**United States
Department of Energy
Enterprise Architecture**

The Department of Energy Transition Strategy & Sequencing Plan

Signatory Approval
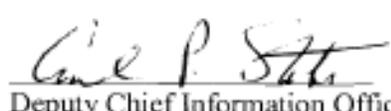
February 2008

DOE Signatory Page

By signing this page, I/we have authorized this two-volume document to be included in the 2008 DOE Enterprise Architecture submission to the Office of Management and Budget.
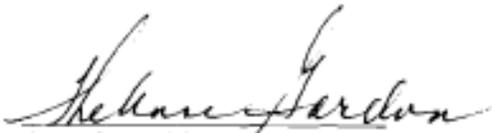
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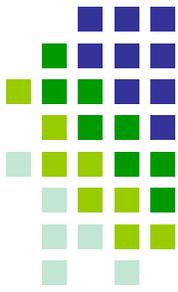
United States
Department of Energy
Enterprise Architecture

DOE Transition Strategy and Sequencing Plan

Volume 1 – The 2008 Annual Report

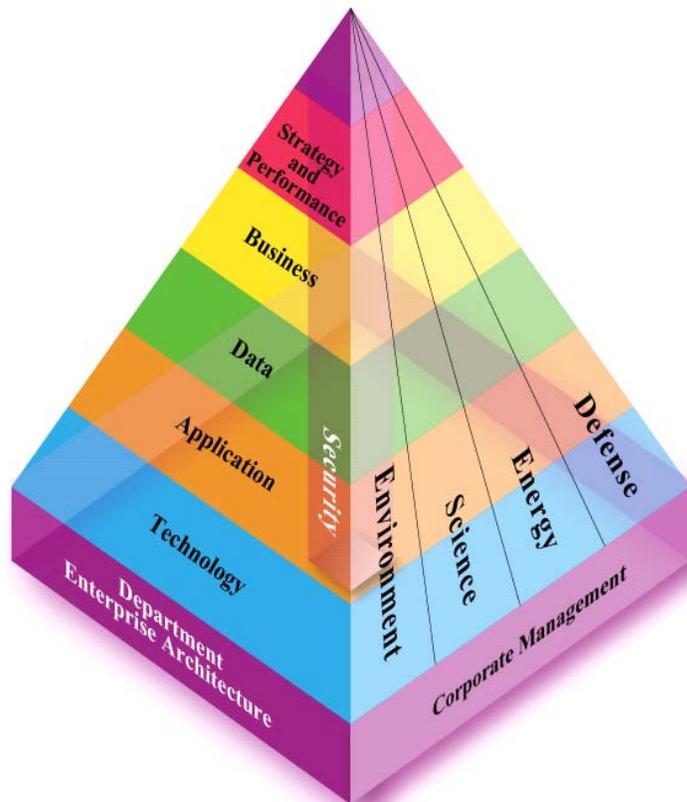### DOE Segment Architectures and Transition Strategies

Version 3.0
February 27, 2008

Table of Contents

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1   Executive Summary

The Department of Energy (DOE) **Enterprise Architecture** (EA) defines how all parts of an enterprise work together to ensure business and technology alignment, realize operating efficiency and effectiveness, identify cost savings / cost avoidance, and be more responsive to the changing needs of the mission. The Department's EA Program provides an opportunity for the leadership to focus on how information technology (IT) processes, solutions and technologies can support Departmental efforts to better achieve mission and business results:

- Make organizations more effective in performing the business
- Align IT investments with business priorities
- Improve business and technology optimization for mission success

The primary purpose of this Transition Strategy and Sequencing Plan (TS&SP) is to identify and sequence Segment Transition Strategies needed to govern, institutionalize, and implement the DOE Target EA Vision depicted in Figure 1 - DOE's Conceptual Target Enterprise Architecture Vision. This vision is DOE's target direction for the agency that meets its mission goals and strategic priorities. It is the foundation for business and IT modernization, driving both investment in and implementation of systems and technologies that will transform DOE's business.
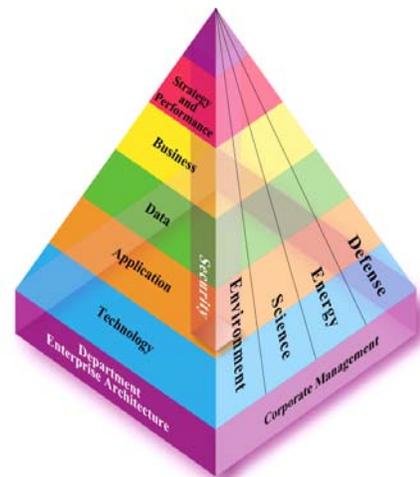
Figure 1 - DOE's Conceptual Target Enterprise Architecture Vision

The DOE EA continues to improve the management planning and decision-making process by integrating EA with key DOE management processes (e.g., Capital Planning, Budgeting, etc.), ensuring compliance and enforcement through a governance process that is measured and managed. To help assure this transformation, the DOE EA Program works with the Program Secretarial Offices (PSO's) across the DOE enterprise to establish performance measures, goals and milestones as an essential part of these investment projects to provide appropriate accomplishment guideposts in the migration to the DOE Target EA Vision.

The TS&SP has been developed then in close collaboration with the PSO's to lay out a step-wise strategy for migrating the Department to its Target Enterprise Architecture through a cohesive collection of Segment Architectures. The result is that the TS&SP has become the agency's high-level strategic roadmap and tool to accomplish that strategy over a 3-5 year period. As the central part of successfully executing this plan, the DOE EA Program provides the structure and governance processes to foster collaboration across the enterprise and to identify integration and shared service opportunities among common DOE mission elements. Consequently, the DOE EA has become the basis for assessing and approving much of the IT Investment Portfolio that the Department executes to achieve its modernization and for tracking the performance of those investments with respect to the DOE Target EA Vision.

2 Introduction

The DOE Transition Strategy and Sequencing Plan (TS&SP) for the Department of Energy (DOE) is a high-level strategic roadmap for modernizing the Department's business and its enabling information technology (IT). It is a plan for moving toward the DOE Target Enterprise Architecture (EA), which defines the desired future state of DOE's strategy and performance, business, data, applications and services, technology and security.

2.1 *The Transition Strategy & Sequencing Plan Breakdown*

This DOE Transition Strategy and Sequencing Plan details DOE's strategy and approach for moving from its "as-is" architecture towards its "to-be" architecture.

The first volume, ***DOE Segment Architecture and Transition Strategies***, covers the how the DOE EA Program works, what constitutes the DOE Target EA Vision, the DOE Segment Approach and FY 2008 Segments along with the DOE Transition Strategies and the Segment Sequencing Plans.

The second volume, ***Enterprise Architecture and the Management of the Department of Energy's Most Efficient Organization(MEO)***, discusses DOE's strategy for compliance with the Trusted Internet Connections (TIC) Initiative, how DOE used EA to assess and approve BY 2009 investments, the range of DOE Major Investment projects and the associated Performance Goals and Measures, along with the DOE Sequencing Plan, including milestones, for the agency's Major Investments. Figure 2 – The Overall Structure of the TS&SP below summarizes this breakdown of the TS&SP.
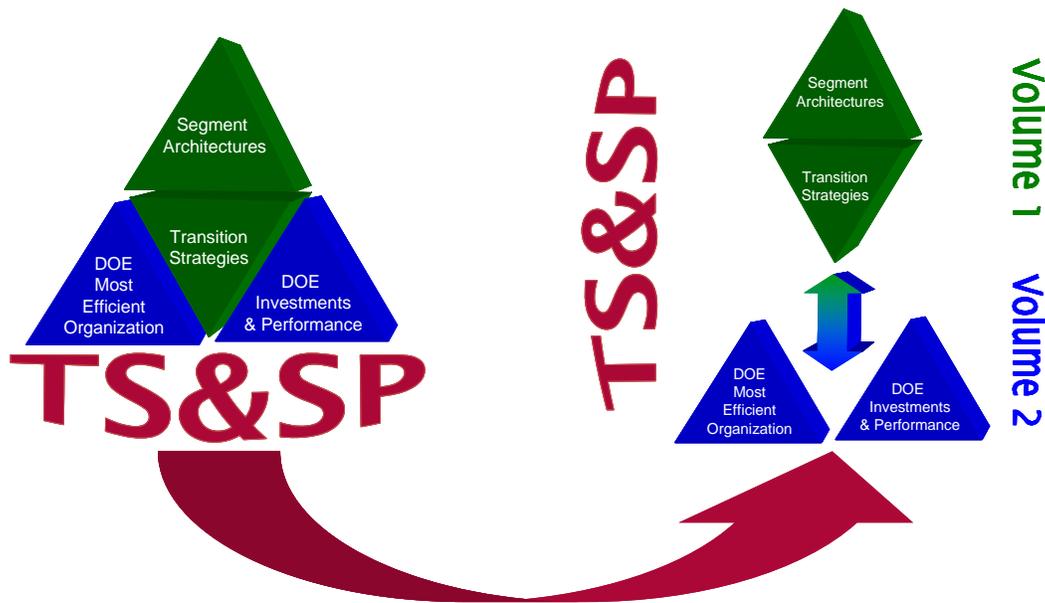

Figure 2 - The Overall Structure of the TS&SP

2.2   The Transition Strategy Overview

DOE a whole, is a large, complex organization with multiple core missions and over $2 billion in annual IT spending.   In developing this plan and identifying appropriate transition activities to pursue, the overall scope from a functional, organizational and geographic perspective is the entire Department of Energy. All aspects of the Department's investment portfolio have been considered and the scope is focused on a sub-set of business functions and supporting IT shared services solely on the basis of feasibility and analysis of which activities would yield the greatest returns.

By virtue of the breadth and complexity of the DOE enterprise, the DOE Transition Strategy is not designed to result in an in-depth architecture for every aspect of the enterprise all at once. Rather, the DOE Enterprise Architecture continues to evolve incrementally and iteratively, as segments of the Enterprise Architecture are identified, chartered, matured and implemented. This Segment Architecture approach is a fundamental element of the Department's strategy for developing an actionable Enterprise Architecture that can be reliably used for investing in and implementing solutions to achieve clearly-defined outcomes. Consequently, at the outset now while the DOE Segment Architectures are being developed, this Transition Strategy builds on those available Segment Architectures mature enough to effectively move DOE toward its Target EA.

The results and benefits for DOE from this Segment Architecture approach to its Transition Strategy include:

- Outcome-driven approach to planning and executing the activities needed to transition to the Target EA.
- Improved Departmental strategic decision-making and communication relative to achieving the desired transition.
- Increased sharing, reuse and collaboration through greater emphasis on enterprise-wide, rather than program-specific, planning and investment.
- Increased program participation in, and ownership of, enterprise-wide or cross-program initiatives through collaborative segment architecture Integrated Project Teams (IPT's).
- Improved portfolio evaluation through linkage of planned investments to major transition activities.

The TSSP is organized into two volumes for ease of use. Volume 1 focuses on, DOE Segment Architectures and Transition Strategies. Volume 2 focuses on DOE Investments and Performance Details. Used together, the volumes meet the stated goals utilizing a core set of guidelines.

2.3   The Sequencing Plan Guidelines

Relationships between the Segment Architectures included in the Transition Strategy were evaluated to determine dependencies between Major Investment initiatives supporting those Segment Architectures. For the FY 2008 featured Segments, no significant dependencies were identified. Consequently, this Sequencing Plan outlines the progress path of the Transition Strategy with the Segment Sequencing Plans running independently and in parallel. The guidelines employed by DOE to develop this Sequencing Plan are briefly described below:

Guideline 1: Focus selectively on Core Mission, Business Services and Enterprise Services segments of the architecture.
The DOE EA program establishes the foundation and gain Departmental of Energy buy-in for moving into the important Core Mission areas as fast as possible as the Segment Architectures mature. Because Business Services and Enterprise Services are cross-cutting, they will get considerable attention as well since they are likely to yield the greatest immediate financial benefits to the Department in terms of cost reduction, cost avoidance, and return on investment (ROI).

Guideline 2: Build on work in progress.
The Sequencing Plan leverages and builds on ongoing DOE efforts. The Department of Energy is already undertaking many important initiatives to modernize IT in support of the business, and the Sequencing Plan is designed to coordinate and support those efforts.

Guideline 3: Incrementally evolve the Department's EA through Segment Architecture.
The Department of Energy's Segment Architecture approach to building out the EA incrementally in manageable, value-driven segments is integral to the Sequencing Plan. The Sequencing Plan is built the Major Investments supporting IT development and implementation work for the Segment Architectures. The execution of the Sequencing Plan will result in the incremental development of the Department's EA through Segment Architectures.

Resource constraints, such as funding, manpower, expertise, and the time required to support a Sequencing Plan were primary considerations in development of this plan. The DOE 2008 Sequencing Plan provides a sound basis for the evolution toward the Department's Target EA. In order for the plan to be executed effectively and for the Department's modernization to be successful, the OCIO and DOE Program Secretarial Offices will need to continue working in a well-coordinated and collaborative manner. Consequently, DOE's Sequencing Plan is expected to support DOE Senior Leadership in their efforts to be:
- Strategy Focused
- Outcome Driven
- Risk Aversive
- Performance Managed
- Decision Oriented

3   DOE EA Program Overview

Enterprise Architecture defines how all parts of an enterprise work together to ensure business and IT alignment, realize operating efficiency and effectiveness, identify cost savings / cost avoidance, and be more responsive to the changing needs of the mission. EA at the Department of Energy is one of the strategic tools used by management to better integrate and align management processes, workflow, and business operations to current and proposed IT solutions.

The vision for the Department's EA Program is that it will provide an opportunity for the leadership to focus on how IT processes, solutions and technologies can support Departmental efforts to better achieve mission and business results:

- Make organizations more effective in performing their business
- Align IT investments with business priorities
- Improve business and technology optimization for mission success

3.1   Support for the DOE Strategic Plan

Enterprise Architecture is strategic in nature and helps the Department of Energy ensure that its resources are aligned with the DOE mission and with its strategic goals. The DOE Strategic Plan was updated during 2007. The DOE EA Program has continued to review its priorities and engage in activities that map to the DOE Strategic Plan and are executed within the IT Portfolio.

The Department's strategic plan flow is highlighted in the cascade shown in Figure 3 – DOE Program Theme. The flow begins with the mission statement which progresses to the Strategic Themes. The Strategic Themes connect to the broader strategic goals, which are linked to the annual performance goals in the performance budget through the multi-year program plans.[1]
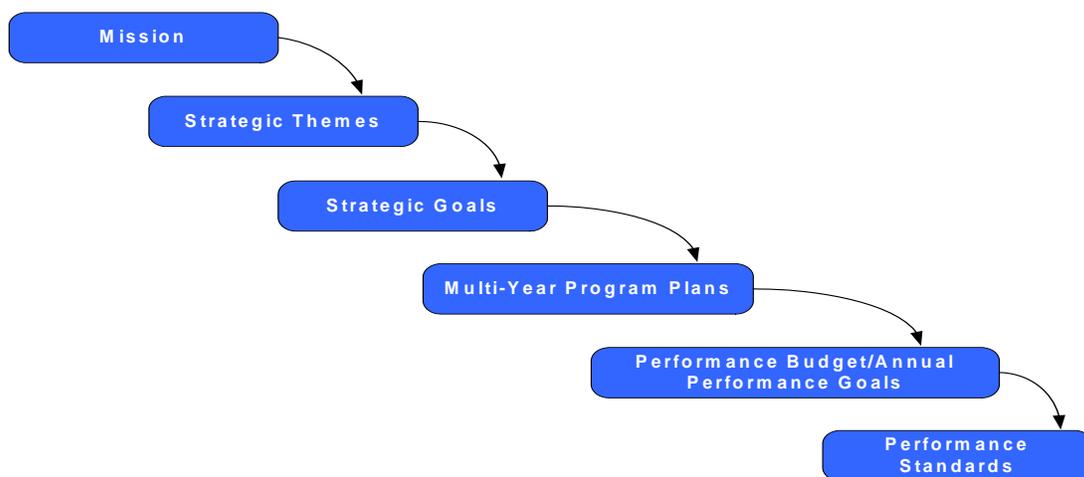
Figure 3 - DOE Program Theme

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[1] U.S. Department of Energy Strategic Plan, October 2, 2006.

From a portfolio management perspective, EA is used to drive decisions about the IT investment portfolio, and the DOE Strategic Portfolio Review process is integral to the Department's IT resource management. The EA Program specifically aligns this decision making with the DOE Performance Management program which is part of the DOE Performance Architecture. The following sub-sections provide an overview of each of the DOE strategic themes.

3.1.1 Energy Security

DOE's Energy Security strategic theme is "Promoting America's energy security through reliable, clean, and affordable energy."

The Department's principal tool for advancing technology is investing in high-risk, high-payoff energy research, development, and demonstration (RD&D) that the private sector will not or cannot develop alone in our market-based economy. Since 2001, the Department has invested nearly $10 billion developing and promoting the use of cleaner, more affordable, and more reliable alternative energy sources and DOE is on the threshold of incredible scientific and technological advances that will change how we power our homes, businesses, and automobiles. In January 2006, the President announced the Advanced Energy Initiative to dramatically accelerate research on domestically-available fuels that will diversify the Nation's use of energy sources and help reduce America's dependence on foreign resources.

The United States is heavily dependent upon oil, especially in the transportation sector. Rapid increases in U.S. and world energy demand, combined with regional resource and production constraints, have led to large increases in oil and natural gas prices, changing the industrial and commercial business environment. The Nation's energy infrastructure is not keeping pace with the growth in energy demand, thereby endangering the reliability of the energy system. Finally, there is a need to reduce the environmental impacts associated with energy use.

3.1.2 Nuclear Security

DOE's Nuclear Security strategic theme is "Ensuring America's nuclear security."

In 2000, the National Nuclear Security Administration (NNSA) was established as a new element within the Department in response to a Congressional mandate to reinvigorate the security posture throughout the nuclear weapons program and to reaffirm the Nation's commitment to maintaining the nuclear deterrence capabilities of the United States. NNSA was chartered to better focus management attention on enhanced security, proactive management practices, and mission focus within the Department's national defense and nonproliferation programs. The Department performs its national security mission involving nuclear weapons and nuclear materials and technology through the NNSA.

Over the next six years, the Department will apply advanced science, engineering, and nuclear technology to help ensure that it meets its national nuclear security strategic goals.

As NNSA continues to drawdown the nuclear weapons stockpile to the lowest levels since the Eisenhower Administration, we must consider the long-term effects of aging and the implications of successive warhead refurbishments which take us further away from the tested

designs of the Cold War stockpile. The current nuclear weapons complex is not sufficiently responsive to fix technical problems in the stockpile or to react to potential adverse geopolitical change. Therefore, the nuclear weapons stockpile and the supporting infrastructure must be transformed. The Department is working closely with the Department of Defense to transform the nuclear deterrent to ensure that it can meet the changing technical, geopolitical, and military needs of the future. A second challenge deals with the ever increasing threat of terrorism. The mere acquisition by terrorists or rogue regimes of nuclear and radiological materials which could be used in weapons of mass destruction or in a "dirty bomb" represents a threat to the United States and to international peace and security. Lastly, increasing National security demands necessitate the development of next-generation naval nuclear propulsion technology.

3.1.3 Scientific Discovery and Innovation

DOE's Scientific Discovery and Innovation strategic theme is "Strengthening U.S. scientific discovery, economic competitiveness, and improving quality of life through innovations in science and technology."

As we look toward the future, we are entering a new era that is characterized by increasingly rapid changes in the pace of discovery and innovation. These changes present both opportunities and challenges, requiring a new U.S. commitment to science and innovative approaches for accelerating the realization of benefits from our research enterprise.

In February 2006, the President announced the American Competitiveness Initiative (ACI) to encourage American innovation and strengthen our Nation's ability to compete in the global economy. The Department has a core responsibility under ACI to cultivate the U.S. scientific base in a way that enables our Nation to compete and win in the global marketplace of ideas and commerce.

The U.S. must remain vigilant as other nations invest heavily in science and technology in an attempt to match our economic productivity and compete with U.S. industry. America's investment in the physical sciences, which many consider to be the cornerstone of the Nation's scientific enterprise, must be strengthened to capture the promise of emerging scientific disciplines that will define the technological progress over the next 100 years. The Nation's incremental changes in technology are not sufficient to maintain the world leadership in industry and academia. The scale and complexity of science and global challenges require multidisciplinary and multinational responses. The Nation's scientific workforce and science literacy must be grown to prepare citizens to compete for jobs and increase overall economic productivity.

3.1.4 Environmental Responsibility

The DOE's Environmental Responsibility strategic theme is "Protecting the environment by providing a responsible resolution to the environmental legacy of nuclear weapons production."

The scope of the Department's environmental cleanup includes stabilization and disposition of some of the earth's most hazardous materials generated from spent nuclear fuel and nuclear radioactive waste material. The cleanup program resulting from over five decades of nuclear

weapons production and energy research is the largest active cleanup program in the world. In addition, after active cleanup, residual risks will remain for significant periods of time at most DOE cleanup sites. The Department will take appropriate action to protect human health and the environment from these residual risks. The Department continues its effort to construct a repository for the final disposal of spent nuclear fuel and high-level radioactive waste. Over the next six years, the Department will apply advanced science, engineering, and cleanup technology to help ensure that it meets its national environmental cleanup strategic goals.

Cleanup of the nuclear weapon's legacy is an enormously complex undertaking involving significant challenges. DOE is also faced with Federal, State, and local regulatory policies that create challenges. The Department's effort to construct a repository for the final disposal of spent nuclear fuel and high-level radioactive waste continues to meet regulatory challenges. Finally, despite aggressive environmental cleanup efforts, the Department must be prepared to address residual risks that will remain for significant periods of time at most DOE sites.

3.1.5 Management Excellence

The DOE's Management Excellence strategic theme is "Enabling the mission through sound management."

The Department's strategic themes and goals will be accomplished not only through the efforts of the major program offices in the Department but with additional effort from staff offices that support the management of the programs in carrying out the mission. DOE is committed to integrated management and is taking steps to ensure that this is one of the critical initiatives that will assist the Department's leadership in achieving the strategic goals. DOE will endeavor to make sure it has the necessary skills available to carry out the mission and to continue bringing in talented and qualified resources for the future. As DOE strives to meet the needs of the Nation in the area of scientific discovery and innovation and the needs of its employees, cost-effective upgrades, renovations, and replacements will be made to aging and outdated facilities. One of the most important keys to managing the Department is financial stewardship and one of the top priorities for DOE is continually improving its financial performance and accountability over the resources entrusted to it by American taxpayers.

DOE is an organization of diverse programs. While this structure has its advantages, it often hampers integrated management of core functions across the Department. In addition, there are economies of scale and improvements in service that could be attained by implementing a common Department-wide approach to core services utilized by all internal stakeholders. This can be difficult to attain in a program-centered approach to the work. However, DOE also faces near-term challenges that are more fundamental. A significant portion of the Department's budget is awarded to contractors each year and achieving excellence in the Department's management of contracts remains a significant challenge.

The average age of the workforce is increasing and the number of skilled employees eligible for retirement suggests an impending knowledge and capability gap in the next three-to-seven years. The Department is implementing a new resource management system that ties together data from various functional disciplines into a single, enterprise-wide network. The implementation of this system combined with recent audit challenges requires the Department to adopt new financial and business practices. The Department currently faces accrued under-funded contractor pension plan and post-retirement benefits liability in the billions of dollars. Finally, DOE's infrastructure is aging, which creates both safety and security concerns.

3.2   DOE Information Resources Management Strategic Plan Integration

In addition to the DOE Strategic Plan, the Department of Energy has also updated the (DOE) FY 2008 – FY 2010 Information Resources Management (IRM) Plan. This IRM Plan identifies the strategies and integrated management frameworks DOE will implement to support its strategic goals, the President's Management Agenda (PMA) and the measures of success for these goals. The IRM Plan also identifies guiding principles, strategic goals and major Information Technology (IT) management activities DOE will undertake to ensure the strategies are implemented in an efficient and effective manner. This integrated approach to IT strategic planning ensures that DOE's investments in IT support DOE's overall E-Government and Lines of Business efforts to improve services to citizens, simplify business processes, and improve DOE's overall interactions with its customers.

In addition to this internal focus, DOE recognizes the need to integrate external policy directions as defined by Congress and the Administration into its IT initiatives. The DOE IRM Plan responds to the legislative mandate in the Clinger-Cohen Act of 1996 (CCA) which "…requires each agency to undertake capital planning and investment control by establishing a systematic process for maximizing the value, and assessing and managing risks of IT acquisitions of the executive agency." The Paperwork Reduction Act of 1995 specifies that agencies shall "…develop and maintain a strategic information resources management plan that shall describe how information resources management activities help accomplish agencies' missions." The Government Performance and Results Act (GPRA) of 1993 specifies the strategic planning context and performance metrics to measure accomplishment against strategic goals. Finally, in accordance with OMB Circular A-130, this IRM Plan further supports DOE's strategic direction.
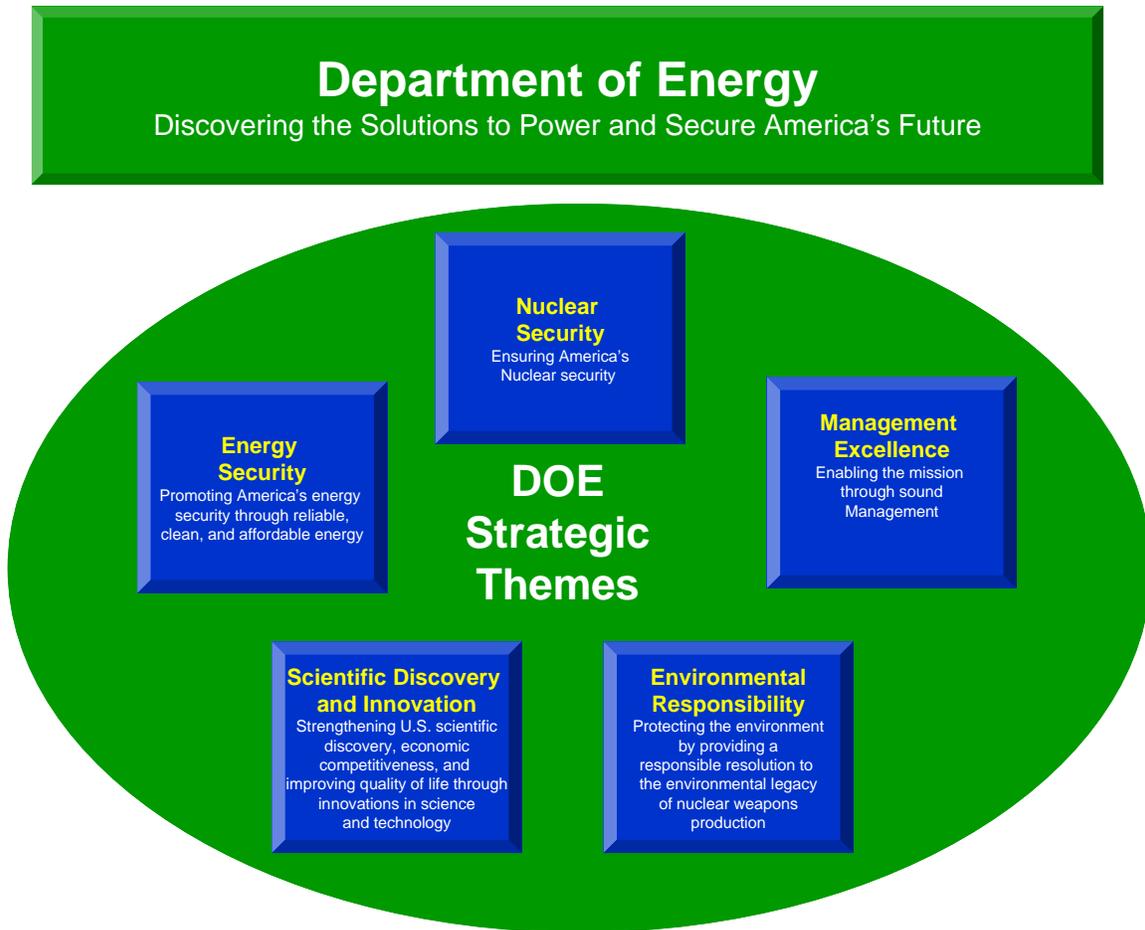
Department of Energy
Discovering the Solutions to Power and Secure America's Future

DOE Strategic Themes

Nuclear Security
Ensuring America's Nuclear security

Energy Security
Promoting America's energy security through reliable, clean, and affordable energy

Management Excellence
Enabling the mission through sound Management

Scientific Discovery and Innovation
Strengthening U.S. scientific discovery, economic competitiveness, and improving quality of life through innovations in science and technology

Environmental Responsibility
Protecting the environment by providing a responsible resolution to the environmental legacy of nuclear weapons production

Figure 4 - Strategic Objectives Mapping

The scope of the DOE IRM Plan encompasses all aspects of Information Technology in DOE, including: mission and administrative systems; telecommunications; and security. It involves all DOE Program Secretarial Offices (PSO's), both at headquarters and their field locations. The DOE IRM Plan communicates IT Strategic Objectives that link to the DOE Strategic Plan, thereby ensuring technological support to the accomplishment of DOE's critical mission requirements. The DOE IRM Plan also communicates IT strategies to link to the Enterprise Architecture (EA) which will expand and evolve to meet DOE business needs as well as OMB EA requirements.

DOE annual performance goals and measures in the updated Strategic Plan FY 2007 – 2012 serve to manage progress towards DOE's strategic objectives. They also provide the baseline performance indicators for how well IT supports DOE and its programs. DOE uses these performance indicators and measures to improve strategies and resource decisions. Figure 4 – Strategic Objectives Mapping above illustrates these strategic linkages.

3.2.1 EA Program Improvement Efforts

EA Program transition projects originate from a variety of sources including federally mandated directives and customer feedback through DOE's continuous improvement processes. The EA Value Measurement Program provides additional input into this process by integrating customer survey results into the planning process.

The FY08 Q1 EA Value Survey established a baseline set of results, which provided insight into the maturity of Program Secretarial Office (PSO) EA programs, their satisfaction with the DOE EA Program, and the perceived value that EA provides to their organizations.

After analyzing the survey results, the DOE EA Team identified four projects, described below, which, collectively help to address improvement opportunities identified from the survey, integrating with the larger EA Program Plan. As these projects are implemented, their progress will be monitored and refined by the Architecture Review Board (ARB) EA governance body.

3.2.2 Revising DOE EA Program Practice Offerings

For the coming year one focus area will be on revisiting how the DOE EA Program Office supports the advancement of EA at the Department. The goal of this project is to help determine what practices and information the DOE EA Program should provide, and to whom. As part of this effort the OCIO will work with the Architecture Review Board and PSO representatives to identify practice offerings that will help drive business transformation within DOE's federated EA environment.

Practice offerings provided by the DOE EA Program Office will be examined within the context of a practice model that outlines the core areas of a successful federated EA program including: Program Management, Architecture Development & Coordination, Information Management, and Mentoring & Guidance. Figure 5 – DOE EA Program Practice Model illustrates the core components of the practice model and areas of Program evaluation.

Figure 5 - DOE EA Program Service Model

- **Program Management** – Program Management encompasses the foundational responsibilities and activities that enable an effective EA. Areas of evaluation include:
  - *Planning, Governance, Communication, and Assessment Support*

- **Architecture Development and Coordination** – Architecture Development and Coordination encompasses the set of activities and practices required to facilitate the development EA and drive change within a federated environment. Areas of evaluation include:
  - *Segment Architecture Identification & Development, Cross PSO Collaboration*

- **EA Information Management** – EA Information Management encompasses the set of practices and capabilities required to manage the storage and distribution of documents and architectural information across the federated environment. Areas of evaluation include:
  - *EA Repository Management, EA Portal Management*

- **Mentoring & Guidance** – Mentoring and Guidance encompasses the set of practices provided to participants within the EA that further the understanding and execution of EA within organizations across the department. Areas of evaluation include:
  - *Counseling, EA Training*

While identifying, classifying, and scoping practices to be provided by the DOE EA Program helps identify future focus areas, the following projects address specific areas within the Program already identified as improvement opportunities.

3.2.3 Enhancing the Communications Strategy

The Communications Strategy and Outreach project focuses on enhancing the communications strategy to more effectively notify the EA stakeholder community about current and planned practices and capabilities of the DOE EA Program Office. As part of this project DOE will:

- **Update the EA Program communications plan** by determining the types, sequencing, frequency, and recipients of information regarding EA Program features, status, and practice improvements. Identify how communication of new features, updates, notices etc. will be updated to stakeholders
- **Develop an EA Practice Offering Catalogue** that will be distributed to stakeholders to further create awareness and provide ease of discoverability of the practices offered.
- **Regularly communicate with stakeholders** by executing stakeholder outreach based on the communications plan.

3.2.4 Measuring EA Value and Customer Satisfaction

The focus of the EA Value Measurement and Customer Satisfaction project is to enhance and maintain a comprehensive customer feedback program within the DOE EA Program by refining feedback mechanisms established in part by the EA Value Measurement Program to measure satisfaction, maintain practice quality. As part of this project DOE will:

- **Maintain a customer satisfaction measurement program** by continuing to refine measures and methods used to measure stakeholder satisfaction with practices and information provided by the DOE EA Program.
- **Link stakeholder feedback to program improvements** by continuing to ensure that stakeholder feedback is assessed and integrated into the EA Program planning lifecycle.

3.2.5 Improving Information Quality

The focus of the Information Quality Improvement project is to identify and improve the delivery and access of EA information to stakeholders. As part of this project DOE will:

- **Identify EA information and reporting requirements** by surveying stakeholders to determine the breadth and depth of information perspectives, and needs.
- **Assess DEAR meta-model and tool capabilities** by determining how well the DEAR meta-model satisfies identified stakeholder information requirements.
- **Implement a data improvement program** by developing and implementing quality control processes to improve the accuracy of information provided by the EA repository.

Progress against these projects will be tracked and updated in next year's Transition Strategy and Sequencing Plan.

4   Integrated EA/Capital Planning Governance

The overarching outcomes of implementation of the DOE Integrated EA Capital Planning Governance are to:

1. Ensure compliance with the Federal Information Security Management Act (FISMA) through the development of Cyber Security Technical Management Requirements for Departmental Elements that set the baseline for securing the Department's systems and data.

2. Ensure alignment with the President's Management Agenda and the mission-specific business needs of DOE.

3. Ensure integration among Chief Information Officer (CIO) functions (such as IT capital planning, IT security and privacy, operations, and enterprise architecture) and with major Federal and Departmental management processes (strategic planning, budget, procurement, and policy).

4.1   Integrated EA Capital Planning Governance Process Overview

Integrated EA Governance at the DOE is an institutionalized part of how enterprise change is planned and managed. EA guidance (policy) provides the mandate for integrated governance based on a rationalized set of roles and responsibilities which is used to assign staff with the experience and authority necessary to fulfill the responsibilities to the defined roles. Governance bodies (decision making) have formal charters which ensure integration of EA and CPIC through the interaction of the Information Technology Council (ITC) and the Architecture Review Board (ARB). Such integrated governance supports active use of the EA to achieve departmental strategic objectives and performance results (outcomes) identified to achieve DOE's mission.

4.2   EA Integration with DOE Strategic Plan & Capital Planning

The Department of Energy, Office of IT Planning, Architecture and E-Government has responsibility for both Enterprise Architecture and Capital Planning and Investment Control. As such, DOE actively manages these tasks in an integrated manner, providing cross-training and cross-focused staff assignments during the budget and EA submission cycles. The DOE Strategic Portfolio Review Process, discussed below, is at the center of this alignment of these programs and the extent to which DOE is involved in integrating EA and CPIC. In addition, OCIO Senior Managers are active in conducting DOE's Performance Analysis. To do this, they work with the DOE CFO's Performance Analysis Work Group.

4.2.1   Capital Planning

At DOE, Enterprise Architecture, Capital Planning and Investment Control (CPIC), and Information Resources Management (IRM) form an integrated framework aimed at effectively managing the Department's portfolio. Figure 6 – CPIC Integration below describes how the three processes integrate at a high level.
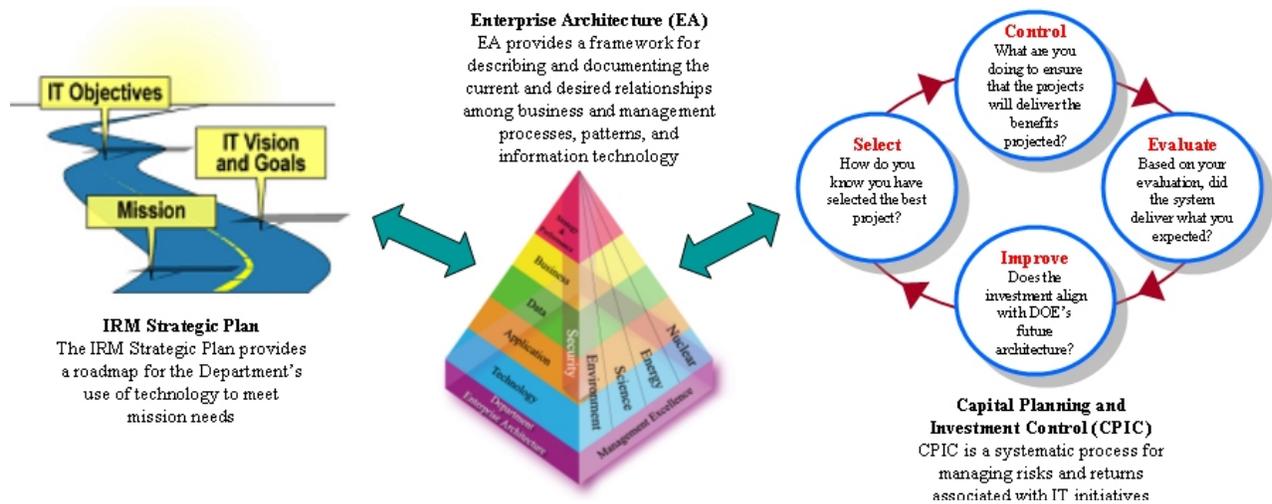

Figure 6 - CPIC Integration

The integration of EA with CPIC processes through the implementation of the Strategic Business Management (SBM) framework yields:
o   Rapid identification of appropriate IT investment goals
o   Access to integrated strategic, budget and IT information that will provide a better "line of sight" and approach for decisions that affect the direction of the Department
o   Development of a more standardized system of prioritization to support the decision-making process
o   Appropriate allocation of resources to the best portfolio of investments ensuring the achievement of those goals
o   Enabling project initiators to search for duplicative technology, which will eliminate duplicative investments in resources and funding
o   Leverage existing scorecards to monitor progress and relevancy of capital investments over time

4.2.2   Strategic Portfolio Review (SPR) Process

The Department of Energy's (DOE) Strategic Portfolio Review (SPR), now on its third year, is an evaluation of the Department's Information Technology (IT) portfolio from the Enterprise Architecture (EA) and Capital Planning and Investment Control (CPIC) perspectives and is designed to advance the maturity of the Department's IT portfolio management processes. The SPR supports the modernization of DOE's IT environment by identifying opportunities for IT collaboration and reuse across the Department. Figure 7 – The SPR Cycle below illustrates this process over the period of the budget year.
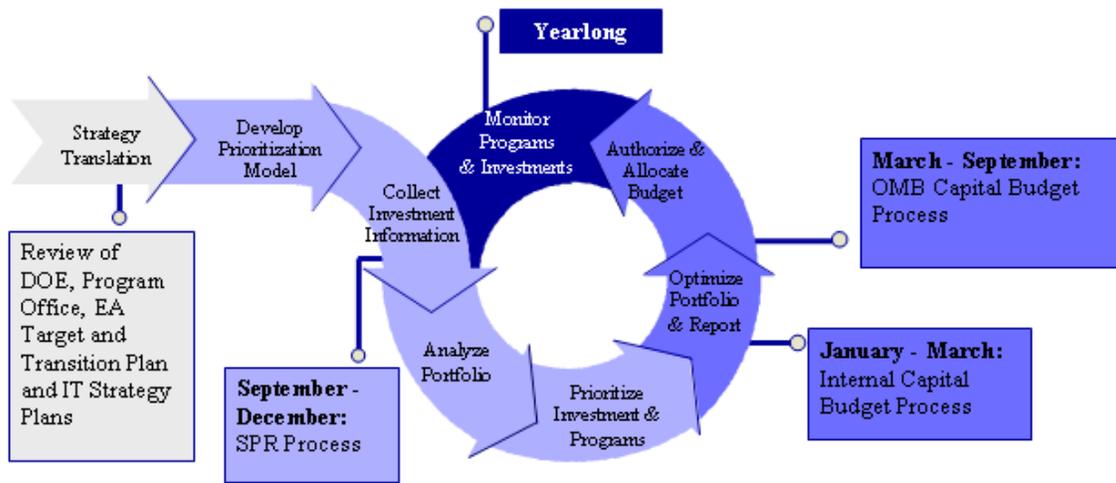
Figure 7 - SPR Cycle

The Strategic Portfolio Review Integrated Project Team (SPR IPT) reviewed the IT Portfolio Analysis table that was prepared using BY2009 IT Investment information by Business Function; FEA Business Reference Model (BRM) and specific detail data by DOE Enterprise Business Model functions. This review was performed with the purpose of developing Department-wide guidance and DOE function-specific findings intended to help improve investment decision making across the Department. The recommendations will be reviewed and further analyzed as needed prior to the commencement of the Department's annual Capital Planning and Investment Control (CPIC) Select process as a major Pre-Select activity and will serve as the first of a series of planned annual activities designed to integrate the Department's Enterprise Architecture (EA) and CPIC processes. A conceptual representation of this process is shown below in Figure 8- SPR Alignment with EA.
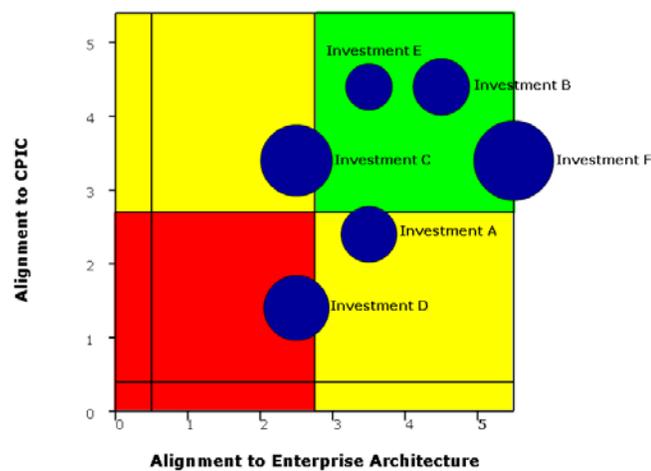

Figure 8 - SPR Alignment with EA

As the major component of DOE's target integrated EA and CPIC process, SPR lays the groundwork for a more comprehensive approach to IT modernization. Using available data sources and industry best practice information, SPR is the initial attempt to classify and analyze the Department's IT portfolio from the functional perspective outlined in the Department's Enterprise Business Model.

The primary focus of the SPR is to align IT investments (such as Exhibit 300s and Exhibit 53 investments) with the Department's functions in order to identify potential areas for collaboration or to decrease unnecessary redundancy. Beginning with the Department's Exhibit 53, the OCIO team developed a draft mapping of each IT investment to the Enterprise Business Model. Then using data stored in the Department of Energy Enterprise Architecture Repository (DEAR) and captured in Exhibit 300s, the OCIO team associated Business Functions with each program investment. The following SPR process flow, Figure 9 – Integrated Processes, further demonstrates the linkage between EA, CPIC and the Budget process.
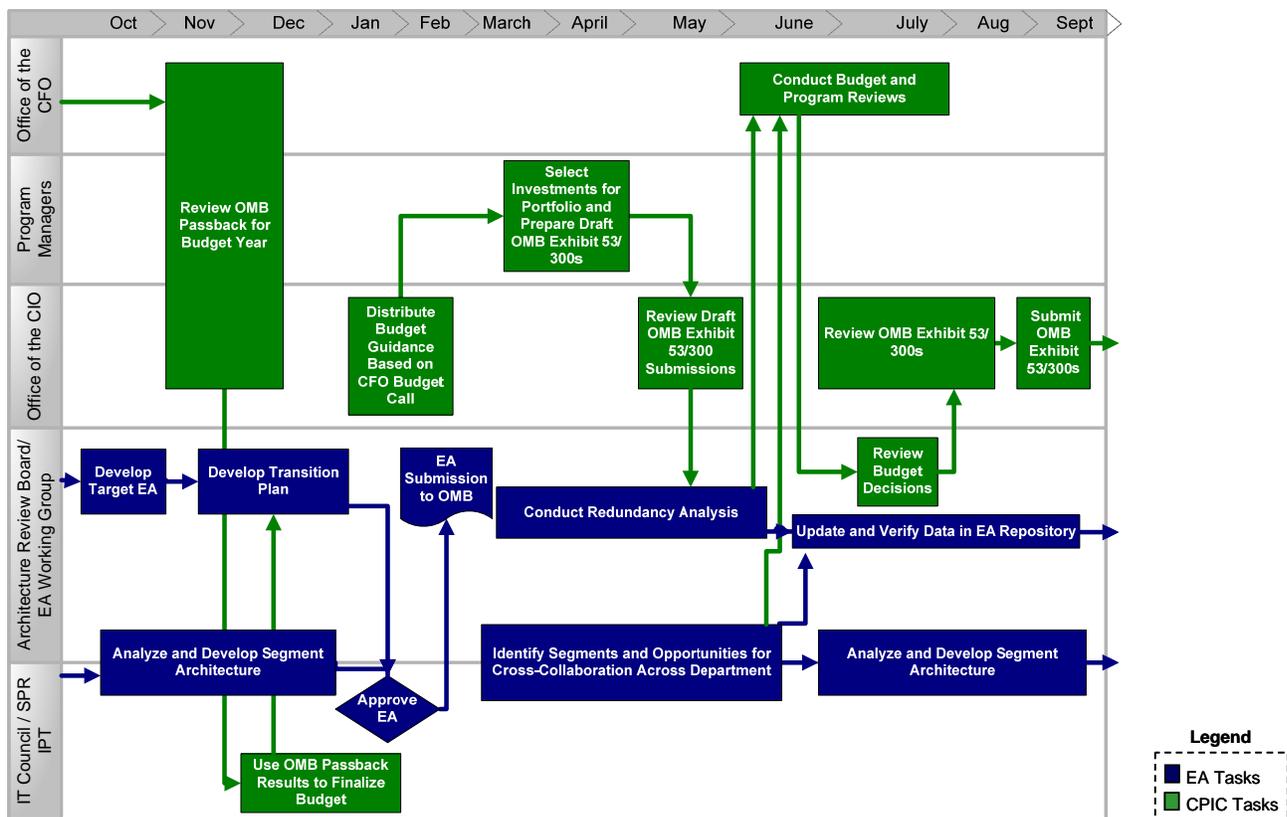

Figure 9 - Integrated Processes

4.2.3 Department of Energy's Enterprise Architecture Repository (DEAR)

The Department of Energy (DOE) Office of the CIO creates and maintains the Department of Energy's Enterprise Architecture Repository (DEAR). Telelogic System Architect is the Commercial-Off-The-Shelf (COTS) software product that supports the DOE enterprise architecture. The DEAR Metamodel is entirely compatible with the Federal Enterprise Architecture Reference Models as well as the DOE Business Architecture which functions as the basis for the DOE Strategic Portfolio Review activities.

4.2.4 Department of Energy's Electronic CPIC Repository (eCPIC)

The eCPIC application is used to facilitate the quarterly Control Review process between the OCIO and the Program Offices. A Control Review Template is provided in the form of a Microsoft Excel file and is accessible for Program Office users to download and complete for their major IT investments. Once complete with quarterly information, the Template is then re-submitted into the eCPIC application.

As part of the Quarterly Control Review, and to comply with guidance from released Office of Management and Budget (OMB) Memorandum (M-05-23), the Department of Energy's Office of the CIO has established a quarterly high risk investment review and reporting process. This process will assess the performance of the major IT investments that are designated as high risk by the Agency and OMB. It is designed to ensure that high risk investments are enabled to correct deficiencies and improve project performance.

The quarterly high risk investment review and reporting process also promote more effective oversight to facilitate better project planning. The guidance sets in place a structured process that is designed to provide senior management with accurate performance information that will allow them to make timely decisions regarding high risk investments.

5   The DOE FY 2008 Transition Strategy

5.1   DOE's Target Enterprise Architecture Vision

The Department's architectural vision has evolved over the last few years to define a conceptual Target EA toward which DOE's Segment Architectures will progress. In particular, while this DOE Target EA Vision incorporates many significant opportunities for improvement, it is not a completely new vision for DOE. Rather, it builds on the many innovative and transformative business and IT initiatives that the Department is already investing in. The vision for the desired future state for DOE is woven into all layers of this Target EA, and encompasses efforts that span the entire enterprise as well as those that are unique to one or more individual offices and programs. Ultimately, DOE's Segment Architectures will collectively define its Target EA. However, until all of DOE's Segments are satisfactorily specified and their associated Segment Architectures developed, this conceptual Target EA will serve as a guidepost to the future. The purpose of this section is to highlight the key themes that comprise the Target EA Vision for the Department. These themes are represented by the architectural layers shown in the Figure 10 – DOE's Conceptual Target Enterprise Architecture Vision as they support DOE's Core Mission areas.
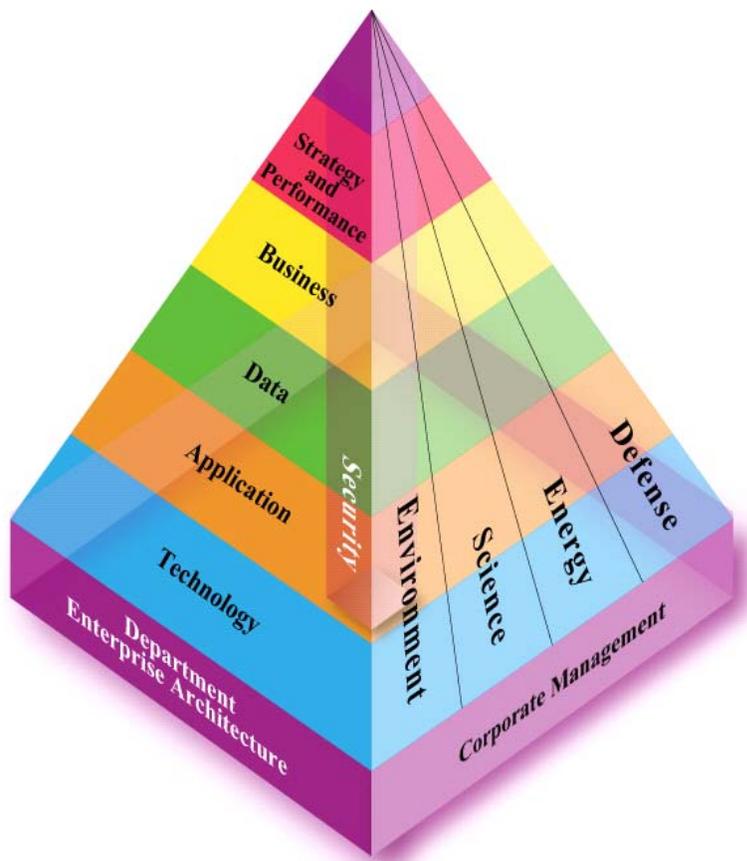

Figure 10 - DOE's Conceptual Target Enterprise Architecture Vision

5.1.1 The Strategy and Performance Layer Vision

DOE's Strategic Vision is well articulated in the Department's Strategic Plan and the Information Resource Management Strategic Plan. The Performance Vision articulates the desired outcomes that the Target EA is intended to help achieve. The key theme related to this layer is using the architecture to help tie investments to mission results. The Federal government as a whole has long strived to better demonstrate accountability and results, and EA has become an important enabler to that end. Due to the breadth of the EA's scope, coupled with the inherent relationships defined between architectural layers, the Department is more able than ever to address key questions, such as:

- If I had an additional dollar to spend, where should I spend it?
- How will this IT investment enable me to meet this strategic goal?
- If this initiative's funding gets cut, what programs will be impacted?
- What are the measurement indicators to support strategic outcomes?

The concept at the heart of using the EA as a framework for measuring performance and results is "line of sight" mapping or the ability to connect the dots between a higher level aspiration such as a strategic goal and a supporting investment in a particular system or technology.
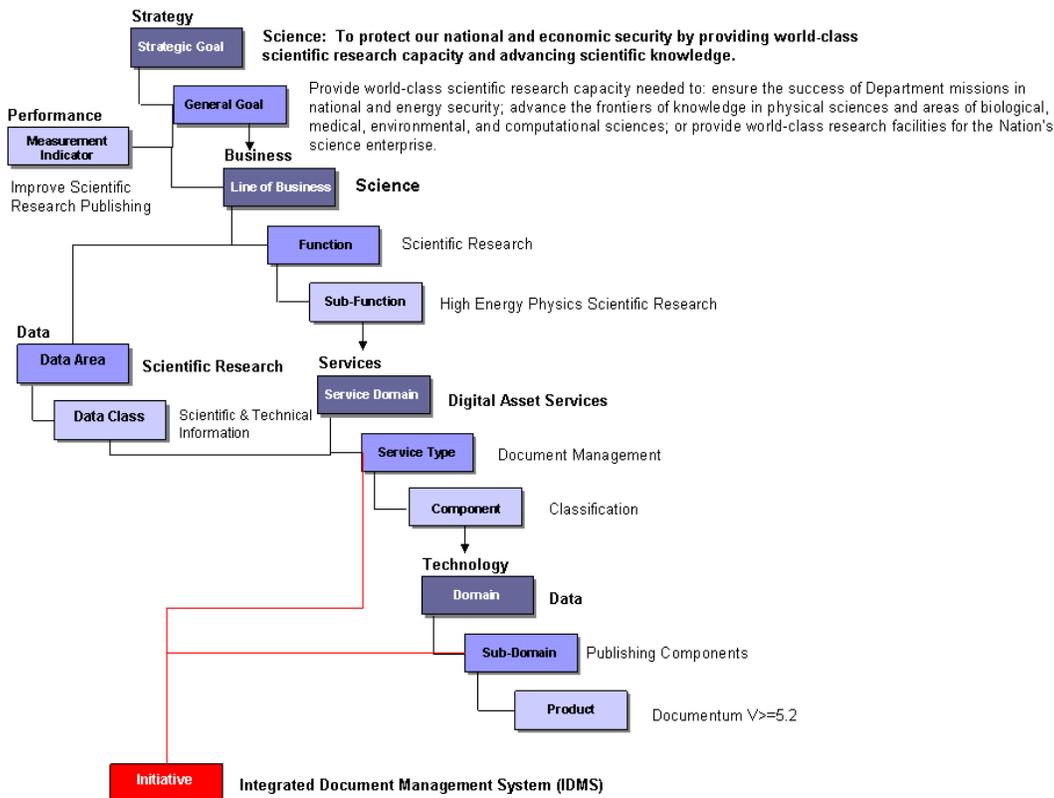

Figure 11 - Illustration of DOE's EA "Line of Sight"

As is shown above in the Figure 11 – Illustration of DOE's EA "Line of Sight," the EA enables traceability from a specific initiative to a strategic goal. In this example, the Science LOB performs a research function in support of the goal of world class scientific research. At one of its particle accelerator or research reactors, it performs high energy physics research, studying sub atomic particles and their behavior. The results of these experiments are published for sharing with other researchers within DOE, and the larger scientific community. In this case, Document Management capabilities, such as classification, can enable more efficient performance of this business function. Those capabilities can then be traced to particular services, standards, or (in this case) products that are desirable in the target environment. Moreover, specific initiatives, such as the Integrated Document Management System (IDMS) Departmental E-Gov initiative can then easily be tied back to the mission.

5.1.2 The Business Layer Vision

DOE's business vision is well articulated in the Department's Strategic Plan, the Enterprise Business Model (EBM), and planning documents maintained by each of DOE's Program Secretarial Offices. There are three key objectives that the Target EA business layer addresses:

- **Drive Business Transformation** – The Target EA and the Department's approach to moving forward with the implementation of the EA represents an opportunity to not merely improve the Department's internal effectiveness and efficiency, but to fundamentally change the nature of the way DOE interacts with its customers, partners, and employees. The Department's view of electronic government (E-Gov) does not start and end with the government-wide E-Gov and LOB initiatives. The Department is identifying new services and products, new ways to improve the accessibility and usefulness of exchanged information, ways to increase self-service, and other innovative advancements to its business. By focusing transition activities around business-focused segment architecture efforts, DOE will bring together business and IT experts from across the Department, and architect solutions from the mission and priorities of the business down to the enabling technologies.

- **Eliminate Organizational and Programmatic Stovepipes** – The Enterprise Business Model contained in this Target EA advances the work of prior EA efforts by re-categorizing the work performed across the Department in a functional model that helps to shift away from viewing the Department's business in terms of organizational and programmatic boundaries. Often, the tendency to view an organization's business through narrow parochial stovepipes is a major barrier to collaboration, consolidation, coordination, sharing, reuse, and process streamlining. The customary objection to this is "We're unique!" And while there are many times where two organizations performing similar functions or processes apply different business rules or use vastly different data, modern architectural models and methods are capable of identifying significant opportunities for sharing and reuse. The Department's approach to Segment Architecture ensures that business units with similar functions and processes come together to explore common architectures and opportunities to collaborate.

- **Architect the Value Chain** – Looking externally, across DOE's extended enterprise, the business architecture can be used to identify other entities within the Federal value chain,

having similar or complimentary missions, functions, and stakeholders (e.g., DOE and DOD) have numerous overlapping functions, as well as many complementary but poorly integrated Defense and National Security functions. This exercise can yield sharing of lessons learned and best practices, as well as opportunities for better integration of efforts that ultimately translate into more responsive and effective government for both citizens and the agencies themselves in terms of mission execution.

5.1.3 Data Layer Vision

DOE's data vision is to foster the evolution of data management and architecture efforts within the Department. This vision will enable the information sharing and reuse across the Department and the Federal Government to promote uniform data management practices by leveraging the FEA Data Reference Model (DRM). The FEA DRM v2.0 concepts and constructs were used in this Target EA. The focus of the target Enterprise Data Model in the data layer is on defining, classifying, and organizing key information assets (i.e., data) that support DOE's business functions and are managed by DOE's applications. In the context of this architectural layer data is conceptualized and identified as high-level information groupings in order to standardize data concepts.

While the focus of the data layer is on categorizing the data itself, the Department's vision for the management of data actually spans the Data, Applications and Services, and Technology layers. The data layer should provide a standard lexicon to organize and describe common data types, which separates the storage and management of the data from the business logic of the applications that use the data (i.e., Applications Layer). This paves the way for a fundamentally different technological approach related to data management at DOE (i.e., Technology Layer). In particular, the Department envisions evolving toward an integrated data services architecture, consisting of logical data repositories, warehouses, or data marts. DOE will implement logical data architecture patterns that are optimized to support the widest variety of application-level services, from transactional to analytical systems.

The DOE logical data architecture, shown in Figure 12 – Illustration of the DOE Logical Data Model below, is comprised of five major components that maintain the data exclusively: 1) Operational Data Store (ODS), 2) Data Warehouse, 3) Data Mart(s), 4) Data Repository, and 5) Data Archive. These components are supported by a collection of tools which include Database Management, Data Warehouse, Data Mart, Data Modeling, Business Intelligence, and Extraction/Transformation/Load (ETL) tools. All of the components and tools work together to provide the users with the necessary transactional, analytical, Meta data management and storage capabilities required without sacrificing performance or efficiency of system resources. This will lead to the development of registries of data ownership in the physical sense such that it will better support SOA and N-Tier constructs addressed in the application layer.
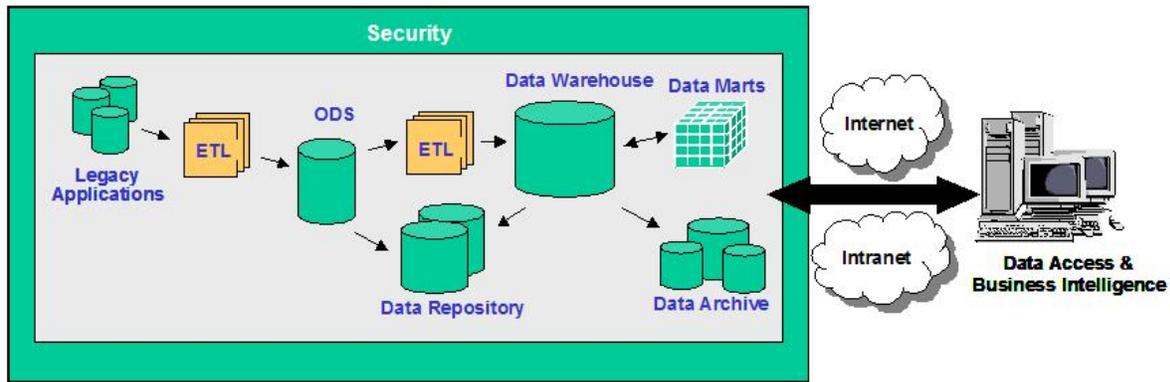
Figure 12 - Illustration of the DOE Logical Data Model

This logical data architecture framework will enable a gradual evolution from a focus on data management to information management and ultimately knowledge management, as depicted graphically Figure 13 – DOE Data, Information, and Knowledge Management below. The migration to a knowledge management environment must be based on a solid foundation and the DOE Data Architecture. The timeframe for accomplishing this is part of the DOE Data Transition Strategy and Sequencing Plan to fulfill the DOE Target EA Vision. This foundation must be built on management practices that result in consistent, accurate, timely, secure, and useful data and information. DOE manages a diverse and complex data environment, with data that ranges from basic elements to highly complex scientific observations. In addition, a significant portion of the Department's data is classified and requires special handling. Managing data and information in an organization such as DOE requires a flexible, responsive process. DOE program offices will remain stewards for their program-specific information and data but should operate within the constructs of the DOE EDM to build a collaborative environment for data management.
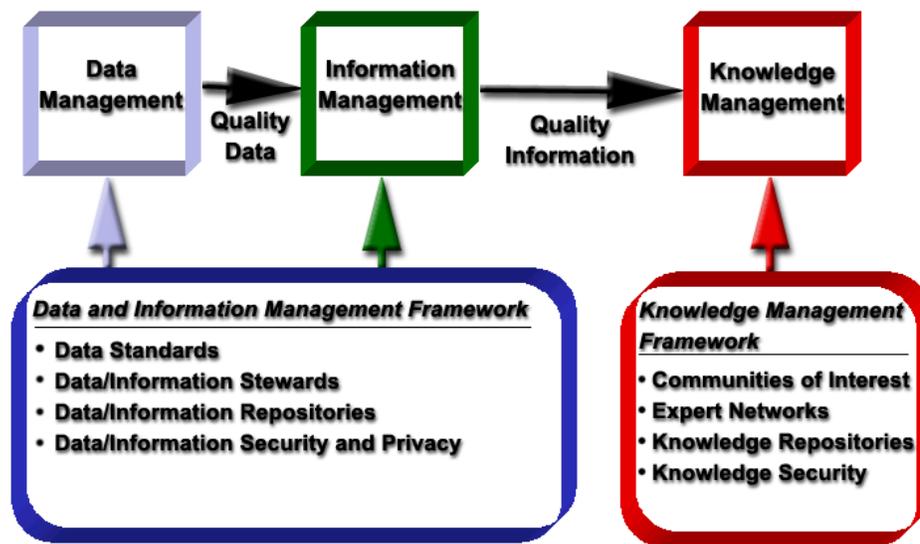

Figure 13 - DOE Data, Information, and Knowledge Management

The Department is working toward a comprehensive data management strategy and data architecture to evolve the EDM. The data management strategy and data architecture should establish the enterprise structures, policies, processes, tools, and techniques for managing DOE data and information. The approach will be to manage the quality of DOE data and information throughout all phases of the data life cycle: collection, storage, transmission, analysis, dissemination and publication, and archiving. This framework encompasses development of enterprise data management policies and guidelines, assignment of data stewardship responsibilities, implementation of data quality assurance mechanisms, development of common data standards, implementation of security and privacy measures, and ultimately the implementation of an integrated data services architecture.

The Department will further evolve toward a more comprehensive knowledge management environment. Similar to other Federal agencies, DOE is facing the prospect of losing many long-term employees who are retiring, and along with them, enterprise knowledge gained over decades. Because the Department has highly valuable scientific and engineering intellectual assets, the potential pay-back of an investment in capabilities to capture and share these assets and make them available for future work is expected to be high. DOE plans to establish key communities of interest as the basis for building a Departmental knowledge network. The knowledge network can then evolve by connecting a series of informal "expert networks" that already exist within the Department.

5.1.4 The Application Layer Vision

DOE's application and services layer vision is to ultimately adopt a service-oriented, component-based approach to architecture. The details of this are specified in the CIO Council's guidance on Service Component-Based Architectures. The goal is that applications and services will be built once and used often to eliminate redundant information technology within the Department. DOE's target applications and services layer describes the capabilities and functionality of DOE's IT applications. The Enterprise Services Model is built around a FEA Service Component Reference Model (SRM) that describes the information processing capabilities needed to support the Department's business (i.e., the ability to capture, store, access, and manipulate business data and information). Due to the breadth of the EA's scope, coupled with the inherent relationships defined between architectural layers, the Department is more able than ever to address key questions, such as:

- What types of IT services could we centralize to eliminate duplicative investments?

- What IT services would improve my relationships with these key customers?

This architectural approach separates the functionality or capabilities of applications into the different services that they perform to promote the sharing and reuse of those capabilities across the enterprise. This approach represents a significant paradigm shift in the way DOE will design, build, deploy, and manage applications and services. There are two key inter-related elements of this direction, each of which is briefly described below, N-Tier Architecture and Service Oriented Architecture (SOA).

5.1.4.1   N-Tier Architecture

The phrase N-tier application architecture simply means an architecture that breaks an application up into multiple tiers, with "n" representing the number of tiers. In common usage, N-Tier architectures typically consist of three or more tiers, providing considerably greater flexibility and reusability than traditional applications. By dividing applications into tiers, developers can change portions of the application or scale up easily without having to re-write an entire application. One example of N-Tier application architecture is depicted in Figure 14 – Conceptual N-Tier Applications Architecture below. In this example, there are five tiers: Access (sometimes referred to as the Client Tier), Presentation, Business/Application, Data Access, and Data Persistence.

While most legacy applications are designed to encompass all of the capabilities and services depicted in this graphic as a single, distinct application, with no ability to share services across applications, the concept of N-Tier architecture is far more powerful when combined with the concept of SOA. In this way, DOE will be able to develop much of an application's architecture just once as a set of common services and allow all applications to share these services.
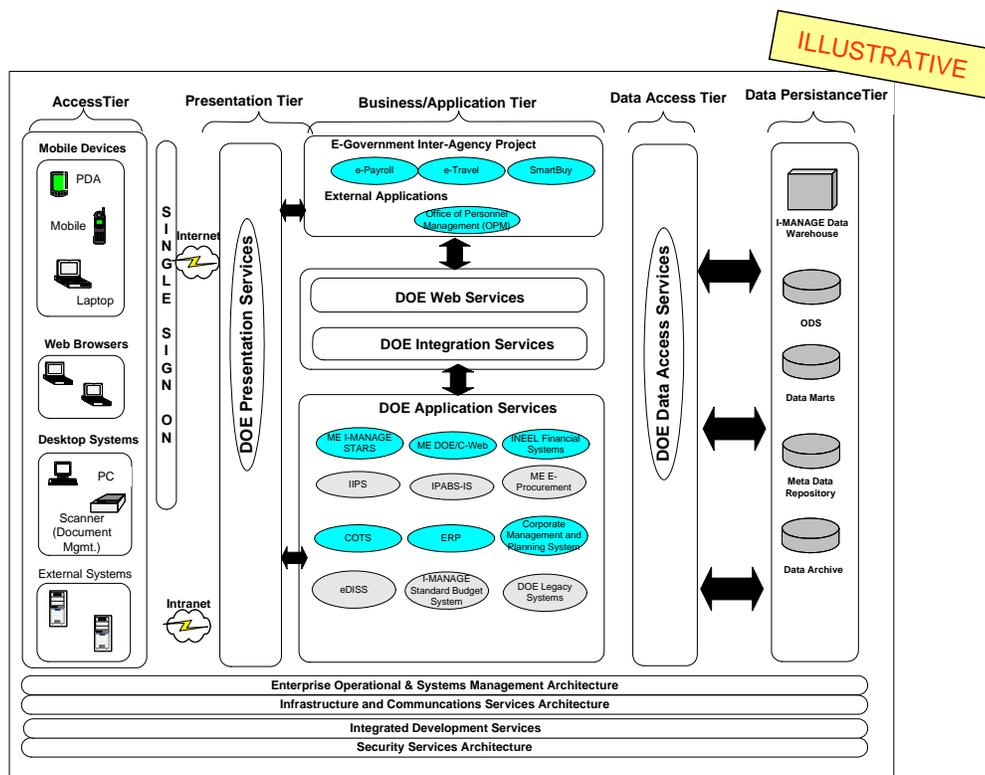

Figure 14 - Conceptual N-Tier Applications Architecture

5.1.4.2   Service Oriented Architecture (SOA)

Consistent with government and industry best practice, in particular the emphasis on service components in the FEA, DOE has adopted a service-oriented and component-based approach to architecture. While there are many competing technical definitions of what constitutes a service or component, DOE believes that the crux of this approach is "build once, use often." In other words, by separating out the functionality or capabilities of a system or application into discrete "services" or "components," they can be shared and reused across the enterprise.

The Service Oriented Architecture (SOA) approach implements the support of the business mission by aligning business to corresponding Information Technology (IT) capabilities enabling business functions (i.e., processes) to be represented as services. Hence, SOA allows the business to derive technologies to support the mission of the Department. The services can be managed from a real-time and life-cycle management perspective. This allows the Department to execute and monitor services for day-to-day operations and enable a robust mechanism for governing the evolution of target services (i.e., Target Applications and Services). The Department's SOA approach is consistent with government and industry best practices; in particular the emphasis on service components in the FEA, DOE has adopted a service-oriented and component-based approach to architecture. While there are many competing technical definitions of what constitutes a service or component, DOE believes that the crux of this approach is "build once, use often." In other words, by separating out the functionality or capabilities of a system or application into discrete "services" or "components," they can be shared and reused across the enterprise.

SOA is best defined as an application architecture in which all functions, or services, are defined using a description language and have invokable interfaces that are called to perform business processes. Each interaction is independent of each and every other interaction and the interconnect protocols of the communicating devices (i.e., the infrastructure components that determine the communication system) do not affect the interfaces. Because interfaces are platform-independent, a client from any device using any operating system in any language can use the service. More simply stated, SOA can be viewed as an architectural style that represents business functionality as implementation-neutral, standards-based shared services. Some key characteristics of SOA are:

- **Use of shared services** – no need to "reinvent the wheel."

- **Loose coupling** – applications can be updated with minimal effect on the services that invoke them.

- **Location transparency** – can re-host applications with minimal effect on services that invoke them.

- **Based on open standards** – decreased dependence on vendor-specific solutions.

As depicted in Figure 15 – Comparison of Traditional and SOA Architectures below, this flexible, loosely coupled environment stands in stark contrast to traditional application environments. In the SOA environment depicted on the right, services can be added, deleted and changed without impacting other services.
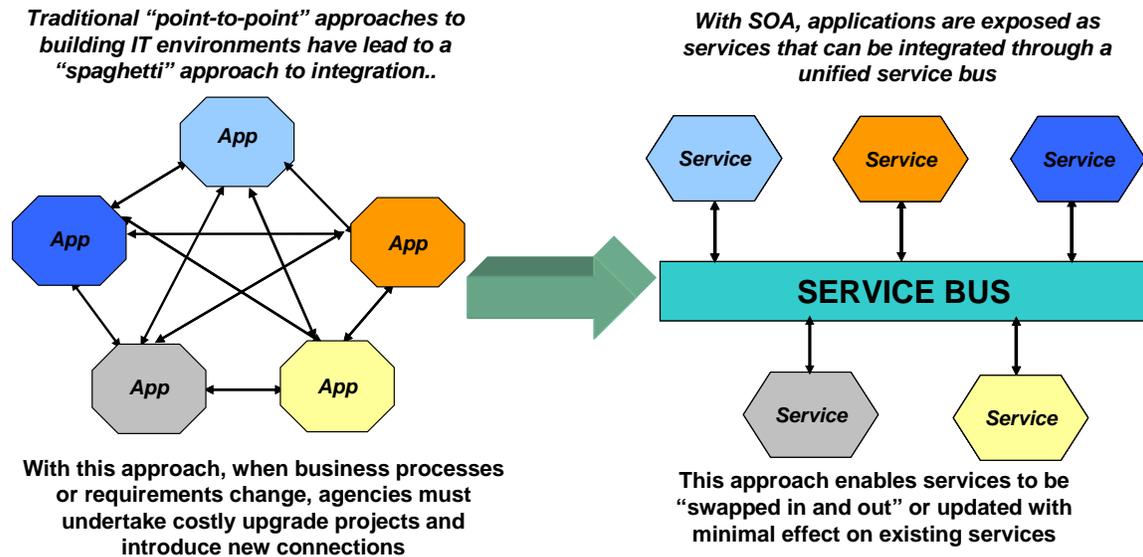

Figure 15 - Comparison of Traditional Architecture and SOA Architecture

As DOE transitions toward a SOA environment, the following benefits will be realized:

- IT can be better linked to operations, thereby improving performance of business operations and resulting in reduced operating costs.

- The ability to leverage shared services means cost reductions for the Department across all lifecycle phases.

- DOE can retain its current IT information assets while extending the impact of those assets, thereby deferring costly IT capital expenditures to a later time.

- IT resources can be opened to stakeholders in a secure, cost-effective manner, better enabling cross-agency business interactions using authoritative data sources.

- SOA's foundation of open standards decreases the Department's dependence on vendor-specific solutions.

- SOA's incremental adoption capability means decreased risk for the Department.

As depicted in Figure 16 – SOA Publish-Discover-Subscribe Model below, SOA services communicate with each other through simple data passing or through the coordination of an activity by two or more services. If two or more organizations share a common business process, or need, then there is a potential opportunity for using a shared service between these organizations. Services are published in service registries by Service Producers ("publish"), discovered by Service Consumers ("find"), and invoked by Service Consumer ("bind").
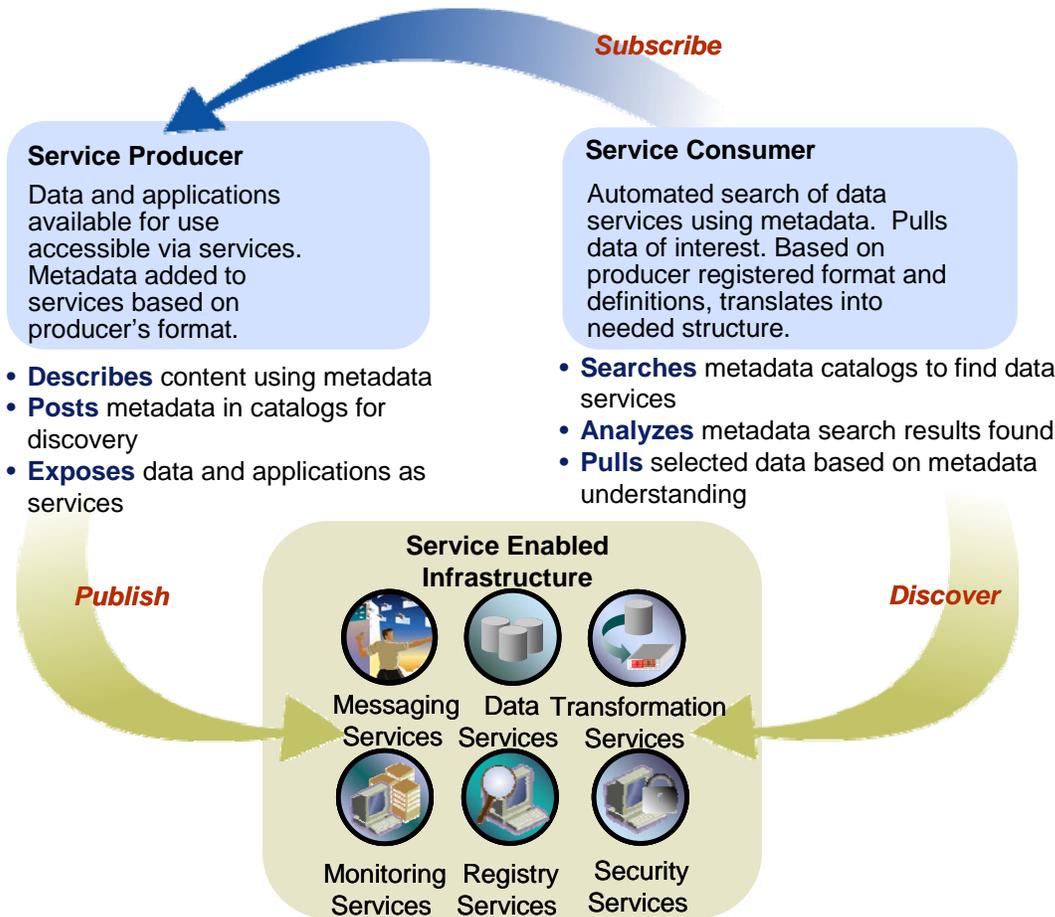
Subscribe

Service Producer

Data and applications available for use accessible via services. Metadata added to services based on producer's format.

- **Describes** content using metadata
- **Posts** metadata in catalogs for discovery
- **Exposes** data and applications as services

Service Consumer

Automated search of data services using metadata. Pulls data of interest. Based on producer registered format and definitions, translates into needed structure.

- **Searches** metadata catalogs to find data services
- **Analyzes** metadata search results found
- **Pulls** selected data based on metadata understanding

Publish

Discover

Service Enabled Infrastructure

Messaging Services   Data Services   Transformation Services

Monitoring Services   Registry Services   Security Services

Figure 16 - SOA Publish-Discover-Subscribe Model

5.1.5 Technology Layer Vision

DOE's technology vision is to have a component-driven infrastructure based on standardized technologies that enables the delivery of services and capabilities in a consolidated infrastructure. DOE is addressing the challenges associated with a large-scale Departmental transformation with a technology approach that delivers more scalable, interoperable, secure, and manageable information systems. The target architecture provides increased specificity on the coordinated set of technologies and implementation styles that DOE has chosen to support its enterprise solutions.

The direction provided within the target – as substantiated by ongoing transition activities – ensures that a common set of technical products, standards, and services will be implemented. Moreover, it gives explicit instructions for what technologies are preferred in order to deliver specific services, as well as what technologies are unacceptable for use. It also points to the balance that DOE seeks to achieve between buying or leasing technical services and products from best-of-breed vendors, versus investing in the development and maintenance of custom DOE solutions. In this manner, the technical architecture will enable collaboration among

multiple groups designing and developing solutions across the Department, leading to a consolidated infrastructure. The conceptual vision for a move toward consolidation is depicted graphically Figure 17 – Virtualization of the Infrastructure Consolidation below. This vision for consolidation is part of the DOE Target EA Vision, particularly with respect to the DOE Application Architecture, and it already includes key DOE initiatives such as Department of Energy Common Operating Environment (DOECOE) and Energy Sciences Network (ESNET).
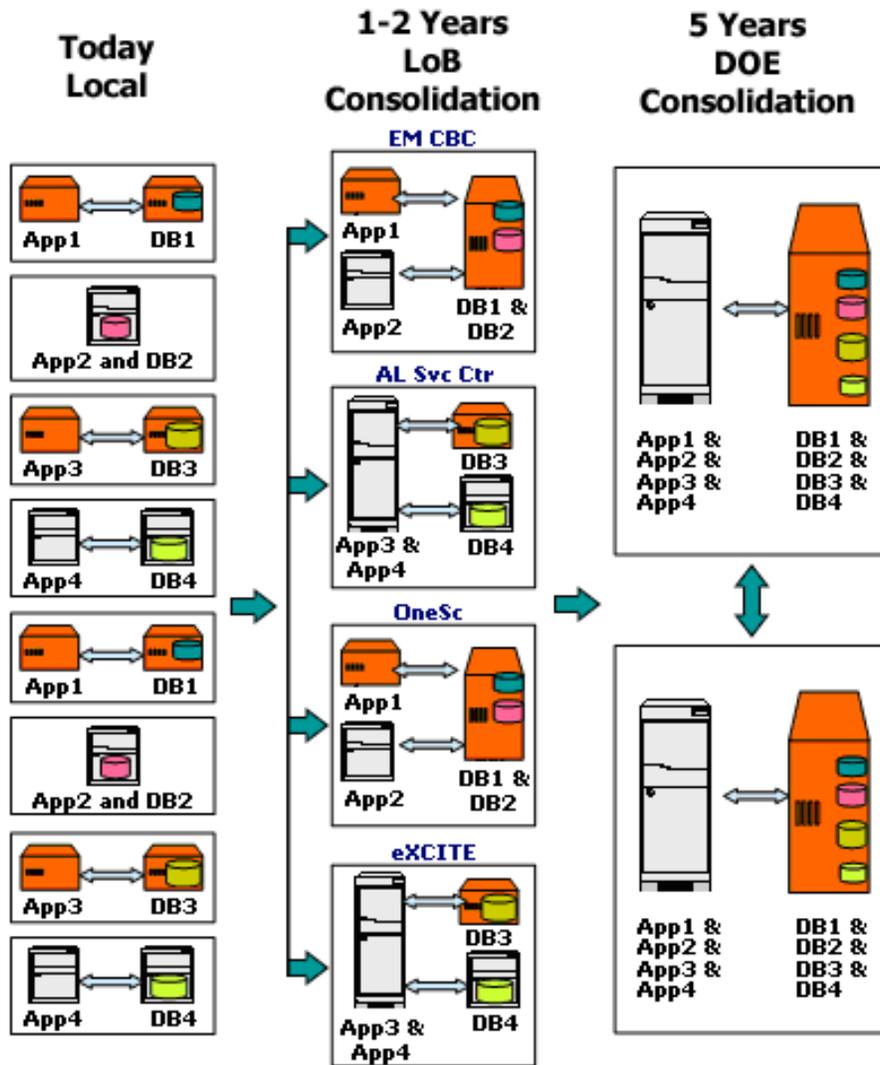

Figure 17 – Virtualization of Infrastructure Consolidation

5.1.6 Security Layer Vision

DOE's security layer vision applies equally to classified and non-classified systems. DOE's information systems security program enables the Department's mission objectives through a comprehensive and consistently implemented set of risk-based, cost-effective controls and measures that adequately protect information contained in Federal Government information systems. The vision for security in the architecture is that security implications are woven into and addressed within all architectural layers. The Department has established the following information systems security management goals and objectives:

- Identify problems and propose solutions to strengthen DOE's ability to identify and defend against threats, correct vulnerabilities, and manage risks.
- Promote seamless, secure information sharing both within the Department and with external stakeholders to improve operational timeliness.
- Improve and promote more consistent security management processes and controls across the Department through adaptation of proven practices.

The Department is also addressing security holistically through a number of related activities:

- **Program Management:** Policy development (including policies related to privacy); budget development; oversight; performance measurement; reporting; and development of a security architecture.
- **Information Systems Lifecycle:** Initiation (security categorization and preliminary risk assessment); acquisition/development (risk assessment, security functional requirements analysis, security assurance requirements analysis, cost considerations and reporting, security planning, security control development, developmental security test and evaluation, and security planning); implementation phase (inspection and acceptance, systems integration, security certification, and security accreditation); operations/maintenance (configuration management and controls, and continuous monitoring); and disposal (information preservation, media sanitization, hardware and software disposal).
- **Situational Awareness:** Network/system discovery and reporting; intrusion and/or anomaly detection; operational management; vulnerability assessment; configuration management; patch management; and other monitoring and analysis tools/capabilities that assist in providing a comprehensive picture of the current system security status.
- **Incident Response Capability:** Identification, detection, evaluation, reporting, and response to anomalous behaviors in a target system or systems.
- **Training, Specialized Training and Knowledge Sharing:** User training to assure that individuals understand information systems security concepts and rules of the system; annual security awareness training for all users; specialized training for people with specific security responsibilities, e.g., developers, system/network administrators, information security professionals, and executives; and knowledge sharing through agency hosting or participation in IT security conferences, meetings, and councils to discuss use of new security technology, important security issues, and innovative security practices.
- **Selection, Evaluation, and Implementation of Security Solutions:** Selection; evaluation; testing; acquisition; and implementation of security products and services.

5.2 DOE's Enterprise Level Transitions

There are agency-wide transitions at the Department that DOE is undertaking in addition to its Segment Strategy approach to fulfill the migration to the DOE Target EA Vision. These broad and overarching initiatives are discussed in the following sections.

5.2.1 Transitioning to Federal Transition Framework (FTF)

The creation of e-services has made it possible for the Federal Government to provide and interact with the citizen more quickly and efficiently then before. Several government-wide initiatives were stood up to answer the need, namely E-Gov and LoB (Line of Business). The IT initiatives within these cross-agency initiatives provide improved services to citizens, increased efficiency and effectiveness of the government, and savings to the taxpayer. With the success of both E-Gov and LoB there came a need for a single source for clear and consistent information describing government-wide IT policy objectives and cross agency initiatives. Therefore, the Federal Transition Framework was established. The establishment of FTF was a product of OMB working with agencies, such as DOE, and the E-Gov and LoB initiatives to establish the FTF Catalog, which contains eighteen cross-agency initiatives. FTF also seeks to establish a catalog of architectural information and implementation guidance for cross-agency initiatives using a simple, familiar structure aligned with the Federal Enterprise Architecture (FEA) Reference Models. There will be several benefits to DOE participation, including:

- Consistent, complete, and detailed information about the participation of DOE in cross-agency initiatives (which will more quickly inform OMB about their enterprise architecture, capital planning, and implementation activities)
- Better decision-making about IT investments from the information gathered which describe cross-agency initiatives
- Improved efficiency and effectiveness of DOE IT investments; with the ultimate goal of improving services and increasing cost savings

From a DOE Enterprise Architecture perspective DOE is accomplishing the following for complete integration of FTF:

- Reflect Cross-Agency Initiatives in the target enterprise architecture
- Conduct gap analysis between current and target architecture to identify gaps in the current implementation of cross-agency initiatives
- Update EA Transition Strategy to incorporate tasks, activities and milestones to close gaps between current and target architecture
- Documentation of initiative usage scenarios uses terms and concepts that are defined by the Line of Business (LOB) Concept of Operations (CONOPS) Document. The LOB CONOPS describes relevant architectural artifacts and provides guidance for the development of cross-agency initiative architecture in each phase
- The FTF Catalog[2] provides the means to locate and review policy and guidance for cross-agency initiatives and define requirements for integration with agency enterprise architecture and the EA Transition Strategy.

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[2] The FTF Catalog can be directly found at this link:
http://www.whitehouse.gov/omb/egov/documents/FTF_Catalog_PDF_Ver10_Final_Dec_2006.pdf

5.2.2 Support for the E-Gov Initiatives in the Transition Strategy

The key goal of participating in the E-Government (E-Gov) and Line of Business (LoB) initiatives are to improve services to citizens, to increase the efficiency and effectiveness of the government, and to provide savings to the taxpayer. To this end, Department of Energy began by identifying fifteen (15) investments from the DOE IT Portfolio for alignment with, or migration to, an E-Government or Line of Business initiative. Furthermore, beginning with the third quarter 2006 DOE, in response to OMB M-06-22 "Cost Savings Memo" provides details to OMB on the cost benefits of participating in E-Gov and LoB initiatives. The information provided, such as the baselines for investments, as part of the response to M-06-22 provided further evidence of the financial benefits of active participation in E-Gov and LoB government-wide initiatives. In compiling the information, the Office of the CIO met with DOE E-Government initiative leads and IT investment owners and provided the guidance and framework included with OMB memorandum M-06-22 to ensure that the costs reported on the attached baselines were developed consistent with the IT Investment Cost Measurement Framework and the guidance and cost principles in Attachment C of OMB Circular A-76. In addition, the Office of the CIO is currently working with IT investment owners to ensure that a process to measure actual investment costs and to identify future cost savings has been established.

5.2.3 DOE Most Efficient Organization (MEO) in the Transition Strategy

In November, 2005, the Department of Energy awarded a seven year, $1 billion award to Energy Enterprise Solutions, LLC, in partnership with the Department of Energy's Most Efficient Organization (MEO), to support the Department's IT requirements as a result of the DOE A-76 IT Competitive Sourcing Study. Under the President's Management Agenda (PMA), Federal Agencies must open many activities deemed not inherently governmental to outside competition. The goals of Government Competitive Sourcing Actions are to improve services and cut costs. The award to the Federal MEO and its industry partners was projected to save DOE about 35% over current IT expenditures throughout the life of the contract. This A-76 contract award consolidated a number of existing and IT-related DOE contracts.

In conjunction with the DOE Federal IT workforce, this single integrated Federal/contractor solution has provided consolidated IT services, simple access, effective management, strengthened security, and improved performance by delivering services on time and with exemplary quality throughout DOE, its Federal stakeholder communities, and the American public. The Federal/contractor partnership continues to support DOE in a wide range of information technology areas including Enterprise Architecture (EA) and Capital Investment Planning & Control (CPIC), as well as cyber-security, applications, web design, and engineering for DOE corporate systems, and technical support for the DOE IT Infrastructure and operations, including telecommunications, network engineering and operations, applications hosting, desktop management and user support services.

Within the DOE OCIO the MEO has undertaken an initiative as part of the DOE Target EA Vision to become ISO 20000 compliant. This would apply only to the areas of service for which the MEO is held accountable. Currently, this is in the planning stage, identifying the best overall strategy for implementation, and the ISO 2000 initiative team is looking at consultant capabilities that can be brought into the agency to do an assessment and perform a gap analysis between the Baseline and Target architectures of the existing service support and service delivery processes. Part of the overall strategy will include training for employees in the MEO, and a structured implementation plan that addresses each of the identified gaps as part of the DOE Transition Strategy. No official timetable has been determined as yet, but when it is available, it will be folded into the agency's Sequencing Plan. Previous to this current effort, the Office of Operations had introduced its employees to ITIL by sponsoring ITIL v2 Foundation Training for several dozen employees. Some of the details of what has been accomplished by the MEO are also discussed in Section 5.1 in Volume 2 of this TS&SP

5.2.4 IT Security Architecture in the Transition Strategy

The Department of Energy (DOE) EA Transition Strategy and Sequencing Plan (TS&SP) identifies, evaluates and sequences transition activities that will migrate DOE to its "To- Be" business and enabling information technology environments, as defined in the February 2007 DOE TS&SP. Currently, DOE is revamping its Security Architecture to fully include all the features the Secure Energy Enterprise System (SEES) Segment Architecture (which was unavailable as yet at the time of this document's preparation) in order that it will also better serve DOE's efforts to fulfill its Target EA Vision. The purpose of establishing the DOE IT Security Architecture is to provide a holistic framework, based upon official DOE CIO Guidance, for the management of IT Security across DOE. The purpose of the DOE IT Security Architecture is to provide guidance that enables a secure operating environment. The architecture is driven by the Department's strategies and links IT security management business activities to those strategies.

The key to the cyber security program is identifying and documenting individual and organizational core values that ensure all levels of Federal and contractor personnel supporting the DOE behave in a manner that supports the strategic cyber security mission and goals. Fundamental to these core values are personal commitment, mutual trust, open communication, continuous improvement, and the full involvement of all affected parties. The core values of Teamwork, Integrity and Respect, Ownership and Accountability, Timeliness, and Honoring Our Partners provide the framework by which cyber security program concepts, technology, and guidance will be implemented to support the DOE community and their diverse missions.

5.2.5 IPv6 Migration in the Transition Strategy

Internet Protocol version 6 (IPv6) Transition Planning and Implementation is a foundational activity focused on the Federal Government's migration from Internet Protocol version 4 (IPv4) to IPv6. As stated in the CIO Council guidance entitled "Integrating IPv6 into Agency Enterprise Architecture Planning," IPv6 is "an enterprise transformation driven by business, environmental, and technology factors, the scope and impact of which extend well beyond the IT organization."

The new features and functionality being introduced with the rollout of IPv6 are substantial, including expanded address space, improved flexibility and functionality, improved information routing, enhanced mobility features, improved security, and simplified activation, configuration and operation of networks.

Internet Protocol (IP) provides the addressing mechanism that defines how and where information moves across interconnected networks. The legacy IPv4 protocol is limited in its ability to support the increasing number of users and devices on a given network. IPv6 was primarily developed to increase the amount of available IP address space and provides many enhanced capabilities from its predecessor IPv4. The primary rationale for this sequencing decision focuses on the following factors.

The Department of Energy (DOE) network backbone is comprised of DOENET and ESnet (Energy Sciences Network). ESnet has been running IPV6 and leading the way for the Department and the scientific R&D community. DOENET will soon follow and be using IPv6 by June 30, 2008.

ESnet runs IPv6 native in the core backbone. The Intermediate System - Intermediate System (ISIS) protocol and the Interior Border Gateway Protocol (i-BGP) are used as interior routing protocols and BGP is used as the exterior routing protocol. The ESnet postal system and one DNS server (NS1) are IPv6 capable. IPv6 service is provided to any site requesting IPv6 connectivity.

A Site Coordinator can request an IPv6 prefix (block of addresses) from ESnet's large IPv6 address space. The service is run as a production service and ESnet accepts and pursues trouble calls related to IPv6. ESnet manages the distributed 6TAP, participates in the 6BONE and the PAIX IPv6 exchanges, and offers to establish native IPv6 peering sessions with R&E and commercial networks as opportunities arise.

6   DOE's Segment Architecture Approach

DOE's overall Segment Approach is comprised of four key strategies which guide the identification, development and deployment of Segments to fulfill the transition to the DOE Target EA Vision. These strategies are described in the sections below.

6.1   Strategy 1:   Focus on Business Services and Enterprise Services segments

The Department has focused segment architecture efforts on Business Services and Enterprise Services to set the foundation and gain Departmental buy-in for moving further into the mission areas as the architecture continues to mature. The Business Services and Enterprise Services are cross-cutting and, as such, they are likely to yield the greatest immediate financial benefits to the Department in terms of cost reduction, cost avoidance, and Return on Investment (ROI). In addition, Business Services and Enterprise Services also provide the greatest opportunity for early adoption and quick cooperation between and among Program Secretarial Offices. The IT investments supporting Business Services and Infrastructure account for a large portion of the total IT investment portfolio. In addition, there are synergies that exist among the Business Services and Enterprise Services segments. For example, the Department's I-MANAGE Program cuts across and integrates multiple functions and services. Likewise, the Business Services and Enterprise Services segments have more direct ties to ongoing government-wide initiatives (E-Government, Line of Business, and SmartBUY), which are leveraged and integrated into DOE's modernization solutions.

6.2   Strategy 2:   Build on work in progress

The Transition Activities defined in the TS&SP leverage and build on ongoing efforts. The Department is already undertaking many important initiatives to modernize IT in support of the business. The Transition Activities in this plan do not always correspond to significant new work. In many cases, a Transition Activity simply ensures that the major initiatives and investments that are already ongoing or planned are: (1) being managed to a common vision; (2) producing common and architecturally aligned work products; and (3) attempting to identify and move toward opportunities to further optimize the business and supporting IT across the Department.

6.3 Strategy 3: Incrementally evolve DOE's EA through Segment Architecture

The Department's segment architecture approach to building out the EA incrementally in manageable, value-driven segments is integral to the TS&SP. The TS&SP is built around the prioritization and sequencing of these large pieces (i.e., segments) of architecture development and implementation work. The execution of the TS&SP has resulted in the development of a vision for each segment and detailed implementation plan, within the context of the overall EA. Individual segments are not architected in isolation (i.e., new stovepipes being created). Rather, a fundamental element of DOE's segment architecture approach is the integration of each of the segment architectures with other related business functions, services, and technologies. The identification of dependencies among Transition Activities in the TS&SP was one of the first steps toward ensuring integration across segments.

6.4 Strategy 4: Driving IT portfolio decision-making

The Department's EA, and efforts to integrate the EA with related management processes such as IT Capital Planning and Investment Control (CPIC), are still maturing. The EA and TS&SP drives IT portfolio decision-making (i.e., increased funding to cover a particular gap, elimination or reduction of duplicative investments). The TS&SP at this stage focuses on identification of the investments associated with a given segment and analysis of how the various investments relate (i.e., potential duplication, opportunities for collaboration and sharing). It attempts to identify priority areas for further analysis. The outcome of the activities in the TS&SP (segment blueprints and implementation plans) drives changes to the portfolio.

7   DOE's FY 2008 Segments

The Department of Energy has adopted the working definition that a ***SEGMENT*** is a "slice" of the business or IT services that can be distinctly described and analyzed. From a Capital Planning and Investment Control (CPIC) perspective, a segment is a "container" of major IT investments that support a business or IT services. At DOE, segments have the following characteristics. They may:

1. Be business-focused (e.g., Line of Business) and/or IT-focused (e.g., IT Service)

2. Be a horizontal or vertical portion of the organization

3. Have a specific purpose that is measurable

Segments can take a variety of forms where each is associated with unique objectives and generally aligns to one of the following four categories:

1. **Core Mission Areas**: Unique service areas that define the mission or purpose of the agency. Core mission areas are defined within the DOE Target EA Business Layer Architecture.

2. **Business Services**: Common or shared business functionality that support the core mission areas. Business services are also defined within the DOE Target EA Business Layer Architecture and include the foundational mechanisms and back office services used to achieve the agency mission.

3. **Enterprise Services**: Common or shared IT services that support core mission areas and business services. Enterprise services are defined within the DOE Target EA Application Layer Architecture and include the applications and service components used to achieve DOE's mission.

4. **Business Units:** An architectural segment may span one or more business units. A Segment is typically easier to develop if it begins with a slice of single business unit. Ultimately, greater economies result from building out Segments that cross business units.

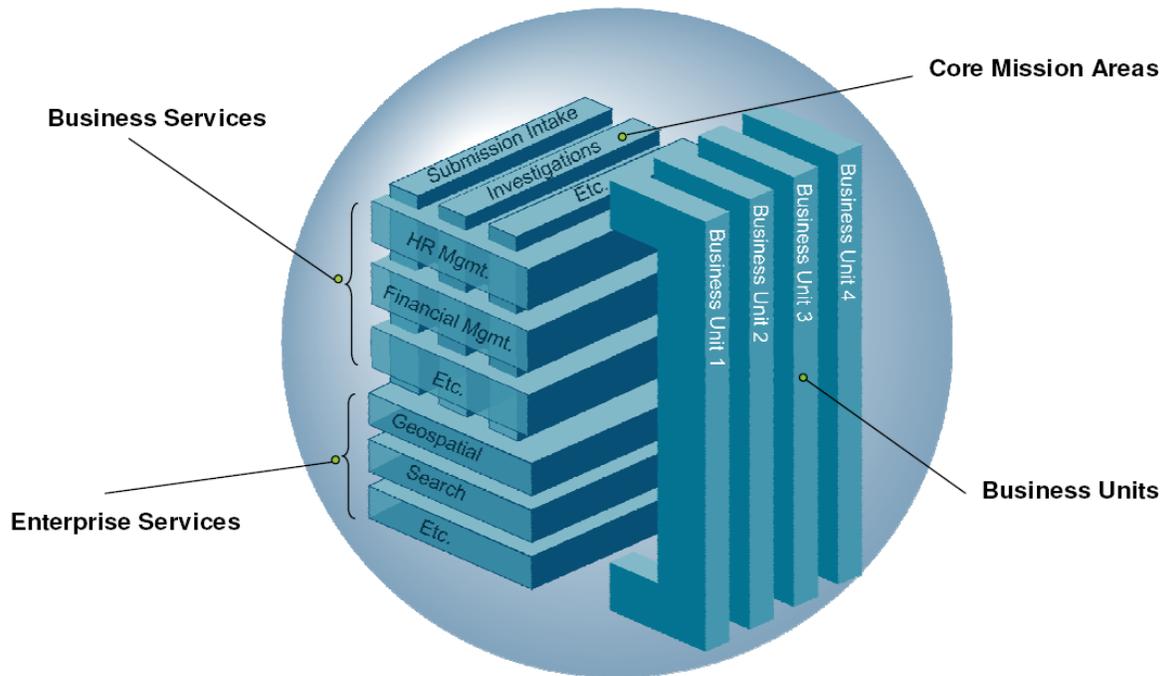The relationships between these Segment Categories are shown in Figure 18 – DOE Segment Categories**.**

Figure 18 - DOE Segment Categories

Associated with each Segment is a **_SEGMENT ARCHITECTURE_** which is a business-driven, results-oriented architecture for a portion or segment of an enterprise (i.e., agency). A Segment Architecture creates a roadmap that the segment business owners and the whole enterprise itself can use to enhance operations and achieve measurable performance improvements. Like an Agency's EA, Segment Architectures encompass performance, business, data, application, and technology layers. This information will be used to identify opportunities for efficiencies and demonstrate business results while evolving towards the desired operating environment.

7.1 DOE Segment Approach

There are special relationships between DOE's Enterprise Architecture, its Segment Architectures and the related Solution Architectures. These relationships are also described in general and in detail in the document, the *FEA Practice Guide,* from the Federal Enterprise Architecture Program Management Office. Figure 19 – Architecture Relationships is from that document and illustrates how these different types of architectures are associated with each other.
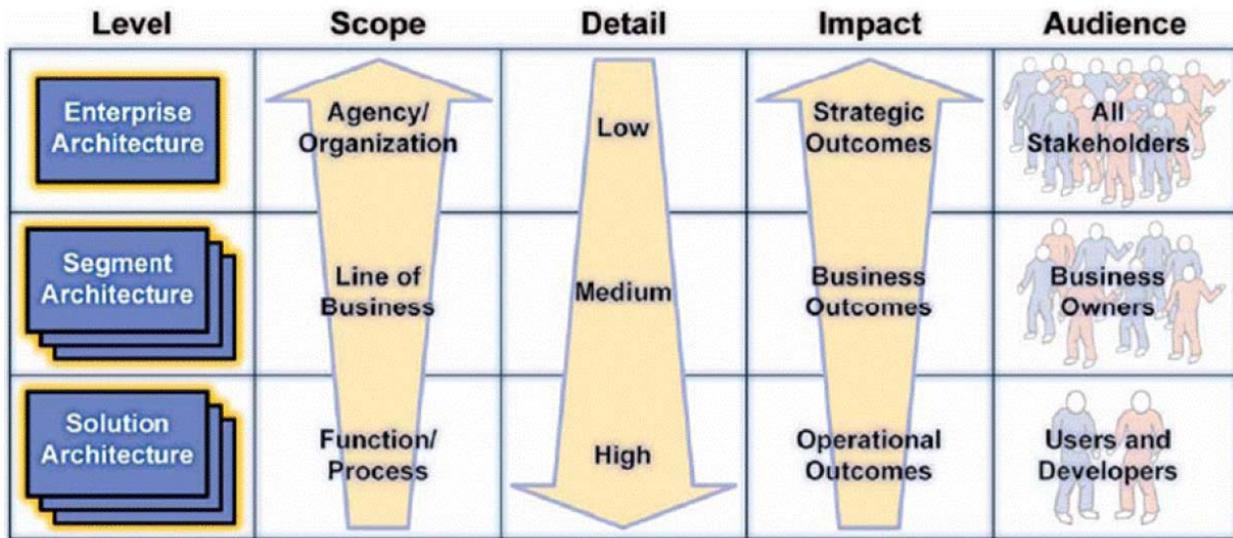
Figure 19 - Architecture Relationships[*]
* Diagram is from the *FEA Practice Guide*, Federal Enterprise Architecture Program Management Office

Each of these types of architectures is briefly described as follows:

- **Enterprise Architecture:** Describes the agency-level vision for business and information management and performance improvement. Major elements of EA include baseline and target architecture along with a transition plan or roadmap.

- **Segment Architecture:** Provides baseline and target architecture and a detailed transition strategy for a portion of the enterprise. Segments are defined by the agency EA, and segment architecture work products are reconciled at the enterprise level to increase collaboration and reuse.

- **Solution Architecture:** Developed for priority opportunities to achieve target performance improvements.

For FY2008, DOE is providing details on the following three Segments and their associated Segment Architectures:

- *Geospatial Science Segment*

- *Business Support Services Segment*

- *Environmental Monitoring Segment*

The following sections discuss DOE's Segment development process and plan in which these segments are selected fit as the foundation of the DOE Transition Strategy as well as an overview of each of these Segments individually.

7.1.1 DOE Segment Development Process

In identifying, selecting and developing its Segments for its Enterprise Architecture, DOE follows the OMB guidance with respect to the interrelationship of the Segment Types as shown in Figure 20 – Relationship of Segment Types. Notably, while both Enterprise Services and Business Services support the Core Mission area, Enterprise Services also directly supports Business Services as well.
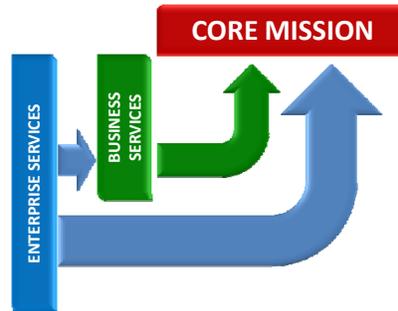
Figure 20 - Relationship of Segment Types

Further, DOE first groups its Segment Components into their respective Segments Types to establish the appropriate hierarchy of these Components for their inclusion in Segments. This is illustrated in Figure 21 – Hierarchy of Segment Types.
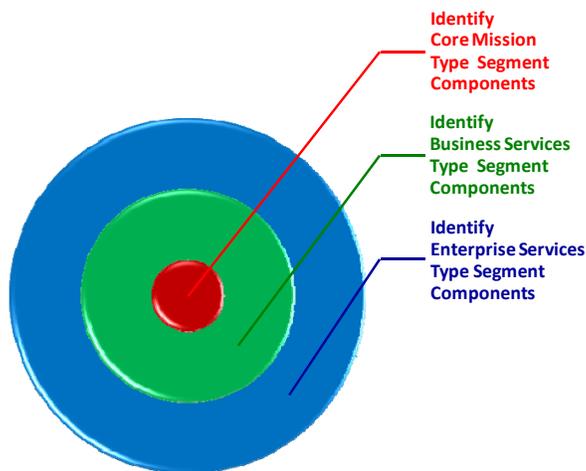
Figure 21 - Hierarchy of Segment Types

Then, DOE groups the Segment Components within each of the Segment Type categories to form potential Segments for the EA. For any given year, there will be Current and Prospective Segments defined on this basis as shown in Figure 22 – DOE Segment Development Process.
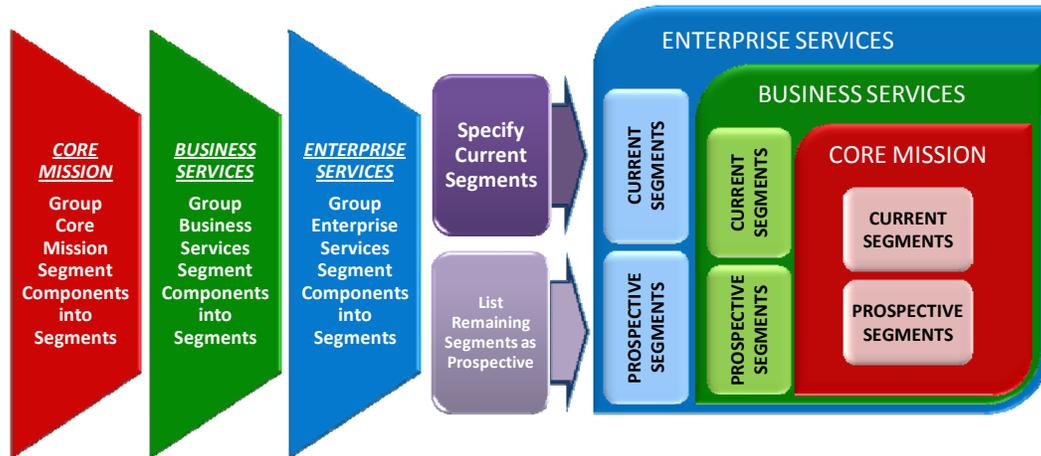

Figure 22 - DOE Segment Development Process

7.1.2 DOE Segment Development Plan

As each Fiscal Year progresses, DOE refines its Master Segment List using its Segment Development Process to re-examine Segment definitions in terms of what Segment Components they are comprised of as well as which Prospective Segments will be moved up into the Current Segment grouping. As depicted in Figure 23 – DOE Segment Development Plan, through the progression of years going forward, DOE plans to develop and deploy additional segments to
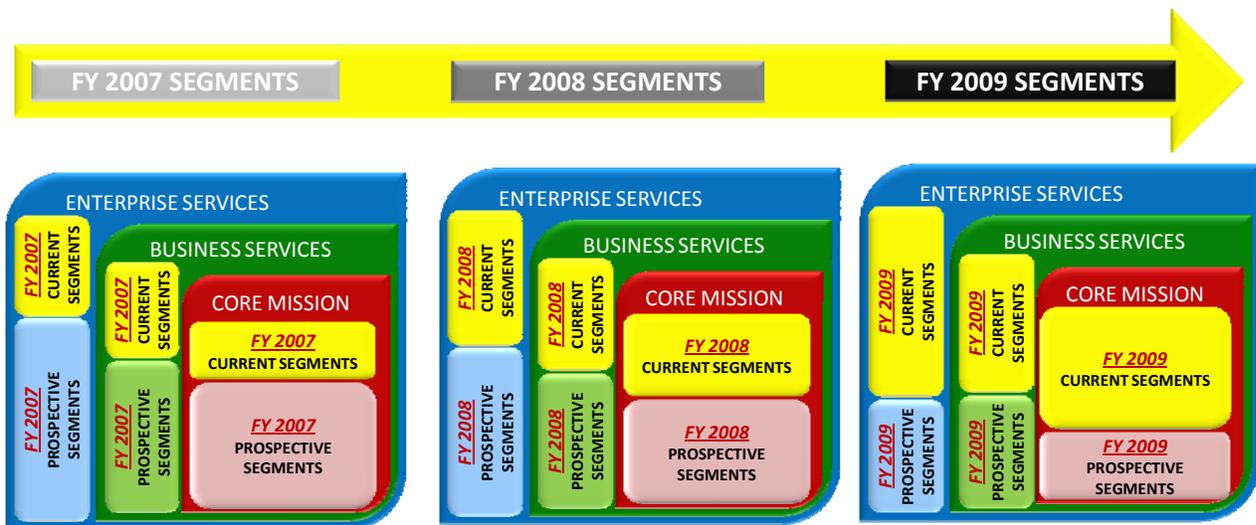

Figure 23 - DOE Segment Development Plan

transition to its Enterprise Architecture Target Architecture Vision.

For FY 2008 and prospectively for FY 2009, DOE plans to implement three to four Segments in FY 2008, and then deploy six Segments by the end of FY 2009. The specifics of which DOE Segments have been and will be available in which years is laid out Figure 24 – DOE Featured Segments.
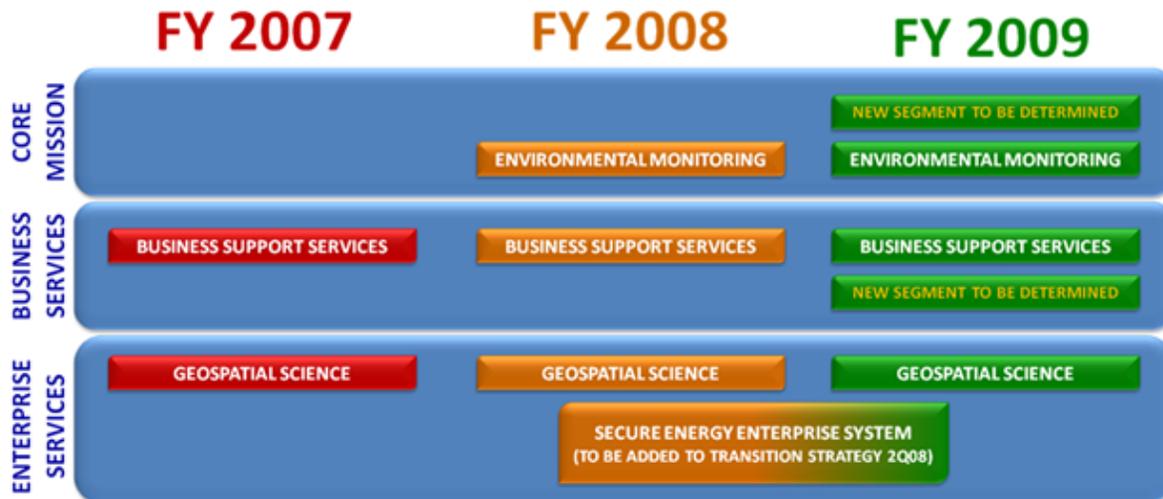

Figure 24 - DOE Featured Segments

7.2 DOE's FY 2008 Segments and associated Segment Architectures

The DOE EA Program has implemented a scalable, repeatable, five-step Segment Architecture development methodology to develop Segment Architectures. Using a common methodology across the Agency will promote more seamless integration of the Segment Architectures into the EA. The application of this methodology should produce Segment Architectures that meet DOE and OMB's goals and requirements for Segment Architecture. This methodology is structured around asking and answering questions about stakeholder requirements. The methodology is used to make informed decisions about the nature and priority of identified opportunities. The information gained is used to plan and initiate business and information management solutions that will aid in the achievement of target performance goals. This methodology is depicted in the schematic in Figure 25 – DOE Segment Architecture Methodology shown below.
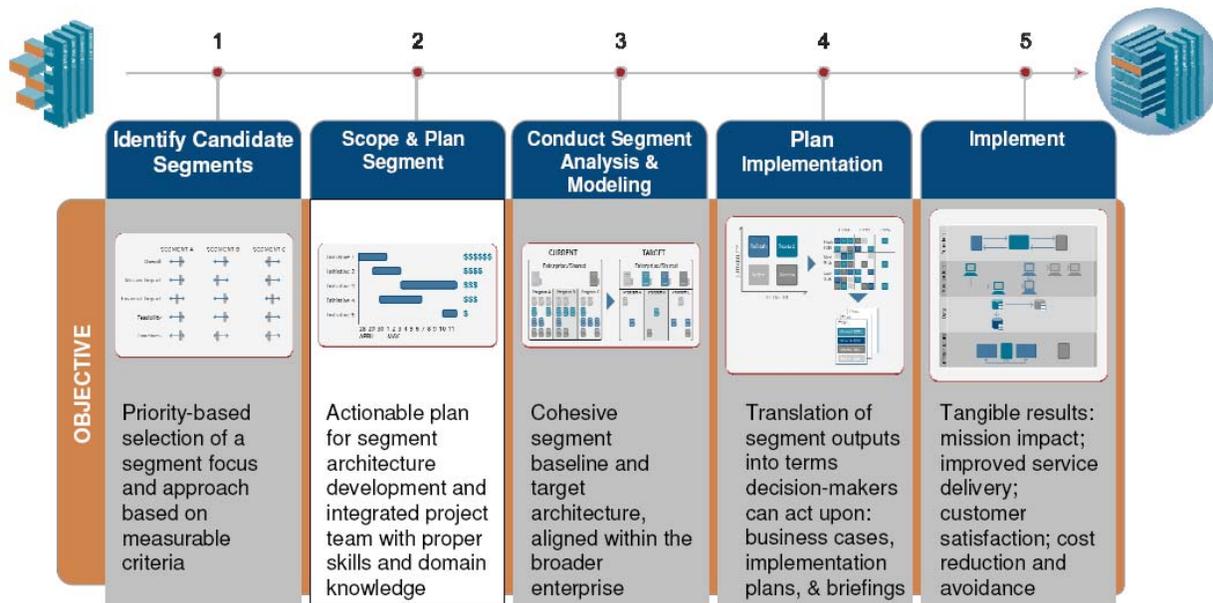
Figure 25 - DOE Segment Architecture Methodology

The value of Segment Architectures for DOE is that they provide a powerful technique for the DOE Program Secretarial Offices (PSO's) to collaborate, implement the DOE EA, and deliver value across the board. As an integrated element of an EA program, completed Segment Architectures can help a PSO drive improvements in business efficiency and effectiveness.

These benefits for DOE include:

1. **Deliver Business Results Quickly**: Segment Architecture focuses on a particular business function, service or enabler, employing "agile" analysis and modeling to accelerate the speed of delivery of solutions to the business.

2. **Achieve Strategic Alignment**: The selection and sequencing of architectural segments is driven by business priorities within a holistic enterprise framework.

3. **Build Trust**: By incrementally delivering business results and by jointly addressing business challenges, the CIO organization will build trust among business leadership.

4. **Reduce Compliance Pressures**: External mandates and compliance pressures are a reality, often THE reality, for government agencies. OMB now requires segment architecture completion as a cornerstone of a "green" EA program rating.

7.2.1 Geospatial Science FY 2008 Segment[3]

The Department of Energy's (DOE's) overarching mission is to discover the solutions to power and secure America's future. The five strategic themes which serve as a roadmap to achieving this mission are energy security, nuclear security, scientific discovery, environmental responsibility, and management excellence. This mission is also enabled through the sound use of information technology, as outlined in the DOE Information Resource Management Strategic Plan.

Each of the Department's strategic themes is supported by geospatial science resources and activities – people, processes, data and technology that collect, analyze, and communicate information that are spatially referenced. Geospatial science is being advanced as an enterprise services segment architecture within the Department's Enterprise Architecture because it is an enabling technology that is cross-cutting nature and there are existing opportunities to leverage work for intra- and inter-agency coordination.

The history of geospatial science in DOE is one of rapid change in response to technological and scientific advances coupled with increasing data availability, departmental and nationwide shifts in emphasis from basic to applied science, the need to respond to changing national priorities and emergencies, and changing funding opportunities (Bollinger et al. 2007).

In 2001, the Geospatial Science Steering Committee (originally called the DOE GIS Core Team) was formed, with a mission to promote effective utilization of geospatial science and technology in the DOE complex by fostering technical excellence and communication, identifying and advocating best business practices, and providing sound recommendations on policy and standards. Representatives from major DOE facilities and national laboratories were selected to comprise this team. The GSSC continues to be active in FY 2008 in reviewing the usage of geospatial resources across the complex, evaluating geospatial needs, planning the future of DOE geospatial activities (Rich et al. 2007).

7.2.1.1 Geospatial Science FY 2008 Segment Architecture

DOE's core mission includes many priorities that are critical to the national security, environmental welfare, and economic vitality of the country. DOE's national security mission includes ensuring the integrity and safety of the country's nuclear weapons stockpile while promoting international nuclear safety. The nation's environmental welfare requires DOE to clean up contaminated sites and dispose of radioactive waste left behind as a byproduct of nuclear weapons production, nuclear powered naval vessels, and commercial nuclear energy production-a legacy on which tens of billions of dollars have been invested in environmental remediation and management.

7.2.1.1.1 Geospatial Science Baseline Architecture

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[3] For a detailed discussion of the Geospatial Science FY 2008 Segment and its Segment Architecture, please refer to the Geospatial Science Segment Architecture document.

The Department of Energy leverages geospatial technology as an enabling capability to support many aspects of its mission objectives. "Geospatial science is used across the DOE complex to address a broad range of problems in support of both basic and applied scientific research, as well as site operations, including emergency response, homeland security, environmental restoration, weapons stewardship, facilities management, transportation routing (nuclear materials, weapons, and hazardous waste), and infrastructure analysis. These activities correspond directly to DOE's mission areas concerning national security, energy sustainability, environmental stewardship, and basic science. DOE's national security mission area is focused on ensuring the integrity and safety of the country's nuclear weapons stockpile, while promoting international nuclear safety and non-proliferation. DOE's energy sustainability mission area is focused on providing diverse and abundant sources of energy and thereby contributing to the nation's economic viability. DOE's environmental stewardship mission area is focused primarily on cleanup of contaminated sites and disposal of radioactive waste left behind as a byproduct of nuclear weapons production, nuclear powered naval vessels, and commercial nuclear energy production—a legacy for which tens of billions of dollars have been invested in environmental remediation and management. DOE's basic science mission area is focused on diverse scientific problems relating to the other mission areas and includes study of climate change, physics, life sciences, fossil and nuclear energy, and the environmental sciences." (Rich, 2007)

7.2.1.1.2 Geospatial Science Target Architecture

The target state of Geospatial Science technology within the Department would encompasses outcomes that cross mission and business lines as well as those that are unique to one or more individual offices and programs. To move toward this strategic direction for geospatial science across the DOE complex, the Geospatial Science Steering Committee (GSSC), consisting of the geospatial community of professional practitioners from the major DOE National Laboratories, Facilities, and Program Offices have proposed the following vision statement to foster geospatial science for the Department (Rich, et. al., 2007).

DOE's geospatial science focuses on cross-complex collaboration in three realms:

1) *to provide cross-cutting capabilities required to address temporal and spatial aspects of complex basic and applied problems facing DOE and the nation, along with rapid and robust response to emergencies;*
2) *to ensure ongoing support for the basic geospatial science research and development required to support DOE's advanced geospatial science applications; and*
3) *to develop a long-term strategy to manage DOE's geospatial science resources (personnel, facilities, data, models, and GIServices for geospatial information management, analysis, and visualization).*

7.2.2 Business Support Services FY 2008 Segment[4]

The Business Support Services (BSS) Segment is supported and characterized by one Information Technology (IT) investment; i.e., the core, enterprise-wide projects (subsystems) from the I-MANAGE (Integrated Management Navigation System) Program. I-MANAGE, as a Program, launched at DOE in 2003, which predates the Office of Management and Budget (OMB) segments requirement. As such, the BSS Segment is already maturing with some subsystems (projects) in steady-state, some in a mixed life cycle stage and others in the acquisition phase.

The principle, taken from OMB's Practice Guide to Enterprise Architecture (EA), that represents the single most important factor of the Business Support Systems Segment Architecture is: "Business-led architecture is more successful in meeting strategic goals, responding to changing mission needs, and serving citizens' expectations than technology, or budget-driven, architecture." (*FEA Practice Guide Section 1: Overview, Pages 1-3*) As such, the BSS Segment and its Segment Architecture are customer-driven and guided by both the Department's Chief Financial officer (CFO) and Chief Information Officer (CIO) to institute a modernization program for core business services.

7.2.2.1 Business Support Services FY 2008 Segment Architecture

The main focus in the BSS Segment architectural activities is the effective and efficient execution of the I-MANAGE Program. I-MANAGE, as a Major Investment Program, launched at DOE in 2003, which predates the Office of Management and Budget (OMB) segments requirement. Consequently, the BSS Segment is already maturing with some subsystems (projects) in steady-state, some in a mixed life cycle stage and others in the acquisition phase.

7.2.2.1.1 *Business Support Services Baseline Architecture*

These core subsystems of the I-MANAGE program define the scope of the BSS Segment Architecture and consist of:

- CHRIS: The Corporate Human Resource Information System is the human-resources component of I-MANAGE.
- STARS: The Standard Accounting and Reporting System is the financial management component of I-MANAGE.
- IDW: The I-MANAGE Data Warehouse component is the enterprise-reporting facility for I-MANAGE.
- STRIPES: The Strategic Integrated Procurement Enterprise System initiative is the procurement and financial assistance component of the I-MANAGE program.
- SBS: The Standard Budget System is the budget formulation and execution component of I-MANAGE.

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[4] For a detailed discussion of the Business Support Services FY 2008 Segment and its Segment Architecture, please refer to the Business Support Services Segment Architecture document.

The owner of the BSS Segment Architecture is the owner of DOE's I-MANAGE Program. Therefore, the Charter for the segment corresponds to the Charter for I-MANAGE. The governance structure for the segment is the I-MANAGE program governance.

7.2.2.1.2 Business Support Services Target Architecture

The Department's own movement from Agency Strategy to Strategic Results reinforces the "line-of-sight" principle in executing its Strategic Plan's priorities and key objectives. The DOE Plan outlines specific Business Support Service results which drive performance while the EA provides high-level guidance for transforming how DOE operates and achieves desired results. Additionally, the Department's Capital Planning and Investment Control (CPIC) process determines an optimal mix of investments and resource allocations to achieve organizational objectives contained in the DOE Strategic Plan, as well as the DOE Enterprise Architecture.

7.2.3 Environmental Monitoring FY 2008 Segment[5]

The Environmental Monitoring segment represents a Core Mission segment for the Department of Energy. Within the context of the larger Environmental Management sub-function and functions performed at DOE, Environmental Monitoring typically falls at the end of the facility Clean-up Lifecycle, as shown Figure 26 – Clean-up Lifecycle below.
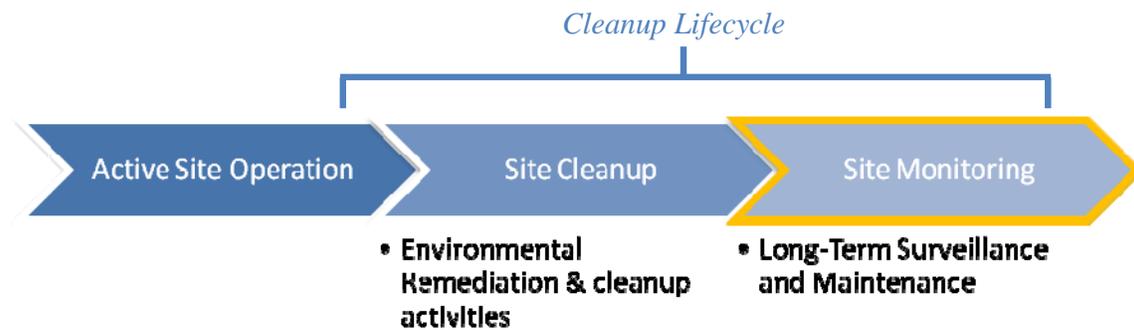

Figure 26 - Clean-up Lifecycle

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[5] For a detailed discussion of the Environmental Monitoring FY 2008 Segment and its Segment Architecture, please refer to the Environmental Monitoring Segment Architecture document.

While multiple organizations within the Department perform Environmental Monitoring functions in support of the mission, the Office of Legacy Management is currently the only participating office. Additionally, while Environmental Monitoring functions typically encompass a broad set of monitoring services including soil, air, and water testing, the current scope of the segment includes only the Ground and Surface Water Testing processes performed at LM closure sites. The Environmental Monitoring segment describes the current and target architectures of these scoped processes from the perspectives of the supporting applications, data and technology.   The Environmental Monitoring segment fulfills DOE's strategic initiatives such as DOE's efforts to increase the efficiency and improve the performance of access to environmental monitoring data for Stakeholder and Regulatory groups. As it supports DOE's Strategic Plan, its activities in doing so are maintained with a clear "Line-of-Sight" to DOE's Strategic Mission and Goals.

7.2.3.1 Environmental Monitoring Segment Architecture

Opportunities to improve performance in the Environmental Monitoring segment currently focuses on the Ground and Surface Water Testing processes performed by the Office of Legacy Management. Performance improvement opportunities for these processes focus on the reduction of paper processes and implementation of streamlined electronic interfaces between people, processes, and technology.

The Environmental Monitoring segment is described within the context of the DOE Enterprise Architecture (EA) Framework. DOE's EA Framework is comprised of seven interrelated architectural layers that constitute a comprehensive EA for the Department. It represents an evolution from the CIO Council's Federal Enterprise Architecture Framework (FEAF) Version 2.2, and is fully aligned with OMB's FEA reference models.

The DOE EA Framework is the model from which the Department's EA and related artifacts are developed, and is represented in the DOE Enterprise Architecture Repository (DEAR). The DOE EA Framework's seven layers represent a conceptual view of the EA for the Department. These layers are represented in the DEAR meta-model, which is built to support the architectural layers, their entities, and entity relationships.

7.2.3.1.1 Environmental Monitoring Baseline Architecture

The Environmental Monitoring segment applies the DOE Enterprise Architecture Framework to create a "line-of-sight" for the segment as shown in Figure 27 - Core Mission & Business Service Segment Line of Sight. As a Core Mission segment, the Environmental Monitoring architecture is documented from the perspective of the Business sub-function "Environmental Monitoring".
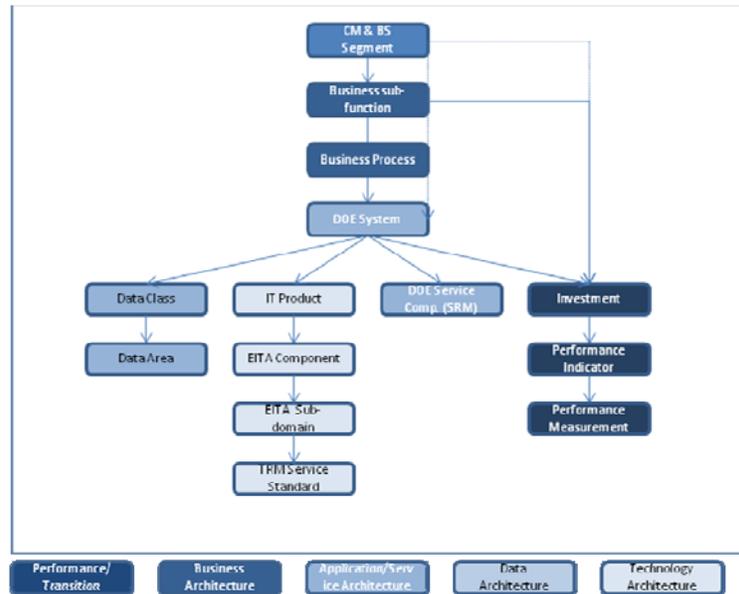

Figure 27 - Core Mission & Business Service Segment Line of Sight

7.2.3.1.2 Environmental Monitoring Target Architecture

The Environmental Monitoring target architecture represents the culmination of several detailed analysis efforts designed to improve the performance of LM's Environmental Field Sampling and Recording processes.

As the target architecture is implemented it is expected that increased efficiencies resulting from decreased processing time will result in substantive cost savings. Measurement of cost savings can be approximated by measuring the number of sample measurements uploaded through AFDCS and extrapolating the reduction in time that would otherwise be spent manually entering information. Because the AFDCS is still a pilot, target performance values have not been set, however the system is expected to rollout organization wide within the coming year. When it does, the Target Ground and Surface Water Testing processes will focus on reducing paper-based and manual input processes by introducing electronic data capture in the field.

7.3 DOE's FY2008 Enterprise Architecture Transition Strategy

The DOE EA Transition Strategy is the collective set of Segment Transition Strategies for any given fiscal year. The objective is to use the progressively greater number of DOE EA Segments each year and their migration to their individual Target Architectures as the Interim Target each year for DOE to continue to build out and fulfill its Target Enterprise Architecture Vision. This is depicted in Figure 28– DOE Enterprise Architecture Transition Strategy Progression as an annual series of Interim Targets based on the Current Segments available each year.
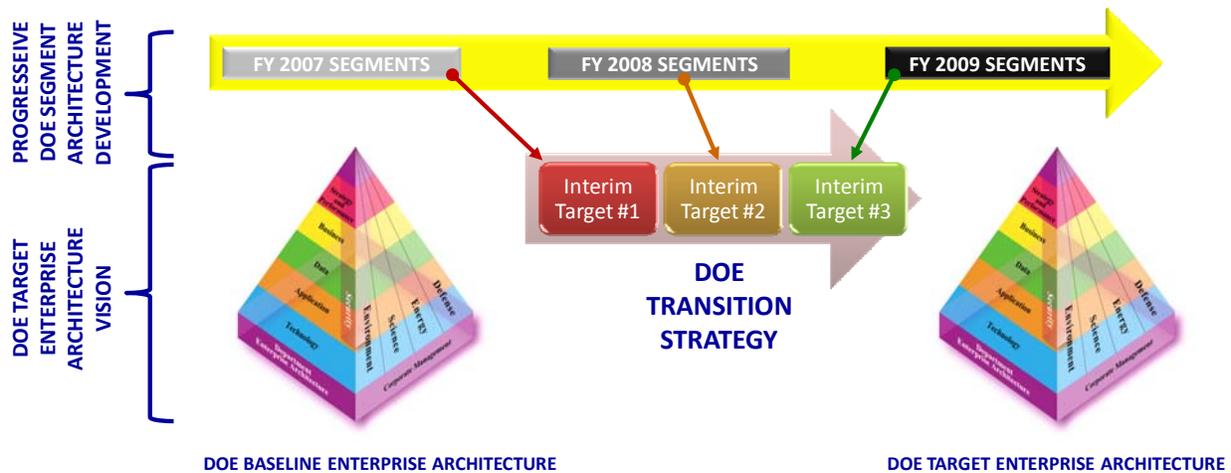
Figure 28 - DOE Enterprise Architecture Transition Strategy Progression

Each Current Segment will have a Transition Strategy of its own to migrate from its Baseline Architecture to its Target Architecture. As more Segments are identified, developed and deployed, the more the DOE Target Enterprise Architecture Vision is "filled out" with Segment Architectures. As such, the DOE Transition Strategy for FY 2008 is the set of the Segment Transition Strategies for the FY 2008 Current Segments taken together as the Interim Target for FY 2008. Each of the FY 2008 Segment Transition Strategies are described in the sections that follow.

7.3.1 Geospatial Science Segment FY 2008 Transition Strategy

The successful preservation of geospatial data assets begins with recognition of the value of geospatial data assets and the *lifecycle* of data. This recognition will need to be explicitly called out in records management policies if DOE is to preserve the data to adequately defend itself against future litigation challenging the justification for its closure actions and remediation activities.

The GS-PMO, in coordination with the GSSC, will establish an Integrated Project Team (IPT) to track and preserve this legacy data, bring it into compliance with Federal standards, and place the data on an enterprise system to support and enhance collaborative work while ensuring the long term configuration management of the underlying data. Thus the long term stewardship of DOE's legacy geospatial science data underpins DOE's important mission to clean up and remediate many of its contaminated sites.

In 2007, DOE has made contributions of time and resources to the development of the OMB Geospatial Line of Business (GLoB) and the Federal Geographic Data Committee's efforts to develop the Common Solution Technical Architecture (CSTA). The CSTA framework will be applied to DOE's geospatial data assets and business processes to insure that geospatial data are transferred and maintained for the historical record.

From the FY 2007 GeoSegArch submission, these are the steps will be taken in FY2008 to remedy the situation:

- Validate risk assumption that geospatial data and its documentation are insufficiently maintained to justify closure / transfer of DOE Environmental Management sites and facilities and pose a possible risk for litigation

- Estimate magnitude of 'potential' loss of data and cost implications to mitigate geospatial data loss and compliance

- Establish a risk Impact / Probability screen for Senior Management review and priority setting of sites in the Risk Pipeline

- Recommend preventative measures to mitigate further loss of data

- Develop guidance and documentation (record of Schedule) for geospatial legacy data compliance

- Inform Program Offices on geospatial legacy data management requirements

The risk assessment, validation and recommendations for these activities are significant to note. Again, the GS-PMO, in coordination with the GSSC, will establish an Integrated Project Team (IPT) to design and perform a limited assessment of select sites to determine if risk premise is valid and deliver recommendations to mitigate data loss and perform long-term archival

➢ Mitigate further loss through compliance guidance and measures

➢ Risk-based Cost/Benefit for historical data update and compliance

➢ Validate risk assumption that geospatial data and its documentation are insufficiently maintained to justify closure / transfer of DOE Environmental Management sites and facilities and pose a possible risk for litigation

➢ Estimate magnitude of 'potential' loss of data and cost implications to mitigate geospatial data loss and compliance

➢ Establish a risk Impact / Probability screen for Senior Management review and priority setting of sites in the Risk Pipeline

➢ Recommend preventative measures to mitigate further loss of data

➢ Develop guidance and documentation for geospatial legacy data compliance

➢ Inform Program Offices on geospatial legacy data management requirements

7.3.2 Business Support Services Segment FY 2008 Transition Strategy

I-MANAGE, as a Program, launched at DOE in 2003, predates the OMB segments requirement. Because of this, the BSS (I-MANAGE) transition strategy was already defined and captured in I-MANAGE documentation. Correspondingly, the target state vision for the BSS Segment is to continue the consolidation of a variety of legacy support systems into an integrated program of support services leveraging a common data warehouse for enterprise reporting.

Goals for this vision include integration with upcoming I-MANAGE systems such as STRIPES (FY 2008 / FY 2009) and SBS (FY 2009 / FY 2010); expand the user base; and continue to achieve collaboration and consolidation opportunities for the Department.

Further, IDW integrates financial and non-financial information and serves as the core reporting source for the Department. Other activities planned for IDW going forward include deploying documented enhancements and change requests; continued interfacing with CHRIS components and with the Project Assessment and Reporting System (PARS) which resides outside of the BSS segment.

I-MANAGE has an approved comprehensive Risk Management Plan that is consistent with both government and industry Risk Management best practices for a mixed lifecycle investment. The Plan reflects the fact that CHRIS is fully operational. STARS and IDW, the two mixed lifecycle I-MANAGE projects, continue to plan for integration of the additional projects, and adjustments in funding to STRIPES and SBS impacts their progress through their phases.

Since the early stages of the I-MANAGE program, continuous improvements in data input and more frequent risk analysis at the I-MANAGE and individual project levels have increased the beneficial usage of tools such as Risk Registers. In an effort to minimize risk within projects, STRIPES and SBS projects continue to leverage the risk strategies previously identified by the more mature projects (STARS, IDW and CHRIS).

Lessons learned during the Post-Implementation Reviews of those more mature projects have been incorporated into STRIPES and SBS project plans. While the fundamental processes (risks ID, evaluation of the probability, impacts of identified risks, and mitigation strategy preparation) have been stable, the I-MANAGE PMO maintains a high-level oversight in risk management.

7.3.3 Environmental Monitoring Segment FY 2008 Transition Strategy

The Environmental Monitoring Segment Transition Strategy outlines how the migration from baseline to target will be achieved and the programs, projects, and investment vehicles that will help support it. The Environmental Monitoring Transition Strategy is represented through Transition Architecture Model, which describes the Segment's programs, projects, milestones, and investments and the relationships between them and other areas of the EA.

The Transition Architecture models how change is implemented and managed. The entity and relationship types that makeup the Segment Transition Architecture are defined below in Figure 29– Environmental Monitoring Transition Architecture Model.
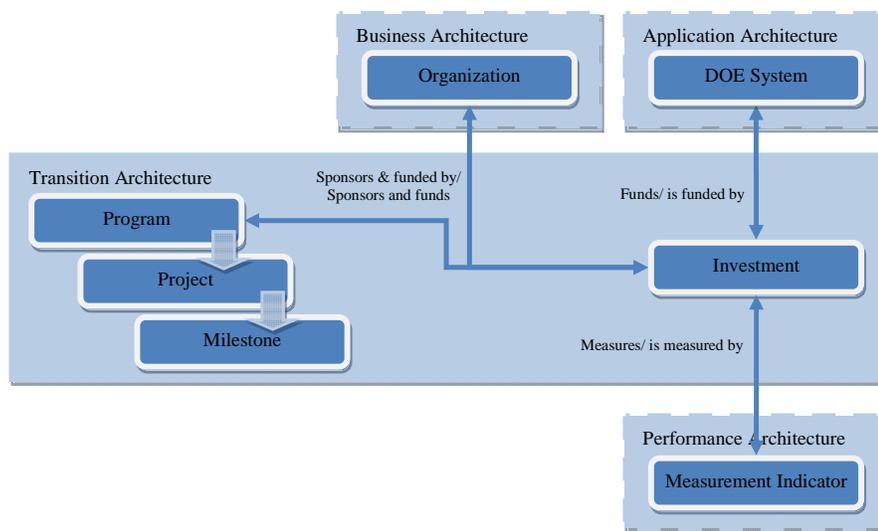

Figure 29 - Environmental Monitoring Transition Architecture Model

These Primary Transition Architecture Entity Types are the following:

- **Program -** A temporary organization or structure set up to drive and coordinate changes in an organization.

- **Project -** A time-delimited set of coordinated and planned activities or tasks that are performed to achieve a set of specific goals and objectives.

- **Milestone -** A specific date on a timeline to be compared with planned dates, either related directly to other objects or via Timeline Event objects.

7.4 DOE's BY 2009 Investments Supporting FY 2008 Segments

As DOE identifies, develops and deploys its EA Segments, it also supports the Transition Strategies of their associated Segment Architectures with key investments.

7.4.1 nvironmental Monitoring Segment BY 2009 Supporting Investments

At this time, there is only one investment directly associated with the Environmental Monitoring segment. The "LM LTS&M SEEPRO, GEMS, & Environmental Systems Spt" OMB-53 provides the funding required to develop and maintain the existing suite of applications owned by the Office of Legacy Management. This investment will also enable the implementation of the new AFDCS system. This is outlined in Figure 30 - Environmental Monitoring Segment BY 2009 Investments.

Direct Investments	
Title	LM LTS&M SEEPro, GEMS, & Environmental Systems Spt
2009 UPI	019-10-01-31-02-3407-00
Full Title	LM LTS&M SEEPro, GEMS, & Environmental Systems Spt
Description	Description: LM Long Term Surveillance & Maintenance Mission. SEEPro, GEMS, and Environmental Systems Support. Operation, maintenance, and Update Services for Environmental Monitoring and GIS systems.
Organizations	LM

Figure 30 – Environmental Monitoring Segment BY 2009 Investments

7.4.2 Business Supporting Services Segment BY 2009 Supporting Investments

A fully implemented I-MANAGE Program will support the accomplishment of the Department's Strategic goal to "Enable Mission through Sound Management". I-MANAGE is the Department's risk adjusted solution for managing enterprise-wide systems initiatives to achieve improved financial and business efficiencies, integrated budget and performance, improved decision making, enhanced security posture, and expanded electronic government in support of the President's Management Agenda.

7.4.2.1 Overview of I-MANAGE Program

The BSS Segment, representing the core of the I-MANAGE Program, demonstrates significant improvement in the Departmental EA based upon three OMB assessment areas (*Federal Enterprise Architecture Program, EA Assessment Framework 2.2, October 2007 page 4*):

- Completion of enterprise architecture
- Use of EA in improved decision-making
- Results to improve agency effectiveness.

The I-MANAGE Program incorporates the core, enterprise-wide projects (subsystems) from three collaborating Department headquarters organizations:

- Office of the Chief Financial Officer
- Office of Human Capital Management
- Office of Management.

These core subsystems of the I-MANAGE program define the scope of the BSS Segment Architecture and consist of:

- CHRIS: The Corporate Human Resource Information System is the human-resources component of I-MANAGE. CHRIS is operational and supports human resource information and processing and is the official system of record for employee information.

- STARS: The Standard Accounting and Reporting System is the financial management component of I-MANAGE. STARS provides a comprehensive, and responsive financial management system that is the foundation for linking budget formulation, budget execution, accounting, financial reporting, cost accounting, and performance measurement.

- IDW: The I-MANAGE Data Warehouse component is the enterprise-reporting facility for I-MANAGE. For reporting purposes, IDW migrates critical information from multiple systems such as human resources, payroll, procurement, and financial management. This data is then aggregated and summarized to provide mission critical reporting and query capability. The IDW provides a single point for reporting. This concept is further explored in Section

- STRIPES: The Strategic Integrated Procurement Enterprise System initiative is the procurement component of the I-MANAGE program, and encompasses both acquisition and financial assistance actions. The STRIPES project will replace and consolidate as many as 30 procurement-related systems across the Department of Energy. It will also improve the efficiency and effectiveness of awarding and administering acquisition and financial assistance instruments. The STRIPES component is the only component that appeared in the SCM/Procurement segment (precursor to BSS) as previously submitted by the Office of the Chief Information Officer to OMB (2/07).

- SBS: The Standard Budget System is the budget formulation and execution component of I-MANAGE. As it replaces legacy systems, SBS will standardize budget formulation and streamline execution processes, integrate and consolidate budget and performance data and support the preparation of the annual budget submission to OMB.

Figure 31 - I-MANAGE Program Vision below shows the overall I-MANAGE program vision that unifies the subsystems.

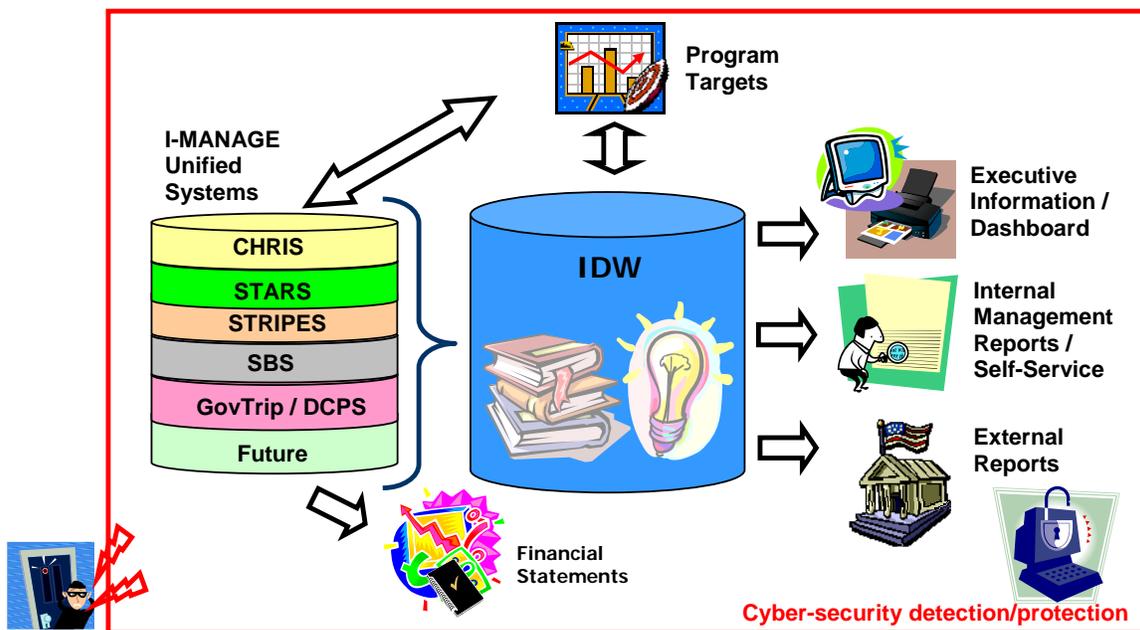**Figure 31 - I-Manage Program Vision**

7.4.2.2 DOE Investment Summary - CF Integrated Management Navigation System (I-MANAGE)

The acquisition and implementation of the two final I-MANAGE systems (STRIPES and SBS) in FY 2008 and FY 2009, will unify several disparate systems into one architecture which can share common data, thus eliminating redundancies and discrepancies by completing the

replacement of multiple, stand-alone corporate business management systems maintained by DOE program offices with a single integrated DOE umbrella system.

A fully implemented I-MANAGE program will support the accomplishment of the Department's Strategic theme "Management Excellence" by standardizing and integrating administrative processes throughout DOE. The Integrated Management Navigation System (I-MANAGE) Program was launched in 2003. I-MANAGE is the Department's risk adjusted solution for managing enterprise-wide systems initiatives to achieve improved financial and business efficiencies, integrate budget and performance, improve decision making, enhance security posture, and expand electronic government in support of the President's Management Agenda. The I-MANAGE Program incorporates enterprise-wide projects from three collaborating headquarters organizations, Office of the Chief Financial Officer, Office of Human Capital Resources, and the Office of Management. The major project investments of I-MANAGE consist of: Standard Accounting and Reporting System (STARS), I-MANAGE Data Warehouse (IDW), Corporate Human Resources Information System (CHRIS), Standard Budget System (SBS), and Strategic Integrated Procurement Enterprise System (STRIPES). SBS and STRIPES are in the acquisition phase. STARS and IDW are mixed lifecycle, and CHRIS is steady state. Operational Analyses were done on CHRIS, STARS, and IDW.

The primary BRM LoBs are: Defense and National Security, Environmental Management, Energy, General Science and Innovation, Service Coverage, Customer Benefit, Security and Privacy, Cycle Time and Timeliness, Quality, Financial, Management and Innovation, Information and Data, and Reliability and Availability.

The program is in lock-step with the Department's current Enterprise Architecture Program and is aligning with the emerging segmented architecture.

The IPT participates in government-wide standards groups that enable E-Gov solutions.

7.4.3 Geospatial Science Segment BY 2009 Supporting Investments

One of the Geospatial Science Program (GSP) Charter (DOE, 2005) Objectives is to "Optimize geospatial resource allocation." A 2007 Planned Activity identified in last year's Geospatial Segment Architecture submission was to review potential funding investment strategies. The Envisioned Outcome was stated as:
Outcome #8: Increased Departmental collaboration on geospatial capabilities to support national defense, basic and applied research, and homeland security issues.

To accomplish this objective, the GSP was to:
"Evaluate the development and submission of an Exhibit 300 Capital Investment Plan to support the transition to the target segment architecture."

As part of the lead up to the establishment of GSP the Department determined the need for geospatial science coordination and formally chartered the GSP. The GSP representation currently provides strategic direction to the OCIO funded service support team to provide technical, administrative and operational support to the GSP. This coordinated response from

the Geospatial Science Program through the OCIO provided further support to the establishment of comprehensive geospatial segment architecture for the DOE.

Geospatial science activities across the Department are funded based upon specific Program Office program/project requirements. In addition, it is estimated that approximately 60% of the geospatial activities across the Complex is funded externally as "work for others."
On April 21, 2006, OMB (OMB, 2006) prepared and released guidelines for agencies to report all major and non-major geospatial investments back to OMB by June 15, 2006. This budget guidance directed all Departments or agencies to identify and report to OMB their geospatial investments and activities as defined by OMB Circular A-16 (OMB, 2002). DOE provided a cross-complex response to the Data Call classifying each identified investment as hardware, software, services (professional), data or other.

While the GSP provides the cross-Departmental coordination, currently no dedicated funding exists for its programmatic execution. Neither an Exhibit 300 nor Capital Investment Plan 53 was deemed feasible to develop for the 2009 submission cycle based on the decision to fund Geospatial activities as part of the programs that these activities are supporting.

7.4.3.1 Investment Summary - Savannah River Mission Support Systems

Savannah River (SR) Mission Support Systems (MSS) supports the FEA BRM Business Area, Management of Government Resources, and the DOE's Environment and Defense LOBs and Missions of the Savannah River Site (SRS), including: 1) accelerated clean up of legacy nuclear waste and facilities, 2) supply of nuclear materials for the nation's weapons programs, and 3) logistics support for the nation's non-proliferation policies. These four systems directly support the President's Management Agenda (PMAs) of Human Capital, Real Property Asset Management, Competitive Sourcing, and expanded E-Gov in support of operations of the site's nuclear processing facilities. MSS supports DOE's Core Mission of Site and Facility Remediation as described in the DOE Enterprise Architecture Transition Plan (EATP), dated February, 2007, and Strategic Theme 4, Environmental Responsibility.

MSS collaborates internally with the Environmental Monitoring Consolidated Infrastructure Investment through the reuse of Hercules for Continuous Asset Management (CAM) to enhance the security profile of the investment. This investment includes steady state operations and maintenance (O&M) of the following systems/projects:

1) PassPort - An integrated work management system to automate the site's nuclear facility maintenance activities and ensure compliance with site technical and nuclear safety requirements. PassPort is a COTS implementation of the Indus Software product.

2) AIM - An integrated configuration management system to maintain the technical baseline(s) of the site's facilities. AIM is a COTS implementation of Intergraph's Asset and Information Management product configured to meet specific nuclear facility management requirements.

3) P&CS - Process and Control Systems (P&CS) are embedded systems within the production facilities that monitor and control nuclear/chemical processes. P&CS includes distributed control systems, data acquisition sensors, and programmable logic controllers managed to comply with technical baseline requirements.

4) EM/NNSA MIPP - Mission information protection programs (labor resources) to ensure computer security support, certification and authorization for operation for systems supporting EM missions, and classified/unclassified NNSA systems.

7.4.3.2 Investment Summary - PNNL EMSL Molecular Science Computing Facility

The Molecular Science Computing Facility (MSCF) is a Mixed Life Cycle investment which is part of the Environmental Molecular Sciences Laboratory (EMSL), a U.S. Department of Energy (DOE) national scientific user facility located at Pacific Northwest National Laboratory (PNNL). The MSCF, managed by the DOE Office of Science (SC) Biological and Environmental Research (BER) Program, provides supercomputing capability to accomplish DOE strategic goal 3.1 to further the President's American Competitiveness Initiative.

MSCF provides supercomputer time and high-capacity data storage systems to its users. MSCF is the only computing facility in the DOE complex that optimizes its systems for the needs of environmental molecular sciences. For example, it is a key tool in DOE's efforts to predict contaminant movement and the impact of remediation methods at contaminated DOE sites, enhance chemical processes (e.g., catalysis) for more efficient energy utilization and less environmental impact, and improve the general understanding of complex and coupled chemical, biological and physical processes.

Following best practices, MSCF maintains a system lifecycle in which high performance systems are replaced every three years. New systems are acquired by procuring commercially available hardware and software via fixed price contracts. Procurement cycles are timed so that new systems complete acceptance when the previous-generation system reaches obsolescence. The current supercomputer is a Linux-based system with a peak performance of 11.8 teraflops and 9.7 terabytes of memory.

MSCF supercomputer time is made available to users funded by DOE's basic (Biological and Environmental Research, Basic Energy Sciences, etc.) and applied R&D (Environmental Management, Legacy Management, Nuclear Energy, Energy Efficiency) programs, as well as users funded by other Federal agencies (e.g., NSF, NIH, USGS, DOD, EPA, etc.)

During development of the BY09 business case, MSCF Project Management reevaluated the investment's PMA alignment and determined it supported only the R&D Investment Criteria in the PMA (as no PMA E-Gov initiative exists for high performance computing). MSCF supports the Scientific and Technological Research and Innovation sub-function of the General Science and Innovation LOB of the Services for Citizens business area of the BRM, and provides computational resources as "Services for Citizens" (001109026) in "Research and Development" (002202069)

8   The DOE FY 2008 Segment Sequencing Plan

Just as each featured segment has a Transition Strategy of its own to migrate from its Baseline Architecture to its Target Architecture, it will also have a Sequencing Plan to execute that Transition Strategy. This means as before with Segment Transition Strategies, as more Segments are identified, developed and deployed, the more the Segment Sequencing Plans taken together fill out the DOE Target Enterprise Architecture Vision with Segment Target Architectures.

As such, the DOE Sequencing Plan for FY 2008 is the set of the Segment Sequencing Plans for the FY 2008 featured Segments taken together to realize their respective Segment Transition Strategies as the Interim Target for FY 2008. Each of the FY 2008 Segment Sequencing Plans is described in the sections that follow.

As discussed before, the progress of the individual Segment Architectures is a collective EA advance by DOE to fulfill its Target Enterprise Architecture Vision. As more prospective Segments are selected and implemented, there will be more of an opportunity for a "consolidated" DOE Sequencing Plan. However, and especially in FY 2008 with just three featured segments, this is impractical and likely misleading. As a result, in the following sections, the Sequencing Plans for the FY 2008 Segments will be described individually. Also the DOE Major DME Investments do have a "consolidated" detailed Sequencing Plan that includes both Activity Milestones and Performance Goals. This will be found discussed in:

- Volume 2, Sections 3.4 – BY 2009 Major DME Investment Activity Milestone Sequencing Plan

- Volume2, Section 4.0 – EA Performance Goals and Outcomes at DOE

8.1   Geospatial Science Segment FY 2008 Sequencing Plan

The first priority for the Geospatial Science Segment is to establish an enterprise-wide shared GIS architecture that would involve the following activities in FY 2008:

- Complete draft GIS program plan

- Upgrade and deploy existing servers

- Develop DOE geospatial science plan

The second priority for the Geospatial Science Segment is to populate DOE GIS data servers with comparable and extensible geospatial data sets that would involve these activities in FY 2008:

- Develop geospatial data migration plan

- Implement data standards and policies

- Acquire enterprise licenses for data/software

- Populate servers with initial key data

8.2 Business Support Services Segment FY 2008 Sequencing Plan

The deployment of the two I-MANAGE subsystems under development, STRIPES and SBS, will unify several disparate systems into one architecture which can share common data, thus eliminating redundancies and discrepancies by completing the replacement of multiple, stand-alone business management systems maintained by DOE program offices within a single integrated DOE enterprise system. Figure 32 - Business Support Services FY 2007 Actual Results shows the actual accomplishments in FY 2007 for the segment.

I-MANAGE FY 07 Actual					
	FY 06 Q4	FY 07 Q1	FY 07 Q2	FY 07 Q3	FY 07 Q4	When
CHRIS	Operational	Operational	Operational	Operational	Operational	FY 98
STARS	Operational	Operational	Operational	Operational	Operational	FY 05
IDW	Operational	Operational	Operational	Operational	Operational	FY 06
STRIPES	Development	Development	Development	Development	Development	FY 08
SBS	Requirements	Requirements	Requirements	Analysis	Analysis	FY 09

Figure 32 - Business Support Services FY 2007 Actual Results

As summarized in Figure 33 – Business Support Services FY 2008 Planned Results below, the subsystem components of the I-MANAGE program continue to evolve along with budget requests that focus spending shifts between individual projects. FY 2008 funding will provide for implementation of STRIPES and design of SBS. Out year funding will provide for the implementation of SBS. STARS focus will be on continued integration development with STRIPES and SBS, while the IDW will continue expansion of data sources.

I-MANAGE FY 08 Planned					
	FY 07 Q4	FY 08 Q1	FY 08 Q2	FY 08 Q3	FY 08 Q4
CHRIS	Operational	Operational	Operational	Operational	Operational
STARS	Operational	Operational	Operational	Operational	Operational
IDW	Operational	Operational	Operational	Operational	Operational
STRIPES	Development	Development	Operational	Operational	Operational
SBS	Analysis	Analysis	Development	Development	Development

Figure 33 - Business Support Services FY 2008 Planned Results

As shown in Figure 34 – I-MANAGE Timeline below, the overriding sequencing for the I-MANGE Program centers on continuing migration of projects (subsystems) from development into operation; inclusion of more business support systems into the I-MANAGE Program and continued enhancements to operational subsystems to reflect functionality and contributions to overall Department success.
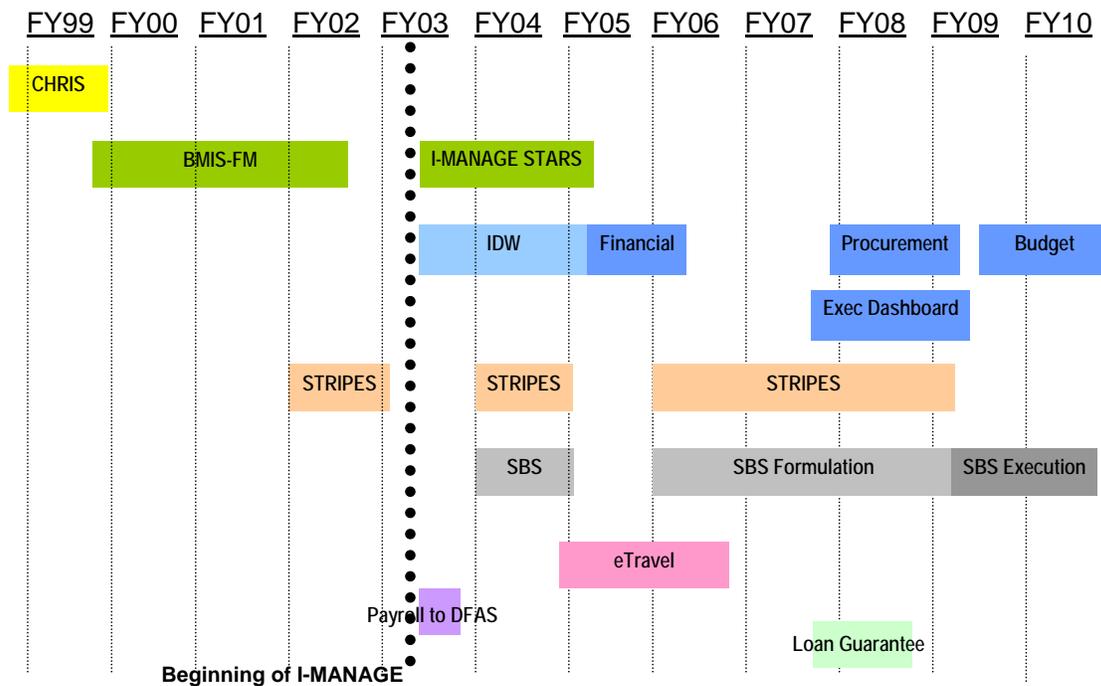

Figure 34 - I-MANAGE Timeline

8.3   Environmental Monitoring Segment FY 2008 Sequencing Plan

To achieve the target vision, a series of ongoing projects will be maintained. The core effort focuses on the completion of the AFDCS Ferdinand Pilot and subsequent implementation. Figure 35 – Segment Sequencing Plan below illustrates this schedule.

#	Project	FY08			FY09
		Q2	Q3	Q4	Q1
1.	FDCS Implementation	Enterprise System Implementation		Final Testing and Customer Acceptance	
2.	SMS Lab Data Exchange	Modify System to Facilitate XML Data Interchange	Final Testing and Customer Acceptance		
3.	GEMS & SEEPro Maintenance		Implement SEEPro Next Release	Final Testing and Customer Acceptance	

Figure 35 - Segment Sequencing Plan

**Figure 37 -
Target
Environment
al Field
Sampling
and**

DOE Transition Strategy and Sequencing Plan
Volume 1 – The 2008 Annual Report – DOE Segment Architectures and Transition Strategies

9   Volume 2 – Investment and Performance Details

The DOE Transition Strategy and Sequencing Plan continues in Volume 2, **_DOE Investments and Performance Details_**. In this next volume of the 2008 Annual Report, the topics that are discussed include:

- EA and the Management of DOE's Most Efficient Organization (MEO)

- How DOE used EA to Assess and Approve BY 2009 Investments

- The range of DOE Major Investment projects

- The Performance Goals and Measures associated with the DOE Major Investments

- The DOE Sequencing Plan, including milestones, for the agency's Major Investments.

- Examples of EA Use at DOE.

The Figure 36 - The Overall Structure of the TS&SP is a duplicate of an earlier diagram, but it is provided here again only as a convenient reminder and reference of how the various parts of the TS&SP fit together.
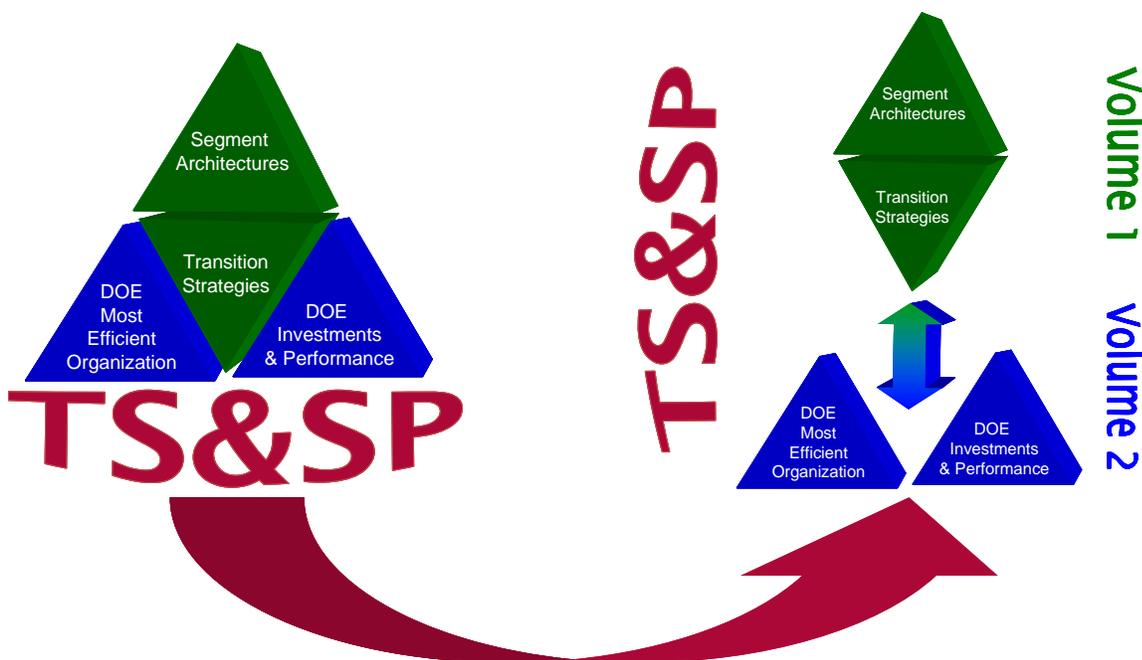

Figure 36 - The Overall Structure of the TS&SP