technology (IT). This is the planning tool that allows the federal government to take advantage of the IT revolution while ensuring the responsible spending of the federal IT budget. It is the one blueprint which will lead to a more efficient delivery of services and is the key to citizen-centric government.

I have seen significant FEA progress during the past year. OMB has completed work on all major aspects of the FEA reference model, giving federal agencies a common way to look at their business functions and align their information investments appropriately. Without this common reference model, each individual federal department was creating "silo" Enterprise Architectures (EA). EPA, like other federal agencies, is now mapping its own in-house EA blueprint and IT investments to the federal model.

Other specific instances of progress are the CIO Council's development of a reusable components strategy—enabling an IT service built by one agency to be used by others. Progress on the privacy and security architecture has been made with the guidance and tools being developed by federal agencies to ensure that their information is protected and shared appropriately.

Finally, the 24 E-government initiatives and the five Lines of Business are proving to be the real-life laboratories which highlight for OMB and the federal CIOs the critical Federal Architectural design decisions needed to achieve both information integration and information sharing throughout all levels of government.

As for challenges, the General Accounting Office (GAO) recently reported that most federal agencies are still in the development stages of building their in-house EA capability. To increase that capacity quickly, OMB and the CIO Council have created a Chief Architects Forum, where all chief architects can leverage their efforts in addressing the specific strategic, management and operational EA challenges. From this grass roots group, we have heard chief architects say that their greatest challenge is educating their own senior officials that EA is not just an IT concept but a strategic management planning tool that positions Agency leaderships to manage the complexities of programs and the delivery of their services.

I think the major challenge is that EA is a new discipline and like all new concepts it will take time for it to take hold. This new discipline is designed to take advantage of IT technology to deliver results and customer satisfaction in a world of complex business relationships. Federal executives must understand that the federal government is exactly that—a very complex set of business relationships. It is important that each Federal agency integrate EA into the fabric of their respective strategic management culture so they can begin to eliminate redundancies, target citizen services, and integrate information for improved decision making.

Finally, I would like to address the topic of "interoperability" as it relates to the FEA and IT networks being built with other levels of governments and the private sector. This is a key challenge facing many federal agencies today.

First, in order for the federal government and our partners to truly achieve interoperable networks, appropriate standards must be developed and agreed to, including data standards. The FEA model provides the foundation for standardizing data in its data reference layer—defining "what" data the federal government needs to do its business. One important criterion for achieving successful interoperability of networks is agreement by all parties on data standards.

Now that significant progress has been made in getting our own federal house in order via the FEA, we must begin reaching out to our IT counterparts at the state, tribal, regional, county and local levels to design the intergovernmental data sharing architecture—setting forth the minimum technical standards and services needed to build networks that can communicate when necessary. It is important to learn from the efforts of the Departments of Homeland Security, Health and Human Services, and Justice, and EPA, to name just a few, which are actively partnering with state, local, and tribal organizations and industry on the development of standards to significantly improve interoperability. Additionally, these Departments are working toward the implementation of a blueprint to promote citizen-centric government and more rapid delivery of services.

Within EPA we are using the EA to design and implement services for environmental decision makers across the country. Approximately 95 percent of the information in EPA legacy systems comes from state and tribal partners. Under the major federal air, water, and waste statutes, a majority of operational responsibilities are delegated directly to these partners. This business reality drives our approach to enterprise architecture: a strong collaborative effort with states and tribes to design and implement common data standards; the implementation of a Central Data Exchange (CDX)—our single point for receiving and sharing reports and data regardless of the source (e.g. states, tribes, and regulatory facility) or type (e.g. Toxic Release Inventory, water discharges, and drinking water lab results); a heavy reliance on the integration of air, water, and waste information to support a holistic look at regulated facilities: and a sharing of information to gain a better understanding of the effects of activities on human health and ecosystems.

In closing, with leadership from the President and support from the Congress, EPA is building an Environmental Information Exchange Network due in large part to a state and tribal program begun by President Bush and funded by Congress. Our strong partnership with state co-regulators will continue to drive innovation and will require EPA to work across agency lines within the federal government particularly with health and resource agencies, to better demonstrate results in protecting human health and safeguarding the natural environment.

Mr. PUTNAM. Thank you all for your opening comments.

Ms. Evans, GAO reports in its testimony that OMB was unable to comment on the status and development of the security profile the FEA component is intended to address IT security. What is the status of the security profile and what are the development plans?

Ms. EVANS. Currently, we are working with the AIC off of the CIO Council to develop those profiles, and we have a plan, and Kim can probably speak more specifically to the due dates where these plans in the profiles will come forward to the Council and then come forward to OMB, so I would yield to her on the specific dates of those profiles.

But I would like to comment on one thing, and there was a lot of discussion going forward, and as the vice chair of the CIO Council when these efforts were going on, while we were talking to OMB, we specifically asked not to have a specific security reference model. And the reason why we asked not to have that was because we didn't want to have security segregated from all the models. What we wanted to ensure was that we had worked so hard and came so far in ensuring that cyber security and overall risk is being looked at as each investment goes forward and how you manage your program overall, that we had concerns as a council that if we had a separate model, that we may start down the path again of separating it without always thinking about it going forward. So that is why we are taking the approach of having it be overlaid across the framework and it will go through all the models that way.

Mr. PUTNAM. Ms. Nelson.

Ms. NELSON. The committee that is working on that security and privacy profile is actually meeting as we speak to review some of the most recent comments that have been received. We hope that document will be available before the end of the summer, and once that is out and is in use, we will start working on another revision.

The one thing I want to point out about that profile, what is so important about it, it really does provide the opportunity for agencies to start thinking about security on day 1 and privacy on day 1 versus thinking about security and privacy when you are ready to roll out a system or once you are into the later design stages.

Mr. PUTNAM. Mr. Hite, do you wish to add anything or respond to the response?

Mr. HITE. I offer a couple thoughts. I agree that security is part and parcel of each of those reference models, it is not a standalone item, and it needs to be interwoven explicitly into those models.

I think there are lessons learned out there. I know IRS went through the same process where they found it useful, after trying to deal with the security elements of their enterprise architecture, to explicitly extract security as a separate visible view into the architecture so that they would in fact be able to make informed decisions about how complete and correct they were in defining their security profile.

So I think there are lessons learned out there in terms of how to proceed in introducing security into the architecture. But I would reiterate what I said in my oral statement, that it is not something that is done after the fact and you try to lay on top of it. Rather it is something that is done in concert with defining the

business and the data and the technical, etc. elements of the architecture.

Mr. PUTNAM. The relationship between the development of the FEA and the agency EA efforts presents something of a chicken and egg dilemma. The FEA is designed to provide a framework to facilitate the adoption of standards into common Lines of Business. Agencies were required to develop their own EAs prior to work on the FEA began to identify potential opportunities for standardization. How is OMB mediating these competing influences?

Ms. EVANS. Well, actually, I have the opportunity to talk from both sides of the fence on this particular issue. Coming from an agency where the work had already started, because having an enterprise architecture is not a new requirement that the agencies were to have; they were to have modernization blueprints. We were supposed to have all of these things going forward. But as we continue to evolve, and I think that it has been clear and it has been said by all the distinguished members of the panel today, that this continues to evolve, and it is not like you finish the work and you are done and you move on. These things have to continue to evolve and the work has to continue to progress, and it is important that OMB now, in this new role that I am in, continues to provide the leadership through the framework and through this effort so that we can then ensure that the agencies' investments and the decisions that they are making support the outcomes that they intend for the overall programs of their departments. It isn't so much the IT itself, but how is the IT supporting the overall program outcomes?

So we are working, and we continuously work, to improve the models and realign those, but also to continuously provide feedback to the agencies so that their ongoing efforts can align with what we are doing governmentwide as well.

Mr. PUTNAM. The initial development of an EA is a huge investment in time, dollars, talent. Recognizing that the maintenance of an EA is an ongoing process, when might we expect to see some dividends returned on this investment?

Ms. EVANS. Well, I would argue that you are seeing them happen right now live, and the reason that I would argue that is that through the efforts and with the budget submissions that came in through 2004 and 2005, OMB had the opportunity to really analyze across the Government where they could see redundant investments or where it looked like agencies were going in a similar direction. That is now what we are calling the Lines of Business analysis. And so we have those Lines of Business going forward. We know how much the agencies intended to invest in that area, we know the numbers of investments that are in those areas, and so now what we are doing is going forward and saying this is an opportunity; "you guys are all working in this same area here," "let us come up with a common solution so that we can reduce the cost, make use from lessons learned, and be able to go forward with a common solution." So you are seeing it now.

Do I have quantifiable benefits? The answer would be no because we haven't defined the common solution. We are targeted to do that in this upcoming month. We had sent out a request for information, and I am happy to say we got the submissions in and we

have well over 100 submissions that came in responding to the Lines of Business in our questions on that and what is the best way for the Government to proceed. That analysis is going on now, and when we come to what the common solution will be, we will have projected benefits that we believe we will be able to obtain.

Mr. PUTNAM. Do you know how much we have spent on FEA efforts so far?

Ms. EVANS. It is outlined on the Exhibit 53s, but we actually have it. It is mixed in with the overall planning. I can get you that number and get back to you and give the number for fiscal year 2004 and 2005, if you would like, sir.

Mr. PUTNAM. Please. And while we are talking about 2004 and 2005, you raised this in your last response about some of the duplication of effort that was identified, how many duplicate investments were identified?

Ms. EVANS. OK, I have that for you. I do have that. OK, in fiscal year 2004 and 2005, we have the dollar amounts, but the top Lines of Business based on what we have done so far is there is a category called Information Technology Management, which includes our cross-agency investments. So the account that we have of investments there are 822 investments. Financial Management, which is one of the Lines of Business that we are currently looking at right now, we have 445 investments in that area. The Knowledge, Creation and Management, which is another top Line of Business that we have identified through investments overall, there are 251.

So we look at these and we say, OK, there is a lot of potential. When you start looking specifically at the ones that we have outlined, and looking forward and saying, OK, for Human Resources how many do we have in there, for investments we have 89 Human Resources investments that showed up in the 2005 budget. For Grants Management we have 36. So when we start looking at that and then we look at the new development dollars that are associated with each of those, for example, in Human Resources, with the 89 investments planned, there is planned new development dollars of $215 million associated with that, which means that there is a possibility that we should be doing things in a consolidated way that could reduce that implementation cost.

From a general appearance, from the 50,000 foot view, when you come into OMB, from our perspective it looks like it is all duplicative, because when you start really looking at what is the business that an agency does, the core accounting types of functions, all agencies do core accounting; they have general ledgers, they produce financial statements. So from our perspective, from an OMB perspective, it all looks duplicative. However, when you have to start getting down into how does an agency manage from day to day, what are they doing, you have to then step back and really use this as the tool that it was intended: it is to start that discussion, it is to start delving down and doing the analysis. Is this one investment that was counted six times in a business case going across or is it truly six different investments within an agency? And that is one of the things that we have learned through the business cases and getting the information in from the business cases, is that we need to continuously give better guidance to the

agencies so that we can then say, OK, this really is truly duplicative or, no, this is the one investment that was counted six times coming across and it is really a corporate, departmental knowledge management system that each agency is counting as they do their business case.

So that is why we go out and we meet with the agencies. We have done the analysis, this high-level analysis, and we hand it back to the agency, and that is the assessment framework that we are doing. And we say from our viewpoint this is what it looks like. We are asking you now, through your budget cycle, through your spraying and your planning cycles and your capital investment plans, to look at these investments. Is it just a data issue or do you truly have that many duplicative systems? And if you do, this is your opportunity to do something about it.

Mr. PUTNAM. How about gaps? Do you have a number on the gaps that were identified? In the 2004 and 2005 budget submissions, when you reviewed those, were there things that stood out as being common gaps that needed to be filled?

Ms. EVANS. We looked more, when we were doing the analysis, to what it appeared that agencies were investing in, not so much was there a big gap overall. I mean, we do know, for example, that EVMS project management types systems, we don't have those, so that was one and that was written into the scorecard so that could then ensure the investments going forward. But what we really are trying to do is get a handle on is this really a duplicative investment. And the other piece is if you have this service component, if you have this type of service that you are doing in your agency, can you leverage that now across with other partners, versus someone who says, oh, I am starting up a new system, and we have another one that looks very mature over here.

So we have tried to ensure that collaboration is occurring among the agencies, so we haven't really looked at what gaps analysis, other than in our skills gaps, which GAO has brought up about chief architects and our overall human capital skill gaps of project management that we need.

Mr. PUTNAM. Let's talk about the skill gap a little bit. A number of agencies, as Mr. Hite pointed out, reported there was a scarcity of skilled architecture staff. Have there been problems recruiting and retaining the skilled personnel to develop and implement EAs?

We will start with Mr. Matthews.

Mr. MATTHEWS. At the Department of Transportation we have been blessed that we have two core architects; one is a gentleman serving on my staff, another comes to us from the FAA. And they have been spearheading inside the department the enterprise architecture requirements. They have been working with all of the operating agencies to bring them up to speed on the enterprise architecture process and also giving them some preliminary or primer type information on enterprise architecture and what it means to them on a day-to-day basis. But, by and large, in the market place there are few resources available to draw on for enterprise architecture. Additionally, as we bring resources into the Federal Government, their ongoing work over time has to be considered and how to keep their skills updated and upgraded with the current goings on in the marketplace.

Thank you.

Mr. PUTNAM. Ms. Nelson.

Ms. NELSON. I concur.

Mr. PUTNAM. What do you see as being the utility of an FEA as you set about developing your own agency's EA?

Ms. NELSON. In EPA, we were one of the agencies that were working on our architecture before the FEA was in place, so what I see as the benefit of the FEA at this point in time is using it, as well as the new Federal Enterprise Architecture Management System that will be put in place, it provides an opportunity for the agency to get an early view of what work is being done in other Federal agencies. So where we might have opportunities for collaboration, both in terms of some of the products that we have developed that we might be able to roll out to other agencies to use, reusable components, like our Central Data Exchange, as well as looking at work that other agencies have done that might allow us to avoid our own significant investments.

So using that new management system which will be available to agencies for the first time, you will be able to look across the Federal Government in an easy-to-use tool and see what kind of investments and projects are underway, and hopefully avoid earlier in the process, redundancies or duplication. OMB has been able to do that after submissions have been made. Like everything else, you want to get ahead of the curve and you want to be able to make those decisions earlier in the process rather than later.

Mr. PUTNAM. Earlier in your testimony, Ms. Nelson, you referred to the Chief Architects Forum. They met for the first time in April of this year to identify the individuals responsible for their own agencies' EA efforts and discuss common concerns. The forum was convened by the CIO Council. What role is the Chief Architects Forum playing in the development of the FEA and what is the relationship between the forum and the CIO Council?

Ms. NELSON. Some chief architects from throughout the Federal Government have been actively engaged in all aspects of the Federal Enterprise Architecture, and they have done that through the CIO Council's Architecture and Infrastructure Committee, of which I am the co-chair, only since December. When the most recent, I guess the third, GAO report came out, my colleague and my co-chair, John Gilligan, who is the CIO for Air Force, decided we needed to take a step back. As the co-chairs of the Architecture Infrastructure Committee, we realized that the work plans we had for that committee for the next year may have been too aggressive if in fact most agencies, as GAO indicated, were still at stage 1. And one of the things we did was to say we really need a large forum, an opportunity for the chief architects to talk to one another.

Before that forum was held in April, the chief architects from the agencies had never once been brought together. So with the forum and quarterly meetings now, they have an opportunity to discuss common issues, challenges, hurdles, solutions, best practices, and hopefully we can use that as an opportunity to work with GAO and say what are the most common—and Mr. Hite was at that introductory meeting—what are the most common challenges and how can we quickly move forward on some easy solutions with the goal

Mr. Gilligan and I have is using that forum to quickly get as many agencies as possible to stage 2 and stage 3, because while that column is very big under stage 1, we think there are some simple solutions where we can quickly slide that column over to stage 2, and we want to use the forum to do that.

Mr. PUTNAM. Do you want to elaborate on what some of those easy things would be to get everybody into stage 2?

Ms. NELSON. Sure. Well, I'll speak for my own agency. My own agency went from a three in the first GAO evaluation to a two to a one. That is not good progress.

Mr. PUTNAM. Going the wrong way.

Ms. NELSON. It is a slide, a slide the wrong way, you are right.

We feel that right now, with some simple changes we have made, we are probably at a three, and using the OMB self-assessment, probably have rated ourselves as a three. Simple thing. We have never had a formal written policy.

Mr. PUTNAM. Wait a second. You gave yourself a three, but they gave you a one?

Ms. NELSON. Well, they did, but the one thing you have to understand about the GAO policy or the GAO approach, and I think it is a good approach, but the one thing you have to understand about it is you could get 31 out of 32 right, and in most classrooms across the country that is an A, that is close to a 95 percent——

Mr. PUTNAM. Even under No Child Left Behind.

Ms. NELSON. But under the GAO framework, if you got 31 out of 32 correct and the one you didn't get correct is a stage 1, then you are way back at the beginning.

Mr. PUTNAM. Do you hear that Mr. Hite? She doesn't like your grading scale.

Ms. NELSON. So you do have to delve down a little. And I am not arguing. I think the questions they are asking are the right questions, but you have to understand that.

So, for instance, all through stage 1, 2, and 3 there are two things we can take care of. One of them is do we have enough resources. We answered no because at that period of time we were in a freeze. We do have enough resources now. That is easy. Checkmark. That automatically takes us to stage 2. Stage 3, we did not have a formal written policy that the Administrator had signed. Even though we are using the architecture, it is part of our investment process, we are applying it, we have aligned it with the FEA. Because there wasn't a piece of paper with Administrator Mike Levitt's signature on it, it kicked us all the way back. We will have that policy signed in the next few weeks; we are working it through the process now.

There are things like that many agencies have cited, and we are helping them find the best policies throughout the Federal Government and get them in place. But what is important is you have to use them. Just having that piece of paper signed is meaningless if you are not really using it.

Mr. PUTNAM. Mr. Hite.

Mr. HITE. I would offer a couple additional thoughts to amplify on what Ms. Nelson is saying.

What you see on that chart is a point in time representation. Most of those responses were as of about 10 months ago. So the

way things are today I would hope are much better than they were then. And as Ms. Nelson is saying, they are in her situation much better.

The other thing to keep in mind when you look at that is that is a representation at an aggregated level of a lot of detailed information. When you aggregate information, you can lose specifics, so you have to have rules governing how you aggregate it. The rule that we used in applying our framework was in order to be at a stage, you need to satisfy all core elements at that stage. If you don't satisfy all, you don't qualify for that stage. So embedded in that is the reality that an organization could be not satisfying one stage 2, and thus be at stage 1, and they may be satisfying a half a dozen stage 3, 4, and 5 elements. That level of detail is not in an aggregated view, it is in the details of what we reported.

And, of course, the other thing to keep in mind, the reason we adopted that philosophy is these things, these core elements that needed to be present were not trivial things; they all have a very real purpose, a purpose that is grounded in best practices, a purpose that is extracted from the Federal CIO Council practical guide on managing enterprise architecture. So they are not things that we came up with, saying this would be nice to have; these are fundamentals.

Mr. PUTNAM. What about this signature thing? If they have this great policy and they are doing it, and they just have a slow bureaucracy that the Administrator can't get around to rubber-stamping this policy that is already in place, that is really enough to backslide two grades?

Mr. HITE. Well, the core element that needed to be met relative to stage 2 was that you had a policy governing enterprise architecture development, and whether in EPA's case it was because a policy existed but it just was not signed, to be honest with you, I can't speak to the specifics of every situation. But the purpose of a policy is very profound. A policy demonstrates an organization's commitment to perform a certain way. In the absence of policy which says this is how we are going to operate in this organization, then people are left to their own devices. And people left to their own devices go off in different directions, all with good intentions, and architecture is designed to get people all marching in the same direction.

Mr. PUTNAM. Is there some deadline when that policy was supposed to be in place by, Ms. Evans?

Ms. EVANS. No, we did not establish a specific deadline that said all agencies have to have a policy. As a matter of fact, I believe that was one of the suggestions that GAO had offered, that we should send a letter out enhancing that and advising going forward on that. That was one of the suggestions going forward, because there wasn't specific guidelines out there saying every agency needs to have a policy in place.

But I would like to followup a little bit on that and say that I don't disagree with the way that the GAO model is set up in ensuring that the basic tenets of a good program are in place. I would like to say, though, that you have to take both of those into consideration to really see if an agency is truly using enterprise architecture to go forward to manage its portfolio. And so we are not here

to debate whether the GAO maturity model and framework is a good one or a bad one, because it is based on the tenets of the CIO Council as well, a framework that came out of the CIO Council, but what we are saying from an OMB perspective is that—and this is another recommendation that came from the GAO report as well—is that we had to exercise even more oversight and more guidance out to the agencies. And that is the reason why we came up with the assessment framework from our perspective, too, because then it compliments what GAO is doing, so that you can then look at it as if, well, OK, if the policy is in draft, then it is going through, but yet they have all the other tenets there and they have the capability and they are using it, then you can use the two frameworks to really get a handle on how an agency is moving forward and how mature that process really is, and is it really embedded into the strategic planning going forward.

Mr. PUTNAM. I don't want to harp on this and punish Ms. Nelson for being candid, but it just seems like the policy ought to be first base. How do you do all the other stuff if you don't have the leadership from the top? That is what we harp on in every one of these hearings, is getting leadership from the top. And if you all are already doing these things, it sure seems like having a policy signed and in place by the agency head or the department head ought to be one of the first things that is done just to get them committed, the name on the dotted line, and get them invested.

Ms. EVANS. I would just like to comment one further point on this. The policy itself isn't so much about do you have an enterprise architecture in place and are you doing certain things. The policies and the guidelines that come out from OMB are based on the tenets that are in the Clinger-Cohen Act and in the E-Gov Act, talking about overall management of the portfolio and how you are moving forward with your capital planning.

Now, if you have a good mature capital investment planning program, then that means you have a modernization blueprint which is your enterprise architecture. So that is the point that I am making, that this is not a new thing that the agencies had to do. So when we talk about the details there, the agencies do have policies and plans in place of how they manage capital investments, and so those are in place, those have been signed by the agency heads going forward.

Additionally, what we have done to bring this to the agency in holding an agency accountable is this is specifically included in the President's management agenda and in the scorecard under the E-Gov element. So for an agency to be able to go green, this is a green criteria; that you have to have your enterprise architecture in place, you have to have that modernization blueprint in there, and you have to be using it. And so that is how we are holding the agencies accountable in that manner through the scorecard.

Mr. PUTNAM. So there is a direct connection, then, between your at-risk status and the FEA initiative. So you use this scoring mechanism to decide whether they are making progress or made progress on the FEA?

Ms. EVANS. We actually use a combination. And so we have our own assessment model, and actually what we do, and you would recognize it, we put up a quadrant when we meet the agencies and

we map our assessment score against the GAO assessment score, and the agency falls into a quadrant. I would be glad to give you a draft, in essence a report that we provide each agency as we go forward so that they can see how we are looking at their architecture efforts in concert with how they showed up in the GAO report, and then we go into a detailed assessment based on criteria that we have developed; and then we show them, based on all of that, how many of your investments aligned to the BRM, we give them very specific information about where we couldn't see clear alignment of investments and we give them the number, and then we also give them very specifically a list of investments that look like they are duplicative to us, getting back to your original comment. So we give them a whole huge package so that they can look at it. And we can give you a draft of this report, a representative sample of how we are doing that.

Mr. PUTNAM. I don't think I want to see. I don't even understand the Cliff Notes version you just gave me.

Ms. EVANS. Well, what happens is that we take this and we take our assessment and we map it on a grid, and there is a maturity model associated with it. And then, with all the other tools that we have in place, we look at, OK, if this isn't in place, there is a series of documents that we look through based on the submission, what they were required to do. So what will happen is if they don't have—I mean, the best way to do this is if they don't have enough information for us to even assess it, we show them what we are doing with the other agencies and it is marked DRAFT all the way across, which then that means they don't have the checkmark on the scorecard that says that they have a modernization blueprint, which then that pretty much drives down, it is a cascading effect to all the other things that are going on that they are being measured for of how they do their overall portfolio.

So if you have an agency who is just trying to get checkmarks, which means that they may have a group of people who are working on filling out paperwork for business cases and another group that is trying to fill out the paperwork so they can get their checkmarks for enterprise architecture, when you pull it all together, you can see that is why they have at-risk investments, that is why they don't have a good cyber security program, because they are just trying to get the checkmarks going forward.

Mr. PUTNAM. Mr. Matthews, do you understand the system? You have to live with it.

Mr. MATTHEWS. Yes, sir.

Mr. PUTNAM. Ms. Nelson, do you understand it?

Ms. NELSON. I believe so. Karen and I are meeting on Friday to go over this, so I am sure I will have a fuller understanding on Friday.

Mr. PUTNAM. Well, bring your quadrant paper. If you all understand it, I am happy. I mean, I think that is great. I just get a little bit nervous about all the different ways that we grade things. A legitimate complaint about things is that we are always changing the rules of the game. So as long as the folks having to do this understand the rules of the game and what they are being held accountable for, I think that is wonderful. But if she thinks she is a three and GAO thinks she is a one, I don't know which quadrant that

puts her in, maybe she is a two, but it does get a little confusing, at least for the slow learner in the crowd who is sitting in this chair.

Ms. NELSON. Can I clarify?

Mr. PUTNAM. Please.

Ms. NELSON. I do want to say, and I think hopefully it came across before, I support the measures that GAO has in place. And, in fact, in conversations with our own architecture committee and our chief architects, I said we need to accept these. This isn't about disagreeing with these, because these are accurate, these are right. All I was trying to do is point out, though, that the numbers on the surface can be deceiving, because you can get up to 20 here. There are about 32 things you get ranked on, and if you miss one of those, you could be stage 4 or stage 1, depending on what you miss. So that is why I am just suggesting delve down one layer to see which one an agency is missing and how significant is that.

It is also important that the GAO model really measures maturity. And that is a little bit different than what OMB is measuring. So while they are different, that is OK, as long as the people who are using them understand the difference. And those of us who are using them, I think we do understand the difference. As I said, we just did our own self-assessment using the OMB model, and I think we are close to a level 3. You don't want to confuse those because they are measuring different things.

Ms. EVANS. Let me try one more time. But when you map the two of those together, because it is the question that you are asking. OK, you get an assessment from GAO and it is saying, for example, let us take EPA, and it says it is a one. Then we have a tool that says, oh, they are a three. So the natural question is, well, what the heck is that and why are you measuring two separate things. Well, we are trying to then give you a view into, OK, they may have the basic tenets, you know, they may be practicing things very well, but they don't have the core of what they need to have a sustaining practice beyond the current people that are there. So that is why we tried to put it in a framework that an agency could look at it.

So if you took a one and a three, based on these two, they would show in the quadrant that is growth, which means that they have the potential to continue to grow in EA competencies, which would definitely show that there is a difference there and that communication needs to go forward; that it is definitely not a best of breed there.

Mr. PUTNAM. Room for growth. Seems like my junior high report card. Room for growth.

I apologize if I have dragged this into the weeds.

Mr. Hite, do you have any comments that you would like to leave us with before we move to panel two? You started all this.

Mr. HITE. Yes, sir, if I could offer a couple of comments on what we have been talking about so we can get further into the weeds, one of which is that I would be willing to accept on behalf, for you, what Karen asked to share with you, because I would be very much interested in seeing those results.

But let me also say that when we did this framework, we didn't believe that it is going to be the end-all and be-all, the one measure

that is going to tell you everything you want to know about progress in enterprise architecture. One of our motives was that it is not being measured now at all, so let us get a measurement tool out there. But we also recognize that it measures a particular thing: it measures the maturity of the management process. It is a process framework. It does not measure maturity of content of the architecture, for example. That is a whole different set of criteria. So we believe that there needs to be multiple measures.

Now, I haven't looked at the specific one that Ms. Evans is talking about, so I can't comment on it particularly, but I can say that I support the idea of multiple measures so that you get a clearer picture of where an agency is in this very important area.

Mr. PUTNAM. How many people work in GAO's IT division?

Mr. HITE. Rough number is 160 to 165.

Mr. PUTNAM. Isn't it fun having 165 people checking out everything you do, Ms. Evans?

Ms. EVANS. Yes, it is.

Mr. HITE. Well, I would like to also add that I have about six looking at enterprise architecture across the entire Federal Government.

Mr. PUTNAM. Well, we haven't really cracked any heads or anything over what is on this chart, and I think now that we are digging in, there are good reasons for doing that. But I think that you can generally say, looking at the trend, for whatever falls are in your scoring mechanism or in the grading content, the trend isn't real high.

Mr. HITE. Absolutely.

Mr. PUTNAM. I mean, you have 76 in stage 1, nobody in stage 4, and 1 in stage 5.

Mr. HITE. Well, this one over here shows you the actual trend. This shows you if things have gotten better since they were in 2001. And that is comparing against the same version of the framework.

Mr. PUTNAM. I think that is the overarching lesson here, without digging down into exactly what the content was. The bottom line is we have a long way to go.

Mr. Matthews.

Mr. MATTHEWS. Mr. Chairman, one thing that I wanted to mention on the OMB version, there are certain criteria in each one of those stages, and while an agency may be working at satisfying criteria in stage 2 and 3, and they don't have, as Ms. Nelson pointed out, a signed document from the Administrator of the Secretary's office, it would reflect them as being in stage 1 until such time as they had that document, even though they had satisfied everything in two, three, four, and five. Perhaps when we report, an acknowledgment that certain criteria are being met in other categories would be a better indication of an agency's growth along that framework path. Certainly agencies need to have senior management support, but the true measure of the work that is going on is how many of those criteria are being met from year to year.

Thank you, sir.

Mr. PUTNAM. Ms. Nelson is going to go camp out in front of the administrator's door and hold him down until he signs her paper.

Ms. Nelson.

Ms. NELSON. I have the pleasure of having an administrator, Mike Leavitt, who gets it, who understands enterprise architecture. In our very first meeting he raised and used those words, so we will get it done. But I concur with Mr. Matthews, because an interesting chart for you to look at maybe is to see if you take the 32 items or characteristics we are being measured on for maturity, how many agencies answered yes to those characteristics in stage 4, stage 5, stage 3, stage 2? Because you are going to see a lot way out there in four and five, and the question becomes some people believe you can't get to four unless you do every single thing in three. I disagree with that. I think in order to really truly sustain it for a long period of time that may be necessary, but I think you can gradually move into higher levels of stages, because it is not a perfect world. And it might be interesting, as Mr. Matthews said, to look out and see how many people do have yeses in threes and fours and five. It just gives you a slightly different picture. We still need to do everything GAO said. I agree wholeheartedly we have to do it. But it is a slightly different picture or perspective on the same situation.

Mr. HITE. I would agree that is a relevant thing to look at and, in fact, we looked at that. So we looked at the performance of core elements between 2001 and 2003, regardless of what stage they were in, and basically we found that—I can't remember the exact numbers, but this is the rough figures. I think it was something like 57 percent of them were being performed or 47 percent were being performed in 2001 and 53 percent of them were being performed in 2003. So if you even look at core elements, regardless of stage, there wasn't much change between 2001 and 2003.

Mr. PUTNAM. Fifty-three percent is an F in most places.

Ms. Evans, do you have any final thoughts?

Ms. EVANS. Well, first and foremost, I would like to thank you for having the hearing today on the Federal Enterprise Architecture, as well as giving the agencies the opportunity to talk about their enterprise architectures. As you can see, this is going to be a continuous challenge just based on the dialog that we were having today, and how we are using it to continue and manage overall. But I think the big key is to really realize that this isn't really just an IT tool, and that the CIOs, yes, are chartered to do it and we have mapped it to do things with the IT investments, but this really is a management tool, and it is a strategic management tool. And I have been able to answer questions very quickly and very rapidly for my management by saying, yes, I know what agencies are in this area providing this type of service and, oh, by the way, I do know how many dollars are being invested in IT this way. We may not necessarily talk about the models, and you can see when you start getting down to a certain level here we have to start talking the same language, and technical people go off in one direction and management people go in another, but the key here is that this tool and a hearing like this raises it to a level where we then can talk about it and start going down that path. So I would like to commend you and thank you for having this hearing today for us.

Mr. PUTNAM. Well, thank you, and you all keep working on it. We have a long way to go, but it is very important, and we appreciate the work that you are doing on it.

The committee will stand in recess for a couple of moments while we arrange for the second panel.

[Recess.]

Mr. PUTNAM. The subcommittee will reconvene.

I would like to welcome our second panel of witnesses and ask that you please rise and raise your right hand, along with any others who may be accompanying you for the purposes of providing information to the subcommittee.

[Witnesses sworn.]

Mr. PUTNAM. Note for the record that all the witnesses responded in the affirmative, and we will move immediately to their testimony.

Our first witness for the second panel is Dr. Dave McClure. Dr. McClure is the vice president for E-Government with the Council for Excellence in Government. In that position, Dr. McClure serves as the strategic leader of the Council's E-Government Information Technology programs, developing strategies with public and private sector leaders to use information and communication technology to improve the performance of government and engage citizens. Dr. McClure is also involved in many of the Council's intergovernmental partnerships and helps runs the E-Government Fellows Program.

Prior to joining the Council in 2002, Dr. McClure was the Director of Information Technology Management Issues at GAO. As a member of the SES at GAO, he conducted governmentwide evaluations of IT investment and performance measurement issues, monitoring agency implementation of IT management improvement efforts, evaluating the progress being made with E-Government initiatives, and reviewing agencies' IT work force planning strategies.

In 1998 and 2001 and in 2004 he was named one of Federal Computer Week's top 100 IT executives in the Federal Government.

Welcome to the subcommittee. You are recognized for 5 minutes.

STATEMENTS OF DAVID MCCLURE, VICE PRESIDENT FOR E-GOVERNMENT, COUNCIL FOR EXCELLENCE IN GOVERNMENT; VENKATAPATHI PUVVADA, UNISYS CHAIR, ENTERPRISE ARCHITECTURE SHARED INTEREST GROUP, INDUSTRY ADVISORY COUNCIL; NORMAN E. LORENTZ, SENIOR VICE PRESIDENT, DIGITALNET; AND RAYMOND B. WELLS, CHIEF TECHNOLOGY OFFICER, IBM FEDERAL, VICE PRESIDENT, STRATEGIC TRANSFORMATIONS FOR IBM SOFTWARE GROUP, APPLICATION INTEGRATION & MIDDLEWARE DIVISION [AIM], IBM CORP.

Mr. MCCLURE. Thank you, Mr. Chairman. It is a pleasure to be here. As you noted, my organization, the Council for Excellence in Government, has been dedicated for more than 20 years to helping achieve high-performance government and increasing public participation and confidence in government.

I think it is very important that we not lose the citizen perspective in the discussions that we have today. Our national polls and some of the homeland security town halls that we have had around the country recently show that the public wants a government that

is accountable, simple, convenient to interact with, and accessible through the means of their choice.

The FEA provides some important tools for defining and providing this streamlined, simplified citizen-centric government to the American public. OMB has provided a crisp analysis of the Federal Government as it is and has offered a strong vision of where it can be. The common program, business and service delivery patterns of government are presented with clarity and help reveal the complex overlapping and often duplicative nature of its interactions with citizens and businesses.

The FEA approach follows leading-edge commercial practice. Many Fortune 500 companies are using similar approaches to better align their technology with business process needs. They have recognized that IT is more than just building and running systems. Enterprise architecture approaches "tune-up" organizations, focusing on management of information as a core asset, and emphasizing component reuse rather than the constant "scrap and build" that we have had in the past.

The FEA is not defining a single architecture for the entire Federal Government. Rather, it assembles the assets and the tools that can provide cross-agency analyses, identification of performance gaps, and opportunities for better alignment of resources. It is not static; it will change and it will evolve as technologies change.

We must stay this course with the FEA. The payoff for the Government simply can be huge. Not only can this help achieve cost savings and performance improvements, but it also can grow the public's confidence, trust, and satisfaction with Government itself.

Let me touch on three important challenges that lie ahead. First, we have to proceed with disciplined maturity and alignment. We have to make some sense of the many moving pieces of Government programs, policies, and services, and the enterprise architecture approach is a valid tool for doing that. But we have to get agencies up to par. GAO's audit work, using its widely endorsed EA Assessment Framework, reveals this very mixed progress in the pace, speed, and direction of the EA work taking place in the Federal Government.

The good news is that there are a lot of bright spots. GAO's aggregate or top line numbers, as you have seen on these charts, while maybe disappointing, tell only a partial picture. Many agencies are actually doing things at higher maturity levels but cannot be tagged that way because they are not performing completely at lower levels. Several of these agencies, by the way, Mr. Chairman, are on the verge of getting fives on GAO's scale.

But putting agency-centric architectures in place really stops short of the larger governmentwide transformation that EA can help create. We need both vertical alignment of goals, processes, and technology within agencies, and, where possible, horizontal alignment across common governmentwide functions and processes. There is a lot of work to be done in both of those areas.

My second point is about the "so-what." It makes sense that those that determine budgets should see measurable impact from the time, cost, and energies that we are putting into enterprise architecture approaches. They are many that come to mind: streamlined and simplified processes, greater systems interoperability

that facilitate the exchange of information, faster application delivery, and enterprise licensing opportunities, just to mention a few.

These are important. They have real dollars attached to them. When combined with measuring and scoring the EA capability maturity, the measures provide a fact-based assessment of capacity, capability, and results. These measures are necessary, but by themselves I don't think are sufficient. The real high value return from enterprise architecture are those that capture the impact on direct mission-related performance, whether that be saving lives, protecting the environment, inspecting the food supply, or identifying and deterring terrorist threats. Better EA should translate into time, cost, and quality improvements in government, and we cannot lose this line of sight.

A final key challenge is leadership. Enterprise architectures require commitment and participation from top leadership, beginning with the heads of agencies and program executives all the way through the CIO, CFO, and procurement officer communities. It cannot be the sole purview of CIOs and CTOs.

In this vein, I think it is imperative that OMB's vacancy in its chief architect position be filled carefully and very expeditiously. This person is the most visible spokesperson for architecture in the Federal Government, and directs the FEA work, and also supports program assessments and business case reviews in the OMB budget cycle. We need a credible, experienced individual with strong outreach, collaboration and communication skills. That person has to translate a lot of the jargon of EA into something that is understandable to non-technology managers and executives, and it is a very, very important job.

So we need continued focused leadership from OMB. We also, Mr. Chairman, need to extend this dialog on the Hill beyond this committee and into the Budget, Appropriations, and Authorizing Committees of the Congress. Enterprise architectures offer great hope both as engines of change and instruments of sorely needed management controls over orderly government transformation. Transparency, accountability, and results that translate into better Government for the American public should be front and center in all of these efforts.

Thank you, and I look forward to your questions.

[The prepared statement of Mr. McClure follows:]

THE COUNCIL FOR
Excellence
IN GOVERNMENT

Testimony of
Dr. David L. McClure, Vice President for eGovernment and Technology
The Council for Excellence in Government
Before
The House of Representatives
Committee on Government Reform
Subcommittee on Technology, Information Policy, Intergovernmental Relations
and the Census
May 19, 2004

Mr. Chairman and members of the Subcommittee, thank you for inviting me to appear before you today to discuss progress being made by OMB and federal agencies in developing and implementing enterprise architectures.

As you may know, the Council for Excellence in Government is a non-partisan, non-profit organization that has been dedicated for more than 20 years to helping government improve the quality of its performance and to increase the public's participation and confidence in government. We work to catalyze reform in government by providing forums for citizen engagement and building bridges between industry best practices and the desired goal of high performance government. We applaud the work of this Subcommittee and your leadership in providing essential congressional oversight focused on the measured progress that OMB and the agencies are making in using technology to enable high quality and cost effective services to the public.

As demonstrated by our regular national public opinion polls and most recently our Homeland Security town halls around the country, citizens want government that is accountable, convenient, easy to navigate, and accessible. The Federal Enterprise Architecture developed by OMB over the last two years is an essential element in defining and providing streamlined and simplified government to the American public.

In its simplest form, the FEA is comprised of five basic reference models that focus on:

- Defining functional lines of business that describe the business operations of the federal government independent of the agencies that perform them (*the Business Reference Model*),

- Measuring the performance of major IT investments and their contribution to line of business and agency program performance (*the Performance Reference Model*),
- Identifying reusable software applications, process automation services, business management services, transactional services, and customer services on a government wide basis (*the Service Component Reference Model*),
- Describing the data and information used in interactions and exchanges that support program and business line operations throughout government (*the Data and Information Reference Model*), and
- Identifying the standards, specifications, and technologies that support the construction and exchange of service components that can be leveraged in component-based or shared services-oriented architectures (*the Technical Reference Model*).

The FEA also provides an important foundation for the President's Management Agenda and its goal of achieving electronic government, financial management, performance and budget integration, and human capital goals. The FEA has provided crisp analyses of government "as it is" and offered a vision of where it can be – showing with amazing clarity and reality the program and business patterns of government.

This process has identified unparalleled opportunities to eliminate unnecessary overlap, redundancies, and inefficiencies in how citizens, businesses, and government employees interact with government and the programs and services it delivers. Why, for example, would government require businesses to submit virtually identical information to the federal government through dozens of different processes, different forms, and with varying degrees of efficiency? Why would we have over two dozen major payroll systems that perform the same basic function but with enormous variances in cost per transaction? The work underlying the FEA has provided unparalleled transparency into how the federal government operates. Moreover, performance outcomes and budget decisions can be more tightly linked using the FEA frameworks as guideposts.

The FEA effort itself – focused on using basic reference models for defining and aligning federal business functions and its supporting IT – represents leading edge practice. Only a handful of large companies have this kind of reference framework in place and other countries around the world astonished at the process used and its deliverables to date. The key to this progress has been focused leadership from OMB, disciplined controls, and a dedicated partnership between government and industry to make it happen.

Nonetheless, make no mistake: This difficult endeavor is full of challenges. The goal is not simply to provide a single, overarching enterprise architecture for the entire federal government. Rather, the FEA seeks to facilitate cross-agency

analysis and identification of duplicative investments, performance gaps, and opportunities for cross-agency collaboration on similar activities. The work in the trenches is far from finished and we find ourselves at a critical crossroads. We must stay the course if we expect to use the frameworks to bring cost efficient and effective service delivery to the public. It will require constant focus, disciplined management, and executive leadership, and a willingness to accept improvements along the way. The payoff can be huge for government performance improvement in terms of identifying opportunities to re-use and re-deploy IT assets across the government. Not only can this help achieve cost savings; it can also grow public confidence, trust, and satisfaction with government itself.

In my remarks today, I want to focus on three critical challenges related to the future of enterprise architectures in the federal government: (1) ensuring disciplined agency architecture maturity and alignment, (2) concentrating on tangible outcomes and measures of impact, and (3) providing continuous, focused leadership.

Let me begin with *disciplined maturity and alignment*. There are simply too many moving pieces within and across the federal government's myriad of programs, policies, and services to manage without enterprise architectures in place. Government programs have grown up over time, responding to time sensitive needs, crises, and public demand. Enterprise architectures provide a disciplined means to map the "business" of government and its corresponding data, information flows, and processes. It can bring visible structure and rigor to understanding what an organization does and the work processes, data, and technology which is attempting to enable mission outcomes.

There is good news in that several methodologies, tools, and assessment frameworks are available to agencies. For example, to assist in analyzing and benchmarking agency maturity in putting core elements of enterprise architectures in place, GAO has also created its own Enterprise Architecture Maturity Model Framework. There is a great deal of consensus in the federal IT community on the framework's value in providing a thorough, comprehensive assessment of agency EA progress. Its focus on performance and security, metrics for measuring EA development, quality, and use, and recognition of the need for using accepted EA methodologies, combined with independent verification and validation, are strong points. Additionally, OMB has created a web-based management system to help discover components, business services, and capabilities across the federal government. OMB has also recently augmented this with its own Enterprise Architecture Assessment Framework. In short, we don't have a shortage of models, guidance, tools, and assessment processes.

The key is ensuring that agencies design and implement their architectures using foundational principles and management processes identified

in the methods, tools, and assessment frameworks. Over the decades, the federal landscape is strewn with sizeable and costly efforts to define enterprise architectures. Most have been little more than abstract, paper product drills that have not been complete or never moved into real implementation and enforcement with corresponding management processes and executive oversight. The GAO assessment framework provides an invaluable way to examine real progress and maturity based on the best of available commercial and public sector approaches.

We must get federal agencies up to par in order to deliver cost effective and high performance government services to the public. As GAO has reported, current agency progress in designing and implementing enterprise architectures is mixed at best. On its maturity scale ranging from one to five, average agency maturity has hovered around 1.75 for the last three years. As noted in GAO's recent government wide assessment, only 22 agencies increased their maturity stage, while 24 declined and 47 remained the same. Still, there are bright spots of progress and maturity as illustrated by efforts at Veterans Affairs, EPA, OPM, HHS, Treasury, DOD, IRS, and the Executive Office of the President. Lack of top management understanding and commitment and of maintaining adequate funding levels for EA development, plus the absence of skilled staff and simple parochialism, offer significant challenges thwarting continuity of design efforts and implementation. Without continued emphasis on disciplined approaches and follow-up management commitment, progress will remain difficult.

But putting agency centric enterprise architectures in place stops short of the true transformation they can help create. We must have both vertical alignment within agency boundaries and horizontal alignment across common functions and business processes of government. As we move forward, it is imperative that agencies construct architectures that are aligned with the FEA and its push toward process and systems consolidations. The FEA provides a true "portfolio" view of government programs, processes, and investments. Moreover, it offers a viable, collaborative way to analyze and approve budget requests that surface from agency-centric ways of doing business. Integrating enterprise architecture work with IT capital planning and investment decision-making, and ultimately performance and budget reporting, should be the norm, not the exception.

Let me turn to the "so what" of using enterprise architectures. We must see measurable impact on performance or a return on investment from the time and effort required to design, implement, and manage architecture efforts. Traditionally, enterprise architectures are valued for their ability to:

- simplify and streamline processes and the supporting technology infrastructure,
- achieve greater levels of interoperability and thus enhanced data sharing capabilities,
- increase flexibility in adapting to technology change,

- deliver applications and systems faster and more cost effectively,
- reduce the overall cost of technology support by eliminating systems redundancy, duplicative data storage, and re-use of application components,
- align technology tightly with business drivers and needs,
- deliver systems on or ahead of schedule, and
- maintain highly reliable, dependable IT service levels.

Measuring compliance with proven methodologies and approaches is one way of determining whether process maturity is occurring. This kind of performance reporting and feedback is valuable and necessary, but by itself not sufficient. Being able to demonstrate productivity gains, cost improvements in the delivery of IT, and cost savings from systems consolidation and component or application re-use are equally important tangible measures of return.

But "real" returns are those that measure impact on direct mission related performance. If architectures are done well, we should expect visible changes in program or service delivery outcomes. For example, if DHS can demonstrate through its enterprise architecture efforts that it is able to identify homeland security threats in minutes or hours rather than days or weeks, then real change has occurred. Similarly, if an industry can submit the same registration or regulatory compliance information on-line once to government rather than numerous times to many agencies in different formats, then lower administrative costs and internal productivity gains to the industry are also a very real impact from the associated reduction in the reporting burden. Further, if social security or veterans' disability claims can be resolved in hours or days because of people, process, and technology improvements that minimize unnecessary data collection and get the right information to claims specialists in a timely, reliable manner rather than taking months or Herculean efforts, we have truly achieved a real return on investment.

This brings me to a final key point. Enterprise architecture work requires leadership and executive understanding, commitment, participation, and constant attention. This work cannot be the sole purview of CIOs and their staffs. The front pieces of the Business Reference Model, the Performance Reference Model, and the Service Delivery Models have to be co-led by the business or program divisions. Governance structures and decision processes must be in place to make this a reality.

One of the most pressing leadership needs confronting us now is filling the position of the Chief Architect in OMB's Office of eGovernment and Information Technology. Progress is in a perilous position as long as this position remains unfilled. This individual leads the important work of the FEA Program Management Office and is the most visible spokesperson for architecture work in the federal government. This void comes at a time when the remaining Data Reference Model is being finalized and vetted within government. The person

chosen for this important position must be a credible, experienced authority in enterprise architecture development and implementation and provide government wide direction to the continuing development, guidance, and oversight of the FEA and agency architectures.

More importantly, the Chief Architect position requires someone with strong outreach and communication skills. The individual must translate the core value of using enterprise architectures as a means of controlling IT investments and achieving cross-agency service delivery synergies essential to achieving high performance government. Working collaboratively with chief architects in the agencies, this individual must engage in constant, constructive dialogues with agency heads, program executives, Chief Financial Officers, and the Congress. We urge the Administration to move with careful but expedient consideration in making this important selection.

The chief architects serving in agencies across the government must also work as a collaborative, cohesive force and be equally engaging with non-IT executives. Importantly, this group recently convened its first government wide forum to network and exchange ideas. The Council is working to ensure that this forum continues as a means of identifying best practices, lessons learned, and conducting broad outreach and problem solving. The Chief Architect is a natural leader for this group and its cause.

In conclusion, Mr. Chairman, having enterprise architectures in place in government is paramount to achieving real performance outcomes. They are engines of change and instruments of sorely needed management control over orderly transformational changes. As we move forward, transparency, accountability, and results that translate into better government for the American public should be front and center. OMB must continue to exercise strong government wide leadership, working collaboratively with agencies but maintaining vigilance in its budget and accountability oversight. Agency leaders must involve themselves in enterprise architecture governance and evaluate progress and performance results. Lastly, it is imperative that the dialogue extends beyond this Subcommittee and into the agendas of the budget, appropriations, and agency oversight committees of the Congress.

Thank you.

Mr. PUTNAM. Thank you, Dr. McClure.

Our next witness is Mr. Venkatapathi Puvvada. Mr. Puvvada serves as Chair of the Industry Advisory Council, Enterprise Architecture Shared Interest Group, and works closely with the CIO Council, Office of Management and Budget, and other Government agencies in that capacity. Mr. Puvvada co-founded the EA SIG in 2002 to address the need for industry and government partnerships to help bring industry best practices and expertise together in a common forum. The IAC EA SIG is comprised of over 200 practicing architects and executives from over 100 companies.

That is harder to say than your name.

Mr. Puvvada was recognized with the prestigious Federal 100 Award in 2003 for his contributions and impact on the direction of IT in government. For more than 18 years, Mr. Puvvada has worked in information systems, 16 years of that with Unisys. In addition to serving as the chair of the EA SIG, Mr. Puvvada is the chief technology officer of Unisys Global Public Sector, as well as the vice president and partner for Unisys Worldwide Enterprise Architecture Solutions Services Practice. The Unisys EA Solutions Practice consists of world-class enterprise solution architects that develop and implement architectures for clients such as the TSA, the GSA, the DOD, the VA, the FDA, and several State governments.

Welcome to the subcommittee.

Mr. PUVVADA. Thank you, Mr. Chairman. We will try to simplify these acronyms next time around.

Thank you for inviting me to speak today. I am really honored to be here representing Industry Advisory Council [IAC], and I would like to acknowledge some of my colleagues that are here for their hard work and their passion to improve architectures in the government in the truly excellent way that they represent 400 member companies of IAC.

In terms of our work, before I get into the details of the testimony, our recommendations and best practices have been successfully published in the form of five white papers, and they have been widely recognized for their innovative insight, and the details are included in my written testimony.

In our view, enterprise architecture is the only practical way on a consistent basis for comparison of investment decision by agency executive leadership. Private sector experience suggests that the proper development and usage of EA can lead to a major transformation of an organization, its processes, and its performance.

As for commenting on the progress of the FEA initiative, the development of the interlinked reference model allows the Government to have an enterprise view of its business for the first time. As a result of the progress on FEA, we acknowledge significant improvements in the way the agencies conduct the quality and the assessment of their budgets and the preparation of the budget process. Various departments and agencies are also making good progress in allowing their enterprise architectures in the context of the Federal Government and FEA. EA products are effectively used by several CIOs as decisionmaking framework in the capital planning portfolio management and general IT governance. Therefore

we rate very high marks for the blueprint for improved IT investment management aspect of the hearing, Mr. Chairman.

However, major hurdles exist for cross-agency collaboration and information sharing aspects. Some of these challenges are as follows. First one is lack of sufficient positive incentives for agencies to collaborate and have common business process integration and secure information sharing. The second one is lack of sufficient funding and key resources, especially chief architect of the OMB, as Mr. McClure referred to, and the skills in the context of business architecture skills to lead and implement this transformation at the department level, as well as the Federal level. Also, the Government needs to move the FEA and EA as a high priority transformation mechanism for the owners business and mission program so that it doesn't turn out to be a technical exercise for architects and the CIOs.

Going forward with the FEA and the agency EA, we believe timely completion and implementation of the data and information reference model is very important. The ability of the Federal Government agencies to understand and map to each other's data through the use of a common model is a major factor in achieving the cross-agency collaboration, information sharing and data interoperability, along with some quick success pilots. Development and implementation of the big 10 enterprise security and privacy architecture, as referred to earlier by Mr. Hite, that is integrated into all layers of EA is very critical as well.

Mr. Chairman, industry really appreciates your commitment, your committee's commitment in getting involved as a major stakeholder in this initiative. We believe that the articulation of legislative priorities and activities in the context of FEA are really pertinent in advancing the maturity of business-driven IT solutions that citizens are expecting.

To summarize our view, IAC is very supportive of enterprise architecture initiatives as a major government priority and agrees with its general direction and recommends staying the course. There are a lot of challenges facing these initiatives, but they can be overcome with strong executive leadership, clear governance, and positive incentives for agencies to collaborate. We applaud the Government for reaching out to IAC and industry and leverage our expertise, and we are committed to continuing this support in future.

Thank you for the opportunity to appear before you today, and I would be very happy to answer your questions.

[The prepared statement of Mr. Puvvada follows:]

WRITTEN STATEMENT OF

VENKATAPATHI R. PUVVADA (PV)

CHAIR
ENTEPRISE ARCHITECTURE SHARED INTEREST GROUP (SIG)
INDUSTRY ADVISORY COUNCIL (IAC)
AMERICAN COUNCIL FOR TECHNOLOGY (ACT)

BEFORE THE
COMMITTEE ON GOVERNMENT REFORM
SUBCOMMITTEE ON TECHNOLOGY, INFORMATION POLICY,
INTERGOVERNMENTAL RELATIONS, AND THE CENSUS
U.S. HOUSE OF REPRESENTATIVES

MAY 19, 2004

Good afternoon, Mr. Chairman, Ranking Member Clay, and Members of the Committee. Thank you for inviting me to speak about the "Federal Enterprise Architecture (FEA): A Blueprint for Improved Federal IT Investment Management & Cross-Agency Collaboration and Information Sharing."

My name is Venkatapathi Puvvada (PV) and I am the Chief Technology Officer (CTO) for Unisys Global Public Sector. However, today I am honored to be speaking on behalf of the Industry Advisory Council (IAC) in my role as the Chairman of its Enterprise Architecture Shared Interest Group. Before I speak on our view of FEA, please let me briefly introduce IAC, its role, and activities.

IAC is an advisory body to the American Council for Technology (ACT), a membership-driven nonprofit organization established in 1979 with the purpose of leading the Information Technology (IT) community to improve government. ACT facilitates and encourages education, communication and collaboration across all levels of government.

ACT created the Industry Advisory Council in 1989, with the goal of working to improve communications and understanding between government and industry. Today, IAC is comprised of more than 400 private sector firms that provide information resources, management products and services to government. Our member firms include hardware manufacturers, software companies, systems integrators, consulting service providers, telecommunications companies and professional services companies, comprised of small and large businesses.

IAC's mission is to bring industry and government executives together to exchange information, support professional development, improve communications and understanding, solve issues, and build partnership and trust, thereby enhancing government's ability to serve the nation's citizenry. This is accomplished by providing a forum for the study and analysis of public sector management and technology issues, advising ACT on the possible impacts of industry trends on government technology issues, serving as a sounding board for changes to federal regulations, assisting in public relations and public affairs programs aimed at improving the health of government; and providing education and training to industry and government personnel.

Enterprise Architecture Shared Interest Group

As a part of this mission, IAC established the IAC Enterprise Architecture Shared Interest Group (IAC EA SIG) because of the crucial role of Enterprise Architectures in achieving improved citizen services, cross agency information sharing and effective mission fulfillment as the Federal Agencies continue their transformation initiatives. IAC has collaborated closely with the Office of Management and Budget (OMB) Federal Enterprise Architecture Program Management Office (FEA-PMO) and the Architecture and Infrastructure Committee (AIC) of the CIO Council in an effort to extend, enhance, and enable the Federal Enterprise Architecture (FEA). The IAC EA SIG is made up of a diverse range of thought-leaders, enterprise architects and solution architects with working knowledge and extensive experience in various aspects of architecture, IT governance and solutions implementation. Our focus and vision has been the following:

- ***Purpose:*** Establish a forum for government and industry to identify and candidly discuss Enterprise Architecture and issues related to it.
- ***Mission:*** Provide a practical implementation approach for utilization of the FEA Reference Models in alignment with the agency EA efforts.
- ***Objective:*** Bring industry best practices in EA and identify opportunities to support Federal government partners in articulating and enhancing the value of architectural approach.

As a part of fulfilling this mission, the IAC EA SIG successfully assembled industry best practices, views and experience into five white papers. The papers discuss the process, modeling, and implementation issues associated with the FEA and Department/Agency-wide EA. These papers are available at http://www.actgov.org.

We are very pleased to report that this work has been widely recognized throughout government and industry for its innovative insights, in-depth analysis and suggestions for practical approach to enable implementation of FEA and achieve cross agency collaboration and interoperability. Brief summaries of these white papers are attached in Exhibit A for your convenience. Currently, IAC EA SIG is actively working with the Office of Management and Budget (OMB), CIO Council, National Association of State CIOs (NASCIO) and Federal Departments and Agencies in providing its views and best practices on a number of initiatives related to FEA and EA. This includes our efforts to

enable approaches for collaboration and information sharing across various boundaries of the government at Federal, State and Local levels.

Mr. Chairman, on behalf of IAC, I owe a debt of gratitude to my IAC colleagues for their commitment and passion to help improve government by generously providing their valuable time, practical insights and expertise on their own initiative. I would also like to point out that most of our IAC EA SIG members are from small and medium businesses, bringing their innovative ideas and unique perspectives to these issues.

Enterprise Architecture: A Blueprint Analogy

Most often EA has been construed as a technical exercise, probably because the underlying concepts and benefits are not articulated in simple business terms. To address this issue as well as to set the stage for this discussion, we would like to simplify the EA concepts, nature and value through an analogy that is easily understood and appreciated by non-technical users.

Enterprise Architecture is very similar to the blueprints used everyday in county planning, community development, building design and construction. To deliver high quality of life for its citizens, this carefully planned and organized blueprinting ensures availability of common infrastructure, standards, codes, and processes resulting in economic vitality, collaboration and efficiency.

- The county planning level blueprint (as akin to FEA), at a macro level, specifies the roadmap of its enterprise with policies, standards, budget processes, and governance through a common shared vision for its citizens. This blueprint also provides a mechanism for interconnecting various communities as well as a framework for common infrastructure.

- The community level blueprint (as akin to agency EA) specifies the requirements, scope and the context of the community within its over-arching county blueprint. One is essentially zooming in on the details of a community needs, goals and transformational plans. This is typically done by the planners and policy makers by recognizing common design patterns and requirements; resulting in effective re-use of previously successful community architectures.

- The individual building design blueprint (as akin to solution architecture for a business line or a system) provides the detailed drawings and specifications

(through a common notation) so that a builder can construct a building with accuracy, consistency and is able to connect to the common infrastructure as specified in the community level blueprint. When an inter-operable infrastructure is clearly specified and available for connection, a building owner does not invest in his or her own expensive and redundant infrastructure or component such as an electric/gas utility plant, water treatment facility, sewer system or a telephone exchange. This allows for a faster and cost-effective way to develop and construct individual buildings while still ensuring high quality.

This analogy illustrates in very simple terms the value of Enterprise Architecture as a proven, carefully planned and collaborative method to achieve mission and business results consistently just as envisioned by the Clinger-Cohen Act and FEA.

Need for Federal Enterprise Architecture

In our view, FEA is very critical to the government to be able to achieve significant improvements in the way it conducts itself. The development of department, agency, and lines of business using a consistent Federal Enterprise Architecture style and process can provide a range of benefits. This is the only practical way cross-agency information sharing and processing can be accomplished. It provides a consistent basis for comparison of investment decisions by the department and agency business leaders and for use by the OMB and Congressional oversight organizations. It can provide a consistent method to make business oriented trade-offs and determine the expected and actual outcomes and performance changes based on changes in legislation, process, organizational structure, and the delivery of services to citizens, government, employees, and to other government agencies including state and local government.

Enterprise Architecture provides the information needed to incrementally or dramatically modernize and transform government based on the facts of how the services are delivered today and how they can be delivered based on changes in the business process, changes in the roles, responsibilities of people, and of course the focused use of technology. The set of Federal Enterprise Architecture activities along with those of states, local government and non-government organizations can create a blueprint for defining the transformation steps to deliver ~~of~~ more efficient and effective government services. There are many opportunities for improvement but the active use of an Enterprise Architecture as the implementation planning tool can help make "investment" and action decisions on where to put not only the IT dollars but more importantly where

to spend the "time and effort" of the government staff and the leadership based on those areas with the highest potential benefit and return on investment.

One of the benefits of Enterprise Architecture is to establish a governance decision-making framework that typically identifies re-usable business and technical patterns such as shared solutions and components, interoperable data management, and data sharing without having to start from scratch every time.

FEA Provides Transformational Opportunities

As is known from private sector experience, substantial use of an EA can and, especially the first time used, will lead to major transformation of an organization, its operations and its results. While IT enables the mechanism for implementing such a transformation, as with most human enterprises, it is the change process for the people involved that is the most critical effort. For this most important reason, the IAC EA SIG focused its first efforts, correctly positioning the Business Reference Model (BRM) as the central driver for change within the organization, with the Performance Reference Model (PRM) as the appropriate measuring stick.

However, there is no easy silver bullet that enables an organization to painlessly create and adopt an EA within the context of FEA. The creative involvement of affected stakeholders early in the process--so that both high-level executives and the employees at all levels have input and the feeling of ownership of the implementation of the EA--is essential for success in transforming an organization. Industry has learned many hard lessons, often more than once, in creating and implementing EA. Industry fully supports the FEA approach and through the IAC EA SIG, we are prepared to provide a means for the federal government to capitalize on these best practices as much as possible.

Status of the FEA Initiatives: Good Progress, But A Long Way To Go

Even with the Clinger-Cohen Act mandate, developing the framework for the diverse range of Federal entities to each define and implement their EA has been a significant challenge. We believe that the establishment of the FEA PMO and the development of the interlinked reference models are very positive and steps in the right direction. These reference models have the potential to form the basis for a common framework to improve IT investment management and enterprise-wide integration of business lines across agencies. OMB has led this effort very thoughtfully. They involved the stakeholders as the reference models are being developed and have gone through extensive discussion and revisions before they are published.

Even though initially, the need for FEA framework grew out of the realization that the eGov initiatives would benefit from some standardization in terms of approach, process and components; it allowed for significant progress in the quality of FY 2005 agency budget preparation and the subsequent OMB budget analysis.

The FEA initiative enabled the government to identify opportunities for improvement through business process integration with the five predominantly administrative/back-office Line of Business (LoB) such as Human Resource Management, Financial Management, Grants Management, Case Management and Federal Health. The General Services Administration (GSA) Office of Government wide Policy (OGP) is currently seeking industry input for some of these LoBs. This provides for an opportunity to have a common architecture approach for these LoBs in time to have a major impact on the FY06 budget recommendation to Congress by the Executive Branch. However, this integration effort will take a number of years to be implemented unless strong executive leadership, clear governance, and positive incentives are provided for agencies to collaborate.

Various departments and agencies are making good progress in maturing and aligning their EA in the context of the FEA. EA products are being used effectively by several CIOs as a decision-making framework in their capital planning, portfolio management, policy compliance, and IT governance. There is evidence of tangible results being produced by EA efforts at agencies such as the US Patent and Trademark Office (USPTO), the Executive Office of the President (EOP), the Department of Housing and Urban Development (HUD), the US Environmental Protection Agency (EPA), the US Agency for International Development (USAID), and the Department of Veterans Affairs (VA). We are monitoring and supporting, where appropriate, the continued progress being made on some major transformation initiatives such as the Department of Homeland Security (DHS) EA and the Department of Defense (DoD) Business Enterprise Architecture (BEA).

We would like to applaud the efforts of the OMB, GAO and the CIO Council in reaching out to industry in a real partnership mode not only to communicate their vision and plans, but also to seek ideas, input and expertise from us. We appreciate the leadership demonstrated by Mr. Mark Forman, Ms. Karen Evans, Mr. Bob Haycock, Mr. John Gilligan, Mr. Randy Hite, Ms. Kim Nelson, Mr. Dan Mathews, Mr. Marty Wagner and other executives for making this one of their top priorities.

We are very encouraged by the approach taken by GAO with their common EA Maturity Model Framework (EAMMF) to measure the progress of agency EA efforts in a very consistent and quantitative fashion. As illustrated by the recent survey, agencies have a long way to go to achieve the goals of EA; however we recognize that the agency EA efforts are maturing steadily. This improvement probably did not translate to an increased overall GAO EAMMF score as the current evaluation mechanism counts all or nothing rating for each factor and the progress at sub-factor level is not completely transparent.

Major Challenges Lie Ahead

We believe there are major challenges and obstacles that exist to be able to fully realize the intended benefits of FEA, especially for cross-agency collaboration and information sharing. Some of the major challenges that we see are:

- EA efforts must be adopted as the main enterprise transformation mechanism by the mission, program and business line owners. The EA context, direction, development and the underlying details must be clearly driven by each owner. Otherwise, the value of EA will continue to be perceived as a technical exercise for CIOs to manage their IT infrastructure. This is a significant challenge that must be overcome if the agency business strategies and goals are to drive the alignment of IT capabilities and initiatives.

- Lack of sufficient positive incentives for Federal Departments and Agencies to collaborate and develop common business process integration and secure information sharing are a cause for concern. This must be addressed quickly to enable a win-win scenario with the FEA and the Line of Business integration activities.

- While progress has been made in integrating and improving business processes and the underlying systems for the administrative and back office functions, there is not a major thrust on the core mission functions and this could limit the return on investments in architecture efforts.

- Lack of sufficient emphasis in overcoming cultural, organizational, leadership, transformational, and change management issues could limit progress.

- Lack of sufficient funding, key resources, and skills to lead and implement this effort across the Federal enterprise could slow the momentum gained so far and derail future progress.

- Security has not been tightly integrated into the EA efforts and will be a major obstacle for federal agencies to collaborate and share information securely while maintaining an appropriate level of privacy.

Critical Success Factors

There are several critical success factors for FEA to fully realize its potential benefits. We have highlighted some important factors below:

- **Timely completion and availability of the Data and Information Reference Model (DRM) is very important.** The ability of the Federal Agencies to understand and map to each other's data is a major factor in achieving the cross agency collaboration and information sharing. Data sharing has been difficult to achieve even in fully integrated private organizations. This must be given the highest priority within the FEA initiative in the short term.

- **Development and implementation of the "baked-in" Enterprise Security Architecture (ESA) aligned with FEA is paramount to the success of the initiative.** The basic essence of ESA must be to ensure privacy while allowing for secure information sharing across the boundaries of the government.

- **Continued maturity and commitment to leverage FEA (by OMB) and EA (by the Federal Agencies) as a management tool for budgeting and performance** management is very important.

- **Adoption of open standards that enable the consistent expression of EA artifacts so that they can be inter-operable and re-used is very important to the future viability of EA.** Some of these important standards are Meta Object Facility (MOF), Business Process Modeling Notation (BPMN) and Unified Modeling Language (UML) and the adoption of these into EA tools will accelerate the cross-agency collaboration.

- **FEA must be relevant and capable of adapting to emerging and future architecture concepts so that industry innovation is continually leveraged to improve government services.**

- A systematic way to achieve cross agency collaboration and information sharing could be through intra-department (agency) transformation initiatives that form the basis for proof points and lessons learned in a smaller scale. **Continued funding and support for these pilot initiatives could be a key factor in validating the emerging FEA models.**

- **More pro-active communication, detailed guidance documentation, exchanges and documented examples will be critical to implement the architectures successfully.**

- **The legislative branch has a key role to play in advancing this initiative as well.** We appreciate the pro-active and continual involvement demonstrated by the Government Reform Committee. We believe that articulation of legislative priorities and appropriation activities in the context of FEA would be very useful in advancing the maturity of Federal IT initiatives.

- Last but not least, industry has a major role to play in this as a government partner. **We strongly encourage that industry best practices, expertise and capabilities continue to be leveraged.**

Conclusion and Recommendations

Mr. Chairman, IAC is very supportive of the FEA initiative as a major priority and agrees with its general direction. We acknowledge the significant progress made by OMB and many of the federal agencies.

As we gauge the progress of this initiative by the two main subjects of this hearing, we conclude that:

- High marks should be given for progress on "A Blueprint for Improved Federal IT Investment Management" aspect of the FEA initiative.

- Major hurdles exist for the "Cross-Agency Collaboration and Information Sharing" aspect of the FEA initiative; however these hurdles can be overcome with commitment and leadership in stewarding collaborative efforts across agencies.

We applaud your efforts in keeping Enterprise Architecture initiatives as a priority and we believe that significant challenges must be overcome to stay the course.

We appreciate the continued partnership between the government and industry and believe that this model will enable the government to continue to leverage industry best practices, which will form the basis for future success.

Thank you for the opportunity to appear before you today and I will be very happy to answer your questions.

EXHIBIT A
SUMMARY OF IAC EA SIG WHITE PAPERS

www.actgov.org

1. Business Integration Driven by Business Lines

The first part of this paper discusses the needs for data modeling and how, with federation and modeling along business lines, the information and data models can evolve and be examined from a business centric point of view. This is not done from a purely technical perspective but rather from the perspective of the virtual "information communities" that share the common business goals within the lines of business that exist across various government agency boundaries. The process of gathering information into these communities is referred to as the "Federated Data Model." and is based on open standards such as Unified Modeling Language (UML), Meta Object Facility (MOF) and eXtensible Markup Language (XML).

2. Advancing Enterprise Architecture Maturity

This paper describes key lessons learned from successful Enterprise Architecture programs and the steps they have taken to achieve their success. Specifically, the report: (1) identifies successful Enterprise Architecture practices, and (2) provides recommendations for cross-agency documentation, evolution and where appropriate, sharing of successful practices.This paper presents a number of practices that have been successful in advancing federal government organizations through the Enterprise Architecture process as presented in the CIO Council Practical Guide to Federal Architecture. The practices, processes, and product artifacts presented/referenced in this white paper are intended to provide insights gained by IAC Enterprise Architecture practitioners, and to serve as a mechanism for strengthening EA efforts throughout government.

3. Business Line Architecture & Integration:

This paper presents an overview of a Business Line oriented Solution approach with both an overall process and top-level reference model. The process defined uses a community based funding strategy and multiple levels of involvement, from the executive team to business line leaders and technical leaders. The approach integrates concepts and approaches from many disciplines such as enterprise architecture, business process management, supply-chain management, cooperative information systems, federated resource and data management, component-based development, declarative and template development, and model-based architecture and integration. The paper proposes a model-driven architecture made up of a combination of commercial products and "open standards" elements based on both open source communities and academic research initiatives that are integrated into

concepts such as Business Line Development Environment, Business Line Hub and the Business Partner Gateways.

4. Interoperability Strategy Concepts, Challenges, and Recommendations

The purpose of this paper is to provide some background on the issues underlying the interoperability challenges, to shed some light on potential approaches to dealing with the problem, and to offer some specific recommendations, based on industry experience, that government at all levels can implement to rapidly address this challenge. The Industry Advisory Council (IAC) brings an industry perspective to the issues facing government and offers solutions that have succeeded in commercial settings that may be useful in addressing the issues facing government. These recommendations are "No Regret" proactive actions that our government should take to move forward. This paper represents a starting point, a basis for initiating a dialog on how to address the issues of interoperability and information sharing. Concepts and Context at its most fundamental level, the concept of interoperability is simply about making things work together. This can be accomplished in a number ways and this paper discusses various options and approaches.

5. Succeeding with Component-Based Architecture in e-Government

Industry's shift to Component-Based Architectures (CBA), a new Enterprise Architecture (EA) process for delivering applications, has fueled a tremendous amount of interest in the IT community over the past few years. With the search for the silver bullet that solves the continuing problems of integrating enterprise solutions as fervent as ever, IT organizations everywhere have jumped on the CBA bandwagon in hopes that it might finally ease the IT planning burden. As one might guess, it is not that simple. The purpose of this white paper is to provide a context for the rise of CBA, sort through the major issues, and provide guidance to the government business and technical managers so that sound business decisions can be made with respect to this key technology approach.

This paper outlines the challenges and enablers of CBA, and provides some guidance on implementing CBA in government organizations. These issues are discussed at a high level this paper and several recommendations are provided for government consideration.

EXHIBIT B

INDUSTRY ADVISORY COUNCIL
ENTERPRISE ARCHITECTURE SHARED INTEREST GROUP

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- ICHnet.org
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- Johnston McLamb Case Solutions, Inc.
- Knowledge Consulting Group
- KSJ and Associates Inc.
- LEADS Corporation
- Managed Objects
- Management Systems Designers, Inc.
- MCI Worldcom
- META Group
- Microsoft Corporation
- NCI Information Systems
- Open Systems and Data Solutions
- OPTIMOS Inc.
- ORACLE Corporation
- Pearson Government Solutions
- Price Systems
- Price Waterhouse Coopers
- ProSight
- PureEdge Solutions
- QSS Group Inc.
- RGII Technologies, Inc.
- SAIC
- Sapient
- SAS Institute
- SeeBeyond Technology Corporation
- Serendipity Consulting
- SI International, Inc.
- SiloSmashers
- SRA International
- Sun Microsystems Federal
- Sytel Inc.
- Tasman Networks
- Titan
- Troux Technologies
- Unisys U.S. Federal Government Group
- Vencal Global Solutions
- Vignette Public Sector & Education
- Webworld Studios
- Xaware Inc

Mr. PUTNAM. Thank you very much.

Our next witness is Norman Lorentz. Mr. Lorentz joined DigitalNet as senior vice president in September 2003. Prior to that, Mr. Lorentz served as the first Chief Technology Officer for the Federal Government at the Office of Management and Budget, where he was also the Acting Administrator for E-Government and Information Technology. While at OMB, Mr. Lorentz spearheaded the White House mission to overhaul the Federal Government information technology infrastructure and its processes. In driving this initiative, he directed the development of the Federal Enterprise Architecture. In addition, during his tenure with OMB, Mr. Lorentz was a member of the Chief Information Officer Council's Executive Committee and the recipient of numerous government and industry awards for his leadership and innovation.

You are a frequent guest of this subcommittee. We are delighted to have you back, and you are recognized for 5 minutes.

Mr. LORENTZ. It is nice to be invited back, and also members of the subcommittee. I am here today to talk about the progress that has been made on the implementation and operationalization of the FEA in OMB and the Federal agencies.

In my role as CTO of the Federal Government and OMB, I directed the development of the FEA. I believed then that the FEA provided a tremendous amount of promise in becoming the structure for governance for the effective development and management of information technology and other asset classes in the Federal Government, and I continue to advocate that today.

I would like to talk a bit about the current situation, what the value of the FEA is to the agency and citizens, the impact on the business plan process, the continuing challenges, and then, finally, success factors.

The FEA models are just about finished. The data reference model and the security profile that has already been discussed are about to be completed, and this framework will provide significant progress. The FEA really consists of two components: the framework outline in the FEA models, as well as the EAs that are in the agencies themselves. Without the connection between the FEA and the EAs, there is not a solid construct within which to make investment decisions.

In the past couple of years, and we have already discussed in quite detail, the GAO and OMB have provided assessment models. What I would say about assessment models is that they are necessary, but they are not sufficient. What is sufficient is the measurement of citizen and mission-centered results. These assessment models are used to describe a weigh station, not the end result. And, finally, OMB is using the FEA to identify high priority Lines of Business and consolidation in the context of those Lines of Business.

The value to the citizen is that the FEA provides visibility into the agencies' business and solidifies future business plans. It helps reduce the cost of current business processes by eliminating redundancies and improving the efficiency of IT investment. The outcome for the citizen is high-quality cost-efficient government services.

From an investment standpoint, the FEA supports the establishment of a portfolio approach to prioritize IT investments. Without the FEA, the Federal Government would not be able to prioritize in a collaborative manner in these investments addressing the highest priority for the citizen. From a governance standpoint, the FEA provides a holistic point of view; it gives both a business perspective in terms of the performance and business reference model, which is the "what" for the improvement, and then it also provides the more technically oriented reference models, which describe the "how." And from a technology standpoint, FEA provides a coordinated approach to reporting between OMB and the Chief Information Officer's Council is making significant progress in maturing the reference models.

The impact of the FEA on the business case process in OMB. Although the agencies have been making progress in the business cases, last year, the first year, the OMB issued guidance in A–11 that included specifics on the FEA. Doing so was a significant step. The agencies should provide similar guidance for consolidation opportunities in the context of the EAs.

The continuing challenges. Some agencies are struggling to implement the FEA. As OMB provides additional support in the reference model areas, this should be accelerated; in building and maturing EAs and gaining participation and ownership of the business areas. This is not a technology problem, this has been reinforced many times. This is a business problem, so it requires business leadership in the agencies; deputy secretaries, chief financial officers, as well as the chief information officer. There is limited up-front visibility in the detail of other agencies' EAs, and so the FEA provides the construct up front to be able to do those consolidation analyses. The target EAs for the agencies are limited in their forecast and scope. In other words, they cannot see very far into the horizon. And some agencies have separated EA and capital planning, and that is not sufficient.

Critical success factors. As an integrated governance model, a marriage between the business owner, the chief financial officer, and the chief information officer in making the business decisions.

To reinforce what my partners here have already said in terms of the chief architect position, it is necessary that we provide someone to that position who has both business and technology expertise. And, also, that OMB architect position is necessary, but not sufficient. There is further analysis resources that are required at OMB level in order to be able to do the cross-organizational analysis for transformation.

In conclusion, I have recognized significant progress, and we have heard that said here. There has been much that has been accomplished, but there is still work to be done. And, finally, in a futuristic scenario, right now the Federal Enterprise Architecture is being viewed to look at the IT asset class. But this business-oriented Federal Enterprise Architecture can also be used for the other asset classes: human capital and fixed assets.

Thank you for the opportunity to be here today, and I would look forward to your questions.

[The prepared statement of Mr. Lorentz follows:]

STATEMENT OF
MR. NORMAN E. LORENTZ
SENIOR VICE PRESIDENT
OF INTERGOVERNMENTAL SOLUTIONS FOR
DIGITALNET GOVERNMENT SOLUTIONS
BEFORE THE
COMMITTEE ON GOVERNMENT REFORM SUBCOMMITTEE ON TECHNOLOGY, INFORMATION POLICY, INTERGOVERNMENTAL RELATIONS, AND THE CENSUS U.S. HOUSE OF REPRESENTATIVES

May 19, 2004

Good afternoon, Mr. Chairman, Ranking Member Clay, and Members of the Subcommittee. Thank you for inviting me here to speak on the progress being made by the Office of Management and Budget (OMB) and the Federal Agencies in the development and "operationalization" of the Federal Enterprise Architecture (FEA).

Prior to joining DigitalNet, I was privileged to serve as the Acting Administrator of Information Technology (IT) and e-Gov as well as the Chief Technology Officer (CTO) for the Federal Government in OMB. In my role as CTO, I directed the development of the FEA. I believed then that the FEA had tremendous promise to become the structure for governance of the effective development and management of Information Technology in the Federal Government, and I continue to be an advocate for the FEA today.

My comments will focus on the current status of the FEA and the progress made to date:

- The value of the FEA to Agencies, and, more importantly, citizens
- The impact of the FEA on the business case process at OMB
- Continuing challenges faced by the Agencies and Departments in integrating their enterprise architectures and;
- FEA success factors.

FEA Progress and Status

The FEA Models are in the final stages of completion, with only the formal releases of the Data Reference Model (DRM) and the Security Profile remaining. Although new versions will be released over time, the initial framework will be complete, and I believe this is significant progress.

The FEA really consists of two components: the framework outlined in the FEA Models, and the agency Enterprise Architectures (EAs) that are linked to that framework. The first of these components will be ready with the completion of the FEA Models. Both components must be in place to have an actionable FEA – one that becomes a solid

construct upon which to make investment decisions. In our support of Government EA practices, we are finding that Agencies are making progress developing their EAs, but they have significant work ahead to mature and "operationalize" them.

One strong positive note is that the General Accounting Office (GAO) and OMB direction is consistent. In the past couple of years, both GAO and OMB have released complementary maturity assessment guidance related to the FEA. This is highly beneficial to the Agencies who are trying to do the right thing. Although the assessments are necessary to the FEA maturation process, they alone are not sufficient to measure success. The key FEA success criteria are citizen- and mission-centered results.

Finally, OMB is using the FEA to identify high-priority lines of business for detailed analysis and architecting Government-wide solutions (e.g., the line of business consolidation analysis).

Value of the FEA to Agencies and the Citizens

At a practical level, the FEA provides visibility into the details of an Agency's business and solidifies future business plans. Having this visibility helps the Agency make better business decisions, close performance gaps, and prioritize future investments aimed at improving mission performance. It also helps them reduce the cost of current business processes by eliminating redundancies and improving the efficiency of the IT infrastructure. The outcome is that the citizen receives high-quality, cost-efficient Government services in the following manner:

- ***From an investment standpoint***, the FEA supports establishment of a portfolio approach to categorize and prioritize annual IT budget requests and review IT program performance. The FEA has done more than any other Federal initiative to help Agencies begin to reduce the duplication of IT resources. With total investments in IT resources topping $60B in FY 2005, and with many Agencies becoming highly dependent on IT resources to accomplish their missions, the FEA represents a foundational element of IT portfolio management. Without the FEA, the Federal Government will not be able to prioritize investments in a collaborative manner such that these investments address the highest priority service needs of the citizen.

- ***From a governance standpoint***, the FEA provides the first holistic view of IT assets across the Federal Government in a way that maps these assets to lines of business and performance outcomes. This is essential to identifying where gaps in Federal services exist, at a level beyond that which individual Agencies can see. In terms of the Reference Models, the Performance Reference Model and Business Reference Model are the governance areas of the FEA and help agencies decide **which** business lines and processes require investments. The Technical Reference Model, Service Component Reference Model, and the Data Reference Model help Agencies decide **how** to select and manage investments to close performance gaps and improve effectiveness and efficiencies of the programs. Additionally, the FEA-related information that annual OMB submissions now provide on IT programs gives unprecedented levels of detail about how IT is being used in support of mission

functions. OMB is therefore in a better position to accomplish its oversight charter and provide IT leadership for the Administration.

- ***From a technology standpoint***, the FEA provides a coordinated approach to EA reporting and analysis by standardizing and unifying approaches between Agencies. The National Institutes for Standards and Technology (NIST) sets the standards that reside in the Agency's standards profiles. Also, the partnership between OMB and the Chief Information Officer (CIO) Council is making rapid progress on maturing these Reference Models and their use in the planning and management of investments. With further development and maturity, the FEA can provide a standard approach to IT solutions planning. Further, the e-Government initiatives (that are intrinsically tied to the FEA) are already providing solutions to citizen and industry service requirements on an accelerated basis.

The FEA also has helped to awaken the Federal sector to the increasingly sophisticated and complex service requirements from citizens, industry, and other Government Agencies. As more services are electronically provided, architectures to enable those services must reach well beyond current approaches, and the FEA is positioned to do that. Without the FEA, there is a real possibility that citizen/industry service expectations would not have been met with effective cross-government solutions for a number of years. This has been avoided, in large part, because of the FEA and its role in supporting all elements of the President's Management Agenda (PMA), but most significantly, Strategy Area Number 4 -- expanding E-Government.

The Impact of the FEA to the Business Case Process at OMB

Although Agencies have been making progress in improving their business cases and individual agency EAs, last year was the first year that OMB issued budget guidance in Circular A-11 that included specifics on the FEA. Doing so was a significant step forward in furthering OMB's ability to analyze the Federal Government's IT investments.

There is a great deal of business case work that is EA work, and vice-versa. FEA-related questions appear in both Part I and Part II of the OMB Exhibit 300 budget request document, which is central to the current approach to Federal capital planning and the business case process. The FY 2005 OMB Circular A-11 required a great deal more information about the intersections of EA and Capital Planning Investment Control (CPIC). A mature and actionable EA provides a great deal of input into the overall business cases within an Agency. There is a very structured crosswalk between elements of the FEA and the business cases. The Business Reference Model information provides data for the justification and description areas of the business cases, while the Performance Reference Model includes specific performance information that is included in the business cases in the areas of the performance table and the project and funding plan. Further, the Technical Reference Model and Service Component Reference Model includes information for use in the Alternatives Analysis, Risk Management, and IT Security sections of the business case.

The FEA information provides the construct for a robust technology analysis, which complements the robust financial analysis performed as part of the budget process.

This balance of financial and technical information is what is needed to make informed IT investment decisions, and the FEA has been structured to provide useful information for this process.

Continuing Challenges

Although significant progress has been made, both OMB and the Agencies face continuing challenges as they mature the FEA:

- *Some Agencies struggle with how to implement the FEA.* As OMB continues its effort to mature the FEA models and strengthens the documentation for FEA implementation methodology, Agencies will also accelerate maturity and implementation, and this problem will be resolved.

- *In building and maturing EAs, gaining participation and ownership by the business areas can be tough.* The business area leaders are the only ones who can articulate the details related to their business and define what success looks like. Without this foundation within the business and performance layers of the architecture, its use is limited.

- *There is limited up-front visibility into the details of other Agencies' EAs, thereby restricting early partnerships and collaboration.* When Agencies have investment needs, they refer to the FEA Models to identify other Agencies supporting the same lines of business. However, without details into other Agencies' EAs, beneficial collaboration opportunities are not always apparent.

- *Agency target EAs are often limited.* Because the traditional IT strategic planning processes look 3 to 5 years into the future, most target EAs lack long-term vision. Leading Agencies are beginning to use techniques such as scenario planning as a thought-stimulating technique to envision how their mission services can be delivered in the future.

- *Some Agencies still have independent EA and capital planning organizations with disconnected governance processes.* Because they are not integrated, the full benefit of the FEA is not achieved and may not be reflected in their investment decisions.

- *The CIO's influence on the budget is dependent on the strength of the Agency integrated governance process and the relationships between the CIO, Chief Financial Officer (CFO), and business leaders.* This is also true in the private sector, with technology being a key business process enabler. The value of the FEA is also dependent on the Agency's recognition of the CIO as having a leadership role regarding the IT budget.

FEA Success Factors

An Integrated Governance Model. Laws, new policies, new business needs, and emerging technology drive business decisions. The FEA provides the foundational construct to operationalize those business decisions, reducing duplication and

redundancy, and improving business efficiency and mission performance. Even when the FEA is technically complete, if not integrated with strategic planning, CPIC, security, human capital, and project management, it can not be leveraged at the right time by the right people to make the right investment decisions.

The OMB Chief Architect. Unless the OMB has a knowledgeable EA leader, the overall Government-wide momentum gained by the EA Programs over the past several years will be adversely impacted. The individual selected must be knowledgeable of both business and technology, and the position must be filled quickly.

Chief Information Officers. CIOs are central to the FEA success and should have the status and authority to use the FEA to influence IT investment decisions.

Budget Guidance. OMB now includes FEA guidance as part of the "Spring Guidance" letters issued during the budget process. The same practice should be mirrored within the Agencies. This would ensure that the FEA gains high-level attention as Agencies prepare their budget submissions.

Conclusion

I recognize the significant progress that has been made on development and implementation of the FEA framework. It is commendable, and it provides a solid foundation for the Agencies to integrate their individual EAs, resulting in an actionable FEA.

While much has been accomplished, there is still work to be done. Critical actions are needed to move the FEA forward. For example, I believe hiring a Chief Architect at OMB tops the list. Furthering the line of business consolidation analysis is also very important.

Finally, I'd like to close with a futuristic scenario. Imagine an FEA with not only IT assets linked to lines of business, but also human capital and other fixed assets, such as facilities, equipment, and vehicles. This expansion would revolutionize the budget process!

Mr. PUTNAM. Thank you very much.

Our final witness on this panel is Dr. Raymond Wells. Dr. Wells is the chief technology officer for IBM Federal and vice president, Strategic Transformations for the IBM Software Group's Application Integration & Middleware Division. In addition, he is on assignment to one of the U.S. Government's classified agencies. Prior to accepting the CTO Federal position in October 2002, he was Director of Strategy for 4 years. He has 35 years experience in information technology and has been employed with IBM since 1993. Dr. Wells has served in various administrations of the State of Alabama and as the Chief Financial Officer for the State of Alabama. He began the process of transforming the State's financial management systems. Later, as Chief Technology Officer, he completed the transformation, known as the Financial Resources Management System, the most integrated financial management system in the public sector at the time.

Welcome to the subcommittee, and you are recognized for 5 minutes.

Mr. WELLS. Thank you, Mr. Chairman. IBM appreciates the committee's invitation to speak today about the Federal Enterprise Architecture. Our message to the committee today is quite simple: the focus provided by the Federal Enterprise Architecture initiative of the Office of Management and Budget is sound policy. FEA is about leveraging technology to focus on strategic priorities. Enormous benefits will be returned to the Government and its citizens.

Enterprise architecture is a framework or a set of interlocking frameworks which has as its core the organization's mission and strategy. It is about the strategic management of technology resources which provides the substantiation and manifestation of efficient and effective business processes. This is paramount. Understanding the key business processes is a prerequisite for prioritizing and guiding information technology investments.

Perhaps no organization understands this better than IBM. Our own transformation has an obvious relevance to the business modernization efforts now in progress within the Federal Government. IBM underwent a major financial, competitive, and cultural transformation beginning in 1995. IBM refocused itself on the customer in the marketplace as the measure of success and recreated the company as an entity that could translate technology into business value.

The Federal Government finds itself in much the same situation as IBM 10 years ago, a vast, siloed organization with disparate information technology systems, a multitude of data bases and applications that didn't work with each other, and with complex and often competing business processes that hindered organizational efficiency.

IBM's own transformation required a fundamental reexamination of everything that we were doing. We consolidated and focused our business processes, improved our time-to-market by 75 percent, reduced business applications we used to run the business from 16,000 to 5,200, consolidated 155 data centers into 12, reduced 31 private networks into 1, went from 128 different CIO positions to 1; we have installed multiples of the IT capacity that we had in 1993 at roughly one third the cost. In short, we learned to manage

technology strategically and discovered it was less expensive and vastly improved productivity.

So enterprise architecture is about common processes and supporting systems based upon open standards which foster interoperability. Enterprise architecture also has the additional advantage of helping to create a unified culture within the agency. IBM's experience dictates one key facet for success: the key to enterprise architecture is sustained executive commitment and the strategic allocation of resources to key operational initiatives.

At the leadership and framework level, the Federal Government is approaching FEA correctly; there is a program office in place to manage the process, a management system is available which provides agencies the tools to assess enterprise architecture requirements and develop and implement their own enterprise architectures. Empirical knowledge and effective solutions are being captured so that the agencies can reuse and extend lessons learned, avoiding duplication and leveraging available resources.

As in any major transformation effort, there are areas for improvement. The examination of OMB's scorecard, as has been repeated here, shows some agencies moving more rapidly than others. In some instances this can be explained by the sheer complexity of the operational requirements and technologies that need to be mapped. What is needed is more agency leadership on enterprise architecture implementation and more discipline with respect to strategic IT investments. We still see far too much in the way of tactical investment in technology.

Consider the Department of Defense, with over $1 trillion in assets and an annual budget of roughly $400 billion and 3 million military and civilian employees, global missions, facilities and suppliers. DOD is obviously the world's largest and most complex enterprise. DOD's enterprise architecture is the largest, most complex, and most pervasive enterprise architecture developed to date, either in the public or private sector. Historically, the Department's services and agencies have used individual procedures with multiple systems to support those procedures. This limits DOD's ability to provide timely, accurate, and reliable business and financial management information, and creates a higher than necessary cost for performing the business of defense.

IBM, along with others, has delivered to the DOD the first stages of an enterprise architecture that will help transform and modernize key business operations. Developing this framework has been and remains a massive undertaking, involving over 2,000 information systems and many thousands of business processes. Hundreds of existing policies will change, dozens of systems will be modified, more than 1,000 existing systems will be sunsetted, and more than 100 new systems will be implemented.

A key component of any agency transformation involves cultural change. You can't do business the same way. Moving to a common agency enterprise architecture and the infrastructure it fosters will contribute to building agency culture. However, sustained commitment of top management officials is required for success.

Enterprise architecture is an enabler of the transformation of government. Enterprise architecture provides the basis for evo-

lution from tactical to the strategic management of technology assets and significant transformation and operational processes.

Mr. Chairman, thank you for the opportunity to discuss our views and experience with you. I look forward to answering any questions you may have.

[The prepared statement of Mr. Wells follows:]

Testimony of Raymond B. Wells, Ph.D.
Chief Technology Officer
United States Federal
IBM Corporation

Submitted to the House Government Reform Committee
Subcommittee on Technology, Information Policy,
Intergovernmental Relations and the Census
May 19, 2004

Mr. Chairman and Members of the Subcommittee, I am Raymond Wells, Chief Technology Officer, U.S. Federal Industry and Vice President of Strategic Transformation for IBM's Software Group.

IBM appreciates the committee's invitation to talk about Federal Enterprise Architecture. We are pleased to submit this written testimony for the committee's record.

My message to the Committee today is rather simple. The focus provided by the Federal Enterprise Architecture initiative of the Office of Management and Budget is sound policy. It helps agencies leverage their technology and their operational processes to focus on strategic priorities. This will be of enormous benefit to the government, citizens and vendors.

Simply put, an Enterprise Architecture is a framework, or more specifically, a set of interlocking frameworks that must have at their core the organization's mission and strategy. The framework will define the infrastructure and technological capabilities that the organization requires, as well as the business processes and data it needs to accomplish its mission. At a high level, we have a technical architecture and a business process or business reference architecture; and, to reiterate, both must strongly reflect and be aligned with the organization's mission and strategy.

An agency preparing its Enterprise Architecture should avoid considering it to be an academic exercise or an obstacle to be overcome in the acquisition process. Key business processes should guide and provide the priority for information technology investments. Enterprise Architecture is not about technology. Rather, it is about the strategic management of technology resources to provide the installation and manifestation of efficient and effective business processes. Tactical management of technology is excessively expensive; EA provides the framework for strategic allocation of information technology resources.

The Office of Management and Budget's Federal Enterprise Architecture (FEA) begins with a correct assumption. An Enterprise Architecture is more than technology or processes. It is strategic. It must be continually assessed and actively managed in order to align the organization's vision and its information

technology investments, and to facilitate the achievement of the Agency's initiatives, and, ultimately, its mission.

Technology's primary purpose is to act as an enabler of efficient and effective processes. The use of information-systems technology has evolved from the automation of simple but repetitive tasks to the management of complex business and mission processes today. Most organizations can no longer function if automated systems are unavailable.

Now technology is shifting to become a key component of service delivery.

Industry discovered during the 1990's that a paradigm shift had to occur in the management of information technology assets. They needed to be managed as a strategic asset not a collection of tactical assets. A generation of easily deployed technologies resulted in the proliferation of hardware and software assets managed by different organizational entities with various levels of expertise.

The result was extraordinary inefficiency in the application of technology assets and a resulting inefficient cost structure.

International Business Machines Corporation, by focusing on using technology to enable core business processes has reduced its cost structure significantly, allowing us to use that money in the pursuit of core business purposes.

The lesson is simple: the strategic management of technology assets, aligned to core business processes, is far less expensive and far more productive.

Let me elaborate further on IBM's transformation in the utilization of technology, and show its obvious relevance to the business-modernization efforts in progress within the Federal Government.

IBM's Business Transformation

IBM has undergone a major financial, competitive, and cultural transformation since 1993. That year, a new vision took hold within IBM that sought to refocus on the customer and the marketplace as the measure of success, and recreate the company as an integrator that could translate technology into business value.

The need for this transformation was self-evident: In 1993, our stock price hit a 20-year low. We posted an $8.1 billion loss. We failed to recognize fundamental changes in the marketplace and saw our profit margins evaporate. IBM operated 24 separate business units, which together sold more than 5,000 hardware products and 20,000 software products. Efforts at cost-cutting and efficiency were dampened by our size and complexity of our operations.

IBM's transformation began with a fundamental examination of everything the company was doing and the processes by which the enterprise was being run. Cutting costs and driving common processes and systems across the entire global IBM organization became the key to going to market as One IBM. Among our efforts:

- Internal Business Processes -- By consolidating and focusing on our internal business processes, IBM improved our time-to-market by 75 percent. This saved more than $9 billion.

- Software Applications -- Prior to our transformation efforts, IBM ran more than 16,000 unique software programs. Now that number is less than 6,000.

- Infrastructure -- Within IBM, we consolidated 155 data centers, 128 CIO positions, 31 private networks and hundreds of different PC configurations into: 12 data centers worldwide; one network; four PC configurations; and one CIO.

These were but a few of our internal accomplishments.

As a recent IDG case study put it, "Since IBM embarked on its business transformation nearly a decade ago, the company has gone from a collection of siloed business units to an agile and integrated enterprise focused on the customer."

IBM has seen direct business results from this transformation:

- From 1994 through 2003, IBM's e-business transformation efforts have realized $17.4 billion in cost savings from $6.4 billion in investment.

- From 1993 to 2003, IBM reduced IT spending by 31 percent, while increasing our IT resources about 2.5 times (since 1996) to support new applications and processes, additional workload volume, enhanced functionality and acquisitions.

- We have continued to move procurement to the Internet, now purchasing some 95 percent of goods and services electronically, generating more than $400 million in cost avoidance.

Now we have taken our EA-enabled transformation a critical step further: creating the e-Business On Demand model that we believe will be the driving force in global business in the near future and beyond.

An on-demand business is an enterprise whose business processes -- integrated end-to-end across the company and with key partners, suppliers and customers -- can respond with agility and speed to any customer demand, market opportunity or external threat. An on-demand business:

Is **responsive** -- responding almost intuitively to dynamic, unpredictable changes in demand, supply, pricing labor, competitors' moves, capital markets and the needs of its constituencies -- customers, partners, suppliers and employees.

Uses **variable** cost structures and adapts processes flexibly. This flexibility will enable it to reduce risk and to do business at high levels of productivity, cost control, capital efficiency and financial predictability.

Is **focused** on its core competencies, its differentiating tasks and assets, while tightly integrated strategic partners manage selected tasks -- from manufacturing, logistics and fulfillment to HR and financial operations.

Is **resilient** enough to manage changes and threats -- from computer viruses, to earthquakes, to spikes in usage -- with consistent availability and security.

IBM believes that as governments, including the United States and its agencies, adopt and embrace the on-demand model, our leaders will be enabled to see and manage their agencies as an integrated whole, central to the transformation process.

What are the Benefits of an Enterprise Architecture?

The IBM story has obvious parallels to the federal government's EA efforts. That brings us to the benefits of the Enterprise Architecture. The primary benefits of an Enterprise Architecture are to move toward common processes and systems, department-wide and cross-agency where appropriate, and to foster more efficient communication, collaboration, and cooperation, through shared business processes and information. It also has the additional advantage of helping to create a unified "culture" within the agency.

A living Enterprise Architecture:

- **Provides a migration path to get to the strategic infrastructure / capabilities**
- **Facilitates program planning and acquisition decision-making**
    - Use and reuse of common components
    - Utilizes consistent frameworks, blueprints, process models, technology
    - Prevents duplicate data being created/deleted by multiple processes
    - Facilitates a simplified technology infrastructure
    - Makes it easier to mix and match, and to use best of breed solutions
    - Impact of changing process or technology can be evaluated

Improves time to program implementation

- Better identification and clarification of scope of project start
- Uses a structured approach to management and development
- Improved communication through a common approach (frameworks, blueprints, processes)

- **Improves resource allocation**
  - Assists in preventing process or technology gaps and overlaps
  - Creates a more flexible technology infrastructure that is transparent to the user
  - Includes allocation of people, time, and money
- **Facilitates continuous improvement**
  - Technology changes and upgrades are hidden from the users
  - Able to apply any new programmatic or process scope requirement
  - Metrics and measurements are designed into the process
- **Provides more flexible and robust, integrated processes and applications**
  - Includes integration of security and privacy elements into the framework and processes
- **Assists prevention of unnecessary organizational role development**
  - Uses consistent roles and relationships

What are the keys to implementing a successful Architecture Management Process?

- Proper organization and staff must be in place. EA organizational alignment with the functional organizations is key.
- Clear ownership of the Enterprise Architecture at each level, with specific process owners, component leaders and department and agency participation
- Active sponsorship and championing including visible management support from Senior Officials

- Proper level of resources (people, tooling, etc.) must be obtained and sustained to support all priority transformation operational initiatives.

  An Architectural Management Process, such as the Federal Enterprise Architecture Management System (FEAMS) needs to be clearly defined and understood. The process must be flexible enough to adapt to departmental needs and changes as necessary. It must be a dynamic process that adds real value to the agency, not just something to be ticked off on the checklist.

- The organization must have effective communications and distribution of the process. The Enterprise Architecture must be constantly and consistently marketed by the staff and departmental leadership. The process must be built into the culture of the agency and its mission.

What is the Federal Government Doing Right?

I would say that at the leadership and framework level the Federal Government is approaching FEA in very much the right way. The Architecture has been defined (all 5 major elements of it), there is a program office in place within OMB to help manage the process, and there is a Management System (FEAMS) now available that gives agencies the tools to assess their requirements and to develop and implement their own Enterprise Architectures. FEAMS also includes a repository of process solutions from other agencies that can be reused or extended, to avoid duplication and to better leverage available resources.

At the OMB level, and from an outsider's perspective, it would appear that the process is being well enforced. EA-related submissions are required as part of agency budgetary requests, whether programmatic or IT, and help to define the value and results expected, and how the proposed expenditures fit within the strategic framework.

As part of this process, OMB has given the agencies a high-level framework, along with tools and guidance, to do Enterprise Architecture Assessments. Among other factors OMB considers are the maturity of an agency's EA, including the status of the agency EA development, and how capable the EA is of being able to guide the agency's strategic investments. A successful EA implementation will give the agency an extremely powerful mechanism to enable successful transformation in achieving the agency's mission.

The other major factor: how is the agency EA being integrated with the broader FEA model. Consistency with the broader FEA model is important for broader collaboration and information sharing, as well as for cross-agency solutions.

The annual Exhibit 300 performance review requirement establishes metrics for how an agency is progressing in its strategic implementations, and what value has been created by its actions, including those in developing and implementing

its EA. This creates quantitative assessments that demonstrate both value and good management. Agency EA progress is further monitored through the quarterly scorecard reviews.

Is there room for Federal Government improvement in implementing the FEA?

The opportunity for Enterprise Architecture improvement is not one that is limited to the Federal Government, but since that is the question asked, I'll answer, yes, there is room for improvement.

I believe the question is not, is the right framework and management guidance in place through the efforts of, among others, OMB, the Federal CIO Council, as well as legislative guidance and oversight by the Congress. I believe that framework and guidance is good. What needs to be done now is to assure that departmental and agency leadership have bought into the EA process and are driving their organizations accordingly.

What we see, if we examine the OMB scorecards, is that some agencies are moving much more rapidly than others in developing and implementing their EAs. In some instances, this can be explained, not by a lack of interest or leadership, or by a lack of actual hard work, but by the complexity of the technological capabilities and operational requirements that need to be mapped. As an example, one only needs to look at the very good work the Department of Homeland Security is doing to determine how great is the effort needed to identify these requirements and to create an architecture to integrate the technological infrastructure and processes of the 22 component agencies of that department.

The Department of Defense Example

Perhaps no better example exists of the challenges facing the Federal Government than that of the U.S. Department of Defense. With over $1 trillion in assets, an annual budget of $378 billion and 3 million military and civilian employees, as well as global missions, facilities and suppliers, DoD may be the world's largest and most diversified enterprise. Therefore, the DoD's enterprise architecture is the largest, most complex and most pervasive enterprise architecture developed to date, either in the public or private sectors.

Historically, the Department's Services and agencies have used many individual procedures to conduct their work, as well as a multitude of systems to support those procedures. Most of these business processes have focused primarily on the Services' and agencies' own operations. This has placed limits on DoD's ability to provide timely, accurate, and reliable business and financial-management information, and to share information. This, in turn, has created higher-than-necessary costs for performing the business of defense.

In April 2002, as part of its Business Management Modernization Program (BMMP) the U.S. Department of Defense (DoD) contracted with IBM, working with other subcontractors, to develop a framework to transform and modernize the way DoD conducts all of its business operations, including strategic planning and budgeting, financial management and accounting, installations and environment, human resources, logistics and procurement. This framework has four main keystones: 1) A "to-be" DoD Business Enterprise Architecture; 2) A capabilities-driven Transition Plan; 3) Portfolio management and system assessment; and 4) A transformation governance and champion organization. Developing this framework has been and remains a massive undertaking involving over 2,000 information systems and many thousands more business processes.

I want to focus on the Business Enterprise Architecture, or BEA, which has been created from the many capabilities and thousands of business processes I mentioned. The BEA model represents the enterprise end-to-end operational processes and activities, information exchanges, and the corresponding systems and technology requirements, that is, it identifies the "to be" capabilities. The model is executable because it provides a clear template for programs, solutions, and other key operational outputs that enable the end-to-end missions of DoD Services and Agencies. The operational results of these BEA-compliant programs and solutions will collectively achieve DoD's Enterprise strategic goals. The BEA model is also executable because it facilitates the development of a Transition Plan based on BEA-based strategic capability needs. Finally, the BEA model is executable because an acquisition and management system can be put in place to oversee the Transition Plan.

To give you an indication of the scope and complexity of the effort, it took a year to develop the initial version of the Activity Model of the DoD Business Enterprise Architecture, which was delivered, on schedule, on May 1, 2003. This Activity Model is part of the "to be" view of the architecture that will drive DoD's business operations in the future. The Activity Model depicts more than 740 activities, 2,589 information exchanges, 9,946 definitions, 76 data stores, 1,081 business rules, and 4,020 business and financial requirements.

Culture change is a key component of BMMP. Hundreds of existing policies will change. Dozens of existing systems will be modified. More than 1,000 existing systems will be phased out and more than 100 new systems will be implemented.

The Business Management Modernization Program will enable DoD to provide greatly improved support for the warfighter. The program will aid DoD in a vast array of tasks, from the mundane, such as issuing supplies on time and with reduced paperwork – to those critical to our country's defense, such as identifying chemical warfare experts through an integrated employee information

profile, or pinpointing what munitions are available at any given place at any given moment. It will also help the Department to accomplish its primary goal to achieve a Clean Audit Opinion by 2007.

The DoD Business Enterprise Architecture is just the first step on a long road to transformation. Results and change are often evolutionary, not revolutionary. In building the BEA, we are developing a Defense-wide information technology infrastructure that will include all appropriate system requirements associated with critical infrastructure protection and information assurances to ensure consistency with DoD's Joint Technical Architecture. The architecture is still evolving and will be updated continually. Further business process re-engineering and definition of data requirements can be expected in the future.

Furthermore, realizing that there must be an active and implementable plan of action, we are taking steps to ensure that the transition plan correlates with the architecture and that it contains measures that help us control future investments in business systems. It will also encourage retirement of outdated legacy systems as quickly as possible.

BMMP Accomplishments

While we have indeed encountered challenges implementing BMMP at the Department, we are already seeing measurable results that have positive impacts on the Department's business processes and capabilities. These successes include the following:

Developed and implemented a broad-based program strategy.

Created initial versions of a Business Enterprise Architecture (BEA) and a Transition Plan.

Established a Department-wide governance structure for business transformation.

Outlined a portfolio management process and corresponding system-assessment process design.

Developed the methodology for business processes reengineering and modeling.

Provided extensive support for business process reengineering in the target areas.
Developed an initial inventory of business systems.

Identified relevant accounting and financial rules and requirements necessary to correct material weaknesses in the Department's Financial Statements and the corresponding financial transactions.

Identified the basic template for a Standard Accounting Code Structure. Developed the template and pro forma entries for implementation of a Standard General Ledger.

Developed an initial Business Process Reference Model to use as a starting point for Business Process Reengineering and Modeling across the Department.

Challenges/Lessons Learned from the DoD BMMP Activity

IBM is aware that adapting transformation models from the private sector to the Federal Government structure is not easy. At DoD, given the shared military and civilian leadership, the culture differences among the Services, varied infrastructure stages of development, existing policies and past practices, delivering a top-down model for implementation is formidable. The breadth, depth and different missions, compounded by national and international interests, add further complexity. There will continue to be a need for change management and individual Service involvement in the planning and execution stages of the BEA development and implementation, just as there is with other agencies, and in the private sector. Further, as ongoing DoD transformation activities emerge that must be considered and integrated into the enterprise architecture, we and DoD will work with all interested and affected stakeholders to receive their support and ideas to enhance the BEA and expand it to include all relevant transformation activities.

Conclusion

We believe the focus on Enterprise Architecture is a key process in the United States Government and its Agencies being able to achieve the same results.

Total cost of ownership of providing technology is the only true measure important. Typical considerations exclude so-called hidden costs. Many focus on the highly visible cost of acquisition of hardware, software and bandwidth. In most industry activity based cost analysis, the human capital costs exceed the technology cost. Certainly that is true in many federal agencies today.

The focus on the Enterprise Architecture process should be the basis for evolution from the tactical, even sub-tactical, management of technology assets within the Federal Government to a more strategic focus. The Federal Enterprise Architecture provides a foundation for governmental transformation which will enable agencies more effectively to accomplish their missions by strategically leveraging their information technology investments and operational processes.

Thank you for the opportunity to discuss or views and experience with you.

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Mr. PUTNAM. Thank you very much, Dr. Wells.

We will begin with some questions for the entire panel, beginning with Dr. McClure. What is the Federal Government's shining achievement in this area? What is the key area where we can hang our hat and say we have actually made some real progress here?

Mr. MCCLURE. Mr. Chairman, I think just looking back 5 years or more and seeing where we are today, despite the fact that those bars on those charts look dismal, we are, believe me, much further ahead than where we were previously. There is agreement on frameworks, there are a lot of available tools, we have a common assessment process that GAO uses that the industry and the agencies accept to a large degree, and we are seeing progress. It is, I think, a tough area, as Dr. Wells just said. The complexity of what we are doing in the public sector environment, particularly at the large department level, can be a little overwhelming at times. I think there is good news here as well in that progress is being made and that we do have some agencies that have done some absolutely fabulous jobs putting architectures together.

The other shining light is the FEA. I think it represents a world-class view of trying to look at how government functions. And for the first time we have a clear picture of the real possibilities of operating government in a different way, and I think that is a very significant achievement.

Mr. PUTNAM. Mr. Puvvada.

Mr. PUVVADA. I concur, Mr. Chairman. I think one of the biggest improvements that we have seen is that agencies are now beginning to think about enterprise architecture at the start of a system development process or the start of an investment management process. So from that perspective, that is a significant change in terms of behaviors, in terms of incentives there. There are aligning IT strategic plans, investment review boards, and business case and budget submissions. We have seen good leadership from OMB. We are obviously concerned about lack of resources, as we talked about earlier, but this has been a priority and this is going to take time to get to see most agencies show up in stage 5 category, but we are really positive about the progress that has been made, and a lot of agencies are actually looking at the first thing that they do this transformation through architecture.

Mr. PUTNAM. Mr. Lorentz, do you wish to add anything?

Mr. LORENTZ. I think the one thing that sticks with me, I didn't keep track of how many times in the course of the testimony to this point that we have referred to this problem as a business problem, not a technology problem. I have to tell you 3 to 5 years ago we probably would not have had that conversation. That is being shown in significant behaviors by business leaders, deputy secretaries. Just look at the five initiative, the President's initiatives, all business oriented, and E-Government enables the other four. So it is really the understanding that we are trying to solve a business problem here.

I sometimes think back to the CTO experience. It should have been chief transformation officer instead of chief technology officer, because I would say 99 percent of the time that I spent in that position was spent on non-technology issues. It was about business mission roles and outcomes. So I think the real major progress, cer-

tainly the FEA I happen to believe is a great "how," but the real issue is mission citizen-centered real business problems.

Mr. PUTNAM. War Eagle.

Mr. WELLS. War Eagle.

I agree completely with Norm's assessment. The change in focus is the correct change, that is, that we are focusing not on IT as a cost center; how much are you spending on X. It should be how much are you spending on X to improve a certain process. So this change in focus I think is the primary success of FEA and the enterprise architecture initiative in the agencies. This is a management problem, it is not an IT problem. It is a management problem, and focusing the assets strategically to be addressed to the mission and processes of the agency itself.

Mr. PUTNAM. Well, you have used a number of examples from your IBM experience and you talked a little bit in your opening testimony about the scale of a department like Defense. What lessons can we draw from the private sector that do apply to something as mammoth as the Federal Government?

Mr. WELLS. The Federal Government has, as most businesses, historically managed information technology either tactically or sub-tactically. By changing to a focus of managing It as a strategic asset to enable the business transformation, we have discovered that it costs a heck of a lot less. I know agencies in town that actually have too much money. And when you have too much money, you can waste it.

IBM ran out of money in 1993, and we had to fundamentally reassess our business. And so when we started managing technology, we took the toys away from everybody and started managing those toys as strategic assets. And for a technology company to take toys away from its employees represented a massive cultural change that had to be managed from the top. But when we did it, we found out we could consume a lot more resource, a lot more, multiples of what we used to consume, with fundamentally much less investment.

Today, the IBM Corp. has no paper processes. I could not even remember the last time I touched a piece of IBM business paper. We manage our business electronically. We have substantially reduced the cost of our support staff, we have substantially increased our own productivity, and we are spending a heck of a lot less. It is a fundamental change in looking at technology as a strategic asset to be managed by senior management, not by the IT staff.

Mr. PUTNAM. Mr. Lorentz, you are back in the private sector. Would you like to comment on the lessons we can pick up from the private sector that apply to something as large as the Federal Government?

Mr. LORENTZ. Well, it is interesting. Recently I have had the opportunity to talk to some private sector CEOs, and a lot of them are taking significant interest in the technology investment, and so that the CEOs are actually saying I need to understand the technology injection because technology now is improving their product line and business processes. Any conversation in the boardroom with the CEO includes whatever the chief technology is, CIO, CTO, as well as the chief financial officer. So the fact that we are putting this construct in place in the Federal Government will, I think as

a leading indicator, the leadership piece of this is a leading indicator to the progress that we can make.

And I certainly support what Dr. Wells was saying. What has to show up now is consequences. Transformation does not occur without consequences. There needs to be more significant analysis done of the cross-agency, cross-organizational opportunities for consolidation, and then the agencies and the Federal Government need to go on a collaboration diet. And that means that they get the money to do the collaborative initiatives and they do not get the money to do the one-offs. And it is not a bottoms-up experience, it is a top-down experience.

Mr. PUTNAM. When you say consequences, are funding issues the best consequence?

Mr. LORENTZ. Absolutely.

Mr. PUTNAM. The only consequence?

Mr. LORENTZ. Yes, certainly. If you take away the resources for—you know, when I was in OMB, I think at the time we did the grants analysis, we had 17 grants engines. OK? You can argue whether we need one. You can certainly believe we don't need 17. And so on the face of it, it doesn't hold water. And, by the way, that means we are spending an extraordinary amount of money doing the analysis down in the vertical and not as much money doing the EA FEA cross-organizational analysis. With that improved analysis and data and the engagement of the leadership, which would be the PMC, the deputy secretaries in those issues, and driving those budget conclusions, then the transformation will occur.

Karen was describing earlier the areas, financial management, human resources and so forth, where they are doing that kind of analysis right now. That is where I think we have the near-term opportunity to exhibit that leadership.

Mr. PUTNAM. Mr. Puvvada would you like to comment on that line of questioning, the lessons learned and the consequences?

Mr. PUVVADA. Digging a little bit deeper into lessons learned, where we find agencies succeed is where they really focus on target architectures. We have a hard time, a lot of times, our folks, when they are working with agencies, convincing agencies not to get too much into documenting technically, as is architecture. So in terms of where the Government needs to be is focused on the target architecture in the context of how do you improve the business and citizen services, as you articulated at the beginning of this hearing. And then taking that target architecture, because it tends to be conceptual because you are, again, not there in terms of implementation, take that transition plan and talk about how that would be integrated into standard business processes. It is not a separate plan, it needs to be institutionalized. I think that is when we are going to really see some results.

One of the things that is not quite evident is that the reason why we are not seeing results is that it is a process where we all understand now that we need to build architectures, we need to think architectures. Now, we are just beginning to see the results. I think as we see more and more of these successes, then we understand a little bit more about how to optimize the cycle of going forward in making some investment decisions as well as implementations.

So it is a lot of work to be done, like we talked about before, but I think positive incentives and focusing on the right area, not necessarily documentation for technical purposes, I think will get us there.

Mr. PUTNAM. Dr. McClure.

Mr. MCCLURE. I can echo a lot of just what has been said. I think it all begins at the top. If you don't have the executive commitment, or even interest in this, it is not going to be successful. That is certainly learned from a lesson learned.

I think, too, disciplined processes have to be in place. Successful organizations, public and private, are ones that find the ways to do things that bring value to what they are in business for, and they repeat them and they institutionalize them; and that is very important as we move forward. The business and performance focus of architecture is what this is all about, and I agree totally with Norm that is the value that we are getting out of this right now.

And two other lessons learned are governance and tools. Don't try to do this unless you have a governance process, because we have spent decades of writing architectures on paper but never putting them in place or enforcing them. And the other is tools. We have some good tools that are available to do enterprise architecture work, but we have to have people that know how to use them. So getting the right skills in place, whether it is inside Government or through the assistance of contractors, is really key for success.

Mr. PUTNAM. The contractors point is an interesting one. What challenges or successes or lessons learned from our contractors' experience can we apply to this enterprise architecture improvement process? They certainly have a big role to play in this. What do we learn from their experience? Anyone.

Mr. PUVVADA. One of the things that we have to do a better job of is simplifying this whole enterprise architecture and its concepts. Typically, we don't do a good job of explaining what it is, to the point where business lines look at this stuff and say that is technical. So we need to do a better job of articulating in very simple terms, very clear terms, here is how you can develop a road map for your business goals and business performance.

Generally, from a contractor point of view, the biggest challenge out there is to find skilled enterprise architects; not just within the Government, even for us. It is an evolving discipline, and it requires not only technical skills, business skills, but the articulation of that, because you are facilitating a business transformation on a regular basis. So we are working hard. Member companies that I represent are working very hard in getting better at these skills so that we can support the Government.

Mr. PUTNAM. This whole notion of cultural change keeps coming up. Everybody has mentioned it in some form or fashion. How do we tackle that challenge? How do we really fundamentally change the culture? And we will begin with Dr. Wells.

Mr. WELLS. Senior management has to provide sustained commitment. I have witnessed several attempts at transformation in the last few years in this community, and it is easy to get a senior manager to articulate the requirement for cultural change. The words flow easy. But then it requires changing behavior and enforcing the behavioral change. And this requires somebody that is

going to be around for a while, going to enforce. Norm said there has to be consequences. There has to be consequences for not changing behavior. Those consequences can come from within the agency or they can be encouraged by the Congress. But there certainly has to be sustained executive commitment to enforcing behavioral change; otherwise, it will never happen. It cannot bubble up from the bottom.

Mr. PUTNAM. Mr. Lorentz.

Mr. LORENTZ. Just to reinforce that, transformation does not come from an internal source. In the private sector it generally comes from a marketplace intervention: you either change your organization or you become extinct, or you have a leader that becomes unreasonable and says this is the way I am going to run the enterprise. So we have to figure out what that looks like in the Federal Government.

Certainly the President's management agenda, good fundamental blocking and tackling management practices, is an excellent start. We have some good codification in law, so regardless of which of us comes and goes, there is actually those permanent positions in place. We need to put people in career positions that can, for instance, the architect position and also in the agencies that can continue to maintain the processes while the necessary leadership changes are occurring.

But it really does come down to what Ray was saying. You have to have leadership ownership, business ownership, and there has to be consequences to actions. The nearest term thing to that in the Federal Government is certainly the budget, but also in the private sector there are other methods that can be used.

Mr. PUTNAM. Mr. Puvvada.

Mr. PUVVADA. If you go back to the enormity of why we need the culture change, Government and lots of private organizations, as a matter of fact, have been so much used to thinking in the context of an organizational structure. So now what we are talking about is going beyond the organizational structure, so the order of magnitude of culture change that is required is enormous. It is going to take different steps, different stages similar to the maturity that has been talked about here. Norm certainly addressed the "who" part of it; you have to have some change agents, whether they are from within the Government, from outside.

I think what will go a long way in impacting the culture change is really some real success stories and the eventualization of those success stories, and real results to go with it. So we really need to see results come out of this initiative and to be able to articulate that value in terms of business and government performance and relate to citizens' expectations. So it is not an easy thing to do. Like Norm said, in the private sector your existence is at stake if you don't change. In the Government, our security is at stake if we don't change. So we have the similar challenges that the private sector continuously goes through, but it is going to take a long time for the culture change to occur.

Mr. PUTNAM. Dr. McClure.

Mr. MCCLURE. I would agree. I think you need a combination of strong levers. Maybe you need a baseball bat. Some people just will not fall in line until there is some real pressure brought to bear.

But I think you have to counterbalance that. You can't do that in the Government just with a forcing function. You have to incentivize change. And I think PV is right on target. We need to have some demonstrated results and we need to go evangelize those results and show executives who are skeptical that change can happen and this can make a big difference. So I think best practices, examples, case studies go a long way.

And then last I think it is just dialog. It is conversation. It is education. It is awareness building. We have to continue to have this dialog with more than just the technical people in the room.

Mr. PUTNAM. Is there any example that you can think of where an agency has done particularly well and the right people have evangelized it and brought about a positive change in behavior?

Mr. MCCLURE. I think there are examples. That is part of the issue, is we have examples in the Federal Government where EA has been used, where investment controls have been used, and there is just not a recognition of the value of actually talking about it. Sometimes there is a fear of talking about it because you don't know what will come back to bite you. So it is just changing the culture and realizing success needs to be advertized.

I think there are examples of cost savings and reduction in duplicative systems and actually progress in making reuse of software in many of our component agencies and departments. There are bits and pieces; they are not fully in place everywhere. So you might have a unit, an office, or an organization within a department that has done some of this, and that just doesn't see the light of day. It is not big enough, the dollars are not big enough when you are talking about billion dollar budgets.

Mr. PUTNAM. Unfortunately, we are going to have to wrap this panel up, but I want to give everyone the opportunity to have some closing remarks, so we will begin with Dr. Wells and move down the panel and share anything that you had hoped to have come out of this hearing that may not have or any thoughts or question that you wish you had been asked, whatever the case may be. Dr. Wells.

Mr. WELLS. I often hear in the agencies a statement that if we had the investment money, we would be glad to modernize our infrastructure. IBM had to self-fund its transformation. It is about using what you have more efficiently.

The second thing that I would conclude with is the whole notion of chief architect. These skills are really rare, as has been mentioned, but the job is really the chief business architect. It is about architecting the business processes. Until you have rearchitected those business processes, you cannot effectively apply technology in a transformational manner.

Mr. LORENTZ. First of all, I thank you for having these hearings and staying the course and showing the interest and that kind of support for Karen Evans, who is there now and I was there before. This is really hard work. There is no aspect of the Government value chain that doesn't need to be changed. In the Government today, pretty much everything operates vertically. That is the natural state. And so the transformation as to horizontal and why should we do that is because of September 11, it is because the needs of the citizen are now horizontal.

The one thing that I would respectfully encourage you to do is to help with the appropriations process, because even when we did manage to get funding for cross-organizational analysis into bills and so forth, we lost that funding in the appropriations process. Part of that is because perhaps we weren't as adept as we could have been at telling our story. But we would really solicit the help in making sure that the appropriations occur horizontally as well as vertically, because again, to reinforce, we are spending a lot of money on EA in the silos. If you look at the amount that we are spending on FEA and cross-silo analysis, it is not quite a rounding error.

Thank you.

Mr. PUVVADA. I echo Norm's sentiments and thank you very much for highlighting this to be a priority issue. And I think the whole methodology as well as the report, has significant impact on this, and we hope that effort certainly continues.

If I net it down to what needs to be done going forward, if you really look at a couple of technical things underlying that actually is going to enable interagency information sharing and collaboration, the whole data architecting issue needs to be a very high priority. And one of the impediments to people wanting to share across is security; do I have security, is my citizens' privacy really taken care of in terms of meeting the expectations there. So if you couple data architecting with the baked in enterprise security architecture as a priority, we will begin to see some progress in that area, and I strongly recommend looking at that deeply and show your commitment as well there.

Thank you.

Mr. PUTNAM. Dr. McClure.

Mr. MCCLURE. I want to commend you, too, Mr. Chairman, and thank you for having the hearing and focusing attention on this topic, as complex and technical as it can get at times.

My bottom line is, I think, as I said at the beginning of my oral statement, at the end of the day we have to keep our sight focused on what this is doing to improve the quality of government. We have to keep the citizen in mind and ensure that we are creating a more simplified and very cost-effective and efficient Government. That is what this all about, and we don't want to lose sight of that.

Second, I think we have to focus on results. We have to move beyond the assessments to focusing on the "so what has happened, what is different" and get examples. The caveat I put on that is that architecture is a long-term process. It requires an up-front investment spike. That is why you see these large dollar figures in terms of what agencies are spending. The returns are slower in coming than if you were building a simple application or a single purpose system. You are rearchitecting and changing and moving lots of pieces of organizations. But, nevertheless, I think we have to begin asking when those results are going to occur. We need tangible, measurable results in the areas that we have talked about today, and we need to hold people accountable when they are saying that those will be the actual results that the Congress and the American people will see.

Mr. PUTNAM. Well, I want to thank all of you for your very informative and insightful testimony. I appreciate your taking the

time out of your schedule to be with us today. And I want to thank Mr. Clay for his participation in the hearing as well.

Clearly, the proper design, development, and implementation of EAs across the Government has the potential to save millions in taxpayer dollars by eliminating redundant spending. Further, agencies' EA efforts are already facilitating the transition to a more responsive and citizen-centric Government by improving efficiency and facilitating cross-agency collaboration. However, as we have seen, we have much work to complete before we fully realize that goal. OMB's efforts in creating a common framework, the FEA, for achieving governmentwide development and implementation has already proven itself to be a valuable IT investment planning tool, as evidenced by the identification and creation of the Lines of Business initiative. While we are experiencing growing pains in integrating the agencies' individual EAs into the FEA, I believe the effort will lead to significant cost savings when the work is further advanced.

In the event that there may be additional questions that we did not have time for today, the record will remain open for 2 weeks for submitted questions and answered.

With that, we again appreciate your hard work, and the meeting stands adjourned.

[Whereupon, at 4:55 p.m., the subcommittee was adjourned, to reconvene at the call of the Chair.]

[Additional information submitted for the hearing record follows:]

Committee on Government Reform
Subcommittee on Technology, Information Policy, Intergovernmental Relations, and the Census
" Federal Enterprise Architecture: A Blueprint For Improved Federal IT Investment Management and Cross-Agency Collaboration and Information Sharing"
May 19, 2004
Karen Evans Response to Questions for the Record

For Enterprise Architecture & Planning we reported in the FY2005 President's Budget $513.2 million and $511.43 for FY2004.

This is the total that agencies reported in Part 3 of their exhibit 53. It includes the following items:

(d) Part 3. Enterprise architecture and planning.
Report amounts for IT investments that support strategic management of IT operations (e.g., business process redesign efforts that are not part of an individual investment or initiative, enterprise architecture development, capital planning and investment control processes, procurement management, and IT policy development and implementation). (Exhibit 53.8 on page 16 from last year's A-11 guidance.)

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